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# A Preliminary Investigation to Determine the Economic Implications of the "404" Permit for Constructing Agriculturally Related Reservoirs in Arkansas


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**A PRELIMINARY INVESTIGATION TO DETERMINE  
THE ECONOMIC IMPLICATIONS OF THE "404"  
PERMIT FOR CONSTRUCTING AGRICULTURALLY  
RELATED RESERVOIRS IN ARKANSAS**

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Technical Completion Report Research Project G-1549-04

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University of Arkansas  
Fayetteville, Arkansas 72701**



**Arkansas Water Resources Research Center**

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## ABSTRACT

### A PRELIMINARY INVESTIGATION TO DETERMINE THE ECONOMIC IMPLICATIONS OF THE "404" PERMIT FOR CONSTRUCTING AGRICULTURALLY RELATED RESERVOIRS IN ARKANSAS

A descriptive inquiry of the economic consequences of federal regulations which restrict the construction of agriculturally related reservoirs in Arkansas's wetlands is presented in this report. The applicable economic principles are identified and applied to the situation without the quantifiable information necessary to evaluate the alternatives. The difficulty of collecting the required quantifiable information necessitates the formulation of a different technique to unravel the dilemma. An alternative method for resolving the wetlands allocation question is presented for a public sector decision maker. This unconventional technique suggests that it may be desirable to estimate and compare the costs associated with the possible errors of a wetlands land use regulation in terms of both their consequences and likelihood.

R. K. FORD and C. R. BRITTON

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Water allocation, Agricultural reservoirs.

## FOREWORD

This project has turned out to be more demanding than was first anticipated. Initially, it appeared to be a relatively straight forward application of economics to a topical situation. However, as work proceeded, the quagmire of elaborately developed economic theories addressing the many overlapping issues of this project slowed its completion. Concurrently, the "topical situation" changed so that the nature of the problem took on different dimensions. As a result, the thrust gradually shifted to a more generalized perspective. The initial proposal called for "a fully developed decision model [to be] formulated from economic theory." In an attempt to balance the initial goals with the ongoing changes in the situation as well as with the multiplicity of approaches found in the literature, a generalized economic model for analyzing the situation is presented and discussed. An attempt has been made to introduce the relevant economic topics into the discussion and to organize them into a consolidated decision-making framework.

The reader is reminded that economics is a science that frequently deals with topics that are inherently

judgmental. As is the case with this project, the "correct" answer cannot be derived from positive (i.e., non-judgmental) economic analysis regardless of how well economic theory is applied. At best, positive economic analysis can identify choices and offer a comparison of their relative merits. The actual selection from these choices is not an activity that economists are particularly trained to do. When considering public sector topics, such as are dealt with in this project, selection of "the correct answer" must be left to the political process. However, the following report should assist Arkansas's decision makers with selecting the most appropriate political agenda to pursue.

### **ACKNOWLEDGEMENTS**

During the course of this project, several people contributed; and, one deserves special mention. Mrs. Clara Jane Rubarth provided several badly needed technical editorial reviews. Without her help, we would still be dangling participles from misplaced commas within an all-too-awkward format.

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## INTRODUCTION

Recently, the U.S. Army Corps of Engineers (Corps) and the Environmental Protection Agency (EPA) have agreed on the specific requirements for the issuance of a "404" permit for the construction of various kinds of reservoirs in Arkansas wetlands. Although based upon the 1972 Federal Water Pollution Control Act, it is the direct result of case law and various negotiations that have taken place between these two regulating agencies.

From a somewhat larger perspective it appears that a new conflict is developing between conservationists and landowners, or between those who express their concern for protecting, conserving, and improving the environment through public sector institutions and those members of the private sector with vested property right interest such as wetland owners, predominantly farmers. Initially one might suppose that this developing conflict is a sign of "modern times" and is a function of recent scientific discoveries concerning ecosystems and America's accelerated rate of abuse of them. During the post World War II era considerable attention has been given to America's "sprawling urbanization," and the "disposable society."

However, the following quotation from a 1931 academic journal is useful in putting this condition into perspective:

Contemplation of the world's disappearing supplies of minerals, forests and other exhaustible assets has led to demands for regulation of their exploitation. The feeling that these products are now too cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in consequence of their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement.

The current conflict, although not new in its fundamental nature is novel because the level of public sector control over private property in this particular area is different (i.e., more direct and stringent) than in the past<sup>2</sup>. Like most conflicts concerning property rights, the emotional component can be seen in various articles of the popular press. The following few examples are presented as symptomatic of the intense nature of this dispute:

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<sup>1</sup> Hotelling, Harold, "The Economics of Exhaustible Resources", Journal of Political Economy, April 1931, Vol. 39, pages 137-175.

<sup>2</sup> It is interesting to note that one of the major catalysts of this current conflict concerning wetlands was a change in definition. When the courts held that a particular tract of land was to be considered a wetland when it had not previously been so considered, the result was that legislative laws that had been in existence for a considerable time took on new meaning as the definition of the term 'wetland' was expanded. (See Appendix 1.)

In a normal world, a clean environment and private property are perfectly compatible. As residents of Leningrad or Leipzig know, private owners do far better by preservation than socialists have done. But in their zeal to cleanse the world of man's sins, U.S. enviros have been ignoring the Constitution's Fifth Amendment ban against the 'taking' of private property without compensation.<sup>3</sup>

In addition to your usual ranting and raving about environmental regulation, your editorial proclaims that 'private property rights lead to a cleaner environment because they imply individual responsibility.' Has it occurred to you that the unchecked exercise of 'private property rights' led to many of the thousands of abandoned toxic-waste sites now being addressed by the federal Superfund law and similar state statutes.<sup>4</sup>

In a letter to Senators, American Agriculture Movement national director, David Senter, wrote that U.S. farmers stand to lose '25% to 50% of their equity due to the outright taking of their land by the federal government.' Federal agencies, he added, 'are using wetlands delineation, clean water, and other laws as a way to take control of vast areas of farmland, much of which has been farmed for decades and has nothing to do with permanent wetlands.'<sup>5</sup>

Farmers in particular believe that they are bearing  
an unfair burden of this current round of public versus

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<sup>3</sup> "EPA v. Private Property", Editorial, Wall Street Journal, August 27, 1990.

<sup>4</sup> J.B. Ruhl, "Letters to the Editor: Who's All Wet on Wetlands Issue?" Wall Street Journal, September 25, 1990

<sup>5</sup> "EPA v. Private Property", Editorial, Wall Street Journal, August 27, 1990.

private sector controversy:

These farmers have been shocked to learn that the Exxon Valdez Oil spill or chemical carelessness like Love Canal are not the environmental crimes of the century, at least in the eyes of government regulators. The Environmental Protection Agency (EPA) has reserved its stiffest criminal and civil penalties for wetlands violators."<sup>6</sup>

In Colorado, Larry Gerbaz faced \$40 million in fines for rebuilding a levee after the Corps refused to say whether he needed a permit. ... 'I asked the Corps of Engineers if I needed a permit, and they wouldn't tell me,' says Larry. 'After the river had come within 20 yards of my house, I pushed up rocks from the bottom of the creek and rebuilt the levee. What we did amounted to putting the river back into its original course.' says Larry. 'The fine for rebuilding the levee without a Section 404 permit is supposed to be \$25,000 a day for each day since the work was completed in 1985. ... Larry has since sold his 19 acres, and the new owner will not permit him to tear down the rebuilt levee. Gerbaz has offered to do bank stabilization work and plant willows. But he says he won't pay a fine. 'It makes your skin crawl to agree to a settlement when you don't believe you were in the wrong,' he says. 'Before this is over, I think I may go to jail.' Jail or not, farmers across the country who operate on wetlands are seeing the consequences of incurring the ire of government agencies which, unlike USDA, do not understand agriculture.'

