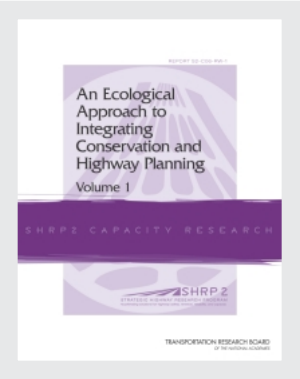

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The Second
STRATEGIC HIGHWAY RESEARCH PROGRAM

SHRP 2 REPORT S2-C06-RW-1

An Ecological Approach to Integrating Conservation and Highway Planning

Volume 1

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The Second Strategic Highway Research Program

America's highway system is critical to meeting the mobility and economic needs of local communities, regions, and the nation. Developments in research and technology—such as advanced materials, communications technology, new data collection technologies, and human factors science—offer a new opportunity to improve the safety and reliability of this important national resource. Breakthrough resolution of significant transportation problems, however, requires concentrated resources over a short time frame. Reflecting this need, the second Strategic Highway Research Program (SHRP 2) has an intense, large-scale focus, integrates multiple fields of research and technology, and is fundamentally different from the broad, mission-oriented, discipline-based research programs that have been the mainstay of the highway research industry for half a century.

The need for SHRP 2 was identified in *TRB Special Report 260: Strategic Highway Research: Saving Lives, Reducing Congestion, Improving Quality of Life,* published in 2001 and based on a study sponsored by Congress through the Transportation Equity Act for the 21st Century (TEA-21). SHRP 2, modeled after the first Strategic Highway Research Program, is a focused, time-constrained, management-driven program designed to complement existing highway research programs. SHRP 2 focuses on applied research in four areas: Safety, to prevent or reduce the severity of highway crashes by understanding driver behavior; Renewal, to address the aging infrastructure through rapid design and construction methods that cause minimal disruptions and produce lasting facilities; Reliability, to reduce congestion through incident reduction, management, response, and mitigation; and Capacity, to integrate mobility, economic, environmental, and community needs in the planning and designing of new transportation capacity.

SHRP 2 was authorized in August 2005 as part of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The program is managed by the Transportation Research Board (TRB) on behalf of the National Research Council (NRC). SHRP 2 is conducted under a memorandum of understanding among the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and the National Academy of Sciences, parent organization of TRB and NRC. The program provides for competitive, merit-based selection of research contractors; independent research project oversight; and dissemination of research results.

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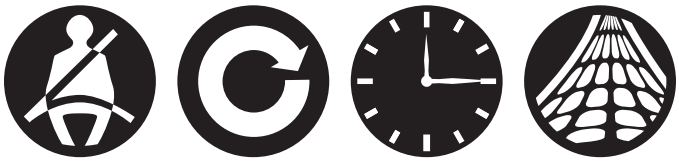

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The preparation of this report was a cooperative effort and relied on the willingness of participants involved in the transportation, planning, and environmental decision-making process to share their experiences. We thank them. We would also like to thank Marie Venner, Shannon Cox and Tom Denbow of URS, and the Staff of Parametrix and SEPI Engineering and Construction.

FOREWORD

Stephen J. Andrle, *SHRP 2 Deputy Director*

The two reports and guide produced as part of the SHRP 2's Capacity Project C06, Integration of Conservation, Highway Planning, and Environmental Permitting Using an Outcome-Based Ecosystem Approach, are intended to help transportation and environmental professionals apply ecological principles early in the planning and programming process of highway capacity improvements to inform later environmental reviews and permitting. Ecological principles consider cumulative landscape, water resources, and habitat impacts of planned infrastructure actions, as well as the localized impacts. The reports introduce the Integrated Ecological Framework (IEF), a nine-step process for use in early stages of highway planning, when there are greater opportunities for avoiding or minimizing potential environmental impacts and for planning future mitigation strategies. Success requires some level of agreement among stakeholders about prioritizing resources for preservation or restoration. Such agreements rely on considering long-range environmental planning as a companion to long-range transportation planning so that there is a basis and methodology for prioritization. The reports provide a structured, collaborative way to approach these issues. They do not address environmental mitigation and permitting actions required by current law or regulation.

This report, *An Ecological Approach to Integrating Conservation and Highway Planning, Volume 1,* describes the role of federal and state agencies and other stakeholders in the early environmental scanning of additions to highway capacity. It presents the five phases of the research approach, and it identifies incentives, benefits, barriers, and assurance needs associated with early involvement of environmental agencies in highway planning; tools such as banking and programmatic agreements for ensuring that the interests of all parties are met; strategies for commitment tracking; an inventory of assurance methods and the limits of using assurance methods at an ecoscale; and major findings. Early involvement, collaboration, and an ecological approach can lead to better transportation projects and more effective environmental protection.

Volume 2 presents the Integrated Ecological Framework, provides technical background on cumulative effects assessment, ecological accounting strategies, ecosystems services, and partnership strategies, along with a summary of the available ecological tools that are most applicable to this type of work. The Volume 2 appendices document three pilot projects that tested the approach during the research.

The *Practitioner's Guide to the Integrated Ecological Framework* provides step-by-step information to help practitioners use the IEF. Essential content from the C06 project is available on the Federal Highway Administration's PlanWorks website (Summer 2014). The site can be accessed by its former name, which is Transportation for Communities: Advancing Projects through Partnerships, or TCAPP (www.transportationforcommunities.com).

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Executive Summary

Strategic Highway Research Program (SHRP 2) Project C06, Integration of Conservation, Highway Planning, and Environmental Permitting Using an Outcome-Based Ecosystem Approach, is intended to support the integration of transportation and ecological planning. This project addresses the questions of how to (1) achieve interagency agreement on ecological solutions, (2) identify and leverage existing ways to increase predictability and assurance that credit will be allowed for addressing agency conservation and restoration priorities early in planning, (3) identify and leverage existing tools to increase resource agency confidence that mitigation commitments will be kept, and (4) make decisions last over time and across jurisdictions. This project is built on the groundwork laid in the development of *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects,* the U.S. Fish and Wildlife Service strategic habitat conservation approach, and other relevant ecosystem-based approaches (Brown 2006). The research approach and major findings of the project are summarized in this report.

This is the first report of a three-volume series. *An Ecological Approach to Integrating Conservation and Highway Planning, Volume 2,* summarizes the approach and outcomes of a partner project, Integration of Conservation, Highway Planning, and Environmental Permitting Through Development of an Outcome-Based Ecosystem-Scale Approach and Corresponding Credit System. The *Practitioner's Guide to the Integrated Ecological Framework* is a guide to using one of the main products of these efforts, the Integrated Ecological Framework (IEF).

The research, conducted primarily between 2008 and 2010, suggests that although there is strong support for integrated transportation and ecological planning, there is room for progress in its implementation.

Surveys and interviews of staff in transportation and resource agencies indicate that the main incentives for integrating transportation and ecological planning are related to efficient decision making, fiscal benefits, and improved outcomes for the natural environment:

- *Efficient decision making:* By investing time and money up front, transportation plans can better avoid critical resources; costly re-do loops and delays in project development can be eliminated or minimized; and advance mitigation on an ecosystem scale can be established.
- *Fiscal benefits:* Monetary savings are expected to result from both efficiencies in the decision-making process and the ability to purchase land for mitigation early, thereby avoiding rising land costs and the declining availability of high-quality conservation areas.
- *Improved outcomes:* Focusing on the ecosystem as a whole, rather than considering resources separately according to individual agencies' jurisdictions, results in better identifying and prioritizing critical areas to conserve and protect. Making this information available and using it during transportation planning will result in better protection of critical natural resources.

Despite the widespread support for the integration of transportation and ecological planning, surveys and interviews identified several barriers or challenges to its implementation:

- Lack of resources, especially time and staff, and to a lesser extent, training and the need for champions;
- Lack of data, information, and tools necessary to implement ecosystem-based approaches;
- Lack of data and agreement around the most important resources, sensitive areas, or conservation opportunities;
- Lack of understanding regarding how to implement ecosystem approaches;
- Issues around coordination, communication, and collaboration;
- Differences in missions or scope of missions;
- Restrictions or assumed restrictions in regulations and guidance; and
- Lack of assurances that mitigation can be paid for today and count for impacts of future projects.

The need for assurances was a major barrier addressed in this study. Transportation agencies need assurance that investments in mitigation in advance of project development will be counted when it is time to apply for a project permit. They also need assurance that they will have achieved compliance with regulations, specifically Section 404 of the Clean Water Act (CWA) and Section 7 of the Endangered Species Act (ESA), and that the conditions under which a decision would be reopened or revisited are minimized. Resource agencies need assurance that the requirements of the CWA and ESA will be met. In addition, they need assurance that priority resources are avoided and that mitigation will be carried out according to design and maintained in the long term.

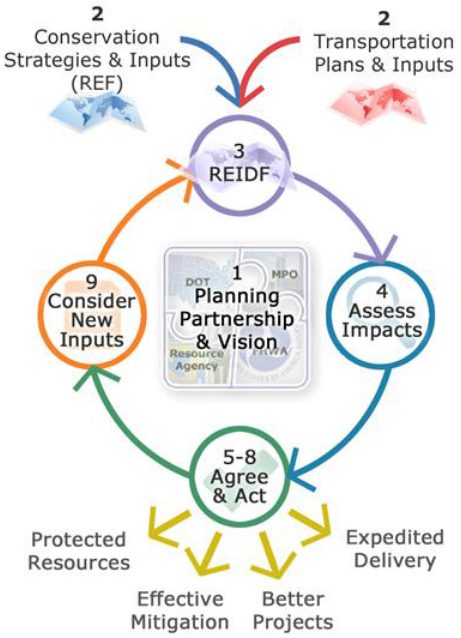
This understanding of incentives and barriers provides direction for targeting support. Chapters 5 and 6 are dedicated to describing existing methods for providing assurances. Examples are programmatic agreements and commitment tracking systems and how they can be applied at ecosystem scales. This analysis showed that many methods are available, some of which are already being used successfully, to provide assurances that support integrated transportation and ecological planning and advance mitigation.

The barriers and incentives identified, along with solutions recommended through surveys and interviews, also led to the identification of essential features of any ecosystem approach and the development of the IEF. The IEF is a step-by-step process guiding the integration of transportation and ecological planning. It is available through Transportation for Communities—Advancing Projects through Partnerships (TCAPP) at transportationforcommunities.com. The IEF is also described in detail in volume 2 of the report and in the *Practitioner's Guide*. The nine steps of the IEF are described in Figure ES.1.

Important steps remain to continue the integration of transportation and ecological planning. Two additional significant barriers are lack of data on priority conservation areas and lack of resources to implement an ecosystem-based approach. Much progress is being made to address these needs in subsequent efforts. For example, the SHRP 2 Capacity program is sponsoring several projects that will culminate in a web-based geographic information system tool that brings together national ecological data sets in a one-stop shop that can be accessed and used by transportation planners. The tool will be tested through multiple pilot applications. Both the tool and the pilot examples will be made publicly available. In addition, SHRP 2, the Federal Highway Administration, and the American Association of Highway and Transportation Officials are working together to provide transportation agencies with funding to support implementing the IEF.

Given the scientific complexity and uncertainty of ecosystem processes, the lack of well-organized and accessible data, and the single-resource approach to mitigation, the development of a true ecosystem-based regulatory framework is challenging. Although a regulatory framework that provides some level of federal authority over ecosystems may be unlikely, that does not preclude resource and regulatory agencies and departments of transportation from using ecosystem science

The Steps of the IEF



Step 1: Build a strong collaborative partnership of transportation and natural resource specialists. Create a shared vision representing the environmental and transportation goals for the planning region. Develop the collaborative framework necessary for cooperative decision making, data development and management, analyses, planning, and implementation.

Step 2: Gather data, expertise, and other inputs about the natural and built environment. Represent all high priority conservation and restoration areas and goals (regional ecosystem framework [REF]). Represent an initial plan to meet transportation goals.

Step 3: Integrate the conservation and transportation information and goals into a regional ecosystem and infrastructure development framework (REIDF).

Step 4: Characterize scenarios of transportation and other land use. Assess the effects of transportation scenarios on conservation objectives, create a preferred scenario, and create an ecosystem-based mitigation strategy to address remaining impacts.

Steps 5–8: Carry out innovative, ecosystem-based crediting strategies, interagency agreements, mitigation plans, programmatic consultations, and permitting to support transportation plans and conservation objectives.

Step 9: Continue to develop and maintain dynamic information on environmental and transportation needs and goals, access to cutting-edge conservation and assessment methods, and mitigation monitoring results in order to support both a viable partnership vision and future planning at the local, watershed, ecoregional, or state level.

Figure ES.1. Steps of the Integrated Ecological Framework.

and theory to advance their individual regulatory missions and conservation goals within the existing regulatory framework.

Despite the challenges of integrating these complex processes, the increasing number of successful examples, the development of geospatial tools and implementation approaches, and increased funding and leadership foster the integration of transportation and ecological planning toward becoming a common practice.

CHAPTER 1

Background

SHRP 2 Capacity Program

To address the challenges of moving people and goods efficiently and safely on the nation's highways, Congress created the second Strategic Highway Research Program (SHRP 2), operated by the Transportation Research Board (TRB). SHRP 2 is a targeted, short-term applied research program that addresses four strategic focus areas: the role of human behavior in highway safety (Safety); rapid highway renewal (Renewal); congestion reduction through improved travel time reliability (Reliability); and transportation planning that better integrates community, economic, and environmental considerations into new highway capacity (Capacity).

The goal of the Capacity focus area is to develop approaches for systematically integrating environmental, economic, and community requirements into the analysis, planning, and design of new highway capacity projects. The scope of the SHRP 2 Capacity focus area extends from the early stages of the transportation planning process, when many potential alternatives are being considered, through project development and permitting.

An Ecological Approach to Integrating Conservation and Highway Planning

Environmental issues in transportation decision making are usually considered in relative isolation, and overlapping regulatory processes of different agencies are frequently addressed independently. Multiple permits are generally negotiated one at a time, and the terms and conditions are not determined within the context of broader ecosystem considerations or priorities. It is common practice to consider only the regulated elements within a given project's area of potential impact. Due to limited legal jurisdiction, agencies may not have the ability to require avoidance or protection of nonregulated resources or areas. In addition, the initial phases of transportation planning may not address environmental considerations until long-range planning is complete. Even then, environmental considerations may not reflect broader ecosystem issues or priorities, but focus instead on finding a compromise between "competing" missions. Resource and transportation agencies recognize that this approach can result in less desirable outcomes for the natural environment, while causing delays and increased expenses.

SHRP 2 Project C06, Integration of Conservation, Highway Planning, and Environmental Permitting Using an Outcome-Based Ecosystem Approach, is intended to support the integration of transportation and ecological planning. This project addresses the questions of how to (1) achieve interagency agreement on ecological solutions, (2) identify and leverage existing ways to increase advance mitigation credit predictability and assurances, (3) identify methods to ensure mitigation commitments are kept, and (4) make decisions hold over time and across jurisdictions. This project is built on the groundwork laid in the development of *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* (*Eco-Logical*), the U.S. Fish and Wildlife Service (USFWS) strategic habitat conservation approach, and other relevant ecosystem-based approaches (Brown 2006). The research approach and major findings are summarized in this volume, which is volume 1 of a three-volume series.

This project was conducted in close cooperation with another SHRP 2 C06 effort, Integration of Conservation, Highway Planning, and Environmental Permitting Through Development of an Outcome-Based Ecosystem-Scale Approach and Corresponding Credit System, which is summarized in *An Ecological Approach to Integrating Conservation and Highway Planning, Volume 2*. Together the two volumes address both the policy and technical aspects of implementing the *Eco-Logical* approach.

The primary product of these complementary efforts is the Integrated Ecological Framework (IEF). The IEF is a step-by-step process guiding the integration of transportation and ecological planning. Each step of the IEF is supported by a database

of case studies, data, methods, and tools. The IEF is available through Transportation for Communities—Advancing Projects through Partnerships (TCAPP) at www.transportationforcommunities.com and is supported by the *Practitioner's Guide to the Integrated Ecological Framework*.

It is not necessary to read Volume 1 completely to find useful information. Each chapter is briefly summarized below to guide readers.

- **Chapter 2: Research Approach—**An explanation of how the research was conducted and the major products that resulted.
- **Chapter 3: Incentives, Barriers, and Assurance Needs—**A description of the incentives for implementing an ecosystem approach to transportation decision making, the needs of transportation and resource agencies, and barriers. The incentives, needs, and barriers are summarized from input gathered through interviews and surveys of transportation agencies, resource agencies, and nongovernmental organizations (NGOs).
- **Chapter 4: Solutions—**This chapter includes two major sections. The first part is solutions identified through surveys and interviews that respond to the incentives, needs, and barriers reported in Chapter 3. The second part describes the IEF and the essential features of any ecosystem approach to transportation decision making.
- **Chapter 5: Inventory of Assurance Methods—**This chapter is an inventory and technical description of the methods available to provide assurances that collective, off-site, or advance mitigations are credited to transportation agencies. The inventory is organized by (1) assurance methods that satisfy the mitigation requirements of both the Clean Water Act (CWA) and Endangered Species Act (ESA), (2) assurance mechanisms used to address the CWA, and (3) mechanisms that address the ESA. A table with basic information for each method is provided at the beginning of the chapter, followed by more detailed explanations and examples.
- **Chapter 6: Using Assurance and Commitment Tracking Methods at an Ecosystem Scale—**Many of the assurance and commitment tracking methods described in Chapter 5 may be used at the ecosystem scale. Chapter 6 describes limits of and approaches for applying these methods at the ecosystem scale. The limits and approaches are discussed broadly, rather than focusing on the individual methods inventoried in Chapter 5.
- **Chapter 7: Gaps and Opportunities—**This chapter summarizes gaps identified between the ecological approach, real-world opportunities, and the available implementation methods. The gaps are related to policy, technical, and institutional factors. Transportation, resource agencies, and NGOs continue to make strides to close these gaps. Some of the ongoing work supported by TRB and the Federal Highway Administration (FHWA) to close these gaps, along with other opportunities, are summarized in the second half of the chapter.
- **Chapter 8: Conclusions—**Key points and take-away messages from the research are summarized in this closing chapter.

CHAPTER 2

Research Approach

Project work was divided into the following phases:

- *Phase 1:* Understand barriers to and opportunities for integrating transportation and ecological planning, and create a framework for integrating conservation planning, highway planning, and permitting.
- *Phase 2:* Identify implementation mechanisms to reduce uncertainties and help resolve the problem of assurances.
- *Phase 3:* Develop business cases for lead agencies and identify transition needs.
- *Phase 4:* Host an interagency invitational symposium.
- *Phase 5:* Submit a final report and guide.

The issues addressed by each phase, along with the purpose, approach, and primary products, are summarized in this chapter.

Phase 1

Purpose

The purposes of Phase 1 were to identify

- The agencies or stakeholder groups involved in or affected by the process of adopting ecosystem approaches;
- Existing agency initiatives compatible with ecosystem approaches and agency leaders of such initiatives;
- Levels of awareness and support for ecosystem approaches across agencies;
- Barriers to implementing ecosystem approaches; and
- Relationships of ecosystem approaches to agencies' interests.

Approach and Product

Data were collected through research, interviews, and surveys. An extensive list of potential contacts was developed for the following groups:

- *Resource/regulatory agencies:* U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries), U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), other federal resource agencies, and state resource agencies. Transportation liaisons at each of these agencies helped identify contacts, who tended to be frontline staff dealing with project permitting and consultation.
- *Transportation agencies and planning organizations:* FHWA, state transportation agencies and state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and regional planning councils.
- *Nongovernmental organizations:* Environmental Defense Fund, the Southern Environmental Law Center, The Conservation Fund, The Nature Conservancy, NatureServe, and others.

Literature review, early conversations with stakeholders, and consultation with the partner–project team were used to create an initial set of interview questions. Using information from initial interviews, more detailed interview questions and a set of survey questions were developed.

In an effort to streamline the interview and survey process and encourage high response rates, short surveys were created with questions tailored specifically to each stakeholder group identified. Although many questions differed between these separate surveys, there was a high degree of overlap to allow comparison of responses across agencies.

Each draft survey was vetted through representatives from the relevant stakeholder group, and an interagency team was assembled. This team functioned as a resource for this project and as liaisons to their respective agencies. For example, DOT and MPO representatives reviewed the DOT and MPO surveys, the USFWS representative reviewed the USFWS survey, and so forth. Their input was used to create a final set of survey questions. A small number of select expert practitioners participated in in-depth, multihour interviews, providing

detailed qualitative information about their experiences related to ecosystem approaches.

The majority of in-depth interviews and surveys were conducted between December 2008 and June 2009. Over this research period, the team reached more than 140 respondents across all stakeholder groups. Further discussions and interviews were held at the July 2009 summer TRB meeting. A summary of the outreach strategy used to reach each stakeholder group follows:

- *USFWS and NOAA Fisheries:* USFWS staff involved in Section 7 consultations for transportation were contacted, with assistance from the FHWA-USFWS transportation liaison.
- *USACE:* USACE staff were contacted with assistance from the FHWA-USACE transportation liaison. Contacts included all division program managers, regulatory chiefs in the districts, DOT-funded positions, and other USACE frontline staff who work on transportation issues.
- *EPA:* EPA contacts took place by phone and in person at the TRB summer meeting in West Virginia in July 2009. These interviews focused on implementation of a watershed approach in the Section 404 process, as well as general barriers, interests, incentives, and solutions.
- *FHWA:* FHWA headquarters staff assisted with distributing the survey to all FHWA division environmental contacts around the country. The project team also performed interviews with several FHWA staff in late 2008, again at TRB in 2009, and at various later times.
- *State DOTs:* In-depth interviews were conducted with DOTs active in the field of advance mitigation and programmatic approaches. To reach all DOT environmental directors and natural resource staff, the project team followed the survey guidance of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on the Environment and worked through environmental directors in each state, asking them to involve their resource specialists and managers. In addition, all DOT planning directors were sent an online survey tailored to their work.
- *MPOs:* The project team contacted MPOs likely to have experience in ecosystem approaches. The Association of Metropolitan Planning Organizations invited all MPOs to participate by taking an online survey.
- *NGOs:* The team contacted a diverse set of NGOs, including the Environmental Defense Fund, the Southern Environmental Law Center, The Conservation Fund, The Nature Conservancy, NatureServe, and others. The team conducted in-depth interviews with several of these groups. Others responded to a survey.

Input and perspectives from agencies, organizations, and sectors that were not the primary targets of this research were also assembled because they sometimes play a role in the process and have valuable input. These organizations included state resource agencies, the U.S. Forest Service, and local governments and regional resource agencies. Perspectives of agricultural and business interests are also considered and discussed, but these were not the primary targets of the outreach effort. Interviewees and survey respondents who sometimes volunteered information in these areas from their perspectives are the sources of data in these sections.

The results from the surveys and in-depth interviews are summarized in Chapter 3.

Phase 2

Purpose

Phase 2 addressed the uncertainty or risks associated with using an ecosystem approach to conservation in transportation decision making by attempting to answer the following questions:

- How can transportation agencies that invest in ecosystem-level analysis to minimize or mitigate impacts be assured that they will get credit for their actions from regulatory agencies and the public?
- If they approve ecosystem-level mitigation strategies, how can regulatory agencies be assured that promised actions will be taken and will satisfy regulations?
- To ensure cooperation at all levels, what incentives are there for local governments to enforce the land management decisions made by transportation, regulatory, and resource management agencies?

Various mechanisms are available to help provide these assurances and incentives. Phase 2 attempted to determine how each of these mechanisms provides assurances to both the agencies implementing avoidance, minimization, conservation, and mitigation actions, and the federal agencies reviewing and approving transportation improvements and associated actions.

Approach and Product

Available methods to address ecosystem-scale minimization and mitigation of impacts on the environment, and the assurances that these mechanisms can offer, were collected, reviewed, and assessed using several approaches:

- *Existing methods to provide mitigation credit assurances.* The first task was to analyze existing methods of providing assurance of credit for collective, off-site, or advance mitigation. Off-site mitigation is mitigation at a location not bordering the impact site; advance mitigation is established prior to project impacts; and collective mitigation addresses compensatory mitigation needs for multiple actions. An inventory of the methods that can provide assurances over time and space and a description of the essential features of each

were developed. Thoughts, ideas, and professional opinions on the relative merits, shortcomings, and adaptability of each tool or method were collected through discussions and correspondence with contacts from resource and transportation agencies. The USACE and EPA joint regulations on compensatory mitigation in the Section 404 program framed the discussion. This information was then compiled into an inventory of tools and methods in use, along with an overview describing the essential features and applicability of each tool.

- *Use of existing assurance methods at an ecosystem scale.* The common elements of success of existing methods for regulatory permitting or consultation processes at an ecosystem scale were identified, along with how these methods assure that ecosystem-scale approaches will be credited. Using the summary of tools and methods developed in the previous task, team experience, and information collected from participating liaisons, the components of each tool and method and their commonalities were assessed. The strengths, weaknesses, and limits of applying each tool at different ecosystem scales were determined, and the ways in which this application could be enhanced were considered. Finally, how each tool succeeds in assuring transportation and permitting agencies that appropriate impact assessment and mitigation has been developed was determined.

  Programmatic agreements for ESA Section 7 and CWA Section 404 compliance were assembled and reviewed, using past research conducted for state DOTs and AASHTO as a starting point. Programmatic agreements addressing natural and cultural resources that take ecosystem approaches broadly compatible with *An Ecological Approach to Integrating Conservation and Highway Planning* and the USFWS strategic habitat conservation initiative were identified. This review was performed by comparing the approach and content of each programmatic agreement and memorandum of understanding (MOU) with the guidelines and recommendations contained in the USFWS and FHWA *Department of Transportation Programmatic Consultation Guidance* (2000), ongoing changes and evolution to that guidance, and the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008). Information from practitioners regarding their experiences during the programmatic agreement/MOU process was collected in the course of extensive surveys and interviews, primarily conducted in the spring of 2009.
- *Gaps in implementation methods.* Gaps between the ecosystem approach and the available methods for gaining regulatory assurances were identified. Approaches to fill these gaps within the current regulatory environment were proposed, noting where both changes to regulations and nonregulatory tools would be helpful.

The following findings are summarized in Chapter 5 and Chapter 6:

- An inventory of existing methods available to provide assurances that collective, off-site, or advance mitigations are credited to a transportation agency;
- An examination of the use of these existing methods for providing assurances at an ecosystem scale, common elements for their success, and gaps that cannot be addressed by existing methods; and
- Identification of approaches to address the gaps.

