SELF-TAUGHT EDUCATION UNIT

Wetland Creation and Restoration as Compensation for Wetland Losses: Management and Policy Implications

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Objectives

The purpose of this self taught education unit is first to familiarize the reader with the historic, scientific and policy aspects of a wetland management tool which has seen increasing use over the last ten or more years within the regulatory arena. This unit will also familiarize the reader with the compensatory mitigation policy adopted by the Commonwealth of Virginia (Appendix A). Also presented will be the language of compensation-mitigation which is confusing in some of its aspects but must be understood clearly in order to deal with this fairly controversial subject.

Following completion of this study unit, the reader will be generally acquainted with:

1. Wetland compensation-mitigation terminology.
2. Technical questions still pending with regard to wetland creation and restoration.
3. Mitigation-compensation policy questions.
4. Virginia's Wetland Mitigation/Compensation Policy
5. Wetland mitigation banking

Definitions

Some confusion has always existed with regard to terminology in this area of wetlands management. **Compensatory mitigation** is properly defined as, "any actions taken which have the effect of substituting some form of wetland resource for those lost or significantly disturbed due to a permitted activity; generally wetland creation or restoration." Many use the term, **mitigation**, when they actually mean **compensatory mitigation**.

Mitigation is in reality a much broader term and generally means "all actions, both taken and not taken, which eliminate or materially reduce the adverse effects of a proposed activity on the living and nonliving components of a wetland system or on their ability to interact." As can be seen from these two definitions, mitigation is the broader of the two and compensatory mitigation is actually a form of, or subset of, mitigation.

In their definition of mitigation, in the National Environmental Policy Act, The President's Council on Environmental Quality outlined a series of steps in the mitigation process which listed avoiding the wetland as the first step and compensating for unavoidable losses as the last step. These steps are collectively called **sequencing** and amount to a prioritization of the collective mitigation process from most desirable to last resort. Sequencing basically promotes the following prioritization:

1. The avoidance of wetland loss;
2. Minimization of the loss of wetlands;
3. Rectifying loss through repair and restoration to wetlands, on site; and
4. Compensation for unavoidable wetlands impacts. The reasons that compensation ranks last in the mitigation pecking order are the poor track record demonstrated thus far, along

with significant wetland creation and restoration knowledge gaps, as well as the absence of basic policy decisions which must as a consequence be made, as yet on a case by case basis. The first tier of Virginia's policy on wetland compensation is a form of sequencing. This will be detailed later in this study unit.

Introduction

The area of wetland compensatory mitigation probably saw its earliest beginnings in attempts by the Corps of Engineers to establish wetlands on dredged material disposal areas in an effort to make them more environmentally "friendly." Most of these initial attempts were somewhat less than successful or absolute failures.

The use of wetland creation and restoration as compensation for permitted wetlands losses has steadily increased in the last ten to fifteen years. This, even though our knowledge of how to set up and maintain such systems remains deficient, particularly in the area of nontidal wetlands. Contributing to this momentum has been the "no net loss" wetland policy adopted by many resource managers in federal and state government. In addition, the compensation concept, at least in theory, allows development to occur and at the same time protects a valuable natural resource which has diminished by half since the U.S. was settled in the seventeenth century. This has great appeal to both the regulator, who is under pressure to issue permits, and the developer, who wishes to be more sensitive to environmental concerns while still producing his products.

The track record for wetland compensation to this point has been fairly poor. However, in tidal waters the knowledge base has increased such that wetland creation and restoration stand a better chance of being successful than in nontidal systems. Despite the generally poor record, compensatory mitigation continues to be the subject of increased interest among the private sector and many governmental entities at all levels. It is therefore quite important to understand the problems and limitations in order to maximize the potential for this management tool to be employed successfully.

Research Questions

A number of studies have been conducted in all parts of the country which have documented the relatively poor track record for marsh creation and restoration and thus for wetland compensation (Race and Christie 1982, Race 1985, Kusler and Kentula 1990). In Florida, the ecological success rate for created wetlands was found to be only 27 percent (Florida DER 1991). In Virginia, researchers compared plant cover estimates between created and adjacent natural wetlands and found plant densities in the artificial wetlands to be significantly lower than that in natural marshes (Figure 1). A national assessment of the science behind wetland creation and restoration concluded that these activities must be viewed and managed with great care (Kusler and Kentula 1990). In California, (Race 1985) concluded, "Continuing the present policy of forcing each permittee to apply an experimental technology in a piecemeal fashion only contributes to poor results and wasted mitigation dollars."

