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# Environmental Offset Policies, Principles, and Methods: A Review of Selected Legislative Frameworks

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biodiversity neutral initiative

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## Executive Summary

*Environmental offsets* seek to ensure that unavoidable adverse environmental impacts of development are counterbalanced by environmental gains, with the overall aim of achieving a net neutral or beneficial outcome. In line with sustainable development, offsets represent one important tool for maintaining or enhancing environmental values in situations where social and economic development is sought despite detrimental environmental impacts. Offsets are generally intended as an option for addressing *residual* environmental impacts of development, after efforts have been undertaken to avoid and minimize impacts.

Although the scale of offset activity worldwide remains small, offsets are emerging as an increasingly employed mechanism for achieving net environmental benefits. Offset activity is most robust for U.S. wetlands, where methods and programs have been under development for the past two decades and implementation has increased markedly in recent years. Indeed, whereas wetland offsets in the U.S. accounted for about 15,000 acres/year in the early 1990s, this has risen to an average of over 40,000 acres/year since 1995. In addition to the United States, a range of other countries have established or are developing offset programs, including Australia, Brazil, Canada, European Union member states, Mexico, Switzerland, and Uganda.

Recognizing the growing interest in environmental offsets, Forest Trends and Conservation International recently established the "Biodiversity Offset Program," an initiative that has drawn together a working group of representatives from government, business, conservation, research, and finance. Program goals include designing and implementing a portfolio of biodiversity offset pilot projects around the world and supporting this effort with the development of a toolkit providing "how to" materials on biodiversity offsets.

Biodiversity Neutral Initiative (BNI) joined the Biodiversity Offset Program working group and advisory committee in late-2004. Following the Biodiversity Offset Program Workshop in Thailand in November 2004, BNI initiated work on this paper. It is intended as a foundational document that, by providing a review of selected legal, regulatory, and policy frameworks governing offsets, supports the Program's wider goal of developing a toolkit of offset "how to" materials. The paper has been prepared as a discussion document for the Biodiversity Offsets Program Meeting to be held in Washington D.C. from June 6-8, 2005.

## Objectives and Limitations

Environmental offsets may be implemented in accordance with legal and regulatory requirements or as voluntary measures. This review focuses exclusively on existing legal, regulatory, and policy guidance governing offsets. The objective is to analyze and

compare how this guidance addresses a range of methodological issues for offsets, and to highlight key similarities, differences, and challenges. Five frameworks are reviewed:

- U.S. Wetlands Mitigation
- U.S. Conservation Banks
- E.U. Natura 2000 Sites
- Australian Offset Policies
- Brazilian Industrial and Forest Offsets

The scope of this offset review was subject to a number of limitations. First, this review is descriptive not prescriptive; the objective is to provide an overview and comparison of existing offset frameworks, not to provide normative comment on how offsets *should* be done. Analysis of potential gaps in offset frameworks (e.g., the need for greater focus on socio-economic issues) represents an important next step. Second, while five of the major offset frameworks are addressed here, some existing frameworks were not reviewed. Of particular interest for enriching understanding about offsets would be further study of emerging approaches in developing countries. Third, while this review focused on offset frameworks for which clear legal, regulatory, or policy guidance exists, it should be recognized that offsets may be carried out in a more *ad hoc* manner under laws and regulations that do not directly reference offsets (e.g., environmental regulatory requirements for mitigation). And even where there are no formal legal requirements for offsets (often the case in developing countries), offsets may be carried out on a voluntary basis.

**Offset Policy Goals, Principles, and Mechanisms: Key Findings**

- **Main Objectives of Offset Frameworks** – Policy goals for the offset frameworks reviewed vary from "no net loss" to "net gain" to more general statements about the need to address adverse impacts.

- **Mitigation Principles and Sequencing** – In considering mitigation options for a proposed project's impacts, offset policies generally adhere to a sequence of: (1) avoidance, (2) minimization, and (3) compensatory mitigation. In the first step of the sequence (avoidance), it is important to note that impacts to unique and rare habitats, special aquatic sites, and other critical environmental assets are generally prohibited; they must be avoided unless it is an exceptional case. In evaluating the proposed impact site against potential alternatives, the main criterion is which site represents the *least environmentally damaging* option. Other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria.

- **Offset Approaches** – For project impacts that cannot be avoided or sufficiently mitigated, compensatory actions may be taken by the project proponent or a designated third party. In the first case, the project proponent retains responsibility for compensatory mitigation, either performing the necessary offset activities itself or hiring an agent to do so. In the second case, the project proponent satisfies its compensatory mitigation obligations by paying a third party to take on legal responsibility for offset activities.

    - *Project Proponents* – When project proponents choose to mitigate impacts through their own development of offsets, they are generally required to submit an offset proposal, with the level of information commensurate with the potential impact of the development project. The types of proposal information required include: baseline information, objectives, site selection rationale, work plan, performance standards, responsible parties, legal means of offset protection, monitoring and long-term management plans, and contingency plans and financial assurances.

    - *Third Parties* – A third party offset "banking" framework has emerged in recent years in which entrepreneurs can invest in developing offsets. Under this approach, entrepreneurs can earn "credits" based on the success of their offset, and then recoup their offset investment by selling these credits to developers. Proponents of this approach suggest it offers a number of significant advantages over traditional project-by-project mitigation, including the opportunity to mitigate at a larger geographic scale (rather than small, isolated offsets for each development project); greater flexibility to select sites that provide the greatest environmental benefits (and lowest risk of failure); more potential for guarding against temporal losses and risks of mitigation failure (since banks may already be established and mature); and greater possibilities for achieving conservation benefits more cost-effectively (due to economies of scale, market mechanisms, greater flexibility for project proponents in meeting mitigation obligations, and reduced compliance monitoring costs for regulators).

**Methodological Challenges: Key Findings**

Establishing offsets requires surmounting a number of methodological challenges. These challenges are described below, along with a brief summary of common approaches and emerging trends among offset frameworks for addressing them.

**1. Equivalence of project impacts with offset gains (in-kind vs. out-of-kind)**

- *As no two areas are ecologically identical, how can offsets best provide benefits that are "equivalent" to losses caused by project impacts?*

- *Are offsets required to be established on an "in-kind" basis, or is "out-of-kind" compensation possible?*

Offset policies indicate that in-kind offsets are preferred in most cases, but there is a trend toward more acceptance of out-of-kind mitigation, as long as it can provide greater environmental benefits than in-kind options.

**2. Location of the offset relative to the impact site (on-site vs. off-site)**

- *Do offset benefits need to accrue to the local geographic area affected by project impacts? What if a proposed "local" offset provides considerably less environmental benefit (e.g., isolated, fragmented habitat) than other more distant proposed alternatives?*

- *How can the choice of offset location best balance needs in the project impact area with potential environmental gains from an off-site offset?*

Offset policies generally prefer on-site mitigation to off-site mitigation because compensation benefits accrue to the project affected area. However, off-site offsets may be supported in cases where they are located in the same ecoregion or watershed as the project site and can provide greater environmental benefits than on-site mitigation options.

**3. "Additionality" (new contribution to conservation); acceptable types of offsets**

- *To what degree must offsetting activities represent genuinely new and additional contributions to conservation?*

- *What types of offsets activities are deemed sufficient compensatory mitigation? For instance, rather than restore or rehabilitate an area, would it be sufficient to preserve an area (under threat) or improve management practices?*

Offset frameworks call for offsets to represent new or additional contributions to conservation, but in many cases there is wide latitude provided regarding what types of offsetting activities are allowable.

**4. "Currency" to support exchange of project impacts for offset gains; appropriate mitigation replacement ratios**

- *To support "trading" of project impacts for offset benefits, what is the most appropriate "currency" or uniform trading unit (e.g., area, function/habitat)?*

- *Given differences in ecological quality and other factors, on what basis can a mitigation replacement ratio be established (i.e., the number of credit units from*

*an offset that must be debited in order to compensate, or replace, one unit of loss at the project site)?*

Offset policies call for "currency" to incorporate values associated with ecological functions, quality, and integrity. Using this currency, mitigation replacement ratios can be adjusted to account for the type of offset, to discourage project impacts to "important" habitat, and to reflect the risk that an offset may fail. In practice, the concepts of currency and mitigation ratios are often conflated, with currency values embedded in acreage/hectare ratios.

**5. Temporal issues: timing of project impacts vs. offset benefits**

- *When must an offset be operational – before, concurrent with, or following project impacts?*

- *What if the offset will require a number of years before ecological maturity brings full benefits? Should mitigation replacement ratios be adjusted to reflect a "temporal premium" (to account for the temporal gap between project impacts and offset benefits)?*

While offset policies generally prefer for offsets to be in place and effective prior to project impacts, strict adherence to such an approach discourages the establishment of offset banks because bankers cannot raise capital through the early release of credits. In recognition of this issue, wetland mitigation banking guidance allows for early credit release under a number of specified conditions. In addition, temporal losses may be addressed through adjustments to mitigation replacement ratios.

**6. Offset duration, management, monitoring, and compliance**

- *What is the appropriate operable period for an offset – in perpetuity? – equal to the duration of project impacts?*

- *What management and monitoring requirements, as well as legal assurances and arrangements, are appropriate for ensuring offsets are in compliance?*

In most cases, offset policies call for offset protection to be established in perpetuity. Offset frameworks note the need for legal and financial assurances to secure site tenure, restrict harmful activities, support long-term management and monitoring, and cover contingency and remedial actions in the event of offset failure. Where the success of an offset is less certain, or early credit release has been allowed, higher financial assurances may be required.

**Offset Assessment Methods and their Implementation: Key Findings**[1]

Offset assessments involve mapping and delineation of site areas, analyzing conditions, functions, services, and values, assessing potential alternative options, determining required mitigation, and determining compensation needs and appropriate compensation ratios. In conducting these activities, offset assessment methods vary considerably in their approach. At one extreme are methods that require complex modeling and at the other are more rapid approaches that may involve little more than measuring the size of the impact area and applying professional judgment about impacts. The tension between these extremes reflects two valid concerns – the need for sophisticated approaches that produce scientifically defensible results, and the need for practical approaches that can be implemented within existing time and budget constraints.

Encouragingly, a number of "middle-ground" approaches have emerged aimed at reconciling these competing needs. These approaches generally involve weighting key variables (based on professional judgment) and applying a scoring system. While such methods rely heavily on the subjective judgment of the user, they also provide a systematic and repeatable approach where judgments and assumptions require justification and can be verified. In addition to emerging "middle-ground" methods, there has been renewed effort to improve the assessment *process*, with particular emphasis on better screening at the front-end to narrow the scope of values and functions requiring more intensive analysis. Such process improvements aim to reduce time and costs while still supporting intensive assessment for identified values and functions of concern.

[1] Offset assessment methods are most developed (and abundant) for U.S. wetlands, with estimates of the number of methods available ranging from 40 to more than 90. Only a few assessment methods were identified for other types of environmental offsets. For this reason, review of offset assessment methods mainly focuses on the wetlands experience.

## 1. Introduction

*Environmental offsets* are beneficial activities undertaken to counterbalance the unavoidable adverse environmental impacts of development, with the objective of achieving a net neutral or beneficial outcome. This paper reviews five environmental offset frameworks supported by legislation, regulations, and policy guidance in the United States, European Union, Australia, and Brazil:

- **U.S. Wetlands Mitigation** – This is the most mature of the offset frameworks reviewed, having been initiated in the 1970s. The policy objective is to offset adverse impacts to wetlands through compensatory mitigation that replaces wetland functions and values. Federal guidance on wetland mitigation banking was issued in 1995, and policy development continues under the auspices of the Federal Interagency Mitigation Workgroup.

- **U.S. Conservation Banks** – Conservation banking is modeled after wetland mitigation banking, except that the objective is to offset adverse impacts to species (rather than replace wetland functions and values). While the State of California has been moving forward with conservation banking since 1995, federal guidance was only recently issued in 2003.

- **E.U. Natura 2000 Sites** – The Birds Directive (1979) and Habitats Directive (1992) underpin the effort to establish a network of Natura 2000 conservation sites throughout the European Union. Guidance addressing offset issues was issued in 2000 and 2001.

- **Australian Offset Policies** – Australian offset programs are being developed at the State/Territory level, with most focused on offsetting the clearance of native vegetation. This review examines native vegetation offset programs in Victoria, New South Wales, and Western Australia. Victoria's BushTender program was piloted in 2001-2002 and its framework for offsets issued in 2002. New South Wales passed its Native Vegetation Act in 2003 and drafted corresponding regulations in 2004. And Western Australia amended its native vegetation legislation in 2003 and issued a position paper on offsets in 2004.

- **Brazilian Industrial and Forest Offsets** – Brazilian federal legislation requires industrial developments to offset their environmental impacts through payments to the National Protected Areas System. The system is still in its early stages of development, especially with regard to equivalency between industrial environmental impact and the benefits derived from offset payments. For Brazilian forest offsets, federal legislation requires that a minimum area of natural vegetation be maintained on private landholdings. However, the legislation

allows for off-site conservation to offset clearing of natural vegetation beyond the required minimum. States such as Minas Gerais and Paraná are developing systems to formalize the offset mechanism through crediting systems.

The objective of this review is to analyze and compare how existing laws, regulations, and guidance governing the five offset frameworks address specified methodological issues, and to highlight key similarities, differences, and challenges. This includes:

- Reviewing relevant laws, regulations and guidance that provide the foundation for offset frameworks (Section 2);

- Describing/comparing offset policy goals, principles, and approaches (Section 3);

- Analyzing how offset frameworks currently respond to key methodological challenges (Section 4); and,

- Reviewing offset assessment tools and their implementation (Section 5).

It should be recognized that the offset frameworks reviewed are at quite different stages of development, which necessarily affects the depth with which the review can address each framework. Whereas U.S. wetland offset policies have been under development for more than two decades, other frameworks have only recently been introduced and remain in the early stages of development. Therefore, as the review moves from a discussion of offset policies to methodological issues and implementation, the wetlands experience often dominates. This is especially the case for Section 5, which focuses on assessment tools and implementation.

## 2. Relevant Laws, Regulations and Guidance for Offsets

Offsets may be implemented in accordance with legal and regulatory requirements or as voluntary measures. This review focuses exclusively on existing legal, regulatory, and policy guidance governing offsets. Laws generally establish the foundation for requiring mitigation of environmental impacts, while corresponding regulations and policy guidance provide direction regarding allowable types of mitigation mechanisms and approaches. For example, the Clean Water Act in the U.S. establishes permit requirements to discharge dredged material or fill material into waters (including wetlands) of the United States, while corresponding regulations require mitigation of any authorized adverse impacts. And a range of policy guidance has been developed to provide principles and direction for performing this mitigation.

Likewise, the Endangered Species Act in the U.S. requires conservation measures to mitigate authorized impacts to listed species and designated critical habitat. Under this law, conservation banking represents one approach for mitigating impacts. As such, policy guidance has been developed to direct the establishment, use, and operation of banks. Finally, recently passed laws and regulations in New South Wales, Australia set the stage for native vegetation offset programs. The Native Vegetation Act 2003 and its corresponding regulations require the prevention of broad scale native vegetation clearing unless the clearing will improve or maintain environmental outcomes (with offsets representing one allowable approach to improving or maintaining outcomes).

This section provides a summary of relevant legislation, regulations, and policy guidance underpinning each of the five offset frameworks reviewed. The information is organized in a series of tables and is intended to provide a resource for identifying the current status of legal, regulatory, and policy guidance development. The following sections of this report discuss each in more detail.

## Tables 2-A to 2-D

### Table 2-A. U.S. Wetlands Mitigation/Compensation: Relevant Legislation, Regulations, and Guidance

| U.S. Federal Legislation | U.S. Code | Enacted | Summary of Relevance |
|---|---|---|---|
| Rivers and Harbors Appropriation Act of 1899 (Section 10) | 33 U.S.C. 401, 403, 407, 610 | 1899 | Excavating or filling a river or harbor without a permit from the US Army Corps of Engineers (USACE) is illegal. |
| Fish and Wildlife Coordination Act | 16 U.S.C. 661 et seq. | 1934 | USACE is required to consult with the Fish and Wildlife Service before making its permit decisions regarding excavating, filling, and related work. |
| National Environmental Policy Act (NEPA) of 1969 | 42 U.S.C. 4321-4347 | 1969 | Federal agencies must *consider* mitigation measures before taking action (including the granting of federal permits) that may have adverse environmental consequences. |
| Endangered Species Act (ESA) | 16 U.S.C. 1531 et seq. | 1973 | FWS or NMFS may issue a biological opinion providing "reasonable and prudent alternatives" that *must* be followed to comply with the ESA. An ESA permit that allows the taking of a protected species must specify how the applicant will "minimize and mitigate the impacts of such a taking." |
| Clean Water Act (Section 404) (amended Federal Water Pollution Control Act of 1972) | 33 U.S.C. 1344 | 1977 | A permit from USACE is required to discharge dredged material or fill material into a water of the US (including wetlands). |
| Food Security Act of 1985 (Swampbusters); Food, Agriculture, and Conservation Act of 1990; Federal Agriculture Improvement and Reform Act of 1996 | 16 U.S.C. 3801-3862 | 1985 | Landowners who plant agricultural commodities in converted wetlands may become ineligible for some federal agricultural loans and payments. They can retain eligibility by performing compensatory mitigation. |
| Transportation Equity Act for the 21st Century | 23 U.S.C. 103 | 1998 | Establishes a preference for using mitigation banks to mitigate the effects of highway projects on wetlands. |

| U.S. Federal Regulations | Code | Issued | Summary of Relevance |
|---|---|---|---|
| CWA Section 404(b)(1) Guidelines. Guidelines for Specification of Disposal Sites for Dredged or Fill Material | 40 CFR 230 | Environmental Protection Agency (1980) | Requires that impacts be avoided if there is a practicable alternative to the discharge that would have less adverse impact (40 CFR 230.10 (a)). Requires that appropriate and practicable steps be taken to minimize unavoidable adverse effects (40 CFR 230.10(d)). Compensatory mitigation may be used to minimize potential adverse effects (40 CFR 230.75(d)) to the aquatic environment. |
| Section 404 Permit Regulations. Policies for Evaluating Permit Applications to Discharge Dredged of Fill Material | 33 CFR 320-330 | Department of the Army | Provides guidance on conditions for issuing Section 404 permits, including requirements for compensatory mitigation. |
| Protection of the Environment (under NEPA) | 40 CFR 1500-1517 | Council on Environmental Quality (2000) | Regulations define mitigation under NEPA to include "compensating for the impact by replacing or providing substitute resources or environments." |

| U.S. Federal Guidance, Policy, and Agreements | Document Type/Code | Date Issued | Summary of Relevance |
|---|---|---|---|
| Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines | Memorandum of Agreement | February 6, 1990 | Sets forth a policy goal of "no overall net loss of values and functions" of wetlands. Requires that the decision to issue permits follow a specified sequence of avoidance, minimization, and compensatory mitigation. Establishes a preference for compensatory actions that are on-site and in-kind. Calls for restoration to be the first option considered, with one for one functional replacement of wetland values at a minimum (planned with "an adequate margin of safety to reflect the expected degree of success associated with the mitigation plan…"). |
| Corps Regulatory Guidance Letter: Guidance on Flexibility of the 404(b)(1) Guidelines and Mitigation Banking | No. 93-02 | August 23, 1993 | Clarifies the appropriate level of analysis required for evaluating compliance with the Clean Water Act Section 404(b)(1) Guidelines requirements for consideration of alternatives (40 CFR 230.10(a)). Specifically, this memorandum describes the flexibility afforded by the Guidelines to make regulatory decisions based on the relative severity of the environmental impact of proposed discharges of dredged or fill material into waters of the United States. |
| Federal Guidance for the Establishment, Use and Operation of Mitigation Banks | 60 FR 58605-58614 | November 28, 1995 | Provides policy guidance for the establishment, use and operation of mitigation banks for the purpose of providing compensatory mitigation for authorized adverse impacts to wetlands and other aquatic resources. This guidance is applicable to the establishment, use and operation of public mitigation banks, as well as privately-sponsored mitigation banks, including third party banks (e.g. entrepreneurial banks). |
| Federal Guidance on the Use of In-Lieu Fee Arrangements for the Compensatory Mitigation Under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act | 65 FR 66914-66917 | November 7, 2000 | Clarifies the manner in which in-lieu-fee mitigation may serve as an effective and useful approach to satisfy compensatory mitigation requirements and meet overall goals of no net loss of wetlands. Elaborates on in-lieu-fee guidance provided in the 1995 Mitigation Banking guidance by outlining where in-lieu-fee arrangements may be used, consistent with existing regulations and policy. |
| Corps Regulatory Guidance Letter (RGL) No. 02-2: Guidance on Compensatory Mitigation Projects | No. 02-2 | December 24, 2002 | Clarifies and supports the national policy for "no overall net loss" of wetlands and reinforces Corps commitment to protect waters of the United States, including wetlands. Reiterates much guidance issued in previous guidance documents. |
| Federal Guidance on the Use of the TEA-21 Preference for Mitigation Banking to fulfill Mitigation Requirements under Section 404 of the Clean Water Act | | July 11, 2003 | Provides interagency guidance on applying the preference for wetlands mitigation banking mandated in the Transportation Equity Act for the 21st Century to compensatory mitigation requirements under Section 404 of the Clean Water Act. |
| Model "Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining" for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act | Memorandum to the Field (USACE) | October 29, 2003 | Provides the original text of ten guidelines to aid in planning and implementing successful mitigation projects, as set forth by the National Research Council in its report entitled *"Compensating for Wetland Losses Under the Clean Water Act"*(2001), and discusses how applicants and field staff can incorporate these guidelines into the development and review of mitigation projects. |

