CHAPTER 7

# Wetland Mitigation Banking

**Michael S. Rolband, Ann Redmond, and Tom Kelsch**

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Mitigating the environmental impacts of necessary development actions on wetlands and other aquatic resources is a central premise of wetland regulatory programs. Offsetting losses through the restoration or creation of replacement wetlands has been promoted as a way to achieve a goal of no net loss of remaining wetland resources while still permitting unavoidable impacts to occur. As evidenced by recent studies, however, the effectiveness of on-site compensatory mitigation efforts has produced mixed results. Success rates range from 27 to 50 percent, due in part to 22 to 34 percent of the mitigation projects never being built (Redmond, 1991; Gallihugh, 1998; DeWeese, 1994; Brown and Veneman, 1998).

In response to problems associated with individual mitigation efforts, there has been growing interest in the concept of mitigation banking. Mitigation banking refers to the restoration, creation, enhancement, and, in certain circumstances, the preservation of wetlands, for the purpose of compensating for multiple wetland losses in advance of development actions. It typically involves the consolidation of small, fragmented wetland mitigation projects into one large contiguous site. Units of restored, created, enhanced, or preserved wetlands are expressed as credits which may subsequently be withdrawn to offset debits incurred at a project development site.

Mitigation banks provide greater flexibility to landowners needing to comply with mitigation requirements and can have several advantages over individual mitigation projects. To the advantage of permit applicants, mitigation banks may reduce permit processing times and provide more cost-effective compensatory mitigation. Most permit applicants do not wish to become wetland experts, but rather they are simply seeking authorization to move forward with their development projects. Through the purchase of credits from an approved mitigation bank, these applicants can transfer the responsibility for providing mitigation to an entity who has the expertise, resources, and incentive to ensure that the mitigation is ultimately successful.

Mitigation banking also enhances the effectiveness of wetland protection programs. The environment benefits from consolidation of compensatory mitigation into a single large parcel, or contiguous parcels, that maximize the opportunity to successfully restore important wetland functions. Establishment of a mitigation bank often involves financial resources, planning, and scientific expertise not practicable to many project-specific compensatory mitigation proposals. Consolidation of resources can increase the potential for the establishment and long-term management

of successful mitigation. Also, mitigation banking typically ensures that compensatory mitigation is implemented and functioning in advance of project impacts. This reduces temporal losses of aquatic functions and uncertainty over whether the mitigation will be successful in offsetting project impacts.

Finally, consolidation of compensatory mitigation within a mitigation bank increases the efficiency of limited regulatory agency resources. The review and compliance monitoring of mitigation projects is improved and, thus, agency ability to ensure the success of efforts to restore, create, or enhance wetlands for mitigation purposes is improved.

## BACKGROUND

The concept of mitigation banking in the United States dates back to the early 1980s when resource agencies, and some in the regulated community, were looking for ways to mitigate wetland impacts more efficiently and effectively. A 1988 U.S. Fish and Wildlife (USFWS) report profiled 13 mitigation banks that were in existence at the time (Short, 1988). Many of these banks were established by enterprising individuals who saw the opportunity to establish joint partnerships to protect and restore priority wetlands using funds from ports, transportation agencies, and others who needed to offset unavoidable impacts. These early efforts were initiated in the absence of any federal or state policies on how to establish mitigation banks.

In 1991, in response to a request by Congress, the Corps of Engineers Institute for Water Resources, in collaboration with the Environmental Law Institute and others, initiated a comprehensive study of mitigation banking. The purpose of the study was to determine the potential of mitigation banking for achieving established wetland goals and to determine the applicability of mitigation banking to the U.S. Clean Water Act Section 404 regulatory program. The study included a critical review and evaluation of existing mitigation banks and an analysis of the economic, policy, and other institutional issues affecting banking (Reppert, 1992).

The study identified 40 mitigation banks in existence, and another 60 banks that were under development or being considered for approval. An increase in the development of mitigation banks from 1988 to 1992 was the result of state departments of transportation recognizing the ecological, economic, and administrative benefits of consolidating mitigation efforts. The increase in banks was also instigated in part because the 1991 Intermodal Surface Transportation Efficiency Act specifically authorized the use of federal funds for such purposes.

Virtually all of the existing banks identified in the Institute for Water Resources study were single-user banks—banks established by a public agency or private company to satisfy their own mitigation needs. Of those banks under development, however, the survey identified several commercial banks whose intent was to offer mitigation credits for sale to the general public. Local agencies, private entrepreneurs, and joint ventures between government agencies and private entities sponsored the commercial bank proposals. The Environmental Law Institute in a 1994 study also noted the trend toward commercial banks.

Another important finding of the mitigation banking study was the need for a specific policy providing ecological, economic, and legal standards for the establishment and use of banks. A policy would reduce uncertainty, and in so doing, encourage further investment. At the federal level, the Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (USEPA) first acknowledged the potential role for mitigation banks in the Section 404 regulatory program in their 1990 Memorandum of Agreement (MOA). In discussing options for providing compensatory mitigation, the memorandum indicates that use of mitigation banks may be acceptable where a bank has been approved by the agencies.

In November 1995, the Corps, USEPA, USFWS, National Marine Fisheries Service, and Natural Resources Conservation Service issued the *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks*. This policy statement details the terms and conditions under which the agencies may approve a mitigation bank for use as compensatory mitigation within the Section 404 regulatory program and the Swampbuster provisions of the Farm Bill.

Mitigation banking has been endorsed by both the Bush and Clinton administrations within their comprehensive plans for reforming federal wetland programs. Moreover, Congress has entertained several legislation proposals to promote the use of mitigation banks. In 1998, Congress passed a new transportation bill (TEA-21) that provides further support for the use of mitigation banks to offset wetland impacts that result from transportation projects.

In addition to the federal policy, approximately 20 states have established, or are in the process of establishing, policies on mitigation banking. While many of these policies are generally consistent with the federal policy, each is tailored to the unique regulatory requirements of state wetland legislation and is responsive to particular regional conditions.

The interest in establishing mitigation banks appears to be increasing, owing in part to the release of federal and state policies. In 1994, the Institute for Wetland Resources identified 46 existing wetland banks in the United States. Only 1 of these 46 was a privately owned bank offering credits to the general public (Environmental Law Institute, 1994). By 1998, the Corps identified over 200 mitigation banks that were either approved or under agency review. Of these 200, approximately 40 existing banks and 75 proposed banks were private commercial banks (unpublished Institute for Wetland Resources survey). Other banking trends include the increased use of mitigation banks as a watershed management tool and the use of mitigation credits for other environmental programs such as endangered species and water quality programs.

## REGULATORY CONTEXT

In the United States, Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities typically regulated under this program include fills for development, water resource projects such as dams and levees, infrastructure

development including highway and airport construction, and conversions of wetlands to uplands for farming or forestry.

In 1990, the Bush Administration implemented the *Memorandum of Agreement between the Department of the Army and the Environmental Protection Agency Concerning Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines* (USEPA, 1990). The Mitigation MOA establishes criteria that must be satisfied before a dredge and fill permit can be obtained from the Corps. First, all practicable steps to avoid wetland impacts must be undertaken by evaluating less damaging project alternatives. Second, applicants must minimize potential impacts to wetlands. And finally, all remaining, unavoidable impacts must be offset through compensatory mitigation. Compensatory mitigation includes the restoration of historic or degraded wetlands, the enhancement of functions of existing wetlands, the creation of new wetlands from uplands, or, in exceptional circumstances, the protection of existing wetlands through acquisition or conservation easement.

As clarified in the Mitigation MOA, there is a preference for compensatory mitigation to be located on-site or as close to the impact site as possible. In this way, environmental impacts to local flooding, water quality, fish and wildlife habitat, and other public interests are minimized. In addition, there is a preference that mitigation be in kind, that is, of the same habitat type as the wetlands to be impacted to ensure the mitigation provides similar functions and values. These preferences notwithstanding, the Mitigation MOA also identifies mitigation banking as an option for offsetting unavoidable impacts.

On August 24, 1993, the White House Office on Environmental Policy issued a comprehensive plan for reforming federal wetland programs. Regarding mitigation, the plan acknowledges that the aforementioned sequential criteria constitute a logical, predictable, and reasonable framework and that mitigation banking is appropriate in some circumstances. The plan suggests Congress should endorse banking as a compensatory mitigation option under the Section 404 regulatory program.

As an outgrowth of the interagency wetland plan, on November 28, 1995, the Corps, the USEPA, the Natural Resource Conservation Service, the USFWS, and the National Marine Fisheries Service issued a Memorandum to the Field titled "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks" (U.S. Army Corps of Engineers et al., 1995). The "Guidance" encourages mitigation banking as an alternative under the Mitigation MOA. The "Guidance" states that mitigation banking is appropriate when compensation for permitted impacts *cannot be achieved at the development site or would not be as environmentally beneficial.*

Under the terms and conditions of the Guidance, applicants for a Section 404 dredge and fill permit may seek approval from the Corps to compensate for unavoidable impacts through the purchase of credits from an operational mitigation bank. In such circumstances, the Corps may approve use of the mitigation credits where on-site mitigation is not practicable (i.e., available and capable of being done) or use of the bank is environmentally preferable to other mitigation options. Moreover, the agencies have established a general preference for using mitigation bank credits to offset minor impacts associated with activities authorized under nationwide and other general permits. Nationwide and general permits are designed to facilitate decision making on relatively small-scale projects and for impacts typically associated with

linear projects such as road development or utility line installation. Upon authorization by the Corps, the legal responsibility for providing mitigation is transferred to the mitigation bank sponsor through the sale of mitigation credits.

