# II. Stream Stewardship Recommendations

## A. Watershed Recommendations for Best Management Practices

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## B. Management Unit (MU) Summary of Recommendations

Photo of Rondout Reservoir taken by Barbara Barone, SCSWCD.

# A. Watershed Management Recommendation Summary

## 1. Riparian Vegetation Management Recommendations

Decision-makers would benefit from a more detailed assessment of the vegetation along the Chestnut Creek. This would help facilitate a prioritization process for addressing the most at-risk riparian areas. Individual riparian management programs aimed at different public sectors, e.g. landowners, highway departments, municipal officials would enable projects of different scale and scope to be spearheaded simultaneously.

The current state of all healthy, functioning riparian areas throughout the Chestnut Creek Watershed should be minimally be maintained, if not augmented. Any additional clearing or damage to these areas reduces valuable source populations and ecosystems that help sustain the general riparian character of Chestnut Creek.

Streamside landowners should consider enhancing the riparian zone by leaving a strip of lawn un-mown and planting supplemental diverse, native grasses, herbs, shrubs, and trees. Education programs and training sessions may be offered to enhance this effort.

Additional riparian vegetation may be added in areas currently occupied by impervious surfaces in the watershed. For instance, a wooded buffer zone may be established on a portion of the paved area near the Town Highway Facility (Volume II, Section II.B, Management Unit (MU) Summary of Recommendations, Tables 1-4).

Additional opportunities to rehabilitate impervious surfaces to augment riparian vegetation should be investigated and a program initiated to target these areas. Residents of and visitors to the watershed should be aware of invasive plants and be encouraged to point them out to resource managers. The sooner an invasive species is spotted, the easier and cheaper it is to address. One way to prevent an invasion is by the deliberate evaluation of soil used as fill for gardening, and highway, road, and culvert replacement projects. Soil and fill material can easily be contaminated with seeds or rhizomes of many different invasive plants, which can quickly establish new colonies. (see "Invasive Threats" section).

Especially where Japanese knotweed and Multiflora rose exist, resource managers and residents should note the rate of expansion. If a colony appears to be expanding rapidly, a resource manager should be notified so property owners can receive advice and assistance to contain it. Bare soil resulting from invasive species removal must be subsequently revegetated to prevent re-establishment of unwanted species in disturbed areas. This is a crucial step to preventing the reinvasion of these problematic species. Monitoring of invasives should continue after the implementation of any control program; most control measures require multiple treatments, sometimes over a few years.

Addressing the issue of woolly adelgid infestation requires information and close

collaboration. Land managers, municipalities, and landowners can work together to determine the extent of infestation and the proper plan of action.

*This is not an exhaustive list of recommendations about daily life next to the stream. If you have any questions or suggestions, please do not hesitate to contact the Sullivan County Soil and Water Conservation District at 845-292-6552.*

### a. Recommended Riparian Vegetation Management Concepts and Practices

Following is a set of general concepts for the public and local government for improving stream conditions through the enhancement of riparian vegetation (See Landowner Guide for additional information):

Riparian buffers: Wider is better

Anyone who owns property bordering a stream should leave as much room as possible for a vegetative buffer between their home or outbuildings and the stream. This vegetation should include a closely spaced mixture of trees, shrubs and ground cover. Native plants are suggested because they require less maintenance and are able to reproduce on their own and adjust to regional climate and conditions.

When determining the location of new construction, such as homes, access roads, or outbuildings, the site plan should allow for a setback of at least 100' from the stream. At least half of this distance should be vegetated buffer. The set back should be significantly (3 to 4 times) greater if there are development limitations present, such as a flood plain, steep slopes or sensitive soils. This larger setback will enable the stream to migrate with reduced risk of damage to the structures from floods or landslides.

