## Section 2 - Stream Corridor Plan Recommendations

# 2. Stream Corridor Management Plan Recommendations

## Introduction

**"The traditional engineering approach to river development has failed to incorporate the practical, physical, aesthetic and financial advantages of approaching river management as maintenance of natural tendencies in river channel behavior." Luna Leopold**

Traditional stream management practices typically focus on single objectives such as bank stabilization or flood threat reduction. While dumped stone, riprap and other hard armoring techniques may achieve the goal of localized bank *stability* or protection, the application of these techniques generally does not consider potential causes or effects downstream, upstream or outside the immediate project area. Additionally, other stream processes such as channel and *floodplain* interaction and *sediment* transport are rarely considered. In many instances, ongoing evolutionary changes in stream form are interrupted by localized stabilization techniques. These interruptions may cause stream *instability* to shift upstream or downstream. Work undertaken to address one form of instability may create a domino effect of instability elsewhere.

One goal of this management plan is to create a better understanding of stream processes and encourage *riparian* landowners and managers to try and understand the potential causes of a particular problem, consider the potential effects of mitigation, and to seek technical guidance when needed. The following recommendations are suggested guidelines to aid and improve stream management in the West Branch basin.

## Recommendations

**RECOMMENDATION #1**

**Integration of the Stream Corridor Management Program and Watershed Agricultural Program**

***The New York City Department of Environmental Protection (NYCDEP), Stream Corridor Management Program (SCMPr) and Watershed Agricultural Council (WAC) should develop and implement mechanisms to comprehensively integrate stream corridor management and stewardship into the Whole Farm Planning and implementation process.***

The Watershed Agricultural Council was formed in 1992 to assist the NYCDEP in the development and implementation of voluntary watershed protection programs that include agriculture and forestry, with the overall objective of safeguarding and improving source water quality in the New York City watershed.

The Watershed Agricultural Program (WAP) is a contractual partnership between WAC and the following agencies: Delaware County Soil & Water Conservation District (DCSWCD), United States Department of Agriculture (USDA) Natural Resources

Conservation Service (NRCS) and Cornell Cooperative Extension (CCE). These partner agencies develop and implement Whole Farm Plans (WFP) that address goals documented in the United States Environmental Protection Agency's Filtration Avoidance Determination (see **Section 4.2**) and the WAC contract with New York City. WAP program staff consists of NRCS planners, agronomists and engineers, DCSWCD civil engineering technicians and technicians, and CCE crop, livestock and nutrient management specialists. WAP teams work collectively to plan and implement agricultural Best Management Practices (BMPs) as an integrated system on each participating farm. BMPs are designed and constructed to NRCS standards and specifications. Other practices not covered by NRCS standards are designed and implemented by a team of WAC engineers and technicians.

Research indicates that approximately 62 percent of the land parcels in the West Branch watershed greater than one acre in size are under agricultural production[1]. With 662 miles of streams in the basin, it is obvious that many of these streams wind their way through agricultural land. Stream management issues exist on many of these farms, but the SCMPr staff, on its own, does not have time to assess all of these sites. WAP resource staff could be trained to identify and assess stream related issues on farms during the Whole Farm Planning process and work with SCMPr staff to develop solutions to the problems.

This training could be designed to:

- Identify stream reach issues, including Japanese knotweed problems (see **Section 5.10.4**), during the Environmental Review/Problem Diagnosis step of the Whole Farm Planning process.
- Describe and/or identify the problems and possible causes.
- Develop a "Stream Stewardship Plan" that outlines inexpensive measures for farmers to maintain stream stability.

WAP staff and SCMPr staff could then cooperate on identified issues such as riparian buffer enhancement, stream bank erosion, cattle access problems, debris jams, Japanese knotweed management or the need to consider other stream restoration measures.

Comprehensive integration of these programs will significantly enhance stream corridor management in the West Branch Delaware River watershed. The SCMPr, Watershed Agricultural Council and New York City Department of Environmental Protection should meet on a timely basis to develop and formulate the integration of these programs.

[1] Contract Task II-4 – Basin Demographics & Land Use. Report compiled by DCSWCD, 2003.

