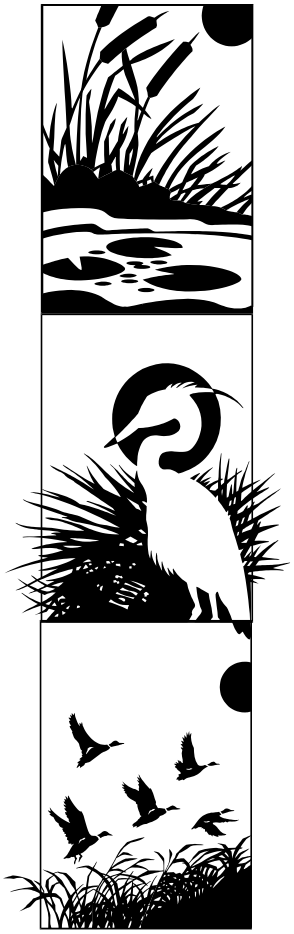

# *NATIONAL WETLAND MITIGATION BANKING STUDY*
## *Wetland Migitation Banking: Resource Document*

**Institute for Water Resources**
**Water Resources Support Center**
**U.S. Army Corps of Engineers**
**Alexandria, Virginia 22315**

**Prepared by**

**Environmental Law Institute**
**Washington, D.C.**

**and**

**The Institute for Water Resources**

**January 1994** **IWR Report 94-WMB-2**

***National Wetland Mitigation Banking Study***

This report is part of a series of reports which are being published during the National Study. General background information pertaining to wetlands mitigation banking and the scope of the national study were the subjects of a report published during the first year of the study.

> Wetlands Mitigation Banking Concepts IWR Report 92-WMB-1, prepared by Richard Reppert, Institute for Water Resources, July 1992, 25pp.

A number of reports presenting the results of the first phase of the National Study are expected to published in 1994, in addition to this report. Among these reports:

> Expanding Opportunities for Compensatory Mitigation: The Private Credit Market Alternatives IWR Report 94-WMB-3, prepared by Leonard Shabman, Dennis King, and Paul Scodari. This study looks at the economic forces affecting the market for mitigation credits. A framework that describes the factors affecting the supply and demand of mitigation credits is presented. Interviews with prospective entrepreneurial bankers were conducted. Also interviewed are relevant regulatory and resource officials for several of the banks.
>
> First phase report IWR Report 94-WMB-4, prepared by Robert Brumbaugh and Richard Reppert, Institute for Water Resources. This report sums findings of phase one of the national wetland mitigation banking study and recommendations for the final study phase.
>
> An Examination of Wetland Programs: Opportunities for Compensatory Mitigation
> IWR Report 94-WMB-5, prepared by Apogee Research, Inc. Sixty eight programs that conduct or facilitate wetland restoration or creation were identified that might be applicable to compensatory wetland mitigation. Fourteen programs with the greatest potential were profiled in more detail.

For further information on the National Wetland Mitigation Banking Study, contact either:


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Reports may be ordered by writing (above address) or calling Arlene Nurthen, IWR Publications, at (703) 355-3042.

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# EXECUTIVE SUMMARY

This report is designed to serve as a resource and research tool for those interested in wetland mitigation banking. It provides detailed information on various types of banks and similar compensatory mitigation mechanisms, statistical and institutional information on all existing banks, an introduction to fee-based mitigation, and a comprehensive annotated bibliography of the literature on wetland mitigation banking. Information was current through summer 1992 except as otherwise noted.

These data were collected by the U.S. Army Corps of Engineers Institute for Water Resources (IWR) during the first phase of a two-phase National Wetland Mitigation Banking Study. The Environmental Law Institute (ELI) contributed much of this information from its study of wetland mitigation banking, which was sponsored by IWR and the U.S. Environmental Protection Agency.

Wetland mitigation banking was conceived as a means to improve on the individual piecemeal mitigation of wetland losses, many of which have gone unmitigated for reasons of practicability. Wetland mitigation banking presented construction interests with an opportunity to mitigate such wetland losses by consolidating them and providing for their mitigation in relatively large blocks in an off-site location. This is the conceptual basis for banking. Banks are normally relatively large blocks of wetlands--restored, created, enhanced, or preserved--with estimated tangible and intangible values termed credits. These credits represent a net gain in value over the condition prior to the wetland project. As anticipated development takes place, credits equivalent to the estimated unavoidable wetland losses are withdrawn or debited from the bank to compensate for the losses incurred.

Wetland mitigation banking, although practiced for more than fifteen years, is a concept still in its infancy. Nonetheless, wetland mitigation banks have demonstrated a capability to contribute to national wetland goals. Banking provides an opportunity to improve upon the traditional piecemeal approach to wetland mitigation.

Wetland mitigation banking is a concept with much promise. Ten years ago there was a mere handful of wetland mitigation banks in existence in the United States. As of the summer of 1992, there were at least 44 wetland mitigation banks in existence. There were also, undoubtedly, more than 60 proposed banks.

Much of the bank specific information provided in this report comes from 22 detailed case studies that IWR conducted with the direct assistance of Corps of Engineers field offices and various contractors. The 22 banks were a representative cross-section of publicly and privately operated banks which existed at that time.

Chapter Two summarizes the findings of each of the case studies in standardized profiles. These profiles include characterizations of the institutional arrangements, the banking instruments, bank physical and biological properties, operational histories, and points of contact. Chapter Three presents generalized characterizations of all the existing and proposed banks identified in 1992.

The national study also examined six fee-based compensatory mitigation programs. Chapter Four presents brief characterizations of these programs.

Chapter Five presents a comprehensive annotated bibliography of 56 published and

unpublished papers and articles available through 1993. Following the annotated bibliography is an index of topics covered in the bibliography.

Existing mitigation banks represent a variety of institutional arrangements, although single-client banks sponsored by state departments of transportation are the most common at present. Their defining characteristics are: (1) established to compensate for unavoidable wetland losses; (2) develop credits with which to compensate for these losses through one or more credit production methods (i.e., wetland restoration, enhancement, creation, and preservation); (3) provide for the deposit or "banking" of credits against which withdrawals can be made; and (4) compensate for multiple wetland losses by the incremental withdrawal of such credits and corresponding reduction of credit balances. However, beyond these essential traits, existing banks vary widely as to their specific objectives, type of sponsorship and clientele, and their mode of operation.

When examined individually, many banks were found to be deficient in one or more aspects whether in implementation or long-term maintenance. However despite these apparent deficiencies, the majority are generally functioning as planned. The reality of banking to date is approaching the initial promise of banking. In general, banks represent valuable accomplishments even though in some cases they have failed to plan for sufficient monitoring, liability, and enforcement.

Further, since the inventory in 1992, a number of banks have been established with long-term operation and oversight requirements that are much more specific than many of the early banks. It must be remembered that banks, for the most part, have been developed in the absence of a national policy. As better guidelines are developed and national policy is crystallized, banking should result in increasingly more success in terms of wetlands management and achievement of national goals.

# ACKNOWLEDGEMENTS

This report was prepared as part of the National Wetland Mitigation Banking Study (National Banking Study) conducted by the Institute for Water Resources (IWR), U.S. Army Corps of Engineers. Section 307(d) of the Water Resources Development Act of 1990 provided the authority to conduct the study to the Assistant Secretary of the Army for Civil Works.

The National Wetland Mitigation Banking Study is being conducted within the IWR Policy and Special Studies Division, whose chief is Eugene Z. Stakhiv. This report and the National Banking Study have benefitted from Dr. Stakhiv's review and guidance throughout the course of the ongoing effort. Kyle Schilling is the Director of IWR.

The report was prepared by the Environmental Law Institute (ELI) with funding from the IWR National Banking Study under an interagency agreement with the U.S. Environmental Protection Agency. Environmental Law Institute staff who prepared this report include James McElfish, Katie Goldberg, Jamie Dycus, Lisa Vogel, and Moira McDonald. Portions of this report were prepared by Robert Brumbaugh and Richard Reppert, IWR.

The report objectives and structure were developed by the IWR study team under the direction of Robert Brumbaugh, Study Manager, who, together with Jim Comiskey, monitored contract efforts.

While the findings of the National Banking Study are being presented in a number of reports expected to be published, the IWR study team recognized that an important objective of the National Banking Study should be the transfer of bank-specific information. Interest on the part of regulatory and resource agencies has rapidly expanded in the last few years, and particularly among prospective bank sponsors, both public and private. Interested parties have asked for bank-specific information -- information that could provide assistance relative to specific prospective banking situations. This report was designed with this need in mind.

Much of the information contained in this report was initially generated by the 22 detailed case studies that were conducted by Corps of Engineers field offices and their consultants. Chapter Two, “Profiles of IWR Case Study Banks,” largely resulted from these efforts. Special thanks go to those who were responsible for preparing the case studies from which these profiles were derived:

> Elizabeth White (Los Angeles District), Molly Martindale (San Francisco District), John Reddoch (New Orleans District), Frank Yelverton (Wilmington District), Steve Eggers (St. Paul District), Phillip Hollis (Vicksburg District), Glen Coffee (Mobile District), Leroy Phillips (Omaha District), Larry Vincent (Sacramento District), Mark Smith (Portland District), and Robin Heubel (Norfolk District). Thanks also go to Brad Daly and Lonnie Mettler (Walla Walla District) for directing case study evaluations by a consultant.

Chapter Three, “Basic Characteristics of Wetland Mitigation Banks," utilizes inventory information gathered from the Corps District field offices for the National Banking Study and supplemented by an ELI inventory. An earlier version was presented in an ELI report published

in July 1993 under the title "Wetland Mitigation Banking."

Chapter Four, "Fee-based Compensatory Mitigation," utilizes information developed for the National Banking Study by Apogee Research, Inc. That effort was directed by Lynn Martin, IWR.

Individuals of the IWR National Banking Study Team who reviewed early drafts of this report in addition to the preparers of this report include Lynn Martin, Jim Comiskey, Margaret Gaffney, and Brian Chromey. Brian Chromey provided editorial assistance for the final report.

# I. INTRODUCTION

This report is designed to serve as a resource and research tool for those interested in wetland mitigation banking. It provides detailed information on various types of banks and similar compensatory mitigation mechanisms, statistical and institutional information on all existing banks, an introduction to fee-based mitigation, and a comprehensive annotated bibliography of the literature on wetland mitigation banking. Information was current through summer 1992 except as otherwise noted.

This information was collected primarily as part of the U.S. Army Corps of Engineers Institute for Water Resources (IWR) National Wetland Mitigation Banking Study (thereafter referred to as the National Banking Study). IWR is evaluating data collected on individual banks. This report presents the bank-specific data in the recognition that it may be of value to those interested in developing or evaluating banking projects or programs, or in performing independent research on wetlands mitigation.

### *Organization of the Report*

Chapter One, this chapter, summarizes the contents of the report, defines terms, and discusses experiences with wetland mitigation banking to date.

Chapter Two summarizes the results of detailed case studies by IWR of 22 wetland mitigation banks, proposed banks, wetlands accounting schemes, and mitigation projects potentially functioning as banks. The case studies were selected to examine a range of privately operated and publicly operated banks. The case studies are summarized in standardized bank profiles, which are intended to serve as a reference source for those involved in the planning, implementation, and operation of mitigation banks. The investigation was conducted during summer 1992 using a standardized questionnaire developed by IWR consisting of 41 questions with multiple subparts. The questionnaires were administered by Corps of Engineers district offices with jurisdiction over the areas in which the banks or other study entities were located.

Chapter Three presents in tabular form detailed information on all 44 wetland mitigation banks known to be in existence as of 1992. It also presents more limited information on a substantial number of proposed wetland mitigation banks.

Chapter Four presents a cursory discussion of fee-based compensatory mitigation case studies conducted by National Banking Study. Fee-based compensatory mitigation is a potential alternative to mitigation banking.

Chapter Five is a comprehensive annotated bibliography of the literature on wetland mitigation banking.

### *Definitions*

**Wetland Mitigation Banking** is a system of compensatory mitigation in which the creation, enhancement, restoration, or in exceptional circumstances preservation of wetlands is recognized by a regulatory agency as generating credits usable as advanced compensation for unavoidable wetland losses on other sites.

**Compensation Credit** means the unit of wetlands value that is recognized as the basis for comparing the destroyed wetlands to the banked wetlands offered in compensation. Credits are expressed in units such as acres or habitat units.

**Debit** means the unit of wetlands value that is withdrawn from the wetland mitigation bank upon approval of a compensation transaction. These are usually expressed in the same units as credits.

**Debiting Wetland** means a wetland area adversely affected by dredge or fill activities for which compensation is required as a condition of regulatory approval.

**Compensation Ratio** means the quantity of wetland credits that must be debited from the wetland mitigation bank to offset the losses from the debiting wetland. A 2:1 ratio, for example, means that for every unit of natural wetlands (e.g., habitat units, acres) destroyed by development, two units must be obtained from the bank.

**Fee-Based Compensatory Mitigation** or **In Lieu Fee Mitigation** means a program in which a regulatory agency collects fees in lieu of requiring a developer to compensate for wetlands losses through onsite mitigation or acquiring credits from a mitigation bank. The fees are accumulated for use in mitigation projects (or banking programs) by the agency or by a designated resource agency.

**Existing Wetland Mitigation Bank** means, for purposes of this report, a wetland mitigation bank that:

(1) has a signed memorandum of understanding, permit, or other legal instrument rendering it authorized to sell credits, or has already issued credits with the acquiescence of one or more regulatory agencies; and

(2) has land on which the credits are or will be produced.

***Overview of Wetland Mitigation Banking***

As of summer 1992, there were 44 wetland mitigation banks in existence, as per surveys by the IWR National Banking Study and by ELI.[1] Several of these banks are not recognized by the Corps of Engineers for § 404 compensation purposes, but are recognized by state or local wetlands agencies as providing compensatory mitigation sufficient to meet state or local requirements. Subsequently, at least two more banks, the W.E.T., Inc. bank (also known as the Millhaven, GA bank), and the Florida Wetlandsbank (also known as the Pembroke Pines bank), received § 404 permits -- in December 1992, and July 1993, respectively. Thus, this report identifies a total of 46 existing wetland mitigation banks. Undoubtedly, other banks were implemented in 1993 given the recent rush to establish banks.

There are more banks authorized "on paper." For example, the state of Maryland enacted a wetland mitigation banking law in 1993. The banks authorized by this law -- and implemented in part by a 1993 MOU with Maryland's Department of Transportation -- are not classed as "existing" because the mitigation lands have not yet been identified.

Eighteen of the 46 existing wetland mitigation banks are operated by state departments of transportation to meet continuing needs for compensatory mitigation. Seven banks are controlled by private developers and used solely to provide advance mitigation for their own projects. Three banks are privately owned and offering credits for sale to the general public: Fina LaTerre (LA), Millhaven (GA), and Florida Wetlandsbank (FL). Fina LaTerre uses the

[1] The Environmental Law Institute, in a study conducted for the IWR and U.S. EPA, recognized 46 banks in 1992. (Austin, et al., 1993). The difference is primarily attributable to ELI's recognition of several multiple-site state highway banks as separate banks.

majority of its credits for mitigation of its own oil and gas activities and to maintain ownership of its property, which would otherwise revert to the state through saltwater invasion; however, it also sells credits to others. Three other banks are publicly owned (or owned by a nonprofit agency) and offer credits for sale to the general public: Bracut Marsh (CA), Mission Viejo-ACWHEP (CA), and Astoria Airport (OR). The remaining banks are government-affiliated and serve limited clienteles such as port improvement districts, the Navy, multiple public works agencies, and local governments.

As of summer 1992, there were more than 60 proposed wetland mitigation banks known to IWR, and undoubtedly many others under consideration or development. In contrast to the mix of publicly owned banks and private single user banks currently in existence, many of the proposed banks (22%) are intended to be privately operated and to sell credits to the general public on a for-profit basis; and 29% are intended to be state or local banks offering credits for sale generally. This shift in the outlook for banking suggests that the experiences of the relatively small number of existing banks offering credits for general sale will deserve greater attention from researchers and policy makers seeking to understand future banking schemes.

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# II. PROFILES OF IWR CASE STUDY BANKS

The following profiles are based on information collected from 22 case studies conducted by the Institute for Water Resources (IWR) in summer 1992. A number of the case studies do not necessarily fit under our definition of banks, but provide useful information relevant to mitigation banking. The range of variation in banks in general is sufficiently wide that one can question whether those at the margin are indeed banks. For example, the North Dakota State Wetlands Mitigation Bank operates as an accounting scheme to track the state's progress in satisfying a statewide goal of "no net loss of wetlands." Another case study is the Henderson Marsh Mitigation Plan in Oregon, which was developed to compensate for individual wetland losses attributable to construction projects involving or benefiting the Weyerhaueser Company. In this case, the development of credits in excess of those needed to compensate for each particular wetland loss was not intended, but the potential for the development of "banked" credits exists. While the 22 case studies were intended to be targeted on existing banks, IWR included the Springtown Natural Communities Reserve in California, a proposed entrepreneurial bank which was believed to be close to implementation.

IWR's purpose in conducting these studies was to ascertain the range of institutional relationships, credit production and valuation schemes, land management approaches, and other features that have evolved along with mitigation banking. The information is presented in a standard format for each of the case studies to facilitate comparison. Thus, for example, if a reader is interested in geographic limits on using banked credits for mitigation, this information is found under "Service Area" in each profile. Similarly, if the reader is interested in the success or failure of wetlands creation, restoration, or enhancement efforts, the reader will find this information collected under "Construction and Physical Operating History" in each profile.

When this study commenced, IWR tried to identify the "sponsor" of the bank or other project. This proved to be more important in the proposed bank phase than in the case of existing banks. It became apparent in the course of this study that many of the banks - even those that had primary proponents - had evolved into projects where a variety of entities performed specific functions. Therefore, in addition to identifying the primary bank proponent or sponsor, the profiles identify the responsibilities of various parties to the banking schemes. These are:

- credit producer,
- management of transactions,
- credit evaluation,
- regulatory,
- long term site ownership, and
- client.

In general, the bank sponsor is the credit producer, and the Corps or a state agency performs the regulatory function, but this is not always the case. Each of these functions is important to consider in evaluating a banking project.

The detailed information in these profiles may be profitably used to identify banking features of particular value, as well as difficulties to anticipate in designing, implementing, and monitoring a wetland mitigation bank. Each of the profiles also identifies contacts for those wishing to inquire further about the bank.

This document does not present an evaluation of the success or failure of the banking programs profiled. The information, for the most

part, speaks for itself. Moreover, many of these projects are relatively new and the long-term success of the mitigation cannot yet be fully assessed.

A guidebook was developed by IWR to conduct the case studies in a standardized manner. The questionnaire that comprised the case study guidebook is summarized as follows.

**Summary of Case Study Questionnaire**

1. Official name or title.
2. Location of bank.
3. Location of the debiting wetlands.
4. Complete description of drainage area in which the bank is located.
5. Before and after descriptions of the physical and biological characteristics:
   location, boundaries and size; general topographic and cover type; pre-bank wetland environments; wetlands delineation; general description of soils; bank development strategies; credit valuation techniques; bank establishment activities requiring a Department of Army permit activities; general hydrology; post-bank wetland environments; significant fish and wildlife and plant species; long-term wetlands maintenance plans; official land use plans or programs involving or incorporating bank; adjacent ownerships and impacts on the bank.
6. Physical and biological description of debiting wetland area(s):
   location, boundaries, and wetland classification; general topographic and cover type; general condition of debiting wetlands; significant fish and wildlife and plant species; general soils description; drainage area description; general hydrology; official land use plans and effect on debiting wetlands.
7. Number of wetland credits available in the bank, overall and by individual wetland type:
   immediately following bank implementation; at crediting initiation; at time of case study; staged development balances; present; agency or individual determining type and amount of available credits.
8. Initial planning, implementation, and early operational stages of the bank, including the following:
   time and way conceived; smooth or problem process; first incentive to establish a bank; date formal agreement was signed or enacted, initial implementation completed, and of first debiting.
9. Descriptions of formal agreements and objectives set forth.
   type of agreement and signatory agencies; statement of objectives; provisions for review, updating, and conflict resolution; responsibilities; bank history to date.
10. Detailed cost breakdown:
    includes physical maintenance costs and financial arrangements to pay for anticipated maintenance and replacement costs and with which to fund unexpected contingencies.
11. Attempts to recoup capital and maintenance costs and cost basis for payment purposes.
12. Original sponsor of bank establishment and current manager.
13. Land ownership and the nature of real estate interests.
14. Future life of the bank: life expectancy; longevity.
15. Planning and implementation of the bank:
    initial bank planning process and logic for analysis of alternatives and bank site selection; geographic limits or boundaries in formal agreement; distances of the debiting wetlands from the bank.

(continued)

**Summary of Case Study Questionnaire (continued)**

16. Hydrological connection between debiting and crediting wetlands:
    nature of hydrological connection; specification in formal agreement.
17. Developmental entities that may be utilized for compensation purposes and construction activities that may be debited:
    potential users for compensation purposes; provisions in the formal agreement; debiting action history in terms of dates, sizes, numbers of credits, types of wetlands requiring compensation.
18. Debiting and crediting information:
    methodology; functions used, determination of bank size; consideration of non-wetland environments and temporal issues; preservation credits; current credit availability.
19. Accounting procedures for debiting and crediting:
    crediting and debiting process and technical criteria and procedural ground rules; adherence to rules; in-kind/out-of-kind restrictions; application and formulation of mitigation ratios; timing of debits; staged development procedures; interchangeable credits between districts for state-wide banks; consideration of scientific uncertainty; type of accounting system for debits and credits; responsibility for credit certification and account maintaining and reporting.
20. Role of the banker and sponsors, and funding of banking activities:
    responsibility for conducting the banking function; formal agreement provision; costs (on an actual annual basis); formal agreement procedures; issuance of bank statements; agreement on existing balances; provisions for audit of bank account.
21. Monitoring of the bank:
    formal agreement provision for periodic monitoring and specific monitoring role; effort and costs for completed monitoring; responsibility for paying monitoring costs; provisions for response to monitoring information; findings of monitoring and actions taken as a result; inclusion in Department of Army permits for review and evaluation of bank performance.
22. Levels of effort on the part of public agencies and natural resource agencies:
    responsibility for public agency involvement costs; additional budgeting for participating agencies; impact of public curtailment of involvement.
23. Provisions for open-ended banks and periodic expansion concurrent with permitted construction.
24. Deficits associated with open-ended banks if additional wetland credits are not deposited:
    conformance strategies; formal agreement provisions; affect on permit process.
25. Enforceability of formal agreements--requirements to ensure success of the bank:
    formal agreement specifications for responsibility, timetable, and penalties; legal authority rulings; tests of formal agreement.
26. Regulatory actions if bank found to operate at a deficit.
27. Commercial sales of credits:
    record of commercial sales of wetland credits for compensatory purposes; provision in formal agreement; any other interest in district outside case study bank; need for revisions to formal agreement in order to provide for open market sales.
28. Relationships between the bank and general permits, SAMPS, or other types of regulatory and land use.
29. Precedence for after the fact compensation in the banks:
    formal agreement provisions; instances.
30. Determination of how bank activities would be altered if delineation methods were to change:
31. Tendency for commercial-type bank planners to resist locational and technical rigor.
32. Effectiveness of the bank in achieving basic wetlands protection objectives.
    implementation and operation of bank in comparison to original plans; impact of problems in expected bank schedule; deficit operation--amount and duration; efforts to rectify deficit; better than anticipated performance and provisions.

(continued)

**Summary of Case Study Questionnaire (continued)**

33. Extent of Corps involvement in planning bank and developing formal agreement:
    involvement in early planning stages; signatory to formal agreement; formal agreement provisions for Corps; banks without Corps signatory to formal agreement--how recognized by Corps; issuance of public notice for proposed bank; satisfaction of NEPA.
34. Conduct of Corps individual permit review process: provision in agreement.
35. Effect of bank on rigor of permit decision-making process.
36. Positive features and shortcomings of the bank--overall evaluation:
    success or failure in providing for consolidated relatively small wetland impacts and their advanced mitigation; bank shortcomings; positive aspects; effect on efficiency of permit review process; ways to improve bank.
37. Summary outline of bank:
    characteristics; formal agreement; methods; currency evaluation procedures; bank activity; problem analysis; summary.

## Anaheim Bay Mitigation Project, California

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable deepwater marine habitat losses associated with water-dependent port improvement activities by the Port of Long Beach including landfill at Pier J and other port construction.

**LOCATION:** Anaheim Bay within the Seal Beach National Wildlife Refuge, which is located within the Seal Beach Naval Weapons Station, Orange County, CA.

**SIZE:** The bank has 119.6 acres in 4 parcels, ranging in size from 7.5 to 53.5 acres.

**SERVICE AREA:** The debiting wetlands must be in a port district of the Southern California Bight.

**TYPE OF MITIGATION:** Mitigation is based on the creation of shallow estuarine coastal embayment habitat. Such habitat, with its relatively high value to marine fishes and migratory birds, has been reduced in Southern California at a greater rate than deep water habitat. The signatory agencies therefore agreed that compensation for adverse project impacts upon the marine ecosystem should emphasize the creation of shallow water, coastal embayment systems. The Memorandum of Understanding (MOU) alternatively uses the terms "restoration" and "creation" to describe the habitat development work involved in Anaheim Bay. However, creation is the most appropriate description of the work because degraded wetlands and upland areas were destroyed in the creation of shallow, estuarine coastal embayment environment. The refuge where the bank is located consisted of tidal sloughs and salt marsh habitat area with adjacent upland and diked areas. The mitigation area consisted of uplands, pickleweed (*Salicornia virginica*) marsh, glasswort (*Batis maritima*), barren salt flats with shallow ponds that formed after winter rains, an old field community dominated by grasses and mustard, and a sandy area with some wetland vegetation. Human disturbance in the area had caused a lack of tidal flow and degradation of wetlands. Expected results of mitigation activities were the formation of intertidal and supratidal habitat, open water nursery habitat for marine fish, and island habitat for the Light-footed Clapper Rail.

**ENABLING INSTRUMENT:** A MOU to establish a procedure for compensation of marine habitat losses was signed 8 January 1986. A second MOU pertaining to dabbling duck and shorebird habitat was signed in August 1986. Signatories to the MOUs are the City of Long Beach Board of Commissioners, the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the California Department of Fish and Game (CDFG). The Corps of Engineers issued a permit for the establishment of the WMB, dated 27 February 1989. The permit authorized the excavation of approximately 1.2 million cubic yards of material and placement of 50,000 cubic yards of fill material to create the island.

- The MOU states that the Port of Long Beach has no responsibility for maintenance or monitoring of the restored area following construction, but the Port has undertaken a 2.5-year monitoring program as a permit condition and conducts monitoring activities quarterly. The involved agencies review the

monitoring reports to ensure compliance with the MOU. USFWS is responsible for management and maintenance of the site.

- The agreement does not address the longevity of the WMB.
- The agreement does not specify that the debiting wetlands occupy the same hydrologic area as the bank.
- The agreement provides for out-of-kind replacement.
- Mitigation ratios are not cited in the MOU.

**RESPONSIBILITIES:**

***Sponsor:*** The Port of Long Beach is the bank sponsor.

***Credit Producer:*** The bank was constructed by the Port of Long Beach, acting through the Board of Harbor Commissioners, and is being monitored and maintained by the Port under a 2.5-year program. Once this program expires, the bank will be maintained by USFWS, which jointly manages the Seal Beach National Wildlife Refuge with the Navy.

***Management of Transactions:*** Responsibility for maintaining and reporting records of debits and credits and the bank accounting is not specified in the MOU. The Port of Long Beach issued a signatory letter of agreement which reported debits and credits.

***Credit Evaluation:*** The types and numbers of available credits are determined by the Port with the approval of USFWS, NMFS, and CDFG. A biological evaluation team is responsible for habitat evaluation.

***Regulatory:*** Following Corps permit issuance to the developer, if the mitigation bank fails, then the applicant is in noncompliance with the conditions of the permit. The Corps can pursue enforcement action against the applicant for noncompliance under 33 CFR 326.4 (d).

***Long term site ownership:*** The land is owned by the Navy.

***Clients:*** The bank was created to offset losses due to Pier J expansion by the Port. The MOU states that excess habitat value units may be used to offset fish and migratory bird habitat losses which result from other port development projects within the Harbor District. The projects must be necessary, water dependent, and port related. The Board of Harbor Commissioners of the City of Long Beach may transfer excess habitat value units to other port districts in the Southern California Bight if the districts are applicants for a Corps permit, California Coastal Act permit, or amendment to the master land use plan of the California Coastal Commission after such district has consulted with USFWS, CDFG, and NMFS and obtained a written approval for the use of Anaheim credits.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Initial construction was completed in April 1990. Management measures included: 1) mechanical excavation to an average elevation of -3.0 feet MLLW, 2) building of culverts to connect these areas with Anaheim Bay to provide unimpeded tidal exchange, and 3) construction of mounded islands. Monitoring results in 1991 indicated that tidal levels in areas of the bank were higher than levels in the nearby ocean. As a result, a much greater proportion of subtidal (73%) and lower proportion of intertidal (24%) and supratidal (3%) habitat was formed than planned. Initial results of the biological sampling indicate that fish are using the restoration areas. Invertebrate colonization of the substratum has occurred and dense growth of filamentous algae has developed in all areas. Limited growth of vascular plants has occurred. Despite differences between predicted conditions and observed outcomes, monitoring results generally indicate successful accomplishment of objectives for the bank creation.

**CREDIT EVALUATION:** Habitat Suitability Indices (HSI) developed using modified Habitat Evaluation Procedures (HEP) are used. The HSI can range from 0.0 for no habitat suitability to 1.0 for complete habitat suitability. Habitat unit gains and losses for 20 listed evaluation species were exchanged on a unit-for-unit basis. The values for the evaluation species are developed by professional biologists using the best available information. The replacement ratio was determined by a comparison of habitat unit changes at Pier J "with and without" the landfill to the habitat unit changes "with and without" Anaheim Bay restoration. The study indicated that for each acre of Pier J landfill constructed, about 0.759 acre of compensating coastal embayment must be created at Anaheim Bay to offset the loss, and this ratio was used for the first transaction. The acreage ratio for the second transaction was 1:1.

**TRANSACTIONS:** The Anaheim Bay Restoration Project created 153.12 credits. The 130.55 debits necessary to mitigate for the Pier J project were already determined and were immediately debited once construction was initiated in January 1989. Another 8.57 credits were used in February 1991 for the construction of Berths 95-97 in the same port. Debiting wetlands have been located in the same drainage area as the bank. Fourteen credits are in "escrow" and will only become available once the 2.5-year monitoring requirement is completed and reviewed.

**FUNDING REGIME:** Agencies bear the cost of their involvement. The Port of Long Beach is not attempting to recoup capital costs. USFWS has the funding capacity to include the WMB in its management plans for the Refuge. The Port has paid for quarterly monitoring. No trust fund or other financial arrangement has been developed to pay for anticipated maintenance and replacement costs or unexpected contingencies.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The debiting wetlands are zoned as "port manufacturing" and are identified in the master land use plan certified by the California Coastal Commission. The bank is part of the Seal Beach National Wildlife Refuge.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The Seal Beach National Wildlife Refuge is bordered on 3 sides by urban areas of Los Angeles.

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## Bracut Marsh Mitigation Landbank, California

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses associated with development of "pocket marshes" in Eureka and other saltwater wetland fills in Humboldt Bay.

**LOCATION:** Eastern shore of Arcata Bay, north arm of Humboldt Bay, approximately 5 miles NE of Eureka, Humboldt County, CA.

**SIZE:** Bank area is 6 acres.

**SERVICE AREA:** Debiting wetlands may be pocket marshes of the City of Eureka or saltwater wetlands in the Humboldt Bay area.

**TYPE OF MITIGATION:** The project involves the restoration of Bracut Marsh. Prior to 1950 the marsh was a small, vegetated wetland bordered by mudflats. The construction of Highway 101 eliminated freshwater inflows from the surrounding watershed. The marsh area was filled and a perimeter dike was constructed, preventing tidal influence. Portions of the marsh were paved, and wood debris, gravel, and sand were deposited on the site. The pre-bank restoration site was characterized by small stressed plants including: *Parentucellia viscosa, Polypogon monpeliensis, Lotus corniculatus, Juncus effusus var. brunneus,* and *Aira elegans*. Soil quality was extremely poor. The goal of the restoration plan was to restore tidal flow and maximize the habitat value of the site. Debiting wetlands have principally been saltwater wetlands containing pickleweed, saltgrass, and/or cordgrass.

**ENABLING INSTRUMENT:** The California Coastal Commission and State Coastal Conservancy approved the "Broadway Wetlands Restoration Conceptual Plan" in April 1980 and subsequently signed the Bracut Marsh Mitigation Landbank Memorandum of Understanding (MOU). The Department of the Army issued a permit to the Conservancy to undertake construction necessary for site restoration.

- The MOU describes 4 "pocket marshes" that could use 2.02 acres of the Bracut Marsh Landbank to provide mitigation if developed; the remainder is to be used to mitigate for losses of saltwater wetlands in the Humboldt Bay area as approved by the Commission. The MOU does not require that the debiting wetlands occupy the same hydrologic drainage area as the WMB, but the Humboldt Bay provides a hydrological connection between the debiting wetlands and the WMB.

- The MOU limits debiting to in-kind replacement.

- The MOU specifies that "the amount of mitigation shall be not less than one square foot of restored marsh for each square foot of filled marsh."

- The MOU does not provide for its review and update.

- The MOU does not require monitoring.
- The MOU does not address longevity of the WMB.

**RESPONSIBILITIES:**

***Sponsor:*** The California State Coastal Conservancy and the California Coastal Commission are the sponsors of the bank.

***Credit Producer:*** The State Coastal Conservancy implemented and currently manages and maintains the WMB. The State Department of Fish and Game has informally agreed to take on management and maintenance of the Bracut Marsh WMB when it is fully debited.

***Management of Transactions:*** The Conservancy keeps a record of all transactions, and periodically provides updates to the Commission.

***Credit Evaluation:*** The Conservancy, in consultation with the Commission, originally determined the number of credits available at the Bracut Marsh WMB. The Commission, as "banker," determines the amount of required mitigation for proposed wetland fills, and then directs applicants to pay the Conservancy a fee based on acreage.

***Regulatory:*** California Coastal Commission and Corps of Engineers regulate the bank through the permitting of debiting activities.

***Long Term Site Ownership:*** The Conservancy purchased the 13-acre parcel for the purpose of restoring and protecting its habitat values, and the land will never be developed. Seven acres are not part of the bank.

***Clients:*** The California Coastal Commission and the State Coastal Conservancy specifically established the Bracut Marsh WMB to provide mitigation for the development of 4 "pocket marshes" located in an industrial area in the City of Eureka. The MOU allows the Commission to use the Bracut Marsh WMB to mitigate development within the Broadway pocket marshes in the City of Eureka. The remaining mitigation credits are available to owners of wetlands in the area of Humboldt Bay.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** The Conservancy's 1981 restoration project included constructing a 50-foot wide levee breach with a riprap sill to provide a hydrological connection to the bay. Interior channels were constructed to provide circulation and drainage. The project was designed to keep flow velocities low to prevent scouring. However, by 1987 the Conservancy and other agencies recognized that the Bracut Marsh project had not achieved its restoration goals, and noted such problems as sparse vegetation, poor water circulation, and poor water quality. The Conservancy hired new consultants to assess current environmental and hydrologic conditions and financed a "Phase 1" enhancement project based on their recommendations. The project included planting alder and willow along the eastern edge of the site to buffer the marsh from the adjacent lumber yard and Highway 101. The Conservancy is providing additional funding to improve tidal circulation at Bracut Marsh. "Phase 2" includes a new levee breach and excavated slough

channels. Despite problems, a number of important habitats exist at Bracut Marsh including tidal pools in the northern portion of the site and a freshwater/brackish wetland habitat in the southeastern portion. A 1991 monitoring of the marsh found increased vegetative cover. Three rare salt marsh plant species occur at Bracut Marsh: *Orthocarpus castillejoides var. humboldtiensis, Grindelia stricta ssp.,* and *Cordylanthys maritimus ssp*. The Conservancy anticipates that the "Phase 2" remedial restoration work at Bracut Marsh will result in a fully functioning, self-maintaining system.

**CREDIT EVALUATION:** The Commission and the Corps of Engineers (in the 2 instances in which it issued permits), have both calculated credits and debits by determining the square feet of habitat lost at the development site and requiring mitigation on at least an equivalent square-foot basis at the WMB. In a few instances, the Commission or the Corps required a compensation ratio greater than 1:1 because the debiting wetlands were of greater habitat value than the crediting wetlands.

**TRANSACTIONS:** The first 3 transactions (for 3 Broadway pocket marshes) occurred in 1980 while planning for the restoration project was still underway. One additional transaction occurred before the Conservancy had completed project construction. Eleven projects have utilized the Bracut Marsh WMB. The most recent debit occurred in May 1990. Of the original 6 acres available, 1.7 acres remain.