Phases 3, 4, and 5

Purpose

Phase 3 was to develop methods to aid transition from the current way of doing business to the ecological way by addressing the development of a common vision, conflict resolution, training and cross training and by drawing on existing agency initiatives, guidance, and good examples. The purpose of Phases 3 and 4 was to develop and solicit review of resources for implementation. The purpose of Phase 5 was to summarize the project work in this final report.

Approach and Products

Phase 3, 4, and 5 products were based on the information gathered in Phases 1 and 2. In addition, practitioners at each agency or agency type were consulted and served as reviewers in a highly iterative production process.

The primary products of the final phases of this project were as follows:

- *Practitioner's Guide to the Integrated Ecological Framework,* which also addresses
  - How planning activities might be funded and how they relate to DOT and MPO programming cycles;
  - Outcomes and products developed at each stage, as well as needed inputs;
  - Benefits of the approach, especially when it goes beyond mitigation required by law;
  - Potential cost savings compared with current approaches;
  - How the various parties can be assured that their concerns will be addressed; and
  - Development of the necessary background data to implement landscape-level, ecosystem- or watershed-based approaches using programmatic agreements, conservation banking, mitigation banking, or a credits system.

- *Programmatic approaches to CWA 404 permitting and ESA Section 7 consultation.* Programmatic templates were provided for a watershed approach to planning and permitting under CWA Section 404 (wetland avoidance, minimization, and compensatory mitigation) and also for programmatic consultation under Section 7 of the ESA.
- *Outreach and review (through e-mail and meetings), including webinars and an interagency invitational symposium.* The project culminated with an interagency invitational symposium in Boulder, Colorado, on September 14–15, 2010, with more than 50 attendees. The purpose of the symposium was to present findings and results, share information from compatible initiatives in a number of agencies, and solicit input on future directions and needs.
- This final project report, in which key findings across all phases are summarized.

CHAPTER 3

Incentives, Barriers, and Assurance Needs

The first step in implementing an ecosystem approach to transportation decision making is to understand the incentives for doing so, the needs of transportation and resource agencies, and barriers to implementation. These topics are discussed in this chapter, and potential solutions are identified in Chapter 4.

For the purposes of this report, the two main types of stakeholders in an ecosystem approach to transportation decision making are transportation agencies (FHWA, MPOs, and DOTs) and resource agencies (USACE, EPA, USFWS, NOAA Fisheries, and state regulatory and natural resource management agencies), along with NGOs and conservation organizations.

Incentives

Incentive-based approaches are much more likely to succeed when they respond to the multifaceted interests and needs of each of the individuals and parties involved. Ecosystem approaches are easier to design, agree on, and implement when trust and interagency experience exist and when participants are able or inclined to think creatively about possibilities and solutions. The interests that support implementation of an ecosystem approach for each type of stakeholder were collected through surveys and interviews. Respondents shared specific incentives to drive the implementation of an ecosystem approach. The identified incentives fell into three main categories: efficient decision making, fiscal benefits, and improved outcomes for the natural environment. These incentives are summarized as follows.

Efficient Decision Making and Fiscal Benefits

Respondents noted the following efficiency- and financial performance–related incentives:

- Achieving mitigation and conservation that are less expensive to maintain and for which achievement of ecological objectives is more likely;
- Making decisions early using widely available or derived/modeled data layers;
- Data-driven decision making and accountability;
- Predictability for project-level environmental permitting and reducing the risk of delay in delivering transportation projects;
- Increasing opportunities for agencies to attract and keep motivated and high-performing employees;
- Reducing costs of implementing transportation projects;
- Improving relationships between transportation and resource agencies;
- Increasing opportunities for agencies to "make a difference" by leveraging their contributions with those of other agencies and organizations;
- Better targeting of field studies; and
- Creating a platform for more innovation through mutual success.

Efficient Decision Making

More efficient decision making was the incentive most frequently mentioned by respondents. With ecosystem approaches, agencies put in more work and make decisions or commitments during planning, which reduces paperwork and analysis late in the project development process. Agencies were looking for increased certainty that time savings and efficiencies would indeed occur in project development in exchange for the upfront investment in planning.

Efficiently addressing multiple resource needs from multiple mandates was an incentive primarily for state transportation, regional, and local agencies.

Certainty in project scope, scale, schedule, and environmental requirements is a big factor and incentive for transportation development. State DOTs also saw the potential to make a meaningful contribution to agency restoration and conservation priorities. From the perspective of state transportation agencies, increased predictability in the ESA Section 7 processes

is a primary incentive to develop or participate in conservation banks. The value of this incentive has translated to DOT willingness to pay for substantial enhancements to ecosystem conservation. Again, this activity is more feasible if it occurs before budgets are set.

Programmatic (earlier, broader scale, multiproject) approaches typically offer much greater predictability for DOT project timelines by addressing resource needs and resource agency interests at the earliest and most flexible stages.

Considering environmental needs and opportunities early in the planning process can enable participating agencies to reach agreement on how certain issues will be handled and what trade-offs may satisfy the interests and regulatory requirements of all participating agencies, while meeting the conservation or enhancement objectives of local governments. Identifying these needs early in the process assists DOTs and partners in coming to more creative and cost-effective solutions that also deliver more for the environment and the communities. By making collaborative decisions earlier in the review process, the length of time needed for interagency negotiations later in the review process can be significantly reduced. Because construction is usually the largest project cost, construction delays as a result of a lengthy review process can significantly inflate project costs; conversely, early negotiations that streamline later approvals can yield savings.

Some MPOs noted that the public has consistently said that the environment is an important planning consideration. In this context, an ecosystem approach helps agencies do their jobs better and helps ensure a more comprehensive and acceptable or defendable product. Crises also serve as powerful incentives. Development of a different, more efficient decision-making process sometimes became imperative when a crisis was at hand: a large number of bridge safety needs had to be addressed, the number of permits could not be issued in the time frame needed, or agencies had otherwise reached an impasse. All agencies may require a breakthrough in the efficiency and effectiveness with which they address regulatory issues and conduct the regulatory process when the need is urgent.

Ecosystem approaches also help achieve larger agency goals outlined in agency mission statements or environmental laws. Often, such larger goals and objectives, which cut across program areas, can get lost in program-specific efforts or the drive to accomplish a certain number of permits, reviews, or inspections in a certain time. Agency staff can experience the satisfaction of making tangible progress toward these important objectives, coupled with the increased opportunity to make a difference by leveraging their contributions with those of others.

Improved environmental decision making at the planning level can help implement effective conservation at the local government level. Ecosystem-based approaches require the collation of environmental data and development of priorities that local governments can then use. The IEF offers an explicit process for doing this. Local officials benefit from valuable planning data and information when watershed, ecoregional, or statewide conservation or green infrastructure planning is done in their area if such information is shared with them. They also get the benefit of resources for environmental restoration and possibly permits for projects through joint mitigation efforts. (Green infrastructure refers to an EPA-supported approach by which communities can maintain healthy waters, provide multiple environmental benefits, and support sustainable communities. Green infrastructure uses vegetation and soil to manage rainwater where it falls. More information is available at http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm#tabs-1.)

Fiscal Benefits

Respondents expected that an ecosystem approach will create efficiencies that in turn will generate fiscal benefits related to rising land costs and diminishing availability of high-quality conservation areas. If agency and NGO conservation and restoration priorities are available in planning, local agencies can respond early to opportunities to acquire land and/or conduct habitat improvements. MPOs noted that both regional and local governments have frequently lacked the staff or financial resources to do this early work on their own. Thus, this is an important area in which an investment by transportation and higher levels of government could make a big difference, and where the data investment could be used multiple times, on multiple scales. Insufficient agency resources can be an incentive to partner with others to accomplish the needed conservation, restoration, and recovery work. Representatives from most agency groups indicated that, although upfront costs are a barrier, they saw eventual cost savings for mitigation conducted in this fashion, which could be directed to more and better mitigation with overall savings. The newly authorized landscape conservation cooperatives operate on this principle and focus on data and research gaps. More broadly, partnerships leverage multiple funding sources for resource protection, restoration, and enhancement. Together, DOTs, land trusts, and other NGOs and resource agencies can design landscape-scale projects that are implemented with multiple sources of funding and a combination of private and public management and ownership.

A back-of-the-envelope analysis of potential cost savings conducted for this project showed that relatively modest investments could produce huge savings, state by state, county by county, municipality by municipality, and project by project. However, it can be difficult to document or extrapolate

environmental cost savings. For many DOTs, two related major obstacles are lack of data on the environment and the expense of collecting the needed environmental data. The long-term nature of environmental programs means that data needed to illustrate effectiveness for annual performance goals and measures are often not available. As noted in *Managing for Results: EPA Faces Challenges in Developing Results-Oriented Performance Goals and Measures,* the limited availability of data on environmental conditions is a major challenge in establishing a relationship between a program's activities and resulting changes in the environment (U.S. Government Accounting Office 2000). The Heinz Center for Science, Economics & Environment (closed in 2013) had been working on a partnership to develop a common set of indicators among federal agencies and gear data to speak to common environmental indicators (Stokstad 2008). In 2008, the Center issued a comprehensive update on the health of U.S. ecosystems, along with a plea for the U.S. government to coordinate and fund future assessments (Stokstad 2008).

The Oregon DOT, in collaboration with the Oregon Bridge Delivery Partners, analyzed the cost–benefit differences between a traditional project permitting approach and the programmatic permitting process used in the Oregon Transportation Improvement Act (OTIA) III State Bridge Delivery Program. Overall, programmatic permitting created delivery efficiencies and economies of scale in the delivery of 365 bridges within the program. The primary benefits measured were reduced costs in four areas: (1) obtaining permits, (2) completing reviews under the National Environmental Policy Act of 1969 (NEPA), (3) providing wetland and habitat mitigation, and (4) completing bridge designs (Oregon Department of Transportation 2008). In Oregon's case, environmental benefits were not calculated and would be additional. The Oregon DOT analysis showed that the mean return on investment for the programmatic permitting process was $3.19 for every $1 expended versus $0.75 for every $1 expended in a traditional permitting approach (Oregon Department of Transportation 2008).

A true cost–benefit analysis that quantifies all the major benefits of ecosystem-based approaches and generates a net equation of all the factors is not feasible. For one, different parties value the intangible benefits in different ways and to different extents. Florida DOT and nearly 30 cooperating agencies created a vision of a more efficient and environmentally meaningful and effective consultation process when they crafted their efficient transportation decision-making framework. In interviews, one federal resource agency representative said that federal and state agencies in Florida thought they achieved a 100% improvement in quality of environmental analysis and consultation with 50% less effort. The extent to which such intangible benefits are valued, however, depends on the individuals involved.

Improved Outcomes for the Natural Environment

Responding agencies saw several specific benefits to the natural environment with ecosystem-based approaches:

- Satisfying the highest watershed needs and obtaining water quality and habitat function rather than just getting wetland acreage;
- Acquiring mitigation and/or conservation lands prior to impacts;
- Effectively conserving larger-scale ecosystems, which have less long-term risk of various alterations and secondary impacts from adjacent land use activities; and
- Mitigating lost resources beyond what is achievable with isolated project-by-project reviews.

Ecosystem-based approaches also offer the following conservation incentives:

- Helping recover currently listed species (by supporting identification of biological processes critical to achieving self-sustaining populations) and preventing new species from being listed;
- Balancing actions protecting suites of species and considering landscape context;
- Improving agencies' ability to respond to climate change;
- Supporting state efforts to efficiently address resource needs in multiple areas from multiple mandates; and
- Focusing on ecosystem priorities, including mitigation and conservation with higher rates of long-term success.

"Conservation banking" typically establishes larger reserves and enhances habitat connectivity. From the NOAA Fisheries or USFWS perspective, banking reduces the piecemeal approach to conservation efforts that can result from individual projects. Directing smaller individual mitigation actions into a bank streamlines compliance for the individual permit applicants or project proponents while providing an improved benefit to the target resources. By involving an array of diverse organizations with interests in protecting recreation areas; game species; threatened, endangered, and other nongame species; as well as associated habitats, conservation banking can bring together financial resources, planning, and scientific expertise not practicable for smaller conservation actions. Collaborative efforts allow agencies to take advantage of economies of scale (both financial and biological), funding sources, and management, scientific, and planning resources that are not typically available at the individual project level. Off-site conservation may offer the possibility for greater environmental benefit. Many DOTs welcome the opportunity to partner with others and contribute to large-scale conservation that may substantially enhance ecosystem conservation or species recovery.

Barriers

Despite the benefits, there are barriers to implementing ecosystem approaches. Key issues and categories of barriers identified through interviews are described, starting with those most frequently mentioned:

- *Lack of resources, especially time and staff, and to a lesser extent, training and the need for champions.* Insufficient resources such as funding, information and communication systems, staff shortages or staff turnover, and inadequate analysis tools can hinder agencies' and staffers' abilities to get to the unconventional, more creative, or larger-scale data-intensive analysis. Lack of funding or high upfront costs of mitigation planning and environmental investments and the competition for funding with transportation are also resource barriers.
- *Lack of data, information, and tools necessary to implement ecosystem-based approaches.* The greatest number of respondents said the key barrier was the lack of data and agreement around the most important resources, sensitive areas, or conservation opportunities; or lack of information on priorities. Other frequent responses included lack of plans that are geospatially mapped and lack of long-range, comprehensive, or coordinated information.
- *Challenges associated with change.* Many comments were related to the broader challenge associated with change, including fear of doing something a different way. For example, some respondents felt that by adhering to established methods, they reduce the risk that their decision could be challenged or their agency sued. Other factors include lack of regulatory requirements or incentives to change and a tendency to prioritize using limited resources to accomplish what is required by law. Specific comments related to change-related challenges include the following:
  - There is a lack of jurisdiction to require and enforce conditions for nonregulated issues.
  - Agreeing to any type of mitigation when the impacts are not well defined can be difficult. Because better definition of impacts typically occurs later in project development, examination is often delayed.
  - There is no requirement to analyze the environmental impacts of long-range plans. State DOTs may complete corridor plans if they choose, but they are not subject to NEPA requirements, and FHWA may not be involved.
  - Changes and direction made at high levels or with management support are not always implemented in the field.
  - The need to cut costs makes it difficult to implement conservation practices.
- *Ecosystem-based approaches are challenging to implement or there is a lack of understanding of how to implement these approaches.* Impact analysis is not usually done at scales greater than the corridor. Uncertainty about how to assign credits was mentioned frequently. Ecosystem-based approaches can also be difficult to implement for newer staff and for those unfamiliar with the processes and interests of other parties involved, how to build a common vision with them, and how to incentivize agreement or movement to a common approach. Staff may not be aware of what decisions can be made at an earlier stage, on broader data sets, and how such early decisions can be effectively accomplished. They may not be aware of higher-level support for ecosystem approaches, or they may be unclear on their immediate supervisor's position and how to motivate change that would enable the whole group to achieve an optimum solution.
- *Issues around coordination, communication, and collaboration and differences in missions or scope of missions among the agencies.* Practitioners noted the difficulty of including all the stakeholders in a geographic area working toward a concerted effort. Others noted that some agencies are hesitant to share sensitive data, making it difficult to plan. Several DOTs mentioned issues associated with the idea that mitigation done by private for-profit bankers targets their profit objectives more than environmental objectives.
- *Restrictions or assumed restrictions in regulations and guidance.* State regulations were mentioned as sometimes being a barrier. Some respondents had a perception that the sequencing requirements in CWA Section 404(b)(1) guidelines restrict USACE from approving mitigation before permitting a project. This perception could stem from an interpretation of the regulations that require that applicants first avoid and then minimize impacts before the evaluation of their mitigation proposal by USACE. USACE cannot provide firm assurance that advanced mitigation work could be used to offset impacts from a future project.
- *Restrictions in the planning and decision-making process at the various agencies involved.* Respondents mentioned the following issues:
  - Breaking down DOT processes and regulatory processes to see where they can better align is difficult.
  - There are severe consequences for not meeting scope, schedule, and budget constraints, because these all drive project delivery.
  - There is a lack of consistency in how planning is conducted (e.g., between districts in conducting corridor planning in general and in the corridor planning–NEPA integration process).
  - Regional planning organization and MPO goals are often based on providing after-the-fact remedies to traffic problems that are initially caused by local zoning issues and decisions.
  - Recovery and conservation objectives often fall last among priorities and policy objectives identified in planning and decision making. They typically come after supporting development and improving transportation

function (or with resource agencies, benefit to a certain or listed species).
- *Lack of assurances* that mitigation can be paid for today and count for impacts of future projects.
- *Documentation* is an issue for all agencies, but DOTs especially. All early, upfront consultation must be documented and linked to a regulatory process.

Assurance Needs

Many of the barriers identified in the previous section are related to the need for assurance. Both transportation and resource agencies would benefit from closer coordination earlier in the transportation decision-making process. For early coordination to be viable, transportation and resource agencies need assurance that what they agree to early in the decision-making process, potentially at the planning level, will occur and count later, in project development and permitting. These needs are explored further.

Assurances Resource Agencies Can Provide for Transportation Agencies

To partner on and implement ecosystem approaches, transportation agencies need a variety of assurances that resource or regulatory agencies can provide.

Mitigation Counts

Investments by DOTs in advance mitigation or conservation are based on agreements, programs, and actions that require long-term commitments and significant investments of time and financial resources. Before committing to these investments, the transportation agencies must have a level of assurance from the regulatory agencies that their investments will be recognized and that they will receive credit when the permit or consultation is finalized. This does not mean, however, that upfront mitigation guarantees that a future project will be permitted. Transportation funds are constrained to transportation purposes, and federal funding for transportation mitigation must be spent for and count for that purpose.

Regulatory Compliance Achieved

DOTs invest in early environmental planning, consultation, and mitigation to assure that issues on the critical path to project completion have been resolved. This assurance is accomplished to the degree that CWA Section 404 reviews and ESA Section 7 consultation processes are complete or key issues are decided. In the past, resource agencies have relied on engineering detail, site surveys, and relatively late decision making. This practice has been due in part to having relatively less environmental information available in planning and more engineering details and survey data available in project development. Opportunities for earlier decision making and achieving the consequent environmental benefits could expand with more data and decision making in planning.

Goals, commitments, and any decisions that are made or can be made in the regulatory process should be documented to minimize the potential for revisiting or reopening decisions or agreements. The IEF identifies how and when some of these early discussions and decisions can occur and subsequently feed into the CWA Section 404 reviews and ESA Section 7 consultation processes.

Reopening Clauses Minimized

Reopening clauses are the language in the agreement that describes the conditions under which a decision would be reopened or revisited. The more circumstances under which a decision would be reopened or reconsidered, the less predictability for the DOT, and the less incentive for it to make ecosystem investments up front.

The ability to minimize reopening clauses is highly dependent on several variables. First, the DOT must be prepared to offer project details, especially mile marker beginning and end points, and basic information on the type of project envisioned. Early project review will not be possible without this minimum set of information.

Reopening may also occur if the project changes beyond the scope described in the initial consultation. Naturally, broader descriptions are more encompassing and less vulnerable to reopening.

Reopening can also occur when the environment or situation for the resource changes substantially from that originally described. Land use change from outside sources; climate change; and threats to species, ecosystems, and water resources from drought, temperature rise, and attendant changes are some of the greatest threats of environmental change that can lead to reopening programmatic decisions. Effective action to avoid and minimize contributions to climate change and overestimating needed mitigation to offer a compensation buffer are the most effective strategies to minimize this risk.

Assurances Transportation Agencies Can Provide for Resource Agencies

Resource agencies have needs that must be addressed to ensure regulatory processes are satisfied.

Avoidance and Minimization

Regulatory agencies must be assured that the requirements of the regulations they carry out are being met. The two main

environmental regulations that affect the transportation decision-making process are the CWA and the ESA. The assurance needs related to these two acts are described.

Requirements of the Clean Water Act

Regulations require that transportation actions avoid and then minimize impacts to Waters of the United States. Typically, the project development and permitting processes provide these assurances. Projects that require filling or excavating wetlands, streams, and other Waters of the United States require permits under Section 404 and state certification under Section 401 of the CWA. Regulatory authority for the Section 404 program lies with USACE, with EPA having ultimate authority over jurisdiction, exemptions, and specification of disposal sites. Table 3.1 describes these agencies' respective responsibilities.

In general, USACE cannot issue a permit if a practicable alternative exists that is less damaging to aquatic resources or if the project results in significant degradation to Waters of the United States. Permit reviews follow guidelines established in CWA Section 404 (b)(1), which specify that applicants must

- Avoid impacts on Waters of the United States to the extent possible.
- Minimize those impacts that could not be avoided.
- Provide compensatory mitigation for unavoidable impacts.

Assurances that minimize damage to wetlands and other aquatic resources are provided through the alternatives analysis process, in particular the 404(b)(1) guidelines. USACE and EPA view projects in two broad categories: water dependent (docks, piers, water intakes) and nonwater dependent.

Table 3.1. Regulatory Agency Authority Under Section 404 of the Clean Water Act

USACE Section 404 Responsibility	EPA Section 404 Responsibility
Implements the program day to day.	
Performs jurisdictional determinations.	Has ultimate authority over jurisdiction, exemptions, and specification of disposal sites through Section 404(b)(1) guidelines.
Reviews and issues general and individual permits.	
Develops policy and guidance.	Reviews and comments on individual permit applications.
Enforces most Section 404 actions.	Enforces cases referred to EPA.

USACE and EPA assume that alternatives that do not involve filling or excavating Waters of the United States always exist for nonwater-dependent projects, such as highway projects. It is up to the applicant to rebut this presumption, a higher "bar," through material provided in the permit application, or as with most DOTs, during project development.

Requirements of the Endangered Species Act

By law, USFWS and NOAA Fisheries, referred to as the Services, cannot allow actions that will jeopardize the existence of a species listed under the ESA. Before they can allow a proposed action to proceed, the Services need assurances that the action will not result in this determination. The Services gain a level of assurance during the ESA Section 7 process, including their review of the transportation agency's biological assessment (BA) for the proposed action.

Once the Services are confident that the proposed action is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat, they issue a final biological opinion (BO) with a concurrence letter and, if required, an incidental take permit for the proposed action. The final approved BO with concurrence letter conveys the Services' opinion that the proposed project meets the requirements of the ESA.

Implementation of Mitigation or Conservation Investment

Resource agencies need assurances that the agreed-on conservation investment and advance mitigation will be implemented and successful in achieving the proposed function. Advance mitigation is the most easily verified and assured option insofar as purchase and legal protections occur in advance of any impact. Although longer-term enhancement strategies are more complicated to document, DOTs and resource agencies often work out feasible annual monitoring arrangements. Failure to implement conservation investments could result in fines.

Performance of Design Commitments

Resource agencies need assurances that transportation projects will be designed as agreed. Design requirements are typically incorporated in DOT design plans. Construction and maintenance requirements are incorporated into the best management practices (BMPs) the agency applies to the project. DOTs use various lists and tracking mechanisms to ensure that environmental commitments are fulfilled.

DOTs have significant incentives to ensure that commitments are carried through project design and construction.

The processes by which DOTs ensure they fulfill their environmental commitments are extremely important, as breakdowns in these processes can produce notable negative results. When transportation agencies fail to implement environmental commitments they face increased regulatory burdens, project delays, and loss of regulatory and resource agency and public trust, which affect the agency's ability to deliver the transportation program or individual projects in a cost-effective and timely manner. It may take years for agencies to recover from an instance of lost trust.

Asset Maintenance

Resource agencies need an assurance that some entity will maintain the asset or real estate right for its intended mitigation purpose. This responsibility takes planning and can require substantial capital outlay. DOTs typically partner with departments of natural resources (DNRs) or NGOs as long-term managers to align agencies' missions, interests, and skills with the needs at hand and to further public objectives. Private for-profit mitigation bankers often want to turn a project over to an agency (e.g., a municipality or DNR) after credits have been released. The custodial party's willingness to assume responsibility for land management depends on whether the mitigation strategy and investment will contribute to the organization's plans and objectives (e.g., watershed plans, ecoregional conservation priorities, or state wildlife action plans). Mitigation done wherever it might generate the highest return, where it is convenient, or where the land is already owned may not address larger ecosystem objectives. The challenges involved in long-term maintenance are discussed later in this report.

Ongoing Management

Once an entity assumes ownership, they must keep managing the asset as part of their ongoing work or provide assurances that others will carry out this responsibility. If the DOT is maintaining the asset, then ideally it is incorporated into an asset management or maintenance management system; however, there are different opinions on this.

Progress Toward Ecoregional Conservation Objectives

Progress toward environmental objectives is of interest to all parties. DOT environmental professionals have a strong interest in seeing public dollars well spent and being able to show that environmental funds are not just focused on reports or mitigation investments that fall far short of what could have been accomplished for the resources in question. Although process requirements may be a top objective, resource agencies have core conservation missions and objectives. Resource agencies seek assurances that the conservation investment and/or advance mitigation by transportation agencies will serve as intended and that net gains are produced for the protected resource at larger scales. All parties have an interest in avoiding future listings of threatened and endangered species.

With the new mitigation rule, mitigation bankers have increased incentive to consider watershed needs in bank siting (U.S. Army Corps of Engineers 2008). Environmental NGOs use progress toward conservation objectives to gauge their own success. Thus, there are great potential incentives for the multiple parties involved in determining where advance mitigation will be located.

CHAPTER 4

Solutions

This chapter summarizes the solutions responding to the incentives of and barriers to an ecosystem approach that were identified through surveys and interviews. These solutions are followed by the essential features of any ecosystem approach and a description of the IEF. Methods to provide assurance are addressed separately in Chapter 5.

Solutions Identified Through Surveys and Interviews

Identify Priority Conservation Areas and Make Data Available

Respondents noted that regional and nationwide geospatial data would assist in addressing many cross-scale questions and produce wide-ranging benefits. Geospatial data can assist transportation specialists in understanding the ecological implications of an individual transportation project. They can also be used by planners to understand the broader, cumulative impacts of a larger regional or statewide transportation system on the natural and human environment. An increased understanding of ecological relationships and the implications of those ecological relationships can support transportation designs that will minimize impacts on the environment and reduce mitigation costs and project delivery delays. Because individual environmental elements are influenced by regional or even global ecological processes, data that provide a larger regional or national context may make it easier to understand how different transportation projects or systems can affect those ecological relationships and pathways that may intersect the project planning area.

