C. Chestnut Creek Management Unit 3

1. Summary Description

This section is intended to summarize the overall character and condition of Management Unit 3 (MU3). Subsequent sections will discuss specific issues (e.g., *riparian* land use and public infrastructure, channel *stability*, etc.) in greater detail.

MU3 is approximately 2400 linear feet (0.46 miles) in length and includes the segment of Chestnut Creek from approximately 300 feet downstream of Benton Hollow Road culvert, to approximately 450 feet upstream of Scott Brook (Photo 1). The drainage area at the upstream and downstream ends of the management unit is 1.21 and 1.49 square miles, respectively, without introduction of any major tributaries and only a few small springs (MU3 General map, Figure 1).

Land use along the stream corridor is predominantly forest along adjacent hillslopes located within six privately owned parcels. The parcels contain several small, scattered private residences situated along the northern banks of the active stream channel. Although privately owned, only a small percentage of the land area is maintained as lawn or contains impervious surface. This section of Chestnut Creek has had minimal anthropogenic influences.

Photo 1. Looking downstream from above XS-52.

An analysis of a series of historic aerial photographs covering the period 1963-2001 documents the stability of the reach and consistent land use. The area remained forested with dense vegetation covering the stream channel and minimal change in land use or *riparian* structure in nearly 30 years. There was no evident change in channel *planform*, or stream pattern, through the aerial series. Aerial photos 2, 3, & 4 taken in 1974, 1985, and 2001 illustrate greatest contrast.

Field inventories, as well as information obtained from interviews with residents and town officials, indicate that MU3 has undergone minimal maintenance activity. Relatively minimal stream stabilization has is occurred along stream channel within the management unit. Efforts by landowners to protect property resulted in 50 feet of concrete block wall near the downstream end of MU3. Almost 700 feet of stone wall was also inventoried. Although perceived to be a result of historic land clearing, and not for flood mitigation, the stone wall may act as an unnaturally high, hardened bank during periods of high flow. These stone walls may constrict and entrench the channel and accelerate water velocities potentially causing unforeseen erosion or other problems both locally and downstream.

The general physical character of the corridor along MU 3 varies in physical

Photo 2. 1974 Aerial Photograph of MU3.

Photo 3. 1985 Aerial Photograph of MU3.

Photo 4. 2001 Aerial Photograph of MU3.

shape or *morphology*, floodplain function, and riparian habitat. From field observation and the aerial photographic series, current vegetative communities seem to be significantly healthier than other downstream units, transitioning from MU2 sand bed, grass dominated corridor through Benton Hollow Road culvert, to a the top of MU3 becoming a forested corridor, consisting of larger mature hardwoods and Hemlocks through the unit (Photo 5). The stream channel becomes less connected to its historic floodplain with coarser *sediment* within the channel boundary.

As documented in following management unit descriptions, downstream units of Chestnut Creek have been substantially modified by development within the stream corridor. These modifications have degraded habitats through a variety of means, including the fragmentation and destruction of habitat by road construction and development, and the introduction of *invasive* plants, such as *Japanese knotweed* and *multiflora rose*. These invasive species, as well as the anthropogenic modifications to the riparian corridor have jeopardized important secondary corridor benefits;

Photo 5. View looking downstream at XS-55. Shows a forested riparian habitat.

including critical habitat, food, shade for the stream, filtering mechanism for pollutants in runoff, and travel ways for wildlife. The ability to support present and future wildlife populations, including riparian habitat critical for migratory birds, waterfowl, and other river dependant species will be heavily dependant upon the management of riparian lands. Therefore, the focus of concern for MU3 is for the preservation of the current healthy riparian community, which will, in turn, assist in preserving the general physical stability of the unit.

2. Riparian Land Use and Public Infrastructure

There are six known property parcels in MU3, which contain or are bounded by the stream corridor. The current stream corridor through MU3 is currently sparsely populated and displays only minor anthropogenic impact. There were no culvert or bridge crossings, stormwater outfalls, or known underground stream crossings documented in the 2001 Stream Assessment Survey . However, as outlined in downstream units, historic development and continued management activities have negatively affected stream corridor potential in the lower Chestnut Creek. This development and encroachment has resulted in undesirable impacts both at the Management Unit level, and has potential impacts throughout the entire system.

