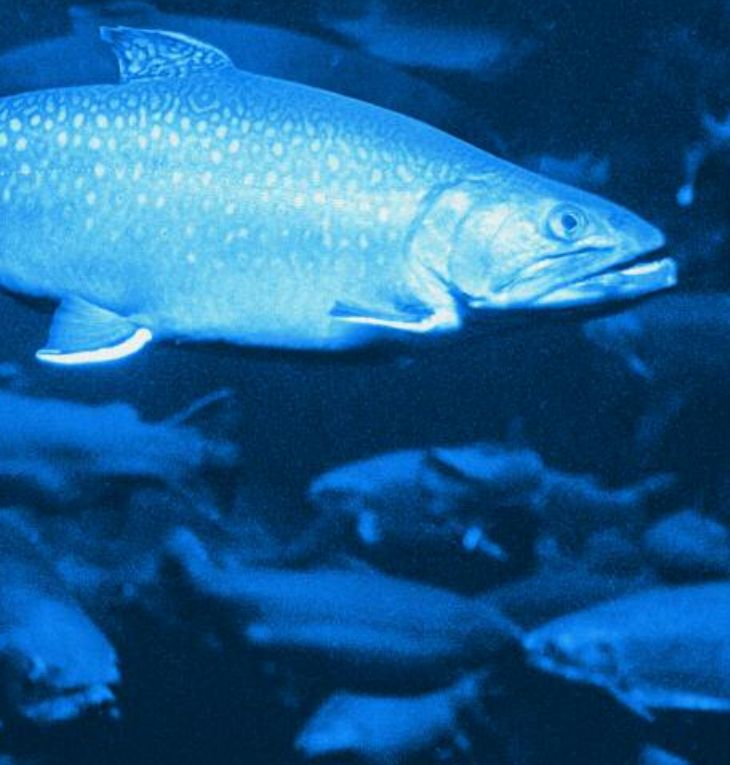




An Ecosystem Approach
to Developing
Infrastructure Projects



Eco-Logical



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Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects

Prepared by the Steering Team
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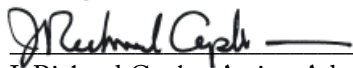
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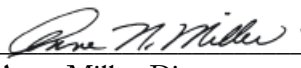
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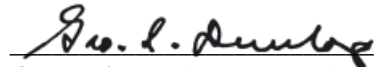
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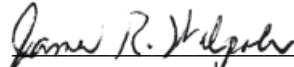
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Benefits for the Steering Team Partners

BLM: Improved resource conservation during land use plan development

EPA: Greater flexibility to do environmental good

FHWA: Streamlined project development and improved mitigation opportunities

NOAA Fisheries Service: Early application of science for solutions

NPS: Using science to protect natural resources while providing visitor experience

USACE: Finding the balance to keep waters clean and clear

USDA FS: Stewardship of natural resources and facilitated use of public lands

USFWS: One conservation framework, endless possibilities for partnership

Acronyms and Abbreviations

BLM	.Bureau of Land Management
CAPS	.Conservation Assessment and Prioritization System
CEQ	.Council on Environmental Quality
CFR	.Code of Federal Regulations
CWA	.Clean Water Act
DOI	.Department of the Interior
DOT	.Department of Transportation
EEP	.Ecosystem Enhancement Program
EO	.Executive Order
EPA	.Environmental Protection Agency
ESA	.Endangered Species Act
FHWA	.Federal Highway Administration
FTA	.Federal Transit Administration
GAO	.Government Accountability Office
GARVEE	.Grant Anticipation Revenue Vehicles
GIS	.Geographic Information Systems
HCP	.Habitat Conservation Plan
L RTP	.Long Range Transportation Plan
MOA	.Memorandum of Agreement
MOU	.Memorandum of Understanding
MPO	.Metropolitan Planning Organization
MTP	.Metropolitan Transportation Plan
NEPA	.National Environmental Policy Act
NHP	.National Heritage Preserve
NGO	.Non-Governmental Organization
NOAA	.National Oceanic and Atmospheric Administration
NPS	.National Park Service
REF	.Regional Ecosystem Framework
SAMP	.Special Area Management Plan
SIB	.State Infrastructure Bank
SIP	.State Implementation Plan
SREP	.Southeastern Rockies Ecosystem Project
STIP	.Statewide Transportation Improvement Program
SWG	.State Wildlife Grants
TE	.Transportation Enhancement
TEA-21	.Transportation Equity Act for the 21st Century
TIP	.Transportation Improvement Program
USACE	.United States Army Corps of Engineers
USDA FS	.United States Department of Agriculture Forest Service
USFWS	.United States Fish and Wildlife Service
WCRP	.Wildlife Conservation and Restoration Program