Respondents recommended the identification of priority conservation areas (uplands, wetlands, vegetation communities), species ranges, and wildlife connectivity by using advanced geographic information system (GIS) and ground truthing. One idea was the creation of an accessible, easy-to-use database showing listed species' ranges, a bibliography of studies done on listed species, and suggested methods to avoid or minimize impacts based on project type. It is also important to make these data available to decision makers early in the process. Interviewees pointed out that if resource agencies share the data they use to make decisions, transportation agencies and local governments will come up with better, more appropriate plans and projects from the start.

Other solutions mentioned in this category included the following:

- Identify areas of overlap between state wildlife action plan conservation priorities and areas that support or may be capable of supporting federally listed species.
- Provide greater specificity as to location of priority resources (habitats, wetlands) and provide information on restoration.
- Define ecoregion priorities that have buy-in from regulatory agencies.
- Use Natural Heritage Program (NHP) and mapped state wildlife action plan data.
- Conduct GIS environmental analysis of the long-range transportation plan, MPO plan, or state transportation improvement program.

Modify the Current Planning Approach

Agencies frequently mentioned solutions that focus on where investments will generate the most environmental benefit. Numerous agencies and individuals spoke of the need for planning-level analysis, linkage to later environmental processes, and programmatic approaches in general.

Improve Coordination Between and Within Agencies

Respondents mentioned a need for a variety of annual, quarterly, and monthly meetings between transportation and resource agencies. Several agencies spoke of the need to take

time to educate each other on their needs and processes. Agencies also emphasized the importance of trust between agencies.

Multiple agencies recommended consultation with agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation during development of long-range transportation plans and leveraging the interrelationships between improving energy efficiency, reducing greenhouse gases, increasing accessibility, and addressing natural resource priorities. Major concurrent work by other infrastructure sectors could drive these partnerships. It was also noted that formal frameworks for these relationships would be helpful.

Several respondents spoke about needed or helpful changes in internal coordination and support. For example, Caltrans created a structured process of briefing agency heads first so they could speak in an informed fashion at their conservation and infrastructure workshop and provide initial leadership to their own staffs, with midlevel managers meeting later to expand and articulate plans and goals. Likewise, in North Carolina, Florida, and Colorado, agency leaders or high-ranking officials provided key leadership by signing off on the programmatic, ecosystem-based approach before other levels worked out the details. Empowering or incentivizing staff to come to solutions at the field level is another key to success. For example, resource agency representatives participate in environmental technical assistance teams in each Florida DOT region and have the authority and responsibility to evaluate projects and coordinate internally, fully representing their agencies' positions. Florida DOT assisted by providing funding. Having a clear elevation process so troublesome issues can be passed up the chain of command and frontline staff can maintain forward momentum on everything else was also recommended. Modification of current roles and responsibilities was seen as a solution. One DOT noted the helpfulness and importance of speaking with frontline staff members about how their jobs and responsibilities would change under the new approach. Oregon's follow-up study on the Oregon Bridges streamlining program noted that internal support was somewhat deficient and that more outreach, such as "sound bites" that succinctly capture program benefits, could have mitigated that problem.

Improve Integration of Transportation and Land Use Planning

Integrated planning, specifically integrated transportation and land use planning, was mentioned frequently as a solution. Land use planning was mentioned as the key to managing growth—that is, without strong land use planning, transportation projects serve the demand that has already exceeded the capacity of the transportation system. Land use plans and growth models also provide a good foundation for identifying potential cumulative impacts on ecological features and possible mitigation opportunities. Land use planning can also be incorporated into the strategies for natural resource protection.

Provide Resources to Execute an Ecosystem Approach

Providing needed time, staff, funds, and training resources to execute the *Eco-Logical* approach (Brown 2006) was a common suggestion, especially among DOTs, MPOs, and FHWA. The need for additional, dedicated funding and the ability to use that funding for upfront costs were mentioned most. MPOs particularly mentioned the need for funding to do integrated planning. Additional staff or environmental staff were mentioned by seven respondents. Four DOTs wanted additional liaisons in resource agencies. A few DOTs indicated the need to use the expertise of NGOs, including training on the data and tools they provide. Notably, only one federal resource agency respondent mentioned additional staff time, training, or dedicated funding as a solution, although the need for a solution in this area is implied by the barriers mentioned.

Demonstrate Benefits and Examples, Report Results, and Develop Formal Agreements

State DOTs and FHWA saw a great need to demonstrate ecological and project-related benefits and/or provide examples of ecosystem-based approaches. To a lesser extent, NGOs and MPOs also suggested this solution. Resource agencies did not mention this as a solution, probably because many agencies are already aware of the benefits of ecosystem-based approaches. Most frequently mentioned in this category was the need for examples of success, preferably demonstration projects in individual states. Several states mentioned the need for examples of the benefits of these approaches in terms of reduced time for project approval, cost savings, and better ecological results. Three DOT and FHWA respondents saw the need for a good business case to demonstrate how and why early investments in mitigation will pay off in the long run. Twenty-one respondents suggested developing formal agreements to support ecosystem-based approaches. Of these, the highest number advocated creating a specific legal document (a memorandum of agreement [MOA]) between agencies to provide assurances that advance mitigation will count. Assurance methods are addressed further in Chapter 5.

Recording and reporting results and/or evaluating performance were mentioned as a solution by 10 DOT respondents, as well as multiple FHWA, MPO, and local government respondents. MPOs and local governments mentioned requirements for consultants to provide semiannual updates of environmental impacts, a long-range transportation plan policy framework

that includes performance measures related to the environment, and a project measuring how the region is attaining the goals of the long-range plan.

Essential Features of an Ecosystem Approach and the IEF

The barriers, incentives, and solutions identified through surveys and interviews conducted for this effort and supported by background research indicate that any ecosystem approach has certain essential features. These essential features are presented in the first part of this section, followed by a description of the IEF.

Essential Features of an Ecosystem Approach

Adheres to Federal Legislation

Ecosystem-based mitigation is an approach to long-term conservation similar to those approaches already encouraged in laws and regulations. The last two federal transportation acts have included provisions that explicitly encourage the use of mitigation banks as a way to compensate for impacts on aquatic resources associated with federal aid highway projects.

Happens from Outgrowth of Integrated Planning

In an ecosystem-based mitigation system, the process of integrating transportation and ecological planning will produce a hierarchy of important resources in a region and their locations. A multiagency steering group can guide the development of a regional mitigation plan and establish a system of accountability and how it will be measured. Logically, decisions to provide mitigation in the most ecologically important locations should lead to an environmentally preferable result if the mitigation occurs and is successful. Accordingly, the service areas for multiresource banks may differ from those of wetland mitigation banks and species and habitat conservation banks. Depending on the nature of the ecosystem mitigation proposal, the range of impacts for which it provides mitigation may be larger or smaller than the service areas of mitigation and conservation banks in the same region, and the impacts may be defined with reference to ecological areas and resources identified during integrated planning. Ultimately, the service area of an ecosystem bank will need approval from CWA and ESA regulators if it is used to offset impacts authorized under these statutes.

Uses Maps of Conservation Priority Areas

Many states have developed geospatially mapped conservation priority areas as part of their state wildlife action planning efforts. In states where these are not available, The Nature Conservancy maintains ecoregional conservation plans with identified conservation priorities based on factors determined by the state natural heritage programs, university researchers, and state and federal resource agency staff.

Focuses on Ecosystem-Level Priorities

Information is often available on the historic range of species and habitats relative to what is left today. Ecosystem-level ecological priorities determined as a "desired future condition" may include the protection of specific species, community types, or landscape functions such as habitat connectivity, productivity, or yield. The Wildlife Society's *Performance Measures for Ecosystem Management and Ecological Sustainability* provides a starting point for evaluating specific structures, functions, and processes that can be used to assess ecosystem health and overall condition (Haufler et al. 2002).

Addresses Vanishing Opportunities

Both DOT and resource agency environmental professionals have been faced with opportunities for which timely action could yield outstanding ecological benefits and delay could lead to a potentially permanent loss of the opportunity. These circumstances are becoming increasingly common. Ecosystem-based mitigation is well oriented to take advantage of these vanishing opportunities before they are lost. The interagency *Eco-Logical* guidance (Brown 2006) takes seriously the threats to existing high-quality conservation lands and recognizes that joint conservation action is often the only way to prevent destruction or degradation of such lands.

Considers Net Benefits

Quantification of resource values could facilitate equitable or improved comparison between proposed ecological restoration activities and the impacts on those values by a proposed project. In addition to serving as an important proponent in developing and using conservation banks, USFWS set a precedent for evaluating net benefits in a 2003 guidance memorandum for ESA Section 7 consultations with the U.S. Forest Service regarding hazardous fuel treatment projects. The memorandum advocates adoption of a long-term view when consulting on projects under Section 7 and acknowledgement that some projects may have short-term adverse effects on some listed species. At the same time, the memorandum states

> Projects with expected net benefits that outweigh short-term adverse effects should be expedited in the interest of the conservation or restoration of native ecosystems and the species that inhabit them. The jeopardy analysis for the Section 7

> consultation should take into account whether the short-term adverse impacts to the individuals are outweighed by the long-term conservation benefits to the species as a whole. (U.S. Fish and Wildlife Service 2002)

FHWA, the Oregon DOT, and USFWS describe this net benefits approach in their comprehensive mitigation and conservation strategy (CMCS). The CMCS integrates wetlands mitigation with habitat conservation and allows impacts to be evaluated at the ecosystem level, with a single accounting system for assigning mitigation credit and debit across all agencies. It establishes a program-level mitigation and conservation approach along with specific conservation and mitigation banks that serve regional ecological priorities:

> Habitat management areas and actions will be designed to achieve a meaningful net conservation benefit. Actions should be designed and the overall CMCS program should be implemented so that on-ground benefits to species/resources at the program scale provide greater ecological benefit than typical on-site mitigation efforts. This additional value will come from focusing not only on compensatory mitigation, but also by providing additional benefits in support of species recovery and conservation goals. (Oregon Department of Transportation et al. 2005)

Uses Multiresource Habitat-Based Approaches

Instead of looking at wetland mitigation and species mitigation as separate activities, ecosystem-based mitigation agreements look at these and other resource functions of the ecosystem holistically and look for synergistic opportunities, thus adding value to these systems. By encompassing wetland and upland habitat into a complete mosaic, strategically located within a landscape and/or watershed, ecosystem-based mitigation enables the protection of ecological functions, values, and processes that are believed to be most important for the regional ecosystem. Habitats and vegetation communities are linking mechanisms. Case law establishes well that the ESA is concerned with two variables in the context of species preservation: the number of species and the amount of species habitat.

Under 16 U.S.C. Sec. 1536(a)(2), the test for whether a habitat proxy is permissible is whether it "reasonably ensures" that the proxy results mirror reality (*Gifford Pinchot Task Force v. United States Fish and Wildlife Service,* 378 F.3d 1059 [9th Cir. 2004]). In the latter, the judge noted that "as 16 U.S.C. §1531 et seq., does not prescribe how the jeopardy prong is to be determined, nor how species populations are to be estimated, it is a permissible interpretation of the statute to rest the jeopardy analysis on a habitat proxy." Likewise, USFWS has argued that predicting species jeopardy based on habitat degradation is within the realm of agency discretion, is scientifically sound, and has been approved by this court in other contexts. An agency's scientific methodology is owed substantial deference (*United States v. Alpine Land and Reservoir Co.,* 887 F.2d 207, 213 [9th Cir. 1989]), and in the context of deference to scientific methodology, the holding of *Inland Empire Pub. Lands Council v. United States Forest Service,* 88 F.3d 754, 761 (9th Cir. 1996), is appropriate, including deference to the agency's expertise in allowing this "proxy on proxy" approach.

The principle of allowing an agency to use proxy modeling to evaluate species population so long as that proxy has a high correlation with the relevant species' population is . . . applicable in the ESA context. The test for whether the habitat proxy is permissible in this case is whether it "reasonably ensures" that the proxy results mirror reality. See *Idaho Sporting Cong., Inc. v. Rittenhouse,* 305 F.3d 957, 972-73 (9th Cir. 2002) (holding that deference to proxy on proxy approaches is not warranted when the proxy method does not "reasonably ensure" accurate results); *Ariz. Cattle Growers',* 273 F.3d at 1250 ("The use of ecological conditions as a surrogate for defining the amount or extent of incidental take is reasonable so long as these conditions are linked to the take of a protected species") (Federal Highway Administration 2005).

In the *Pinchot* case the court found that the habitat analysis was not a simplistic "x acres = y species individuals" but was strengthened by taking into account the type of land, extent of degradation of the habitat, relationship between different habitats, the species' distribution, and the species' range. The jeopardy analysis also takes into account nonhabitat factors, including competition from other species and disease. "This detailed model for owl population is sufficient to ensure that the USFWS' habitat proxy reasonably correlates to the actual population of owls. . . . Bearing in mind the deference owed the USFWS' scientific judgment, *Alpine Land,* 887 F.2d at 213, we cannot say that use of a habitat proxy was impermissible. . . . Focus on actual species count is an overly narrow interpretation of what is required under the jeopardy prong. . . . Because the ESA does not prescribe how the jeopardy prong is to be determined, nor how species populations are to be estimated, we hold that it is a permissible interpretation of the statute to rest the jeopardy analysis on a habitat proxy" (Federal Highway Administration 2005). The court ruled that "[f]urther, **if habitat models are sufficiently accurate and are robust, in the sense that the results are accurate in many cases, then the models function as if the USFWS were counting species individuals,**" accomplishing the same function (Federal Highway Administration 2005).

In *NWF v. Babbitt,* the Ninth Circuit court upheld a habitat-based approach, saying that counting species individuals was not required. The court rejected the plaintiff's arguments that

the Plan was obliged to "estimate the number of individual members of a species within the Permit area" and "then estimate the number of members of the species that will be taken," saying there is "no authority for this interpretation of the ESA."

Builds on Existing Effectively Conserved Areas

For at-risk species and ecological communities, effective conservation occurs when, given current conditions, biodiversity is expected to persist as a result of conservation actions. Effective conservation is a measure of three categories: biodiversity status, future threat status, and protection and land management status. Scientists generally agree that retention of functional core areas is an essential conservation strategy, whether they are harbors for affected species, receivers of species needing to move, or systems in which species can adapt. Functional core areas must be sufficiently connected to receive and export species. Barrier-free dispersal corridors (i.e., wildlife movement corridors, which are often the areas wildlife use to move from one habitat area to another) are important for many species, especially with increasing temperatures and climate change.

A species or type of community may be considered effectively conserved when a sufficient number or distribution of a conservation target are under effective conservation; that is, when all three categories of effective conservation can be evaluated as "good" or "very good." The Colorado NHP and other NHPs have shown how this can be illustrated on a scorecard for each state and by ecoregion as roll-up measures from individual species and communities. The effect of a conservation and/or mitigation area is effectively leveraged and its value increased when existing effectively conserved areas are linked where they were not before, or at least when larger patches become available through locating newly conserved areas adjacent to already conserved areas. This practice also effectively reduces the risk of isolation or land use change on the sides that are merged.

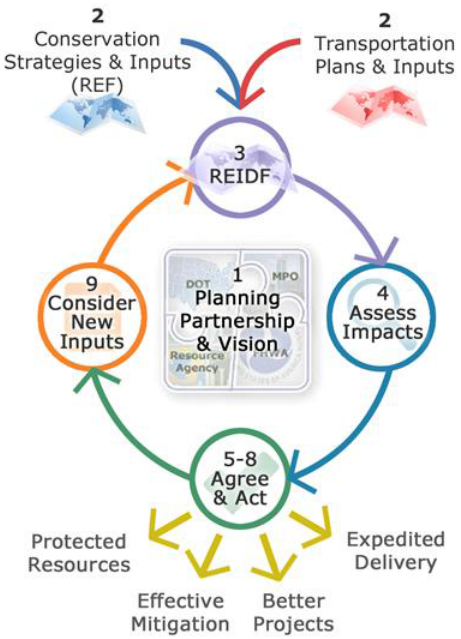
Uses Transportation Funds for Advance Mitigation and to Support Priorities

The ability to use transportation funding for advance mitigation of habitat and wetlands has been continually clarified for more than a decade. On March 10, 2005, FHWA reiterated information on federal aid eligibility of wetland and natural habitat mitigation, specifically emphasizing that "wetland and natural habitat mitigation measures, such as wetland and habitat banks or statewide and regional conservation measures, are eligible for federal aid participation when they are undertaken to create mitigation resources for future transportation projects." These activities are eligible for funding "either concurrent with or *in advance of* the construction of highway or other transportation projects funded under Title 23, or even in advance of completion of project level environmental reviews" (emphasis retained) under 23 *Code of Federal Regulations* (CFR) Part 710.513 and 23 CFR Part 777, using either National Highway System or Surface Transportation Program federal aid funds (Federal Highway Administration 2005). The Transportation Equity Act for the 21st Century (TEA-21); the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU); and implementing regulations provide other important information on the flexibility of FHWA to participate in various aspects of mitigation for wetlands and natural habitat. In addition to the ability of DOTs to fund mitigation separately from transportation projects, mitigation planning, design, construction, monitoring, establishment, and acquisition of land or "interests therein" are all eligible for funding (23 CFR Sec. 777.5). Furthermore, funding for long-term maintenance can and should be included with investments in mitigation or conservation banks or an in lieu fee (ILF) program (see Chapter 5). DOTs may also acquire lands in cooperation with other parties and may transfer lands to an appropriate resource management agency or third party, providing for "the continued use of the lands for the purpose for which they were acquired" (23 CFR Sec. 777.11[d]). FHWA's legal sideboards for this flexibility specify that impacts must result from a federal aid project in order to qualify for federal funds and must be considered a "reasonable public expenditure." DOTs also generally avoid acquiring advance mitigation lands by eminent domain and must comply with federal law and state transportation planning processes.

Integrated Ecological Framework

As described in Chapter 1, this project was conducted in close cooperation with a related SHRP 2 effort (described in Volume 2 of this three-report series). The primary product of these complementary efforts is the Integrated Ecological Framework (IEF). The IEF is a step-by-step process guiding the integration of transportation and ecological planning. It was developed to respond to the barriers and incentives described in Chapter 3, and it encompasses the essential features of an ecosystem approach described in the previous section. The IEF is available through Transportation for Communities—Advancing Projects through Partnerships (TCAPP) at trans portationforcommunities.com. It is also described in detail in volume 2 of this report and in the *Practitioner's Guide*. The nine steps of the IEF are shown in Figure 4.1. The six critical needs that the IEF can answer are listed in a sidebar in the November–December 2013 issue of *TR News,* p. 25.

The Steps of the IEF



Step 1: Build a strong collaborative partnership of transportation and natural resource specialists. Create a shared vision representing the environmental and transportation goals for the planning region. Develop the collaborative framework necessary for cooperative decision making, data development and management, analyses, planning, and implementation.

Step 2: Gather data, expertise, and other inputs about the natural and built environment. Represent all high priority conservation and restoration areas and goals (regional ecosystem framework [REF]). Represent an initial plan to meet transportation goals.

Step 3: Integrate the conservation and transportation information and goals into a regional ecosystem and infrastructure development framework (REIDF).

Step 4: Characterize scenarios of transportation and other land use. Assess the effects of transportation scenarios on conservation objectives, create a preferred scenario, and create an ecosystem-based mitigation strategy to address remaining impacts.

Steps 5–8: Carry out innovative, ecosystem-based crediting strategies, interagency agreements, mitigation plans, programmatic consultations, and permitting to support transportation plans and conservation objectives.

Step 9: Continue to develop and maintain dynamic information on environmental and transportation needs and goals, access to cutting-edge conservation and assessment methods, and mitigation monitoring results in order to support both a viable partnership vision and future planning at the local, watershed, ecoregional, or state level.

Figure 4.1. Steps of the Integrated Ecological Framework.

CHAPTER 5

Inventory of Assurance Methods

The assurance needs of resource agencies and transportation agencies as they relate to ecosystem approaches were summarized under Assurance Needs in Chapter 3. Many of these needs relate to advance mitigation. The goal of mitigation is to restore, create, enhance, and/or preserve natural resources for the purpose of compensating for unavoidable resource impacts. Mitigation ensures that ecosystems, habitats, and species populations remain sustainable and productive over time.

Council on Environmental Quality regulations (40 CFR 1508.20) define mitigation as

- Avoiding an impact altogether by not taking a certain action or parts of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Existing methods to provide assurances that collective, off-site, or advance mitigations are credited to transportation agencies are inventoried in this section. The inventory is organized by first addressing regulatory assurance methods, including (1) assurance methods that satisfy the mitigation requirements of both the Clean Water Act (CWA) and Endangered Species Act (ESA), (2) assurance mechanisms used to address the CWA, and (3) mechanisms that address the ESA.

Table 5.1, which summarizes the inventory of regulatory assurances, is provided as a guide to help point readers to methods suited to their particular needs.

Programmatic Agreements for Multiple-Purpose Mitigation

Overview

Programmatic agreements address multiple projects and can address multiple regulations (i.e., CWA and ESA) and multiple resources. In this, they are distinguished from project-level approaches. Programmatic agreements are tools for achieving ecological benefit across wide scales (watersheds and ecoregions) and geographic areas.

Some states have developed programmatic agreements to guide and formalize negotiations related to satisfying ESA Section 7 and CWA Section 404. Examples include the Colorado DOT Shortgrass Prairie Initiative Memorandum of Agreement, which records early agreements on the assessment (GIS and expert consultation, habitat based) and mitigation approach (existing network plus bridges), projects to be covered (all construction and maintenance activities for 20 years), species to be covered (36 listed and unlisted species), and reopening contingencies (Colorado Department of Transportation et al. 2001).

The following tools are available to help agencies develop programmatic agreements:

- *Programmatic Agreement Toolkit for state departments of transportation environmental projects and programs:* To assist state DOTs in their environmental streamlining, the American Association of State Highway and Transportation Officials' (AASHTO) Center for Environmental Excellence created this toolkit on developing programmatic agreements. The toolkit presents information, guidance, and recommendations on developing and implementing programmatic agreements among state DOTs, FHWA, and agencies responsible for the protection of environmental

(text continues on page 28)

Table 5.1. Essential Features and Limitations of Mechanisms for Regulatory Assurances

Regulatory Tool	Description	Assurances Provided	Advantages	Disadvantages	Page Number in Report
Clean Water Act Section 404 Assurances					
Wetland banking	Either a DOT or a third party establishes an area of constructed, restored, or preserved wetlands and negotiates agreement with resource agency regarding the number of credits that can be sold to applicants requiring wetland mitigation. Applicants pay for credits, applying them to the mitigation requirements for their projects.	Most mitigation is completed in advance of the application for a permit, though limited credits may be available before the first year of monitoring. Functional wetland replacement can be required, with no time lag between the impact and replacement. Bonds or other financial assurances help make certain a condition is achieved.	National Academy and other major studies generally show better performance for consolidated mitigation, such as ILF and banking, over individual on-site, activity-specific compensatory mitigation projects. Multiple resource issues may be addressed and provide mitigation credits for these issues per legal requirements. Purchasing credits potentially minimizes expenses involved in site selection, purchase, development, monitoring, and long-term maintenance.	Banks must be up and approved before credits are assigned, as only limited credits of total bank mitigation credits may be available before first-year monitoring if certain stipulations are met. Service areas for mitigation banks may not overlap project impact areas. Restored or created wetlands must be sited to contribute to identified watershed needs and priorities, not just where some environmental benefit may occur or where profit can be maximized.	30
In lieu fee (ILF) programs	Third party establishes an area of restored or preserved wetlands and negotiates agreement with resource agency regarding the number of credits that can be sold to applicants requiring wetland mitigation. The purchaser of ILF credits provides payment for mitigation to a sponsor for a mitigation project. The purchaser's credits are applied to the mitigation requirements for their projects.	Required to perform the mitigation within a certain time period after the permit is issued. Functional wetland replacement exists. Bonds or other financial assurances help make certain function is provided.	National Academy and other major studies generally show better performance for consolidated mitigation versus individual activity-specific compensatory mitigation projects. ILF investments tend to be targeted to watershed priorities identified by the state agency or conservation group; involve larger, more ecologically valuable parcels; and have more rigorous, scientific, and technical analysis compared with individual activity-specific mitigation projects. Multiple resource issues may be addressed and provide mitigation credits for these issues per legal requirements. By paying into the ILF program, DOTs have the potential to minimize expenses involved in site selection, purchase, development, monitoring, and long-term maintenance.	Protected areas must be up and approved before credits are assigned. Service areas for mitigation may not overlap project impact areas. Accountability has been problematic for some ILF programs.	32
Nationwide permit (NWP)	Most common general permit issued by USACE. Issued for specific activities that USACE has determined result in minor impacts on aquatic systems.	Designing a project such that it qualifies for an NWP demonstrates substantial avoidance and minimization.	Resource agencies are generally assured that avoidance and minimization have occurred, and impacts are minimal. DOTs benefit through increased predictability (NWPs are granted if certain requirements are met and sometimes written concurrence is not necessary). NWPs have much faster review times; there is a 45-day review period once USACE receives a completed preconstruction notification. Especially useful with programmatic agreements for Section 106 or ESA consultation.	Projects must be designed to meet specific permit requirements and 401 requirements. National requirements exist, and many USACE districts have added district, regional, or state conditions. Limited to specific project activities.	35

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Table 5.1. Essential Features and Limitations of Mechanisms for Regulatory Assurances (continued)