3. History of Stream and Floodplain Work

Efforts by streamside landowners to protect property have resulted in revetment through approximately 1.1% of the channel through this unit. A single concrete block wall measuring 54 feet was documented running along the channel's left bank. During the assessment in 2001 the wall was failing and much of the stream bank was exposed to erosive forces. The concrete wall appears to have failed by the water *eroding* the bank behind the revetment. Piled stone wall along the stream channel banks, possible from agricultural land clearing, accounts for 14% of the altered bank. An assessment of the historical aerial photography of MU3 did not reveal any further significant stream channel stabilization, modification, or maintenance.

General impacts of traditional approaches to stream management have been addressed in the Watershed Recommendations for Best Management Practices, Volume II, Section II.A of this plan. Specific impacts and management considerations in relation to the assessment of MU 7 are included with this section of the plan.

4. Channel Stability and Sediment Supply

Following the 2001 Stream Assessment Survey, MU3 was divided into thirteen *reaches* on the basis of the Level II – *Morphologic* Description (Rosgen, 1996). (MU3 Stream Types and Cross Sections map, Figure 2).

The overall physical structure of the reach changes primarily by the varied encroachment of high banks along the active channel. The impingements of the high banks create multiple *entrenchment* changes over relatively short segments.

The largest portions of this unit include slightly and moderately *entrenched* C and

B channel types (Photo 6 shows C-type, Photo 7 shows B-type). Mature trees and shrubs provide lateral control along the majority of these reaches. Slightly and moderately entrenched reaches benefit from the deep-rooted structure and stability of mature vegetation.

Highly entrenched reaches (i.e., F-types) account for 28% of the total length. Because they lack a wide floodprone area, entrenched reaches experience considerable stress during storm flow and tend to be more susceptible to stability problems, particularly bank *erosion* and bed scour or *degradation*. In addition, these types of channels route storm flow quickly to downstream reaches where they can contribute to channel instability and flooding. The stream types tend to shift multiple times throughout the unit, which could indicate an imbalance and should be monitored. The morphological data collected through the unit is summarized in Table 1 and illustrated in Figure 2.

Photo 6. View looking downstream at XS-41, C-type stream.

Photo 7. View looking downstream from right bank towards left bank at XS-44, B-type stream.

The majority of the stream channel bed material in MU3 is composed of gravel, with 150 feet of the stream bed consisting of bedrock in one continuous section.

The 2001 Stream Assessment Survey identified several debris jams and other dam-like structures, both human-made and natural (Photo 8). Debris jams and other channel obstructions may cause problems by trapping sediment, which initiates and/or accelerates the development of gravel bars and reduces channel capacity. Debris jams can cause an increase in flood stage and result in bank erosion. Alternately, small blockages that don't span the entire channel width, can create and maintain beneficial physical habitat, as well as assist in controlling stream channel *incision* and degradation. Although the current debris jam appears stable, regular monitoring can detect a potential future problem. The monitoring should include an inventory of the debris jam to include the potential future problems such as risk of sudden release of the sediment and debris.

The 2001 Stream Assessment Survey documented approximately 490 feet (10.2%) of channel containing mid-channel and lateral bars. The majority of the bars are vegetated with grasses and shrubs and considered natural occurrences for the current channel morphology. With exception to the debris jams and dams, MU3 is considered in balance with its

Table 1 - Summary of Morphological Data for Reaches along Management Unit 3.

Reach	Length (ft)	Area (ft^2)	Width (ft)	Mean Depth (ft)	W/D	Ent	Slope (ft/ft)	Stream Type
1	731	15.8	20.2	0.8	27.0	3.1	.014	C4
2	99.5	19.2	16.4	1.2	13.8	1.4	.018	B4
3	218.5	21.1	24.2	0.9	27.5	2.4	.016	C4
4	330	22.2	36.3	0.6	59.0	1.0	.039	F4b
5	391.5	21.2	23.7	0.9	26.5	1.8	.037	B1
6	83	19.9	17.9	1.1	16.0	7.3	.021	C4b
7	30	17.2	19.1	0.9	21.0	1.2	.029	F4b
8	220	17.3	15.8	1.1	14.0	1.9	.027	B4
9	90	22.5	17.9	1.3	14.0	1.1	.020	F4b
10	122	16.1	14.5	1.1	13.0	4.8	.023	C4b
11	172	16.8	18.1	0.9	20	1.2	.030	F3b
12	87	22.4	18.2	1.2	15	1.6	.020	B4
13	31	20.6	18.8	1.1	17	1.0	.030	F4b

current sediment regime, meaning that it transports sediment sufficiently to neither degrade nor aggrade its stream channel.

