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"No Net-Loss" – Instrument Choice in Wetlands Protection

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Introduction

Since European settlement, the continental United States has lost roughly half of its wetlands through drainage, conversion and erosion.[2] Much of this destruction has occurred over the last five decades, with annual losses of almost 60,000 acres of wetlands occurring just six years ago. [3] Beyond the aesthetic loss, this has resulted in real economic loss. Wetlands provide a range of ecosystem services, from trapping nutrients and sediments, water purification and groundwater recharge to flood control and support of bird, fish and mammal populations. While not sold in markets, all of these services have real value. Often, however, their value is only realized after the wetlands have been destroyed – when property owners survey their flooded homes or face a large tax increase to pay for a new water plant to treat polluted drinking water. Opinions may differ over the value of a wetland's scenic vista, but they are in universal accord over the contributions of clean water and flood control to social welfare.

While not a high priority issue for most people, the public has long recognized the general importance of wetlands. During President George H.W. Bush's campaign in 1988, he pledged to ensure there would be "no net loss" of wetlands. President Clinton reiterated this commitment in his campaign four years later. In its National Wetlands Mitigation Action Plan issued in December, 2002, President George W. Bush's administration stated its commitment to no net loss of wetlands.[4]

Despite these continuous presidential pledges to protect wetlands, in recent decades, as more and more people have moved to coastal and waterside properties, the economic benefits from developing wetlands (and political pressures on obstacles to development) have significantly increased. Seeking to mediate the conflict between no net loss of wetlands and development pressures, the U.S. Environmental Protection Agency (EPA) and Army Corps of Engineers (Corps) have employed a range of policy

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[1] Professor of Law and Environmental Policy, Duke University; Professor, Florida State University School of Law. This article draws from our prior publications in the area, including James Salzman and J.B. Ruhl, *Currencies and the Commodification of Environmental Law,* 53 STANFORD LAW REVIEW 607 (2001) [hereinafter Currencies]; J.B. Ruhl and J. Gregg, *Integrating Ecosystem Services Into Environmental Law: A Case Study of Wetlands Mitigation Banking,* 20 STANFORD ENVIRONMENTAL LAW JOURNAL 365 (2001); and James Salzman and J.B. Ruhl, *Paying for the protection of watershed services – lessons from wetland banking in the USA***,** in S. Pagiola et al., SELLING FOREST ENVIRONMENTAL SERVICES: MARKET-BASED MECHANISMS FOR CONSERVATION (2002). The authors are particularly grateful for the comments of Michael Bean, Jim Boyd, Dan Cole, Dick Craswell, Alyson Flournoy, Jody Freeman, Royal Gardner, Larry Goulder, Bob Hahn, Oliver Houck, Jason Johnston, Charlie Kolstad, Carol Rose, Mark Seidenfeld, Dick Stewart, Dan Tarlock, Buzz Thompson, and Tom Tietenberg. The empirical research for this article was supported by the U.S. Environmental Protection Agency's Science to Achieve Results (STAR) program grant R82612-01. Because this article was not subjected to any EPA review and does not necessarily reflect the views of the Agency, no official endorsement should be inferred.

[2] http://www.epa.gov/OWOW/wetlands/vital/status.html

[3] Information on the current status of US wetlands can be found at http://www.epa.gov/owow/wetlands.

[4] http://www.epa.gov/owow/wetlands/NWMAP122402signed.pdf

instruments to slow and reverse wetlands conversion. Through the 1970s and 1980s, the EPA and the Corps relied on prescriptive regulation that discouraged development of wetlands and, even if a permit for wetland filling were granted, required on-site mitigation of destroyed wetlands to ensure no net loss. To defuse the growing political pressure for substantial change to this "404 Permit" process for developing wetlands, however, since the 1990s the agencies and state governments have favored a market mechanism that seeks to ensure wetlands conservation at minimum economic and political cost.

This instrument is known as wetlands mitigation banking (WMB). In WMB, a "bank" of wetlands habitat is created, restored, or preserved and then made available to developers of wetlands habitat who must "buy" habitat mitigation as a condition of government approval for development. This mechanism has also provided a model for endangered species protection and is in the process of being extended to other settings including watershed protection.

Given the shift in emphasis from prescriptive regulation to trading, the government's longstanding pursuit of no net loss of wetlands provides a particularly useful case study for this workshop. First, WMB provides a rare example of robust trading outside the air pollution context. As we shall see, trading habitat-based goods raises very different concerns than seen in trading mobile pollutants. Moreover, the history of wetlands protection shows an evolution from on-site mitigation to banking and offsite mitigation. In many respects, on-site mitigation represented a form of prescriptive regulation while banking introduces a market mechanism. Thus one can compare the application of different types of policy instruments in the same setting.

Second, examining WMB forces us to think carefully over how to assess the "success" of a trading program. The traditional measure would likely be efficiency. But one must also consider effectiveness. In this regards, WMB poses two different types of failures – failure of instrument design (a "front-end" problem) and failure of implementation through monitoring and enforcement (a "back-end" problem). As many of the case studies in this book illustrate, performance of WMB depends critically both on institutional design and implementation. Another important measure of success concerns distributional equity. Who wins and who loses from banking? Such concerns are far more difficult to assess as good or bad policy in habitat trading than the traditional "hot spots" of pollutant trading programs.

The first part of the paper describes the legal and historical background to wetlands mitigation banking, identifying the expected advantages, and highlighting the practical difficulties. The discussion then focuses on the three main limitations of WMB design: ensuring meaningful compliance monitoring, currency adequacy, and exchange adequacy. These theoretical concerns are then tested by looking at experiences to date in the field. The paper ends by drawing out key lessons for market-based approaches to watershed protection.

Wetlands Compensatory Mitigation

The primary law conserving wetlands in the United States is the Clean Water Act (CWA), passed in 1972. Section 311 of the CWA broadly prohibits "the discharge of any pollutant by any person" into navigable waters, where a pollutant is defined as a discrete unit of pollution (e.g., an emission of sulfur dioxide or discharge of toxic waste). On its face, this would seem to prevent the filling of most wetlands.[5] The CWA provides a limited exception to this prohibition in Section 404, which authorizes the Secretary of the Army to "issue permits, after notice and opportunity for public hearings for the discharge of dredged or fill material into navigable waters at specified disposal sites".[6] These permits, administered principally through the Army Corps of Engineers (the Corps) and known as "404 permits", "wetland permits", or "Corps permits", are the cornerstone of federal efforts to encourage protection of wetland resources through market-based means. The permitting program, however, suffers many exceptions and nuances. For the purposes of this discussion, we note that many routine land development activities require and receive 404 permits before they can proceed. Our focus is on how market mechanisms have been developed within this framework to promote the conservation of wetlands.

In granting 404 permits, the Corps guidelines call for a "sequencing" approach which essentially lists wetland protection actions in the following order of desirability: (1) avoid filling wetland resources; (2) minimize adverse impacts to those wetlands that cannot reasonably be avoided; and (3) provide compensatory mitigation for those unavoidable adverse impacts that remain after all minimization measures have been exercised.[7] Thus, when applying for a 404 permit, a developer must convince the Corps that no reasonable alternatives exist to the development of the wetlands, that the design of the development minimizes harm to the wetlands, and, if these two conditions have been satisfied, that other wetlands have been restored to compensate for the wetlands destroyed (known as "compensatory mitigation").[8]

The EPA and the Corps have traditionally preferred on-site to off-site locations for compensatory mitigation activities, and have preferred in-kind mitigation to mitigation that uses a substantially different type of wetland.[9] As an example, if a mall is built on a salt marsh, on-site mitigation would require restoring a wetland on immediately adjacent land (versus a distant site) and in-kind mitigation would require restoring a salt marsh (versus a fresh water cattail marsh). Finally, regardless of location, the EPA and

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[5] Although the CWA makes no reference to wetlands with respect to the 404 program, early in the program's history judicial interpretation required the Corps to extend its reach to tidal wetland areas. *See* Natural Resources Defense Counsel v. Callaway, 392 F. Supp. 685, 686 (D.D.C. 1975).

[6] The EPA has the power to veto Corps permits if it finds the discharge would have an unacceptably adverse effect on environmental resources, but it has exercised this power infrequently. *See* S. Burkhalter, *Oversimplification: Value and Function: Wetland Mitigation Banking*, 2 CHAPMAN LAW REVIEW 1 (1999).

[7] *See* Memorandum of Agreement Between Department of the Army and the Environmental Protection Agency Concerning the Clean Water Act Section 404(b)(1) Guidelines, 55 Fed. Reg. 9210, 9211-12 (1990) [hereinafter Memorandum of Agreement].

[8] Section 404 does not mention a mitigation requirement for permit issuance. Rather, this provision of the statute directs EPA, in conjunction with the Corps, to develop guidelines that the Corps must apply in deciding whether to authorize the fill disposal at a wetlands site.