In addition to regulation at the federal level, some states have promulgated regulations on mitigation banking (Table 1). Regulation by states has the effect of applying the philosophy and needs of the region to the practice. There are no cases (as of April 1999) where state law alters the existing federal regulations. In all cases, mitigation banking is one tool in the mitigation toolbox.

## The Banking Process

A bank sponsor, who proposes to establish and operate a mitigation bank, initiates mitigation banking. Pertinent regulatory agencies form a mitigation bank review team (MBRT) to work with the bank sponsor. In the United States, the mitigation bank review team typically consists of an interagency group of federal, state, tribal, and/or local regulatory and resource agency representatives. The sponsor will discuss the concept with the MBRT in a pre-application meeting, thereby providing early feedback for the banker as to whether the concept appears viable. The MBRT members may also have knowledge of the project area that will assist the banker in its decision to move forward with the concept. For example, there may be a proposal to build a wellfield proximal to the proposed bank site that would likely affect hydrologic restoration. Alternatively, there may be a recent or pending designation of the area as being of significant conservation interest, to which the bank can then contribute.

A prospectus describes the proposed project, and in permitting parlance would constitute a permit application. In the early stages, the prospectus will normally be presented at a conceptual to moderate level of detail, depending on the region or project. Once the proposed bank has been deemed appropriate, then the final details are developed and provided to the MBRT.

An accepted prospectus becomes a Mitigation Banking Instrument (MBI). The MBI is developed by the bank sponsor, in consultation with the MBRT, and submitted to the MBRT for review and approval. The role of the instrument is to authorize the mitigation bank project. The instrument includes a preamble describing the project and sections regarding the establishment, operation, maintenance, and monitoring of the project. If a Section 404 permit is also required, the permit is issued as a separate authorization. Because of the importance of these projects, all MBIs must be publicly noticed. The Institute for Water Resources (1996) has developed a model MBI.

The MBRT continues to oversee the project once the mitigation bank has been approved and implemented. The operational phase of the project will continue for years, until the project has been declared ecologically successful and transitions to the long-term management phase. During this phase, the sponsor preserves the project site, completes the physical site work, markets, sells, or uses the credits, and monitors and maintains the site. The MBRT reviews the monitoring reports, performs compliance inspections, approves the release of credits, and approves the use of credits for the offset of permitted impacts. The mitigation bank is then debited an

Table 1 Examples of State Wetland Banking Regulations

| State | Wetland Banking | | Use of Credits | Mitigation Type | | Management | Land |
|---|---|---|---|---|---|---|---|
| Florida | Department of Environmental Protection and the 5 regional water management districts (Chapter 62-342, Florida Administrative Code) | Private or public | Some advance credits may be available; credit releases are made with increasing function at the site; some credits are withheld until success | Restoration of native, pre-existing habitats is preferred | Credit assessments are made using a functional assessment methodology | Perpetual management is required and must be endowed prior to the sale of credits | State lands are prohibited for use as mitigation banks |
| Hackensack Meadowlands District, New Jersey | Interagency Compensatory Wetland Mitigation Agreement (Corps, EPA, NJDEP, Hackensack Meadowlands commission, NMFS and FWS) | Private or public | Possible to obtain umbrella agreement for establishment and operation of multiple bank sites; some advance use of credits may be approved; preservation credits available once site is preserved | Wetland restoration, creation or enhancement may be used; uplands within the bank site may be assigned credit | Compensation amounts for the offset of impacts is decided on a case by case basis | Endowed perpetual management is required | Public or private lands may be used |
| Louisiana | State's Coastal Zone | Private or public | Preservation and financial assurances are required for advance credits; preservation is for 20 yr for marshes and 50 yr for forested wetlands | Wetland restoration, creation, enhancement, and protection may be used | Credits are assessed using a functional assessment procedure; compensation amounts for the offset of impacts is decided on a case by case basis | | Public or private lands may be used |

Table 1 (continued) Examples of State Wetland Banking Regulations

| State | Wetland Banking | Mitigation Bankers | Use of Credits | Mitigation Type | Credits | Management | Land |
|---|---|---|---|---|---|---|---|
| Maryland (non-tidal) | | Private or public | Up to 50% of the credits may be available for use in the first two years after construction when the site has been preserved in perpetuity, construction is completed, and the bonding requirements (private banks only) are met; subsequent credit releases are made based on demonstrated increases in function at the site | | | | State lands may be used |
| Maryland (tidal) | Department of the Environment (COMAR 26.24.05.01.B(9) in consultation with local, state, and federal agencies | | No specific regulations on mitigation banks | | | | |
| North Carolina | Federal guidance; state provides its assent by signing the Mitigation Banking Instrument | Private | Mitigation via payment to a trust fund for those permit applicants requiring a 401 water quality certification | | No specific state provisions governing credit release, perpetual management, financial assurances, service areas, or credit assessments for impacts | The state regulations require "adequate, dedicated financial surety" exists for the perpetual land management | Public or private lands may be used |
| Virginia (nontidal) | Does not specifically regulate wetlands banking; regulations establish maximum service area size for banks approved in accordance with applicable federal and state guidance, laws, or regulations | | Department of Environmental Quality (DEQ) authorizes permits to use nontidal wetland banks | Uplands within the bank site may be assigned credit; wetland restoration, creation, enhancement, and protection may be used | No specific state provisions governing credit release, perpetual management, financial assurances, service areas, or credit assessments for impacts | | Public or private lands may be used |
| Virginia (tidal) | Virginia Marine Resource Center (VMRC) and Virginia Institute of Marine Science (VIMS) | Private or public | Sequencing is required prior to authorizing the use of an approved bank as compensation from permitted wetland losses | Generally habitat restoration or creation; also enhancement or in exceptional circumstances, preservation | Credit assessments are made using the Function Specific Credit Calculation methodology; performance standards are used to determine credit availability and bank success | Provisions for long-term management and maintenance are required | Public or private lands may be used |
| Washington | Federal guidance, state rules expected by December 1999 | Private or public | Use of credits prior to meeting all performance standards is allowed | Wetland restoration, creation, enhancement, and preservation may be used, though restoration is preferred | Long-term management and financial assurances are required | The state Department of Ecology and local governments will be signatories to the banking instruments | |

amount representing the loss of wetland functions at the impact site. The permit applicant financially compensates the bank sponsor in exchange for allowing its bank to be debited.

The bank should be protected and managed over the long term after it has been declared successful. The bank must be legally protected from other future land uses through a conservation easement or similar mechanism. The sponsor is responsible for assuring the financial stability of the bank project over the long term. This necessitates appointment of a long-term manager. This may be the sponsor or another entity, such as a public land manager or environmental organization.

## Types of Wetland Mitigation Banks

The type of sponsor and the operational use can characterize wetland mitigation banks. Sponsors include governmental or quasi-governmental agencies, nonprofit organizations, conservation groups, and private for profit companies. Operational uses include single user and open market sales. The two major types of banks are dedicated banks and commercial banks.

Dedicated banks are typically created to compensate for a specific type of activity by a single entity. Dedicated banks include industrial banks—banks created by agreement or permit to mitigate for a specific user impact in a geographic area by a private company. An example of an industrial bank in the United States is the Tenneco LaTerre (Reppert, 1992), a bank sponsored by a private corporation, Tenneco LaTerre, for the purpose of mitigating wetland losses occurring from its oil and gas exploration activities in Louisiana coastal marshes. Another example is the Sunrise Valley Nature Park, a bank that consolidates mitigation for impacts on various separate parcels owned by Mobil Land Development Company in Reston, VA.

Another type of dedicated bank is a public works bank. State highway departments, port authorities, or local governments for the purpose of providing mitigation for public works projects sponsored 75 percent of the 46 banks identified by the Corps Institute for Water Resources in 1994.

Commercial banks are established by entities whose wetlands credits are available for purchase on the open market by unrelated entities who need wetlands compensation for permitted wetlands impacts. Several types of commercial banks exist. Private entrepreneurial banks create wetland credits and sell them at a profit sufficient to produce an economic return commensurate with the risk undertaken. Nonprofit banks provide mitigation for various activities to achieve a particular ecological and/or economic objective. Credit prices are set so that the sponsor can recover only the costs of the mitigation. For example, the Ohio Wetlands Foundation, a nonprofit group formed by members of the Ohio Homebuilders Association, created a mitigation bank so that builders could have a source of wetland credits and solve an industry problem in a specific geographic area. Governmental banks are banks established by a governmental agency (typically a local government agency) to create mitigation and cover its costs from sales to mitigate for impacts by other governmental or private entities.

## PERSPECTIVES ON MITIGATION BANKING

### Ecological Perspective

Mitigation banking offers several ecological advantages compared to other mitigation vehicles. Many of the regulations governing mitigation banking require that sites be managed over the long term. Therefore, an important evaluation criterion of the mitigation bank planning and approval process is the long-term viability of the site. Long-term viability must be assessed within the context of expected changes in the site's landscape setting. An assessment of this type typically receives less attention in other mitigation planning.

Mitigation banking typically consolidates many smaller mitigation obligations into one moderate to large site. Larger sites are more likely to provide significant wetland functions and values than smaller sites. Because banks are typically larger projects than project-specific mitigation, they often include adjacent upland communities. This results in a natural mosaic of upland and wetland in the landscape, increasing the function and value of the wetland and adjacent areas. Also, the relatively large size of mitigation banks facilitates their contribution to watershed-based planning efforts.

Mitigation banks typically provide compensation in advance of impacts, meaning that there is little temporal loss in function and value. By contrast, traditional on-site or off-site mitigation is typically implemented or functioning after project impacts occur. This is particularly true of in lieu fee programs, wherein impacts are offset by payment to a management program or conservation organization. As a consequence, temporal losses of functions and values routinely occur. In cases when mitigation fails, function and value losses may be permanent.

