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# Wetland Mitigation

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# Technical Report

No. 94-7

## Wetland Mitigation

Megan Greiner

### Introduction

**W**ith the increasing pressures of development, conflicts between economic development and the preservation of our natural resources continue to escalate. The management of our nation's wetlands offer a poignant example of the need for flexible and innovative natural resource management strategies. Various wetland mitigation techniques are emerging as such a tool.

We are caught in a trend of decreasing wetland resources, largely from pressures of agriculture, agroforestry and urban development (Salveson, 1991). Today's wetland resources represent less than 46% of the country's original wetlands, with an estimated decrease from an original 148 to 185 million acres (60 to 75 million hectares) to the present 103 million acres (42 million hectares) (Mitsch and Gosselink, 1986; OTA, 1984). Estimates of average wetlands loss are in the range of 350,000 to 550,000 acres (222 672 hectares) per year (Salveson, 1991; OTA, 1984) with few signs of a declining loss trend. The demand for land continues to increase as our population and development needs grow. This exacerbates the stress on our already reduced wetland resources not only through direct destruction but also through land use practices that degrade/disturb wetlands.

In the early 1970's and 1980's legislative changes were made to strengthen wetlands protection efforts. Prior to this, federal agricultural

policies had encouraged wetlands conversion by providing credit, loans, and commodity price supports. Legislative action eliminated incentives to destroy wetlands and replaced them with tax incentives and laws promoting the preservation of wetlands (Dennis, 1985; Henderson, 1985).

The Conservation Foundation's National Wetlands Policy Forum in 1988 recommended that "the nation establish a national wetlands protection policy to achieve no overall net loss of the nation's remaining wetlands base, as defined by acreage and function, and to restore and create wetlands, where feasible, to increase the quality and quantity of the nation's wetlands resource base." This recommendation was upheld recently by the Clinton Administration in a White House report on Environmental Policy. In the report, the administration proposes policy changes to increase fairness and flexibility in wetlands permitting and encourage more non-regulatory programs for wetlands protection (White House Office on Environmental Policy, 1993).

As states emphasize and strive to attain this "no net loss" of wetlands, the challenge of balancing development and preservation needs becomes increasingly difficult. Developers, resource managers and regulators need to respond with innovative and more flexible means of dealing with wetlands permitting, including mitiga-

tion. It remains to be determined at this point whether compensatory mitigation will play a major role in future wetlands management programs.

### Mitigation Defined

Mitigation serves as a valuable management tool in its role of reducing and minimizing impacts, and compensating for losses. In 1978, mitigation was defined by the Council on Environmental Quality to involve a five step sequential process which ranges from avoidance of an impact to restoration to compensation. Mitigation is defined as:

1. the avoiding of an impact altogether by not taking a certain action or part of an action
2. the minimizing of impacts by limiting the degree or magnitude of the action and its implementation
3. the rectifying of the impact by repairing, rehabilitating, or restoring the affected environment (restoration)
4. the reducing or eliminating of the impact over time by preservation and maintenance operations during the life of the action

5. the compensating for the impact by replacing or providing substitute resources or environments (compensatory mitigation)

Restoration of wetlands, defined as one type of mitigation, is controversial. Restoration of an existing disturbed wetland in exchange for wetlands impacts results in an overall loss of wetlands resources. Restorative mitigation could involve requiring the cleanup of a disturbed wetland adjacent to a wetland that will be filled as a result of development. This mitigation would result in the total loss of the wetland to be filled without an "equal" wetland replacement. This brings into question the issue of what functions will the restoration reestablish; will the functions be new ones not previously performed by the degraded wetland, or, will the functions be similar to the ones previously performed by the wetland to be filled. Regardless, this type of restorative mitigation ultimately results in a loss of some wetlands. Thus, the argument that restoration contradicts the "no net loss" goal and therefore does not represent mitigation of any form is easily made.

Generally, current regulatory programs do not "acknowledge" restoration as a management practice and thereby discourage its use. However, evidence indicates that an increasingly large number of wetlands are sorely in need of restoration (Clark, 1985). With estimates claiming that over half of our wetland resources are functioning at a minimal level, if at all (Clark, 1985), the future might see restoration become one of the more important forms of mitigation.

