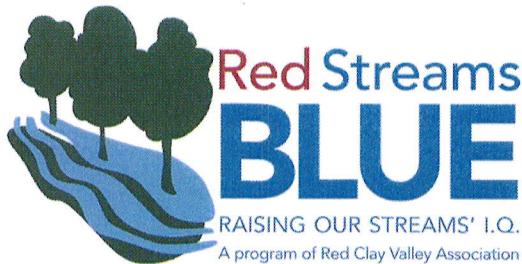


# Upper East Branch Red Clay Creek Watershed Restoration Plan

East Marlborough and Kennett Townships  
Chester County, Pennsylvania

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## **1.0 INTRODUCTION**

Red Clay Valley Association (RCVA) has implemented the Red Streams Blue program to ensure that all streams within the Red Clay Creek Watershed meet Pennsylvania Water Quality Standards. The Red Streams Blue Program targets impaired (Red) stream reaches for restoration. The program goal is to improve water quality and habitat within each Red stream so that scientific assessments determine the stream to be unimpaired (Blue).

The Upper East Branch Red Clay Watershed includes approximately 3.37 square miles. The study area begins in the headwater areas just north of East Doe Run Road in East Marlborough Township in the north and near Longwood Gardens in the east. The study area extends downstream to the Kennett Township/Kennett Square Borough line. The Upper East Branch Red Clay Watershed is considered a Red Stream by RCVA. The stream is listed by the Pennsylvania Department of Environmental Protection (DEP) on its 303(d) list of impaired stream reaches (DEP 2010). DEP identifies the overall watershed impairments as agricultural siltation and habitat alterations, agricultural nutrients (organic enrichment, low dissolved oxygen), urban runoff/storm sewers (siltation, water/flow variability), and polychlorinated biphenyl (PCB) contamination. In the spring and summer of 2010, RCVA worked with Clauser Environmental, LLC to develop an assessment report to determine baseline conditions and targeted sources of impairment within the watershed. The watershed assessment confirmed that the watershed is impaired and determined that restoration projects should focus on addressing the legacy impacts of agriculture, as well as increasing development pressures and stormwater concerns in the uplands. In order to make substantial improvements within the watershed, best management practices such as floodplain restoration, streambank stabilization, stormwater volume and quality controls, native riparian buffer installation, and streambank fencing should be considered.

Here, a restoration plan for the Upper East Branch Red Clay Watershed is presented to address specific areas of impairment. As the solutions outlined within this restoration plan are implemented, substantial progress will be made in turning this Red Stream Blue.

## **2.0 METHODOLOGY**

To determine the areas within Upper East Branch Red Clay Watershed in need of the most attention, Kathy Bergmann, Robert Struble, and Jane Fava of Red Clay Valley Association and Aaron Clauser, Ph.D. of Clauser Environmental, LLC conducted a stream walk on May 5, 2010. Photographs, field notes, and GPS coordinates were collected at areas identified as points of interest. Where access was not permitted, impacted areas were identified by conducting windshield surveys from roadways and reviewing aerial photography provided by the Chester County GIS Department. Sources of impairment were identified at the parcel level.

Clauser Environmental, LLC located the points of interest within the watershed using a Trimble GeoXT Global Positioning System (GPS) receiver during the site visits. The

instrument settings used were: a) Elevation Mask of 15 degrees to limit lowest angle of satellite acceptance to 15 degrees, b) Signal Noise Ratio Mask 6 to minimize weak signal strength, and c) PDOP Mask 6 to control the geometry of satellite constellations. Logging interval was set at 1 second with typically a minimum of 30 readings collected at each point (Trimble Navigation 2008). Data collected in the field was downloaded to a personal computer for differential correction using GPS Pathfinder Office software (Version 4.20). Correction files were obtained from a dedicated base station located in Chester County, PA. Mission planning, parameter settings, and post processing typically allow an accuracy of less than (<) 1 meter. The precision of GPS collected data is subject to variation caused by canopy cover, atmospheric interference, time of day, and satellite geometry. GPS collected data should not be used in situations involving high property values, controversial projects, or in situations where legal questions may arise (Hook et al. 1995).

