Wetland Banking Basics
Doug Van Werden

ABSTRACT

This paper addresses the basics of wetland mitigation banking. It starts by giving a brief history of wetlands, then legally defining the terms wetlands and mitigation banking and the legal jurisdictions wetlands fall under. The paper then gives an overview of the types of wetlands and wetland projects followed by the hierarchy of remediation measures to be attempted before using a mitigation bank. The types of wetland banks are then discussed along with each type's advantages and disadvantages. The paper concludes with some general guidelines to evaluating a bank and a brief discussion about costs.

KEYWORDS

Mitigation banks, wetlands, wetland banking, wetland costs, CWA, Section 404

INTRODUCTION

Wetlands, those areas of farm fields that farmers tile to make the land productive. Or the wet area that had no good use other than to fill it in and build a nice expensive house on. Or the swamp that is full of mosquitoes with nasty diseases that should be filled in to get rid of the insects. These were typical thoughts about wetlands. Originally wetlands had the reputation of being a nuisance, disease breeding grounds, and basically unproductive land (Weems, 1995). The U.S. Fish and Wildlife Service estimats that the U.S. has lost 50% of its wetlands since the colonial days. Some states having reportedly lost over 90% of their original wetlands (Turner, 1991; Salvesen, 1990; Dahl, 1990). The unenlightened people still see nothing wrong with the loss of the wetlands. They consider wetlands to be another thing in the way of progress. But in truth, wetlands serve an important ecological role in the environment. They filter pollutants, provide flood control, erosion control, and provide habitats to animals and plants (Silverstein, 1994).

Today, governmental regulations and laws have been set in place to not only stop the loss of wetlands, but in some cases increase wetland acreages. These regulations and laws have had a mixed effect. There are now so many federal, state, and local laws that it is like a quagmire trying to navigate the procedures to modify or move a wetland. Furthermore, there is still a net loss of wetlands despite the federal government's goal of no net loss of wetlands (section 404 of the Clean Water Act) (Houck, 1988). One of the reasons cited for this was the emphasis put on compensatory mitigation and its scientific imprecision. Another reason was the lack of governmental oversight (Salvesen, 1990).

Along with these problems, developers have also found the procedures for rebuilding wetlands to be time consuming, frustrating, and easily misinterpreted. These problems have left developers in a quandary of how to meet the federal guidelines. To help alleviate some of the problems, federal law has backed the use of wetland mitigation banking. The federal government does not mean for this to be the primary wetland remediation means. Other steps need to be tried first, but if the only option left is to build new wetlands, then wetland banking can be a major means developers use to help simplify the mitigation process.

DEFINITIONS

A commonly cited reference (Cowardin, 1979) defines wetlands as:

> Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Wetlands

must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

Mitigation banking as per President Clinton's wetland protection plan, is defined as:

> "wetland restoration, creation, or enhancement …. " performed in advance of permitted wetland losses (White House Office on Environmental Policy 1993).

LEGAL JURISDICTION

The Clean Water Act (CWA) of 1977 was the original federal law that dealt with protecting U.S. wetlands. Section 404 of the act regulates the "discharges" of "dredged or fill material" into waters of the U.S. Since wetlands have water, they fall under this section of the act. The section also states that the wetlands program goal is "no net loss of wetlands" (Silverstein, 1994). The CWA does contain some wetland exemptions and it allows some types of projects, such as highway building, to automatically receive general permits (Goldfarb, 1993).

Section 404 gives the Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) primary joint responsibility to regulate wetlands. It requires any construction project that may require the loss of an acre or more of wetlands to notify and apply for a permit from the Corps (ODOT, 1996). The determination of mitigation and responsibilities between the Corps and the EPA are found in a 1990 Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army (Memorandum, 1990).

The 1991 Intermodal Surface Transportation Efficiency Act specifically addressed the use of wetland mitigation banks and authorized the use of federal funds for this type of wetland remediation.