A number of physical constraints were inventoried within the unit, both natural and human-made. These include stonewalls, concrete blocks, and natural topography, which laterally control the unit alignment. Exposed moss covered bedrock currently provides grade control along a portion of the unit (Photo 9), thereby preventing channel degradation.

Photo 8. View looking upstream from below XS-47. Sediment has accumulated due the debris jam shown above.

Preliminary observations indicate that most of the channel along this management unit is laterally stable (i.e., bank erosion rates are low) which includes areas along high banks (Photo 10). Mature trees and shrubs also provide lateral control along the majority of the management unit. The 2001 Stream Assessment Survey determined that 117 feet (2.4%) of the streambanks are actively eroding. The erosion occurs in three small sections ranging from 15-50 linear feet and mostly consists of slightly undercut areas along low banks (Photo 11). The erosion appears local in nature, should require little or no intervention, and potentially adds to the fish and wildlife habitat.

A component of the stream assessment included evaluating the reaches along Chestnut Creek to determine the relative

Photo 9. View of bedrock, looking upstream from below XS-48.

Photo 10. View looking upstream towards dam at XS-46.

Photo 11. View looking downstream at XS-54.

contribution to sediment problems in the Chestnut Creek/Rondout Reservoir System. The sediments eroded from the reaches along Chestnut Creek are generally coarse (i.e., sand, gravel and cobble). Unlike other watersheds where exposed *silt* or clay deposits are a water quality concern because they contribute very fine material to the suspended load, these coarser sediments tend to move as bed load and settle out quickly after storms. The preliminary results of the fieldwork indicate that MU3 currently has minimal impact to the overall sediment supply of the Chestnut Creek. Debris jams that seem to be collecting sediment should be evaluated and addressed in order to maintain sediment transport capacity.

5. Riparian Vegetation

The riparian area in Management Unit 3 is generally stable and consists of mature trees and shrubs (Photo 12). Vegetated riparian zones act as buffers against pollution and are therefore very important in mitigating the adverse impacts of human activities. Forested riparian buffers facilitate stream stability and function by

Photo 12. View looking upstream at XS-53, with cobble bed.

providing rooted structure to protect against bank erosion and flood damage. Streamside forests also reduce nutrient and sediment runoff, provide organic matter that can be used by aquatic animals, while providing shade to dampen fluctuations in stream temperature. Wide forested riparian buffers protect streams from runoff and generally provide better habitat than narrow buffers.

6. Restoration and Management Recommendations

As presented previously, the Chestnut Creek Management Plan will be utilized to guide and facilitate stakeholders in their efforts to correct stream channel instability problems, restore and maintain natural floodplain functions, control runoff from developed areas to reduce pollutant loadings from channel and upland sources, restore and protect in-stream habitat, and reduce the need for future channel maintenance.

This section includes specific restoration and management recommendations for Management Unit 3, as well as a general discussion of the approach to stream corridor restoration and management recommended for the Chestnut Creek Watershed. The SCSWCD, NYCDEP, and other agencies and organizations will be working with the community to implement the restoration and management strategies outlined in this Management Plan. It is critical that stream and upland area projects be integrated to avoid potential conflicts in their respective objectives. Therefore, this section also includes comments and recommendations regarding the integration of proposed strategies in upland areas, in particular floodplain management and storm water management practices.

Restoration and Management Recommendations Management Unit 3

1. Promote protection and preservation of the current riparian areas. Implement strategies to educate riparian landowners on the benefits of preserving the current riparian area and limiting land use changes.

2. Promote protection of the current stream channel. Implement strategies to educate adjacent landowners on the benefits of sustaining naturally functioning stable stream reaches.

3. Evaluate the existing failing *revetment* for replacement with an adequate stabilization structure which will maintain and promote a naturally function stream channel. Any stabilization technique should incorporate *bioengineering* and/or re-vegetation.

4. Perform stabilization techniques only where necessary using best management practices which promote and maintain a naturally functioning stream channel. Stabilization techniques should only include methods which assist in the natural recovery of the localized sections and which will benefit the reach.