**FUNDING REGIME:** The Conservancy and the Commission originally conceived establishment of the Bracut Marsh Landbank as a fully reimbursable effort, with the Conservancy's expenditures reimbursed on a pro-rata basis by mitigation fees. Price per square foot of mitigation was to be determined by dividing the total square footage of marsh available for mitigation purposes by the estimated cost of WMB construction and management. The Commission and the Conservancy agreed to charge no more than $0.75 for each restored square foot of wetland habitat at the Bracut Marsh WMB. No provisions have been made to fund future maintenance costs. Neither the Conservancy nor any other public agency kept any account of the staff time needed for project selection, permitting, oversight, or management. Furthermore, although in 1981 the Conservancy acknowledged it would only receive approximately 74% of its expenditures, at this time the Conservancy anticipates receiving reimbursements totaling only approximately 54% of its expenditures if all mitigation credits are purchased.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Establishment of the Bracut Marsh bank is the direct result of the California Coastal Commission's 1979 “Statewide Interpretive Guidelines for Wetlands and Other Environmentally Sensitive Areas” which suggests that filling small, isolated and unproductive wetlands might be allowed if carried out in conjunction with the restoration of an area contiguous to a larger, high-value wetland. The Guidelines require that the wetland area to be filled be “less than one acre in size, isolated from other wetlands, low in habitat value, and incapable of recovering to a high level of biological productivity.” The Commission drafted the Guidelines in part to respond to regulatory problems that emerged as it was working with the City of Eureka on its Local Coastal Program (LCP). In 1980 the Commission, the Conservancy, and the City of Eureka worked together to identify mitigation sites. Bracut Marsh was zoned by the Humboldt County General Plan as a site for industrial use. In 1982, after the Conservancy had restored the site, the County changed that designation to “resource dependent” in its LCP. This designation allows resource-dependent activities, such as marsh restoration. The City of Eureka LCP specifically provides for the use of the Bracut Marsh WMB for wetland fills in the Broadway pocket marshes and in other saltwater wetlands within its jurisdiction.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The site is approximately one mile south of Jacoby Creek, which drains several hundred acres of agricultural, forested, and developed lands. The site is isolated from the surrounding drainage basin by State Highway 101 and Northwestern Pacific Railroad tracks, located on the eastern boundary of the marsh. On its bayward side, a dike separates the marsh from Humboldt Bay. The adjacent bay waters are part of the U.S. Fish and Wildlife National Wildlife Sanctuary, and greatly improve the overall habitat quality of Bracut Marsh. Bracut Lumber Company is located on the uplands just south of Bracut Marsh. Noise from the mill and traffic entering and exiting the site can disturb wildlife using Bracut Marsh. The Conservancy recently planted the southern portion of Bracut Marsh with alders and willows to help buffer it from noise and activity at the lumber mill.

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## Huntington Wetlands Restoration Project, California

**STATUS:** Active.

**PURPOSE:** The bank was created to mitigate joint impacts of California Department of Transportation (CALTRANS) and Orange County, CA Flood Control District (OCFCD) projects on wetland and dune habitats.

**LOCATION:** Between Highway 1, the Santa Ana River, the Talbert Flood Control Channel, and Brookhurst Street in the City of Huntington Beach, Orange County, CA. The Huntington Wetlands Restoration Project is part of 160 acres of degraded wetlands known as the Huntington Wetlands.

**SIZE:** The bank has 24.9 acres in 4 parcels. Only 6.25 acres of this area is available for mitigation purposes, including 1.6 acres of dune habitat.

**SERVICE AREA:** Debiting wetlands must be located within the same hydrologic drainage area as the WMB.

**TYPE OF MITIGATION:** The project involved the restoration of tidal action to degraded coastal salt marsh, flats, and sand dune habitat. Prior to restoration, the Huntington Beach Wetlands Conservancy (HBWC) property consisted of degraded and severely degraded salt marsh. The Talbert Valley Flood Control Channel wrapped around the restoration site and entered the ocean downcoast of the site. Two earthen levees which formed the Talbert Channel isolated the restoration site from tidal influence. Forty percent of the site was submerged or had emergent wetland cover. The remaining area was either barren or had upland vegetative

cover. Post-bank conditions consist of 6.9 acres of open water including shallow tidal channels and ponds, 10.3 acres of wetlands between 0.0 and 4.0 msl, and 7.7 acres of uplands at or above 4.0 feet msl.

**ENABLING INSTRUMENT:** The first Memorandum of Agreement (MOA) was signed in December 1988 by CALTRANS, the City of Huntington Beach, the California Department of Fish and Game, the U.S. Fish and Wildlife Service (USFWS), the California State Coastal Conservancy (the Conservancy), and HBWC. A second MOA was signed in November 1988 by the Orange County Flood Control District (OCFCD), the HBWC, the Conservancy, USFWS, California Department of Fish and Game, California Coastal Commission, City of Huntington Beach, and the Orange County Sanitation Department (OCSD). A separate contract between the Conservancy and the HBWC establishes HBWC's management responsibilities.

- The HBWC is required to make regular inspections of the marsh; repair fences, interpretative signs, and other improvements; lead tours of the wetlands; regularly inspect wetlands and dunes for die-out areas and replace these areas when necessary; restrict public access and trespass to sensitive areas; collect and dispose of wind-blown debris; and submit annual monitoring reports of the marsh to the Conservancy for a minimum of 5 years.

- The MOA which applies to CALTRANS stipulates that implementation of the restoration project shall begin before construction of the highway project, and the restoration project shall be completed before the highway project.

- The MOAs provide for the use of credits to mitigate for loss of "similar habitat." Salt marsh and freshwater marsh have been credited and debited interchangeably.

- The MOAs remain valid for 30 years and can be reviewed and amended on an as-needed basis.

**RESPONSIBILITIES:**

***Sponsor:*** The California State Coastal Conservancy is the bank sponsor.

***Credit Producer:*** The mitigation bank is managed by HBWC for a period of 20 years. HBWC is responsible for preparation of annual monitoring reports which include analyses of water quality, soils, vegetation, wildlife, and recommendations for improvement. Orange County maintains the flood channel, levees, and channel outlet.

***Management of Transactions:*** No balance sheet exists. Transactions to date have been by letter; the California State Coastal Conservancy and the debtors are responsible for maintaining and reporting on the accounting system. The MOA states that the County Flood Control District will maintain accurate records on the use of mitigation credits and notify all signatories each time such credits are used. Regulatory agencies determine whether the transactions are valid.

***Credit Evaluation:*** The initial credit availability was determined by the California Department of Fish and Game. State and Federal resource and regulatory agencies concurred with the Department's

assessment. Debits are determined by OCFCD, the California Coastal Commission, the California Department of Fish and Game, USFWS, and the California Coastal Conservancy.

***Regulatory:*** Authority for work associated with the highway and flood control projects and the Huntington Beach Wetland Restoration Project was combined in permits issued by the Corps.

***Long Term Site Ownership:*** The 4 parcels are owned by 3 different parties: HBWC, OCFCD, and OCSD. The HBWC parcel is 15.2 acres and is owned in fee. The parcel was given to HBWC by the Conservancy, which acquired the land from CALTRANS. The OCFCD parcel is 4.0 acres and also owned in fee. A conservation easement over this property was given to HBWC. OCSD owns 2 parcels in fee, totalling 5.7 acres, and conservation easements on both parcels were given to HBWC.

***Clients:*** Credits are jointly available to CALTRANS to compensate only for habitat losses associated with the widening of California Highway 1 in the vicinity of the project, and to OCFCD only for compensating habitat losses in conjunction with construction of Talbert Valley Channels projects.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Wetland restoration actions and the first phase of the flood control and highway projects were constructed and completed simultaneously in October 1987. The County's seaward channel levee was removed and a new outlet channel through the middle of the wetlands was built to improve tidal circulation and create intertidal habitat. The District's property was landscaped to screen a treatment plant and paved for maintenance and public viewing of the marsh. Fill material (57,000 cubic yards) was removed from the site. Monitoring reports following restoration show modest growth of *Salicornia virginica* and *Distichlis spicata,* but no other salt marsh plants have been found. Reports have also noted improvements in water quality and increases in fish and shorebird diversity. Two species of concern, the California Least Tern and the Belding's Savannah Sparrow, have been observed at the site. No remedial actions have been recommended.

**CREDIT EVALUATION:** Credits were derived from the restoration of wetland and sand dune habitat. The restored acreage was calculated and cost estimates were assigned based on the overall cost of the restoration project. Debits are based on a review of the proposed project and the type, size, and value of habitat to be lost. Best professional judgement is used to evaluate the appropriate ratio and acreage allowable for debiting. Ratios to date have been 1:1.

**TRANSACTIONS:** A total of 6.25 acres of mitigation were reserved as follows: 0.8 and 0.55 acres of deep water habitat credits to CALTRANS and OCFCD, respectively; 3.3 acres intertidal habitat credits to OCFCD; and 1.6 acres dune habitat credits to CALTRANS. Approximately 3.6 of the reserved credits have been debited. The first debiting was in August 1988 and the most recent debiting was in May 1992. The greatest distance between debiting and crediting wetlands has been 5 miles. OCFCD has 2.65 acres of wetlands remaining in the bank to debit upon the approval of state and Federal resource and regulatory agencies.

**FUNDING REGIME:** CALTRANS and the County contributed cash and in-kind services to HBWC for its mitigation credits pursuant to the MOAs. Both the County of Orange and HBWC have made 20 year

commitments to manage and operate the wetlands, and have the necessary funds and resources. The Conservancy pays for the first 5 years of monitoring reports; monitoring reports are completed with the help of volunteer labor. The County pays for monitoring and maintenance of flood control measures. A fund is managed by HBWC. Monies enter the fund through grant administration overhead, grants, donations, charitable contributions, oil spill clean-up activities, and other sources. The Conservancy has recovered its costs for the mitigation credits, including acquisition, restoration, maintenance, and monitoring. Work done above and beyond mitigation was funded by the Conservancy through fish and wildlife bond acts.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** This wetland restoration plan was part of an effort to certify a land use plan for a 160-acre area. The City of Huntington Beach has a certified Local Coastal Program (LCP) for its wetlands except the Bolsa Chica and Huntington Wetlands. The Coastal Conservancy was asked by the City to work with landowners, the City, HBWC, and state and Federal resource and regulatory agencies to prepare an acceptable land use plan for the Huntington Wetlands. The plan, which designates the 160 acres as conservation/wetland area, was approved by the City and the Coastal Commission. Certification of the City's zoning ordinances for this area are still pending with the Coastal Commission. The ordinances define allowable uses of the land (i.e. water-dependent uses, nature interpretation, wetland restoration) and require permit applicants to explore alternatives to wetland fill or disturbance and to mitigate for impacts.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The adjacent lands are mostly publicly owned. Streets, a flood channel, and the Santa Ana River border the site. Private landowners immediately upcoast of the site were concerned about the approval (by the City and the Coastal Commission) of the land use plan which designated their properties as wetland/conservation areas, but were not concerned with site restoration plans. The restoration project was probably beneficial to the landowners.

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## Naval Amphibious Base Eelgrass Mitigation Bank, California

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for dredge and fill activities of the Navy resulting in impacts to eelgrass *(Zostera marina)* habitat and an area suitable for eelgrass growth. The Navy agreed to provide

an eelgrass transplantation site to mitigate for its planned project and to create additional banked credits for future Navy projects in San Diego Bay.

**LOCATION:** Along the south shore of the Naval Amphibious Base, Coronado Peninsula, on the west side of San Diego Bay, San Diego County, CA.

**SIZE:** The bank is 10 acres (4.2 acres for one-time mitigation project and 5.8 acres for banking).

**SERVICE AREA:** The mitigation area will be used to mitigate for impacts to eelgrass habitat of the Naval Amphibious Base in San Diego Bay.

**TYPE OF MITIGATION:** Mitigation entails the creation of eelgrass beds. The bank site was a marine subtidal area sloping down to a flat unconsolidated bottom at -11 MLLW. The signatories planned to create a marine subtidal system at -1 MLLW with an aquatic bed of eelgrass. Construction activities included the deposition of dredged material and the planting of eelgrass root stock taken from adjacent beds. The debiting habitats for the Navy project were eelgrass beds.

**ENABLING INSTRUMENT:** The Memorandum of Understanding (MOU) was signed in 1986 by the Department of the Navy, the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), and the California Department of Fish and Game (CDFG). An Army Corps permit authorizes the deposition of dredged material to establish eelgrass habitat.

- The agreement limits debiting to in-kind replacement.
- The MOU cites a 1:1 replacement ratio.
- The MOU requires the Navy to provide alternative mitigation if the transplant effort fails (specifically the transplant of 4.2 acres of eelgrass coverage necessary to mitigate for 2 original Corps permits).
- The MOU states that the Navy is responsible for semi-annual status reports for 4 years. The reports are submitted to NMFS. The Corps reviews the monitoring reports and recommends remedial actions as necessary.
- According to the MOU, credits may only be used after the 4-year monitoring program is complete.

**RESPONSIBILITIES:**

***Sponsor:*** The U.S. Navy is the sponsor of the bank.

***Credit Producer:*** The Navy contracted out the work of filling the site and planting the site with eelgrass. NMFS agreed to conduct the monitoring program at the expense of the Navy. After a 4-year period, if the site meets the success criteria as determined by the Corps, resource agencies, and the Navy, the Navy is no longer responsible for maintenance of the bank.

***Management of Transactions:*** The responsibilities of accounting and banking functions have not been established.

***Credit Evaluation:*** The Corps determines the number of available credits through consultation with NMFS, USFWS, and CDFG.

***Regulatory:*** Following issuance of a Corps permit, if the bank fails, the applicant is in noncompliance with the conditions of the permit. The Corps can then pursue enforcement action against the applicant for noncompliance under 33 CFR 326.4 (d).

***Long Term Site Ownership:*** The Navy owns the site.

***Clients:*** The Navy is the only bank client.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Initial implementation was completed in February 1990. Construction included recontouring, wave attenuation fencing, and replanting. Only 5.8 acres of eelgrass have been created. In addition, 6.2 acres of existing eelgrass beds were damaged during preparation of the bank site by the deposit of dredge material. The Navy agreed to rectify the problem but never took action. Three years later the bed restored itself naturally. The Navy has not paid for monitoring of the site as agreed. The Corps has not pursued any enforcement action.

**CREDIT EVALUATION:** The MOU states that the Navy will mitigate for impacts to eelgrass on a 1:1, acre-for-acre basis. A report on the monitoring and evaluation agreement from NMFS further defines the habitat evaluation credit system as follows: 1) when mean density of shoots is 75% or greater than shoot density at an adjacent control site, percent coverage multiplied by the area will equal the acreage credit; 2) if mean density of shoots at the transplant site is between 50-74% of the control site then the habitat credits determined in (1) will be reduced by 50%; 3) if mean density of shoots at the transplant site is less than 50%, the transplant will be considered a failure and no habitat credit will be allowed.

**TRANSACTIONS:** Prior to plan implementation, the Navy reserved 4.2 acres of the bank for its original proposed project, which required 2 Corps permits. The 2 debiting actions for the project were in 1989 (August and November). However, bank construction was delayed until 1990. Therefore, contrary to the requirements of the MOU, the bank was debited before the transplant was successful, and the bank operated at a deficit for approximately one year. To date, only 5.8 of the 10 planned acres of eelgrass habitat have been created. The failure of the Navy to carry out monitoring responsibilities and the lack of a prescribed accounting system have produced uncertainty as to the number of available compensatory credits, although 1.6 acres should be available if the 5.8 acres is successful at a 1:1 ratio. Debiting habitats have occupied the same drainage area as the bank; the farthest distance from the debiting area to the bank is 2.65 miles.

**FUNDING REGIME:** The Navy is required to pay for site construction and the 4-year monitoring program.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** No official land use plans incorporate the WMB.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The bank is located approximately 250 feet offshore, adjacent to existing eelgrass beds in San Diego Bay. It is bounded on the north by the Naval Amphibious Base, and on the west by the Silver Strand of Coronado. The land and shore are owned and operated by the Navy.

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## Port of Los Angeles Inner Harbor Mitigation Bank, California

**STATUS:** Active.

**PURPOSE:** The bank was established to facilitate port development and permit processing by ensuring advanced mitigation for construction projects which involve excavation and filling.

**LOCATION:** On-site, Port of Los Angeles Inner Harbor, City of San Pedro, approximately 15 miles south of Los Angeles.

**SIZE:** The bank has no fixed size. Size is dependent on the scale of port development. Initially, the site was 17.7 acres. Additions are currently pending.

**SERVICE AREA:** Only projects undertaken within the waters of the boundaries of the Inner Harbor of the Port of Los Angeles can be applied to the bank.

**TYPE OF MITIGATION:** Deepwater habitats are created to compensate for deepwater habitat losses due to construction projects. Water depths within the Inner Harbor are generally greater than 20 feet. Habitats are unconsolidated bottom, wood and concrete pilings, boat floats, and water column/surface. Habitats found

along shoreline areas include rock/riprap, concrete/steel/wood bulkhead, and quarry muck. Fish and wildlife relying on San Pedro Bay, of which the Inner Harbor is a part, include a significant number of marine fishes and water-associated migratory birds. The Federally and state endangered California least tern and California brown pelican feed in the Outer Harbor and use the Inner Harbor to a lesser extent.

**ENABLING INSTRUMENT:** An MOU establishing the bank was signed in October 1984 by the City of Los Angeles Board of Harbor Commissioners (representing the interests of the Port), the United States Fish and Wildlife Service, the California Department of Fish and Game, and the National Marine Fisheries Service.

- This bank includes only deepwater habitats.
- Certain terms of the MOU, such as additions to credits based on increases in surface water acreage and the individual projects to be debited in the future, can be modified upon agreement by all signatories.
- The MOU provides that no signatory shall unreasonably withhold required agreement or consent.
- The bank is active until all bank credits have been used or until the existence of the bank is rescinded upon agreement by all signatories to the MOU.
- No maintenance or monitoring activities are required for the bank. No provisions have been made to ensure that the bank program exists in perpetuity.
- The withdrawal of such credits for compensation purposes may not take place until deepening projects are completed.

**RESPONSIBILITIES:**

***Sponsor:*** The Port of Los Angeles is the bank sponsor.

***Credit Producer:*** The Port of Los Angeles is the primary credit producer. However, the MOU provides that the Board of Harbor Commissioners, with the written consent of all signatories, may accrue habitat value from excavation done by another person or entity if the person or entity is an applicant for a Corps of Engineers permit.

***Management of Transactions:*** The Port of Los Angeles tracks credits and debits and provides this information to the signatories to the MOU.

***Credit Evaluation:*** Signatories to the MOU agreed upon the initial number of credits. The Port of Los Angeles has determined acreages impacted by debiting projects.

***Regulatory:*** Following issuance of a Corps permit, if the bank fails, the applicant is in noncompliance with the conditions of the permit. The Corps can then pursue enforcement action against the applicant for noncompliance under 33 CFR 326.4 (d).

***Long Term Site Ownership:*** The waters of Inner Harbor are considered tidelands of the State of California. The State deeded the lands to the City of Los Angeles.

***Clients:*** The bank was designed to facilitate implementation of Port-sponsored projects and other projects beneficial to harbor activities. The MOU provides that the Board of Harbor Commissioners, with the written consent of all signatories, may allow the use of previously created habitat value as compensation by others proposing fills in the Inner Harbor.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** The extent of construction is the excavation of land or deepening of shallow water areas to create deepwater habitat. The creation of deepwater habitats in the Inner Harbor has been successful. Studies have indicated that full biotic communities were established within five years of habitat creation.

**CREDIT EVALUATION:** Replacement is by area, based on the corresponding gain or loss of water surface area resulting from a project. Credits in the bank are created when fast land is excavated or shallow water areas are deepened to become deepwater areas. Debits are accounted for when existing deep water areas are filled to become fast land in accordance with port development plans. The original number of credits in the bank (17.7 acres) was based on the net increase in water surface area that occurred as a result of projects within the Inner Harbor from June 1975 to 1984.

**TRANSACTIONS:** The bank became active in 1984. Debits for 4 projects have been applied to the bank. As of 27 April 1992, the Port of Los Angeles estimates that 17.07 acres have been debited, resulting in a balance of 0.63 acres. However, the Port is in the process of calculating actual surface water acreages impacted from as-built conditions.

**FUNDING REGIME:** The agencies bear the cost of mitigating actions.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Los Angeles Harbor is considered in numerous local and regional land use plans including the Port of Los Angeles Master Plan, the City of Los Angeles Port of Los Angeles, San Pedro Community and Wilmington-Harbor City District Plans, the Los Angeles River Basin Water Quality Control Plan, the Water Control Policy for Enclosed Bays and Estuaries, and regional air quality plans. The bank waters come under jurisdiction of the California Coastal Commission (CCC). The Port of Los Angeles Master Plan, which formally incorporates the existence and use of the bank, was approved by the CCC.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The Port and the adjacent Long Beach Harbor occupy part of the 6000-acre marine coastal embayment known as San Pedro Bay. San Pedro Bay is semi-enclosed by 9 miles of breakwater. Private landowners on lands adjacent to Inner Harbor waters can potentially decrease or increase the surface acreage of Inner Harbor and impact the biological, physical, and chemical characteristics of harbor waters and sediments.

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## Springtown Natural Communities Reserve Mitigation Program, California

**STATUS:** Pending.

**PURPOSE:** Development and commercial sale of mitigation credits to compensate for environmental impacts of one acre or less resulting from construction activities involving both upland and wetland habitats.

**LOCATION:** Springtown, City of Livermore, Alameda County, CA.

**SIZE:** The bank has a total area of 92.57 acres in 2 parcels of 72.70 and 19.87 acres. The bank has the potential to expand to approximately 400 acres.

**SERVICE AREA:** Few restrictions are envisioned relative to out-of-kind compensation, the timing of compensation requirements, the geographic or hydrologic location of debiting actions, or other circumstances regarding wetland losses.

**TYPE OF MITIGATION:** Mitigation measures will involve restoration of degraded wetlands, particularly historic hydrology. Habitats of the restoration site include valley sink scrub, alkali meadow, alkali marsh/seep, and northern clay pan vernal pools. Twenty-one acres were classified as jurisdictional wetlands according to the 1987 delineation manual. The natural conditions in Springtown have been significantly altered in the last 30-40 years due to the building of a surrounding subdivision and a flood control levee, grazing, stream channelization, site discing, trash dumping, invasion by exotic plants and animals, fire control management practices, and on-site recreation. The hydrologic conditions at Springtown have been affected by diversions, urbanization, and the movement of faults. The major goal for site restoration is the optimization of habitat conditions for the Federally listed endangered palmate-bracted bird's beak (*Cordylanthus palmatus*), an annual herb. A number of other significant plant and animal species are associated with the habitats being restored on the site. Improvement of existing hydrological conditions will be made through management of surface water flows. An adaptive management scheme will be used. An initial 100-foot-wide buffer system will be built to protect the site against intrusions by neighbors. In addition to wetland mitigation, the site will serve the mitigation needs of other types of impacted environments. Detailed restoration plans are not known at this time.

**ENABLING INSTRUMENT:** A Memorandum of Understanding (MOU) between the Environmental Mitigation Exchange Company (emax) and the California Department of Fish and Game (CDFG) has been drafted. Signatory approval of the Corps of Engineers and other Federal agencies is not expected to be sought. Final approval is pending.

- At this time, the scale of compensation is limited to impacts of less than 1 acre.
- Operating guidelines are reported to have the approval of the CDFG for the satisfaction of non-Federal regulatory requirements, however, no effort is being made to determine their acceptability within the Federal sector at this time. This question will be addressed on a case-by-case basis when requests do arise to compensate for larger actions which require individual Corps Section 404 permits.
- Monitoring requirements and goals for monitoring periods are included in the agreement.
- The agreement includes a procedure for conditional and staged development of the MOU, dependent upon the outcome of experimentation according to a mutually acceptable experimental design. Experimentation follows an initial period of conservation and establishment of baseline monitoring.
- The agreement contains provisions for conflict resolution--contract provisions of U.S. and California law in a court of competent legal jurisdiction.
- The Springtown Natural Communities Reserve (SNCR) is planned to last in perpetuity.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is the Environmental Mitigation Exchange Company.

***Credit Producer:*** The Environmental Mitigation Exchange Company is the credit producer.

***Management of Transactions:*** Transactions will be managed by CDFG and the Environmental Mitigation Exchange Company. CDFG will handle all aspects of the debiting and crediting, and the Environmental Mitigation Exchange Company will handle all of the pricing and price negotiations over credit purchases. The Environmental Mitigation Exchange Company reports transactions to CDFG, which records the transaction and sends a copy of the balance of debits and credits to the Company.

***Credit Evaluation:*** The CDFG determines the type and number of credits available. In the future, an agreement may include the U.S. Fish and Wildlife Service, EPA, and the Corps in the credit evaluation process.

***Regulatory:*** The Environmental Mitigation Exchange Company is fully liable for corrective actions. The Company must complete a mitigation installation which fulfills the expectations of CDFG. Liability extends to management responsibility in perpetuity for the Company and its successors or

assigns. Penalties for negligence and non-performance of installation, maintenance responsibilities, and other expectations may be remedied in a court of law.

***Long Term Site Ownership:*** The Environmental Mitigation Exchange Company presently has an option agreement with owners of SNCR lands which will be acquired upon approval of the program. Initially, a conservation easement is expected to be placed on the lands. Fee ownership and long-term management responsibility will be transferred to CDFG when all transactions have been completed.

***Clients:*** The bank is proposed to service the compensatory needs of a broad range of potential users mitigating for a variety of impacting activities.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Implementation of bank construction actions has not yet occurred. Construction will occur when funds for the mitigation work have been received from project debtors. The site will not be built in increments that are only marginally functional; rather, numerous credits will be sold before a major mitigation action is undertaken so that a highly functioning habitat area can be achieved.

**CREDIT EVALUATION:** The methodological basis for evaluating credits and debits has not yet been developed. However, compensation credits are expected to be available upon initiation of incremental wetland restoration efforts. Approximately 36% of the available credits will be based on preservation using a replacement formula. When the results of experiments show that the site is capable of supporting certain levels and capacities of species, functions, and values, additional credits will be issued accordingly. With the variety of wetland and upland sites within SNCR, an array of credits representing multiple program outputs is ultimately expected. There will be 92.57 acres of general impact credits available at the initiation of crediting.

**TRANSACTIONS:** No debiting has occurred; however, several transactions are expected to occur pending final approval of the agreement.

**FUNDING REGIME:** A trust fund will be set up as part of the agreement. The project debtors will contribute to the fund. The fund will be managed by the Environmental Mitigation Exchange Company until its duties are transferred to CDFG for long term management. Interest on contributions to the fund in the early years will be used for operation and maintenance costs. The Environmental Mitigation Exchange Company will supply a performance bond for the mitigation work. If deficiencies are found, the bond covers replacement costs up to preset limitations.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The bank land is presently zoned for low density residential development and open space. The North Livermore General Planning process, currently underway, will probably include the bank. Also, the Natural Communities Conservation Act of 1991 enables the state to comprehensively plan for the integration of natural resources in regions which have threatened natural communities. The law allows the state to move endangered species from place to place within a region to consolidate, protect, and trade off high value habitat for lower value habitat.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The idea to establish the bank followed the 1982 discovery of the endangered *Cordylanthus palmatus* in the Springtown area, which has experienced rapid growth on the periphery of the Oakland-San Jose metropolitan area. Land uses surrounding the proposed bank are agriculture and low density residential development. Both of these uses could threaten the integrity of the potential bank unless specific steps are taken to maintain the hydrologic regime and curtail sedimentation, particularly in areas up-slope from the site. A large land parcel to the north of the bank is owned by the City of Livermore. The City has suspended a grazing lease on the parcel to lessen impacts on endangered plants. In the future, the bank may expand to include this parcel; however, if the Environmental Mitigation Exchange Company cannot obtain use of the land for banking purposes, future uses that the City may propose for its land could have a major effect upon the site since its land lies upslope of the site. Already, a major road and a golf course have been proposed for the City's property. The land use decisions regarding parcels to the east and west of the SNCR are also important to the future of the bank. The private landowner to the east has made attempts in the past to sell his parcel for the building of housing projects. Lands located to the west of the bank are owned by another developer who has proposed to build houses on the land. This land is being disced on a regular basis, causing runoff on the SNCR site which may cause degradation of the lands and water which serve as habitat for sensitive species including bird's beak, tiger salamander, and fairy shrimp.

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## Idaho Transportation Department Wetland Mitigation Bank

The Idaho Transportation Department (ITD) bank consists of 3 separate parcels, *Acequia*, *East Marsh (a.k.a. Mud Lake Wildlife Management Area)*, and *Old Beaver*.

**STATUS:**

***East Marsh:*** Inactive.
***Old Beaver:*** Active.
***Acequia:*** Active.

**PURPOSE:** The banks were created to compensate for unavoidable wetland losses due to highway development and improvement projects within District 6 of the Idaho Transportation Department.

***East Marsh:*** The site was established to mitigate impacts to 16 acres of wetlands filled during construction of Interstate 15 (I-15) as a categorical exclusion under Nationwide Permit 23. Involved agencies expected that mitigation actions would create bank credits in excess of the construction requirements.

***Old Beaver:*** ITD originally purchased the WMB site to provide mitigation for 21 acres of project-specific impacts due to highway construction permitted as a categorical exclusion under Nationwide Permit 23. Because the owner of the site would not split his 42-acre parcel, ITD purchased the entire 42 acres, intending to use roughly half of the site as a mitigation bank.

***Acequia***: The mitigation site was established for experimental purposes, because ITD wanted to attempt a wetland creation project as part of a borrow pit reclamation operation.

**LOCATION:**

***East Marsh:*** Ten miles north of Terreton in Jefferson County, in portions of Sections 28, 29, 32, and 33; Township 7 North; Range 35 East.

***Old Beaver:*** Adjacent to Interstate 15 (I-15) approximately 3 miles north of Spencer, in Sections 2 and 35, Township 12 North, Range 36 East, Clark County.

***Acequia:*** Adjacent to Snake River, 1.5 miles east of Acequia, Minidoka County, Idaho.

**SIZE:** The bank area totals 213 acres.

***East Marsh:*** The parcel is 150 acres.

***Old Beaver:*** The parcel is 42 acres.

***Acequia:*** Acequia is 21 acres in area, 5 acres of which are wetlands.

**SERVICE AREA:** The bank may be used to mitigate impacts within the same watershed, human impact zone, and ITD district.

**TYPE OF MITIGATION:**

***East Marsh:*** Bank establishment involves the restoration of seasonally flooded palustrine emergent marsh and scrub-shrub. The lowland areas at East Marsh typically supported a mix of emergent wetland plants such as bulrush (*Scirpus sp.*), spikerush (*Elecharis sp.*), foxtail (*Alopecurus sp.*), and cattail (*Typha sp.*), with some willow (*Salix spp.*) and cottonwood (*Populus sp.*). Sagebrush (*Artemisia sp.*), rabbit-brush (*Chysothamnus sp.*), and knapweed (*Centaurea sp.*) were the dominant plants on upland mounds. Historically, precipitation and runoff filled Mud Lake, causing excess water to flow into the East Marsh area. This type of pre-bank hydrological regime produced a natural mosaic of wetland and upland habitats that changed with variations in groundwater levels, irrigation demands, precipitation rates, and evaporation rates from Mud Lake. To maintain water levels through the waterfowl nesting season, the Idaho Department of Fish and Game (IDFG) formerly supplemented the natural hydrology by pumping groundwater into East Marsh from an off-site well. Beginning in the 1970s, IDFG began having problems keeping the marsh flooded, primarily because they did not have exclusive rights to the well. Drought conditions and increased demands on groundwater for irrigation purposes caused the local aquifer to recede. As a result, the extent and quality of natural wetland habitat in East Marsh began to decline. Bank restoration goals were to improve site hydrology for wetland conditions. The impacted wetlands, located 10 miles from the restoration site,

were classified as seasonally flooded palustrine-persistent-emergent wetlands. Vegetative cover was abundant, species composition was diverse, and the hydrology was relatively stable.

***Old Beaver:*** Credits will accrue from the restoration of palustrine emergent marsh and scrub-shrub. Prior to restoration, the site was highly disturbed by cattle grazing. Soil was intensely compacted, and vegetative cover was sparse and dominated by annual grasses and some herbs. Shrubs such as willow (*Salix spp.*) and aspen (*Populus tremuloides*), which would normally have been abundant on the site, were nearly eliminated. The debiting wetlands were scattered along several miles of the I-15 right-of-way, within 3-10 miles of the WMB. These wetlands were generally similar to the WMB wetland, but in slightly better condition.

***Acequia:*** Mitigation credits are based on the creation of riparian (shrub-scrub) and palustrine emergent wetlands as well as some open water and aquatic-based wetland.

**ENABLING INSTRUMENT:** Two documents were created to address wetland mitigation banking in Idaho: the Memorandum of Agreement (MOA) for Development and Use of a Wetland Bank in Idaho, dated September 1988, and the Operating Procedures for the Development and Use of a Wetland Bank in Idaho. Signatories are: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency (EPA), the Federal Highway Administration (FHWA), U.S. Fish and Wildlife Service (USFWS), Idaho Transportation Department (ITD), Idaho Department of Fish and Game (IDFG), Idaho Department of Lands (IDL), Idaho Department of Water Resources (IDWR), and Idaho Department of Health and Welfare (IDHW-DE). These documents set up a statewide banking system that applies to all wetland units within the system. In addition, the East Marsh Management MOU was signed by ITD and IDFG to establish the agencies' management responsibilities for the East Marsh site. The interagency team reconvened in July 1993 has proposed revisions to the MOA and Operative Procedures.

- The MOA stipulates that bank sites be located in such a manner that they match the physical, chemical, and biological character of, and be as close as possible to anticipated impact sites.

- The Operating Procedures state that the WMB may only be used to mitigate impacts within the same watershed, human impact zone, and ITD district.

- The Operating Procedures state that replacement ratios must be based on equal values as defined by Habitat Evaluation Procedures (HEP).

- The MOA contains an unusual provision which tends to constrain out-of-kind wetland replacement: "in no case may the dollar value of out-of-kind replacement be of greater value than the cost of in-kind replacement."

- All signatories to the MOA are responsible for reviewing and approving revisions/updates on an as-needed basis.

- Life expectancy of the WMBs is not specifically defined in the 2 Idaho documents, but the banks are expected to be perpetual. There is some uncertainty about the lifespan of the East Marsh bank because the Management MOU refers to the 20-year life of the project.

- The East Marsh Management MOU states that credits available to ITD are directly proportional to its financial contribution to restoration of East Marsh wetlands (i.e., the total net gain in wetland credits is prorated according to the respective financial contributions of ITD and IDFG, with the former available for banking purposes and the compensation of highway construction projects. The primary interest of IDFG is waterfowl production.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor of the East Marsh and Old Beaver sites is ITD, District 6. The sponsor of the Acequia site is ITD, District 4.

***Credit Producer:*** ITD is the credit producer; however, at East Marsh IDFG agreed to operate the pump and manage the site.

***Management of Transactions:*** ITD conducts the banking function with oversight by the Army Corps of Engineers and other signatories. ITD is responsible for reporting on the status of the WMB whenever a transaction occurs and at the end of any construction activities.

***Credit Evaluation:*** At East Marsh, ITD and IDFG are responsible for determining the number of available credits. At Old Beaver and Acequia, ITD, in conjunction with the Corps and other interested signatories to the Memorandum of Agreement, will determine the number of available credits based on follow-up HEP studies.

***Regulatory:*** Corps of Engineers regulates the WMB through its permitting of debiting activities.

***Long Term Site Ownership:*** The East Marsh is the property of IDFG. ITD owns the Old Beaver site until all credits have been used and ITD can solicit a resource agency to accept management duties. Acequia is owned by the U.S. Bureau of Reclamation and leased to ITD.

***Client:*** ITD is the bank client.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:**

***East Marsh:*** Implementation activities included installation of a pump on the existing IDFG well, construction of levees, rehabilitation of existing irrigation ditches, and installation of culverts and headgates to control water movement and levels. None of these activities required a Corps permit. The East Marsh restoration has not been successful. For 2 months after the bank was established in spring 1990, about 100 acres of the site were saturated through water pumping activities. Due to structural deficiencies, prolonged drought, and excessive groundwater pumping by adjacent landowners, the site now lacks adequate hydrology and is being invaded by xeric vegetation. Potential structural and other remedies for the water problem exist, however, ITD and IDFG have deferred such efforts until natural drought conditions abate.

***Old Beaver:*** The restoration work was completed in 1989. A Habitat Evaluation Procedures analysis was conducted and fencing was constructed to prevent cattle grazing and permit natural revegetation. The restoration project has been successful in increasing the quality and size of wetland communities in Old Beaver. In 2.5 years the site changed from a degraded and excessively grazed wet pasture to

a hydrologically stable and botanically diverse wetland community. The wetland is dominated by emergent wetland plants, including bulrush (*Scirpus sp.*), sedge (*Carex sp.*), bluegrass (*Poa sp.*), dock (*Rumex sp.*), fireweed (*Epilobium sp.*), foxtail (*Alopecurus sp.*), and rush (*Juncus sp.*). Substantial re-establishment of the willow shrub layer has occurred. ITD's long-term plan is to passively manage the area by keeping cattle out, controlling invasive species, and facilitating the re-establishment of willow, alder (*Alnus sp.*), and aspen trees and shrubs on the site.

