THE WHITE WATER TO BLUE WATER PARTNERSHIP

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ABSTRACT

White Water to Blue Water (WW2BW) is an international partnership that was launched at the World Summit on Sustainable Development in South Africa in September 2002. It is based on the recognition that "*white water*" that flows off terrestrial surfaces and into the "*blue water*" of marine and coastal ecosystems are ecologically linked. To achieve sustainable development the management of terrestrial and marine systems needs to be better coordinated. In the United States, the WW2BW partnership is viewed as a White House Initiative with leadership by NOAA and involving several departments, including USDA. The partnership is governed by an international steering committee that has representatives from governments, the United Nations, nongovernment organizations, universities, and the private sector.

The initial efforts for the WW2BW partnership are being focused on the Wider Caribbean Region. In the Caribbean the conditions of marine estuaries, coastal zones, and coral reefs are being negatively impacted by chemical and sediment runoff from islands and the continental mainlands. Of particular note is the large hypoxia zone in the Gulf of Mexico that has arisen due to heavy amounts of nitrogen fertilizer entering the Gulf from the Mississippi River Basin. Agroforestry technology, in the form of riparian and upland tree-based buffers, can reduce sediment and fertilizer runoff. In March 2004, an international conference was held in Miami, Florida to promote the formation of partnerships to facilitate the implementation of solutions including agroforestry.

Keywords: water quality, hypoxia, nonpoint source pollution, buffers

INTRODUCTION

Fresh water is one of our nation's most important assets. Large supplies of high quality water are needed to supply uses like crop irrigation, industrial, commercial, and residential applications, recreational activities, and drinking water. Unfortunately, contaminants in many of our surface waters exceed national health and safety standards. The problem is also spilling over into our coastal marine and estuary ecosystems. In regions dominated by farming, like the Mississippi River Basin (MRB), the nutrient runoff is so large that it triggers a biological chain reaction each summer in the Gulf of Mexico that depletes the oxygen from an area covering 8,000 square miles. Nitrogen-rich runoff triggers the growth of algae that later die and consume the dissolved oxygen in the water as they decompose. This creates hypoxic conditions, which suffocate crabs and other slow-moving creatures, while fish and shrimp swim to escape to waters further offshore. Much of the water pollution can be attributed to two sources:

Agriculture: Streams that course through croplands are typically devoid of vegetation along their banks. This allows runoff containing fertilizers, pesticides, animal wastes, and soil sediments to enter surface waters unabated. Most of the nonpoint pollution in the US originates from agriculture. In the MRB the sources of nitrogen have been estimated as: fertilizer (31%), cropland soil mineralization (31%), N-fixing legumes (21%), atmospheric deposition (7%), feedlot manure (6%), and municipal (1%), with about 8% of the total nitrogen actually discharged to the Gulf of Mexico each year. Although this discharge comes from various sources, most of what reaches the Gulf has been attributed to cropland sources (Mitsch et al. 2001).

Community Stormwater: As communities expand, the urbanized landscape displaces lands that were once used to grow forests, raise crops, graze livestock, and provide natural areas. The natural functions of the landscape that absorb, filter, and transport water are lost. Rain flows off rooftops, driveways, parking lots, and streets and is collected by stormdrains and routed through concrete pipes. The result is massive volumes of stormwater, containing antifreeze, oils, and other contaminants, being discharged at high velocities into streams. This causes bank erosion, channel cutting, and flooding downstream, while producing a general disruption in the ecological function and integrity of our nation's waterways.

AN ALL LANDS APPROACH IS NEEDED

Most watersheds support a mixture of land uses, such as agriculture and forestry. But very importantly most of these watersheds also contain cities and towns. Therefore, taking care of water quality in a watershed is a shared responsibility and requires an effective partnership between rural landowners and community residents. When the primary water management approach in a watershed is to convey runoff through terraces and tile drains, through channelized streams, and through underground pipes, the hydrology of the landscape will be dramatically altered. Water percolation down into the soil, where it can contribute to subsurface and groundwater flows, is restricted, resulting in reduced base flows to streams and wetlands, and degraded in-stream and terrestrial habitats.