One disadvantage of mitigation banks is that they do not replace lost functions and values at the point of impact. As such, in cases where on-site mitigation would be viable, that option should be given strong consideration in advance to reduce the local ecosystem impacts. Certain wetland functions, such as flood storage and attenuation and water quality, may not be transferable off site. In some states, such as Florida, nontransferable functions and values are handled separately to ensure their appropriate resolution.

### Regulatory Management Perspective

Mitigation banks can also enhance the effectiveness of wetlands protection programs. U.S. federal guidance mandates a team approach to the assessment of mitigation banking proposals. This approach brings the regulatory and commenting agencies to the same table, with the result that all agencies can contribute their expertise and perspective to the project review. This results in a more meaningful review of the bank proposal and can act to shorten the processing time. The review of one large mitigation proposal is more efficient than the review of numerous, project-specific mitigation proposals. A potential disadvantage of this process is the ability of the team to meet. Limited budgets can limit travel, and coordinating

multiple schedules can be difficult. Reaching consensus on the terms and conditions of the MBI, as is encouraged by the Federal Guidance, can also be a difficult and time-consuming process.

Establishment of a mitigation bank involves financial resources, planning, and scientific expertise at a level not practicable to many project-specific mitigation proposals. Consolidation of resources increases the potential for the successful establishment and long-term management of the mitigation project.

Finally, consolidation of mitigation within a bank increases the efficiency of limited agency resources for inspection and compliance monitoring. This improves the agency's ability to ensure the success of efforts to restore, create, or enhance wetlands for mitigation purposes.

### User Perspective

Most permit applicants do not wish to become wetland experts but are seeking authorization to move forward with their development projects. Mitigation projects may be implemented by people whose main expertise and incentive lies in an unrelated area, such as housing development or highway construction. By contrast, mitigation banks are typically sponsored by organizations whose staff is devoted to implementing successful mitigation projects. A successful banking team provides the permit applicant with the talent and expertise necessary to ensure that the environmental goals set forth in a permit will be achieved.

Mitigation banking offers several other advantages to the user. The mitigation plan already has been approved by the agencies, so the time required reviewing and approving a permit is substantially reduced. Purchasing credits from an approved mitigation bank transfers the liability for mitigation success from the user to the banker. The use of credits from a mitigation bank is generally cost competitive with on-site mitigation. By contrast, the costs of implementing successful on-site mitigation may be considerable and open-ended.

## ECONOMICS

The primary economic issues faced by the sponsor of a mitigation bank resemble those of any business with a product for sale, particularly the real-estate development industry. The product a bank sponsor offers is not necessarily a functioning and valuable wetland, but a mechanism that allows a bank user to impact wetlands elsewhere. The goal of the user is more likely to be houses, highways, utility corridors, or some other development or development-related activity. However, mitigation banks are somewhat unique in that the sale of credits produces parks and greenways that provide societal benefits to people other than the bank user.

Several factors must be assessed in order to determine the viability of a mitigation bank (Table 2). Each of the factors that contribute to the economic viability of a wetland mitigation bank can be quantified. However, these factors are extremely variable and volatile, which is why the wetland mitigation banking industry, in its current state of development, is extremely risky. One major element of risk is that

bank demand, product quality, product alternatives, and sometimes price are established or strongly influenced by regulations and policies. These regulations and policies may change frequently and often vary from project to project and user to user.

**Table 2 Factors That Should Be Assessed in Order to Determine the Viability of a Mitigation Bank**

| |
|---|
| Competitive supply of the product and product alternatives |
| Risk assessment and presale of the product |
| Capital and operating costs of product development |
| Long-term stewardship of the product |

## Demand for the Product

The demand for mitigation credits is driven by three primary factors: service area, regulatory climate, and user requirements (Figure 1).

### *Service Area*

The service area is the geographic area in which a particular mitigation bank can compensate impacts to wetlands. Ecological concerns (e.g., mitigating in the same watershed where the impact occurred) tend to constrain the appropriate size of a wetland mitigation bank's service area. Economic concerns dictate that the larger the service area, the more likely it is that the bank will experience a sufficient level of demand to be economically practicable. This is because the larger the service area, all other factors being equal, the greater the number of expected wetland impacts.

### *Regulatory Climate*

Regulatory climate is a term often used to describe how businesses perceive the difficulty of conducting business in a particular location because of local, state, and federal government regulatory agencies. If the regulatory climate is so restrictive that no user in a service area can obtain a permit to impact wetlands, there will be little demand for wetland mitigation credits (Figure 2). Similarly, the regulatory climate may impose mitigation conditions so burdensome (e.g., wetland replacement ratios, performance monitoring, etc.) that impacting wetlands is not cost-effective. Conversely, mitigation requirements may be so minimal that users can satisfy requirements without purchasing credits from a mitigation bank. Thus, the regulatory climate strongly influences the demand for credits generated by economic activity users within a service area. Regulatory decisions in several key areas determine the perception of regulatory climate (Table 3).

#### *Service Area Size*

Free-market advocates suggest that service areas should be unlimited, or at least very large, to encourage maximum levels of competition. This competition could

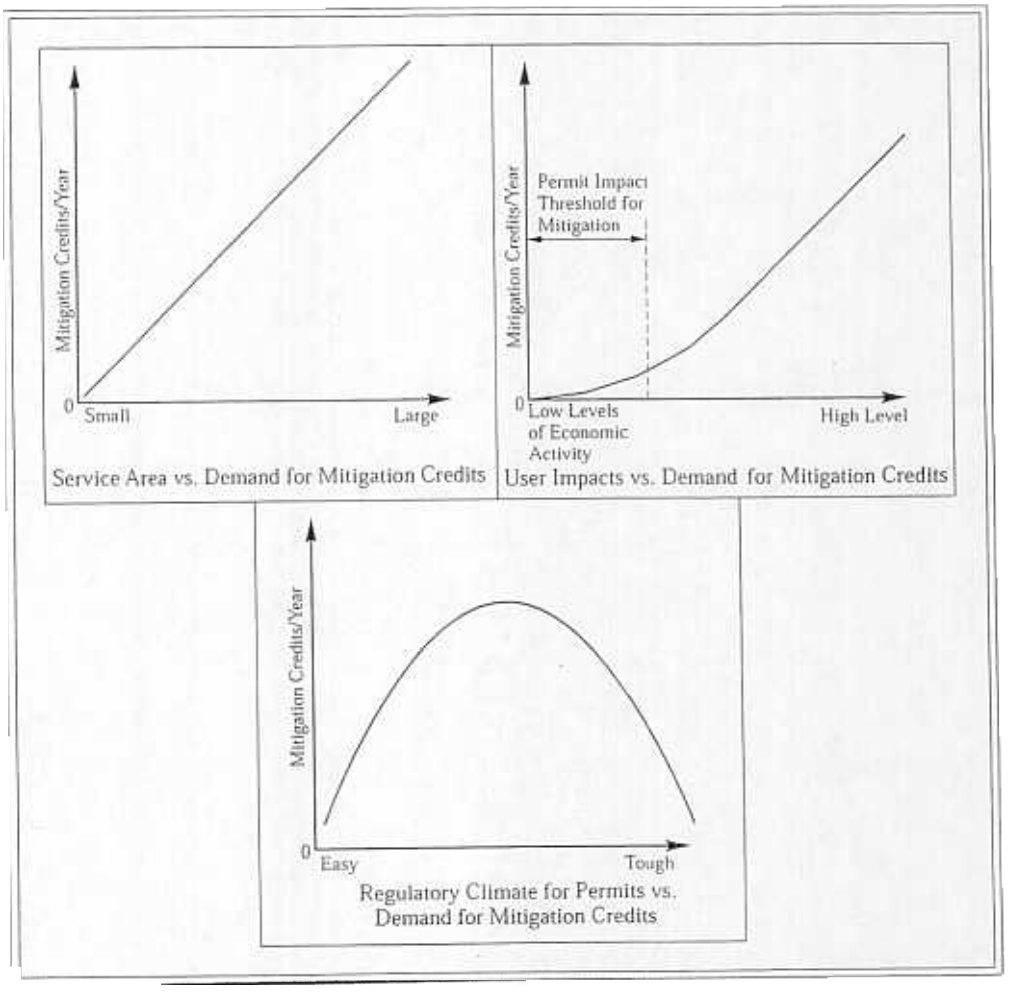


**Figure 1** Demand for mitigation credits vs. service area size, regulatory climate for obtaining permits to impact wetlands, and the level of prospective user impact to wetlands in the service area.

lead to lower prices, and if the quality of created wetland credits was linked to mitigation ratio requirements, to higher quality wetland compensation. However, the current regulatory climate appears to be focusing on limiting service areas to relatively small areas. If the service areas are too small, the economic practicability of wetland banks will be eliminated. For example, the state of Maryland has recently (1993 to 1998) averaged about 15 hectares (ha) of wetland impacts per year and has established 20 service areas. A mitigation bank is unlikely to be economically viable.