***Acequia:*** A former borrow pit was reclaimed and a depressional wetland was created. Construction activities included the creation of a stream channel with rock drop structures and a small rock dam to divert water into the wetland from an adjacent irrigation ditch, and installation of a 24-inch outfall culvert connecting the site to the Snake River. None of these activities required a Corps permit. The inundated/saturated areas are smaller in area than originally expected, possibly due to grading design errors. In addition, the flow of water through the site has not met initial expectations, principally due to improper design of the intake structure and associated diversion weir at the irrigation waste-water ditch of the site's west boundary. Water depths, duration of inundation/saturation, and stagnant water problems are limiting wetland vegetation development. Thus, a very small portion of the bank meets wetland vegetation criterion. Adverse environmental conditions in the area due to regional, continuing drought may be playing a role in the failure of this site. If drought conditions improve, the bank may become operational. The site is also plagued by uncontrolled public access and off-road vehicle use. Several modifications to improve the site have been noted. The repair of the diversion structure at the intake would provide a more constant source of oxygenated water for the project. Several rock drop structures need repair. Slopes adjacent to the racetrack-shaped wetland area appear to be too steep and may act as limiting factors for the development of wetland vegetation. Much of the wetland area fills to depths of water too great to allow the establishment of wetland vegetation. Several weed species should be managed to reduce their abundance at the site. The species include Russian-olive and reed canarygrass. If these or similar actions are undertaken, the Acequia site may begin to function as a wetland and mitigation credits could become available for use in District 4.

**CREDIT EVALUATION:** Crediting and debiting will be based on functional wetland replacement using Habitat Evaluation Procedures (HEP) or the FHWA Method for Functional Wetland Assessment. Species evaluated in the pre-bank wetlands HEP study included muskrat, breeding mallard, red-winged blackbird, spotted frog, and yellow warbler. General functions and values were evaluated using best professional judgement. Functions of primary concern include wildlife habitat, flood desynchronization, sediment trapping, nutrient export, food chain support, and groundwater recharge/discharge. In simple situations the MOA provides for the use of best professional judgement, with replacement normally expected to be on an acre-for-acre basis.

**TRANSACTIONS:**

***East Marsh:*** Credits have not accrued and no formal debiting has yet taken place. However, the permitted construction work on I-15 has progressed, conditioned on the compensation of wetland losses. ITD has been granted an extension of time in which to fulfill this compensation. Wetlands impacted by I-15 construction are approximately 10 miles from the bank and are located in the same hydrologic subbasin.

***Old Beaver:*** Credits have not yet accrued and no formal debiting has taken place. The Corps, however, has permitted ITD construction projects contingent on future bank debiting. Bank monitoring will take place in 1993 and 1995 to determine whether credits have accrued.

***Acequia*:** Credits will be available upon approval of successful wetlands creation. There have been no proposals to use this site for mitigation credits.

**FUNDING REGIME:** ITD (and IDFG at the East Marsh site) pays for implementation and operation of the bank, as well as monitoring.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:**

***East Marsh:*** Zoning and land use planning in the area of the East Marsh WMB is under the jurisdiction of the Jefferson County Planning Department. Land use in the county is addressed in the *Jefferson County Comprehensive Land Use Plan* published in May 1988. The area in which the East Marsh site is located is zoned for agricultural use.

***Old Beaver:*** Zoning and land use planning in the area of the Old Beaver site is under the jurisdiction of the Clark County Planning Department. Land use in the county is addressed in the *Clark County Interim Land Use Plan*, released for public comment the week of 19 July 1992. The area in which the Old Beaver site is located is zoned for agricultural use.

***Acequia*:** No information is available.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:**

***East Marsh:*** The site and most of the adjacent land is part of the Mud Lake Wildlife Management Area, administered by the IDFG. This site is primarily managed for waterfowl production, although some land is reserved for crop farming. These activities affect the hydrology of the bank site. Production of waterfowl habitat requires that certain water levels be maintained throughout the marsh. However, farming creates a demand for irrigation water and lowers the water levels in the local aquifer.

***Old Beaver:*** The Old Beaver bank occupies a long, narrow tract of land between I-15 and the Pacific Union Railroad right-of-way. The land adjacent to the bank is privately-owned cattle pasture. Intensive grazing on land adjacent to the bank could produce contaminated surface runoff. The Old Beaver wetland system could be adversely affected by sediment and nutrient-laden runoff entering the site.

***Acequia:*** No information is available.

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## Fina LaTerre Mitigation Bank, Louisiana

**STATUS:** Active.

**PURPOSE:** The bank was set up to provide offsite mitigation for future unavoidable impacts of oil and gas drilling operations, and for other mitigation.

**LOCATION:** Terrebonne Parish, southeastern Louisiana, approximately 12 miles southwest of Houma, LA.

**SIZE:** The bank has an area of 7014 acres.

**SERVICE AREA:** The debiting wetlands must be located in the same hydrologic unit as the mitigation site unless approved by the interagency review team.

**TYPE OF MITIGATION:** The bank employs a marsh management strategy to enhance the capacity of the management area to provide habitat for selected fish and wildlife, to retard or reverse the conversion of the managed area into open water, and to enhance marsh productivity. The bank consists primarily of marsh, adjacent shallow open water areas, and natural levees formed as a result of the deposition of Mississippi River sediments. The sediments formerly entered the area via Bayou Lafourche, a distributary of the Mississippi River. In 1904 the distributary was permanently separated from the Mississippi River by a closure constructed by the Corps of Engineers. Levee construction along the Lower Mississippi River and the constructed closure virtually eliminated freshwater and sediment transport to area wetlands. Natural subsidence occurring at about one foot per century, and other factors such as excavation of major navigation canals, canalization for oil and gas exploration and production, and saltwater intrusion via man-made waterways have led to the conversion of fresh marsh to open water and more saline vegetation types. The marsh management plan was developed by the Soil Conservation Service at the request of Tenneco Oil Company, the previous landowner. The plan involves construction and maintenance of a system of levees and weirs around the management area to allow management of water levels and reduce salinity. Water flows are actively managed to convert brackish marsh to intermediate marsh, encourage the growth of freshwater plant species desirable as food for wildlife, and promote growth of emergent plants in shallow water areas and submergent species in deeper water areas. The marsh management strategy is not expected to reverse the general trend of degradation, which is projected for the entire area of which the bank is a part. The management program is expected to postpone the area's eventual conversion to open water.

**ENABLING INSTRUMENT:** The final signatures on the original Memorandum of Agreement (MOA) were obtained in January 1984. The bank opened in 1985, and a revised MOA, with substantial alterations in credits and debits, was signed in early 1987. Signatories to the MOA are: U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), U.S. Soil Conservation Service (USSCS), Louisiana Department of Natural Resources, Louisiana Department of Wildlife and Fisheries (LADWF), and Tenneco Oil Company (now binding on Fina Oil and Chemical Company).

- The MOA does not limit the types of wetlands that can be debited, but it does require that only projects occurring in the same hydrologic unit can be debited from the bank, unless a request to apply credits outside the hydrologic unit is unanimously approved by the interagency review team.

- USFWS projects that the bank area would convert to open water in 77 years without active bank management, therefore, the estimated life expectancy of the bank is set at 77 years.

- At the end of 25 years, an interagency review team must conduct an evaluation of the management program. The agencies will negotiate a course of action that takes into consideration the sponsor's interest in maintaining subsurface mineral rights as well as all parties' interests in protecting the ecological integrity of the wetlands.

- The MOA specifically provides for the sale of credits to others by Fina.

- The revised MOA stipulates that unavoidable impacts to 88 acres of wetlands or less require a debit equal to the average annual habitat unit (AAHU) loss caused by the project (i.e. 1:1 ratio). Impacts over 88 acres require a debit of twice the AAHUs lost through the project (i.e. 2:1 ratio).

- The revised MOA specifies resource categories and allowable compensation between categories. In addition, wildlife losses may be offset only by wildlife AAHUs, freshwater fisheries losses may be offset only with freshwater fisheries AAHUs, and estuarine fisheries losses may be offset only with estuarine fisheries AAHUs.

- A developer of a project located on the portion of the bank area not owned by Fina may be required to provide mitigation in addition to the AAHU loss caused by the project either at an offsite location or by negotiating with Fina to allow additional debiting from the bank.

- In the event that the interagency review team requires that a canal be plugged, the debits initially assigned to the indirect impacts of that canal will be reduced.

- The MOAs have no provisions for regular review and updating, however, the original MOA does have a provision that allows revisions upon agreement by all parties.

- The MOA stipulates that the interagency review team shall conduct a complete reevaluation of the management program 1, 5, and 25 years after implementation. The MOA stipulates that whenever significant operational and/or structural changes are made to improve the success of the bank, another complete evaluation should be conducted 3 to 5 years following these changes.

- Bank credit applicants must demonstrate to the satisfaction of all parties signatory to the MOA that no reasonable on-site alternatives are available for mitigation.

**RESPONSIBILITIES:**

***Sponsor:*** Fina LaTerre, Inc., a subsidiary of Fina Oil and Chemical Company, is the bank sponsor.

***Credit Producer:*** Fina LaTerre, Inc. is the credit producer. Fina is committed to active management of the bank for 25 years beginning in 1988. Fina has conducted at least bi-monthly monitoring of salinity, water levels, and turbidity at stations within the bank area and control stations outside the management area since plan implementation in 1985. USFWS is actively involved in operation of the bank and has assumed responsibility for periodic evaluation.

***Management of Transactions:*** The MOA requires USFWS to maintain the ledger on bank transactions and to provide data sheets with credit or debit calculations for each transaction to each MOA signatory for signature concurrence. No debits or credits are final until all agencies and the sponsor concur.

***Credit Evaluation:*** The original Habitat Evaluation Procedures (HEP) study was conducted by personnel from the United States Fish and Wildlife Service with assistance from the National Marine Fisheries Service, Louisiana Department of Natural Resources, Soil Conservation Service, and Tenneco LaTerre. The interagency team, which now includes Fina in place of Tenneco, determined initial credit availability, determines debits to the bank for particular projects, and evaluates the success of the management plan in producing credits.

***Regulatory:*** The Corps of Engineers regulates the bank through its permitting of debiting activities.

***Long Term Site Ownership:*** Five thousand acres of the bank are owned by Fina Oil and Chemical Company. The remaining 2014 acres, while included in the area affected by marsh management activities, are held by other owners. Fina has not obtained agreements from these landowners with respect to developments on their holdings within the bank's boundaries.

***Clients:*** Fina LaTerre, Inc. is the main client of the bank. Fina's motivations to establish the bank were both economic and practical. The bank is in an area where loss of marsh to open water had been proceeding rapidly. In Louisiana, when vegetated marsh degrades to open water contiguous with state waters, title to the mineral rights in the area may pass to the state. The bank protects the company's mineral rights and produces mitigation credits for exploration activities. The MOA specifically provides for the sale of credits to others by Fina. Since initial establishment of the bank there have been 12 such sales.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Initial implementation was completed in July 1985. Actions included construction of new weirs, maintenance of existing weirs, construction and maintenance of levees and spoilbanks, and breaching of selected spoilbanks. The 5-year evaluation, completed in 1990, demonstrated net areal increases in marsh and scrub-shrub habitat and dramatic increases in freshwater fish credits. However, credit shortfalls were noted for wildlife and estuarine fisheries which resulted in recommendations for both structural and operational changes in the bank. According to the MOA, Fina is obligated to implement some but not all of the recommendations. If AAHUs cannot be recouped, the operational life of the bank may be reduced.

**CREDIT EVALUATION:** Credits in the bank depend on maintenance and/or improvement in habitat quantity and/or quality for selected species beyond the conditions which would be expected without any management,

as determined by an HEP analysis. The species selected for use as evaluation elements for the HEP analysis were: muskrat, nutria, alligator, largemouth bass, Gulf menhaden, Atlantic croaker, white and brown shrimp, lesser snow goose, migratory puddle ducks, and wading birds such as herons, egrets, and ibises. Credits were determined for gains in habitat units at the end of 25 and 77 year periods of active management. Credits are expressed as average annual habitat units or AAHUs. For the 25-year period of Fina's active management, 158,949 available credits were computed.

**TRANSACTIONS:** A total of 7,729 AAHUs have been debited against the original credit balance of 158,949. Fourteen debiting actions have taken place since 1987; 12 of the actions were credit sales to other companies at a cost of about $25 per AAHU. The first debiting took place in February of 1987, and the most recent action occurred in 1990.

**FUNDING REGIME:** Costs of property management are debited against a land operation budget at Fina. The budget is subsidized by royalties from oil income. Hunting and trapping leases also contribute to the fund. USFWS has paid for its own involvement in setting up and managing the WMB. Credits have been sold to other companies.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The mitigation bank is located within the Terrebonne Unit of the Central Gulf Coast Wetlands Study Area. Based on wintering waterfowl use, the unit ranks first out of 14 key privately-owned wetland units located along the coasts of Louisiana, Mississippi, and Alabama. Louisiana's 19 coastal parishes currently have the authority to pass their own local coastal zone management programs with approval of the Coastal Management Division (CMD) of the Louisiana Department of Natural Resources. Under such programs, oil and gas development remains under the jurisdiction of the CMD. As of 1987, Terrebonne Parish did not have a program.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Over 2000 acres of the management area adjacent to Fina-owned land are held by numerous other landowners. The revised MOA includes credit for habitat improvement on these acres because they directly benefit from management activities undertaken on Fina-owned land. If the holders of these acres carry out projects requiring mitigation within the bank boundaries, debits for the project will be subtracted from the bank, but the developer may have to conduct additional mitigation activities.

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## Louisiana Department of Transportation and Development Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The purpose of the bank is to compensate for unavoidable wetland losses caused by highway construction projects.

**LOCATION:** Grant and LaSalle Parishes, LA, partially within Little River Wildlife Management Area.

**SIZE:** The bank has 2944 acres in 11 separate parcels.

**SERVICE AREA:** Throughout Louisiana, outside the coastal zone.

**TYPE OF MITIGATION:** Mitigation credits were derived from the preservation and enhancement of wildlife values through public acquisition and timber management. The mitigation sites are comprised primarily of bottomland hardwoods with the exception of the higher ridges which have some pine timber. The lands are dominated by overcup oak bitter pecan and cypress in the lowest areas. The middle elevations on the sites contain Nuttall oak, willow oak, water oak, overcup oak, and blackgum. Sycamore, sweetgum, cottonwood, loblolly pine, and cow oak are prevalent in the highest banks of the lakes and the river. Much of the area is subject to inundation from Little River, and a number of small lakes are found in the area. Backwater flooding is beneficial to sport and commercial fish production in these lakes. A large population of free-ranging hogs and cattle severely restrict the ability of the lands to support deer and rabbit. In addition, timber management practices could improve habitat for turkey and squirrel. Louisiana Department of Wildlife and Fisheries (LDWF) plans to improve habitat for wildlife on bank lands by implementation of forest management practices. Debiting wetlands have varied widely in size and quality, although they have generally been of the same type as the bank wetlands.

**ENABLING INSTRUMENT:** All understandings pertaining to establishment and operation of the bank and to the assignment of agency responsibilities are in the form of verbal agreements among USFWS, LDOTD, and LDWF. A resolution was passed by the Louisiana State Legislature which allowed LDOTD to purchase bank lands and authorized transfer of these lands to LDWF. The deed that transferred title to bank lands from LDOTD to LDWF also transferred all responsibility for the management and maintenance of bank lands to LDWF.

- Debiting actions to date have not been limited to the same hydrologic unit as the bank. Informal guidelines pertaining to bank operation allow for debiting throughout the non-coastal areas of the state.

- No agreements have been made pertaining to the life of the bank.

- Responsibility for corrective actions is unclear. A dispute over who should bear the costs of the initial boundary surveys resulted in a determination that LDOTD would bear the cost.

**RESPONSIBILITIES:**

***Sponsor:*** LDOTD is the bank sponsor.

***Credit Producer:*** LDOTD purchased lands and transferred the titles to LDWF to implement habitat improvements. However, no provisions were made to reimburse LDWF for implementation and management costs.

***Management of Transactions:*** USFWS keeps track of debit and credit balances and maintains a written record of transactions.

***Credit Evaluation:*** USFWS conducted the Habitat Evaluation Procedures (HEP) analysis to determine the number of initial credits. USFWS, LDWF, and LDOTD collectively decided on the appropriate management scenario to determine the number of initial credits. All 3 agencies have worked closely throughout the life of the bank to determine debits for individual projects, although USFWS has had the primary role in determining actual debit amounts.

***Regulatory:*** The Corps of Engineers, as the permitting agency for LDOTD wetland conversions, presumably has the means to enforce the achievement of WMB objectives. If, during the initial processing of a permit, the Corps found the WMB to be operating at a deficit, the Corps could deny the permit or require compensation of wetland losses through some other means.

***Long Term Site Ownership:*** Lands were originally purchased by LDOTD in 1981 and transferred to LDWF in 1989. The title contains a provision for the lands to revert back to LDOTD if they are not used for banking purposes. Four of the 11 bank tracts are now included in LDWF's Little River Wildlife Management Area (WMA).

***Clients:*** LDOTD is the sole client of the bank.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Land management efforts have been hindered by the large number of separate tracts and the lack of a formal lands survey. LDWF is attempting to consolidate the lands into larger parcels by swapping with adjacent landowners. LDOTD originally planned to fence the larger tracts, however, this idea was later abandoned by all agencies due to the expense. Wetland management measures have not been implemented; therefore, the bulk of the original credits may be invalid. LDWF has long term plans to improve habitat on Little River Wildlife Management Area lands for multiple game and nongame wildlife species through timber management. LDWF is currently conducting preliminary forest inventories on bank lands. The agency also plans to enhance public access to the lands by improving roads and trails, building new trails, and posting signs for boundaries, roads, and trails. WMA lands are open to public hunting and LDWF personnel will conduct bag checks to patrol WMA lands.

**CREDIT EVALUATION:** Credit evaluation was originally based on functional replacement using average annual habitat units (AAHUs). AAHUs were defined as the gains in habitat values achieved for the selected species

at the end of 50 years of active management. The evaluation species selected for the HEP analyses were gray and fox squirrels, white-tailed deer, swamp rabbit, raccoon, wood duck, and mink. Of the 17 projects which have been debited, HEP analyses to compute the number of AAHUs were conducted only for the first 5. Because the Federal Highway Administration requires mitigation to be determined on an acre-for-acre basis, LDOTD requested that some way of debiting on an acre-for-acre basis be incorporated into the debiting process. A uniform system of debiting was developed that converted the number of wetland acres impacted into AAHUs. USFWS assumed that the Habitat Suitability Index of the bank area and the wetland habitat impacted by projects were the same, and the index was set at 0.29. The product of 0.29 and the number of converted wetland acres yielded the AAHUs to be debited from the bank. The shift from a crediting and debiting method based on functional replacement to one based on areal replacement has created confusion over the number of remaining credits. Initially, 376.03 AAHUs were assigned, based primarily on habitat enhancement to be accomplished through management measures. None of the management measures necessary to create credits have been implemented. Also, in the computation of available credits it was assumed that approximately 15% of the bank area would have been converted to agriculture had it not been acquired and placed in public ownership, resulting in 64.46 AAHUs based on this assumption of preservation. Eighty percent of the original 376.03 AAHUs have been debited.

**TRANSACTIONS:** LDOTD ultimately received 376.03 AAHUs as initial credits for the purchase of and habitat enhancement activities on bank lands. However, no habitat enhancement measures have been undertaken to date. Assuming that only the 64.46 credits based on preservation were valid, the bank has been operating at a deficit of -231.94. Seventeen debiting actions have occurred to date; the first occurred in 1983, the most recent occurred in 1989. A total of 296.40 AAHUs have been debited.

**FUNDING REGIME:** No funding regime has been established.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Aside from the 4 tracts which are part of the Little River Wildlife Management Area, the zoning of the banks is unknown.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The lands surrounding the 11 bank tracts are owned by timber companies and private landowners who manage the lands primarily for timber production.

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## Minnesota Wetland Habitat Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses associated with highway construction projects located within each of the 9 Minnesota Department of Transportation (MnDOT) districts.

**LOCATION:** Forty-six sites are distributed throughout Minnesota.

**SIZE:** The total area of the bank is 1750 acres. Sites range from 0.1 to 670.0 acres and average 38.1 acres in area.

**SERVICE AREA:** Credits are not transferrable between MnDOT districts. The debiting wetlands are not required to occupy the same drainage area as the credit site.

**TYPE OF MITIGATION:** Mitigation actions create or enhance primarily inland, shallow marshes and deep, freshwater marshes.

**ENABLING INSTRUMENT:** The formal document is a MnDOT technical memorandum dated 18 June 1987, and letters of concurrence from the Federal Highway Administration (FHWA), the U.S. Fish and Wildlife Service (USFWS), and the Minnesota Department of Natural Resources (MnDNR).

- The agreement contains no provisions for bank monitoring.
- The agreement does not provide for its own review and updating.
- The agreement states that credit areas are awarded a percentage of their Habitat Evaluation Procedures (HEP) value based on the security and longevity of MnDOT's ownership: areas in public ownership receive 100% of HEP value; areas secured by easements on private land are awarded less than 100%; and areas for which neither title nor easement can be secured initially receive 100% which is then discounted based on the number of years the project is expected to remain successful.
- Out-of-kind compensation of wetland losses is one of the basic objectives in the establishment and operation of the Minnesota WMB.
- The agreement requires written agreements between MnDOT and the entities managing the sites concerning funding, liability, design, engineering, construction, and other aspects of the banking scheme.

- The agreement states that if a project does not have the unanimous approval of the bank managers, mitigation for the project will be coordinated outside the bank.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is MnDOT.

***Credit Producer:*** MnDOT is responsible for wetland improvements and for securing any required permits and approvals. The multi-parcel bank is managed by various parties, including state agencies, local governments, and private entities.

***Management of Transactions:*** The WMB accounts are managed by a team consisting of personnel from MnDOT headquarters, MnDOT personnel stationed within the district sponsoring the project, a MnDNR biologist, a USFWS biologist, and a representative from FHWA. Accounts of credits are kept at the Central Office of MnDOT and statements are circulated to districts, cooperating agencies, and FHWA twice a year or as requested.

***Credit Evaluation:*** Biologists from MnDOT, MnDNR, USFWS, and the managers of the mitigation sites determine credit availability.

***Regulatory:*** The Army Corps of Engineers (the Corps) regulates the bank through its permitting process.

***Long Term Site Ownership:*** Most credit areas are purchased by MnDOT and turned over to MnDNR.

***Clients:*** MnDOT is the sole client of the WMB.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** In general, wetlands are created and enhanced through mechanical excavation and construction of low dams to impound water in upland environments or prior wetland areas (mainly wet meadows and scrub-shrub), and construction of islands conducive to waterfowl nesting. The objective of the MnDOT bank is the creation and enhancement of waterfowl habitat.

**CREDIT EVALUATION:** Functional valuations of debits and credits are based on Habitat Evaluation Procedures (HEP). Habitat units (HUs) are the currency used to quantify the value of wetland debiting and crediting areas. The extent of credit also varies according to the nature of the real estate interest, as described in the "Enabling Instrument" category. Although wildlife habitat is the principal wetland function considered for evaluation purposes, other functions and values such as flood control, aesthetics, and biodiversity are reported to be considered in bank planning and design. Because preference is given to development of bank credits for high waterfowl habitat value, wide differences exist in habitat value of debiting and crediting sites. As a result, replacement ratios of less than 1:1 on an acreage basis are common. Overemphasis of waterfowl habitat values has resulted in a high rate of out-of-kind mitigation. The Corps and the Environmental Protection Agency (EPA) have been openly critical of this management strategy and advocate that more emphasis be placed on in-kind replacement of wetland resources.

**TRANSACTIONS:** The first debit occurred in February 1984, and the most recent took place in 1992. There have been 32,029 HUs used for 104 debit sites. The distance between debit sites and the various bank parcels has ranged from 10 to 120 miles and averages 75 miles. Each of MnDOT's 9 districts has at least 2 bank areas to use for debiting purposes. The completion of wetland creation and enhancement efforts in 5 of the districts postdated the recorded date of first debitings. Each district maintains its own account of debits and credits, and credits are not transferrable. In 1991, 6 districts had positive credit balances and 3 districts had negative balances (which were maintained for as long as 8 years). MnDOT made good faith efforts to restore positive credit balances and did away with the necessity for USFWS and USEPA to impose a moratorium on further permit issuance. The bank as a whole has maintained a positive credit balance over the years. Between 1984 and 1991, the statewide balance was 32,487 HUs.

**FUNDING REGIME:** Agencies have paid the costs of their own involvement. MnDOT has funded construction activities. No trust fund or other financial arrangement has been developed to pay for the costs of maintenance, replacement, or unexpected contingencies.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Information is not available.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Information is not available.

**UPDATE:** The Minnesota Wetland Habitat Mitigation Bank has been incorporated within a state banking program for general use. The program was created by the Minnesota Wetland Conservation Act, 1991 amended in 1993. The banking program is administered by the Minnesota Board of Water and Soil Resources.

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## Mississippi State Highway Department Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses associated with the construction and stabilization of roadway embankments and bridge abutments in waters of the United States outside the Mississippi Coastal Zone Area, and for associated discharge of dredged and fill material covered by a Corps of Engineers statewide general permit.

**LOCATION:** The bank consists of four separate parcels located in three Mississippi counties:

***State Line Pitcher Plant Bog:*** Greene County, MS.
***Dead Dog Pitcher Plant Bog:*** Greene County, MS.
***Dahomey National Wildlife Refuge Addition:*** Bolivar County, MS.
***Malmaison Wildlife Management Area Addition:*** Grenada County, MS.

**SIZE:** The 4 parcels total 786 acres. The above parcels are 103 acres, 205 acres, 160 acres, and 318 acres respectively.

**SERVICE AREA:** The bank may be used to compensate for losses in the Vicksburg, Mobile, Memphis, and Nashville Districts of Mississippi. Debiting wetlands must be located outside the coastal zone counties.

**TYPE OF MITIGATION:** Restoration, enhancement, and preservation are the mitigation techniques used to generate credits. In general, the debiting wetland areas have had the same biological and topographic characteristics as the restored or enhanced wetland areas.

***State Line Pitcher Plant Bog:*** Wet pine savannah and pitcher plant bog habitats were restored. The area is classified as a palustrine system, emergent class, persistent subclass, saturated. The value of the area as pitcher plant habitat was virtually destroyed by drainage ditches and fire control for silvicultural purposes. The site's significant plant species include the spreading pogonia, pipewort, pitcher plant (*S. leucophylla* and *S. rubra wherryi*), yellow-eyed grass, sundew, and yellow fringeless orchid. The area also provides habitat for the burrowing crayfish.

***Dead Dog Pitcher Plant Bog:*** Hillside bogs were enhanced through gradation, resulting in pitcher plant flats. The area is classified as part upland, which serves as a recharge area, and palustrine system, emergent class, persistent subclass. The pitcher plant habitat in this area had been severely damaged by drainage ditches and fire control for silviculture purposes. The site's significant species include the pitcher plant (*S. rubra wherryi* and *lephylla*), yellow fringeless orchid, and the gopher tortoise.

***Dahomey National Wildlife Refuge:*** Hardwood forest wetlands were preserved to produce credits. Some restoration activities also occurred. The area is classified as a palustrine system with part bottomland hardwood and part bottomland hardwood that had been converted for farming. Clearing and ditching for agricultural purposes had virtually destroyed the wildlife habitat value in parts of the area. Significant species include deer, squirrel, turkey, resident wood ducks, and migratory waterfowl.

***Malmaison Wildlife Area Addition:*** Bottomland hardwood wetlands were preserved and bottomland hardwood forest cover was restored on cleared lands. The area is classified as a palustrine system with part bottomland hardwood and part bottomland hardwood that had been converted for farming. Wildlife habitat in many portions of the site had been diminished or destroyed by clearing and ditching for agricultural purposes. Significant species include deer, squirrel, turkey, resident wood ducks, and migratory waterfowl.

**ENABLING INSTRUMENT:** The bank sites were established through the Corps of Engineers General Permit issued 9 January 1990 with an appended Mitigation Plan. The General Permit was chosen as the enabling instrument after efforts to develop an interagency Memorandum of Agreement failed. A Memorandum of

Understanding was signed on 31 December 1990 by the U.S. Fish and Wildlife Service and the Corps pertaining to acquisition and incorporation of bank lands in the Dahomey National Wildlife Refuge. There is also a Memorandum of Agreement dated 18 March 1988 between Mississippi State Highway Department (MSHD) and Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) pertaining to transfer of bank lands to Mississippi Department of Wildlife Conservation.

- The permit allows for the establishment of additional bank sites by MSHD.
- In-kind mitigation and hydrological connection between the debiting and crediting sites are not required.
- The permit will be in effect until 9 January 1995, at which time it will be reevaluated and possibly reissued.
- The permit does not provide for WMB monitoring.
- The general permit limits fills to 7 acres of wetlands at each single crossing of a water of the United States where the proposed highway work involves upgrading an existing highway within an established corridor, and no more than 3 acres of wetlands along a new alignment.
- For stream or river crossings, no more than 2000 cubic yards of permanent fill material and no more than 2000 cubic yards of temporary fill material may be discharged below the elevation of ordinary high water at any one crossing. Wetland limits apply to direct and indirect impacts.
- The general permit is open-ended in the sense that additional bank sites can be and have been added by the Mississippi Highway Department from time to time. Bank sites may include one or more of the following wetland types: 1) wetlands currently cleared and in agricultural use, 2) wooded wetlands previously impacted by anthropogenic hydrologic changes where such changes can be reversed by construction of water control structures, 3) pristine wetlands that are vulnerable to loss or deterioration in value due to natural or human-induced impacts.

**RESPONSIBILITIES:**

***Sponsor*:** MSHD is the bank sponsor.

***Credit Producer:*** MSHD is the credit producer. Some projects have been performed under the guidance of MDWFP and the Mississippi Forestry Commission.

***Management of Transactions:*** MSHD functions as "banker" and maintains accounts of credits and debits. MSHD must notify the Corps of changes in credit balances.

***Credit Evaluation:*** MSHD evaluates all credits and transfers the record of transactions to the Corps. The Vicksburg District plays a direct role in the selection and delineation of bank sites and the quantification of wetland credits.

***Regulatory:*** The Corps of Engineers enforces the terms of the General Permit.

***Long Term Site Ownership:*** The State Line and Dead Dog sites are owned by MSHD. MSHD deeded the Dahomey site to USFWS to be maintained as part of the Dahomey National Wildlife Refuge in perpetuity. The Malmaison site was deeded to the Mississippi DWFP to maintain and manage in perpetuity. The State Line and Dead Dog sites will be deeded to DWFP as well.

***Clients:*** The General Permit is limited to MSHD, and this agency has been the client on all transactions.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:**

***State Line Pitcher Plant Bog:*** Drainage ditches were filled and prescribed burns were conducted where burning had been controlled. Select cutting of trees occurred later. Increased pitcher plant density as well as expansion of the growth area by 10 to 15% was found in the first growing season following construction. The filled ditches successfully restored hydrology.

***Dead Dog Pitcher Plant Bog*:** Controlled burns and a selective cutting of trees were conducted. Increased pitcher plant density and an expansion of pitcher plant growth area were found in the first growing season after burning.

***Dahomey National Wildlife Refuge Addition:*** A previously farmed portion was planted with seedlings and acorns. Once the plants have been well established, the hydrology will be restored to the extent practicable by filling ditches or diking.

***Malmaison Wildlife Management Area Addition:*** Portions of the area were planted with seedlings and acorns. Hydrology will be restored in the future.

**CREDIT EVALUATION:** Credits for replacement cannot be less than a 1:1 ratio on an acreage basis. MSHD attempts to credit losses with wetlands of a higher quality and value when mitigated at a 1:1 ratio. On the basis of professional judgement, a ratio of greater than 1:1 may be required to replace lost values.

**TRANSACTIONS:** A total of 22 projects have been debited to 95 acres of WMB. All site losses have been mitigated from the WMB closest to or within the watershed of the debiting area. The smallest debit was 0.89 acres, and the largest was 8.47 acres. The average size of debits to date is 3.00 acres. The State Line and Dead Dog sites were first debited on 20 September 1990, and the Dahomey site was first debited on 26 August 1991. No debits had occurred at the Malmaison site as of 1 June 1992.

**FUNDING REGIME:** MSHD paid for initial costs to establish the WMB. When the Dahomey site was deeded to USFWS, funds were placed in escrow with the Mississippi Nature Conservancy for restoration costs and maintenance. Also, when the Malmaison site was deeded to DWFP, monetary resources for planting and maintenance were provided.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The Dahomey site is part of the Dahomey National Wildlife Refuge Management Plan of USFWS. The Malmaison site is part of the Mississippi Malmaison Wildlife Management Area Plan of DWFP.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The State Line and Dead Dog sites are adjacent to privately-owned lands. The Dahomey and Malmaison sites are adjacent on one side to privately-owned and on the other side to publicly-owned, forested land.

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## Special Management Area Plan for the Port of Pascagoula, Mississippi

**STATUS:** Active.

**PURPOSE:** Three management units were created to facilitate development of the Port of Pascagoula and mitigate for wetland losses occasioned by such development. The Bangs Lake and Middle River Management Units were established to mitigate up front for various identified port and industrial developments. They do not operate as a bank. The Highway 90 Mitigation Area can be used to mitigate case-by-case for other types of water-dependent development activities associated with construction work not specifically addressed in the SMA Plan and for which individual permits are required.

**LOCATION:** City of Pascagoula, Jackson County, MS.

***Bangs Lake:*** East of Bayou Casotte, 1 to 2 miles south of U.S. Highway 90, bounded on the east by the Mississippi-Alabama state line.

***Middle Lake:*** South of the CSX Railroad, bounded by the Mississippi Sound from the west bank of the West Pacagoula River to a north-south extension of the Ingalls Shipbuilding western boundary.

***Highway 90:*** Between the East Pascagoula and West Pascagoula Rivers, bounded on the south by the CSX Railroad and on the north by the "West River-East River Cut."

**SIZE:** The total area is 4675 acres (Bangs Lake, 3500 acres; Middle River, 600 acres; Highway 90, 575 acres).

**SERVICE AREA:** The debiting wetlands must occupy the same hydrologic drainage area as the mitigation sites. The debiting wetlands for the Bangs Lake and Middle River Units were located in the Port of Pascagoula. The Highway 90 Mitigation Area can be used for any development activity that is located within the SMA, however, no provisions in the SMA Plan restrict activities outside the SMA from using this mitigation area.

**TYPE OF MITIGATION:** Compensation for specific projects of the SMA Plan was based on preservation of Bangs Lake and Middle River Units. Credits are produced in the Highway 90 corridor through restoration, enhancement, and creation of wetlands.

***Bangs Lake:*** The area consists of a variety of undisturbed intertidal, upland, and open water habitats. Saline marshes contain black needlerush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), and smooth cordgrass (*Spartina alterniflora*). The area contains approximately 20 acres of oyster reefs. Approximately 200 acres of tidal marsh have been lost due to natural erosion between 1956 and 1979, and an estimated 10 acres per year continue to erode.

***Middle River:*** The site consists of emergent estuarine wetlands dominated by threesquare *(Scirpus spp.)*, black needlerush, saltmeadow cordgrass (*Spartina patens*), and giant cordgrass (*Spartina cyosuroides*). The eastern boundary wetlands have been impacted previously by intensive industrial development, dredged material disposal, and construction of the Singing River Island Causeway. Wetlands west of the causeway, however, are relatively undisturbed and are experiencing deltaic accretion rather than erosion or subsidence.

***Highway 90:*** Four hundred acres are emergent estuarine wetlands with vegetation similar to Middle River, and 115 acres are scrub-shrub wetlands dominated by *Baccharis halimifolia*. These wetlands have been previously disturbed due to industry and commercial activity on the West Pascagoula River and East Pascagoula River boundaries; construction of the old Highway 90, the present-day U.S. Highway 90, and the CSX Railroad; and the dredging of the "West River-East River Cut."

**ENABLING INSTRUMENT:** The Memorandum of Agreement (MOA) implementing the Port of Pascagoula SMA Plan was signed on 11 March 1986. On 15 May 1986, the Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management concurred with the revision to the Mississippi Coastal Program incorporating the SMA Plan. The MOA does not specifically address the WMB element, except by reference to the provisions of the SMA Plan. Agencies signatory to the SMA Plan MOA constitute the SMA Task Force. They are: the Mississippi Department of Wildlife, Fisheries and Parks, the Mississippi Department of Environmental Quality, the Mississippi Department of Archives and History, the Jackson County Board of Supervisors, the Jackson County Port Authority, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

- The formal agreement does not limit the types of wetlands which can be debited.
- All signatory agencies are involved in annual review of the SMA Plan.
- The SMA Plan provides alternatives for the SMA Task Force to resolve non-compliance issues; enforceability is based on permit conditions.
- The agreement specifies that the debiting wetlands must occupy the same hydrologic drainage area as the mitigation site.
- Periodic monitoring is not provided for in the formal agreement. Monitoring of mitigation activities may be included in permit conditions. Monitoring costs are borne by the permittee.

- By formal agreement, the Corps agrees to accept the mitigation for impact to wetlands detailed in the Plan as adequate for the specific approved development plans.

