

Request for Albemarle County, the City of Charlottesville, and Rivanna Water and Sewer Authority to Use Portion of Water Base Rate for Green Infrastructure to Reduce Sediment in the South Fork Rivanna River Watershed

By
The Center for Natural Capital

Executive Summary

The 2009 South Fork Rivanna Stewardship Task Force Report describes sedimentation as the greatest threat to the reservoir. The report notes that future capacity in the main stem is expected to decline to 16% of original storage by 2059. The Task Force listed the beneficial uses the reservoir provides; drinking water supply, drinking water quality, rowing, fishing, paddling, education, and aesthetics. Negative impacts on these uses such as clogging of the water supply intake were also listed. The Task Force concluded their report with a recommendation to investigate selective dredging. A dredging feasibility study was completed by RWSA in 2010. The study provided an estimated volume and cost of sediment that could be removed. In July 2011 the RWSA Board approved \$3.5 million to dredge portions of the South Fork Rivanna Reservoir.

In 2010, the Virginia Department of Forestry and the Center for Natural Capital¹, working in cooperation with a variety of local entities including Albemarle County, City of Charlottesville, University of Virginia, Rivanna Water and Sewer Authority, the Thomas Jefferson Soil and Water Conservation District, and local environmental and economic development organizations, launched a pilot project called *Forests to Faucets*. The purpose of the Forests to Faucets (F2F) Initiative is to determine if increased forest cover or Green Infrastructure could be a cost effective approach to reduce sedimentation as a management strategy for a rehabilitated South Fork Rivanna Reservoir, when compared to dredging or Grey Infrastructure². The program also created and tested a voluntary landowner tree planting payment process. An interim Forests to Faucets report completed in 2012 showed that the lifetime cost³ to remove a ton of sediment through new forest cover is roughly the same as through dredging, and when considering other co-benefits, such as nutrient reduction, increased habitat, increased summer baseflow, aesthetics, etc., may be less than dredging.

The Center now proposes that the Rivanna Water and Sewer Authority study the use of Green Infrastructure, in addition to Grey Infrastructure, as a cost effective Capital Expenditure to reduce future sedimentation. The purposes of the study would be to:

- Confirm the Center's Green Infrastructure Sediment Reduction Efficacy Estimates
- Determine a base rate Green Infrastructure allocation formula

The Center suggests that the County Board of Supervisors and City Council request RWSA to move forward with the proposed study, pending availability of grant funds to support the effort. Green infrastructure funding by water/wastewater utilities is a considered by some foundations to be a “breakthrough” type of water security initiative. It is likely that grant resources would be available to support this effort should the City and County support the study.

¹ The Center for Natural Capital (www.naturalcapital.us), formerly the organizations Public Policy Virginia & Conserv, is a 501 c-3 charitable applied research and education organization, based in Orange, Virginia, focused on the use of economic development through ecosystem health in four program areas; energy, rivers, landscape, and people.

² **Grey Infrastructure** is conventional water and wastewater storage, drainage, and treatment systems (i.e. dredging, dams, pipes, tanks, water and sewage filtration machinery and chemical processes). **Green Infrastructure** is forests, natural areas, bio-filtration, ponds, wetlands, rain gardens and other natural land and plant based ecological treatment systems and processes. We use the term “rehabilitated reservoir” to mean that some significant portion of the original storage volume is restored. Once that is done, we suggest consideration of use of Green Infrastructure to augment use of Grey Infrastructure to achieve management of rehabilitated storage volume at least cost.

³ Lifetime cost is the capital and maintenance cost of a practice (i.e. dredging, tree planting) to remove or prevent an amount of sediment.

Background

Forests and wetlands provide many essential services to our communities. These natural ecosystems filter the water we drink, protect us from flooding, sustain summer river and streamflows, and provide habitat for fish and wildlife. A concept of thinking of these natural ecosystems as a form of green infrastructure has recently emerged, as concrete and steel, or grey infrastructure, has become increasingly expensive to build and maintain. “Green Infrastructure” is made up of the interconnected network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas; greenways, parks, and other conservation lands; working farms, ranches and forests; and wilderness and other open spaces that support native species, maintain natural ecological processes, sustain air and water resources and contribute to health and quality of life (McDonald, Benedict, and O’Conner, 2005). “Grey Infrastructure” is conventional piped drainage and water treatment systems (i.e. dredging, dams, pipes, tanks, conventional treatment systems including energy-intensive water treatment systems and processes such as membranes and reverse osmosis). Now, in some leading edge communities in the U.S., with aging grey infrastructure and increasing fiscal austerity, public facilities managers are recommending capital investments in green infrastructure to complement the services received from grey infrastructure, to achieve least cost solutions to meet water challenges of the 21st century.