Why is it so difficult to create wetlands? There are many reasons, as the poor success record would indicate. Many of the people planting wetlands have minimal knowledge of the systems with which they are dealing. In many cases the knowledge, which must come from long term studies, simply does not exist. In others, the individuals are not trying to create a wet-

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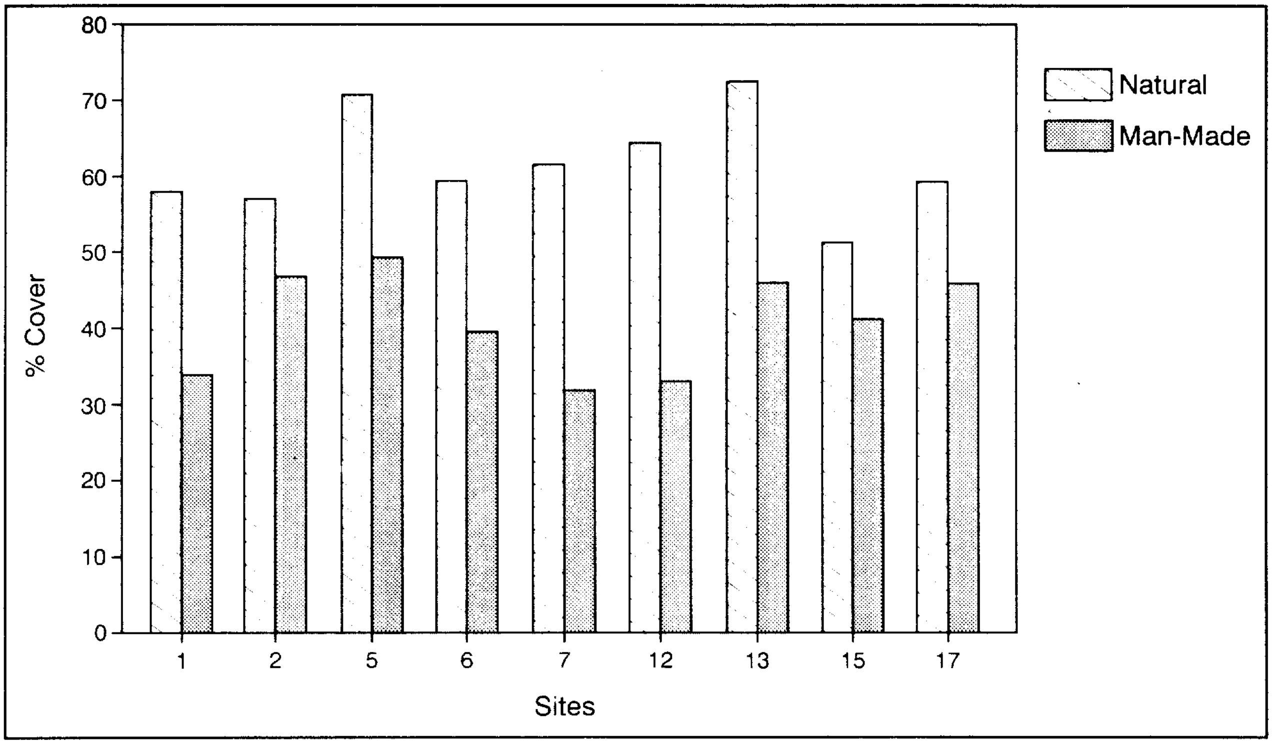