On the conservationists' side of the issue, many

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<sup>6</sup> Taylor, Marcia Z. and Darrell Smith, "New Wetlands Rules Drain Farmers", Farm Journal July 1990, page 16.

<sup>7</sup> Ibid, page 19.

emotionally 'loaded' articles have also appeared in the popular press:

An exciting concept is taking shape on the drawing boards of Conservation Department engineers ... Eagle Bluffs Wildlife Area is attracting national attention for its innovative concept: use water that would otherwise be discharged as waste to create a wetland ecosystem.<sup>8</sup>

As one would suspect, elected officials find themselves in the middle of this controversy and are frequently holding public hearings and/or sponsoring bills to appease various segments of the public in attempts to improve the situation. As an example, consider the following:

Congressman Hammerschmidt criticized as 'totally unreasonable' the Corps' proposed permitting fee increases, which would raise the charge for review of individual, non-commercial permits from the current \$10 to \$500, and the fee imposed for commercial development, from \$100 to \$2,000<sup>9</sup>

'Since January 1989, I have become increasingly alarmed at the regulatory overkill pursued by your agency in regards to certain lands that suddenly met new wetlands definitions,' Bumpers said in a letter to the Corps. 'Although I am sensitive to the cost inherent in the administration of your various permit programs, I must object to your

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<sup>8</sup> Editors, "Wetlands from Waste," Missouri Conservationist, April 1990.

<sup>9</sup> News release from Congressman John Paul Hammerschmidt, January 3, 1991.

proposal for such large fee increases.<sup>10</sup>

The controversy continues in the press and in the halls of Congress as can be seen on the front page of local newspapers. (See Appendix 2.) Although the issue seems to be an insolvable struggle between "property righters" and the environmentalists, there are ways to examine this apparent dilemma in economic terminology which will facilitate finding a resolution agreeable to rational persons.<sup>11</sup>

In order to scrutinize this obvious quandary in economic terms, it is first necessary to focus the discussion on the small portion of this national debate which concerns this paper namely concentrating on the construction of agriculturally associated reservoirs (viz., farm ponds) on real estate classified as "wetlands." The fundamental objective of this report is to identify the economic issues and tradeoffs germane to

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<sup>10</sup> "Bumpers Angry at Corps Proposed Wetland Fees Draws Criticism", Arkansas Gazette, December 11, 1990.

<sup>11</sup> It has been suggested that everyone with a vested interest in either of the two conflicting sides may be too personally involved (i.e., emotional or financially connected) to qualify as a "rational person." Land owners who are campaigning against the attenuation of their property rights are unquestionably personally involved. Less obvious, but still personally involved, are members (or sympathizers) of environmental groups. It should be acknowledged that these people also have personal interests at stake since their objective is to compel land owners to use wetlands according to standards partly determined by them.

the problem of deciding the "appropriate" degree of government control which should be exerted over a wetland property owner desiring to construct a farm pond. Toward this end, the next section will identify and briefly discuss the various economic issues and tradeoffs inherent in this problem. The discussions are presented in the context of how a resolution might be reached using economic logic instead of guiding the reader to a particular conclusion. This approach is necessary for two reasons: first, much of the quantifiable information essential for the problem's evaluation is currently unavailable, and second, where an objective approach to solve the problem is not available, the value judgments required for a solution open elements entirely beyond the scope of this paper.

After the economic issues are introduced and examined, an explanation of policy decision errors is presented which is a supplemental approach to this problem. Finally, a summary is presented. The summary emphasizes the unknowns, or the particular kinds of questions that need answering before a rational policy decision can be made on economic grounds.



## ECONOMIC PROBLEMS

Should a particular section of Arkansas land be employed as an agriculturally related reservoir (ie., farm pond) or as a wetland? This is the fundamental question of this paper, and it is appropriate to consider the question in economic terms since economics is the science of choices. Many fundamental, and some lesser known, economic principles apply to this question. By examining this question in light of these economic concepts, a better perspective can be achieved through which the question can be approached and alternative solutions evaluated.

The first principle applicable to this land use question is sometimes called the principle of the "highest alternative use." This principle states that all resources should be allocated to their most overall productive use if society is to maximize its total welfare. That is, if the total benefits associated with a farm pond are greater than the total benefits associated with using that particular portion of land as a wetland, then a pond should be constructed. Failing this test, the land should be allocated to wetlands, or even some other alternative.

The principle of highest alternative use is easy to understand but difficult to apply, since **quantifying** "total associated benefits" is a difficult task, especially for the wetlands option. It has been well documented that wetlands provide many benefits. (See Appendix 1.) Included among the benefits that wetlands provide are habitats for threatened and endangered species, a benefit which accounts for a significant percent of the total number of those threatened species in this country. (See Appendix 4.) But what is the **value** of saving a particular species from extinction? What is it **worth** to increase the number of a particular species so that it is no longer on the endangered species list, or no longer on the threatened species list?

These questions are, of course, hypothetical since market values do not exist for removing species from endangered or threatened lists. However, most people would agree that positive value does exist for this type of activity, even though it is not typically determined through the market. There are two important consequences associated with this fact: first, the actual values can only be estimated; and second, this feature indicates that there is a "market failure" in this situation.

Typically the market system will not provide a "public good" even though its production would increase society's overall welfare.<sup>12</sup> Public goods have the dual properties of being **nonrival** in consumption and **nonexcludable** in their distribution. The attribute of nonrival in consumption is not a particular problem since it simply means that more than one person can enjoy, or consume the good.<sup>13</sup>

The nonexcludable attribute of a public good does, however, present a problem. Once produced, a true public good cannot be withheld from consumption. Therefore the producer is unable to exclude someone from consuming the product, which means the producer is usually unable to be rewarded for the production process. The market system relies on self interest as the incentive to stimulate production. Without the ability to capture returns, or get rewarded for one's efforts, there is little incentive for a public good to be produced in the private sector.

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<sup>12</sup> Generally, economists are prone to advocate "market solutions" since private property, self interest, and competing alternatives can be demonstrated to lead to an efficient solution when free markets are working properly. However, a public good is an example of a situation where a market system can be demonstrated to be inefficient.

<sup>13</sup> A example of a nonrival good is a sunset - many people can enjoy it without interfering or diminishing the others' enjoyment, unlike a food item which can be consumed only by one person.

Furthermore, even though all consumers may find the public good desirable, each will be motivated not to pay because they cannot be prevented from consuming it.<sup>14</sup>

Many of the benefits associated with wetlands are properly classified as public goods. Because of the nonexcludable aspects associated with the wetland benefits which are public goods, the market system will provide no incentive for private land owners to properly appraise these benefits when considering the highest alternative use for their land. Consequently, society will be undersupplied with wetlands without some type of private market intervention.