5. Promote floodplain protection, which is critical in maintaining stream stability in moderately entrenched reaches.

6. Monitor the areas containing debris jams and channel blockages for changes in channel stability.

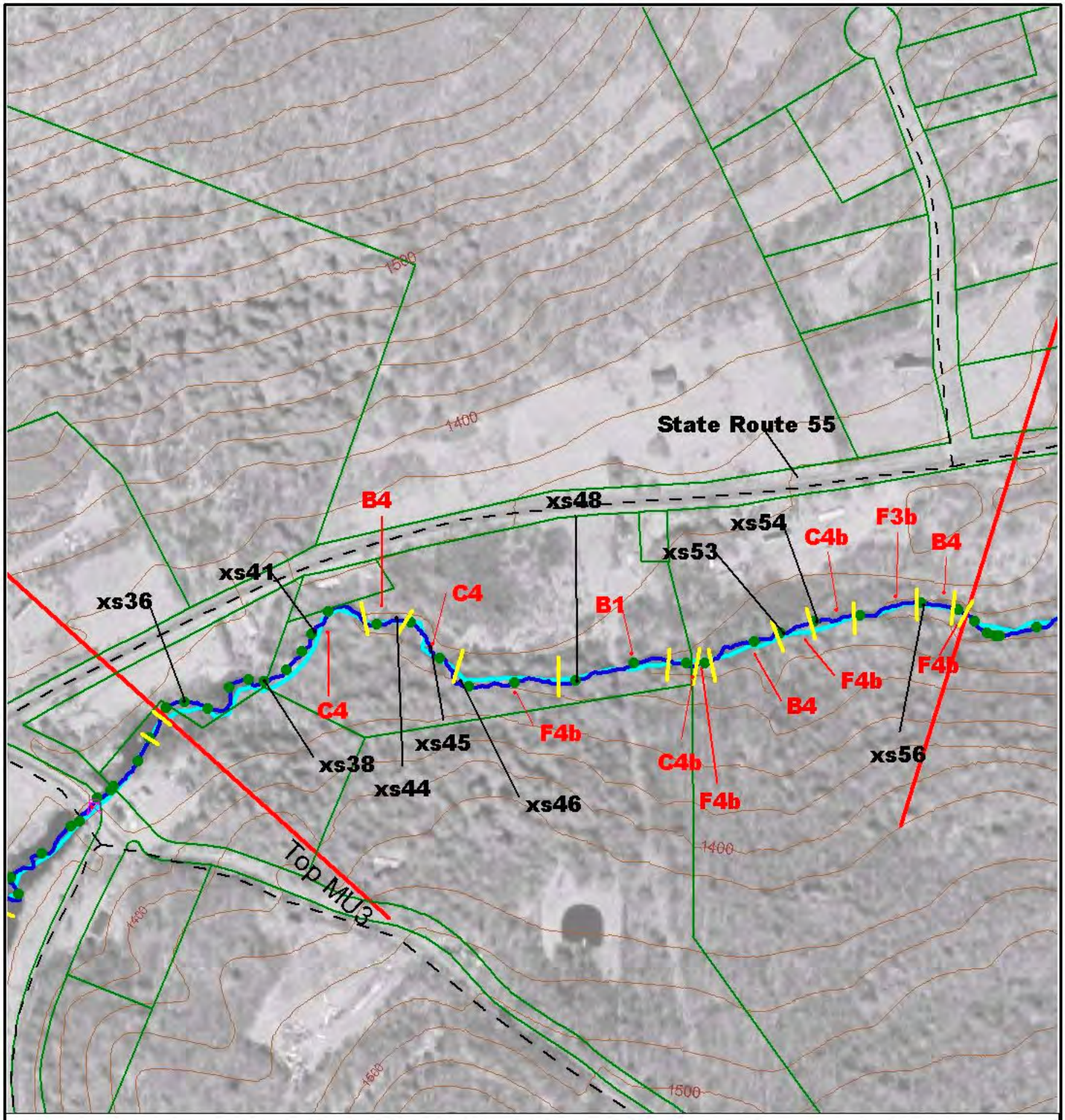

Figure 2. Chestnut Creek MU3 Stream Types & Cross Sections

Stream Assessment Survey 2001

N

Contour Interval 20 feet

200 0 200 400 Feet

1:4,000

*See Disclaimer

Legend

- Management Unit Limits
- Cross Sections
- Monitoring cross section
- B3 Rosgen Stream Types
- Roads
- Neversink Parcels
- Mainstem Chestnut-GPS CL
- Digitized stream location
- Stream type breaks
- Stream Crossing (bridges show inlet/outlet)