In 1993, President Clinton released his wetlands protection plan called "Protecting America's Wetlands: A Fair, Flexible, and Effective Approach" (White House Office on Environmental Policy 1993). This plan attempted to balance the needs of landowners with the need to prevent further wetland losses. This plan endorsed the increase use of mitigation banking.

Further direction was given to using wetland mitigation banks with a 1995 Memorandum to the Field. This memorandum was a cooperative effort between the EPA, the Corps, the Natural Resource Conservation Service, the U.S. Fish and Wildlife Services (USFWS), and the National Marine Fisheries Service. Titled "Federal Guidance for the Establishment , Use and Operation of Mitigation Banks" the memo gave more detailed guidance to the use of mitigation banks than had been given before when other types of compensation "cannot be achieved at the development site or would not be as environmentally beneficial".

Many state, regional, and local levels of government also have rules and regulations on the use or modifications of wetlands. These rules and regulations must be as strict or stricter than the federal regulations and laws affecting wetlands. This may seem to not impose much of a problem, but in reality it has greatly added to the quagmire. For instance there is no federal law that require bordering states to have the same regulations. Thus wetlands that lay on state boundaries may require developers to conform to two different set of regulations that may not be compatible.

As the ecological importance of wetlands becomes better known, more of the water and land resource management entities will start to want to have a piece of the control of the wetlands in their jurisdictional areas. At the federal level this means thirteen congressional committees and subcommittees, eight cabinet agencies, six independent regulatory agencies, and two White

House offices. It is estimated that there are over 300 departments at the state level and over 100,000 local water-related entities (Mann, 1993; Goldfarb, 1993).

The 1985 Food Security Act is an example of this expansion of wetland jurisdictional rights. Part of this act says that farmers who convert wetlands can not receive federal farm aid or benefits for commodities grown on the converted land. Even legally converted wetlands are not an exception to this act (U.S. General Accounting Office, 1991; Salvesen, 1990).

WETLANDS ASSESSMENT

The definition of wetlands seems simple enough, but it actually covers a wide range of ecological systems. The EPA (http://www.epa.gov/owow/wetlands/types/) breaks wetlands into:

- Marshes
  - Tidal
  - Nontidal
    - Wet meadows
    - Vernal pools
    - Prairie potholes
    - Playa lakes
- Swamps
  - Forested Swamps
    - Bottomland Hardwoods
  - Shrub Swamps
    - Mangrove Swamps
- Bogs
  - Northern Bogs
  - Pocosins
- Fens

It is important to note that even though they are all wetlands by definition, they each have very different ecological properties. Thus it is very important to correctly classify any wetlands undergoing remediation if the end state is to have comparable or better wetlands. One way to classify wetlands is with the Hydrogeomorphic (HGM) classification system (Brinson, 1993).

This classification system is based upon landscape position, hydrodynamics, and hydrological source. The information obtained from the assessment is used to make a model of the assessed wetlands. The model can then be compared to reference models developed for this assessment tool. This comparison then helps development planners design the remediation project.

Other assessment systems look at the flora and fauna in a wetland or are based upon how remediation can improve the wetlands. For example an improvement type of assessment would be used if the remediated wetlands where to go from being a large mudhole to a designed natural waste water filtration system.

IN-KIND PROJECTS VERSUS OUT-OF-KIND PROJECTS

This part of project classification is based on state/local definitions of In-Kind and Out-of-Kind. These definitions vary from state to state and are partly defined by the types of wetlands assessment systems each state allows. In-kind generally means that the remediated wetlands are ecologically and for some states hydrologically the same. Out-of-Kind means that the remediated wetlands are not ecologically and hydrologically the same as the original wetlands.

The government prefers in-kind projects since they have the smallest impact on the ecological system. Unfortunately, even when done on site, they can be hard to accomplish unless the remediation actually uses the old wetlands. Most off-site mitigation projects are classified as Out-of-Kind projects. It is easier for developers to meet the definition of In-Kind If the assessment

system mainly looks at flora and fauna. Most projects will be classified as Out-of-Kind projects if the assessment system looks at hydrology and soils types.