There are several approaches to address market failures. Unfortunately, no particular technique has been identified as generally superior in all situations. When considering environmental policies, the possible choices range from moral suasion<sup>15</sup> to direct control. (See Appendix 5.) Each of these approaches has its

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<sup>14</sup> This is frequently referred to as the "free-rider" problem. Self interest will motivate each individual not to pay because consumption without paying is possible.

<sup>15</sup> Moral suasion is sometimes referred to as "jaw-boning" and relies on either individual morality or social pressures to persuade people to "do the right thing." Although this is sometimes effective, it can be expensive and may not have lasting effects.

advantages and disadvantages, as outlined by Byrns and Stone. (See Appendix 6.)

The effectiveness of an approach to correct a market failure can and should also be considered when selecting the best alternative solution. Some of these considerations have been summarized by Baumol and Oates. (See Appendix 7.) A perusal of these appendices with the wetlands question in mind will yield three basic options available for addressing the market failure in this situation: (1) governmental control through laws and/or regulations, (2) market manipulation by subsidies and/or taxes, and (3) providing wetlands benefits through public ownership. An elaboration of each of these methods is presented in the following paragraphs.

Governmental Control Through Laws or Regulations.

Correcting the market's failure to properly account for the benefits obtained from wetlands with laws and regulations is the approach currently being pursued. Notice that Byrns and Stone identify this method as "politically most popular" as one of its advantages. This could explain why the technique is prevailing, since the other two advantages (i.e., 'extremely harmful

pollutants', and 'horizontal equity'<sup>16</sup>) are not applicable in the wetland versus farm pond situation.

It is also significant that in Appendix 6, "direct regulation" has more listed "disadvantages" (a total of six) than any of the other "policy options" listed. Particularly troublesome among these six with respect to the wetlands situation are the first and third items. By enforcing a set of regulations based on the policy of "no net wetlands loss"<sup>17</sup> there is a shortage of incentives encouraging landowners to create more wetlands.<sup>18</sup>

The level of intervention in this method of correcting a market failure is noticeably high as was demonstrated by the popular press excerpts in the preceding section. Whether or not private property is being seized without compensation is a legal question<sup>19</sup>.

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<sup>16</sup> Horizontal equity is defined as "treating equals the same," or "individuals who are equal in all important respects should be treated equally."

<sup>17</sup> Currently, the Bush Administration is advocating the policy of "no net loss" with respect to the quantity of wetlands to be maintained nationally.

<sup>18</sup> The long term goal of the Conservation Foundation is "To increase the quantity and quality of the nation's wetlands resource base", Protecting America's Wetlands: An Action Agenda. The Final Report of the National Wetlands Policy Forum, published by the Conservation Foundation, 1988.

<sup>19</sup> Just because property rights are attenuated by law does not in and of itself constitute "illegal taking of private property". Zoning laws are a case in point.

Nonetheless, it is apparent from the fervent flavor of these quotations that governmental intervention is particularly distasteful to landowners. As a system, laws and regulations to protect wetlands lack an internal method of allowing substitutes or tradeoffs in environmental matters, as is the case with a wetlands versus a farm pond decision<sup>20</sup>.

Finally, there is a wealth transfer consideration. Wetlands produce public goods which benefit society without compensating the landowner who, by law, must forgo alternative uses of the land which would yield more wealth. The effect is that the entire cost for providing wetland benefits are borne by wetland owners even though all of society "consumes" these benefits. Therefore the landowner is being reduced in wealth to the extent that the landowner must forgo recurring returns which could be acquired from an alternative use of his property.

Market Manipulation by Subsidies or Taxes. Subsidies can be effectively used to correct market failures,

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<sup>20</sup> A farm pond provides many of the same kinds of benefits, environmental and otherwise, as listed in Appendix 3, Taxonomy of Major Wetland Values. However, a system of rigid laws does not allow forfeiting some, but not all of the wetland benefits in exchange for gaining the benefits that are exclusively associated with a pond.

especially in the wetland situation. In fact, this is currently being pursued:

Under the Conservation Reserve Program, farmers are paid about \$ 50 per acre each year for a contract of 10 years or more to return their lands to a natural state.<sup>21</sup>

It is interesting to note that Robert Stavins estimated a \$55 value, (as opposed the \$50 currently used) in his 1988 Ph.D. dissertation:

This translates into an annual ecological benefit level of \$55, which is within the range of typical annual new (private) returns to conversion. This is as we would expect, since social optimization would call for wetland conversion to be avoided whenever the marginal value of externalities is in excess of the private returns to conversion.<sup>22</sup>

Whether or not the \$50 or \$55 per year rate is sufficient to induce enough landowners to either put or convert their land to wetlands is an empirical question that can only be answered by experience. It should be apparent that some level of subsidy could be determined which would provide the number of wetlands acres determined appropriate. Furthermore, if such a system

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<sup>21</sup> "Incentives Grow For Replanting In Hardwoods: Farmers Put Acorns In Poor Wetlands," Arkansas Gazette, May 20, 1991.

<sup>22</sup> Stavins, Robert N., The Welfare Economics of Alternative Renewable Resources Alternatives: Forested Wetlands and Agricultural Production. Unpublished Ph.D. dissertation, May 1988, page 102.



were in place, there would be little need for preventing the construction of farm ponds from wetlands (or potential wetlands) by regulation since the "wetlands allowance" system would be providing the correct amount of this public good.

The problem of wealth transfer inherent in the governmental regulation system would not exist if a wetlands subsidy system were correctly established. Those land owners who elected to receive the wetlands subsidy would be paid for by the benefits that wetlands provide. Furthermore, the cost for providing wetlands benefits would be paid by the "consumers" of these benefits, namely society.

Providing Wetlands Benefits Through Public Ownership.

One other approach to solving the market inefficiency problem of wetland allocation is public ownership. Our society could embrace the concept of public ownership of wetlands which would entail a one-time cost to solve the perceived shortage of wetlands, as opposed to incurring annual fees as would be required of the subsidy system solution. The Federal Government could buy either wetlands and/or potential wetlands and convert it to wetlands. Not only would this method of correcting a

market failure avert an ongoing annual fee, but it may also help prevent other problems of national concern. Currently, several agricultural crops are produced in surplus. Many crops are in fact produced in surplus quantities because of various price support programs or direct subsidies. By removing some farmland from production and converting it to wetlands, the surplus output levels could be reduced while simultaneously providing part of the financing for public ownership of wetlands<sup>23</sup>. A possible and interesting facet of this approach exists. It could be administered in conjunction with various federal agricultural lending programs already in existence. If a specific section of agricultural real estate passed to government ownership because of foreclosure proceedings, it could be deeded to a "wetland preserve" as opposed to being auctioned. This would increase the supply of wetlands benefits enjoyed by all of society, a public good, and decrease the supply of agricultural products, many of which are produced in surplus quantities. Furthermore, it could be argued that

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<sup>23</sup> Since some government funds are already allocated to various price support programs, removing farmland from production would reduce the overall cost of the subsidy program and could provide financing for purchasing land for a wetland actuation program.

transferring the land from "production" to wetlands status would most likely be efficient since it is assumed the low productivity of the land contributed to its foreclosure in the first place.<sup>24</sup>

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<sup>24</sup> To the extent that this assumption is true, the land least suited for production would be reallocated to wetlands status.