### **3.0 WATERSHED PROBLEMS AND SOLUTIONS**

This section focuses on the sources and causes of impairment within the Upper East Branch Red Clay Watershed and potential restoration practices that can be completed to address the noted impacts for high and medium priority areas. Low priority restoration projects are included in Appendix B. Each impacted segment identification number can be cross-referenced with its approximate location on the map in Appendix A.

### **3.1 High Priority Projects:**

#### **Impacted Stream Segment #1-3:**

This stream segment is located in the headwaters of the mainstem of the Upper East Branch Red Clay Creek. Stormwater inputs and past agricultural sedimentation have contributed to a stream channel that is incised approximately 3 to 4 feet. The streambanks are eroding, but in some areas are healed over with herbaceous vegetation.



#### **Solution:**

While streambank stabilization could provide a quick fix in this location, restoration of this area should include reconnecting the stream with its floodplain and installing a forested riparian buffer to the west of the stream. Reconnection of the floodplain in this area should help to reduce the impacts of stormwater within the forested area down slope. As the area immediately adjacent to the stream is currently open space, it may be possible to place soil removed from the floodplain on-site.

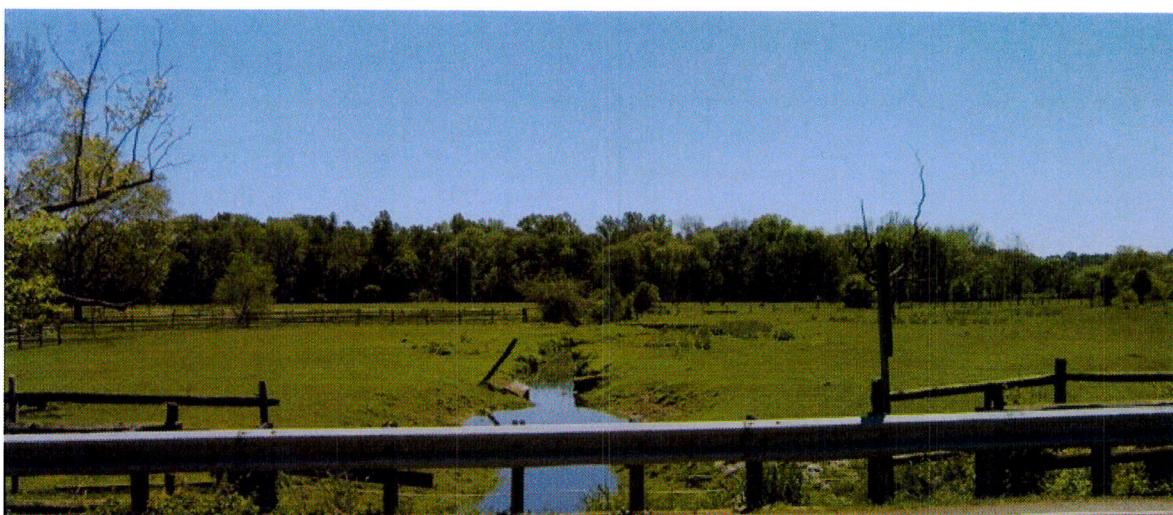
### **Impacted Stream Segment #8-9:**

Within this stream segment, livestock have direct access to the stream. While the streambanks are stable, the stream is exposed to direct sunlight throughout most of this section. The combination of nutrient inputs from livestock within and adjacent to the stream and full sun exposure likely contributes to algal blooms. Corresponding algal population crashes contribute to the impaired nature of stream assesment site 4 (Clauser and Clauser 2010).



### **Solution:**

Restoration of this area should primarily focus on getting the livestock out of the stream. Limiting livestock access to the stream will decrease nutrient inputs, sediment discharges, and pathogen levels within the stream. A combination of streambank fencing, stabilized stream crossing areas, and upland watering structures will be required to improve the water quality throughout this reach. Within the fenced buffer areas, native trees and shrubs should be planted to aid in shading the stream and mitigating water temperature fluctuations.

