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Steinhoff, Gordon

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Wetlands Mitigation Banking and the Problem of Consolidation

*Gordon Steinhoff
Utah State University, Logan, Utah, USA*

Abstract

A mitigation bank is a large wetland or wetland complex that is restored or created for the sake of selling credits to private developers or government agencies to compensate for the loss of natural wetlands. Mitigation banking is now emphasized within federal environmental policy. Proponents of banking claim that banking is beneficial to the environment, but studies have shown that this practice threatens biodiversity. The problem is consolidation. With banking, wetlands in a broad geographical area are collapsed into a relatively small area. Wetlands within banks tend to be larger and they are less diverse in type than the wetlands that are lost. Studies have shown that consolidation threatens the diversity and abundance of amphibians and wetland birds. Mitigation banking rests not on arguments concerning its environmental benefits, but on arguments concerning the benefits it provides to humans.

Introduction

In accordance with Section 404 of the Clean Water Act (33 USC §1344) one may not place dredged or fill material within protected wetlands (those that are waters of the United States) unless one obtains a special permit from the United States Army Corps of Engineers (or other authorized agency). The Corps typically sets as a condition for issuing a Section 404 permit the restoration or creation of an equal or greater number of acres of wetlands to compensate for the wetlands that are lost. Increasingly, compensatory mitigation takes the form of mitigation banking. A mitigation bank is a large wetland or wetland complex that is restored or created for the purpose of selling credits to compensate for the loss of natural wetlands. The credits represent a certain number of acres of newly restored or created wetlands. The Corps often sets as a condition for issuing a Section 404 permit the purchase of a certain number of bank credits. Mitigation banking is now emphasized within Corps' policy, and it has become big business within the United States (Coleman, n.d.). It is often presented as a "win-win-win" solution (see for example Neff, 2000, and Washington State Department of Ecology, 2007). Private developers and government agencies seeking a permit simply buy the required number of credits, Corps regulators are able to more efficiently approve permit applications, and there are supposedly benefits to the environment.

As will be discussed, however, studies have shown that mitigation banking threatens biodiversity. The problem is consolidation. As natural wetlands are destroyed and replaced through mitigation banking, small, isolated wetlands scattered through the landscape are replaced by one large wetland or wetland complex. Banking collapses wetlands that lie within a large geographical area into a relatively small area. The historic pattern of wetlands within a landscape is not respected. Bank wetlands are typically larger than the wetlands they replace. Also, wetlands within banks are less diverse in type than the wetlands they replace. Bank wetlands tend to have stable water levels. In natural wetlands, water levels are not stable through the year, but fluctuate seasonally. Although proponents of banking claim that banking is environmentally beneficial, ecologists warn of the environmental consequences of consolidation. As will be discussed, studies have shown that consolidation threatens the diversity and abundance of amphibians and wetland birds. Mitigation banking rests not on arguments concerning its environmental benefits, but on arguments concerning needs within our society for economic development and efficiency in the development process. In short, banking rests on arguments concerning its benefits to humans.

In the past, the Corps and the United States Environmental Protection Agency (EPA) emphasized “on-site” mitigation, that is, locating mitigation wetlands adjacent to the wetlands that are affected by development. The 1990 Memorandum of Agreement between EPA and the Corps (EPA, 1990) concerning mitigation clearly gives priority to on-site mitigation. According to this document, “Compensatory actions should be undertaken, when practicable, in areas adjacent or contiguous to the discharge site (onsite compensatory mitigation)” (Policy section, Compensatory Mitigation). Mitigation banking is given low priority. In guidance issued in 1995, EPA and the Corps reiterate their preference for on-site mitigation, but the agencies stress the virtues of mitigation banking and give Corps regulators latitude to require banking as compensation (EPA, 1995). In April of 2008, EPA and the Corps issued a new rule (a federal regulation) concerning compensatory mitigation. The new rule drops the preference for on-site mitigation. Banking is placed first among mitigation options (EPA, 2008). The new rule states: “the district engineer should give preference to the use of mitigation bank credits ...” (p. 19673).