REMEDIATION MEASURES

Most of the laws and regulations on wetlands attempt to promote doing the least damage possible to a wetland project. This promotion has been legally translated into a required sequence of remediation measures. These measures must be followed before the Corps will even consider a compensatory mitigation permit to allow the wetlands to be reconstructed in another location or wetland banking credits to be bought. The following sequence must be followed in the listed order. The sequence is based on the premise that less is best.

1. Avoidance – The best thing to do is to avoid modifying the wetlands at all. It must be shown that there are no viable alternatives to avoiding the wetlands while still being able to continue the development.

2. Minimization – If the wetlands can not be avoided, then the impact on them should be minimized. This could mean building a bridge over the wetlands or using construction techniques that have minimum impact on the wetlands.

3. Repair & Rehabilitation – Repairing or rehabilitating the wetlands equal to the state they were in before the development project.

4. Mitigation - Building a new wetland area to replace the destroyed wetlands. The government considers this as the last resort, not the first resort. A permit must be granted by the Corps. The application for the permit must contain an explanation of why the other sequence steps will not work. Mitigation is broken down into two general parts, where the mitigation site is and what type of mitigation will be accomplished.

   Where mitigation is to occur:

   a. On-site – Rebuilding the new wetlands on the same development site as the old wetlands were on. This is the preferred method for mitigation since the ecological and hydrodynamics properties should closely match the destroyed wetlands' properties. It is also preferred since it will help maintain the ecological balance on the development site. On-site mitigation generally leads to small, in-kind wetland construction.

   b. Off-site restoration – Rebuilding a new wetlands some place other than the development site. Government regulations generally require developers to prove that On-site is not feasible. Regulators also prefer the off-site wetland properties match as close as possible to the destroyed wetlands properties. This has been one of the major drawbacks to off-site restoration since matching the properties in an available site is generally hard to accomplish. Off-site restoration can be in the form of small, in-kind wetlands or a large wetland mitigation bank.

   Types of mitigation (Morgan, 2002):

   a. Enhancement – Taking a current wetland and improving it. Examples are reseeding, planting trees, and adding wildlife habitat like goose nesting barrels.

   b. Restoration – Restoring previous wetlands back to their natural state. This usually means restoring the original hydrology such as breaking the field tile on reclaimed farm land or removing fill material used to fill in the old wetlands.

c. Preservation – Purchasing existing wetlands and putting them into public trust. For instance buying a privately owned swamp and donating it to the local chapter of Swamps Unlimited.

d. Construction – Building wetlands where wetlands never existed before.

WETLAND COMPENSATION RATIOS

On top of minimizing the impact on affected wetlands, another major factor in deciding what level of remediation to use deals with the compensation ratio. Federal policy requires compensation to be based on a comparison of functions and values of the new post remediated wetlands to the original wetlands (King, 1994). There are no specific federal compensation values so states have generally dictated the ratios. These ratios are state specific and seem to have no consistency.

Compensation ratios are the number of acres the remediation plan must use to compensate for each acre of affected wetlands. Some states, such as Maryland, have a different ratio for each type of remediation project type. Other states set all the ratios the same. For example Florida requires two newly remediated wetland acres per affected old wetland acre (King, 1995).

The Department of Energy has been trying to help bring consistency to compensation ratios. To do this, they hired the University of Maryland to develop a model for determining compensation ratios (King, 1995). This model is designed for figuring compensation ratios for In-Kind projects. An excellent discussion on the subject of compensation ratios is found in King's 1995 paper on wetland costs.

SOME COMMON PROBLEMS

Wetland remediation runs into a host of problems. Starting with all the different government entities involved. The first problem is even understanding which government entities are involved. Government entities don't always communicate with each other well and sometimes don't even know that they share wetland jurisdiction. Once the government entities are identified the paperwork begins. Wetland remediation paper work can be a nightmare and will usually require legal counsel.

A second problem is attempting to meet the In-Kind government preference. If the preference can not be meant, it must be well documented as to why In-Kind can not be meant. This documentation will usually include an expert consulting study and backing.

