

Wetland Protection as Land-Use Planning: The Impact of Section 404 in Wisconsin, USA

CATHERINE R. OWEN

Land Resources Program
Institute for Environmental Studies
University of Wisconsin-Madison
Madison, Wisconsin 53706, USA

HARVEY M. JACOBS*

Department of Urban and Regional Planning and
Institute for Environmental Studies
University of Wisconsin-Madison
Madison, Wisconsin 53706, USA

ABSTRACT / The ability of Section 404 of the Clean Water Act to act as an effective, efficient, and equitable land-use planning tool was assessed through a survey of Section 404 permits in Wisconsin. In a six-month period of permitting, the 404 program reduced wetland losses in the state by 15%. Several factors were examined that may affect permit deci-

sions; these factors are water dependency, alternatives, project type, wetland type, and public or agency comments. Only the water dependency of the project had a statistically significant effect on permit decisions, although development projects that were perceived to provide public good were more likely to be permitted. Environmental impacts of a proposed fill project were not adequately assessed in any of the permit decisions. Because of the way Section 404 is interpreted and administered by the US Army Corps of Engineers, increasing net benefits and achieving an equitable distribution of those benefits is difficult. The corps does not perform any functional evaluations of wetlands nor do they attempt to measure economic value and environmental impacts. In addition, the 404 review process is, in effect, inaccessible to the public. The de facto interpretations of the Section 404 regulations and a lack of program funding and trained personnel all contribute to the program's ineffectiveness.

The alarming loss of wetlands across the United States has prompted the creation of many alternative approaches and programs for wetland protection (e.g., Burke and others 1988). Possibly the largest of these programs is Section 404 of the Federal Clean Water Act (FCWA) (33USC 466 et seq.). Section 404 is designed to prevent the discharge of any dredged or fill material into the waters of the United States, including most wetlands, without a permit from the US Army Corps of Engineers (USACE). Recent estimates from the US Fish and Wildlife Service (USFWS) indicate that the present rate of wetland loss is approximately 584,000 acres/yr in the United States (Wakefield 1982). An earlier study by the Office of Technology Assessment (OTA) estimated that over 80% of all wetland losses are the result of unregulated activities, primarily drainage for agriculture (OTA 1984). The remaining 20% of the loss can be accounted for by the permits granted under Section 404 and state regulatory programs. Early research suggested that in 1981 Section 404 reduced wetland losses by 50% of what they presumably would be in the ab-

sence of the 404 program (McChesney 1983). More recent research suggests that in fiscal year 1986, it prevented wetland loss in the range of 24%–39%, depending upon the region of the country [General Accounting Office (GAO) 1988]. In Wisconsin, where 47% of the state's wetlands have been lost [Wisconsin Department of Natural Resources (WDNR) 1990b], an average of 1311 acres/yr were filled under Section 404 from 1982 to 1989 (WDNR 1989), while an average of 953 acres/yr were lost to agricultural drainage (US Soil Conservation Service 1990).

In deciding which wetlands it will allow to be filled, the USACE is, in effect, using Section 404 to control land-use decisions.

In order to be successful, land-use planning tools should not only be effective in achieving their goals (in this case, wetland protection), but they should also achieve those goals in an equitable and efficient manner (Ervin and others 1977, Jacobs 1989). The 404 program has been attacked by wetland advocates and developers alike as an unfair and ineffective means of controlling land use (Wakefield 1982, GAO 1988, WDNR 1990a). This article evaluates the effectiveness, efficiency, and equity of the 404 program, based on a survey of individual 404 permits in Wisconsin for the first six months of fiscal year 1988 and a review of the 404 decision-making process in the St. Paul (Minnesota) District of the USACE.

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*Author to whom correspondence should be addressed.

Effectiveness in the 404 program is defined here as a reduction in wetland losses, particularly of wetlands that have high ecological or economic value. Value inherently depends on the wetland type and location and can only be assessed on a site-specific and project-specific basis (Adamus and others 1987, Carter 1986, Ogawa and Male 1990).