[9] Ecologists generally divide wetlands into seven major types, within which there is tremendous variation from region to region in terms of physical characteristics and functions. *See* ENVTL. L. INST., WETLAND MITIGATION BANKING 77 [hereinafter ELI-Wetland] (1993)

the Corps favor measures that restore prior wetland areas, followed by enhancement of low-quality wetlands and creation of new wetlands. Least-favored of all is the preservation of existing wetlands.

Notwithstanding its official status as the least-favored alternative in the agencies' sequence of preferences, compensatory mitigation proved popular because it freed at least some highly valued wetlands for development. Building a shopping center around an avoided wetlands site, on choice commercial development land, can present costly design constraints. Compensatory mitigation freed up highly valued wetlands for more comprehensive and flexible development. The developer is in the best position to evaluate these economic efficiencies and knows when the compensatory land swap is superior in comparison to the avoidance strategy. Compensatory mitigation thus took some of the "sting" out of 404 permits and reduced the frequency of incidents when 404 permitting could be portrayed as unreasonably obstructive.[10]

Nonetheless, the on-site and in-kind mitigation requirements remained unpopular with developers, who started exerting significant political pressure in the 1980s to loosen up or even gut the 404 permitting process. While compensatory mitigation does share some features of an offsets program, if closely following the Corps guidelines there are few opportunities for market transactions to arise for the simple reason that mitigation should take place *on site*. Calls for reform of the 404 program came from environmentalists, as well, who decried the practical experience of mitigation projects.

Indeed, while attractive in theory and providing some political shelter, the project-by-project compensatory mitigation approach soon became widely regarded as having failed miserably in terms of environmental protection. Whether on-site or near-site, the piecemeal approach complicated the Corps' ability to articulate mitigation performance standards, monitor success, and enforce conditions.[11] Many developers went through the motions of so-called "landscape mitigation"—planting what was required or regrading where required to meet the minimum letter of the permit—then moved on, leaving the "restored wetland" to revert back to its original habitat, usually a wetland in name only, if even that. For reasons that are still not entirely clear, there was remarkably little compliance monitoring of the mitigated sites by the EPA, the Corps, or relevant state agencies. Without the threat of being found out, a wetlands restoration expert bluntly noted, it was "easier and cheaper to hire, say, a landscaper who will design and build something that looks green and wet . . . than hire a restoration expert."[12] The net result of

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[10] *See* Royal C. Gardner, *Banking on Entrepreneurs: Wetlands, Mitigation Banking, and Takings*, 81 IOWA L. REV. 527, 586 (1996) ("The federal retreat from strict sequencing is an attempt to provide regulatory relief to small landowners and small businesses.") [hereinafter Gardner]. One study of commercial wetlands mitigation banks concluded that "it is the practice of regulators to relax the first two sequencing requirements—avoidance and minimization of wetland impacts—if the wetland that will be impacted is of low to mid quality," thus creating a market for mitigation. Shirley Jeanne Whitsitt, *Wetlands Mitigation Banking*, 3 ENVTL. LAW. 441, 463-64 (1997).

[11] *See* Michael S. Rolband, Antoinette L. Pepin, Chris Athanas & Ineke Dickman, *Wetlands Banking for Sound Mitigation? Yes, Virginia*, NAT. WETLANDS NEWSL., May-June 1999, at 4.

[12] Keith Bowers, *What Is Wetlands Mitigation?*, LAND DEVELOPMENT, Winter 1993, at 28, 33. Lawrence R. Liebesman & David M. Plott, *The Emergence of Private Wetlands Mitigation Banking*, 13 NAT. RESOURCES & ENV'T 341 (1998) [hereinafter LIegesman & Plott] (discussing a Florida state agency study finding a 27 percent success rate of such projects); Gardner, *supra* note 10, at 540-42 (discussing the Florida study); *see also* ELI-WETLAND, *supra* note 9, at 31 (discussing the dismal record of piecemeal on-

this institutional failure, as Royal Gardner observed, was that "the failure of compensatory mitigation is wetland regulation's dirty little secret."[13]

Enter the Market Mechanism

In light of these problems, the Corps and EPA (supported by many commentators) started shifting compensatory activities from on-site to off-site mitigation, thus opening the door for greater use of market instruments, in particular, the wetlands mitigation banking technique. This approach, its proponents argued, would prove advantageous both in terms of efficiency and ecological benefits, aggregating small wetlands threatened by development into larger restored wetlands in a different location. Defined generally as "a system in which the creation, enhancement, restoration, or preservation of wetlands is recognized by a regulatory agency as generating compensation credits allowing the future development of other wetland sites,"[14] wetlands mitigation banking allows a developer who has mitigated somewhere else in advance of development to draw from the resulting bank of mitigation "credits" as the development is implemented and wetlands are filled.

When contrasted with the compensatory mitigation experience, the arguments presented by EPA and the Corps for WMB in 1990 seemed compelling: [15]

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site mitigation projects); CHESAPEAKE BAY FOUNDATION, MARYLAND NONTIDAL WETLAND MITIGATION: A PROGRESS REPORT 30-39 (1999) [hereinafter Chesapeake Bay Foundation] (discussing independent study finding poor record of compensatory mitigation). It is also worth noting that while compensatory wetland mitigation policies relying primarily on wetland creation can result in no net loss of wetlands, they are likely to result in overall loss of habitat since the land being converted to wetlands usually is already open space. That is, the net result is less undeveloped land than before. Compensatory mitigation that relies on enhancement or preservation of existing wetlands is likely to produce a net loss of wetlands. *See* Alyson C. Flournoy*, Preserving Dynamic Systems: Wetlands, Ecology, and Law*, 7 DUKE ENVTL. L. & POL. F. 105, 128-29 (1996). Under any compensatory approach, of course, there is no guarantee that the mitigated site would have remained undeveloped indefinitely, but even in this sense the compensatory mitigation approach can present a baseline problem. Wetlands are dynamic systems. By considering only existing wetlands in deciding what should be protected, compensatory mitigation stifles the process of wetlands creation (e.g. the hardening of coastal shorelines). The result is an "invisible loss of wetlands" that are not naturally created and will never have the chance to become so. Interview with Alyson Flournoy, Professor, University of Florida School of Law (Apr. 28, 2000).

13 *See, e.g.,* Michael J. Bean and Lynn E. Dwyer*, Mitigation Banking as an Endangered Species Conservation Tool*, 30 Envtl. L. Rep. (Envtl. L. Inst.) 10537, 10538-9 (2000) [hereinafter Bean & Dwyer] ("The track record of traditional, project-by-project wetland mitigation is dismal."); Gardner, *supra* note 10, at 540 ("The failure of compensatory mitigation is wetland regulation's dirty little secret."); Virginia C. Veltman, *Banking on the Future of Wetlands Using Federal Law,* 89 NW. U.L. REV. 654, 670 (1995) [hereinafter Veltman] ("The California State Coastal Conservancy sponsored a review of fifty-eight permits issued for creation and restoration projects in the San Francisco Bay Area between 1978 and 1983. The report found that only two of the fifty-eight projects could be deemed successful.").

14 *See* ELI-WETLAND, *supra* note 9, at 3.

15 Federal Register, 1990. Virginia Veltman similarly summarizes the rationales cited for shifting from on-site to off-site mitigation locations and from small to large scales of mitigation sites:

> [O]ffsite mitigation provides a greater selection of hydrologically and ecologically favorable locations, thus increasing the opportunity for a well-functioning replacement. Additionally, offsite projects can be joined into one large mitigation, which is beneficial because 'larger wetland systems are generally more self-sustaining. They can provide habitat for more types of species, a longer and more self-sustaining food chain, more habitat niches, and a wider variety of habitat

- It may be more advantageous for maintaining the integrity of the aquatic ecosystem to consolidate compensatory mitigation into a single large parcel of contiguous parcels when ecologically appropriate.
- Establishment of a mitigation bank can bring together financial resources, planning, and scientific expertise not practicable to many project-specific compensatory mitigation proposals. This consolidation of resources can increase the potential for the establishment and long-term management of successful mitigation that maximizes opportunities for contributing to biodiversity and/or watershed function.
- Use of mitigation banks may reduce the time spent on permit processing and provide more cost-effective compensatory mitigation opportunities for projects that qualify.
- Compensatory mitigation is typically implemented and functioning in advance of project impacts, thereby reducing temporal losses of aquatic functions and uncertainty over whether the mitigation will be successful in offsetting project impacts.
- Consolidation of compensatory mitigation within a mitigation bank increases the efficiency of limited agency resources in the review and compliance monitoring of mitigation projects, and thus improves the reliability of efforts to restore, create or enhance wetlands for mitigation purposes.
- The existence of mitigation banks can contribute towards attainment of the goal of no overall net loss of the nation's wetlands by providing opportunities to compensate for authorized impacts when mitigation might not otherwise be appropriate or practicable.