**RESPONSIBILITIES:**

***Sponsor:*** The State of Mississippi is the bank sponsor.

***Credit Producer:*** The State of Mississippi is the credit producer. The Mississippi Department of Wildlife, Fisheries and Parks, Bureau of Marine Resources manages the areas.

***Management of Transactions:*** The Mississippi Department of Wildlife, Fisheries and Parks, Bureau of Marine Resources maintains records on the use of the Highway 90 Mitigation Area.

***Credit Evaluation:*** As the SMA Plan trustee, the Mississippi Department of Wildlife, Fisheries and Parks, Bureau of Marine Resources accounts for the acreage in the mitigation areas, subject to coordination through the SMA Task Force. Credit evaluation for mitigating projects in the Highway 90 site will occur on a case-by-case basis through the permitting process and SMA Task Force coordination.

***Regulatory:*** The Corps of Engineers and the SMA Task Force can declare actions to be in non-compliance and pursue enforcement activities.

***Long Term Site Ownership:*** The areas are owned by the State of Mississippi.

***Clients:*** The Port of Pascagoula and private developers use the bank.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:**

***Bangs Lake and Middle River:*** Although no formal wetlands maintenance plans exist, limited management activities are performed on an ad hoc basis (e.g. controlled burning and anticipated minor erosion control projects).

***Highway 90:*** One piecemeal marsh restoration/enhancement effort is underway in the Highway 90 corridor involving 76.8 acres. The project involves the restoration of land that was altered during construction of the original Highway 90. High ground will be degraded back to marsh level and the area will be planted with marsh vegetation from adjacent areas. A trench will connect the marsh to an existing pond and encourage water exchange.

**CREDIT EVALUATION:**

***Bangs Lake:*** Under the SMA Plan, the 3500-acre Bangs Lake Unit is to be preserved in perpetuity to compensate for approximately 200 acres of wetlands lost due to approved port development.

***Middle River:*** The 600-acre Middle River Unit is to be preserved to compensate for wetland losses associated with development of a transportation corridor to Singing River Island. Wetlands located to the west and north of the transportation corridor are to be preserved for 50 years, and wetlands east of the corridor, which have been historically subject to developmental pressures, will be preserved for 15 years beginning in 1989.

***Highway 90:*** Future debits against the Highway 90 Mitigation Area for restoration, enhancement, or creation activities will be approved on a case-by-case basis during the permit application process, as coordinated by the SMA Task Force. Incremental compensation efforts in the Highway 90 corridor require determination of specific replacement requirements; however, compensation does not involve the banking of wetland credits. Replacement is based on area and replacement ratios which are established on a case-by-case basis. A total of 115 acres were available for restoration/enhancement when the area was designated as a mitigation area. Additional acreage in this area could be made available.

**TRANSACTIONS:** The initial debit took place on 3 December 1984 with issuance of a permit for the construction of Terminal "D." Wetland losses were debited against the preservation of the Bangs Lake Wetland Unit. The Bangs Lake and Middle River Units have been fully debited against approved development by Jackson County Port Authority. The first mitigation project began at Highway 90 Mitigation Area in the spring of 1992 and is currently underway. The project entails the restoration of 36.2 acres at a replacement ratio of 1:1 and enhancement of 40.6 acres at a replacement ratio of 3:1. This project is the only creation/restoration action to date.

**FUNDING REGIME:** The State of Mississippi does not intend to recoup capital costs.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:**During the development of the SMA Plan, specific approved development activities were considered which included construction of water-dependent facilities by the Port of Pascagoula and the City of Pascagoula in wetlands subject to Section 404 regulation. Mitigation for the approved development activities was accomplished by the preservation of the Bangs Lake and Middle River wetlands units. All 3 areas are incorporated into the SMA Plan for the Port of Pascagoula, which in turn is incorporated into the Mississippi Coastal Program (MCP). The MCP designates the WMBs as preservation zones. The areas have also been designated as areas of special interest under the Mississippi Natural Heritage Program. Bangs Lake is one of 8 areas in Mississippi classified as approved for the direct harvest of shellfish.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Tidally influenced wetlands and open water areas adjacent to the WMBs are owned by the State of Mississippi, pursuant to recent decisions relating to Public Trust Tidelands.

***Bangs Lake:*** The site is bounded on the west by the Chevron and Mississippi Phosphate properties. Large tracts of wetland to the north and east of the site have been purchased or are being considered for purchase by the Federal government for establishment of the Grand Bay National Wildlife Refuge. The refuge would provide a buffer against adjacent development.

***Middle River:*** The Middle River site is bounded by the Mississippi Sound from the west bank of the West Pascagoula River to a north-south extension of the Ingalls Shipbuilding western boundary. Areas immediately east of the Middle River area have experienced intensive port and industrial development.

***Highway 90:*** This management unit is located between the East Pascagoula River and the West Pascagoula River, bisected by U.S. Highway 90 and portions of the abandoned Highway 90 road bed, and bounded on the north by the "West River-East River Cut" and on the south by the CSX Railroad.

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## Montana Department of Transportation Wetland Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable losses of wetlands due to highway construction projects throughout Montana. The overall objective of the MDT program is to prevent net loss of wetlands on an annual basis. However, it is recognized that due to varying program effectiveness, negative or positive balances may result and be carried forward from year to year. It is not the intention of the program to develop and accumulate substantial amounts of wetland credits which can be applied to the future compensation of anticipated losses. The MOA does not use the term "bank," and for the most part does not operate like one.

**LOCATION:** Wetland mitigation sites are located throughout Montana.

**SIZE:** The bank has no fixed size.

**SERVICE AREA:** Mitigation must take place within the same biotic region or geographic area as the wetlands which are lost.

**TYPE OF MITIGATION:** The Montana Interagency Wetlands Group (composed of state and Federal agencies) does not run a formal “mitigation bank” but instead attempts to prevent any net loss of wetlands. Mitigation involves both on-site and off-site mitigation measures. On-site measures are preferred and include avoidance and minimization through engineering design changes and occasionally wetlands restoration, enhancement, and creation within the highway corridor. Off-site measures to date have mainly involved enhancement of existing marsh habitat for waterfowl production. Wetlands are various freshwater types, principally palustrine.

**ENABLING INSTRUMENT:** The first interagency Memorandum of Understanding (MOU) for the conservation of wetland resources associated with highway construction projects in the state of Montana was signed in 1987 and expired 2 years later. A revised agreement was signed in 1992. The Montana Interagency Wetlands Group, which oversees the MOU, consists of the following signatories: Montana Department of Transportation (MDT); Montana Department of Fish, Wildlife & Parks (MDFWP); Montana Department of Health &

Environmental Sciences (MDHES); Federal Highway Administration, Montana Division (FHWA); Environmental Protection Agency, Montana Office (EPA); U.S. Fish and Wildlife Service, Montana/Wyoming Office (USFWS). It is uncertain whether the Corps of Engineers will sign the agreement. The MOU is characterized as a highly generalized document. It does not provide details of the mitigation actions to be considered.

- The agreement does not require in-kind replacement.
- The Technical Subcommittee (composed of one specialist from MDT, MDFWP, and the Corps) assesses potential impacts to wetlands using state and Federal environmental regulations as guidelines.

**RESPONSIBILITIES:**

***Sponsor:*** MDT is the bank sponsor.

***Credit Producer:*** MDT is the credit producer. USFWS manages bank lands for the conservation of wildlife and habitat resources. Monitoring and evaluation is performed by the Technical Subcommittee. Occasional spot field inspections are conducted by individual members of the Interagency Wetlands Group.

***Management of Transactions:*** MDT operates a "Wetland Resource Ledger/Mitigation Balance Record" to account for all crediting and debiting.

***Credit Evaluation:*** The Technical Subcommittee establishes replacement ratios for mitigation on a case-by-case basis.

***Regulatory:*** The Corps of Engineers and MDHES regulate the bank.

***Long Term Site Ownership:*** To date, all crediting has occurred on public lands managed by USFWS. These lands are usually rent-free or leased to MDT. Long-term easements on private lands are being proposed, but no consensus on duration has been determined. Some future projects will impact tribal, U.S. Forest Service, and state-managed areas.

***Client:*** MDT is the bank client.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** USFWS has noted that the mitigation process has worked rather smoothly. However, some problems have occurred. In one case, a contractor failed to do the required soil sampling. The resultant "wetland" did not hold water as expected and credits were not approved. In another, a contractor constructed a small replacement wetland at the wrong location which was eventually approved for credit. The major problem has been difficulty in obtaining areas for off-site compensation.

**CREDIT EVALUATION:** The methodological basis for quantifying credits is acre-for-acre replacement, using best professional judgement of the Technical Subcommittee for value replacement. All wetland types are given the same replacement value.

**TRANSACTIONS:** The first mitigation action took place in 1989 and approximately 50 such actions have occurred to date. Many of the mitigation efforts which have been counted in the "bank" have involved avoidance and minimization on-site. Implemented off-site projects include a joint effort with USFWS and the Montana Department of Fish, Wildlife, and Parks in which MDT received 25 acres of compensation credit for acquisition and enhancement of shallow marsh in the Blackfoot Waterfowl Production Area. Another off-site project involved wetlands enhancement within the Lee Metcalf National Wildlife Refuge in which MDT received approximately 15 to 20 credits. A sizeable acquisition known as Browning East and West Area, which is in the planning stage, will be the source of additional credit. Approximately 50% of the replacements have been out-of-kind with approval of the Technical Subcommittee (composed of one specialist from MDT, MDFWP, and the Corps). As of 6 August 1992, the MDT "Wetland Resource Ledger/Mitigation Balance Record" indicated a deficit of 68 acres for highway projects which were in the construction/planning phase at that time. Inaccurate tracking of the mitigation debits and credits has been a problem.

**FUNDING REGIME:** MDT is responsible for funding the WMB.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Information is not available.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Ownership of adjacent lands varies with the bank site. Most sites are surrounded by public lands, most often USFWS holdings.

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## Washoe Lake State Park Mitigation Area, Nevada

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses associated with construction of US Highway 395.

**LOCATION:** South end of Washoe Lake, 2 miles north of Carson City, Washoe County, Nevada, adjacent to US Highway 395.

**SIZE:** Total bank area is 88.5 acres, with potential for staged development to 269 acres.

**SERVICE AREA:** In-kind mitigation is required, and debiting actions have all been located in the same hydrologic drainage area as the crediting site.

**TYPE OF MITIGATION:** The wetland area created and enhanced was an irrigated pasture containing sedges, rushes, and hydric grasses. Mitigation actions included the elimination of grazing activities, the construction of levees to improve hydrology, and the creation of open water areas. The site is categorized as palustrine system, emergent class, persistent subclass, and temporary to seasonally flooded. Debiting wetland areas contain small streams, overgrazed irrigated wetland pasture, and habitat for the spotted bat, a rare species.

**ENABLING INSTRUMENT:** The Washoe Lake State Park Mitigation Area was established in response to an enforcement action in which the Nevada Department of Transportation (NDOT) was cited for the unauthorized discharge of fill material in a regulated wetland in conjunction with the construction of US Highway 395. In November 1987 the Army Corps of Engineers issued a permit (after-the-fact) which authorized continued construction of 395 with mitigation requirements. A January 1988 Interagency Agreement between NDOT, the Nevada Division of State Parks (NDSP), and the Nevada Division of State Lands (NDSL) outlines the use of state park lands for bank development, operation, and maintenance. Two additional Corps permits contained special conditions for use of the WMB.

- The agreement and Department of the Army permits require NDOT to monitor bank success for 3 successive years following completion of bank construction. Remedial work is required in the event of failure, and must be followed by an additional 3-year monitoring program.
- The Corps reviews the monitoring reports.
- The agreement limits debiting to in-kind replacement.
- The agreement requires NDOT to pay for damages to the property of the Division of State Lands caused by NDOT activity.
- The agreement authorizes the Division of State Lands to grant NDOT a temporary easement and right of entry on designated lands during periods of levee construction.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is NDOT.

***Credit Producer:*** NDOT is the credit producer. Management of WMB lands is coordinated with the Nevada Department of Wildlife, and maintenance activities are the responsibility of the Nevada Division of State Parks. Upon completion of crediting, the bank will become a state park.

***Management of Transactions:*** NDOT is responsible for producing annual monitoring reports; the Corps must concur in the recognition of transactions.

***Credit Evaluation:*** NDOT is primarily responsible for determining the type and amount of available credits; however, the determination of NDOT is subject to Corps concurrence that a viable wetland is being created and existing wetland is being enhanced.

***Regulatory:*** The Army Corps of Engineers has issued permits allowing for use of the WMB by NDOT.

***Long Term Site Ownership:*** The Nevada Department of State Lands holds the title to the property.

***Clients:*** NDOT is the bank client.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** A main levee was restored and a cross levee was constructed on McEwen Creek so that water from the creek would feed the wetland. Other measures included plantings, excavation of ponds, and control of cattle grazing. The construction work to create and enhance the site wetlands was divided into a 6-phase plan. The first stage has been completed. The work resulted in 80 acres of enhanced wetlands and 8 acres of created wetlands. The area provides year-round and seasonal homes to many raptors, waterfowl, shorebirds, and songbirds including Bald Eagles, Osprey, Yellow-headed Blackbirds, American Coots, Mallards, Gadwalls, and Northern Pintails. An undependable water supply has been reported as a significant problem. The first formal review of the WMB in June 1992 found the site to lack sufficient water to comply with Section 404 permit conditions.

**CREDIT EVALUATION:** In-kind functional replacement is determined by WET. Compensation ratios by area are set at 3:1 ratio for enhanced wetlands and 0.3:1 for created wetlands.

**TRANSACTIONS:** The first debiting action occurred in 1988 and the most recent debiting action was authorized in February 1991. Only 2 highway projects have been debited to date. Both debiting actions have occurred in the same hydrologic drainage area as the bank, located between 10 and 19 miles from the site of the bank. The credits remaining are 4.7 acres of created wetlands and 55.4 acres of enhanced wetlands. A lack of water has limited the success of the bank and the Corps has determined that remaining credits cannot be used until a reliable source of water can be delivered to the bank.

**FUNDING REGIME:** NDOT is responsible for funding construction costs. The nominal maintenance and administrative costs are absorbed by the Nevada Division of State Parks budget.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The wetland mitigation area is part of Washoe Lake State Park Master Plan. The area is zoned as public lands and is open to the public during non-nesting times for birding and walking on the levees.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The basin consists primarily of pasture land. The state of Nevada owns most of the adjacent lands of the Washoe Lake State Park. Ranching activities at an adjacent cattle ranch may impact water quality at the WMB site. The McEwen Creek water rights are held by the owner of the ranch, and the State has secondary holdings. During irrigation months the stability of the wetlands may be jeopardized because the mitigation area receives only irrigation tailwaters.

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## Company Swamp Mitigation Bank, North Carolina

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses associated with highway construction projects adjacent to the Roanoke River.

**LOCATION:** Five miles north of Williamson, Bertie County, NC, adjacent to Roanoke River.

**SIZE:** The bank is 1031 acres.

**SERVICE AREA:** Debiting actions are not required to be located in the same hydrologic drainage area as the bank. Debiting actions have been located as much as 250 miles from the bank, and average 100 miles distant.

**TYPE OF MITIGATION:** The Company Swamp mitigation site is a preservation bank. Management plan considerations include initial and long-range habitat improvement measures to enhance nongame and old-growth timber values. The topography of the area is mostly flat floodplain along the Roanoke River. Company Swamp contains about 390 acres of tupelo gum-bald cypress forest, of which 177 acres have been recently logged, and 213 acres are undisturbed and mature. The gum-cypress habitat in Company Swamp is classified as palustrine, forested, semipermanently-flooded wetland. The bank also contains about 641 acres of bottomland hardwood forest of which about 381 acres have been recently logged. A diverse hardwood canopy/subcanopy is present in the 260 acres of undisturbed bottomland hardwood forest, containing American elm, ash, overcup oak, red and silver maple. The bottomland hardwood forest habitat in Company Swamp is classified as palustrine, forested, seasonally or temporarily flooded wetland. Company Swamp habitat types include beaver ponds, blackwater streams, and diverse vegetative growth of box elder, spicebush, pawpaw, buckeye, sedges, and cane. Scientists believe that the area holds the highest density of songbirds in North Carolina. At least 214 species of birds make extensive use of the wetlands. Other representative animals are amphibians and reptiles, which include the southern leopard frog, green tree frog, southern dusky salamander, black rat snake, eastern cottonmouth, yellow-bellied turtle, snapping turtle, and five-linked skink. Some of the many fish species include striped bass, blueback herring, alewife, hickory shad, and American shad. Mammal populations in the area include white-tailed deer, gray squirrel, marsh rabbit, raccoon, mink, muskrat, otter, fox, bobcat, beaver, and opossum.

**ENABLING INSTRUMENT:** A Memorandum of Understanding (MOU) establishing the bank was signed in September 1985 by the North Carolina Department of Transportation (NCDOT), the North Carolina Wildlife Resources Commission (WRC), the North Carolina Nature Conservancy, and the U.S. Fish and Wildlife Service (USFWS).

- The agreement has a 30-year life with provisions for two 30-year renewals.
- The MOU states that the WRC will manage the bank site in perpetuity. However, when the bank is incorporated into the Roanoke River National Wildlife Refuge, USFWS will take over maintenance and management. USFWS has already assumed management responsibilities for the property, protecting the area from development pressures.
- The agreement only allows for in-kind replacement of bottomland forest habitat.
- The agreement calls for a preliminary analysis of the program to be conducted after 5 years, followed by a complete reevaluation of the bank after 10 years.
- The agreement can be amended or modified with the consent of all parties within 1 year.
- The agreement specifies a 1:1 ratio for wetland mitigation actions less than 5 acres, and the use of Habitat Evaluation Procedures for all projects greater than 5 acres.

**RESPONSIBILITIES:**

***Sponsor:*** NCDOT is the bank sponsor.

***Credit Producer:*** NCDOT is the credit producer, and WRC implements the management plan and maintains the bank.

***Management of Transactions:*** USFWS maintains data sheets for each credit or debit transaction. All MOU parties must provide signature concurrence to data sheets before credits or debits are applied.

***Credit Evaluation:*** The type and number of credits were determined by an interagency group headed by USFWS.

***Regulatory:*** The Corps of Engineers regulates the bank through its permitting of debiting activities.

***Long Term Site Ownership:*** Bank lands were initially acquired by the North Carolina Nature Conservancy and have subsequently been acquired by the State of North Carolina.

***Clients:*** NCDOT will utilize Company Swamp credits.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** A study of development pressure on and around Company Swamp indicates that the area would have been severely logged over a 6-year time frame without

the establishment of the bank. The area would then enter a cycle of 80-year regeneration followed by another 6-year cutting cycle. As a wetland mitigation bank, the Company Swamp tract will receive strategic cuttings for enhanced wildlife management. The preliminary evaluation, which was to have been completed in 1990, has not yet been conducted.

**CREDIT EVALUATION:** Habitat Evaluation Procedures will be employed on projects involving bottomland hardwood losses of more than 5 acres to determine functional value replacement requirements. Acre-for-acre (1:1 ratio) withdrawals will be utilized for smaller acreage amounts. An independent 1990 analysis of 15 proposed debiting actions under 5 acres indicates that the 1:1 ratio captures only about one third of the functional value of the wetlands which are lost. The situation could result in a revision of the debiting and crediting procedures for the bank. The initial credit base in the bank was 49,414 average annual credit units (AAHUs).

**TRANSACTIONS:** As of October 1992, USFWS proposed debiting 32 projects from the bank. These 32 projects involve 26 projects less than 5 acres and 6 projects greater than 5 acres. The projects will utilize 18% of the bank. Formal debiting has not occurred. The absence of any official debiting of the bank, in spite of 32 permits which have been issued conditioned on the compensation of wetland losses, is reported to be due to the fact that signatories have not yet signed any debiting forms as required by the terms of the MOU. This bookkeeping problem appears to be of little consequence in view of the large size of the bank.

**FUNDING REGIME:** Company Swamp is a preservation bank and therefore requires no significant development costs. The bank will be incorporated into the larger USFWS Roanoke River Wildlife Refuge. USFWS will then enter into a revenue sharing agreement with Bertie County to partially offset the loss of County taxes.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** As one of North Carolina's 20 coastal counties, Bertie County has developed a land use plan under the NC Coastal Area Management Act. This plan indicates that the Company Swamp Mitigation Bank is in the Conservation Class, which provides for effective long-term management of significant, limited, or irreplaceable resources. The bank lands will be incorporated into the Roanoke River National Wildlife Refuge which is administered by USFWS for the preservation of natural resource values.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The bank is part of a 1436-acre tract known as Company Swamp. The WMB tract of 1031 acres is bordered by the Roanoke River along the south side and the Coniott Creek along the north side. It is anticipated that the WMB will soon be included within the management zone of the adjacent Roanoke River National Wildlife Refuge.

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## North Carolina Department of Transportation Pridgen Flats Mitigation Site

**STATUS:** Active.

**PURPOSE:** The bank was established to compensate for unavoidable losses to pocosin-type habitat due to highway construction projects.

**LOCATION:** One mile south of the town of Kerr, Sampson County, NC.

**SIZE:** The bank is 127.3 acres of a 348.2-acre tract. The final area is dependent upon determination of the extent of hydric soils.

**SERVICE AREA:** The bank may be used to compensate for unavoidable losses to pocosins associated with NCDOT projects occurring anywhere in the coastal plain of North Carolina; the debiting actions are not necessarily located in the same hydrologic drainage area as the bank. The 6 projects which have been approved as potential bank debits are located as far as 85 miles away from Pridgen Flats and average 50 miles distant.

**TYPE OF MITIGATION:** Mitigation entails the restoration of prior converted farmland to pocosin. Pocosin vegetation had been removed and the land drained via drainage ditches on all but 16 acres. The undisturbed section of the site has a scattered canopy of pond pine (*Pinus serotina*) with a dense shrub layer composed of *Gordonia lasianthus, Lyonia lucida, Cyrilla recemiflora, Ilex glabra, Ilex coriacea, Myrica cerifera,* and *Persea borbonia. Smilax laurifolia* and *Sphagnum* species are also present. A 64-acre area of old field contains scattered loblolly pines (*Pinus taeda*), various small shrubs and trees (*Baccharis halimifolia, Persea borbonia,* and *Acer rubrum*), and grasses and forbs.

**ENABLING INSTRUMENT:** A Memorandum of Understanding (MOU) was signed in June 1992 by the N.C. Department of Transportation (NCDOT), the N.C. Wildlife Resources Commission (WRC), and the U.S. Fish and Wildlife Service (USFWS).

- The term of the agreement is 20 years.
- The MOU requires a complete evaluation 5 years after implementation. Planting survival evaluations will be conducted by NCDOT 3 and 5 years after replanting is completed. If acceptable survival is not achieved, then replanting will be performed or the feasibility of the bank will be reevaluated.
- Amendment or modification of the agreement may be proposed at any time. Adoption of an amendment or modification requires the approval of all signatories.
- The MOU requires NCDOT to assume responsibility for failure of the structures used to block the drainage ditches for the life of the bank.

- The MOU requires in-kind debiting.
- Mitigation ratios of 2:1 are specified in the MOU.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is NCDOT.

***Credit Producer:*** NCDOT pays for restoration activities and associated monitoring for 5 years. USFWS is responsible for long-term monitoring and maintenance costs.

***Management of Transactions:*** USFWS will provide data sheets for each credit or debit transaction to all parties to the MOU for signature concurrence. No credits can be applied until all parties concur with the USFWS data sheet analysis. USFWS prepares annual summaries of credits and debits and provides copies to the participating parties.

***Credit Evaluation:*** An interagency team of MOU signatories determines the type and amount of credits.

***Regulatory:*** The Corps of Engineers regulates the bank through its permitting process.

***Long Term Site Ownership:*** The bank consists of 127.3 acres of a 348.3-acre conservation easement on a farm which reverted to the Farmer's Home Administration (FmHA). The easement, which is in a single tract, was subsequently deeded to USFWS.

***Clients:*** NCDOT is the sole client of the bank.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Restoration measures include removing tile drains, blocking existing drainage ditches with controllable weirs, partially clearing existing vegetation, and reestablishing pocosin vegetation. NCDOT has installed flashboard risers in the ditches to block drainage and restore wetland hydrology to the site. Ten wells have been installed and additional wells will probably be installed to measure hydrologic restoration. About 120 acres of the site have been burned to clear all vegetation in preparation for seeding. The initial effort to reestablish pocosin vegetation through seeding failed. Follow-up efforts include planting root stock. Sixty-four adjacent acres have been left in an early stage of old field succession to allow natural succession. Construction activities are not yet complete.

**CREDIT EVALUATION:** Acres necessary for mitigation will be determined using a 2:1 mitigation ratio. The ratio was based on a Habitat Evaluation Procedures (HEP) analysis performed on an unrelated pocosin tract.

**TRANSACTIONS:** Although restoration efforts are not yet complete and the signatory agencies have not approved debiting actions as required, the Wilmington District has issued 6 permits conditioned on the replacement of pocosin wetlands. The debiting projects adversely impacted 58.3 acres of pocosin wetlands.

**FUNDING REGIME:** If any structure installed by NCDOT fails within the life of the MOU (20 years), the structure will be repaired or replaced by NCDOT. USFWS will pay for long-term maintenance costs. The sponsor is not attempting to recoup its capital or maintenance costs.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** No official land use programs involve the WMB.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Adjacent land is privately-owned. The WMB is bisected by an old railroad bed, bordered on the west by Pridgen Flats Carolina Bay Pocosin, on the east by farmland, and on the north and south by upland woods.

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## North Dakota State Highway Department Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The purpose of the bank is two-fold: 1) development of an administrative mechanism for tracking the piecemeal replacement of USFWS wetland easements which are unavoidably drained or filled due to construction of Federal aid highways, and 2) acquisition and creation of wetlands to credit against future highway construction activities affecting non-easement wetlands.

**LOCATION:** Parcels are located statewide.

**SIZE:** The bank has no fixed size.

**SERVICE AREA:** Debiting wetlands are located statewide.

**TYPE OF MITIGATION:** Mitigation involves restoration and creation of wetlands. Types of habitats include seasonally flooded basins, inland fresh meadows, shallow marshes, deep marshes, open water areas, inland saline flats, inland saline marshes, and open saline lakes. Shrub swamps, wooded swamps, and bogs are included on a case-by-case basis.

**ENABLING INSTRUMENT:** A Memorandum of Understanding between the North Dakota Department of Transportation (NDDOT) and the United States Fish and Wildlife Service (USFWS) is dated August 1975. A new MOU is currently being negotiated.

- The MOU provides for its review on an as-needed basis. The MOU can be canceled by either party upon 30 days notice.
- The MOU contains a formalized basis of exchange for replacement of easement wetlands.
- Replacement ratios reflect the geographic location of the debiting wetlands; however, a hydrologic connection between the crediting and debiting wetlands is not required.
- The bank is expected to exist in perpetuity.
- The agreement provides for out-of-kind replacement.
- Monitoring is not required.

**RESPONSIBILITIES:**

***Sponsor:*** NDDOT is the bank sponsor.

***Credit Producer:*** NDDOT purchases the tracts and implements wetland restoration and/or creation activities, then transfers the land in fee to USFWS, which manages and maintains the WMB. NDDOT and the Federal Highway Administration have funded evaluation studies.

***Management of Transactions:*** NDDOT and USFWS both keep a running total of credit and debit transactions.

***Credit Evaluation:*** NDDOT and USFWS determine the type and number of credits available.

***Regulatory:*** The bank is regulated by the Corps of Engineers and other permitting agencies, depending upon the wetland debiting activity.

***Long Term Site Ownership:*** USFWS is the owner of the tracts.

***Clients:*** NDDOT is the bank client.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Construction actions are conducted to impound wetlands, develop subimpoundments, restore drained wetlands, and create wetlands. Cropland received into

the bank is converted into grassland. In some cases, excavated wetlands have not been constructed to specifications.

**CREDIT EVALUATION:** Replacement is by area using one or a group of exchange options and replacement ratios which have been arrived at through mutual agreement by NDDOT and USFWS. Replacement options according to type, listed in descending order of desirability, are as follows:

1. Restoring drained wetlands (if in-kind wetlands are available, this option will permit replacement on a 1:1 basis.)
2. Impoundments constructed and owned in fee.
3. Excavated wetland basins constructed and owned in fee.
4. Impoundments constructed for replacement with flowage easement interests obtained by the NDDOT.
5. Existing wetlands where some upland management potential exists. Upland acreage will apply to wetland replacement.
6. Native prairie owned in fee.
7. Tame grassland owned in fee.

Replacement options according to their location are listed in descending order as follows:

1. Along project right-of-way.
2. Within the biotic sub-region (Steward and Kantrud).
3. Within the biotic region.
4. Outside the biotic region.

Actual replacement ratios vary according to the type of wetlands impacted and the type and location of the replacement option which is agreed upon. Within the same biotic region, prescribed ratios range from 0.25:1 to 4:1 (except that if Types III, IV, V, IX, X, and XI are replaced with existing wetlands of the same type, the ratio is determined on a case-by-case basis). If replacement wetlands are located outside of the biotic region in which the losses take place, the above ratios can be as much as doubled depending on the region involved and other qualitative factors.

**TRANSACTIONS:** Through 1991, 16 highway projects resulted in the loss of 118.5 acres of easement wetlands which have been replaced with 128 acres of wetlands and 382 acres of upland habitats. At the end of 1991, the bank had a positive credit balance of 56.30 acres. Approximately 25.2% of transactions have been in-kind and 74.8% have been out-of-kind. One reported problem has been that replacement acreages have emphasized wetland and upland habitats of lower value than the habitats replaced.

**FUNDING REGIME:** NDDOT bears acquisition and construction costs. No provisions have been made to fund operation and maintenance costs.

**OFFICIAL LAND USE PLANS INCORPORATING THE** WMB: The lands are part of the official easement and refuge management plans established by USFWS.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Adjacent lands are primarily privately-owned agriculture base lands. Current land uses range from intensive cultivation to grazing. Soil

erosion and pesticide runoff pose potential problems in some tracts. At least some of the highway easements are adjacent to existing refuges.

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## North Dakota State Wetland Mitigation Bank

**STATUS:** Active.

**PURPOSE:** The bank was created to track compensation for wetland losses associated with agricultural practices and to ensure that North Dakota has no net loss of wetlands below the 1987 level.

**LOCATION:** Sites are located across the State of North Dakota.

**SIZE:** There is no fixed size for the North Dakota WMB.

**SERVICE AREA:** Debiting wetlands may receive mitigation credits from crediting wetlands statewide. The enabling instrument stipulates that at least 50% of wetland losses must be replaced with credits in the following order: 1) in the same county, 2) in a contiguous county, or 3) in the same biotic region. If the 50% requirement is not satisfied, a drainage permit may still be issued if the debit balance does not exceed 2500 acres.

**TYPE OF MITIGATION:** The no-net-loss-of-wetlands program involves wetland restoration and creation for various freshwater and inland saline wetlands within palustrine and lacustrine systems. Bank wetlands are further characterized as being permanent or temporary in nature. Temporary wetlands are recognized for their importance to breeding pintails or yellow rails, while semipermanent wetlands are important to breeding redheads or sora rails.

**ENABLING INSTRUMENT:** The WMB was authorized by the 1987 State Legislature. The North Dakota Century Code Section 61-32-05 establishes a comprehensive agricultural no-net-loss-of-wetlands program. The State developed the program to maintain total statewide wetland acreage at the 1987 level.

- All types of wetlands can be debited against the WMB.
- A hydrologic connection between debiting and crediting wetlands is not required.
- The Code requires the State Water Commission to periodically report on the status of the WMB.
- The Code does not provide for monitoring or evaluation of the WMB.
- The North Dakota WMB will be managed in perpetuity.

**RESPONSIBILITIES:**

***Sponsor:*** The State of North Dakota is the bank sponsor.

***Credit Producer:*** Federal conservation programs, principally of the Soil Conservation Service (SCS), the U.S. Fish and Wildlife Service (USFWS), and the U.S. Forest Service, have produced approximately 95% of the WMB credits through Federally funded restoration efforts.

***Management of Transactions:*** The accounting system is jointly managed by the North Dakota State Water Commission (SWC) and the North Dakota Department of Game and Fish. The North Dakota WMB crediting and debiting ledger is maintained by the Office of the State Engineer.

***Credit Evaluation:*** The SWC and the Director of the North Dakota Department of Game and Fish determine credit availability.

***Regulatory:*** No activity within the North Dakota WMB has required a Corps permit. The Omaha District of the Corps does not recognize credits from the WMB.

***Long Term Site Ownership:*** Credit development has occurred primarily on USFWS lands either fee or easement and paid for by USFWS. USFWS commonly enters a long-term agreement with the landowner-cooperator so that the landowner-cooperator will manage the wetland for wildlife habitat.

***Clients:*** Clients are principally farmers.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Wetland creation is accomplished by construction of impoundments in natural drainages and dugouts. Wetland restoration occurs when a previously drained or manipulated natural wetland basin is restored or enhanced to increase water-holding capacity.

**CREDIT EVALUATION:** Credit evaluation is based on acre-for-acre replacement. The total surface area of an impacted site is used when debiting the bank, and the surface area of the portion of created or restored wetlands less than 3 feet deep are used in crediting the wetland bank. Functional values are not assigned.

**TRANSACTIONS:** Credits and debits are recorded in 4 separate accounts. The *Government Agency Account* comprises wetlands restored, created, or lost in conjunction with an identifiable government project. The

*Permanent Account* comprises all other gains and losses of permanent wetlands other than those associated with surface coal mining. The *Surface Coal Mining Account* comprises gains and losses associated with coal mining activity. Finally, the *Temporary Account* comprises the gains and losses of temporary wetland types. All previously drained or natural wetlands which have been restored, or manmade wetlands with material wildlife values which have been created after 31 December 1986, must be credited to the bank unless their restoration or creation constitutes mitigation of a Federal or Federally assisted project. All wetlands lost after 1 January 1987, except for projects for which permits were requested prior to that date, must be recorded as debits against acreage credit balances. The majority of wetland debits have been reported by the SCS. Bank managers began implementing the provisions of the no-net-loss law, including establishment of the wetlands bank, upon its passage in 1987. As of April 1992 the bank balance was 4425 credits, resulting from the recorded 5000 acres of credit and 575 acres of debit (in 118 debiting actions). This positive balance may be exaggerated since only 2% of wetland conversion activities in which involved fills have been recorded as debits.

**FUNDING REGIME:** The SWC maintains a Wetland Replacement Fund. Debtors pay 10% of the average cost of restoring wetlands to the Fund. Land values are averaged for the counties in the 4 biotic areas. This value plus the statewide average construction cost makes up the wetland replacement cost. Wetlands restored or created by USFWS or other groups for conservation purposes can subsequently be used as mitigation for private wetland filling and drainage projects. Most other wetland mitigation under the statewide framework is conducted by sponsors as a means to accommodate mitigation requirements involving planned development in which they have a direct or indirect involvement. Costs may be reflected in rents, leasing fees, or tonnage charges.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** No official land use plans include the bank. Some sites may be listed within Farm Management Plans with the Soil Conservation Service, and many USFWS wetlands restoration and creation projects are associated with Farmers Home Administration easements and the North American Waterfowl Management Plan.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Adjacent ownership and impacts are not considered in the North Dakota WMB. Most lands surrounding the mitigation wetlands are agricultural.

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## Astoria Airport Mitigation Bank, Oregon

**STATUS:** Active, temporarily suspended.

**PURPOSE:** The bank was created to provide compensation for unavoidable wetland losses associated with general water dependent projects.

**LOCATION:** South side of Young's Bay in the Columbia River estuary between Astoria Airport and the mouth of the Lewis and Clark River, Clatsop County, OR.

**SIZE:** Total bank area is 33 acres.

**SERVICE AREA:** The debiting wetlands must be between the top of Tongue Point and the west bank of the Skipanon River, on the Oregon side of the Columbia River estuary. The area has an 8-mile radius and is within a single watershed.

**TYPE OF MITIGATION:** Mitigation credits are produced through restoration. Pre-bank conditions at the restoration site included persistent emergent marsh, palustrine scrub-shrub marsh, alder forest, freshwater channels, upland dike area, and cleared forest. Restoration of the site was expected to result in the formation of brackish sedge high marsh, brackish scrub-scrub marsh, brackish swamp, brackish estuarine channels, and ponds. The debiting wetlands were intertidal and subtidal mudflats.

**ENABLING INSTRUMENT:** The enabling instrument is a Memorandum of Agreement (MOA) dated May 1987. The MOA was amended January 1988 to reserve credits for the Port of Astoria in exchange for land and fill. Signatories to the MOA are: Oregon Division of State Lands (ODSL), Port of Astoria, Oregon Department of Fish and Wildlife, Oregon Department of Land Conservation and Development, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service (USFWS), Environmental Protection Agency (EPA), and National Marine Fisheries Service (NMFS).

- The MOA includes 3 limitations on the types of projects which can be debited against the bank: 1) projects must involve unavoidable and necessary impacts under the local comprehensive plan; 2) on-site mitigation must be unavailable or only partially meet the mitigation requirements; and 3) projects must be located between the tip of Tongue Point and the west bank of the Skipanon River along the Oregon side of the Columbia River Estuary. The debiting wetlands must occupy the same hydrologic drainage area as the WMB.