If there is insufficient space available for a wide riparian buffer, then property owners should make the best of what is available. Assess the quality of the buffer and consider all the components necessary for a healthy riparian zone. Are there trees, shrubs and ground cover? Is there space and light for more plants? Would the addition of organic material improve the quality of the soil and the vigor of the vegetation? Watch the stream during high flow events, like during spring snow melt. Where is bankfull, the point where the flow begins to spread out on the floodplain? Any planting effort should start here and work back from the stream. The stream will maintain a general channel without any permanent vegetation. Before attempting to plant on a bank next to the stream make sure to seek the advice of the Soil and Water Conservation District or a local nursery. Disturbing the bank - even with the best of intentions - can accelerate erosion. The best time for planting is the early spring, but trees and shrubs can be planted in the early fall during their dormant season. Mulch and weed your plants; use tree tubes to protect young seedlings from deer browse. Remember to water new vegetation until it becomes well established, especially in periods of drought conditions.

Identify which plants naturally grow along the banks of the stream and use them as a guide to what should be planted. Native plant nurseries are an expanding business in the Catskills and are becoming increasingly popular. Their plants are typically very well adapted to conditions in this area. Any plant that is planted on or near the floodplain should be able to

withstand moist soil conditions and periodic inundation. Conservation plants suitable for wet areas are also available from the Soil and Water Conservation District.

Protecting Riparian Buffers: Watch for Knotweed, Hemlock Woolly Adelgid, and Multiflora Rose

As a hardy, highly competitive and quickly growing invasive plant already present in the valley, Japanese knotweed threatens to colonize many of the disturbed banks along Chestnut Creek. The first step toward preventing the spread of knotweed is knowing how to identify the plant and monitoring stream banks for its presence (see Vol. I, Sect. IV,B.3: Riparian Vegetation Issues In Stream Management). Watch along the edge of the stream for young plants attempting to take root in sand and gravel deposits. Pulling the plant - including the roots - can be accomplished while it is tender after first frost in the fall or when it first emerges in the spring. Cutting the plant back frequently in the summer can reduce its vigor by reducing its ability to make and store food. Preventing the conditions which enable establishment of new colonies is also very important. Refrain from disturbing the stream bank and avoid dumping fill and garden material on the stream bank or in the floodplain. Even a small piece of Japanese knotweed stem or root can become a full plant if given the chance, so be careful to dispose of any knotweed in the garbage. Perhaps the best weapon against the invasion of knotweed is a dense, vigorous riparian plant community. Knotweed does not like shade.

Hemlock Woolly Adelgid has been reported in Chestnut Creek Watershed (see Vol.I, Sect.IV,B.3: Riparian Vegetation Issues In Stream Management). If there are hemlocks growing on your property, become familiar with the appearance of the adelgid and check the lower branches of your trees for the insect. Participate in a local monitoring program and stay abreast of any trial efforts to combat the insect. Any pure stands of hemlock located on steep slopes along the stream are areas of primary concern. Planting other types of trees or encouraging natural regeneration on these sites through thinning may eventually be necessary to ensure future stream bank stability. Woolly Adelgid infestation causes rapid mortality (in as few as 5 years) and can decimate entire stands of trees faster than natural regeneration can replace them.

Multiflora Rose has presented a problem along several sections on Chestnut Creek. Multiflora Rose spreads quickly, is highly adaptable to a wide array of conditions, and impedes natural succession. This thorny shrub is difficult to eliminate. As with knotweed, pulling the plant and root mass after first frost, cutting the plant frequently throughout the summer season, and refraining from streambank disturbance can reduce the vigor and colonization of Multiflora Rose.

Conserve Riparian Corridors and Connections to Upland Communities

Animals use streamside vegetation communities as corridors to move up and down the valley. Similarly, fish need cover along the stream to migrate to and from spawning locations and cool water refuge without falling prey to predators. Exposed areas therefore become barriers to passage.

