06 Sediment

Target Statement

By 2050, we understand more about the contribution and movement of sediment from the watershed into the Hudson River estuary which is reflected in both management actions and monitoring data trends. This knowledge will support the planning and appropriate actions in the watershed to improve tributary habitats and water quality, as well as robust shallow water estuary habitats. By 2030, 25 projects are underway to either reduce sediment in tributaries where excess sediment is a documented impairment, or deliver more sediment to shallow estuary habitats needing more sediment to sustain levels with sea level rise.

Summary

Sediment is a fundamental component of any aquatic system as it influences light penetration, carries/hosts pollutants, supplies nutrients, supports wetland maintenance and provides habitat for plants and macroinvertebrates and can help reduce risk of flooding and erosion. The Hudson River estuary has been characterized as a naturally turbid system with significant capacity to both store and transport sediments, but a challenging paradox exists between tributaries and the estuary. Currently, many tributaries are impaired by too much sediment deposition from storm water run-off, eroding streambanks and stream channels adjusting to higher peak flows. Conversely, several tidal wetlands in the estuary are vulnerable to sea level rise because sediment accretion rates may not be able to keep pace. If sediment accretion rates in these wetlands are not able to keep pace with sea level rise, they are likely to shift to an open water habitat and significant wetland functions would be lost. Thus, tidal wetlands may require more sediment to maintain their function. There are other challenges in the estuary affected by sediment transport including maintenance dredging for commercial ports, recreational marinas and the navigation channel (see Navigation), and where to put historic fill material removed for aquatic restoration purposes. Sediment stored behind both large and small tributary dams also warrants consideration when scoping dam removal opportunities.

The amounts of sediment entering the estuary vary greatly from year to year as a function of precipitation and streamflow. Human activities associated with navigation channel development and management, shoreline hardening, historical logging and agricultural practices along with intensifying land-use conversion and development in the watershed have likely altered the rate, patterns, and composition of sediment delivered to and transported through the estuary. These changes likely influence both tributary and main stem processes and conditions. Although sediment delivery and transport are very difficult and expensive to quantify, estimates suggest that contemporary delivery rates are eight times higher than at the time of pre-European settlement but half as much as experienced during the peak of animal-powered agriculture and logging practices at the end of the 19th century. Since then our intentional interaction with and management of sediments in the river has greatly intensified as evidenced by the development and maintenance of a navigation channel and the establishment of commercial ports and recreational facilities. Another complicating factor is that most sediment core samples, although sparse relative to the area of the estuary, indicate PCB contamination levels of about 0.1 ppm and above. These levels are common, but certainly not universal. Concentrations above this threshold can complicate meeting the standards typically associated with “beneficial use” opportunities (e.g., beach nourishment, wetland restoration, strip mine reclaimation, etc.); a “beneficial use detemination” can be the significant element in project feasibility. Additionally, the intensity and frequency of significant precipitation events are expected to increase, which could lead to a related increase of sediment delivery events. A common and documented source of chronic water quality impairment in tributaries is excess sediment. Yet, in the estuary, periodic sediment delivery events can have long-term implications. For example, Tropical Storm Irene resulted in high loads of sediment to the estuary that smothered estuarine aquatic

vegetation, resulting in near total loss of submerged aquatic vegetation following the storms. By 2017, approximately 2/3 of the known submerged aquatic vegetation coverage has recovered. To overcome these challenges, an improved understanding of sediment dynamics and characteristics both within individual tributary watersheds and between all tributaries and the estuary itself are needed to improve our ability to identify and implement management objectives, strategies and actions.

Excluding the significant sediment delivery from the Mohawk River, run-off induced erosion from uplands and in-channel erosion within tributaries to the Hudson are a primary sediment source. These sources support maintenance, and possibly accretion, in some of the shallow water habitats typically found at the confluence with the estuary. However, a lack of monitoring data precludes the prioritization of stream segments to be more appropriately managed to allow for natural adjustments to increased peak stream flows. Strategic prioritization, likely through modeling exercises, is a critical step as restoration experience from the Catskills suggests costs between $200 and $285 per linear foot. A tributary watershed approach that prioritizes specific reaches within tributaries for restoration and provides nature-based restoration guidance is necessary. This guidance should include elements of wetland protection, stream channel, floodplain and riparian area restoration, dam removal, culvert right-sizing, and improved urban, suburban, and agricultural stormwater management. Other nature-based restoration actions capable of reducing peak discharge rates and enhancing the safe passage of sediment and debris flows should also be considered.

In the estuary, a sediment management strategy based on an improved understanding of sediment source/fate dynamics is necessary to meet both natural and social demands. This will require additional research into the estuary sediment transport dynamics, a management framework that quantifies the trade-offs among management activities, stakeholder coordination and implementation resources. Through an improved understanding of existing sources, supply/discharge rates, concentration, and transport patterns, finding a balanced solution to both challenges will likely become more attainable. Although complex and time consuming, a strengthened, comprehensive approach to sediment management is an imperative, fundamental step to achieving many of the restoration and resilience goals identified in this plan.