

# The Dollar Value of Wetlands: Trap Set, Bait Taken, Don't Swallow

*There is no evidence that providing "best available" dollar estimates of wetland values has ever resulted in improved wetland protection, and there is mounting evidence that it will result in less.*

By Dennis King

**T**he market value of an acre of dry land can be as high as a few hundred thousand dollars per acre, even a few million dollars per acre in some prime coastal areas. If the land is a wetland but is "permissible," its market value might be slightly less because developing it would require draining and filling as well as some "compensatory mitigation." The same wetland, if it had no hope of being permitted for development, could have a market value as low as a few thousand dollars per acre. Some small part of this "residual" market value of wetlands is based on its value as a wetland; the rest is based on speculation that some day policies will change and allow the site to be developed.

The low market value of protected wetlands and the fact that protecting them makes non-wetland areas more expensive distresses many landowners and land developers. Allowing wetlands to be developed into building lots, hotels, golf courses, or whatever also generates local jobs, incomes, and business sales and increases the local tax base, so protecting wetlands also distresses many politicians and civic leaders. These people — not wetland protection advocates — are demanding answers to questions about the "economic value" of wetlands. They have legitimate questions, but that does not mean that there are legitimate answers. Nor does it mean that trying to answer them will result in more wetland protection than not answering them at all.

Wetland development advocates have discovered that "best available" estimates of wetland values come in two varieties that both favor their positions. On the one hand, there are estimates, usually by economists, that are based on careful analyses of

economic payoffs from one or two specific wetland functions (such as flood protection or derived fisheries values). These result in credible estimates of value for a few wetland services but vastly understate the overall economic value of all wetland services. On the other hand, there are estimates of wetland value that are based on methodologies that do not resort to tracing and measuring specific bio-physical and socio-economic linkages and claim to be "comprehensive." These estimates, usually developed by non-economists on the basis of various "embodied energy" or replacement cost theories of value are not logical and would not withstand even the slightest challenge.

Either way reducing wetland debates to a battle of numbers provides a competitive advantage for wetland development advocates: The numbers are either small or indefensible. To my knowledge, there is no evidence that providing "best available" dollar estimates of wetland values has ever resulted in improved wetland protection, and there is mounting evidence that it has resulted in less.

## The basics of wetland valuation

Economic values are not the only useful measure of "value" for wetlands or anything else. However, in conventional economics, it is generally accepted that a measure of "value" should be based on what people want; and that people, not the government, the scientist, or the preacher, are the best judge of what they want. Based on this individualistic notion of "value," the amount of one thing a person is willing to give up to get more of something else is considered a fair measure of the relative "value" of the two things in the eyes of that person. Dollars are an enormously useful and universally accepted basis for expressing economic values because the number of dollars that people are "willing to pay" for something reflects how much of all other for-sale goods and services they are willing to give up to get it. In the case of

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wetlands, it is important that measuring the economic value of something based on this notion does not require that it be bought and sold in markets, only that someone estimate how much purchasing power (dollars) people would be willing to give up to

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by evidence that people would be “willing to pay” that much in dollars — would be willing to give up that much of other marketed goods and services — to get them or keep them.

There are only three acceptable ways of developing credible evidence of dollar values. They are:

*Revealed willingness to pay* (such as market prices): When people purchase something (such as a home near a wetland) or spend time and money to get somewhere (such as a fishing spot or bird watching dependent on a nearby wetland), they reveal that they are willing to pay at least what they actually spend; they may be willing to pay more.

*Expressed willingness to pay* (such as survey results): Many wetland services are not traded in markets (for example, a scenic view or a day of bird watching) so people may never “reveal” what they are willing to pay for them. Simply asking them what they would be willing to pay can sometimes yield useful results. Surveys of “willingness to pay” are expensive and controversial and usually yield results that are reliable only when questions are asked about specific wetland services provided in specific contexts.

*Derived willingness to pay* (such as circumstantial evidence): This method involves tracing and measuring the functions provided by a wetland (such as retaining floodwater, reducing wave energy, maintaining water quality) and estimating what people would be “willing to pay” to avoid the adverse effects of losing them. The dollar value of flood and siltation damage avoided because of a wetland is an example of derived willingness to pay for wetland services.

To appreciate what would be involved in developing a comprehensive estimate of the full economic value of a wetland

get it (or would need to be paid to give it up) if they were offered a choice.