### *Mitigation Ratios*

Mitigation ratios are established by regulators to compare functions and values of the impacted wetland to the mitigated wetland. The expected likelihood of success

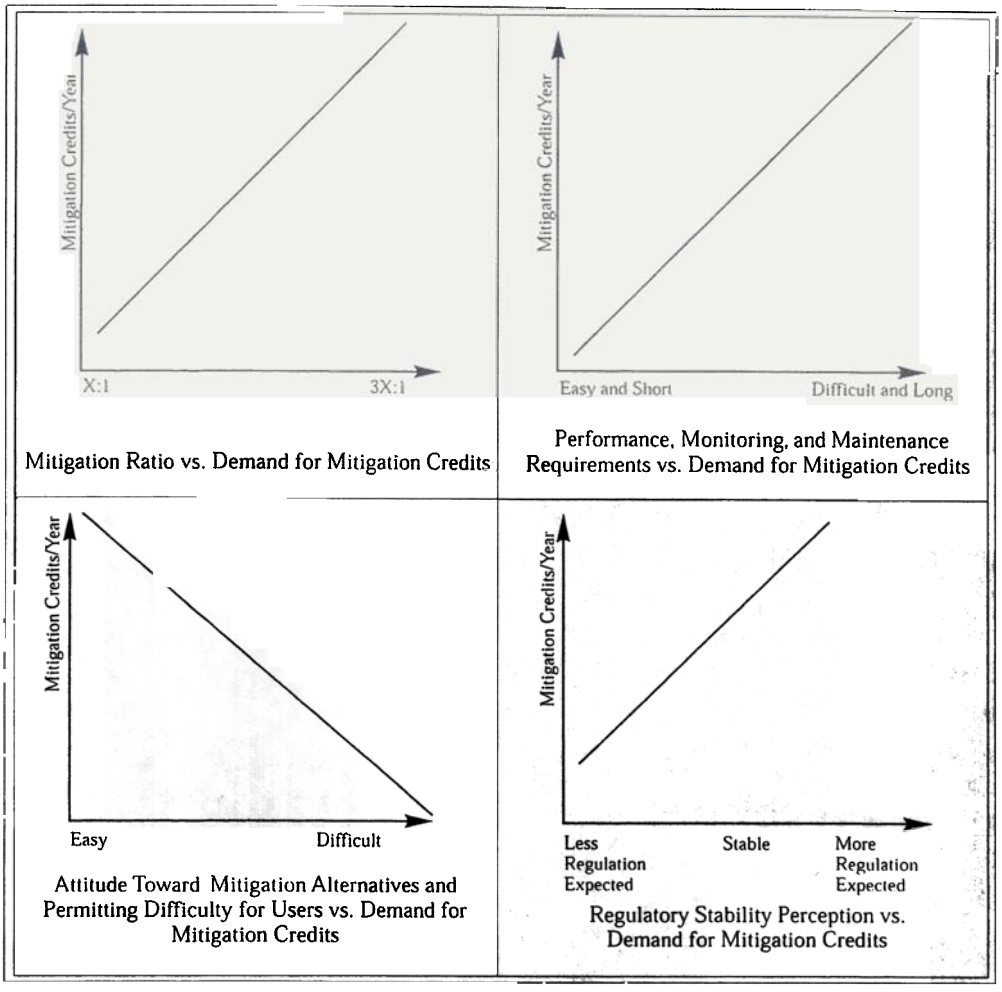


**Figure 2** Regulatory climate factors vs. demand for mitigation credits.

**Table 3 Regulatory Decisions in These Key Areas Determine the Perception of Regulatory Climate for Mitigation Banking**

| |
|---|
| Service area size |
| Mitigation ratios |
| Performance requirements |
| Monitoring and maintenance requirements |
| Permitting difficulty |
| Attitudes toward compensatory mitigation alternatives and determinations of the practicability of avoidance of impacts |
| Regulatory stability |

(i.e., a safety factor) and the temporal loss of functions and values (i.e., the time lag between impact and successful mitigation site completion and maturity) are also considered. In other words, the appropriate (mitigation) compensation ratio is based on the level of functional replacement provided, the speed at which functional replacement is achieved, and the risk that the compensation wetland will not perform as expected (King et al., 1993). Some regulators grant lower mitigation ratios to mitigation banks in recognition of their reduced temporal loss, reduced risk of failure, and greater function and value relative to smaller, discontiguous sites. Other regulators grant the same mitigation ratio to mitigation banks as to other types of mitigation. In at least one instance (Maryland), the mitigation ratio is greater for banks than for other types of mitigation. The latter has the effect of discouraging the development of a mitigation banking industry.

Another aspect of risk involves the predictability of the mitigation ratios. Some regulators are moving toward specific ratio standards for particular types of impacts. Others are moving toward function and value assessment methodologies that are repeatable, predictable, and useful for all mitigation efforts. This minimizes staff demands, maximizes predictability, and ensures fairness for both users and mitigation providers. However, other regulators seem to be moving in the opposite direction by relying on the best professional judgment of the permit project manager for each specific project. This can lead to unpredictable or biased decisions and consume more staff and banker resources.

Regulatory decisions to penalize or reward mitigation banks with higher or lower mitigation ratios are a key indicator of the regulatory climate and are the key determinants of the demand for credits in a service area. The predictability of mitigation ratios by the bank sponsor affects the economic risk and marketability of the bank credits. Once the sponsor of a bank has estimated the projected wetland impacts in a service area over a given time frame, the mitigation ratio must be used to estimate mitigation credits (i.e., mitigation ratio times projected wetland impacts equals the mitigation credits). If the mitigation ratio cannot be predicted, it is difficult to sell the product to a user. This is particularly true if competing products, such as contributions to a trust fund, have a specified payment rate or mitigation ratio. Unpredictability of the mitigation ratio also makes it difficult to develop a sound business plan and economic model for project financing.

### *Performance Requirements*

The demand and cost of creating mitigation credits are affected by the nature of wetland performance requirements. The risk of obtaining performance requirements is related to the specificity of the requirements. For example, if a forested wetland is required to have 12 5-cm-dbh trees and 160 seedlings per ha by the end of the third growing season, the cost can be projected relatively accurately. However, if performance requirements are less specific (e.g., provide forested wetland vegetation), bank construction costs could reasonably be reduced 75 percent by only planting seedlings. The risk is high, however, that a future compliance inspection will determine that performance requirements are not satisfied, and the bank will

not be permitted to sell credits. The inability of the bank to guarantee credits, or credits at a fixed price, will lead potential bank users to develop their own mitigation sites rather than purchase bank credits. Experience has shown that providers of site-specific mitigation rarely suffer hardship due to poor performance.

A linkage between performance requirements and mitigation ratios is logical and could be structured so as to provide economic incentives to achieve the desired outcome of mitigation quality. Unfortunately, at this time, many regulators are not supportive of this practice. Historically, a significant shortcoming of traditional wetland mitigation has been the lack of specific performance requirements. This has led to the low success rate of mitigation projects and a significant number of mitigation projects never being initiated (Redmond, 1991; DeWeese, 1994; Brown and Veneman, 1998; Gallihugh, 1998).

### *Monitoring and Maintenance Requirements*

The demand and cost of creating mitigation credits is affected by the nature, specificity, and duration of monitoring and maintenance requirements. At this time, there are no national or regional standards for these requirements, and extreme variability between projects and locations has been noted. For example, monitoring duration often varies from 5 to 10 years, and the number of vegetation sample plots from 0.4 to 8 or more per ha. The sponsor of a proposed bank must attempt to project these costs in order to complete his business plan. The longer the duration and the more specific the monitoring and maintenance requirements, the greater the demand for credits as most permit applicants prefer to minimize temporal commitments to an individual project.

### *Permitting Difficulty*

There is no demand for credits unless a permit is issued by the appropriate agencies to allow a wetland area to be impacted. There is also no demand for credits if impacts are allowed to wetlands without compensation or the only compensation required is the preservation of the remaining wetland on a project site. Neither situation allows a wetland bank to be economically viable. Therefore, a careful assessment of historical permitting actions and trends is necessary to predict the regulatory climate characteristic to a specific service area.

### *Attitudes about Mitigation Alternatives*

A mitigation bank cannot sell its credits unless the regulatory agencies agree that the credits are appropriate compensation and that on-site alternatives are not ecologically preferable or practicable. Therefore, the demand for credits will depend on whether on-site mitigation is practicable or whether or not alternatives such as in lieu fee programs are deemed preferable. Attitudes appear to differ with geographic and political region.

### *Regulatory Stability*

Wetland regulations in the United States change regularly. If users perceive that regulations will be relaxed, demand will be reduced as some users wait for less restrictive regulations. Conversely, a perception of impending greater restrictions will lead to an acceleration of demand as users try to gain entitlement approvals before permitting requirements increase.

### *User Requirements*

At this time in the evolution of the wetlands banking industry, users simply desire to purchase the quantity of credits required by the regulators for a particular impact. As long as the user, after paying the sponsor, can clearly transfer all wetland performance risk to the bank sponsor, the user has no interest in the quality of the product. In most credit sales, this is the situation. This is not the case in single user banks and in situations where contractually the users share in the risk. User demand for quality could occur where more than one bank exists in the same service area if the quality of wetlands affected the permitting decision. However, as of 1999, there are no reports of quality of wetlands mitigation becoming a permitting factor.

Wetland impacts are the result of development activities. As such, the fundamental determinants of the level of mitigation bank user demand are the rate of economic growth in a given service area, local zoning regulations, and the terms and conditions of wetland permits that authorize wetland impacts. A related determinant is the areal threshold of wetland impact that requires wetland mitigation. The lower the threshold, the greater the mitigation acreage created by users of wetland resources.

## Competitive Supply of the Product and Product Alternatives

The economic feasibility of a wetland bank is dependent upon the availability of compensatory options. The quantity, cost, and regulatory favorability of these options must be assessed and compared to the product offered by the proposed bank to estimate what share of the estimated demand the proposed bank can capture. At some time in the future, regulations may exist that will also require the assessment of the quality offered by these alternative options. However, at this time, it is not an issue in supply or demand analysis for credits.

Options for compensatory mitigation of wetland impacts should be evaluated to determine the economic feasibility of a wetland bank. These options include on-site and off-site opportunities for wetland mitigation, the availability of suitable wetland restoration and creation landforms, existing and proposed wetland banks, and in lieu fee alternatives.