## ALTERNATIVE SOLUTIONS

Specifically, the question addressed by this paper is whether or not a particular site in Arkansas should be employed as an agriculturally related reservoir (ie., farm pond) or a wetland? The preceding section examined this question from an economic perspective. However, the investigation originated from the implied prospective of searching for a "correct solution". Normally such a method of inquiry is thoroughly adequate, especially when operating with relatively known parameters and relatively short time frames. However, the reservoir - wetlands choice has considerable uncertainty and time involved. The consequences associated with incorrect decisions because of these factors could be quite substantial. Realizing this, the authors of this report sought an alternative solution based upon the errors associated with an incorrect decision and the consequences. That alternative approach looks for ways to minimize damage or costs instead of maximizing benefits. Although this may appear to be the same thing, such is not necessarily the case. Normally high returns (ie., benefits) are associated with high risks (i.e., substantial mistakes). Alternatively an individual may accept lower returns for

less exposure to risks. If only the possible result (high benefits) is considered, one may prefer one solution while the other (lower risks) is much more preferable from an error perspective. When a weighted average of the two are considered, one or the other may be preferable depending on the assigned weights.<sup>25</sup>

When considering two different results associated with two choices, a two by two matrix can be used to clarify the situation. Such a matrix is presented in Table 1. Note the factors have been dichotomized thereby constraining the outcomes to four.<sup>26</sup>

Of the four decision cells presented in Table 1, two are desirable outcomes; whereas, two are not. The task at hand is to explore the undesirable outcomes and their consequences.

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<sup>25</sup> A "weighting" is similar to assigning risks as when evaluating financial investment alternatives. Higher interest payments associated with low probability of payment is generally not a very good choice.

<sup>26</sup> It's possible to structure the problem in ways other than limiting the choices and results to two each (i.e., dichotomizing both factors). However, the chosen approach serves well since it focuses attention on the discussion, and is also an adequate model of the administrative policies concerning wetlands use since the regulations are assumed to be uniformly applied.

One undesirable outcome is to construct an agri-

T A B L E 1

Choices	An agriculturally related reservoir is not constructed on wetlands	An agriculturally related reservoir is constructed on wetlands
Results		
Assume that the net wetlands environmental benefits are <b>greater</b> than the net water related benefits	Correct Decision	Policy Decision Error
Assume that the net wetlands environmental benefits are <b>less</b> than the net water related benefits	Policy Decision Error	Correct Decision

culturally related reservoir on wetlands when the net wetlands environmental benefits are greater than the net water related benefits. This undesirable outcome is currently what the various agencies of the Federal Government dealing with this issue are trying to prevent by accepting the other policy choice. However, what are the likely "down side risks" associated with this outcome. If every Arkansas farmer with wetlands

(regardless of the land's current use status) constructed all the farm ponds they wanted, what would be the total negative effect to the environment? Estimates are currently unavailable on the total acreage that would be converted to farm ponds. However, it can be assumed to be relatively small since the regulations restricting this are new.<sup>27</sup> Furthermore, diverting land from its current use would only occur in the private sector when the economics justified the expense. This too, suggests a limiting factor to the total number of acres which can be converted to farm ponds in the absence of prohibitive regulations.<sup>28</sup>

The second undesirable outcome occurs if the net wetlands environmental benefits are less than the net water related benefits and the pond is not constructed because of a policy decision. If a farm pond was constructed for irrigation water supply (a logical assumption in the region of Arkansas which constitutes most of the state's wetlands) but was prevented by

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<sup>27</sup> Since land owners have been free to construct farm ponds without government interference on their property until recently, it is safe to assume that no current "back-log" exists for farm pond construction.

<sup>28</sup> Building a reservoir in eastern Arkansas, (the region of the state where wetlands are most prevalent), is relatively expensive. It is safe to assume that considerable thought would be invested before starting construction.

regulation, it is appropriate to investigate the secondary results. These secondary results can be thought of as repercussions or echoes from a specific policy. Two different, but not necessarily independent, secondary results can be identified.

One secondary result of a policy decision error associated with restricting the construction of farm ponds will most likely be political pressure for more government constructed water projects. Since existing irrigation water supply will not be augmented by privately funded construction of farm ponds, it is reasonable to expect some amount of pressure on the public sector institutions for publicly financed assistance, or augmentation of the agricultural or irrigation water supplies.<sup>29</sup> The magnitude of this type of secondary result is practically impossible to forecast and also equally difficult to quantify after the fact. However, logic suggests that some repercussion would be

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<sup>29</sup> This activity could manifest itself in requests for constructing public sector water supply reservoirs, or for the redesignating of existing water supplies from other water uses to agricultural irrigation. Another possible reaction to such a policy decision could be increased pressure for diverting surface water from other regions of the country for irrigation purposes.



highly plausible, and not necessarily desirable.<sup>30</sup>

The other identified secondary result of a policy which prevented constructing farm ponds would likely be increased usage of underground water supplies for agricultural irrigation. In other words, the already heavily used Arkansas aquifers would be drained at an increased rate. At this time the linkage between such a policy decision and the increased rate of water usage from the aquifers is not known. However, logic once again dictates that such a connection probably exists. Furthermore, it seems prudent to attempt to collect information concerning such a linkage and estimate the magnitude and effect of such an increased rate of water withdrawal from the aquifers. Preliminary estimates of both the wetlands environmental effects and the increased rate of the aquifer depletion may prove sufficient to select the better policy decision in this situation.<sup>31</sup>

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<sup>30</sup> Since water for agricultural irrigation is basically a "private good" as opposed to a "public good", it would be more economically efficient to provide it through the private sector.

<sup>31</sup> If only order-of-magnitude estimates were derived by specialists, the question may be answerable without more research. It may be that the net damage done to wetlands ecosystem would be minimal if construction of irrigation reservoirs was unrestricted because such land use conversion would represent a small percent of the total wetlands. Furthermore, it may be that relatively small farm ponds would provide a significant portion of the irrigation water that otherwise can be predicted to be withdrawn from aquifers.

One last consideration should be mentioned with respect to looking at the possible errors. When analyzing both errors and secondary effects of policy decisions, the "costs" of correcting mistakes should also be considered. It may be relevant to consider both the possibility and the feasibility of reversing a policy decision if future events demonstrate that an error was made. Again, the opinions and research findings of various specialists are required. However, if it is judged that one type of error has results, or secondary results, that are irreversible, while the other type of error is "correctable" or "reversible" then the prudent decision should be one of avoidance. That is, it may be best to select the policy decision that if wrong, can be reversed along with its negative consequences, thereby avoiding a policy decision that, if wrong, can lead to irreversible outcomes. In other words, with respect to wetlands, it is best to minimize the long-run potential costs.<sup>32</sup>

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<sup>32</sup> As an example, if it is possible and feasible to convert farm ponds back to wetlands, but impossible to "recharge" a depleted aquifer, then decision makers may want to ponder these "costs of correcting and error" considerations.

## CONCLUSIONS

It is highly unlikely that a "scientifically-derived"<sup>33</sup> answer is possible to the question raised in this paper. The authors do believe, however, that certain valuable contributions have been provided in this report for policy makers to consider.

With respect to the requirements associated with the "404" permits for constructing agriculturally related reservoirs in Arkansas, certain elements were singled out for consideration. First, if there were no permit requirements, the landowner is going to use the land in its highest valued alternative. This will maximize total economic welfare of society from a private property perspective if the landowner has correctly evaluated the economic benefits and costs. In other words, if the total economic benefits associated with land being used as a farm pond are greater than the total economic benefits of the same land remaining as wetlands, then the pond should be constructed.