Regulatory Tool	Description	Assurances Provided	Advantages	Disadvantages	Page Number in Report
Regional general permit (RGP)	Permits issued to cover activities within a limited geographic area.	Designing a project such that it qualifies for an RGP demonstrates substantial avoidance and minimization.	Resource agencies are generally assured that avoidance and minimization have occurred, and impacts are minimal. DOTs benefit through increased predictability (RGPs are granted if certain requirements are met and written concurrence is not necessary) and faster review times. Can be very effective with programmatic agreements for ESA consultation.	Projects must be designed to meet specific permit requirements and 401 requirements. Requirements differ by USACE district and state. Limited to specific geographic areas.	35
Special area management plan (SAMP)	SAMPs are USACE's main vehicle for taking a watershed approach and streamlining permitting on a watershed basis. USACE undertakes a comprehensive review of aquatic resources in an entire watershed to achieve a balance between aquatic resource protection and reasonable economic development and infrastructure.	Assures comprehensive evaluation of aquatic resources and potential development impacts in a geographic area to identify priority areas for preservation, identify potential restoration areas, and determine the least environmentally damaging locations for proposed projects.	SAMPs produce abbreviated permitting procedures and assure Waters of United States are preserved in the right places. Sensitive (high-quality) areas and potential areas for development (lower-quality areas) are identified upfront. Potential mitigation areas are identified in advance of projects. Early identification of potential restoration sites eliminates need for DOT site evaluation and selection. Produces efficiencies for permittees with much faster processing times and greater clarity about regulatory expectations. Useful in especially sensitive environments under intense development pressure.	Although SAMPs lay out critical resources, potential development sites, and potential compensatory mitigation areas, they are not super permits. However, RGPs may be designed around the SAMP to help implement it. SAMPs can be time consuming to complete, but produce time savings once developed.	35
Advance identification of aquatic resources (ADID)	Wetland sites providing the highest functions and overall quality are identified.	By identifying highest-quality wetland resources in advance, increased avoidance is strongly encouraged. A permitting component is not included, so 404 applicants have no increased assurance with use of ADID.	Helps both DOTs and regulatory agencies reduce conflict situations by communicating in advance about what areas are most valuable and where complete protection is expected. Also assures highest-quality wetland resources are identified in advance.	Requires expenditure of resources upfront and can be time consuming to complete the evaluations. Mechanism has only been used in a handful of geographic areas and has been superseded by other mechanisms. Actions in high-quality sites are likely to be highly scrutinized.	38
Watershed resources registries (WRRs)	States or other government agencies establish a list of potential restoration sites within a watershed (often aquatic/wetland but could be terrestrial as well).	Provides some assurance or indication that resource agencies would value restoration of the site.	Early identification of potential restoration sites eliminates the need for DOT site evaluation and selection. Sites should be selected to meet specific needs of the watersheds. Can be an important tool for siting potential mitigation areas.	Registries may only indicate willingness and may not include technical evaluation of the site. Timing for DOT participation may be problematic due to land costs and potential bidding war between DOTs and bankers.	38

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Table 5.1. Essential Features and Limitations of Mechanisms for Regulatory Assurances (continued)

Regulatory Tool	Description	Assurances Provided	Advantages	Disadvantages	Page Number in Report
Endangered Species Act Section 7 Assurances					
Standard ESA Section 7 consultation	Informal or formal consultation between the federal project lead agency (FHWA) and USFWS or NOAA Fisheries.	Provides FHWA with the assurance that listed species and their habitats are not jeopardized and critical habitat is not destroyed or adversely modified.	Thorough, documented assessment of potential impacts on listed species.	Consultation frequently results in suggestions for mitigation efforts, including redesign, relocation, and compensatory mitigation.	41
Programmatic ESA Section 7 consultation	Programmatic consultations evaluate the potential for federal agency programs to affect listed species and designated critical habitat. They address species, habitat, or project needs on a multiple-project scale, often addressing ecosystems as well as individual species.	Provides FHWA with the assurance that listed species and their habitats are not jeopardized and critical habitat is not destroyed or adversely modified. FHWA and DOTs receive certainty regarding what actions will be required to comply with Section 7.	Better and more cost-effective integration of ecosystem and recovery planning activities with Section 7 consultation; streamlined consultation processes; added predictability for all parties; minimization of the potential piecemeal effects that can occur when evaluating individual projects out of the context of the complete agency program; and the opportunity to integrate the action agency's 7(a)(1) responsibilities at the program level.	Uncertainty regarding specific future projects and the future status of species. The Services must provide the benefit of the doubt to the species and use best available scientific information. Depending on the complexity of the program to be covered, developing programmatic agreement and accompanying BA and BO could take 1–3 years; however, review times for covered projects are shortened.	41
Conservation banks	Land parcel containing natural resource values restored, conserved, and managed in perpetuity for listed species; used to offset impacts occurring elsewhere on the same resource values.	Permitted banks have been determined by the USFWS to be an effective conservation strategy for offsetting adverse effects of proposed projects on listed species.	Credits sold are considered part of the environmental baseline. Saves time and money by identifying preapproved conservation areas and simplifying the regulatory process. Reduces piecemeal approach to conservation efforts. May be used to satisfy state-listed species requirements. Appropriate for species where habitat loss is a factor (i.e., the vast majority of species).	Not appropriate for all impacts or all projects. Potential lack of private banks in areas where mitigation is most needed. Establishing DOT-specific banks takes time and is expensive, although partnerships can make this much more practical.	45

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Table 5.1. Essential Features and Limitations of Mechanisms for Regulatory Assurances (continued)

Regulatory Tool	Description	Assurances Provided	Advantages	Disadvantages	Page Number in Report
Recovery credits	A specific program established to implement recovery actions on nonfederal lands for specific species while creating a bank of credits for a federal agency to use to offset the effects of its actions.	Recovery credits require a net benefit to the recovery of a species.	Better and more cost-effective contributions to recovery through agency activities, more exact analysis, and increased predictability for all parties.	Only conservation that occurs on nonfederal lands can be counted for recovery credits. Actions taken under a recovery credit system are still subject to Section 7 consultation. Some listed species may not be appropriate for inclusion in a credit system. Private landowner anonymity can be a drawback if issues arise with activity on or adjacent to the easements because there is no landowner to contact when in need of a resolution.	49
Habitat conservation plans (HCPs)	Planning documents required as part of an application for an incidental take permit under Section 10(a)(1)(b) of the ESA. They describe the anticipated effects of the proposed taking, how those effects will be minimized and mitigated, and how the HCP is to be funded.	The Services will honor assurances as long as the permittee is implementing the terms and conditions of the HCP, permit, and other associated documents in good faith.	HCPs can apply to both listed and nonlisted species, including candidate species. Conserving species before they are listed can provide early benefits and prevent the need for listing. In addition to substantial predictability, HCPs provide for those operating under their auspices. The incidental take permit allows the permit holder to legally proceed with an activity that would otherwise result in the unlawful take of a listed species.	For private landowners only, without a federal nexus, although NiSource, the Federal Energy Regulatory Commission, and USFWS have illustrated that HCPs can be used where a federal nexus is involved. HCPs must be consistent with species recovery plans. HCPs also require NEPA and Section 7 ESA reviews.	50
Candidate conservation agreements (CCAs) with assurances (CCAAs)	CCAs are formal agreements between the Services and one or more parties to address the conservation needs of proposed or candidate species, or species likely to become candidates, before they become listed.	The CCAA provides users with the assurance that if they implement various conservation activities, they will not be subject to additional restrictions if the species becomes listed under the ESA. The assurances are only available to nonfederal entities for actions on nonfederal lands.	Private landowners can use their land in a manner consistent with the agreement with the assurance that if they implement agreed-on conservation measures, they will not be subject to additional restrictions if the species becomes listed under the ESA. CCAAs are transferable to subsequent owners of the land if they choose to participate in the agreement.	The CCAA program is specifically targeted to nonfederal landowners. Incidental take may or may not be authorized (depending on the agreement and the species) for certain actions. Landowners may need to identify and use external sources of funding to implement the agreement. Monitoring and reporting are required.	51

resources. These agencies include state historic preservation officers, the Advisory Council on Historic Preservation, USFWS, USACE, and others. The tool kit focuses primarily on programmatic agreements that fulfill FHWA's responsibilities under Section 106 of the National Historic Preservation Act of 1966. There are plans to expand the listing in the toolkit. FHWA also maintains an internal list of all agreements (American Association of State Highway and Transportation Officials, Programmatic Agreement Tool Kit).

- *DOT programmatic consultation guidance:* In 2000, USFWS, in cooperation with FHWA, provided this guidance to help streamline ESA compliance on transportation projects. The USFWS Director's Order 108 gives guidance on how to establish these agreements. Order 108 provides uniform guidance for implementing reimbursable funding agreements between USFWS and state DOTs. A critical part of this order is cooperative USFWS participation "in the prescoping and scoping stages of transportation planning, when environmental concerns can be resolved most effectively." Thus, USFWS would be initially engaged by the acting agencies at the earliest stage of planning efforts. USFWS is developing updated programmatic consultation guidance for transportation, as well as more general programmatic guidance (U.S. Fish and Wildlife Service and Federal Highway Administration 2000).
- *AASHTO library of best practice programmatic agreements:* AASHTO maintains a library of programmatic agreements developed to streamline compliance with federal environmental laws. The library is publicly accessible on the web and anyone can submit a request to add a programmatic agreement to the library (American Association of State Highway and Transportation Officials, Programmatic Agreement Library).

CWA Perspective

Off-site mitigation enables consolidation of smaller, potentially scattered mitigation sites into a larger, potentially more important and effectively managed mitigation area. Likewise, off-site mitigation offers the opportunity to address larger watershed needs, if planned with that as a priority. Multiple-project—and frequently multiresource—mitigation can be accomplished through consolidated mitigation such as banking or ILF programs, which can be oriented toward broader ecosystem-based mitigation.

The USACE rule enhances the opportunity for multiresource mitigation opportunities by means of watershed plans or other regional conservation plans (regulatory or nonregulatory) (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008). Because the focus of the regulatory program and mitigation is on replacement of aquatic and wetland functions (in-kind or out-of-kind), mitigation is typically designed to serve multiple resource functions and values. The new rule provides additional assurance elements ranging from siting to postconstruction monitoring of mitigation sites. The new rules also highlight the benefits of programmatic approaches such as North Carolina's Ecosystem Enhancement Program and the Washington State DOT's (WSDOT) Transportation Permit Efficiency and Accountability Committee.

ESA Perspective

According to the USFWS' conservation banking guidance, credits from a conservation bank may be used to compensate for environmental impacts authorized under other programs, such as CWA Section 404 (U.S. Fish and Wildlife Service 2003).

If impacts occur on the same acre, with multiple species or resource values, resources that provide similar crosscutting values elsewhere might be conserved at one location. In some instances, a bank may contain habitat that is suitable for multiple listed species. When this happens, it is important to establish how the credits will be divided. For instance, once a project buys a credit for one species, that credit cannot be sold again for another species. If the proposed project has impacts on multiple species and the bank contains the same multiple species, then the credits can be sold for in-kind replacement. As a general rule, overlapping multiple species credits can overlap for a single project, but not multiple projects (U.S. Fish and Wildlife Service 2003).

Advantages, Disadvantages, and Examples

Programmatic approaches seek and usually deliver greater efficiency and effectiveness. The four examples that follow highlight advantages and disadvantages.

Oregon Transportation Improvement Act Program

When the Oregon DOT and FHWA began working with several federal and state regulatory and resource agencies in late 2002 to develop permitting strategies to meet dual goals (providing timely review of individual permit applications for the Oregon bridge renewal program and protecting or enhancing the natural and built environments), they identified the following criteria for their permitting approach:

- *Efficiency:* A primary goal of the streamlining effort was to minimize redundancy of permitting hundreds of similar projects, reducing the duration of consultation with the federal wetland and water-quality permitting agencies (the Services) and the state permitting agency (the Oregon Department of Fish and Wildlife).
- *Legal defensibility:* The higher the risk of liability and legal challenge, the less desirable the approach was to the Oregon DOT and the resource/permitting agencies.

- *Simplicity:* Approaches that reduced the regulatory process to the simplest method possible were favored.
- *Stewardship:* A key objective for the Oregon DOT was to demonstrate commitment to the stewardship component of the agency's transportation mission through building green bridges with minimal effect to the environment.
- *Agency relations:* Maintaining excellent agency relations was of paramount importance to the Oregon DOT.

Oregon DOT's multiresource approach addressed water and wetland resources and fluvial performance standards, as well as listed and nonlisted species, for which environmental performance standards were designed to minimize and avoid impacts. A fluvial performance standard was developed to ensure that bridges replaced under the Oregon Transportation Improvement Act (OTIA) III Program would enhance, not simply maintain, geomorphologic features at bridge sites (Bonoff et al. 2005). The Oregon DOT received the BO 3 months after submitting the BA. The joint BO from NOAA Fisheries and USFWS addressed 73 threatened, endangered, proposed, and selected sensitive species and their designated or proposed critical habitat. In addition to listed fish, wildlife, and plants, the BA satisfied the requirements of the Oregon ESA, Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act, and Fish and Wildlife Coordination Act. Using the programmatic approach, 85% to 90% of the bridges under the OTIA III Bridge Program were permitted, resulting in significant time and cost savings. By late 2008, Oregon DOT found that the program had already saved about $75 million. This Oregon DOT approach has involved relatively little off-site mitigation to date.

Colorado DOT Shortgrass Prairie Initiative

With the shortgrass prairie initiative, the Colorado DOT sought coverage for all small- and large-capacity projects that might occur in the ecoregion while reducing the risk of listing widespread candidate species (e.g., prairie dog, mountain plover, others) that would require consultation on nearly every project. Another objective was enhancing conservation and habitat management for over 30 other imperiled and listed species as well as important, nonlisted indicator species and aquatic resources. USFWS sought to ensure implementation of best management practices (BMPs) in state-funded maintenance, over which federal agencies had less control, along with a standard set of construction practices, most extensively applied in aquatic areas. Efficiency, utilization of existing species recovery and ecoregional conservation plans, leadership, legal defensibility, anticipated threats and costs, transparency and simplicity, stewardship, making tangible improvements for regulated species, and increasing the resilience of the ecosystems were all driving factors. Finally, proactive, advance mitigation yielded advantageous mitigation ratios. USFWS approved all sites and the ongoing monitoring and adaptive management strategy in the programmatic BO. Project-level BAs/BOs are expected to be five pages or less and discuss projects' fit within the programmatic approach (Colorado Department of Transportation et al. 2001).

North Carolina's Ecosystem Enhancement Program

North Carolina's Ecosystem Enhancement Program (EEP) is focused primarily on aquatic resources. The east coast and the state of North Carolina have many fewer listed species than the west coast, but some projects target aquatic species, such as endangered mussels. Through one of the first statewide watershed-based and -oriented 404 mitigation programs in the country, the EEP's agreement with the North Carolina DOT, North Carolina Department of Environment and Natural Resources (DENR), and USACE provides

- High-quality, cost-effective projects for watershed improvement and protection;
- Compensation for unavoidable environmental impacts associated with transportation infrastructure and economic development; and
- Detailed watershed planning and project implementation efforts within North Carolina's threatened or degraded watersheds (North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program).

San Diego's TransNet Program

In San Diego, California, TransNet, a local transportation and environmental mitigation bond program, will provide $850 million for the San Diego Association of Governments' (SANDAG) Environmental Mitigation Program. SANDAG employs the program to help fill the mitigation needs of the major transportation infrastructure improvement projects and programs identified in the regional transportation plan. In particular, the Environmental Mitigation Program provides for the proactive, large-scale acquisition and management of habitat lands for future mitigation in advance of the requirements of each individual project. The program allows SANDAG to buy land early—at lower costs—and bank it for future needs. For resource agencies, it ensures conservation of land that would be otherwise developed and unavailable for conservation in the future.

SANDAG estimates that $200 million in economic savings could be achieved, which could in turn be applied to region-wide habitat preservation efforts like the Multiple Species Conservation Program and the Multiple Habitat Conservation Program. In 2008, the agencies involved signed an agreement on how they are going to work together, and the board certified

acquisition criteria and a finance plan to determine how much will be allocated each year. Acquisitions have been completed, and USFWS has issued a BO for Highway 176, among other areas (San Diego Association of Governments, TransNet).

Clean Water Act Section 404 Assurances

Overview

Avoidance and minimization are required before the selection of any type of compensatory mitigation under the CWA. This approach is also a common expectation for conservation of other resources. The approaches in this section describe alternatives to project-by-project compensatory mitigation, as the latter is generally small in scale and may not be able to sufficiently address landscape-scale or watershed priorities. Discrete mitigation projects focused on one resource are often the easiest for agencies to process and consider; however, the National Research Council of the National Academy of Sciences recognized the shortcomings of this approach to compensatory mitigation in their report titled *Compensating for Wetland Losses Under the Clean Water Act.* This report states that "The [NAS NRC] committee endorses the watershed approach and finds the automatic preference for in-kind and on-site compensatory mitigation to be inconsistent with that approach" (National Academy of Sciences 2001). Although some functions, such as water filtration, are best implemented on-site through BMPs, the report noted that "especially under a watershed approach" frequently "on-site or in-kind mitigation is neither practicable nor environmentally preferable" (National Academy of Sciences 2001).

The 2008 Mitigation Rule (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008) specifically adopts a watershed approach. It requires that no matter what type of compensatory mitigation is selected, the decision must be guided by determining how compensatory mitigation will best address defined aquatic resource needs. Such needs are guided by "the best tool for planning compensatory mitigation, a holistic watershed plan" (National Academy of Sciences 2001). Holistic watershed plans are those that (1) have been reviewed and approved by federal and state agencies; (2) consider multiple stakeholder interests and competing land uses; and (3) address issues of habitat, water quality, hydrology, cumulative impacts, and restoration priorities for a watershed (National Academy of Sciences 2001). In the absence of such a plan, the National Research Council and USACE have said a watershed-based approach to mitigation should be used to develop mitigation proposals. A watershed approach takes into account a wide range of factors: 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.

Rules for the siting, design, and execution of mitigation banks are now more formally established. The 2008 Mitigation Rule raises the value of preservation in an overall compensatory mitigation package, particularly for resources that are seen as difficult to replace, and provides additional flexibility in implementing a watershed approach to compensatory mitigation. Required compensation ratios remain greater for the preservation component of a proposed compensatory mitigation package. Finally, out-of-kind mitigation is supported under the 2008 regulations, provided that an approved watershed plan identifies specific aquatic resource needs within the watershed (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008).

An overview of the key mitigation elements now required by the USACE mitigation rule and the associated assurances they support is provided in Table 5.2.

Wetland Banking

How It Works

Wetland mitigation banking involves the restoration, creation, and enhancement of wetlands. Mitigation banking can also include preservation of wetlands expressly for the purpose of compensating for unavoidable losses to wetlands and other aquatic resources. The overall goal of a mitigation bank is to provide economically efficient and flexible mitigation opportunities while fully compensating for wetland and other aquatic resource losses in a manner that contributes to the long-term ecological functioning of the watershed within which the bank is located. This goal includes the need to replace essential aquatic functions that are at risk of loss within the bank's service area.

Generally, mitigation banking involves the bank sponsor restoring, enhancing, establishing, and/or preserving wetland and aquatic habitat in advance of development actions. Mitigation banks are established through an interagency team review process that includes development of banking agreements signed by USACE, responsible resource agencies, and the bank sponsor. Any member of the public can purchase credits from the bank sponsor to provide compensatory mitigation for unavoidable impacts at the proposed project site. Consistent with guidance, permittees may use mitigation credits from a bank, approved through the interagency review team, as partial or full compensation for unavoidable losses to the aquatic environment.

Mitigation banking has a solid basis in CWA regulations as interpreted by USACE and EPA. This position was described in the 1995 wetland mitigation banking guidance and further

Table 5.2. Overview of the Key Mitigation Elements Required by USACE Mitigation Rule

Mitigation Elements	Description	Assurances
Site selection criteria	Agency measures and evaluators that help to optimize external and site-specific conditions that could affect success of mitigation site.	Optimal sites are identified by DOTs, banking sponsor, ILF sponsor, consistent with USACE mitigation rule.
Site protection instruments	Site-specific and external land protection mechanisms.	Assure long-term functionality of site by controlling site use and adjacent land use, which, if altered, could affect quality of mitigation.
Baseline information—impact sites	Data and information required to assess functions of aquatic resource affected and determine functional replacement goals.	Site characterization using validated methods assures that affected site features are clearly understood relative to functions provided.
Baseline information—compensation sites	Data and information required to assess overall match of mitigation site with original site affected relative to ecosystem functions provided.	Site will replace lost functions and/or be suitable as a mitigation site.
Credit determination methodology	Mechanism for measuring value of ecosystem services to be provided and/or mitigated.	Lost functions will be replaced on a 1:1 or greater basis based on aquatic resource type and credit system used.
Mitigation work plan	Conceptual, design, and construction plans for mitigating lost functions of aquatic site.	Establishes physical, biological, and hydrologic components of replacement aquatic site.
Maintenance plan	Identify measures that will be taken at mitigation site to assure that mitigation objectives (functions) are achieved.	Components of mitigation site are sustained to assure mitigation objectives are achieved per permit.
Ecological performance standards	Observable or measurable physical, chemical, and/or biological attributes that are used to determine if a mitigation project meets its objectives.	Attribute data to set performance standards for measuring if mitigation site meets its objectives.
Monitoring requirements plan	Plan to identify what and when data and information will be collected to determine mitigation site's conformance to approved plans and specifications.	Information and data used to support and document that mitigation site meets permit conditions and overall mitigation site objectives.
Long-term management plan	Plan to establish long-term stewardship of mitigation site, including ownership and ongoing maintenance after site is determined to meet conditions of permit.	Actions will be taken to protect site and conduct maintenance to assure long-term functions provided are sustained.
Adaptive management plan	Plan that identifies the management strategy for anticipating challenges with the mitigation site and identifies actions and commitments to optimize performance.	Both known and unknown challenges will be dealt with over the long term.
Financial assurances	Monetary commitments required to assure that mitigation site will be obtained, monitored, and managed under the conditions of the permit.	Adequate funds will be available to complete the compensatory mitigation project and comply with conditions of permit.

Source: U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (2008).

strengthened and clarified in the 2008 Mitigation Rule (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008). Transportation legislation has also supported the concept. TEA-21 established a preference for mitigation banking. Banks may be publicly or privately owned, profit or nonprofit. Implementing guidance for the preference says that, to the extent that a mitigation bank will provide suitable compensation for impacts on Waters of the United States caused by a federal aid highway project, a bank should be approved for use. In deciding among more than one approved bank "and where other suitable mitigation alternatives have been identified, the FHWA and State DOT will choose among suitable alternatives based on availability and practicability" (Federal Highway Administration et al. 2003). Practicability considerations used by FHWA include "cost, existing technology, and logistics, in light of overall project purposes" (23 CFR 777.2). USACE and EPA, for Section 404 purposes, define practicability in a similar manner and consider practicability a factor in determining the overall suitability of alternatives and compensatory mitigation according to the 404(b)(1) Guidelines (40 CFR 230.10[a][2]).

Advantages and Disadvantages

Mitigation banks generally reduce uncertainty over the ecological success of the mitigation. Banking has been considered beneficial, particularly in its provision of compensatory mitigation in advance of impacts (i.e., temporal benefits), although in

actual implementation, a portion of credits may be released at the initial establishment of a bank through long-term protection of the mitigation site. Phased credit release allows banks to sell credits as specific milestones are met. Bankers have also been criticized for unrealistic long-term management plans and presuming that resource agencies or local jurisdictions will assume long-term management. Usually these issues should be resolved before bank authorization through the banking instrument, but sometimes unrealistic plans leave these issues addressed in ways that fall short of long-term viability.

According to the 1995 guidance, mitigation banking is authorized when "on-site compensation is either not practicable or use of a mitigation bank is environmentally preferable to on-site compensation"; it is expected to reduce permit processing times and provide more cost-effective compensatory mitigation opportunities (U.S. Environmental Protection Agency and U.S. Army Corps of Engineers 1995). The 2008 Mitigation Rule actually established a soft preference for the use of banking and ILF approaches, in part again because compensation is in place before the impacts occur, but also because such mitigation is assumed to involve "larger, more ecologically valuable parcels, and more rigorous scientific and technical analysis, planning and implementation, than permittee-responsible mitigation" (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008).

Examples of Wetland Banking

Interviewees at the Michigan DOT indicated that mitigation construction and private mitigation banking costs were generally $75,000 to $150,000 per acre. Michigan DOT brought costs down to about $25,000 to $30,000 per acre and increased efficiency and wetland success by implementing a watershed approach. First, the department funded wetland mitigation in advance, separately from projects, which facilitated selection of consolidated mitigation areas designed to address watershed needs. Subsequently, it developed a wetland mitigation site selection tool that helps staff perform watershed analysis and evaluate the restoration potential of prospective sites, based on weightings of hydric soils, historic wetlands, and topographic wetness. When mitigation was tied to projects, Michigan DOT typically took regulators to four or five sites, and if none were acceptable, might take them to four or five more. Now, however, the process helps the department easily screen out poor sites; as a result, regulators now approve 95% of the sites on the first showing, making much better use of regulators' time and producing more effective and successful mitigation sites.

An interviewee in the Kentucky Transportation Cabinet indicated that they have also dramatically reduced costs by partnering with USFWS to find Section 404 mitigation sites. A presentation documenting their approach is available online (Waldner, Streamlining ESA and USACE Processes).

The WSDOT Springbrook Creek Wetland and Habitat Mitigation Bank was designed to reduce the impacts of current and future transportation and development projects in and around the city of Renton. This project enhanced 110 acres of wetlands and buffer, restoring and creating a larger, connected 20 acres of wetland. Among the benefits, the Springbrook Wetland and Habitat Mitigation Bank project set up the site in advance of project development and wetland impacts and consolidated mitigation for multiple small wetland impacts into one large site with greater ecological value (Washington State Department of Transportation 2009).

The Illinois DOT wetland mitigation banks include the 830-acre Morris site in north-central Grundy County; the 1,640-acre La Grange site in extreme northeastern Brown County; and the 105-acre Sugar Camp Creek site in central Franklin County. At these sites, wetlands were restored in advance of unavoidable losses from highway projects. Impacts within the bank's approved service area may be mitigated at the bank. Instruments for both the Morris and La Grange bank sites were prepared in accordance with the 1995 federal guidance. Sugar Camp Creek was prepared in accordance with the April 10, 2008, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (U.S. Army Corps of Engineers and U.S. Environmental Protection Agency 2008). The Illinois DOT also sponsors three multiuse wetland compensation sites located on the floodplain of the Mississippi River in Madison and St. Clair counties, which function similarly to banks. Wetlands have been restored on each of the sites before any loss from highway construction. Use of the sites is determined on a case-by-case basis. Each of these sites is or will be protected in perpetuity with a conservation easement or a similar instrument and will be transferred to a resource agency or conservation organization for long-term management (Illinois Department of Transportation, Illinois Wetland Mitigation Banks).

In Lieu Fee

How It Works

An ILF arrangement provides required compensatory mitigation off-site for impacts on Waters of the United States. Generally, funds are paid to a nonprofit or governmental entity such as a state natural resource agency that has performed watershed analyses and planning and carries out the mitigation project. ILF mitigation is based on watershed needs identified by the state, watershed groups, and other conservation partners. The purchaser of ILF credits provides payment for mitigation to a sponsor for a mitigation project, similar to purchasing credits from a mitigation bank, typically providing more flexible implementation. For example, the Florida DOT provides funding to water management districts on a per acre fee,

established by state legislation, for unavoidable impacts. Water management districts conduct water-quality and restoration planning within their districts, identifying both preservation and restoration needs.