- The agreement allows for out-of-kind mitigation.

- The agreement sets a credit/debit ratio of 1:1 using the ODSL relative value system.

- The MOA will be reviewed, and the available credits will be updated by an interagency task force, 5 years after construction, and 3 to 5 years following significant operational or structural changes.

- The agreement requires annual monitoring by ODSL.

- MOA modification can be proposed by any signatory agency. The modification will only be adopted if accepted by all involved parties. A party proposing a modification that has not been accepted within one year can elect to terminate its participation in the agreement.

- The agreement does not address the bank's life expectancy, but it is assumed that the bank's life is indefinite.

**RESPONSIBILITIES:**

***Sponsor:*** ODSL is the credit producer.

***Credit Producer:*** ODSL is responsible for restoring the wetland. ODSL is also responsible for the monitoring of site conditions, with approval of the signatory agencies.

***Management of Transactions:*** All the signatory agencies must agree to a debiting action. ODSL will produce annual debit/credit sheets as well as annual monitoring reports, which will be provided to all the signatory agencies.

***Credit Evaluation:*** The signatories to the MOA agreed upon the availability of 70 credits. An interagency team will reevaluate credit availability.

***Regulatory:*** The Corps of Engineers, ODSL, and other permitting agencies regulate the bank.

***Long-term Site Ownership:*** A portion of the land was deeded to ODSL from the Port of Astoria and the remainder of the land was acquired by the State of Oregon from private owners. According to the Oregon Mitigation Bank Act of 1987, the bank will remain the property of ODSL indefinitely.

***Clients:*** Bank credits are generally available for projects covered under Oregon's Removal-Fill Law and Corps of Engineers regulatory authorities. The Port of Astoria became involved in the WMB project to prepare for future development in the area that would require mitigation. The Port of Astoria has reserved approximately 20 credits by deeding land and providing fill material necessary for the project.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Dikes constructed in the 1880s prevented water exchange with the estuary except under extreme conditions. In the winter of 1986-87, construction of the bank began: new dikes were built, the old dikes were breached, and portions of the old dikes were excavated to encourage the formation of a tidal marsh. Due to faulty construction, actual inundation after construction occurred only during extreme events. Freshwater wetlands began to form. In 1987 the excavated tidal channels were deepened and widened, and new channels were created. However, saltwater intrusion remains limited, and freshwater wetlands continue to form. Plant species in the bank are mainly

freshwater species. The area outside of the dike is dominated by a mixture of bullrush (*Carex lyngbyei*) and sedge (*Scirpus validus*). Inside the dike, species are more varied. Species represented include willows (*Salix sp.*), sedges (*Carex obnuta*), red alder (*Alnus rubra*), skunk cabbage, and grasses. The future of the site as a mitigation bank is contingent upon further corrective construction or a change of banking objectives. The crediting methodology will be reevaluated at an interagency task force meeting. Debiting has been suspended in the interim.

**CREDIT EVALUATION:** The number of credits available was determined before construction, using the Oregon Division of State Lands (ODSL) relative value system. The system rates estuarine wetlands for productivity and biodiversity on a scale of 1 to 6. The rating is multiplied by acreage to determine the number of credits or debits.

**TRANSACTIONS:** In 1987, 10.59 credits were debited; 59.41 credits remain.

**FUNDING REGIME:** Total project costs, including land acquisition, design, and construction were paid for by ODSL. Monitoring costs have been funded by ODSL as well. Maintenance of the dike is the responsibility of the City of Warrenton. No other maintenance costs have been identified. The Oregon Wetland Mitigation Revolving Fund was established by the Oregon Mitigation Bank Act of 1987. This fund is to be used for construction, acquisition, monitoring, and maintenance of wetland mitigation banks. Monies to be included in the fund are: Federally appropriated wetland funds, Federal wetland grants, gifts, monies obtained from use of banks, and interest on monies in the account. To date, no monies have been put into the fund. Credit costs reflect all initial bank implementation costs as well as maintenance, monitoring, and other recurring costs. Currently, credits are valued at $4,500 per credit, payable in cash or like value.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The bank is included in the 1983 CREST Mitigation Plan for the Columbia River estuary. The bank is provided for in the Statewide Land Use Planning Goals developed by the Oregon Land Development Commission.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The land west of the mitigation bank is owned by the Port of Astoria, and the tidal marsh to the east and north of the site is owned by the State of Oregon. The Port of Astoria is required by Federal regulations to maintain a low tree height in the area to allow clearance for airport runways. The Port of Astoria may periodically cut trees on the site.

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## Henderson Marsh (a.k.a. Weyerhaeuser) Mitigation Plan, Oregon

**STATUS:** Active. Net balance of credits is maintained at or near zero.

**PURPOSE:** The Henderson Marsh Mitigation Plan (HMMP) is intended to compensate for Weyerhaeuser Company development activities affecting wetlands. The plan describes construction projects and fill actions that may require mitigation and outlines specific marsh management actions which could provide mitigation. The plan is to be used by the landowning company as a tool in planning for further development.

**LOCATION:** North spit of Coos Bay, North Bend, Coos County, OR.

**SIZE:** Bank area is 420.14 acres made up of 12 parcels ranging in size from 1.90 to 230.00 acres.

**SERVICE AREA:** The debiting wetlands are on-site within Henderson Marsh.

**TYPE OF MITIGATION:** Mitigation activities listed in the plan include the restoration and enhancement of existing habitats and the creation of freshwater ponds. The debiting areas include shoreline/willow wetlands, waterlily pond/willow wetlands, deflation plain shoreline/willow wetlands, deflation plain, willow wetland, and saltmarsh in a drainage canal. Post-mitigation lands are expected to consist of salt marsh, freshwater emergent marsh, willow upland, wet conifer, dune hummock, scrub-shrub wetland, water treatment lagoon, drainage ditches, and deflation plain. Deflation plain is the principal landform, comprising 276.27 acres or approximately 66% of the Henderson Marsh area.

**ENABLING INSTRUMENT:** Weyerhaeuser Paper Company updated a plan that was developed by the previous land-owner, Menasha Corporation. The HMMP, dated 11 May 1984, is signed by Weyerhaeuser Co., Oregon Department of Fish and Wildlife (ODFW), and the U.S. Fish and Wildlife Service (USFWS).

- The agreement states the locations of the debiting and crediting sites; all sites are within the same hydrologic drainage area.

- The HMMP does not limit compensation to in-kind replacement. The HMMP states that mitigation actions will occur prior to or concurrently with associated fills, except when prohibited by engineering constraints. Under such constraints, ODFW and USFWS may agree to allow a maximum delay of 90 days.

- The plan requires Weyerhaeuser to monitor mitigation projects for 2 years. After the monitoring period, Weyerhaeuser will notify USFWS and ODFW. The agencies will have 30 days to notify Weyerhaeuser regarding any problems with the site. If no problems are identified, ODFW then becomes responsible for operations and maintenance of the site. For a 3-year period after the transfer of maintenance responsibilities, Weyerhaeuser remains responsible for the success of mitigation actions.

- Oregon Division of State Lands will settle any disputes between Weyerhaeuser and ODFW during their period of joint responsibility for the mitigation sites.

- Lack of a plan expiration/update date has caused confusion regarding the current validity of the plan.

- Confusion exists between the agencies and Weyerhaeuser as to whether the document legally binds the Corps and Oregon Division of State Lands, non-signatories, to advance acceptance of the mitigation actions in the plan.

**RESPONSIBILITIES:**

***Sponsor:*** Weyerhaueser Company is the bank sponsor.

***Credit Producer:*** Weyerhaeuser is responsible for implementation of marsh management procedures as well as maintenance and monitoring for a 2-year period. ODFW then takes over maintenance activities. Weyerhaeuser continues to be responsible for the success of individual marsh management projects for 3 more years unless failure is due to ODFW maintenance activities.

***Management of Transactions:*** As Weyerhaeuser fills wetland areas it will phase in mitigation actions as required by Corps permits. As an action is identified for implementation, Weyerhaeuser must notify ODFW and USFWS (and the land manager, if the mitigation site is not owned by Weyerhaeuser).

***Credit Evaluation:*** Initial Habitat Evaluation Procedures (HEP) work was completed by USFWS, ODFW, and Weyerhaeuser Company. The Corps of Engineers and other permitting agencies make the final decision regarding the mitigation for specific developments according to the permit process.

***Regulatory:*** Following issuance of a Corps permit, if mitigation plans fail, the applicant is in noncompliance with the permit. The Corps can then pursue enforcement action against the applicant for noncompliance under 33 CFR 326.4 (d).

***Long Term Site Ownership:*** The majority of land mentioned in the HMMP is owned by Weyerhaeuser; some of the mitigation sites are on U.S. Forest Service land or land leased to Weyerhaeuser by the Corps of Engineers.

***Client:*** The Weyerhaeuser Company will be the major user of the plan; however, Henderson Marsh may be used for compensation by other entities with company approval.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** The initial mitigation actions occurred concurrently with utility road construction in 1984. Portions of the land were graded and excavated to create a series of freshwater ponds and a continuous wetland that remains wet year-round. Enhancement of tidal wetlands was accomplished by construction and placement of a reverse tidegate in the entrance of an existing tidal channel. Access roads which restricted water flow into the site were removed. The actions were completed in 1986 and have been considered successful. No other actions have occurred.

**CREDIT EVALUATION:** The plan includes a list of sites to be filled and expected habitat unit value (HUV) losses at each site. It also includes a list of mitigation sites and actions with calculated HUV gains. A modified version of the Habitat Evaluation Procedures (HEP) was employed to determine functional values of habitat losses and gains. Mitigation standards in the HMMP require the surface area of mitigation sites to be equal to or greater than the surface area of the development site. The ratio (implied) of HUV credits and debits will be 1:1. However, decisions on credit valuation and ratios will ultimately be made on a case-by-case basis through the Corps permit review process. Nominal amounts of residual wetlands credits which may result following the completion of individual mitigation efforts can be applied to future development, although "banking" is not the goal of the plan. The HMMP states that net gains in freshwater HUVs resulting from mitigation actions cannot be banked for use outside the plan. Presumably, excess HUVs involving saltwater marshes may be more generally applied. The HMMP projects the filling of 162.32 acres and mitigation actions on 420.14 acres, including the creation of 117.5 acres of wetlands. Projected fills will eliminate 835.16 HUVs and projected mitigation actions will create 858.73 HUVs.

**TRANSACTIONS:** One transaction has taken place since the development of the HMMP. Actions completed to mitigate for the loss of 13 acres due to construction of the Trans-Pacific Highway by the Port of Coos Bay created 62.48 habitat units. The Corps permit for the construction required the creation of 62.3 habitat units. The actions were completed in 1986.

**FUNDING REGIME:** Weyerhaeuser Company will pay for mitigation measures. Weyerhaeuser must pay to maintain mitigation sites for a five year period, unless a problem arises as a result of ODFW actions. If the causes for project deficiencies are difficult to determine, then the Oregon Division of State Lands will be asked to determine the responsible party and the appropriate corrective actions.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The HMMP is the only land use plan for Henderson Marsh. The Weyerhaeuser-owned land is zoned as industrial.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Henderson Marsh abuts lands owned by ODFW and the U.S. Forest Service. The Forest Service also owns approximately 32 acres within Henderson Marsh. The HMMP calls for long-term management of the mitigation sites by ODFW.

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## Goose Creek/Bowers Hill Tidal Mitigation Bank, Virginia

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable impacts to wetlands from Virginia Department of Transportation (VDOT) highway construction projects.

**LOCATION:** Adjacent to Goose Creek, a tributary to the Western Branch of the Elizabeth River, Chesapeake, Virginia.

**SIZE:** Total bank area is 10.64 acres.

**SERVICE AREA:** Generally, all debiting wetlands have been located in the coastal plain of Virginia within 50 miles of the WMB. Debiting actions are not restricted to the same hydrologic area as the bank.

**TYPE OF MITIGATION:** The bank was established through the creation of intertidal marsh. The bank site was a Virginia Department of Highways and Transportation (VDOT) borrow pit prior to wetland creation on the site. High marsh dominated by *Phragmites australis*, *Typha angustafolia*, *Scirpus robustus*, and *Spartina cynosuroides* covers 4.63 acres; low marsh community dominated by *Spartina alterniflora* covers approximately 3.7 acres; and scrub-shrub side slope community covers approximately 2.31 acres. Debiting wetlands have been low saline marshes dominated by emergent vegetation. All but 2 transactions have been in-kind replacement.

**ENABLING INSTRUMENT:** The construction work necessary for bank development was authorized by an Army Corps permit issued by the Norfolk District on 27 July 1982. The Norfolk District was involved in the initial planning of the site, but no formal agreement was developed. The Corps District is currently in the process of drafting procedural guidance on the establishment of VDOT WMBs within the Commonwealth of Virginia.

- The Corps would not fully approve the WMB until a viable wetland had been established.
- The stated position of the Corps is that the WMB can only be used for highway projects where on-site mitigation of wetland impacts is not possible.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is the Suffolk District of VDOT.

***Credit Producer:*** VDOT constructed and manages the WMB. The Virginia Institute of Marine Sciences (VIMS) has been monitoring the WMB and plans to publish the information gained from the

monitoring when funding is available. The Norfolk District has periodically inspected the WMB to judge the success of the project. Neither VIMS nor the District has monitoring responsibilities.

***Management of Transactions:*** The debiting process involves a case-by-case review of proposed debiting projects at monthly Federal/state interagency VDOT coordination meetings. Debits and credits are accounted for on balance sheets which are updated by VDOT and submitted to the Corps each time a new debiting project is approved and each time an actual debiting takes place.

***Credit Evaluation:*** Interagency inspections are used to determine the success of the created wetlands. The progress of the WMB is reviewed by the coordinating agencies (Corps of Engineers, US Fish and Wildlife Service, EPA, National Marine Fisheries Service, Virginia Water Control Board (now Virginia Department of Environmental Quality), Virginia Department of Game and Inland Fisheries, Virginia Marine Resources Commission) at the monthly VDOT coordination meetings. After consideration of the agencies' comments, the Corps of Engineers determines the number of wetland credits available in the bank.

***Regulatory:*** Following issuance of a Corps permit, if the bank fails, then the applicant is in noncompliance with the conditions of the permit. The Corps can then pursue enforcement action against the applicant for noncompliance under 33 CFR 326.4 (d).

***Long Term Site Ownership***: When VDOT received funding for the bank, the Federal Highways Administration and VDOT agreed that the bank will remain a tidal wetland under the ownership of VDOT in perpetuity.

***Client:*** VDOT is the sole client of the WMB.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** The borrow pit was excavated and graded to intertidal elevations. The bank was then hydrologically connected to Goose Creek by a 60-foot-wide by 100-foot-long tidal channel. A pre-existing perimeter ditch along the northern two-thirds of the borrow pit was also connected with the tidal channel. Prior to tidal connection, hydrology of the site consisted only of rainwater and upland runoff. During June 1982, the borrow pit was planted with *Spartina alterniflora* and *Spartina cynosuroides* plugs taken from the adjacent marshes. *S. alterniflora* was planted in a 2.56-acre semi-circle surrounding the tidal channel inlet. The remaining 5.77 acres of the borrow pit bottom were planted with *S. cynosuroides*. The 2.31 acres comprised of side slopes were planted with transitional grasses and shrubs such as *Iva frutescens*, *Baccharis halimifolia*, and *Spartina patens*. The site has been successfully opened to tidal inundation. The *S. alterniflora* has flourished in the low marsh (3.70 acres). The high marsh is now dominated by *Phragmites australis*, *Typha angustifolia*, *Scirpus robustus*, and *S. cynosuroides* (4.63 acres). A total of 1.1 acres of the side slopes meet the criteria for jurisdictional wetlands.

**CREDIT EVALUATION:** Credits and debits are quantified on a square-foot-for-square-foot basis. The use of the bank for mitigation purposes has only been approved for those projects having no on-site practicable means for mitigation. Ninety-five percent of debiting has been for in-kind compensation.

**TRANSACTIONS:** The first debiting action took place in November 1982. Sixteen debiting actions, totalling 2.10 acres, have occurred. There are 8.54 acres available.

**FUNDING REGIME:** To date, all involvement costs have been borne by the individual agencies. If more responsibilities become necessary (the threshold is uncertain), it is likely that certain agencies would not be involved without reimbursement of the related costs.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** Information is not available.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** The bank is bounded by Goose Creek to the north/northeast, the newly constructed Route 664 to the south/southeast, and residential and agricultural lands to the east and west. The property is owned by VDOT and private individuals. Construction of Route 664 may increase development on adjacent private properties.

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## Patrick Lake Wetland Mitigation Bank, Wisconsin

**STATUS:** Active.

**PURPOSE:** The bank was created to compensate for unavoidable wetland losses caused by Wisconsin Department of Transportation (WDOT) District 1 highway construction projects.

**LOCATION:** Town of Bristol, Dane County, Wisconsin.

**SIZE:** Total bank area is 225.38 acres, with 160 to 170 acres restorable to wetland.

**SERVICE AREA:** Debiting wetlands are within the ten county area of Highway District 1 in south-central and southwestern Wisconsin. In-kind replacement and a hydrological connection between the debiting and crediting wetlands are not required.

**TYPE OF MITIGATION:** The Patrick Lake WMB is a restoration project designed to return wetland values and functions to a drained glacial lake. Patrick Lake's hydrologic unit is within the upper Mississippi and upper Rock Rivers. Wetland restoration has primarily occurred in deep and shallow palustrine emergent marsh with submergent and floating-leaved species in deeper areas. Under pre-restoration conditions the site was a mixture of cultivated and fallow ground. Corn was the main crop cultivated and fallow ground cover was dominated by agricultural weeds, primarily by foxtail (*Setaria faberi* and *S. glauca*). Debiting wetlands may include all wetland types except bottomland hardwoods.

**ENABLING INSTRUMENT:** The Interagency Cooperative Agreement (ICA) between the Wisconsin Departments of Transportation (WDOT) and Natural Resources (WDNR) outlines the concept of a WMB and management procedures. The agreement was reached before Patrick Lake was selected as the bank site. Letters of concurrence were received from the Federal Highway Administration, the Environmental Protection Agency, the Corps of Engineers, and the Fish and Wildlife Service. In addition to the ICA, Patrick Lake WMB is managed under the more specific guidelines set forth in the Patrick Lake Mitigation Bank Procedures and Operations booklet.

- The agreement gives preference to wetland restoration, followed by creation of new wetlands where technically feasible.
- The agreement offers compensation for both primary (direct) and secondary (indirect) impacts of construction projects.
- The agreement gives preference to in-kind mitigation or mitigation accomplished in the vicinity of the impacted area. Preference is also given to lands not presently under WDNR ownership.
- The agreement calls for long-term protection of all restored and created sites, including clear identification of site ownership and management.
- Monitoring for up to 5 years after construction is encouraged by the agreement.
- The Patrick Lake Mitigation Bank Procedures and Operations booklet specifies that the WMB should always maintain a positive acre-balance.

**RESPONSIBILITIES:**

***Sponsor:*** The bank sponsor is WDOT.

***Credit Producer:*** WDOT is the credit producer. WDNR assists in the monitoring of the WMB site.

***Management of Transactions:*** WDOT is responsible for administering the bank account.

***Credit Evaluation:*** WDOT calculates credits which must then be approved by WDNR.

***Regulatory:*** The Corps of Engineers permits for debiting actions.

***Long Term Site Ownership:*** The land for the Patrick Lake WMB was purchased by WDOT and is owned by the State of Wisconsin (DNR). Patrick Lake WMB is placed in public trust and managed in perpetuity by WDNR for wetland and wildlife purposes.

***Clients:*** The bank client is WDOT.

**CONSTRUCTION AND PHYSICAL OPERATING HISTORY:** Wetland restoration in the main basin was accomplished through the elimination of a pumping system to allow the basin to fill with water. A spillway structure was

designed and installed at the northeast end of the main basin to serve as a water level control structure. Wetland restoration is in its second year and vegetation is in the initial stages of establishment. The post-restoration condition (as of May 1992) is open shallow water with a developing palustrine emergent wetland. Deeper parts of the basin are expected to be vegetated by submergent and floating-leaved species. Waterfowl species observed at Patrick Lake include tundra swans, redheads, wood ducks, scaup, coots, hooded mergansers, and the widgeon. Long term maintenance and development of wildlife management plans will be developed by WDNR. A management project may entail periodic drawdowns to promote growth of emergent vegetation. Information gathered through post-restoration monitoring will be used to determine the applicability of techniques and methods to future restoration efforts.

**CREDIT EVALUATION:** The WMB credits are assigned by area, with a minimum replacement ratio of 1:1. Actual ratios are determined with the use of functional analysis, which computes comparative productivity-diversity index values. The methodology, which is similar to Habitat Evaluation Procedures, is known as the Minnesota Wetlands Evaluation Method. Future banks in Minnesota and Wisconsin will likely use a different method for debiting and crediting. The St. Paul District of the Army Corps of Engineers and EPA Region V have signed off on a banking format that uses acres by type (i.e. vegetation cover type) as the currency for any future banks in those states. The new method will compensate for lost functions and values by striving for in-kind replacement, acre-for-acre. This replacement will be done on-site where feasible, or within the same watershed.

**TRANSACTIONS:** Two projects totalling 39 acres were debited prior to actual wetland restoration. As a result, the bank was operating at a deficit for 2 years until 1991. Future projects will only be assessed against completed restoration credits. Three other highway projects, consisting of 16 acres, are proposed to be debited. Distances from debiting sites to the bank range from 100 miles to 2 miles and average 30 miles. All debiting projects have occurred in the same hydrologic unit. There are 121 acres of credits available of the original 160 acres (39 have been debited).

**FUNDING REGIME:** WDOT acquired the land and shares implementation, management, and maintenance costs with WDNR.

**OFFICIAL LAND USE PLANS INCORPORATING THE WMB:** The WMB is not part of any land use plan.

**OWNERSHIP OF ADJACENT LANDS/ASSOCIATED IMPACTS TO THE WMB:** Surrounding lands are predominately agricultural with some residential development. Upland areas surrounding the WMB basin are used for hay production (alfalfa and brome grasses) and row crops (principally corn). Open oak wood lots are present in three areas adjacent to the main basin.

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# III. BASIC CHARACTERISTICS OF WETLAND MITIGATION BANKS

This chapter provides in tabular form basic information about existing and proposed wetland mitigation banks. Table 1 identifies the 44 existing wetland mitigation banks known to IWR in 1992, plus two entrepreneurial banks established in 1993. Table 2 identifies proposed wetland mitigation banks known to IWR as of summer 1992. It is necessarily less comprehensive. It is highly probable that there are many more proposed banks than those listed here. Also, a number of these proposals were not pursued or resulted in wetlands compensation through mechanisms other than banking. Nevertheless, this table provides a reasonable review of the types and locations of banks being proposed. It suggests, among other things, that there is a much greater level of interest in entrepreneurial, for-profit wetland mitigation banking than is reflected in the current complement of existing banks, which are heavily oriented toward satisfying public works mitigation needs.

The information provided for existing banks includes the bank's identification and location, the credit producer, the overseeing agencies, the clients, and land ownership of the bank site(s). It also includes the legal instrument authorizing the bank (e.g., memorandum of understanding, § 404 permit, or state permit), whether the bank is recognized for use in providing mitigation for § 404-permitted actions, the bank's geographic scope or "service area," its size in acres, and the wetland types in the bank. The table also show what type of compensation is being performed (e.g., wetland creation, restoration, enhancement, preservation), the credit valuation method, and the applicable compensation ratios.

The information provided for proposed banks is more limited, but does include the bank location, the type of compensation activity to be conducted, the proposed clientele, and the bank proponent.

This information is less reliable than the information developed through detailed case study evaluations. In any inventory, the source of information is particularly important. An individual in one agency may not be aware of a bank, whether in planning or operational, that is sponsored by a companion agency. Thus, inventories can vary depending on the inquirer's point of contact. A more common problem for inventorying banks is the point of contact's perspective. One agency representative may view a program as a "bank" while a companion agency representative sees the same program as something other than a bank. Affecting the validity of any list of banks are the reliability of bank information and agreement on bank characteristics and status.

The listing of a program on this inventory does not necessarily denote validation or agreement by IWR or ELI that the program is indeed a “true bank.” As the discussion at the beginning of Chapter II indicates, some programs appear to be banks only marginally. However, the purpose of the inventory was to provide a data base that represented a wide variety of arrangements. Further, any such inventory is susceptible to the interpretation or viewpoint of the agency or individual providing bank information for specific regions.