The most recent White House Policy on wetlands acknowledges both the degraded condition of many wetlands and our ability to restore many of these wetlands. Restoration of disturbed wetlands is encouraged, albeit through voluntary, non-regulatory programs (White House Office on Environmental Policy 1993).

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Commonwealth's Declared Policy:  
"to preserve the wetlands and to prevent their  
despoliation and destruction . . ."

At present, wetlands compensation through creation is the hot topic as jurisdictions strive for "no net loss" of wetlands. Compensatory mitigation has come into wider use almost by default. The majority of wetlands creation efforts are aimed at meeting the "no net loss" goal in terms of acreage, but not necessarily function. An increased understanding of wetlands and wetland processes has also allowed wetland creation to become a viable mitigation method despite all the controversy concerning its "success."

Wetlands creation in-kind and on-site is considered the most acceptable type of compensatory mitigation. In-kind replacement involves creating a wetland with the same plant and animal communities as the impacted wetland. On-site refers to the placement of the wetland in a position adjoining or near the lost wetland such that hydrology, soil conditions and topography are as similar as possible. Construction of the same type of wetland in the same area as the impacted wetland is believed to offer the greatest potential for structural and functional "equivalency" to the impacted wetland. The thought surrounding this preference involves the idea that it is ". . . more important and realistic to identify the processes responsible for wetland self maintenance than to identify which characteristics are valuable or invaluable to humans" (Salveson 1991).

Other variations are 1) out-of-kind, on-site, 2) in-kind, off-site, and 3) out-of-kind, off-site. Unfortunately, structural and functional equivalency in a different location and/or with different vegetation is very difficult to achieve. Equally difficult, is the task of determining the meaning of "equivalency." Similarly, the already complex task of monitoring wetlands creation success is exacerbated by differences in

vegetation and the physical characteristics of the locations between the created wetland and the impacted wetland. Increased planning and monitoring efforts are necessary in order to ensure that the design and functioning of the replacement wetland meets some of the needs of the ecological system. As a result, these forms of mitigation are considered last resort options.

### Mitigation Banking

Mitigation banking is an innovative permutation of off-site compensation. Banking differs from other compensation strategies in that it aggregates mitigation for a number of small sites in one location and provides compensation for unavoidable project impacts in advance of the impacts. A bank may be created when a sponsor (typically an industry or government agency) develops a plan which is formalized through a Memorandum of Understanding (MOU). The signatories of the MOU involve the sponsor and the agencies having regulatory authority over the wetland resources in the area.

Once the plan for a wetlands bank is approved and the bank is constructed, the resultant benefits are quantified as "credits." This quantification may be as simple as an acre for acre value or may use the FWS's Habitat Evaluation Procedure (HEP) for habitat value. These credits are banked until debited through mitigation. Any debit actions occurring in the bank are subject to approval by all signatories.

Guidelines for banks include statements explaining that the existence of a mitigation bank does not allow bypassing of other alternatives, nor does it ensure blanket approval of proposed projects. It comes into play only when no other alternatives for resource compensation are physically or economically feasible. As much as possible, the bank is required to exist within