Limiting access points to the stream to narrow stretches of less than 20 - 30 feet will help maintain the integrity of the riparian corridor. Likewise, riparian connections to the upland community should be conserved to enable animals to access the stream. Even though plants don't move, their genetic material moves as their seeds pass across the upland - riparian interface by wind, gravity and animals. Roadways and lawns that separate the riparian community from the upland plant community break these linkages and make the riparian community vulnerable to competition from invasive plants as well as slowing the recovery of vegetation from disturbance events such as floods.

**b. Specific Program Recommendations**

Streamside Vegetation Improvement Along Roads

Roads along the stream, such as Rte. 55, frequently encroach on the stream's floodplain or floodprone area, and affect the streamside vegetation. The road isn't likely to be relocated, but efforts can be made to mitigate the impact of the road's encroachment on the riparian vegetation community by supplemental plantings and improved care of existing vegetation. The Town Highway Department has worked in cooperation with this planning effort and is aware of the value of this vegetation in reducing long term infrastructure maintenance costs from failing road embankments and plugged road culverts. Stakeholders and sponsors of this planning effort should continue to work in cooperation with the Town Highway Department to identify and prescribe specific sites for action and provide funding or assistance for plantings either as buffers or as bioengineering/ biotechnical stabilization projects. A similar program should be developed for the eradication of Multiflora Rose and Japanese Knotweed along roadways. Sites are suggested in each Management Unit and in the Management Unit Recommendations Summary Table (Volume II, Section II. B. Management Unit Summary of Recommendations).

Conservation of Riparian Vegetation Along Utility Lines

Like roadways, utility lines also impact riparian vegetation and can reduce its vigor. Stakeholders and sponsors of this plan should work in cooperation with the major utilities to prepare a plan for maintenance of utility lines at stream crossings and other places where lines pass through riparian vegetation. Whenever possible, such as when poles are replaced or new spurs are established, location of the utility lines away from streams should be considered. A first step might entail review of the rights of way and mapping of specific locations where the lines intersect with streamside vegetation. A review of specifications for maintenance of vegetation near utility lines may provide managers with a set of innovative practices that enable the utilities to mitigate the impact of the lines on riparian vegetation and the stream.

Streamside Gardening Program

Streamside gardening is an alternative to traditional landscaping and the extensive use of lawns as well as exotic trees and shrubs. Streamside gardening promotes the use of native plants that provide multiple benefits, including: improved wildlife habitat, soil and bank stability, and the aesthetics of a natural streamside

landscape. Streamside gardening generally does not include the use of pesticides and results in reduced labor required for mowing. Streamside gardening also promotes landscape designs that allow views and access to the stream without opening up the stream bank to erosion. Because stream side gardening is a relatively new concept, education and examples of successful gardens would assist the public to understand and consider adopting streamside gardening practices.

Stakeholders and sponsors of the planning effort should consider the funding of streamside gardening training for landowners in the valley and establishing a program for the provision of professional advice and material for the planning and creation of streamside gardens. This program might provide incentives for supporting innovative conservation practices and would result in the creation of local gardens that could act as models for the extension of these practices to additional streamside landowners of Chestnut Creek.

Japanese Knotweed Control Program

NYC DEP and Soil and Water Conservation Districts in the Catskill region should cooperate on the development of a joint task force to research, monitor and manage Japanese knotweed within water supply watersheds including Chestnut Creek. The effort would establish a program researching the ecology of Japanese Knotweed and testing various management prescriptions. The findings of this research would be applied to management programs throughout the Catskill watersheds. An initial phase of the effort would entail an education and awareness program to inform landowners of the appearance, habits and impact of Japanese Knotweed. The program also would work with NYS DEC and NYC DEP Land Management Program to ensure that public lands in Chestnut Creek are included in management efforts.