The efficiency of any land-use planning tool reflects net benefits; an efficient land-use planning scheme would ensure that the overall net benefits of the situation were as large as possible (Ervin and others 1977). To arrive at an efficient outcome, decision makers must know the economic and ecological value of the wetland in its unfilled and filled states. Both individual and cumulative ecological impacts must be assessed.

The equity of the program represents the distribution of the costs and benefits. Equity has two components, procedural equity and allocative equity (Ervin and others 1977, Jacobs 1989). A process has high procedural equity if it both receives and takes into account the input from a wide variety of groups. A process has high allocative equity if its final outcome distributes costs and benefits fairly among all the affected parties. An efficient outcome is not necessarily an equitable one. For example, if the net benefits of the outcome are greater than in the previous situation, it is more efficient, but if those benefits are distributed unfairly among the groups involved, it would be assessed as inequitable. Groups most likely to be involved in 404 permitting decisions are current landowners, prospective landowners, and the general public, including special-interest groups such as wetland conservationists and business groups. The vested ecological and economic interests of these groups generally decrease with increasing distance from the specific wetlands in question.

Applying these criteria to natural resource regulation is difficult because both ecological and economic value must be considered, and the two are not always interchangeable. Moreover, these values will not be the same to all groups with an interest in a resource (in this case, wetlands). Although wetlands in their natural state provide large economic and ecological value to society through flood control, water quality improvement, and the provision of wildlife habitat, they can provide very little economic value to individual wetland owners (Farber and Costanza 1987). The best way for wetland owners to personally capture the nonecological value of their wetlands is often to fill or drain them and then convert them to residential, commercial, or agricultural uses. Thus a wetland owner may gain personally at the socially borne cost of lost ecological values. Conversely, if a wetland owner is prevented, by the USACE's denial of a 404 permit, from realizing any economic gain from

their wetland so that society may reap the benefits of the intact wetland, the landowner may have to bear an unfair share of the cost of wetland protection. No mechanism to compensate a landowner for lost economic value exists; generally, the courts have not considered restriction on wetland development under the 404 program to constitute a taking of private property requiring compensation under the Fifth Amendment of the US Constitution (Hunter 1988).

The individual permits issued under Section 404 are the most stringent of the different wetland permits in the program. However, a survey of individual 404 permit files in Wisconsin, and analysis of the decision making involved in the permit process, reveals that the Section 404 permit process has been unable to function as an effective, efficient, or equitable tool for wetland protection. The drawbacks of the program rest in its regulations, in the de facto interpretations of those regulations, and in a lack of program funding and personnel.

Overview of the 404 Decision-Making Process

After the USACE receives an application for a 404 permit to discharge fill material, the agency must conduct an environmental review according to guidelines outlined by the US Environmental Protection Agency (EPA) (40 CFR 230). As part of its permit review process, the USACE issues a public notice, which is available to anyone, including many agencies that are required to respond to every permit. In Wisconsin, these agencies include the State Historical Preservation Office (SHPO), and the regional offices of the US Fish and Wildlife Service (USFWS) and EPA. In addition, the Wisconsin Department of Natural Resources (WDNR) must respond to permits for which state water quality certification is required under Section 401 of the FCWA or it must waive certification.

These groups and individuals usually have 15–30 days to comment on the proposed project. Once the public review period is over, the USACE reviewer in charge of the permit application assembles the information. The St. Paul District of USACE, which includes Wisconsin, has devised an evaluation and decision document (USACE 1988) that implements the EPA's 404(b)(1) guidelines (40 CFR 230). This document highlights the different factors that the USACE must weigh in order to make a decision. These factors include both public and private interests and are in no way limited to environmental costs and benefits.