In many cases, mitigation banks sell credits to compensate for wetland losses within very broad geographical areas. The 1995 guidance suggests that a bank’s “service area” be limited to a county or watershed (EPA, 1995), but each bank lies within a number of nested watersheds, leaving open the possibility of extending a bank’s service area to large parts of an entire state.¹ Additionally, banks typically allow sales of credits for projects that fall outside their official service areas. The result is that banking collapses wetlands within a broad geographical area into a relatively small area. Perhaps the most extreme example is the Mile High Wetland Bank in Colorado. This bank’s service area includes eight counties and is approximately 10,000 square miles in size, yet bank wetlands are gathered into an area of less than 1,000 acres (see Mile High Wetlands Group, 1999, Overview page, also Environmental Law Institute, 2002, pp. 47-48). The Delta Mitigation Bank in northern Mississippi is only 553 acres in size, yet the service area for this bank is enormous, extending along the Mississippi River through 28 counties from Jackson almost to Memphis (Delta Mitigation Bank, 2008, Service Area page). In Oregon, the Foster Creek Mitigation Bank’s service area covers roughly 350 square miles (estimate from map), which is approximately 200,000 acres, yet bank wetlands occupy only 72 acres (Oregon Department of State Lands, 2007). Maps available on the Internet (search under “mitigation banking service area”) illustrate very well the collapsing of wetlands due to banking in different states across the country.

The Society of Wetland Scientists (SWS) recently endorsed mitigation banking. In a position paper on banking, the SWS (2007) states: “Generally, large wetlands are preferred over small ones because they provide habitat for species that do not survive in small, isolated wetlands” (Scientific Considerations section). Federal and state regulatory agencies, as well as banking companies, praise the environmental benefits of banking. In a recent report on banking, the California Department of Fish and Game (2007) makes this strong claim: “Mitigation banking helps to consolidate small, fragmented wetland mitigation projects into large, contiguous sites which will have much higher wildlife habitat values” (Mitigation Banking section). The new rule issued by EPA and the Corps justifies the emphasis on banking in part by saying “Mitigation banks typically involve larger, more ecologically valuable parcels” (EPA, 2008, p. 19673). According to the Delta Mitigation Bank (2008), “the environment benefits from having one large, high quality wetland rather than several traditional ‘postage stamp’ off-site wetlands” (Benefits page).

The Problem of Consolidation

Yet ecologists have emphasized the value of small, isolated wetlands, and they have warned of the ecological consequences of consolidation. In an essay, Raymond Semlitsch (2000) is critical of regulatory agencies including EPA and the Corps of Engineers. He writes, “While the regulatory landscape values larger wetlands over smaller ones, the ecological landscape presents a different view” (p. 5). Semlitsch believes that a number of wetland-dependent plants and animals require a sufficient density of small, isolated wetlands scattered through the landscape. Considering pond-breeding amphibians, the proper distribution of wetlands in the landscape allows amphibians from one area to recolonize wetlands in another area after drought or some other natural catastrophe has led to extinction. According to Semlitsch (2002), pond-breeding amphibians are subject to naturally high rates of extinction. Amphibian populations “vary widely in size, have episodic recruitment, are subject to local extinction, and depend on recolonization” (p. 621). Small wetlands serve as stepping stones in amphibian dispersal, Semlitsch