**RECOMMENDATION #2**

**Provide Technical Support to the USDA Conservation Reserve Enhancement Program (CREP)**

***The Stream Corridor Management Program (SCMPr) and the NYCDEP should continue to fund and provide technical and design assistance for stream bank stabilization projects at potential CREP sites. The goal of this assistance is to stabilize stream banks so they are eligible for CREP participation.***

From the results of the walkover assessment and the vegetation mapping exercise conducted during the planning effort, SCMPr staff found that protection and enhancement of the riparian forest buffer should be one of highest priorities for the future protection of the river's main stem, its tributaries and the lands adjacent to these streams.

Locally, vegetation and the streambanks at established CREP sites in the West Branch watershed have begun to recover. This initial recovery is due in large part to the exclusion of livestock from the stream, resulting in a reduction of hoof shear stress on the banks. Decreased erosion and the opportunity for vegetative growth on the streambanks reduce nutrient and pathogen-laden runoff from reaching streams, improving stream health throughout the basin.

Sixty-two percent of the parcels along the West Branch main stem are under agricultural production. Under federal rules, CREP cannot be implemented on unstable streambanks. SCMPr staff should prioritize and expand efforts to provide technical and design assistance to USDA and Watershed Agricultural Program staff for implementation of streambank stabilization projects at potential CREP sites. Funding sources for these projects should be explored and identified to facilitate CREP implementation.

As mentioned in **Section 6.3.2**, the United States Department of Agriculture (USDA) administers CREP. CREP authorization is currently scheduled to expire on September 30, 2007. SCMPr staff should work with USDA, Watershed Agricultural Council, and New York City Department of Environmental Protection staff to seek congressional re-authorization of the New York City watershed CREP beyond 2007.

**RECOMMENDATION #3**

**Enhance the Implementation of CREP on New York City Watershed Cropland and Explore Long-Term CREP Contracts**

***The Stream Corridor Management Program (SCMPr) should work with the New York City Department of Environmental Protection, United States Department of Agriculture, US Environmental Protection Agency, Watershed Agricultural Council and other pertinent federal, state and local agencies and***

***organizations to enhance CREP implementation on cropland and explore long-term CREP contracts.***

Cropland CREP

Currently, only 17% of CREP buffers implemented in Delaware County are on cropland demonstrating the need to enhance CREP participation on stream side cropland. Many producers do not opt for CREP buffers along cropland because:

- Quality cropland is in valley bottoms and available acreage is in short supply
- Crop values are significantly higher than CREP payments
- Necessitated enterprise changes make it too costly to produce crops on uplands

A review of LIDAR contour mapping and field verification reinforces that many runoff patterns are parallel to the stream. In these cases, *hydrologic delivery zones* should be identified where nutrients and sediments enter the stream. This may allow for narrower buffers along streams with parallel runoff patterns while shifting the main focus of a buffer in the hydrologic delivery zone areas or wider buffers with perpendicular runoff patterns.

An interagency Cropland Buffers Working Group should be established to:

- Assess cropland acres for CREP applicability under current program rules
- Develop a planning protocol to identify and address hydrologic delivery zones
- Develop applicable vegetation buffer standards for parallel runoff patterns
- Develop equitable incentive and payment protocols

Approximately 31 miles of cropland along the West Branch main stem are currently un-buffered, suggesting the need to review and enhance CREP rules on cropland.

Long-Term CREP

Under current program guidelines, CREP contracts are executed with either a ten or fifteen year life span. Landowners are required to follow an operation and maintenance plan during the life of the contract to ensure required plant survival rates and to protect the buffer area from destruction. Once the contract has expired, however, the commitment to maintaining the buffer will also expire.

There are documented improvements in stream health where CREP is currently implemented. The environmental benefits gained by extending existing CREP contracts and providing for longer-term future contracts would be an integral component of sound stream and land-use management.

**RECOMMENDATION #4**

## Implement a Variable Width Riparian Buffer Pilot Program

***The Delaware County Soil and Water Conservation District (DCSWCD) Stream Corridor Management Program (SCMPr) should work with the New York City Department of Environmental Protection (NYCDEP), New York State Department of Environmental Conservation, Watershed Agricultural Council, Catskill Watershed Corporation, Cornell Cooperative Extension and other pertinent federal, state and local agencies and organizations to develop and implement a pilot program to establish variable width riparian buffers along unstable stream reaches and monitor their effectiveness.***

Mitigating unstable streambanks to facilitate the implementation of the USDA Comprehensive Reserve Enhancement Program (CREP - see **Section 6.3.2**) can be cost prohibitive. It is also important to recognize that mitigation measures may carry a high risk of failure if implemented within an improperly functioning stream reach. This is the case with three sites identified for mitigation along the West Branch Delaware River. These sites are located in a 4.35 mile reach of the river that is not properly functioning. Sections of this reach have become straightened, most of the reach has over widened and excessive deposition is occurring. Evidence suggests that this section of the river will continue to adjust and deposit sediment.