To help describe how wetland banking works in practice, a pictorial representation is given in Figure 1 below. The developer obtains a permit from the Corps to fill 25 hectares of wetlands, and negotiates the permit conditions – in this case, to restore 50 hectares elsewhere. Rather than undertaking this restoration work itself,

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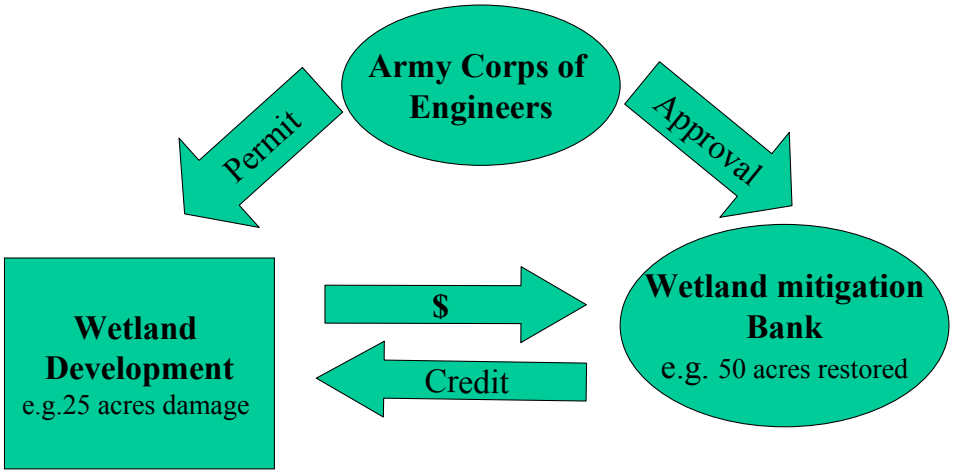
types—which, in turn, can better accommodate ecosystem succession, migration, and change.' Thus, the presumption in favor of onsite versus offsite mitigation often encourages, rather than prevents, poorly designed wetlands that will either fail or, if viable, provide a nonequivalent replacement.

Veltman, *supra* note 13, at 673 (citations omitted); *see also* Michael Rolland, *The Systemic Assumptions of Wetland Mitigation: A Look at Louisiana's Proposed Wetland Mitigation and Mitigation Banking Regulations*, 7 TUL. ENVTL. L.J. 497, 510-11 (1994) (noting also that on-site mitigation "puts the mitigation for wetlands loss in the hands of a sometimes hostile developer").

Notwithstanding these oft-cited benefits, replacing many small "postage stamp" wetlands with large contiguous mitigation projects is not necessarily always a desirable approach, as research indicates that some systems of small isolated wetlands provide more biodiversity value than a large contiguous wetland of the same type. In sufficient abundance and proximity, small isolated wetlands provide greater variability of conditions, insurance against natural perturbations, and source-sink population dynamics than can a contiguous wetland of equal total size. Moreover, the desirability of either kind of wetland habitat will depend on the particular species in mind, thus a policy favoring large contiguous wetlands necessarily disadvantages species that depend on systems of small isolated wetlands. *See* Raymond D. Semlitsch*, Size Does Matter: The Value of Small Isolated Wetlands*, NAT'L. WETLANDS NEWSL., Jan.-Feb. 2000, at 5.

however, the developer negotiates to acquire credits for the required 50 hectares from a wetland mitigation bank that has been approved by the Corps. The bank holds the legal and financial responsibility to maintain the restored wetlands, not the developer. In simple terms, wetlands mitigation banking can be described as a transaction where, in exchange for a payment from the developer, the wetlands mitigation banker informs the regulatory agency that a certain number of mitigation acres have been purchased by the developer (and which, presumably, are sufficient for the agency to grant the 404 permit to the developer).

Figure 1 – Wetland mitigation banking in practice



The establishment of Wetlands Mitigation Banks must follow clear federal (and increasingly state) guidelines. The *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks* (*Federal Guidance*) articulates a standard review procedure for establishing and using wetlands banks in the 404 permit process.[16] A prospective Bank must submit a prospectus to the Corps. This prospectus is reviewed by a Mitigation Bank Review Team that takes account of its compliance with the sequencing approach and other preferences applicable to compensatory wetlands mitigation. The

[16] *See* Federal Guidance, *Supra* note 16. *See generally* Gardner, *supra* note 10, at 563-69. A prospective bank sponsor must submit a prospectus to the Corps. The relevant federal and state agencies, known as the Mitigation Bank Review Team, use the prospectus to evaluate the merits of the bank pursuant to the sequencing approach and other preferences applicable to compensatory wetlands mitigation in general. The agencies and the bank sponsor then negotiate a banking instrument outlining all the details of bank objectives, ownership, operation, and enforcement. Finally, the proposed bank instrument is submitted for public notice and comment before a final bank instrument is implemented. A number of states have also provided statutory or regulatory frameworks for using commercial wetlands mitigation banks in satisfaction of state wetlands protection laws. *See* ELI-WETLAND, *supra* note 9, at 16-18; Gardner, *supra* note 10, at 569-77.

Review Team and Bank then negotiate all the details of Bank objectives, ownership, operation, and enforcement before the proposed Bank is submitted for public notice and comment. In addition to these federal guidelines, a number of states have provided statutory or regulatory frameworks for using wetlands mitigation banks to ensure compliance with state wetlands protection laws.

While there is no uniform bank model, most banks fit either a "single client" or "entrepreneur" approach. Under single client models, one developer, whether public (for example, a state roads department) or private (for example, a utility company), establishes a bank for personal use. The entrepreneur model involves a bank developer who intends to sell "credits" to a number of land developers from those building a mall or a housing complex to state highway departments building roads. In both cases, the banking entity must gain the approval of federal and state regulators.

With the support of federal agencies, as well as many environmental advocacy groups,[17] land development interests,[18] and academics,[19] the wetlands mitigation banking program has blossomed since the early 1990s.[20] A decade later, wetland mitigation banking now resembles a commodity market, with freewheeling, entrepreneurial wetlands banks offering for sale (and profit) finished off-site wetlands as "credits" to anyone who is in need of mitigation for their 404 permits.[21] It is precisely this technique that the Corps and EPA officially endorsed in their 1995 *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks*

In a wide range of fora, its advocates have contended that off-site mitigation banking should be preferred over on-site or near-site compensatory mitigation because of greater efficiency, scale effects, and environmental protection.[22] If these arguments seem similar to those advanced on behalf of mainstream environmental trading markets over the prescriptive model of regulation, it is no coincidence. Notwithstanding the substantial

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17 *See* ELI-WETLAND, *supra* note 9, at 153 (concluding that wetlands mitigation banking can offer ecological advantages to on-site mitigation in some instances and "can also provide economies of scale and greater regulatory certainty").

18 *See* Liebesman & Plott, *supra* note 17, at 371 (touting wetlands mitigation banking as "an innovative, market-based solution for many of the problems with the existing wetlands regulatory system").

19 *See* Gardner, *supra* note 10, at 557-62 (advocating the ecological and efficiency benefits of wetlands mitigation banking).

20 Dr. Robert Brumbaugh, manager of the Corps of Engineers' Institute for Water Research National Wetlands Mitigation Banking Study, reports that there were five banks in operation in 1985, 40 in 1992, and more than 100 in 1995 with hundreds more in development at that time. *See* Robert W. Brumbaugh, *Wetland Mitigation Banking: Entering a New Era*, WETLANDS RES. PROGRAM BULL., Oct.-Dec. 1995, at 3 & fig. 1 (available at <http://www.wes.army.mil/el/wrtc/wrp/bulletins/v5n3/brum.html>) [hereinafter Brumbaugh]]. An annual national conference on wetlands mitigation banking, now in its third year of production, has sponsors including the Corps, EPA, and a wide variety of private and public entities and pitches itself to mitigation bankers, landowners, developers, regulators, local government, suppliers, nurseries, engineers, and a host of others interested in banking policy and methods. *See 3rd National Mitigation Banking Conference: Learn About Wetlands, Habitat & Conservation Banking* (brochure for May 17-19 conference, Denver, Colo.).

21 There are over seventy such commercial mitigation banks operating in the United States today. *See* Lawrence R. Liebesman and David M. Plott, *The Emergence of Private Wetlands Mitigation Banking*, 13 NAT. RESOURCES & ENV'T 341 (1998).