Earlier in this report it was pointed out that there could be a problem with the private property approach

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<sup>33</sup> The term "scientifically-derived" is used here to mean a value free method of investigation and discovery.

from an externalities point of view. Externalities exist when the private calculations of benefits or costs differ from the calculated benefits or costs to all of society. The value of the benefits to society of land remaining as wetlands may be undervalued. If so, ponds may be constructed based upon only private economic considerations which would not be economically desirable from a societal view point. This report noted that such action would constitute an error. If the "404" permit requirements are constraining on the behavior of private landowners in such situations then the "404" permit has helped to correct the occurrence of this type of error.

This report also pointed out a second possible error. If the private economic benefits of constructing a pond exceeded the total economic benefits, including all societal benefits of the land remaining as wetlands, then the pond should be constructed. If the reservoir is not constructed (because of "404" permit requirements) then this is also an error.

This report attempted to address the policy considerations which would have to be made to correct the above mentioned error. Obviously, if the reservoir should have been constructed but wasn't, then this error

is easily rectified by building the pond. If the pond was constructed but should not have been, then the correction would require that the land be allowed to revert back to its original state of being wetlands. Although, this sounds somewhat difficult, the literature indicates that allowing both farm land and ponds to revert back to their natural state is not as difficult as most imagine.

The secondary effects of the above error were also mentioned in this report. If the pond was constructed but should not have been, there are still secondary benefits to be considered. The reservoir helps to either recharge or to save the underground aquifer being used for irrigation. These benefits are sometimes ignored in policy decisions. If these secondary benefits are included in the analysis, then the error may disappear, or at a minimum decrease in importance.

As with all reports it seems that the more analysis one does the more questions one discovers which should be addressed. This report is not different. As can be ascertained by reading only the conclusions there are many very serious areas of study which still must be undertaken. It is hoped that other scientific fields

will help to provide the information needed for better economic analysis to be developed in the future.

APPENDIX 1

**FIVE EXAMPLES OF WETLANDS DEFINITIONS**

**U.S. Fish and Wildlife Service** "Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water..."Wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly untrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

**U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers** "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

**State of Wisconsin** "Those areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which have soils indicative of wet conditions."

**State of Connecticut** "Wetlands means land, including submerged land, which consist(s) of any soil types designated as poorly drained, very poorly drained, alluvial or flood plain by the National Cooperative Soils Survey, as may be amended from time to time, by the Soil Conservation Service of the U.S. Department of Agriculture."

**State of California** "Lands within Coastal Zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish marshes, swamps, mudflats, and fens."

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Source : Salvesen, David Wetlands: Mitigating and Regulating Development Impacts, Washington D.C., the Urban Land Institute, 1990 , page 10.

APPENDIX 2

**Newspaper Article**  
**Arkansas Gazette, May 17, 1991**

**Page 1 - "BATTLE BUILDING OVER WHAT TO DO WITH WETLANDS" WASHINGTON** - Arkansas farmer David Yokum's message to a Senate committee was a simple one Thursday: The federal government shouldn't be able to keep a fellow from working his own property by invoking wetlands regulations. "I don't think the government should be allowed to stifle the farm economy due to wetlands," Yokum, who farms in Lake Village, told Sen. Dale Bumpers' Senate Small Business Committee. But the message from Nancy Delamar, the director of the Arkansas Nature Conservancy, was just as simple. "Wetlands represent a unique asset that once lost cannot be recaptured," she told Bumpers and his colleagues. The United States, she warned, is losing about 450,000 acres of valuable flood-control and wildlife breeding grounds each year, so they must be protected or they will disappear.

The opposing stands taken by Yokum and Delamar represent what could erupt into the biggest environmental battle of the year in Washington. It's over whether tough federal regulations to protect environmentally sensitive wetlands will remain intact or be watered down. Farmers, developers and many small-businessmen argue that current restrictions are so prohibitive and the bureaucratic administration of them so cumbersome that development is stifled and basic property rights denied.

And several bills-including one authored by Rep. John Paul Hammerschmidt, R-Ark., and one co-sponsored by Rep. Beryl Anthony, D-Ark.-have been introduced to ease the restrictions. But Delamar and other environmentalists fear that such legislation will gut the regulations and permit the wholesale destruction of important wetlands. "This is one of the most complex issues this country is going to have to deal with," said Bumpers, who said he hopes to find some middle ground.

The battle over wetlands isn't new. It's just coming to a head in Congress. In the 1970s, Congress adopted a Clean Water Act that required people to get permits to dump materials into water. The courts since then



interpreted the laws to include marshy, swampy wetlands areas. And on his way to the White House, George Bush, who said he wanted to be known as the environmental president, said he wanted "no net loss" of wetlands.

The issue was no big national deal, however, until last year when the four federal agencies responsible for overseeing wetlands issued their definitions of what constituted wetlands and began enforcing them.

Farmers and developers suddenly found their property with wetlands designations and that they needed government permits to plant or build a house on certain pieces of property. Worse, they had trouble getting straight answers or permits from the agencies. And if they ignored the process or even inadvertently broke the law, they found the penalties were severe.

"I personally was about put into bankruptcy by wetlands regulations," Michael Zunich, a North Ridgeville, Ohio, homebuilder told Bumpers' committee Thursday. The situation was especially out of control in Arkansas, where much of the eastern portion of the state fit the definition of wetlands. In response, Bumpers and several other farm-state senators, including Sen. David Pryor, D-Ark., got the federal bureaucracies to agree to an exemption for farmland that has been tilled or worked - even if it fit within the wetlands definition. Congress also wrote into last year's version of the farm bill a program that would pay farmers to put wetlands into a permanent easement that they would agree not to touch. But that didn't solve all the problems for farmers who wanted to otherwise develop their land. Nor did it answer the concerns of developers or other businessmen who wanted to build or expand. Permits still were required of them. After the furor, the federal bureaucracy went back to the drafting table and is about to issue new guidelines for what constitutes wetlands. Bumpers obtained a copy of the new manual late Wednesday. And while he hasn't had an opportunity to study it, some environmentalists were complaining Thursday that more than 10 million acres across the nation would lose federal protection new definitions.

That's the amount of lost wetlands that James Tripp, counsel for the Environmental Defense Fund, said the

nation really should restore rather than lose over the next 10 to 20 years for flood control, wildlife breeding habitat and purer water. Many agricultural and business interests fear that the new manual will not solve their problems. They want all wetlands areas cataloged in three categories based on how valuable they really are for various purposes. But environmental groups fear that approach would lead to greater destruction still. And, as Delamar said, wetlands once lost are gone forever.

