



Free Executive Summary

Compensating for Wetland Losses Under the Clean Water Act

Committee on Mitigating Wetland Losses, Board on Environmental Studies and Toxicology, Water Science and Technology Board, National Research Council

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Recognizing the importance of wetland protection, the Bush administration in 1988 endorsed the goal of "no net loss" of wetlands. Specifically, it directed that filling of wetlands should be avoided, and minimized when it cannot be avoided. When filling is permitted, compensatory mitigation must be undertaken; that is, wetlands must be restored, created, enhanced, and, in exceptional cases, preserved, to replace the permitted loss of wetland area and function, such as water quality improvement within the watershed. After more than a dozen years, the national commitment to "no net loss" of wetlands has been evaluated. This new book explores the adequacy of science and technology for replacing wetland function and the effectiveness of the federal program of compensatory mitigation in accomplishing the nation's goal of clean water. It examines the regulatory framework for permitting wetland filling and requiring mitigation, compares the mitigation institutions that are in use, and addresses the problems that agencies face in ensuring sustainability of mitigated wetlands over the long term. Gleaning lessons from the mixed results of mitigation efforts to date, the book offers 10 practical guidelines for establishing and monitoring mitigated wetlands. It also recommends that federal, state, and local agencies undertake specific institutional reforms. This book will be important to anyone seeking a comprehensive understanding of the "no net loss" issue: policy makers, regulators, environmental scientists, educators, and wetland advocates.

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Executive Summary

Wetlands are complex ecosystems that, depending on their type and on circumstances within a watershed, can improve water quality, provide natural flood control, diminish droughts, recharge groundwater aquifers, and stabilize shorelines. They often support a wide variety of plants and animals, including rare and endangered species, migratory birds, and the young of commercially valuable fishes. Their beauty and diversity contribute recreational value.

The current high regard for wetlands, however, contrasts with earlier practices of draining and filling prior to the mid-1970s. Some past federal policies encouraged wetland conversion to promote agricultural, commercial, and residential development; mosquito control; and other activities that benefited society. By the 1980s the wetland area in the contiguous United States had decreased to approximately 53% of what it had been in the 1780s.

In recent years, concern about the loss of wetlands in the United States has led to federal efforts to protect wetlands on both public and private lands. Provisions in the Clean Water Act especially, the Food Security Act, several court rulings, and government policies, regulations, and directives regulate discharge of pollutants to wetlands and the filling of wetlands.

A principal objective of the Clean Water Act is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” The U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency define the “waters of the United States” to include

most wetlands. This interpretation recognizes that some wetlands improve water quality through nutrient cycling and sediment trapping and retention; it is based on the judgment that some goals of the Clean Water Act cannot be achieved if wetlands are not protected. Indeed, in 1989, President Bush stated that “no net loss” of wetlands was a goal of his administration, and that was reflected in interagency agreements soon afterward.

The Clean Water Act prohibits the discharge of materials, such as soil or sand, into waters of the United States, unless authorized by a permit issued under Section 404 of that act. The Corps of Engineers, or a state program approved by the Environmental Protection Agency, has authority to issue such permits and to decide whether to attach conditions to them. To achieve no net loss of wetlands within the Section 404 program, a permittee is first expected to avoid deliberate discharge of materials into wetlands and then to minimize discharge that cannot be avoided. When damages are unavoidable, the Corps of Engineers can require the permittee to provide “compensatory mitigation” as a condition of issuing a permit.

Compensatory mitigation specifically refers to restoration, creation, enhancement, and in exceptional cases, preservation of other wetlands as compensation for impacts to natural wetlands. The permit recipient, either on a permit-by-permit basis or within a single-user mitigation bank, carries out “permittee-responsible” mitigation. In third-party mitigation (i.e., commercial mitigation bank, in-lieu fee program, cash donation, or revolving fund program), another party accepts a payment from the permittee and assumes the permittee’s mitigation obligation. Most compensatory mitigation has been done by permit recipients, rather than by third parties.