## 2. Infrastructure Recommendations

Management of roads, bridges, culverts and roadside drainage presents an important opportunity for collaboration between area stream managers working on Chestnut Creek. Town and county highway departments may be able to make use of resources available through programs administered by other Project Advisory Committee (PAC) members to reduce impacts of infrastructure maintenance on the stream, and in turn can lower infrastructure maintenance costs. The following recommendations are initial proposals to begin discussion of public infrastructure and stream issues, and summarize conversations between highway department staff and the NYC DEP and SCSWCD.

### a. Road-side ditches

Ditches are periodically cleaned ( scraped out and re-shaped) to increase stormwater conveyance and reduce the possibility that culverts through which they discharge will become clogged with debris. The raw soil of recently cleaned roadside ditches, however, can introduce significant amounts of fine sediment (silts and clay) turbid stormwater into the stream during storms. Road crews may not have the

resources to adequately re-vegetate (seed) following ditch cleaning.

Recommendation

Develop programs to provide road maintenance crews with additional resources for seeding newly cleaned roadside ditches with native ground-cover appropriate for protection. Make application to the Catskill Watershed Corporation's Stormwater Retrofit Grants program for funds to purchase hydroseeding equipment.

**b. Culvert outfalls**

Culvert outfalls create point sources of discharge, collected from diffuse sources of runoff from roads or other impervious surfaces. These outfalls can discharge significant amounts of concentrated pollutants (salt, oil, and sediment) into the stream. Other outfalls may produce intermittent heavy flows that physically disturb soil and plants at the outfall. Additionally, outfalls over bare revetment (rip rap, concrete, etc.) or falling from a distance may cause additional stress due to water heating or added erosive power. Road crews may not have the resources to improve treatment practices at these outfalls.

Recommendation

Identify and prioritize the most critical outfalls with regard to point-source discharges and substrate stability, and which offer opportunities for mitigation. Vegetation can break the fall of concentrated water, cools water by shading, filters out pollutants, and stabilizes soil and streambed. Make application to the Catskill Watershed Corporation's Stormwater Retrofit Grants program for funds to install best stormwater management practices.

**c. Utilities**

Power and telephone lines that pass through trees are at risk of being downed by falling branches during high winds. Consequently, utility managers frequently trim branches above and around where the lines pass through the trees. The understory is also frequently cleared in the right-of-way. Excessive trimming, however, can stress the health of trees and shrubs, reducing the energy available for maintaining root mass. When these trees and shrubs are also along streambanks, and playing a critical role in streambank stability along a road embankment, protection of the utility lines and protection of roads can be at cross-purposes. Both are critical public safety concerns.

Recommendation

Identify locations where utility line right-of-ways pass through vegetation that is critical to bank stability. Develop management prescriptions for minimizing stress to these trees resulting from trimming streamside vegetation. Develop strategies and programs to replant these areas with tree and shrub species which require less maintenance, and seek resources to implement these strategies and programs. This should also be implemented along roads, since stressed vegetation can not hold embankments as well, which could result in increased sediment in runoff from road ditches.

**d. Snow removal**

Snow removal on roads in narrow valleys like the Chestnut Creek presents serious

difficulties for road crews, especially during heavy snowfalls. Sidecast snow, which often contains a good amount of road gravel and soil, can result over time in the burying of tree roots and lower trunks, which in turn can severely stress many species of trees. When these trees are also playing a critical role in maintaining streambank stability along road embankments, snow removal sidecast may be increasing road embankment maintenance costs. Melting sidecast snow can also introduce a significant volume of fines and salts to the stream.

Recommendation

Identify critical road embankment/ streambank locations and develop strategies to strengthen riparian vegetation through planting of native species combinations that are both hardy to having their "feet" buried, and which can serve to trap fine sediment. Seek funding to implement these strategies.

### e. Bridge and culvert maintenance

Repair and reconstruction of bridges, culverts and abutments represents a significant expenditure for towns and county highway departments. The design of bridges and culverts can also dramatically affect stream functions like sediment transport and stability, both upstream and downstream. The limits of bridge right-of-ways constrain the ability of engineers to incorporate into bridge designs stream channel stabilization and restoration practices on private property. Coordination between maintenance/ engineering staff and other stream managers on the PAC represents opportunities to bring additional resources into the process of bridge maintenance or replacement.