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Council on Environmental Quality Preface

Embodying the intent and principles of the National Environmental Policy Act (NEPA) and Executive Order 13352 on Facilitation of Cooperative Conservation, *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* offers a framework for achieving greater interagency cooperative conservation. *Eco-Logical* provides a nonprescriptive approach that enables Federal, State, tribal and local partners involved in infrastructure planning, design, review, and construction to work together to make infrastructure more sensitive to wildlife and their ecosystems. It recognizes open public and stakeholder involvement as the cornerstone for cooperative conservation.

Developed by a team of representatives from eight Federal agencies and the Departments of Transportation for four States, this Guide articulates a vision of how infrastructure development and ecosystem conservation can be integrated to harmonize economic, environmental, and social needs and objectives. It describes ways to make more efficient and effective the governmental processes needed to advance infrastructure projects – in compliance with applicable laws – while maintaining safety, environmental health, and effective public involvement.

Eco-Logical is intended to be a starting point for identifying and addressing the greatest conservation needs associated with the development of infrastructure projects. It is also meant to help agencies join in partnerships as catalysts for greater stakeholder cooperation and coordination. Using this Guide, infrastructure improvements can be advanced in productive harmony with the restoration of fragmented habitats, reduction of wildlife mortality, and other cooperative conservation goals. With *Eco-Logical*, we encourage agencies and stakeholders to integrate environmental solutions and goals into planning for infrastructure development and to implement efficient, predictable, and open processes for the review and management of the ecological effects of our Nation's infrastructure projects.

Executive Summary

Infrastructure consists of the basic facilities – such as transportation and communications systems, utilities, and public institutions – needed for the functioning of a community or society. Sometimes the development of these facilities can negatively impact habitat and ecosystems. Techniques have been developed to better avoid, minimize, and mitigate these impacts, as well as the impacts of past infrastructure projects. However, the avoidance, minimization, and mitigation efforts used may not always provide the greatest environmental benefit, or may do very little to promote ecosystem sustainability. This concern, along with a 1995 Memorandum of Understanding (see Appendix A) to foster an ecosystem approach and the Enlibra Principles,¹ mobilized an interagency Steering Team to collaborate over a three-year period to write *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*. The Executive Order for Environmental Stewardship and Transportation Infrastructure Project Reviews (EO13274) and the Work Group on Integrated Planning established under it advance this effort by ensuring that agencies work to integrate planning. Similarly, the Executive Order for the Facilitation of Cooperative Conservation (EO 13352) reinforces *Eco-Logical* by ensuring that agencies of the Departments of the Interior, Agriculture, Commerce, and Defense and the Environmental Protection Agency implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation, with an emphasis on appropriate inclusion of local participation in Federal decisionmaking, in accordance with respective agency missions, policies, and regulations.

The Steering Team began with a shared vision of an enhanced and sustainable natural environment, combined with the view that necessary infrastructure can be developed in ways that are more sensitive to terrestrial and aquatic habitats. In the Steering Team's view, it is possible to significantly contribute

¹ Find the Enlibra Principles at www.oquirrhinstitute.org.