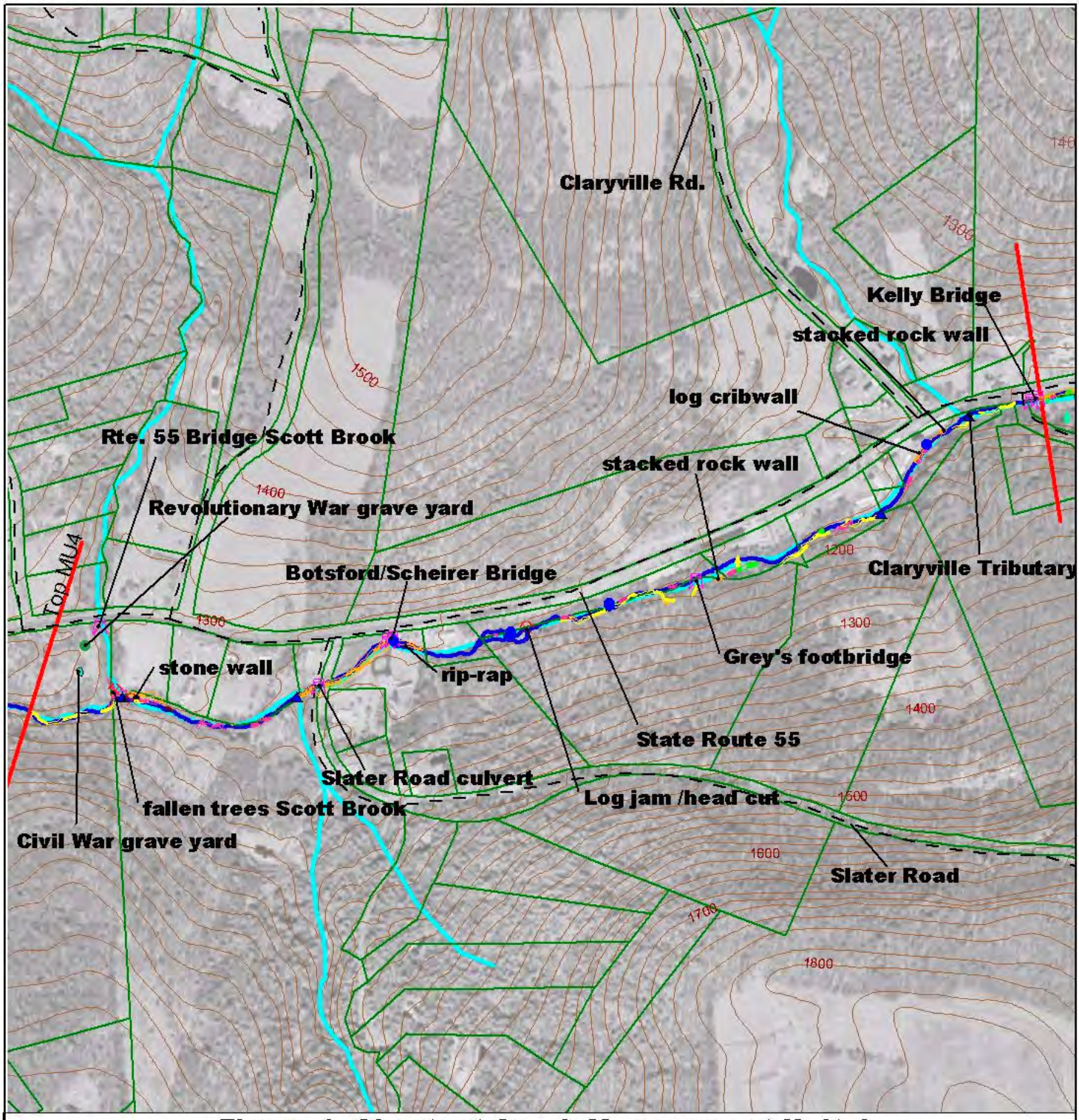

Figure 1. Chestnut Creek Management Unit 4

Stream Assessment Survey 2001

N

Contour Interval 20 feet

400 0 400 800 Feet

Scale 1:7,500

*See Disclaimer

Legend

- Neversink Parcels
- Management Unit Limits
- Revetment
- Road
- Stream Crossing (bridges show inlet/outlet)
- Drainage culvert
- Digitized stream location
- Mainstem Chestnut-GPS CL
- Landfills
- Tributary confluence
- Bedrock
- Erosion
- Debris Jams or Dams
- Knotweed