3.3 Watershed Assessment and Inventory

A watershed assessment protocol was prepared to support the development of the Schoharie and East Kill Stream Management Plans. The protocol was meant to provide the project team with a general baseline inventory of conditions throughout the stream corridor.

Schoharie/East Kill project team near a dam in the upper Schoharie

Stream Feature Inventory

In the initial stages of a watershed assessment and planning effort, it is necessary to gain a basic familiarity with the stream corridor and surrounding watershed. An inventory of stream features can reveal trends important to understanding the stream system. The stream feature inventory protocol provided an inventory of the following features:

1) Conditions that affect hydraulic function, particularly sediment transport function such as bedrock sills and banks, cultural and natural grade controls, berms, and rip-rap or other revetment, and inadequate riparian vegetation;

2) Potential sources of water quality impairment in the corridor, especially eroding banks, clay exposures, road runoff outfalls, dumps sites, and exposed septic leach fields or other hazards;

3) Locations of bank erosion monitoring sites to be monumented and surveyed for study of bank erosion rates;

4) Infrastructure, including road crossings, bridge abutments, culverts and outfalls, and utility lines or poles;

5) Other features such as tributary confluences, water intakes, springs, wells, diversions, and invasive species.

This stream feature inventory was also used to help define and prioritize further assessment, and scope the issues to be addressed in the management plan. Most of the data presented in the Management Unit Descriptions in Section 4 was derived from the stream feature inventory walkover conducted during the Summer of 2006. The Trimble GeoXH Global Positioning System (GPS) was used to map locations of features described above. Photographs and attribute data were also taken at each feature. Protocol used for attribute collection is detailed in Appendix E, Stream Management Data Dictionary Guide.

Schoharie Project Team Member assesses a stretch of Schoharie Creek as part of 2006 walkover.

Following collection, all data was integrated into a common geodatabase using the Stream Analyst ArcGIS extension. The geodatabase is the common data storage and management framework for ArcGIS. It supports all the different types of data that can be used by ArcGIS such as; attribute tables, geographic features, and survey measurements. Utilizing GPS coordinates, each feature was then linked to the management unit in which it was located creating an improved organizational structure and allowing for the reporting of stream feature statistics based on management unit. The first page of each of the Management Unit Descriptions in Section 4 presents the results of this data for each individual management unit. The following are summary statistics for the Schoharie Creek mainstem.

2006 Schoharie Creek Stream Feature Statistics

6 miles or 20% of streambanks had experienced erosion
7.4 miles or 24% of streambanks had been stabilized
82 feet or 0.1% of streambanks had been bermed
1.6 miles of clay exposures
698 acres of inadequate vegetation within 300 ft of Schoharie Creek
23 miles of road within 300 ft of Schoharie Creek
354 structures located in 100-year floodplain

Riparian Vegetation

Riparian vegetation mapping of a 300-foot stream corridor was conducted to identify the status of the vegetative community, and identify areas in need of enhancement. This protocol provided a characterization of the vegetative community (physiognomic) structure of riparian areas from remotely-sensed data. Characterizing riparian vegetation supported the assessment of the capacity of the riparian buffer to mitigate potentially deleterious water quality impacts from upland land uses. In addition, riparian classification defines the role of vegetation in the cohesiveness of stream bank soils and the integrity of the stream and riparian ecosystems. This analysis will lead to recommendations of where improvements to the riparian buffer may be most critical and/or effective, and locations of reference riparian vegetative communities within the watershed. The mapping also provided the area of impervious surfaces (e.g. roofs, driveways, roads) within the 300 foot buffer. The complete protocol and resulting riparian vegetation maps are located in Appendix B. Planting recommendations and descriptions of the existing riparian community are presented in each management unit (Section 4).

Japanese Knotweed Mapping

As part of stream feature inventory, locations of Japanese knotweed (*Fallopia japonica*) along the streambank were identified. This invasive species has become a widespread problem in recent years, shading out other species and not providing adequate root structure to stabilize the soil in streambanks. The results can include rapid streambank erosion and decreased community richness. Japanese knotweed occurrences are discussed in each management unit (Section 4) and included on the riparian vegetation maps located in Appendix B.