Advantages of ILF

Most ILF programs reviewed are offered by nonprofit organizations or land trusts whose primary missions are focused on natural resource conservation; thus, the organizations are geared to maximize ecological benefit rather than maximize financial returns for the owner/investor (Environmental Law Institute 2006). These organizations tend to have expertise in prioritizing sites for their ecological and other environmental values and have significant experience working collaboratively with diverse groups to achieve beneficial ecological outcomes (Environmental Law Institute 2006).

ILF programs have been pioneers in watershed-based site selection and ensuring long-term stewardship of conservation and restoration sites. Programs tend to be targeted by watershed and thus more effective at addressing specific local needs. They also tend to have more intimate, historical knowledge of local resources.

Disadvantages of ILF

Although DOT-supported ILF programs typically ensure compensatory mitigation in advance of impacts, with other ILFs, the lag between the time that permitted impacts occur and when mitigation projects are implemented is more difficult to manage for permittee-responsible and ILF mitigation. Also, securing upfront funds to implement the project can be more challenging for nonprofit organizations and land trusts, which often have less access to the public and private capital necessary to offset the significant upfront expenses typically associated with private or publicly funded banks.

Unrealistic plans for financing acquisition, implementation, and long-term management can be problematic. Some ILF programs have accepted fees after the agreement is in place but before site identification and have underestimated the costs to replace the aquatic resources lost. Accountability and record-keeping were early problems in some cases.

A disconnect between the goals and objectives of USACE and mitigation providers can occur when the goals of the conservation organizations and USACE do not completely coincide. For example, a particular conservation organization may prefer land preservation and focus on larger watershed or ecoregion needs, while USACE may focus on replacing affected aquatic resource functions.

The issues of the Wetland Mitigation Bankers Association and the disadvantages previously described were largely addressed with the 2008 federal mitigation regulations; ILF programs now operate more like a bank. Watershed planning remains a key focus of ILF programs, highly compatible with the decisive focus of the 2008 regulations. A prospectus and ILF instrument must be developed by the sponsor and approved by the district engineer in the appropriate USACE district before compensatory mitigation dollars can be accepted.

Examples of ILF

North Carolina Ecosystem Enhancement Program

In order to deal with a rapidly expanding transportation program with a high volume of new alignment, the North Carolina DOT and DENR designed the Ecosystem Enhancement Program (EEP). EEP evolved from a multiyear effort by state and federal agencies: the North Carolina DOT, DENR, the North Carolina Wildlife Resources Commission, USACE, EPA, and USFWS. Goals were to streamline the project delivery process for transportation improvement projects through the use of a programmatic mitigation approach, to reduce environmental impacts in concert with avoidance and minimization, and to incorporate the compensatory mitigation requirements for these projects into comprehensive watershed restoration and protection strategies. A year of multiagency process-improvement workshops determined that compensatory mitigation should be decoupled from individual permits and project reviews and performed on a watershed basis, with mitigation projects constructed in advance of permitted impacts.

The EEP incorporated the functions of the North Carolina Wetlands Restoration Program, a state ILF program initiated by the North Carolina state legislature in 1996. The program was established by the North Carolina General Assembly as a nonregulatory statewide wetlands restoration program for the acquisition, maintenance, restoration, enhancement, and creation of wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, wildlife habitat, and recreational opportunities. With the inception of EEP, all of the North Carolina DOT's off-site compensatory mitigation needs would be met through EEP, and the EEP's mitigation effort would be watershed based, through analytical efforts conducted on the state level and through consultation with local experts and communities.

EEP protects the state's natural resources through assessment, restoration, enhancement, and preservation of ecosystem functions and through identifying and implementing compensatory mitigation programmatically at the watershed level. The system used by the EEP

- Enables multiple project impacts (wetlands, stream corridor, water quality, species, and habitat) to be addressed in a comprehensive manner, in advance of project impacts.
- Targets mitigation resources to better protect the natural resources of the state by assessing, restoring, enhancing,

and preserving ecosystem functions and compensating for impacts at the watershed level. The program addresses watershed concerns, including preservation of threatened high-quality sites and restoration of wetlands and riparian buffers along impaired streams. The system also ensures that the state and FHWA's "no net loss" objectives are met and surpassed.
- Saves time and money by reducing permit staff workload and project controversy and by improving communication, planning, and environmental stewardship.
- Dramatically increases the ecological effectiveness of the investments of public dollars in compensatory mitigation, thus illustrating better stewardship of public resources, and setting a nationwide standard for mitigation at the ecosystem level for unavoidable impacts resulting from transportation improvements.

EEP's streamlined approach evaluates the cumulative impacts of all transportation projects within a watershed and implements mitigation focused on achieving a net increase in wetland and riparian functions in the watershed and across the state. As it is able and when information exists, EEP incorporates other data trends for private development and municipal infrastructure projects into its estimated watershed approach and mitigation planning effort. The program developed an environmental information and decision support system for identifying watersheds in which to concentrate planning and restoration activities. The system enables a comparison of the relative problems and assets of the local watersheds by relying on GIS data analysis of five broad categories of information: baseline watershed conditions, watershed resources or attributes, watershed problems, potential threats and stressors, and other factors of interest. Local watershed data from existing databases and functional assessments, as well as baseline watershed conditions data, are entered into a watershed attribute matrix for each 14-digit local watershed. Analysis narrows the field of eligible local watersheds by selecting only those areas with a combination of restoration needs and opportunities, potential future stressors (primarily anticipated growth and development), and other factors, such as local interest (North Carolina Wetlands Restoration Program 2001). Once the screening methodology has been applied to identify target areas for restoration, EEP works with local governments, NGOs, and other stakeholders to complete local watershed plans, including a baseline assessment, a detailed watershed analysis, and development of an implementation plan. To ensure that program goals are met, a ledger of implemented projects and actual impacts is produced for each watershed. Annually, these ledgers are compared to determine if "no net loss" of wetland and riparian functions has been achieved. Any shortcomings are programmed for correction in the next cycle. Excess mitigation is reserved for future use. Strategies also take into account North Carolina's Million Acre Initiative and areas of important habitat value, with the goal to leverage the state's and the North Carolina DOT's investment (North Carolina Department of Environment and Natural Resources, Million Acre Initiative).

Florida DOT Wetland Mitigation Program

The Florida DOT Senate Bill mitigation program (currently referenced as Florida Statutes 373.4137) was established by the Florida legislature in 1996 (amended in 2005) to provide regional, multiproject wetland mitigation to offset the impacts of transportation projects on wetlands. With this program, Florida DOT provides mitigation funds to the representative water management district for each acre of wetland affected by Florida DOT's transportation improvement projects. The amount of mitigation funds is predetermined based on a cost per acre of wetland impact and transferred to a state transportation trust fund. During FY 2008–2009, the cost per acre of wetland impact was approximately $99,000.

Each year, each of the state's five water management districts develops mitigation plans for projects that Florida DOT, or another transportation authority, expects to implement in the coming fiscal year. These projects are included in a Florida DOT work plan submitted to the water management districts. Project impacts are estimated and planned for years in advance, but the Florida DOT work plan is updated annually based on priority and the availability of construction funds. After mitigation plans are approved and funds are available, Florida DOT transfers funds into an escrow account within the state transportation trust fund. The water management district may then request a transfer of funds to implement its mitigation projects. Anticipated escrow funds for the next fiscal year form the basis for the program's annual work plan. If no project-specific mitigation plan has been approved by the water management district, then Florida DOT must develop an alternate mitigation plan.

The advantage to using Senate Bill mitigation for Florida DOT projects is that wetland impact costs can be predetermined and budgeted at a much earlier point in the process. This program also allows Florida DOT to mitigate wetland impacts for projects that are not located within a mitigation bank service area and to provide mitigation funds to the water management district without a concern for future maintenance and monitoring costs that would be associated with wetland creation or enhancement. The cost has occasionally been a disadvantage in south Florida, where wetlands are more plentiful and Florida DOT districts can purchase mitigation bank credits at a lower cost with the same assurances of mitigation success. Therefore, not all mitigation for Florida DOT transportation projects is handled with Senate Bill mitigation. It is at each district's discretion to use the Senate Bill program based on impact costs and coordination with the local water management district.

Nationwide Permits, State Programmatic General Permits, and Regional General Permits

How It Works

USACE issues a nationwide permit (NWP), state programmatic general permit (SPGP), or regional general permit (RGP) to authorize certain activities that result in minimal adverse effects on aquatic resources. These permits provide an abbreviated review process for certain types of activities that USACE has determined would minimally affect the aquatic environment. NWPs apply across the nation, but depending on the geographic region, they may have regional conditions to ensure activities will have minimal impacts on the aquatic environment. SPGPs are general permits issued by USACE that are administered by a state agency on behalf of USACE. RGPs are similarly developed to provide an abbreviated review process for certain types of activities within a certain geographic region.

Advantages and Disadvantages

By developing a project such that an NWP, RGP, or SPGP would apply, applicants have shown strong actions to avoid and minimize potential impacts. It is these projects in particular that can benefit from advanced compensatory mitigation measures such as banks, ILFs, and similar actions. SPGPs and RGPs can reduce duplication of effort and enable tailoring of specific general permits to types of projects and unique local conditions not covered by NWPs. RGPs can be developed in association with special area management plans (SAMPs) and watershed plans to implement their preservation, enhancement, and mitigation objectives while adding predictability to the development process.

Examples of NWPs, SPGPs, and RGPs

Florida DOT and Florida Turnpike Enterprise Regional General Permit SAJ-92

This permit is authorized for use only in nontidal Waters of the United States and within the operation areas of the Florida DOT and Florida Turnpike Enterprise and applies to three types of projects specifically approved by FHWA. These types of projects are Type 1 categorical exclusions, programmatic categorical exclusions, and capacity improvement projects. This permit is limited to linear transportation projects that have been reviewed through the Florida DOT efficient transportation decision-making process (U.S. Army Corps of Engineers 2008).

Oregon Regional General Permit

An RGP approach was also developed in Oregon. Prior to the Oregon Bridges project, an interagency process-improvement group using the Collaborative Environmental and Transportation Agreement for Streamlining tracked environmental impact statement–level projects and environmental assessment–level projects and facilitated discussion and concurrence points. The bridge program benefited from "a list of where the bridges were and a lot of really good scoping information, which went into the baseline reports. They had a lot of information on the impacts. That provided a high enough level of comfort to develop a RGP." The Oregon Bridges program uses several appropriate NWPs in addition to the RGP they developed.

Special Area Management Plans

How It Works

SAMPs balance aquatic resource protection and reasonable economic development and result in both abbreviated Section 404 permitting and restrictions on undesirable activities. SAMPs can also be used to facilitate a watershed approach and transfer of development rights from areas where development should be avoided to areas where development may be allowed. SAMPs can address comprehensive infrastructure plans, including power lines, communication lines, and water, sewer, and gas lines. SAMPs are often developed in geographic areas of special sensitivity under intense development pressure. They offer comprehensive advance planning to identify wetlands that merit protection and others that may be developed, as well as increased predictability for property owners, project planners, and local governments. RGPs are often based on SAMPs. Development of programmatic and general permits based on SAMPs is also a goal (Field 2004).

SAMPs usually develop landscape-level functional assessments, watershed-scale indices of the ecological integrity of riparian resources, alternatives analyses, and watershed restoration plans. Interagency, public, and stakeholder involvement is an essential part of the SAMP. The SAMP should not be considered as a super permit that accelerates development in the watersheds, but it does give greater clarity and predictability to conservation priorities and development processes. DOTs can use these landscape plans and mitigation priorities to seek and develop advance mitigation opportunities focused on sites in the SAMP already endorsed by other agencies.

Advantages and Disadvantages

Districts that have adopted this watershed approach have seen initial positive outcomes in terms of time efficiencies and program effectiveness. Having information on wetland locations and priority restoration and conservation areas available greatly increases the voluntary and proactive wetland avoidance that can occur on local, regional, and state levels. Categorization of wetlands into those that are critical and not-so-critical to

protect is controversial, though there is recognition of the need to ensure public resources (including conservation and restoration investments) are spent wisely.

Adopting an ecosystem approach to infrastructure projects allows USACE some flexibility in assessing the effects of activities in uplands on Waters of the United States and gaining other agencies' buy-in and assistance in addressing indirect and cumulative impacts beyond USACE scope, as well as priority conservation and restoration needs. In sum, the watershed approach enabled by SAMPs, ILFs, and now mitigation banks gives USACE more influence over Waters of the United States and the functions and values they provide and a better chance at protecting them.

When used as a tool to direct resource planning, SAMPs are considered more strategically focused on critical regional ecological resources than the traditional project-by-project mitigation site-identification process. Traditional approaches to mitigation in the site-specific context may lead to the cumulative loss of resources over time; in contrast, SAMPs are fashioned to take into account indirect and cumulative effects on aquatic resources over a region. SAMPs can provide DOTs with valuable baseline information on what high-priority aquatic and terrestrial resources exist and also can address priority restoration needs. SAMPs often identify lower-priority wetlands, as well, which are either less critical to protect for their immediate value or which could offer restoration priority areas. USACE has found that developers' proposals tend to avoid the most important resources; they also tend to offer creative proposals for how to restore priority areas (personal communication with Corps SPL District staff, including M. Durham and C. Farrar, 2009 and 2010).

Examples of SAMPS

Examples of completed SAMPS are provided in Table 5.3.

Coastal Zone Management Program

SAMPs are used by USACE and NOAA as part of their coastal zone management program. The Los Angeles District's objectives in implementing watershed plans were to maximize environmental protection and use their own staff resources better. Through the mechanism of a SAMP, the district was able to identify important resources, steer impacts away from the most critical ones, determine levels of impacts (at both direct and cumulative scales) that could be considered minor, and offer appropriate permitting vehicles for both minor and larger projects. The Los Angeles District found that since SAMPs and associated RGPs have been in place, applicants have been able to recognize key areas and resources early in the planning process and better avoid impacts on these important ecosystem components. This reduces, and in some cases eliminates, potential conflicts between agency and applicant and eases the permitting process. Although ecosystem outcomes have not been measured in a functional sense, the approach has led to better protection of resources and functions, better use of USACE staff time (as well as applicants' staff time), and a better understanding of the resource.

Alternative Development Scenarios and Ecosystem Integrity in Southern California

Several landscape-scale assessment efforts, including SAMPs for aquatic resources, are being led by the Los Angeles District and staff from the USACE Engineer Research and Development Center. Watershed-scale aquatic resource delineations were undertaken for each SAMP by using field-verified GIS and remote sensing to determine where riparian ecosystems and other aquatic resources exist in the study areas. Based on the delineation, the watersheds were divided into "riparian reaches," relatively homogenous assessment units. Baseline assessments of riparian ecosystem integrity were performed for each of the riparian reaches in the study area. The assessment process includes consideration of three indicators: hydrology, water quality, and habitat integrity.

Groups of indicators were then combined to generate hydrology, water quality, and habitat integrity indices. Based on the index scores, the reaches were ranked according to their ecological integrity. The reach rankings were among the factors considered in analyzing alternatives and developing watershed restoration plans.

To determine which development scenarios would result in the least degradation of riparian resources, baseline ecological index values were compared with the index values under various simulation conditions. In the watershed restoration plan, riparian restoration opportunities within the study area were identified and compared. For each riparian area, the SAMP team estimated a restoration potential, a measure of functional restoration that is practical given existing conditions, with particular focus on geomorphic features and processes. The team can assess the cost-effectiveness of various combinations of restoration activities, such as concentrating restoration in the most degraded reaches or prioritizing those projects that are expected to provide the greatest functional lift per unit of effort.

All inventory, assessment, alternatives analysis, and planning activities are linked to GIS databases, allowing the integration and visualization of the full range of data for other watershed planning activities in the study area, and expanded alternatives analyses for major highway projects (Environmental Law Institute 2004).

Riverside County Integrated Project

The Riverside County Integrated Project involves the integration of land use, transportation, and conservation planning to develop a consensus for the future development of Riverside County. It is considered a cutting edge project by locals and it is

Table 5.3. Representative Completed SAMPs

SAMP Project (State)	Description	Source for Additional Information
San Juan Creek Watershed–San Mateo Creek Watershed (California)	USACE Los Angeles District conducted a comprehensive aquatic resource plan to achieve a balance between aquatic resource protection and reasonable economic development.	http://www.spl.usace.army.mil/Media/FactSheets/tabid/1321/Article/2925/regulatory-program.aspx
Riverside County (California)	The County of Riverside undertook an integrated planning effort (Riverside County Integrated Project) that includes transportation, habitat conservation (multispecies habitat conservation plan), and the county's general plan (local land use) in two watersheds. The goal is to establish a watershedwide aquatic resource reserve program and to minimize individual and cumulative impacts of future projects in these watersheds.	http://environment.fhwa.dot.gov/integ/case_riverside.asp
South Wilmington (Delaware)	The project area includes lands south of the Christina River within Wilmington, Delaware, and a portion bordering New Castle County, down to I-495. The south side of the Christina River, although urban in nature, has remained largely underused and represents one of the most significant opportunities for economic development and community revitalization in the region. This area, known as South Wilmington, is approximately 1.6 square miles. Industrial and heavy commercial uses dominate the area, particularly along the waterfront. A long industrial history has resulted in numerous areas with suspected or known soil contamination, an important consideration for redevelopment planning.	http://www.dnrec.delaware.gov/coastalPages/WilmingtonSAMP.aspx
Upper Turkey Creek (Kansas)	According to the SAMP information sheet: SAMP goals include establishing an Upper Turkey Creek advisory committee to identify, coordinate, and implement actions that address Turkey Creek resource needs. Identifying opportunities and mechanisms to educate and involve the public in enhancement of Turkey Creek is also a priority. The SAMP sought to improve Turkey Creek water quality to support native aquatic communities and enhance and maintain high-quality aquatic and terrestrial habitat in the Turkey Creek watershed. Detailed, comprehensive statements of policies, standards, and criteria to guide public and private uses of lands and waters were developed, as well as outlines of mechanisms for implementation. A regulatory component addressing USACE 404 permits, stormwater permits, and EPA regulatory information was established, as well as other relevant regulatory components identified and agreed to through memoranda of understanding (MOUs) with the various agencies and stakeholders, giving some sense of continuity and predictability based on a watershed area approach.	http://www.watershedinstitute.biz/files/Turkey_Creek_SAMP_INFORMATION_SHEET-_20072.pdf
Mentor Marsh (Ohio)	This comprehensive plan sets out natural resource protection and economic growth plans for this large wetland complex on the southern shore of Lake Erie in Mentor, Ohio. The plan contains statements of policies, standards, and criteria to guide public and private uses of lands and waters within its watershed.	http://www.dnr.state.oh.us/Portals/13/partners/mentorplan.pdf
Beaufort County (South Carolina)	This SAMP addresses stormwater and other sources affecting the waters of Beaufort County. It identifies the necessary actions needed to prevent further deterioration of county waters and addresses a broad range of topics and activities, including stormwater controls and management, wastewater management and septic systems, boating, and water-quality monitoring needs.	http://www.scdhec.gov/environment/ocrm/docs/SAMP/BFTS/bsamp.pdf
Revised Salt Pond Region (Rhode Island)	Four priority areas for enhancing the Rhode Island Coastal Resources Management Program are addressed: SAMP, cumulative and secondary impacts, wetlands, and public access. The revisions to the SAMP also implement recommendations of the Narragansett Bay Project by developing statewide critical resource protection policies. The revisions will facilitate the implementation of Rhode Island's Coastal Nonpoint Pollution Control Program. Beyond fulfilling program requirements and recommendations, the revisions to the SAMP address the challenge of a growing population and the need for innovative land use controls to address the impacts of existing and proposed development on the salt ponds.	http://www.crmc.state.ri.us/regulations/SAMP_SaltPond.pdf
Murrells Inlet (South Carolina)	Phase 1 of the Murrells Inlet SAMP involves work in partnership with Georgetown and Horry Counties to ensure that water quality is given equal consideration to water quantity in the drainage improvement projects being undertaken in the inlet watershed. To do this, the SAMP will develop and fund a demonstration project to treat stormwater runoff to provide sufficient filtration and settling before the water reaches the inlet, examine the potential to retrofit roads and bridges that are shown to be high-impact runoff problems in the watershed, and provide input to Georgetown and Horry Counties on how they may reduce impervious surface coverage and/or move it away from receiving waters.	http://www.scdhec.gov/environment/ocrm/plan_tech/samp.htm

intended to streamline the environmental process while establishing long-term development goals. The project integrates four plans: a new general plan, four new transportation corridors under the Community and Environmental Transportation Acceptability Process, a multispecies habitat conservation plan (MSHCP), and a SAMP. A SAMP was developed to assist federal, state, and local agencies in their permitting decision-making process to protect, restore, and enhance aquatic resources while accommodating various types of development activities. The SAMP establishes an expedited review process by USACE under CWA Section 404 in conjunction with a programmatic streambed alteration agreement with the California Department of Fish and Wildlife. Mitigation designed in accordance with the SAMP and other plans increased assurance of mitigation acceptability for all parties (Riverside County Integrated Project, no date).

Advance Identification of Aquatic Resources

How It Works

The EPA sponsors advanced identification of aquatic resources (ADID) pursuant to CWA with USACE and other partners in areas where development, mining, agricultural, or other pressures threaten high-quality or locally critical wetlands. ADIDs protect wetlands by providing science-based information to those making local land use decisions. Impacts on critical wetlands identified through an ADID would cause a high level of scrutiny or the rejection of a permit application.

Advantages and Disadvantages

The ADID process provides a means to identify high-quality wetland resources in a region or at the watershed scale. The intent of identifying these high-quality wetlands in advance is to guide development away from the resource. Newer wetland mapping and data consolidation methods could increase the ease and efficiency of advance identification of wetland characterization methods and boost their use in regulatory permitting and watershed restoration processes. When used in the regulatory process, advance identification of the best locations for mitigation increases certainty and assurances that mitigation in those locations will be acceptable. The ADID approach has been considered expensive and somewhat controversial to implement, as some property owners might feel their land values have been diminished along with its development potential if high-quality wetlands are identified on-site.

Examples of ADIDs

Kane County, Illinois

The Kane County ADID study is a cooperative effort between federal (EPA Region 5, USACE Chicago District), state, and local agencies to inventory, evaluate, and map high-quality wetland and stream resources in the county. ADID information is used by federal, state, and local governments to aid in zoning, permitting, and land acquisition decisions. In addition, the study provided information to agencies, landowners, and private citizens interested in restoration or acquisition of aquatic sites. The wetland functions of particular concern were identified and prioritized by a planning and policy committee. In addition, an interagency technical advisory committee developed an evaluation approach that defined two categories of wetland function: habitat value and water-quality and stormwater-storage value. The approach included an assessment of the opportunity of a wetland to perform a specified function, as well as its expected effectiveness in performing the function. Wetlands and streams were evaluated through GIS screening and aerial photo interpretation (U.S. Army Corps of Engineers, Kane County Illinois, Advanced Identification of Wetlands).

Southeastern Wisconsin Regional Planning Commission

Maps of ADID wetlands were developed under a cooperative program with USACE, EPA, and the Wisconsin Department of Natural Resources (DNR). Draft maps showing the aerial extent of ADID wetlands in southeastern Wisconsin are available in PDFs for Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha counties (Southeast Wisconsin Regional Planning Commission, Advanced Identification of Wetland Disposal Areas).

Watershed Restoration and Mitigation Registries

How It Works

Watershed restoration and mitigation registries are an emerging method to identify priority mitigation areas on a watershed basis where funds can be directed to help restore watershed health. Watershed resource registries (WRRs) are considered "a unique tool to integrate Planning, Mitigation and Sustainable Development" and a "blueprint for transitioning from a single program-based approach to an integrated (multi-program) watershed systems approach allowing for greater integration and coordination among regulatory requirements and resource protection efforts" (Denise Rigney. "Green Highways Partnership." EPA Region 3. Presentation. April 8, 2008). The greater coordination and integration may act as a prescreen, improving identification of prospective mitigation sites and their acceptability to regulatory agencies.

As EPA describes it, a WRR helps ensure resource agencies get what they want. The WRR shows where multiple ecological benefits might be found. Sites have been evaluated in a way that maximizes the ecological benefits for the entire

watershed. Selected areas can fulfill multiple beneficial watershed needs and regulatory requirements for a number of agencies at the same time. For example, restoring wetlands adjacent to a Section 303(d)–listed impaired waterway could also address Section 404 wetland compensatory mitigation requirements and Section 401 water-quality requirements while creating habitat resources and improving water quality in the watershed.

The actual methods for identifying mitigation sites, both priority and nonpriority, have ranged from ad hoc websites and databases for posting restoration and mitigation site opportunities to more formal approaches such as completion of comprehensive plans (e.g., SAMPs) and other special studies to identify priority restoration areas. Even these plans vary widely in the level of analysis and information provided, ranging from general inventories of potential sites requiring further study during the development of the mitigation design to detailed studies that essentially serve as watershed plans that spell out specific sites, costs to restore, time frames for completion, and funding.

Advantages and Disadvantages

The integration of traditionally competing regulatory and nonregulatory authorities in one tool can improve resource planning, enhance time and resource efficiency, and minimize redundancies in the decision-making process. At one level, watershed restoration and mitigation registries are not a new concept, as applicants for Section 404 permits have been seeking mitigation sites since the need first arose. Wetland banks were created because the cost to find individual sites took considerable resources on the part of the applicant and because they were a way to mitigate lost functions while satisfying in-kind and out-of-kind mitigation requirements in an efficient manner. Whether they actually contributed to maintaining and restoring watershed health is an issue that has been addressed in several technical publications (Brown and Veneman 2001; Johnson et al. 2002; Kihslinger 2008; Mack and Micacchion 2006).

EPA has attempted to estimate the benefits of the WRR approach. The review is available in a July 29, 2010, webinar (Bryson 2010).

Examples of WRRs

In a 50-state study by the Environmental Law Institute, few states reported having a method for ranking lands and aquatic sites for restoration and a state registry to identify restoration sites (Environmental Law Institute 2008). Connecticut, New Mexico, Oklahoma, and Texas were identified as having a state registry in 2008. Nineteen other states reported that they have a method for prioritizing lands and aquatic sites for restoration. There is a range of examples of watershed restoration and mitigation registries. An overview of methods for identifying priority mitigation sites is provided in Table 5.4, followed by a more detailed explanation of selected examples.