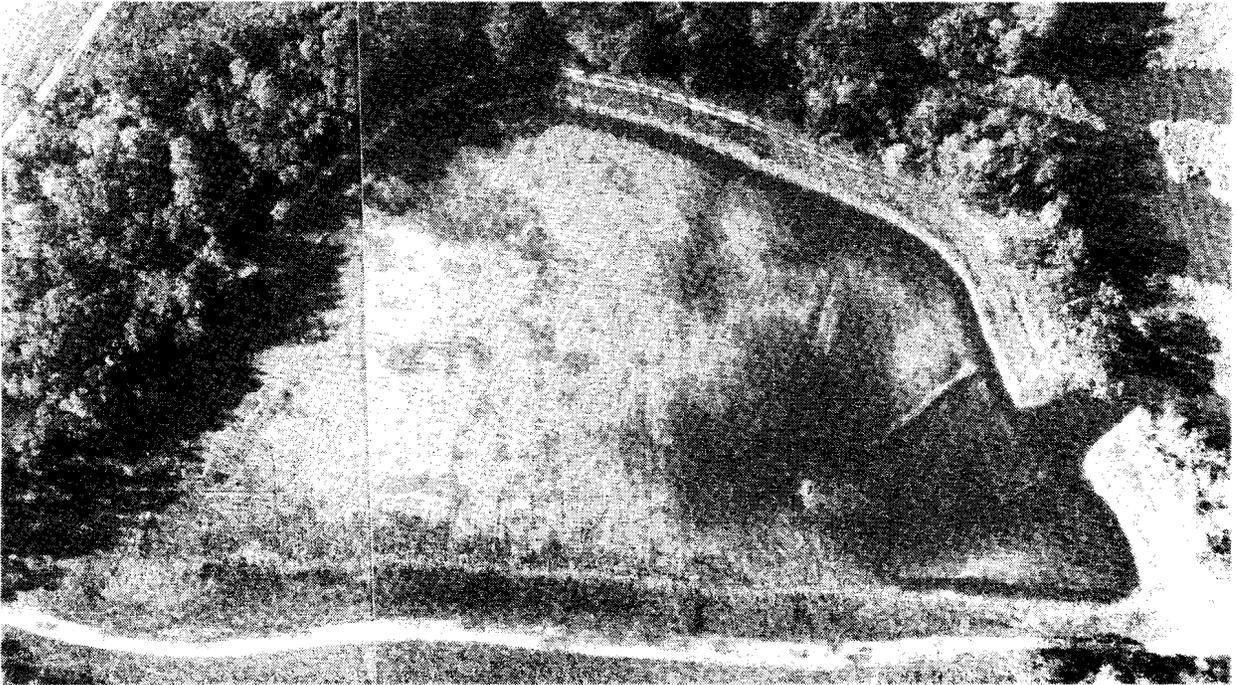
the same system as the debit wetlands and whenever possible, an in-kind replacement is done. Banks are required to be self-sustaining and require long-term monitoring.

As a wetlands management tool, mitigation banking is still relatively new. Due to the uncertainties of wetlands creation as well as the difficulties of assigning and debiting wetland credits, scientists and regulators are reluctant to support banking as a viable management tool. However, if constructed and managed properly, mitigation banks have the potential to serve a valuable function as they provide an additional option for mitigating wetland losses. A singular advantage presented by mitigation banking is the establishment of the compensation wetland **prior** to the loss of the natural system, something which is unlikely to occur under the more standard in-kind, on-site compensation scenario. Although controversial, the use of mitigation banks was endorsed by the Clinton administration in order to help attain

the goal of no net loss of wetlands (White House Office on Environmental Policy, 1993).

### **Mitigation in the Landscape**

As knowledge of wetlands and natural systems as an integrated whole increases, wetland scientists are turning toward larger scale cumulative impact assessments. The Council on Environmental Quality (CEQ) defines cumulative impacts as “. . . the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future impacts . . .”(40CFR part 1508.7 &1508.8). Cumulative impacts represent an area of increasing concern to regulatory agencies because the piecemeal loss of wetlands over time is quietly depleting our wetland resources. However, due largely to the absence of knowledge in this area, there is a noticeable lack of comprehensive and accurate cumulative impact assessments (Gosselink and Lee 1988).