If a proposed project does not comply with any of the EPA guidelines, the permit must be denied. Three points are important here. First, if the project is not

Table 1. Summary of 404 individual permit applications in Wisconsin^a

| Project type | Number of applications | | Acres of wetland filled | Mitigation | | |
|-------------------------|------------------------|--------|-------------------------|------------|-------------------|-----------|
| | Total | Denied | | Created | Restored/enhanced | Protected |
| Residential building | 13 | 5 | 4.52 | 11.34 | | 10.00 |
| Residential landscaping | 7 | 3 | 1.09 | | | |
| Commercial building | 3 | 0 | 11.00 | 2.80 | | 24.20 |
| Cranberry farm | 18 | 0 | 313.45 | | | |
| Other farm | 1 | 1 | 0.00 | | | |
| Parks/recreation | 1 | 0 | 2.80 | | 3.00 | |
| Wildlife habitat | 6 | 0 | 27.54 | | | |
| Road/bridge work | 5 | 1 | 59.05 | 27.70 | 64.00 | 91.70 |
| Utility/sewer | 1 | 0 | 0.30 | | | |
| Erosion control | 2 | 0 | 0.45 | | | |
| Airport | 1 | 0 | 1.70 | 1.40 | | |
| Totals | 58 ^b | 10 | 421.85 | 72.34 | 67.00 | 125.90 |

^aData are drawn from the first 500 applications for all permit types in fiscal year 1988 in the St. Paul District of the US Army Corps of Engineers.

^bA total of 58 individual permits were applied for in the State of Wisconsin in the first half of fiscal year 1988. Of these applications, 3 were withdrawn, 10 were denied, and 45 were issued permits.

water-dependent, a less damaging alternative is presumed to exist unless clearly demonstrated otherwise (40 CFR 230.10). In deciding whether an alternative is "practicable," the USACE must consider cost and purpose of the project; land not owned by the applicant may be considered a practicable alternative site for the project (40 CFR 230.10). If a practicable alternative exists, the permit must be denied; the applicant must provide information on alternatives. Second, the reviewer must have sufficient information on the environmental and economic effects of the project to judge whether it will have significant adverse impacts. If the information provided is insufficient, the discharge does not comply with the guidelines and the permit cannot be granted (40 CFR 230.12). Finally, the USACE document asks for a summary of "the relative extent of the public and private need for the proposed work" (USACE 1988, p. 7). The emphasis that the USACE does or does not place on each of these points determines how the USACE actually implements the 404(b)(1) guidelines and thus affects whether or not the program meets its goals.

Evaluation of the 404 Program

Section 404 permit files from the first half of federal fiscal year 1988 (October 1987–October 1988) in the St. Paul District of the USACE were examined in detail to determine the type of activity proposed, alternatives proposed, relative public–private benefit of the activity, wetland type and size impacted, environmental impact, and the comments of other parties. In addition, these

data are also compared with those of a long-term (January 1982–August 1989), less in-depth permit survey conducted by the Wisconsin Department of Natural Resources. Only individual permits, rather than general permits, were considered in both the WDNR survey and this study because they receive the strongest review and thus represent the best-case scenario for the 404 program.

Of the 500 applications in the first half of fiscal year 1988, 58 sought individual 404 permits for wetland fill projects in Wisconsin. Of the 58 permits sought, 31 were issued without restriction, 6 were issued with modifications, 8 were issued with mitigation, 10 were denied, and 3 were withdrawn. Table 1 summarizes the permit applications by project type, number of acres of wetland filled, USACE decision to issue or deny the permit, and type of mitigation, if any, required to offset the negative impacts of the projects. Table 1 shows that 421.85 acres of wetlands were permitted to be filled in six months of permitting. The ten projects that were denied permits would have filled 71.9 acres of wetlands. The denial rate of 17% in this sample is higher than the national average denial rate of 2%–3% (Wakefield 1982, Barnard 1984) but less than the state average of about 22% from 1982 to 1989 (WDNR 1989).

Effectiveness Criterion

We consider the 404 program effective if it reduces wetland losses and if the likelihood of denying a permit increases as the ecological–economic value of the intact wetland increases. One caveat to this definition of effectiveness is that it does not take into account the po-

tential deterrent effect of the 404 program. If people are discouraged from filling wetlands by the very knowledge that they will have to get a permit, then the 404 permit program's effectiveness in protecting wetlands is underestimated by defining it in terms of percent of wetlands that are not filled because permits were denied. However, because this study does not account for illegal filling, the program's effectiveness may actually be overestimated, or at best these two effects may cancel each other out. Both of these effects are in the realm of speculation.