| U.S. Federal Guidance, Policy, and Agreements | Document Type/Code | Date Issued | Summary of Relevance |
|---|---|---|---|
| Model Compensatory Mitigation Plan Checklist for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act | Memorandum to the Field (USACE) | November 7, 2003 | Provides a technical guide for Clean Water Act Section 404 permit applicants preparing compensatory mitigation plans by identifying the types and extent of information agency personnel need to assess a mitigation proposal's likelihood of success. The checklist provides a basic framework intended to improve predictability and consistency in the development of mitigation plans for permit applicants. |
| ***National Wetlands Mitigation Action Plan***<br><br>(NWMAP documents listed below are either in draft form or are technical resource documents) | | December 24, 2002 | Federal Interagency Mitigation Workgroup (FIMW)[2] commits to action items including clarifying mitigation guidance, integrating compensatory mitigation into a watershed context, improving compensatory mitigation accountability, clarifying performance standards, and improving data collection and availability.<br>For updates on progress: http://www.mitigationactionplan.gov |
| a) *Draft* Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation Under Section 404 of the Clean Water Act | | April 7, 2004 | Provides interagency guidance on the use of off-site and out-of-kind compensatory mitigation undertaken to meet permit requirements under Section 404 of the Clean Water Act. |
| b) *Draft* Federal Guidance on the Use of Preservation as Compensatory Mitigation Under Section 404 of the Clean Water Act | | August 27, 2004 | Provides guidance on the use of preservation as compensatory mitigation undertaken to meet permit requirements under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. |
| c) *Draft* Federal Guidance on Protection and Mitigation of Difficult to Replace Aquatic Resources Under Section 404 of the Clean Water Act | | August 27, 2004 | Provides interagency guidance on the special emphasis given to protection of wetlands and other aquatic resources for which compensatory mitigation through restoration or creation is not feasible or scientifically viable – referred to as difficult to replace (DTR) aquatic resources. Also provides guidance on compensatory mitigation for DTR aquatic resources when necessary to meet permit requirements under Section 404 of the Clean Water Act. |
| d) *Draft* Federal Guidance on the Use of Vegetated Buffers as Compensatory Mitigation Under Section 404 of the Clean Water Act | | August 27, 2004 | Provides guidance on the use of vegetated buffers as a component of compensatory mitigation plans undertaken to meet permit requirements under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. |
| e) Measuring Mitigation: A Review of the Science for Compensatory Mitigation Performance Standards | Technical resource document | April 2004 | Technical review commissioned by the FIMW to assist with the development of mitigation site performance standards |
| f) Physical Stream Assessment: A Review of Selected Protocols for Use in the Clean Water Act Section 404 Program (Stream Mitigation Compendium) | Technical resource document | | Technical review commissioned by the FIMW to assist with selecting, adapting, or devising stream assessment methods appropriate for impact assessment and mitigation of fluvial resources |

[2] Signatories of the National Wetlands Mitigation Action Plan include the Environmental Protection Agency, Department of Defense, Department of Commerce, Department of the Interior, Department of Agriculture, and Department of Transportation.

## Table 2-B. U.S. Conservation Banking: Relevant Legislation, Regulations, and Guidance

| U.S. Federal/State Legislation, Regulations, and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| National Environmental Policy Act (NEPA) of 1969 | 42 U.S.C. 4321-4347 | 1969 | Federal agencies must *consider* mitigation measures before taking action (including the granting of federal permits) that may have adverse environmental consequences |
| Endangered Species Act (ESA) – Sections 7 and 10 | 16 U.S.C. 1531 et seq. | 1973 | Section 7(a)(1) of the ESA requires that all Federal agencies ...in consultation with and with the assistance of the [Service], utilize their authorities in furtherance of the purposes of [the ESA] by carrying out programs for the conservation of [listed species]. Section 7(a)(2) of the ESA also requires each Federal agency to consult with the Service regarding effects of their actions to insure that the continued existence of listed species will not be jeopardized and that designated critical habitat will not be destroyed or adversely modified. Impacts to listed species are minimized by including conservation measures for the listed species in the Federal agency's project description.<br>Section 10(a)(1)(B) of the ESA authorizes the Service to issue to non-Federal entities a permit for the incidental take of endangered and threatened species. This permit allows a non-Federal landowner to proceed with an activity that is legal in all other respects, but that results in the incidental taking of a listed species. A habitat conservation plan, or HCP, must accompany an application for an incidental take permit. The purpose of the HCP is to ensure that the effects of the permitted action on covered species are adequately minimized and mitigated and that the action does not appreciably reduce the survival and recovery of the species. |
| Official Policy on Conservation Banks | The Resources Agency and California Environmental Protection Agency | April 7, 1995 | Provides formal policy guidance for the State of California on the use of conservation banks as a means to accomplish resource management goals. |
| Guidance for the Establishment, Use and Operation of Conservation Banks | U.S. Department of the Interior | 2003 | Provides guidance on the establishment, use, and operation of conservation banks for the purpose of providing a tool for mitigating adverse impacts to species listed as threatened or endangered under the Endangered Species Act of 1973, as amended. The guidance can also be used to aid in the establishment of banks for candidate species. The guidance is intended to help Service personnel: (1) evaluate the use of conservation banks to meet the conservation needs of listed species; (2) fulfill the purposes of the ESA; and (3) provide consistency and predictability in the establishment, use, and operation of conservation banks. |

## Table 2-C. European Union Natura 2000 Sites: Relevant Legislation, Regulations, and Guidance

| European Union Directives and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| Council Directive on the conservation of wild birds ("Birds Directive") | 79/409/EEC | April 2, 1979 | Commits governments of the European Community to the conservation of wild birds. The Directive identifies 181 endangered species and sub-species for which the Member States are required to designate Special Protection Areas (SPA). |
| Council Directive on the conservation of natural habitats and of wild fauna and flora ("Habitats Directive") | 92/43/EEC | May 21, 1992 | Commits governments of the European Community to the conservation of an extensive range of wildlife species and habitat types by requiring each Member State to identify and designate Special Areas of Conservation (SAC). The SAC designated under the Habitats Directive, together with the SPA designated under the Birds Directive, make up the Natura 2000 network for nature conservation. |
| Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC | European Commission | 2000 | Provides guidelines to Member States on the interpretation of certain key concepts used in Article 6 of the 'Habitats' directive. The primary targets of the document are Member State authorities and not individuals. It was drafted by the services of the Environment Directorate-General of the European Commission. As such, the guidance reflects only the views of Commission services and is not of a binding nature. |
| Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC | European Commission | 2001 | Provides non-mandatory methodological help to carry out or review the assessments required under Article 6(3) and (4) of the habitats directive. Such assessments are required where a project or plan may give rise to significant effects upon a Natura 2000 site. The guidance is designed principally for use by developers, consultants, site managers, practitioners, competent authorities and national agencies in the EU Member States and in the candidate countries. |

## Table 2-D. Australian Offset Policies: Relevant Legislation, Regulations, and Guidance

| Australian Commonwealth/State Legislation, Regulations, and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| National Heritage Trust – Partnership Agreements for Bushcare | Commonwealth of Australia | 1997 | Natural Heritage Trust (NHT) was established in May 1997 by the Commonwealth government and provided $1.25 billion to invest in the reclamation, rehabilitation and protection of the environment. Delivery of NHT objectives is primarily through the states/territories by way of Partnership Agreements signed between the Commonwealth and each state or territory. Bushcare, with a budget of $348 million over the life of NHT, is the largest of the NHT programs and has the goal of reversing the decline in the quality and extent of Australia's native vegetation cover. |
| Environment Protection and Biodiversity Conservation Act of 1999 | Act No. 91 of 1999 as amended; Commonwealth of Australia | 1999 | The Act seeks to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance, and to promote ecologically sustainable development, conservation of biodiversity, and protection and conservation of heritage. Establishes that Commonwealth approval may be required for native vegetation clearing that will have, or is likely to have, a significant impact on aspects of the environment that are of national significance. |
| Environment Protection and Biodiversity Conservation Regulations 2000. | Statutory Rules 2000 No. 181 as amended; Commonwealth of Australia | 2000 | Regulations supporting the Environment Protection and Biodiversity Conservation Act of 1999. |
| ***New South Wales*** | | | |
| Offsets, salinity and native vegetation discussion paper | Government of New South Wales | 2001 | Provides a discussion of whether and how the negative impacts of clearing native vegetation might be offset by separate actions that have positive impacts. It was developed to stimulate discussion on the use of offsets and to explore ways to make such a system practical, effective, and responsive to new information. |
| Green offsets for sustainable development: Concept paper | Government of New South Wales | 2002 | Presents the concepts underlying green offsets and introduces five green offset initiatives. |
| Native Vegetation Act 2003 | No. 103, Government of New South Wales | 2003 | The Act seeks to promote the management of native vegetation, prevent broadscale clearing, protect native vegetation of high conservation value, improve the condition of existing native vegetation, and encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation, in accordance with the principles of ecologically sustainable development. |
| Draft Native Vegetation Regulation 2004: Environmental Outcomes Assessment Methodology | New South Wales Department of Infrastructure, Planning and Natural Resources | 2004 | The *Native Vegetation Act 2003* aims to end broadscale clearing except where the clearing will improve or maintain environmental outcomes. The Environmental Outcomes Assessment Methodology sets out the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes (including comparison of proposed clearing to proposed offsets). |

| Australian Commonwealth/State Legislation, Regulations, and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| The NSW Wetlands Management Policy | New South Wales Department of Land and Water Conservation | 1996 | A whole-of-government policy to encourage ecologically sustainable conservation, management and use of wetlands in New South Wales. The policy establishes nine wetland management principles. Principle six states that natural wetlands should not be destroyed or degraded, but when social or economic imperatives require it, the rehabilitation or construction of a wetland is necessary. |
| Compensatory Wetlands: A discussion paper under the NSW Wetlands Management Policy. | New South Wales State Wetland Advisory Committee and New South Wales Department of Land and Water Conservation | 2002 | When wetland loss occurs or is projected to occur, Principle 6 of the *NSW Wetlands Management Policy* provides no guidance for compensation. The compensation that does take place is *ad hoc*, not transparent, and mostly inadequate in that there is no allowance for the long-term management of, and responsibility for the wetlands. This discussion paper outlines the major principles, options and issues associated with compensatory wetlands, with the aim that guidelines on the compensation principle will eventually be developed and adopted under the *NSW Wetlands Management Policy*. |
| ***Victoria*** | | | |
| Planning and Environment Act 1987 | Act No. 45/1987. Version No. 075 incorporating amendments as at 15 December 2004 | 1987 | Establishes a framework for planning the use, development and protection of land in Victoria. Environmental impacts of land use can be considered through this planning system. Native Vegetation Retention controls were introduced in 1989 (as set out in Clause 52.17). These controls require a planning permit for the removal, destruction or lopping of native vegetation subject to a range of exemptions designed to facilitate normal domestic and rural practices. |
| Flora and Fauna Guarantee Act 1988 | Act No. 47/1988. Version No. 030 incorporating amendments as at 29 June 2000 | 1988 | Establishes a legal and administrative structure to enable and promote the conservation of Victoria's native flora and fauna and to provide for a choice of procedures which can be used for the conservation, management or control of flora and fauna and the management of potentially threatening processes. |
| Victoria's native vegetation management -a framework for action | Victoria Department of Natural Resource and Environment | 2002 | Sets out the broad approach to achieving a Net Gain in extent and quality of native vegetation, including a vision, principles, goals, key agencies, and implementation tools (including adoption of the "habitat hectare" method for assessing conservation significance. |

| Australian Commonwealth/State Legislation, Regulations, and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| ***Western Australia*** | | | |
| Environmental Protection Act 1986 | Government of Western Australia | 1986, as amended | Recent amendments (2003) provide a basis for offsets: "A clearing permit may be granted subject to such conditions as the CEO [Department head] considers to be necessary or convenient for the purposes of preventing, controlling, abating or mitigating environmental harm or offsetting the loss of the cleared vegetation" (51H(1)). "The following list sets out things that the holder of a clearing permit can be required to do (at the expense of the holder) under conditions attached to the clearing permit—…establish and maintain vegetation on land other than land cleared under the permit in order to offset the loss of the cleared vegetation, or make monetary contributions to a fund maintained for the purpose of establishing or maintaining vegetation" (51I(2)(b)). [Sections inserted by No. 54 of 2003 s. 110(1).] |
| Environmental Offsets: Preliminary Position Statement No. 9 | Western Australia Environmental Protection Agency | 2004 | Sets out the EPA's view on environmental offsets, provides overarching guidance, and establishes the purpose, scope and principles for environmental offsets that the EPA will consider in future advice and recommendations. It is intended to provide a consistent policy approach on environmental offsets by clarifying options for industry, developers, environmental consultants, specialist scientists and community groups who may be involved in developing or reviewing options for environmental offsets. |

## Table 2-E. Brazilian Offset Policies: Relevant Legislation, Regulations, and Guidance

| Brazilian Federal Legislation, Regulations, and Guidance | Document Code/ Author | Enacted/ Issued | Summary of Relevance |
|---|---|---|---|
| Protected Areas Law (#9985)<br>Decree 4340 | Federal Government of Brazil | 2000,<br>2002 | The law requires that industrial development projects must offset their environmental impacts, as described in their Environmental Impact Assessment, through payment to the National Protected Areas System. The minimum offset is 0.5% of capital costs of the industrial development, and is determined on a case-by-case basis by a regulatory commission. To date, there is no guidance for determining the offset amount or any attempt to determine equivalence between environmental impact and benefits of offset. The offset can be directed to any protected area within the national system, unless the industrial development directly impacts a specific park, in which case that park must be the beneficiary. Offset funds must be spent (in order of priority) on: 1) demarcation of protected area; 2) elaboration, revision, implementation of management plan; 3) acquisition of goods and services for management, monitoring, and protection of area; 4) studies necessary for creation of new protected areas; 5) research necessary for conservation management. |
| Forestry Code (#4771)<br>Provisional Measures 2166/67 | Federal Government of Brazil | 1965,<br>2001 | The law requires that landowners must maintain a fixed minimum percentage of natural vegetative cover on their property. The minimum area requirement varies by region: Atlantic Forest = 100%; Amazon Forest = 80%; Amazon Savannah = 35%; all other areas = 20%). The requirement can be satisfied through the use of off-site conservation offsets. State level crediting systems (e.g. conservation banks) are in development in the states of Minas Gerais and Parana. Equivalence is handled by requiring that offset is same type of ecosystem within the same watershed, and if that is not possible due to lack of natural vegetation, then the next closest watershed. |

## 3. Offset Policy Goals, Principles, and Mechanisms

This section describes and compares offset policy goals, principles, and mechanisms. The aim is to provide an overview of how the governing frameworks for offsets converge and diverge on key issues. Understanding such context is a necessary precursor to assessing offset methodological challenges and implementation issues (Sections 4 and 5). Key questions addressed include:

- *What are the main objectives of offset policies?*
- *What principles guide decisions about when offsets are an appropriate mitigation response?*
- *What approaches are employed to implement offsets?*

### 3.1. Policy Goals

Policy goals for offsets vary from "no net loss" to "net gain" to more general statements about the need to address adverse impacts. The main objective of U.S. wetlands mitigation policy is "no overall loss of values and functions," as established under 1990 legislation as well as a Memorandum of Agreement between the U.S. Army Corps of Engineers and Environmental Protection Agency (Table 3-A). However, a recent announcement by President Bush on Earth Day 2004 called for "moving beyond" this policy toward net gain (The White House 2004).

Policy statements from three Australian states call for offsets to achieve a "net environmental gain," but this is only an aspiration, not a requirement. As such, these policy objectives would probably be better characterized as "no net loss or better." In Victoria, the Department of Natural Resource and Environment (2002) has developed a vegetation management and offset policy that calls for a reversal in the decline of native vegetation, "leading to a net gain." However, for specific vegetation losses, the policy is much less ambitious, noting: "The Net Gain approach… at the on-the-ground level, expresses the principle that where losses are directly permitted and/or incurred, effort should be made, at a minimum, to balance such losses with commensurate gains in some way." Likewise, the Western Australia Environmental Protection Agency's (2004) offset goals are open to wide interpretation, as its preliminary guidance suggests "offsets should be used with an aspiration of achieving a 'net environmental benefit'." Offset concept papers prepared by the Government of New South Wales suggest "offsets must result in a net environmental improvement." But recent draft regulations for native vegetation call for offsets to have "equal or greater regional conservation significance as the site

proposed for clearing," indicating that a policy akin to "no net loss or better" may eventually be adopted.

Brazilian forest offsets imply no net loss of habitat under a defined minimum forest cover for private landholdings. That minimum area requirement varies by region: Atlantic Forest = 100 percent; Amazon Forest = 80 percent; Amazon Savannah = 35 percent; all other areas = 20 percent. The implications of this policy are twofold: in regions where forest cover currently exceeds those limits, further habitat loss is likely to occur over time; in the state of Minas Gerais, natural habitat has already dipped below the 20 percent minimum, implying that a gain in habitat will be necessary.

U.S. conservation banking, E.U. Natura policy goals, and Brazilian industrial offsets do not directly address issues of no net loss or net gain. Conservation banking objectives are to offset adverse impacts to threatened and endangered species, but specific federal or State of California policy guidance regarding "how much" such impacts should be offset is not provided. Nonetheless, in practice, implementing agencies in California seek no net loss of habitat values or carrying capacity of listed species populations. For the E.U. Natura 2000 network, the stated goal is to maintain overall (ecological) coherence of the sites. This goal appears open to wide interpretation, since it presumes the original network (when it is fully developed) will be coherent and that impacts will be measurable in a manner which allows for determinations regarding violations of "coherence." Brazilian industrial offset legislation defines no linkage between environmental impacts and the benefits of offset payments, therefore making it impossible to measure net difference in environmental values.

### 3.2. Mitigation Principles

In considering mitigation options for a proposed project's impacts, offset policies generally adhere to a sequence of: (1) avoidance, (2) minimization, and (3) compensatory mitigation (Table 3-B). This was first established for U.S. wetlands mitigation (USEPA and USACE 1990), and it appears that most other policies have adopted a similar mitigation hierarchy, with some minor variations. Under the U.S. wetlands policy, the first step is to avoid adverse impacts "to the maximum extent practicable."[3] Any unavoidable impacts should then be minimized "to the extent appropriate and practicable." After which, any remaining impacts will require compensatory mitigation. All policies make clear that offsets are intended as an option of "last resort," to be considered in addressing any residual impacts after efforts to avoid and minimize have been undertaken.

In the first step of the sequence (avoidance), it is important to note that impacts to unique and rare habitats, special aquatic sites, and other critical environmental assets are generally prohibited; they must be avoided unless it is an exceptional case. In evaluating

[3] Practicable is defined as "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.3(q))

the proposed impact site against potential alternatives, the main criterion is which site represents the *least environmentally damaging* option. For instance, Natura 2000 policy makes clear that in the consideration of alternative solutions to a proposed project, "other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria" (European Commission 2000). Likewise, U.S. wetlands policy notes that "compensatory mitigation may not be used as a method to reduce environmental impacts" to make a potentially avoidable project appear more acceptable (USEPA and USACE 1990).

Two policies provide minor variations to the "avoid" and "minimize" steps. First, the E.U. Natura policy appears to apply a stricter standard for project acceptance. If project alternatives cannot be identified, rather than assessing potential measures for minimizing impacts, the E.U. policy first requires an assessment of whether there are "imperative reasons of overriding public interest, including those of a social or economic nature, which require the realization of the plan or project in question" (European Commission 2000). These imperative reasons are defined in an open-ended manner to include projects that are indispensable "to protect fundamental values for citizens' lives (health, safety, environment); within the framework of fundamental policies for the State and society; [or] within the framework of carrying out activities of an economic or social nature, fulfilling specific obligations of public service" (European Commission 2000).

Second, Western Australia extends the three-step sequence to five steps, adding "rectification" and "reduction" as additional minimization steps for consideration prior to assessing offset options. Rectification involves "repairing, rehabilitating or restoring an impacted site," whereas reduction refers to "gradually eliminating the adverse impact over time by preservation and maintenance operations during the life of the action" (Western Australia Environmental Protection Agency 2004).

### 3.3. Offset Mechanisms

For project impacts that cannot be avoided or sufficiently mitigated, compensatory actions may be taken by the project proponent or a designated third party. In the first case, the project proponent retains responsibility for compensatory mitigation, either performing the necessary offset activities itself or hiring an agent to do so. In the second case, the project proponent satisfies its compensatory mitigation obligations by paying a third party to take on legal responsibility for offset activities. This might involve buying credits from a mitigation/conservation bank or paying an in-lieu fee to a fund intended to support mitigation activities (usually administered by a conservation organization or government agency).

