

Status Report Executive Summary

Legacy Sediment Workgroup

For: PA Chesapeake Bay Tributary Strategy Steering Committee Meeting July 21, 2006

Re: Legacy Sediment Workgroup Meeting July 13, 2006

Team Leader(s): Jeffrey Hartranft (Chair), Dorothy Merritts and Robert Walter, Co-chairs

- Education and Outreach – Since the last workgroup meeting on May 1, Merritts and Walter (F&M) gave lectures to the following institutions:
 - University of California at Berkeley Fluvial Geomorphology Group (Prof. Bill Dietrich and colleagues – Note: Prof. Dietrich is a fellow of the National Academy of Science, and one of the most influential fluvial geomorphologists in the country);
 - Maryland State Highway;
 - Maryland Department of Natural Resources;
 - Pennsylvania Department of Environmental Protection, South Central Region (organized by Jineen Boyle);
 - Shippensburg University K-12 Teacher Training.

- Merritts, Walter and Ward Oberholtzer (LandStudies) gave four, separate day-long tours of legacy sediment and floodplain restoration sites in Lancaster County to:
 - Legacy Sediment Workgroup (with Dan Galeone and Mike Langland, USGS);
 - Prof. Dietrich, University of California;
 - Christian Broderick, a graduate student of Prof. Dietrich's who will incorporate legacy sediment research into his Ph.D. dissertation on the origin of gravel bed streams; and
 - the Maryland Department of the Environment in conjunction with officials from the Professional Golfer's Association (PGA). Note: Many golf courses are built along valley bottoms and are constructed upon legacy sediments. Given their location, they generally have problems with bank erosion and flooding. Golf

course owners are promising targets for sharing the costs of floodplain restoration.

- Education and outreach continue with the following events:
 - National Association of Conservation Districts East Region and PA Conservation District joint meeting in State College, July 23 (including a field tour of legacy sediment sites in Centre County and a keynote address at the opening session of the conference (Merritts and Walter).
 - Watershed Windows presentation to PA DEP Staff July 28-RCSOB (Hartranft, Merritts & Walter).
 - August 3rd presentation to the Smithsonian Environmental Research Center (Merritts and Walter).
 - October presentation to US Army Corps of Engineers, Baltimore District Regulatory Branch (Hartranft).
 - A lecture at PENNDOT for the fall is being arranged by workgroup member Joe Baker (PENNDOT archaeologist).
 - A one-day tour of legacy sediment and floodplain restoration sites between Philadelphia and Lancaster for the Geological Society of America professional meeting, October 21, 2006 (Merritts, Walter, and Oberholtzer).

- The Franklin and Marshall research team presented an update of their recently awarded PA DEP and PA Chesapeake Bay Commission grants and current research projects:
 - Two new research staff positions were sought and filled through the PA DEP award:
 - Mike Rahnis (MSc), geospatial analyst (start date 6/12/06)
 - Andrew Stubblefield (PhD), hydrologist and geochemist (start date 6/17/06)
 - GIS analysis and database construction for legacy sediment sites. LiDAR data of the Conestoga Watershed is proving very useful for identifying the extent and distribution of legacy sediment deposits. A protocol for identifying legacy sediments using GIS analysis, particularly with LiDAR and imaging sources, is being developed for application in the BMP. LiDAR will be available for all of PA in the next few years, so it is a promising tool for all future PA floodplain/stream restoration site evaluations and monitorings.