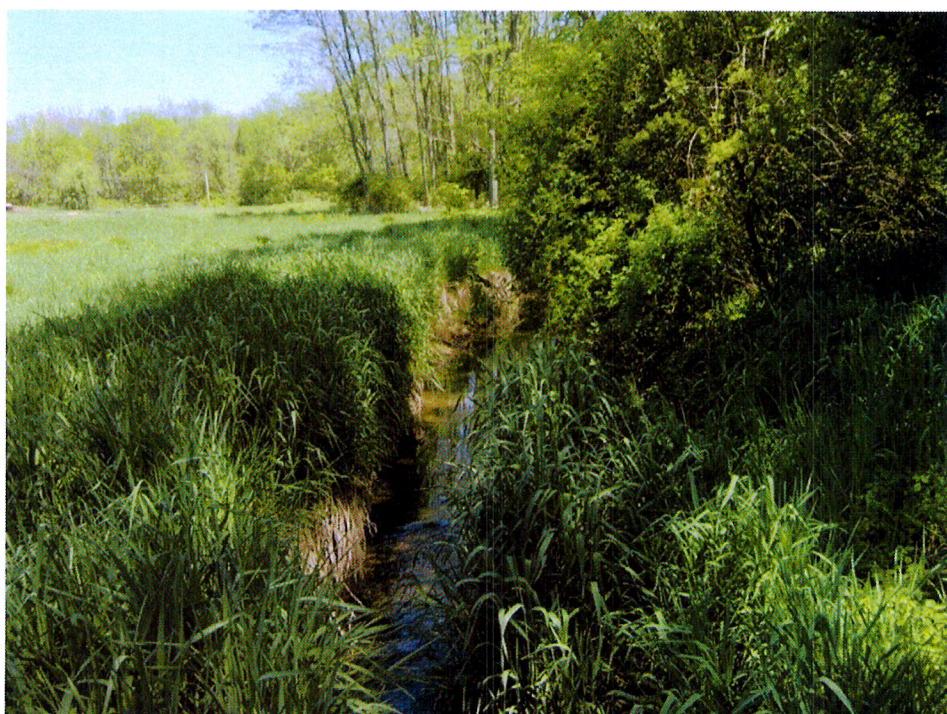


### **Impacted Stream Segment #23-25:**

Legacy sediment is prevalent throughout the floodplain within this stream reach. The streambanks throughout this area are 3 to 4 feet high and actively eroding. The riparian zone to the west of the stream is mowed to the top of the bank. In areas where trees and shrubs are located along the banks, multiflora rose dominates.

#### **Solution:**

Restoration of this area should focus on reconnection of the active floodplain with the stream. The stability of the stream should be considered from a fluvial geomorphology standpoint. As the stream bottom is covered in sediment throughout much of this section, the use of instream structures to provide fish habitat should be considered. Reconnection of the floodplain and stabilization of the streambanks throughout this reach should result in measurable water quality benefits downstream.



### **Impacted Stream Segment #35-36:**

Throughout this forested area, legacy sediment has accumulated throughout the floodplain. Lateral erosion of the streambanks has left raw banks that are several feet high. Bedrock is visible on the stream bottom near the upstream end of this stream segment and will limit farther down cutting of the stream.



### **Solution:**

Restoration of this stream segment would require legacy sediment removal and restoration of the floodplain. The riparian forest and wetlands that are located on top of the legacy sediment will need to be impacted and restored at historic elevations in order to achieve the greatest long-term stability in this area. Before restoration of this area is undertaken, permit review staff from the regulatory agencies should be invited to the site to discuss the project objectives and restoration requirements of the project.

### **Impacted Stream Segment #36-37:**

This stream segment is severely impacted by legacy sediment and has several areas with raw, eroding stream banks. Invasive species dominate the areas along the stream where a riparian buffer exists. The golf course has mowed to the top of streambank throughout much of the reach.