A need exists to develop criteria to facilitate riparian buffer implementation on agricultural lands along certain unstable streambanks. Since meandering is a natural stream function, the meander pattern can be reasonably predicted for a given reach of stream. Therefore, buffer limits could be established to allow a stream to naturally adjust within established limits. Buffer width could vary depending on site specific situations. Rock armoring could be planned at critical locations along a future streambank. If future needs were determined rock could be placed in dry conditions with reduced construction costs and minimal to no de-watering costs. Vegetative planting sequences could be phased over time as stream adjustment progresses.


**Figure 2.1** Example of rapid lateral migration near Hamden resulting from the April 3, 2005 storm. This section of stream is one of the 3 sites located in the 4.35 mile stream reach.

The SCMPr and NYCDEP should work with all involved agencies and stakeholders to further advance the variable width riparian buffer concept, implement a pilot program to address identified needs and monitor program effectiveness.

**RECOMMENDATION #5**

**Participation with the Catskill Watershed Corporation**

***The Stream Corridor Management Program (SCMPr) should cooperate with the Catskill Watershed Corporation (CWC) to explore the enhancement of existing CWC programs and explore the development of new CWC funding programs that address stream related stormwater issues, stream stewardship, public education and outreach, and stream stability issues.***

The CWC, a local not-for-profit development corporation has a dual goal to protect the water resources of the New York City watershed west of the Hudson River while preserving and strengthening communities located within the region. CWC is a logical choice to fund stream corridor management projects and programs identified in each county's Stream Corridor Management Plan, thereby reducing the need to set up new funding mechanisms and governing boards.

The SCMPr and CWC, in cooperation with New York City Department of Environmental Protection, should:

1. Explore opportunities to enhance existing CWC stormwater programs to include the following:
   - Cooperative public outreach efforts to educate businesses, municipalities and residents regarding stormwater impacts on streams.
   - Enhanced public outreach efforts to include funding for stream management education and stream stewardship training, including Japanese knotweed identification and management (see **Section 5.10.4**), for landowners, local planning boards and highway departments, contractors, schools, community groups and other interested stakeholders.
   - Funding for retrofitting selected culverts that pose stormwater and fish passage issues.
   - Funding for storm flow solutions at bridges with problematic stormflows.
2. Explore new programs for stream/stormwater management to:
   - Fund a culvert sizing and design program for municipalities (see **Recommendation #9**).

**Figure 2.2** Poorly designed culvert outfall along NYS Route 10 upstream of Bloomville. Note direct discharge into river with lack of energy dissipation and sediment control measures. This site could benefit from a stormwater retrofit.

- Fund stream stewardship activities which may include selective berm and/or debris removal.
- Fund future mitigation projects related to stream channel and streambank stability.

See **Section 4.7** for further information on the Catskill Watershed Corporation.

## RECOMMENDATION #6

### Stream Corridor Management Plans for Non-Agricultural Riparian Landowner Stewardship

***The Stream Corridor Management Program (SCMPr) should seek funds to develop a program to provide non-agricultural riparian landowners with their own site specific Stream Corridor Management Plans.***

The development of an individual Whole Farm Plan for agricultural production and a Forestry Plan for forest landowners has been essential to improving and maintaining water quality in the West Branch watershed. These plans inventory and assess soil, water and forest resources and provide a clear plan of action by recommending both structural and managerial Best Management Practices which meet both landowner and water quality objectives.

**Figure 2.3** Example of site that could benefit from individual landowner stewardship.

Although 62% of the parcels in the basin over one acre are under agricultural production (see **Recommendation #1**), there remains a significant amount of riparian property that is non-agricultural land. As with agricultural and forestry practices, certain activities by riparian landowners may contribute to stream and riparian buffer degradation. Therefore, the SCMPr recommends development of a program to provide non-agricultural riparian landowners with an individual Stream Corridor Management Plan. This Plan would be provided at the request of the landowner free of charge. The Plan would address floodplain function, stream processes (including streambank and stream channel maintenance), invasive species control with Japanese knotweed management as a primary focus (**see Section 5.10.4**), and the importance of desirable native riparian vegetation and its function.