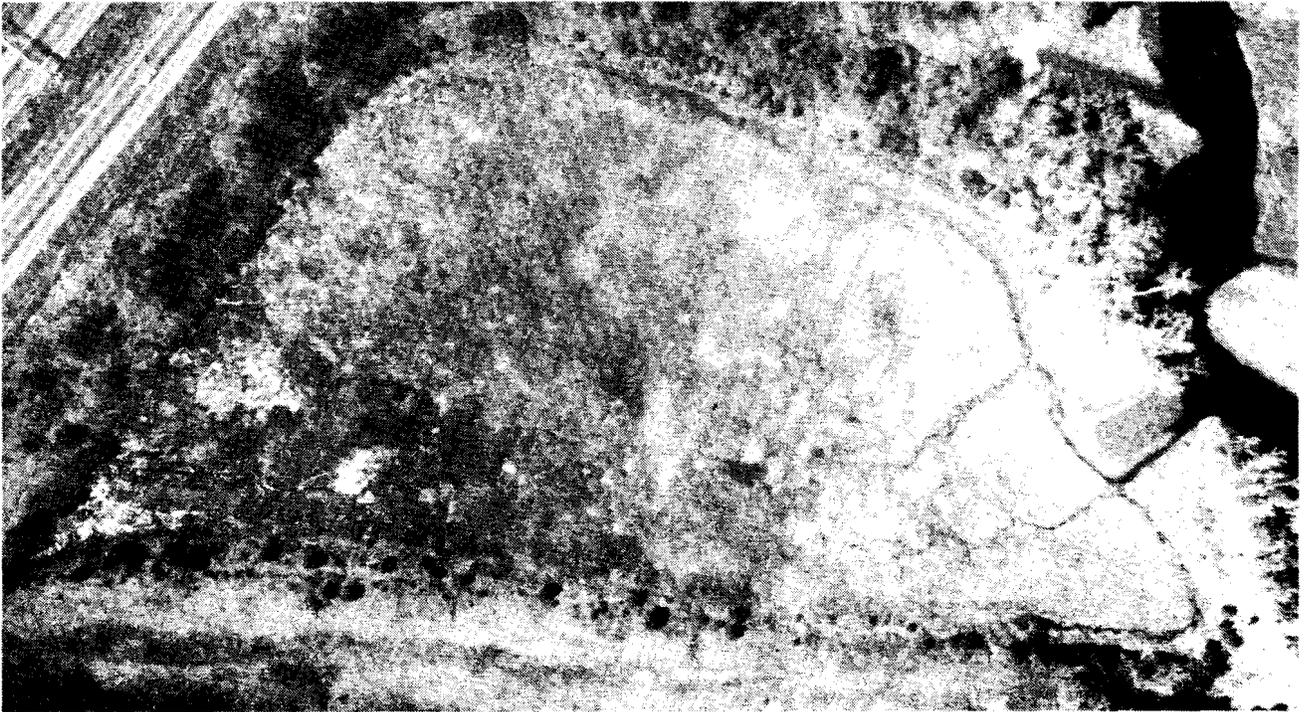


Aerial photograph of eight acre compensation wetland constructed by the Virginia Department of Transportation (VDOT) within a borrow pit used earlier to obtain fill for road construction. This photo was taken in 1982, shortly after the marsh was planted and the area connected to tidal waters.

In-kind, on-site replacement is an attempt to keep the natural system as static as possible while at the same time accommodating numerous and potentially harmful changes to the surrounding landscape. Preference by wetland managers for on-site, in-kind mitigation has resulted in management programs which emphasize this type of mitigation almost exclusively. Recent efforts to view wetlands as part of the overall landscape suggest that ecosystems may be best served by mitigation planning efforts in which a larger scale watershed approach is used. The watershed approach to mitigation planning allows for an assessment of cumulative impacts incorporating the proposed wetland loss. Replacement of functions important to the entire system, may be best achieved by replacement in a location that will maximize those functions important to the entire watershed. In this case, "... compensation can be used to create wetlands to provide desirable site specific conditions . . . compensation . . . can be designed and executed to lead to a net gain to the environment" (Garbisch 1985).

It appears that wetland science may be in a position to establish the basis for a more comprehensive approach to mitigation. More information is necessary on the larger ecosystem processes and interactions of wetland functions with surrounding landscape. However, one does not have to go far to see that wetland mitigation may be more "successful" in terms of keeping a well-balanced and functioning ecosystem if it were to consider replacement of wetlands in the sense of **what** location and **what** wetland functions would most benefit the watershed.

It is important to keep in mind that wetland impacts and losses due to development are often associated with impacts and changes to the surrounding landscape as well. Thus, whatever past interactions occurred between the wetland and surrounding landscape will be changed. Knowledge of cumulative effects and wetland location within changed landscapes is important in determining the most effective future mitigation strategies.



This photograph was taken in 1993 and shows the same wetland as on the facing page. Note the heavy vegetative cover and the natural drainage patterns which have developed in the marsh.