### *On-Site Opportunity for Wetland Mitigation*

The nature of the activities in a service area can create significant opportunities for on-site mitigation. For example, if demand is caused by large planned community

developments in a geographic area that includes broad flat floodplains with substantial areas of prior-converted croplands (PC lands), then it is likely that these projects will have ample opportunity for on-site mitigation. As the land values of these parcels are based upon development yield projections (i.e., how many houses can be built), and houses are not usually allowed in floodplains today, there is no allocated land cost to these potential mitigation areas. Therefore, PC lands can be converted to wetlands with minimal capital costs. In this example, the supply of on-site mitigation opportunities could render a wetland bank economically nonviable.

Alternatively, this could be a fine banking opportunity if a developer used these lands to create a bank sufficiently large to handle his needs and sell credits to others or a banker created a joint venture with the developer using his credit needs as an "anchor tenant." Either way, the availability of on-site opportunities for wetland mitigation greatly influences the economic viability of a prospective bank.

### *Off-Site Opportunities for Wetland Mitigation*

In many areas of the United States in the mid- to late-1990s, developers, wetland consultants, and entrepreneurs have learned that one way to avoid the rigorous review process, performance requirements, monitoring duration, and sometimes greater mitigation ratios of wetland banks was to simply develop off-site mitigation. The economies of scale associated with bank projects are achieved in this case by pooling the mitigation needs of multiple projects in one location, or simply building mitigation areas in phases with savings primarily occurring in the monitoring and maintenance phases.

Areas within the proposed service area that are suitable for easy conversion to wetlands (such as PC lands), and have a low value for other allowable uses, offer a product that could be used instead of mitigation bank credits. If this is also an area where regulators typically impose minimal performance, monitoring, and maintenance requirements, a bank is unlikely to be able to compete against this supply alternative.

In the current regulatory climate, off-site mitigation can save considerable costs. A review reveals that many off-site mitigation sites had a cost advantage over banks because they only required 5 years of monitoring (vs. 10 years in most banks), had less restrictive performance requirements, and had no financial assurance requirements or maintenance funding requirements. If this practice is encouraged in the service area of a proposed bank, the product supply opportunity could render the bank economically nonviable.

### *Other Wetland Banks*

Obviously the quantity and characteristics of credits available from existing wetland banks in the proposed service area, as well as proposed banks, should be determined by contacting the appropriate regulatory agencies. It should be emphasized that wetland banks have developed on an ad hoc basis during the late 1970s to late 1990s. The result is that the agreements that establish these banks are variable, and existing banks could be operating under agreements that give an economic or

marketing edge over new banks. Therefore, characteristics such as mitigation ratios and performance requirements that could favor other wetland banks over the proposed bank in the same service area should be analyzed carefully.

### *In Lieu Fee Alternatives*

In lieu fee alternatives emerged in the late 1990s to become one of the most significant supply threats to the economic viability of wetland mitigation banks. Current regulatory structures have permitted compensation for wetland impacts to be in the form of monitoring fees that do not cover the full costs of compensation. Several U.S. examples illustrate this point. The Bracut Marsh public commercial bank developed by the California Coastal Conservancy is forecasted to recover only 54 percent of total costs at sellout (Environmental Law Institute, 1993). The Fairfax Land Trust accepted a US $315,000 payment to purchase and preserve a ±28 ha tract of wetlands to mitigate for 3 ha of forested wetland impact at the Stafford County, VA, Airport. The Trust had no funds remaining after the transaction for taxes and long-term maintenance and monitoring, and relies upon public donations to fund its operation (Hal Wiggins, personal communication). In the Chicago area, in lieu fee alternatives virtually stopped mitigation credit sales in late 1998 by charging significantly less than the credit costs of private banks (John Ryan, personal communication).

Another advantage of in lieu fee programs is that many do not face the compensation timing constraints and service area restrictions endorsed by banks. Regulatory pressure usually minimizes the presale of mitigation credits which exposes private banks to the difficulty of raising capital and the risk of exposing capital. Regulatory pressure, environmental groups, some state laws, and federal guidance restrict the service areas of banks. Presale restrictions increase the risk and cost of credit production and increase capital needs, while service area requirements reduce the demand for credits for specific banks. Therefore, in lieu fee programs that do not face these restrictions can gain an economic edge. For example, one Nature Conservancy Trust Fund agreement with the Corps allows the Fund to collect fees from anywhere in Virginia, and expend the funds on preservation, restoration, and creation projects anywhere in the state. By contrast, a state law requires mitigation bank service areas to occur in the hydrologic unit code (HUC) of the bank or on an adjacent HUC within the same rivershed of the bank. The Trust also had the advantage of establishing fees on an impact-by-impact basis and operating without any specific, published monitoring and maintenance requirements.

The Norfolk District of the Corps has recognized the potential economic edge for in lieu fees and has established fees at the same (or greater) prices charged by mitigation banks. By contrast, the Chicago Corps District had nine permitted and successful wetland banks by the end of 1998. The recent expansion of the in lieu fee program, in conjunction with a nonprofit organization known as Corlands, has almost eliminated bank credit sales. The Corlands program has several advantages over mitigation banks, including no assumption of risk, no specific performance requirements, lesser service area restrictions, and no timing restrictions. Also, Corlands pricing does not cover all direct project costs, and some monies are directed toward studies rather than restoration and creation of resources. The Savannah Corps District

has handled these competitive problems by allowing the use of in lieu fees only in those service areas that do not contain an operating wetland bank (Ryan, 1998).

At this time, U.S. federal regulators appear to have no consistent policy relating to in lieu fee programs, although Corps, USEPA, and USFWS officials have discussed this issue in public forums. As of May 1999, an interagency policy memorandum on this topic was still being negotiated.

## Risk Assessment and Presale of the Product

Ecological concerns about the success of mitigation bank developments cause some regulators, environmental groups, and policy makers to substantially limit or prohibit presales of credits and, in some cases, call for no sales until after 5 or 10 years of successful monitoring. In lieu fee programs and traditional on-site or off-site mitigation programs typically do not face this requirement.

An intriguing issue is the role of the U.S. federal government in determining presale requirements. The development of a wetland bank is a real estate development project, with a relatively unique product. While the agencies involved in mitigation banking limit the amount of presales for mitigation bank credits, other federal agencies involved in the financial banking industry have placed extreme pressure on financial institutions that provide federally guaranteed deposits to minimize lending exposure to speculative real estate ventures. They do this by requiring substantive (i.e., 50 percent or more) presales or preleasing. These agencies have learned that development projects without substantial precommitments from users have a high likelihood of economic failure because expected future demands do not always materialize at the projected time or price.

At this time, the regulators of mitigation banks rarely make the connection between economic and ecological success. Most mitigation bank regulators focus on minimizing presales, yet the mitigation option that is stated as being the most ecologically preferred, on-site mitigation, is a 100 percent presale.

Every dollar of funds raised by the presale of credits reduces the capital required to develop a mitigation bank. Rarely have traditional commercial lenders financed private banks as bank development activity is considered extremely risky. Venture capitalists and speculation investors, expecting rates of return in the 30 to 45 percent range, have been the primary capital sources to date. The availability of capital from presales can dramatically reduce the amount of capital required to be raised and, thus, reduce the cost of the project by reducing the investment return required.

Pre-sales decrease the market risk and reduce exposure to regulatory climate risk. As the projected length of time that a project sell-out period increases, so too does the risk premium necessary to compensate investors for this exposure. For example, the possibility exists that changes to the definition of wetlands areas may cause some isolated wetlands to be nonjurisdictional (Lazarus, 1998). Other recent court rulings may cause certain activities in wetlands to no longer require mitigation (Lee, 1997; McElfish, 1997). These actions could clearly reduce mitigation bank credit demand.

From the previous discussion, it is evident that delaying the timing of credit sales increases the risk and the cost of mitigation. This increases the break-even

sales price and must be factored into any economic analysis of a prospective bank. Figure 3 illustrates the effect on credit prices for a hypothetical conversion of prior converted cropland from credit sale delays on the break even sales price (Shabman et al., 1998). This dramatic example may actually underestimate the effect of postponing sales in today's economic climate. An investment rate of return of 35 to 45 percent is typically required by potential bank investors to account for the cost of money, risk level, and alternative investment opportunities.