explains, allowing recolonization. Small, isolated wetlands are also important as habitat for amphibian reproduction. In his studies of Atlantic Coastal Plain wetlands in South Carolina, Semlitsch has found that small wetlands, which tend to dry out seasonally, produce greater numbers of juvenile amphibians than do large wetlands. The drying-out process effectively reduces fish predation (Semlitsch, 2000). Semlitsch is concerned that the loss of small, isolated wetlands interferes with amphibian metapopulation dynamics and results in population losses. He and other ecologists believe that the observed drastic declines in amphibian populations are due in part to habitat destruction (see Semlitsch, 2002, Rothermel & Semlitsch, 2002, Marsh & Trenham, 2001). Semlitsch recommends protecting wetlands even as small as 0.5 acre. We should not simply assume that one large wetland of 40 acres is ecologically equivalent to 40 small, isolated wetlands of one acre each. Semlitsch writes, "Small isolated wetlands are not expendable if the goal is to maintain present levels of biodiversity" (2000, p. 13). Also, "The biodiversity value of a wetland is ... intimately tied to its position on the landscape with respect to other wetlands" (p. 6). He recommends that conservation efforts include restoration of "the natural density and spatial configuration of wetlands" (2002, p. 623).ⁱⁱ

A recent study of mitigation banks in Ohio by Mack and Micacchion (2006) represents, in the words of its authors, "the most comprehensive, detailed effort to evaluate the success of mitigation banking undertaken to date" (p. 2). The authors describe a number of problems, one of which is that in Ohio the wetlands within banks do not well represent the diverse types of wetlands lost to development. Shrub wetlands and forested wetlands are gradually being replaced by emergent wetlands (marshes and wet meadows). According to Mack and Micacchion, in Ohio "50% or more of permitted wetland impacts are to forested wetlands" (p. 17), yet only 11% of the acreage of mitigation banks consists of forested wetlands. The authors write that the scarcity of forested wetlands "is a serious omission in bank restorations" (p. 17). Shrub wetlands are also poorly represented. According to the authors, "No good examples of typical Ohio shrub communities were observed at any of the bank sites" (p. 7). Shrub and forested wetlands are relatively difficult and expensive to construct, mainly because it takes years for wetland shrubs and trees to mature (National Research Council, 2001, p. 23). Emergent wetlands are relatively easy and inexpensive to construct. Emergent wetlands constitute 63% of the replacement wetlands within Ohio mitigation banks (Mack & Micacchion, 2006, p. 7). The functions associated with shrub and forested wetlands, for example providing high quality amphibian habitat, are gradually being lost.

Another problem discussed by Mack and Micacchion (2006) is that a significant percentage of bank wetlands in Ohio (25%) are large, open-water ponds with steep slopes and little vegetation. They lack the vegetated, shallow areas that amphibians depend upon for feeding and hiding from predators. According to the authors, such ponds do not have natural counterparts, but they are constructed to replace natural wetlands. Also, bank wetlands in Ohio tend to have stable water levels. Again, in natural wetlands water levels are not stable through the year, but fluctuate seasonally. Bank wetlands do not mimic natural wetlands in this way. Stable water levels encourage the presence of predatory fish. Mack and Micacchion found predatory fish in 68% of mitigation bank wetlands. The authors write, "Not one bank site provided habitat for wood frogs or spotted salamanders, two species indicative of high quality sites" (p. 17). They conclude that compared to natural shrub or forested wetlands; Ohio mitigation banks have created poor quality amphibian communities.

Porej and Hetherington (2005) explain that the boundary area between wetland and upland is "a critical area for wetland-dependent organisms" (p. 453). Pond-breeding amphibians spend the terrestrial stages of their life cycles in these areas. In their study of compensatory mitigation wetlands in Ohio (not limited to mitigation banks), the authors found that typically one large wetland is created for every 3 smaller wetlands that are lost to development. They estimate that this practice eliminates over 30% of wetland/upland boundary. This "consolidation of smaller wetlands into larger ones may ... limit the functioning of replacement wetlands as quality amphibian habitat" (p. 453). The authors are also concerned with the reduction of wetland types as small wetlands are replaced by fewer, large wetlands. A high percentage of compensatory mitigation wetlands in Ohio (reported as over 36% in Porej, 2002) are large ponds with steep slopes and little vegetation. These are comparable to gamefish ponds in design. In surveys, Porej and Hetherington (2005) found that such ponds are "used by only a limited number of amphibian species" (p. 452). They write, "Given the diverse habitat requirements of amphibians in our region, one type of wetland is not likely to provide adequate habitat for all species" (p. 453). The authors

cite studies showing that birds, aquatic snakes, and turtles also require a diversity of wetland types in close proximity to maintain species diversity. They recommend that “consolidation be avoided, and that several diverse wetlands be created in lieu of one large wetland” (p. 453).

