

## WETLANDS AS BMPs AND THEIR USE IN TRADING OF NUTRIENT AND SEDIMENT REDUCTION CREDITS

J. Schubauer-Berigan (NRMRL), D. Brown (NRMRL), D. Burden (NRMRL), T. Canfield (NRMRL), W. Franz (R5), J. Kressel (NRMRL), M. Heberling (NCEA), K. Hurl (OW), C. Lane (NERL), M. Morrison (NRMRL), M. Mikota (OW), C. Nietch (NRMRL), W. Sidle (NRMRL), R. Sumner (OW), and H. Thurston (NRMRL)

### Science Questions

MYP Science Question #2 - What BMP's, treatment systems and restoration technologies remain as uncertain options for watershed management? For mixed land use watersheds? For habitat alteration? For priority stressors?

MYP Science Question #3 -

How can classification schemes, modeling scenario analyses, landscape classification, and economic projections be applied to provide alternatives for meeting water quality goals efficiently at multiple scales? What are the economic benefits of watershed management?

### Research Questions

Primary: How much do natural and constructed wetlands capture and attenuate watershed stressors during various flow regimes resulting from, seasonal fluctuations in precipitation and from land use changes? Are there novel approaches, such as utilizing market forces or "trading" that can be used to influence or drive voluntary improvements and compliance?

Secondary: How can wetland processing and attenuation of watershed stressors be effectively monitored and modeled for use in TMDL development and implementation? How can wetlands be effectively designed, scaled and optimally utilized at the watershed scale, within a watershed management program and their integrated pollutant control performance is assessed?

### Research

Human activities in watersheds can cause flooding and the release of nonpoint source pollutants (particularly sediments and excess nutrients) that can threaten life, damage property and degrade the ecological health of receiving waters. Wetlands, because of their inherent ecological functions, have been highlighted for their potential to accumulate and transform nutrients, particularly sediments, phosphorus and nitrogen. In fact, constructed wetlands are currently being effectively used to remove these stressors from wastewater treatment plant effluents. A number of researchers have suggested that an array of strategically located constructed, restored and enhanced wetlands coupled with the services naturally provided by native and protected wetlands, could be used to economically reduce impacts from excess nonpoint source loadings of nutrients and sediments', while also providing additional ecological values. Using this approach on a large scale has been suggested as a means of reducing nitrogen loading to the Gulf of

Mexico from the Mississippi River Basin in an attempt to reduce the annual zone of hypoxia termed the "dead zone."

Currently, ORD is conducting research that is focused on gaining a better understanding how to effectively restore native wetlands and design, deploy and manage constructed wetlands to mitigate water quality stressors so they can be effectively utilized for nonpoint source pollutant management. NRMRL has a number of ongoing wetland case studies; one in the Wisconsin in Upper Mississippi River Basin (Joint EPA AIUSGSIUSFW study), one in the Delaware Basin, two in the SW OH and one in Kankakee watershed in MI-IN. These case studies are of manual for "Constructed Wetlands Treatment of Municipal Wastewaters".

With regard to water quality trading, ORD is trying to resolve the numerous technical issues related to wetland and ecological function, assigning economic value/credits or for estimating treatment credits and economic research related to the market formation, to evaluate the feasibility of using wetlands as a component of an effective water quality trading program. An ORD-OW team is developing active research collaborations in the area of wetlands and water quality trading. A feasibility study is underway and an expert panel meeting designed to refine critical research directions is planned for the spring of 2006. A number of new wetland and water quality trading projects (joint ORD/OW/EP A Region/State), are in the initiation or planning stages with CA, OR and UT. All of these activities support the President's goal to restore, improve and protect at least three million additional acres of wetlands.

### Impact and Outcomes

Contractors and watershed managers can use case study and generic results in decisions on wetland restoration, and BMP selection, design, implementation and monitoring. OW, States and other stakeholders will be able to appropriately recommend the inclusion of wetlands in TMDL development and implementation strategies. The trading research will provide information and results from pilot studies that will inform OW policy decisions on implementing water quality trading nationwide. As a result, more effective measures should be taken to restore and protect aquatic ecosystems, and an increased number of wetlands will exist to provide their associated ecosystem services.