In this sample period, 422 acres of wetlands were allowed to be filled, while only about 72 acres were saved from filling; the 404 program thus reduced wetland losses by only $72/(422 + 72)$ or 15%, the lowest of all the estimates available for the nation as a whole and for specific regions, which ranged from 24% to 50% (McChesney 1983, GAO 1988). Similarly, the WDNR (1989) study found that from 1982 to 1989, 1348 acres of wetlands were saved when permits were denied, while 9250 acres were lost; this implies an effectiveness of 12.7%. The WDNR study differs from this study in that they define wetland loss as both the acres directly filled (primary loss) and those which were flooded or drained as the result of filling activity (secondary loss), while this study takes into account only primary losses.

Almost 75% of the wetlands filled in this study were converted for cranberry beds. While the impact of the reservoirs that accompany these monoculture cranberry beds on wildlife diversity is debatable, it is clear that the new beds themselves do not function as wetlands and are no longer considered wetlands (USACE 1991); thus these functions are lost for as long as the beds are maintained.

An additional complicating factor is the effect of mitigating wetlands on the measurement of effectiveness. Forty new acres of wetlands were restored or created under the terms of these permits, which can be viewed as reducing the acres filled, so the effectiveness of the program increases to almost 16%. Unfortunately, substantial evidence indicates that most wetland mitigation sites are lower quality than the natural wetland they were supposed to replace (Race and Christie 1982, Kunz and others 1988, Owen 1990, Kusler and Kentula 1990, Florida Department of Environmental Regulation 1991). These studies also revealed that anywhere between 17% and 34% of the restored/created wetlands had not been constructed at all. Therefore, the ability of mitigation to increase the effectiveness of the 404 program is questionable. Another form of mitigation is the enhancement or protection of existing wetlands, which purport to improve the functions of that wetland, while

not adding any new wetlands to the existing wetland acreage. Because the 404 review process has no measurement of wetland functions, wetland enhancement and protection could not be incorporated into the definition of effectiveness used here.

The evaluation of wetland functions and of the environmental impact of the proposed fill project on those functions are essential components of an effective wetland permitting program. Both wetland functions and environmental impact are reflected in the type, condition, size, and location of the wetland and of the fill project; this is the basic information required to estimate environmental impacts. Of these factors, only project type, as reflected in water dependency, affected the permit decision-making process in this sample.

Table 2 shows that the type of wetland filled was not a factor in the decision-making process because the observed number of denials was not significantly different from expected number of denials. For example, the overall denial rate was 17%, so if wetland type is not a factor, then the number of denials within each wetland type is expected to be the denial rate times the number of applications for permits to fill that wetland type. In addition, the permit review files showed that the wetland type and its condition rarely were discussed in any of the cases in this sample. In fact, wetland type and condition only seem to be an issue in very pristine and/or locally uncommon wetland types, such as calcareous fens. In 13 of the cases studied, no information at all was available on the wetland type that was filled; only rarely was any mention made of the condition of the wetland.

Size of the wetland area to be filled may be another indicator of environmental impact. Although the smallest projects had the highest denial rate (see Table 2), size was not a statistically significant factor in the decision-making process. The low rate of denials for larger projects can probably be attributed to the cranberry marsh projects.

In order to minimize the impact of a fill project, reviewers and applicants are supposed to seek ways to modify projects so that less wetland area would be filled. The seven permits that were issued with modifications probably would have filled approximately an additional one acre total without the restrictions that the USACE imposed on the projects. This figure is imprecise because the extent of the modifications is not always clearly spelled out relative to the original proposal. Assessment of USACE's review process on size or impact of the proposed project is further made difficult by the fact that the USACE does a great deal of preapplication and informal consulting with applicants to convince