Maryland Water Resources Registry

The USACE Baltimore District, EPA Region 3, and Maryland resource and transportation agencies developed a WRR to

Table 5.4. Overview of Methods for Identifying Priority Mitigation Sites

Method	Description	Key Elements
State mitigation restoration database	Ohio, Oklahoma, and other states have established voluntary web-based databases made available to watershed groups, communities, and project sponsors who may have or are looking for available mitigation sites (Ohio Environmental Protection Agency, Surface Water Enhancement; Oklahoma Conservation Commission, Wetlands Program).	Voluntary web-based databases listing candidate locations for restoration. Detailed listing of site attributes, contact information, physical characteristics of site also provided. Site information is provided by agency or entities seeking mitigation dollars.
Philadelphia Watershed Mitigation Registry	Pilot program intended to identify "ready to go" priority mitigation sites within the watersheds considered critical to Philadelphia's drinking water system.	Sites available for restoration have been established through comprehensive evaluation of urban and urbanizing watersheds. Areas considered important to sustaining drinking water supply. Working with USACE. Representative indicators of created hydrologic, biological, habitat, and social functions determine the value of a project, rather than project acreage.
North Carolina Ecosystem Enhancement Program (EEP)	North Carolina comprehensive watershed management program focused on identifying priority sites for mitigation.	Comprehensive program for providing mitigation in advance of project implementation. Managed by state DNR. Requires annual report from North Carolina DOT indicating the upcoming year's mitigation needs. Most comprehensive program of its type.

(continued on next page)

Table 5.4. Overview of Methods for Identifying Priority Mitigation Sites (continued)

Method	Description	Key Elements
Watershed action plans (Ohio, other states)	Representative example of state program implemented by local watershed groups to identify mitigation priorities (Ohio Environmental Protection Agency 1997).	Voluntary process designed to identify problems and establish program for protection and restoration. Requires participation of public officials and other stakeholders. One of several program examples around the United States.
Species banks—ecosystem marketplace	Clearinghouse for species credit trading designed to provide efficient, transparent, equitable conservation markets to develop and that can be used to identify priority mitigation opportunities. www.SpeciesBanking.com will serve as a platform for conservation bank owners to publicize credit availability, credit buyers to find solutions to their mitigation needs, and prospective bank developers to research current market conditions. It will also allow agency staff to learn about activities outside their jurisdictions, and academics, investors, and others to monitor and analyze industry trends (Ecosystem Marketplace, SpeciesBanking.com).	Basic information such as number of banks, species covered, location, availability of credits, and contact details.
Conservation Registry	The concept of the registry emerged from efforts to understand the scope of conservation activities across the landscape and to identify areas where landowners and organizations can generate the greatest strategic benefits for fish and wildlife. The same group has established a state-specific conservation registry for Idaho, Oregon, and Washington and a regional spin-off in Colorado (The Conservation Registry, no date).	This western United States web-based tool is an accessible database and mapping system that allows users to enter, search, map, and track conservation projects. The registry gathers data from multiple sources, ranging from small organizations and landowners to federal resource agencies, nonprofit organizations, tribes, and foundations. The registry helps users understand the context, distribution, and effectiveness of collective efforts to protect and restore ecosystems.
Watershed resource registry (Maryland)	The WRR shows where multiple ecological benefits might be found. Sites have been evaluated in a way that maximizes the ecological benefits for the entire watershed. Selected areas can fulfill multiple beneficial watershed needs and regulatory requirements simultaneously for multiple agencies. Pilot project of the EPA Healthy Watersheds Initiative, which focuses on maintaining aquatic ecological integrity by conserving and protecting the highest-quality watersheds or intact components of watersheds (U.S. Environmental Protection Agency, Healthy Watersheds).	WRRs evaluate watershed conditions and create a database of sites in a watershed for the protection of high-quality resources, restoration of impaired resources, and the establishment of treatment systems and best management practices (BMPs). A methodology for developing the WRR and for integrating its use in 404 permitting was developed based on a pilot effort focused in southwestern Maryland. EPA says the WRR will aid all those involved in watershed management decisions at the local, state, and national levels by providing the best available information on which to base decisions, in one centralized location.
Pennsylvania River Registry	State effort to identify priority restoration sites on a watershed basis. Funded in part by grants from the Keystone Recreation, Park and Conservation Fund, the Rivers Registry is a component of the Community Conservation Partnerships Program. These river conservation plans have been approved for placement on the registry by the Pennsylvania DNR because they meet or exceed the minimum standards in the Rivers Conservation Program (Pennsylvania Department of Conservation and Natural Resources, Rivers Conservation Program).	One of the older programs in the United States, the registry identifies on a statewide basis where approved watershed plans have been completed. Includes an identification of restoration priorities.

identify preferred locations for conservation and restoration in four watersheds in southwestern Maryland. To support the registry, the Baltimore District GIS staff created a comprehensive mapping tool that suggests what types of activities might be most beneficial to a watershed and where those activities ought to occur. The approach is now being expanded statewide for the following purposes:

- To identify potential CWA Section 404 compensatory mitigation sites based on a watershed analysis and watershed goals and needs in accordance with the 2008 Mitigation Rule;
- To better use state mitigation dollars and to address 303(d)-listed streams and issues highlighted in Section 305(b) reports, thus integrating CWA authorities under Sections 401, 402, and 404 and producing a positive effect on watershed water quality;
- To improve and streamline Section 404, NEPA, and state-developed decision processes;
- To protect, restore, create, enhance, or preserve aquatic resources in rapidly developing watersheds and last remaining linkage areas before these opportunities are permanently lost; and
- To identify mitigation sites that are consistent with the site needs identified in state wildlife action plans, greenways and green infrastructure plans, species recovery plans, ecoregional conservation strategies, and city or regional open space plans (Maryland Watershed Resources Registry, no date).

Assurances Related to ESA Section 7

Compliance with the ESA of 1973, as amended, is a key regulatory driver for conservation of listed (threatened or endangered) species and investment in ecosystem-based mitigation by transportation agencies. Under the ESA, private and public entities invest in species and habitat conservation in order to minimize impacts and provide compensatory conservation measures. USFWS provides transportation agencies assurances that they are in regulatory compliance with the ESA through tools such as incidental take permits, concurrence letters, or biological opinions (BOs) that specify conservation obligations.

Ecosystem conservation and recovery of species, such that listing is no longer necessary, are primary goals of the ESA. As described in Section 2(b) of the act, "The purposes of this ESA are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species" (16 U.S.C. Sec. 1531[b]). That is, the ESA is a primary means to conserve ecosystems and to provide a program to conserve threatened and endangered species and assist in their recovery (ESA Sec. 3 [3]), 50 CFR Sec. 402.02.

A key function performed by environmental professionals, both within the Services and working with the Services, is to ensure this connection is made in permitting and consultation. Assurance methods related to ESA Section 7 are inventoried in this section.

Standard ESA Section 7 Consultations

Section 7(a)(2) of the ESA states that for any federal action that may affect a threatened or endangered species (or its habitat), the action agency must consult with USFWS or NOAA Fisheries to ensure that the federal action (1) is not likely to "jeopardize the continued existence of" an endangered or threatened species and (2) will not result in the "destruction or adverse modification" of the designated critical habitat of the listed species (16 U.S.C. Sec. 1536[a][2]).

Such consultations are known as Section 7 consultations. The *Endangered Species Consultation Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998) provides internal guidance and establishes national policy for conducting consultation and conferences pursuant to Section 7 of the ESA. The handbook addresses the major consultation processes, including informal, formal, emergency, and special consultations, and conferences. The process for managing Section 7 consultations for transportation projects is described in the FHWA *Guidance Memorandum on Management of the Endangered Species Act (ESA) Environmental Analysis and Consultation Process* (2002).

Many of the tools described in this section, including the *Endangered Species Consultation Handbook,* specifically encourage the use of flexibility and innovation while coordinating during the Section 7 process. In a section directly addressing "Flexibility and Innovation," the handbook notes that the "Section 7 process achieves greatest flexibility when coordination between all involved agencies and nonfederal representatives and the Services begins early. Biologists should be creative in problem solving and look for ways to conserve listed species while still accommodating project goals." The handbook also addresses shortening time frames, noting that the Services have been implementing measures to streamline consultation and that "biologists for the Services are encouraged to review examples of these streamlined consultations and to look for ways to incorporate streamlining techniques into other consultation procedures" (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

Preconsultation Under ESA Section 7

Perhaps the most effective manner of streamlining the Section 7 consultation process is to engage the Services in preconsultation

during the planning phase. Preconsultation allows the action agency, in coordination with the Services, to assess the most appropriate method for ESA consultation (i.e., informal, formal, programmatic, or other) for the proposed action. During preconsultation, the Services can provide information regarding the species that might be present, the threats and conservation needs of the species within the area, potential conflicts that may arise, and unique opportunities to further conservation and recovery. The Services and the transportation agency can then work together to address these potential conflicts before the project design is set, while design flexibility may still exist, and while the maximum set of conservation or mitigation alternatives are available. During this process, transportation agencies have the option of addressing candidate as well as listed species and of seeking programmatic consultation on an ecosystem approach encompassing all species of concern. Closer to the time of project implementation, if the Services review the proposed action and find it to be consistent with the conservation strategy and design standards previously agreed to, a final BO can typically be issued in an expedited manner.

Recovery Plans

Section 7 consultations are informed either by species recovery plans or by recovery strategies or outlines when plans have not yet been developed or approved. In their *Interim Recovery Planning Guidance,* the Services state that

> [w]herever possible, recovery plans should focus on the broader view of the species' health, by working to ensure the health of its habitat and ecosystem functions, rather than the narrower view of looking at the species only. As implied in the ESA, conserving the ecosystems upon which a species depends is more likely to ensure the species' long-term viability. In keeping with the ESA's directive, this guidance focuses not only on the listed species themselves but also on restoring their habitats as functioning ecosystems. (U.S. Fish and Wildlife Service and National Oceanographic and Atmospheric Administration 2004)

The 2004 *Interim Recovery Planning Guidance* further notes that while single-species recovery plans have been the most common type of plan prepared since the enactment of the ESA, multispecies plans and ecosystem plans have gained increasing currency since the mid-1990s. The guidance states that

> It is important to note that, although the ESA appears to focus on the individual species, subspecies, or distinct population segments, the purposes of the ESA include conserving the ecosystems upon which listed species depend. Recovery plans should aim to address threats by restoring or protecting ecosystem functions or processes whenever and wherever possible. . . . (U.S. Fish and Wildlife Service and National Oceanographic and Atmospheric Administration 2004)

USFWS and NOAA Fisheries are charged with developing and implementing recovery plans for the conservation and survival of species (ESA Sec. 3 [f]) and then using this information in the consultation process. Recovery-related resources that may be used in addition to actual recovery plans include the following:

- *Interim Endangered and Threatened Species Recovery Planning Guidance, Version 1.2* (National Marine Fisheries Service 2004, Section 5.1 updated 2007): This guidance stresses the importance of stakeholder input and the formation of partnerships in recovery planning. Valuable indicators of success are included that infrastructure and conservation partners can use in developing and evaluating the success of ecosystem efforts.
- *Five-year reviews:* Five-year reviews may be an excellent source of the most recent rangewide information on listed species. A 5-year review is a periodic analysis of a species' status conducted to ensure the listing classification of a species as threatened or endangered is accurate. It does not involve rulemaking; the review only recommends whether to change the species' classification, thus indicating that a rulemaking may be necessary.
- *SLOPES:* USFWS, in consultation with USACE, is developing procedures for improving coordination on projects that may affect listed species or critical habitats designated under the ESA. This has resulted in the creation of standard local operating procedures for endangered species (SLOPES), which provide a stepwise process to assist federal agencies, state, and local governments, as wells as individuals, in developing a determination as to the extent that a federal action will affect federally listed species or critical habitats. SLOPES also identifies options that may be available to avoid or minimize the effects of the action. From this process, modifications can be proposed which, if implemented, will protect listed species from activities that otherwise could be harmful.
- *Wildlife action plans:* To receive federal funds through the State Wildlife Grants program, Congress charged each state and territory with developing a state comprehensive wildlife conservation strategy, or wildlife action plan. These plans set a vision and a plan of action for wildlife conservation and funding in each state (Association of Fish and Wildlife Agencies, State Wildlife Action Plans).
- *Watershed and ecoregional conservation plans:* These plans have been developed by various nonprofit organizations. Among the most well-known, and based on Natural Heritage Program (NHP) data, are The Nature Conservancy's Ecoregional Conservation Plans, available with coverage of all of the lower 48 states, and The Conservation Fund's Green Infrastructure Plans.

FHWA Web-Based Biological Assessment Tool

The FHWA web-based BA tool is an online resource to streamline preparation and submittal of complete regular, non-programmatic BAs under ESA Section 7, for which FHWA is the lead federal action agency.

The five priorities that drove development of the tool were

- Streamline the BA development process by helping preparers develop complete and accurate BAs.
- Reduce project delays associated with incomplete BAs and requests for additional information.
- Expedite regulatory review and decision-making transactions.
- Promote BA consistency (among states and projects), accountability, and administrative transparency.
- Track BA development activities across the nation (Federal Highway Administration 2009).

The tool does not facilitate programmatic approaches, but it offers support in many other areas to "demystify and expedite BA development, submittal and review," including

- Library, glossary, search, and FAQ resources;
- Nationally standardized BA template with context-sensitive instructions;
- Geographic contacts and resources;
- Secure online file cabinets to improve coordination, collaboration, and administrative documentation; and
- Geospatial, project archiving with posting, and searching functionality (Federal Highway Administration 2009).

The tool's online file cabinet saves time and facilitates the exchange of information among team members. The tool is self-explanatory and user friendly, outlining the highest or most detailed level of information likely to be required in a BA. In this manner, the tool tilts toward project-specific consultations developed after all design information is available. It does not yet offer a template for an ecoregional or programmatic approach. This lack does not mean that programmatic consultations are not allowed and encouraged by the Services and FHWA; rather, it indicates that standardization and quality improvement for regular BAs were pursued first.

Programmatic Section 7 Consultations

How It Works

Programmatic consultations are used to evaluate the potential for federal agency programs to affect listed species and designated critical habitat. These programs guide implementation of the agency's future actions by establishing standards, guidelines, or governing criteria to which future actions must adhere. Programmatic consultations address species, habitat, or project needs on a multiple-project scale, often addressing ecosystems as well as individual species. Consultation must, in the end, address impacts on, and have a nexus to, species individuals, but impacts can be addressed "by proxy" in terms of "all individuals associated with or dependent upon" a particular habitat area.

Federal agencies are free to consult on programs, plans, or strategies, although consultation is optional prior to project development in the transportation process. In cases in which a federal agency adopts or approves a plan (e.g., a long-range transportation plan or a statewide transportation improvement program) or strategy that will be used to guide the development and implementation of future projects, a programmatic approach can be executed, involving two tiers of federal agency action. The first-tier action is to adopt the broad plan or strategy; second-tier actions involve implementing individual actions or projects that occur under the plan. FHWA does not typically consult on plans, but USFWS certainly can and is accustomed to doing so in other sectors. FHWA and DOTs have the option to include candidate species, as well as listed species, in a programmatic Section 7 consultation.

If future actions or species information are uncertain, Service staff project or estimate the potential effects of future actions in order to conservatively protect the species. Acres or other measures of impact are tracked as projects occur, and the baseline is updated as appropriate. Changing information on the status of the species is updated, as well. The Executive Order 13274 Integrated Planning Work Group advises development of a "landscape-scale perspective" to facilitate inventory of target resources using existing information and to determine the status and trends of target resources and supporting ecosystem values. From this, a conservation strategy may be developed. Such a strategy enables more efficient and effective identification of fatal flaws, conservation needs, and partnership opportunities.

Court cases over the past decade have upheld USFWS' ability to conduct programmatic or "tiered" consultations (*Buckeye Forest Council v. U.S. Forest Service,* 04-259 [S.D. Ohio, Western Div., July 20, 2005]; *Gifford Pinchot Task Force v. United States Fish and Wildlife Service,* 378 F.3d 1059 [9th Cir. 2004]; *Pacific Coast Federation of Fishermen's Associations v. National Marine Fisheries,* No. 97-CV-775, 1998 WL 1988556 [W.D. Wash., May 29, 1998]).

Lessons learned from those cases relevant to programmatic consultations may be summarized as follows (*Pacific Coast Federation of Fishermen's Associations v. National Marine Fisheries,* No. 97-CV-775, 1998 WL 1988556 [W.D. Wash., May 29, 1998]; *Pacific Coast Federation of Fishermen's Association v. National Marine Fisheries Service,* 71 F.Supp. 2d 1063 [W.D. Wash., 1999], *Pacific Coast Federation of Fishermen's*

Association v. National Marine Fisheries Service, No. 99-36027 [9th Cir. 2001]):

- Provide a rationale for watershed or landscape-scale analysis.
- Aggregate the effects of site-specific actions when considering regional-scale plans.
- Analyze and verify whether site-specific projects are compliant with the conservation strategy and that mitigation actually occurs. Assess whether the appropriate elements of the plan's standards and guidelines are being implemented.
- Explain treatment of short-term effects and their potential to jeopardize listed species.
- Consider resource conditions immediately postaction, not only 10 years in the future.
- Do not disregard management plans that have already been developed or adopted for the species of concern, especially when binding standards or guidelines have been developed.
- Show consideration of cumulative effects.

Advantages and Disadvantages

Landscape conservation and addressing climate change are USFWS priorities in conjunction with the strategic habitat conservation approach. USFWS leaders have noted that programmatic Section 7 consultations are a primary way to address these priorities.

Programmatic consultation has been avoided in some cases due to the level of information available in planning. However, at the earliest stages of transportation planning, much is known that can be used as the basis of a programmatic BA and BO:

- The location of transportation activities is known. All states know where the existing transportation network is located. In many states, this existing network and infrastructure (including off-system bridges) now receives over 99% of the state's infrastructure investment.
- The types of transportation activities occurring there are known; generic descriptions of transportation activities have been compiled by USFWS staff and DOT counterparts in the development of programmatic approaches in multiple states.
- Species of concern (listed and other declining species) are often known or can be identified, and habitat associations and range can be drawn from known and readily available data or modeling (or in older programmatic cases, often the best professional judgment of USFWS, NGOs, and university scientists).

According to the USFWS interim guidance on programmatic consultation,

> Programmatic consultation techniques have the greatest potential to increase the efficiency of the Section 7 consultation process because much of the effects analysis is completed one time, up front rather than repeatedly each time a new action, or batch of actions, is proposed. By completing this analysis up front in a programmatic consultation document, the anticipated effects of the action agency's future projects can be added into the environmental baseline before the project's completion, providing predictability for action agencies as they can be assured that the effects of their future actions have already been broadly accounted for. Thus, all other future Section 7 consultations (i.e., those not covered by the programmatic consultation document) will be evaluated within the context of these effects having already been added to the environmental baseline. By completing this analysis up front, the process for completing consultation for future actions proposed under the programmatic consultation can be dramatically shortened. (U.S. Fish and Wildlife Service 2003)

Types of Programmatic Approaches

Tiered and Appended Programmatic Consultation Approaches

When there is insufficient information regarding individual future actions to complete a batched-programmatic consultation, a tiered or appended programmatic consultation approach may be used. Both types of programmatic approaches involve the initial development of a programmatic BO that analyzes the potential effects of implementing the federal agency's program, followed by the development of appropriate project-specific documentation that addresses the specific effects of individual projects that are proposed under the agency's program. In the case of the tiered programmatic approach, the Service complete a project BO that tiers to the programmatic opinion. In the case of the appended programmatic approach, the Service produce project-specific documentation that is physically appended to the programmatic BO.

Incidental take is not generally exempted at the program level for these two approaches, as there is typically insufficient project-specific information. Under the tiered approach, the project-specific BO will contain a stand-alone incidental take statement; under the appended approach, each specific project is appended to the program-level incidental take statement (the take exemption takes effect at the time that each specific project is appended to the statement).

Batched-Programmatic Consultation Approach

Though it is not the classic form of programmatic consultation, the batched approach is widely used. Under this programmatic consultation approach, the action agency groups, or batches, a series of proposed projects into one proposed action, and the Service produce a single BO or concurrence letter to fulfill the action agency's consultation requirements. In effect, several individual consultations are combined into one document.

Considerable project-specific information is required for this approach. The design of each project is sufficiently developed to accurately assess its potential effects and anticipated take, if any. Thus, the effects of each project are evaluated both individually and cumulatively within one document. This approach, although the most legally protective, is not always practical as it requires the action agency to have its specific future actions sufficiently developed to accurately evaluate their impacts. This approach can be used when there is sufficient information to exempt take at the program level, and no further project review is needed.

For Oregon's programmatic BA for bridge repair and replacement, agency representatives determined that a formal, streamlined batched-programmatic Section 7 federal ESA consultation would be the most effective and efficient approach to environmental compliance for the Bridge Program. In contrast to a strictly programmatic approach, a batched-programmatic approach was deemed appropriate because the proximity, distribution, duration, and disturbance frequency of the proposed action were known (these are formally recognized batched elements); and the timing, nature of the effect, disturbance, intensity, and severity are controlled through measures administered throughout the Bridge Program (these are the programmatic elements) (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998). This consultation approach had been used in previous Section 7 consultations, such as the Wildland Urban Interface Fuel Treatment batched-programmatic BA prepared by the Southwestern Region of the U.S. Forest Service (U.S. Department of Agriculture 2001).

The Oregon DOT's selection of a batched-programmatic consultation assured the Services that the level of effects analysis would provide the detail needed to adequately assess overall program impacts. This approach provided numbers of bridges, acreages of affected habitat, and species-specific effects analysis and enabled a "no jeopardy" determination under Section 7 of the ESA.

Examples of Programmatic Section 7 Consultations, BAs, and BOs

Several sample programmatic Section 7 consultations, BAs, and BOs were reviewed. Table 5.5 summarizes their essential features.

The model programmatic consultation was developed for this project and is included in the *Practitioner's Guide,* the third volume in this series. The template programmatic BA and BO combines basic elements of successful programmatic agreements that have been developed around the United States. It draws from approaches that have received awards within and outside of USFWS. The Colorado Field Office received an award from USFWS headquarters for the shortgrass prairie initiative, a 20-year advance mitigation programmatic BA–BO and conservation strategy for listed and nonlisted species, accompanied by on-site conservation measures for aquatic species. Example text from the Oregon Bridges batched BA–BO is also included. Both measures have also received environmental excellence awards from FHWA.

The range of actions, geographic scale, habitats, and species covered by a programmatic agreement can vary widely; thus, the complexity of a programmatic agreement can increase as it includes multiple actions over a large area and adverse effect determinations with incidental take. For those transportation agencies with little or no programmatic agreement experience, the template offers an approach that is achievable with a level of data all states and DOTs generally have. The sample language is provided in plain English (avoiding legalese) as guidance to exemplify the nature and scope of each section of the agreement.

Conservation Banks

How It Works

USFWS describes a conservation bank as a parcel of land containing natural resource values that are conserved and managed in perpetuity for listed species and is used to offset impacts occurring elsewhere to the same resource values (i.e., in-kind mitigation) (U.S. Fish and Wildlife Service 2003). Conservation banks are established for the long-term protection of a specific species that is affected on a project's site. They enable large, contiguous areas of habitat to be preserved, restored, created, or enhanced to compensate for impacts on species and their habitats. Conservation banking differs from wetland banking in that the goal is not to replace the functions and values of the habitat, but to employ a broader concept of offsetting adverse impacts or providing net benefits to the species as a whole, rather than individual members of that species.

Conservation banks may be established on tribal, state, local, or private lands. The value of the natural resources within a bank's lands is translated into credits and may vary by habitat type or management activities. Some of the biological criteria used when determining credit values may include habitat quality and quantity, species covered, conservation benefits, property location and configuration, and available or prospective resource values (U.S. Fish and Wildlife Service 2003). USFWS affirms preservation of existing habitat with long-term conservation value as an appropriate target of conservation banks; such investments can offset the loss of isolated and fragmented habitat that may have little long-term value to the species. The price for bank credits typically includes funding for acquisition and long-term natural resource protection and management.

Conservation banks must be approved by USFWS and the state agency responsible for protecting state-listed species.

Table 5.5. Sample Programmatic Section 7 Agreements, Biological Assessments, and Biological Opinions

State	Title	Year	Agencies	Proposed Action	Action Area	Species Covered	Incidental Take	Mitigation–Compensation
California	Programmatic Formal Endangered Species Act Consultation on Issuance of 404 Permits for Projects with Relatively Small Effects on Listed Vernal Pool Crustaceans within the Jurisdiction of the Sacramento Field Office, California	1996	USFWS USACE	Any action under review by USACE that meets the conditions of the agreement. Actions are limited to projects "involving relatively minor impacts"; however, this is not defined.	20 counties	Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool tadpole shrimp, vernal pool fairy shrimp.	Unknown number of covered species and their cysts and up to 50 acres of their habitat in each of 20 counties.	Required preservation component, either on-site or in "ecosystem preservation bank." Also requires creation either on-site or in habitat mitigation bank.
California	Programmatic Biological Opinion on the Effects of Minor Transportation Projects on the San Joaquin Kit Fox, Giant Kangaroo Rat, Tipton Kangaroo Rat, Blunt-nosed Leopard Lizard, California Jewelflower, San Joaquin Woolly-threads, Bakersfield Cactus, and Recommendations for the San Joaquin Antelope Squirrel	2004	USFWS California Department of Transportation (Caltrans)	Repair, rehabilitation, maintenance, and other routine activities related to the operation of the California State Highway Transportation System. USFWS reviews proposed project to determine if project is appropriate to append to programmatic BO or needs individual BO.	Within 1,000 feet of Caltrans roadways in 10 counties; also within 1,000 feet of Caltrans stockpiles, access, and borrow site locations in these 10 counties.	San Joaquin kit fox, giant kangaroo rat, Tipton kangaroo rat, blunt-nosed leopard lizard, California jewelflower, San Joaquin woolly-threads, Bakersfield cactus, San Joaquin antelope squirrel.	San Joaquin kit fox–880 acres; blunt-nosed leopard lizard–760 acres; giant kangaroo rat–710 acres and 2 individuals; Tipton kangaroo rat–630 acres and 2 individuals.	Land acquisition for newly disturbed habitats within same county where project occurs (unless otherwise approved by USFWS). Wildlife crossings for kit fox at 0.25-mile intervals.
Colorado	Colorado Central Shortgrass Prairie Initiative Memorandum of Understanding and Programmatic Biological Opinion	2003	USFWS Colorado DOT FHWA Colorado Department of Natural Resources and Division of Wildlife The Nature Conservancy Colorado Natural Heritage Program	All construction and maintenance activities on the existing right-of-way and existing bridges (on or off system) in the eastern third of the state, over a 20-year period.	Eastern third of the state (shortgrass prairie ecoregion), including the state's most- and least-populated areas.	36 species including the bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, lesser prairie chicken, loggerhead shrike, long-billed curlew, McCown's longspur, mountain plover, black-tailed prairie dog, Massasauga rattlesnake, Texas horned lizard, western box turtle, Arkansas River feverfew, pueblo goldenweed, roundleaf 4-o'clock.	Anticipates incidental take of bald eagle will occur through permanent or temporary loss of food and cover habitat. Calculated 3,688 acres maximum potential loss of habitat.	Acquired and preserved a minimum of 15,160 acres of habitat (1:1 ratio of potential impact to mitigation acres). Contracted with The Nature Conservancy and Colorado NHP to identify and manage mitigation lands.