Thirdly is planning, designing and constructing the wetlands. This is often a problem when building wetlands where no wetlands existed before. There is probably a good reason why no wetlands existed there before, such as the hydrology and/or soil type. Construction will normally require a major amount of dirt work and reshaping the environment. It also may include a complete change in soil type. But even after all this work; many constructed wetlands fail (Morgan, 2002; Salvesen, 1990).

Kenneth Morgan's study of Tennessee constructed wetlands ((Morgan, 2002) found that many of the Tennessee failures did not have water availability estimates in their plans. This was a grave error considering that many wetland scientists consider hydrology to be the most important factor in wetland development and maintenance (Mitsch, 1993; Bedford, 1996). This lack of an estimate was one of the reasons for the poor hydrologic planning and construction. He also found inappropriate or poor vegetation establishments. This was partly due to mortality of planted stock which was attributed to hydrological problems. Even though Morgan only studied Tennessee, it is doubtful that Tennessee is the only state having these types of problems.

A fourth problem is who will manage the wetlands and how will the mitigated wetlands be managed. Most developers do not want to become wetland experts, nor do they want to manage

wetlands that they construct. In this case, developers will usually hire an outside firm or manager for the wetlands. Hiring an outside company or person to manage the wetlands moves many of the legal responsibilities from the developer to the outside manager.

A final major problem is the time that it takes for new wetlands to become productive. Many times the government wants the new wetlands built before the old wetlands are destroyed.

WETLAND BANKING

Studies from the 1990's show a 27 to 50 percent success rate for on-site mitigation efforts (Redmond, 1991; Gallihugh, 1998; DeWeese, 1994; Brown and Veneman, 1998). As previously mentioned there are several reasons for the lack of success such as poor planning, development and management. A mitigation bank is one way for developers to ensure success.

Wetland mitigation banks are formed by a private or public entity for profit or not for profit. A wetland mitigation bank is a land-space that is used to preserve, restore, enhance, or create wetlands in anticipation of future mitigation needs. These future needs may or may not be identified before the bank is developed. The appropriate regulatory agency translates the amount of mitigation into "banking credits". The credits are then placed into a mitigation bank account. The credits can be traded or sold to developers for use in-lieu of creating their own wetlands for a development project.

The credits are used to offset the "debit" incurred in the loss of wetlands at the development site. How the debit is assessed in comparison to how the credits are assessed is used to calculate how many credits are needed to meet the developer's debit. Government regulators are responsible for approving the final conversion. The "bought" credits are then put into an account for the developer and subtracted from the bank's credit account. Once the bank's credit account is empty, the bank can not sell or trade any more credits.

General Advantages:

1. Grouping wetland remediation sites into one large site allows for better management and monitoring (ODOT, 1996; Silverstein, 1994).

2. Most of the legal responsibilities are transferred from the developer to the manager of the mitigation bank. Unless of course the developer is the manager of the mitigation bank. In this case the developer is still legally responsible for all aspects of the wetlands management (McDonald, 1993; Haynes).

3. Utilizing an established mitigation bank expediates the development since no time will have to be spent in designing and constructing the wetlands (Silverstein, 1994).

4. Receiving a permit will be more stream lined and take less time (McDonald, 1993; Haynes).

5. Developers will know ahead of time exactly how much it will cost to mitigate the wetlands since they will be doing it by buying credits from the mitigation bank (Short, 1988).

6. Mitigation banks are more economical and cost efficient. Mitigation banks can generally afford technology and consultants that small-scale projects can not afford (Short, 1988). Mitigation banks increase the efficiency of limited resources (Kent, 2001).

7. Large mitigation banks can be more successful than small wetland patches (Salvesen, 1990). Large banks allow for a larger variety of flora and fauna which

gives the mitigation bank more flexibility with respect to changes in the ecosystem. Large banks also have lower amounts of species inbreeding. (Silverstein, 1994).

8. No lag time between destroying the old wetlands and having the new wetlands being productive. Becoming a productive wetlands generally takes several years (Short, 1988).