22 *See* Federal Guidance, *supra* note 16, at 58,607. Banking also avoids the threat of takings claims that may arise from exercising the avoid and minimize requirements of sequencing.

expense and procedural rigor associated with establishing a commercial wetlands mitigation bank, the program, both conceptually and by official endorsement, has all the makings of a trading market. One commentator describes it as "akin to a commercial paper transaction: Party A (the credit producer) informs Party B (the regulatory agency) that the credits should be released to Party C (the entity with mitigation requirements)."[23] The Corps succinctly describes this feature of commercial wetlands banks as "an implicit move away from a rigid, onsite, in-kind preference for piece-meal compensatory mitigation towards a broader-based trading system that takes advantage of qualitative differences among wetlands and that can use the potential economic profits from the development of some low-valued wetlands (that may be doomed in any event)."[24]

What do such exchanges look like? The town of Libertyville, Illinois, for example, converted 80 acres of former corn fields into a wetland bank. A private company converted the fields into wetlands for $1.2 million. For every acre sold to developers as a mitigation credit, developers pay about $65,000 and the town gets $6,000.[25] Nationally, the cost of credits can run from as low as $7,500 in rural areas to $100,000 per acre in urban or suburban regions. In theory, the price covers the costs of maintaining and monitoring the site to ensure it maintains conditions conducive to wetland plant and animal life.[26]

The Corps of Engineers tracks the national acreage of permitted wetlands fill and mitigation required. From 1993 to 2000, 9,500 hectares of wetlands were filled in exchange for 16,500 hectares restored or created in mitigation.[27] Despite the rapid growth of mitigation banks and their use, though, a number of questions remain. At the top of the list we need to ask whether performance has matched expectations. Has wetlands mitigation banking led to the conservation of wetlands and "no net loss" of wetlands? In what follows, we disentangle the experience of wetlands mitigation banking by focusing on whether the trades have exchanged wetlands of equivalent value (an issue we call "currency adequacy") and how the exchanges have been restricted to ensure equivalent value (an issue we call "exchange adequacy").

Currency Adequacy

In any environmental trading market, whether exchanging sulfur dioxide, halibut, chlorofluorocarbons, or wetlands, a fundamental issue is determining the trading metric – the "currency". It is the currency that establishes what is being traded and therefore protected. Currencies drive the structure of environmental trading markets, directly influencing their construction, rules of exchange, and provision for public participation. Whether we can confidently trade "x" for "y" depends on what we are trying to maximize

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23 *See* Royal C. Gardner, *Federal Wetland Mitigation Banking Guidance: Missed Opportunities*, 26 Envtl. L. Rep. (Envtl. L. Inst.) 10075, 10075 (1996) [hereinafter Gardner II].

24 *See* Brumbaugh, *supra* note 22, at 4.

25 Madhu Krishnamurthy, *Wetlands restoration pays off for Libertyville* , CHICAGO DAILY HERALD, Aug. 14, 2001, at 4.

26 *See* Anika Myers, *Progress report; As Wetlandsbank enters ninth year, jury of environmentalists still out on mitigation efforts,* BROWARD DAILY BUSINESS REVIEW, April 19, 2001, at A1.

27 NATIONAL RESEARCH COUNCIL, COMPENSATING FOR WETLAND LOSSES UNDER THE CLEAN WATER ACT (2001, National Academy Press) [hereinafter NAS report].

and our standard of measurement, both of which turn on the currency of exchange. Put simply, unless the currency captures what we care about, we can end up trading the wrong things.

To ensure equivalent trades of wetlands, the currency must incorporate important values provided by both the wetlands to be lost and the wetlands used for mitigation. Of course, this begs the questions of *what* the relevant values are, how we measure them, and how we reflect them in a conveniently traded currency. Put another way, since 1988 successive presidential administrations have solemnly pledged to ensure no net loss of wetlands, but what does that mean? No net loss of *what*? If all that concerns us about wetlands protection is acreage, then the job is simple – identify acres of wetlands lost and restored and count up the net gain or loss in area. But is that really why we care about wetlands? Isn't it more likely that we care about wetlands, at least in large part, because of their functional value to the environment and the economy? If so, then counting acres may make for easy accounting but poor policy. Not all wetlands are created equal. Context matters. Wetlands differ by type, location, and the services they deliver. If one cares about the ability of wetlands to provide flood control, water quality, and to act as a nursery for fish and wildlife, then acres are a terrible currency because they cannot capture these service values. They necessarily remain absent to the transaction and become uncaptured externalities. In other words, unless currencies can capture some meaningful measure of service provision, wetlands become increasingly nonfungible commodities when their ecosystem values are considered.

To express this in a simple example, let's consider the ideal case of trading, where the objects exchanged are completely fungible and all variance across space, type, and time is eliminated. Here, trades of homogeneous commodities simultaneously take place in a small, discrete location—small blue marbles traded at the same time across a kitchen table. If we are trading identical blue marbles, the number of marbles may serve as a perfectly adequate metric (five marbles for five marbles). If we are trading blue and yellow marbles, the number and color of marbles are adequate currencies (three yellow marbles for four blue marbles). If, however, some marbles are highly radioactive and others are not, the simple currency metrics of color and quantity fail to capture an important variable.[28] If the currency cannot incorporate the environmental values we care about, these become external to the exchange and, as a result, trades may actually worsen the environment or natural services delivered. Inadequate currencies allow externalities to bleed out of the trading market. We may end up with a nice pile of marbles that glow in the dark.[29] In the extreme case, the currency can actually encourage

[28] To take another example, knowing that one car costs $20,000 and another costs $80,000 tells me a great deal about the cars and that consumers value one more than the other; but if I need to buy a car that can haul a trailer the currency of dollars is inadequate. It fails to capture an important value and express it. Or, to introduce a market dynamic, assume that apple trees in an orchard produce two types of apples, pretty and ugly, but that both taste the same. Farmers currently sell apples by the bushel. A supermarket will pay a higher price per bushel than a canning factory but only wants to buy pretty apples. In this case, there is a market incentive to develop a grading system (a more sophisticated currency) so the values important to the supermarket are meaningfully captured and communicated.

[29] In the above example, the currency must capture color, number, and, hopefully, radioactivity. Note, however, that a similar result may occur even if the currency *does* capture radioactivity. This will happen if the parties are indifferent to this value. In such a case the disjunction between between private and public interests in trading can result in a loss of social welfare.

environmentally harmful behavior.[30]

This problem is not unique to WMB. Indeed, the problem of currency adequacy is present in all environmental trading markets. As the table below sets out, nonfungibilities can arise across three dimensions—space, type, and time—in a number of settings and, depending on the market, an effective currency may need to capture all three.

Environmental Trading Market	Nonfungibility of Space	Nonfungibility of Type	Nonfungibility of Time
California Rule 1610: Program allows trading of reduced vehicle volatile organic emissions for increased refinery volatile organic emissions emissions	Vehicle emissions are geographically diffused versus "hot spot" of concentrated refinery emissions	Vehicle emissions may be less carcinogenic than refinery emissions	Vehicle emissions fluctuate in regular patterns over 24-hour periods whereas refinery emissions experience irregular peaks
Wetlands Mitigation Banking: Corps of Engineers permit allows destruction of wetlands in return for contributing to wetlands restoration project located elsewhere	The lost ecosystem services may have been delivered to many people whereas the services of the restored wetlands may be delivered to few	The destroyed wetlands may have had a higher capacity of service provision compared to the restored wetlands	The permit may allow destruction of the wetlands before the quality of the restoration of other wetlands is known
Habitat Conservation Plans: Fish and Wildlife Service permit allows destruction of endangered species habitat in return for securing preservation of another parcel of the habitat located elsewhere	The lost habitat may have been part of a contiguous habitat system for the species, whereas the preserved habitat may be isolated and thus of less overall value	The lost and preserved habitats may have provided functional values to different populations of the species, and we do not know which population is more important to the overall viability of the species	The lost habitat may have been of ideal vegetative maturity for the species, while the preserved habitat may require time to achieve that state
Acid Rain Program:	Emissions from the	Negligible potential for	The two plants may

Choosing the wrong currency increases the chances that environmental protection will suffer, but one might argue that serendipity can work both ways on a case-by-case basis and may, on occasion, lead to environmental improvements.

[30] [W]ith respect to fishing allowances, a [tradable environmental allowance] may employ a relatively simple measure, as would be the case where an individual fishing quota is measured in pounds or tons of a particular target fish. But fishermen know that bigger fish bring more at the market than smaller ones, and this can induce them to "high-grade," keeping the bigger fish and simply discarding the smaller (and now dead) specimens, with potentially disastrous effects on the fish population as a whole. . . . [T]he quest for simplicity in [tradable environmental allowances] has feedback effects on what actually gets preserved.

Carol Rose, *Expanding the Choices for the Global Commons: Comparing Newfangled Tradable Allowance Schemes to Old-fashioned Common Property Regimes*, 10 DUKE ENVTL L. AND POLICY FORUM 45, 60 (1999).