The Committee on Mitigating Wetland Losses, which prepared this report, was established by the National Research Council to evaluate how well and under what conditions compensatory mitigation required under Section 404 is contributing toward satisfying the overall objective of restoring and maintaining the quality of the nation’s waters. The committee reviewed examples of wetland restoration and creation projects in Florida, Illinois, and southern California that were required as a condition of Section 404 permits; received briefings from outside experts; and conducted an extensive review of the scientific literature on wetlands, government data and reports, and information provided by a wide variety of experts and organizations.

THE COMMITTEE’S PRINCIPAL FINDINGS

Conclusion 1: The goal of no net loss of wetlands is not being met for wetland functions by the mitigation program, despite progress in the last 20 years.

A recent study by the U.S. Fish and Wildlife Service suggests that the rate of loss of wetland area has slowed over the past decade. From 1986 to 1997, the estimated annual rate of wetland loss (58,545 acres per year) was about 23% that of the previous decade. Wetland losses due to agriculture declined precipitously, and there were significant reductions in losses due to urban and rural development. The decrease in wetland loss due to development may be attributable to the 404 permit process; however, the available data are not sufficient for drawing a firm conclusion.

The Corps of Engineers keeps data on the areas of permitted fill and areas of compensatory mitigation required as a condition for permits. From 1993 to 2000, approximately 24,000 acres of wetlands were permitted to be filled, and 42,000 acres were required as compensatory mitigation on an annual basis. Thus, 1.8 acres were supposed to be mitigated (i.e., gained) for every 1 acre permitted (i.e., lost). If the mitigation conditions specified in permits were actually being met, this ratio suggests that the 404 permit program could be described as resulting in a net gain in jurisdictional wetland area and function in the United States. The committee, however, found that the data available from the Corps were not adequate for determining the status of the required compensation wetlands. In addition, the data do not report the wetland functions that were lost due to the permitted fill. Further, the literature on compensatory mitigation suggests that required mitigation projects often are not undertaken or fail to meet permit conditions. Therefore, the committee is not convinced that the goal of no net loss for permitted wetlands is being met for wetland functions. The magnitude of the shortfall is not precisely known and cannot be determined from current data.

Recommendations

- The wetland area and functions lost and regained over time should be tracked in a national database. This database could include the Corps of Engineers' Regulatory Analysis and Management System database.
- The Corps of Engineers should expand and improve quality assurance measures for data entry in the Regulatory Analysis and Management System database.
- The Corps of Engineers, in cooperation with states, should encourage the establishment of watershed organizations responsible for tracking, monitoring, and managing wetlands in public ownership or under easement.

Conclusion 2: A watershed approach would improve permit decision making.

Wetland functions must be understood within a watershed framework in order to secure the purposes of the Clean Water Act. The federal

guidelines for permit decision making express a strong preference for compensation as near the permitted impact site as possible and for the same wetland type and functions. The committee concluded that such a preference for on-site and in-kind mitigation should not be automatic, but should follow from an analytically based assessment of the wetland needs in the watershed and the potential for the compensatory wetland to persist over time.

On-site compensation is typically constrained by hydrological conditions that are likely to have been or are being modified by the developments requiring mitigation. Hydrological conditions, including variability in water levels and water flow rates, are the primary driving force influencing wetland development, structure, functioning, and persistence. Proper placement within the landscape of compensatory wetlands to establish hydrological equivalence is necessary for wetland sustainability. The ability to achieve desired outcomes within a specific location is also a function of the degree of degradation of the hydrological conditions, soils, vegetation, and fauna at the site. The more degraded the local site and the more degraded the watershed, the less likely it will support a high-quality project. Thus, opportunities for in-kind compensation need to be sought within a larger landscape context.

