Article 14

Technical Note #86 from Watershed Protection Techniques. 2(3): 443-444

Impact of Suspended and Deposited Sediment

There is little doubt that construction sites rank among the most significant sources of sediment today. For example, Goldman (1986) computed that construction sites are responsible for an estimated export of 80 million tons of sediment into receiving waters each year. On a unit area basis, construction sites export sediment at 20 to 2,000 times the rate of other land uses. While the muddy waters that run off from construction sites are easy to observe, many watershed managers are not fully aware of the many downstream impacts eroded sediments have on both the environment and the economy. Given the cost and effort needed for ESC control, it is important to remember why it matters.

The effects of sediment on biota, recreation and the economy are both subtle and profound, and they can be gleaned from several recent literature syntheses. The nature of the sediment impacts depend on whether sediments are suspended in the water column (Table 1) or are deposited on a stream channel or lake bottom (Table 2). Taken together, the 30 reported impacts confirm that eroded sediment is a major pollutant in waterways.

Much of the research on the impacts of sediment on aquatic systems is rather dated. However, two more recent biological surveys indicate that eroded sediment can have a dramatic influence on aquatic biota. For example, while often overlooked, freshwater mussels are a major component of the ecology of streams and rivers. Mussels filter out plankton from running waters, and in turn, serve as a key food source for fish, wading birds, and other vertebrates. A recent review of the status of native mussels in North America strongly suggests that this important freshwater resource is imperiled. In fact, of 297 native species reviewed by Williams *et al.* (1993), 72% are either endangered, threatened or of special concern. Only 24% of all native species are considered to be stable.

The sharp decline in biological diversity noted for native mussels is primarily a result of habitat alteration (by dams, channelization, and invasion by non-native species). Of particular concern is the effect of deposited sediments on mussel habitat. Siltation and the subsequent shifting and smothering of the stream or river bottom are cited as major factors in the decline of mussel biota. Clearly, native freshwater mussels are particularly vulnerable to increased watershed erosion and sediment deposition, and may be at risk if upstream construction sites are poorly managed.

Recent research has also revealed that rare and threatened fish species are vulnerable to even relatively small increases in stream turbidity. For example, Kundell

Table 1: Summary of the Impacts of Suspended Sediment on the Aquatic Environment

- Abrades and damages fish gills, increasing risk of infection and disease
- Scouring of periphyton from stream (plants attached to rocks)
- Loss of sensitive or threatened fish species when turbidity exceeds 25 NTU
- Shifts in fish community toward more sediment tolerant species
- Decline in sunfish, bass, chub and catfish when monthly turbidity exceed 100 NTU
- Reduces sight distance for trout, with reduction in feeding efficiency
- Reduces light penetration causing reduction in plankton and aquatic plant growth
- Reduces filtering efficiency of zooplankton in lakes and estuaries
- Adversely impacts aquatic insects which are the base of the food chain
- Slightly increases stream temperature in summer
- Suspended sediments are a major carrier of nutrients and metals
- Turbidity increases probability of boating, swimming and diving accidents
- Increased water treatment costs to meet drinking water standards of 5 NTU
- Increased wear and tear on hydroelectric and water intake equipment
- Reduces anglers chances of catching fish
- Diminishes direct and indirect recreational experience of receiving waters

and Rasmussen (1995) recently reported on the sensitivity of six state or federally listed endangered fish species in Georgia rivers that were adversely impacted when turbidity exceeded 10 to 25 nephelometric turbidity units (NTUs). The fish species included blue shiners, freckle-belly madtom, river darter, amber darter, log perch and freckled darter. Three-quarters of these species were eliminated when turbidity occasionally exceeded 25 NTU on a monthly basis; all were lost when turbidity more frequently exceeded 25 NTU.

Construction site erosion is but the first pulse in sediment load associated with urban development. A second, and possibly greater sediment pulse, occurs as stream banks begin to erode in response to the greater volume and frequency of stormwater flows generated by impervious cover. More research is needed to define the impacts of suspended and deposited sediments during both pulses occurring in developing watersheds.

—TRS

References

Goldman, S., *et al.* 1986. *Erosion and Sediment Control Handbook.* McGraw-Hill. New York. 443 pp.

Kundell, J., and T. Rasmussen. 1995. "Recommendations of the Georgia Board of Regents Scientific Panel on Evaluating the Erosion Measurement Standard Defined by the Georgia Erosion and Sedimentation Act." pp. 211-217. In: *Proceedings 1995 Georgia Water Resources Conference.* University of Georgia, Athens, GA.

Williams, J., M. Warren, K. Cummings, J. Harris, and R. Neves. 1993. "Conservation Status of Freshwater Mussels of the United States and Canada." *Fisheries* 18(9): 6-22.

Table 2: Summary of the Impact of Deposited Sediments on the Aquatic Environment

- Physical smothering of benthic aquatic insect community
- Reduced survival rates for fish eggs
- Destruction of fish spawning areas and redds
- “Imbedding” of stream bottom reduces fish and macroinvertebrate habitat value
- Loss of trout habitat when fine sediments are deposited in spawning or riffle-runs
- Sensitive or threatened darters and dace may be eliminated from fish community
- Increase in sediment oxygen demand can deplete DO in lakes or streams
- Significant contributing factor in the alarming decline of freshwater mussels
- Reduced channel capacity, exacerbating downstream bank erosion and flooding
- Reduced flood transport capacity under bridges and through culverts
- Loss of storage and lower design life for reservoirs, impoundments and ponds
- Dredging costs to maintain navigable channels and reservoir capacity
- Spoiling of sand beaches
- Deposits diminish the scenic and recreational value of waterways