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 1. Anaheim Bay Mitigation Project | Anaheim Bay, Seal Beach National Wildlife Refuge, Orange County, CA | Port of Long Beach acting through Board of Harbor Commissioners | USFWS, NMFS, COE, EPA, CA Coastal Commission, Regional Water Quality Commission, CA Dept. of Fish and Game | Port of Long Beach and potentially other port developers | U.S. Navy |
| 2. Bracut Marsh Mitigation Land Bank | Humboldt Bay, CA | CA Coastal Conservancy | CA Coastal Commission, CA Dept. of Fish and Game | multiple public & private clients | CA Coastal Conservancy, which has long-term management responsibility |
| 3. Huntington Wetlands Restoration Project | Orange County, CA | CA Coastal Conservancy | CA Coastal Commission, CA Dept. of Fish and Game, CA Coastal Conservancy, USFWS | CALTRANS, Orange County Flood Control District | Huntington Beach Wetlands Conservancy owns most of land; Orange County Flood Control and Sanitation Districts own the rest, but granted easements to HBWC |
| 4. Mid City Ranch | Humboldt County, CA | CA Dept. of Fish & Game | CA Dept. of Fish & Game, City of Eureka, Humboldt County | Humboldt County, City of Eureka | CA Dept. of Fish & Game |
| 5. Mission Viejo/ ACWHEP | Orange County, CA | Mission Viejo Company & Orange County Dept. of Harbors, Beaches, and Parks | USFWS, CA Dept. of Fish and Game | multiple - general | public- Orange County |
| 6. Naval Amphibious Base Eelgrass Mitigation Bank | West side San Diego Bay, San Diego, CA | U.S. Navy | USFWS, NMFS, CA Dept. of Fish and Game | U.S. Navy | U.S. Navy |
| 7. Port of Long Beach - Pier A Newport Mitigation Bank | Newport Beach, Orange County, CA | Port of Long Beach (Board of Harbor Communications) | USFWS, NMFS, COE, EPA, CA Dept. of Fish and Game (City of Long Beach) | Port of Long Beach | CA Dept. of Fish and Game |
| 8. Port of Los Angeles Inner Harbor Mitigation Bank | Inner Harbor - Port of Los Angeles, CA | Port of Los Angeles | Board of Harbor Commissioners, CA Dept. Fish & Game, NMFS, USFWS | Port of Los Angeles and potentially other port developers | City of Los Angeles |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 9. Port of Los Angeles - Pac Tex, Batiquitos Lagoon | Carlsbad, CA | Port of Los Angeles | Board of Harbor Commissioners (Port of L.A.), USFWS, NMFS, City of Carlsbad, CA State Land Commission, CA Dept. of Fish and Game | Port of Los Angeles | CA State Land Commission |
| 10. San Joaquin Marsh | Orange County, CA | Irvine Company | USFWS, CA Dept. of Fish and Game | Irvine Company | Irvine Co. & Univ. of CA Natural Reserve System |
| 11. Sea World Eelgrass Mitigation Bank | San Diego County, CA | Sea World | CA Coastal Commission, COE | Sea World (others can apply through Sea World) | Sea World leases the land from City of San Diego |
| 12. Florida Wetlandsbank | Pembroke Pines Broward County, FL | Florida Wetlandsbank | COE | private clients | City of Pembroke Pines in Broward County |
| 13. Cheval Tournament Players Club | Hillsborough County, FL | Cheval Associates Partnerships, Inc. | S.W. FL Water Management District | one - private client | |
| 14. Hillsborough County Utilities Dept. Mitigation Bank | Hillsborough County, FL | Hillsborough County Utilities Dept. | S.W. FL Water Management District | one - public; local government | Hillsborough County |
| 15. Northlakes Park Mitigation Bank | Hillsborough County, FL | Hillsborough County | Hillsborough County Environmental Protection Commission, S.W. FL Water Management District | Hillsborough County | Hillsborough County |
| 16. Polk Parkway Bank | Polk County, FL | local govt. of Polk County | S.W. FL Water Management District | county government | Polk County |
| 17. Polk Regional Drainage Project Bank | Polk County, FL | local govt. of Polk County | S.W. FL Water Management District | county government | Polk County |
| 18. Southeast Mitigation Bank | Hillsborough County | Hillsborough County, FL | S.W. FL Water Management District | county government | unknown |
| 19. Turner Citrus Inc. | DeSoto County, FL | Gene Turner and brother | S.W. FL Water Management District | private | private |
| 20. Weisenfeld/ Meadow Woods | Orlando, FL | Joseph Weisenfeld | State Bureau of Wetland Resource Management | private | unknown |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 21. Georgia Dept. of Transportation | various | GA DOT | USFWS, COE, EPA | GA DOT | State of Georgia |
| 22. Millhaven | Burke and Screven Counties, GA | W.E.T., Inc. | COE | private | W.E.T., Inc. holds conservation easement |
| 23. ID Transportation Dept. Wetland Mitigation Bank | land in 3 parcels located in Minidoka, Jefferson, and Clark Counties, ID | ID Transportation Dept. (ITD) | ITD and ID Dept. Fish & Game | ITD | Old Beaver site is owned by ITD; East Marsh site is owned by ID Dept. Fish & Game; Acequia is owned by the U.S Bureau of Reclamation and leased to ITD |
| 24. Geist Reservoir | Marion County, IN | Shorewood Corp. | COE | private - Shorewood | private |
| 25. Morse Reservoir | Hamilton County, IN | Shorewood Corp. | COE | private - Shorewood | private |
| 26. Louisiana Dept. of Transportation and Development (DOTD) Mitigation Bank | Grant and LaSalle Parishes | LA DOTD | LA Dept. of Wildlife and Fisheries, LA DOTD, USFWS | LA DOTD | LA Dept. of Wildlife and Fisheries |
| 27. Fina LaTerre | Terrebonne Parish, LA | Fina Oil and Chemical Co. | USFWS, NMFS, SCS, LA DNR, LA DWF | Fina LaTerre, Inc., a subsidary of Fina Oil and Chemical Co. | Fina Oil and Chemical Co. |
| 28. Minnesota Wetland Habitat Mitigation Bank | statewide | MN DOT | MN DOT, MN DNR, USFWS, FHWA | MN DOT | credit areas purchased by MN DOT, turned over to MN DNR |
| 29. Mississippi State Highway Mitigation Bank | 4 sites in Bolivar, Grenada, and Greene Counties, MS | MS State Highway Dept. (MSHD) | USFWS, COE, MS Dept. of Wildlife, Fisheries & Parks | MS State Highway Dept. | 2 sites owned by MSHD; 1 site deeded to USFWS; 1 site deeded to MS Dept. of Wildlife, Fisheries, and Parks |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 30. Special Management Area Plan for the Port of Pascagoula | Jackson County, MS | state of MS | USFWS, Jackson County Port Authority, MS Dept. of Wildlife, Fisheries & Parks, MS Dept. of Archives & History, MS DEQ, COE, EPA, NMFS, Jackson County Board of Supervisors | Port of Pascagoula and private developers | State of Mississippi |
| 31. MT DOT Wetland Mitigation Bank | statewide | MT DOT | Dept. of Health & Environmental Sciences, FHWA, USFWS, EPA, COE, MT Dept. of Fish, Wildlife, & Parks | MT DOT | USFWS |
| 32. Washoe Lake Wetland Mitigation Area | Washoe County, NV (near Carson City) | NV DOT | NV DOT, NV Div. State Parks, NV Div. of State Lands, COE | NV DOT | NV Division of State Lands - upon completion of credits, bank will become a state park |
| 33. Company Swamp Mitigation Bank | Bertie County, NC | NC DOT | NC Wildlife Resources Commission, USFWS, NC Nature Conservancy | NC DOT | state owns bank; will become part of the Roanoke River National Wildlife Refuge |
| 34. NC DOT Pridgen Flats Mitigation Site | Sampson County, NC | NC DOT | NC Wildlife Resources Commission, USFWS | NC DOT | USFWS |
| 35. North Dakota State Highway Dept. Bank | statewide | ND State Highway Dept. | USFWS and ND State Highway Dept. | ND State Highway Dept. | USFWS |
| 36. ND State Wetland Mitigation Bank | statewide | primarily Federal conservation programs | ND State Water Commission, ND Dept. of Game & Fish, Office of the State Engineer | general - principally farmers | primarily USFWS, but varies widely |
| 37. Astoria Airport Mitigation Bank | Clatsop County, OR | OR Division of State Lands | EPA, COE, NMFS, Dept. of Land Conservation and Development, OR Dept. of Fish & Wildlife, OR Div. of State Lands, Port of Astoria, USFWS | general | OR Division of State Lands |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 38. Henderson Marsh Mitigation Plan | Coos County, OR | Weyerhaeuser Paper Co. | OR Dept. of Fish & Wildlife, USFWS, COE | Weyerhaeuser and others if approved by Weyerhaeuser and COE | Weyerhaeuser owns most of the land; some sites owned by USFS and some leased to Weyerhaeuser by COE |
| 39. Highway Mitigation Bank, South Carolina | Black River Farms, central SC | SC DOT | USFWS, COE, Dept. of Health, SC Coastal Council, SC Water Resources Comm., SC Wildlife Marine Resources Div. | SC DOT | future - SC DOT |
| 40. Wetlands Accounting System | Arlington, SD | SD DOT | FHWA, USFWS, SD Games, Fisheries, and Parks | SD DOT | SD DOT owns it until all credits used; will then donate to public or private conservation agency |
| 41. West Tennessee Wetland Mitigation Bank | Shelby County, TN | TN DOT | TN Dept. of Environment and Conservation, TN Wildlife Resources Agency, FHWA | TN DOT | TN DOT currently; at completion - TN Dept. of Environment and Conservation or TN Wildlife Resources Agency |
| 42. Goose Creek/Bowers Hill Tidal Mitigation Bank | Chesapeake, VA | VA DOT | EPA, COE, USFWS, NMFS, VA State Water Control Board (Now called: Dept. of Envir. Quality, DEQ), VA Marine Resources Commission, VA Dept. of Game & Inland Fisheries | VA DOT | VA DOT |
| 43. Cabin Creek | Prince Georges County, VA | VA DOT | EPA, COE, NMFS, VA DEQ, VA Game Commission, VA Marine Resources Council, VA Fish & Game | VA DOT | VA DOT |
| 44. Fort Lee Wetland Mitigation Bank | Prince Georges County, VA | VA DOT | EPA, COE, USFWS, NMFS, VA DEQ, Marine Resources Council for Fish and Game, VA Marine Resources Council, VA Fish & Game | VA DOT | Fed. COE owned; granted easement to VA DOT |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | LOCATION | CREDIT PRODUCER | OVERSEEING AGENCIES | CLIENTS | LAND OWNERSHIP current/future |
|---|---|---|---|---|---|
| 45. Otterdam Swamp | Greensville County, VA | VA DOT | EPA, COE, USFWS, VA DEQ, VA Game Commission | VA DOT | VA DOT |
| 46. Patrick Lake Wetland Mitigation Bank | Dane County, WI | WI DOT | COE, EPA, USFWS, FHWA, WI DNR | WI DOT | perpetual public trust with WI DNR |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | AUTHORIZING INSTRUMENT | USE FOR 404? | GEOGRAPHIC SCOPE | SIZE IN ACRES | WETLAND TYPE(S) IN BANK |
|---|---|---|---|---|---|
| 1. Anaheim Bay Mitigation Project | 2 MOUs, 1986 | yes | Port districts of Southern CA Bight | 119.6 | shallow estuarine, coastal embayment |
| 2. Bracut Marsh Mitigation Land Bank | MOU and Broadway Wetlands Restoration Conceptual Plan | yes | Humboldt County | 6-acre bank on 13-acre parcel | mitigates for 'pocket' marshes (2 acres) with a larger constructed marsh |
| 3. Huntington Wetlands Restoration Project | 2 MOAs, 1988 | yes | within same hydrologic drainage area as wetland mitigation bank | 24.9 | coastal ecosystem - tidal marsh |
| 4. Mid City Ranch | MOA, 1988 | yes | Humboldt County | 8.2 | freshwater, seasonal wetlands |
| 5. Mission Viejo/ACWHEP | MOA | yes | within Aliso Viejo Greenbelt - 3,400 acre open-space | 32.3 | freshwater marsh |
| 6. Naval Amphibious Base Eelgrass Mitigation Bank | MOU | yes | Naval Amphibious Base, San Diego Bay | 10 | aquatic beds of eelgrass |
| 7. Port of Long Beach - Pier A | MOU, 1984 | yes | within 25 miles of Long Beach Harbor | 29 | salt marsh, estuarine |
| 8. Port of Los Angeles Inner Harbor Mitigation Bank | MOU, 1984 | yes | within Inner Harbor of Port of Los Angeles | 17.7 and possible expansion | deep water habitat |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | AUTHORIZING INSTRUMENT | USE FOR 404? | GEOGRAPHIC SCOPE | SIZE IN ACRES | WETLAND TYPE(S) IN BANK |
|---|---|---|---|---|---|
| 9. Port of Los Angeles - Pac Tex, Batiquitos Lagoon | MOA | yes | "Area of Ecological Continuity". Batiquitos Lagoon is 80 miles from Pac Tex Impact site. | lagoon - 600 acres credit area - 363 acres | shallow water, coastal embayment |
| 10. San Joaquin Marsh | MOA between Irvine Co., USFWS, CA Dept of Fish and Game | no | the Irvine Ranch - 65,000 acre wetland system | 18 | freshwater marsh |
| 11. Sea World Eelgrass Mitigation Bank | MOA | yes | same watershed | less than one (.07) | eelgrass |
| 12. Florida Wetlandsbank | permit with COE | yes | projects in same area and same watershed will be given priority | ±358 | sawgrass marsh, upland forested buffer, emergent marsh, cypress forest, open water, forested wetland |
| 13. Cheval Tournament Players Club | permit with S.W. Florida Water Mgmt. District | not specified | county | 26.94 | forested wetland |
| 14. Hillsborough County Utilities Dept. Mitigation Bank | permit with S.W. Florida Water Mgmt. District | not specified | county | 13 | forested wetland |
| 15. Northlakes Park Mitigation Bank | permit with S.W. Florida Water Mgmt. District | no | county | 10.95 | cypress wetland |
| 16. Polk Parkway Mitigation Bank | permit with S.W. Florida Water Mgmt. District | no | county | 3.2 | forested wetland |
| 17. Polk Regional Drainage Bank | conceptual permit with S.W. Florida Water Mgmt. District | no | county | 24.3 | forested wetlands |
| 18. Southeast Mitigation Bank | MOU | no | watershed | 31 | upland - buffer areas, new wetlands, and enhancement of disturbed areas |
| 19. Turner Citrus, Inc. | permit with S.W. Florida Water Mgmt. District | yes | watershed | 2 parcels totalling 47 acres | pine flatwoods |
| 20. Weisenfeld/Meadow Woods | MOA | no | watershed | 235 | cypress and mixed hardwood wetlands, forested wetlands |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | AUTHORIZING INSTRUMENT | USE FOR 404? | GEOGRAPHIC SCOPE | SIZE IN ACRES | WETLAND TYPE(S) IN BANK |
|---|---|---|---|---|---|
| 21. Georgia DOT | MOA, 1987 | yes | try to stay as close as possible within drainage site or 100 miles from impact | varies | varies |
| 22. Millhaven | COE permit with written agreement | yes | Chatham County, GA and Savannah River Basin north to limits of Coastal Plain | 350 | Cypress, Oak, Ash, Hickory |
| 23. ID Transportation Dept. Wetland Mitigation Bank | MOA | yes | try for same watershed, human impact zone, and ITD district | 3 parcels of land totalling 213 acres | palustrine emergent marsh and scrub-shrub |
| 24. Geist River | COE permit with written agreement | yes | not specified | 25.4 | forested wetland, some scrub-shrub and emergent |
| 25. Morse Reservoir | COE permit with written agreement | yes | not specified | 14.5 | palustrine forested wetland, mixed hardwood |
| 26. Louisiana Dept. of Transportation and Development Mitigation Bank | verbal agreement; state legislative resolution for purchase & transfer of lands | yes | statewide - outside coastal zone | 2944 | forested wetlands, bottomland hardwood |
| 27. Fina LaTerre | MOA | yes | within same hydrologic unit; other areas on case-by-case basis | 7014 | freshwater marsh, brackish marsh, shallow, open water, coastal and estuarine marsh |
| 28. Minnesota Wetland Habitat Mitigation Bank | MN DOT technical memorandum with letters of concurrence from Federal agencies | yes | within DOT districts | 1750 | mainly inland, shallow and deep freshwater marshes |
| 29. Mississippi State Highway Dept. Mitigation Bank | COE general permit with appended Mitigation Plan; MOU and MOA pertain to land transfer | yes | outside coastal zone counties in Vicksburg, Mobile, Memphis & Nashville Districts | 4 parcels totalling 786 acres | bottomland hardwoods, wet pine savannah/pitcher plant bog |
| 30. Special Management Area Plan for the Port of Pascagoula | special management area plan & MOA implementing plan | yes | same hydrologic drainage area as mitigation site | 4675 | intertidal marshes and flats, open water habitat, estuarine scrub-shrub |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | AUTHORIZING INSTRUMENT | USE FOR 404? | GEOGRAPHIC SCOPE | SIZE IN ACRES | WETLAND TYPE(S) IN BANK |
|---|---|---|---|---|---|
| 31. MT DOT Wetland Mitigation Bank | MOU | yes | same biotic region or geographic area | no fixed size (170 acres to date) | freshwater wetlands, principally palustrine |
| 32. Washoe Lake Wetland Mitigation Area | interagency agreement | yes | within same hydrologic drainage area as bank | 88.5 | palustrine persistent emergent |
| 33. Company Swamp Mitigation Bank | MOU | yes | statewide; preferably within coastal plains | 1031 | bottomland hardwood, gum-cypress |
| 34. NC DOT Pridgen Flats Mitigation Site | MOU | yes | coastal plains area | 127.3 | pocosin |
| 35. ND State Highway Dept. Bank | MOU | no | statewide; priorities are: 1) along project; 2) in biotic sub-region; 3) in biotic region; 4) outside biotic region | no fixed size (175 acres to date) | inland marshes and palustrine emergent wetlands |
| 36. ND State Wetland Mitigation Bank | N.D. Century Code §61-32-05. 1987 State Legislature | no | statewide | no fixed size (5000 acres to date) | freshwater and inland saline wetlands within palustrine and lacustrine systems |
| 37. Astoria Airport Mitigation Bank | MOA | yes | 8 mile radius - single watershed | 33 | freshwater marshes; working to achieve brackish marshes |
| 38. Henderson Marsh Mitigation Plan | Henderson Marsh Mitigation Plan | yes | on-site within Henderson Marsh | 420.1 | salt and freshwater marsh, deflation plain, scrub-shrub |
| 39. SC DOT | none | yes | statewide | 1,000 | forested wetlands |
| 40. Wetlands Accounting System Bank (SD) | MOU | yes | watershed, then biotic region or outside biotic region, if necessary | 25 | palustrine emergent |
| 41. West Tennessee Wetland Mitigation Bank | MOA | yes | same watershed | 398 | 100 acres - bottomland hardwoods, forested wetlands, old creek channels; 298 - cleared and drained for agriculture |
| 42. Goose Creek/Bowers Hill Tidal Mitigation Bank | none; debits reviewed by interagency committee and incorporated into individual permits | yes | not specified; generally in coastal plain of VA | 10.64 | estuarine emergent, palustrine forested, shrub-scrub |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | AUTHORIZING INSTRUMENT | USE FOR 404? | GEOGRAPHIC SCOPE | SIZE IN ACRES | WETLAND TYPE(S) IN BANK |
|---|---|---|---|---|---|
| 43. Cabin Creek | none; verbal commitment with interagency review and comment | yes | general DOT district | 9 | palustrine forested |
| 44. Fort Lee Wetland Mitigation Bank | none; verbal commitment with interagency review and comment | yes | DOT district with preference to sites close to bank | 34 | palustrine forested, emergent |
| 45. Otterdam Swamp | none; debits reviewed by interagency committee, incorporated into individual permits | yes | DOT Suffolk district | 14 | palustrine herbaceous, shrub-scrub, forested |
| 46. Patrick Lake Wetland Mitigation Bank | cooperative agreement between WI DOT and WI DNR, with letters of concurrence from relevant Federal agencies | yes | WI DOT district 1 | 160-170 | palustrine emergent marsh |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | COMPENSATION METHOD | CURRENCY/EVALUATION METHOD | COMPENSATION RATIOS |
|---|---|---|---|
| 1. Anaheim Bay Mitigation Project | restoration & creation | modified HEP | case-by-case based on habitat suitability indices for 20 species |
| 2. Bracut Marsh Mitigation Land Bank | restoration | acres | determined by CA Coastal Commission on a case-by-case basis; never less than 1:1 |
| 3. Huntington Wetlands Restoration Project | restoration | best professional judgment | ratio not specified; has been 1:1 to date |
| 4. Mid City Ranch | restoration, creation, & enhancement | modified HEP | acre-for-acre; determined by CA F&G on case-by-case basis |
| 5. Mission Viejo - ACWHEP | enhancement & creation | acres | starts at 3:1, can be lowered under certain circumstances |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | COMPENSATION METHOD | CURRENCY/EVALUATION METHOD | COMPENSATION RATIOS |
|---|---|---|---|
| 6. Naval Amphibious Base Eelgrass Mitigation Bank | transplant of eelgrass to bank | habitat evaluation credit system based on mean density of eelgrass | 1:1 acreage basis |
| 7. Port of Long Beach - Pier A | restoration & enhancement | "Consensus Habitat Evaluation" analogous to HEP | 1.5:1 |
| 8. Port of Los Angeles Inner Harbor Mitigation Bank | creation | water surface acreage at mean high water | 1:1 |
| 9. Port of Los Angeles - Pac Tex, Batiquitos Lagoon | restoration & enhancement | surface water acres | 1:1 |
| 10. San Joaquin Marsh | enhancement | HU - modified HEP called Habitat Value Analysis | 1:1 minimum |
| 11. Sea World Eelgrass Mitigation Bank | restoration | survey for density, quality, and quantity of eelgrass: impacted and mitigated areas must have similar eelgrass density | 1.2:1 - the 0.2 represents the amount of time (2 years) the habitat is out commission. |
| 12. Florida Wetlandsbank | restoration & enhancement | Integrated Functional Index (IFI) determined by ADID study | bank applicant's "mitigation obligation acreage" is multiplied by .85 or .75 depending on whether they are located in ADID study area |
| 13. Cheval Tournament Players Club | creation & enhancement | WET & best professional judgment | sliding scale dependent on success criteria |
| 14. Hillsborough County Utilities Dept. Mitigation Bank | creation | WET & best professional judgment | sliding scale dependent on success criteria |
| 15. Northlakes Park Mitigation | rehydration of drained wetlands | case-by-case; impacts known in advance | 1:1 to 2.5:1 - varied depending on impact |
| 16. Polk Parkway Bank | creation | acreage based on success criteria: 30% canopy closure in forested wetlands; 85% species survival | 2.5:1 - immediately after construction began; 1:1 after success criteria met |
| 17. Polk Regional Drainage Project Park | creation | WET (reference wetland); type-for-type | sliding scale dependent on success criteria |
| 18. Southeast Mitigation Bank | creation, enhancement, & preservation | PMAs (Potential Mitigation Acres) | high replacement ratio initially with sliding scale |
| 19. Turner Citrus Inc. | creation, restoration, & enhancement | ratio dependent on wetland type and wetland quality | have used various ratios; 1:1 and greater |
| 20. Weisenfeld/Meadow Woods | enhancement & preservation | FL DER valuation questionnaire | sliding scale from 20:1 to 6:1 dependent upon success criteria |
| 21. Georgia DOT | creation, restoration, & protection | regulating agencies - professional judgment | 2:1 - 1:1 |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | COMPENSATION METHOD | CURRENCY/EVALUATION METHOD | COMPENSATION RATIOS |
|---|---|---|---|
| 22. Millhaven | restoration, creation, & enhancement | professional judgment of Corps | Corps decides ration on case-by-case basis |
| 23. ID Transportation Dept. Wetland Mitigation Bank | creation & restoration | HEP | 1:1, determined by COE |
| 24. Geist Reservoir | restoration | acres | 1:1, determined site-by-site |
| 25. Morse Reservoir | restoration | acres | 1:1, determined site-by-site |
| 26. Louisiana Dept. of Transportation and Development Mitigation Bank | enhancement & preservation | Originally AAHUs HEP; now acreage | 1:1 |
| 27. Fina LaTerre | enhancement | AAHUs and HEP 76 | 2:1 |
| 28. Minnesota Wetland Habitat Mitigation Bank | enhancement & creation | modified HEP with preference for waterfowl habitat and publicly-owned land | varies |
| 29. Mississippi State Highway Dept. Mitigation Bank | restoration, enhancement, & preservation | acres -- best professional judgment | 1:1 or greater |
| 30. Special Management Area Plan for the Port of Pascagoula | preservation of Bangs Lake & Middle River Management Units; restoration, enhancement, & creation of Highway 90 Mitigation Area | no method necessary for preserved sites; case-by-case for Highway 90 Mitigation Area | case-by-case determined by Special Management Area Task Force |
| 31. MT DOT Wetland Mitigation Bank | restoration, enhancement, creation, & preservation | best professional judgment | ratios determined on case-by-case basis by technical subcommittee |
| 32. Washoe Lake Wetland Mitigation Area | creation & enhancement | WET | 3:1 for enhanced wetlands, 0.3:1 for created wetlands |
| 33. Company Swamp Mitigation Bank | preservation | HEP for losses of more than 5 acres; acreage for losses under 5 acres | varies according to HEP for > 5 acres; 1:1 for < 5 acres |
| 34. NC DOT Pridgen Flats Mitigation Site | restoration | ratio based on HEP analysis done on unrelated pocosin tract | 2:1 |
| 35. ND State Highway Bank | restoration & creation | replacement by area using exchange options and ratios | 0.25:1-8:1 determined by USFWS and ND DOT based on type and location of wetlands |
| 36. ND State Wetland Mitigation Bank | restoration & creation | HEP & WET | none specified |
| 37. Astoria Airport Mitigation Bank | restoration | OR Dept. State Lands Relative Value System; functional valuation ratings of 1-6 | sliding scale based on habitat value ranging from 1:1 to 6:1 |

**Table 1. Existing Wetland Mitigation Banks, 1992 (continued)**

| BANK | COMPENSATION METHOD | CURRENCY/EVALUATION METHOD | COMPENSATION RATIOS |
|---|---|---|---|
| 38. Henderson Marsh Mitigation Plan | restoration, enhancement, & creation | modified HEP | 1:1 |
| 39. South Carolina Dept. of Transportation | restoration | not specified | not specified |
| 40. Wetlands Accounting System Bank, SD | restoration, creation, enhancement, & preservation (restoration preferred) | acres | none |
| 41. West Tennessee Wetland Mitigation Bank | restoration, enhancement, creation, & preservation (in order of preference) | acres | case-by-case; minimum 2:1 |
| 42. Goose Creek/Bowers Hill Tidal Mitigation Bank | creation | acreage | not specified, but generally 1:1 |
| 43. Cabin Creek | creation | acreage | 2:1 |
| 44. Fort Lee Wetland Mitigation Bank | creation | acreage | 2:1 |
| 45. Otterdam Swamp | creation | acreage | 1:1 |
| 46. Patrick Lake Wetland Mitigation Bank | restoration | Minnesota Wetlands Evaluation Methodology (WEM) | at least 1:1 |

**Table 2. Proposed Wetland Mitigation Banks, 1992 (continued)**

| PROPOSED BANK | LOCATION | COMPENSATION METHOD | PROPONENT / CLIENTS |
|---|---|---|---|
| Alabama Highway Dept./ Wheeler Wildlife Refuge | Tennessee Valley drainage basin, Morgan County, AL | restoration & enhancement | AL Highway Department / AL Highway Department |
| City & Borough of Juneau WMB | Juneau, AK | creation, restoration, protection, or enhancement | City & Borough of Juneau / general |
| Asarco | Pinal County, AZ | preservation & restoration | Asarco / Asarco |
| AR Highway & Transportation Dept. (AHTD) WMB | Mississippi Delta, Gulf Coastal Plain, & Interior Highlands | restoration & enhancement preferred | AHTD / AHTD |
| Bill Signs Trucking WMB | San Diego County, CA | enhancement | Bill Signs Trucking / Bill Signs Trucking and general |
| Dune Mitigation Bank | Eureka, CA | restoration | City of Eureka / City of Eureka |
| Mission Bay Eelgrass Mitigation Bank | San Diego County, CA | restoration | City of San Diego / City of San Diego |
| Placer County WMB | Placer County, CA | creation, restoration, enhancement, & preservation | Placer County Planning Dept. / general |
| Sacramento County CALTRANS Bank | Sacramento County, CA | restoration | CALTRANS / CALTRANS |
| Springtown Natural Communities Reserve Mitigation Program | Livermore, CA | restoration | Environmental Mitigation Exchange Co. / general |
| East Lake/ McMullan Booth Road MB | Pinellas County, FL | | Local Govt. / Local Govt. |
| Florida DOT | Polk County, FL | restoration & enhancement | FL DOT / FL DOT |
| Jerry Lake Weir WMB | Pinellas County, FL | creation | Local Govt. / Local Govt. |
| Mud Lake Mitigation Bank | Orange County, FL | restoration & enhancement | Greater Orlando Aviation Authority / Orlando Aviation Authority |
| Northwest Hillsborough County Mitigation Bank | Hillsborough County, FL | creation & enhancement | local government / local government |
| Orlando International Airport Build-out | Orange County, Orlando, FL | | Greater Orlando Airport Authority / Orlando Airport Authority |

**Table 2. Proposed Wetland Mitigation Banks, 1992 (continued)**

| PROPOSED BANK | LOCATION | COMPENSATION METHOD | PROPONENT / CLIENTS |
|---|---|---|---|
| Pinellas County WMB | Pinellas County, FL | restoration | Pinellas County / County agency/ public |
| Southwest FL Regional Wildlife and Wetlands Conservation Mitigation Area | Collier County, FL | | FL Game & Freshwater Fish Commission / general |
| Marshland Plantation Commercial WMB | Camden County, GA | restoration | Marshland Plantation / general |
| Homebuilder's Association of Greater Chicago WMB | Northeastern IL | restoration preferred; enhancement & creation allowed | Homebuilder's Association of Greater Chicago / general |
| Lake County WMB | Lake County, IL | restoration, enhancement & some creation allowed | Lake County Stormwater Management Commission / general |
| St. Clair County WMB | St. Clair County, IL | restoration & enhancement | County / general |
| Barksdale Air Force Base WMB | Bossier County, LA | enhancement & restoration | Air Force / Air Force |
| Himont Expansion Bottomland Hardwood Bank | Calcasieu Parish, LA | restoration | Himont USA, Inc. / Himont and general |
| Pass A Loutre Deltaic Splay Development | Plaquemines Parish, LA | restoration | LA Dept. of Wildlife & Fisheries / general |
| Terrebone - Point Au Chien Wildlife Management Area | Terrebone Parish, LA | restoration | LA Dept. of Wildlife & Fisheries / general |
| Maryland Highway Administration Bank | | restoration, creation, or enhancement within same watershed | MD Highway Administration / MD Highway Administration |
| Prince George's County | Prince George's County, MD | creation, restoration & enhancement | Prince George's County, MD DNR / Prince George's County |
| Lancaster County WMB | Lancaster County, NE | | private/public / general |
| Nebraska Department of Roads | "Wetland Complex" where fill occurred | restoration preferred, but creation is allowed | NE Department of Roads / NE Department of Roads |
| New Hampshire DOT Bank | statewide, NH | restoration | NH DOT / NH DOT |
| Chimento Mitigation Bank | Monmouth County, NJ | restoration & preservation | Mr. Chimento / public or general |
| Hackensack Meadowlands | Hudson County, Hackensack, NJ | enhancement & creation | Hackensack Meadowlands Development Commission / general |

**Table 2. Proposed Wetland Mitigation Banks, 1992 (continued)**

| PROPOSED BANK | LOCATION | COMPENSATION METHOD | PROPONENT / CLIENTS |
|---|---|---|---|
| New Jersey DOT WMB | statewide, NJ | creation & enhancement | New Jersey DOT / New Jersey DOT |
| Passaic River Central Basin Wetlands Bank | Passaic River Basin, NJ | | State of NJ / general |
| Valencia County WMB | Valencia County, NM | preservation & enhancement | NM State Highway and Transporta-tion Dept. / NM HTD |
| Homebuilder's Association of Ohio | | restoration | Homebuilder's Association of Ohio / general |
| Dalton Lake | Columbia County, OR | | OR DOT / OR DOT |
| Port of Astoria WMB | Clatsop County, OR | creation | Port of Astoria / Port of Astoria |
| Turner Mitigation Bank | Marion County, OR | | OR DOT / OR DOT |
| West Eugene Mitigation Bank | Lane County, OR | restoration | West Eugene / general |
| Commercial Mitigation Bank | Arkansas County, TX | | Commercial Mitigation Bank / general |
| Dow Nature Refuge | Lake Jackson, TX | creation | Dow Chemical USA / Dow Chemical |
| General Land Commission | Galveston & Dallas/Ft. Worth, TX | | State of Texas / general |
| Taylor Lake Nature Preserve and WMB | Harris County, TX | creation & enhancement | Friendswood Development Company / Friendswood and general |
| Wetlands Management, Inc. | Trinity River S.E. of Dallas, TX | creation | Wetlands Management, Inc. / general |
| Northeast Utah WMB | Salt Lake, Davis & Weaver Counties, UT | restoration | Thurgood & Thurgood Land Planning, Research & Development / general |
| Provo City WMB | Provo, UT | preservation & maintenance | City of Provo; Office of Mayor Jenkins / City of Provo and maybe general |
| Tenth West Corridor WMB | Logan, UT | creation | City of Logan / general |
| Creeds WMB | Virginia Beach, VA | restoration, enhancement, & creation | City of Virginia Beach / City of Virginia Beach and maybe others |

**Table 2. Proposed Wetland Mitigation Banks, 1992 (continued)**

| PROPOSED BANK | LOCATION | COMPENSATION METHOD | PROPONENT / CLIENTS |
|---|---|---|---|
| Dale City WMB | Prince William County, VA | | Hylton Enterprises / Hylton and general |
| Lowe's Island WMB | Loudon County, VA | | Chevy Chase Bank / Chevy Chase and general |
| Neabsco Wetlands Bank | Prince William County, VA | creation | Wetland Studies and Solutions / general |
| Northern Virginia WMB | Manassas, VA | | VA DOT / VA DOT |
| Ragged Island Wildlife Management Area | VA | creation | public agency / public agency |
| Port of Everett | Snohomish County, WA | restoration | Port of Everett / Port of Everett and general |
| Washington State DOT WMB | statewide, WA | creation, restoration, & enhancement | WA DOT / WA DOT |
| Wisconsin Statewide WMB | statewide, WI | restoration & creation | Wisconsin DOT & Wisconsin DNR / Wisconsin DOT |
| Wyoming Highway Dept. WMB | statewide, WY | restoration, enhancement, & creation | WY Highway Department / WY Highway Department |

# IV. FEE-BASED COMPENSATORY MITIGATION

Fee-based compensation arrangements, also called "in lieu fee systems," involve programs or ad-hoc agreements where money is paid by a wetland developer for implementation of either specific or general wetland projects. Projects can include wetland restoration, creation, or enhancement, as well as various aspects of management of the sites. Such arrangements are usually established to accommodate the mitigation requirements of numerous, often small, wetlands impacts. They have been designed to be either optional or mandatory. Fees are usually combined to fund projects that are larger and expected to be more ecologically beneficial than mitigation implemented individually. The program managers may either use the mitigation fees alone to fund the wetland projects, or combine them with programmatic or other sources of funds (e.g., penalty fees, voluntary contributions). Where impacts are frequent and small, formal fee-based compensation programs can be established to accommodate the mitigation requirements through memoranda of agreement and other guiding documents. In instances where the need for alternatives to on-site mitigation are infrequent, ad-hoc fee-based arrangements have sometimes been utilized.

A key feature of fee-based compensatory mitigation is that the regulatory agency, in some cases, whether state, regional, or Federal--considers a permit applicant's mitigation requirements fulfilled upon payment of the fees. These fees are charged in-lieu of the direct implementation of individual mitigation projects by permittees. At the time of payment, fee-funded wetland mitigation projects typically have not yet broken ground--or they may be incomplete. Where impacts are frequent and small, formal fee-based compensation programs can be established to accommodate the mitigation requirements through memoranda of agreement and other guiding documents. Wetland mitigation projects may not have been specifically identified. Thus, the term "in-lieu" typically connotes a collection of fees for some future program in-lieu of specific compensatory mitigation action. However, in some instances, compensation fees paid into trusts might be used to facilitate the establishment of wetland mitigation banks.

The National Wetland Mitigation Banking Study being conducted by IWR identified several fee-based mitigation schemes. A closer examination of these was undertaken as part of the national study. Six fee-based compensatory mitigation programs were studied by Apogee Research, Inc. in 1992.[2] This description of fee-based compensatory mitigation is based on the findings of that study. The study examined programs operated by the:

- Arkansas Nature Conservancy,
- Dade County, Florida,
- Ohio Wetlands Foundation,
- Maryland Nontidal Wetlands Compensation Fund,

[2] The findings are presented in a working paper by Apogee Research, Inc., prepared for IWR, *Alternative Mechanisms for Compensatory Mitigation: Case Studies and Lessons About Fee-Based Compensatory Wetland Mitigation*, March 1993.

- Pine Flatwood Wetland Mitigation Trust, St. Tammany Parish, Louisiana, and the

- Corps of Engineers Vicksburg District Office.

In each of these programs, compensatory mitigation activities are conducted on the ground only after receipt of the fees. The permittee's mitigation obligation is deemed fulfilled upon payment of the fees. Although fees had been collected by all six programs, a substantial number of the fee-based compensatory mitigation actions under these programs had not yet commenced at the time of the study.

Four of the six programs (excluding Dade County and the state of Maryland) rely on participating nonprofit organizations to receive the fees and perform the mitigation work. The Corps of Engineers is directly involved in four of the six programs (again excluding Dade County and Maryland). Trust funds for receipt of the fees had been established in four of the six cases, excluding the Arkansas Nature Conservancy and the Vicksburg District Office programs.

The administrative and institutional characteristics of the fee-based programs are summarized in Table 3.

In assessing the utility of fee-based mitigation, the adequacy of the fees is an important component. In five of the six case studies, the fees were based on actual and projected mitigation costs based on the required compensation acreage. In contrast, the Vicksburg District Office program assessed a flat fee.

The Vicksburg program applied fee-based mitigation to oil and gas exploration operations conducted under a general permit issued in 1987. The permit provided for payment of a flat $200 fee as a condition of each oil and gas exploration operation. The permittee could elect not to pay the fees if another form of mitigation was performed. The fees were required to be paid to a nonprofit conservation organization within the state of the impact and within the Vicksburg District. The nonprofit organization, in turn, was required to use the funds for purchase of wetlands, purchase of wetland easements, or wetlands restoration or enhancement projects.

There are no records on the total amount collected by the nonprofit organizations under the Vicksburg program, nor on their expenditures for mitigation activities. However, based on the number of general permittees from 1987-1992, $54,000 should have been received by the nonprofit organizations. No accounting was required of the receipts and expenditures by the nonprofit organizations. (One 1991 individual permit issued by the Vicksburg District assessed $1500 per acre for 103 acres of impact -- the $154,500 was paid to the Louisiana Nature Conservancy). Typical 1992 individual permits issued for oil and gas exploration activities after the expiration of the general permit provided for $300 per acre fees.

The Dade County program's "East Bird Drive" component assessed fees ranging from $2,003 per developed acre in 1989 to $3,005 per acre in 1992, using a 1.5:1 compensation ratio. Funds were spent for restoration activities in and around the Everglades National Park. The change in the fee amount reflected rising costs of *melaleuca* eradication as more mitigation was completed and activities moved further from the Park where melaleuca density was higher. The fund had taken in $295,809 from permittees and paid out $169,595 through 2 November 1992 with another $60,000 due for helicopter expenses already incurred, leaving a balance of $85,693 including accrued interest on the fund. Fees for the “Bird Drive”and “North Trail Basins” in the Dade County program are projected at $24,750

## Table 3. Characteristics of Case Study Fee-based Compensatory Mitigation Programs

| | Arkansas | Dade Co. | Maryland | Ohio | St. Tammany | Vicksburg |
|---|---|---|---|---|---|---|
| **Corps District Involvement** | Direct | Indirect | Indirect | Direct | Direct | Direct |
| **Role of Other Public or Private Entity** | Nature Conservancy receives fees, mitigates | Dade County administers program, collects fees; Everglades National Park mitigates | MD DNR administers program, collects fees, some mitigation; other public agencies help identify sites | Ohio Wetlands Foundation collects fees; OH DNR manages mitigation sites; private firm does mitigation | LA Nature Conservancy collects fees, manages sites; other public agencies help identify and monitor sites | Several conservation nonprofits and state resource agencies receive fees |
| **Operating Agreements** | Individual permits, letters of agreement | MOA, general permit | Legislation, regulation, general and individual permits | MOA, individual permits | MOA, individual permits | General and individual permits, letters of agreement |
| **Eligibility** | Corps district determines case-by-case | Option automatic under general permit | Option automatic under general permit, others case-by-case | Corps district determines case-by-case | Corps district determines case-by-case | Option automatic under general permit, others case-by-case |
| **Fee Determination** | Varies per acre; based on cost of mitigation | Fixed per acre; based on cost of mitigation | Fixed per acre; based on cost of mitigation in each county | Varies; based on cost of mitigation | Fixed per acre; based on cost to mitigate and manage | Flat fee under general permit; varies under individual permit |
| **Management of Fees** | No special accounts | Trust | Trust | Trust | Trust | No special accounts |
| **Scope of Mitigation Projects** | Wetlands in Arkansas | Eradication of exotics in East Everglades | Nontidal wetlands in Maryland | Wetlands in Ohio | Pine flatwood wetlands in St. Tammany parish | Wetlands in district (AR, LA, and MS) |
| **Long-Term Project Management** | Not specified; no funding earmarked | Partially specified: park will manage site it plans to acquire, $ not included in fee | Specified: public and private site owners manage according to plan for site, $ not included in fee | Specified: Ohio DNR manages sites, $ included in fee | Specified: LA Nature Conservancy for 50 yrs., $ included in fee | Not Specified; no funding earmarked |

per developed acre (using a 1.5:1 compensation ratio).

The Ohio Wetlands Foundation had not yet arrived at a fee amount because the mitigation plan had not yet been decided upon. Hence, costs were unavailable at the time of the case study.

Maryland uses a detailed fee schedule which includes calculation of amounts for land acquisition and for design, construction and monitoring. Fees range from a low of $11,500 per acre to a high of $58,000 per acre. In addition, the permittee may be required to compensate at a level ranging from 1:1 to 3:1. The Fund had collected $165,355 since its establishment. Maryland had completed one project with 13 others in progress at the time of the study.

The Pine Flatwoods Wetland Mitigation Trust in St. Tammany Parish, Louisiana, is operated by the Nature Conservancy. The Corps New Orleans District Office sets the mitigation fees. Current fees are $1,700 per disturbed acre. At the time of the study, the Fund had collected $100,000 but had not yet acquired land or undertaken mitigation.

The Corps Little Rock District has, on six occasions, allowed fee-based compensatory mitigation payments to the Arkansas Nature Conservancy, and the Memphis District has done so on one occasion. Fees were negotiated in the context of individual permits and ranged from $750 (for a 1 acre offsite compensation, where the onsite impact was 0.58 acres and 0.3 was compensated onsite), to $30,000 (for a 40 acre offsite compensation, where the onsite impact was 28 acres and 35.5 acres were compensated onsite).

Table 4 shows the costs covered by the fees. These are highly variable among the programs. Only the St. Tammany program is intended to cover all four cost categories: planning, site acquisition, project implementation, and site management. The Ohio Wetlands Foundation program fees cover all but site acquisition; the Foundation intends to use public lands. Interestingly, while fees under these two programs are designed to cover all costs comprehensively, they are the only two of the six where no actual mitigation activities had yet occurred at the time of the study.

General observations derived from the case studies suggest that the design of fee-based mitigation programs should take into account the likely number of transactions to be handled. Programs involving a large number of transactions will need stronger procedures to assure adequate performance and follow through on mitigation activities. In all fee-based programs, identification of precise mitigation projects and objectives in advance is desirable to assure that compensation activities occur within a reasonable period of time.

The use of trust funds and similar accounts can improve the performance of fee-based programs, as well as generate and accumulate interest on the fees deposited in advance of mitigation expenditures.

Finally, fee-based mitigation programs may be particularly useful in the context of general permits, where individually designed compensatory mitigation is frequently impracticable and where, in the absence of fees, no compensatory mitigation might otherwise occur.

**Table 4. Costs included in Compensatory Mitigation Fees**

| Program | Planning | Land Acquisition | Project Imple-mentation | Site Man-agement |
|---|---|---|---|---|
| Arkansas | No | Yes | Yes | No |
| Dade County | No | No | Yes | No |
| Maryland | No | Yes | Yes | No |
| Ohio | Yes | No (publicly-owned) | Yes | Yes |
| St. Tammany | Yes | Yes | Yes | Yes |
| Vicksburg | No | No | Yes | No |

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# V. WETLAND MITIGATION BANKING ANNOTATED BIBLIOGRAPHY

This bibliography is the product of a serious effort to obtain and review every published work containing a significant discussion of wetland mitigation banking. Several particularly useful unpublished papers and articles have been included as well. The only works that have been excluded are reports specific to a single banking operation that are not likely to be of general interest or usefulness.

1. Anderson, Robert and Mark Rockel. April 1991. Economic Valuation of Wetlands: Discussion Paper #065. American Petroleum Institute, Washington, D.C. 57 pp.

This paper examines the role of economics in guiding wetland policy, including mitigation banking and use decisions. The first section considers wetland definitions, wetland functions, and regulatory efforts to protect wetlands. It discusses the implementation of government policies, especially banking, to slow the rate of wetland loss, and the relevance of statutory requirements that persons releasing hazardous substances into the environment restore or compensate for lost values.

The paper continues with discussions of techniques for valuing wetland functions. It also includes a review of studies containing estimates of the value of wetland functions. The authors conclude from this review that many wetland functions have never been valued, and that there can be enormous variation in functional values, depending on local conditions.

The paper's last section examines the economics of mitigation. It offers a brief summary of Federal mitigation policies and state wetlands protection programs. The authors discuss the concept of mitigation banking, the objectives of this approach, and the agreement component of mitigation banks. Finally, they provide descriptions of mitigation banking programs in eleven states and a discussion of specific costs associated with banking.

2. Association of State Wetland Managers. 1992. National Wetland Symposium. Effective Mitigation: Mitigation Banks and Joint Projects in the Context of Wetland Management Plans. Palm Beach Gardens, Florida, June 24 - 27, 1992. 93 pp. plus bibliography.

This conference document is a collection of papers, statutes and guidelines dealing with mitigation banks and joint projects. The introductory paper first discusses some of the advantages of these mitigation techniques, including the following: (1) they offer the possibility of larger projects; (2) they may result in improvement of the functional values of wetlands; (3) they allow favorable location of mitigation sites; (4) they offer more flexibility; (5) they offer greater certainty of successful mitigation; (6) they result in decreased permitting time; (7) they may result in lower mitigation costs.

The paper then discusses the disadvantages of these techniques, including: (1) they may fail to compensate for the loss of site-specific, on-site values; (2) they may raise issues of legal liability; (3) they may replace one type of wetland with another; (4) they may encourage developers to choose off-site mitigation

when on-site mitigation is available; (5) they may provide developers with incentives to avoid alternatives analysis and impact reduction; (6) their planning is time-consuming and requires considerable expertise; (7) they may prove difficult to maintain; (8) regulatory agencies may not have the expertise required for their construction; (9) the payment of funds for wetland permits may be looked on as "buying permits", and mitigation banking may be viewed as a way of funding regulatory programs rather than as a technique for the restoration of wetlands; and (10) if government agencies agree to collect and hold private funds to create wetlands in the future ("fee-based mitigation"), there is no adequate assurance that wetlands will be created.

The paper then describes Federal and state initiatives pertaining to mitigation banks and joint projects. It concludes with a brief discussion of issues relevant to the implementation of these mitigation approaches.

The next section of the conference document outlines a method for defining types of mitigation banks and provides a glossary of mitigation terms. There follows a section that summarizes current Congressional and administration proposals for banking. Another section summarizes a preliminary inventory by the U.S. Army Corps of Engineers Institute for Water Resources of planned and existing wetland mitigation banks, including information on location, activity, and sponsors. The report also reproduces Federal guidance documents and state laws on mitigation banking. Finally, it provides a 58-page bibliography on created and restored wetlands.

3. Anderson, Robert and Robert DeCaprio. 1992. *Banking on the Bayou.* National Wetlands Newsletter 14(1):10.

This is a case study of the LaTerre wetland mitigation bank in Terrebonne Parish, Louisiana. The Tenneco LaTerre (later Fina LaTerre) corporation established the bank in order to preserve a freshwater marsh threatened by saltwater intrusion, and thus protect its own mineral rights in the marsh. Under Louisiana law, the mineral rights to wetlands becoming open water could revert to the state. The study recounts the investments made by the company to protect the wetland from the 1950's until 1983, when a memorandum of agreement establishing the bank was signed. It also discusses the company's management responsibilities.

According to the study, Tenneco projections suggest that its efforts to protect the marsh will postpone its loss as a freshwater wetland for at least 25 years. Habitat units are calculated by multiplying habitat suitability for the species of interest to wildlife managers by the number of protected acres. Tenneco earns credits for any increase in the acreage of intact wetlands; it can use these credits to offset proposed development or it can sell them. The study also discusses the types of developments for which credits can be used and restrictions on those uses. For developments inside the bank, for example, a ratio of 2:1 (credits:debits) must be used.