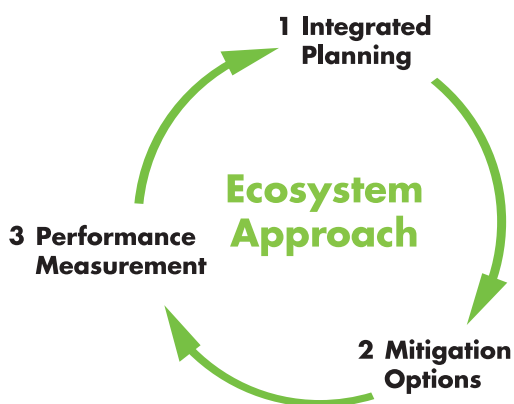
to the restoration and recovery of declining ecosystems and the species that depend on them, while cost-effectively developing the facilities, services, forest products, and recreation opportunities needed for safety, social well being, and economic development. To help do so, *Eco-Logical* encourages Federal, State, tribal, and local partners involved in infrastructure planning, design, review, and construction to use flexibility in regulatory processes. Specifically, *Eco-Logical* puts forth the conceptual groundwork for integrating plans across agency boundaries, and endorses ecosystem-based mitigation – an innovative method of mitigating infrastructure impacts that cannot be avoided.

The following goals drive the Steering Team’s pursuit of improved ways to avoid, minimize, and mitigate impacts:

- **Conservation** – Protection of larger scale, multi-resource ecosystems;
- **Connectivity** – Reduced habitat fragmentation;
- **Predictability** – Knowledge that commitments made by all agencies will be honored, i.e., that the planning and conservation agreements, results, and outcomes will occur as negotiated; and
- **Transparency** – Better public and stakeholder involvement at all key stages in order to establish credibility, build trust, and streamline infrastructure planning and development.

These goals all support an ecosystem approach to infrastructure development. An ecosystem approach is a process for the comprehensive management of land, water, and biotic and abiotic resources that equitably promotes conservation and sustainable use. The approach shifts the Federal government’s traditional focus from individual agency jurisdiction to the actions of multiple agencies within larger ecosystems. It finds ways to increase voluntary collaboration with State, tribal, and local governments, and to involve other landowners, stakeholders, interested organizations, and the public.

As a means to implement an ecosystem approach, *Eco-Logical* introduces ecosystem-based mitigation – the process of restoring, creating, enhancing, and preserving habitat and other ecosystem features in conjunction with or in advance of projects in areas where environmental needs and the potential environmental contributions have been determined to be greatest. Ecosystem-based mitigation extends existing compensatory mitigation options by offering a way to evaluate alternatives for off-site mitigation and/or out-of-kind mitigation in the ecologically most important areas as defined by interagency partners and the public. It is a potentially enhanced approach to crediting mitigation that builds on existing approaches. Integrating this new concept with lessons learned from previous experience can allow agencies to capitalize on opportunities for substantial habitat connectivity and wildlife conservation while developing needed infrastructure.



In addition, *Eco-Logical* recommends an eight-step, nonprescriptive process that can serve as a starting point from which ecosystem-based mitigation decisions can be considered and made. The process, integrated planning, is defined as a course of action that agencies and partners

take to combine planning efforts, understand where programmed work will interact, and define ecological resources of highest concern.

No agency acting on its own can effectively implement an ecosystem approach to infrastructure development. Cooperation is necessary to view ecosystems from a range of perspectives and to address a region's highest-priority ecological needs; and since these needs are dynamic and often not fully understood, partners also need to agree on adaptive performance measures to ensure that desired benefits are occurring. By working together, streamlined project development and sound stewardship of natural resources – which are impacted by a variety of competing interests – are achievable outcomes.

The *Eco-Logical* authors include representatives from the Bureau of Land Management (BLM), U.S. Environmental Protection Agency (EPA), Federal Highway Administration (FHWA), National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries Service), National Park Service (NPS), U.S. Army Corps of Engineers (USACE), U.S. Department of Agriculture Forest Service (USDA FS), U.S. Fish and Wildlife Service (USFWS), the Knik Arm Bridge and Toll Authority, and several State Departments of Transportation (DOT), including North Carolina DOT, Vermont Agency of Transportation, and Washington DOT.