Recommendations

Develop arrangements to institutionalize coordination on bridge repair/replacement between town and county highway personnel and stream management personnel. Actively seek resources to incorporate natural channel design practices into bridge repair/replacement plans.

### f. Revetment maintenance

In narrow valleys like Chestnut Creek, road maintenance includes maintenance of significant lengths of revetted embankments and streambanks, and these represent a significant expenditure for town and county highway departments. Revetted streambanks can have significant impacts on stream biological and hydraulic functions.

Recommendations

Consider, where appropriate, dumped rock revetments for upgrade to stabilization practices that permit wider shoulders, incorporate biostabilizing materials, and increase protection of both the toe of the revetment and of adjacent reaches. Seek the necessary resources to implement these upgrades, as advised by town and county highway managers.

## 3. General Recommendations for Chestnut Creek Watershed

### a. Follow-up Assessment

The 2001 Stream Assessment Survey was a good initial effort at providing information for evaluating channel stability, flooding, and water quality

problems in the Chestnut Creek Watershed. However, additional work needs to be conducted in order to complete the evaluation. The following outline includes recommendations for additional field studies and evaluation components.

1. Conduct a field reconnaissance:

a. Identify, map, and photo-document existing land use activities, identify and document unstable conditions in upland and riparian areas, characterize stream channel morphology and condition, and identify point and non-point pollution sources in the remaining Chestnut Creek subwatersheds.

b. Determine the effect that problems identified in subwatershed areas may be having on mainstem reaches to which they drain.

c. Evaluate land areas draining to storm drain outfalls identified during the 2001 Stream Assessment Survey. Identify potential storm water retrofit opportunities.

2. Resurvey monumented cross-sections and overlay them with the initial surveys to determine rates of lateral and vertical erosion. Prioritize these sites for management.

3. Evaluate man-made structures (e.g., wood weirs, rock check dams, etc.) identified during the 2001 Stream Assessment Survey to determine if they are having a negative effect on channel stability and/or sediment transport. If so, recommend corrective measures.

4. Prioritize mainstem and subwatershed problems identified during the 2001 Stream Assessment Survey and the Follow-up Field Reconnaissance.

5. Identify and prioritize restoration and management projects to address problems identified along the mainstem and in the subwatersheds.

**b. Stream Corridor Management**

Traditional approaches to managing streams and floodplains in the U.S. and other developed countries have included filling floodplains to accommodate new development and channelizing streams and constructing flood berms to protect existing properties in the floodplain. Riparian and streamside vegetation is routinely impacted by mechanical removal and spraying with herbicides for preparation of riparian land for cultivation or grazing; maintenance of power line, utility, and road rights-of-way; maintenance of public parks, recreation and open space areas; maintenance or expansion of yards in residential areas or for parking adjacent to businesses.

Experience has demonstrated that these types of channel and floodplain "improvements" often have unintended consequences, in that they result in a loss of flood storage capacity and prevent floodwaters from spreading out across the floodplain. These alterations to normal stream-floodplain interactions convey passing floodwaters more rapidly to downstream areas, increasing peak flood stage and increasing the energy of the flood downstream. The result is decreased channel stability, increased channel migration, increased bank and bed erosion on neighboring properties, increased damage to property and adjacent utilities,

increased maintenance costs, increased loss of land, and degraded in-stream habitat.

The effects of riparian and streamside vegetation removal include increased bank erosion and lateral migration, increased channel width and decreased depth, increased water temperature, lowered water tables, increased velocity of flows in overbank areas, reduced trapping of sediments in floodplain areas, increased damage to property and adjacent utilities, increased maintenance costs, increased loss of land, and decreased fish and wildlife habitat.