APPENDIX 3

TAXONOMY OF MAJOR WETLAND VALUES

FISH AND WILDLIFE VALUES

Fish and Shellfish Habitat  
Waterfowl and Other Bird Habitat  
Furbearer and Other Wildlife Habitat

ENVIRONMENTAL QUALITY VALUES

Water Quality Maintenance  
Pollution Filter  
Sediment Removal  
Oxygen Production  
Nutrient Recycling  
Chemical and Nutrient Absorption  
Aquatic Productivity  
Microclimate Regulator  
World Climate (Ozone Layer)

SOCIO-ECONOMIC VALUES

Flood Control  
Wave Damage Protection  
Erosion Control  
Groundwater Recharge and Water Supply  
Timber and Other Natural Products  
Energy Source (Peat)  
Livestock Grazing  
Fishing and Shellfishing  
Hunting and Trapping  
Recreation  
Aesthetics  
Education and Scientific Research

SOURCE: Tiner, Ralph W., Jr. Wetlands of the United States: Current Status and Recent Trends. Washington D.C.: U.S. Department of the Interior, Fish and Wildlife Service, March 1984

APPENDIX 4

THREATENED AND ENDANGERED SPECIES  
ASSOCIATED WITH WETLANDS

Taxon	Number of Species	Percent of U.S. Total Threatened Endangered
Plants	95	3 %
Mammals	5	15 %
Birds	22	31 %
Reptiles	4	31 %
Amphibians	3	50 %
Fish	22	54 %

Source: Mitsch, William J. and James G. Gosselink, Wetlands, Van  
Nostrand Reinhold, New York, 1986, page 399.

## APPENDIX 5

### APPROACHES TO ENVIRONMENTAL POLICY

#### POLICY INSTRUMENTS

1. MORAL SUASION (publicity, social pressures, etc.)
2. DIRECT CONTROLS
  - A. Regulations limiting the permissible levels of emissions.
  - B. Specification of mandatory processes or equipment
3. MARKET PROCESSES
  - A. Taxation of environmental damage
    1. Tax rates based on evaluation of social damage
    2. Tax rates designed to achieve present standards of environmental quality.
  - B. Subsidies
    1. Specified payments per unit of reduction of waste emissions.
    2. Subsidies to defray costs of damage-control equipment.
  - C. Issue of limited quantities of pollution 'licenses'
    1. Sale of licenses to the highest bidders
    2. Equal distribution of licenses with legalized resale
  - D. Refundable deposits against environmental damage
  - E. Allocation of Property Rights to give individuals a proprietary interest in improved environmental quality.
4. GOVERNMENT INVESTMENTS
  - A. Damage prevention facilities (e.g., municipal treatment plants)
  - B. Regenerative activities (e.g. reforestation, slum clearances)
  - C. Dissemination of information (e.g., pollution-control techniques, opportunities for profitable recycling)
  - D. Research
  - E. Education
    1. Of the general public
    2. Of professional specialists

#### ADMINISTRATIVE MECHANISMS

1. ADMINISTERING UNIT
    - A. National Unit
    - B. Local Agency
  2. FINANCING
    - A. Payment by those who cause the damage
    - B. Payment by those who benefit from improvements
    - C. General revenues
  3. ENFORCEMENT MECHANISM
    - A. Regulatory organizations or police
    - B. Citizen suits (with or without sharing of fines)
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Source: Baumol, William J. & Wallace E. Oates, Economics, Environmental Policy, and the Quality of Life, Prentice-Hall, Englewood Cliffs, N.J. 1979, p 218.

## SUMMARY &amp; EVALUATION OF VARIOUS ENVIRONMENTAL POLICY OPTIONS

Policy Option	Advantages	Disadvantages
<b>Moral Suasion</b>	<ul style="list-style-type: none"> <li>*Least disruptive to market processes.</li> <li>*Educates &amp; sensitizes people to nature of environmental problems</li> <li>*Permits individual choice.</li> </ul>	<ul style="list-style-type: none"> <li>*Ineffective in reducing pollution levels.</li> </ul>
<b>Market Solutions</b>  (lawsuits & pollution "rights")	<ul style="list-style-type: none"> <li>*Requires little government intervention.</li> <li>*Reduces pollution to a given level depending upon the policy established.</li> <li>*Relatively easy to administer.</li> <li>*Private lawsuits enable individuals harmed to recover.</li> </ul>	<ul style="list-style-type: none"> <li>*Sometimes hard to develop good estimates of external costs for particular pollutants and polluters.</li> <li>*License to pollute is politically unpopular.</li> <li>*It may be difficult to prove in a lawsuit who damaged whom.</li> <li>*Lawsuits can be lengthy and expensive.</li> <li>*Typically requires a closed environment to administer effectively</li> </ul>
<b>Tax Penalties &amp; Subsidies</b>  (effluent charges, output taxes & subsidies)	<ul style="list-style-type: none"> <li>*Relatively easy to administer.</li> <li>*Largest polluters have greatest incentives to reduce pollution.</li> <li>*Generates revenue to further clean up the environment.</li> </ul>	<ul style="list-style-type: none"> <li>*Sometimes difficult to estimate appropriate charge or tax.</li> <li>*Monitoring compliance can be expensive, especially when large numbers of polluters are involved.</li> <li>*Output taxes provide incentive to clean up pollution or adopt cleaner technology.</li> </ul>
<b>Direct Regulation</b>	<ul style="list-style-type: none"> <li>*Can be used to keep extremely harmful pollution below dangerous levels.</li> <li>*Standards can preserve horizontal equity of the program.</li> <li>*Politically most popular.</li> </ul>	<ul style="list-style-type: none"> <li>*Once Standard is met, polluter has no incentive to further reduce pollution.</li> <li>*Administrative regulation often quite complex and cumbersome</li> <li>*Most interventionist in scope</li> <li>*Large bureaucracy is required to administer</li> <li>*Does not generate its own revenue.</li> <li>*Can become captive agency of particular special-interest group</li> </ul>

Source: Byrns, Ralph T., Gerald W. Stone Economics 4th Ed. Scott, Foresman & Co. Glenview, Il 1989, page 705.

**CRITERIA FOR EVALUATING ENVIRONMENTAL POLICIES**

- 1) **DEPENDABILITY** -- How reliable is the approach in achieving its objective? Are its workings fairly certain and automatic or does it depend on a number of unpredictable elements?
- 2) **PERMANENCE** -- Is the program likely to be effective only so long as it captures public interest, or can it be expected to endure even when other issues have seized the attention of the media and the public?
- 3) **ADAPTABILITY OF ECONOMIC GROWTH** -- Is the program flexible enough to adapt to normal expansion in economic activities and population growth, both of which tend to accentuate problems of environmental damage?
- 4) **EQUITY** -- Does the program divide its financial burdens among individuals and enterprises fairly?
- 5) **INCENTIVES FOR MAXIMUM EFFORT** -- Does the program offer inducements to individuals or enterprises to minimize environmental damage, or does it encourage no more than barely acceptable behavior?
- 6) **ECONOMY** -- Does the program achieve its results at relatively low costs to society or does it waste resources?
- 7) **POLITICAL ATTRACTIVENESS** -- Is the method likely to recommend itself to legislators and to voters?
- 8) **MINIMAL INTERFERENCE WITH PRIVATE DECISIONS** -- Does the method tell the individual or the businessman exactly what to do, or does it offer the broadest scope of choices consistent with protection of the environment?

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Source: Baumol, William J. & Wallace E. Oates, Economics, Environmental Policy, and the Quality of Life, Prentice-Hall, Englewood Cliffs, N.J. 1979, p 232.