Eco-Logical: Important Definitions

Purpose: To help guide agencies and partners to work proactively in developing and implementing an ecosystem approach for mitigating the effects of infrastructure projects – the public works that provide the basic facilities and services on which communities depend.

Audience: Federal, State, tribal, and local partners involved in infrastructure planning, design, review, and construction.

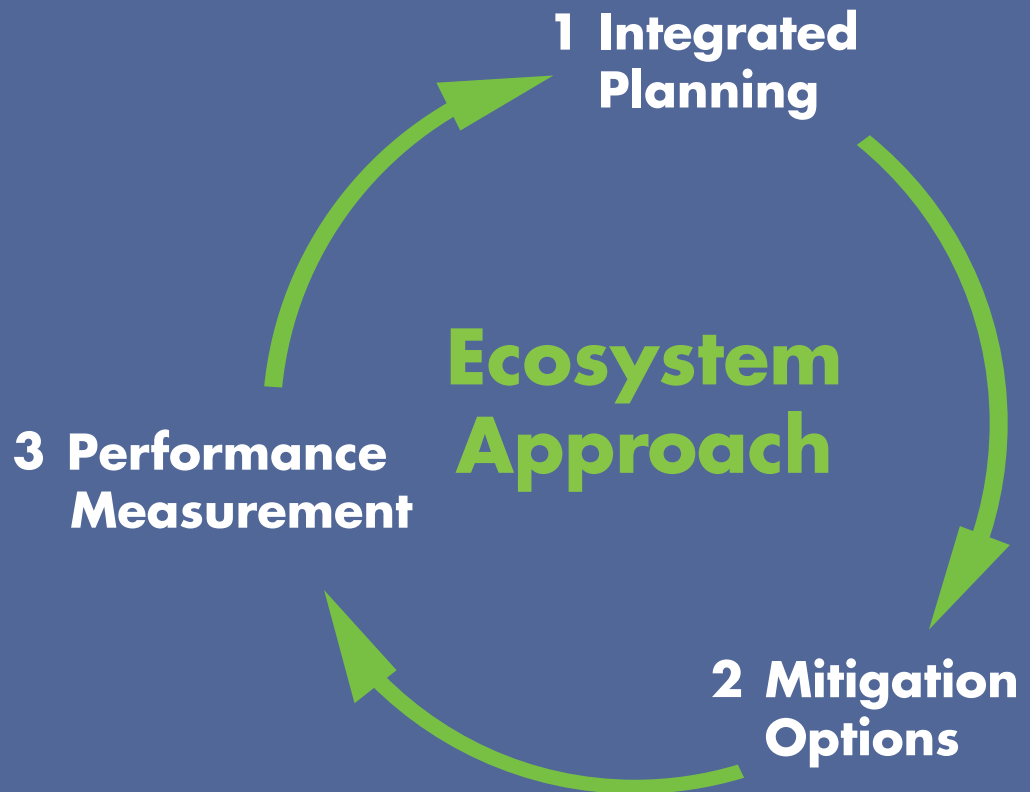
Extensions: *Eco-Logical* should help lead to the next logical steps in compensatory mitigation—finding and taking vanishing opportunities to conserve and improve important ecosystems. Although the Steering Team's discussions primarily focused on transportation, the concepts applied in the Guide can be applied to other types of infrastructure.

Ecosystem: An interconnected community of living things, including humans, and the physical environment in which they interact.

Ecosystem Approach: A method for sustaining or restoring ecological systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

Infrastructure: The basic facilities—such as transportation and communications systems, utilities, and public institutions—needed for the functioning of a community or society.

Wildlife and Habitat: For the purposes of the Guide, the term “wildlife” is meant to be inclusive of terrestrial and aquatic animals and invertebrates; “habitat” refers to the ecosystems, plants, and interactions that support wildlife.