This traditional approach to stream and floodplain management has been practiced throughout the Catskills with predictable results. The following recommendations are put forth to assist the Town of Neversink in its efforts to correct the flooding and channel stability problems that this approach has caused in the Chestnut Creek Watershed. They are also intended to encourage the Town to work with all stakeholders to develop an approach to managing Chestnut Creek that will minimize the potential for more serious consequences developing as the population of the watershed continues to grow.

1. Watershed/Stream/Floodplain Corridor: Ordinances and/or Land Use Covenants

To minimize the potential for future flooding and channel instability problems, current land use practices involving stream channels, floodplains and riparian vegetation should be modified.

a. The Town of Neversink should work with the Sullivan County SWCD, NYCDEP, NYSDEC and consulting engineers trained in geomorphology and natural channel design to evaluate its existing Flood Damage Prevention ordinances. Questions/issues for consideration by the evaluation team should include:

- Do the ordinances, as written and currently enforced, provide the intended level of protection indicated in its Purpose Section? Particular emphasis should be placed on evaluating the effectiveness of Section 27-2. Purpose, Subsection C – "Control the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of floodwaters"; Subsection D – "Control filling, grading, dredging and other development which may increase erosion or flood damages"; and Subsection E – "Regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands". These sections should be evaluated from a geomorphic perspective.

- The evaluation may determine that amendments to existing ordinances and/or plans, review and enforcement policies and procedures are necessary. If so, the Evaluation Team should assist in developing the necessary additional management measures.

- Existing Flood Insurance Rate Maps are over thirty years old. Given the changes in land use as well as channel and floodplain modifications that have occurred since the maps were completed, should the maps be updated?

- Although Flood Insurance Rate Maps are valuable planning tools, they were not intended to be used for evaluating

effects of alterations to individual properties on channel and floodplain hydraulics. The Town should request that a detailed flood study be conducted for the mainstem Chestnut Creek for use in evaluations of proposed site-specific alterations to the channel and/or floodplain.

- Should restrictions be placed on the disturbance or removal of riparian trees and shrubs, except as needed to restore or improve natural channel and floodplain function, control multiflora rose and noxious weeds, or conduct emergency maintenance activities?

b. In addition to the ordinances, the Town of Neversink could establish protective covenants for particularly sensitive areas that would be voluntarily agreed to in writing by all participating landowners. These covenants would control and restrict certain land use activities in areas prone to flooding and areas immediately adjacent to stream channels.

2. Channel Maintenance Procedures

It is recognized that even after the mainstem and subwatershed restoration projects have been completed some channel maintenance will be necessary over the long-term. However, landowners should forgo conducting their own channel maintenance work. In anticipation of future maintenance needs, the Town of Neversink, in collaboration with the Sullivan County SWCD, NYCDEP, and NYSDEC should develop procedures for conducting emergency flood restoration work and routine maintenance that is based on the recommendations in this Plan and geomorphic principles and natural stability concepts.

3. Joint Review and Evaluation of Public Projects

The Town of Neversink, in collaboration with Sullivan County SWCD, NYCDEP, and NYSDEC should review and evaluate the proposed extension of any public services along the stream corridor. For example, the proposed extension of the existing sanitary sewer system should be reviewed and evaluated to ensure that the proposed alignment of the sewer main, as well as proposed laterals are designed to minimize impacts to Chestnut Creek and adjacent riparian areas.

The following list of questions were adapted from the Pennsylvania Natural Stream Channel Design Guidelines, and include a series of questions/issues that need to be answered, refined, and documented for effective evaluation and future restoration projects. Further, this document should be utilized in planning for restoration of the proposed unstable or eroding sites within the Chestnut Creek Watershed. They are as follows:

Site specific questions:

- What are the causes of the observed problems?
- Are there relationships between channel stability and watershed changes?
- How does the project support the overall vision for watershed health?
- Is the project compatible with concurrent or planned activities within the watershed?
- Can priorities be established? Project goals?
- Is there a sequence of interventions that make sense?
- What are the treatment options?
- What is the cost/benefit ratio?