- Three new pieces of laboratory analytical equipment for soil and water nutrient analysis were purchased through the PA CBC award: two instruments are installed and are being calibrated for quality control and quality assurance. These two instruments are: (1) a CEM microwave digester (installed 6/19/06) used to obtain partial dissolution of soil samples for total sorbed phosphorus (P) and trace metal analysis; and (2) a Lachat Flow-Injection Analyzer (installed 7/6/06) for phosphorus (phosphate, organic P, and total P) and nitrogen (nitrate, nitrite, and ammonia) measurements of available nutrients in soils. The third instrument, the Costech Elemental Combustion Analyzer for total nitrogen and total carbon analysis of soils, is being shipped from the factory on 7/20/06 and will be installed at F&M the first week of August.
- A high-speed, large-data storage computer was purchased with CBC funds to support GIS data acquisition and geospatial analyses for bank erosion studies.
- Legacy sediment samples for nutrient analysis are being collected from selected stream bank sites in the Piedmont and Ridge and Valley physiographic provinces of PA's Chesapeake Bay Watershed. Nutrient analyses for these regions will be used to establish BMP protocols for nutrient reductions within Pennsylvania's Chesapeake Bay watershed. These sites include (those in italics have been sampled):
 - Lancaster County – *Big Spring Run, Little Conestoga Creek, West Branch of the Little Conestoga, Conoy Creek, and Hammer Creek.*
 - York County – East Branch Codorus Creek, South Branch Codorus Creek, and Kreutz Creek,
 - Centre County – *Penns Creek*, Bald Eagle Creek, Spring Creek
 - Huntingdon County – Emmas Creek, Spruce Creek and various tributaries of the Little Juniata River (to be determined).
- A GIS map of Lancaster and York Counties, showing the location of 18th and 19th Century mill dams, has been prepared based on extensive historic research in these two counties (see attached Figure). Similar maps will be prepared for Centre and Huntingdon Counties. These maps are used to illustrate the

extent of stream impairments caused by mill dam construction, and help guide our sampling strategy.

- Bank erosion rates of legacy sediment will be assessed for each legacy sediment sample site using a combination of remote sensing and ground based measurement surveys.
 - Erosion rates are essential to establish the Legacy Sediment BMP, and for use in the CBP Model, and are the most challenging parameter to obtain. To aid in this effort, the F&M research group is compiling a list of sites from previous DEP Growing Greener and Section 319 awards where long-term bank-erosion data are available and where monitoring still exists. James Kreider, a research intern at LandStudies, Inc., has compiled an extensive list from these sources, and the F&M research group is meeting with Gary Peacock (York County Conservation District), Matt Hoch (Penn State Univ at York), and others in York County to determine which York County bank erosion sites are most promising to acquire bank erosion rates.
 - Jeff Hartranft, Scott Cox, and others at DEP have collected channel cross section data (laser level and total geodetic station surveying) at the Hammer Creek Pump Station dam removal site since 2001, just prior to dam removal and multiple times since dam removal, including in April and July of 2006. F&M researchers are now collaborating with the DEP team to continue this monitoring in order to document in great detail the erosion of legacy sediment from a reservoir after dam breaching. Note: Significant bank erosion did not begin until the channel had incised down through the channel fill, providing “accommodation” space and a sufficient drop in channel base level to initiate the process of bank calving, collapse, and scour.
- EPA - CBP Modelers are aware of and involved in the Workgroup activities. Legacy sediment topics are being discussed at various EPA CBP meetings.
 - Discussions continued on the selection of a demonstration site for legacy sediment and floodplain restoration. Possible sites include Conoy Creek (Masonic Villages), Big Spring Run, and Chiquies Creek (Mount Joy), all in Lancaster County. Big Spring Run has an advantage in being a small watershed, and it was the subject a ten year hydrologic

study by the USGS ending in 2002, providing crucial pre-restoration stream data that would be very valuable in assessing the effectiveness of restoration in reducing sediment and nutrient loads.

- Legacy sediment and nutrient trading issues involve an understanding of the nutrient contents of legacy sediment, the rates of their contribution (erosion and transport) to waterways and a market for these nutrients. The workgroup held lengthy discussions on ways to create markets for legacy nitrogen, phosphorus and sediment, where currently only nitrogen is tradable. In this regard, Walter reported on a visit to the Rodale Institute, where he engaged staff scientists from Rodale on the concept of mixing legacy sediment with manure to make a composted soil. This concept has potential for the marketing and trading of nutrients, and continued discussions among F&M, Rodale, DEP and the workgroup are encouraged.
- Next workgroup meeting tentatively scheduled for August 24, 2006.
- At the September workgroup meeting, F&M researchers will provide a tour of the new nutrient/GIS facilities at F&M (provided with DEP and CBC funding) and will present initial results of nutrient analysis of legacy sediments from several sites.

Figure Caption: The location of 18th and 19th Century mill dams in Lancaster and York Counties, based on historic documents and maps.
Note: Not for general circulation until map is published.