In a review of the literature on compensatory mitigation, Gwin, Kentula, and Shaffer (1999) found that a common wetland type, palustrine open-water wetlands, “were required as mitigation for the destruction of wetlands of a variety of types, not only in Oregon, but also in California, Washington, and several southeastern states” (p. 478). The authors claim that, apparently, the shift to palustrine open water wetlands is occurring throughout the country. They believe that the increase in abundance of open water wetlands leads to greater problems with exotic and nuisance species, including, in the Pacific Northwest, introduced bullfrogs. Bullfrogs require permanent open water, and they have been “associated with predation on, and the decline of, several native species of amphibians,” including red-legged frogs (p. 478). The authors conclude with this warning: “The specific ecological effects of increasing the abundance of open water wetlands and decreasing the abundance of other types are unknown” (Gwin et al.).

Krapu, Pietz, Brandt, and Cox (2004) write that as prairie pothole wetlands have been destroyed in the American Midwest to create cropland, replacement wetlands have typically been large and concentrated within relatively small areas. The new wetlands tend to be permanent in the landscape. Krapu et al. found that in the prairie pothole region of North Dakota, the larger, permanent expanses of fresh water allow mink to survive periods of drought, resulting in greater numbers of mink and increased mink predation on ducklings. The authors write, “wetland consolidation potentially poses the greatest long term source of expansion of permanent fresh water” (p. 338). This “creates conditions that may allow mink to survive drought at higher densities than in the past, thereby increasing duckling mortality from predation” (Krapu et al.). Also, the permanency of the new wetlands reduces the growth of wetland plants, leading to lower production of macroinvertebrates. This in turn causes slower growth of ducklings and higher duckling mortality. The authors are concerned with the effects of consolidation on gadwall, mallards, ruddy ducks, American coots, and pied-billed grebes. Relatively sedentary species such as ruddy ducks are likely more vulnerable to mink predation. The authors caution wildlife managers to “consider risks to migratory waterbird populations” when proposed projects will “create permanent water bodies” in the Prairie Pothole Region (p. 339).

Finally, McParland and Paszkowski (2006) studied the effects of introducing small fish into Aspen Parkland pothole wetlands in central Alberta. Their results suggest that the introduced fish reduced the number of invertebrates available to wetland birds, specifically, blue-wing teals. The reduced number of invertebrates resulted in changes in the foraging behaviors of the birds (p. 53). The results of this study suggest that in these wetlands small fish compete with these birds for invertebrate prey. The authors conclude by writing that consolidation of small wetlands into larger wetlands should be avoided, since larger wetlands may allow fish to survive periods of drought, which reduces the food available to blue-wing teals and perhaps other wetland birds (p. 54).ⁱⁱⁱ

Here is a brief summary of important points from the above studies and essays: the proper distribution of small, isolated wetlands in a landscape is critical for dispersal and recolonization of amphibians and perhaps other species, and so is essential for maintaining biodiversity. The loss of these wetlands may be one of the causes of the observed drastic declines in amphibian populations. Large wetlands with stable water levels encourage the presence of fish that prey on amphibians. In Ohio and perhaps other states, a large percentage of bank wetlands contain predatory fish. A high percentage of compensatory mitigation wetlands in Ohio and other states are large ponds with stable water levels, steep slopes, and little vegetation. Yet such ponds have little value as wildlife habitat (see Mack & Micacchion, 2006, p. 20, also Porej, 2002, p. 157). Replacing small, isolated wetlands with fewer, large wetlands eliminates wetland/upland boundary critical for amphibians. And the reduction of wetland types to one type, typically an emergent or open-water wetland, is a problem throughout much of the country. This practice eliminates habitat for amphibians and wetland birds. More specifically, in Ohio the loss of shrub and forested wetlands eliminates high-quality amphibian habitat. Large expanses of permanent fresh water in the Prairie Pothole Region enable mink to survive drought, leading to increased mink predation on ducklings. In central Alberta, large, permanent wetlands encourage the presence of fish that may

compete with blue-wing teals and perhaps other species of wetland birds for food. The increased abundance of open-water wetlands across the country encourages colonization by exotic and nuisance species such as bullfrogs, which prey on other amphibians.