In practice, project proponents usually retain responsibility for compensatory mitigation rather than pay a third party to take on the liability. For example, project proponents implemented 75 percent of compensatory mitigation required for impacts to U.S. wetlands in 1998, whereas mitigation banks accounted for nine percent, and the remaining mitigation was provided through other mechanisms, such as in-lieu fees and

in-kind exchanges (NRC 2001). However, it should be recognized that third party approaches are relatively new. Consider that federal guidance on U.S. mitigation banking was only issued in 1995, in-lieu fee arrangements in 2000, and conservation banking in 2003. In Brazil, forest offsets became regulated in 2001 and few states have developed the internal capacity to organize and regulate crediting systems yet. And a native vegetation banking approach called "BushBroker" in Victoria Australia, which is modeled after U.S. wetland mitigation banking, is only now nearing the pilot stage.

### *3.3.1. Offsets by Project Proponents*

When project proponents choose to mitigate impacts through their own development of offsets, they are generally required to submit an offset proposal along with the permit application for the development project. The level of information provided in the proposal should be commensurate with the potential impact of the development project. The types of information generally required in the proposal include: baseline information, objectives, site selection rationale, work plan, performance standards, responsible parties, legal means of offset protection, monitoring and long-term management plans, and contingency plans and financial assurances.

To illustrate in more detail, consider the types of information required for U.S. wetland offset proposals.[4]

- Baseline information – offset location, size, and hydrology.
- Offset objectives – offset's aquatic resource type(s) and functions provided.
- Site selection factors – cost, technology, logistical issues and how the offset site contributes to specific aquatic resource needs of the affected watershed.
- Offset work plans – maps and boundaries of the site; construction methods, timing, and sequence; source(s) of water supply, connections to existing waters, and proximity to uplands; native vegetation proposed for planting; and a range of other construction, maintenance, and management issues.
- Performance standards – appropriate standards and indicators (e.g., vegetation, hydrology) that provide a basis for assessing whether the offset is achieving its planned goal.
- Responsible parties – identification of parties responsible for compliance and their role in the offset.
- Site protection – legal means for offset protection (e.g., conservation easement).

[4] Similar information is required regarding the impact site to provide a basis for comparison (impact site losses vs. offset site gains) when assessing the proposal's potential for achieving the policy goal of no net loss of wetland functions and values.

- Monitoring and long-term management plans – identification of long-term measures to support achieving offset compliance with performance standards.

- Contingency plans and financial assurances – Plans for addressing unexpected problems, and financial assurance mechanisms (e.g., performance bonds, trusts) to support compliance in the event remedial measures are needed (USACE 2002).

### *3.3.2. Third Party Approaches*

Developers (or hired agents) normally perform the necessary offsetting activities, with each new project requiring an accompanying offset. However, this project-by-project mitigation approach has come under criticism for inefficiencies and poor mitigation results. Due to these problems, a new entrepreneurial approach to mitigation has been developed that essentially establishes a "banking" framework in which entrepreneurs can invest in developing offsets. Under this approach, entrepreneurs can earn "credits" based on the success of their offset, and then recoup their offset investment by selling these credits to developers. Proponents of this approach suggest it offers a number of significant advantages over traditional project-by-project mitigation.

- **Greater geographic scale of mitigation:** Rather than develop small, isolated mitigation projects for each new project causing adverse impacts, offsets may be developed as larger conservation reserves or areas that support habitat connectivity. By consolidating piecemeal mitigation projects into one large mitigation site, offsets can secure a range of environmental benefits, such as greater complexity of habitats, improved viability of populations, and increased buffering to guard against potential disturbances from adjacent land uses.

- **Greater flexibility for site location:** Offsets can be located where they provide the greatest environmental benefits (and lowest risk of failure), as opposed to the traditional approach of mitigation at the proposed development site, which may or may not generate significant environmental benefits. Indeed, whereas project-by-project mitigation is often isolated with little connection to the surrounding ecosystem (increasing the chance of failure), offsets can be incorporated into a larger eco-region, watershed, and/or conservation plan.

- **Opportunity to guard against temporal losses and risk of mitigation failure:** Development projects often proceed concurrently with mitigation efforts, but the development may be complete well before success or failure of the mitigation effort can be determined. In contrast, offsets established under a banking framework may be mature and effective (and offering credits) before project impacts occur. Such offsets can reduce both the temporal losses associated with the "gap" between project impacts and effective mitigation and the risks of mitigation failure.

- **More cost-effective conservation:**

  - **Economies of scale:** Developing a large offset, rather than designing appropriate mitigation for each of several small project impacts, can be more cost-effective because of the advantages of economies of scale. Offsets can bring together financial resources, planning, and scientific expertise not practicable for smaller conservation activities.

  - **Turning liabilities into assets:** Since the banking approach provides a mechanism for implementing conservation within a market framework, owners of environmentally significant habitat can view their land as an asset (from which saleable credits can be generated) rather than as a liability (due to restrictions on development). In this manner, the offset mechanism also provides private landowners with greater incentives to play a positive role in conservation.

  - **Lower costs for project proponents and regulators:** As an additional mitigation option, offset banks provide project proponents with greater flexibility in how they meet their conservation obligations. Project proponents can potentially save time and money by buying credits from existing offsets, either because the credits are cheaper than their proposed mitigation projects or due to the benefits of a simplified regulatory compliance process. Regulators also benefit from reduced costs, as monitoring compliance for one large offset will be less expensive than for several small mitigation sites.

3.3.2.1. Wetland Mitigation Banking[5]

> "Mitigation banking has been defined as wetland restoration, creation, enhancement, and in exceptional circumstances, preservation undertaken expressly for the purpose of compensating for unavoidable wetland losses in advance of development actions, when such compensation cannot be achieved at the development site or would not be as environmentally beneficial. It typically involves the consolidation of small, fragmented wetland mitigation projects into one large contiguous site. Units of restored, created, enhanced or preserved wetlands are expressed as 'credits' which may subsequently be withdrawn to offset 'debits' incurred at a project development site" (U.S. Department of the Army et al. 1995).

Under wetland mitigation banking, proponents of a project expected to cause unavoidable impacts to a wetland area can offset these losses by purchasing "credits" from a third party holder of a wetland bank. However, "credits may only be authorized when on-site compensation is either not practicable or use of a mitigation bank is environmentally preferable to on-site compensation" (U.S. Department of the Army et al. 1995). The

[5] For more detailed description and analysis of wetland mitigation banking approaches and practices, see Environmental Law Institute. 2002. Banks and Fees: The Status of Off-Site Wetland Mitigation in the United States. Washington, DC: Environmental Law Institute; and National Research Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. Washington, DC: National Academy Press.

Transportation Equity Act for the 21st Century (1998) provided an exception to these conditions for federally funded transportation projects, for which mitigation banks will be given preference "to the maximum extent practicable."

To establish a wetlands bank, prospective bank sponsors must prepare a "mitigation banking instrument" providing a range of information about the bank for review and authorization by the Mitigation Bank Review Team (MBRT) – a team of representatives from the U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), Fish and Wildlife Service (FWS), and other appropriate government agencies and levels. The banking instrument should provide a detailed description of the physical and legal characteristics of the bank, and how the bank will be established and operated. A complete list of required banking instrument information is provided in Box 3-A.

**Box 3-A. Mitigation Banking Instrument Information Requirements**

- Bank goals and objectives;
- Ownership of bank lands;
- Bank size and classes of wetlands and/or other aquatic resources proposed for inclusion in the bank, including a site plan and specifications;
- Description of baseline conditions at the bank site;
- Geographic service area;
- Wetland classes or other aquatic resource impacts suitable for compensation;
- Methods for determining credits and debits;
- accounting procedures;
- Performance standards for determining credit availability and bank success;
- Reporting protocols and monitoring plan;
- Contingency and remedial actions and responsibilities;
- Financial assurances;
- Compensation ratios;
- Provisions for long-term management and maintenance.

Source: U.S. Department of the Army et al. 1995

Although permittee-responsible offsets continue to be the dominant manner in which to provide compensatory mitigation, the past decade has seen a considerable increase in the use of mitigation banks – from 46 approved banks covering 18,000 acres in 1992 to 219 approved banks encompassing 140,000 acres in 2001, with an additional 95 banks pending approval (Environmental Law Institute 2002). And this increase reflects a sharp rise in "entrepreneurial banks" (i.e., private commercial banks). Compared to only one private commercial bank (2 percent) in operation in 1992, there were 135 private commercial banks (62 percent) operating in 2001. Conversely, the proportion of mitigation banks sponsored by state highway agencies, port authorities, or local governments, which amounted to almost 75 percent of banks in the early 1990s, had dropped to about 25 percent by 2001 (Environmental Law Institute 2002).

Studies by the Environmental Law Institute (1993 and 2002) suggest the increase in private sector banks can be attributed to two factors. First, federal mitigation banking guidance issued in 1993 and 1995 provided a greater basis for consistency and predictability regarding permitting and mitigation decisions, credits, and expectations of banking returns. Second, the common practice of allowing for the early sale of credits, before a bank has reached maturity, has provided bank sponsors with the necessary capital to establish their banks, thereby reducing the disincentive of high start-up costs.

Indeed, Environmental Law Institute (2002) estimates that "as many as 92 percent of the nation's banks allow credits to be withdrawn in advance of bank maturity." Despite 1995 federal guidance calling for banks to be established "in advance of development actions," widespread early credit release has occurred because the 1995 guidance also suggests that "decisions to allow credits to be withdrawn from a mitigation bank in advance of bank maturity be made on a case-by-case basis to best reflect the particular ecological and economic circumstances of each bank." Across the banks selling credits prior to meeting all performance standards, the amount of credits sold varies widely from 15 percent to 100 percent. Most banks, however, retain at least half of their credits for release after some performance standards have been achieved (Environmental Law Institute 2002).

### 3.3.2.2. In-Lieu Fee Arrangements[6]

> "In-lieu-fee mitigation occurs in circumstances where a permittee provides funds to an in-lieu-fee sponsor instead of either completing project-specific mitigation or purchasing credits from a wetland mitigation bank approved under the Banking Guidance" (U.S. Department of the Army et al. 2000).

An in-lieu-fee arrangement is an agreement between a regulatory agency and a mitigation sponsor (usually a state agency, land trust, or conservation organization) that allows the sponsor to collect funds from multiple project proponents "in lieu of" their required project-specific compensatory mitigation. The sponsor then uses the funds to establish offsets to satisfy the project proponents' compensatory requirements. In-lieu-fee arrangements are only allowed under a limited range of circumstances – when project impacts are unavoidable, on-site mitigation is not available, practicable or preferable to off-site mitigation, and no mitigation bank credits are available. As stated in 2000 federal guidance, "use of a mitigation bank is preferable to in-lieu fee mitigation where permitted impacts are within the service area of a mitigation bank and approved to sell mitigation credits, and those credits are available" (U.S. Department of the Army et al. 2000). However, in-lieu-fee arrangements offering in-kind compensation may be preferable to mitigation banks that provide only preservation credits or out-of-kind compensation.

The 2000 federal guidance was issued in response to concerns about the effectiveness of existing in-lieu-fee programs in spending funds on mitigation, providing ecologically sound mitigation, and doing so in a timely manner. To address these issues, the 2000 guidance requires an evaluation of the "demonstrated performance of natural resource management organizations (e.g., government organizations, land trusts) prior to approving them to manage in-lieu-fee arrangements." Moreover, in-lieu-fee arrangements must include "distinct provisions that clearly state that the legal responsibility for ensuring mitigation terms are satisfied fully rests with the organization

[6] For more detailed description and analysis of in-lieu-fee arrangements, see Environmental Law Institute. 2002. Banks and Fees: The Status of Off-Site Wetland Mitigation in the United States. Washington, DC: Environmental Law Institute; and National Research Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. Washington, DC: National Academy Press.

accepting the in-lieu-fee." The 2000 guidance also strengthened the standards for operating an in-lieu-fee program by requiring prospective program sponsors to provide information in advance of establishing the program on "(1) potential sites where specific restoration projects or types of restoration projects are planned, (2) the schedule for implementation, (3) the type of mitigation that is most ecologically appropriate on a particular parcel, and (4) the financial, technical, and legal mechanisms to ensure long-term mitigation success" (U.S. Department of Army et al. 2000). A complete list of requirements for in-lieu-fee agreements is provided in Box 3-B.

**Box 3-B. Requirements for Establishing In-Lieu-Fee Agreements**

- A description of the sponsor's experience and qualifications with respect to providing compensatory mitigation;
- Potential site locations, baseline conditions at the sites, and general plans that indicate what kind of wetland compensation can be provided (e.g., wetland types, restoration or other activity, proposed time line, etc.);
- Geographic service area;
- Accounting procedures;
- Methods for determining fees and credits;
- A schedule for conducting the activities that will provide compensatory mitigation or a requirement that projects will be started within a specified time after impacts occur;
- Performance standards for determining ecological success of mitigation sites;
- Reporting protocols and monitoring plans;
- Financial, technical and legal provisions for remedial actions and responsibilities (e.g., contingency fund);
- Financial, technical and legal provisions for long-term management and maintenance (e.g., trust); and
- Provision that clearly states that the legal responsibility for ensuring mitigation terms are fully satisfied rests with the organization accepting the fee.

Source: U.S. Department of the Army et al. 2000

As of 2001, there were 87 active in-lieu-fee programs in the United States (Environmental Law Institute 2002). In light of the 2000 federal guidance on in-lieu-fee arrangements, many of these programs have been in the process of transitioning from *ad hoc* arrangements with poor tracking of data and funds to more formal programs. Of the 87 active programs identified, Environmental Law Institute (2002) found that 39 programs lacked data on in-lieu fee funds, 15 programs could not provide information on the number of wetland acres affected (that generated in-lieu-fees) or the number of compensatory acres, 44 programs were silent as to whether the sponsor had legal responsibility for completing mitigation, 58 programs did not require that funds be spent in a specific time frame, and 17 programs did not require any specific performance standards. This combination of "loose" arrangements and lax data collection are what led to the issuance of the 2000 federal guidance. Indeed, for most of these active programs there was no specified obligation to achieve defined outcomes at their mitigation sites. Consider an in-lieu-fee agreement between USACE Sacramento district and The Nature Conservancy, which states that "The Nature Conservancy does not guarantee any specific results, actions, or effects on any lands acquired, managed or restored under this agreement but will use good faith efforts to meet the objectives of the program" (Environmental Law Institute 2002). Such open-ended obligations are no longer acceptable under the 2000 federal guidance.

In Brazil, industrial offsets emulate an in-lieu fee system, but the implementing third party is always the National Protected Areas System. The theory here is that payments to the protected areas system will generate environmental benefits that offset industrial impacts. By limiting the developer's obligation to a simple payment, it speeds the permitting process and does not obligate them to become directly involved in conservation projects. Under this system offset funds must be spent by the National Protected Areas System, in order of priority, on: 1) demarcation of protected area; 2) elaboration, revision, implementation of management plan; 3) acquisition of goods and services for management, monitoring, and protection of area; 4) studies necessary for creation of new protected areas; 5) research necessary for conservation management.

### 3.3.2.3. Conservation Banking

> "Conservation bank – a site where habitat and/or other ecosystem resources are conserved and managed in perpetuity for listed species expressly for the purpose of offsetting impacts occurring elsewhere to the same resource values" (U.S. Department of the Interior 2003).

Conservation banking in the U.S. essentially transfers the concept of wetland mitigation banking to endangered and threatened species conservation. Similar to wetland mitigation, proponents of projects causing authorized adverse impacts to listed species (including habitat loss or modification) can satisfy their mitigation requirements by purchasing "credits" from a conservation bank. A conservation bank may be established by acquiring existing habitat, protecting existing habitat through conservation easements, restoring or enhancing disturbed habitat, creating new habitat, and prescriptively managing habitats for specified biological characteristics (U.S. Department of the Interior 2003). To allow bankers in the U.S. to gauge demand for a bank's potential credits, it is possible to divide banks into sub-areas and implement in phases. However, once the first credit of a bank or phase of a bank is sold, the land within the bank or its phase must be permanently protected, with any land use restrictions legally established in perpetuity. This is intended to guard against any future fragmentation of the habitat.

Similar to the process for wetland mitigation banks, a prospective conservation banker in the U.S. must come to agreement on conditions and criteria under which the bank will be established, operated, and managed with a Conservation Bank Review Team (CBRT), which will include representatives from the Fish and Wildlife Service and any other participating federal, state, or local agencies. The conservation bank agreement must contain a range of information on bank location, establishment and management of credits, bank funding, and a management plan. A list of required bank agreement and management plan elements is provided in Box 3-C.

Presently, only the State of California has an established program for conservation banking, initiated under its "Official Policy on Conservation Banks" (1995). As of 2002, over 90 banks had been established, with most in Southern California, especially in San Diego and Orange County where population growth and a relatively high number of listed species has generated greater interest in conservation banking (Denisoff 2002).

Outside of California, only a few conservation banks have been established (e.g., red-cockaded woodpecker in North Carolina), and this has happened on an *ad hoc* basis as no other states have established policy guidance on conservation banks. However, with the issuance of federal guidance on conservation banks in 2003, it is expected that states will follow with the development of their own conservation bank program guidance.

Elsewhere in the world, conservation banking is also developing. In effect, current efforts in Minas Gerais and Paraná to establish credit systems for third party offsets may eventually evolve into formal banking arrangements with government oversight. Presently, state governments are developing land and ecosystem registration systems that will make this possible. A variant within this system are "condominium" arrangements where groups of landowners establish private conservation bank to offset their collective liabilities off-site.

**Box 3-C. Requirements for Establishing and Managing Conservation Banks in the United States**

1. A general location map and legal description of the property, including GPS coordinates if possible.
2. Accurate map(s) of the bank property on a minimum scale of 7 minutes. U.S. Geological Survey quad map or finer scale, if available.
3. Name of the conservation bank.
4. Name of the person(s)/organization(s) to hold fee title to the conservation bank.
5. Name of the person(s)/organization(s) who will have management responsibility for the conservation bank and for how long. This entity must have demonstrated experience in natural lands management.
6. Name of the person or entity who will hold a conservation easement on the property.
7. Preliminary title report indicating any easements or encumbrances on the property, including Native American hunting, fishing, and gathering rights. This information should be supplied early in the bank evaluation and development process to ensure that the conservation banks goals are compatible with other current or planned activities on the property.
8. An enumeration of the types of potential activities that may include public access and that are compatible with the property's primary function as habitat for species.
9. A description of the biological value of the bank, including habitats and species. This may include a vegetation map and biological resources inventory.
10. Number and kind of conservation credits within the bank. Final credit numbers and any constraints on types of credits to be sold will be determined by the Service in accordance with a methodology clearly set forth in the agreement.
11. An accounting system to track credits, funding, and other reporting requirements.
12. Description of the Service Area of the bank. The appropriate Service Area will be determined by the Service and with the bank owner/manager.
13. Description and delineation of each bank phase, if more than one phase is proposed. The description will include phase boundaries, number of conservation credits associated with each phase, explanation for why the use of phases is preferred, and agreed up on process for terminating the bank prior to the implementation of all phases.
14. Compliance with applicable State and Federal laws such as State endangered species acts.
15. Results of a Phase I hazardous materials survey for the property.
16. A review of mineral and water rights associated with the property.
17. Discussion of any prescriptive rights on the property (e.g., road access, etc.),
18. An agreement to accurately delineate in the field all boundaries of the bank property, including any bank phases, and construct any required fences before the first conservation credit is sold, fee title transferred, or conservation easement granted.
19. An agreement to remove any trash, structures, or other items on-site that would otherwise reduce the long-term biological value of the site before the first conservation credit is sold, unless otherwise agreed to.
20. Provisions for the Service to enter property for inspections, quality control/assurances and other duties as needed.
21. Performance standards that must be achieved.
22. Contingency management, funding, and ownership plans in the event that the bank owner and/or manager fails to fulfill the obligations as listed under the bank agreement and management plans, including an applicable dispute resolution process to address these contingencies.
23. A management plan for the ban k property that includes:
    - Property description, including geographical setting, adjacent land uses, location relative to regional open space plans, geology, and cultural or historic features on-site.
    - Description of biological resources on-site, including vegetation map.
    - Identification of activities allowed and prohibited on the conservation banks land.
    - Identification of biological goals and objectives for the bank.
    - Management needs of the property, including control of public access, restoration or enhancement of habitats, monitoring of resources, maintenance of facilities, public uses, start-up funding necessary, budget needs and necessary endowment funds to sustain the budget, and yearly reporting requirements. Any special management requirements that are necessary to implement the biological goals and objectives of the bank should also be discussed in detail.
    - Any monitoring schedules and special management plan activities, including adaptive management practices.
    - Any decision trees or other structures for future management.

Source: U.S. Department of the Interior 2003

3.3.2.4. Auction and Brokering Schemes: The BushTender and BushBroker Programs

The Government of Victoria, Australia piloted an auction program called BushTender beginning in 2001, with the aim of testing an approach for better conserving the over one million hectares of native vegetation remaining on private land, much of it of high conservation significance. This vegetation remains subject to degradation due to land-use practices such as livestock grazing, firewood collection, and weed and pest invasion (Stoneham et al. 2003). Under the BushTender competitive auction process, landholders in North Central and North East Victoria had the opportunity to bid their own price for management services they were prepared to carry out to improve the quality and extent of native vegetation on their property.

