Sediments and the Conowingo Dam

The Biggest Single Threat to the Chesapeake Bay

During 4 days in 1972, the flood waters of Tropical Storm Agnes transported 4 years worth of sediment and pollutants down the Susquehanna River from New York and Pennsylvania. When the flood waters reached Maryland and the Conowingo Dam, the waters scoured another 10 years of pollutant-bearing sediment that had been trapped in the reservoir behind the dam. This "catastrophic pulse" of 14 years worth, or 30 million tons, of sediments combined with the surge of freshwater to inflict the biggest single damaging event ever recorded in the Chesapeake Bay. Over the past 35 years this sediment has accumulated to a level exceeding 1972 levels and scientists agree that the question is not if this will occur again, but only a matter of when.

The paradox is that the Conowingo Dam currently collects and retains an average of 60-70% of the annual load of sediment being transported down the Susquehanna. This essentially makes the Conowingo Dam the biggest single mitigation tool, or "Best Management Practice", in the Chesapeake Bay. However the pollution-control value of the dam is reaching its end as the sediment fills in behind the dam, removing its ability to trap sediment. Once this "steady state" is reached, the load of sediment from the Susquehanna to the Chesapeake Bay will increase by 150 to 250% (from 1.2 million tons to 3.2 million). Along with this sediment, we will see an additional 30 to 40% increase in phosphorus (from 5.2 million pounds to 8.7 million). These increases will affect aspects of Chesapeake Bay management from channel dredging frequency to size of the "dead zones".

Research has already been conducted to determine the effects of the increases in sediment and phosphorus loading, and this was summarized in the Chesapeake Bay Program's Science and Technology Advisory Committee (STAC) report entitled "**The Impact of Susquehanna Sediments on the Chesapeake Bay".** However that is where the research stopped in 2000.

The Chesapeake 2000 Agreement specifically documented the need to address this problem: "**Water Quality Protection and Restoration: Nutrients and Sediments,** Goal 5. By 2003, work with the Susquehanna River Basin Commission and others to adopt and begin implementing strategies that prevent the loss of the sediment retention capabilities of the lower Susquehanna River dams." In the Preamble of the Chesapeake 2000 Agreement all signers agreed to address this problem: "In affirming our recommitment through this new *Chesapeake 2000*, we recognize the importance of viewing this document in its entirety with no single part taken in isolation of the others. This Agreement reflects the Bay's complexity in that each action we take, like the elements of the Bay itself, is connected to all the others."

Given proper funding, the U.S. Army Corps of Engineers, the U.S. Geological Survey and other partners are prepared to conduct the needed studies to determine current conditions and the feasibility of various removal strategies. To do this we need committed federal funding and a non-federal match. This non-federal match appears to be what stalled this process in 2001 when the need was brought to the states. At that time the match need was 1.2 million dollars, or $600,000 each for Maryland and Pennsylvania, the two states most closely associated with this problem. There are indications that EPA may be able to help the states with this funding through State Implementation Grants, but a match would still be required from state funds and/or services. Additional matches may come from EPA if the states take the lead on funding.

This is where we find ourselves today. The Chesapeake Bay Program, Susquehanna River Basin Commission, U.S. Geological Survey and university scientists all agree that we have an imminent and major threat to the Chesapeake Bay, a threat that could undermine the years of efforts that have been made to restore the Bay. We need these studies as soon as possible to determine what can be done to remove or reduce this threat.

Excerpts of the CBP STAC Report on Susquehanna Sediments

The Objective of the Workshop was to survey the possible consequences of the increased delivery of sediments from the Susquehanna River to the Chesapeake Bay as a result of the loss of retention of sediment storage in the reservoirs behind the existing dams on the river.

The material presented emphasized **the complexity of the possible effects** of increases in sediment discharge to the Bay and of the increase in severity of scouring events. This is compounded by our inability to forecast the timing or intensity of these scouring events in the river and reservoirs. Detailed predictions are therefore not possible but the consequences that can be predicted with most confidence are:

1) Increased loading of phosphorus in the Middle Bay below the Estuarine Turbidity Maximum zone (the ETM) from sediments that move beyond this zone during large-flow scouring events.

2) Increased needs for dredging the navigation channels in the Upper Bay as the overall load of sediment deposition in the Upper Bay increases. Past information shows that almost all of the sediment delivered by the Susquehanna River is deposited north of the Baltimore area. There is a tendency for high rates of accumulation of finer materials in the deeper channels. These areas are those where the greatest impacts from increased sediment delivery can be expected. If channel dredging continues it will have to be more frequent, and with increased costs.

3) Higher turbidity and faster sedimentation everywhere, but especially in the navigation channels. The range of flow dynamics will be increased, especially during storms.
Without channel dredging there will be rapid channel filling, downstream displacement of the salt front, and possible major changes in circulation and sedimentation patterns.

4) Adverse effects on the recovery of Submerged Aquatic Vegetation (SAV) due to decreased light penetration. Most SAV species in the bay have high light requirements.
Sediment solids are always a major factor and any increase in the amount present will be a serious hindrance to the recovery and re-establishment of the SAV population and the habitat which this provides for many of the Bay biota.

5) Benthic organisms will be adversely affected by increased sediment loads that increase the energetic costs from burial. Episodic deposition also rapidly increases mortality and recruitment. Young oysters are sensitive to increased sediment deposition and long-term community structures will be changed by the impoverishment of the macrofauna.

6) Potential effects of increased sediment loading on fish populations in the Upper Bay and the ETM include:

1) direct effects of feeding, clogged gill tissues and smothering of eggs;

2) indirect effects on the abundance of planktonic prey of larval and juvenile fish, and

3) habitat alterations through increased silting and sedimentation with changes in the location and mode of operation of the ETM.

To the extent that increased sediment loading in the Upper Chesapeake Bay will require more dredging and associated activities to maintain channels there may be an increased threat to spawning and nursery habitats for anadromous fishes: this may become an issue in the future.