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Wetlands: America's Lost Resource?

Abstract

A trend toward draining wetlands emerged as the United States grew in population, expanded geographically, and developed economically. Farmers and developers found that it was profitable to drain wetlands for farming and development purposes. The draining of wetlands was economifly efficient to a point but, because of the characteristics of wetland benefits, far more wetlands were drained than would have been efficient. This article will discuss the main benefits of wetlands, why more wetlands were drained than would have been efficient, and what the government should do to try to correct this inefficiency.

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Wetlands: America's Lost Resource?

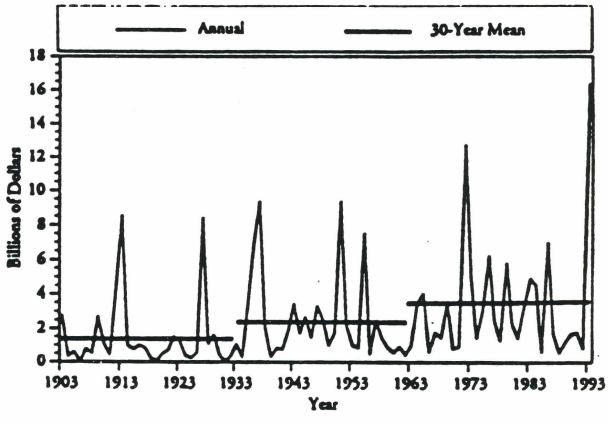
John Gutowski

A trend toward draining wetlands emerged as the United States grew in population, expanded geographically, and developed economically. Farmers and developers found that it was profitable to drain wetlands for farming and development purposes. The draining of wetlands was economically efficient to a point but, because of the characteristics of wetland benefits, far more wetlands were drained than would have been efficient. This article will discuss the main benefits of wetlands, why more wetlands were drained than would have been efficient, and what the government should do to try to correct this inefficiency.

Wetlands have many benefits that are both aesthetic and economic in nature. The easiest benefit to measure is the flood control effect that the wetlands produce. Wetlands act as a flood control device in several ways. They tend to hold rain where it falls, with the water either being retained in the soil or evaporating. Wetlands also slow the flow of rivers and work to dissipate excess water when the river stage is high (Hey & Philippi, 1995).

The importance of wetlands in flood control is not a new one. Congress, in 1852, commissioned a study by Charles Ellet, Jr., an engineer, to respond to the Mississippi Delta river flooding. Ellet wrote, that "the greater frequency and more alarming character of the floods are attributed..." to two primary characteristics (Hey & Philippi, 1995, p. 10). The first characteristic was the vast extension of cultivated land throughout the Mississippi Valley which diminished the capacity for evaporation and drainage which allowed the flood waters to move more rapidly into the country below. The second characteristic was the extension of levees along the borders of the Mississippi River and its tributaries and outlets. Before the levees were constructed water was allowed to flow over many thousand square miles of low land, but the levees forced the confinement of the river channel (Hey & Philippi, 1995). As a country we certainly did not follow the advise of Mr. Ellet and other like-minded forward thinkers. In fact, over the last 140 years quite the opposite has occurred. The rush toward progress, in the United States, has drained wetlands and erected levees mainly for the purpose of creating farmland (Excerpts, 1995). The reduction of wetlands and increasing dependence on levees has made flooding worse by increasing the river stage and velocity, just as Ellet predicted.

FIGURE 1: National annual and 30 year mean flood damages, adjusted to 1993 dollars



Source: U.S. Weather Bureau from Hey & Philippi, 1995

This increase in the destructive power of floods has real costs to our society that can be seen in the increase in the 30 year mean flood damage (see FIGURE 1). For the first 30 years in the study the mean annual damage

was 1.4 billion dollars; in the last 30 years, depicted in the graph the mean annual damage was 3.4 billion dollars. This represent an increase of 140% (Hey & Philippi, 1995).

Hey and Philippi (1995) use the flooding in the upper Mississippi river basin in 1993, as an example of how increasing the current amount of wetlands would have made a tangible difference in flood control. The historically heavy dependence on levees and draining of wetlands in this region, combined with an unusually wet spring and early summer created the conditions necessary for the devastating floods that occurred. According to their calculation, the amount of flood water (water in excess of the normal amount) that passed St. Louis during 80 days of flooding during 1993 would have covered 13 million acres at a depth of three feet which is also about the depth of a deep marsh. The watershed above Thebes, Illinois, from 1780 to 1980, has lost 26 million acres of wetlands. By increasing the current amount of wetlands by only 13 million acres, which is only half of the wetlands that have been drained, the U.S. would create a watershed that is better able to deal with a flood the magnitude of the 1993 flood.