(continued on next page)

Table 5.5. Sample Programmatic Section 7 Agreements, Biological Assessments, and Biological Opinions (continued)

State	Title	Year	Agencies	Proposed Action	Action Area	Species Covered	Incidental Take	Mitigation–Compensation
Ohio	Programmatic Agreement for the Ohio Programmatic Biological Opinion–Department of Transportation's Statewide Transportation Program and its effects on the Indiana Bat	2007	USFWS FHWA Ohio DOT	Continuing implementation of Ohio DOT's statewide transportation program, including current and future road construction and maintenance projects over a 5-year period (2007–2012).	Statewide	Indiana bat	Anticipate no more than 15 takes each year for 5 years (total = 75 takes). Anticipates up to 22,118 acres of suitable Indiana bat habitat will be removed due to projects over the 5-year period.	(1) Protection of land/habitat through conservation easement or deed restriction; (2) protection/restoration of riparian forage areas; (3) protection/restoration of forested wetland foraging areas; (4) tree planting to create future suitable habitat, travel corridors, and restore connectivity of habitat; (5) invasive species plant control; (6) mist-nest surveys on public land to refine knowledge of suitable habitat areas (research bank).
Oregon	Programmatic Biological Opinion–Oregon Department of Transportation's OTIA III Statewide Bridge Delivery Program	2004	USFWS NOAA Fisheries FHWA USACE Oregon DOT	Repair and replacement of 430 bridges.	Statewide	3 mammals 4 birds 9 fish 2 invertebrates 9 plants	Take of fish species quantified by (1) number of individuals handled and mortality; and (2) permanent and temporary area (acres) and length (feet) of riparian vegetation. disturbance. Acres of habitat removal, acres of harassment, and number of known nests used for terrestrial wildlife.	As of the BO date, specific methodologies for developing conservation priorities, refining estimates of impacts, and identifying and targeting appropriate mitigation actions were under development. Oregon DOT will establish a network of habitat management areas distributed across various ecoregions of the state.

Conservation banks must remain under active management in perpetuity and can be either privately or publicly owned. In each case, the bank operator is allowed to sell credits to infrastructure agencies needing to satisfy legal requirements to compensate for their projects' environmental impacts. When an agency buys conservation bank credits, the entity that owns the bank is making that guarantee when it is permitted by the USFWS and when it sells the credit. The price of the credit covers the guarantee.

The *Guidance for the Establishment, Use, and Operation of Conservation Banks* provides a collaborative, incentive-based approach to endangered species conservation that can aid in species recovery (U.S. Fish and Wildlife Service 2003).

Advantages and Disadvantages

Release of Liability

Once credits are purchased from a bank, a DOT is no longer responsible for ensuring the success of the conservation action effort. That responsibility is placed in the hands of the bank site's developer, who is likely much better suited to managing conservation lands than is the DOT. This differs from the situation in which a DOT acquires and/or performs conservation actions and remains responsible for ensuring success of the conservation activity.

Use of Credits for Multiple Species

Credits may be bought, sold, or traded for the purpose of offsetting adverse impacts of federal, state, local, or private activities. However, conservation credits may only be exchanged for debits resulting from projects that affect a species specifically covered by the bank. In some instances, a conservation bank may contain habitat that is suitable for multiple listed species. When this occurs, it is important to establish how the credits will be divided. Credits from a conservation bank may be used to compensate for impacts of activities regulated under Section 7 or Section 10 of the ESA, as well as environmental impacts authorized under other programs (e.g., NEPA and state or local regulatory programs). For this application, the same credit may be used to compensate for an activity that requires authorization under more than one program; however, the same credit cannot be used to compensate for more than one activity (U.S. Fish and Wildlife Service 2003). As a general rule, overlapping multiple species credits is acceptable for a single project, but not multiple projects (U.S. Fish and Wildlife Service 2003).

The Florida DOT Platt Branch Conservation Bank provides an example of this approach. Under the terms of the original MOU with USFWS and the Florida Fish and Wildlife Conservation Commission, the bank provided Florida DOT with conservation credits for three listed species. In 2006, the MOU was revised to allow additional state and federally listed species to be covered by the bank. Florida DOT has approximately 688 hectares (1,700 acres) in the upland mitigation bank, which is used to offset project impacts for 27 state- and federally listed species in a 15-county service area. FHWA reimburses the Florida DOT when credits are used for specific transportation projects. A trust fund was established with the Florida Fish and Wildlife Conservation Commission for perpetual management and maintenance of the habitat for listed species. Improvements that result in higher listed species populations result in increasing available credit. An inventory is taken every 5 years to document population status.

Protection of Viable Populations, Improved Chances of Success, and Reduction of Fragmentation

It is important to site conservation banks in areas where viable communities can be preserved, where fragmentation of habitat can be reduced, and where management measures can address other threats that a species might encounter, including invasion of nonnative species or disruption of natural disturbance regimes. Species recovery plans, state conservation plans, and ecoregional plans developed by third-party conservation organizations may contribute goals, objectives, and target conservation areas for conservation banking.

Greater Efficiency and Predictability as Desirable Offsets Are Secured

Conservation banking reduces the piecemeal approach to conservation efforts that can result from individual projects by establishing larger reserves and enhancing habitat connectivity. Directing smaller individual mitigation actions into a bank streamlines compliance for the individual permit applicants or project proponents while providing a higher benefit to the target resources. Conservation banking brings together financial resources and the planning and scientific expertise not practicable for smaller conservation actions. By encouraging collaborative efforts, it becomes possible to take advantage of economies of scale (both financial and biological); funding sources; and management, scientific, and planning resources that are not typically available at the individual project level.

Use of Credits for Clean Water Act Mitigation

According to the USFWS conservation banking guidance, credits from a conservation bank may be used to compensate for environmental impacts authorized under other programs, such as CWA Section 404. For example, wetland mitigation banks in south Florida are authorized by USFWS to "bundle" credits for panther habitat mitigation (i.e., panther habitat units) with the wetland credits. If impacts occur on the same acre, with multiple species or resource values, resources that provide similar crosscutting values elsewhere might be conserved at one location, so that multiple acres in multiple locations are not required for a unitary impact.

Examples

East Plum Creek Conservation Bank, Colorado

Three bridge projects were proposed that would cross East Plum Creek in Colorado. Establishing the bank was seen as cheaper than case-by-case mitigation, and it would also provide an opportunity to create a larger habitat area. Conservation credits for the bank were established for meeting success criteria in different areas. There were 6.32 credits certified at bank establishment to reflect the conservation easement and the initial habitat restoration activities that took place. Achieving success criteria for maintaining alluvial groundwater levels would release 12.65 credits. Achieving success criteria for habitat vegetation would release 3.80 credits. Achieving success criteria for the Preble's meadow jumping mouse based on presence and population density would release 2.53 credits (National Oceanic and Atmospheric Administration 2003).

Carolina Heelsplitter Conservation Bank

The Carolina Heelsplitter Conservation Bank is dedicated to preserving, enhancing, and restoring key parcels of land in target watersheds with viable populations of the federally endangered Carolina heelsplitter mussel. The bank offers a creative, landscape-scale solution to the preservation and recovery of this rare and endangered mussel species. The service area of the bank includes watersheds with known populations of the Carolina heelsplitter mussel in North and South Carolina. Credits may be purchased from the bank and used to offset mitigation requirements associated with the Carolina heelsplitter mussel with the approval of federal, state, and/or local agencies. The initial phase of the Carolina Heelsplitter Conservation Bank encompassed approximately 810 acres of land. The bank will incorporate a trust fund to support the ongoing research and surveying efforts to provide long-term protection and reestablishment of the endangered Carolina heelsplitter mussel, along with an endowment fund to protect, manage, and monitor the land in perpetuity (Environmental Banc and Exchange 2009).

Recovery Credits

How It Works

Recovery credits were introduced by USFWS in November 2007 as an additional conservation tool to aid federal agencies in meeting their ESA obligations to conserve listed species. Similar to a conservation bank, a recovery credit system (RCS) allows federal agencies to bank credits in advance of anticipated impacts on threatened and endangered species and their habitat and its functions. Unlike a conservation bank, recovery crediting encourages federal agencies to partner with private and nonfederal landowners to accrue credits through mutually beneficial conservation agreements that may be in perpetuity (easement or fee title purchase) for permanent impacts or that may address temporary construction impacts through nonperpetual easements. Also, unlike a conservation bank, the RCS requires the combined effects of both adverse and beneficial actions to achieve a net benefit to the recovery of the species. "Net benefit to recovery" is defined as the enhancement of a species' current status by addressing the threats identified at the time of listing or in a current status review.

A federal agency may develop and store credits to be used at a later time to offset particular adverse effects of its actions. The Service reviews each RCS to ensure the net conservation benefits outweigh any potential impacts that could occur during project implementation. Each proposal is evaluated on its own merit, and some activities related to particular listed species may not be appropriate for the new credit system (Harrelson 2008).

Advantages and Disadvantages

The goal of an RCS is to enhance the ability of federal agencies to promote the recovery of listed species on nonfederal lands and offset adverse effects to listed species from proposed actions. Potential benefits of an RCS include the following (Harrelson 2008):

- Better and more cost-effective integration of recovery with agency activities;
- Streamlined ESA Section 7 consultation; and
- Increased predictability for federal action agencies and private landowners.

Examples of RCS

The first application of the RCS was in Texas, where the U.S. Army and the Fort Hood Military Reservation banked credits for conservation actions conducted on private lands to offset impacts on endangered golden-cheeked warbler habitat.

Another example illustrates the value of avoiding piecemeal approaches to endangered species conservation. FHWA and Arkansas Highways initiated a pilot project to establish a market-based system (Habitat Credit Trading) to address Section 7 of the ESA requirements for transportation projects on a local scale. The particular project application was Arkansas State Highway 18, connecting the city of Jonesboro and other townships in northeast Arkansas to I-55. The federally endangered fat pocketbook mussel (*Potamilus capax*) occurs in streams adjacent to private lands within the project area downstream of USACE water control structures that drain Big Lake National Wildlife Refuge. It was determined that "the relationship between cost per credit and credits generated becomes increasingly favorable as the RCS site size increases" and further, that "the proposed debiting framework provides an efficient ratio

which is likely to cause development entities to evaluate project alternatives prior to impacting threatened and endangered species and their habitats" (Peck et al. 2009).

Habitat Conservation Plans

How It Works

Permits (e.g., incidental take permits) can be issued under ESA to allow the take of endangered or threatened species under certain circumstances. The permit applicant must have a habitat conservation plan (HCP) approved before an incidental take permit can be issued. HCPs are prepared by the permit applicant and identify specifically how the applicant is going to avoid, minimize, and mitigate the take of any threatened or endangered species that may result from their actions. USFWS reviews the HCP and decides whether to issue the incidental take permit. Nationwide, there are more than 675 HCPs in effect covering nearly 600 species on approximately 42 million acres (U.S. Fish and Wildlife Service 2011).

Advantages and Disadvantages

The primary disadvantage of an HCP for state transportation agencies is that nearly all of their capacity projects are federally funded and thus require Section 7 consultation. Section 7 compliance with preparing an HCP is not an option. Despite these limitations, HCPs offer an outstanding example of how to accomplish multispecies, and often multiresource, conservation on an ecosystem basis. The existence of an HCP can greatly facilitate advance or programmatic conservation measures. Nevada, Wisconsin, and California provide good examples of a DOT contributing to implementation of an HCP and receiving coverage under Section 10 for state actions or Section 7 for federal actions, if combined with a consultation.

Example of a Habitat Conservation Plan

NiSource in Indiana is a natural gas distribution company that is seeking an incidental take permit for the take of threatened and endangered species that may result from their routine operation and maintenance activities. The company operates a 17,500-mile network of interstate natural gas pipelines across 17 states. Routine operation and maintenance includes repairing, upgrading, replacing, and expanding pipelines and associated infrastructure. These activities are sometimes in or near endangered or threatened species habitat and thus could result in taking a listed species. NiSource is currently developing an HCP in conjunction with its application for a permit. The permit would cover all pipeline work within a 1-mile-wide corridor (0.5 mile on either side of the centerline of the pipe) that might result in take of a listed species.

Each year, NiSource undertakes approximately 400 projects across its natural gas pipeline system to repair, upgrade, replace, and expand its natural gas infrastructure. According to NiSource, these projects are almost always located in areas that trigger ESA compliance requirements under Section 7. NiSource maintains that although their work has a temporary, and for the most part, negligible impact on listed species and their habitats, compliance with the ESA under Section 7 carries a significant budgetary and administrative burden for the company, USFWS, and numerous other federal agencies with regulatory authority over NiSource activities.

In 2005, NiSource approached USFWS to explore the feasibility of developing a multistate MSHCP that would provide conservation benefits to federally listed species and accommodate future construction, operation, and maintenance of NiSource natural gas pipelines and ancillary facilities. NiSource and USFWS agreed that efforts to develop an MSHCP and issuance of an incidental take permit under Section 10(a)(1)(B) of the ESA represented the best approach for harmonizing the conservation needs of threatened and endangered species with the regulatory compliance obligations of NiSource. The approach would seek to integrate NiSource's natural gas pipeline activities with the conservation and recovery goals of listed species, reducing conflicts between listed species protection and economic development and streamlining ESA consultation procedures among a variety of agencies.

Three key issues reflected uncertainties and questions: (1) no applicant had ever attempted to develop an MSHCP on such a large scale; (2) the NiSource activities to be implemented, and where and when they would be implemented, were unknown; and (3) the amount of take and methods for calculating take were uncertain.

NiSource and its consultant developed matrices on the activities the pipeline work entailed, where species breed and feed, and the relation of these factors to the landscape and impacts. They produced a threats analysis of the activities, identifying particular stressors the activity could have on the species, and then filled out activities likely to occur in any given location and the duration of those activities. From this, NiSource and USFWS generated an estimated amount of take for each species. Next, they looked at the effects analysis, including the impacts of the current and anticipated take on the species; decided what measures would avoid and minimize impacts on the species; and then considered what NiSource would need to mitigate. NiSource also agreed to implement their BMPs all the time and to avoid highly sensitive areas for imperiled species in new construction (U.S. Fish and Wildlife Services, NiSource Habitat Conservation Plan).

Candidate Conservation Agreements with Assurances

How It Works

Candidate conservation agreements (CCAs) are formal agreements between the Services and one or more parties to address the conservation needs of proposed or candidate species or species likely to become candidates. The participants voluntarily commit to implementing specific actions that will remove or reduce the threats to these species, thereby contributing to stabilizing or restoring the species so that listing is no longer necessary.

Candidate conservation agreements with assurances (CCAAs) commit those bound by the agreement to a package of voluntary conservation measures that the Services believe will contribute tangibly to the recovery of the species. In exchange, the party or parties to the agreement receive assurances from the Services that additional conservation measures will not be required should the species become listed in the future.

A CCAA must include

- A description of the population levels (if available or determinable) of the covered species existing at the time the parties negotiate the agreement; the existing habitat characteristics that sustain any current, permanent, or seasonal use by the covered species on lands or waters owned by the property owner; and/or the existing characteristics of the property owner's lands or waters included in the agreement that support populations of covered species on lands or waters not on the participating owner's property;
- A description of the conservation measures that the property owner is willing to undertake to conserve the species covered by the agreement;
- An estimate of the expected conservation benefits as a result of conservation measures (e.g., increase in population numbers, enhancement, restoration, or preservation of suitable habitat; removal of threats) and the conditions that the property owner agrees to maintain;
- Assurances that the Services will not require additional conservation measures or impose additional take restrictions beyond those agreed to if a covered species is listed in the future (for DOTs, this assurance would need to apply to future consultation requirements and "reasonable and prudent measures" required in incidental take statements);
- A monitoring provision that may include measuring and reporting progress in implementation of the conservation measures described above and changes in habitat conditions and the species' status resulting from the measures; and
- A notification requirement to provide the Services or appropriate state agencies with a reasonable opportunity to rescue individuals of the covered species before any authorized take occurs.

Advantages and Disadvantages

CCAAs are intended for nonfederal entities (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1999). Although state DOTs and other state agencies are ostensibly eligible for CCAAs, the federal funding for transportation projects necessitates Section 7 consultation.

State transportation agencies and the private conservation organizations with which they may partner in the development of conservation agreements are clearly nonfederal entities and thus eligible for assurances when they treat candidate species as if they were listed and design and implement conservation measures that contribute to their recovery. However, the assurances of value and interest to state DOTs relate to incidental take statements under Section 7 of the ESA rather than incidental take permits under Section 10.

Conservation benefits may include reduction of habitat fragmentation rates, restoration or enhancement of habitats, increase in habitat connectivity, maintenance or increase of population numbers or distribution, reduction of the effects of catastrophic events, establishment of buffers for protected areas, and areas to test and develop new and innovative conservation strategies. Recognizing that while a species is a candidate, and a property owner is under no obligation to avoid take, the assessment of benefits would include consideration for what the property owner agrees not to do as well as any enhancement measures he or she agrees to undertake. If the Services and the property owner cannot agree on what constitutes benefits, the Services would not enter into the agreement. CCAAs are subject to a strict beginning baseline, below which losses cannot occur; this is one reason this vehicle is not frequently recommended.

Example of a CCA

In Idaho, efforts have been made to use CCAs and CCAAs to avoid the need to list additional species and provide direct beneficial effects for species. Slickspot peppergrass (SSPG; *Lepidium papilliferum*) is an annual or biennial white flower thought to occur only in southern Idaho. SSPG was intermittently designated as a candidate species under ESA for over a decade. In early 2003, the state Office of Species Conservation was made aware that USFWS believed that an endangered listing was appropriate based on the information available and that significant changes in land use would result from this listing.

Through negotiation by interested parties including the Office of Species Conservation, Idaho Department of Fish and Game, Idaho National Guard, Idaho Bureau of Land Management, and a consortium of ranching interests, efforts were made to avoid listing of the species through development of

a CCA. In July 2003, USFWS delayed their listing decision by 6 months to allow completion of the CCA and resolution of some final issues. USFWS and NOAA's Policy for Evaluation of Conservation Efforts was applied as a guideline for the development of this CCA; this was the first application of this policy for CCA development. Conservation measures prepared to address each threat to SSPG were included in the CCA. A USFWS-facilitated scientific review panel validated conclusions reached by the SSPG partnership and found that the CCA would substantially delay risks of extinction of SSPG.

In January 2004, USFWS issued a determination that the proposal to list SSPG was not warranted because of the management plans developed and instituted under the CCA, a win-win solution for all parties to the agreement and for the species (Inghram 2005).

Commitment Tracking Methods

In addition to the assurance methods described in this section, there is another group of methods that can be described as commitment tracking methods. Commitment tracking methods help DOTs assure that commitments and informal agreements made to the resource agencies are implemented. Guidance issued by the Council on Environmental Quality (CEQ) in 2011, *Appropriate Use of Mitigation and Monitoring and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact,* further emphasizes the need for agencies to adhere to environmental commitments, monitor the effectiveness of mitigation, and make that information publicly available (Council on Environmental Quality 2011). Typically, commitments are recorded in permit or consultation documents, but they need to be effectively conveyed from planning or project development departments within the DOT to construction and maintenance. Commitment tracking mechanisms used by DOTs were evaluated in a recent National Cooperative Highway Research Program (NCHRP) report, *Compendium of Best Practices for Incorporating Environmental Commitments into Transportation Construction and Maintenance Contract Documents* (Venner and Paulsen 2009). That report should serve as a useful resource of methods that help to provide assurance that conservation and mitigation commitments made early in planning are kept.

CHAPTER 6

Using Assurance and Commitment Tracking Methods at an Ecosystem Scale

Many of the assurance and commitment tracking methods described in Chapter 5 may be used at the ecosystem scale. This chapter describes the limits of and approaches for applying these methods at the ecosystem scale.

Limits of Using Methods at an Ecosystem Scale

Reluctance to Use a Habitat Approach

There has been some reluctance to use habitat acres as a surrogate for species impacts. Although habitat is not a limiting factor for some species of concern, it is for the vast majority, and there is growing recognition of the value of habitat- and ecosystem-based approaches in recovery and conservation planning. Much has changed in the last 5 to 10 years. *National Wildlife Federation v. Babbitt* upheld a habitat approach, and now USFWS is advocating strategic habitat conservation and landscape-level conservation, including landscape conservation cooperatives that will try to fill data gaps to enable these conservation approaches to be used more easily. USFWS is also integrating recovery planning, with its greater habitat and ecosystem conservation approach, with ESA Section 7 consultation.

Need for Protection of Priority Site Before Permit or Consultation Is Finalized

Often the very highest conservation priority areas face significant and urgent threats from development or destruction. In some cases, destruction or the loss of the parcel for conservation purposes is an imminent threat during the time before the Section 404 permit or the programmatic consultation can be completed. Still, DOTs may not be able to secure the site until the regulatory agency can provide written confirmation that the site is desirable for its conservation or restoration values and, most of all, that the site will qualify as an acceptable mitigation or offsetting measure for ESA Section 7 consultation or CWA 404 review.

Reluctance to Presume Presence of Species

At times, some USFWS staff have been reluctant to assume a species is present and to overestimate impacts, primarily as a result of the *Arizona Cattle Growers Association v. United States Fish and Wildlife Service* decision; however, as the court identified, the threshold for USFWS to clear in terms of evidence of impacts is very low. The agency should demonstrate that a species is or could be in an area before regulating it and must establish a causal connection between the land use being regulated and harm to the species in question; mere speculation as to the potential for harm is not sufficient (*Arizona Cattle Growers Association v. United States Fish and Wildlife Service,* No. 99-16102, 273 F. 3d 1229 [9th Cir. 2001]). In *Arizona Cattle Growers,* the court held that USFWS would have to demonstrate that a "take" of protected species was "reasonably certain to occur"; however, this was a case in which the regulated party objected to broader estimation of potential presence. This is the opposite of the situation for state DOTs, which would have an interest in reasonable estimation of presence so they can proceed with earlier environmental decision making and ecological approaches to mitigation.

Uncertainty and Insufficient Information

When developing an effects analysis and associated incidental take statement that includes future actions for which insufficient information is available to make accurate determinations (e.g., when consulting at the plan level and the specific combination of future activities and locations is not yet identified), the Services must provide the benefit of the

doubt to the species and develop reasonable projections of potential conflicts between activities that can occur under the agency's program and the protection of listed species. From these projections, the Services must estimate the potential effects and derive the anticipated level of incidental take that is likely to occur, corresponding to the maximum level of impacts that may be caused by the action (*Conner v. Burford,* 848 F.2d 1441; *Silver v. Babbitt; Silver v. Thomas*). The Service has called this "reasonable worst case assumptions."

USFWS allows for the times when "uncertainty regarding the potential effects of future actions developed through implementation of the action agency's program may be so great that it is not possible to accurately project the potential effects that may result. To address these situations the Services should work with the action agency to jointly develop 'assumptions' that will be used to constrain the effects analysis" (U.S. Fish and Wildlife Service 2003).

Concern Over Nonregulated Resources

An ecosystem approach means that nonregulated resources will often be protected in the process of regulatory compliance for regulated resources. With regulatory agency input, transportation agencies can include offsetting measures in their proposal or project description. Those activities then become an intrinsic part of the proposed action.

Implementation of Mitigation and Conservation Measures

Implementing required conservation or mitigation is less an issue than it may first appear; advance conservation and mitigation assure the action in fact occurs. If it is not acceptable and implemented, no permit is issued and the project stops. Consultation and mitigation that occur on the planning level have the advantage of being implemented and potentially evaluated years before a transportation improvement is built.

How DOTs manage mitigation commitments is very important for agency relationships and DOT credibility. To date, environmental commitments on the planning level are a relatively new concept. They have not yet been incorporated into DOT environmental commitment tracking systems, which have primarily focused on assuring commitments are covered in design and construction. Some of the typical challenges and needs for DOT commitment tracking systems are compiled in the NCHRP report *Asset Management of Environmental Mitigation Features* (Venner et al. 2009).

Approaches for Using Methods at an Ecosystem Scale

Implement Best Practices for Using Commitment Tracking Systems

Commitment tracking systems are emerging as ways to track smaller commitments of DOTs (i.e., those commitments outside of the off-site, off-system conservation and mitigation that are the main focus of this project and report). In *Best Practices of Incorporating Environmental Commitments into Contracts,* WSDOT reported conclusions from an evaluation of their own commitment tracking system. They concluded that, although regions used a variety of different methods to track commitments, all generally did a good job. The study found that violations or shortfalls were not related to insufficiencies with commitment tracking or communication. Approaches for further improvement included continuation of common practices, including

- Extract permit conditions into contract provisions or plan details, in addition to attaching the permit as an appendix of the contract.
- Enhance standard specifications and general special provisions to address common permit conditions.
- Work with resource agencies to clarify and standardize permit language.
- Recognize that environmental compliance has a cost to the DOT that cannot be deferred to the contracting agency (Washington State Department of Transportation 2008).

These and other approaches to support commitment tracking and follow-through at DOTs are described in the NCHRP report *Compendium of Best Practices for Incorporating Environmental Commitments into Transportation Construction and Maintenance Contract Documents* (Venner and Paulsen 2009). In general, the more systematic the process is and the more tools are developed to support it, the more robust and reliable the process tends to be.

Show How Avoidance and Minimization Occurred in Planning

Transportation agencies should develop and document avoidance and minimization measures at every stage of the project, from planning through permitting. As many have pointed out, the greatest avoidance can be achieved in planning, when routes are not yet firmly established and projects have yet to be budgeted.

To respond to agency regulations, successful approaches to advance mitigation must demonstrate avoidance and minimization; in particular,

- Project-level practicable alternatives analysis for those with individual permits (40 CFR Sec. 230.10[a]); and
- Avoidance and taking "appropriate and practicable steps . . . which will minimize potential adverse impacts of the discharge on the aquatic ecosystem" (40 CFR Sec. 230.10[d]).