### **Solution:**

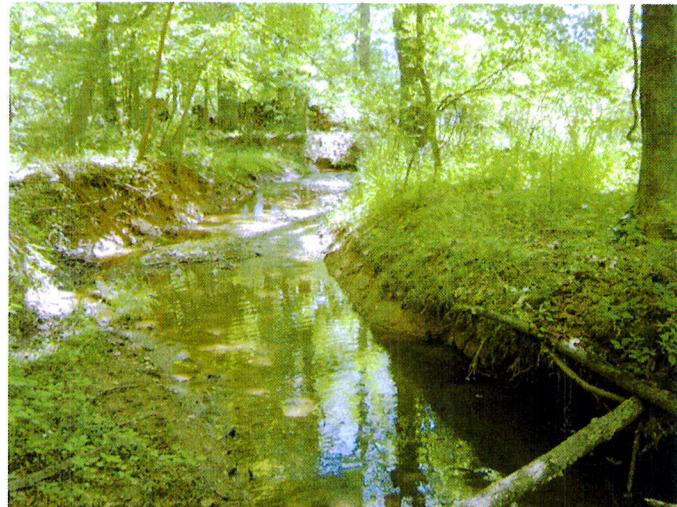
Restoration of this stream segment is ongoing. Funding of this project is provided by a DEP Growing Greener Grant, Kennett Square Golf and Country Club, Chester County Conservation District, Dockstader Foundation, and Red Clay Valley Association. The use of natural stream design, floodplain reconnection, two acres of riparian buffer plantings, bank stabilization and one acre of wetlands improvement should greatly enhance this stream segment. Upon completion, this project will serve as a showcase demonstration project within the watershed that will be a great reference project for attaining landowner support for future projects.

### **3.2 Medium Priority Projects:**

#### **Impacted Stream Segment #3-8:**

The streambanks within the forested portion of this reach are eroded and about 3 to 5 feet high. The stream channel appears overly wide and incised. As the stream flows into the open field and lawn area at the bottom of the reach, bank erosion is less of a concern, but the riparian buffer is lacking.

#### **Solution:**



Balancing the impacts of floodplain restoration and streambank stabilization within this forested area will be challenging. A mix of instream structures and minimal bank restoration grading will likely be necessary to stabilize this reach. Downstream of the forested area, a native riparian buffer should be planted.

#### **Impacted Stream Segment #20-22:**

Within this stream segment, the stream channel is incised 2 to 3 feet with raw, eroded banks on both sides of the stream. Streambank erosion in this area is likely a major contributor to the impairment of stream assessment site 5 (Clauser and Clauser 2010). A mowed lawn extends to the top of the stream bank in the downstream portion of the stream segment.

#### **Solution:**



Restoration of this stream segment should include streambank stabilization with a floodplain restoration component. Restoration of this reach would be challenging. Wetlands and mature forest are perched on top of legacy sediment deposits throughout the forested section. A limited streambank stabilization and buffer planting in the lower section of the reach would require substantially less resources, but would also have less of an impact downstream.

### **Impacted Stream Segment #26:**

A stormwater basin at this location is experiencing an algae bloom. Excessive nutrient inputs likely occur from the upslope playing field and lawn areas.



### **Solution:**

The landscape crew that is responsible for maintaining the playing field and lawn areas for the Unionville High School should be contacted to discuss implementing a nutrient management plan. Additionally, education and outreach within the watershed should focus on downstream impacts of over-application of lawn fertilizers.

### **Impacted Stream Segment #33-34**

A small earthen dam was breached within this segment. Legacy sediment is evident on the northern streambank. The streambank is several feet high and actively eroding.

### **Solution:**

Restoration of this area should include a minor streambank stabilization project. The eroding area is just over 200 feet long. Streambank work within this area would likely qualify for general permit coverage. Wetlands do not appear to be an issue. Soils that are removed from the streambank could likely be spread over the upslope crop fields out of the floodplain.