Based on landowners' bids, the amount of habitat management services being offered, and property assessments to evaluate the biodiversity significance of remnant vegetation (using a "biodiversity benefits index"), bids offering the "best value for money" were accepted. These landowners then received periodic payments for their management services under a three-year agreement (Victoria Department of Natural Resource and Environment 2002). In total, 98 landholders tendered 148 bids covering 186 sites. Of these, 73 landholders and 97 bids were successful. Overall, the pilot allocated approximately $400,000 to successful bidders to secure protection for nearly 3,200 hectares of significant native vegetation over the three-year period (average allocation of $125/ha/3yr or about $40/ha/yr). The most common management commitments were to control rabbits, exclude livestock, retain fallen timber, retain large trees and other standing trees, and control weeds. Some landowners also agreed to perform supplementary planting or revegetation activities (Stoneham et al. 2003).

As part of their commitments made under BushTender management agreements, participating landholders submitted annual reports on their specified management actions. Following the first year of reporting, one third of properties were visited by a BushTender Field Officer to assess the effectiveness of landholders in meeting their management commitments, identify any areas where the plans required refinement, and respond to any concerns/issues raised by the landholders. Nearly all landholders successfully fulfilled their management commitments (Victoria Department of Environment and Sustainability http://www.dse.vic.gov.au/dse/index.htm viewed 7/3/05).

In 2002, the BushTender Trial was extended to Gippsland Victoria where there are 255,000 hectares of native vegetation on private land. In total, 73 bids were received from 51 landholders, and 33 landholders signed management agreements for sites covering an area of 1,684 hectares. Of the successful bids, all but one opted for at least a six year management agreement period, with almost half of all bids committing to further protection. Overall, the pilot allocated approximately $800,000 to the successful bidders (average allocation of $475/ha/6+yrs, or roughly $60/ha/yr) (Victoria Department of Environment and Sustainability http://www.dse.vic.gov.au/dse/index.htm viewed 7/3/05).

BushTender offers a number of attractive features as a conservation tool. First, payments to landholders can motivate conservation activity where it may not have occurred due to

the low (or negative) private benefits of such actions. Second, BushTender contracts can be varied to match different environmental and economic contexts, allowing for increased economic efficiency compared to more uniform, broadly applied regulation. Third, as a voluntary program, BushTender preserves (rather than infringes on) landholder autonomy. Therefore, landowners are more likely to perceive the program as fair, which in turn should reduce enforcement costs (relative to programs viewed as unfair and unreasonable). Fourth, the BushTender approach may be particularly well suited for addressing threats to biodiversity that require active and ongoing monitoring and management from landholders, such as invasive weeds, habitat restoration, and environmentally beneficial burning and grazing regimes (Government of Australia 2004).

Nonetheless, BushTender could represent a drain on public funding, and the cost-effectiveness of the program may be undermined in cases where environmental services were already being provided prior to the program. In light of these concerns, the Government of Australia is developing principles to guide the design and implementation of biodiversity stewardship programs such as BushTender to ensure the efficiency and cost-effectiveness of public funding. These principles include:

- Allocating biodiversity stewardship payments on the basis of best value for money, assessed in terms of the contribution of the landholders' actions towards achieving public good biodiversity objectives.

- Avoiding payments for actions that are likely to be of net benefit to landholders, individually or as a group, or that are otherwise part of landholders' legal obligations.

- Allocating payments on a competitive basis, with all landholders who can contribute to the desired outcomes being eligible to participate in the program (Government of Australia 2004).

As a follow-on program to BushTender, the Government of Victoria is in the process of developing BushBroker, a program to facilitate landowners in purchasing off-site offsets to compensate for vegetation clearing on their property. Under Victoria's Native Vegetation Management Framework (2002), losses associated with vegetation clearing must be offset. But difficulties arise where the gains required for offsetting cannot be generated by proponents of the clearing on their own property. To address this situation, the Government of Victoria is planning to pilot BushBroker, which would provide a central clearing house of available offsets (namely those established through the BushTender program), and support and oversee exchanges of impacts for offsets. Biodiversity credits would serve as the "currency" of these exchanges.

While BushBroker is similar in some respects to existing models, such as wetland mitigation banking, the approach is unique in its reliance on auctions for establishing the offset credit supply (Crowe 2003). However, in developing the BushBroker program, a number of significant challenges will need to be addressed before it can be effectively implemented, including:

- Legal requirements for creating and trading biodiversity credits;
- Legal and administrative arrangements for the long-term security of the credits;
- Options for the type of entity best-suited for the broker role;
- Level and sources of demand for biodiversity credits in Victoria;
- Pricing of credits including transaction costs and allowances for stewardship; and,
- Cost-effectiveness of broker services compared to landowners seeking third-party offsets using their own resources (Crowe 2003).

**Table 3-A. Policy Goals Guidance**

| Policy Framework | Policy goals | Source |
|---|---|---|
| U.S. wetlands mitigation | "There is established, as part of the Corps of Engineers water resources development program, an interim goal of no overall net loss of the Nation's remaining wetlands base, as defined by acreage and function, and a long-term goal to increase the quality and quantity of the Nation's wetlands, as defined by acreage and function."<br>"The Corps will strive to avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources, and for wetlands, will strive to achieve a goal of no overall loss of values and functions."<br>"the President announced an aggressive new national goal – moving beyond a policy of 'no net loss' of wetlands – to restore, improve, and protect at least 3 million wetland acres over the next 5 years in order to increase wetland acres and quality." | Water Resources Development Act of 1990 (as Amended Through P.L. 106-580, Dec. 29, 2000), Section 307<br><br>U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section II.B.)<br><br>The White House. Conservation Initiatives Fact Sheet. August 4, 2004 |
| U.S. conservation banks | "The overall goal of any conservation bank should be to provide an economically effective process that provides options to landowners to offset the adverse effects of proposed projects to listed species." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (II.B.1.) |
| EU Natura 2000 sites | "…the Member state shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected." | Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, Article 6(4) |
| Australia:<br>New South Wales<br>• Native Vegetation | "Prevent broadscale clearing [of native vegetation] unless it improves or maintains environmental outcomes."<br>"…the offset vegetation for biodiversity is either of equal or greater regional conservation significance as the site proposed for clearing." | Government of New South Wales. 2003. Native Vegetation Act 2003 No. 103 (Part 1, Section 3)<br>NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (Principle 1(C), p. 4) |
| • Wetlands | "Natural wetlands should not be destroyed, but when social or economic imperatives require it, the rehabilitation or construction of a wetland should be required."<br>"No net loss of wetlands is an objective under the NSW Wetlands Management Policy and is consistent with the principles of Ecologically Sustainable Development."<br>"For the purposes of this paper, no net loss refers to wetland area, values, services and functions." | The NSW Department of Land and Water Conservation. 1996. The NSW Wetlands Management Policy (Principle 6)<br>NSW State Wetland Advisory Committee and NSW Department of Land and Water Conservation. 2002. (p. 12) |
| • General | "Offsets must result in a net environmental improvement."<br><br>"An offset should lead to a net gain that improves the condition of the environment." | NSW Government. 2002. Green offsets for sustainable development (p. 4)<br>NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (p.8) |
| Australia:<br>Victoria<br>(Native Vegetation) | "Our primary goal for native vegetation management in Victoria is to achieve: A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p. 14) |
| Australia:<br>Western Australia | "The EPA is of the opinion that environmental offsets should be used with an aspiration of achieving a 'net environmental benefit'."<br>"The 'net benefit' concept is an extension of the 'no net loss' concept and aims to ensure more environmental gains occur compared to environmental losses. It refers to an overall improvement in total extent, quality, ecological integrity and security of environmental assets and their values. The concept is subject to cumulative gains and losses within a specific area, region, or project." | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (Principle 1.C., p. 4 ) |
| Brazil Industrial | Industrial developments must offset their environmental impact through compensatory biodiversity | Protected Areas Law, #9985, 2000 |

| | | |
|---|---|---|
| Offsets | conservation payments. No stated policy on biodiversity conservation goal (e.g. no net loss). | Decree 4340, 2002 |
| Brazil Forest Offsets | Retain set minimum natural habitat cover on private lands. Off-site conservation offsets are intended to maximize economic and ecological values of land. | Forestry Code, #4771, 1965<br>Provisional Measures 2166/67, 2001 |

## Table 3-B. Mitigation Hierarchy Guidance

| Policy Framework | Mitigation Hierarchy | Source |
|---|---|---|
| U.S. wetlands mitigation | "Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences."<br>"Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem."<br>"In evaluating standard Section 404 permit applications…the Corps… first makes a determination that potential impacts have been avoided to the maximum extent practicable: remaining unavoidable impacts will then be mitigated to the extent appropriate and practicable by requiring steps to minimize impacts and, finally, compensate for aquatic resource values."<br>"The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." | U.S. Environmental Protection Agency. 1980. CWA Section 404(b)(1) Guidelines. Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR 230.10(a))<br><br>40 CFR 230.10(d)<br><br>U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section II.B.)<br><br>40 CFR 230.3(q) |
| U.S. conservation banks | "The use of conservation banks should be evaluated in the context of unavoidable impacts of proposed projects to listed species."<br>"Impacts to listed species are minimized by including conservation measures for the listed species…conservation measures could include…purchase of credits in a conservation bank." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (I.A. and II.A.1.) |
| EU Natura 2000 sites | "The first step…is to examine the possibility of resorting to alternative solutions which better respect the integrity of the site in question. …It should be stressed that the reference parameters for such comparisons deal with aspects concerning the conservation and the maintenance of the integrity of the site and of its ecological functions. In this phase, therefore, other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria."<br>"In the absence of alternative solutions…the second step…is to examine the existence of imperative reasons of overriding public interest, including those of a social or economic nature, which require the realisation of the plan or project in question."<br>"'Imperative reasons of overriding public interest'…refer to situations where plans or projects envisaged prove to be indispensable: within the framework of actions or policies aiming to protect fundamental values for citizens' lives (health, safety, environment); within the framework of fundamental policies for the State and society; [or] within the framework of carrying out activities of an economic or social nature, fulfilling specific obligations of public service."<br>"The compensatory measures constitute the 'last resort'. They are used only when other safeguards provided for by the [Habitats] directive are ineffectual and the decision has been taken to consider, nevertheless, a project/plan having a negative effect on the Natura 2000 site." | European Commission. 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (p. 42-45) |

| Policy Framework | Mitigation Hierarchy | Source |
|---|---|---|
| Australia:<br>New South Wales<br>• Wetlands | "Where a project is deemed to be overwhelmingly in the public interest and no feasible alternative exists to the destruction or degradation of a natural wetland, the Policy requires compensation."<br>"Decisions to proceed with development in wetlands can be made after determining that:<br>-the development is imperative for reasons of over-riding public interest;<br>-there are no other alternatives, and<br>-all possible compensatory measures have been considered and have or will apply.<br>…there are some wetlands that are highly valuable and impossible to replace and cannot, under any circumstances, be subject to development." | The NSW Department of Land and Water Conservation. 1996. The NSW Wetlands Management Policy (Principle 6)<br><br>NSW State Wetland Advisory Committee and NSW Department of Land and Water Conservation. 2002. (p. 9) |
| • General | "Environmental impacts must be avoided first by using all cost-effective prevention and mitigation measures. Offsets are then only used to address remaining environmental impacts." | NSW Government. 2002. Green offsets for sustainable development (p. 4) |
| Australia:<br>Victoria<br>(Native Vegetation) | "1. To avoid adverse impacts, particularly through vegetation clearance.<br>2. If impacts cannot be avoided, to minimize impacts through appropriate consideration in planning processes and expert input to project design or management.<br>3. Identify appropriate offset options." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p. 23) |
| Australia:<br>Western Australia | "Mitigation, in an environmental context, refers to a sequence of considerations designed to help manage adverse environmental impacts, which includes (in order of preference):<br>1. Avoidance – avoiding the adverse environmental impact all together;<br>2. Minimisation – limiting the degree or magnitude of the adverse impact;<br>3. Rectification – repairing, rehabilitating or restoring the impacted site as soon as possible;<br>4. Reduction – gradually eliminating the adverse impact over time by preservation and maintenance operations during the life of the action; and,<br>5. Offsets – undertaking such activities (at a distance from the impact site) that counterbalance an adverse, residual environmental impact." | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (p. 3 ) |
| Brazil Industrial Offsets | Offsets appropriate for "unavoidable impacts" only. | Protected Areas Law, #9985, 2000<br>Decree 4340, 2002 |
| Brazil Forest Offsets | Any impacts to Atlantic Forest are prohibited. | Forestry Code, #4771, 1965<br>Provisional Measures 2166/67, 2001 |

## 4. Methodological Challenges to Establishing Offsets

Regardless of the offset approach, whether it be mitigation/conservation banking, in-lieu-fee arrangements, or auction and brokering schemes, the design and implementation of an effective program requires surmounting a number of daunting challenges. Major issues include: What counts as an offset? How much does it count? Where should the offset be located? When does it need to be operational and for how long? How should it be managed and monitored? What if it fails?

On most of these issues, there is an emerging consensus among offset programs on basic principles for moving forward. But detailed guidance often remains elusive. In part, this reflects the difficulties associated with providing "one-size-fits-all" guidance for offset programs aimed at addressing complex impacts that vary with the local context. It also reflects the fact that most offset methodological development is still in its infancy. Indeed, with the exception of the U.S. wetlands mitigation program, all other offset policy frameworks reviewed in this paper were initiated during the past decade and continue to be in the early phases of development and implementation.

This section provides an overview of some of the chief methodological challenges to establishing offsets and how existing offset programs are attempting to address them. These challenges include:

- Equivalence of project impacts with offset gains (in-kind vs. out-of-kind)
- Location of the offset relative to the impact site (on-site vs. off-site)
- "Additionality" (new contribution to conservation); acceptable types of offsets
- "Currency" to support exchange of project impacts for offset gains; appropriate mitigation replacement ratios
- Temporal issues: timing of project impacts vs. offset benefits
- Offset duration, management, monitoring, and compliance

In an effort to make the extent of existing guidance on these issues clear, relevant sections of regulatory and policy guidance documents are quoted and provided in a series of tables (Tables 4-A to 4-F) corresponding to one of the methodological issues. These tables are provided at the end of this section.

### 4.1. Equivalence ("in-kind" vs. "out-of-kind" offsets)

- *As no two areas are ecologically identical, how can offsets best provide benefits that are "equivalent" to losses caused by project impacts?*

- *Are offsets required to be established on an "in-kind" basis, or is "out-of-kind" compensation possible?*

"In-kind" offsets refer to compensatory mitigation that provides habitat, functions, values, or other attributes similar to those affected by the project, whereas "out-of-kind" offsets allow for different forms of compensation. Offset policies indicate a general preference for in-kind compensatory mitigation, calling for compensation that is in "comparable proportions" providing comparable functions (European Commission 2000) or "like for like or better" (NSW Government 2001, Western Australia EPA 2004). The preference for in-kind compensation is based on the premise that the best means of ensuring full and equivalent replacement of losses is to compensate with the same type of habitat, functions, and values. In-kind compensatory mitigation is viewed as particularly important when the affected area is considered locally important (USACE 2002).

Although offset policies call for mitigation that is "comparable," "commensurate," and "like for like," only U.S. wetlands mitigation policy states explicitly that "in-kind compensatory mitigation is preferable to out-of-kind" (USEPA and USACE 1990). But this position has been evolving to where "out-of-kind compensation may be acceptable if it is determined to be practicable and environmentally preferable to in-kind compensation (e.g., of greater ecological value to a particular region)" (U.S. Department of the Army et al. 1995). And more recently, out-of-kind wetland mitigation has been deemed appropriate where it may provide greater watershed benefits, especially if this is supported by a "holistic watershed plan" (USACE 2002 and Federal Interagency Working Group 2004a).

Although the offset program for native vegetation in Victoria Australia requires mitigation to be "commensurate," direct in-kind replacement is only required in cases where vegetation losses are of "higher significance" according to a grading system. For losses of lower significance, the program provides more flexibility and discretion to local planning authorities to determine whether out-of-kind mitigation should be supported to "optimise conservation outcomes" (Victoria Department of NRE 2002).

In Brazil, the forest offset system requires that an offset be of the same ecosystem type, and within the same watershed if physically possible (Provisional Measures 2166/67, 2001). Industrial offsets, on the other hand, are basically out-of-kind, as the types of environmental impacts are not linked to the objectives of conservation expenditures made with offset payments (Decree 4340, 2002)

Programs designed to offset impacts to species favor mitigation measures that "fit within the conservation needs of the species," rather than focusing on replacing the exact (in-kind) functions and values of specific habitat adversely affected by a project (U.S.

Department of the Interior 2003). However, mitigation must support the affected species; conservation benefits "for one group of species cannot be used to offset impacts to a species not part of the group." And offsets must provide "biologically comparable habitat" (U.S. Department of the Interior 2003). For birds, Natura 2000 offsets should be along the same migration path and "accessible with certainty by the birds usually occurring on the site affected by the project" (European Commission 2000).

It is worth noting that despite the trend toward greater acceptance of out-of-kind offsets, as evidenced by policies in the United States and Australia, there remains no support (legal, regulatory, or otherwise) for "very out-of-kind" forms of mitigation such as funding for conservation training and education, except in Brazil. Indeed, U.S. federal guidance on the use of in-lieu-fee arrangements for wetlands specifically rejects such approaches to offsets, noting that "funds collected under any in-lieu-fee arrangement should be used for replacing wetlands functions and values and not to finance non-mitigation programs and priorities (e.g., education projects, research)" (U.S. Department of the Army et al. 2000).

*Summary*

Offset frameworks indicate a preference for in-kind offsets in most cases, but there is a trend toward more acceptance of out-of-kind mitigation, as long as it can provide greater environmental benefits than in-kind options.

### 4.2. Location of Offset Relative to Impact Site (on-site vs. off-site)

- *Do offset benefits need to accrue to the local geographic area affected by project impacts? What if a proposed "local" offset provides considerably less environmental benefit (e.g., isolated, fragmented habitat) than other more distant proposed alternatives?*

- *How can the choice of offset location best balance needs in the project impact area with potential environmental gains from an off-site offset?*

Offset policies are in consensus that on-site mitigation is preferable to off-site mitigation. This is based on the premise that compensation should accrue to affected areas. However, offset policies differ in their interpretation of "on-site" and the potential factors that would make off-site mitigation preferable. For example, while U.S. wetlands policy indicates that "compensatory actions…should be undertaken, when practicable, in areas adjacent or contiguous to the discharge site," Natura 2000 offsets need only be in "the same biogeographical region in the same Member State" (USEPA and USACE 1990, European Commission 2000).

The offset program for native vegetation in Victoria Australia varies the need for on-site mitigation based on the quality of the vegetation proposed for clearance. Although the program calls for "an adequate geographic link between losses and offsets," it only

requires offsets to be "as close as possible" when "higher significance" vegetation is affected. For vegetation losses of lower significance, local planning authorities have discretion to determine whether off-site mitigation would be preferable (Victoria Department of NRE 2002).

U.S. federal guidance on wetlands allows for off-site mitigation when it is "environmentally preferable" to on-site options (U.S. Department of the Army et al. 1995). Such determinations should be based on an evaluation of "the likelihood for successfully establishing the desired habitat type, the compatibility of the mitigation project with adjacent land uses, and the practicability of long-term monitoring and maintenance to determine whether the effort will be ecologically sustainable, as well as the relative cost of mitigation alternatives" (U.S. Department of the Army et al. 1995). More recent wetlands guidance has placed greater emphasis on supporting off-site mitigation where it provides "more watershed benefit than on-site mitigation," though off-site options should be, where possible, "within the same hydrologic unit… or ecoregion as the impact site" (USACE 2002 and Federal Interagency Working Group 2004a). Draft federal guidance also proposes to extend the criteria for evaluating whether off-site mitigation is preferable to include the following:

- On-site conditions do not favor successful establishment of the required vegetation type, or lack the proper soil conditions, or hydrology.

- On-site compensation would result in an aquatic habitat that is isolated from other natural habitats or severely impaired by the effects of adjacent development.

- Off-site location is crucial to one or more species that is threatened, endangered, or otherwise of concern, and the on-site location is not.

- Off-site location is crucial to larger ecosystem functions, such as providing corridors between habitats, and the on-site location is not.

- Off-site compensation has a greater likelihood of success or will provide greater functional benefits (Federal Interagency Working Group 2004a).

Similar to wetlands policy, federal guidance on U.S. conservation banking states a preference for on-site mitigation, but allows for off-site mitigation where on-site efforts are not practicable or in cases where off-site mitigation is environmentally preferable to on-site options (U.S. Department of the Interior 2003). However, in determining appropriate conservation banking sites, it appears that on-site vs. off-site considerations play a lesser role in site evaluation than other criteria.

> "The important point…is to site banks in appropriate areas that can reduce the threat of fragmentation and provide management measures that address other threats that a species might encounter…. The Service will give careful consideration to the ecological stability of a site…the location, size, and configuration…topographic features, habitat quality, compatibility of existing and future land use activities surrounding the bank, and species use in the area" (U.S. Department of the Interior 2003).