Problematic Endorsements

The Society of Wetland Scientists (SWS) has recently endorsed mitigation banking for this reason among others: “Generally, large wetlands are preferred over small ones because they provide habitat for species that do not survive in small, isolated wetlands” (SWS, 2007, Scientific Considerations section). The SWS acknowledges, however, that large wetlands are not always preferred. Some small, isolated wetlands are ecologically quite valuable, the SWS notes, including vernal pools, and wetlands such as prairie pothole wetlands that “provide food support along migratory paths” (SWS). Semlitsch (2000) claims, however, that small, isolated wetlands widely provide support for amphibians and perhaps other wetland-dependent species along dispersal paths. He believes that small, isolated wetlands are generally valuable in this way. He also believes that small, isolated wetlands provide important habitat for amphibian reproduction. The claim that large wetlands are generally preferred over small, isolated wetlands is too strong. The SWS cites a report on mitigation banking by the Environmental Law Institute (1994), which describes the ecological benefits of large wetlands. The report also recognizes the importance of small, isolated wetlands. It goes on to say: “many species—salamanders for example—depend on small ‘patch’ wetlands” (p. 26). Porej and Hetherington (2005) stress that large wetlands do not provide the extent of wetland/upland boundary, critical to amphibians, provided by small wetlands. Predatory fish are more likely present in large wetlands. Assuming the goal is amphibian conservation, large wetlands are not preferable to small, isolated wetlands.

Also, given that the goal is to enhance habitat for ducks and other wetland birds in certain regions, additional large wetlands may not be preferable to small, isolated wetlands. Ecologists concerned with the effects of consolidation on wetland birds are not denying that large wetlands are ecologically valuable. In a survey of marsh wetlands in Iowa, Brown and Dinsmore (1986) found that larger marshes are richer in bird species than small marshes. They believe that small marshes “may exclude area-dependent species” such as mallards and black terns (p. 395).^{iv} Some wetland birds are classified as “open water birds,” including black terns, ruddy ducks, great egrets, great blue herons, and American white pelicans. According to Galatowitsch and van der Valk (1994), these birds require large wetlands, greater than 40 acres, with areas of open water (pp. 44-45). (For comparison, the small wetlands Semlitsch is concerned with are approximately 0.5 to 4 acres in size.) Yet ecologists are concerned with the risks of further creating large, permanent bodies of water in certain regions. Krapu et al. (2004) explain: “Permanent freshwater wetlands historically have been relatively scarce across much of the PPR [Prairie Pothole Region]” (p. 332). They believe that in the past drought probably drastically reduced numbers of mink in this region. Consolidation has led to higher abundance of mink. Wildlife managers often support the creation of additional large, permanent wetlands for the sake of enhanced waterfowl habitat, but as Krapu et al. point out, they should be aware that by doing this they may be severely limiting the production of ducks.

The California Department of Fish and Game (2007) writes, “Mitigation banking helps to consolidate small, fragmented wetland mitigation projects into large, contiguous sites which will have much higher wildlife habitat values” (Mitigation Banking section). Within the text of the new rule concerning compensatory mitigation, EPA and the Corps (2008) write, “Mitigation banks typically involve larger, more ecologically valuable parcels” (p. 19673). These statements illustrate the problem addressed by Semlitsch (2000): regulatory agencies overstate the value of large wetlands. Large wetlands are presented as ecologically more valuable in all contexts. Small, isolated wetlands are portrayed as relatively unimportant and expendable. The Delta Mitigation Bank (2008) makes this unjustifiable assertion: “the environment benefits from having one large, high quality wetland rather than several traditional ‘postage stamp’ off-site wetlands” (Benefits page). Contrary to claims such as these, the studies discussed above suggest that in order to preserve biodiversity wetlands should be protected and restored in a natural array, specific to each region, of types, sizes, density, and distribution in the landscape (see Semlitsch, 2002, p. 623). According to a report on compensatory mitigation by the National Research Council (2001), we should “recognize the need for and the desired locations of