## **4.0 RESTORATION IMPLEMENTATION**

Restoration of the Upper East Branch Red Clay Watershed will require a combination of best management practices (BMPs) that are especially tailored to improving the aquatic conditions of streams flowing through developing areas with legacy agricultural impacts. Appendix D provides information related to the implementation of each of the proposed restoration BMPs. The format is such that each of the individual BMP sheets may be selected as needed for a particular property/project and provided to the individual landowner.

## **5.0 COST ESTIMATES**

As the restoration of the Upper East Branch Red Clay Watershed moves from the assessment and planning stages into the funding and implementation stages, it is imperative that an understanding of both the benefits and costs of completing each project is held by the partnering organizations and landowners. In the previous sections, the benefits of stream restoration are described. In this section, the design and implementation costs for each high and medium priority restoration project are estimated.

Clauser Environmental, LLC prepared a preliminary construction cost opinion based upon its experience in the field and costs for various best management practices based on PRedICT 2007 to serve as a general guideline for the approximate project costs (Appendix E). For each project, a maximum and minimum estimated cost is presented.

Costs associated with stream restoration are quite variable depending upon the overall restoration goals, landowner objectives, project-funding requirements, availability of building materials and rock, site conditions, volunteer hours, level of detail required for survey and design, and permitting costs.

The total estimated cost to implement all of the high and medium priority projects within the watershed is \$1,362,500 to \$1,555,000. Currently, high priority stream segment 36-37 is being restored. Funding committed to the project totals \$415,000. Completion of the remaining high and medium priority projects would cost approximately \$947,500.00 to \$1,140,000.

To set each project in motion, the project partners will need to seek out interested landowners and funding opportunities. Landowner support and objectives will need to be at the forefront of every decision during the design, permitting, and construction stages of the projects. After reviewing the project on the ground with the landowner, a more refined cost opinion should be developed and utilized as a guide to seeking funding for the project. Important considerations should include access to the project site, locations of resources of special concern (wetlands, etc.), funding limitations, volunteer matches available, and permitting requirements.

After the project is funded and design and permitting are complete, a set of bid documents should be prepared. The bidding process should be conducted in accordance with accepted practices and at least three bids should be sought. The selection of a contractor should be based upon experience with the type of project being conducted, a check of references, capacity to complete the project within the desired timeline, and cost.

## **5.0 OBTAINING SUPPORT AND MONITORING PROGRESS**

Attaining landowner support is often the most challenging step in restoring a watershed. Developing a positive relationship with landowners is critical. RCVA has been active within the watershed for many years and is completing a major stream restoration project at Kennett Square Golf and Country Club. The successful implementation of past projects with respected organizations as partners provides RCVA an excellent foothold for new opportunities.

Some of the key teaming partners for the watershed include:

- East Marlborough and Kennett Townships (adoption of protective municipal ordinance language to protect critical watershed resources)
- Chester County Planning Commission
- Longwood Gardens
- Kennett Country Club
- Unionville High School
- Chester County Agricultural Preservation Board (farmland preservation)
- Chester County Conservation District (soil conservation, nutrient management, and watershed consultation)
- Natural Resources Conservation Service (agricultural BMPs)
- Pennsylvania Department of Environmental Protection (water quality grant opportunities)
- Pennsylvania Department of Conservation & Natural Resources (land preservation, resource management and grant opportunities)
- Pennsylvania Fish & Boat Commission (fisheries protection, resource management, and aquatic habitat improvement)
- Pennsylvania Game Commission (wildlife protection and habitat improvement)
- Ducks Unlimited (volunteers and funding assistance)
- Trout Unlimited (volunteers and funding assistance)
- Local Scout and Civic Groups (riparian buffer planting volunteers)

The effectiveness of installed restoration projects should be monitored within the watershed. The background data collected during the assessment phase of this project provides a baseline by which to compare data collected with the same standard methodologies. Monitoring will aid in not only understanding what best management practices are having the greatest impact and guiding future projects, but will also provide crucial supporting data to demonstrate success and leverage funding of future projects.

## **7.0 LITERATURE CITED**

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