Figure 1. Wetlands compensation sites cover estimates. Natural vs. man-made. (Barnard and Mason 1990)

land so much as they are trying to meet a deadline or adhere to artificial but required success criteria. There are no blueprints for wetlands; they are not made up of materials one can order from the local building supply. Wetlands are highly complex systems which have evolved intricate connections and relationships over thousands of years. We don't know what all of the building materials are, much less how all the interdependent linkages work and why. Wetlands are made up of mobile species that respond to weather patterns and other extreme physical conditions. We don't know how to create the complex mosaic which gives wetlands the ability to persist through extremes. Wetlands like many natural systems are dynamic. They operate in cycles over long periods of time and we don't have models we can copy that have this full range of variability built in. At best we have a few studies that are really only "snapshots" of a "natural" wetland and these are only valid for that region and time. We may have some understanding of wetland plants and animals but we don't always understand how functions such as water quality maintenance and critical habitat, derive from these core materials or organisms. Given the foregoing independent variables and unknowns involved with compensation through wetland creation, it is very important that reasonable steps be taken to help insure the long term survival of a created wetland.

Fortunately, we do know more about and have significant experience in planting tidal *Spartina* marshes along the East and Gulf coasts of the U.S. Tidal marshes such as these are generally less complex and the all-important hydrology is easier to duplicate than in nontidal wetland systems. So long as the substrate elevation is correctly achieved, long term maintenance of hydrology is generally assured by the highly predictable nature of the tides. In addition, tidal plants such as salt marsh cordgrass, can be fully established in three years or less. This is not to say that the process is easy or simple in tidal systems. Many precautions are necessary, but if properly located, designed and installed, the probability of establishing the tidal wetland vegetation is reasonably good.

Still a number of questions remain to be answered. Wetlands are not just an association of plants but a highly interactive community involving numerous living and nonliving components. How long does it take for a created wetland to reach functional, fully interactive equivalency (*i.e.* the services: pollutant trapping, habitat, flood buffering) to the natural wetland which it replaces? How does one know when a marsh is successfully established? How does one measure success? These are technical questions which scientists are still working to answer. Some of the questions cannot be fully answered, yet. Additionally, the answers may be different for each wetland.

There are also a number of policy questions which bear addressing when considering wetland compensation. How much compensation is enough? How can one best insure the survival of the compensation marsh? Is buying and preserving an existing wetland a legitimate form of compensation? Should monitoring be required? Does it matter where the compensation marsh is located relative to the impacted wetland? Should it be at the same site as the wetland loss? Is in the same watershed sufficient? Should the location of the replacement wetland be dictated by landscape factors? (See Figure 2.)

Even with the number of questions remaining to be answered, compensation is a wetland management tool and as such is being used on a limited basis by wetlands managers, for both tidal and nontidal areas. Some successes have been documented but many projects, unfortunately, have not been monitored or studied to determine how successful they might be.

An additional factor being studied at present is the susceptibility of newly created wetlands to invasion by opportunistic plant species, such as the common reed, *Phragmites australis,* and the effects that such may have on the wetland. In general, this invader is considered an undesirable species but how much of the pest is too much? At what density in a wetland does *Phragmites* begin to have a significant on the wetland?

The Virginia Wetland Mitigation/ Compensation Policy (Appendix A)

Virginia's Mitigation/Compensation Policy reflects the state's basic "go slow" approach to the process. The policy has been promulgated by the Virginia Marine Resources Commission after a public interest review following the mandates of the Administrative Processes Act. The policy describes a two-tiered approach; **Specific Criteria,** the first tier, basically proscribes sequencing, as previously discussed in the definitions section of this unit. In addition, the project must meet a water dependency test and possess significant public and private benefits as part of tier one requirements. In general, managers must balance socio-economics and community desires with their charge to protect and conserve wetlands resources. This process is made doubly difficult in many cases because the value to society of the functions or services performed by wetlands cannot be put in standard currency terms for comparing proposed economic benefits such as jobs, tax base, etc.

Once first tier (Specific Criteria) requirements have been satisfied and it is decided that compensation is required, the policy offers guidance on increasing the probability of successful tidal marsh establishment. This is accomplished through the **Supplemental Guidelines**, the second tier of the policy. Nontidal wetlands are not addressed in this policy because Virginia does not have a nontidal wetlands law.