Even with a suitable position in the landscape, the ability to establish desired wetland functions will depend on the particular function, the restoration or creation approach used, and the degree of degradation at the compensation site. Landscape position, hydrological variability, species richness, biological dynamics, and hydrological regime all are important factors that affect wetland restoration and mitigation of loss. Some wetland types—in particular, fens and bogs—cannot be effectively restored with present knowledge. Mitigation efforts that do not include a proper assessment of such factors are unlikely to contribute to the goals of the Clean Water Act.

Recommendations

- Avoidance is strongly recommended for wetlands that are difficult or impossible to restore, such as fens or bogs.
- Site selection for wetland conservation and mitigation should be conducted on a watershed scale in order to maintain wetland diversity, connectivity, and appropriate proportions of upland and wetland systems needed to enhance the long-term stability of the wetland and riparian systems. Regional watershed evaluation would greatly enhance the protection of wetlands and/or the creation of wetland corridors that mimic natural distributions of wetlands in the landscape.
- All mitigation wetlands should become self-sustaining. Proper

placement in the landscape to establish hydrogeological equivalence is inherent to wetland sustainability.

- The biological dynamics should be evaluated in terms of the populations present in reference models for the region and the ecological requirements of those species.
- The science and technology of wetland restoration and creation need to be based on a broader range of studies involving sites that differ in degree of degradation, restoration efforts, and regional variations. Predictability and effectiveness of outcomes should then improve.
- Hydrological variability should be incorporated into wetland mitigation design and evaluation. Except for some open-water wetlands, static water levels are not normal. Because of climatic variability, it should be recognized that many wetland types do not satisfy jurisdictional criteria every year. Hydrological functionality should be based on comparisons to reference sites during the same time period.
- Riparian wetlands should receive special attention and protection, because their value for stream water quality and overall stream health cannot be duplicated in any other landscape position.

A mitigation site needs to have the ability to become self-sustaining. This means that the hydrological processes that define a wetland in the ecosystem need to be present and expected to persist in perpetuity. To aid regulators and mitigators in designing projects that will become ecologically self-sustaining, the committee offers 10 operational guidelines.

Operational Guidelines for Creating or Restoring Self-Sustaining Wetlands

1. Consider the hydrogeomorphic and ecological landscape and climate.
2. Adopt a dynamic landscape perspective.
3. Restore or develop naturally variable hydrological conditions.
4. Whenever possible, choose wetland restoration over creation.
5. Avoid over-engineered structures in the wetland's design.
6. Pay particular attention to appropriate planting elevation, depth, soil type, and seasonal timing.
7. Provide appropriately heterogeneous topography.
8. Pay attention to subsurface conditions, including soil and sediment geochemistry and physics, groundwater quantity and quality, and infaunal communities.
9. Consider complications associated with wetland creation or restoration in seriously degraded or disturbed sites.
10. Conduct early monitoring as part of adaptive management.

Conclusion 3: Performance expectations in Section 404 permits have often been unclear, and compliance has often not been assured nor attained.

The attainment of no net loss of wetlands through both permittee and third-party mitigation requires that performance requirements for individual compensation sites be clearly stated and that the stated requirements will be met by the parties responsible for the mitigation. Some mitigation sites studied by the committee have met the criteria for permit compliance and are, or show promise of, developing into functional wetlands. However, in many cases, even though permit conditions may have been satisfied, required compensation actions were poorly designed or carelessly implemented. In other cases, the location of the mitigation site within the watershed could not provide the necessary hydrological conditions and hence the desired plant and animal communities, including buffers and uplands, necessary to achieve the desired wetland functions.

At some sites, compliance criteria were being met, but the hydrological variability that is a defining feature of a wetland had not been established. Concern that sites might not meet hydrological criteria used to define wetlands in the permitting process often encouraged construction of permanently flooded open-water wetlands. In some situations, seasonally and intermittently flooded or saturated wetlands would have better served the needs of the watershed. Compliance criteria sometimes specified plant species that the site conditions could not support or required plantings that were unnecessary or inappropriate. Monitoring is seldom required for more than 5 years, and the description of ecosystem functions in many monitoring reports is superficial. Legal and financial mechanisms for assuring long-term protection of sites are often absent, especially for permittee-responsible mitigation.