Market for SO_2 emissions allows power plant to exceed allowed emissions by purchasing credits from other power plants that emit less than their allowance	plant purchasing credits may be blowing over eastern states, whereas emissions from the plant selling credits may have been blowing over the ocean	differences	have different peak emissions periods if, for example, one is located in a cold climate (winter peak) and the other in a hot climate (summer peak)
Alaska Halibut Individual Transferable Quotas: Permits to catch Alaska Halibut are traded among fishers to avoid derby pressures in fishery	One fisher may catch in halibut breeding area, while other may catch fish in non-breeding zones	Tons of halibut does not account for bycatch, highgrading or size of fish (juvenile instead of mature)	One fisher may catch halibut during breeding season, while other catches out of breeding season

As the chart demonstrates, one can easily see how mitigation banking would encompass trades between nonfungible wetlands. Different types of wetlands may be exchanged for one another; wetlands in different watersheds might be exchanged; and wetlands might be lost and restored in different time frames. As the potential range of variables we care about increases, the need for a refined currency becomes acute. More particularly, when the currency cannot accurately capture the important values (e.g., the habitat service, the flood control service, the water filtration service) we have less reason to be confident in the equivalency of trades. Thus, assessing the success of WMB must start with an examination of the wetland assessment methodology used by banks and the government.[31]

To be meaningful, we argue, wetland assessment methodologies must be able to capture the provision of valuable services for both the wetlands to be lost and the wetlands used for mitigation. One might try to compensate for margins of error in estimating service provision values through using simple trading ratios. Thus, for instance, where the Corps is uncertain over the true range of functions it might require that two or three times as much wetlands area be restored as destroyed. This approach works well if our goal is no net loss of wetlands acreage, but fails to address meaningfully the conservation of wetlands services. Thus, for example, the loss from filling a wetlands that provides a valuable service of flood control upstream of a community cannot be meaningfully compensated by restoring twice as much wetlands that provides little flood control or, taking into account landscape context, the provides flood control downstream of the town.

To the extent that reliable measurements of function value can be made within a landscape, wetlands mitigation banking offers a flexible mechanism for achieving wetland protection goals at minimum cost. In practice, however, reviews of assessment methodology suggest that explicit measures of service values remain beyond the reach of virtually all assessment methods in use.

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[31] Wetland function assessment methods "attempt to establish, in either a qualitative or quantitative fashion, the nature and extent of different services which a wetland may provide. Once those services are known, they may be translated into a 'currency' which can serve as the medium of trade for a wetland mitigation bank." ELI-WETLAND, *supra* note 9, at 77.

The Corps has granted broad discretion to state and local authorities to select currencies.[32] Roughly forty different wetlands assessment methods have been developed, varying in terms of the type of habitats in which the method is used, the basic targets of assessment, and the functional and social values encompassed in the assessment.[33] Over half of the methods go beyond assessment of habitat suitability to encompass some assessment of wetland function, but many of these function-based methods are bounded by limitations on type of habitat for which the method can be used (e.g., coastal wetlands only) and limited in terms of the functions assessed (e.g., limited to avian species functions).[34] Moreover, the data requirements for these advanced methods are significant.[35]

Reviews of wetland assessment methodology theory and practice conducted since banking sprang onto the scene have categorized assessment methods into three major types:

> - *Simple indices* are derived from quickly and easily observed characteristics of a wetland, and usually serve as surrogate "indicators" of one or more ecological functions (for example, percent cover of aquatic vegetation).
> - *Narrowly tailored systems* attempt to measure directly a limited range of wetland services, such as wildlife habitat, through a detailed procedure focusing on that particular wetland service (for example, percent duck habitat).
> - *Broadly tailored systems* examine a range of wetland functions covering a number of observable characteristics.[36]

Simple index methods, such as counting acres, make mitigation banking easier and less costly, but "are often the least sensitive to wetlands values and functions. Also, most simple indices do not take into account scale effects."[37] As many of the preceding examples have made clear, it would be difficult to integrate ecosystem service valuation into wetlands mitigation banking programs relying on simple index methods. Narrowly tailored methods, such as those attempting to evaluate habitat values, are generally focused on specific habitat types or species and represent an improvement over counting acreage, but still do not directly measure service provision. Moreover, they can result in "mitigating to the test"—that is, driving the banking process toward the favored habitat type or species. "Comparing cumulative [habitat units] for different sets of species involves risks inherent in comparing apples and oranges."[38] In other words, the narrowly

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32 "Because wetlands are complex and incompletely understood, it is difficult to assign a quantitative number to their value. Instead of confronting this difficulty head-on, the Corps-EPA Mitigation MOA provides broad guidelines for valuing wetlands, leaving local permitting authorities with virtually unfettered discretion in determining whether a just compensation for destroyed wetlands has been achieved." Veltman, *supra* note 13, at 673-74.

33 *See* CANDY C. BARTOLDUS, A COMPREHENSIVE REVIEW OF WETLAND ASSESSMENT PROCEDURES: A GUIDE FOR WETLAND PRACTITIONERS (1999).

34 *Id.* at tbls. 1-3.

35 *Id.* at tbl. 3.

36 ELI-WETLAND, *supra* note 9, at 78.

37 *Id.* at 89.

38 *Id.* at 90. For example, if we measure habitat value based on what makes good habitat for ducks,

tailored methods fail to produce a currency that can be reliably used across nonfungible features of assessment, suggesting that these methods will not successfully integrate all the value measurements needed if the goal is to produce a currency applicable across nonfungible biological, economic, and social factors. Thus, the Environmental Law Institute (ELI) concludes, "[f]or wetland managers concerned about the spectrum of functions provided by a wetland, there is no substitute for a carefully considered, broadly tailored analysis."[39]

In practice, however, these broader assessment methods tend to be expensive and to produce reams of qualitative results which, for ease of comparison, wetlands managers tend to reduce to quantitative value scores that often mask the ecological rationales.[40] Indeed, comprehensive reviews in 1992 and 1993 of wetlands mitigation banks in operation concluded that only a small number employed a broadly tailored method (a complex currency), while among the rest "debiting and crediting transactions are based on two basic currencies—acreage and functional replacement."[41] To determine whether banks established after these studies have adopted more complex currencies, we contacted new banks by telephone and e-mail.[42] We identified and were able to describe in detail thirty-six banks established after 1994.[43]

Overall, we found that wetlands assessment methods used by wetlands mitigation banks have advanced very little from the beginning of the banking program and simple currency methods continue to dominate.[44] *Wetlands mitigation banking entities seem*

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which for a variety of institutional reasons many of the habitat-based indices use as the benchmark, we will wind up with more duck habitat and less habitat for species that do not thrive in duck habitat. *See id.* at 36.

[39] *Id.* at 90.

[40] *Id.* at 91.

[41] Writing in 1994, ELI found four banks used the Wetland Evaluation Technique (WET), a broadly tailored method, and the rest were split between using acre counts (a simple index) and the Habitat Evaluation Procedure (HEP) (a narrowly tailored method). *See* ELI-WETLANDS, *supra* note, at app. B. Similarly, in its 1994 *First Phase Report* of the National Wetland Mitigation Study, the Corps' Institute for Water Resources (IWR) reviewed 44 banks existing in 1992. IWR's conclusions were consistent with those of ELI, finding 12 banks used an inventory method (acres) exclusively, eight used a function evaluation method (usually habitat units) exclusively, and the other banks used other methods and combinations of methods. IWR counted none using what ELI would call a broadly tailored index method. INSTITUTE FOR WATER RESOURCES, U.S. ARMY CORPS OF ENGINEERS, NATIONAL WETLANDS MITIGATION STUDY: FIRST PHASE REPORT 31-32 (1994) [hereinafter First Phase Report].

[42] This work was conducted under an EPA STAR grant with Jim Salzman as principal investigator. *See* Ruhl and Gregg, *supra* note 1.

[43] Nineteen of these banks use an acre-based index; fifteen use one of the function-based methods, and two use a "best professional judgment" approach. This split between acre-based and function-based methods is consistent with ELI's and IWR's earlier findings. *See* INSTITUTE FOR WATER RESOURCES, *supra* note, at 31-32 (providing pre-1994 data).