North Carolina DOT has effectively dealt with these issues by ensuring project-by-project reviews for individually permitted actions, but in a programmatic context. USACE concurs with purpose and need, alternatives, selection of alternatives, and then minimization of impacts and a determination of whether on-site mitigation is practicable and environmentally beneficial. North Carolina's EEP is used for compensatory mitigation only after these steps.

States have taken pains to preserve the sequencing process in many advance mitigation efforts. In the Washington State and North Carolina programs, USACE and EPA always reserve the right to say that use of a bank or advance mitigation is not appropriate. Likewise, the Caltrans–FHWA MOA on early mitigation planning commits that

> When an individual transportation project for which a mitigation strategy was developed is undergoing preliminary design and environmental studies, an evaluation will be made to determine if all appropriate avoidance and impact minimization measures have been incorporated. Caltrans will request concurrence from the resource agencies in this evaluation. If concurrence is granted, then the compensation plan as agreed upon in the Agreement of Mitigation Strategy will be the basis for offsetting the remaining unavoidable impacts. (Caltrans and Federal Highway Administration 2003)

GIS and commitment tracking systems are enabling DOTs to do more documentation and quantification of how they are avoiding and minimizing impacts throughout the transportation planning, development, design, and construction process. Texas DOT has gone through a process of demonstrating avoidance and minimization on the planning level and NEPA Tier I for the I-69 corridor to preserve the sequencing process and consider compensatory mitigation opportunities.

For both ESA and CWA concerns, illustrating how and where avoidance and minimization occur in the process can allay concerns. Developing and applying BMPs or standards to be met on a programmatic basis helps achieve avoidance and minimization.

Address Mitigation and Conservation Risk Factors

Understanding the risk factors and planning to address them can reduce the uncertainty associated with mitigation and conservation. Risk factors and considerations to address them were identified in a working paper to support the Willamette Partnership in Oregon. The factors identified in that paper are summarized in this section and in Table 6.1 (Willamette Partnership 2009).

Table 6.1. Environmental Mitigation and Conservation Risk Factors

Risk Factor	Description
Quality of the original site (locally and for broader landscape)	If a site and its adjacent land cover meet a certain set of criteria (e.g., low-invasive cover, adjacent to natural lands, located in a priority area), they are more likely to produce lasting ecological value.
Suitability of the restoration design	If a site is restored to historic or reference conditions, it is more likely to reach its site system potential.
Qualifications of the land manager and/or restoration practitioner	If a manager or practitioner has experience, capacity, and a restoration mission, he or she is more likely to deliver a successful restoration project.
Timing of credits related to impacts	Credits created after an impact has occurred increase temporal loss of function and create a risk that functions lost may not be replaced if the restoration does not perform as planned. Credits released before performance standards are reached increase the risk that the project may never meet these standards.
Known effectiveness of development and conservation action	The response of ecosystems to some human actions is much better understood than others. Wetland restoration generates more predictably measurable benefits than wetland creation.
Long-term management (plan, person, and funds)	Sites that are protected with long-term leases or easements, have money set aside for management, and have someone in charge of them are more likely to sustain their benefits.

Considerations to address the risks identified in the working paper for the Willamette Partnership include

- *Additionality:* All credited projects need to demonstrate they provide "additional" conservation benefits. The additionality requirement ensures credits are awarded for doing more than what would otherwise have happened.
- *Minimum quality standards:* Projects that generate credits need to meet minimum standards of quality. Quality standards help save time and money by ensuring good site selection and project design.
- *Service areas and other site selection or eligibility criteria and requirements:* Eligibility criteria are designed to exclude overly risky or inappropriate projects. Design qualifications may be set as a type of eligibility requirement, such as target species, habitat elements, and diversity. Strict eligibility criteria generally lead to fewer conservation or restoration projects; however, the likelihood of success may increase.
- *Baseline assessment, monitoring, and reporting:* Verification answers two general questions: (1) are mitigation project developers complying with rules and procedures? and (2) is the site achieving the required performance measures?

CHAPTER 7

Gaps and Opportunities

This research effort identified various gaps between the ecological approach, real-world opportunities, and available implementation methods. The gaps are related to policy, technical, and institutional factors. The Integrated Ecological Framework (IEF), the analysis reported in this three-volume series, and subsequent work supported by TRB and FHWA all help to address these gaps and build on opportunities.

Understanding Ecosystem Approaches

A true ecosystem approach recognizes the dynamic interconnections within and between ecosystems and attempts to account for these interconnections in designing compensatory mitigation. Currently, protection is granted to various components of an ecosystem without a regulatory framework to address the interconnectivity of the whole ecosystem.

To develop and implement an ecosystem approach to transportation impacts and mitigation, one must first understand what an ecosystem is. Most definitions refer to communities of plants and animals and their environment and the link between biotic and abiotic components. To understand the functions of an ecosystem, the processes linking the various components, including the soil, biology, geology, topography, and hydrology, must be understood, as well as the flow of material and energy. Spatial scale is also important to consider, and the implications for resources of concern. In general, watersheds and ecoregions have been the major unit of organization for ecosystem studies and theory.

Although numerous scientific studies have worked to understand the processes of and interconnections within ecosystems, full understanding remains a difficult goal. Ecosystems are inherently dynamic, and scientists accept that in many cases a stable, steady state is neither possible nor natural. Regulators must contend with these difficulties and a substantial amount of uncertainty when considering how to construct ecosystem approaches to transportation planning and mitigation.

Providing Data, Methods, and Measures

Many sources of data on multiple facets of the ecosystem are available for any given geographic location in the United States; however, the accessibility and usability of that data (in terms of type, quality, compatibility, and format) varies, and a uniform national standard is not available. Nevertheless, considerable progress has been made. Over the last 30 years, much has been learned about the composition, structure, and function of most wetland types in the United States. For example, through the National Wetland Inventory, preliminary maps showing the extent and distribution of the various wetland types have been developed. In addition, the NHP network has developed extensive data sets on the locations of rare, threatened, and endangered plant and animal populations and other features of conservation interest. Programs such as the Gap Analysis Program have looked at relatively large areas and assessed protection status and priorities for listed species. Despite these excellent efforts, nationwide data sets specifying boundaries, ranges, likelihood of species presence, and habitat or wetland quality are largely lacking.

In addition to consistent ecosystem-level data, a need exists for a standardized approach to integrating the data. Although identification, delineation, and assessment methodologies have been evolving with more sophisticated technology and scientific knowledge, they are not yet readily available for use by regulators and project planners. In addition, although these methodologies are relatively affordable, a committed investment in their development will be required.

Finally, a lack of assessment measures is another gap to implementing ecosystem approaches. The availability of measures to assess ecological functions or estimate the quality of a resource depends on the interest in that resource that stems

from a conservation, regulatory, or academic perspective. Interest in wetland function was arguably primarily academic until the enactment of CWA Section 404. The past 30 years of intensive study of wetland function on a site-by-site basis has led to the development of rapid assessment tools that general practitioners can apply. Outside of wetlands, the study of other ecosystem functions is rapidly proliferating but still lies largely in the academic and conservation realms. A number of developing rapid assessment techniques serve as analogs for more intensive, site-specific studies. One example is a comprehensive, scalable "biodiversity scorecard" developed by the Colorado NHP and The Nature Conservancy. The scorecard translates fine-scale information for lay audiences. GIS-based tools are readily available that allow the analysis of patch size, connectivity, and edge metrics and the assessment of potential projects based on the degree to which patches are fragmented or consolidated. These metrics may also serve as analogs for detailed or site-specific assessments of ecosystem function.

Regulatory Framework for Ecosystem Approaches

Single-Resource Approach

Existing law essentially mandates that each agency adopt a single-resource approach as opposed to an ecosystem approach to infrastructure planning. Although regulators and permit writers are often interested in broader-based ecological outcomes, the regulations limit focus to specific resources for each agency. For example, USACE is required to primarily assess project-related impacts on those resources under their regulatory authority, such as jurisdictional wetlands. Although the CEQ and resource agencies signed an interagency MOU encouraging an ecosystem approach in 1995, there is still progress to be made in implementation (Council on Environmental Quality 1995).

Imbalance in Mitigation of Resources

In theory, the NEPA process is designed to account for impacts on all natural resources. Accounting for impacts on multiple resources and ecological functions through mitigation (including compensatory mitigation) is key to an ecosystem approach, but existing regulatory priorities and the single-resource approach work against this. In addition to regulated resources, nonlisted species and unprotected areas need to be conserved and sometimes restored. For instance, a nationwide trend of major declines in upland plant communities has been documented (Reed et al. 1995). This decline may be a result of the regulatory focus placed on wetlands while upland communities are neglected. The vigorous protection of one group of plant communities can push projects and impacts disproportionately to communities without such regulatory protection.

States have primary authority over conservation planning for nonlisted species because they hold primary authority and responsibility for protection and management of fish, wildlife, plants, and their habitats. Under the ESA, the federal government preempts this authority in the case of federally listed threatened and endangered species. Nevertheless, Section 6 of the ESA provides that USFWS and NOAA Fisheries will cooperate to the maximum extent practicable with the states in carrying out the program authorized by the act. Agencies can work together on consolidated, multiresource mitigation methods and approaches organized around regulated resources to accomplish ecosystem objectives with benefits to nonlisted species and other nonregulated resources.

Federal Authority of an Ecosystem-Based Regulatory Framework

Given the scientific complexity and uncertainty of ecosystem processes, the lack of well-organized and accessible data, and the single-resource approach to mitigation, the development of a true ecosystem-based regulatory framework is challenging. A federal jurisdiction approach may be the logical scale at which to offer regulatory protection for resources with national value that cross many other jurisdictional boundaries. However, a federal approach would involve much controversy and runs counter to recent devolution trends. The evolution of federal authority over wetlands as Waters of the United States has been well documented and is still being challenged. Given this one example, it is difficult to imagine how federal authority over even broader ecosystems or landscapes would be asserted, what group in the legislature would champion such a cause, how this authority could be asserted under the constitution, and how it would survive the certain legal challenges. Nevertheless, the U.S. Department of Agriculture (USDA) has established the Office of Environmental Markets (formerly called Office of Ecosystem Services and Markets) in conjunction with a federal governmentwide Conservation and Land Management Environmental Services Board to assist the development of new technical guidelines and science-based methods to assess environmental service benefits (U.S. Forest Service 2008). These actions will promote markets for ecosystem services, including carbon trading to mitigate climate change.

The regulatory framework is perhaps the most difficult gap. Although a regulatory framework that provides some level of federal authority over ecosystems may be unlikely, that does not preclude resource and regulatory agencies and DOTs from using ecosystem science and theory to advance their individual regulatory missions and conservation goals within the existing regulatory framework.

Coordinating Federal and State Conservation Efforts

Leveraging Diverse Federal Efforts

Various federal and state programs acquire land for conservation purposes. Environmental agencies and organizations have engaged in conservation planning to identify areas of highest priority and to direct limited conservation resources in a strategic manner. However, these efforts are often disconnected, making it difficult to achieve a unified picture of conservation priorities that can assist DOTs and MPOs with their planning efforts.

The January 12, 2009, MOU titled *Partnership for Cooperative Conservation* established a framework among six federal agencies (U.S. Department of the Interior, EPA, USDA, U.S. Department of Defense, CEQ, and NOAA) to enable continued collaboration on natural resource and environmental management across organizational and jurisdictional boundaries (Partnership for Cooperative Conservation 2009). The August 2004 Executive Order on Cooperative Conservation (13352) provided initial direction to the federal agencies that oversee environmental and natural resource policies and programs to promote cooperative conservation in full partnership with states, local governments, tribes, and individuals. There is an opportunity to build on these efforts to achieve a unified federal program for conservation planning.

Different Spatial and Temporal Scales of Conservation Planning and Need for Online Coordination of Conservation Planning Efforts

Conservation planning can occur at different spatial and temporal scales. Subglobal or regional approaches to conservation planning often guide decisions and planning within relatively large areas such as ecoregions and identify species, communities, and locations that should be conserved (Gordon et al. 2005). Similarly, conservation planning occurs across a wide variety of stakeholders and action agencies. This information tends to reside at the institutional level at which it was generated, leading to disconnects among differing agency efforts and spatial and temporal scales. Systems are needed for high-level integration of this information and to make this integrated information readily available to decision makers.

There is no compendium of these programs and regional conservation planning efforts across the United States in a format that can be applied to transportation planning. As noted earlier, regional conservation efforts across the country include

- Multispecies conservation, biodiversity, or watershed plans or programs that set goals or targets (e.g., population numbers, amounts of habitat) or use "hot spot" or gap analysis program methodology and are applied to private lands and other landowner categories;
- Ecosystem-based conservation plans that set goals or targets and are applied to private lands and other landowner categories;
- Ecoregions identified as high priority or high risk for ecological or species loss to systems; and
- Single-species conservation plans that represent broad-scale, high-profile, collaborative initiatives affecting ecosystems.

A report by the National Council for Air and Stream Improvement, *Summary of Conservation Planning Efforts in Forested Regions of the United States,* provides a first step to help DOTs and FHWA link with these multiple-agency and public–private programs, which occur at scales ranging from small regions to multiple states and countries (Mehl and Haufler 2008). However, a compendium does not address how the regulations associated with each program can be met in a combined fashion or how transportation agencies might link with the initiatives. The IEF addresses this issue, which is worthy of additional research.

A top priority is development and display of conservation priorities in geospatial or mapped form. Only 30 of the state wildlife conservation/action plans incorporate mapped priority conservation areas, much less depict areas already under effective conservation. This information is essential for DOTs to take action to leverage investments thus far and help execute conservation objectives in the geographic areas where they work.

NGOs such as The Conservation Fund and The Nature Conservancy are familiar with the bulk of these conservation programs and may be able to more quickly and easily consider how DOT needs, conservation opportunities and priorities, and incentive programs for the relevant parties may be matched and leveraged for maximum conservation benefit. DOTs would also benefit from preidentification of specific restoration opportunities by conservation groups. Furthermore, DOTs may be able to partner with conservation groups to contribute to maintenance of these projects. Some DOT maintenance departments have indicated an interest in these sorts of partnerships.

Improving Information and Data-Related Gaps

Many of the challenges of implementing an ecosystem approach are related to information and data gaps. To date, DOTs and resource agencies have not invested in nationwide or regional data sets that could answer many ecological questions and enable many permitting and consultation questions to be resolved earlier in the design process. However, overall data quality, management, storage, access, and security concerns have been ongoing issues, and many agencies are making progress in this area. For example, USFWS landscape conservation

cooperatives address some of these issues. Many agencies do not have the time to identify data sets and understand what is available. The IEF identifies data sets to implement an ecosystem-based approach. The SHRP 2 Capacity program is also sponsoring a project to bring together national ecological data sets in a one-stop shop.

Local Land Use and Land Protection Gaps

DOT investments in mitigation sites often are compromised over time by changes in local land use that ultimately affect the resource created or restored through the DOT's mitigation effort. These impacts, when combined with the institutional and technical challenges of finding and acting on conservation and restoration of priority sites for mitigation, make it a real challenge to implement the *Eco-Logical* approach (Brown 2006). The sections that follow explore some of these gaps in more detail.

Delegated Land Use Authority by State and Local Jurisdictions

All 50 states have adopted zoning and enabling legislation that largely relegates land use control to local jurisdictions. States vary markedly in how they award planning authority. Means for delegating land use authority include home-rule provisions, state constitutions, legislation, and adoption of municipal charters. Home rule means cities or counties can adopt the "plenary police power" of the state and legislate on any matter that affects the health, safety, or welfare of the citizens, except for matters of statewide concern. Some states adopt a uniform building code for the entire state and prohibit local governments from adopting codes that differ from the state's code.

Delegated land use authority does not always come with a planning requirement. Only about half of all states require municipal or comprehensive planning. States requiring planning also vary in the extent to which they impose conditions on these plans. Some, such as California, require local plans to have a transportation element or have created incentives for integrated planning and consideration of greenhouse gases or natural resource implications. In addition to comprehensive planning, zoning and subdivision regulations become the legal tools that communities and counties have to manage what actually gets built (location and intensity of development), to establish growth controls, and to protect natural resource services important to the overall quality of life and the health, safety, and welfare of their citizens. Finally, subdivision regulations and range ordinances and regulations can govern the actual placement and design of what gets built. Although it is not the purpose of this research to examine these strategies for protecting local resources, the sustainability of ecosystem resources will likely be driven in many areas by the ability and willingness of local governments to manage land use in such a way as to preserve watershed hydrologic functions and protect open space resources while also sustaining their economic development interests.

Implementing the *Eco-Logical* approach to the fullest extent possible will require that the gap between local economic and land use interests be linked to regional, state, and national ecosystem restoration and protection goals and objectives and to communities' natural resource base and the services they provide or can provide through restoration. Sustainable development depends on this. The first, easiest, and now very timely step would be to provide data on conservation and restoration needs and priorities to local governments for voluntary local action. By making it easy for local governments to take this information into account in their own planning, without needing specialized staff or waiting for input from few and overstretched natural resource agency staff, effective local decision making, comprehensive planning that includes natural resources, and local and more informed environmental advocacy can proceed.

Long-Term and Short-Term Land Protection

Land protection ensures benefits are protected even if landownership changes. Long-term agreements that run with the land, such as conservation easements, are always preferable to short-term contracts; however, requiring permanent easements is a significant barrier to entry and is not recommended for temporary impacts. For permanent impacts (e.g., wetland removal and fill or species take), creditable projects need permanent conservation easements or the equivalent (deed restrictions, covenants, or agreements from public agencies). For temporary impacts (e.g., air or water pollution), creditable projects need a lease covering the crediting period of the project, at minimum. For example, if nutrient reductions are sold for 5 years, there should be at least a 5-year lease with the landowner to protect those reductions.

Lack of Monitoring of Deed Restrictions on Private Property

The most serious disadvantage to deed restrictions on property not owned by a conservation agency or organization is the lack of a designated party to assume monitoring and enforcement responsibility. In some states, such as Michigan, the law limits who can enforce the restrictions and for how long they can do so. For example, if a landowner inserts restrictions in the deed and then sells or transfers the land without retaining land nearby, the restrictions may not be enforceable.

Climate Change Uncertainty

Climate change uncertainty relates to the viability of—or in another view, the need for—a conservation investment by the time the transportation improvement actually occurs. Pressure will continue to increase on all species and habitats, making conservation today more important than ever. DOTs and resource agencies risk that species may still face sharp declines despite large investments in their recovery and expansion. One thing nearly all parties in the transportation and conservation planning process seem to agree on is the need for greater focus on the impacts climate change will have on the long-term functionality of the conservation investment.

Organizational and Process Gaps

Key organizational and process gaps are discussed.

Guidance on Implementing the Watershed Approach

The 2008 joint USACE and EPA Mitigation Rule stresses a watershed approach to making decisions about mitigation, but it leaves the specifics up to each of the 38 USACE Districts about how they will implement the watershed approach to establish mitigation site priorities. The 2008 rules promote using watershed plans as a basis for identifying priorities, but many areas of the country do not have watershed plans. Where plans have been completed, a range of approaches has been used to develop them (U.S. Environmental Protection Agency 2008; Schueler and Kitchell 2005; Ohio Environmental Protection Agency 1997). Although some states have clearly defined restoration needs in the form of a "watershed capital improvement plan," others provide only very general restoration needs. Guidance on implementing a watershed approach and information about reliable wetland locations and conservation and restoration priorities are greatly needed.

Guidance on Integrating Section 404 Mitigation and Section 7 Projects

The *Eco-Logical* approach would be supported by guidance defining how to implement mitigation projects that, when possible, collectively meet Section 404 and Section 7 compensatory mitigation requirements. An example of this combined approach occurs in south Florida, where wetland mitigation banks have been authorized by USFWS to sell credits for impacts on Florida panther habitat (referred to as panther habitat units, or PHUs). Because wetlands also serve as panther habitat, each wetland credit at the bank also contains a specified number of PHUs. The number of PHUs tied to a wetland credit depends on a variety of factors, including the bank's location and the quality of wetland habitat represented by the credit. The purchaser of a wetland credit is also purchasing PHUs with the stipulation that the wetland credit and PHUs associated with that credit must be used to mitigate wetland and panther habitat impacts for the same project. It would be considered double-dipping if the wetland credit were used for one project and the PHUs associated with that credit were applied to mitigate panther impacts resulting from another project.

Criteria for Evaluating Conservation Efforts

USFWS considers any conservation efforts by state or local governments, tribal governments, federal agencies, businesses, organizations, or individuals that positively affect species' status in listing decisions. The Services criteria for listing are a good starting place for evaluating other conservation efforts, including the value of DOT contributions to conservation of species and ecosystems. According to USFWS, the certainty of implementation and effectiveness of a formalized conservation effort may also depend on criteria specific to each particular species, habitat, location, and action. Individual circumstances will also determine the amount of information necessary to satisfy these criteria. These factors are important for DOTs and their partners to consider in developing conservation banks or participating in proactive efforts to improve conditions for declining species in order to avoid future species listings.

Better Funding of Long-Term Environmental Maintenance and Monitoring

In locations where DOTs retain responsibility for long-term maintenance of environmental features, better estimation and funding are needed to allow these activities to be reliably carried out. Resource agencies can support this effort through more complete decision making in planning, in advance of programming, so that environmental needs can be budgeted as early as is practicable. Capital cost estimates for environmental mitigation features generally do not extend past construction to long-term monitoring or maintenance, beyond what may be specified in a permit and included in contracts. However, there are many reasons why good estimates are critical to sound project and program management.

CHAPTER 8

Conclusions

This project is intended to support the integration of transportation and ecological planning. Although there is strong support for integrated transportation and ecological planning in theory, the research indicates that there is room for progress in implementation. Surveys and interviews of staff in transportation and resource agencies indicate that the main incentives for integrating transportation and ecological planning are related to efficient decision making, fiscal benefits, and improved outcomes for the natural environment:

- *Efficient decision making:* By investing time and money upfront, transportation plans can better avoid critical resources; costly re-do loops and delays in project development can be eliminated or minimized; and advance mitigation on an ecosystem scale can be established.
- *Fiscal benefits:* Monetary savings are expected to result from both efficiencies in the decision-making process and the ability to purchase land for mitigation early, thereby avoiding rising land costs and the declining availability of high-quality conservation areas.
- *Improved outcomes:* Focusing on the ecosystem as a whole, rather than considering resources separately according to individual agencies' jurisdictions, results in better identifying and prioritizing of critical areas to conserve and protect. Making this information available and using it during transportation planning will result in better protection of critical natural resources.

Despite the widespread support for the integration of transportation and ecological planning, surveys and interviews identified a number of barriers or challenges to its implementation:

- Lack of resources, especially time and staff, and to a lesser extent, training and the need for champions;
- Lack of data, information, and tools necessary to implement ecosystem-based approaches;
- Lack of data and agreement around the most important resources, sensitive areas, or conservation opportunities;
- Lack of understanding of how to implement ecosystem approaches;
- Issues around coordination, communication, and collaboration;
- Differences in missions or scope of missions;
- Restrictions or assumed restrictions in regulations and guidance; and
- Lack of assurances that mitigation can be paid for today and count for impacts of future projects.

The need for assurances was identified as a major barrier. Transportation agencies need assurance that investments in mitigation in advance of project development will be counted when it is time to apply for a project permit. They also need assurance that they will have achieved compliance with regulations, specifically CWA Section 404 and ESA Section 7, and that the conditions under which a decision would be reopened or revisited are minimized. Resource agencies need assurance that the requirements of the CWA and ESA will be met. In addition, they need assurance that priority resources are avoided and that mitigation will be carried out according to design and maintained in the long term.

This understanding of incentives and barriers provides direction for targeting support. Chapters 5 and 6 describe existing methods for providing assurances. Examples are programmatic agreements and commitment tracking systems and their application at ecosystem scales. This analysis showed that there are many methods available, and in some cases, already being used successfully, to provide assurances that support integrated transportation and ecological planning and advance mitigation.

The barriers and incentives identified, along with solutions recommended through surveys and interviews, also led to the identification of essential features of any ecosystem approach and the development of the IEF. The IEF, which is

a key product of this effort, is a step-by-step process guiding the integration of transportation and ecological planning. It is available through Transportation for Communities—Advancing Projects through Partnerships (TCAPP) at transportationforcommunities.com. The IEF is also described in detail in volume 2 of this report and in the *Practitioner's Guide*. The nine steps of the IEF are described in Figure 4.1.

Important steps remain to continue the integration of transportation and ecological planning. Two additional significant barriers are lack of data on priority conservation areas and lack of resources to implement an ecosystem-based approach. Much progress is being made to address these needs in efforts subsequent to this research. For example, the SHRP 2 Capacity program is sponsoring several and pilot projects that will culminate in a web-based GIS tool that brings together national ecological data sets in a one-stop shop that can be accessed and used by transportation planners. The tool will be tested through multiple pilot applications. Both the tool and the examples of its application in practice will be made publicly available. In addition, SHRP 2, FHWA, and AASHTO are working together to provide transportation and resource agencies with funding to support implementing the IEF.

Given the scientific complexity and uncertainty of ecosystem processes, the lack of well-organized and accessible data, and the single-resource approach to mitigation, the development of a true ecosystem-based regulatory framework is challenging. Although a regulatory framework that provides some level of federal authority over ecosystems may be unlikely, that does not preclude resource and regulatory agencies and DOTs from using ecosystem science and theory to advance their individual regulatory missions and conservation goals within the existing regulatory framework.

Despite the challenges of integrating these complex processes, the increasing number of successful examples from practice, the development of supporting geospatial tools and implementation approaches, and institutional support through funding and leadership will foster the integration of transportation and ecological planning as it becomes a common practice.

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Related SHRP 2 Research

Integration of National-Level Geospatial Ecological Tools and Data (C40A)

Application of Geospatial Ecological Tools and Data in the Planning and Programming Phases of Delivering New Highway Capacity: Proof of Concept—California US-101 (C40B1)

Application of Geospatial Ecological Tools and Data in the Planning and Programming Phases of Delivering New Highway Capacity: Proof of Concept—East-West Gateway Council of Governments (C40B2)

Application of Geospatial Ecological Tools and Data in the Planning and Programming Phases of Delivering New Highway Capacity: Proof of Concept—Contra Costa County Transportation Authority (C40B3)

TCAPP and Integrated Ecological Framework Pilot Projects: Synthesis of Lessons Learned (C41)