Long-term management is especially important, because wetland restoration and creation sites seldom achieve functional equivalency with reference sites or comply with permit requirements within 5 years. Up to 20 years may be needed for some wetland restoration or creation sites to achieve functional goals. The amount of time needed to become fully functional depends on the type of wetland, its degree of degradation, conditions in the surrounding watershed, and uncertainties in the application of scientific understanding. Once wetlands become fully functional, long-term stewardship, including monitoring or periodic assessment, is critical to achieving the goals of the Clean Water Act. "Long-term stewardship" implies a time frame typically accorded to other publicly valued natural assets, such as parks. This time frame emphasizes the importance of developing mitigation wetlands that are self-sustaining, so that the long-term costs are not unmanageable. The committee recommends three general goals to ensure compliance of sites that contribute to the water-

shed. The committee made nine specific recommendations to achieve these goals.

General Goals

- Individual compensatory mitigation sites should be designed and constructed to maximize the likelihood that they will make an ongoing ecological contribution to the watershed; this contribution should be specified in advance.
- Compensatory mitigation should be in place concurrent with, and preferably before, permitted activity.
- To ensure the replacement of lost wetland functions, there should be effective legal and financial assurances for long-term site sustainability and monitoring of all compensatory wetland projects.

Specific Recommendations

- Impact sites should be evaluated using the same functional assessment tools as used for the mitigation site.
- Mitigation projects should be planned with and measured by a broader set of wetland functions than are currently employed.
- Mitigation goals must be clear, and those goals carefully specified in terms of measurable performance standards, in order to improve mitigation effectiveness. Performance standards in permits should reflect mitigation goals and be written in such a way that ecological viability can be measured and the impacted functions replaced.
- Because a particular floristic assemblage might not provide all the functions lost, both restoration of community structure (e.g., plant cover and composition) and restoration of wetland functions should be considered in setting goals and assessing outcomes. Relationships between structure and function should be better known.
- The Corps of Engineers and other responsible regulatory authorities should use a functional assessment protocol that recognizes the watershed perspective to establish permittee compensation requirements.
- Dependence on subjective, best professional judgment in assessing wetland function should be replaced by science-based, rapid assessment procedures that incorporate at least the following characteristics: effectively assess goals of wetland mitigation projects; assess all recognized functions; incorporate effects of position in landscape; reliably indicate important wetland processes, or at least scientifically established structural surrogates of those processes; scale assessment results to results from reference sites; are sensitive to changes in performance over a dynamic range; are integrative over space and time; and generate parametric and dimensioned units, rather than nonparametric rank.

- The Corps of Engineers and other responsible regulatory authorities should take actions to improve the effectiveness of compliance monitoring before and after project construction.
- Compensatory mitigation sites should receive long-term stewardship, i.e., a time frame expected for other publicly valued assets, such as parks.
- The Corps of Engineers and other responsible regulatory authorities should establish and enforce clear compliance requirements for permittee-responsible compensation to assure that (1) projects are initiated no later than concurrent with permitted activity, (2) projects are implemented and constructed according to established design criteria and use an adaptive management approach specified in the permit, (3) the performance standards are specified in the permit and attained before permit compliance is achieved, and (4) the permittee provides a stewardship organization with an easement on, or title to, the compensatory wetland site and a cash contribution appropriate for the long-term monitoring, management and maintenance of the site.

Conclusion 4: Support for regulatory decision making is inadequate.

In addition to using a watershed framework, the federal regulatory authorities can work to improve functional wetland assessment, permit compliance monitoring, staff training, research, and collaboration with state agencies. The committee recommends that the Corps of Engineers, Environmental Protection Agency, and other responsible regulatory authorities take several specific actions.