The first and most important of the Supplemental Guidelines is the requirement of a detailed plan which must, at a minimum, include:

1. A statement of goals and objectives
2. A scaled plan view drawing with points located with tie-down distances relative to permanent onsite benchmarks
3. A description of the wetland type to be constructed
4. The mean tide range at the site (MTR)
5. The proposed substrate elevations relative to a tidal datum, generally mean low water (MLW)
6. A chronologically ordered, step by step description of the proposed grading and planting or seeding process

The statement of goals and objectives is all-important because it is the basis on which the proposal is first evaluated for such factors as replacement adequacy, general technical reasonableness and feasibility, adequate planning and design, site compatibility, etc. It is also of importance as one of the primary thresholds by which success is to be measured or evaluated in the compensation wetland.

The goals and objectives should be targeted at replacement of functional values or services. These can be those of the lost resource (shoreline erosion control, for example) or can be chosen on the basis of perceived or demonstrated functional needs within a watershed context (stormwater treatment). Because of the present difficulty with linking structure or form and function, a specific plant composition plan, mimicking that lost, may be chosen or plants may be chosen which will eventually provide functions previously identified. The policy requires a minimum 1:1 areal exchange, unrelated to function.

The scaled, compensation plan drawings are of equal importance with the goals and objectives because they are critical to assessing the technical merits of the proposal and are the major bench mark by which successful establishment will be judged. Further, the plan will be critical in minimizing the adverse impact of the compensation, itself; will outline how the all-important wetland hydrology will be attained and maintained; and will serve as the blueprint for the creation of the wetland.

It is important to realize that once the wetland is constructed it will basically develop at its own pace and in a direction dictated by physical and biological conditions which occur after construction and are not entirely predictable. Dead plants can be replaced after the first one or two growing seasons but little other manipulation is desirable or feasible in most cases. The plan needs to be as well thought out as possible in order to best insure that the goals for the project are achieved. Since all biological systems are dynamic, change over the years is inevitable and actually desirable. If the marsh is designed to vary with the conditions that occur, then resiliency will be the result. If one is constructing a fringe marsh to aid in erosion buffering, the marsh should be allowed to adapt and change over time with changing conditions. It should not be envisioned as a stable barrier as a seawall is seen. The fringe marsh should be designed wide enough to baffle wave energy and to expand landward, and thus maintain its effective width as, for example, sea level rises.

The supplemental guidelines also suggest:

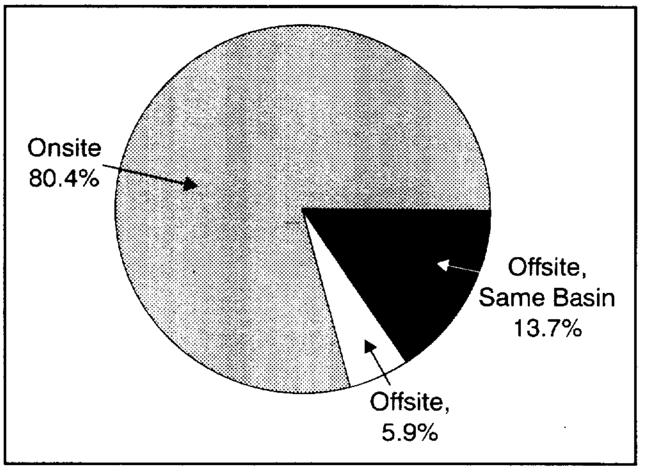

Figure 2. Compensation site locations used in Virginia tidal wetlands (Barnard and Mason 1990).

1. Onsite compensation is the preferred location alternative with offsite in the same sub-basin or hydrologic unit as second choice. This guideline places the compensation as close to where the impact has occurred as possible.
2. The type of plant community proposed be one that has been established successfully in the region and has a favorable planting history.
3. In selection of the compensation site, one aquatic community should not be used or lost for the creation of another. This may result in additional impacts to the marine environment as a result of the compensation. Additionally, the manipulation of the vegetation in an existing wetland as a type of enhancement is not an acceptable form of compensation.
4. Nonvegetated wetlands are also highly productive systems, though emergent vegetation is not present, and should not be managed differently from vegetated wetlands.
5. The compensation plan and its implementation should be accomplished by experienced, knowledgeable professionals and once the grading and hydrology are established, the site should be inspected by a competent authority in order to insure that the elevations are appropriate to the vegetation proposed.
6. Especially for larger projects, a performance bond or letter of credit should be required and

Figure 3. One-year-old planted marsh.

a conservation or other easement employed for the project.