Finally, the study addresses criticisms of the bank. These include arguments (1) that mitigation banking should occur only on permanent wetland areas, not on disappearing wetlands, and (2) that while dikes and weirs protect the designated area, they increase salinity and exacerbate wetland losses outside the protected area.

4. Austin, Jay, and James McElfish and Sara Nicholas. July 1993. Wetland Mitigation Banking. Environmental Law Institute, Washington, D.C. 159 pp. plus appendices and bibliography.

This is a comprehensive study of wetland mitigation banking co-funded by the Corps of Engineers and EPA. It explains wetland mitigation banking and provides suggestions for its improvement. It begins with definitions, an analysis of the regulatory context in which mitigation banking occurs, a discussion of the sources of Federal mitigation requirements, and an examination of state regulatory schemes. The study then addresses mitigation banking from an ecological perspective, providing discussions of such ecological considerations as wetland type, bank location, and wetland mitigation technologies.

Next, the study provides an extensive examination of the institutional components of mitigation banking. In a chapter devoted to bank organization and enabling instruments, the authors consider six functions which must be performed by parties to a mitigation bank: (1) client, (2) permitting, (3) credit production, (4) long-term property ownership, (5) credit evaluation, and (6) bank management.

The authors also devote a chapter to the types of mitigation used in banking, considering (1) the four basic types of compensation: creation, restoration, enhancement, and preservation, (2) on-site vs. off-site mitigation, (3) in-kind vs. out-of-kind mitigation, and (4) timing of mitigation. In the next chapter, they outline goals for bank siting, review various site selection policies, and discuss considerations that may affect siting decisions. The following chapter treats credit valuation methods, discussing three types of valuation: (1) simple indices (e.g. acreage), (2) narrowly tailored assessment methods (e.g. HEP), and (3) broadly tailored assessment methods (e.g. WET).

Another chapter addresses the prevention and correction of bank failure, and includes discussions of such issues as: (1) reasons for bank failure, (2) standards to prevent failure, (3) contingency plans, (4) risk assignment and financial assurance, (5) enforcement of bank mitigation requirements. This chapter also discusses the long-term status of bank lands. The next chapter addresses the financing of mitigation banks. The study continues with an examination of legal methods by which mitigation banking might be incorporated into land use management schemes.

Finally, the authors offer their conclusions, some of which follow: (1) mitigation banking can be an effective means of protecting wetlands; (2) banking requires firm and consistent regulation of wetland conversions; (3) banking will be successful only if regulatory attention is also given to the terms and conditions of on-site compensatory mitigation; (4) off-site mitigation should occur in the same watershed as the loss for which it compensates; (5) out-of-kind mitigation is acceptable; (6) valuation methods should be simple, should be linked to banking goals, and should require a greater than 1:1 replacement ratio; (7) mitigation banking instruments should be enforceable; (8) there should be financial assurance; (9) there should be contingency plans for bank failure; and (10) there should be provisions for long-term management of bank sites.

The study includes three appendices, which provide a list of existing and proposed mitigation banks, a table of information on all 46 existing mitigation banks, and a summary of all Federal banking policies and guidelines. The study also includes an extensive bibliography.

5. Bierly, Ken. 1987. *Oregon Mitigation Banking*. In Proceedings, Northwest Wetlands: What Are They? For Whom? For What?, Seattle, Washington. Institute for Environmental Studies, University of Washington. pp. 197 - 200.

The Oregon Department of State Lands reports on the early status of its mitigation banking efforts. The author notes that the state's banking efforts occur under the Fill and Removal Law, and that they are concerned exclusively with estuarine values. He provides a brief overview of the history of mitigation banking in Oregon and discusses the state's efforts to establish a bank in Astoria, Oregon.

6. Boesch, Russell. 1987. *Mitigation Banking: A Balance of Interests*. In Coastal Zone: Proceedings of the 5th Symposium on Coastal and Ocean Management. pp. 2516 - 2529.

This article provides an overview of mitigation banking from the standpoints of regulator and developer. The author begins by discussing the history of mitigation banking and the factors that motivate its use.

The author then considers mitigation from the standpoint of the regulator, touching on such issues as: (1) the problem of whether a human-made wetland can provide habitat values equal to those provided by a natural wetland, (2) the difficulty of assigning responsibility for the long-term success of a bank to the permittee, (3) the likelihood that permittees will be unable or unwilling to fulfill their obligations with respect to bank creation and maintenance, and (4) the need for a comprehensive system of land management within whose context mitigation will be more effective.

Next, the author considers mitigation from the developer's standpoint. He discusses the following difficulties: (1) the danger that developers may feel that regulators are using the mitigation option as a lever to discourage development, (2) the inability of developers to plan effectively when faced with doubts about regulatory acceptance of a mitigation plan, (3) the long-term risk involved with a project which must be approved by regulators at various stages, and (4) the possibility that resources expended on mitigation may not be used efficiently.

The author then describes the elements of a mitigation banking MOA, and discusses the advantages of mitigation banking. He first notes its advantages for the developer, including (1) its ability to streamline the permitting process and (2) its ability to provide economies of scale. Next, he notes its advantages for the regulator, including (1) its ability to place the regulator more firmly in control of the mitigation process by means of a system of checks and balances incorporated into the MOA, (2) its ability to streamline the regulator's workload by consolidating mitigation efforts, and (3) the possibility that banking MOAs may stipulate that the bank be turned over to a resource agency or conservation group upon the completion of mitigation.

Finally, the author notes concerns about mitigation banking, including the danger that it will appear to be a system for the sale of permits and doubts about whether banking MOAs provide for the permanent maintenance of banks. The article closes with a brief criticism of in-lieu fee systems.

7. Brady, John. 1990. *Mitigation Damage to Wetlands in Regulatory Programs and Water Resource Projects.* 41 Mercer L. Rev. 893 - 991.

This article includes a section on wetland mitigation banking. It provides an overview of banking, case studies of the Bracut and Tenneco La Terre mitigation banks, a summary of Oregon's banking statute, and a discussion of agency positions on the difficulties associated with mitigation banking. The article discusses several potential issues: (1) off-site location of banks, (2) administrative complexity of banking, (3) credit systems, (4) definition of geographical area, (5) in-lieu fees, (6) cost of acquiring and maintaining a wetland, (7) avoidability of losses, (8) monitoring, (9) dedication of sites, and (10) identification of sites.

The article also comments on the advantages of mitigation banking, some of which follow: (1) it addresses cumulative wetland impacts; (2) it forces agencies to evaluate regional needs for new wetland habitat; (3) it forces agencies to establish relationships between impacted and mitigated wetlands; (4) it forces agencies to establish priorities in preservation of wetlands; and (5) it puts mitigation "up-front" in the planning process.

8. Brown, James D., David M. Soileau and R. Wilson Laney. 1986. *Mitigation Banking in the Southeast*. In Proceedings, Southeastern Workshop on Aquatic Ecological Effects of Power Generation, Kumar Mahadevan, Rhonda K. Evans, Paul Behrens, Thomas Biffar and Lawrence Olsen (eds.); pp. 455 - 475. Report Number 124. Sarasota, Florida, December 3 - 5, 1986: Mote Marine Laboratory.

This paper begins by explaining the concept of mitigation banking. To illustrate the concept, the authors consider established mitigation banks in the Southeast. In particular, they discuss the Tenneco Oil Company Mitigation Bank in Louisiana and the North Carolina Department of Transportation Mitigation Bank. They provide background on the two bank sites and list important provisions of the Tenneco Memorandum of Agreement (MOA) and the North Carolina DOT Memorandum of Understanding (MOU). They then discuss the benefits and drawbacks of mitigation banking. They suggest that, with careful interagency cooperation and planning in the development of banks, wetland mitigation banking could be an effective way to achieve mitigation needs.

9. Castelle, A.J., S. Luchessa, C. Conolly, M. Emers, E.D. Metz, S. Meyer and M. Witter. March 1992. Wetland Mitigation Banking. Report prepared by Adolfson Associates, Inc., Herrera Environmental Consultants, Inc. and W & H Pacific, Inc., for Shorelands and Coastal Zone Management Program, Washington State Department of Ecology, Olympia, Washington. Publication Number 92-12. 37 pp. plus appendices.

The objective of this succinct but thorough report is to provide guidance for the implementation of mitigation banks. It includes discussions of the key components of this process, which are: (1) establishment of program goals and objectives, (2) selection of bank sites, (3) creation of bank operator/interagency agreements, (4) establishment of a policy for the use of credits and currency, (5) establishment of criteria for mitigation bank use, (6) development of mitigation options, (7) construction, maintenance, and monitoring of the bank, and (8) development and implementation of a long-term management plan.

The report discusses various approaches to these components, considering the advantages and disadvantages of each approach, providing examples, and recommending alternatives. It then provides discussions of the rationale for mitigation banking, the effectiveness of compensatory mitigation and mitigation banking, and banking efforts in Washington state. Finally, the report outlines a process for the successful establishment of a banking system. Appendices to this report contain a glossary of wetlands management and mitigation banking terms and a summary of existing mitigation banking programs.

10. City and Borough of Juneau, Department of Community Development. May 1989. City and Borough of Juneau Wetlands Management Plan. Public Hearing Draft. Mitigation banking: pp. 73 - 76. Wetlands ordinances for mitigation banking: pp. 51 - 55. Regulations: Appendix A.

The City and Borough of Juneau (CBJ) presents a draft Wetlands Management Plan that aims to enhance predictability for development and protection of wetlands and to decrease wetland permit processing time. Under the plan, a mitigation bank will be available to allow permit applicants to more expeditiously mitigate damage to wetlands, and to allow development of certain wetlands without allowing a net loss of wetland values in Juneau. The plan describes the roles that the Wetlands Review Board, the CBJ and the CBJ Lands Division will play in creating and managing a mitigation bank. It also provides an example of mitigation bank accounting, by which the monetary value of a resource credit is determined. Resource value is calculated by the Wetlands Review Board using the Adamus Rapid Assessment and the CBJ Weighting System. The plan places two restrictions on the operation of the bank: (1) wetlands protection or enhancement projects must be conducted before mitigation bank credits are available to permit applicants; and (2) credits cannot be used for any permit action where the adversely affected wetlands area exceeds five acres. The Plan describes the operation of the revolving bank fund, and lists the purposes for which bank funds may be used. Finally, it provides an example of how the mitigation bank will work. An appendix to the plan provides the regulations that will establish and govern the mitigation bank.

11. Clark, D.R., J. Barras, and M. Swan. 1989. Land Loss and Habitat Change in the Fina LaTerre Mitigation Bank Management Plan From 1984 to 1988 Using Classified Landsat Satellite Imagery With a Comparison Between Earlier Classifications and Photointerpreted Digital Data. Wetland Resources Section, Information Services Section, Coastal Management Division, La. Dept. of Natural Resources, Baton Rouge, Louisiana. 29 pp.

This report analyzes and compares data gathered from three different methods of aerial monitoring over the Fina LaTerre Mitigation Bank. The three methods are: (1) the SCS Grid Method, (2) the Earth Resources Data Analysis System (ERDAS) Thematic Mapper (TM) Landsat Satellite Method, and (3) the Photointerpreted-digitalized Method. The report notes that the data generated with the first two methods correlate well, but that the data generated by the third method do not correlate well with those generated by the first two. However, all three methods indicate a gain in marshlands in the management area between 1985 and 1988.

12. Clark, Darryl R. 1990. Mitigation Banking in Coastal Louisiana: General Banking Procedures and MOA Provisions. Paper presented by Louisiana Department of Natural Resources, Baton Rouge, at the State Wetland Managers' Conference, Jackson, Mississippi, April, 1990. (Excerpts).

In this paper, the Louisiana DNR presents its General Banking Procedures and MOA Provisions, using the Fina LaTerre bank as an example. It makes the following suggestions: (1) that preservation should not be accepted as a mitigation project, (2) that mitigation projects should encourage the developer to perform restoration that it would not ordinarily perform, (3) that the simplest banking credit methodology should be used (acreage being one of the simplest), (4) that credits may be bought, sold, and traded -- provided that the terms of the bank agreement are met, (5) that double debiting be employed for certain projects, (6) that the bank life should be stated in the MOA, and (7) that the bank cannot be debited until the restoration project is fully implemented. The paper also includes a section on the possible advantages and disadvantages of mitigation banking. Finally, the paper provides material specifically relevant to the Fina LaTerre Mitigation bank proposal and management plan, including: the Fina Bank ledger sheet, the Louisiana DNR's concerns about the draft bank MOA, Louisiana DNR's conclusions from monitoring of the Fina area, and permit provisions for the Fina Bank management plan.

13. Comiskey, J. J. and Eugene Z. Stakhiv. 1983. Applications of Mitigation Banking to U.S. Army Corps of Engineers Programs. Draft report submitted by U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 167 pp. plus appendices.

The purpose of this report is to explore the possibility of U.S. Army Corps of Engineers involvement in wetland mitigation banking. It begins with an overview of mitigation banking and related wetland compensation activities carried out by Federal and state agencies.

The next section of the report establishes a legal framework for Corps of Engineers involvement in mitigation banking. It discusses possible sources of authority for such involvement, including: (1) the Fish and Wildlife Coordination Act of 1958, (2) NEPA, (3) the Rivers and Harbors Act of 1899, (4) §404 of the Clean Water Act, and (5) the Coastal Zone Management Act. It also provides guidelines for the integration of mitigation requirements into dredge and fill permits. Finally, it examines methods by which tax deductions for conservation easements could stimulate interest in and use of mitigation banks by private individuals.

The following section is devoted to other land use management techniques similar to mitigation banking, including: land banking, water banking of wetlands, transfer of development rights (TDR), and the banking of offsets for air quality planning. The next section considers mitigation techniques employed by five Federal agencies and several states and their relevance to mitigation banking. The agencies it discusses are FWS, the Corps itself, the National Marine Fisheries Service, the Federal Highway administration, and the Soil Conservation Service. The report's final section suggests five policy options for Corps involvement in mitigation banking through its Planning and Regulatory Permit program.

14. Dunham, Fred O. February 1986. *Mitigation Banking: A State Perspective*. In Proceedings of the National Wetland Assessment Symposium, Jon A. Kusler and Patricia Riexinger (eds.); pp. 257 - 259. Technical Report Number 1. Portland, Maine, June 17 - 20, 1985: Association of State Wetland Managers, Inc.

This article treats mitigation banking from the perspective of the Louisiana Department of Wildlife and Fisheries (LDWF), which reviews and comments on proposed projects requiring permits pursuant to the Fish and Wildlife Coordination Act and the Clean Water Act. LDWF established mitigation criteria to offset adverse impacts on Louisiana's fish and wildlife resources. Mitigation banking developed out of the need to compensate for unavoidable habitat losses.

Brief mention is made of Louisiana's first two mitigation banks: the State Department of Highway bank and the Tenneco bank. The article briefly discusses the issues that were negotiated as provisions of the Tenneco bank Memorandum of Agreement: (1) the lifespan of the bank, (2) assessment methodology, (3) debiting availability, (4) geographic limits on the bank, (5) selling or trading of credits, (6) protection of the bank site, (7) monitoring of the bank, and (8) credits banked. The components necessary for a successful bank are noted, as are the advantages of mitigation banking.

15. DuPriest, Douglas M. and Jon Christenson. 1988. *Constraints on Mitigation Banking: Oregon's Mitigation Banking Act of 1987*. National Wetlands Newsletter 10(6):9 - 11.

This article discusses the Oregon Wetland Mitigation Banking Act of 1987, which allowed four pilot projects before July 1, 1991. The Act was passed in response to conservationists' concerns about existing mitigation banks and about the fact that Oregon's Fill and Removal Law required wetland mitigation but did not provide for mitigation banking.

The article presents provisions of the Act and the reasons for its passage. It lists the criteria for site selection and the components of a mitigation bank plan. It also notes that a key provision of the Act is that banks will be used only after all on-site mitigation methods have been examined and found to be impracticable.

Among other provisions mentioned by the article are the following. Under the Act, developers may not purchase more than five acres of wetland value credits per permit action. In addition, developers may use credits neither outside the same estuarine ecological system or freshwater tributary, reach or sub-basin, nor at a bank greater than forty miles from the impacted area. Finally, the pilot banks must be publicly owned and managed.

The article also discusses the operation of the Oregon Wetland Mitigation Revolving Fund and the provision ensuring that mitigation bank credits are priced to cover expenses the state incurs in establishing and maintaining a mitigation bank. Finally, it notes that the state is directed to coordinate its efforts with the Oregon Wetlands Priority Plan, which it did by adopting a comprehensive development process for areas covered under the Plan.

16. Eliot, W. 1985. Implementing Mitigation Policies in San Francisco Bay: A Critique. California State Coastal Conservancy, Oakland, California. 36 pp. plus appendix.

This paper evaluates fifty-eight permits in San Francisco Bay that required wetland restoration as a permit condition. The goals of the study are to "(1) assess the effectiveness of mitigation policies in achieving wetland restoration and (2) to recommend policies that can increase the success of these mitigation policies."

The study finds that many of the fifty-eight mitigation projects were not completed by the date specified in their permits or were not successful. In many cases, habitat objectives were not explicitly addressed in the permit, but were left to the discretion of the permittee, who frequently had no experience with wetland mitigation. Furthermore, according to the study, permit conditions were often not enforced, and many of the mitigation projects were ad hoc arrangements which included in-lieu fees and quasi-mitigation banks.

After concluding that current mitigation policies are inadequate, the paper suggests some ways to improve them, including: making the permits more specific, with clearly stated habitat objectives and restoration procedures; improving regulatory enforcement, including better monitoring and long-term maintenance; and increasing flexibility with respect to on-site and in-kind mitigation requirements.

The last part of the paper describes the California State Coastal Conservancy's Mitigation Bank Program. The program was intended to allow "applicants unable to mitigate for the adverse impacts of project development on-site to contribute fees toward a wetland site that is acquired, enhanced and maintained by the Conservancy." It was meant to eliminate the lag time between projected habitat losses and mitigation, and provided that mitigation fees would be based on the cost of mitigation rather than on estimated costs. At the time of writing, the Conservancy was conducting an inventory of restorable sites and working on defining regional habitat goals.

The report ends by suggesting ways to improve mitigation banking. It also includes an appendix which puts into matrix form information about the fifty-eight development projects and the corresponding mitigation requirements.

17. Grenell, Peter. May 1988. *The Coastal Conservancy's Emerging Role in Shaping Wetland Mitigation Approaches: Standards and Criteria*. In Proceedings of the National Wetland Symposium: Mitigation of Impacts and Losses, Jon A. Kusler, Millicent L. Quammen and Gail Brooks (eds.); pp. 99 - 102. Technical Report Number 3. New Orleans, Louisiana, October 8 - 10, 1986: Association of State Wetland Managers, Inc.

This article begins with a brief overview of the California State Coastal Conservancy's wetland and watershed enhancement projects and of mitigation projects that have broadened the Conservancy's program. The Conservancy's mitigation activities must be approved by the regulatory agencies. The issues addressed by these agencies and the technical advisory agencies include the location, type, amount, and timing of the intended mitigation, and provisions for management and maintenance of the mitigation site. On-site and in-kind mitigation are preferred by the permitting agencies, and a modified Habitat Evaluation Procedure is

normally used to determine a project's impact on a wetland and the requirements necessary to mitigate the impact. The standard of a one-to-one mitigation ratio has been virtually abandoned, but has not been replaced by any other particular ratio. A public agency normally assumes management responsibilities, but financial commitment for maintenance is a crucial negotiation point. The article discusses these permitting issues with respect to the Conservancy's mitigation-related activities, including pilot mitigation bank programs in San Francisco Bay and Humboldt Bay. The article also mentions the principal advantages of mitigation banking, as well as the problems encountered by the Conservancy.

18. Grenell, Peter and Melanie Denninger. June 1992. Banks and Joint Projects. California State Coastal Conservancy, Oakland, California. 19 pp.

This paper examines mitigation and mitigation banking from the perspective of the California State Coastal Conservancy. Its authors discuss the Conservancy's experience with two mitigation bank projects (Bracut Marsh and North San Francisco Bay), two in-lieu fee programs (Santa Cruz Harbor District and Pacific Texas Pipeline), and three joint projects (Huntington Beach Wetlands, H.A.R.D. Triangle Marsh, and San Diequito River Valley Restoration). Case studies for these projects include discussions of lessons learned by the Conservancy on such subjects as: (1) the uncertainty involved in mitigation efforts, (2) the variability and inconsistency of agency policies and guidelines, and (3) the inconsistency of off-site mitigation with the restoration needs of the existing habitat at the mitigation site.

The Conservancy also draws conclusions and makes recommendations: (1) obstacles encountered by any mitigation project also exist for mitigation banks; (2) problems specific to mitigation banks exist; (3) joint projects with specifically listed characteristics are more likely to be successful; (4) mitigation banks make sense in the identified narrower contexts; (5) agencies could improve the permitting process with guidelines requiring documentation regarding avoidance, minimization; and analysis of alternatives under Federal and state laws; (6) the costs of advance site identification could be underwritten by certain types of permit applicants, who could also establish more reliable mitigation planning through consultation with agencies; and (7) the establishment of regional port mitigation banks should be considered.

19. Haynes, William J. II and Royal C. Gardner. May 1993. *The Value of Wetlands as Wetlands: The Case for Mitigation Banking*. Environmental Law Reporter 23(5):10261 - 10265.

The authors argue that wetland mitigation banking has many potential benefits and that its practice should be encouraged by regulatory agencies. They begin with a brief overview of mitigation banking and proceed to a summary of its benefits. They cite its environmental benefits, including: (1) it may advance the goal of no-net-loss of wetlands through the development of an industry whose purpose is wetlands protection; (2) it may reduce the lag time between the loss of wetland values and compensation for that loss; and (3) it may consolidate compensation efforts so that they produce large wetland systems. They also cite its benefits to the regulated community, including: (1) it may help developers to plan ahead for their mitigation needs; and (2) it may help developers to more accurately estimate project costs.

In their discussion of the benefits of mitigation banking, the authors pay particular attention to "its potential to reduce the risk of effecting compensable takings". The authors also note an increase in the number of takings claims and warn that this increase may threaten the ability of regulatory agencies to protect

wetlands. They argue that mitigation banking may reduce this threat in two ways: (1) by causing the Corps of Engineers to approve more §404 permits and (2) by reducing the likelihood that the denial of a permit will destroy the economic value of a property.

The authors conclude by addressing four arguments against mitigation banking: (1) that it will create the perception that permits are for sale, (2) that if credits are provided in exchange for the preservation of wetlands, a net loss of wetlands will result, (3) that credits will be fungible, and (4) that there will be too much uncertainty about the success of mitigation projects and about the perpetual protection of restored wetlands.

20. Heagerty, Daniel and Michael O. Concannon. April 1988. *Mitigation Banking: Investments for Public and Private Benefits*. In Proceedings of a Conference: Increasing Our Wetland Resources, John Zelazny and J. Scott Feierabend (eds.); pp. 325 - 326. Washington, D.C., October 4 - 7, 1987: National Wildlife Federation.

The authors begin by describing the negative results of forms of compensatory mitigation other than mitigation banking. These include (1) fragmentation of wetland resources, (2) diminishing functional values, and (3) compromise of industry and local economic development objectives due to scaled-down projects or missed market opportunities. They then advocate a more comprehensive, long-range approach to wetlands protection, in the form of mitigation banking. The benefits of mitigation banking are discussed, and incentives for private developers and public agencies to establish banks are listed. The specific uses and advantages of mitigation banking are demonstrated by reviews of the Batiquitos Lagoon mitigation project in California and of the Henderson Marsh Mitigation Plan in Oregon.

21. Heagerty, Daniel. 1987. *Major Offsite Mitigation: Batiquitos Lagoon*. In Coastal Zone: Proceedings of the 5th Symposium on Coastal and Ocean Management. pp. 2544 - 2548.

This article offers an overview of the project approach used in developing a restoration plan for the Batiquitos Lagoon in San Diego County, California. The restoration was developed in order to satisfy the mitigation needs of the Port of Los Angeles, which intended to carry out a 72-hectare net fill in San Pedro Bay. The author begins by listing the most notable features of the restoration project, including: (1) the distance between the area to be filled and the area to be restored (90 km), (2) the size of the mitigation area (200 ha) and the magnitude of the construction project ($15M), (3) the creation of bankable mitigation credits, and (4) the use of an iterative environmental engineering process. He notes that the plan is of particular scientific importance because it involves both a large construction project and the preservation of habitat values at the construction site. He concludes by detailing the elements of the engineering design, including: (1) soil and sediment analysis, (2) fisheries habitat analysis, (3) protection plan for existing habitat, (4) analysis and design of tidal inlet, (5) water quality analysis, (6) design for newly created habitats, (7) dredging and disposal plan, (8) sediment control plan, and (9) public access and safety plan.

22. Isber, Caroline and Robert L. Kerr. 1988. Wetland Mitigation Banking: A Study of the Development and Implementation of the Bracut Marsh Mitigation Bank. Report prepared by Kerr & Associates, Inc., for Regulatory Reform Staff, Office of Policy, Planning and Evaluation, Environmental Protection Agency, Washington, D.C. 65 pp. plus appendices.

This is a comprehensive look at the policy choices directing the creation of the Bracut Marsh bank and the institutional arrangements for the bank. The following sections comprise the body of the report: (1) summary of the bank structure, as delineated by the MOU, (2) review of the pressures and decisions leading to the bank's creation; also, findings of a study evaluating the biological and ecological success of the Bracut restoration project, (3) summary of local, state and Federal agency roles in creating and managing the bank, (4) use of the bank, (5) subsequent changes in requirements for use of the bank, and (6) issues raised by the Bracut bank, such as the basis for mitigation, area planning, monitoring, management, and the formal structure of the bank.

The report identifies the most critical factors in effective banking as the following: (1) the existence of a formal MOU defining the parties, their obligations and the bank's operation, (2) the involvement of all possible parties in negotiating the MOU, (3) the assignment of responsibilities for evaluation, monitoring and management to resource protection agencies, including the designation of a lead agency, and (4) a credit/debit system designed to assure protection of both the quantity and quality of the wetlands.

Appendices to this report include the MOU between the California Coastal Commission and the California Coastal Conservancy, the U.S. Army Corps of Engineers §404 permit, the California Coastal Commission's coastal development permit, Humboldt Bay Harbor Recreation and Conservation District's permit, and a tally sheet documenting use of the Bracut Marsh bank.

23. Jensen, Meg. 1987. Mitigation Banks: An Alternative to Traditional Mitigation Techniques. Bureau of Land Management, Anchorage, Alaska. 18 pp. plus appendices.

In this report, the Bureau of Land Management (BLM) declines to recommend the use of mitigation banking by the Municipality of Anchorage to compensate for wetlands development. The reasons cited are (1) the municipality's need to first clarify its wetland management and mitigation goals, (2) the municipality's need to develop a mitigation strategy, according to which banking should be the last alternative, (3) the need for further studies, (4) an insufficient budget to support a banking program, and (5) the lack of political support.

The BLM identifies and discusses three phases in the mitigation banking process. The first phase involves prebanking studies necessary to establish a program framework. Ten steps are outlined to satisfy this phase. One step, choosing a wetlands assessment method, is examined more closely. The second phase involves making the decision to utilize mitigation banking as a compensation method. Three types of mitigation banking are available: (1) purchase and donation to the municipality of wetlands, (2) payment of fees as partial or total compensation for development, or (3) actual wetlands enhancement or creation by the developer. The design of a specific mitigation bank agreement is examined in detail. This process involves two steps: a preliminary meeting, followed by negotiation of the bank agreement. The latter should address policy and management guidelines, site-specific considerations, and monitoring of the completed project. The

final phase in the banking process involves completion of the mitigation bank project and monitoring and management of banked wetlands.

There are three appendices to the report. The first is a review of literature on problems associated with past mitigation banking efforts. The discussion focuses on policy issues, development of mitigation bank terms, and monitoring of the completed mitigation bank project. The second appendix is a review of the literature dealing with successful mitigation banking strategies. The discussion focuses on program guidelines and policy, mitigation bank negotiation and design, and monitoring of the bank project. The third appendix suggests goals and policies for wetland mitigation. The report also includes a bibliography with sections on mitigation banking, mitigation in general, mitigation policy, wetlands, wetlands restoration, and wetland value assessment.

24. Kelley, Laura. 1992. Mitigation Banking: A Potential Tool for Port Planners. Master of Marine Affairs Thesis, University of Rhode Island, Kingston, Rhode Island. 156 pp.

The purposes of this study are to review the use of mitigation banks in the U.S. and to assess their value to the port industry. The growth in the number of mitigation banks since 1988 is attributed primarily to an increase in their use by state Departments of Transportation. Interviews with bank sponsors revealed positive attitudes toward banking as an approach to compensating wetland losses.

The study provides an overview of mitigation, which includes a description of relevant legislation and of the roles of local, state and Federal agencies in wetland regulation. This is followed by background on the port industry and a discussion of ports and the permitting process. The study notes that the complexity of port expansion projects and the likelihood that such projects will be accompanied by permit delays require development of long-term community goals that will incorporate mitigation into development proposals. The study examines the use of mitigation banking as a potential planning tool. It then identifies the elements necessary to a successful banking agreement.

The next section of the study provides a detailed inventory of mitigation banks. The author also reviews interviewee comments on the following questions: (1) whether banking has led to more cooperative regional planning among developers and regulators, (2) whether banking has reduced permit-processing times, (3) whether the effort involved in negotiating an agreement is justified by the results, (4) whether citizen and interest groups have generally supported banking, (5) whether compensation through mitigation banking is less expensive than traditional mitigation, and (6) what are the greatest problems associated with mitigation banking?

25. Kerr, R. and Associates, Inc. 1987. Wetland Mitigation Banking: A Study of the Development and Implementation of the Tenneco - LaTerre Bank. Report submitted to Regulatory Reform Staff, Office of Policy, Planning, and Evaluation, Environmental Protection Agency, Washington, D.C. 107 pp. plus appendices.

This is a comprehensive study of the Tenneco-LaTerre Bank in Louisiana. Its first section outlines the bank's management plan and its objectives for the area being mitigated. It examines the basic structure of the banking agreement, including authority for bank operations, lifetime of the bank, use of credits,

monitoring requirements, and conditions for reevaluations and revisions of bank rules. There follow explanations of the way in which credits are calculated and the way in which debiting occurs.

The report's second section describes the roles that Federal and state agencies played in the development of this bank. The third section considers the types of issues mitigation bank planners must address: (1) ecological and environmental issues, (2) economic issues, and (3) agency resource issues.

Finally, the study discusses the negotiation and structure of the banking Agreement. The authors conclude that effective mitigation banking depends upon (1) a formal agreement defining the parties, their obligations and the bank's operation, (2) the involvement of as many responsible parties as possible during negotiations, (3) the assignment of management responsibility to resource agencies, with designation of a lead agency, and (4) a credit/debit system that assures protection of both the quantity and the quality of wetlands.

26. King, Dennis M. 1992. *Avoiding Another Taxpayer Bailout*. National Wetlands Newsletter 14(1):11-12.

This article is an economic examination of the effect of the law of supply and demand on mitigation banking. The author argues that the success of mitigation banks depends on whether markets for mitigation credits can be developed without the use of a taxpayer subsidy. The author discusses two mitigation bank schemes. In one scheme, a supply of credits is created in anticipation of future mitigation needs. In the second scheme, credits are not created until they are in demand. According to the author, mitigation banks are analogous to the bond and futures markets, in that wetlands are created on demand or on speculation and then sold to those who require mitigation or expect to do so. The author next addresses the economic forces that affect the supply of and demand for wetland mitigation credits, illustrating the potential economic performance of wetland mitigation banking in two settings: North Dakota potholes and Cape Cod coastal wetlands. Finally, the author suggests that where banks are uneconomic they may require public subsidies.

27. Knatz, Geraldine. 1987. *Offsite Habitat Mitigation Banking: The Port of Long Beach Experience*. In Coastal Zone: Proceedings of the 5th Symposium on Coastal and Ocean Management. pp. 2530 - 2543.

This article provides a brief history of mitigation banking efforts by the Port of Long Beach, California. In 1981, the Port began seeking mitigation projects outside its own jurisdiction in order to compensate for development projects it wished to pursue. The article considers three projects. The first of these was the planned development of an artificial reef in San Pedro Bay. This project was not implemented.

The second project was the restoration, now complete, of a wetland area in the Upper Newport Bay Ecological Reserve. Provisions of the MOU included: (1) a "1 acre restored:1.5 acres filled" credit ratio, (2) the assumption by the Port of all responsibility for restoration, (3) the requirement that construction work be scheduled so as to avoid impacts to endangered species, (4) the inspection by state agencies of final construction at restoration site prior to the use of credits by the Port, and (5) the use of credits by parties other than the Port, with the written consent of all parties to the MOU.

The third project, called the Anaheim Bay restoration, took place at a National Wildlife Refuge managed by the U.S. FWS and was in the final design stages at the time of writing. A modified version of the 1980 HEP was used to direct the biological evaluation. Evaluations were conducted for the existing condition, for target year 1, and for target year 50. The article includes tables of habitat suitability indices and habitat units for the twenty species used to evaluate the harbor and compensation site and explains the method by which an appropriate area of restoration was calculated.

28. Kusler, Jon. 1992. *The Mitigation Banking Debate*. National Wetlands Newsletter 14(1):4.

This introduction to mitigation banking begins by referencing introduced or adopted legislation authorizing wetland mitigation banks. The author notes the advantages of mitigation banks, which include their encouragement of large wetland areas, their ability to provide developers with greater flexibility, and their ability to optimize wetland functions and values through project design and location. The author contrasts these advantages with the problems faced by mitigation banks, including: (1) mitigation banks involve off-site mitigation, and many wetland functions are site-specific and cannot be replaced at a new site; (2) mitigation banks often replace wetland habitat types with ones that are easier and cheaper to create; (3) agencies may lack sufficient statutory powers and expertise to create and supervise mitigation banks; (4) agencies may face pressure from developers to avoid alternative analyses and impact reduction; and (5) monies paid into a government-operated in-lieu fee bank may be spent for non-wetland purposes.

The author also discusses joint projects. In a joint project, a group of developers agree to carry out a specific mitigation project in order to compensate for specific losses; funds are collected and allocated for that project alone. The author argues that the specificity of joint projects facilitates cooperative action and reduces potential problems with governments holding private money. Finally, he reports that the California State Coastal Conservancy, which has instigated, facilitated or supervised more joint projects than any other agency in the nation, favors joint projects over mitigation banks because of the problems associated with the latter.

29. Laney, R. Wilson, Dennis L. Stewart, Gerald R. McCrain, Carol Mayes and V. C. Bruton. 1988. Final Report on the North Carolina Department of Transportation Company Swamp Mitigation Bank, Bertie Country, North Carolina. Report submitted to U.S. Department of the Interior, Fish and Wildlife Service, Division of Ecological Services, Raleigh Field Office, Raleigh, North Carolina. 37 pp. plus appendices.

This report describes the establishment of the Company Swamp mitigation bank, the results of its habitat analyses, and its final operational procedures. The introduction focuses on (1) the roles played by agencies involved in the §404 permitting process, (2) the development of the bank, and (3) the banking agreement.

The next section of the report provides information on the history of Company Swamp and on its natural resources. The FWS Habitat Evaluation Procedures (HEP) were selected to document the quality and quantity of available terrestrial habitat in the bank. The habitat assessment methodology and results are discussed. All species in the bank are shown to benefit from the banking effort.

Finally, proposed banking implementation and operational procedures are examined. These include (1) period of analysis, (2) determination of credits, (3) computation of debits for unavoidable impacts less than and greater than five acres, (4) accounting responsibilities, (5) monitoring of the mitigation bank, and (6) interagency coordination. Appendices to the report include the Company Swamp MOU and comments by the North Carolina Department of Transportation on the mitigation bank draft EIS.

30. Lewis, Roy R. 1992. *Why Florida Needs Mitigation Banking.* National Wetlands Newsletter 14(1):7.

The author discusses three studies of regulatory agency-permitted mitigation projects in Florida. According to the studies, only eight of 174 projects achieved compliance with permit requirements. The author notes that these figures do not reflect the number of projects which were never begun (34% of the projects in one study; 60% of those in another), and argues that inadequate compliance monitoring and a lack of "wetland police" are the problem.

The author argues for up-front mitigation banking programs as a faster and less costly means of achieving successful mitigation. According to the author, banks should be regional, should be subject to monitoring for a minimum of 3-5 years after their completion, and should be certified as successful before mitigation credits are awarded. He argues further that because permit applications for banks are rarely denied, banks should be established only for public agencies at first. Finally, the author lists reasons for the ability of mitigation banks to improve the success of mitigation.

31. Marcus, Laurel. 1987. *Wetland Restoration and Port Development: The Batiquitos Lagoon Case*. Coastal Zone: Proceedings of the 5th Symposium on Coastal and Ocean Management. pp. 4152 - 4166.