9. Eliminates public concerns that mitigation will not take place or not work (Short, 1988).

10. Developers will not be responsible for maintenance of the wetlands (Silverstein, 1994).

11. Utilizing mitigation banks can help prevent regulatory takings and the claims thus generated. Regulatory takings occur when the government forces a private owner to sell property to a developer in the interest of the population or restricts the property owner of how they can to use their property. (Humbach, 1993; Lucas 1992; Silverstein, 1994).

12. A mitigation bank is not constricted by the land area of the development project.

General Disadvantages:

1. Possible loss of specific types of wetlands.

2. Mitigation banks generally are not considered as in-kind mitigation

3. Loss of local ecological environment.

4. Mitigation banks might be composed of less valuable compensatory wetlands (Lockhead, 1993).

5. Lower stewardship by the governmental. Some opponents believe that the government regulators will not force developers to attempt the other steps in remediation and thus not even attempt to save the local ecological environment (Short, 1988; Silverstein, 1994).

6. Potential for a net loss of wetlands. Seen when regulators allow the acquisition and preservation or upgrading of already existing wetlands to replace the destroyed wetlands (Short, 1988; Silverstein, 1994).

Types of Banks (Silverstein, 1994)

Single-Client – This type of bank is owned and managed by the developer. Developers can be either private or public entities. Bank sponsoring entities generally construct a bank to compensate for planned future projects. State highway departments are a common user of this type of bank (Short, 1988).

Advantages:

a. Developer has complete control of the bank.
b. Developer can place on-site at a large project to compensate for several small on-site/off-site wetland patches.
c. Allows for wetland compensation in advance of planned future projects.

Disadvantages:

a. Developer is responsible for all the legal aspects.
b. Developer must plan, design, and construct.

c. Developer is responsible for the management.
d. Developer pays all costs.
e. No income is gained.

Publicly-Sponsored, Credit-For-Sale – Developed by public or quasi-public entities. The developer then sells credits in the bank to other developers on a nonprofit basis. This type of bank is also known as "mitigation-fee", "fee-based", or "cooperative" banks. Funding for the bank is from the fees received from selling bank credits.

Advantages:

a. Sponsor is paid to develop, construct, and manage.
b. Bank credit buyers pay a lower per credit fee than if the bank was for profit.
c. Owners usually build to protect and enhance wetlands (Salvesen, 1990).
d. Owners may use to bring business into an area (Silverstein footnote n141, 1994).
e. Owners are generally highly motivated to make the bank work.
f. Consolidation of permitting, credit-production, oversight, and management for the different developers buying credits.

Disadvantages:

a. May be difficult to find sponsors.
b. Credits are generally not sold until the project is completed
c. Sponsors must be able to pay for the planning and development.
d. Unforeseen costs later in a bank's life can not be charged to credit buyers (Short, 1988).
e. Credits are bought over a time period.

Privately-Sponsored, Credit-For-Sale – Formed as a profit generating business.

Advantages:

a. Can be profitable.
b. Is a business.
c. Brings market forces behind the saving of wetlands.
d. Must be of high quality so as to attract credit buyers.

Disadvantages:

a. Legal responsibilities may revert back to credit buyers if sponsor goes bankrupt.
b. Potential for sponsor to deceive buyers who generally may not know enough about wetland mitigation.
c. Sponsor in it for the money.
d. Credit fees higher than if buying into a nonprofit bank.

EVALUATING A WETLANDS BANK

The following checklist can be used to facilitate evaluating a wetlands bank. Part of the evaluation requires that the bank's wetlands be visited. The other part of the evaluation can be done by phone/mail.