wetlands of all sizes and types,” and not automatically favor “fewer large, charismatic compensatory mitigation wetlands” (p. 144).

The Real Argument for Banking

A certain benefit to the environment is often mentioned within arguments for banking: bank wetlands are constructed far from economic development, so they are much less likely to be harmed by pollution, habitat fragmentation, and other consequences of development than are on-site mitigation wetlands. Since bank wetlands are constructed in areas that are economically less valuable, they are much less likely to be threatened by future development.^v According to the Environmental Law Institute (2002), EPA and the Corps currently favor banking because past emphasis on “on-site” mitigation led to the construction of new wetlands within developed areas, with a high rate of failure (p. 17). In the introduction to the new rule concerning mitigation, EPA and the Corps write, “We disagree that the rule should establish a preference for on-site compensatory mitigation because the failure rate for such projects is quite high” (EPA, 2008, p. 19601). A large bank wetland may be ecologically more valuable than a number of smaller, on-site mitigation wetlands because it is located further from economic development and potential development.^{vi}

Another environmental benefit often attributed to banking is that bank wetlands are designed and constructed by those who are properly trained in such work. We can expect that, due to proper expertise and resources, bank wetlands will have a higher probability of success than the mitigation wetlands constructed under responsibility of the “permittees,” those granted Section 404 permits (see for example EPA, 2008, p. 19673). Wetland mitigation has often been attempted by those who lack proper expertise. Mitsch and Wilson (1996) address this problem, writing that “projects are often carried out by organizations and individuals not well versed in wetland ecology” (p. 78). Those who attempt to restore or create a wetland must have “substantial training in plants, soils, wildlife, hydrology, water quality, and engineering” (p. 82). It may be preferable, then, to place responsibility for wetland mitigation in the hands of specialists within banking companies. Advertisements for commercial mitigation banks stress this benefit of banking, for example: “Implementation and maintenance of a bank requires the focus of significant technical, financial and institutional resources that are dedicated solely for banking purposes” (Mile High Wetlands Group, 1999, Benefits page). It should be mentioned, however, that bank wetlands have not been particularly well constructed from the standpoint of creating high-quality amphibian and bird habitat (see Mack & Micacchion, 2006, also Porej, 2002).

In the early days of banking, it was claimed that banking is environmentally beneficial since bank wetlands are in place and functioning prior to selling credits, with the result that there is no lag time between permitted losses and compensation for those losses. Indeed, the 1995 guidance on banking issued by EPA and the Corps defines “mitigation banking” as:

the restoration, creation ... of wetlands and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. (EPA, 1995, Background section)

In later years, however, banks have not generally provided this benefit. In many cases, bank wetlands are not complete and functioning prior to selling credits. According to the Environmental Law Institute (2002), “as many as 92% of the nation’s banks allow credits to be withdrawn from a bank in advance of bank maturity” (p. 63). Recently, EPA and the Corps adopted a new definition that does not specify that banking provide mitigation in advance of authorized impacts. Within the new rule, “mitigation bank” is defined as:

a site, or suite of sites, where resources (e.g. wetlands, streams, riparian areas) are restored, established ... for the purpose of providing compensatory mitigation for impacts authorized by DA [Department of the Army] permits. (EPA, 2008, p. 19673)

Within the rule, the agencies explain that since an approved bank development plan and “real estate and financial assurances” must be in place prior to selling credits, a mitigation bank may reduce the temporal

loss of wetland (or other resource) functions compared to permittee-responsible mitigation (p. 19673). Banking no longer provides assured mitigation in advance, but it may reduce the lag time between permitted wetland losses and compensation for those losses.