Conservation banking guidance developed for the State of California appears more pointed in dismissing the relevance of on-site vs. off-site considerations in evaluating bank sites: "the priority for mitigation should be to accomplish it at a site which provides for the long-term conservation of habitat and species. As such, off-site mitigation is specifically sanctioned in the context of an otherwise permissible conservation bank" (The Resources Agency and California Environmental Protection Agency 1995).

Brazil's industrial offsets follow this lead by placing no geographic boundary at all on the expenditure of offset funds, unless the industrial development specifically impacts a particular protected area, in which case it becomes the beneficiary (Decreto 4340, 2002).

*Summary*

Offset frameworks state a general preference for on-site mitigation over off-site mitigation because compensation benefits accrue to the project affected area. However, off-site offsets may be supported in cases where they are located in the same ecoregion or watershed as the project site and can provide greater environmental benefits than on-site mitigation options.

### 4.3. "Additionality" and Acceptable Types of Offsets

- *To what degree must offsetting activities represent genuinely new and additional contributions to conservation?*

- *What types of offsets activities are deemed sufficient compensatory mitigation? For instance, rather than restore or rehabilitate an area, would it be sufficient to preserve an area (under threat) or improve management practices?*

Offsite policies, with the exception of Brazil's industrial offsets, are in consensus that compensatory actions must result in benefits that are additional to any existing values (and existing values includes planned/funded programs that will generate the same benefits). For instance, Natura 2000 guidance makes clear that "measures required for the 'normal' implementation of the 'Habitats' and 'Birds' directives cannot be considered compensatory for a damaging project. …Compensatory measures should be additional to proper implementation" (European Commission 2000). And draft regulations in New South Wales, Australia call for offsets to be "additional to actions or works carried out using public funds or to fulfill regulatory obligations" (NSW Department of Infrastructure, Planning and Natural Resources 2004a). In the U.S., conservation banking guidance, which tends to take a more flexible approach to offsets, states unambiguously that "land used to establish conservation banks must not be previously designated for conservation purposes (e.g., parks, green spaces, municipal watershed lands)..." (U.S. Department of the Interior 2003). In the case of Brazil's forest offsets, off-site conservation must be additional to the minimum required conservation land on the parcel where the offset is implemented. In other words, all landowners may be required to

conserve 20 percent of their land, so landowners accepting offset liabilities from another, must conserve a total of more than 20 percent of their land. Because all landowners must meet the 20 percent requirement, any offset can be considered additional.

Under the "additionality" requirement, a number of types of offsets are deemed acceptable compensatory mechanisms. For Natura 2000, compensatory measures can consist of recreating habitat, or in exceptional cases proposing a new site. Native vegetation offset programs in Australia allow for a wide array of compensation, including revegetation, regeneration, restoration, and enhancement in New South Wales (NSW Government 2001), and improved management (e.g., control of weeds), avoidance of further permitted impacts (e.g., stock grazing, harvesting timber for on-farm use), recovery from forest product harvesting, mining operations, and wildfires, and supplementary plantings in Victoria (Victoria Department of Natural Resource and Environment 2002). Western Australia has divided compensation types into primary and secondary activities – primary offset activities are restoration, rehabilitation, re-establishment, sequestration of emissions, and banking/credit trading/trust fund, whereas secondary offset activities include acquiring land for conservation, protection, on-going management, education, research, and removal of threats (Western Australia Environmental Protection Agency 2004).

U.S. conservation banking allows for a similarly wide range of compensation options including "preservation, management, restoration of degraded habitat, connecting separated habitats, buffering of already protected areas, creation of habitat, and other appropriate actions." Rather than a specific compensation mechanism, conservation banking guidance is more concerned with how the mechanism will contribute to the main objective of achieving and maintaining "mitigation in perpetuity on existing functioning and occupied habitat for a majority of those species facing threats of habitat loss and fragmentation" (U.S. Department of the Interior 2003).

Wetlands mitigation allows only a narrower set of compensation options. First, in light of the difficulties associated with establishing effective wetland offsets, guidance on compensation makes clear that "restoration should be the first option considered" (USEPA and USACE 1990). Restoration is divided into "re-establishment" (i.e., returning natural or historic functions to a former wetland with a resultant gain in wetland acres) and "rehabilitation" (i.e., repairing natural or historic functions of a degraded wetland with a resultant gain in wetland functions but not acres). If restoration is not possible, wetland creation and wetland enhancement measures (e.g., water quality improvement) may be acceptable forms of compensation. Wetland preservation, however, will only be allowable under exceptional circumstances as it only serves to prevent the decline of a wetland but does not result in a gain in wetland acres (USACE 2002).

Brazil's industrial offset policy does not stress additionality. Industrial offsets go directly to existing protected areas, although it is possible that they could be used for establishment of new protected areas. One might argue that offset payments fill a major funding gap for the management of the country's protected areas that would otherwise

not be filled – but this is not an explicit rationale for ensuring additionality under Brazilian policy.

*Summary*

Offset frameworks call for offsets to represent new or additional contributions to conservation, but in many cases there is wide latitude provided regarding what types of offsetting activities are allowable.

### 4.4. "Currency" and Mitigation Replacement Ratios

- *To support "trading" of project impacts for offset benefits, what is the most appropriate "currency" or uniform trading unit (e.g., area, function/habitat)?*

- *Given differences in ecological quality and other factors, on what basis can a mitigation replacement ratio be established (i.e., the number of credit units from an offset that must be debited in order to compensate, or replace, one unit of loss at the project site)?*

More developed offset policies clearly support establishing a currency (debit/credit unit) that incorporates the values associated with ecological functions, quality, and integrity, rather than simply using acreage/hectare units. But detailed guidance on how to establish such a currency is seldom provided. As a result, a plethora of assessment methods have been developed for establishing currency units (especially for wetlands), based on differing local contexts, varying criteria, and differences in professional judgment. Because these methods are often complex, expensive, and time-consuming to implement, currency development based on ecological criteria often, in practice, gives way to simple area-for-area swaps. (Section 5 provides an overview of the progress and challenges involved with developing and implementing assessment methods).

Mitigation replacement ratios establish the number of credit units that must be debited from an offset to compensate or replace one unit of loss at the project site. This ratio may be adjusted for a range of factors including the chosen compensation mechanism (e.g., restoration, preservation), equivalence of the offset (in-kind vs. out-of-kind), conservation significance (unique vs. common), location (on-site vs. off-site, in/out of watershed, ecoregion, or service area), temporal lags between project impacts and offset maturity, and risks of offset failure.

Before describing policy guidance on establishing currency and mitigation replacement ratios, it is important to make two points. First, while currency and mitigation ratios are distinct concepts, they are often conflated in assessment methods with mitigation ratios adjusted to reflect "quality" issues not accounted for in the currency unit. Second, for most offsets, methods for establishing currency and mitigation ratios are in their infancy. The exception is wetland offsets, for which methodological development has been on-going for two decades.

On the issue of establishing currency, U.S. wetlands mitigation guidance states a preference for offsets to provide "at a minimum, one for one functional replacement," but allows that "in the absence of more definitive information on the functions and values of specific wetlands sites, a minimum of 1 to 1 acreage replacement may be used as a reasonable surrogate" (USEPA and USACE 1990). As a result of this caveat, and due to the practical challenges of establishing currency units, most wetland mitigation credits continue to simply reflect acreage units. For instance, as of 2001, 61 percent of wetland mitigation banks defined their credits by acreage (Environmental Law Institute 2002).

Mitigation replacement ratios for wetlands are often "tailored" to direct compensatory mitigation to particular areas, and to generally discourage impacts to unique or important wetlands types and large wetlands. For example, the tailored approach might require three acres of replacement wetland for every one acre of impacts to specified wetland types (e.g., woody riparian wetland). Out of 219 mitigation banking instruments reviewed by the Environmental Law Institute (2002), 112 provide information on mitigation ratios, and almost half had adopted this "tailored" method. While using professional judgment to "tailor" mitigation ratios appears common, it is also the case that a number of states have established defined mitigation ratios depending on the type of compensatory action (i.e. restoration, creation, enhancement, or preservation) (Box 4-A).

**Box 4-A. Wetlands Mitigation Replacement Ratios for Different Compensation Mechanisms: Selected States**

The following states have tied replacement ratios or credit definitions to the selected compensatory method. Since states often combine replacement ratios and how credits are defined, no distinction between the two approaches is made here. Replacement ratios are presented in acres offset to acres impacted. Credit valuation is presented as the number of acres per credit.

| | |
|---|---|
| Indiana | Enhancement/Preservation: >1:1<br>Credit value as low as 10-25% of credit value for created/restored wetlands |
| Maine | Restoration/Enhancement/Creation: 1:1 to 2:1 (depending on type of wetland impacted); Preservation: 8:1 |
| Maryland | Preservation: 1/10$^{th}$ credit, equal to about 15:1 replacement ratio |
| Michigan | Preservation: 10:1 |
| Missouri | Preservation: only partial credit |
| New Jersey | Restoration 2:1; Creation 2:1 or less |
| Ohio | Restoration/Creation: 1:1; Enhancement: 2:1; Preservation 2:1 |
| Oregon | Restoration 1:1; Creation 1.5:1; Enhancement: 3:1 |
| Wisconsin | Restoration 1:1; Enhancement: no credit to 1:1 depending on comparison of functional values; Creation: 2:1 |
| Wyoming | Restoration/Creation: 1:1; Enhancement: awarded for percentage increase in measurable values (up to 50% increase) |

Source: Environmental Law Institute 2002.

U.S. conservation banking calls for credits to reflect "a species' or habitat's conservation values," with credit values based on biological criteria, habitat types, and management

activities. Potential criteria include "habitat quality, habitat quantity, species covered, conservation benefits, including contribution to regional conservation efforts, property location and configuration, and available or prospective resource values." However, this guidance also allows that "in its simplest form, one credit will equal one acre of habitat or the area supporting one nest site or family group" (U.S. Department of the Interior 2003). Similar to wetland mitigation banking, each conservation bank may choose its method for defining and estimating credits. (For illustration, Section 5 provides an overview of how to define credits for conservation banking of the California red-legged frog). Data were not available across existing conservation banks on types of currency used (i.e., credits based on biological and other criteria vs. acreage) and mitigation ratios.

In line with U.S. policies, Australian offset guidance favors assessment methods that take into account ecological quality in the establishment of credits. Two assessment tools have been adopted for this purpose: the "habitat hectares" method in Victoria and the "South Australian Biodiversity Assessment Tool (SABAT)" in South Australia. The habitat hectare method involves comparing remnant native vegetation to a "benchmark" for the same vegetation existing in a mature and long-undisturbed state. Based on an assessment of site conditions and the landscape context, component scores are developed as a basis for estimating the overall "habitat quality," which is then multiplied by the area of the site to establish the number of habitat hectare units (see Section 5, Box 5-F for an overview of the habitat hectare method). The SABAT has been developed to support the allocation of Biodiversity Significance Scores (BSS) to patches of native vegetation or revegetation. As this tool is in development, further information on its approach/use was not available at the time of writing.

Consistent with the "net gain" objective of Australian offset policies, guidance on mitigation replacement ratios tends to support offset to impact ratios greater than 1 to 1. In New South Wales for example, offset vegetation should be "of equal or greater regional conservation significance as the site proposed for clearing" (NSW Department of Infrastructure, Planning and Natural Resources 2004a). Likewise, Western Australia calls for offset to impact ratios greater than 1:1 and specifies that ratios should be higher "where risk of failure is apparent" (Western Australia Environmental Protection Agency 2004).

*Summary*

Offset policies call for "currency" to incorporate values associated with ecological functions, quality, and integrity. Using this currency, mitigation replacement ratios can be adjusted to account for the type of offset, to discourage project impacts to "important" habitat, and to reflect the risk that an offset may fail. In practice, the concepts of currency and mitigation ratios are often conflated, with currency values embedded in acreage/hectare ratios.

### 4.5. Timing of Project Impacts and Offset Benefits

- *When must an offset be operational – before, concurrent with, or following project impacts?*

- *What if the offset will require a number of years before ecological maturity brings full benefits? Should mitigation replacement ratios be adjusted to reflect a "temporal premium" (to account for the temporal gap between project impacts and offset benefits)?*

In principle, offset policies call for offsetting activities to be operational and proven prior to allowing project impacts. This "anticipatory" approach is intended to ensure that offsets are effective and safeguard against any temporal loss of values. For example, Natura 2000 makes clear that "the [compensatory] result has normally to be operational at the time when the damage is effective on the site concerned with the project unless it can be proved that this simultaneity is not necessary to ensure the contribution of this site to the Natura 2000 network" (European Commission 2000). Likewise, U.S. conservation banking guidance notes "at the time the first credit in a bank or phase of a bank is sold, the land within the bank or its phase must be permanently protected through fee title or a conservation easement, with any land use restrictions set in perpetuity for the land legally established" (U.S. Department of the Interior 2003). In Brazil, industrial offset payments must be made before issuing environmental permits for industrial developments.

While such anticipatory approaches may ensure that compensation through offsets does not result in temporal losses of values, they also establish some significant disincentives to developing offsets in the first place. Without the ability to raise funds by releasing credits "early" (prior to the offset being operational), the anticipatory approach imposes substantial upfront costs for financing the establishment of conservation/mitigation banks and other offsets. That is, the full cost of planning, establishing, operating, and monitoring an offset must be borne by the banker for perhaps years before the offset meets specified performance standards[7] and the banker has an opportunity to recoup the investment. It should also be noted that if offsets are to be "like-for-like," the anticipatory approach requires bankers to foresee the impacts of the proposed project before they have occurred, which can be especially difficult for complex impacts.

For these reasons, Australian and Brazilian forestry offset policies and U.S. wetland mitigation banking take a more flexible approach to the timing of project impacts and offset benefits. In Brazil, all offsets are retroactive once forest clearing is completed. New South Wales native vegetation policy requires offsets to be in place but not necessarily mature: "clearing should only proceed when the offset site is making acceptable progress towards the predicted ecological state and management arrangements

[7] For wetlands, performance standards may be established for major functions related to hydrology, vegetation, water quality, wildlife habitat, and soil. In practice, performance standards for wetland mitigation banks are based mainly on vegetation measurements (95 percent) and hydrology criteria (58 percent). Use of other measures of performance are much less common (Environmental Law Institute 2002).

are legally secure" (NSW Government 2001). As part of its "habitat hectare" approach, Victoria factors in temporal issues as another element subject to scoring, depending on when offsets are initiated:

> "To ensure that delays between clearing and mitigation do not unnecessarily exacerbate the risk to environmental values during the 'transition' to recovery through offsets, the timing of offsets needs to be appropriate. It is also important to properly manage risks of non-compliance, particularly for the most significant impacts. There will be a graded response: from formally initiating offsets prior to clearing taking place, to initiating offsets as soon as seasonally practicable after clearing has taken place" (Victoria Department of Natural Resource and Environment 2002).

Wetland mitigation banking guidance addresses the temporal issue directly, expressly allowing for limited credit releases in the early phases of bank development, as long as banks have met a number of requirements:

> "Since financial considerations are particularly critical in early stages of bank development, it is generally appropriate, in cases where there is adequate financial assurance and where the likelihood of the success of the bank is high, to allow limited debiting of a percentage of the total credits projected for the bank at maturity. Such determinations should take into consideration the initial capital costs needed to establish the bank, and the likelihood of its success. However, it is the intent of this policy to ensure that those actions necessary for the long-term viability of a mitigation bank be accomplished prior to any debiting of the bank. In this regard, the following minimum requirements should be satisfied prior to debiting: (1) banking instrument and mitigation plans have been approved; (2) bank site has been secured; and (3) appropriate financial assurances have been established. In addition, initial physical and biological improvements should be completed no later than the first full growing season following initial debiting of a bank. The temporal loss of functions associated with the debiting of projected credits may justify the need for requiring higher compensation ratios in such cases" (U.S. Department of the Army et al. 1995).

In light of this guidance, early credit release is very common in wetland mitigation banking in the U.S. As noted earlier (Section 3.3.2.1.), Environmental Law Institute (2002) estimates that in the U.S. "as many as 92 percent of the nation's [wetland] banks allow credits to be withdrawn in advance of bank maturity." The study argues that, by providing bank sponsors a source of capital for bank establishment and operation, early credit release has been one of the most important factors galvanizing growth in mitigation banking. Of the 157 banking instruments reviewed by Environmental Law Institute (2002), approximately 90 percent allow for credits to be sold prior to achieving *any* performance standards. On average, banks allow for debiting of 42 percent of credits prior to achieving *interim* standards, and 66 percent of credits prior to achieving *all* performance standards. As noted in wetland mitigation banking guidance, temporal losses associated with early credit release may be addressed through adjustments in mitigation replacement ratios, though data on this practice were not available.

*Summary*

While the policy preference is for offsets to be in place and effective prior to project impacts, strict adherence to such an approach discourages the establishment of offset

banks because bankers cannot raise capital through the early release of bank credits. Wetland mitigation banking guidance takes a more flexible approach. Despite a preference for offsets to compensate for unavoidable losses "in advance of development actions," early credit release is allowable under a number of specified conditions. In addition, temporal losses may be addressed through adjustments to mitigation replacement ratios.

### 4.6. Offset Duration, Management, Monitoring, and Compliance

- *What is the appropriate operable period for an offset – in perpetuity? – equal to the duration of project impacts?*

- *What management and monitoring requirements, as well as legal assurances and arrangements, are appropriate for ensuring offsets are in compliance?*

Whereas offset protection in perpetuity assumes project impacts are irreversible, finite protection assumes there is potential to reverse damage at the project site. Offset policies are in consensus that offset protection in perpetuity is preferable, but at the very least offsets should be operable for the duration of any project impacts. Only the U.S. conservation banking policy provides for no possibility of finite protection, requiring banks to "safeguard in perpetuity the species or habitat conservation values upon which the credits are based" (U.S. Department of the Interior 2003). U.S. wetland mitigation banking guidance strongly favors protection in perpetuity, but allows for finite protection "in exceptional circumstances. …However, in no case should finite protection extend for a lesser time than the duration of project impacts for which the bank is being used to provide compensation" (U.S. Department of the Army et al. 1995). In Australia, offset principles for native vegetation developed by the New South Wales Department of Infrastructure, Planning and Natural Resources (2004a) call for offset benefits to "persist for at least the duration of the negative impact of the proposed clearing," though "permanent conservation measures are given greater value than other management actions."

As most offsets will require protection that is either long-term or in perpetuity, legal and financial assurances are necessary to secure site tenure, restrict harmful activities, support long-term management and monitoring, and cover contingency and remedial actions in the event of offset failure. All the offset policies reviewed address the need for such legal and financial assurances, at least in general terms. For example, Australian policies call for offsets to "demonstrate security of purpose, security of tenure and security of management" and ensure that "management actions are likely to be deliverable and enforceable" (NSW Department of Infrastructure, Planning and Natural Resources 2004a). Likewise, Natura 2000 guidance states:

> "It will be necessary, through legally binding mechanisms, to ensure that the long-term conservation interests of the Natura 2000 network are maintained. This will require the security of site tenure to be guaranteed, management plans to be drawn up with clear, achievable short-, medium- and long-term objectives, and for long-term monitoring

> mechanisms to be in place. …should monitoring reveal failures in the compensatory measures ability to achieve their original objectives, steps will be taken to address and rectify those failures" (European Commission 2001).

However, the most specific and direct guidance is provided for wetland mitigation banking. To secure a site, banks should use "appropriate real estate arrangements (e.g., conservation easements, transfer of title to Federal or State resource agency or non-profit conservation organization). Such arrangements should effectively restrict harmful activities (i.e., incompatible uses) that might otherwise jeopardize the purpose of the bank." To ensure permit conditions are met, "monitoring should be conducted at time intervals appropriate for the particular project type and until such time that the authorizing agency(ies), in consultation with the MBRT, are confident that success is being achieved (i.e., performance standards are attained). The period for monitoring will typically be five years." The wetland mitigation guidance is clear that the bank sponsor bears responsibility for bank monitoring and management. This includes securing sufficient funds or financial assurances[8] to cover "realistic cost estimates for monitoring, long-term maintenance, contingency and remedial actions. …Accordingly, banks posing a greater risk of failure and where credits have been debited, should have comparatively higher financial sureties in place, than those where the likelihood of success is more certain" (U.S. Department of the Army et al. 1995).

Since the issuance of federal guidance on wetland mitigation banking in 1995, 79 percent of the banks indicate financial assurances for bank monitoring, maintenance, and contingency plans (Environmental Law Institute 2002). In most cases, the duration of these financial assurances is linked to the monitoring period or to meeting performance standards. Financial assurances for long-term management may not be necessary if a bank has met its final performance standards and has been designed to be self-sustaining. Correspondingly, less than half of banks indicate financial assurances for long-term management. Those that do most commonly have set up a trust or endowment fund (Environmental Law Institute 2002). Data were not available on bank failures and the use of financial assurances to support remedial actions.

*Summary*

In most cases, offset frameworks call for offset protection to be established in perpetuity. Offset policies note the need for legal and financial assurances to secure site tenure, restrict harmful activities, support long-term management and monitoring, and cover contingency and remedial actions in the event of offset failure. Where the success of an offset is less certain, or early credit release has been allowed, higher financial assurances may be required.