Riparian landowner stewardship is essential to proper stream corridor management. Efforts by individual riparian landowners to improve and maintain proper stream processes and riparian buffers can be very significant, especially with the control of invasive species and the management of desirable native vegetation. Well informed and educated riparian landowners can also be instrumental in maintaining floodplain function and stream channel and streambank functions. Many times streambank and stream channel unraveling begin as small problems that could have been mitigated or corrected without public funding assistance by a well educated riparian landowners. The preparation of individual Stream Corridor Management Plans will also provide SCMPr staff with opportunities to proactively monitor stream health, identify emerging issues and/or problems in the watershed, and develop greater rapport with riparian landowners.

**RECOMMENDATION #7**

**Stream Gravel Deposition Issues**

***The Delaware County Soil and Water Conservation District (DCSWCD) Stream Corridor Management Program, New York City Department of Environmental Protection and Delaware County Department of Watershed Affairs will identify opportunities to work with the New York State Department of Environmental Conservation and U.S. Army Corps of Engineers for the purpose of identifying options pertaining to the management of deleterious gravel deposits within the West Branch of the Delaware River system.***

Several members of the public and local government leaders have stated, throughout the public review process of this management plan, that they believe certain gravel deposits have had a deleterious effect on streambank stability and flooding over the years and have expressed their concern with current policies and regulations restricting their removal. The Stream Corridor Management Program has the responsibility to investigate these issues and respond to these concerns by advancing discussion with the appropriate regulatory agencies to identify what information is needed to determine if and where an appropriate level of response and intervention can or should be exercised. The DCSWCD wishes to create an informed dialog about gravel and stream processes in the West Branch Delaware River (WBDR) watershed, to improve both the professional manager's and general public's understanding of the mobilization, transport and deposition processes of both sediment and woody debris in the WBDR system. The DCSWCD recognizes that in order to successfully advocate a specific plan of action regarding gravel, it must both develop a science-based understanding of specific stream processes and secure the participation of the key regulatory agencies.

**RECOMMENDATION #8**

**Streamline Stream Work Permitting**

***The Stream Corridor Management Program (SCMPr) proposes that the permitting process for stream work be simplified and streamlined. It is proposed that an interagency working group composed of representatives from the New York State Department of Environmental Conservation, U.S. Army Corps of Engineers, Delaware County Soil & Water Conservation District (DCSWCD), New York City Department of Environmental Protection, neighboring Soil & Water Conservation Districts, Delaware County Department of Public Works (DCDPW) and local community leaders identify ways to delegate, simplify and streamline the permitting process for the benefit of all agencies and stakeholders.***

The purpose of this recommendation is to improve the permitting process so that necessary stream stabilization efforts may be made in a timely and efficient manner. As described in **Section 5.13**, the permitting process for stream disturbance is involved and lengthy, particularly for larger projects. Permitting can also be very costly. For example, administrative costs for SCMPr staff alone to prepare permit applications for the Town Brook demonstration project were nearly $2,850. The permitting process for emergency stream work in the aftermath of floods should also be reviewed.

One goal should be to enhance delegated permitting authority to the DCSWCD by NYSDEC for implementation of approved stream management practices under its current General Permit.

**RECOMMENDATION #9**

**Assist Municipalities with Culvert Sizing and Design**

***The Stream Corridor Management Program (SCMPr), in cooperation with the Catskill Watershed Corporation, Delaware County Department of Public Works and NYCDEP should develop a program to provide technical assistance to Town Highway Superintendents for culvert design, sizing and placement.***

Culverts are frequently used for highways crossing tributaries to the West Branch Delaware River, particularly in headwater areas where the tributaries are smaller and bridges are not required or economically practical. Culverts are also used under highways to drain roadside ditches, many of which create their own outfall watercourse to streams or wetlands.

While performing the walkover assessments in the watershed, SCMPr staff observed that road culverts often caused increased erosion below, and many exhibited increased deposition above the crossing. Typically these problems relate to the size or shape of the culvert selected or the installation of the culvert. Improper orientation, the lack of energy dissipation, and numerous other problems related to culvert installation reduce culvert efficiency, and impact stream channel and streambank stability. Additionally, incorrect culvert design/installation may have significant impacts on fish passage. The number of culverts in the watershed is quite large and therefore the total deleterious effect of improperly installed culverts could be significant.