Ground shot of the VDOT marsh. It looks like a marsh, smells like a marsh . . . but does it function in the same manner as a natural system?

### **Mitigation "Success" and Permitting**

Some of the biggest problems with wetland mitigation and compensation are the permitting process, enforcement and creation "success" (Redmond, 1992). A study by the Florida Department of Natural Resources disclosed that only four of 63 permits issued were found to be in full compliance with permit requirements; only 27% of actual attempts at compensatory mitigation (17 out of 63 permits) were found to be "ecologically successful" and that in 34% of the cases, no mitigation had even been attempted (Redmond, 1992). The same results can be found in a similar study done in both the San Francisco Bay (Race, 1985) and the Chesapeake Bay area (Bernstein, 1990).

Experts disagree on how to define or determine mitigation success. A study completed by the

U.S. Fish and Wildlife Service concluded that compensatory mitigation was only successful when all the permit requirements were met (Bernstein, 1990). In contrast, the other two studies referenced above (Redmond, 1992; Race, 1985), used indicators of ecological success which were not necessarily based on permit conditions.

A lack of clearly specified goals and measurable success criteria make the problem of determining success in wetland creation/restoration projects inherently difficult (Kusler & Kentula 1990). While, ideally, success should be ". . . measured as the degree to which the functional replacement of the natural system has occurred . . ." (Kusler and Kentula 1990), this can be difficult as wetland scientists have yet to reach a consensus on the evaluation of wetland functions.

One solution to the above problem could involve establishing specific goals that can be quantitatively measured in an evaluation. Erwin (1991) proposed several simple criteria that could be used. These would involve stating the type of wetland to be established, along with percent cover of different species, a list of undesirable plant species, desired water levels and whatever may be appropriate to the creation project at hand. Erwin also proposes that species and numbers of macrofauna be included as they are good environmental stress indicators. These criteria would be established ahead of time in a manner that is measurable and attainable in a specified time. Kusler and Kentula (1990) propose a similar set of criteria involving specific goals of wetland size, functions, vegetation type, density and growth rate. This type of approach would require planning ahead of time and provide a unique definition of success for each project.

A second solution that is being tossed around by researchers revolves around the concept of using a reference wetland. A reference wetland is an undisturbed natural wetland that is determined to be similar to the wetland being created. Obviously, the use of the reference wetland would still require some goal setting at least in terms of defining a "similar" reference wetland. Success is then defined by the similarity of the created wetland to the reference wetland. This could involve comparing soils, inundation periods or percent cover of different species.

One aspect of wetland compensation that most researchers appear to agree on is the need for systematic monitoring of creation efforts. Not only would this increase our knowledge base for future wetland creation and restoration projects, but would also allow for mid-course corrections in projects being monitored (Kusler and Kentula 1990). Oftentimes, replanting, water level manipulations or dredging may be needed in the first few years after construction. Wetland creation efforts are an area where ex-

perience is important. There is no global set of guidelines for successful wetland creation. Each project has its own unique set of conditions and environmental parameters. Wetland construction "success" depends to a certain extent on careful design and implementation (Kusler and Kentula 1990). Monitoring is important to ensure long term success, as well as to aid in determining future mitigation strategies and the feasibility of future creation plans.

## Conclusion

Wetland mitigation is still an evolving science. While many will point to its successes at resolving seemingly unsolvable conflicts, others will turn to its track record and question the definition of "success." It is clear that a "no net loss" policy, which requires the maintenance of our wetland resources and emphasizes the importance of wetlands in the watershed, will be difficult to implement. It is unrealistic to expect the conflicts between development and preservation to cease. These conflicts may become more easily resolved as wetland mitigation comes to offer alternative ways of maintaining a balanced ecosystem.

Much more research will be necessary in order to determine the best methods of assessing cumulative impacts, evaluating wetland-landscape interactions and designing successful mitigation strategies. If development in and adjacent to our nations wetlands resources continues, which appears likely, effective and practical mitigation tools based on landscape level assessments, may be valuable in minimizing the incremental loss of our wetland resources.

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## Technical Report

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