Eco-Logical suggests a method for achieving an ecosystem approach that expects agencies to work together, and with the public, to integrate their respective plans to determine environmental priority areas. With priorities understood, mitigation options can be explored where impacts are unavoidable. The performance of implemented mitigation can then be measured, providing information useful to future iterations of the integrated planning process.

Advantages of an Ecosystem Approach

CHAPTER I

An ecosystem approach is a method for sustaining or restoring ecological systems and their functions and values. It is goal driven and is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

Over the last several decades, an understanding of how infrastructure – the basic facilities needed for the functioning of a community or society – can negatively impact habitat and ecosystems has grown. Awareness of how to better avoid, minimize, and mitigate these impacts has also matured. Regarding the latter, mitigation of project impacts has commonly been focused on replacing similar resources as close to the impact site as feasible. This approach generally focuses on satisfying regulatory requirements, but may not be serving the highest ecological needs in a given area.

Within an ecosystem approach, the context of a particular infrastructure project(s) and the partners implementing it determine the ecosystem's boundaries. For this reason, an ecosystem approach can help move agencies from being confined to project boundaries and regulatory checklists to addressing permitting predictability and habitat conservation on broader, ecosystem scales. An ecosystem approach can allow for more efficient and cost-effective ways to avoid and minimize impacts. It can also help to identify and capitalize on opportunities for meaningful mitigation and conservation – opportunities that may be quickly disappearing or becoming too expensive to realize as areas of ecological importance are developed.

Federal Agencies Support an Ecosystem Approach

In December of 1995, the Council on Environmental Quality (CEQ) and the agencies jointly publishing this document signed an interagency Memorandum of Understanding (MOU) encouraging an ecosystem approach. The MOU articulated a policy that the “Federal Government should provide leadership in and cooperate with activities that foster the ecosystem approach to natural resource management, protection, and assistance. Federal agencies should ensure that they utilize their authorities in a way that facilitates, and does not pose barriers to the ecosystem approach.” It also emphasized “forming partnerships between Federal, State, and local governments, tribes, landowners, foreign governments, international organizations, and other stakeholders.” The MOU provides a starting point for the encouragement and direction that *Eco-logical* offers. See Appendix A for the complete MOU.

All Benefit

Together, partners can work to implement an ecosystem approach to infrastructure projects. In doing so, substantive contributions to species, watershed, and ecosystem health and recovery can be made that are sometimes missed when regulations are administered on a project-by-project basis. Although the approach can have significant and tangible benefits to the environment and the public, and has the potential for improved interagency coordination, it cannot completely eliminate conflict. Instead, an ecosystem approach should be viewed as a tool for partners to develop acceptable solutions that complement agency missions.

Some of the other mutual benefits of an ecosystem approach to infrastructure projects include:

- **Safer, improved infrastructure** – All agencies and stakeholders contribute to the delivery of infrastructure. The collective abilities and knowledge shared within an ecosystem approach should allow a more balanced understanding of ecological and social concerns.
- **Improved watershed and ecosystem health** – A systematic approach to the preventive, diagnostic, and prognostic aspects of ecosystem management, and to the understanding of relationships between ecological issues and human activities.
- **Increased connectivity and conservation** – Since an ecosystem approach to infrastructure projects takes a broad view of interacting human and natural systems, it can help agencies plan and design infrastructure in ways that minimize habitat fragmentation and protect larger scale, multi-resource ecosystems.

- **Efficient project development** – Uncertainty during project development imposes a high cost on agencies and partners, in both time and money. An ecosystem approach fosters cost-effective environmental solutions that can be incorporated early in the planning and design of infrastructure projects.
- **Increased transparency** – Infrastructure projects developed with an ecosystem approach provide opportunities for and encourage public and stakeholder involvement at all key stages of planning and development.



Positive opportunities for environmental stewardship can be permanently lost when the traditional, project-specific approach to avoiding, minimizing, reducing, or compensating impacts is used. Using *Eco-Logical's* proposed approach, agencies can collaborate, share resource data and plans, and agree on the location of ecologically important areas and the important resources there. The Oregon Bridge Replacement Stewardship program is an outstanding example of interagency coordination and collaboration that provides significant benefits to transportation and the environment by fundamentally changing how a major construction program and numerous State and Federal environmental laws are administered and implemented within existing legal frameworks.

