Buffer Options for the Bay

Successful Buffer Restoration Case Studies From Around the Country

OVERVIEW

The Coastal Science Literature Review considered both primary literature and previous literature reviews, the products that are shaped from this review will be of service to all buffer management stakeholders in the Great Bay region, including landowners and the consultants who work with them, regulatory agencies and municipalities, conservation organizations and foundations, and scientists interested in conducting research that will lead to more effective buffer management. The following case studies represent examples of buffer restorations that have been "successfully" employed, i.e., natural vegetation has been re-established. Where information is available, we have also discussed the evidence that these restoration efforts have resulted in quantifiable benefits to target ecosystem services. Also included are case studies highlighting successful protection efforts that have maintained functional buffers in places where they still occur. Compared to restoration, fewer case studies have quantified the ecosystem service benefits of protection of existing buffers. More specifically, we were unable to find watershed-scale case studies that had compared the benefits of using available resources to conserve existing buffers versus restoring lost buffers. We flag this as a research gap given that restoration is often costly and not always successful.

Columbia River Watershed

In other areas of the United States, buffer restoration projects have had success in targeting areas impacted by forestry and agriculture. In the Columbia River watershed in the western United States, since the 1960's buffer areas have been added to reduce the impacts of logging – in particular, slope failure and soil erosion (National Research Council 2004). Additionally, Washington State's Conservation Reserve Enhancement Program (CREP) has provided financial incentives for farmers to restore riparian buffers on agricultural land for nearly 20 years. Survival of planted vegetation ranged from 75 percent to 90 percent throughout the state, with most positive results seen after 5+ years of the buffer being implemented, especially for canopy cover, which provides the service of shading the buffer and adjacent water body (Smith 2012).

Fox Creek Canyon, Oregon

In Oregon in 2003, the Fox Creek Canyon underwent a restoration project coordinated by various partnering agencies to mitigate the degradation caused by open-range cattle grazing. Sixteen acres were seeded with native grasses, 4,000 native cuttings and seedlings were planted, and 7 miles of fence were installed to exclude cattle (Machtinger 2007). Results were not quantified, but grasses and forbs had regenerated on the banks of Fox Creek within two years of the restoration efforts.

Bog Brook, New Hampshire

Various other projects in the Northeast and western United States that included buffer restoration as a component of their water quality and habitat improvement techniques demonstrated successes, although the degree to which buffer restoration contributed to the successes remains indeterminable. A buffer was implemented as part of a streambank stabilization project at Bog Brook in the upper Connecticut River basin of northern New Hampshire, an area dominated by agriculture. Riparian vegetation was removed decades ago, presumably to increase the arable land area available, which caused streambank erosion and a subsequent decline in water quality (U.S. Environmental Protection Agency 2006). In 2004, the streambank was stabilized through natural stream channel design, including planting of deep-rooted shrubs to form a vegetated buffer to supplement the shallow-rooted (six-inch) grasses in existence. The shrubs consisted of alder and willow, among others. One-year post-construction, the vegetation was well-established and firmly rooted, and the channel had become more narrow and deeper, both indicative of channel stability. Because of this restoration, Bog Brook was reclassified as “Fully Supporting” from “Impaired” by the New Hampshire Department of Environmental Services.

Mousam Lake, Maine

Another project that included buffer implementation to address water quality issues was the restoration of Mousam Lake’s shoreline in southern Maine. The lake’s water quality had been in decline for decades due to excessive phosphorus inputs via stormwater runoff. However, after ten years of nonpoint source pollution control projects that started in 1997, water clarity increased by three feet, the lake was in a stable or improving trophic state, and it attained water quality standards set by the Maine Department of Environmental Protection, thereby allowing it to be removed from the list of impaired water bodies (U.S. Environmental Protection Agency 2008). Best management practices, including vegetated buffer plantings, were installed along the lake shoreline at 45 priority sites to stabilize erosion and improve roadside drainage and gravel road surfaces. The associated reduction in pollutant loading to the lake was more than 150 tons of sediment and 130 pounds of phosphorus per year – this equates to a ten percent reduction in phosphorus to the lake. Consequently, this high profile work inspired protection efforts on several neighboring lakes.

Highland Lake, Maine

Similarly, buffer restoration was one method used to combat water quality declines in Highland Lake outside of Portland, Maine. In the 1980’s and 1990’s, the lake showed signs of declining water quality caused by excessive soil erosion throughout the watershed. Restoration work beginning in 1997 addressed significant erosion sites and reduced polluted runoff by planting more than 1,000 shrubs,

trees, and groundcovers, and installing other best management practices such as water bars, rain gardens, and riprap. Lake water clarity stabilized and met water quality standards, thereby allowing it to be removed from the state's list of impaired water bodies in 2010. Furthermore, the amount of sediment and phosphorus exported to the lake declined significantly; it was estimated that pollutant loading was reduced by 278 tons of sediment and 1,070 pounds of phosphorus per year (U.S. Environmental Protection Agency 2010).

Gila River Watershed

Although not topographically similar to the Northeast, the Gila River watershed provides another example of buffer restoration and protection being used to revive an impaired watershed successfully. Portions of the watershed within Arizona and New Mexico have been degraded by past fire management, logging, and domestic grazing practices, thereby reducing water quality, species diversity, and floodplain function (Natural Resources Conservation Service 2006). Protection and restoration efforts began in the late 1970's and included prescribed fire, improved livestock and off-road vehicle management, and the use of bioengineering techniques. Protection and restoration of the riparian area appears successful, as a new rare species of stonefly was observed during biotic condition index monitoring, breeding numbers of the southwestern willow flycatcher increased, and sediments and ash were observed to be trapped onsite rather than lost downstream.