Table 2. Effect of EPA guidelines and other factors on permit decision outcome

| | Total permits | Requested denials | Observed denials | Expected denials | Chi square ^a |
|-----------------------------------|---------------|-------------------|------------------|------------------|-------------------------|
| Water dependency | | | | | |
| Water-dependent | 26 | | 0 | 4.5 | 8.1** |
| Non-water-dependent | 32 | | 10 | 5.5 | |
| Alternatives | | | | | |
| Alternatives exist | 27 | | 6 | 4.7 | 0.74 |
| No alternatives | 7 | | 1 | 1.2 | |
| No information | 24 | | 3 | 4.1 | |
| Public/private benefit | | | | | |
| Public benefit | 15 | | 1 | 2.6 | 1.31 |
| Private benefit | 43 | | 9 | 7.4 | |
| Wetland type | | | | | |
| Aquatic | 1 | | 0 | 0.2 | 0.33 |
| Emergent | 26 | | 5 | 4.5 | |
| Scrub/shrub | 12 | | 2 | 2.1 | |
| Forested | 14 | | 2 | 2.4 | |
| No information | 5 | | 1 | 0.8 | |
| Project size (acres) | | | | | |
| <0.5 | 19 | | 7 | 3.23 | 7.03 |
| 0.5–5.0 | 20 | | 1 | 3.4 | |
| 5.1–20 | 13 | | 2 | 2.21 | |
| >20 | 6 | | 0 | 1.02 | |
| Comments received | | | | | |
| WDNR | 6 | 1 | 0 | 1.04 | 19.81* |
| Wisconsin Historical Preservation | 58 | 2 | 2 | 10.00 | |
| EPA | 1 | 1 | 0 | 0.17 | |
| US Fish and Wildlife | 30 | 14 | 10 | 5.17 | |
| Wisconsin Public Intervenor | 10 | 9 | 4 | 1.72 | |
| Bureau of Indian Affairs | 1 | 1 | 0 | 0.17 | |
| Local/regional planning | 13 | 5 | 3 | 2.24 | |
| Native American tribes | 2 | 2 | 0 | 0.35 | |
| Environmental groups | 20 | 17 | 3 | 3.45 | |
| Private citizens | 9 | 7 | 4 | 1.55 | |
| Business groups | 2 | 0 | 0 | 0.34 | |

^aAsterisks mark chi squares that are significantly different from distribution expected if no weight were given to this factor (* $P < 0.05$, ** $P < 0.01$).

them to change the dimensions of the proposed project (Roherty 1988). These informal changes are not reflected in the permit file and thus cannot be quantified.

Location is sometimes a factor in that projects in rural areas are more likely to be permitted than those in urban areas (Roherty 1988), but location is not accounted for in any other way.

Although many wetland functions are difficult to measure (Carter 1986), especially in the short time allowed for review of a permit application, both the USACE evaluation and decision document (USACE 1988) and the EPA's 404(b)(1) guidelines, which must be followed in the 404 permitting process, require the reviewer to indicate whether or not a proposed wetland fill project will have a beneficial, adverse, or no effect on various aspects of the environment, including many wetland-related functions such as groundwater, shore-

line processes, flooding, food-chain support, etc. EPA's 404(b)(1) guidelines outline very detailed environmental determinations that must be made about the effect of the fill on water circulation patterns, water chemistry, biota, and other factors (40 CFR 230.11). To completely assess each of these probable effects would require an investigation that is well beyond the scope of even the most highly trained reviewer; indeed, the impact of wetland fill on most of these environmental categories is not well understood even in the scientific literature (O'Brien 1988). Nevertheless, many wetland assessment techniques are available that would allow the reviewer to consider the wetland type, size, and location, and thus more accurately estimate the potential effect of the project on the wetland and the environment (Adamus and others 1987). However, even these quick assessment techniques are not part of the required evaluation

process. In many cases, the reviewer does not even have time to visit the site.

Efficiency Criterion

The 404 program has two mechanisms that potentially can be used to maximize the net benefits resulting from a decision to issue or deny a permit. These mechanisms, which indirectly reflect environmental and economic costs and benefits, are the alternatives test and the significant impact test. If either of these tests are not met, the 404(b)(1) guidelines mandate that the permit be denied.