It can be argued that the above environmental benefits of banking are offset or outweighed by the negative environmental consequences of consolidation. With banking we are placing wetlands out of the way of actual and possible economic development, with its pollution, habitat fragmentation, etc., and we are possibly reducing the lag time between wetland losses and compensation for those losses. But the documented negative impacts of consolidation include destruction of dispersal pathways for amphibians and perhaps other species, loss of diversity of wetland types, loss of wetland/upland boundary, and creation of conditions that lead to increased fish predation on amphibians, mink predation on ducklings, greater numbers of exotic and nuisance species such as bullfrogs, as well as other problems. It appears that consolidation is especially harmful to amphibians. It is worth noting that consolidation would still be a problem even if banking were done in an ecologically more responsible fashion, with restoration or creation of a complex of small wetlands rather than one large wetland, with greater diversity of wetland types, gradual slopes for the pools, fluctuating water levels, more wetland/upland boundary, etc. Inherent within the Corps' permitting and mitigation process, with its emphasis on banking, is the loss of small, isolated, scattered wetlands and their replacement by wetlands concentrated within relatively small areas, in some cases within landscapes in which such an arrangement has historically been rare. This is in itself, apparently (from the above studies), harmful to amphibians and wetland birds. In spite of claims that banking is a "win-win-win" solution, mitigation banking is not genuinely supported by arguments concerning its environmental benefits. Mitigation banking actually rests on arguments concerning the need for economic development within our society, and the efficiency banking makes possible in the permitting process and in monitoring and maintenance of the new wetlands.^{vii} Banking actually rests on arguments concerning its benefits to humans.^{viii}

The New Rule: Less Protection for Wetlands

Underlying the Section 404 permitting process has always been the assumption that wetland preservation should be balanced with economic development (Environmental Law Institute, 2002, p. 7). With the more traditional on-site mitigation, wetlands were preserved in roughly their natural distribution in the landscape. EPA and the Corps also favored "in kind" mitigation, which called for the restoration or creation of wetlands of the same type and functions as the wetlands that are lost (EPA, 1990). Wetland preservation was balanced with economic development, but with on-site and in-kind mitigation preservation was heavily weighted in the balancing, at least in theory. Development might be limited to some extent for the sake of preservation. The agencies placed compensatory mitigation within a required sequence: avoidance, minimization, and mitigation. Developers were required, first, to avoid wetland impacts, and then minimize unavoidable impacts by project modifications. Mitigation was the third step, required for those wetland losses that are unavoidable after "all appropriate and practicable minimization has been required" (EPA, 1990, Policy section, Compensatory Mitigation). The emphasis on on-site and in-kind mitigation fit well into this generally protective stance.

The new rule is less protective. The rule requires avoidance of wetland impacts: "Permit applicants are responsible for proposing an appropriate compensatory mitigation option to offset unavoidable impacts" (EPA, 2008, pp. 19672-19673). There is no longer a requirement to minimize wetland impacts, however, through project modifications. The preference for in-kind mitigation has been maintained (p. 19675), but off-site mitigation in the form of banking is given highest priority. Within the new rule wetland preservation is balanced with economic development, but considering that project modifications are no longer required, and that the rule encourages consolidation of wetlands, development is more heavily weighted in the balancing. The new rule represents failure within our society to live up to the high ideals represented in earlier regulations and federal legislation. The National Environmental Policy Act of 1969, section 101, for example, calls for us to coexist with nature "in productive harmony" (42 USC §4331). The announced goal of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC §1251).

One task of environmental philosophy is to uncover assumptions that lie behind environmental policy. This is an assumption that underlies mitigation banking: wetland preservation must accommodate desired high levels of economic development and efficiency in the development process. With adoption of the new rule, this assumption is now embedded within agency policy.