**Figure 2.4** Culvert installation that could benefit from improved alignment, fish passage, outfall dissipation, headwall installation and top cover.

The SCMPr should work in cooperation with other interested parties such as the CWC and DCDPW to develop a protocol to expand assessments of existing culverts to include geomorphic assessments, and work collectively where necessary in the prioritization of culverts for replacement and on the designs for retrofitting existing culverts. This technical assistance could be provided through recommendations made during the development of individual Town Highway Management Plans (HMPs) currently being developed by the DCDPW and Delaware County Planning Department (DCPD) Special Flood Hazard Areas as identified on Flood Rate Insurance Maps should also be included in this protocol (see **Section 5.14**).

## RECOMMENDATION #10

### Participation with the Delaware County Action Plan (DCAP)

***The Stream Corridor Management Program will continue to work closely with all DCAP participants to integrate the West Branch Delaware River Stream Corridor Management Plan and its recommendations into all relevant components of the Delaware County Action Plan.***

DCAP is a local initiative that comprehensively evaluates water quality issues and coordinates and facilitates local, state and federal initiatives to improve water quality in Delaware County (see **Section 4.6**). Integration of the Stream Corridor Management Plan and its recommendations into existing DCAP programs will ensure water quality benefits are maximized and/or enhanced.

**RECOMMENDATION #11**

**Expand Public Education and Outreach Efforts**

***The Stream Corridor Management Program (SCMPr) should expand public education and outreach efforts to better inform and educate all stakeholders, including municipalities, regarding stream stewardship, the importance of floodplain function, stream processes and the importance of riparian vegetation. These efforts should be developed and implemented in cooperation with the Project Advisory Committee with funding from the Catskill Watershed Corporation.***

Earlier outreach efforts by the SCMPr were largely limited to those that facilitated field work or helped formulate and direct the development of this Stream Corridor Management Plan. However, much more needs to be done. We must keep in mind that government programs, including this SCMPr, cannot take the place of stewardship by the general public and individual riparian landowners. Stream stewardship is the responsibility of everyone who lives in a watershed and participation from all stakeholders is the preferred objective.

To accomplish this objective, all stakeholders need to more fully understand stream processes such as stream bank erosion, sediment transport and the function of stream features such as riparian forest buffers, floodplains, and riparian wetlands. This understanding will guide stakeholders as they adopt practices that will protect the stream and improve its overall stability. Likewise, stream managers need to understand and account for the perspective and priorities of the stakeholders as they develop future stream management efforts.

Education and outreach efforts should be expanded to include, but not be limited to, the following:

- Development of a dialog with stakeholders on stream processes and the best management of stream features such as floodplains and riparian buffers.
- Facilitation of enhanced stormwater management.
- Promotion of action by new and existing watershed associations, stream management public interest groups and other groups and organizations interested in stream corridor management.
- Education of the public and municipalities regarding the importance of controlling invasive species, especially Japanese knotweed (see **Section 5.10.4**).
- Facilitation of public and municipal involvement in Flood Hazard Mitigation efforts (see **Section 5.14**).
- Support of landowners interested in furthering their understanding of streams through stream management education efforts such as field days and workshops.
- Development of brochures, presentations, exhibits, press releases and other educational materials for the public and stakeholder groups.

The DCSWCD and DCPD should initiate education and outreach with the local planning boards. When a planning board conducts a subdivision review or a site plan evaluation, they should be aware of the concerns of the DCSWCD in regards to the impact on streams in light of additional growth and development. The planning boards could then be used as a local engine to distribute information hosting workshops for private property owners that are current stakeholders or adjoining property owners.

The formation of local watershed associations should also be encouraged. These local stakeholders can be a valuable asset by contributing both historical and current stream reach information, sponsoring community based projects, and assisting in the procurement of project funding. Local planning boards could serve as the facilitator of these associations.