Historical Channel Alignments

A series of historical stream channel alignments from 1959, 1967, 1980, 2001, and 2004 was used to determine the frequency and magnitude of historical channel avulsions. ArcGIS 9.2 was used to georeference aerial photographs, when necessary, and then used to digitize each stream channel alignment. The alignment from each flight series was compared to locate areas of historic instability. This characterization was also one criteria used to divide the stream corridor into management units. Historic stream channel alignments from 1959, 1980, and 2001, overlayed with the 2006 aerial photographs, can be viewed in each management unit under historic conditions.

<u>Management Unit Delineation</u>

To describe the current conditions and recommendations for the stream corridor, the 30.2 miles of Schoharie Creek was divided into eighteen management units based on the following criteria:

1) Valley Slope - A profile of the valley slope was created using United States Geologic Survey contour data. This profile was divided into segments based on common slope characteristics (Figure 3.3.1).

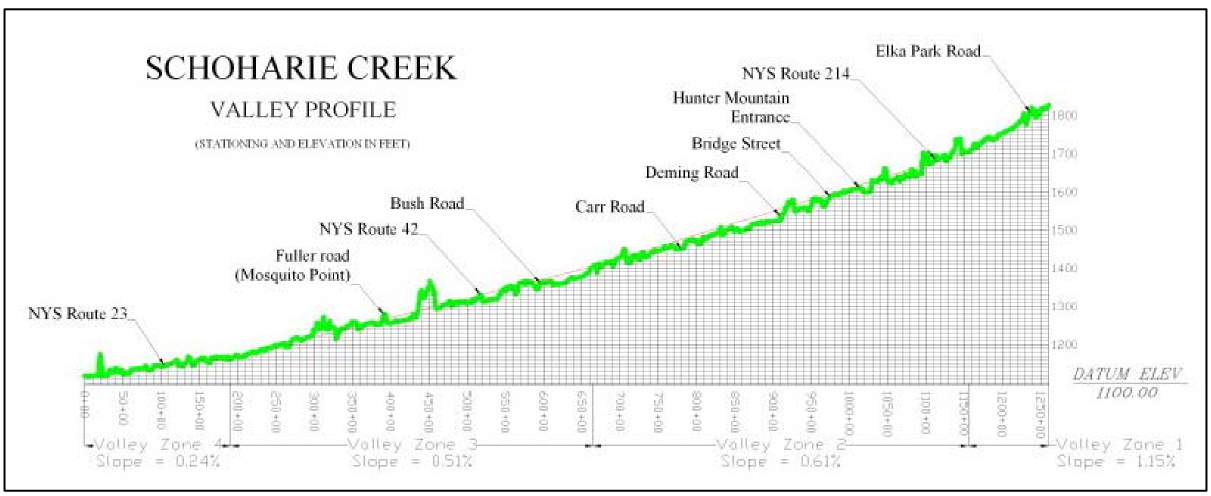

Figure 3.3.1 Schoharie Creek Valley Profile

2) Valley Confinement - The width of the 100-year floodplain was measured perpendicular to the valley fall line at each of the cross-sections along the mainstream, and the ratio of the width to bankfull and floodprone width at each was determined. A graph of these ratios was generated and analyzed to identify segments exhibiting common valley confinement characteristics.

3) Historical Channel Alignment - Stream alignments were created from 1959, 1967, 1980, 2001 and 2004 aerial photographs (as described above). These alignments were overlaid to determine segments of historical stream instability.

4) Vertical and Lateral Controls - Bedrock channels and banks, revetments, bridges and berm locations were documented in the 2006 GPS walkover. Frequency of occurrence of these controls influenced management segment breaks.

The resulting 18 management units are described in Section 4 and depicted in Figure 4.0.1. The data were then compiled by management unit to facilitate interpretation of conditions, trends and to make recommendations.