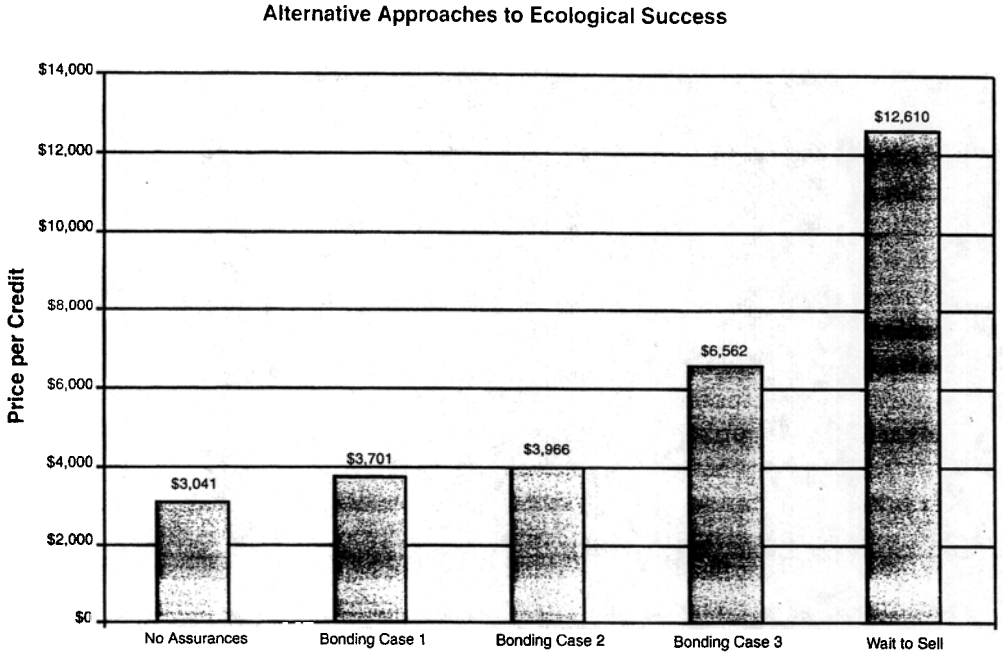


**Figure 3** Wetland credit prices under alternative scenarios for ecological success (given 20 percent target rate of return) for prior converted cropland conversion. No Assurances—30 percent of credits sold during the construction year, balance sold over the next 12 years, no bond. Boding Case 1—Same sales rate as no assurances, but performance guaranteed by a surety bond. Bonding Case 2—30 percent of credits sold in the first year after construction, balance sold over the next 11 years, performance bonded. Bonding Case 3—30 percent of credits sold in the fifth year after construction, balance sold in the next 7 years, all bonded. Wait to Sell Case—no presales, 30 percent of credits sold in the 10th year after construction, balance sold in the next 2 years. (Adapted from Shabman et al., 1998. With permission.)

## Revenue Projections

Assessing the economic viability of a proposed bank requires a projection of revenues. The prospective banker must project the rate at which credits can be expected to be sold over time and the price at which credits can be sold. The competitive supply of the product and product alternatives, and expected presale restrictions, will affect the projection.

The projection typically exhibits an inverse relationship between sales rates (or assumption of the product) and sale price. Local knowledge of mitigation costs, land

costs, and development pressures is necessary to make such projections. Revenue expectations vary widely throughout the United States (Table 4). By comparison, wetland mitigation costs for highway projects in the mid-Atlantic States have often exceeded US $272,000 per ha (Dennison and Schmid, 1997). As for any product, classical supply/demand relationships will determine the appropriate price of mitigation credits. Figure 4 illustrates the supply and demand relationship relative to credit price (Shabman et al., 1994).

**Table 4 Reported Mitigation Credit Sale Prices (US$ per ha) throughout the United States**

| State | Credit Sale Price | Date | Source |
|---|---|---|---|
| Louisiana | 3,500–12,400 | | Michael Henry, Hydrik Consulting |
| Ohio | 29,700–39,500 | | Tom Sutliff, Ohio Wetlands Foundation |
| Georgia | 60,000–80,000 | 1999 | Art Berger, Wet Inc. |
| Florida | 118,600–148,300 | 1998 | Ann Redmond, Florida Wetlands Bank |
| Central Virginia | 148,300–197,700 | 1998 | Mike Kelly, Williamsburg Environmental |
| Northern Virginia | 197,700–308,900 | 1998 | Michael Rolband, Wetland Studies and Solutions, Inc. |
| New Jersey | 370,700–494,200 | 1998 | Bob Sokolove, U.S. Wetland Services |
| Washington | 617,800 | 1999 | Steve Johnson, Paine Field |

## COSTS OF MITIGATION BANK DEVELOPMENT

Costs must be estimated for the specific project to determine whether it is feasible after assessing the demand for mitigation credits and the likely sales price for these credits. Land development costs, including mitigation bank development costs, usually fall into three categories: land costs, hard costs, and soft costs.

### Land Costs

Although land costs can be a relatively small portion of a development project's total cost, the costs are always extremely site specific and may vary considerably. Mitigation banking costs are no different. Therefore, the particular land selected for acquisition has an enormous influence over the costs of the project. For example, prior converted cropland has relatively low conversion costs. Sometimes only plugging drains is necessary to restore wetland's hydrology. Costs can be enormous if the site requires extensive cut and removal of soil and rock, followed by topsoil replacement. Alternatively, the sale of these materials could pay for the entire mitigation project if the material removed is quality sand and aggregate. Often an entire tract must be purchased, but only a portion can be utilized as a wetland bank, causing an increase in the net land cost per wetlands area of creation.

As wetland mitigation becomes more common, landowners and realtors are realizing that land easily convertible to wetlands may have a higher value under that

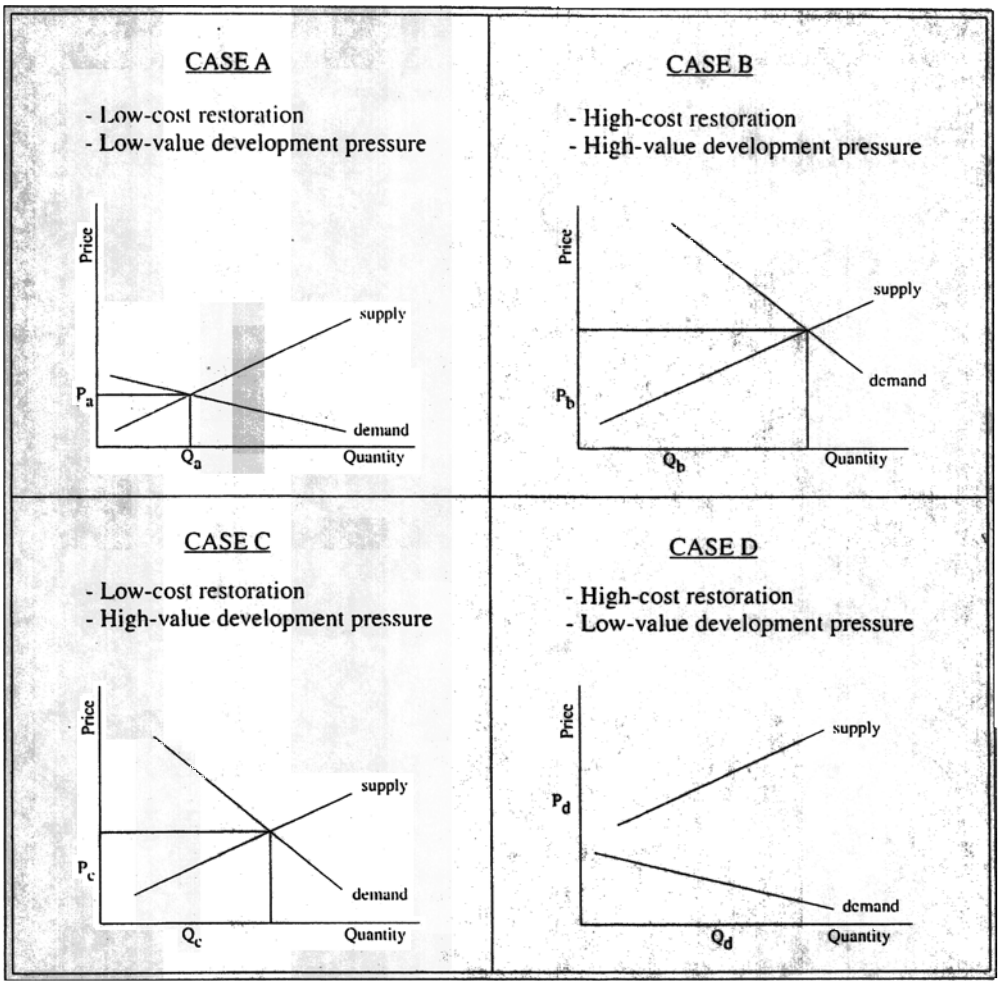


**Figure 4** Regional economic effects on the potential for mitigation credit markets. (Adapted from Shabman et al.,1994. With permission.)

use than under more traditional uses (e.g., cropland). This is due to the intrinsic low cost of converting such land when there is a limited supply in a service area.

## Hard Costs

Hard costs include earthwork, erosion and sediment controls, planting, amenity and habitat enhancements, monitoring, and maintenance. Earthwork costs typically are the largest cost component, often running from 50 to 80 percent of a project's cost. The primary cost variables are the volume of material to be moved, the distance the material needs to be moved, the number of moves of material, surface area of final grade lands, and geometry of the site. For example, sites with a high aspect ratio (long and skinny) cost more than low aspect ratio (square) sites to grade. Topography, hydrologic characteristics, and soils establish these variables,

although design concepts, particularly topsoil treatments, can also have a significant effect.

Local regulatory practices typically establish erosion and sediment control requirements. Because many wetland mitigation projects are built adjacent to natural wetlands, erosion and sediment controls can be critical in avoiding unnecessary impacts. It is not uncommon to see redundant (i.e., dual) erosion and sediment control systems required next to sensitive areas such as wetlands and streams. Therefore, these costs are highly variable depending upon site conditions and local regulations. Costs range from less than US $247 per ha for regularly shaped sites surrounded by development, to more than US $24,700 per ha for irregularly shaped creation sites surrounded by wetlands with redundant control requirements. Some local regulations also require cash escrows and bonds to assure compliance with erosion and sediment control regulations which must be accounted for in cash flow projections.

The cost of providing wetland plantings for a mitigation project is highly dependent upon regulator opinions. Currently, there are three general schools of thought regarding appropriate plantings for wetland mitigation. The first school recommends providing good soils, wetland hydrology, and an erosion cover crop, and then allowing wetland plants to volunteer. The second school recommends planting a wetland seed mix and seedlings of the target species to assure that a wetland with the desired species composition is obtained. Often nonpioneer species (e.g., *Quercus* spp.) that are desired in a mature system will be planted as seedlings, while pioneer species (e.g., *Acer rubrum, Nyssa* sp.) will not be planted because they are expected to volunteer naturally. Finally, the third school of thought recommends planting a wetland seed mix, seedlings, and a selection of larger, mast producing specimens to minimize the temporal loss of habitat, particularly for forested wetlands. For example, sites planted with 2.5- to 5-cm-diameter trees provide a 7- to 15-year headstart over seedling-planted sites. Estimated costs associated with these three schools of thought are illustrated in Table 5. As can be seen from the table, there are significant cost differences between the planting schemes.