Another major benefit of wetlands is that they act as a natural water pollution filter. The capability of wetlands to transfer and store organic matter is why they are often referred to as "the kidneys of the landscape" (Mitsch & Gosselink, 1993). Hans Brix (1995) points out that this benefit of wetlands has been recognized for centuries, with ancient Egyptian and Chinese cultures using wetlands for the disposal of waste water. Wetlands are currently being used extensively in Europe for the purpose of treatment of waste water (Brix, 1995). The use of wetlands for this purpose may be more cost-effective than the United States' current system, and is an option that certainly should be considered in the future. However, the main benefit of the pollution-filtration aspect of wetlands in the United States is their ability to deal with nonpoint water pollution.

Many of our pollution control laws in the United States are not set-up to deal with nonpoint water pollution (Tietenberg, 1992). Wetlands could be part of the U.S. answer to this problem. Wetlands have been shown to be an effective filter of run-off water from agricultural land, which is often contaminated with pesticides and fertilizers (Osborne & Kovacic, 1993). The need for wetlands is important especially in the heavily agriculturalized Midwest, with agriculture-derived contaminants making up the largest amount of nonpoint water pollution (Osborne & Kovacic, 1993).

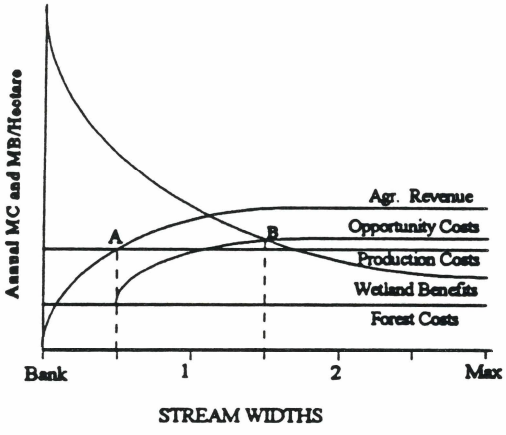
Wetlands also have an environmental benefit that should be considered in any discussion of increasing the area of wetlands. Wetlands provide many recreational benefits that have real value, but are much harder to measure. These recreational uses include fishing, hunting, and hiking. Wetlands provide an important habitat for many different types of plants and animals. In Illinois, wetland plants make up about 32 percent of the total flora and many different types of animals use wetlands. In fact, 64 percent of the 94 species of vertebrates listed on the threatened or endangered list that live within Illinois use wetlands (State of IL., 1994).

The question now is why, with all of the benefits the wetlands produce, has the United States drained more of its wetlands than would have been advisable? The answer lies in the fact that the type of benefits wetlands produce, which are flood control, pollution control, and environmental benefits, are all public goods.

Public goods are goods that are both nonrival and nonexclusive in nature. Goods that are nonrival can be consumed by one consumer and it does not reduce the ability of another consumer from consuming the same good. If one person enjoys the benefits of greater flood protection that increasing wetlands would produce, it does not reduce

the ability of another person from enjoying that same flood protection. The nonexclusive aspect of public goods means that it is hard, if not impossible, to exclude people who do not pay for a good from benefiting. If the number of wetlands is increased it would create cleaner water for everyone, regardless of who actually paid for the increase in wetlands. Because of the characteristics of public goods they will be underproduced in a market economy. When the private individual is weighing the costs and benefits of a decision he will not take into full account benefits that are public goods because he is not able to reap those benefits personally. So while the individual fails to take into account the benefits of public goods, as a society these benefits must be taken into account.

FIGURE 2: Marginal Costs and Benefits of Wetlands as Related to the Distance from the Stream



Source: C.L. Lant University of Iowa

C.L. Lant of the University of Iowa did a study on why wetlands are currently being underproduced in the United States. In this study he created a model to show graphically this idea of the difference in the amount of the individual's (in this case a farmer) allocation of land for wetlands and the efficient amount that society would require (see FIGURE 2). This model uses for its Y-axis the annual marginal costs and benefits per hectare. The X-axis represents the distance from the stream bank to the edge of the flood prone area (the edge of the floodplain is based on the 100 year flood plain). The farmer begins farming on land where the "Agricultural Revenues" curve crosses the "Production Costs" line at point A. The land to the left of point A is not profitable for the farmer to farm because for any number of reasons it is of poorer quality. The costs of farming in this area of the graph outweigh the revenues and therefore the farmer would not farm. The land to the right of point A would be farmed because the benefits of farming outweigh the costs.

Society, which takes into account the positive externalities of wetlands, should use where the "Opportunity Costs" curve and "Wetland Benefits" curve intersect to decide how much land to allocate for wetlands. The "Opportunity Costs" curve is the cost of the agricultural revenues foregone plus the cost of establishing wetlands (Lant refers to wetlands as riparian wetland forests hence "Forest Costs") minus the "Production Costs" which are not incurred because there is no farming. Lant derives the "Wetland Benefits" curve by including the same major categories of benefits that I have discussed which are flood control, pollution control, and environmental benefits. Notice that the curve is downward sloping, this is due to the fact that the benefits of wetlands display diminishing marginal returns, that is they decrease as the distance from the source of water increases.