Recently, the National Research Council (2002) took the position that the restoration of riparian functions along America's water bodies should be a national goal since they perform such a disproportionately important and diverse set of ecological functions in the landscape. Mitsch et al. (2001) estimated that a reduction of about 40% of the nitrogen loading to the Gulf of Mexico is possible through the strategic implementation of a suite of practices, which include:

- Changing farm practices to avoid over application of nitrogen fertilizers, eliminate fall fertilization, reduce acreage of N-fixing legumes (soybeans, alfalfa) and high input annual crops like corn, improve manure management, and apply improved soil nitrogen testing methods.
- Diverting floodwaters to backwaters, coastal wetlands, and riparian zones rather than rely primarily on engineering approaches that confine floodwaters to river channels.

- Creating or restore wetlands and riparian buffers between agricultural fields and streams and rivers. These should be strategically placed in the landscape where agricultural sources of nitrogen are highest.
- Creating or restoring 5–13 million acres of wetlands on existing farmland, especially adjacent to streams (0.7% to 1.8% of the MRB). Much existing farmland was created by draining natural wetlands. Consequently, streams and rivers are no longer buffered from runoff emanating from the uplands.
- Restoring 19-48 million acres of riparian forest buffers, especially bottomland hardwood forests, on existing farmland (2.7% to 6.6% of the MRB).

Agroforestry technologies, like riparian forest buffers, have been shown to be effective in using trees to reduce water pollution from agricultural activities. Trees roots can increase soil porosity, improve water infiltration, absorb excess nutrients, promote soil denitrification, degrade pesticides, and stabilize streambanks. Trees and shrubs growing in riparian buffers provide wildlife habitat and protect downstream communities from floods. In addition to improving the environment, trees can also provide an alternative crop to augment on-farm income.

Towns and cities in the US are now required to treat stormwater runoff rather than continuing to rely on concrete drains and pipes to collect and route stormwater onto downstream neighbors. Agroforestry technologies, like riparian forest buffers, that were originally crafted to address agricultural concerns, are now being modified to help communities retain and treat stormwater runoff and manage solid and liquid wastes. These agroforestry solutions are cost-effective and rely on properly designed and strategically located plantings of trees, shrubs, grasses, and other plants to provide ecological functions for processing stormwater runoff more naturally. These designs can often be applied at the rural/urban interface and in many cases within an urban area.

THREE KEY CONSIDERATIONS FOR USING TREE-BASED BUFFERS

<u>What Functions Should the Buffer Perform?</u> Upland and riparian tree-based buffers can be used to perform a variety of functions, so it is important to determine the primary functions that are desired. For example, buffer design and plant materials will influence the amount of sediment that can be trapped. Soluble nutrients like nitrogen rely on designs that allow water to be detained and infiltrated into the soil, while insoluble nutrients, like phosphorus, are commonly bound to soil particles and can therefore be effectively controlled by the same design elements that control sediments. Once primary functions have been considered in the design, ancillary benefits like wildlife habitat can be optimized by adjusting the design.

<u>What is the Best Design for the Site?</u> A site-based study is useful for improving the design and success of a buffer system. Site considerations include soils, hydrology, and topography. Native varieties of trees, shrubs, grasses, and sedges should be considered, as they will often be best adapted to the site. However, if the hydrology adjacent to a stream has been significantly altered, it may be necessary to incorporate more drought-tolerant upland species in riparian zones.

Where on the Landscape Should the Buffer be Located? Since it is not practical to install buffers in all locations on the landscape, it is desirable to have some process of determining which locations will produce the greatest benefit for water quality. Landscape-scale studies should be conducted to guide the strategic placement of upland and riparian buffers in watersheds for the purpose of maximizing water protection, while optimizing for other benefits, such as wildlife habitat, carbon sequestration, and economic diversification. Tools such as geographic information systems (GIS) enable communities and rural landowners to jointly analyze watersheds and determine the best locations for environmental conservation and restoration efforts.

REFERENCES

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