One form of Green Infrastructure, forest cover, is widely understood to provide the lowest pollution load to streams and rivers, among all land cover types (commercial, residential, etc.). Forest cover for decades has been thought to be a “good idea” for water supply reservoir watersheds. However, what had not been understood were the quantitative benefits of Green Infrastructure (forest cover) relative to merits of Grey Infrastructure (dredging). The Center for Natural Capital, an economic development non-profit organization based in Orange, Virginia, completed a study for the Virginia Department of Forestry in 2012 that showed for the first time that over several decades, specific forms of Green Infrastructure, specifically tree planting and forest conservation easements, have a lifetime cost effectiveness at least equal to and perhaps greater than dredging.

The Challenges

Roughly 25% of the sediment that has entered the South Fork Reservoir is from erosion of the watershed’s landscape. We call this primary erosion. Roughly 75% of the sediment is from land disturbance occurring decades and centuries ago (legacy sediment) and on-going in-stream loss. We call this secondary erosion. New forest cover, one form of Green Infrastructure, can reduce primary erosion entering the reservoir. Dredging, one form of Grey Infrastructure, can be used to remove both primary and secondary erosion from the reservoir. Dredging, however, does nothing to address one of the causes of sedimentation, eroding land cover. A long term approach to sediment reduction, including both dredging (effect) and tree planting (cause) is proposed as the optimum long term cost-effective strategy (Center for Natural Capital, 2012).

An additional challenge is the difficulty of achieving further pollution reduction from rural lands via new environmental regulations. New regulations are increasingly difficult to implement due to compliance and oversight costs and public concern about increasing government oversight.

Proposal to Address Challenges

A cost effective long range green and grey infrastructure complimentary strategy to address the cause and effect of sedimentation in the South Fork Rivanna River Reservoir is proposed. In addition to ongoing dredging, a complementary voluntary tree planting and forest conservation program would be created and paid for through reallocation of a small portion of the water base rate used for dredging. A Green/Grey Infrastructure Capital Planning Tool created and tested by the Center on the South Fork Rivanna Reservoir showed that a mix of tree planting, forest conservation easements, and dredging was the most cost effective method to maintain a rehabilitated reservoir. Specific findings included:

- Tree planting in the South Fork Rivanna Reservoir Watershed has similar impact on reservoir lifetime as does dredging for approximately the same expenditures during a 30 year planning horizon.

- The lifetime cost effectiveness of tree planting as compared to dredging ranges from approximately the same to significantly greater, due to sediment load reduction that continues beyond the 30 year planning horizon, depending on the likelihood of reversion of areas planted with trees to another land use.
- Forest conservation easements have a high lifetime cost effectiveness to mitigate future increases in sedimentation when forestland conversion to another land use is certain.

Funds created via the Green Infrastructure portion of the base rate would be used in a voluntary program to pay rural landowners to increase or conserve forest cover. The F2F pilot program showed that landowners in the Rivanna River Basin will accept payments to establish and maintain trees through 20 year forest establishment contracts and enhanced conservation easements at unit rates similar to conservation funds provided by USDA.

Benefits of the proposed strategy include:

- non-regulatory
- no increased cost to ratepayers (after the cost of rehabilitating the current reservoir)⁴
- potential least cost sediment reduction strategy for primary erosion for County and City taxpayers
- incentives for rural landowners in the South Fork Rivanna Reservoir watershed
- conservation benefits including nutrient reduction, increased habitat, increased summer baseflow, & aesthetics

A study is needed to determine an optimum Green and Grey Infrastructure allocation formula. Deliverables from the study are expected to include:

- Technical review of the Center's research on the cost effectiveness of green infrastructure (tree planting and forest conservation easements) as compared to dredging
- Optimum base rate allocation formulas for green and grey infrastructure to reduce sediment at least cost

The study is estimated to cost \$300,000 and take three years to complete, by a multi-disciplinary team of engineers, economists, and environmental scientists.

What Other Communities Are Doing

Communities on the east and west coast are now investing in green infrastructure. Portland, Maine and the Washington Suburban Sanitary Commission in Maryland are reallocating baseline budgets for source water protection and financing it through approaches similar to the proposed revenue structure. Other communities such as New York City and Raleigh, N.C., have funded Green Infrastructure (permanent protection of watershed forest lands) in lieu of additional Grey Infrastructure (water treatment plant) capital expenditures. Raleigh charges 10 cents per 1000 gallons to pay for watershed protection (WRI Issue Brief #9, Feb. 2012).

The American Water Works Association (AWWA) is working with member communities such as Denver and Philadelphia on green infrastructure to protect water supply watersheds (Solutions Journal, Feb. 2013).

Recommendation

The Center recommends that Albemarle County and Charlottesville request RWSA to conduct a study on use of a portion of the water base rate for Green Infrastructure Capital Expenditures. The study will be predicated on the availability of foundation funding for consultants and staff time from sources other than the City, County, and RWSA.

⁴ The Green Infrastructure Funding concept is reallocation of some portion of whatever portion of the base rate that had been used exclusively for Grey Infrastructure. The reallocation formula would set Green/Grey percentages of total capital expenditures for sediment reduction.