## RECOMMENDATION #12

### Geomorphic Assessments at Bridges and Culverts

***The Stream Corridor Management Program (SCMPr) and NYCDEP should develop a protocol and program to perform a full geomorphic assessment at prioritized bridges and large culverts. This program should be developed in cooperation with the New York City Department of Environmental Protection, Delaware County Department of Public Works, Delaware County Planning Department, Town and Village Highway Superintendents and New York State Department of Transportation.***

Stream assessment observations by SCMPr staff show that the West Branch main stem and a significant number of tributary crossings near their confluences with the river commonly exhibit signs of stress, such as gravel deposition near bridges and large culverts. These gravel deposits are generally a result of the inability of the stream to transport sediment during lower flows and can lead to decreased storm flow capacity through the structure and bank erosion and/or bed scour near the structure.

Geomorphic assessments at identified and prioritized structures, in conjunction with available historic hydraulic data, would result in a description of stream related issues at each site for incorporation into a set of initial recommendations for consideration in future maintenance, rehabilitation or replacement. As an example, considerations could include maintenance of low flow

**Figure 2.5** Gravel deposit under McMurdy Brook bridge on NYS Route 10 near Hobart. Note restriction of the waterway.

channels through structures and/or floodplain relief structures at elevated bridge approaches.

These assessments should be done as part of the environmental review process conducted during the design phase of a project in coordination with the municipality or agency having maintenance jurisdiction.

**RECOMMENDATION #13**

**Flood Hazard Mitigation and Flood Recovery**

***Work with Delaware County Planning Department and Emergency Services to develop a county-wide Hazard Mitigation Plan. Continue to work with the Delaware County Board of Supervisors, New York City Department of Environmental Protection (NYCDEP), New York State Department of Environmental Conservation (NYSDEC) and the State Emergency Management Office (SEMO) to revise the Federal Emergency Management Agency (FEMA) flood study and floodplain maps.***

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects. Flood recovery is federal and state assistance available through FEMA and SEMO, the agencies that administer their respective hazard mitigation programs for Presidential declared flood disasters. Flood Studies and Flood Insurance Rate Maps (FIRMs) provide vital information to communities considering flood hazard mitigation and stream management options.

The DCPD has substantially completed preparation of a county-wide Hazard Mitigation Plan which will enable communities to apply for funding through hazard mitigation programs. Plans are also under way in cooperation with the Delaware County Board of Supervisors, NYCDEP and NYSDEC to update current floodplain maps. Stream Corridor Management Program staff will continue to participate with and support both efforts.

See **Section 5.14** for more information.

**RECOMMENDATION #14**

**Continuation of Geomorphic Research/Assessments**

***The Stream Corridor Management Program (SCMPr) and New York City Department of Environmental Protection, in consultation with the Project Advisory Committee, should continue Rosgen Level II assessments and perform Rosgen Level III and Level IV assessments at prioritized locations throughout the West Branch Delaware River watershed.***

To more fully understand the problems facing the West Branch of the Delaware River basin, further investigation of the main stem and tributaries will be required. The original contract for the SCMPr outlined a process where Rosgen Level I through Level III assessments would be performed on the West Branch main stem, with Rosgen Level IV to be performed in restoration project reaches. Due to the size of the watershed, additional time is required to adequately perform necessary assessments to compile a complete data set of watershed conditions, their causes, and the potential effects of current and proposed management practices. Additional assessments will be necessary to reinforce preliminary determinations and validate assumptions.

Efforts should be made to seek funds and staff necessary to complete this work.

**RECOMMENDATION #15**

**Seek Funds Necessary for Construction of Walton Streambank Stabilization Projects**

***The Stream Corridor Management Program (SCMPr) will continue to seek all funds necessary to implement two streambank stabilization projects located at Terrace Avenue and South Street in the Village of Walton.***

In early 1999, two sites in the Village of Walton, approximately 5 miles upstream of the Cannonsville Reservoir, were identified for mitigation of severely eroding streambanks. Erosion at these two locations has been steadily increasing since the January 1996 flood resulting in significant risks to water quality, private property, public infrastructure and aquatic habitat. The upstream site is located at the eastern limit of the village adjacent to Terrace Avenue and consists of an actively-eroding streambank along the edge of a sandy terrace. The eroded section is approximately 600 feet in length and 30 feet high. Erosion has recently accelerated at this site due to the extremely wet conditions during 2003 and 2004. It is estimated that 10-12 lateral feet of embankment (approximately 7000 tons) has sloughed into the river during this period. The downstream site is located adjacent to Stockton Avenue and consists of a 25-foot-high bank that is eroded at its toe, and intermittent shallow translational failures of the upper bank for approximately 500 feet.