To maximize net benefits, the most environmentally and economically efficient thing to do is to deny a permit whenever a practicable alternative exists. A "practicable" alternative is one that is available and capable of being done, considering costs, existing technology and logistics, all in the light of overall project purposes (40 CFR 230.10). Yocom and others (1989) present an excellent discussion of alternatives analysis under Section 404. If an alternative site for a project exists that will not harm a wetland, the community and the permit applicant can still enjoy the economic benefits of the project without incurring environmental costs. The permit applicant will be hurt if the alternative site is more expensive than the wetland site, but this is an equity issue that will be addressed later. In maximizing overall benefits, the alternatives test assumes that the cost incurred by the applicant to relocate the project is less than the environmental costs of filling the wetland.

If a project is not water-dependent, it is assumed that there are other, less damaging alternatives. Water-dependent projects, which must be in or adjacent to water in order to operate, typically include marinas, canals, wildlife ponds and, at the time of this study, cranberry farms. In other parts of the country, applicants must prove the water dependency of each project (Yocom and others 1989); in the St. Paul District, water dependency appears to be categorically defined and is seldom officially determined according to the 404(b)(1) guidelines (WDNR 1989). An applicant must provide information on alternative sites or designs that would be less damaging to the wetland; the reviewer can also suggest alternatives. If suitable alternatives are found, the permit must be denied. If the only available site for a water-dependent project is in a wetland, the permit may be issued.

Presumably because water-dependent projects are assumed to have no alternatives, the rate of permit denial for water-dependent projects was very low (0 of 26, contrasted with 10 of 32 for non-water-dependent projects); this difference is statistically different from the denial rates expected if the reviewers gave no weight to

water dependency (Table 2). Thus water dependency is a factor in deciding if alternatives are available, even though nearly half of the water-dependent projects (12/26) identified alternatives that were less damaging.

Despite the higher rate of denial for non-water-dependent projects, the existence of alternatives did not seem to be a factor in the permits examined here (Table 2). Sixty-seven percent of non-water-dependent projects with no alternative got a permit, while 50% of non-water-dependent projects that identified alternatives also got a permit. Thus, the odds of obtaining a permit were only slightly higher for non-water-dependent projects that could not identify any alternatives.

A second means of achieving the most efficient maximum net benefit result from the 404 process is the significant impact test. If large ecological or economic costs will result from granting a permit or a series of similar permits with a cumulative impact, then it makes sense to deny the permit. The 404(b)(1) guidelines mandate that a proposed project that would have a significant adverse impact on water supplies, wildlife, ecosystem diversity, and aesthetic or economic values be denied a 404 permit. Although these guidelines do mandate that the USACE determine individual and cumulative impacts (40 CFR 230.11), the reviewers have neither sufficient time nor information on the specific sites in question or on the impacts of wetland loss in general to evaluate the impact of filling in a wetland. USACE reviewers do not even consult their own records of past permits in a given watershed to judge cumulative impact. According to the EPA guidelines (40 CFR 230.20), if information is insufficient to make a reasonable judgement about any of the points in the guidelines, a permit must be denied. If this regulation were strictly adhered to, very few permits would be granted under the present permit-review system, given the short time frame and low staffing of the USACE.

Equity Criteria

Two types of equity are considered here. Procedural equity measures how open the decision-making process is to the opinions of all groups involved in an issue. Allocative equity measures the distribution of the costs and benefits among the different groups affected by the decision.

Procedural equity. Each individual 404 permit application is available for review and comment by members of the general public and by other agencies and groups for 15–30 days. Input into the permit review process from all sources was scarce in the permits studied here. A total of 152 comments were received, often more than one comment on some permits and none on others. Fifty-nine of these comments requested denial of

the permit. Table 2 shows that the overall effect of these comments on USACE's decision was statistically significant, but, as Table 2 shows, some commentators had more of an impact on the permit decision than others.

Of all the governmental agencies involved, the USFWS provided the most consistent, detailed, and site-specific input. USFWS comments frequently included suggestions for project alterations that would minimize adverse impacts, as well as detailed proposals for mitigation. Of the 14 instances in which USFWS objected to the issuance of a permit, ten resulted in denial.