APPENDIX 8

EXAMPLES OF WETLANDS LOSSES IN VARIOUS STATES

State	Original Wetlands (Acres)	Today's Wetlands (Acres)	Percent of Wetlands Lost
Iowa's Natural Marshes	2,333,000	26,470	99 %
California	5,000,000	450,000	91 %
Nebraska's Rainwater Basin	94,000	8,460	91 %
Mississippi Alluvial Plain	24,000,000	5,200,000	78 %
Michigan	11,200,000	3,200,000	71 %
North Dakota	5,000,000	2,000,000	60 %
Minnesota	18,400,000	8,700,000	53 %
Louisiana's Forested Wetlands	11,300,000	5,635,000	50 %
Connecticut's Coastal Marshes	30,000	15,000	50 %
North Carolina's Pocosins	2,500,000	1,503,000	40 %
South Dakota	2,000,000	1,300,000	35 %
Wisconsin	10,000,000	6,750,000	32 %

Source: Salvesen, David Wetlands: Mitigating and Regulating Development Impacts, Washington D.C., the Urban Land Institute, 1990 , page 19.



APPENDIX 9

**SIZE DISTRIBUTION OF ARKANSAS FARMS IN THE LOWER MISSISSIPPI ALLUVIAL PLAIN, 1935 AND 1982**

Size Class (acres)	1935	1982
less than 49	58.7 %	25.2 %
50 - 99	21.0 %	19.3 %
100 - 179	13.6 %	16.2 %
180 - 259	3.5 %	10.4 %
260 - 499	2.3 %	13.4 %
500 - 999	0.6 %	9.2 %
1000 - 4999	0.2 %	6.0 %
over 5000	0.0 %	0.2 %

SOURCE: Starvins, Robert Norman, "The Welfare Economics of Alternative Renewable Resource Strategies: Forested Wetlands and Agricultural Production," (1988) Ph.D. Dissertation, page 163.

**FOREST AND AGRICULTURAL ACREAGE THIRTY-SIX INTERIOR  
COUNTIES\* LOWER MISSISSIPPI ALLUVIAL PLAIN, 1934-1984**

Year	Forest Acreage **	Acreage of Four Major Crops ***
1934	6,274	3,661
1939	5,970	3,648
1944	5,730	3,688
1949	5,341	3,934
1954	5,201	4,156
1959	4,826	4,329
1964	4,170	4,894
1969	3,506	5,758
1974	3,063	6,311
1979	2,927	7,015
1984	2,638	6,808

SOURCE: Starvins, Robert Norman, "The Welfare Economics of Alternative Renewable Resource Strategies: Forested Wetlands and Agricultural Production," (1988) Ph.D. Dissertation Page 175.

\* The 36 counties are: ARKANSAS: Chicot, Clay, Craighead, Crittenden, Cross, Desha, Greene, Lee, Mississippi, Phillips, Poinsett, St. Francis, Woodruff, LOUISIANA: Concordia, East Carroll, Franklin, Iberville, Madison, Pointe Coupee, Richland, St. Charles, St. James, St. John/Bapt., Tensas, West Baton Rouge, West Carroll, MISSISSIPPI: Bolivar, Coahoma, Humphreys, Issaquena, Leflore, Quitman, Sharkey, Sunflower, Tunica, Washington

\*\* Thousands of acres

\*\*\* Soybeans, Cotton, Rice, Corn

**OTHER FEDERAL LAWS AFFECTING WETLANDS**

The Coastal Zone Management Act of 1972 (16 U.S.C. Sections 1451 et seq.) Provides financial incentives for states to adopt federally approved coastal zone management programs to protect coastal resources, which include beaches, barrier islands, barrier reefs, dunes, and wetlands. Federal actions, such as offshore oil leasing, must conform with a federally approved state program. If not, the state may "veto" the federal action. This is the so-called "consistency requirement," which has been the focus of considerable debate and litigation between the states and the federal government.

Approved state programs must: 1) delineate the coastal zone boundary; 2) indicate which activities are permissible within the defined coastal zone; 3) inventory special resource areas requiring protection; and 5) include sufficient legal authority to implement the program.

About 24 of the 30 coastal states, including the Great Lake States, have federally approved coastal zone management programs.

The Endangered Species Act of 1973 (16 U.S.C. Sections 1531 et seq.) Enacted to protect rare plants and animals, such as the California Condor, that are in danger of becoming extinct. The act requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, to ensure that any action authorized will not jeopardize endangered or threatened species directly, nor hurt or destroy their habitat, including wetlands. It also prohibits any person from "taking" an endangered species. Taking includes hunting, trapping, harming, or harassing such species.

The National Flood Insurance Act of 1968 (42 U.S.C. Sections 4001-4128) Provides financial incentives for communities to adopt federally approved floodplain management programs. Administered by the Federal Emergency Management Agency (FEMA), the program utilizes a financial carrot and stick to coax communities into adopting programs that will ultimately reduce the loss of lives and property from floods. For communities with approved programs, the federal government provides subsidized flood insurance to those who own property in the floodplain (the carrot). Communities that do not

APPENDIX 11  
( continued )

participate in a program to regulate future floodplain uses are ineligible for federal disaster assistance (the stick). In general, the programs apply to new and rebuilt construction in floodplains, and usually include restrictions on the type and location of development. Although not its primary focus, the program covers development in wetlands, since nearly all coastal and most inland wetlands occur in floodplains.

The Coastal Barrier Resources Act of 1982 (16 U.S.C. Sections 3501-3510) The act restricts, and in some cases eliminates, federal subsidies for building on undeveloped coastal barriers. The act does not prohibit development on coastal barriers, but it does prohibit federal expenditures and financial assistance, such as federal flood insurance, for such development.

Fish and Wildlife Coordination Act of 1934, amended 1946, 1958, 1977 (U.S.C. 661-667e) The act requires the Corps to consider the comments of federal and state fish and wildlife agencies, such as the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, before issuing a Section 404 permit.

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Source: Salvesen, David Wetlands: Mitigating and Regulating Development Impacts, Washington D.C., the Urban Land Institute, 1990 , page 23.

**STATE WETLANDS PROGRAMS AT A GLANCE**

**Alabama** Permits required under its Coastal Area Management Act for activities (dredging, dumping, etc.) that alter tidal movement or damage flora and fauna.

**Alaska** Regulates activities in its coastal zone under the state Coastal Management Act. Federal lands exempt.

**Arizona** No specific wetlands protection program.

**Arkansas** No specific wetlands protection program.

**California** Statewide Coastal Commission regulates all development activities in the coastal zone, except around San Francisco Bay which is regulated by BCDC.

**Colorado** No specific wetlands protection program.

**Connecticut** Permit required for just about any alteration of coastal or inland wetlands, including dredging, removal fill, and construction. All wetlands mapped. Program administered by local governments. Most agricultural activities exempt.

**Delaware** Regulates activities in coastal wetlands, including dredging, filling, bulkheading, etc., under its Wetlands Act. Essentially forbids construction of private, nonwater-dependent projects in tidal wetlands. Delaware is developing a freshwater wetlands protection law.

**Florida** Regulates activities (dredge and fill) in both freshwater and coastal wetlands.

**Georgia** Regulates activities (dredge, fill, and drain) in salt marshes under its Coastal Marshlands Protection Act.

**Hawaii** Regulates development (dredging, removal, grading, construction, etc.) in the coastal zone under its Coastal Zone Management Act. Permit required from county coastal management authorities. Establishes shoreline setbacks of between 20 and 40 feet for new construction.