[44] Indeed, the Corps has been criticized for being unwilling to engage in broad functional measurement in other aspects of the 404 permit program as well, including wetland delineation and permit approval and denial. *See* Michael J. Mortimer, *Irregular Regulation Under Section 404 of the Clean Water Act: Is the Congress or the Army Corps of Engineers to Blame?*, 13 J. ENVTL. L. & LITIG. 445, 460-73 (1998) (providing an empirical study of Corps actions). Many state wetland protection programs are accused of suffering from the same shortcoming. For example, Maryland has one of the most sophisticated regulatory programs in place for wetlands protection yet it, too, relies on a simple currency. As a Chesapeake Bay Foundation report described, the Maryland Department of the Environment's method "to calculate the amount of mitigation required to compensate for wetland impacts is replacement ratios. While this method

focused on using the simplest and most expedient assessment method that the relevant regulatory bodies will approve and, to date, most regulatory bodies do not appear to require or even encourage a more sophisticated approach. A comprehensive currency seems too expensive to mint and too arduous to use. Thus instead of developing and refining valuation approaches for assessment and trades, wetlands mitigation banking assessment methods have largely stagnated in the acre-based and narrow function-based approaches, resulting in the use of relatively crude currencies for wetlands habitat trading purposes.

Exchange Adequacy

The analytical framework we have proposed in earlier research predicts that crude currencies, such as those derived from the simple index measures of wetland qualities that prevail in wetlands banking programs, will result in tightly constrained trading schemes if the market maker desires to control for environmental externalities.[45] By contrast, sophisticated wetland assessment methods, such as ones that fully reflect wetland function values, can be converted to currencies that limit externalities sufficiently to allow the market maker to permit trades to be made regardless of type, space, and time differences. The comprehensive currency, reflecting function and service value, would make differences in type irrelevant, allow comparison of impact to different locations, and allow discounting for purposes of timing differentials.[46] The wetlands banking program, hamstrung as it is by its crude currency forms, bears out this postulated inverse relationship between currency sophistication and intensity of market constraint. The following paragraphs briefly set out how WMB trading rules have sought to squeeze out the nonfungibilities of type, space and time.

Nonfungibility of type

The preference the Corps and EPA demonstrate for in-kind compensatory wetland mitigation reflects the substantial differences in rarity, time to maturity, and functions that different wetland types exhibit. Because crude currencies such as acres and habitat function fail to capture these complex differences in wetlands, wetlands mitigation banking programs also are reluctant to stray far from a strict in-kind policy. For example, the *Federal Guidance* allows, at least in principle, out-of-kind mitigation in banking only "if it is determined to be practicable and environmentally preferable."[47] Even when out-

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considers acreage, vegetation, and to a limited extent, uniqueness, it does not specifically consider wetlands functions gained or lost." CHESAPEAKE BAY FOUNDATION, *supra* note 12, at 10.

45 *See* Currencies, *supra* note 1, at 638.

46 For example, when Florida recently enacted legislation requiring all state and local agencies engaged in wetland mitigation banking to devise and adopt a uniform functional assessment method, *see supra* note, it anticipated the type, space, and time nonfungibilities inherent in the process. The assessment method thus must (1) "account for different ecological communities in different areas of the state"; (2) "determine the value of functions provided by wetlands . . . considering . . . location"; and (3) "account for the expected time-lag associated with offsetting impacts." Fla. H.B. 2365, § 4 (2000) (amending FLA. STAT. § 373.414(18)). The Florida Department of Environmental Protection had until January 2002 to devise this all-encompassing currency for mitigation banking.

47 Federal Guidance, *supra* note 16, at 58,611.

of-kind trading is allowed, however, banks typically impose fixed trading ratios between acres of the wetland types as a surrogate for more precise measurements of comparative function value.[48] In short, as compared to open or fixed ratio out-of-kind trading, "[i]n-kind mitigation requires less understanding of tradeoffs because it is based on the assumption that certain wetland functions . . . will follow the wetland form."[49] The cost of this in-kind requirement, however, is a thinning of the wetlands trading market from all wetlands to only the defined in-kind type.

Nonfungibility of space

The value of wetlands' services depends fundamentally on their landscape context.[50] Even controlling for type, a bog wetland in Maine may not provide the same function values as one in Oregon, or even one in the next county. And even if it does, it certainly will not deliver the services of nutrient trapping, flood control, or nursery habitat to the same parties. Obviously, however, the preference for on-site mitigation the Corps and EPA have adopted for compensatory mitigation in general cannot apply strictly to wetland mitigation banking. Instead, the concept of a geographically defined "service area" is imposed on wetlands banks to define the area "wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources."[51] In general, service areas should be no larger than the watershed within which the bank is located, unless reaching beyond that market is "practicable and environmentally desirable."[52] Coupled with an in-kind constraint, this service area constraint should further narrow the potential supply of wetlands in the trading market.[53]

Nonfungibility of time

One of the purported advantages of wetland banking programs is that the bank has created the wetlands before the credits are drawn, so that the mitigation is secured before the wetlands are filled. In general, therefore, the *Federal Guidance* provides that "[t]he number of credits available for withdrawal (i.e., debiting) should generally be commensurate with the level of aquatic functions attained at a bank at the time of

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48 *See* ELI-WETLAND, *supra* note 9, at 92. Trading ratios also are often imposed to adjust for different mitigation forms (e.g., restoration versus preservation) and for the general uncertainty that the bank wetlands will exhibit as much acre-for-acre integrity as the filled wetlands. *See id.*

49 *Id.* at 30.

50 *See* James Salzman, *Valuing Nature's Services*, 24 ECOLOGY L. QUART. 887, 896 (1997) ("The value of a wetland's nutrient trapping services, for instance, depends on the location of its out-flow. Does it flow to shellfish beds (high value) or a fast-flowing ocean current (low value)?"). In our EPA grant, we studied a trade in Florida of inland wetlands for wetlands located on a small island in a river. Even if the two wetlands have the same biophysical capacity, the delivery, and therefore value, of their services will differ significantly. *See also* ELI-WETLAND, *supra* note, at 30 ("[M]ost wetland functions have value because of where they exist in the landscape.").

51 Federal Guidance, *supra* note 14, at 58,611.

52 *Id.*

53 The spatial fungibility issue is even more complicated in the endangered species context, where strategic siting of bank service areas must account for species movement, habitat succession, and discontinuities in suitable habitat locations. *See* Bean & Dwyer, *supra* note 13, at 10,537.

debiting."[54] With large commercial banks, however, the expense and time involved with establishing functional wetlands, particularly those of types that require long maturation periods, could make the banking cost prohibitive if credits could not be drawn before the bank's wetland values are fully in place. The *Federal Guidance* thus allows some leeway in the timing requirement, allowing credit withdrawal before equal wetland values are established, if the bank possesses adequate financial assurance and has exhibited a high probability of success.[55] In some cases this policy results in lags of up to six years between the times of wetland destruction and wetland replacement.[56]

How Well Does Mitigation Banking Work?

The Process

Our findings and those of others suggest that practical constraints on the implementation of more sophisticated assessment methods designed to produce a refined currency for trades—in terms of costs, time demands, and complexity—have prevented wetland mitigation banking from ensuring currency adequacy. Thus, wetlands banking has been forced into the next best alternative—designing market constraints to plug up the holes that the crude currency otherwise leaves open to externalities. Assessment methodology has become the proverbial tail that wags the dog, keeping the wetlands program from tapping the full benefit of market trading efficiency as the market makers (EPA and the Corps) attempt to shore up the weak currency with market constraints.

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[54] Federal Guidance*, supra* note 16, at 58,611. Studies of wetland restorations have found a remarkably low rate of success. The Florida Department of Environmental Regulation found a success rate of forty-five percent for tidal wetlands creation, twelve percent for freshwater wetlands creation. Veltman, *supra* note 13, at 669.

[55] *See* Federal Guidance*, supra* note 16, at 58,611. Explaining the pressure to relax time restraints, a Corps official has written:

> Among the most critical issues that affect the financial success of commercial banks, and thus the willingness on the part of the private sector to get involved in commercial banking, is the timing of debiting versus accrual of credits in the bank. Ideally, mitigation banks are constructed in advance of development projects that result in wetland losses and are seen as a way of reducing uncertainty in the wetlands replacement process. However, virtually all private commercial bank entrepreneurs argue that for their banking ventures to be economically viable, they need to be allowed to sell credits before replacement wetlands are fully functioning or self-maintaining. Allowing a bank to be debited before it achieves a fully functioning stage involves a trade-off between ecologic and economic risks. The later the bank may be debited (along a time continuum from planning through design, construction, and operation), the lower the ecologic risk. However, delays in allowing debiting increase the financial risk to the investor. The private sector generally needs some level of immediate return to justify the financial risk or to supplement initial funding. . . . Private commercial banks implemented to date reflect the value of time. Regulators have allowed debiting (generally to a limited extent) shortly after bank construction, during construction, or even shortly before construction, if there was an approved site plan and appropriate real estate arrangements and financial assurances (such as funds for remedial work, if needed, and for long-term management)."

Brumbaugh, *supra* note 22, at 4-5.

[56] *See* Michael G. Le Desma, *A Sound of Thunder: Problems and Prospects in Wetland Mitigation Banking*, 19 COLUM. J. ENVTL. L. 497, 506 (1994).