Amenities such as birdhouses, deadfalls, observation blinds, nature trails, boardwalks, and interpretive stations can be accomplished at all price ranges. Rarely do regulators require such features, but several bankers have provided significant packages of amenity and habitat enhancements to maximize wildlife use and human educational interaction. Costs have been reported from US $250 to US $12,350 per ha. Amenity programs can become very expensive very quickly. For example, boardwalk costs range from US $86 to US $325 per $m^2$.

Monitoring and maintenance costs are directly related to the duration of the requirement, the type of wetland system designed, the performance requirements specified in the banking instrument, and natural events. For example, maintenance can be very expensive if a flood washes away newly planted trees. Monitoring and maintenance costs are often difficult to estimate because the maintenance aspect is dependent upon the timing of natural events, and regulatory requirements of the mitigation banking instrument. The latter is usually negotiated after initial economic investment.

Table 5 Estimated Costs for Wetland Plantings Associated with Three Schools of Thought*

| School | E&S Seeding[1] | Wetlands Seed Mix[2] | Seedlings @ 2.44 m (8 ft) O.C.[3] | Container Shrubs @ 3.65 m (12 ft) O.C.[4] | 4 cm (1.5 in.) dbh trees @ 12.19 m (40 ft) O.C.[5] | Total Plant Cost/Ha |
|---|---|---|---|---|---|---|
| | $3,600.00 | N/A | N/A | N/A | N/A | $3,600.00 |
| | $3,600.00 | $7,200.00 | $5,050.00 | N/A | N/A | $15,850.00 |
| | $3,600.00 | $7,200.00 | $5,050.00 | $11,250.00 | $9,050.00 | $36,150.00 |

* The table depicts an order of magnitude difference between vegetation options for a forested wetland.

[1] $0.36/m²—a typical cost for sites in the 1-ha size range (seed and mulch).

[2] $0.72/m²—a typical cost for a diverse wetlands seed mix on a 1-ha site (seed and mulch).

[3] Furnished and installed bare root seedlings with fertilizer and mulch (with warranty); 1,680/ha [2.44 m off center (O.C.)] at $3.00 each, with 1 yr 65 percent survival warranty (1,500 to 2,000 seedlings).

[4] 1 gal container grown plants (furnished and installed); 750/ha (3.65 m O.C.) at $15.00 each (with 1 yr warranty).

[5] 4 cm dbh trees furnished and installed; 67/ha (12.19 m O.C.) at $135.00 each (with 1 yr warranty).

## Soft Costs

Soft costs include regulatory approval costs, design costs, review fees, financial assurances, marketing, accounting, administrative costs, and taxes. Regulatory approval costs are dependent upon the trading rules established by regulators to increase the probability of mitigation success (Shabman et al., 1994). Site monitoring, site maintenance, the costs (liability) of project failure, mitigation site design standards, and other factors may be required. Meeting the requirements of the trading rules can increase costs and should be incorporated into the capital and operational costs budgeted for the development of a bank.

Entrepreneurial bankers across the country have reported extremely significant direct costs (in the range of several hundreds of thousands to millions of dollars) attributable to gaining regulatory approval of the mitigation banking instrument, and related costs of controlling the selected site(s) during the approval process. Costs include land contract costs (i.e., attorney fees, surveys, title searches, options, and deposit costs), legal fees for developing the mitigation banking instrument, and design development costs such as groundwater monitoring, biological surveys, wetland delineation, and preliminary mitigation plan design. Figure 5 illustrates how regulatory approval costs can have a very large effect upon wetland credit prices.

The design of the constructed wetland will have to meet two important constraints. These include the constraint imposed by the site itself, and the constraints imposed by regulators and the local plan approval processes. Before the site is committed, a preliminary mitigation design should be completed to ensure the site has the potential to support wetlands and to ensure that the constructed wetland will be acceptable as mitigation. Once the above constraints have been addressed,

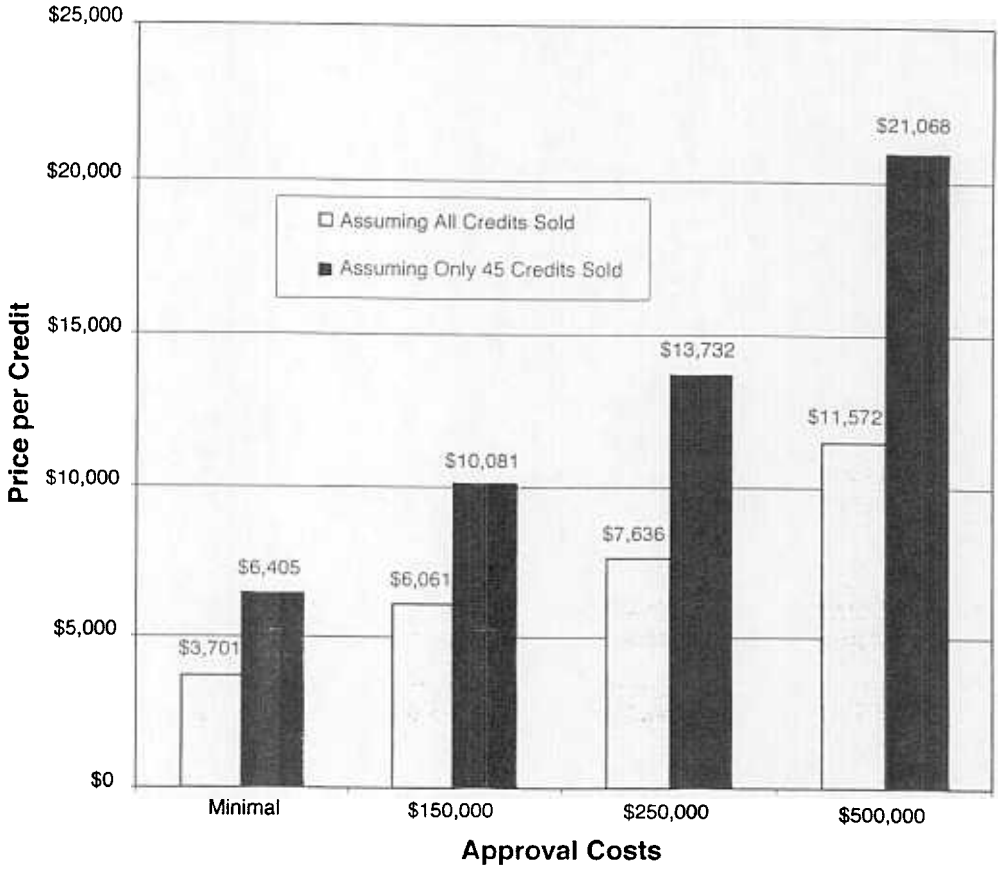


**Figure 5** Wetland credit prices vs. approval costs and demand uncertainty. (Adapted from Shabman et al., 1998. With permission.)

final site design will include site hydrology analysis, water budget analysis, grading plans, erosion and sediment controls, soil requirements, and vegetation selection and distribution.

Design costs can vary with the site. A relatively simple site, such as a flat floodplain area where the hydrologic linkage with a contiguous stream can be relatively easily restored, may have low design costs. Conversely, the design costs of a complex site that includes a number of wetland cells with differing hydrologic and soil requirements may be high.

Some mitigation projects require permits from federal and state agencies, though usually these fees are relatively small. However, many local government fees, required to process grading and erosion and sediment control plans, can be quite expensive. Costs may be hundreds to thousands of dollars per ha in some localities.

Financial assurances are methods used to provide some guarantee that a mitigation bank will succeed, and that there are funds available for planned or unplanned contingencies. Contingencies include site monitoring, maintenance, erosion repair, and vegetation replanting due to storm effects. Financial assurances will result in economic costs to the mitigation banker if the mitigation bank does not succeed.

Surety bonds can be used to ensure that a mitigation bank meets specified criteria. The bonds are only released after the specified criteria are met. This may include completion and approval of the entire project, or it may address certain milestone criteria at which, upon completion, a part of the bond is released. For example, milestone criteria could include a certain vegetation density or percent cover over a specified part of the mitigation site.

Escrow accounts are another way to ensure that funds are available to conduct maintenance and other activities (e.g., monitoring) that are necessary for a successful mitigation bank. Funds are paid into the escrow account when the mitigation bank receives payment for credits. The amount of deposits into the escrow account can vary depending upon the factors being considered by regulators. If regulators accept the presale of wetland credits, then the payment into the escrow account could reflect the risk of failure of the mitigation site, as well as the requirement to have funds available for monitoring, maintenance, and catastrophic events. If regulators approve the wetland mitigation (e.g., based upon site design standards), then the escrow payment may be lower (or a portion of funds collected can be released) and reflect only the future costs of maintenance and other activities.

Marketing, accounting, and administrative costs can become a very significant cost component of wetland bank development over time. Prospective sponsors must budget for the staff time, office overhead, and direct expenses related to their activities. If the product is successfully marketed to users, costs carefully accounted for, and the entire product managed well, a wetland bank can be ecologically successful but still be a financial failure.