1. Are the wetlands flourishing? This can only be properly done by visiting the bank's wetlands. A competent consultant should be hired to perform this visit. At a minimum the consultant's report should contain an evaluation of the viability of the wetlands, type of wetlands incorporated in the bank, evaluation of long term

management plan, how the credits are assessed, will the wetlands meet the client's need, and how many credits will be needed for the client's needs.
2. Does the bank have goals and objectives?
3. What type of agreements does the bank have in place with government agencies, bank sponsors, and bank management? (Weems, 1995)
4. What are the responsibilities of the credit buyer after buying the credits?
5. Does the bank have the resources for providing money for the long term maintenance, monitoring, and reporting?
6. Who are the other credit buyers that have used the bank?
7. What do other credit buyers have to say about their experiences with the bank?
8. What do government regulators monitoring the bank recommend?
9. What happens to the bank and its credits if bankruptcy is declared?
10. What legal responsibilities would occur for the credit buyers in the event of bankruptcy?
11. What is the public opinion of the bank? The opinions of both the general public and the land owners/renters around the wetlands should be evaluated.

COSTS

Costs are wide ranging from a few dollars per acre to hundreds of thousands per acre. The low end of the cost scale generally means that a tile line is removed or broken. This allows farm land that originally was wetlands to revert back to its natural state. At the other end of the cost spectrum is the land that never was wetlands. Costs can range from 66,000 to 306,000 dollars per acre on land that originally was not meant to sustain wetlands (ODOT, 1996).

The Ohio Department of Transportation estimates that it saves 75% of the cost to rebuild wetlands when buying into a mitigation bank (ODOT, 1996).

CONCLUSION

Wetland mitigation banking should never be the first step used for wetland remediation. It should always be the last possible solution. Developers should follow the procedural steps of the remediation hierarchy. These procedures incorporate a hierarchy of steps to take to prevent the destruction of the original wetlands. If after using these steps, it is still necessary to destroy the original wetlands, the laws and regulations point to a means of rebuilding the wetlands in another place.

As shown in this paper, wetlands present a social problem in that they are ecologically needed yet infrastructure modernization requires that some wetlands be destroyed. To assist society in balancing the ecology and destruction of wetlands federal laws and regulations have been enacted. These laws and regulations require specific procedures to be used when developing over wetlands.

This paper showed how wetlands were defined, who the main regulatory agencies are, and the different types of wetlands. The paper then addressed the order (hierarchy) of remediation procedures that must be attempted before being allowed to replace the original wetlands through a mitigation bank. The paper went on to address the types of mitigation banks along with some of their advantages and disadvantages. The paper finished with the general guidelines to evaluating a bank and expected costs.

This paper did not include the steps necessary for establishing a bank. For information on that topic please refer to Weems, (1995) Planning and Operational Guidelines for Mitigation Banking for Wetland Impacts and Kent. (2001) *Applied Wetlands Science and Technology,* 2nd ed.

REFERENCES

1. Bedford, B.L. (1996) The Need to Define Hydrologic Equivalence at the Landscape Scale for Freshwater Wetland Mitigation. *Ecological Applications*, Vol. 6, pp 57-68.

2. Braubaugh, R., and Reppert, R. (1994) *First Phase Report National Wetland Mitigation Banking Study*. U.S. Army Corps of Engineers, Institutes for Water Resources, IWR Report 94-WMB-4.

3. Brinson, M.M. (1993) *A hydrogeomorphic classification for wetlands*. U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS, USA. Technical Report WRP-DE-4.

4. Brown, S., and Veneman, P. (1998) *Compensatory Wetland Mitigation in Massachusetts*. Massachusetts Agricultural Experiment Station, University of Massachusetts, Amherst. Research Bulletin Number 746.

5. Cowardin, L.M. (1979) *Classification of Wetlands and Deepwater Habitats of the United States*, FWS/OBS-79/31, December, Washington, DC: U.S. Fish and Wildlife Service.

6. Dahl, T,E, (1990) *Wetlands Losses in the United States 1780's to 1980's*. U.S. Fish and Wildlife Service Study, Wetlands of the United States: Current Status and Trends vii (1984).

7. DeWeese, J. (1994) *An Evaluation of Selected Wetland Creation Projects Authorized through the Corps of Engineers, Section 404 Program*. U.S. Fish and Wildlife Service, Sacramento, CA.