[8] Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, legislatively-enacted dedicated funds for government operate banks or other approved instruments. Such assurances may be phased-out or reduced, once it has been demonstrated that the bank is functionally mature and/or self-sustaining (in accordance with performance standards).

## Tables 4-A to 4-G

### Table 4-A. Equivalence: In-kind vs. Out-of-kind Offsets

| Policy Framework | Equivalence: in-kind vs. out-of-kind offsets | Source |
|---|---|---|
| U.S. wetlands mitigation | "Generally, in-kind compensatory mitigation is preferable to out-of-kind." "…mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values), with an adequate margin of safety to reflect the expected degree of success associated with the mitigation plan…"<br><br>"Out-of-kind compensation may be acceptable if it is determined to be practicable and environmentally preferable to in-kind compensation (e.g., of greater ecological value to a particular region)."<br><br>"The Federal agencies and in-lieu-fee sponsor should give careful consideration to the ecological suitability of a site for achieving the goal and objectives of compensatory mitigation (e.g., possesses the physical, chemical and biological characteristics to support the desired aquatic resources and functions, preferably in-kind restoration or creation of impacted aquatic resources)."<br><br>"In-kind replacement generally is required when the impacted resource is locally important. …Out-of-kind mitigation is appropriate when it is practicable and provides more environmental or watershed benefit than in-kind compensation (e.g., of greater ecological importance to the region of impact)."<br>"The best tool for determining whether off-site or out-of-kind compensatory mitigation is environmentally preferable is a holistic watershed plan incorporating mitigation and restoration priorities. …In the absence of a holistic watershed plan, evaluations of mitigation options should take into account a wide range of factors such as: site conditions that favor or hinder success; the needs of sensitive species; chronic environmental problems such as flooding or poor water quality; current trends in habitat loss or conversion; current development trends; and the long-term benefits of available options." | U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section II.B.)<br><br>Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section II.D.5.)<br>Federal Guidance on the Use of In-Lieu Fee Arrangements for the Compensatory Mitigation Under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. November 7, 2000. (65 FR 66914-66917) (Section IV.A.4.)<br><br>U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002.<br><br>*Draft* Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation Under Section 404 of the Clean Water Act (Apr 7, 2004) (Section IV.C.) |
| U.S. conservation banks | "While in wetland mitigation banking the goal is to replace the exact function and values of the specific wetland habitats that will be adversely affected by a proposed project, in conservation banking the goal is to offset adverse impacts to a species."<br>"…the [Fish and Wildlife] Service evaluates whether the mitigation will fit within the conservation needs of the species."<br>"Ultimately, the credits purchased from a conservation bank must provide biologically comparable habitat to the area affected by the activity to be mitigated."<br>"In general, a bank established to provide credits for one group of species cannot be used to offset impacts to a species not part of the group…." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Sections I.B.2., II.B.3., II.B.5., and II.C.5.) |
| EU Natura 2000 | "In order to ensure the overall coherence of Natura 2000, the compensatory measures proposed for a | European Commission. 2000. Managing Natura 2000 sites: The |

| Policy Framework | Equivalence: in-kind vs. out-of-kind offsets | Source |
|---|---|---|
| sites | project should … address, in comparable proportions, the habitats and species negatively affected…[and] provide functions comparable to those which had justified the selection criteria of the original site [for Natura 2000]."<br>"[Under the 'Birds' directive] the overall coherence of the network is ensured if: compensation is ensured along the same migration path [and] the compensation site(s) are accessible with certainty by the birds usually occurring on the site affected by the project." | provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Section 5.4.3.) |
| Australia:<br>New South Wales<br>(Native Vegetation) | "Offset actions should be based on 'like for like or better.' An area of vegetation can only be offset by an offset action involving a similar vegetation type or one with higher environmental value. This requires vegetation to be ranked based on the environmental values most relevant in the region concerned. For example, rankings might be based on the effectiveness of different vegetation types in managing salinity or on the rarity of vegetation types in the region."<br>In evaluating potential compensatory mitigation, draft regulations require conducting 'improve or maintain' assessment tests for water quality, salinity, biodiversity, and land degradation (soils).<br>"Improve or maintain test: Proposed broadscale clearing [of native vegetation]… is to be regarded as improving or maintaining environmental outcomes if either: in relation to development applications, the impacts of the clearing will improve or maintain environmental outcomes for each relevant environmental value; or in relation to a draft Property Vegetation Plan (PVP), the impacts of the proposed clearing and the benefits from any offset will improve or maintain unless it improves or maintains environmental outcomes for each relevant environmental value." | NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (Principle 2, p. 9)<br><br>NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (Sections 2.3 and 3-6) |
| Australia:<br>Victoria<br>(Native Vegetation) | "…where clearing is permitted offset criteria have been established to provide a clear link between gains and losses and in this way ensure that the 'commensurate' requirement of mitigation is met."<br>"To ensure that there is a clear link between the vegetation or habitat type that is lost through clearing and the subsequent mitigation, there will be a graded response: from a direct link between loss and offset for higher significance, down to more flexibility for lower significance (at the discretion of the planning authority) leading to opportunities to optimise conservation outcomes." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.6, p. 23) |
| Australia:<br>Western Australia | "Environmental offset and impact should ideally be 'like for like or better'." | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (Principle 1.C., p. 15) |
| Brazil Industrial Offsets | Out of kind – all environmental impacts offset by payment for biodiversity conservation in protected areas. | Protected Areas Law, #9985, 2000 Decree 4340, 2002 |
| Brazil Forest Offsets | In-kind – same ecosystem type. | Forestry Code, #4771, 1965 Provisional Measures 2166/67, 2001 |

**Table 4-B. Location of Offset Relative to Impact Site (on-site vs. off-site)**

| Policy Framework | Location of offset: on-site vs. offsite | Source |
|---|---|---|
| U.S. wetlands mitigation | "Compensatory actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands) should be undertaken, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). If on-site compensatory mitigation is not practicable, off-site compensatory mitigation should be undertaken in the same geographic area if practicable (i.e., in close proximity and, to the extent possible, the same watershed)." | U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section II.C.) |
| | "Mitigation banks should be planned and developed to address the specific resource needs of a particular watershed. Furthermore, decisions regarding the location, type of wetlands and/or other aquatic resources to be established, and proposed uses of a mitigation bank are most appropriately made within the context of a comprehensive watershed plan." | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Sections II.B.6., II.D.3., and II.D.4.) |
| | "The service area of a mitigation bank is the area (e.g., watershed, county) wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources." | |
| | "The agencies' preference for on-site mitigation, indicated in the 1990 Memorandum of Agreement…, should not preclude the use of a mitigation bank when there is no practicable opportunity for on-site compensation, or when use of a bank is environmentally preferable to on-site compensation. …In choosing between on-site mitigation and use of a mitigation bank, careful consideration should be given to the likelihood for successfully establishing the desired habitat type, the compatibility of the mitigation project with adjacent land uses, and the practicability of long-term monitoring and maintenance to determine whether the effort will be ecologically sustainable, as well as the relative cost of mitigation alternatives. In general, use of a mitigation bank to compensate for minor aquatic resource impacts (e.g., numerous, small impacts associated with linear projects; impacts authorized under nationwide permits) is preferable to on-site mitigation. With respect to larger aquatic resource impacts, use of a bank may be appropriate if it is capable of replacing essential physical and/or biological functions of the aquatic resources which are expected to be lost or degraded. Finally, there may be circumstances warranting a combination of on-site and off-site mitigation to compensate for losses. | |
| | Mitigation should be required, when practicable, in areas adjacent or contiguous to the discharge site (on-site compensatory mitigation). …However, off-site mitigation may be used when there is no practicable opportunity for on-site mitigation, or when off-site mitigation provides more watershed benefit than on-site mitigation…. In choosing between on-site and off-site compensatory mitigation, Districts will consider: 1) likelihood for success; 2) ecological sustainability; 3) practicability of long-term monitoring and maintenance or operation and maintenance; and, 4) relative costs of mitigation alternatives." | U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002. |

| Policy Framework | Location of offset: on-site vs. offsite | Source |
|---|---|---|
| | "If off-site mitigation is consistent with or supported by a holistic watershed plan, then it is considered acceptable. If it is not, other considerations for determining if off-site mitigation is environmentally preferable include, but are not limited to the following:<br>• On-site conditions do not favor successful establishment of the required vegetation type, or lack the proper soil conditions, or hydrology.<br>• On-site compensation would result in an aquatic habitat that is isolated from other natural habitats or severely impaired by the effects of adjacent development.<br>• Off-site location is crucial to one or more species that is threatened, endangered, or otherwise of concern, and the on-site location is not.<br>• Off-site location is crucial to larger ecosystem functions, such as providing corridors between habitats, and the on-site location is not.<br>• Off-site compensation has a greater likelihood of success or will provide greater functional benefits.<br>When determining whether off-site mitigation is environmentally preferable, the value of the site-specific functions at the project site, such as flood control, nutrient retention, sediment filtering, and rare or unique habitats or species, should be fully considered. When conditions do not favor on-site compensation, off-site compensatory mitigation should be located as close to the impact site as possible, while still replacing lost functions. Preference should be given to off-site options within the same hydrologic unit (e.g., based on the 8-digit U.S. Geological Survey Hydrologic Unit Code or appropriate substitute) or ecoregion as the impact site. | *Draft* Federal Guidance on the Use of Off-Site and Out-of-Kind Compensatory Mitigation Under Section 404 of the Clean Water Act (Apr 7, 2004) (Section IV.E.) |
| U.S. conservation banks | "The priority for mitigation should be to accomplish it at a site which provides for the long-term conservation of habitat and species. As such, off-site mitigation is specifically sanctioned in the context of an otherwise permissible conservation bank."<br><br>"In some cases, the use of off-site banks may be the only mitigation option when on-site conservation measures are not practicable for a project or when the use of the bank is environmentally preferable to on-site measures."<br>"The important point in establishing a bank is to site banks in appropriate areas that can reduce the threat of fragmentation and provide management measures that address other threats that a species might encounter…"<br>"The Service will give careful consideration to the ecological stability of a site for achieving mitigation. The Service will evaluate the location, size, and configuration of the proposed bank. Additional items to consider when determining the suitability of an area as a conservation bank might be topographic features, habitat quality, compatibility of existing and future land use activities surrounding the bank, and species use of the area."<br>"In general, the Service Area of a conservation bank… defines the area (e.g., recovery unit, watershed, county) in which the bank's credits may be used to offset project impacts." | The Resources Agency and California Environmental Protection Agency. 1995. Official Policy on Conservation Banks. April 7, 1995.<br><br>US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Sections I.A., II.B.1., II.B.5., and II.C.2.) |

| Policy Framework | Location of offset: on-site vs. offsite | Source |
|---|---|---|
| EU Natura 2000 sites | "In order to ensure the overall coherence of Natura 2000, the compensatory measures proposed for a project should…concern the same biogeographical region in the same Member State…. The distance between the original site and the place of the compensatory measures is not therefore an obstacle, as long as it does not affect the functionality of the site and the reasons for its initial selection." | European Commission. 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Section 5.4.3.) |
| Australia: New South Wales (Native Vegetation) | Principle B: "the benefits of the offset occur in the same area as the impacts of the proposed clearing."<br><br>"Offsets must be located appropriately – they must offset the impact in the same area." | NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (p. 4)<br>NSW Government. 2002. Green offsets for sustainable development: Concept paper (p. 4) |
| Australia: Victoria (Native Vegetation) | "There needs to be an adequate geographic link between losses and offsets if mitigation benefits are to generally accrue to the catchments and plant/animal populations that have been impacted. There will be a graded response: from as close as possible and/or effective for higher significance, down to more flexibility for lower significance (at the discretion of the planning authority) leading to opportunities to optimize outcomes." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.25) |
| Australia: Western Australia | No specific guidance provided. | |
| Brazil Industrial Offsets | Offset payments fund protected areas anywhere in country, unless industrial facility directly impacts a specific protected area, in which case that protected area becomes beneficiary of offset payments. | Protected Areas Law, #9985, 2000<br>Decree 4340, 2002 |
| Brazil Forest Offsets | Offset within same watershed, if possible. | Forestry Code, #4771, 1965<br>Provisional Measures 2166/67, 2001 |

**Table 4-C. Additionality and Acceptable Types of Offsets**

| Policy Framework | Additionality and acceptable types of offsets | Source |
|---|---|---|
| U.S. wetlands mitigation | "Because the likelihood of success is greater…restoration should be the first option considered."<br><br>"In some circumstances, it may be appropriate to site banks on Federal, state, tribal or locally-owned resource management areas (e.g., wildlife management areas, national or state forests, public parks, recreation areas). …Mitigation credits generated by banks of this nature should be based solely on those values in the bank that are supplemental to the public program(s) already planned or in place, that is, baseline values represented by existing or already planned public programs, including preservation value, should not be counted toward bank credits."<br><br>"Credit may be given when existing wetlands and/or other aquatic resources are preserved in conjunction with restoration, creation or enhancement activities, and when it is demonstrated that the preservation will augment the functions of the restored, created or enhanced aquatic resource. …In addition, the preservation of existing wetlands and/or other aquatic resources in perpetuity may be authorized as the sole basis for generating credits in mitigation banks only in exceptional circumstances…." | U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section II.C.)<br><br>Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Sections II.B.2. and II.B.4.) |
| U.S. conservation banks | "Land used to establish conservation banks must not be previously designated for conservation purposes (e.g., parks, green spaces, municipal watershed lands), unless the proposed designation as a bank would add additional conservation benefit. …Where conservation values have already been permanently protected or restored… the Service will not recommend, support, or advocate the use of such lands as conservation banks for mitigating impacts to species listed under the ESA."<br><br>"Conservation banks will rely on a range of strategies to achieve and maintain mitigation in perpetuity on existing functioning and occupied habitat for a majority of those species facing threats of habitat loss and fragmentation. Such strategies include preservation, management, restoration of degraded habitat, connecting separated habitats, buffering of already protected areas, creation of habitat, and other appropriate actions." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Sections II.B.4. and II.B.7.) |
| EU Natura 2000 sites | "The compensatory measures constitute measures specific to a project or plan, additional to the normal practices of implementation of the 'Nature' directives."<br>"Compensation must be additional in relation to the Natura 2000 network to which the Member State should have contributed in conformity with the directives."<br>"The compensatory measures can consist of: recreating a habitat on a new or enlarged site, to be incorporated into Natura 2000; improving a habitat on part of the site or on another Natura 2000 site, proportional to the loss due to the project; in exceptional cases, proposing a new site under the 'Habitats' directive." | European Commission. 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Sections 5.4.1. and 5.4.2.) |

| Policy Framework | Additionality and acceptable types of offsets | Source |
|---|---|---|
| Australia:<br>New South Wales<br>(Native Vegetation) | Principle G: "the offset is additional to actions or works carried out using public funds or to fulfil regulatory obligations."<br><br>"Offsets must be supplementary – beyond existing requirements and not already being funded under another scheme."<br><br>Potential offset actions include: revegetation, regeneration, restoration, and enhancement. | NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (p. 4)<br>NSW Government. 2002. Green offsets for sustainable development: Concept paper (p. 4)<br><br>NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (p. 8) |
| Australia:<br>Victoria<br>(Native Vegetation) | "Gains in extent include: new areas of revegetation primarily for biodiversity conservation, and new areas of revegetation for land protection, greenhouse or other purposes which have included sufficient locally indigenous species to be considered part of the native vegetation estate. Gains in quality include: improved management of threatening processes within existing native vegetation including both active improvement (e.g., control of weeds) and avoidance of further impacts by landholders agreeing to forego permitted uses (e.g., stock grazing, harvesting timber for on-farm use), recovery from forest product harvesting and mining operations, recovery from wildfires, and supplementary plantings into depleted existing native vegetation." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.19) |
| Australia:<br>Western Australia | Primary offset activities: restoration, rehabilitation, re-establishment, sequestration of emissions, banking/ credit trading/ trust fund.<br>Secondary offset activities: acquiring land for conservation, protection, on-going management, education, research, removal of threats, other. | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (p. 20) |
| Brazil Industrial Offsets | No explicit policy. Possible to assume that protected areas system in Brazil might otherwise not receive full funding. | Protected Areas Law, #9985, 2000<br>Decree 4340, 2002 |
| Brazil Forest Offsets | All offsets must be additional to required conservation area on any private landholding. | Forestry Code, #4771, 1965<br>Provisional Measures 2166/67, 2001 |

**Table 4-D. "Currency" and Mitigation Replacement Ratios**

| Policy Framework | "Currency" and mitigation replacement ratios | Source |
|---|---|---|
| U.S. wetlands mitigation | "…mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values), with an adequate margin of safety to reflect the expected degree of success associated with the mitigation plan…. In the absence of more definitive information on the functions and values of specific wetlands sites, a minimum of 1 to 1 acreage replacement may be used as a reasonable surrogate for no net loss of functions and values. However, this ratio may be greater where the functional values of the area being impacted are demonstrably high and the replacement wetlands are of lower functional value or the likelihood of success of the mitigation project is low." | U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section III.B.) |
| | "The 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 debiting. The level of function may be determined through the application of performance standards tailored to the specific restoration, creation or enhancement activity at the bank site or through the use of an appropriate functional assessment methodology." | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section II.D.6.) |
| | "The Corps has traditionally used acres as the standard measure for determining impacts and required mitigation for wetlands and other aquatic resources, primarily because useful functional assessment methods were not available. However, Districts are encouraged to increase their reliance on functional assessment methods. Districts will determine, on a case-by-case basis, whether to use a functional assessment or acreage surrogate for determining mitigation and for describing authorized impacts. … In the absence of more definitive information on the functions of a specific wetland site, a minimum one-to-one acreage replacement may be used as a reasonable surrogate for not net loss of functions." | U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002. |
| U.S. conservation banks | "Credits are the quantification of a species' or habitat's conservation values within a bank. The conservation values secured by a bank are converted into a fixed number of credits that may be bought, sold, or traded for the purposes of offsetting the impacts of private, State, local, or Federal activities. In its simplest form, one credit will equal one acre of habitat or the area supporting one nest site or family group. Credit values are based upon a number of biological criteria and may vary by habitat types or management activities. When determining credit values, some of the biological criterion that may be considered include habitat quality, habitat quantity, species covered, conservation benefits, including contribution to regional conservation efforts, property location and configuration, and available or prospective resource values." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Section II.C.3. and II.C.5.) |
| | "Every conservation banking agreement should specify the methods for determining credits within the bank and debits outside the bank, setting performance standards to calculate credit availability, and devising accounting procedures to track the creation and use of such credits. …The rationale for any differential weighting schemes should be clearly articulated in the mitigation agreement or elsewhere." | |

| Policy Framework | "Currency" and mitigation replacement ratios | Source |
|---|---|---|
| | "While the use of [mitigation] ratios may be based initially on a general knowledge of the relationship between the amount of habitat remaining and what should be conserved to achieve the site-specific conservation strategy, every adverse impact will need to be evaluated individually. In some circumstances, the ratios can be based on qualitative factors such as scale or impact or quality of habitat. This allows different ratios to be applied to ensure mitigation proportionate to the impact." | |
| EU Natura 2000 sites | No specific discussion of mitigation ratios.<br>"[T]he compensatory measures proposed for a project should … address, in comparable proportions, the habitats and species negatively affected…[and] provide functions comparable to those which had justified the selection criteria of the original site [for Natura 2000]."<br>"[Under the 'Birds' directive] the overall coherence of the network is ensured if: compensation is ensured along the same migration path [and] the compensation site(s) are accessible with certainty by the birds usually occurring on the site affected by the project." | European Commission. 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Section 5.4.3.) |
| Australia: New South Wales (Native Vegetation) | Principle C: "the offset vegetation for biodiversity is either of equal or greater regional conservation significance as the site proposed for clearing."<br>Principle F: "the benefits of the offset are assessed using the same methodologies used to assess the impacts of the proposed clearing."<br>"Clearly defined, measurable units are needed to assess the environmental value of native vegetation and offset sites. | NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (p. 4)<br><br>NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (Principle 2, p. 8) |
| Australia: Victoria (Native Vegetation) | "[T]his Framework introduces an accounting system…based on habitat hectares, a site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type."<br>"Calculation of the amount of gain associated with the offset actions will be based on an estimate of the improvements that will be realized within 10 years of the actions being initiated." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.6, p.23) |
| Australia: Western Australia | "Positive environmental offset ratios should apply where risk of failure is apparent. …That is, the size of the offset to impact ratio should be larger than 1:1 and be proportional to both the importance of the environmental asset being impacted, and the likelihood that the offset is unlikely to achieve a 'net environmental benefit' outcome. Offset ratios should be based on past findings, success rates, current research or other similar projects being undertaken." | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (p. 16) |
| Brazil Industrial Offsets | No guidance, although regulation states that payment should be commensurate with impact (minimum payment is 0.5% of total capital cost of development). | Protected Areas Law, #9985, 2000 Decree 4340, 2002 |
| Brazil Forest Offsets | 1:1 habitat area offset, in-kind. | Forestry Code, #4771, 1965 Provisional Measures 2166/67, 2001 |

