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Targeting Investments To Cost Effectively Restore and Protect Wetland Ecosystems: Some Economic Insights

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What Is the Issue?

Over the last several decades, concerns over the loss of wetland ecosystems have led to legislation restricting wetland conversion and promotion and funding of wetland restoration and conservation. Consequently, USDA has spent more than \$4.2 billion on wetland restoration and protection during the period. The environmental benefits of wetland conservation—cleaner water, increases in wildlife populations, and carbon sequestration—depend on climate, human influences, and landscape characteristics. This study assesses how future wetland conservation funding might be targeted within States and regions and across the United States to maximize benefits relative to costs of restoring and preserving wetlands. Information on the sizes and spatial distributions of the benefits and costs of wetland protection can help public and private decisionmakers understand the economic implications of efforts to reduce wetland losses, improve existing wetlands, and restore prior-existing wetlands through regulation and economic incentives.

What Did the Study Find?

A number of different types of wetland benefits were considered as part of this analysis. The ranges in wetland benefits and costs across the country demonstrate potential gains from targeting public and private wetland restoration efforts by location and by wetland characteristics. Some benefits can be estimated more precisely than others:

- The annual benefits to duck hunting from restoring wetlands in the Prairie Pothole Region (primarily, lands in the eastern Dakotas and western edges of Minnesota and Iowa) range from near \$0 to \$143 per wetland acre.
- The annualized value of a new wetland's effect on atmospheric concentrations of greenhouse gases ranges from \$0 to \$129 per wetland acre in the areas studied. In other areas, wetlands can increase, decrease, or have no net effect on atmospheric levels of greenhouse gases.
- Wetlands on agricultural land are not likely to provide notable flood-protection benefits unless they are located in close proximity to urban areas.
- Wetlands in the Upper Mississippi and Ohio River watersheds can annually remove from 11 to 1,800 pounds of nitrogen per wetland acre in waters leaving farm fields from watershed streams and rivers.

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- About 1,756 counties in the contiguous States have wetland-associated imperiled species, with some counties having as many as 23 imperiled species. About 1,355 counties have no wetland-associated imperiled species, but this does not suggest that the value of wetland-species protection benefits in these counties is low. The analysis found no information that illustrates how a new wetland might affect species' survival probabilities. Additionally, it found no information on the public's willingness to pay (or how it might prioritize support) for changes in imperiled species' survival probabilities.
- Many wetlands recharge groundwater supplies, but the majority do not. Some wetlands exist because they are fed by groundwater. Others exist because they have impermeable subsoil.
- Sediment removed by wetlands, while protecting other bodies of water, can reduce other wetland benefits as the sediment accumulates.
- The benefits of wetlands as open-space protection in rural areas are likely to be very small.

Based on contract data from USDA's Wetlands Reserve Program, the costs of restoring and preserving a wetland range from \$170 per acre in the western Dakotas, Montana, Arkansas, and Louisiana to \$6,100 per acre in the major corn-producing areas and along the Northern Pacific Coast. These estimates reflect the change in the value of the land with and without a permanent wetland easement plus wetland restoration costs.

An analysis of the combined benefits and costs of new wetlands revealed the following:

- Restoring wetlands in the western Prairie Pothole Region is likely to generate duck-hunting benefit-cost ratios close to or greater than one; that is, restoration funds spent in this area would be a good investment. However, most of the people who would benefit from the added duck populations in the region are hunters who live elsewhere.
- The value of new wetlands' greenhouse gas impacts exceeds wetland costs in the western half of the Prairie Pothole Region and in most of the Mississippi Alluvial Valley (from southern Illinois, covering western portions of Tennessee and Mississippi and eastern portions of Missouri and Louisiana).
- The amount of nitrogen that can be removed for each dollar spent on wetland restoration and protection in the Upper Mississippi and Ohio River watersheds ranges from 0.2 to 34.0 pounds. The costs of nitrogen removal through new wetlands range from \$0.03 to over \$5.00 per pound of reduced N loadings in nearby waterways.

How Was the Study Conducted?

To quantify wetland ecosystem effects on amenities, and the value the public places on these amenities, ERS researchers reviewed and analyzed economic, ecological, and engineering literature and data. In some cases, researchers used existing data and models; new models were also developed. Benefits were estimated at the county and subcounty levels across limited portions of the Nation, depending on the spatial resolution (e.g., geographic reliability) of supporting data and economic and ecological models.

Researchers used Wetlands Reserve Program contract data to empirically estimate wetland cost models for major wetland regions. These models were then used to generate county-level estimates of the costs of new wetlands. Where the estimates allowed, researchers generated county- and subcounty-level benefit-cost ratios by dividing the benefit estimates by the cost estimates. These ratios illustrate areas where wetland restoration funding might be allocated to best serve public interests. When it was not possible to estimate economic benefits, researchers generated ratios of the wetlands' cost effectiveness—the quantity of services produced relative to costs. Lastly, where data were limited, representative measures were generated that illustrate the scope and the magnitude of possible benefits.