Appendix A Riparian Vegetation Analysis for the Streamside Planting Program

Background

The Stony Clove Creek Streamside Planting Program has evolved since originally proposed in 2002 as an EPA Five Star Grant project proposal, but the goals have remained essentially the same:

-develop a protocol that uses the information gathered during the morphological and riparian vegetation characterization analyses, undertaken as a part of the development of Stream Management Plans, to identify potential planting sites where improvement of the riparian vegetation is likely to be both effective and successful (i.e., where water quality or stream stability conditions could be meaningfully improved by plantings, and where the existing channel conditions did not pose a high risk of losing the investment in plantings to bank erosion). This analysis should produce planting site recommendations for the management plan;

-develop treatment designs for these sites using primarily native plants that address landowner esthetics, ecological enhancement and water quality improvement or protection;

-plant the designs, and document both the planting process and results for program replication and general education/outreach.

While the EPA did not award the proposal a grant, in 2003 the Watershed Forestry Program did. The grant was for $40,000, to treat eight project sites, including 2000 cumulative feet of low bench in the channel, 1500 cumulative linear feet of bankfull area and 2200 cumulative linear feet of riparian floodplain or upland area. Details of the proposal are included in Attachment A.

This proposal originally called for an RFP to be issued for a design/construct contract for implementation of the plantings. The RFP was issued in July 2003. Only one proposal was received, technically inadequate and with a cost well over our not-to-exceed number. After reviewing our options, we decided to use the WFP funds to hire a consultant to produce the designs for the eight sites and purchase materials, and then subcontract just the plantings. A request was made to WFP to amend the terms of the grant contract to reflect the new approach, and this was approved in January 2004.

We requested and received in November 2003 a proposal from Munro Ecological Services (Attachment B), a consultant specializing in ecological restoration of floodplains, to produce the designs and installation specifications, in a form that can be attached to the bid document for the planting contract. The specifications will be in modular form (rather than specific to the each individual site), and referenced in the site plans by planting practice, enabling them to be used as needed in future planting design and contracts.

Designs and landowner negotiations were completed in Summer 2004, bidding of contract for planting is scheduled for the Spring 2005 followed by planting.

Identifying Priority Planting Sites

This section describes the process used to locate priority sites for streamside plantings. Two distinct target areas were identified: within the bankfull channel, and in the 100' riparian corridor; the text below describes the methods used to identify each.

Phase 1: In-channel Areas

In-channel plantings are targeted first in the Stony Clove Creek sub-basin because:

1) the dominant threat to water quality in SCC appears to be elevated suspended sediment loading from in-channel sources;
2) the dominant threat to aquatic habitat appears to be thermal impacts of anthropogenic alteration of both channel width, and of the vegetative cover on the banks and in riparian zones;
3) the dominant threat to infrastructure appears to be catastrophic channel adjustments through avulsion.

In general, plantings within the bankfull channel are intended to:

1) reduce over time the W/d ratio of the bankfull channel (to increase sediment transport effectiveness at bankfull Q), and/or
2) to increase bank cohesiveness, and/or
3) to improve aquatic habitat value by providing thermal shading and physical complexity.

Locations for these types of plantings will typically be aggradational settings, and the goal of plantings will be to narrow and deepen the channel, and to convert what are currently overwide bars into a vegetated low bench and, eventually, a floodplain. In Rosgen's schema, the goal is to accelerate the evolution of "C" channels within "F" channels where appropriate, or to prevent "C" channels from evolving into "D" channels.

Identification of candidate sites begins by excluding inappropriate sites. These include settings that are likely to be degradational, as well as those entrenched settings where narrowing and deepening the channel would still not result in the channel meeting the criterion for "Low Entrenchment" in Rosgen's classification process (i.e., "F" channels that have not evolved sufficient beltwidth within the entrenched channel to allow the development of a stable "C").

Sites considered for planting within the bankfull boundary will meet all of the following conditions:

1) The W/d ratio of the channel is greater than the first standard deviation above the mean of the W/d ratios of all cross-sections. XS with the highest width/depth ratio will receive higher ranking. Watershed context will also be considered; e.g., priority will also be given to management units with clusters of cross sections

with high width/depth ratios, while very high W/d ratio sections followed by very low W/d ratio sections will call for scrutiny of longitudinal stability and the potential for headcuts to develop. Appropriate width/depth ratios will be determined from statistical data for that watershed.

2) The slope of the reach is less than 0.02.

3) The cross-sectional form of the stream and floodplain permits the development of a "Low Entrenchment" reach (actually a high ratio, where $W_{fp}/W_{bf} > 2.2$). Some streams in entrenched situations may require significantly more erosion of high banks to sufficiently widen beltwidth and active floodplain, to allow development of "C" channels inside "F" channels. Where the shear stresses associated with flows $>Q_{bf}$ are likely to raze plantings because the flows cannot access the floodplain (i.e., where there is not sufficient break in the t/Q curve), plantings will be too risky.