There is good reason to believe this problem will be endemic to *habitat* trading programs in general until ecologists can deliver a cheaply calculated, refined currency for habitat values.[57] The cost of valuing the currency in the sulfur dioxide program is low—a ton is a ton. But the cost of creating habitat currencies is either very cheap—an acre is an acre—or, if we demand reliable measures of environmental and social service values, very expensive.

It is important to recognize that WMB trading programs differ in another fundamental way from typical markets, as well. Assume, for example, that Charlie sells a bike to Jody. Jody has every reason to ensure that the bike works well and will hold up for her rides around town. This transaction has a built-in quality check. Jody does not want to buy a lousy bike. The WMB program, however, does not work in a similar manner, for quality is not valued. Indeed, the developer has virtually no interest in the quality of the wetlands being restored. He simply wants a permit from the Corps. Similarly, the banker doesn't care about the quality of the wetlands, either. She simply wants the Corps to sign off so she can sell credits. She is supposed to maintain restored wetlands after the credits have been sold, of course, but will likely only do so if compliance monitoring and enforcement by the Corps are likely. Thus in all key respects, the central player in all this is the Corps. There is no invisible hand at work here. It falls on this agency, *which is not a market participant,* to ensure the quality of the restored wetlands because neither the buyer nor seller have an incentive to do so.

Developers and bankers have an obvious profit incentive to use the least expensive currency the government will allow. But the government needs to be careful in demanding wetlands quality and equivalence of trades. It has an incentive not to make the currency too expensive to mint, or no one will use it and the trading program will expire of its own accord. Because of these agency and participant incentives, the net result has been Gresham's Law in practice – simple currencies have driven out complex ones.

Despite policies mandating that habitat trading ensure equivalent value and function,[58] the experience is that most programs are not administered this way. In practice, most habitat trades to date in wetlands programs have been approved on the basis of acres, in many instances ensuring equivalence in neither value nor function. If parties have a choice between a complex (and expensive) currency that measures equivalent function or a simple metric, and both deliver a 404 permit, simplicity will always win. Thus, given the choice in the habitat context of acres or complicated measures of value, acreage has won.

Moreover, now that the Corps has committed to the mitigation banking program as the ideal of compensatory mitigation, many believe that there is pressure within the Corps to facilitate the program by easing the official avoid-minimize-compensate

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[57] I just returned from a year in Australia on a Fulbright studying ecosystem service markets for biodiversity, water quality and salinity. In every single market, the assessment methodology for use in the field to score specific land parcels was absolutely critical to the success of the market mechanism.

[58] *See* Memorandum of Agreement, *supra* note 7, at 9212 (Wetland values shall be determined "by applying aquatic site assessment techniques generally recognized by experts in the field and/or the best professional judgment of Federal and State agency representatives, *provided such assessments fully consider ecological functions included in the Guidelines*.") (emphasis added).

sequencing policy that has already eroded substantially.[59] Avoiding wetlands and minimizing wetland impacts reduce the demand for mitigation bank credits and thus thin the market. Predictably, the pressures to adopt crude currencies and to keep markets thick combine to allow the seepage of externalities from the wetlands mitigation banking market.[60]

One way to get around this problem might be to "subcontract" the oversight role to a party that has an institutional concern over wetlands quality – perhaps a group such as Ducks Unlimited or The Nature Conservancy. These organizations could play the role of approving wetlands banks and determining the ratio of filled to restored wetlands. Beyond public accountability, The obvious downside to such an approach is that conservation organizations can have their own narrow interests (most notable in the case of Ducks Unlimited and protecting wetlands for waterfowl hunting).

Given this state of affairs, the aggressive integration of open trading models into wetlands and other habitat contexts poses concerns for environmental protection. Even the most developed habitat assessment methods presently in use are ill-prepared to produce reliable, inexpensive, and ready measurements of a habitat's environmental and service values. Such measurements require far more money and time to produce on a site-specific basis than developers, habitat bankers, and the government seem prepared to allocate. In the absence of such measurements, the government and environmental groups will likely require at a minimum constraints on habitat trading markets (i.e., stronger exchange adequacy).

But even the current trading constraints are seen by many as too restrictive. Observers have criticized the *Federal Guidance* for adhering too strictly to the sequencing approach and other conditions applied generally to compensatory mitigation, arguing that "this policy could prevent a banking market from ever emerging."[61] This is the inevitable pressure any regulated market faces when externalities must be controlled through market constrictions rather than through a refined currency—at some point the constraints threaten to swallow the market. Surely a loosening of type, space, and time constraints would make banking more flexible and economically attractive to entrepreneurs, but at what price to the environment?

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[59] *See* Bean & Dwyer, *supra* note 13, at 10,550 ("[C]onservation interests worry that the practical effect of the mitigation banks is to tempt regulators to skip rather lightly past avoidance and minimization and proceed instead directly to compensation in the form of purchasing credits from a bank.").

[60] In another article (Currencies, *supra* note 1), we argue that this state of affairs suggests the need for a third layer of analysis – "Review adequacy" to ensure that trades really do promote the public welfare. Such an approach, however, will surely raise transaction costs, undercutting the efficiency benefits of environmental markets. At the workshop, Jason Johnston suggested a way around this problem by having expert third parties take over the role of the Corps. Thus the Nature Conservancy or some other land trust might decide whether trades ensure no net loss of services. Whether such parties would be regarded by developers as neutral or acceptable, however, is an open question.

[61] Liebesman & Plott, *supra* note 17, at 342; *see also* Gardner II, *supra* note 24, at 10,075 (stating that the Federal Guidance "does not go far enough to encourage private-sector investment in the process of wetland mitigation"); William W. Sapp, *The Supply-Side and Demand-Side of Wetlands Mitigation Banking*, 74 OR. L. REV. 951, 981-90 (1995) (arguing for relaxation of strict sequencing, on-site mitigation preference, and in-kind mitigation preference in order to increase the demand for mitigation banking credits—i.e., to thicken the market).

Indeed, the *Federal Guidance* invites further pressure to restrict the market with its "practicable and environmentally desirable" standard for exceptions to the set of trading constraints. As commercial banking becomes more widespread, it is likely that the criticisms bank sponsors have already lodged against the *Federal Guidance* will intensify if the market for credits does not swell. Moreover, to the extent mitigation banking is intended to replace the project-by-project approach to compensatory mitigation in the regime of 404 permits, the Corps already feels pressure to ensure that the market does not become too thin. And make no mistake, the Corps *is* feeling pressure to loosen the timing restrictions of the *Federal Guidance* and other exchange adequacy safeguards and has openly discussed relaxation of its restrictions.

At the extreme, of course, land developers and bank sponsors most prefer a nationwide bank of freely transferable credits, and have been pushing for this and relaxation of other restraints.[62] Such relaxation of space, type, and time restraints may seem reasonable if the Corps believes the existing crude wetlands currencies are sufficient. If so, though, it will be banking on sheer serendipity to believe that wetlands banking and other habitat trading programs will produce consistently positive results for the environment.

How to Measure Success?

The preceding analysis has focused on the problems inherent in creating a wetlands market for nonfungible goods and services. But have these theoretical concerns been borne out in practice? There are three useful ways to measure success – efficiency, distributional equity, and effectiveness.

Despite all its potential shortcomings, WMB certainly remains popular. Credits in Florida are now trading anywhere from $30,000-$80,000 per acre. There clearly is demand and banks are still being created to supply it. The program seems efficient, in that calls for gutting the 404 program have fallen off the political landscape while wetlands protection and development both continue at costs that appear acceptable to the parties. But this is only one, and arguably deceptive, measure of success.

If one looks at distributional equity – market-driven 'migration' of wetlands across the urban-rural landscape – the case is less clear. As noted earlier, landscape context matters. Even if a restored wetlands provides the same biophysical level of services as the filled wetland, the services may have little or no value if they are not delivered to a population that needs them. This is an issue of *distributional equity* – who is winning and who is losing through WMB trades? A study of wetland banking in Florida, for example, found that trades, even in the same watershed, have produced "a transfer of wetlands from highly urbanized, high-population density areas to more rural low-population density areas."[63] The same problem has plagued mitigation banking in Virginia, where a study found that most mitigation banks are located in rural areas while

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[62] *See* ELI-WETLAND, *supra* note 9, at 58.

[63] Dennis King and L. W. Herbert, *The Fungibility of Wetlands*, 19 NATIONAL WETLANDS NEWSLETTER 10, 11 (1997).

most wetland losses take place in urban and suburban areas.[64] In other words, as can be expected from a market efficiency perspective, developers want to develop wetlands where land is dear (urban) and wetland banks want to locate where land is cheap (rural). The result is trades that move wetlands out of areas where they may provide valuable services to urban populations and into sparsely populated areas where, most likely, their service provision is either redundant or less valuable. The existing wetlands mitigation banking framework lets this happen, or at least fails to scrutinize the externality effects of the practice.