- What kinds of risks are associated with each alternative?
- What are the environmental impacts of each alternative?
- What are the short term and long term multiple benefits of the project?
- What are the long-term maintenance requirements?
- What types of data are needed to support the objectives of the project?
- What data exists to support your project, and what data gaps exist?
- What types of monitoring data should be collected?
- What site constraints exist?
- Will the project significantly reduce risk to public health and safety and/or fish and wildlife resources?
- Is this an emergency stabilization project?
- For emergency projects, encourage natural channel design alternatives to hard engineering stabilization.

A clear description of the project objectives and scope of work, including the approach to data collection and analysis and plans to evaluate all proposed alternatives should be outlined.

## B. Management Unit (MU) Summary of Recommendations

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 presents an approach to stream corridor restoration and management recommended for the Chestnut Creek Watershed and includes specific restoration and management recommendations organized by Management Units.

The SCSWCD, NYCDEP, and other agencies and organizations will be working with the community to implement restoration and management strategies outlined in this Management Plan. Stream and upland area projects must be integrated to avoid potential conflicts in their respective objectives. Therefore, this section also includes comments and recommendations regarding integration of proposed strategies in upland areas, in particular floodplain management and storm water management practices (see Tables 1 - 4).

For a detailed description of the recommendations, see Volume II, Chestnut Creek Management Units.

**Table 1: Summary of all recommendations corresponding with Management Unit (MU)**

| MU Recommendations | MU1 | MU2 | MU3 | MU4 | MU5 | MU6 | MU7 | MU8 | MU9 |
|---|---|---|---|---|---|---|---|---|---|
| Stabilize banks and provide long-term lateral control by reestablishing bank vegetation composed of native trees, shrubs, and grasses. | X | | | X | X | X | X | X | |
| Evaluate the presence and extent of knotweed and multi-flora rose, and evaluate an invasive exotic vegetation eradication and control program. | | | | X | X | X | X | X | X |
| Research the extent of Wooly Adelgid infestation, develop and implement a strategy for control. | X | | | | | | | | |
| Promote protection and preservation of current healthy riparian areas. | | X | X | | | | | X | X |
| Implement strategies to educate riparian landowners on the benefits of preserving the current riparian area and limiting land use changes. | | X | X | | | | | X | X |
| Work with landowners to establish a wooded buffer zone along reaches with little or no vegetation. | | | | X | X | X | X | | X |
| Evaluate the potential for removing a portion of the paving and fill along the Town Highway Facility Property. | | | | | X | | | | |
| Evaluate the potential for increasing the riparian buffer between the NYCDEP facilities and Chestnut Creek. | | | | | | | X | | |
| Evaluate the potential of replacing or modifying stabilized areas (riprap), as needed with alternative stabilization techniques including bioengineered vegetation and vane/ log style structures. | | | | | | | X | X | X |
| Implement storm water mgmt for properties w/ highest percent impervious surface along corridor. | X | | | X | X | X | X | | X |

**Table 2: Summary of all recommendations corresponding with Management Unit (MU)**

| MU Recommendations | MU1 | MU2 | MU3 | MU4 | MU5 | MU6 | MU7 | MU8 | MU9 |
|---|---|---|---|---|---|---|---|---|---|
| Evaluate reconstructing channel along historically active reach. | X | | | X | X | | | | |
| Provide grade control structures at key points along channel to maintain bed stability. | | | | | X | X | X | | |
| Reconstruct problematic dry hydrant sites to provide low maintenance facilities. | | | | | X | X | | | |
| Assess affects of check dams on channel stability, sediment transport, habitat and fish passage. Remove poorly functioning check dams. | | | | | | | X | | |
| Promote protection of current stable stream channel. Implement strategies to educate landowners on benefits of stable stream reaches. | | X | X | | | | | X | X |
| Evaluate failing revetment for replacement with stabilization structure to maintain naturally functioning channel. Should include bioengineering and/or re-vegetation. | | | | X | | | | | |
| Perform stabilization only where necessary using BMPs which promote and maintain a naturally functioning channel. | | X | X | | | | | X | X |
| Promote floodplain protection, which is critical in maintaining stability in moderately entrenched reaches. | | X | X | | | | | X | |
| Monitor areas w/ debris jams and channel blockages for changes in channel stability and threat to infrastructure. | | X | X | X | | | | X | X |
| Initiate monitoring strategy in selected areas to document channel stability for comparison purposes, and inclusion into a local reference reach database. | | X | | | | | | X | X |