Monitoring should be required for all wetland creation projects. The degree, length of time and scale of the monitoring should be dictated by the vegetation type, structural complexity, size and relative risk assessment of the proposal. Monitoring may take the form of anything from visual assessment over two or more growing seasons to complex sampling of various living and nonliving components of the created and adjacent natural wetlands of similar structure. Examples would be monitoring organismic colonization of the wetland substrate, the soil chemistry and soil organics. Use of the wetlands by fish, birds and mammals could be monitored. All of these dictated by the original goals and objectives. The assessment of whether the project is successfully established or not should be based on the original goals and objectives, the site plan and the monitoring.

Mitigation Banking

Wetland mitigation banking is generally defined as an offsite method of compensating (i.e. creating compensation credits) for present, but more particularly, future wetland losses due to development. It most often consists of wetland creation or restoration. In a bank, wetlands are created in anticipation of offsetting future wetlands losses as a result of development of some type. The bank may be started by a government agency such as a port authority that has its own development plans or by large development companies that anticipate their activities will adversely affect wetlands. At present there is a great deal of interest in privately developed banks which would sell credits to others for profit. This approach is being explored in Virginia but as yet is not a reality.

Wetland banking to date has been conducted primarily by state highway agencies with most other banks being developed by other segments of state or local government. The private sector has shown increasing interest in this management option but to date few

Figure 4. Five-year-old planted marsh.

permits have been granted and there are many issues to be resolved concerning the sale of credits, the location and design of banks and their specific operations. Many agencies are highly reluctant to permit the loss of a segment of a natural wetland with no guarantee that the created bank system will replace the lost wetland value(s). Banking can only work in a coherent regulatory context since demand for compensation credits is created and maintained only by regulatory action. The economics of banking and therefore its success can only occur where demand can be anticipated with a reasonable degree of certainty.

Wetland banking will only be successful from an environmental perspective if it is planned and designed within an holistic ecological framework. A functional goal reaches its maximum potential within a landscape context and banking must be viewed on this scale if it is to have reasonable expectations of success. Any wetland siting action, but particularly banking sites, due to potential size factors, must be located within a landscape context. For example, if the watershed from which a wetland is being lost contains a large segment of heavily grazed pasture or feedlots, then the siting of a bank or other wetland where it will receive the runoff from such areas, creates the greatest potential good or service value for the compensation. This is also where wetland mitigation banking achieves its highest potential relative to other forms of compensatory mitigation.

The economies of scale, among other factors, give mitigation banking a relatively high potential for success compared to the piecemeal actions of day-to-day permitting. Banks may well be better planned, developed and managed since they will be larger and there will be a direct economic incentive involved. Additionally, they offer the potential to provide "up front" compensation and their size alone may give them an inherently larger natural ecological value. Long term monitoring, which should be required for large creation activities, may advance our knowledge of wetlands systems and the manipulation of specific wetland function within the context of management goals and objectives.

Banking is not without its potential disadvantages, however. It is possible to make large ecological investments without offsetting returns if a bank fails for either economic or ecological reasons. To reach its greatest potential a bank developer requires both a complete knowledge of wetland creation/restoration and an understanding and utilization of landscape relationships. Successful banking will also require a stable regulatory framework, guarantee of a long term operating structure. This may be difficult to achieve given the historical fact of political volatility, which is often reflected in the regulatory sector. Ultimately, wetland mitigation banking requires resource managers to believe that the profit motive is capable of utilizing and advancing the state of our knowledge of wetland creation and restoration. Additionally, they must believe that wetland function can be replaced and that landscape scale planning can help large created systems perform functions such as pollutant capture at least as well as natural systems. At the same time, the entrepreneurs must see enough profit potential to agree to future regulatory requirements which may necessitate their acquisition of large land tracts, banks planned and constructed around watershed scales and needs and finally, the development of large continuous wetland tracts or greenways.

In summary, wetland mitigation banking may have the greatest potential within the scientific context to offset many adverse effects of wetland loss due to development. At the same time, it also offers the greatest potential risk of uncompensated resource loss and the potential for abuse. At the present time, it appears that banking will get the opportunity to operate within a mitigation context. Whether its potential is realized or not must await future policy decisions and events.

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