Should we be concerned about this market-driven shift of wetlands from urban to rural areas, even if it simply reflects the efficiency of trading? If we care about the equity of who receives wetland services and their value, then the answer is yes, and we should closely examine the redistribution of wetland service values within the environment and between human populations.[65] Are there identifiable groups that would be harmed by conversion in one area and not compensated by mitigation in another? And if so, how severe is that damage, and what mechanisms might be put in place to compensate these losers? If we care primarily about keeping the wetland banking market thick or no net loss of wetland acreage, however, then maybe we shouldn't be overly concerned, for to add another location restriction based on keeping trades within the same "population-shed" would surely thin the market.

And what can we say about whether WMB is effectively meeting the overarching goal of no net loss? Despite its role as the central justification for wetlands policy, there are surprisingly few detailed data available on WMB trades. While a number of case studies in the literature provide trade-specific data on the size of mitigated areas, few disclose price or functional details. Indeed we have come across no studies that closely track trends in regional or local volume of trading over time (either number of trades or land area), the prices of mitigation credits, or the costs of establishing and operating banks. Reflecting this dearth of data, the most comprehensive study on mitigation banking to date, a 2001 report by the National Academy of Sciences, recommended the creation of a national database to track the loss and restoration of wetlands function over time.[66] Any overall conclusions on the WMB experience are hampered by this lack of data and the Bush Administration has responded in its National Wetlands Action Plan of 2002 by pledging to establish a comprehensive mitigation database and annual public report card on wetlands programs by 2005.

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[64] *See* Ann Jennings, Roy Hoagland & Eric Rudolph, *Down Sides to Virginia Mitigation Banking*, NAT'L WETLANDS NEWSL., Jan.-Feb. 1999, at 9, 10. The Virginia study also found an increasing trend toward the use of banks in one watershed to compensate for losses in a different watershed. *See id*. at 9-10.

[65] We are not suggesting that the shift from urban to rural wetlands is necessarily an unwise policy in all cases. In some settings, the urban wetlands to be developed may be comprised of many small, isolated wetlands of poor quality, whereas the rural mitigation bank may produce a large, contiguous, high-quality habitat. We are suggesting, however, that the shift between the human populations serviced may be significant and thus should be considered in the evaluation of the mitigation banking policy, whereas the Florida and Virginia studies show that it has not been. Moreover, research has revealed the importance of small, isolated wetlands to maintaining biodiversity and habitat for some species, thus the ideal of large, contiguous rural wetlands will not always provide superior environmental value.

[66] *See* NAS Report, *supra* note 28.

If one looks at acreage, the overall results of the nation's wetlands protection programs appear positive. According to the National Wetlands Inventory, conducted every ten years by the U.S. Fish and Wildlife Service, the rate of wetlands loss from 1985-1995 was 0.11% per year.[67] The National Resources Inventory, conducted by the U.S. Department of Agriculture and employing a different sampling method, reached a roughly similar conclusion, finding a net wetlands loss of 0.07% per year from 1982-1992.[68] These are almost a quarter lower than rates of loss from the preceding decade.[69] WMB has contributed to this trend. The Corps estimates that from 1993-2000, roughly 24,000 acres of wetlands were permitted to be filled and 42,000 were required as compensatory mitigation, a *gain* of 1.8 acres for every acre developed.[70]

If one looks at service provision, though, the data suggest WMB has not performed well. For example, despite claims by the Maryland Department of the Environment that the state had gained 122 acres of wetlands between 1991 and 1996, a Chesapeake Bay Foundation study found that there had been a net *loss* of fifty-one acres of wetlands functions.[71] In the most comprehensive study to date on this issue, in 2001 the National Academy of Sciences examined the practice of wetlands compensatory mitigation. The very first of the Committee's Principal Findings was that "the goal of no net loss of wetlands is not being met for wetland functions by the mitigation program."[72] In response to this report, the Bush Administration has gone even farther, acknowledging in its recent Wetlands Mitigation Action Plan that,

> As a general matter, compensatory mitigation decisions are made on a case-by-case basis and often do not consider the proper placement of mitigation projects within the landscape context, the ecological needs of the watershed, and the cumulative effects of past impacts… EPA has identified improving wetlands ecological performance and results of compensatory mitigation as a priority.[73]

Given the reliance on crude currencies and loose exchange restrictions, such a conclusion is hardly surprising. To its credit, the Bush Administration has pledged in its Action Plan to implement most of the NAS Committee's recommendations. Given the trade-offs between thick markets, on the one hand, and refined currencies and tight trading restrictions, on the other, however, we remain cautious over whether the promised reforms (assuming they are implemented) will produce significantly different results on the ground.

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67 David Sounding and David Zilberman, *The Economics of Environmental Regulation by Licensing: An Assessment of Recent Changes to the Wetland Permitting* Process, 42 NATURAL RES. J. 59, 71 (2002).

68 *Ibid*.

69 The largest single category of wetland loss is that of agricultural and silvicultural activities, neither of which are subject to the compensatory mitigation procedures described above.

70 It is worth noting that the National Academy of Sciences study did not trust the mitigation data, saying they were inadequate to determine the status of compensated wetlands. NAS Report, *supra* note 28, at 3. It is also worth noting that, when compared to the overall estimate of 58,545 acres lost *per year*, then the contribution of WMB is minor.

71 *See* CHESAPEAKE BAY FOUNDATION, *supra* note 12, at i.

72 NAS Report, *supra* note 28, at 2.

73 EPA, NATIONAL WETLANDS ACTION PLAN 4 (Dec. 24, 2002).

Conclusion: Lessons for Habitat Market-Based Instruments

Environmental trading markets remain popular and are growing. Mature environmental trading markets are active in reducing air pollution, regulating land development, and are under serious consideration for endangered species habitat. It is easy to imagine the use of such a mechanism in forestry, where a particular land use is valued for its watershed protection services.

In asking whether mitigation banking has been successful, one must look beyond market volume and consider what success means, and in comparison to what alternative. As described above, focusing on the identification of trading currencies forces policy makers to articulate what the goal of the market-based mechanism should be. If the goal is no net loss of wetland acreage, then acres are a fine currency. If the goal is no net loss of wetlands function and delivery of services, then the current reliance on acreage metrics will likely to continue to fail.

In comparing on-site versus off-site mitigation (which in this context serve as rough proxies for prescriptive regulation versus a market-based approach) one must assess whether the gains from the mitigation areas are sufficient to offset the losses in the conversion area. This must be done both from the view of distributional equity, overall loss of service provision, and overall value of service provision.

To be sure, creating an environmental market by no means ensures environmental protection. Beyond design issues such as creation of stable property rights lies the equally critical issue of implementation. In retrospect, the greatest failing of on-site mitigation may well not have been its prescriptive approach but, rather, the virtually nonexistent monitoring and enforcement of the mitigation projects. This was an institutional, not an instrument design, failure. As a result, one cannot draw a conclusion from the wetlands case over whether prescriptive regulation or market instruments was more effective. Had on-site mitigation actually been monitored and enforced, perhaps services would not only have been conserved but continue to be delivered to the same populations as before. We just don't know.

More generally, as this chapter has pointed out, WMB programs are particularly vulnerable to implementation failures because the government, not the market actors, must ensure the quality and equivalence of the exchange. This inherent challenge is no different than with the other important habitat trading instrument – habitat conservation plans (HCPs) under the Endangered Species Act. In exchange for taking endangered species and adversely modifying part of the species habitat, development interests agree to manage (and often restore) other parts of the landscape. This does not produce credits that can be traded, but the similarities to WMB are striking for in both schemes the government decides on the equivalency of the exchanges. In both cases, there is an inherent tendency that will lead to a net loss of prime habitat/wetlands over time. In the case of HCPs, this occurs because there is an overall reduction in habitat as a result of the permitted development. In the case of WMB, the reduction occurs not in the form of total acreage but, rather, in a likely decrease of valuable service provision.

At a basic level, if the currency is unable to capture accurately the value sought to be measured (the ecosystem service values), then confidence in the procedural and substantive adequacy of the trading system will erode. Developing an assessment methodology that measures the ecosystem service value, or some reliable indicator of the valued product (e.g., water quality, floodwater retention, etc.), will be the critical first step in developing a framework for any trading-based mechanism. The actual shape of the trading mechanism for habitat protection will, of course, depend upon the particular setting and management goals. If the currency can be easily set, measures of value determined cost effectively, and trading restrictions established that still provide a market thick with participants, then trading mechanisms will work well. If any of these are lacking (as most are in the case of wetlands), then one will have less confidence that the trading ensures and promotes environmental protection.