Other governmental agencies responding to 404 permits were the Office of the Wisconsin Public Intervenor (WPI), a public advocacy division of the Attorney General's office. Of the eight projects to which the WPI objected, five received permits; four of these five permits were issued with mitigation requirements. In the three cases in which the WPI objected to a project and the permit was denied, USFWS and other groups also objected to permit issuance.

Local and regional governments and agencies did not play an active role in the 404 review process during this sample period, and their comments did not seem to have a significant impact. A permit was almost always (37 of 39 cases) issued when at least one of these governmental organizations expressly stated that it had no objection to the project. Conversely, if only one of these agencies objected, the permit was still issued (5 of 5). Only if all responding agencies objected was the permit more likely to be denied (7 of 9). For the governmental agencies there seems to be power in numbers; unfortunately this was not as often true for nongovernmental groups, which did not have a significant impact on the permit decision either individually or en masse. Private individuals, in most cases neighbors, had even less success, with an even lower number of denials than would be expected if their comments were not considered; by this analysis, their comments receive a negative weighting.

These findings underscore the findings of the GAO report on the 404 program (GAO 1988, p. 37), which found that the "Corps districts consider but often do not implement resource agency recommendations," nor do they listen to anyone else. The results of this Wisconsin survey indicate that governmental agencies have the greatest influence on decisions made by the St. Paul District of the USACE and that private groups and individuals have the least. The only time that outside input, either from the public or private sector, has a large effect is when there is a huge outcry over a proposed project. The USACE reserves a special section on its evaluation and decision document for "controversy"; yet even when there is significant controversy over a

project, it may not affect the decision. An example from this survey comes from two applications from the same cranberry grower to fill 24.5 (9.5 ha) acres for cranberry beds. The proposed projects were opposed by two Native American groups and one environmental group. These groups feared not only loss of valuable wetlands, but contamination of the groundwater from pesticide use in the cranberry beds over the sandy aquifer. The USACE noted in its review that some studies indicate possible pesticide contamination of groundwater from cranberry farming but decided that the data were inconclusive. The permits were issued despite this controversy. Whether or not the decision makers listen to and incorporate outside opinion has a large bearing on public perception of the program.

Allocative equity. The USACE evaluation and decision document (USACE 1988, p. 7) asks the reviewer to evaluate the relative extent of the public and private need for a proposed project. To accomplish this, the USACE is supposed to consider the environmental impact of the project, the existence of alternatives, and the type of project for which wetlands are to be filled.

As indicated earlier, the information available to reviewers is inadequate to evaluate the environmental impact of the project. By ignoring the type of wetland that will be filled and the resulting loss of ecological values, the USACE favors public and private interests that will benefit from the fill project. Even when the project has enormous public benefits, a sound decision cannot be made without weighing those benefits against the costs of losing the wetland, which are borne predominantly by the public sector.

Clearly, the project type, rather than environmental impact, project size, applicant type, public input, or wetland type, is the largest factor in the USACE's decision to issue a permit. Projects that are water-dependent are clearly favored, as explained earlier; in addition, projects that are perceived as providing public benefit are more likely to be approved despite opposition and despite environmental impacts. One category of wetland fill activity that is both water-dependent and benefits the public is wildlife (waterfowl and fish) habitat construction; none of the six permit applications for these projects were denied.

Of the non-water-dependent activities, projects that may be perceived to have greater public benefit also tend to be permitted more often than projects that provide mostly private benefits. The private-benefit group consists of residential and commercial building and landscaping and certain farm activities. Of 24 applications for fill permits in this category, nine were denied (38%). The non-water-dependent public-benefit group seems to include erosion protection, construction and

maintenance of recreation parks, roads, utility and sewer lines, and airports. Of eight applications in this category, only one was denied (13%). Government activities, which are assumed to be beneficial to the public, also have a similarly low rate of permit denial (1/9).