Recommendations

- To assist permit writers and others in making compensatory mitigation decisions, a reference manual should be developed to help design projects that will be most likely to achieve permit requirements. The manual should be organized around the themes developed in this report. The Corps of Engineers should develop such a manual for each region, based in part on the careful enumeration of wetland functions in the 404(b)(1) guidelines and in part on local and national expertise regarding the difficulty of restoring different wetland types, hydrological conditions, and functions in alternative restoration or creation contexts.
- The Corps of Engineers and other responsible authorities should commit funds to allow staff participation in professional activities and in technical training programs that include the opportunity to share experiences across districts.

- The Corps of Engineers and other responsible regulatory authorities should establish a research program to study mitigation sites to determine what practices achieve long-term performance for creation, enhancement, and restoration of wetlands.
- States, with the participation of appropriate federal agencies, are encouraged to prepare technical plans or initiate interagency consensus processes for setting wetland protection, acquisition, restoration, enhancement, and creation project priorities on an ecoregional (watershed) basis.

Conclusion 5: Third-party compensation approaches (mitigation banks, in-lieu fee programs) offer some advantages over permittee-responsible mitigation.

The committee evaluated several compensatory mitigation mechanisms and developed a taxonomy to evaluate their potential strengths and weaknesses. Mechanisms were characterized by the following five attributes: (1) on-site or off-site compensatory mitigation action; (2) responsible party; (3) timing of the mitigation actions; (4) whether the Mitigation Banking Review Team process is used; and (5) stewardship requirements. The committee does not favor any particular mechanism but has offered recommendations that will, if adopted, assure that permittee-responsible as well as third-party mitigation will secure no net loss of wetlands. In addition, the committee believes that no net loss of wetlands will require a strengthened partnership with the states.

Recommendations

- The taxonomy developed by the committee is recommended as a reference point for discussions about compensatory mitigation. In practice, however, a compensatory mitigation mechanism may not fit neatly into one of the listed categories (e.g., mitigation bank versus in-lieu fee versus cash donation). Accordingly, the committee recommends that when an agency reviews mitigation options, it is most important to focus on their characteristics or attributes (e.g., who is legally responsible, the timing of the mitigation actions, whether the Mitigation Banking Review Team process is used, and whether stewardship requirements are in place).
- Institutional systems should be modified to provide third-party compensatory mitigation with all of the following attributes: timely and assured compensation for all permitted activities; watershed integration; and assurances of long-term sustainability and stewardship for restored, created, enhanced, or preserved wetlands.
- The Corps of Engineers and the Environmental Protection Agency should work with the states to expand their permitting and watershed planning programs to fill gaps in the federal wetland program.

CONCLUSION

The Clean Water Act Section 404 program should be improved to achieve the goal of no net loss of wetlands for both area and functions. The above recommendations will help to achieve this goal. It is of paramount importance that the regulatory agencies consider each permitting decision over broader geographic areas and longer time periods, i.e., by modifying the boundaries of permit decision making in time and space.

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Preface

The U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) share responsibility for regulating the mitigation (lessening of impacts) of damages to wetlands. In response to a request from EPA, the National Research Council (NRC) formed the Committee on Mitigating Wetland Losses to evaluate mitigation practice as a way to restore and maintain the quality of the nation's waters, particularly as regulated under Section 404 of the Clean Water Act.

The committee reviewed the available literature on replacement of wetland functions, considered both restoration and creation efforts, visited several mitigation sites around the United States, and then evaluated both the ecological performance of mitigation projects and the institutions under which mitigation projects are conducted (permittee-responsible mitigation banks and in-lieu fee programs). At a series of five meetings, the committee worked in a truly interdisciplinary and collaborative manner to develop the conclusions and recommendations presented in this report.

The committee is grateful for the briefings and the assistance provided by the staff of EPA, the Corps, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

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Joy B. Zedler
Chair, Committee on Mitigating Wetland Losses

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COMPENSATING FOR
WETLAND LOSSES
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