**Table 4-E. Timing of Project Impacts and Offset Benefits**

| Policy Framework | Timing of project impacts and offset benefits | Source |
|---|---|---|
| U.S. wetlands mitigation | "Since financial considerations are particularly critical in early stages of bank development, it is generally appropriate, in cases where there is adequate financial assurance and where the likelihood of the success of the bank is high, to allow limited debiting of a percentage of the total credits projected for the bank at maturity. Such determinations should take into consideration the initial capital costs needed to establish the bank, and the likelihood of its success. However, it is the intent of this policy to ensure that those actions necessary for the long-term viability of a mitigation bank be accomplished prior to any debiting of the bank. In this regard, the following minimum requirements should be satisfied prior to debiting: (1) banking instrument and mitigation plans have been approved; (2) bank site has been secured; and (3) appropriate financial assurances have been established. In addition, initial physical and biological improvements should be completed no later than the first full growing season following initial debiting of a bank. The temporal loss of functions associated with the debiting of projected credits may justify the need for requiring higher compensation ratios in such cases."<br><br>"[Mitigation] construction should be concurrent with authorized impacts to the extent practicable. …In general, when impacts to aquatic resources are authorized before mitigation is initiated, [USACE] Districts will require: 1) a Corps-approved mitigation plan; 2) a secured mitigation project site; 3) appropriate financial assurances; and, 4) legally protected, adequate water rights where necessary. Initial physical and biological improvements in the mitigation plan generally should be completed no later than the first full growing season following the impacts from authorized activities. If beginning the initial improvements within that time frame is not practicable, then other measures that mitigate for the consequences of temporal losses should be included in the mitigation plan." | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section II.D.6.)<br><br>U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002. |
| U.S. conservation banks | "Upon sale of the first credit in the bank or subarea, the land in the bank or subarea must be permanently protected through fee title or conservation easement."<br><br>"At the time the first credit in a bank or phase of a bank is sold, the land within the bank or its phase must be permanently protected through fee title or a conservation easement, with any land use restrictions set in perpetuity for the land legally established. Consequently, once any credit in a given bank or phase is sold, the entire area is automatically and legally protected, regardless if the rest of the credits in the bank or phase are sold, thereby by eliminating future fragmentation of habitat."<br>"Conservation banks may be divided into sub-areas and implemented in phases. …A prospective banker may not be sure there will be sufficient demand to use all of the potential credits. Therefore, the banker may decide to implement a conservation bank on only a portion of the habitat area during the first phase of the bank. Later phases of the bank would be added if and when the credits from this first phase are exhausted." | The Resources Agency and California Environmental Protection Agency. 1995. Official Policy on Conservation Banks. April 7, 1995.<br><br>US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Sections II.C.3.) |

| Policy Framework | Timing of project impacts and offset benefits | Source |
|---|---|---|
| EU Natura 2000 sites | "A site should not be irreversibly affected by a project before the compensation is indeed in place. For example, a wetland should normally not be drained before a new wetland, with equivalent biological characteristics, is available for inclusion in the Natura network."<br>"The [compensatory] result has normally to be operational at the time when the damage is effective on the site concerned with the project unless it can be proved that this simultaneity is not necessary to ensure the contribution of this site to the Natura 2000 network." | European Commission. 2000. Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Section 5.4.2.) |
| Australia: New South Wales (Native Vegetation) | "An offset agreement should not lead to permanent environmental costs due to delay before offset actions yield environmental benefits. …To account for these time lag problems, offsets should only be applied where: the values lost can be replaced at least as rapidly as they are lost (e.g., fast responding aquifers, improved management of existing vegetation); where the loss of values causes no permanent harm (e.g., clearing of young regrowth in well vegetated regions); or where clearing is postponed until the offset action is fully functional."<br>"Clearing should only proceed when the offset site is making acceptable progress towards the predicted ecological state and management arrangements are legally secure." | NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (Principle 3, p. 10 and Principle 4, p. 11) |
| Australia: Victoria (Native Vegetation) | "To ensure that delays between clearing and mitigation do not unnecessarily exacerbate the risk to environmental values during the 'transition' to recovery through offsets, the timing of offsets needs to be appropriate. It is also important to properly manage risks of non-compliance, particularly for the most significant impacts. There will be a graded response: from formally initiating offsets prior to clearing taking place, to initiating offsets as soon as seasonally practicable after clearing has taken place." | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.25) |
| Australia: Western Australia | No specific guidance provided. | |
| Brazil Industrial Offsets | Offset payment required prior to environmental permitting. | Protected Areas Law, #9985, 2000 Decree 4340, 2002 |
| Brazil Forest Offsets | Offset occurs retroactively after land clearing. | Forestry Code, #4771, 1965 Provisional Measures 2166/67, 2001 |

**Table 4-F. Offset Duration, Management, Monitoring, and Compliance**

| Policy Framework | Offset Duration, Management, Monitoring, and Compliance | Source |
|---|---|---|
| U.S. wetlands mitigation | "The wetlands and/or other aquatic resources in a mitigation bank should be protected in perpetuity with appropriate real estate arrangements (e.g., conservation easements, transfer of title to Federal or State resource agency or non-profit conservation organization). Such arrangements should effectively restrict harmful activities (i.e., incompatible uses) that might otherwise jeopardize the purpose of the bank. In exceptional circumstances, real estate arrangements may be approved which dictate finite protection for a bank (e.g., for coastal protection projects which prolong the ecological viability of the aquatic system). However, in no case should finite protection extend for a lesser time than the duration of project impacts for which the bank is being used to provide compensation. …The bank sponsor is responsible for securing adequate funds for the operation and maintenance of the bank during its operational life, as well as for the long-term management of the wetlands and/or other aquatic resources, as necessary." | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section III.E.2.) |
| | "Monitoring is an important aspect of mitigation, especially in areas of scientific uncertainty. Monitoring should be directed toward determining whether permit conditions are complied with and whether the purpose intended to be served by the condition is actually achieved. …For projects to be permitted involving mitigation with higher levels of scientific uncertainty, such as some forms of compensatory mitigation, long term monitoring, reporting and potential remedial action should be required." | U.S. Environmental Protection Agency and U.S. Army Corps of Engineers. 1990. (Section III.B.) |
| | "The bank sponsor is responsible for monitoring the mitigation bank in accordance with monitoring provisions identified in the banking instrument to determine the level of success and identify problems requiring remedial action. …Monitoring should be conducted at time intervals appropriate for the particular project type and until such time that the authorizing agency(ies), in consultation with the MBRT, are confident that success is being achieved (i.e., performance standards are attained). The period for monitoring will typically be five years; however, it may be necessary to extend this period for projects requiring more time to reach a stable condition (e.g., forested wetlands) or where remedial activities were undertaken." | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section III.E.3.) |
| | "Monitoring will be required for an adequate period of time, normally 5 to 10 years, to ensure the project meets performance standards. Corps permits will require permanent compensatory mitigation unless otherwise noted in the special conditions of the permit." | U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002. |
| | "The bank sponsor is responsible for securing sufficient funds or other financial assurances to cover contingency actions in the event of bank default or failure. Accordingly, banks posing a greater risk of failure and where credits have been debited, should have comparatively higher financial sureties in place, than those where the likelihood of success is more certain. In addition, the bank sponsor is responsible for securing adequate funding to monitor and maintain the bank throughout its operational life, as well as | Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. Nov 28, 1995. (60 FR 58605-58614) (Section III.E.5.) |

| Policy Framework | Offset Duration, Management, Monitoring, and Compliance | Source |
|---|---|---|
| | beyond the operational life if not self-sustaining. Total funding requirements should reflect realistic cost estimates for monitoring, long-term maintenance, contingency and remedial actions. Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, legislatively-enacted dedicated funds for government operate banks or other approved instruments. Such assurances may be phased-out or reduced, once it has been demonstrated that the bank is functionally mature and/or self-sustaining (in accordance with performance standards)."<br>"Financial assurances should be commensurate with the level of impact and the level of compensatory mitigation required." | U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2*. December 24, 2002. |
| U.S. conservation banks | "The amount of credits by a bank and available for sale to Service Area projects for mitigation are implicitly contingent on the banks exercise of appropriate management to safeguard in perpetuity the species or habitat conservation values upon which the credits are based. This may require a range of management practices and responses, including those customarily identified as adaptive management practices."<br>"Monitoring is the responsibility of the bank. The scope of the monitoring program should be commensurate with the scope of the conservation actions undertaken by the bank."<br>"The bank agreement must identify and include a requirement for adequate funding to provide for the conservation bank's perpetual operation, management, monitoring, and documentation costs." | US Department of the Interior. 2003. Guidance for the Establishment, Use and Operation of Conservation Banks (Sections II.D.1., II.D.2., and II.D.4. ) |
| EU Natura 2000 sites | "[T]he assessment of the compensatory measures does not cease there. It will be necessary, through legally binding mechanisms, to ensure that the long-term conservation interests of the Natura 2000 network are maintained. This will require the security of site tenure to be guaranteed, management plans to be drawn up with clear, achievable short-, medium- and long-term objectives, and for long-term monitoring mechanisms to be in place. Monitoring is particularly important to ensure that the conservation objectives of Natura 2000 are achieved."<br>"There is evidence that, should monitoring reveal failures in the compensatory measures ability to achieve their original objectives, steps will be taken to address and rectify those failures." | European Commission. 2001. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (Sections 3.4.4. and 3.6.3.) |
| Australia:<br>New South Wales<br>(Native Vegetation) | Principle A: "the benefits of the offset persist for at least the duration of the negative impact of the proposed clearing."<br>Principle D: "management actions are likely to be deliverable and enforceable."<br>Principle E: "permanent conservation measures are given greater value than other management actions."<br>"The offset action should be effective for the period that the clearing has an impact."<br>"Ongoing monitoring will be required to assess the effectiveness of offset agreements."<br><br>"Offsets must be enduring – they must offset the impact of the development for the period that the impact occurs."<br>"Offsets must be enforceable – through development consent conditions, licence conditions, covenants or a contract." | NSW Department of Infrastructure, Planning and Natural Resources. 2004a. (p. 4)<br><br>NSW Government. 2001. Offsets, salinity and native vegetation discussion paper (p. 9)<br><br>NSW Government. 2002. Green offsets for sustainable development: Concept paper (p. 4) |

| Policy Framework | Offset Duration, Management, Monitoring, and Compliance | Source |
|---|---|---|
| Australia: Victoria (Native Vegetation) | "To ensure that the management actions required to achieve offsets are undertaken, and that permanent losses from clearing are mitigated by gains of an on-going and secure nature, offset arrangements will be formally established through the routine and streamlined use of management agreements or permit conditions."<br>"Requirements to achieve offsets must be identified in the associated management agreements &/or the permit conditions. Gains must be of an on-going and secure nature. | Victoria Department of Natural Resource and Environment. 2002. Victoria's native vegetation management – a framework for action (p.26, Appendix 4) |
| Australia: Western Australia | "Environmental offsets must be undertaken on the understanding that the activities and outcomes must be long-term. Offset projects should demonstrate security of purpose, security of tenure and security of management. When relevant to ecosystems, the offset site should be legally protected with covenants or conservation agreements or transferred into the conservation estate to ensure that the positive environmental benefit is long lasting. Legal agreements may be required in some instances to ensure the on-going management and maintenance of the offset site over an ecologically meaningful timeframe (10-30 years plus)."<br>"Environmental offsets must be clearly defined, transparent and enforceable. …Offset activities must always be enforceable through compliance auditing and enforcement activities and penalties issued when breaches are apparent." | Western Australia Environmental Protection Agency. 2004. Environmental Offsets: Preliminary Position Statement No. 9 (p. 17-18) |
| Brazil Industrial Offsets | No regulation or guidance | Protected Areas Law, #9985, 2000 Decree 4340, 2002 |
| Brazil Forest Offsets | No regulation or guidance | Forestry Code, #4771, 1965 Provisional Measures 2166/67, 2001 |

## 5. Offset Assessment Methods and their Implementation

Offset assessments involve a range of activities and analyses, including mapping and delineation of site areas, analyzing conditions, functions, services, and values, assessing potential alternative options, determining required mitigation, and determining compensation needs and appropriate compensation ratios. Presently, offset assessment methods are most robust (and abundant) for wetlands, as these methods have been under development since the 1970s when efforts to protect wetlands increased in the United States. Indeed, estimates of the number of available wetland assessment methods range from 40 (Bartoldus 1999), to 54 (King and Price 2004), to more than 90 (Kusler 2003a).[9] This study identified only a handful of offset assessment methods not specifically developed for wetlands (e.g., habitat/species, native vegetation). Therefore the following discussion of assessment methods mainly focuses on the wetlands experience, though examples from other offset policy frameworks are provided where possible.

Wetland assessment methods vary considerably in their approach. At one extreme are methods that require complex modeling of multiple functions, championed largely by the policy and scientific community. At the other extreme are more rapid approaches that often involve little more than measuring the size of the impact area and applying some degree of professional judgment about potentially affected functions. This position finds greater support among the implementing community (field-based regulators, wetland owners/consultants, mitigation banks), as evidenced by actual practices (see "Assessment in Practice"). The tension between these extremes reflects two valid concerns – the need for sophisticated approaches that produce scientifically defensible results, and the need for practical approaches that can be implemented within existing time and budget constraints.

Encouragingly, a number of "middle-ground" approaches have emerged aimed at reconciling these competing needs. These approaches generally involve weighting key variables (based on professional judgment) and applying a scoring system. While such methods rely heavily on the subjective judgment of the user, they also provide a systematic and repeatable approach where judgments and assumptions require justification and can be verified (see "Box D. Wetlands Rapid Assessment Procedure"). In addition to emerging "middle-ground" methods, there has been renewed effort to improve the assessment *process*, with particular emphasis on better screening at the front-end to narrow the scope of functions requiring more intensive analysis. Such process

[9] Bartoldus (1999) provides a review of 40 wetland assessment procedures, including 2-3 page profiles of each method. These profiles provide basic information about the methods, along with contact people, expertise needed to carry out the method, applicable habitat types, procedural outputs, estimate time required to apply the method, extent of use/field testing of the method, and other summary information. Likewise, Fennessy et al. (2004) reviews 16 rapid assessment methods. National Research Council (2001) and Environmental Law Institute (2002) also provide analysis of a number of wetland assessment methods.

improvements aim to reduce time and costs while still supporting intensive assessment for identified functions of concern.

As methodological development moves forward for a variety of offset types, it is important to consider the lessons of the wetlands experience. First, while sophisticated models promising more accurate results are certainly attractive, practical concerns about implementation cannot be ignored. Methodological development will advance more effectively if such trade-offs are acknowledged and a pragmatic balance is achieved (ideally with consensus among the main stakeholders as to where this proper balance lies). Second, for complex systems such as wetlands, it is unlikely that any single method can comprehensively support evaluation of all functions and values. Emphasis may be better placed on the development of screening mechanisms and a selection of methods. Third, methodological development takes time, suggesting the need for strategic planning about the goals for assessment development, consensus about appropriate "interim" approaches and "second-best" methods, and on-going support for information sharing, networking, and coordination.

### 5.1. Wetland Assessment Methods through the Years

Over the past three decades, the combination of greater public recognition of wetland values and increased regulation to protect, enhance, and restore wetlands has generated a need for increasingly sophisticated wetland assessment methods. During the 1970s, assessments largely focused on developing inventory information and evaluating a limited number of functions and values (Bartoldus 1999). In 1980, the U.S. Fish and Wildlife Service (USFWS) published a manual – **Habitat Evaluation Procedures** (HEP) – providing guidance on how to conduct evaluations of wildlife habitat potential; the method was intended to support evaluation of lands under consideration for acquisition for wildlife management purposes (USFWS 1980). But HEP can be applied to most wetland and aquatic habitats as well. HEP involves documenting the quality and quantity of available habitat for selected species with the objective of developing an estimate of the number of habitat units per acre suitable for each species examined. Because HEP can be used to assess existing conditions, as well as habitat value for a planned future conditions, it provides an approach for assessing the value gained from compensatory mitigation (Thiesing 1998).

However, HEP's focus on habitat suitability, rather than ecological functions, limits its utility as a basis for wetland permit decisions. To assess wetland functions, the U.S. Army Corps of Engineers (USACE) and Federal Highway Administration developed a procedure during the 1980s called the **Wetland Evaluation Technique** (WET). Developed for rapid, "broad brush" evaluation purposes, WET uses the presence/absence of wetland characteristics as correlative predictors of wetland functions (i.e., the qualitative likelihood – high, medium, or low – that a wetland performs given functions) (Thiesing 1998). WET assesses eleven functions: groundwater recharge, groundwater discharge, flood flow alteration, sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, production export, wildlife diversity/abundance, aquatic

diversity/abundance, recreation, and uniqueness/heritage. In addition, WET provides a procedure for evaluating habitat suitability for a range of wetland-dependent species (Bartoldus 1999). However, WET only evaluates *whether* wetlands perform a given function; it does not measure the *extent* of a function's performance, making it often an unsuitable method for assessing compensatory mitigation.

Under the Section 404 regulatory program, new guidance during the 1990s increased the need to quantify the functional performance of wetlands. A Memorandum of Agreement between the U.S. Environmental Protection Agency (USEPA) and USACE (1990) confirmed a policy goal of "no net loss" for wetlands, referring to both wetland acres and functions – physical, chemical, or biological processes occurring within wetland systems. In support of this objective, policy guidance on compensatory mitigation for wetlands called for consideration of functional values and the use of functional assessment methods where possible.

> "In determining compensatory mitigation, the functional values lost by the resource to be impacted must be considered. …mitigation should provide, at a minimum, one for one functional replacement (i.e., no net loss of values), with an adequate margin of safety to reflect the expected degree of success…" (USEPA and USACE 1990, Section II.C.3. and III.B.).

> "An appropriate functional assessment methodology (e.g., Habitat Evaluation Procedures, hydrogeomorphic approach to wetlands functional assessment, other regional assessment methodology) acceptable to all signatories should be used to assess wetland and/or aquatic resource restoration, creation and enhancement activities within a mitigation bank, and to quantify the amount of available credits. The range of functions to be assessed will depend upon the assessment methodology identified in the banking instrument. The same methodology should be used for both credits and debits. If an appropriate functional assessment methodology is impractical to employ, acreage may be used as a surrogate for measuring function" (Federal Guidance for the Establishment, Use and Operation of Mitigation Banks. 60 Fed. Reg. 228, 58612. 1995).

Cognizant of policy guidance, as well as the shortcomings of existing functional assessment tools, USACE developed a new approach in the early 1990s called the **Hydrogeomorphic Method** (HGM) suitable for measuring a wide range of wetland functions in a quantifiable, consistent manner. The method requires developing models of a variety of wetland functions for different wetland regional subclasses. The measurement of functional capacity at a site can then be compared to reference wetlands from the same regional wetland subclass. The advantages of HGM over previous methods led the USACE and Natural Resources Conservation Service (NCRS) to agree in the mid-1990s to formally adopt HGM as a uniform procedure for functional assessment for the Section 404 regulatory program and the U.S. Department of Agriculture programs (NRC 2001). Moreover, USACE proposed in 1996 that HGM be used for evaluation in 90 percent of Section 404 permits (Kusler 2003b). But by 1998 (and even several years later), almost no use has been made of HGM to assess regulatory permits, largely because the method is complex, time consuming, and expensive to implement. Most recently, interest has shifted to the **Index of Biological Integrity** (IBI) approach (Box B), but this too can be a time consuming and expensive approach (Kusler 2003b).

## 5.2. Making Sense of Multiple Methods

> "[Assessment methods] range in level of rigor from those based on ad hoc consensus among professionals to more sophisticated peer-reviewed mechanistic models. Consequently, these techniques differ greatly in the level of detail, objectivity and repeatability of results. There is also considerable variability in the range of wetland functions that are considered by any given technique. Some methodologies are narrowly focused and may only consider a single or a small related group of functions such as fish habitat, bird habitat, wildlife habitat, flood storage…; others look at a broader range of wetlands functions concurrently…. Because wetlands are such complex systems, however, there is no single technique, no matter how comprehensive, which can evaluate all functions performed by a given wetland" (Thiesing 1998).

In seeking to provide an approach for assessing two different wetlands so that impacts at one could be offset by improvements at another, wetland scientists and managers have developed a multitude of assessment methods. These methods evaluate wetland functions, conditions, and/or services, in a qualitative or quantitative manner, with the objective of determining a "currency" – translation of those functions, conditions, and services into a unit that can be used to establish appropriate compensation ratios. Given the complexity of wetland systems, it is not surprising that this effort has resulted in a proliferation of methods. Nonetheless, it is possible to broadly group the assessment approaches in three categories according to their focus: (1) ecological functions/values, (2) ecological conditions/integrity, and (3) landscape context. Each category is described briefly below, with a summary of one of the category's prominent assessment methods provided for illustrative purposes.

- **Ecological functions/values** – These approaches assess the ability of wetlands to produce specified goods and services. Examples of wetland functions and values include: flood storage, flood conveyance, reduction of wave damage, erosion control, reduction in sediment loadings, prevention and treatment of pollution, crop and timber production, groundwater recharge, provision of habitat, scenic beauty, recreational opportunities, and so on (Kusler 2003a).