Bank Erosion Monitoring Sites (BEMS)

Using data collected from the 2006 stream feature inventory ten bank erosion monitoring sites were chosen along the Schoharie Creek. These banks were monumented and cross-section and long profile surveys were conducted for the purpose of long-term monitoring. To determine the distribution of bed material at each cross-section a pebble count in accordance with the Modified Wolman Pebble Counts Procedure was performed.

Bank erosion sites were evaluated using Rosgen's Bank Erodibility Hazard Index (BEHI) (Figure 3.3.2). BEHI is a means of measuring the potential for significant bank erosion at specific locations. This tool was used to evaluate and predict the potential for bank erosion at each bank erosion monitoring site. The BEHI method evaluates bank erosion potential by measuring seven criteria; bank height versus the *bankfull stage*, ratio of riparian vegetation rooting depth to stream bank height, bank angle, percentage of root density, composition of stream bank materials, soil stratification, and bank surface protection afforded by debris and vegetation. As the ratio of bank height to bankfull depth increases, the potential for bank erosion increases. Steep bank angle, low root density, high soil stratification and homogeneous particle distribution contribute to a higher potential for bank erosion. Values of these seven criteria are calculated and each assigned an index number, which are totaled to determine bank erosion potential.

BANK EROSION HAZARD INDEX

SITE: Stony Clove BEHI#							DATE:						
DATA COLLECTED BY:							LOCATION:						
Notes:													
CRITERIA		VERY LOW		LOW		MODERATE		HIGH		VERY HIGH		EXTREME	
		VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX	VALUE	INDEX
BANK HT/ BKF HT		1.0 - 1.1	1.0 - 1.9	1.1 - 1.19	2.0 - 3.9	1.2 - 1.5	4.0 - 5.9	1.6 - 2.0	6.0 - 7.9	2.1 - 2.8	8.0 - 9.0	> 2.8	10
ROOT DEPTH / BANK HEIGHT		1.0 - 0.9	1.0 - 1.9	0.89 - 0.50	2.0 - 3.9	0.49 - 0.30	4.0 - 5.9	0.29 - 0.15	6.0 - 7.9	0.14 - 0.05	8.0 - 9.0	< 0.05	10
ROOT DENSITY (%)		100 - 80	1.0 - 1.9	79 - 55	2.0 - 3.9	54 - 30	4.0 - 5.9	29 - 15	6.0 - 7.9	14 - 5	8.0 - 9.0	< 5	10
BANK ANGLE (DEGREES)		0 - 20	1.0 - 1.9	21 - 60	2.0 - 3.9	61 - 80	4.0 - 5.9	81 - 90	6.0 - 7.9	91 - 119	8.0 - 9.0	> 119	10
SURFACE PROTECTION (%)		100 - 80	1.0 - 1.9	79 - 55	2.0 - 3.9	54 - 30	4.0 - 5.9	29 - 15	6.0 - 7.9	15 - 10	8.0 - 9.0	< 10	10
TOTALS													
NUMERICAL ADJUSTMENTS	None												
TOTAL ADJUSTED SCORE													**0.0**

BANK MATERIALS:
- BEDROCK: BANK EROSION POTENTIAL ALWAYS VERY LOW
- BOULDERS: BANK EROSION POTENTIAL ALWAYS LOW
- COBBLE: DECREASE BY ONE CATEGORY UNLESS MIXTURE OF GRAVEL/SAND IS OVER 50%
- GRAVEL: ADJUST VALUES UP BY 5 - 10 POINTS DEPENDING ON COMPOSITION OF SAND
- SAND: ADJUST VALUES UP BY 10 POINTS
- SILT/CLAY: NO ADJUSTMENT

STRATIFICATION: 5 - 10 POINTS (UPWARD) DEPENDING ON POSITION OF UNSTABLE LAYERS IN RELATION TO BANKFULL STAGE

BANK EROSION POTENTIAL	
Very Low	5-9.25
Low	10-19.5
Moderate	20-29.5
High	30-39.5
Very High	40-45
Extreme	46-50

Figure 3.3.2. Sample BEHI data collection sheet from Rosgen, Dave "Applied River Morphology." Wildland Hydrology Books, Pagosa Springs, Colorado, Table 6-8, pg. 6-41, 1996 revised 2001