ⁱ The service area is to be “the area wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources” (EPA, 1995, Geographic Limits of Applicability section). The new rule includes similar language. The new rule suggests that a bank’s service area be “the watershed, ecoregion, physiographic province, or other geographic area” (EPA, 2008, p. 19682).

ⁱⁱ Semlitsch (2002) writes:

more restoration of the metapopulation landscape to the natural density and spatial configuration of wetlands is critical.... This may necessitate the development of new, small, artificial wetlands that replace those degraded or lost to development and act as ‘stepping stones’ to help increase connectivity and, potentially, recolonization among extant populations. (p. 623)

In a recent article, Semlitsch (2008) writes that in pond-breeding amphibians “movement among populations is essential for recolonization after local extinction” (p. 260), especially, he adds, in “fragmented and altered landscapes” (pp. 264 and 265). Attempts to conserve amphibians should focus on “the importance of pond density and distributions” (p. 265).

ⁱⁱⁱ Potthoff and Butler (2002) write that “the increase in depth of many prairie pothole wetlands due to drainage and consolidation” has led to far greater numbers of fathead minnows and more permanent populations (abstract). The fish have reduced zooplankton and macroinvertebrate diversity and abundance, resulting in much higher numbers of algae. The “overall degradation of wetlands deters waterfowl use,” they write (abstract).

^{iv} Brown and Dinsmore (1986) do not conclude that larger marshes are better. They found that there is a limit. The sites richest in bird species were not the largest sites in their survey. Also, they found that a complex of small marshes contained more species than one large, isolated marsh. They recommend that wildlife managers give preference to preserving and creating complexes of small marshes over large, isolated marshes. Complexes of small marshes offer greater habitat heterogeneity (p. 397).

^v In our society we have not learned to coexist with wetlands. Some progress has been made. For example, tunnels have been developed that allow amphibians to cross safely under roads (Jackson, 2003 and 1996). A troubling aspect of the new emphasis on banking is that it removes the incentive to learn to live with wetlands. With banking, we are gradually pushing wetlands from our everyday lives.

^{vi} It must be pointed out, however, that some bank wetlands *are* threatened by economic development. An investigative reporter, Pittman (2006), writes that in Central Florida the “preserved-in-perpetuity” Reedy Creek Mitigation Bank lies in the path of a proposed road to a subdivision. Two banks in North Florida lie in the path of a natural gas pipeline. The Florida Wetlandsbank has become “an island of green surrounded by [urban] sprawl” (section 6). Pittman also reports that a number of Florida banks include much dry land. For example, over 90 percent of Lake Louisa’s credits correspond to dry land, not wetlands. Considering ten mitigation banks in Florida, over a third of their credits correspond to dry land. This is not to say that these banks preserve valuable wetland/upland boundary. These banks preserve “bone-dry uplands” that are not wetland related.

^{vii} “Consolidation of mitigation at a bank makes agency compliance more effective. Rather than visiting many individual mitigation sites, a regulator need visit only a single bank site” (National Research Council, 2001, p. 68).

^{viii} Mitigation banking also harms people, however. King and Herbert (1997) studied mitigation banking in Florida. They found that as wetlands are lost in more economically developed areas and constructed in

less developed areas, important wetland functions such as flood control, water purification, wildlife habitat, and recreation are lost to people who live in the more developed areas. Those who live in less developed areas gain wetland functions. According to these authors: "The data clearly show that the siting of mitigation banking and permitting is resulting in a transfer of wetlands from highly urbanized, high population density areas to more rural, low-population density areas" (p. 11). We are, they write, experiencing a "market-driven 'migration' of wetlands" across the landscape (King & Herbert). A more recent study of mitigation banking in Florida reaches the same conclusion. See Ruhl and Salzman (2006).

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Gordon Steinhoff, Ph.D. gordon.steinhoff@usu.edu, Department of Languages, Philosophy, and Speech Communication, Utah State University, Logan, UT 84322-0720, USA. Phone: 1-435-797-3688.

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