**Box 5-A. Hydrogeomorphic Approach –** This method is used to assess wetland functions in the 404 Regulatory Program as well as other regulatory, planning, and management situations. The approach requires developing models of a variety of wetland functions, depending on the wetland regional subclass. Functions assessed include those related to hydrological processes, biogeochemical processes and habitat. The procedure allows for the measurement of functional capacity of a site relative to wetlands from the same regional wetland subclass. Development and assessment of each regional wetland subclass usually requires several months of work by an interdisciplinary team.
Source: Bartoldus 1999

- **Ecological conditions/integrity** – These methods aim to measure the ecological conditions and biological integrity of a wetland rather than functional capacity. Biological integrity refers to the ability of a wetland to support and maintain a balanced, integrated, and adaptive biological system (Bartoldus 1999). These assessments can be especially important for evaluating restoration potential.

**Box 5-B. Index of Biological Integrity –** This method uses samples of living organisms to assess biological integrity and the consequences of human actions on biological systems. It involves classifying environments to define homogenous sets within or across ecoregions (e.g., streams, lakes, wetlands). Use of metrics and scores allows for comparison of biological integrity at one site to the biological integrity of reference conditions at sites from the same geographic region. Conducting the assessment requires months of work by biologists for each habitat type.
Source: Bartoldus 1999

- **Landscape context** – These assessments characterize land uses and the distribution and abundance of wetland types throughout an area. The landscape profile can help guide wetland protection and restoration decisions, including the location and design of compensatory mitigation projects (USEPA 2002). Increasingly, policy guidance calls for compensatory mitigation to be designed and constructed in a manner that maximizes the ecological contribution to the landscape/watershed (NRC 2001).

**Box 5-C. Synoptic Approach –** This approach provides a framework for making comparisons between landscape units (e.g., watersheds, ecoregions, or counties) so that impacts to wetlands can be considered in management decisions. It supports watershed planning and prioritizing areas for restoration or protection. The method addresses four aspects of wetland ecosystems: function (habitat, water quality, and hydrologic); value; functional loss; and replacement potential. The assessment requires months of (primarily office) work by an interdisciplinary team
Source: Bartoldus 1999

**Table 5-A. Assessment Methods: Scope vs. Intensity**

| | | **Intensity** | |
|---|---|---|---|
| | | ***Time intensive*** | ***Rapid*** |
| **Scope** | ***Comprehensive*** | Complex modeling of multiple functions/ conditions<br><br>*Examples: Hydrogeomorphic Approach, Index of Biological Integrity* | Professional judgment, evaluation tools, scoring indexes across multiple functions/ conditions<br>*Examples: Wetland Rapid Assessment Procedure (Box5-D), "habitat-hectares" method (Victoria, Australia) (Box 5-F)* |
| | ***Specific*** | Complex modeling of specific function/condition<br>*Examples: Hydrologic Engineering Center models of flood flows, Rosgen stream stability model* | Professional judgment, evaluation tools, scoring indexes for a particular function, species, or habitat<br>*Examples: Avian Richness Evaluation Method; California Red-Legged Frog Credits (conservation banking) (Box 5-E)* |

In addition to the focus on ecological functions/values, ecological conditions/ integrity, or landscape context, it is possible to differentiate methods based on their scope and intensity (Table 5-A). Scope refers to the range of ecological functions and conditions evaluated, with some approaches more comprehensive in their coverage and others aimed at assessing a particular element. Intensity refers to the depth of data/information collection and analysis required and length of time to complete the assessment, with time-intensive approaches often involving the development of complex data-driven models, whereas rapid methods rely more on subjective judgment and qualitative measures.

**Box 5-D. Wetland Rapid Assessment Procedure (WRAP): A Method Used to Define Credits for Several Mitigation Banks in Florida**

The USACE Jacksonville District recognizes that federal agencies are in the process of developing the HGM method for use throughout the United States, but in the interim USACE Jacksonville has adopted WRAP. While permit applicants are not required to use WRAP, it can expedite the application evaluation. WRAP focuses on six variables:

- Wildlife utilization
- Overstory/shrub canopy of desirable species
- Wetland vegetative ground cover of desirable species
- Adjacent upland/wetland buffer
- Field indicators of wetland hydrology
- Water quality input and treatment

After reviewing existing site information, making site visits, and completing data sheets for each variable, the user(s) of WRAP assign scores of 0 to 3 for each variable for the existing condition and "with-project" condition. However, for the "with project" condition, impacts are usually such that each variable receives a "0" score. As all functions may not be of equal importance, WRAP allows the user(s) to apply differing weights to each variable, as long as specific information warrants it. In assigning weights, WRAP user(s) should consider five questions:

- Does the project result in identifiable ecological benefits to established watershed issues (i.e., does an increase or decrease of functions affect an issue listed in a watershed plan or other similar effort)?
- Does the project result in identifiable benefits to adjacent lands/waters of regional importance (e.g., is any function particularly important to regionally important downstream waters)?
- Does the project/restoration impact or improve the status of Federal and/or State listed, threatened, endangered or candidate species?
- Does the project/restoration impact, improve, restore, or create ecological features considered to be unusual, unique or rare in the region (e.g., will impact or restoration affect certain habitats/functions that have been largely removed in the past)?
- Are there any other special considerations?

Scores for each variable are summed and divided by the maximum possible score to derive a WRAP score (0.0-1.0) for the wetland, which can be multiplied by the total acreage of the wetland to arrive at the units of "loss" from the project impact. Compensatory mitigation must then be designed to offset this loss, with an equal amount of "credit" units (estimated using WRAP).

| **WRAP Formula: Example** | Wildlife utilization | Overstory | Ground Cover | Buffer | Hydrology | Water Quality |
|---|---|---|---|---|---|---|
| Existing condition | 1.5 | 1.5 | 2.5 | 2.5 | 3.0 | 2.5 |
| With-project | 0 | 0 | 0 | 0 | 0 | 0 |
| Change (divided by 3) | 1.5/3 | 1.5/3 | 2.5/3 | 2.5/3 | 3.0/3 | 2.5/3 |
| Multiply by weight factor | 1/3 | 1/3 | 1/12 | 1/12 | 1/12 | 1/12 |
| Units | 1.5/9 | 1.5/9 | 2.5/36 | 2.5/36 | 3.0/36 | 2.5/36 |
| Total units (10 acre site) | Sum = 22.5/36 = 0.625 units per acre; 0.625 x 10 acres = 6.25 units "loss" | | | | | |

In assessing offsets, WRAP also attempts to quantitatively account for concerns associated with temporal lags and risk factors. Where project impacts occur prior to the offset project's benefits, WRAP allows for a "present value" adjustment of those future benefits. This increases the amount of compensation units required. Likewise, WRAP accounts for risk factors by allowing for an assessment of the probability of offset success based on the mitigation type (creation, restoration, preservation), size of offset and landscape context of site, maintenance requirements and maintenance plan. Scores range from 0.0-1.0, with 1.0 indicating 100 percent probability of success.

WRAP scoring is ultimately intended to support, but not supplant, professional judgment.

Sources: Miller and Gunsalus (1997)

**Box 5-E. Determining Credits for Conservation Banks: California Red-Legged Frog**

To support conservation banking for the California Red-Legged Frog, a threatened species (Fed. Reg. 61: 25813-25833), the Sacramento Fish and Wildlife Office (SFWO) has developed a method for determining available credits, applicable within the nine San Francisco Bay area counties of SFWO jurisdiction. Available credits for proposed bank sites are determined by a committee of biologists from the Fish and Wildlife Service and other federal, state, and local agencies. They evaluate five criteria, which are presented in the following table and summarized below.

| **Criteria Category** | Points |
|---|---|
| 1. **Preserve Size and Shape** (500 acres = 1 point, n = number of acres) | n/500 |
| 2. **Importance to Recovery** (location, connectivity, unique features) | 0-2 |
| 3. **Frog Use of Waters/Wetlands/Uplands** (breeding habitat, dispersal/refugia opportunities) | 0-2 |
| 4. **Condition of the Site** (habitat quality and diversity, absence of exotic species) | 0-2 |
| 5. **Defensibility of the Site** (watershed integrity/defensibility, on-site and adjacent land uses) | 0-2 |
| Total Bank Value = Total points divided by 5 (categories above), usually it is between 1-2 | |
| Total Bank Credits = Bank Value x acres of aquatic frog habitat and acres of associated upland habitat within 500 feet from the edge of all aquatic frog habitat | |

**Preserve size and shape** – A point is awarded for each 500 acres. The bank's shape can contribute to or detract from the preserve's effectiveness. For instance, points may be deducted for sites with a high ratio of edge to area if the site is adjacent to land/uses that are incompatible with the preservation of the frog.

**Importance to recovery** – This category awards points for bank sites located in areas identified as priorities for frog recovery and where there are habitat components essential for the primary biological needs of the frog. *Location* points (0.500) are awarded for sites within an identified core area of the California Red-Legged Frog Recovery Plan and/or for sites within a designated critical habitat unit of the frog (0.500). *Connectivity* points (0.500) are awarded for sites providing, or contributing significantly to, connectivity between separate populations of frogs, core areas, and/or critical habitat units. *Unique feature* points (0.500) are assigned for sites with unique/important qualities that contribute to frog recovery.

**Use of waters, wetlands, uplands by the frog** – Frogs need breeding habitat and areas providing foraging, refuge, and dispersal opportunities. Bank sites are evaluated for the frog's current and potential use. Sites must either have some *breeding habitat* or be located adjacent/connected to protected breeding habitat. Points are higher for bank sites with abundant breeding areas (max 1.000 point). Likewise, sites with greater opportunities for *dispersal, refugia, and foraging* receive a higher score (max 1.000 point)

**Condition of the site** – This category addresses the site's overall habitat quality for the frog. Bank sites are not scored relative to a particular reference site; scoring is based on the evaluation team's best professional judgment. *Habitat quality and diversity* points (max 1.000) are awarded based on the condition of existing frog habitat (e.g., water flow, water quality, diversity of habitat types available, riparian/other vegetation habitat structure). Bank sites with an *absence of exotic species* that could adversely affect the frog can receive full credit (1.000 point). Presence of exotic species predatory on the frog (e.g., bullfrogs, crayfish, bass, mosquitofish) will result in a lower score.

**Defensibility of the site** – This category addresses long-term sustainability of the site, with scores based on the best professional judgment of the evaluation team. Highly defensible sites generally include all or most of the frog's watershed, or they are adequately buffered from any foreseeable adverse effects from incompatible activities on adjacent lands. *Watershed integrity and defensibility* scores (max 1.000 point) depend on how sufficient the watershed is to maintain the hydrologic regime of the frog habitat. Existing/potential contamination and siltation can result in a lower score. *On-site and adjacent land uses* (and plans) will be evaluated for possible adverse impacts to the frog. Bank sites with incompatible adjacent land uses (e.g., urban, intensive agriculture, golf courses) will receive lower scores, whereas sites adjacent to protected parcels or grazing lands will generally receive higher scores (max. 1.000 point).

Source: SFWO 2001

**Box 5-F. Assessing the Quality of Native Vegetation Using the "Habitat Hectares" Method (Endorsed by the Victorian Government, Australia in 2002)**

"Habitat hectare" assessments rely on a comparison of remnant native vegetation to a "benchmark" for the same vegetation existing in a mature and long-undisturbed state. After identifying the vegetation communities (ecological vegetation classes) present at the assessment site, the method involves an evaluation of site conditions and landscape context (see table below). Site condition components have been selected in consultation with a range of botanists and ecologists. These components were considered both important for a wide range of vegetation species and suitable for rapid assessment by non-specialist ecologists.

Component scores are developed based on a site assessment. For instance, the score for "large trees" depends on the presence and health of large trees. According to the method, a stand with 40-70 percent of the benchmark number of large trees per hectare, and 30-70 percent canopy health (i.e., expected canopy cover is present, not missing due to disease, etc.), receives a score of 5 percent out of a possible 10 percent. Likewise, "lack of weeds" is calculated based on an assessment of the average projective weed foliage cover across the stand and the percentage cover of "high threat" weed species. Weed cover of 25-50 percent, where the percent of weed cover due to high threat weeds is >50 percent, would result in a score of 4 percent out of a possible 15 percent.

After each component is evaluated and scored, they are summed to obtain a final habitat score – a measure of habitat quality. A habitat score of 100 percent would require excellent site conditions and for the stand to effectively be part of a wilderness area. This is unlikely for most remnant vegetation. Trials of the method have found that high-quality remnants occasionally score above 80 percent, while stands of native vegetation in very poor condition rarely score below 10 percent.

The final step is to multiply the habitat score by the area of the stand provides a "quality-quantity" unit that the method refers to as a "habitat hectare." For example, a 10 hectare stand with a habitat score of 50 percent would receive a final score of 5 "habitat hectares."

| | **Component** | **Max. value (%)** |
|---|---|---|
| Site Condition | Large trees | 10 |
| | Tree (canopy) cover | 5 |
| | Understorey (non-tree) strata | 25 |
| | Lack of weeds | 15 |
| | Recruitment | 10 |
| | Organic litter | 5 |
| | Logs | 5 |
| | Patch size | 10 |
| Landscape context | Neighbourhood | 10 |
| | Distance to the core area | 5 |
| | Total | 100 |

Source: Parkes et al. 2003.

## 5.3. Multiple Methods, Multiple Challenges

> "The possible array of procedures now available for functional wetland assessment has grown to the point that there is considerable confusion about what is acceptable or preferable and by which regulator or scientist…. Most procedures are site-specific, with only a few providing assessments at the wetland system or landscape scale. Many are specifically designed to assess one or a few wetland functions, such as fish and wildlife habitat, and lack any procedures to assess other functions or a comprehensive assessment of all functions. Many limit consideration to wetland functions with societal value. Some were developed to generate scores that are scaled to wetland area, such that functions are explicitly assume to be multiplicative (which is not always the case). Although most use systematic models, many are based on qualitative and often subjective interpretations rather than measurement of discrete variables or parameters." (NRC 2001, p. 131)

Despite the numerous assessment methods available, all are subject to criticism and few are actually being used (see "Assessment in Practice"). Criticism tends to center on the practical constraints of budget and time, along with the technical challenges of carrying out complex methods. In addition to these practical considerations, many methods fail to consider all the relevant factors/functions for a site, ignore the dynamic nature of wetlands, compare "apples and oranges", rely too heavily on subjective interpretations and untested weighting/scoring mechanisms, provide general information that does not adequately support permitting decisions, or produce highly inaccurate results (Kusler 2003a, Fennessey et al. 2004).

Policy guidance, however, remains committed to functional assessments despite these problems. Most recently, the National Research Council (NRC) (2001) weighed in with recommendations that underlined support for functional assessments, and even called for an expansion in scope to better incorporate the watershed context of a wetland system: "The committee recommends that the Corps and other responsible regulatory authorities use a functional assessment protocol that recognizes the watershed perspective…to establish permittee compensation requirements." While admitting that "it is possible that there is no single 'best' wetland assessment procedure", the NRC sees no defensible alternative to a functional assessment approach:

> "[I]n the mitigation process it is essential that there be an ability to relate the structural characteristics of a site to the resulting functions. Only in that way can the compensation site be designed to secure certain functions. …Dependence on subjective, best professional judgment in assessing wetland function should be replaced by science-based, rapid assessment procedures that incorporate at least the following characteristics:
>
> - Effectively assess goals of wetland mitigation projects.
> - Assess all recognized functions.
> - Incorporate effects of position in landscape.
> - Reliably indicate important wetland processes, or at least scientifically established structural surrogates of those processes.
> - Scale assessment results to results from reference sites.
> - Are sensitive to changes in performance over a dynamic range.
> - Are integrative over space and time.
> - Generate parametric and dimensioned units, rather than non-parametric rank.

### 5.4. Assessment in Practice

Despite the urgings of the NRC recommendations and established policy guidance stating a clear preference for functional assessments, in practice, use of these methods is the exception rather than the norm. For example, of the 40 assessment methods identified by Bartoldus (1999), 27 have been used in five or fewer states, and 13 have been used in only one state. Even methods with formal support, such as HGM (adopted by the USACE as its uniform procedure), have only been applied in six states. Although HEP has reportedly been used in all 50 states, this reflects the long period of use (since the 1980s) and application by USFWS to habitat evaluation beyond just wetlands (Bartoldus 1999). In attempting to explain the failure in most cases to adopt functional assessments, Kusler (2003a) argues that the methods have simply not proven useful:

> "[Assessment] methods have often not met the needs of wetland managers. The combination of narrow perspectives, time-consuming procedures, failure of models to fit given situations, expense and relatively low levels of accuracy have proven unacceptable to wetland managers, limiting the use of these techniques. Agencies lose confidence in an assessment method when the results applied to a project do not make sense or can be generated more quickly with a field visit and a little logic. For example, agencies have often found that a quick, holistic look at a wetland and a qualitative evaluation with other resource agencies provides a more accurate evaluation of functions and values than the use of a formal rapid assessment approach" (Kusler 2003a).

Although it could be expected that more intensive assessments might be shunned due to time and budgetary concerns, rapid assessment techniques also appear to be playing little or no role in wetland permitting decisions. Based on interviews of "hundreds of regulators at state, tribal, federal and local levels," Kusler (2003a) finds that regulators commonly described rapid assessment methods as "unrealistic, unusable and impractical." Moreover, this is an opinion shared by wetland consultants representing private and public landowners. Kusler (2003a) notes that three prominent consultants, whose firms have been collectively responsible for more than 6,000 wetland permits, reported that "they had never used a rapid assessment technique, nor had they been asked to do so by a regulatory agency." However, they have employed relatively detailed field investigations in many wetland assessments.

Functional assessments have also played only a minor role in defining credits for wetland mitigation banks, despite 1995 federal guidance on mitigation banks calling for the use of such methods. In a study of over 200 wetland mitigation banks throughout the United States, the Environmental Law Institute (ELI) (2002) found that 61 percent of banks defined credits simply by acreage. Only 13 percent of banks applied a formal functional assessment method to define credits, while 23 percent used a combined approach – relying on "best professional judgment to scale wetland acreage according to some value of functionality." Where formal functional assessment procedures were applied, the most commonly used method was the Wetlands Rapid Assessment Procedure (WRAP) or its modified version (six banks in Florida), followed by HEP (four banks), and WET-based approaches (four banks). Only one bank indicated using HGM to establish credits (ELI 2002). Of the 40 assessment methods identified by Bartoldus (1999), only seven have

been applied (or are being considered) to establish credits in mitigation banks (NRC 2001).

### 5.5. No "Silver Bullet": From Methods to Process

Recognizing the challenges of successfully developing any single method or model for wetlands assessment, some recent efforts have focused on developing a more practical process for assessment emphasizing screening, sequencing, and a more collaborative approach. For instance, USEPA's National Wetland Program has developed a "three-tier framework" that separates assessment procedures into a hierarchy of three levels that vary in intensity and scale. Work may begin at any of the three levels with each level intended to help inform/validate the others.

- Level 1 – *Landscape Assessment* to characterize land uses and the distribution and abundance of wetland types across an area;

- Level 2 – *Rapid Wetland Assessment* to evaluate the general condition of individual wetlands using simple indicators;

- Level 3 – *Intensive Site Assessment* to test biological and physico-chemical indicators and validate/calibrate rapid methods (USEPA 2002, Fennessy et al. 2004).

While also calling for more emphasis on "sorting procedures" and "sequencing", Kusler (2003b) advocates a "Collaborative Assessment Process." Noting the roles of landowners/consultants, local governments, state and federal agencies, and the public, Kusler (2003b) suggests that more collaboration in information gathering (and more coordinated use of existing expertise and information) would reduce time and expenses and help to build consensus among stakeholders about critical issues regarding the proposed activity's key impacts and adequacy of proposed restoration measures. The process should involve sorting procedures to identify "red flag" issues requiring an immediate permit rejection and "yellow flag" issues signaling the need for more detailed information gathering. In addition, the process should sequence information gathering, placing an initial focus on obtaining "easy" information (e.g., is the site endangered species habitat?) and general information on significant wetland functions and values that may be affected by the proposed activity. Such screening information would help regulators in selecting the most appropriate assessment technique among the many existing approaches (Kusler 2003a).

**ABOUT BNI**

Biodiversity Neutral Initiative (BNI) is a non-profit organization that researches and promotes best practices for corporate biodiversity management. The organization's long-term goal is to develop voluntary standards for measuring, communicating, and offsetting biodiversity impacts with compensatory conservation projects -- helping leading companies to become "biodiversity neutral."

Regulatory standards exist for environmental offsets in the U.S., Australia, and Europe. BNI will build on those experiences to develop voluntary standards that can be applied in a broad range of ecosystems found worldwide. This will be particularly important for multi-national corporations operating in regions where biodiversity is highest and impacts are of greatest concern. BNI standards will be developed using a consultative approach that includes conservation groups, scientists, and industry.

BNI is currently collaborating with major international conservation groups, energy and mining companies, socially responsible investors, auditing and certification companies, and government regulators. The organization's board of directors includes representatives of Smithsonian Institute, Conservation International, and the World Business Council for Sustainable Development.

For more information about BNI, visit our web site: www.biodiversityneutral.org.

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