Real estate taxes are typically assessed upon private landowners. Thus, until the site is transferred to a long-term steward that is tax exempt, this is a cost that must be budgeted for. Some localities will provide significant tax reductions on land held in open space for conservation, some may tax the land at the projected value of the mitigation credits, and others at its market value based on traditional highest and best use valuations. These practices vary by state and locality and can range in costs by an order of magnitude. Therefore, this cost must be evaluated on a site by site basis.

## LONG-TERM STEWARDSHIP

The purposes of long-term stewardship are to provide long-term maintenance and to assure that no inappropriate land use occurs. Although the ideal wetland would be self-sustaining and require no maintenance, such wetlands are very rare. This is particularly true in the short term. In reality, a lack of maintenance can result in the modification or loss of wetland functions. One common result of a lack of maintenance is the invasion of unwanted vegetation. Brazilian pepper (*Schinus terebinthifolius*), common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria)*, and, in some regions, cattails (*Typha* sp.) are undesirable in the United States. Other results can occur also, including topographical changes due to sedimentation or scouring, and water level changes due to problems with input or output systems. Each of these occurrences can result in ecological changes that may need to be addressed in order to achieve the goals of the wetland mitigation effort. For

example, scouring can result in the formation of new channels in the wetland, causing water to exit the wetland more quickly, and decreasing the residence time available for water column/sediment/vegetation interactions.

The best way to assure long-term protection of any mitigation area from intentional disturbance by man is to record a deed restriction, easement, or conservation covenant among the land records of the local courthouse that has jurisdiction to the lands in the mitigation area. This document should identify the legal description of the property to be protected and the activities allowed on the property. Once this protection is in place, the land can be safely transferred to the long-term steward.

In order to guarantee that appropriate long-term stewardship occurs, some entity must be responsible for the site, and there must be sufficient funds available to accomplish the necessary tasks. Entities available for long-term stewardship include federal, state, and local resource agencies, nonprofit organizations, and private entities engaged in land conservation.

Government entities require the funds and the manpower to conduct long-term stewardship of a site. Funding of a government agency, or even the existence of the government agency, is dependent upon a legislative body, and the priorities of such bodies may change in the future. Some of this uncertainty can be alleviated by the presence of long-term funding from a financial assurance program (e.g., trust fund established by the banker), although manpower problems may still occur owing to budgetary constraints.

Government entities may also have trouble protecting the wetland site from other government entities or programs. Revenue generating activities such as forestry and agriculture are allowed in wetlands and may appear attractive to government entities suffering budgetary constraints. In addition, large wetland areas may be the most economically attractive routes for new roads, particularly if no other alternatives are available. Political pressure on the government entity could result in impacts to the constructed wetland site. Nevertheless, government entities can, and do, protect and maintain an extremely diverse array of natural areas very well.

Nonprofit organizations are less vulnerable to political pressure, but they are vulnerable to financial problems. These organizations have been known to sell, for commercial purposes, properties that they consider less important relative to other properties. Some nonprofits, such as the Nature Conservancy, relinquish some of their acquisitions to government entities. However, most nonprofit organizations operate on low budgets and are able to utilize low paid or volunteer personnel. Thus, nonprofit organizations may be able to efficiently utilize trust fund or other available money for long-term maintenance and protection. Certain nonprofit organizations may reap additional benefits from a mitigation site that tends to provide additional incentives to protect the site. For example, educational institutions could utilize such a site for long-term research or study with the assurance that the site will remain available for a very long time.

The mitigation banker does not usually wish to retain ownership of a site after all of the mitigation credits have been sold. There is no more profit to be made either from the site or from the long-term stewardship of the site. Thus the mitigation banker, or other private entity that owns the land, will probably donate the site to a governmental entity or a nonprofit organization. However, occasionally there are

private entities that simply want to conserve the land. The deed restriction discussed earlier ensures long-term protection regardless of land ownership changes.

## Economic Projections

The economic aspects of developing a wetland mitigation bank have been discussed in this chapter. To gain the financial resources needed to actually build and operate a bank from investors, venture capitalists, or financial institutions, these elements must be quantified and analyzed. Supply, demand, and regulatory policies should be assessed by the prospective banker to assess the price that wetland mitigation credits can be sold at in a specific area. Figure 6 illustrates the relationships of the factors discussed throughout this chapter.

The fundamental elements needed to economically justify creation of a bank include capital and operating cost budgets, cash flow requirement projections (i.e., how the costs budgeted are expected to be expended over time), and sales rate and sale price projections (which are typically inversely related). These elements should be combined into one cash flow spreadsheet to model the economics of the proposed bank. Development of the model then allows sensitivity analyses to determine the effects of the more variable elements of the project. These elements include sales rates and credit prices, presale requirements, and phasing of capital expenditures.

The model can then be used to estimate potential returns on the capital needed to develop the proposed wetland bank. The returns will be adjusted based upon the perceived level of risk by potential funding sources and compared to alternative investment options by such sources. A mitigation banker must find capital sources that recognize the proposed bank to be a superior investment alternative based upon its risk tolerance and investment interests. The appropriate capital budgeting techniques used in this analysis are identical to those involved in any capital intensive industry, and thus are not described in detail herein. For those inexperienced in such techniques, there are a number of excellent textbooks that address this topic (e.g., Bierman and Smidt, 1993).

The fundamental economic test that a wetland bank must meet is the ability to sell credits at a price that exceeds expected costs and investor return requirements. This seemingly simple concept is very difficult to predict at this stage in the development of the mitigation banking industry. The market at this time is thin, and it is dependent upon regulatory practices and policies that often appear to change faster than wetland banks can be approved, constructed, and grown.

A successful wetland bank is one that satisfies both economic and ecological criteria. Several banks have achieved that goal to date. Whether or not these dual goals can be achieved consistently throughout the country by this nascent industry, and create wetlands ecologically superior to traditional on- and off-site approaches, remains to be seen. The USEPA has proposed to engage the U.S. National Academy of Science to study this question over the 1999–2000 time period.

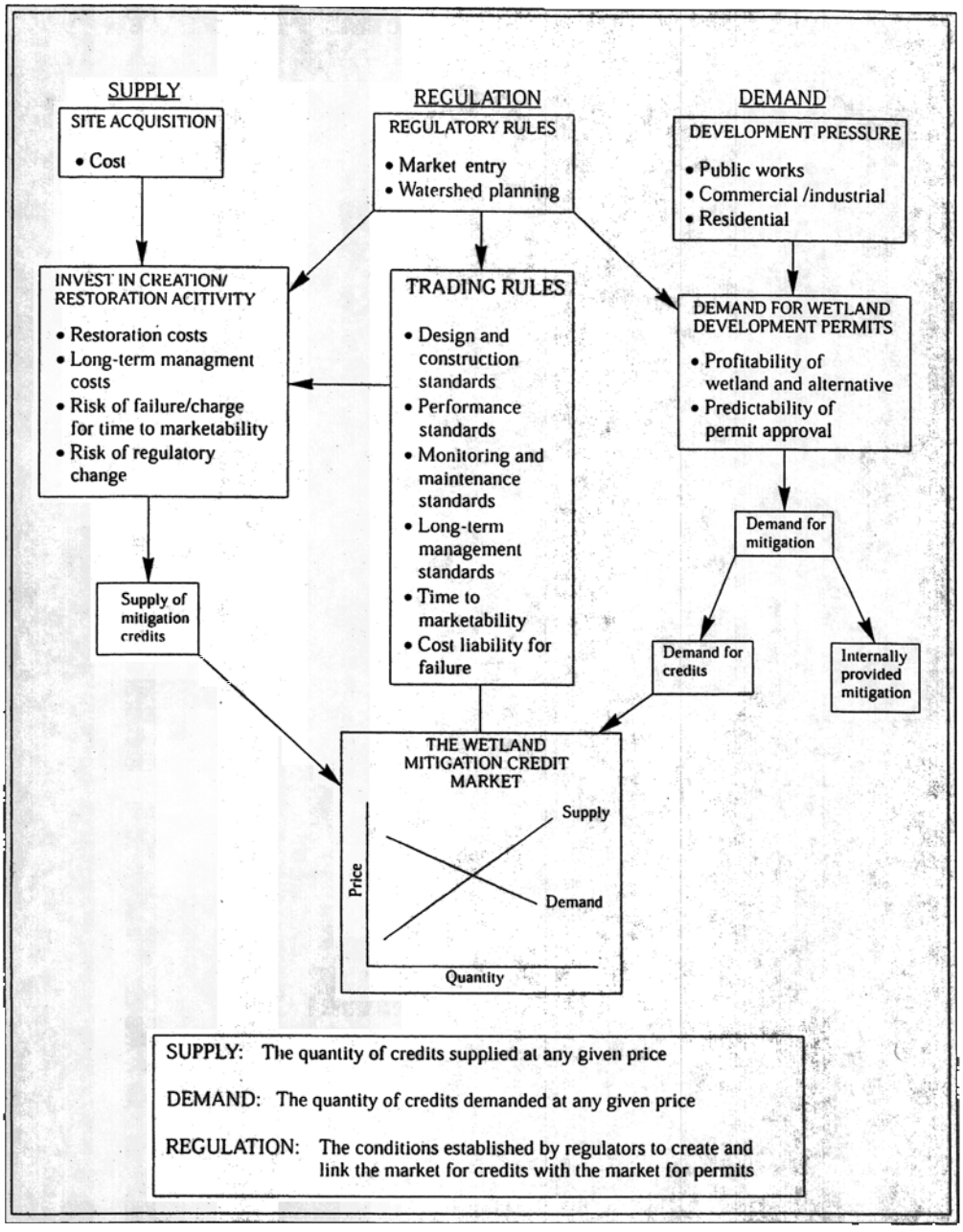


**Figure 6** Regulatory policies influence wetland mitigation credit markets. (Adapted from Shabman et al., 1994. With permission.)

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