This notion of economic value is so “anthropocentric” that it infuriates many conservationists. However, in courtrooms and hearing rooms all over the world — places where most important decisions about wetlands are made — the validity of claims about the dollar value of wetlands is judged on the basis of whether they are backed up

area, consider the fact that wetlands provide about 15 different bio-physical functions — from nutrient and flood water management to fish and waterfowl habitat and biodiversity support — and that each of these functions results in many different types of services — from improved recreational opportunities and aesthetics to flood and storm wave protection. Consider that measuring some wetland values requires tracing bio-physical linkages across vast distances in space and time. The dollar value of next year’s catch of bottom fish off the coast of Maryland, for example, depends in critical ways on conditions in spawning and feeding areas in coastal New England wetlands several years ago. Gulf coast shrimp landings next year depend on the level of sediment trapped by wetlands along the Upper Mississippi River. There are hundreds of similar ecological-economic linkages related to wetlands, and they are not the same for all wetland areas.

So the wetland valuation problem can be boiled down to this: If we use the generally accepted definition, the “dollar value” of a wetland is how much each person in the world would be “willing to pay” for each of the services and products generated by each function that a wetland provides summed across all functions and all persons. The challenge of linkages across vast distances to develop such an estimate would be reduced only slightly if we concern ourselves only with benefits that accrue to U.S. citizens.

Extremely convincing arguments can be made that it does not make sense to try to assign economic values to wetlands using any of the three generally acceptable methods because: a) most important wetland services are not traded in markets so people cannot reveal the dollar value they place on them; b) people do not know about or appreciate the many functions and services that wetlands provide and therefore will not express that they are “willing to pay” as much as they should for wetlands; and c) wetlands generate so many diverse functions, services, and products that the cost of tracing and measuring all of them to impute their economic value is prohibitive.

These arguments have been used effectively for years. In fact, the logic behind them is the main reason why the national “no net loss” goal for wetlands was generally accepted without resorting to “conventional” benefit-cost analysis. However, as we enter an era where justifying public policy using dollar measures of benefits is falling into vogue, it is worth considering what is available in the published literature about the dollar benefits of wetlands. There are two distinctly different sources of information: the conventional economics literature and the popular science literature.

### Skepticism warranted

During the past 10 years, four major reviews of wetland valuation methods and numerical estimates of wetland values have been published, two in the United States, one in Sweden, and one in

England.\* After reviewing all the relevant journal articles and published and unpublished technical reports dealing with these topics, all four studies reached the same general conclusions as those reached as a result of unpublished literature reviews. They can be summarized as follows:

1) Wetland functions provide a wide range of services and products with economic benefits that accrue primarily off-site. Most of these are not reflected in markets, or at least not in markets linked directly with wetlands, and cannot be captured as income by the owners of wetlands.

2) Accepted methods exist for tracing and estimating the economic value of some specific wetland services, but they have not been widely applied.

3) The few useful estimates of economic value that exist are related to specific wetland services; there are no reliable comprehensive estimates of economic value for any particular wetland area.

4) Many wetland areas function primarily as components of broader ecosystems (such as watersheds) and generate off-site economic values that may be inseparable from those of the broader ecosystems.

5) The economic value of a particular wetland area and its contributions to broader ecosystem functions and values depends in critical ways on its location within the broader ecosystem, and also on the number, size, condition, and location of other wetlands that provide similar functions in that ecosystem.

6) The cost of replacing a wetland can be estimated reliably and puts an upper bound on what people should be “willing to pay” for it. However, it does not establish that people would be “willing to pay” that amount to replace it and, therefore, is not an acceptable measure of economic value.

7) Although wetlands, like energy, food, and shelter, are essential to life, “all or nothing” comparisons based on the overall economic value of wetlands provide no practical basis for estimating “willingness to pay” for the contribution of any particular wetland area.

One clear implication of these economic reviews is that it is very easy to waste money on economic studies aimed at assigning dollar values to wetlands. Another is that estimates of wetland economic values that show up in the literature should be viewed with great skepticism.

But for three problems, this would probably be enough for a reasonable person to decide to rely exclusively on economic arguments that justify protecting wetlands without resorting to specific dollar estimates of their value. The first problem is that political institutions, without enormous pressure to the contrary,

treat no-value estimates as zero-value estimates. The second problem is that the popular “scientific” literature is becoming littered with dollar estimates of wetland values that are misleading and unsound, but are being used. The third problem is that professional economists

may never be willing to throw in the towel on wetland valuation.

Admitting that non-market valuation methodologies are too controversial, inconclusive, and expensive to contribute here, where the economic stakes are so high, could have far-reaching implications and undermine support for using applied economic analysis to evaluate all sorts of environmental problems.

The results from conventional economic studies of wetland values have been so frustrating and disappointing for wetland protection advocates that a few wetland scientists, and some economists, have decided to come to their aid. Based on the assumption that “any number is better than no number,” they have furnished “best available” dollar estimates of wetland values. These are not being published in the conventional economics literature — where they would be carefully scrutinized — but in journals such as *Wetlands* and *Ecological Applications*, and in popular scientific magazines such as *Science* and *Nature*. Since these dollar estimates can be cited back to wetland professionals and specific publications and are bigger than the few partial wetland values available in the economics literature, they are being used with increasing frequency by wetland advocates in public testimony and in technical and press reports. However, their use is backfiring in ways that are harmful to wetlands, to the way science and economics are used in wetland policy, and to the credibility of wetland advocates.