This article describes the development by the California Coastal Conservancy of a plan for the restoration of Batiquitos Lagoon in San Diego County, California. Once a fully tidal lagoon system, Batiquitos Lagoon underwent drastic changes as a result of American and European settlement of its watershed. Road and rail crossings constricted water flow, large quantities of sediment entered the lagoon, and fresh water from the lagoon was diverted for human use. As a result, tidal influence on the lagoon was almost completely eliminated. The goal of the project was to restore this influence. Funding would be provided by the Port of Los Angeles, which would use the project to satisfy its own mitigation needs.

After providing a brief history of the lagoon, the author proceeds to discussions of its hydrology, water quality and biological features. She then raises the two primary questions faced by the Conservancy in planning the restoration: (1) how large the tidal prism had to be in order to keep the lagoon mouth open, and (2) how to create intertidal mudflats while maintaining the habitat values provided by the lagoon's existing sand/salt flats. She describes the Conservancy's approach to these problems, which involved efforts by the California Department of Fish and Game, the National Marine Fisheries Service and the U.S. FWS, and included the use of a modified version of the HEP process. She then explains the two restoration alternatives which resulted from the evaluation of the lagoon. Finally, she offers recommendations for the lagoon itself and for an evaluation of the region's future mitigation needs.

32. Marsh, Lindell L. and Dennis R. Acker. 1992. *Mitigation Banking on a Wider Plane*. National Wetlands Newsletter 14(1):8 - 9.

This article raises two questions that have affected the use of wetland mitigation banks. First: to what extent should banks provide credits to those impacting a wetland in exchange for the conservation of a different type of wetland? Second: should mitigation occur in the same watershed or within a fixed distance of the impacted wetlands? The authors report that as a result of the problems associated with mitigation banking, the development of banks is carried out almost exclusively by single, large public or private development entities for their own future uses. Examples of such banks are provided.

The authors support the use of focused and area-wide plans to address wildlife conservation in the context of anticipated development, such as "Special Area Management Plans" under the Coastal Zone Management Act, "Resource Management Plans" under Florida legislation, and "Habitat Conservation Plans" under the Endangered Species Act and other wildlife legislation. The use of such plans can resolve the two initial questions rationally and in context. The benefits of incorporating mitigation bank elements into these plans are discussed.

33. McCrain, Gerald R. 1992. *Habitat Evaluation Procedures (HEP) Applied to Mitigation Banking in North Carolina*. Journal of Environmental Management 35:153 - 162.

The objectives of this study are (1) to compare the cost effectiveness of acre-for-acre compensation with that of the use of Habitat Evaluation Procedures (HEP) credits and (2) to determine if habitat value, as measured by HEP, may be fully mitigated by acre-for-acre transactions. The introduction to the study contains (1) an explanation of the concept of mitigation banking and a discussion of its advantages, (2) a discussion of banking resource credits, and (3) a description of the North Carolina DOT Company Swamp mitigation bank.

The study's "Materials and Methods" section includes discussions of HEP methodology, habitat suitability index (HSI) models, project management scenarios, and bank debiting. The study provides (1) initial HSI values for species in the Company Swamp Bank and in the highway study sites, (2) changes in HSI and subsequent Average Annual Habitat Unit (AAHU) values due to anticipated use of the land without highway development, (3) bank debits expressed in dollars, (4) bank debits expressed in Habitat Units, (5) a comparison of habitat values between highway sites, and (6) a comparison of habitat values between highway sites and the bank.

The study's next section discusses (1) the success of the Company Swamp bank, (2) monetary valuation of wetlands, (3) functional value assessment with HEP, (4) habitat values at highway sites and at the Company Swamp tract, (5) establishment of mitigation needs, and (6) policy and management recommendations.

The study concludes that acre-for-acre transactions provide only one third of the functional value replacement provided by HEP unit debiting. The study also shows that a minimum replacement ratio of 3:1 is needed to ensure no net loss of wetland functions and values. Appendices to the study include the

MOU establishing the Company Swamp bank, AAHU values without project condition, and net changes in AAHUs.

34. Niedzialkowski, Diane M. and John A. Jaksch. 1989. *Wetland Mitigation Banking as an Innovative Approach to Wetlands Regulation*. In Freshwater Wetlands and Wildlife. R.R. Sharitz and J.W. Gibbons (eds.); pp. 1087 - 1097. DOE Symposium Series Number 61. Perspectives on Natural, Managed and Degraded Ecosystems Symposium, Charleston, South Carolina, March 24 - 27, 1986: Savannah River Ecology Lab, Aiken, South Carolina.

The authors, who are USEPA officials, present mitigation banking as a creative approach to off-site compensation for unavoidable losses of wetlands or wetland functions. They define mitigation, explain mitigation banking, and provide a table containing information about ten mitigation banks, including: (1) location, (2) manager, (3) status, (4) size, and (5) habitat type. They summarize mitigation and mitigation banking guidelines of the Federal agencies having authority or review responsibilities under §404 of the Clean Water Act (EPA, the Army Corps of Engineers, FWS, and the National Marine Fisheries Service). They then discuss the way in which bank MOUs define such issues as geographic scope, user eligibility, manager/sponsor responsibilities, methodology for computing credits, and monitoring and evaluation. A table provides information on nine banks, including: (1) signatories to MOUs, (2) users, and (3) geographic scope of habitat type. Finally, the authors summarize the benefits provided by mitigation banking and list unresolved policy and technical issues associated with banking efforts.

35. Reppert, Richard. Wetland Mitigation Banking Concepts. July 1992. IWR Report 92-WMB-1, U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources. 25 pp.

This report is an initial product of the National Wetland Mitigation Banking Study conducted by the U.S. Army Corps of Engineers Institute for Water Resources. The report briefly describes the study, which is to be a comprehensive description and evaluation of wetland mitigation and fee mitigation. The report also indicates that the study will attempt to determine the need for and feasibility of wetland mitigation banks and fee mitigation as part of efforts to achieve no-net-loss of wetlands. The report defines wetland mitigation banking and discusses various types of banks. It considers six types in particular: (1) industrial banks, (2) highway-related banks, (3) port-related banks, (4) Federal project banks, (5) commercial banks, and (6) wetland mitigation trusts and trust funds. The report also identifies issues associated with banking and provides a preliminary evaluation of wetland mitigation banking to date. It also includes tables and maps which identify and locate existing and planned wetland mitigation banks across the United States. Finally, the report provides a brief discussion of the advantages and disadvantages of mitigation banking.

36. Riddle, Elizabeth P. May 1988. *Mitigation Banks: Unmitigated Disaster or Sound Investment?* In Proceedings of the National Wetland Symposium: Mitigation of Impacts and Losses, Jon A. Kusler, Millicent L. Quammen and Gail Brooks (eds.); pp. 353 - 358. Technical Report Number 3. New Orleans, Louisiana: Association of State Wetland Managers, Inc.

The author begins by defining the term "mitigation bank", drawing distinctions among mitigation banks, mitigation projects, and in-lieu fee programs. She discusses the advantages of mitigation banking, including: (1) it places responsibility for bank design on resource agencies which have experience in mitigation and which are motivated to complete mitigation projects; (2) it eliminates delay between the loss of wetland values at a project site and compensation for those values at a mitigation site; (3) it allows agencies to use the political and financial leverage of permit applicants to push mitigation projects through; and (4) it places a price on habitat loss, allowing developers to assess the cost effectiveness of their projects.

The author then discusses the difficulties involved in mitigation banking, including (1) the possibility that banks will fail to meet design objectives (if they do not do so, habitat losses resulting from each project may be compounded over time), (2) the potential problems associated with coordinating and mediating issues among divergent interests (problems which complicated the development of the Batiquitos Lagoon mitigation bank), (3) the difficulty of developing an equitable and replicable method for evaluating habitat values, (4) the difficulty of reducing the sponsoring agency's risk of incurring substantial management or maintenance costs (in developing the Batiquitos Lagoon mitigation bank, for example, the agreement included the establishment of an annuity fund and an investment account by the developers), and (5) the difficulty of ensuring that the sponsoring agency recovers the funds it expends in developing the bank. The author notes that the Bracut Marsh mitigation bank and the pilot mitigation bank in San Francisco Bay provide examples of the last of these difficulties. She provides guidelines for the use of a mitigation bank whose inclusion in formal agreements between the sponsoring agency and permitting agencies might help to solve these problems. She cautions resource agencies against developing only those enhancement projects that provide mitigation credits.

According to the author, there are three reasons for engaging in mitigation banking: (1) to satisfy specific mitigation needs (as an example, she cites the California State Coastal Conservancy's Dune Mitigation Bank), (2) to consolidate habitat (she cites the Bracut Marsh Mitigation Bank), and (3) to accomplish regional restoration goals (as potential examples, she cites the Humboldt Bay salt marshes and California's major ports).

37. Riddle, Elizabeth P. and Melanie F. Denninger. February 1986. *Coastal Wetland Mitigation Banks: The California State Coastal Conservancy Experience*. In Proceedings of the National Wetland Assessment Symposium. Jon A. Kusler and Patricia Riexinger (eds.); pp. 260 - 264. Technical Report Number 1. Portland, Maine: Association of State Wetland Managers, Inc.

This article discusses the planning and management of effective off-site wetland mitigation through the use of mitigation banking. It does so from the perspective of the California State Coastal Conservancy. Its analysis is based on the authors' experiences in Humboldt Bay, San Francisco Bay, and the Los Angeles area. The authors provide their recommendations on the development of a mitigation bank.

According to the authors, it is essential that mitigation bank sponsors commit to completion of the mitigation program, and that they are willing to bear mitigation costs for an indefinite period. Once the sponsors' commitment is established, the authors suggest, an advisory working group should be established which consists of those parties to the mitigation process who will have decision-making authority. The authors

recommend that these persons develop program guidelines to be incorporated into a formal agreement for the use of the bank.

The authors also suggest that regional wetland restoration goals be established to direct site selection and enhancement plan design. As an example of this process, the authors cite the Humboldt Bay working group's use of goals to develop its mitigation bank. According to the authors, the bank working group should define its criteria for site selection and prepare an inventory of potential mitigation bank sites. The authors discuss criteria the working group should consider and the importance of site selection. Finally, the authors suggest, the working group should prioritize potential bank sites, and consider barriers to their use. Here the authors discuss obstacles encountered during the site selection process in Humboldt Bay, San Francisco Bay, and Los Angeles and Orange Counties.

Once the establishment of a mitigation bank appears likely, the authors suggest, formal management and mitigation bank agreements should be signed. The working group should review the regional wetland restoration goals, and should evaluate existing and projected habitat values. A site-specific enhancement plan should then be finalized.

After enhancement of the bank is completed, according to the authors, the sponsor must determine the cost to the permit applicant. The authors discuss these costs, and the reasons for holding applicants responsible for the costs of managing and monitoring the bank. Finally, the authors report, the mitigation bank unit cost must be determined. A general rule is to allow applicants to use only the units of habitat value added on a bank site to compensate for project development impacts, keeping in mind the goal of no net loss of wetlands.

38. Russell, Steve C. April 1983. *Virginia Develops Wetland Bank*. AASHTO Quarterly, pp. 16 - 17.

In this article, the Virginia Department of Highways and Transportation relates its creation in 1982 of the Wetland Bank. The Wetland Bank is an eleven-acre salt marsh in a state-owned borrow pit, adjacent to a tidal tributary of the Elizabeth River. Shortly after the bank's creation, the Department earmarked approximately 0.55 acres of the marsh to compensate for the wetland impacts of five proposed highway improvements in the Tidewater area. The Department notes that use of the mitigation bank lowers the costs of highway construction.

39. Russell, Steve C. April 1985. *Update on Wetland "Banking" in Virginia*. AASHTO Quarterly, p. 15.

The Virginia Department of Highways and Transportation relates that the Wetland Bank established in 1982 is working. About 10 percent of the eleven-acre bank has been designated to offset the impacts of seven highway projects. The Department predicts a ten-year lifespan for the bank, after which branches will need to be opened. Long-term monitoring studies are being conducted of the marsh's contribution to the area's aquatic ecosystem.

40. Salvesen, David. June 1993. *Banking on Wetlands*. Urban Land. pp. 36 - 40.

The author's objective is to raise some of the issues addressed at a January 1993 "information exchange" on wetland mitigation banking held by the Urban Land Institute. He begins with a brief explanation of mitigation banking and its recent history. He describes three types of banks: the single owner/user bank, the entrepreneurial bank, and the joint project.

The author then notes advantages of mitigation banking, including (1) its ability to create large wetlands, instead of numerous small, isolated wetlands, (2) its ability to streamline the permitting process by making credits readily available to developers, (3) its transfer of the responsibility for wetlands restoration from developers to parties whose interest in wetlands protection may be stronger, (4) its provision to the private sector of incentives for the restoration of degraded wetlands.

The author argues that the chief obstacle to the development of private, market-oriented mitigation banks is uncertainty due to the fact that the market for mitigation banking depends entirely on government regulations for its continued existence. He lists other issues that must be addressed if private banks are to succeed, including: (1) ability of banks to assure regulators of successful mitigation, (2) establishment of criteria for successful mitigation, (3) timing of credit sale (with respect to completion of mitigation), (4) location of banks, (5) assignment of responsibility for long-term bank maintenance, (6) establishment of system for measuring value of wetlands, (7) establishment of exchange ratios for created and filled wetlands, (8) resolution of questions about wetland type (i.e., should restoration of one type of wetland compensate for degradation of another type?), (9) resolution of questions about sequencing.

The author concludes that there is a large untapped market for mitigation banks but that the uncertainty of the present institutional climate makes their establishment too risky for investors. The article also includes sidebars by the Environmental Law Institute, King and Associates, and the Disney Development Company.

41. Schonholtz, Robert. 1988. *San Joaquin Marsh Mitigation Program: An Example of Urban Wetland Management on a Large Scale*. In Proceedings of the National Wetland Symposium: Urban Wetlands; Jon A. Kusler, Sally Daly and Gail Brooks (eds.); pp. 336 - 339. Oakland, California: Association of Wetland Managers, Inc.

This paper discusses opportunities a large landholder may have for large-scale urban wetland management due to: (1) the long term over which its activity in an area may occur and (2) the broad range of wetland types its holdings may contain. The author cites the San Joaquin Marsh Mitigation Program as an example.

The author describes the physical aspects of the San Joaquin Marsh, including its resident plant species. He then outlines the methodology behind each of the steps leading to the mitigation agreement. He reports that a wetland inventory was performed for use in enhancement planning and monitoring and that draft enhancement plans were prepared by each mitigation program participant. A Habitat Value Analysis was performed in order to evaluate changes in habitat value that would result from implementing the enhancement plan. Ten avian species groups were evaluated in the analysis. In a table, the author lists these groups and

representative species. He reports that the Habitat Unit figures generated for the ten species groups were combined into three major species groups. From these groups, "riparian birds" were selected for mitigation banking, because they were "in kind" with impacted species. The author then details the key points established in the participants' agreement.

The last section of this paper discusses the ability of the San Joaquin Marsh Program to respond positively to certain wetlands management concerns, which has resulted in part from the participation of a large landowner in the bank. These concerns include "in-kind" compensation, fragmentation of important habitat, the uncertainties associated with compensation, and the complex and time-consuming nature of permitting.

42. Shabman, Leonard, Paul Scodari and Dennis King. October 1993. Making Wetland Mitigation Work: The Private Credit Market Alternative. Staff Paper SP-93-12, Department of Agriculture and Applied Economics, Virginia Tech. Replaces Staff Paper SP-93-5. 67 pp.

The objectives of this report, which revises and supplements an earlier report, are (1) to describe the operation of private markets in wetland mitigation credits and the way in which they are affected by economic forces and regulatory policy, (2) to outline trading rules to promote credit markets while limiting and allocating risk of mitigation failure, and (3) to recommend regulatory reforms to improve the effectiveness of credit markets as a means of protecting wetlands.

The authors cite institutional problems that lead to mitigation failure and argue for credit markets as the solution to these problems. They argue that a credit market would (1) better marshal existing resources and expertise than do regulatory agencies, (2) overcome the current lack of regulatory resources by allowing regulators to focus on a few mitigation sites, (3) make it easier for regulators to limit and assign liability for bank failure, (4) create a few large projects instead of numerous small isolated wetlands, and (5) make credit available in small amounts, increasing the practicality of mitigation for small wetlands losses. The authors describe the effect of market forces and regulation on the supply of and demand for mitigation credits. They note that regulatory policies dictate the demand for permits and influence the cost of providing credits. The authors suggest five reforms of trading rules for credits: (1) allow sale of credits prior to mitigation project completion, (2) establish standards for bank performance, monitoring and management, (3) allocate liability for mitigation failure, (4) ensure that liability reflects real risk, (5) establish rules for credit definition and use. They also suggest two regulatory reforms: (1) make regulatory reforms to encourage market entry, and (2) incorporate credit markets into watershed planning and management.

The authors conclude with a list of factors to be addressed if the establishment of a private credit market is an objective of regulatory policy: (1) timing of credit marketability, (2) bank performance standards, (3) bank monitoring and maintenance, (4) long-term bank management, (5) financial assurance of bank success, (6) credit definition and evaluation, (7) consistency of mitigation requirements, (8) pricing of publicly supplied credits, (9) pricing of privately supplied credits, (10) trading area, (11) watershed planning for bank siting and design, and (12) watershed planning to achieve wetland categorization. The report also includes a short bibliography and an appendix containing the results of interviews with regulators and prospective bank entrepreneurs.

43. Shirey, P. 1991. Regional Plans and Mitigation Banking: An Oregon Example. Presented at Wetlands in Washington Conference. Professional Education Systems, Inc., Eau Claire, Wisconsin.

This paper discusses the various issues that should be taken into consideration when planning a wetland mitigation bank; these include siting, valuation, and governance issues.

44. Short, Cathleen. July 1988. Mitigation Banking. Biological Report Number 88(41). U.S. Fish and Wildlife Service, Research and Development, Washington, D.C. 97 pp. plus appendix.

This report evaluates mitigation banking as a tool for seeking compensation for project-related resource losses. The report opens with an explanation of mitigation banking. It summarizes the advantages and disadvantages of banking with respect to more traditional approaches, as well as the applicability of banking to various project types. It continues with a discussion of implementation procedures, which include (1) regulatory coordination, (2) site selection, (3) creation of a formal banking agreement, (4) design of the bank enhancement plan, (5) identification of geographic area of applicability, (6) establishment of bank life, (7) creation of an interagency team, (8) selection of evaluation methodology, (9) bank crediting and debiting, (10) management and maintenance, and (11) monitoring and evaluation. The report also makes recommendations on (1) deciding on the appropriateness of a mitigation bank, (2) review procedures for mitigation bank involvement, (3) bank size, (4) bank life, (5) bank management options, (6) bank land ownership, (7) the technical acceptability of mitigation techniques, (8) banking agreements, (9) evaluation methodology, (10) debit and credit procedure, (11) mitigation ratios, (12) setting a dollar value on bank credits, (13) long-term bank management and maintenance, and (14) monitoring and evaluation.

The report provides the legislative background for mitigation banking and an account of banking's integration into the regulatory process. There follows a summary of Federal and state agency involvement in mitigation banking. Finally, the report provides a detailed review of the thirteen mitigation banks with which FWS has been involved. An appendix lists contacts and addresses for FWS regional mitigation bank projects.

45. Short, Cathleen. 1989. *Wetland Creation and Restoration Efforts Associated with Mitigation Banks*. In Proceedings of the Fifteenth Annual Conference on Wetlands Restoration and Creation; F.J. Webb (ed.); pp. 249 - 258. Tampa, Florida: Hillsborough Community College Institute of Florida Studies.

This article provides an overview of mitigation banking and brief discussions of eight mitigation banks. The author begins by outlining the purposes of mitigation banking, the legal framework in which banking occurs, and the parties typically involved in banking efforts. She notes that the U.S. Fish and Wildlife Service has been involved in eight mitigation banking efforts which have included the creation or restoration of wetlands, and she provides a brief discussion of each of these banks. The banks include: the Astoria Airport bank, Bracut Marsh, the Batiquitos Lagoon bank, the Newport Bay and Anaheim Bay banks, the Minnesota DOT bank, the Goose Creek bank, and the North Dakota State Highway Department bank.

The author goes on to discuss concerns about mitigation banking, which include: (1) mitigation banking is still in the experimental stages, and its usefulness as a method of providing permanent compensation for wetlands loss cannot be guaranteed; and (2) there have been problems with achieving compliance with permit conditions and with monitoring of banks. She notes that these concerns are balanced by the potential benefits of mitigation banking, which include (1) its ability to eliminate lag time between wetlands loss and compensation and (2) its ability to provide economies of scale.

The author recommends that three questions be addressed when mitigation banking is being considered as a method of compensating for a projected wetlands loss: (1) how well can we measure wetlands functions that will be lost; (2) do we know enough to create an analogue for these functions at a mitigation site; and (3) do we have enough practical field experience to compensate for any lack of specific knowledge. She provides further recommendations, stressing the need for ongoing project monitoring and evaluation of banking efforts. She concludes that our knowledge about wetlands creation and restoration is incomplete, and that we will have to improve this knowledge as we carry out mitigation banking efforts. The article also includes a short bibliography.

46. Silvers, Matt and Don Linke. 1990. Mitigation Banking: Its Viability as a Mitigation Mechanism. Unpublished paper, Tulane Law School, New Orleans, Louisiana. 38 pp.

This unpublished paper is an examination of the underlying theory and practical application of mitigation banking. The authors analyze (1) existing mitigation requirements as a framework within which mitigation banking must function, (2) the advantages, disadvantages, potential dangers, and unresolved issues surrounding mitigation banking, and (3) the future of mitigation banking and the changes necessary to ensure its viability as a mitigation mechanism. The authors conclude by noting the importance of developing guidelines to aid in the early stages of the growth of mitigation banking. They suggest that with certain refinements, mitigation banking can be a reliable mechanism for offsetting the impacts of development on wetlands.

47. Simmering, Richard and Billy Craft, John Woodard and Darryl Clark. September 1989. *An Evaluation of the Tenneco LaTerre Mitigation Bank Management Plan*. In Proceedings of a Symposium, Marsh Management in Coastal Louisiana: Effects and Issues, Walter G. Duffy and Darryl Clark (eds.); pp. 319 - 329. Biological Report Number 89(22). Baton Rouge, Louisiana: U.S. Department of the Interior, Fish and Wildlife Service and Louisiana Department of Natural Resources.

The introduction to this article discusses the events leading to the establishment of the Tenneco LaTerre mitigation bank. It includes a map illustrating the status of the bank in 1982. It notes certain provisions of the Tenneco LaTerre Memorandum of Agreement and lists the objectives of the management plan. It then describes and illustrates the structural changes as these objectives began to be achieved.

The methodology and results are presented for (1) the historical change in ratio of land to open water, (2) tide level elevations at weir 1 for 1986 and 1987, (3) average salinity and range at 12 stations during 1986 and 1987, (4) the prevalence index values for monitored sites in October, 1987, and (5) wildlife harvest for three hunting and trapping seasons. Results showed that structural changes have reduced water-level

fluctuations by about 100% within the bank. The data are insufficient to show a positive effect on salinity levels due to structural changes, although salinity has decreased from 1982 levels. The data do not demonstrate that management has either halted the erosion process or improved marsh quality; however, there are indications that positive impacts are occurring. There are no patterns to suggest that management is having any effect on the amount of wildlife being harvested. The authors conclude that impacts to the vegetative communities are expected to occur slowly, and that further study of the bank is required.

48. Soileau, D.M. June 1984. Final Report on the Tenneco LaTerre Corporation Mitigation Banking Proposal. Terrebonne Parish. U.S. Department of the Interior, Fish and Wildlife Service, Division of Ecological Services, Lafayette, Louisiana. 23 pp. plus appendices.

This report describes the proposed establishment by Tenneco LaTerre (TLT) of a mitigation bank on approximately 5,000 acres of coastal marshlands in Louisiana. The bank would create fish and wildlife habitat benefits (credits) that TLT could use as mitigation for unavoidable impacts associated with activities requiring Army Corps of Engineers §10 or §404 permits and Louisiana Coastal Use permits. The report includes a discussion of the bank's proposed implementation and operational procedures. These include (1) period of analysis, (2) mitigation credits to be banked by TLT, (3) areas of applicability of mitigation benefits, (4) sale and trading of mitigation credits, (5) computation of debits from the mitigation bank for permitted actions, (6) future permit actions within the mitigation area, (7) accounting responsibilities, (8) monitoring of the mitigation bank, and (9) establishment of a formal Memorandum of Agreement. The report concludes that there is potential for banking to become a workable approach to the achievement of off-site mitigation of unavoidable habitat losses. It provides recommendations for mitigation bank implementation and operation.

49. Soileau, David M., David W. Fruge and James D. Brown. 1985. *Mitigation Banking: A Mechanism for Compensating Unavoidable Fish and Wildlife Habitat Losses*. National Wetlands Newsletter 7(3):11-13.

This article, written by FWS officials, is divided into three sections: (1) Mitigation and the "Banking" Concept, (2) Policy and Management Considerations, and (3) Banking Benefits and Risks. The authors note that the FWS is optimistic that mitigation banking will become a positive part of the regulatory process in the future, but that FWS policy on mitigation banking is still in the formative stage.

The concept of mitigation evolved out of the Fish and Wildlife Coordination Act's requirement of a determination of means to prevent loss of or damage to wildlife resources. The authors describe mitigation banking, which the FWS defined in the early 1980's as "habitat protection or improvement actions taken expressly for the purpose of compensating for unavoidable, necessary losses from specific future development actions". Tenneco Oil Company's mitigation bank is cited as the best planned mitigation bank to date. An FWS report concluded that a voluntary mitigation banking program should be viewed as a viable option for compensating for unavoidable losses associated with permitted actions, particularly oil-related, gas-related and other small industrial developments.

The authors make policy recommendations about the minimal requirements a development project should meet before mitigation bank credits should be applied. These are: (1) that public interest benefits should outweigh foreseeable detrimental impacts on fish and wildlife resources, (2) that access or proximity to or siting in the aquatic environment should be required, (3) that only projects incorporating the least damaging alternatives should be eligible for use of mitigation bank credits, (4) that all other avenues of impact avoidance and minimization should be exhausted before allowing use of mitigation bank credits, and (5) that mitigation bank credits should be used only when on-site mitigation means are unavailable.

Management techniques recommended by the authors include (1) use of a habitat-based methodology such as the Habitat Evaluation Procedures, (2) inclusion in mitigation banking of "in kind" credits from wetland habitat of equal or greater value than the habitat being impacted, (3) assignment to credits of a period of effectiveness equal to or greater than the duration of the project impacts, and (4) weighing of the expenditure of time and money required to establish a mitigation bank against the expected benefits.

Finally, the authors discuss the benefits and risks of mitigation banking. As a benefit, they cite the fact that mitigation banking puts mitigation "up-front". This reduces conflicts between developers and regulators and saves money and time. As a risk, they cite the possibility that banked credits will be used before means of avoidance or minimization of impact have been exhausted. Another risk is that developers may view mitigation banking as guaranteed approval of future permit applications.

50. Sokolove, Robert D. and Pamela D. Huang. Summer 1992. *Privatization of Wetland Mitigation Banking*. Natural Resources and Environment 7(1):36.

This article discusses the opportunities presented by privatization of wetland mitigation banking. The authors discuss problems associated with on-site mitigation, and argue for mitigation banks as the solution. They also discuss the development of the Habitat Evaluation Procedures (HEP) and the creation of the Tenneco LaTerre Mitigation Bank in Louisiana. They address concerns about mitigation banking, including the potential compromise of sequencing requirements; the likelihood of out-of-kind mitigation; the possibility that mitigation banking would create an appearance of wetlands permits for sale; and the risk of large-scale bank failure.

The authors argue that mitigation banks will allow a more efficient allocation of regulatory resources and will improve the success rate of mitigation projects. Next, they discuss the need to provide the private sector with incentives for involvement in mitigation banking. They suggest that such incentives exist (among them are the potential financial and public relations benefits of mitigation banking) and that these incentives will be strengthened if regulators allow mitigation banks to prosper.

The authors also argue that the uncertainty associated with mitigation banking must be limited through the creation of a set of generic performance standards for mitigation banks, from which specific performance standards for individual banks could be derived. These standards would be known to potential bank creators, and their satisfaction would guarantee regulatory acceptance of mitigation efforts. They would be included in a formal banking agreement, and would address such issues as (1) the acreage of wetlands to be created

or enhanced, (2) techniques for maintaining appropriate hydrology, (3) the number and type of plantings, and (4) maintenance procedures for the long-term viability of the bank site.

The authors conclude by arguing that it is only through the involvement of the private sector in mitigation banking that the goal of no net loss of wetlands can be achieved.

51. Tettemer, John M. May 1988. *Mitigation Banking: Our Best Chance for Long-Term Wetlands Preservation and Management*. In Proceedings of the National Wetland Symposium: Mitigation of Impacts and Losses, Jon A. Kusler, Millicent L. Quammen and Gail Brooks (eds.); pp. 350 - 352. Technical Report Number 3. New Orleans, Louisiana, October 8 - 10, 1986: Association of State Wetland Managers, Inc.

The author, a developer, briefly explains the concept of mitigation banking, and argues that its success is made possible by the common interest of developers and regulators in financing the long-term enhancement, preservation, and management of wetlands.

The author lists sources of concern which may discourage the acceptance of mitigation banking by regulators, including: (1) the public perception that regulators are in league with developers, (2) lack of rigor in banking evaluation procedures, (3) use of acre-for-acre exchange instead of value-for-value exchange, (4) difficulty of developing a formula under which to accomplish future mitigation.

The author also lists developers' arguments in favor of mitigation banking, including: (1) wetlands maintenance requires funding, which developers can provide; (2) arrangements can be made with developers to transfer of privately held wetlands to government ownership and to provide them with permanent maintenance funding; (3) a strictly regulatory approach only maintains the status quo, which is not an adequate long-term objective; (4) developers can provide ongoing funding that will ensure that wetlands are not degraded; (5) a banking system may simplify the regulatory role; (6) mitigation banks may help to meet a need for regional habitat management planning, which land owners would welcome.

The article concludes by highlighting a few points. Mitigation banking is superior to a strictly regulatory approach, which only attempts to maintain the status quo. Banking allows wetlands improvement on a permanent basis; and methods for evaluating wetlands values are adequate. The author reports that there is a need for (1) transfer of wetlands to public ownership for long-term maintenance, (2) creation of a permanent operation and maintenance fund and objective for wetlands, (3) development of formal agreements that clearly define the rights and responsibilities of involved parties, and (4) improvement of communication about successes in wetlands management.

52. U.S. Department of the Interior, Fish and Wildlife Service. January 1987. Wetland Mitigation Banking in the Municipality of Anchorage. Draft report prepared by U.S. Fish and Wildlife Service, Anchorage, Alaska, for municipality of Anchorage and Anchorage Wetlands Management Task Force. 21 pp.

The purposes of this report are to define and present the concept of wetland mitigation banking and to present a framework for the implementation of mitigation banking in Anchorage, Alaska. Its first chapter

provides definitions of mitigation and mitigation banking, and a discussion of the potential benefits and problems of mitigation banking. Its second chapter outlines goals and policies for mitigation banking in Anchorage. It establishes specific goals for wetlands management, mitigation and mitigation banking, and provides general policy guidelines for the involvement of the municipality of Anchorage in mitigation banking, as well as specific guidelines on habitat value assessment methods, eligible habitat types, geographic limits on bank siting, monitoring and evaluation of bank sites, sale of credits, and bank life. The report's third chapter outlines a thirteen-step process for mitigation bank establishment. Its fourth chapter sets out guidelines for bank establishment, including specific recommendations on the roles and responsibilities of parties to the bank, on site selection, and on the attributes of the banking agreement. The report's fifth and final chapter consists of a hypothetical example of the establishment of a public mitigation bank. The report also includes a short bibliography and a glossary of mitigation banking terms.

53. U.S. Department of Transportation, Federal Highway Administration. 1992. Proceedings and Summary of Findings, FHWA Wetland Mitigation Banking Workshop. Alexandria, Virginia, May 5 - 7, 1992. 3 pp.

This is a summary of conclusions agreed upon by participants in the FHWA workshop. These included FHWA regional and divisional offices and officials of ten states with wetland mitigation banking experience related to highway project development. The strategies of state highway agencies in developing banking agreements varied from detailed, formal agreements with multiple agency participation, to alternative forms of administrative management, to limited written banking agreements addressing specific project impacts or single agency programs other than §404. The participants of the workshop concluded that banking in some form should remain an element of project mitigation activities.

54. World Wildlife Fund. 1992. *Mitigation Banking: The Pros and Cons*. In Statewide Wetlands Strategies: A Guide to Protecting and Managing the Resource, p. 68. Island Press, Washington, D.C.

The article notes that mitigation banking has been used mainly by state highway departments to mitigate wetlands losses from transportation projects. The success of these banks is often uncertain, because monitoring data are unavailable or measures of success have not been established. The article also lists the advantages and disadvantages of mitigation banking. Finally, the article sets forth the guidelines of the National Wetlands Policy Forum for establishing mitigation banks, which follow: (1) banks should be consistent with statewide wetlands strategies, (2) contributions to a bank should be preceded by a permit review, (3) banks should include only restored or newly created wetlands, (4) restoration and creation of wetlands should precede compensated losses, and (5) monitoring and enforcement systems should be established to ensure a bank's success.

55. Zagata, Michael D. 1985. *Mitigation By "Banking" Credits -- A Louisiana Pilot Project*. National Wetlands Newsletter 7(3):9 - 11.

This article offers the perspective of an industry representative on mitigation banking. The author reports that administration of the mitigation requirement of §404 of the Clean Water Act presents the following problems: (1) add-on costs after the proposed project's budgeting and planning process, (2) possible delays

in permit issuance, (3) non-integration into a land management scheme, (4) off-site mitigation that may not directly benefit the applicant who pays for it, and (5) possible loss of property title. The author notes the advantages of using the Habitat Evaluation Procedures to determine the impact of a development activity on a habitat, and provides a specific example of habitat unit calculation. He then discusses the benefits of mitigation banking and the incentives it provides to industry. Finally, he discusses the Tenneco LaTerre mitigation bank, providing details of the credit and debit process resulting from the enhancement of the 7,200 acres of wetlands in the bank over the next 25 years. From its investment in this project, the author reports, Tenneco expects to (1) maintain its property and mineral rights, (2) bank enough credits to offset future mitigation requirements, and (3) expedite the permit process.

56. Zagata, Michael D. 1988. *Mitigation Banking as an Incentive to Industry and to Fish and Wildlife Agencies*. In Transactions of the Fifty-Third North American Wildlife and Natural Resources Conference, pp. 164 - 170.

The author argues that the best way to protect wetlands is to provide economic incentives for wetland preservation and enhancement. He begins by describing the problems with current government regulatory programs. He notes that the §404 permit process focuses on reducing adverse impacts to wetlands, rather than on promoting wetlands management and enhancement, and argues that its result is that mitigation is seen as a means to obtain a permit, and not as a means to achieve wetland protection. He reports that other government incentive programs, such as subsidies or tax credits for environmental protection or public education, are passive, and focus on preserving the status quo. Finally, he points out that wetlands are still being lost, despite the fact that these regulatory programs have been in place since the passage of the Water Quality Act. He attributes this loss to the fact that "wetlands possess societal values perceived to be worth less in the marketplace than are property values".

The author goes on to describe mitigation banking as an incentive to wetlands protection. He presents the Tenneco LaTerre bank in Louisiana as an early success story. He notes that calculations by FWS show that the life of the wetlands will probably be extended by the bank. Furthermore, as of September 14, 1987, a total of 3,623 credits out of the original 158,949 had been debited for eight permits. According to the author, these figures show that: "(1) there was no rush to utilize all available credits; and (2) because the unused credits are forfeited at the end of each year, there was a definite gain to the public values associated with the wetland." While banking serves the public, because it encourages the private sector to engage in activities that benefit the public good, it also serves permit applicants by allowing them to avoid the cost of lengthy permit applications and by allowing them to plan mitigation before beginning a project. The author concludes by noting that banking negotiations cause agencies and industry to work together to maximize public benefit rather than merely minimizing the impact of development.

***Update***

This annotated bibliography included works produced through 1993. Several works reporting or evaluating wetland mitigation banking experiences have been published since this annotated bibliography was produced. Included among those works (in addition to several reports produced this year as part of the National Wetland Mitigation Banking Study which are listed on the inside cover of this report) are the following:

Association of State Wetland Managers. 1994. Effective Mitigation: Mitigation Banks and Joint Projects in the Context of Wetland Management Plans. Proceedings from a National Wetland Symposium. Palm Beach Gardens, Florida, June 24-27, 1992. 220 pp.

Crookshank, Steven L. 1994. Air Emissions Banking and Trading: Analysis and Implications for Wetland Mitigation Banking. Research Study #74. American Petroleum Institute, Washington, D.C. 45 pp.

Mckenzie, Tracey P. and Michael Rylko. 1994. *Partnerships in Restoration Mitigation Banking*. In Partnerships & Opportunities in Wetland Restoration. Proceedings of a Workshop, Seattle, Washington, April 1992, U.S. Environmental Protection Agency, Region 10, Seattle, Washington

### *Index of Topics*

The following is a partial list of topics covered by the works in this bibliography. Each topic is followed by numbers indicating the works that include a significant discussion of that topic.

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