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USGS Chesapeake Bay Activities

Ecosystems: Chesapeake Bay – Floodplain Sedimentation Dynamics

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Statement of Problem: Excess sediment is having an adverse affect on the living resources and associated habitat of the Chesapeake Bay and its watershed. Submerged aquatic vegetation (SAV) has declined drastically in over the past 30 years due to degraded water clarity associated with suspended sediment and eutrophication. Excessive sedimentation can bury or affect the vitality of filter feeders in the Bay. The chemical constituents and potential pathogens associated with sediment are believed to impact fisheries and other living resources in the Bay and its watershed. Excess sediment degrades the habitat needed to support benthic invertebrates in streams throughout the Bay watershed. Finally, sediment is threatening the economic and recreational vitality of the Chesapeake Bay region due to filling of commercial and recreational shipping and boating channels. Due to some of these concerns, the Chesapeake Bay was listed as an impaired water body under the Clean Water Act. Sediment storage, retention time, and remobilization are critical to the development of a sediment budget. A sediment budget or facsimile is necessary to approach one of the Place Base goals, understanding the impact of sediment on water clarity and biota.

Objectives: Our objectives are 1) to estimate the rates and amounts of sediment stored along tributaries to the Chesapeake, principally on floodplains (usually forested but along some marshes as well), 2) to estimate the retention time of sediment stored in various fluvial landforms and the distance traveled when mobilized, 3) to estimate the sources of stored sediment (this includes the collection and analysis of suspended sediment), and 4) to integrate our results with other sediment studies toward the development of an accurate sediment budget.

Approach: Our sampling design includes the establishment of permanent multiple transect-based sites from the stream to the hillslope. We use dendrogeomorphic (tree ring) techniques to obtain "long term" rates of sediment deposition and clay markers to obtain "short term" rates. These data are then used to estimate volume of sediment and associated contaminants and nutrients trapped annually. Additionally we analyze (or use the analyses of others) sediment for

organic content (loss on ignition), bulk density, sediment size, and nutrient concentrations. Fluvial geomorphic forms and processes are studied determine the area of storage; these are all important parameters necessary to understand sedimentation dynamics. We have established wells/water-stage recorders, or developed from gaging station records estimates of the hydroperiod for each of our sites.

Our study is designed to sample along both brown- and black-water systems on both the Eastern and Western Shore. This includes the Chickahominy, Mattaponi, Pamunkey, Piankatank (Dragon Run), Patuxent, Choptank, and Pocomoke Rivers. These rivers drain agricultural, urbanizing, and "pristine" or reference basins. These rivers are monitored upstream near the Fall Line and downstream to tidal reaches (no flow reversals). Some rivers like the Pocomoke and Chickahominy are monitored more intensely (5 to 7 sites each). In FY 03 we will begin similar studies along tributaries to the Susquehanna River and will begin site selection for similar efforts on the Potomac River. The Pocomoke (agricultural), Chickahominy (urbanizing), and Dragon Run (reference) are also sampled for radio and stable isotopes and other physical properties in/of the sediment to aid in source and retention time determination. Several of these streams are also sampled for vegetation composition, density, and biodiversity.