8. Gallihugh, J.L. (1998) *Wetland Mitigation and 404 Permit Compliance Study, Vol. 1*. Report and Appendices A, B, D, E, U.S. Fish and Wildlife Service, Barrington, IL.

9. Goldfarb, W. (1994) *Boston College Environmental Affairs Law Review*, Spring, 21 B.C. Envtl. Aff. L. Rev. 483.

10. Humbach, J.A. (1993) Evolving Thresholds of Nuisance and the Takings Clause. 18 *COLUM. J. ENVTL. L.* 1 (1993).

11. Haynes, W.J. II, and Gardner, R.C. Dialogues: The Value of Wetlands as Wetlands: The Case for Mitigation Banking. *Environmental Law Institute*, 23 ENVTL. L. REP 10261.

12. Houck, O.A. (1988) Ending The War: A Strategy to Save America's Coastal Zone. 47 *MD. L. REV*. 358.

13. Kent, D.M. (2001) *Applied Wetlands Science and Technology,* 2nd ed., Lewis Publishers, New York, NY, pp181-213.

14. King, D., and Bohlen, C. (1995) *The Cost of Wetland Creation and Restoration*. U.S. Department of Energy, Bartlesville, OK. DEO/MT/92006-9, August 1995.

15. King, D., and Costanza, R. *The Cost of Wetland Creation and Restoration*. U.S. Department of Energy, Pittsburgh Energy Tech. Center, Pittsburgh, PA. DOE/MT/92006.

16. Lochhead, C. (1993) Clinton's Wetlands Proposal Remarkably Similar to Wilson's. *San Francisco Chronicle,* Aug 25, 1993 at A4.

17. Lucas v. South Carolina Coastal Council. 112 Supreme Court 2886 (1992).

18. Mann, D.E. (1993) Political Science: The Past and Future of Water Resources Policy and Management. Water Resources Administration in the United States

19. MacDonald, C. (1993) Mitigation Banking Should Play a Central Role in the Section 404 Program. *Robinson & Cole Wetlands Watch*, National Wetlands Coalition, Issue Paper, Nov 8, 1993,

20. Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines, 55 Fed. Reg. 9210 (1990).

21. Mitsch, W.J., and Gosselink, J.G. (1993) *Wetlands*. 2nd ed., Van Nostrand Reinhold, New York, NY.

22. Morgan, K.L., and Roberts, T.H. (2002) Characterization of Wetland Mitigation Projects in Tennessee, USA. *Wetlands*: Vol 23, No. 1, pp 65-69.

23. Ohio Department of Transportation (1996) ODOT Compensates for Wetland Impacts. *American City & County*, Aug 1996, Vol. 111 No. 9, pg. 38.

24. Redmond, A. (1991) Report on the effectiveness of Permitted Mitigation. Florida Department of Environmental Regulation.

25. Salvesen, D. (1990) Wetlands: Mitigating and Regulating Development Impacts. Washington, DC: ULI-Urban Land Institute.

26. Short, C. (1988) Mitigation Banking. *Biological Report* 88 (41), July, Fort Collins, CO: U.S. Fish and Wildlife Service, National Ecology Research Center.

27. Silverstein, J. (1994) *Boston College Environmental Affairs Law Review*, Fall, 129.

28. Short, C. (1988) Mitigation Banking. U.S. Fish and Wildlife Service, *Biological Report* 88(41), 4 July 1988.

29. Turner, K., and Jones, T. (1991) Wetlands: Market and Intervention Failures – Four Case Studies. London, Earthscan Publications.

30. Weems, W.A., and Canter, L.W. (1995) *Planning and Operational Guidelines for Mitigation Banking for Wetland Impacts*, *Environ Impact Assess Rev*., 15, pp. 197-218.

31. White House Office on Environmental Policy (1993) Protecting America's Wetlands: A Fair, Flexible, and Effective Approach. August 24, 1993.

32. U.S. General Accounting Office, (1991) Wetlands Overview – Federal and State Policies, Legislation, and Programs. GAO/RCED-92-79FS, November, Washington DC.