In August, 1999, the Delaware County Soil and Water Conservation District applied for $369,000 (75% of the original project cost estimate of $469,000) in state funding through the Clean Water/Clean Air Bond Act for State Fiscal Year 1999/2000. The New York State Department of Environmental Conservation (NYSDEC) awarded a Performance Partnership Grant (PPG) in November 2000 in the amount of $246,800 and a contract was executed for the work in September, 2001. Construction was originally planned for 2003.

**Figure 2.6** View of relocated shed along severely eroding bank at the Terrace Avenue site. Note area near center of photo where upstream edge of shed was located (December, 2004).

Between the time of grant application and time of award, site conditions have worsened; it became apparent that the project needed to be increased in scope and magnitude. New cost estimates were projected and in May, 2002, a Letter of Interest was submitted to NYSDEC requesting additional funds through the Watershed Environmental Assistance Program (WEAP). Additional funds from this program are not expected. In April 2003, Fisch Engineering of Vicksburg, Mississippi was awarded a contract to develop a conceptual design for these sites with multiple alternatives considered. New cost estimates for the preferred alternatives at both sites total $1,222,000. To date all funds necessary to complete the projects have not become available. NYSDEC has issued a final contract extension for expenditure of the $246,800 in PPG grant funds through December 31, 2007, at which time the projects must be completed. At the time of the first draft of this document, an additional $975,200 was currently needed for completion. On April 15, 2005, it was announced that $916,500 in WRDA funds were earmarked for these sites. SCMPr, the Village of Walton and the Delaware County Department of Watershed Affairs are working within the following schedule to complete these projects:

**Figure 2.7** Closer view of the unstable embankment at the Terrace Avenue site (December, 2004).

2005 – procure commitments for remainder of required funding
2006 – project survey, design and permitting
2007 – project implementation

**Figure 2.8** South Street location showing condition of embankment (December, 2000).

**RECOMMENDATION #16**

**Prioritization of Identified Stream Intervention Projects**

***The Stream Corridor Management Program, working with the Project Advisory Committee and New York City Department of Environmental Protection, will prioritize potential restoration reaches relative to the type and level of intervention needed.***

Stream reaches in need of management action vary both in the magnitude of the problem and level of intervention needed. Water quality, property and aquatic habitat protection will be priorities for all reaches prioritized for intervention. The level of intervention will be based on the current need and condition of the stream as well as the type of existing and future land uses. Properties surrounding streams which have the potential for development based on location, accessibility, size, soils and local land use controls will be deemed as more critical for intervention.

Preservation – This intervention level should be considered when stream and surrounding floodplain are in excellent condition with low flooding and erosion threats, good water quality, and sustainable functioning aquatic and terrestrial habitat. These sections should be identified as valuable anchor points for stable stream morphology and good habitat, as well as helping to preserve and/or enhance water quality and flood dynamics.

Passive – Passive intervention should be considered when a stream reach and surrounding floodplain are in generally good condition, exhibiting apparent stability and sustainable function without further need for intensive management or changes. These reaches may not be in the most stable condition but may recover unassisted over time. Some visual monitoring or inspection of certain features or areas may be warranted, but generally no active management is recommended.

Assisted Recovery – Partial intervention, or "assisted recovery," involves direct management intervention on a small scale. Assisted recovery must be done carefully and with a good understanding of the stream type and setting to avoid further instability. Assisted recovery may be as simple as planting riparian vegetation to maintain bank stability or as complicated as designing comprehensive stormwater management retrofits or reconstructing sections of streambank.

Full Geomorphic Restoration – This intervention level, very costly and requiring the most intensive management, should be reserved for the most severe locations of stream instability with the greatest impact to management goals. This level of management requires much greater time and financial resources and technical expertise to ensure stability restoration is consistent with both management goals and the stream type and setting that will ensure project success and longevity.

**RECOMMENDATION #17**

**Develop a Process for Updating the West Branch Delaware River Stream Corridor Management Plan**

***In cooperation with the Project Advisory Committee and New York City Department of Environmental Protection, the Stream Corridor Management Program shall develop a process for updating the West Branch Delaware River Stream Corridor Management Plan.***

It is expected that as this plan and its recommendations are addressed and implemented, additional information and data will be collected and other management issues identified. In order to keep the plan a "living document" it should be updated as needed. The updates would track the implementation of the plan's recommendations, consider post-project monitoring, and compile and analyze new data, information, and management issues.