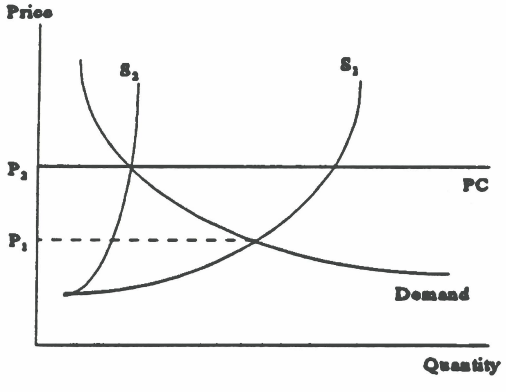
This model shows that private individuals, who own most of the land that might be converted back into wetlands, would allocate their land to point A for wetlands. Society, which takes into account the positive externalities, would allocate to point B for wetlands. By examining Lant's model it becomes apparent that society would desire much more land for wetlands than individuals

will produce. The question now becomes one of what should be done to deal with this "underproduction of wetlands" (Lant, 1987).

In most cases where public goods are concerned it is necessary for the government to take some action to make up the difference between what the individual produces and what society desires. Unfortunately, in the case of wetlands, the government has not worked to increase the number of wetlands. In fact, through its programs it has both directly and indirectly done the opposite.

As mentioned earlier, the United States developed and drained most of its wetlands in the name of progress. This program was strongly supported by the federal government with much of the work being done by the Army Corps of Engineers. The legislative record is full of laws like the 1848 Swamp Land Act that were used to provide funding for the draining of wetlands (Dahl, 1990). To go along with the government's direct program of wetlands abatement has been the indirect effect of government subsidies (price controls) on farm commodities which have affected the allocation of land for wetlands use.

FIGURE 3: Effect of Government Price Controls on Food Production



Source: Leekley, 1995

The effect of government price controls--set at line PC--has been to bend the supply curve leftward from S1 to S2 (see FIGURE 3). What this increase in price from the equilibrium level of P1 to the price control level of P2 has done is to decrease the farmers allocation of land for wetlands. This happens because as Lant's (1987) model (figure 2) suggests an increase in the farmers' price for his crops would shift the "Agricultural Revenues" curve leftward. This means that land that the farmer would have left in its natural state (wetlands), because the agricultural benefits were less than the production costs, is now economically viable because of the high "Agricultural Revenues." Thu point A shifts to the left. There are many problems with government price controls which are beyond the scope of this paper, but needless to say they certainly only add to the inefficiency of the allocation of land for wetlands.

A major problem the government would have if it tried to increase the number of wetlands stems from the fact that most of the necessary land is privately owned. But there are still certain policy actions the government could take to try and increase the number of wetlands without encroaching on individual property rights. The most obvious and certainly the easiest government action would be to simply reverse its current programs which support the draining of wetlands. While this idea would be unpopular with some interest groups it is certainly feasible. Another idea would involve ending the current policy of price controls on agricultural commodities. This seems logical enough; take away the incentive individuals have to farm the land by making it unprofitable. The problem with this idea is that eliminating or even cutting farm subsidies is like playing with political fire (Flora, 1995). In reality, because of political pressure, it would be impossible to get rid of the current agricultural price controls.

Another idea that is much more feasible would be to take some of the money that is currently being spent on farm subsidies and use it instead for the retirement of farmland back into wetlands. This could be part of the farm subsidies program because a large part of that program centers on the government paying farmers not to farm land to keep the price high ("Radical," 1995). The government could require that in areas where possible, the land that it is paying to be left idle is instead converted into wetlands. This would require an initial increase in funds to revert the farmland back to wetlands, but the government could justify this by pointing to all of the benefits that wetlands produce. Another bonus of this idea is that it could work within the current system of price controls.

Fortunately, this story has an encouraging, if not quite a happy, ending. The government, recognizing that farming was the greatest cause of wetlands losses in 1994, created through the U.S. Department of Agriculture the Wetlands Reserve Program to protect and restore wetlands. This program is currently being offered in twenty states. Through this program private landowners can file an intention to offer their land to the government to be restored into wetlands under the stipulation that the government places a permanent easement on their land. In Illinois, in 1994, intentions were filed for a little over 24,000 acres of wetlands to be restored or protected (State of IL., 1995).

This article has shown that wetlands have many benefits but because of the nature of these benefits they will be underproduced. The underproduction of these benefits requires some government action. While the government is currently moving in the right direction with programs such as the Wetlands Reserve Program, it is not doing enough. The approximately 24,000 acres that Illinois landowners filed intentions for and the 93 million dollars spent by the U.S. government on the Wetlands Reserve Program are just a drop in the bucket (Excerpts, 1995). The government should take much more aggressive action to try to increase the number of wetlands. There is a real need for the benefits that wetlands produce. The government must do more to see that this need is met.

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