**Table 3: Summary of all recommendations corresponding with Management Unit (MU)**

| MU Recommendations | MU1 | MU2 | MU3 | MU4 | MU5 | MU6 | MU7 | MU8 | MU9 |
|---|---|---|---|---|---|---|---|---|---|
| Convert the existing F and unstable B reaches to stable B channels. | | | | | X | X | | | |
| Repair and stabilize the worst erosion sites along mainstem and tributaries draining to MU. | | | | X | X | X | | | |
| Evaluate potential for removing all or portion of paving and fill along old Town Highway Building to reestablish wooded buffer zone and floodplain area. | | | | | X | | | | |
| Establish a better angle of repose on unstable banks and lower bank to bankfull height ratio, by grading high, vertical banks. | | | | X | X | X | X | | |
| Install flow diverting structure (e.g, rock or J-Hook vanes, etc) at key points along channel to reduce stress in near bank region as an alternative to bank hardening revetment.. | | | | X | | X | X | | |
| Evaluate culvert at road crossing to determine best method to reduce scour, improve sediment transport and conveyance of bankfull and flood flows. If this adds to channel instability install flow diverting structures. | X | X | | X | X | | | | X |
| Repair or replace bridge at Mohr Property. If replaced, should be designed to convey 25-year storm, have X.S. area and width that conveys bankfull discharge without causing scour or deposition. | | | | | X | | | | |
| Evaluate Covered Bridge to determine best method for reducing scour, improving sediment transport, conveyance of bankfull and flood flows. | | | | | X | | | | |

**Table 4: Summary of all recommendations corresponding with Management Unit (MU)**

| MU Recommendations | MU1 | MU2 | MU3 | MU4 | MU5 | MU6 | MU7 | MU8 | MU9 |
|---|---|---|---|---|---|---|---|---|---|
| Reconstruct channel by Davis Lane Bridge, removing bars, narrowing width to depth ratio, steepening slope by reinstalling sewer line under current specs, and construct a W-Weir to direct bankfull flows through one opening, allowing flood flows to pass through both openings. | | | | | | X | | | |
| Evaluate the River Road Bridge to determine the best method for improving sediment transport and conveyance of bankfull and flood flows. | | | | | | X | | | |
| Reconstruct River Road reach to provide a larger radius of curvature and install rock vanes to divert flow away from the reconstructed banks. | | | | | | X | | | |
| Evaluate existing bridge and culvert crossings for ability to facilitate fish passage during varying flow periods. | | | | | | | X | X | X |
| Assess local condition surrounding remaining abutments of the historical bridge. Evaluate potential for removing abutments to improve flood conveyance, aesthetics, and reduce potential liability. | | | | | | | X | | |
| Relocate and stabilize the stream channel in the area of the high eroding bank. | | | | | | | X | | |
| Consider efforts to promote land use planning within the corridor to protect the existing resource. | | X | | | | | | | X |
| Extend assessments beyond upstream limit of MU to the headwaters, including major tributaries. | | | | | | | | X | X |
| Evaluate existing berms to quantify the degree of disconnection from its floodplain, impacts to the channel and evaluate and quantify benefits of removal or redesign. | | | | | | | | X | X |