In projects that are not water-dependent, the USACE often uses mitigation to offset the loss in public environmental values. In this study, many of the projects that incited negative reaction from agencies or individuals were permitted, but mitigation was required (in eight cases). Unfortunately, as discussed earlier, few of the mitigation wetlands function as well as the natural wetlands, and some of the mitigation sites are never constructed. Mitigation was never required in the case of water-dependent projects studied here, further decreasing the ability of mitigation activities to compensate for lost value.

No compensation is available to landowners when a permit is denied, but since most (7/10) of the denials involved very small projects (less than 0.5 acres), it can be argued that the loss of value is insignificant. Moreover, Hunter (1988) and others argue that this kind of restriction of landowners' rights must not be viewed as a taking and therefore should require no compensation. Hunter argues that it is the duty of the state to protect the public's health and welfare by preventing a property owner from damaging ecologically valuable land such as wetlands, which are not physically or ecologically suitable sites for construction; this concept was upheld in the case *Just v. Marinette County*. Not surprisingly, a few applicants expressed the belief in their right to do anything they want with their own land. These arguments seemed to carry no weight with USACE reviewers.

Conclusion

Based on this analysis, the 404 program receives very low ranking as a land-use planning tool. First, the program is not very effective in Wisconsin, having reduced wetland losses by only 15%, in contrast to estimates from across the country ranging from 24% to 50%. The program also fails to take advantage of wetland assessment techniques or computerized tracking of past wetland losses to estimate wetland functions and environmental impacts. Secondly, the 404 regulations, if strictly adhered to, could result in an optimal, maximum benefit decision, with a high efficiency rating. Unfortunately, alternatives are not seriously sought or considered, and environmental impacts are not assessed. USACE reviewers, faced with an enormous workload and pressure to review cases quickly, and lacking any good environmental or economic data, are left to rely

on project type (water dependency, public gain) as a guide to relative public and private costs and benefits.

Finally, the program is inequitable both in the outcomes of its decisions and in how it makes those decisions. The procedural equity of the program is low, since suggestions from outside sources are rarely heeded unless they provide site-specific ecological information or suggestions of alternatives. Opinions carry little weight with reviewers, but because the opinions of outside sources may reflect economic and social costs and benefits, these opinions should not be completely disregarded.

The allocative equity of the 404 program demonstrates both positive and negative points. The good news is that projects that are assumed to provide public benefit are more likely to receive permits; however, these assumptions are made with little or no specific environmental or economic information. The bad news is: (1) that the USACE's inability to assess environmental impacts results in a lower weighting of the value of the unfilled wetland, thus favoring private benefits (development) over public benefits (wetlands); and, (2) the ability of mitigation to compensate the public sector for the lost value of the wetland is limited by wetland restoration technology; if the mitigation wetland does not reproduce the functions and values of the filled wetland, then the public loss increases, and the private benefit is decreased by the cost of the mitigation.

Land-use planning across the country is conducted under regulatory systems similar to the 404 program outlined here. All these programs attempt to allow development to proceed without significant environmental damage. Society is at the point where it must decide how much development and how much damage is enough; in order to do this, we must have a clear idea of what we are losing when a wetland or other natural area is destroyed. At this point, the scientific knowledge base is inadequate to define exactly how wetlands function in the landscape. Without this basic science and a clear directive from society on how much development is enough, it is difficult for regulatory agencies to balance public and private costs and benefits.

Despite these fundamental problems, the USACE can take several important steps to improve the existing 404 program. Clearly, the enormous number of permits that must be processed in these types of programs precludes an in-depth environmental impact statement on each one; however, increased staffing and funds for the reviewing agencies would make it possible to visit each site and conduct a quick wetland assessment. Computerized tracking of past wetland losses would also help the 404 program. Less reliance on mitigation would seem prudent until the technology of wetland

restoration improves. Finally, improved information on the economic value of proposed projects to communities can be obtained by asking the applicants to state the number of jobs or other public benefits their developments will provide and by soliciting and listening to the opinions of local and state groups and individuals. Only by taking these steps will the 404 program be able to function as a reliable and responsive land-use planning tool.

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