APPENDIX 12  
( continued )

**Idaho** No specific wetlands protection program.

**Indiana** No specific wetlands protection program.

**Illinois** No specific wetlands protection program. Regulates some activities in floodways under its Rivers, Lakes, and Streams Act of 1911.

**Iowa** No specific wetlands protection program. Has active wetlands acquisition program by which state purchases and restores wetlands, primarily prairie potholes. Wetlands protection bill introduced to legislature

**Kansas** No specific wetlands protection program.

**Kentucky** No specific wetlands protection program.

**Louisiana** Under its State and Local Coastal Resources Management Act, state and/or local permits required for activities (dredge and fill) in coastal wetlands.

**Maine** Permit required for activities that affect "protected natural resources," including coastal and inland wetlands. Freshwater wetlands under 10 acres exempt. Also, local governments establish setbacks for developments along freshwater and coastal wetlands.

**Maryland** Two programs: one regulating dredge and fill of tidal wetlands, the other regulating a wide variety of activities (such as removal, alteration, destruction of plants, grading) in freshwater wetlands. Both programs generally exempt agriculture and forestry. Established a no-net-loss policy for nontidal wetlands.

**Massachusetts** Wetlands program administered by local conservation commissions. Regulates activities (removal, fill, dredge, and alteration) in both freshwater and coastal wetlands.

**Michigan** The only state to "assume" the federal 404 program. Regulates development in wetlands under a variety of programs. Generally exempts agriculture and recreation.

APPENDIX 12  
( continued )

**Minnesota** Permits required for any work in wetlands, under its Protected Waters and Wetlands Permit Program. Regulates lakes, ponds, cattail marshes, and open water marshes over 10 acres in rural areas and over 2.5 acres in cities. Certain uses prohibited outright, such as filling wetlands for a parking lot. Generally exempts agricultural drainage.

**Mississippi** Regulates dredging, dumping, filling, destruction of flora, and construction in coastal wetlands. Many activities exempt.

**Missouri** No specific wetlands protection program.

**Montana** No specific wetlands protection program.

**Nebraska** No specific wetlands protection program

**Nevada** No specific wetlands protection program.

**New Hampshire** Permit required for any alteration of coastal or freshwater wetlands. Regulations stricter for coastal wetlands.

**New Jersey** Regulates development in both freshwater and coastal wetlands. Freshwater wetlands program similar, but broader, than the 404 program.

**New Mexico** No specific wetlands protection program.

**New York** Under a variety of laws, the state regulates development in freshwater and tidal wetlands. Generally, the freshwater wetlands program applies to wetlands of 12.4 acres and larger, all of which the state has mapped. Freshwater wetlands of less than 12.4 acres are covered if of "unusual local importance." Local governments can assume administration of freshwater program, but few have. Agricultural exemptions.

APPENDIX 12  
( continued )

**North Carolina** Under its dredge and fill act, a permit is required to fill or excavate tidal wetlands. In addition, under its Coastal Area Management Act, the state also regulates development in areas of environmental concern, which include wetlands, estuaries, and floodplains within the coastal zone.

**North Dakota** Wetlands program focuses on agricultural drainage. Permits required to drain a wetland within a watershed of 80 acres or more. Requires replacement of drained wetland on a one-for-one basis.

**Ohio** No specific wetlands protection program. Ohio's "antidegradation policy" under its water-quality standards requires mitigation for wetlands alterations permitted by the Corps.

**Oklahoma** No specific wetlands protection program.

**Oregon** Under its Fill and Removal Act, a permit is required to fill or remove any material from "waters of the state," which include inland and coastal wetlands. In addition, local governments incorporate statewide planning goals, which include wetlands protection.

**Pennsylvania** Under its Dam Safety and Encroachments Act, the state regulates encroachment on bodies of water, which includes draining, filling, or enlarging wetlands. Regulations are more stringent for "important" wetlands. Exemptions for cutting vegetation.

**Rhode Island** The state regulates development in both coastal and freshwater wetlands. Coastal wetlands are more stringently regulated than freshwater wetlands. Coastal program establishes six wetlands categories and identifies permitted uses in each. Freshwater program exempts small freshwater wetlands (i.e., swamps under three acres or marshes under one acre).



APPENDIX 12  
( continued )

**South Carolina** Under its Coastal Management Act, the state regulates activities (dredge, fill, drain, etc.) in "critical areas," which include coastal waters and tidelands. Freshwater wetlands unregulated by the state.

**South Dakota** No specific wetlands protection program.

**Tennessee** No specific wetlands act, but the state regulates any alteration to "waters of the state," including wetlands, under its Water Quality Control Act. No development allowed in outstanding wetlands. Most agricultural activities exempt.

**Texas** No specific wetlands protection program.

**Utah** No specific wetlands protection program.

**Vermont** The state Water Resources Board designates "wetlands of state significance" and, instead of requiring permits, the board establishes allowable uses in those wetlands. The board is authorized to regulate activities that threaten state-protected values such as flood control, water quality, wildlife habitat, and aesthetics.

**Washington** Under its Shoreline Management Act, the state regulates development in waters of the state, including wetlands. Although not the main focus of the act, the state has jurisdiction over wetlands associated with tidal areas and over large streams and lakes. Permits issued by local governments, with final approval required by the state. Only local approval needed for very small projects (e.g., projects with a market value under \$2,500).

APPENDIX 12  
( continued )

**Virginia** Regulates activities in coastal wetlands under the Wetlands Act. Permits issued either by state or by local governments that adopt the state's Wetland Zoning Ordinance. The act provides standards and policies for evaluating wetlands development proposal.

**West Virginia** No specific wetlands protection program.

**Wisconsin** Wisconsin's shoreland Management Program requires each county to adopt state-approved zoning ordinance for shorelands, defined as 1,000 feet from lake or pond and 300 feet from river or stream. The ordinance includes a shoreland-wetlands zoning district, which permits certain activities such as recreation and forestry, and prohibits all others, such as dredge and fill.

**Wyoming** No specific wetlands protection program.

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Source : Salvesen, David Wetlands: Mitigating and Regulating Development Impacts, Washington D.C., the Urban Land Institute, 1990 , page 48 - 49.

**Typical Mitigation Measures**

1. Limit wetland uses to those with minimal impact on natural values (e.g., parks, growing of natural crops)
2. Limit development densities (e.g., require large lot sizes)
3. Cluster development on upland sites to protect sensitive and hazardous areas
4. Elevate structures on pilings or other open work
5. Route access roads, sewers, and water supply systems around the most sensitive areas
6. Fence wetlands and floodplains, where appropriate, to protect natural vegetation and water quality and to reduce erosion
7. Replant wetland and other vegetation where destruction of vegetation cannot be avoided
8. Reduce erosion in exposed areas through rip-rap or other measures
9. Construct fish pools in channelization projects; install fish ladders at dams
10. Manage game to enhance and reestablish species
11. Use silt fences and similar measures to control runoff from construction sites; construct detention ponds to trap sediments
12. Operate dams to provide sufficient flows for downstream fish and wildlife and to periodically flush wetlands
13. Construct new wetlands and other wildlife areas by diking, land acquisition, or other means to compensate for unavoidable losses

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Source: Burke, Erik, Tiner, and Hazel, Protecting Nontidal Wetlands, American Planning Association Chicago Il., 1988, page 13.

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