To get a sense of the problem, consider the following illustrations. These are based on arguments that have taken place at conferences and at a few informal meetings and administrative hearings over the past few years, where they may have had an impact on wetland policy. They are presented here as they would unfold if they took place in more formal legal or administrative proceedings, where their impacts on wetlands would be more direct. *I emphasize these are anecdotal. They are not citable case studies that have been written up anywhere.*

#### *Case Number 1: The “Willingness to Pay” Survey*

At a coastal zone hearing, a wetland advocate bases his testimony on survey results published in the journal *Wetlands*

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\* Scodari, Paul, *Measuring the Benefits of Environmental Protection*, ELI (1993); American Petroleum Institute, *Economic Valuation of Wetlands* (1991); Beijer International Institute for Ecological Economics, *Economic Valuation of Wetlands: A Survey* (Sweden, 1994); University of York and the Ramsar Convention Bureau, *Economic Valuation of Wetlands* (England, 1997).

(July 1995) showing that people are willing to pay \$100 per household to protect wetlands within 25 miles of their homes. An opposing expert points out that the survey did not specify the type, size, or condition of the wetland or how many other

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wetlands were in the survey area. She presents evidence that the survey results in a nearly infinite dollar value being placed on tiny degraded wetlands in an urban settings — where there are many households — and a very low value being assigned to large pristine wetlands in rural areas. Admitting that the cost of doing the survey correctly would be prohibitive, the wetland advocate withdraws his testimony and the wetland in question is permitted for development. Bad willingness to pay surveys don't hold up; good ones are expensive and still may not hold up.

*Case Number 2: The "Derived Fishery Value" Approach*

Studies show that coastal wetlands in Massachusetts support about 75 percent of commercially valuable fish species that are landed in that state. However, Massachusetts fisheries have been so mismanaged and overfished over the past 20 years that their economic value is near zero. A contracted study to estimate the "derived value" of wetlands to the state's fisheries yields estimates that the value is less than one dollar per wetland acre. Using this method, the mismanagement of fisheries results in very little justification for protecting the wetlands on which fishery recovery may depend.

*Case Number 3: The "Hedonic Housing Value" Approach*

At a public hearing to consider a wetland development, a wetland advocate cites a wetland valuation study showing that the average price of a home adjacent to a wetland in the Chesapeake Bay area is \$10,000 higher than an identical home that is not adjacent to a wetland. Later in the day experts representing the prospective wetland developer accept this as a valid basis for comparing economic value. They then provide results from a similar study showing that the average price of a home adjacent to a wetland area that has been filled and bullheaded with a dock on an adjacent water body is \$50,000 to \$80,000 higher. It is dangerous to validate a statistical method unless you know how it can be used against you.

*Case Number 4: The "Benefit Transfer" Approach*

An environmental group presents testimony in Oregon based on a widely disputed study in Louisiana that generated a wetland

economic value of \$28,000 per acre. After disputing the validity of the estimating method and of using estimates from Louisiana in Oregon, the opposing side agrees to accept the number as fact, and points out that the county already requires \$40,000 per acre in compensation for wetland impacts as part of its "in lieu" mitigation fee program. Later in the year, a group of wetland developers who are also paying \$40,000 per acre as wetland impact fees sue the state to reduce the fee and, using evidence presented by the environmental group, get the fee lowered to \$28,000.

*Case Number 5: The "Innovative Valuation" Approach*

A county ecologist cites the results of an "innovative" wetland valuation study that assigned a dollar value of \$20,000 per acre to wetlands based on their "embodied energy." However, several university scientists contracted by the developer's expert provide evidence that the "embodied energy" in an acre of wetland, an acre of poison ivy, or an acre of strawberries is about the same. They go on to note that it is not much different than the embodied energy in a swarm of malaria-infested mosquitoes or the last humpback whale. The county economist then testifies that the "embodied energy" in wetlands or anything else has absolutely no relationship to how much people are "willing to pay" to protect them or for the services or products they provide. The county ecologist is taken off the list of county officials asked to provide comments on wetland development proposals.

*Case Number 6: The Replacement Cost Approach*

At the request of state wetland managers, local engineers estimate that the cost of trying to restore a 1,000-acre bottomland non-tidal wetland area that is being threatened with development to pre-colonial conditions is more than \$300,000 per acre. This figure is used at a public hearing as an indicator of "wetland value." Under questioning the wetland manager agrees that "no one in his right mind" would spend \$300 million to try to restore this 1,000-acre site to pre-colonial conditions. When asked if it was fair to offer the \$300,000 per acre figure as an estimate of the economic value of this wetland area, the wetland manager admits he is not sure it is. When asked if the \$3,000 in fees paid to the engineering firm to estimate restoration cost was a good use of tax dollars he admits that he is sure it wasn't.