   Several dynamics must be considered together in this regard. If the bankfull channel is narrowed by plantings, and depth increased to produce a width/depth ratio closer to the mean, can the resulting entrenchment ratio exceed 2.2? Can the new bankfull XS area pass Qbf? What is the resulting bed averaged shear stress? Is it greater than t_{ci} for the supplied sediment, but not *so* much greater that the bed degrades? Is rooting depth sufficient to supply cohesiveness for the new bankfull depth that will result from deepening after revegetation?

As in the case of upland plantings, bank failures at documented bank erosion monitoring sites will not be candidates for vegetative restoration. These sites are experiencing severe erosion and will need channel and/or bank reconstruction before vegetation can be successfully established. We also need to consider knotweed occurrences in each case; such an occurrence increases priority, all other considerations equal.

The process:

- Create a series of maps based on management units depicting the most recent aerial photographs, reaches that meet entrenchment ratio, slope and width/ratio conditions and bank failure sites.

- Compile a list of priority in-channel areas targeted for vegetative restoration using this series of maps and the professional judgement of the Stony Clove Creek project staff.

- Compile a list of landowners' contact information for priority sites.

Riparian Areas

The objective of managing vegetation in the riparian corridor outside the bankfull channel boundary is three-fold. First, some vegetative cover types increase soil cohesiveness more than others. Rooting depth and density are important elements in determining the boundary conditions in a stream channel that partially control rates of lateral channel migration and channel enlargement, and therefore sediment production. For that area of the riparian zone immediately adjacent to the stream channel, then, the contribution of the vegetative cover to bank stability will be a priority management objective.

The second objective is to limit the input of pollutants from upland sources into the streamflow from overland or interflow, and to trap and store pollutants from overbank flows. The pathways for pollutants include overland flow from upland areas, overbank flows during flood events and interflow.

Priority sites for riparian plantings outside the bankfull boundary will include all areas within a 100' buffer of the stream currently characterized by herbaceous vegetation or non-vegetated, where the near bank has not been identified as a bank erosion monitoring site. This may also include joint plantings in rip-rap revetments. "Herbaceous" and "cobble" categories were chosen as the top priority land cover categories because they have the least streambank stabilization benefit, and because the goal is to promote buffers with the characteristics of the native climax terrestrial vegetation community found in reference riparian sites, which in most riparian locations will not be herbaceous (one exception may be E-channel dominated wetlands). The process will be as follows:

- Using the GIS riparian vegetation classification coverage (created through analysis of the new DOQQs), map those areas other than forest or shrub / scrub cover within the 100ft. buffer, outside the bankfull boundaries of the stream.

- Include coverage of reveted areas, to be targeted for joint planting. Joint planting involves placing of live stakes in the joints of previously installed rock rip-rap. It is intended to increase the effectiveness of the rock system by forming a living root mat underneath the rock and to improve the habitat and aesthetic value of the rip-rap.

- Areas adjacent to bank failures (at the documented BEHI sites) will not be candidates for vegetative restoration. These sites are experiencing severe erosion and will need channel geometry adjustments before vegetation can be successfully established.

- Create a series of maps based on management units depicting the most recent aerial photographs, herbaceous and cobble vegetation coverage, revetment areas, and bank failures.

- Compile a list of priority upland areas targeted for vegetative restoration will be using this series of maps and the professional judgement of the Stony Clove Creek project staff.

- Compile a list of landowners' contact information for priority riparian areas.

Steps after prioritization

-Outreach mailing to landowners who own priority areas, including information describing the streamside landscaping program, briefly describing the priority areas and how planting vegetation could benefit their property and a response form to indicate their interest in participation. These materials will include a discussion of expectations regarding the maintenance responsibilities of the landowners.

-On the basis of landowner response from this mailing, select a subset of high priority sites on which to pilot plantings.

-Conduct site visits to collect additional information and prepare development of a planting design contract.

- Let the design contract.

-Negotiate designs with designer and landowners; get maintenance agreements signed.

-Develop plant materials list.

-Order plant materials

-If not installing in-house, develop bid document for bidding out installation, announce bid competition, arrange and conduct site showings, conduct bid opening, and award contract. Develop contract.

-Coordinate with designer and install plantings.

-Follow up on maintenance, monitor plantings for survival. Negotiate for replantings with planting contractors if necessary, or replant.

-Document the project for ongoing outreach.

-Develop process for handing off pilot to appropriate agency/community group for the second iteration of the process addressing other Stony Clove sites.

-Extend process to other sub-basins.