**Defensible numbers**

The conventional economic literature provides some useful partial estimates of the dollar values associated with specific wetland services provided by specific wetlands in specific landscape contexts, but no practical basis for estimating the full dollar value of wetlands. With a huge infusion of research funds this situation may change, but this is not likely, so reliable dollar estimates of wetland values cannot be expected from this source. The popular science literature is beginning to offer up dollar estimates of

wetland values, but they can be classified generally as “fool’s gold.” They seem to be worth something, but in courtrooms and hearing rooms where it really matters, and increasingly in the eyes of the public, they are not worth anything.

The best strategy is most certainly to avoid entering into debates about the dollar value of wetlands if at all possible; and to minimize the influence of any dollar estimates on wetland deliberations. The truly enormous undertaking of tracing and measuring all the values associated with all the services resulting from all the functions of a wetland has not yet been undertaken. Until this is done, it should always be possible to establish that dollar estimates based on summing up the values of individual wetland services are only partial estimates of full wetland value. On the other hand, if numbers are offered up as being comprehensive estimates of overall wetland values based on methodologies that don’t require tracing and measuring individual wetland services (such as embodied energy or replacement cost theories) one can be sure that they are conceptually flawed.

If one is pressed to provide some dollar-based justification for wetland conservation, the numbers listed in Table 1 may be better than nothing. These are based on wetland mitigation projects undertaken in the United States and show the dollar amount being spent in attempts to restore an acre of wetland. Many of these projects resulted in environmentally and economically insignificant mud puddles, so these dollar figures do not

represent wetland replacement costs. On the other hand, some of the projects provided economic benefits that clearly exceeded the cost of restoration, so the amount spent does not represent the economic value of the wetland services that a wetland provides. What the numbers do reveal is the dollar amount that wetland regulators, and to a lesser extent elected officials, have been willing to have permit seekers spend attempting to replace lost wetland services and values.

There are two ways to view the numbers presented in Table 1. On the one hand, our political and regulatory institutions operate in such a bizarre way that it may be impossible to sort out the countervailing forces that resulted in specific levels of spending on wetland restoration. On the other hand, since wetlands generate primarily public benefits, the amount that public officials, acting on our behalf, have been “willing to pay” (or more properly are willing to have spent by wetland permit seekers) attempting to restore lost wetland services is about as useful a number as we can hope for. Are the dollar figures in Table 1 estimates of wetland values? Clearly, they are not. However, they are defensible numbers based on “revealed willingness to pay” that tell us something about wetland values. In the final analysis, where no one can produce credible dollar estimates of wetland values, the logic that we should be willing to pay at least as much to conserve natural wetlands as we are spending trying, with limited success, to restore degraded wetlands makes good economic sense. ■

Table 1

### Revealed “Willingness to Pay” to Attempt Wetland Restoration\*

Study #1: King and Bohlen		Study #2: Louis Berger and Associates, Inc.	
WETLAND TYPE	1997 \$ COST/ACRE	WETLAND TYPE	1997 \$ COST/ACRE
Aquatic bed	\$ 45,000	Emergent	\$ 43,675
Complex	\$ 95,000	Scrub/Shrub	\$124,144
Freshwater mixed	\$ 52,000	Intertidal emergent	\$415,007
Freshwater forested	\$124,000	Open water - emergent	\$273,700
Freshwater emergent	\$ 84,000	Open water - shrub/forest	\$130,220
Freshwater tidal	\$ 78,000	Emergent scrub/shrub	\$351,591
Salt marshes	\$ 49,000	Emergent/intertidal	\$ 59,238
Mangroves	\$ 24,000	Emergent - forested	\$235,799
Prairie potholes	\$ 4,000	Riverine emergent	\$ 82,928
Other agricultural	less than \$1,000		

King, Dennis and Curtis Bohlen, “Making Sense of Wetland Restoration Costs,” University of Maryland, Center for Environmental Science, January 1994; and Louis Berger and Associates, Inc., “Costs for Wetland Creation and Restoration Projects in the Glaciated Northeast,” A Report to EPA, July 1997

\* Numbers do not reflect the full cost of restoring wetland services. Numbers do not reflect the full value of wetland services. Numbers do represent how much money state and federal agencies in the United States, acting on our behalf, have been willing to spend or have spent by permit seekers to attempt to restore wetland services. Numbers include pre-construction, construction, and post-construction tasks paid for by providers of wetland mitigation, but they do not include the time and resources of government agencies. Numbers were not adjusted to account for significant failure rates for restoration or delays in wetland recovery after restoration, which result in expected flows of wetland services from restored wetlands that are significantly lower than expected service flows from natural wetlands.