Setting the Stage

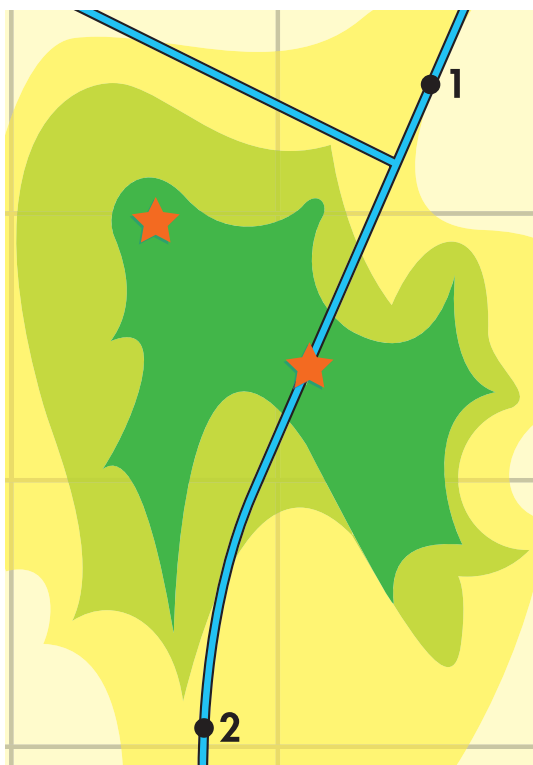
CHAPTER II

While any agency implementing or mitigating infrastructure projects could use *Eco-Logical's* proposed approach, transportation-related examples are the focus here. Today, projects address system capacity, maintenance, and safety. Some of these projects improve traffic flow without adding substantial lengths of new lanes or alignments. Projects that are related to facilities on existing alignments provide little opportunity for avoidance and minimization. Similarly, should mitigation be required, these projects are often not located within areas that present the best opportunities for environmental stewardship and ecological gain. Positive opportunities can be permanently lost when the traditional, project-specific approach to avoiding, minimizing, reducing, or compensating impacts is used.

The hypothetical scenario discussed here illustrates this condition. In the map on page 6, the green areas indicate the region's ecologically most vital areas. These areas may include important wildlife, habitat, biologically diverse and productive forests, wetlands and water resources, or other important environmental features. The potential for meaningful conservation and environmental stewardship efforts is significant in these areas.

A transportation agency (the action agency² in the scenario) has Projects 1 and 2 planned along an existing corridor in the region. Examples of these projects could include roadway reconstruction, overlays and widening, the creation of turning lanes, and/or the installation of guardrails and barriers, among others. The stars indicate places of ecological importance where mitigation opportunities exist. Potential mitigation projects here might be a land purchase for conservation, the reestablishment of a stream meander, or the creation of a wildlife crossing, among many others.

² Action agency – An agency whose actions may impact the quality of the human and/or natural environment.



Map of planned infrastructure projects and ecologically important areas. Numbers indicate infrastructure project locations, green indicates the most ecologically vital areas, while the stars show opportunities for the most meaningful mitigation, should it be necessary.

Environmental Policy Act (NEPA) and Section 404 of the Clean Water Act (CWA). If agencies could graphically show how current or proposed projects are related and how they interact, the cumulative effects that can occur could be better determined. This could enable more effective planning and design of projects and any resulting mitigation.

Using the *Eco-Logical* approach, agencies can collaborate, share resource data and plans, and agree on the locations of ecologically important areas and the important resources there. When possible, they may then try to avoid infrastructure development in these areas. If mitigation is necessary, it can be directed to the particularly important locations – even if the resources there are off-site and/or out-of-kind⁴ – in order to achieve the greatest ecosystem benefit.

A way to set the stage for agencies and their partners to do similar work is through integrated planning. Chapter III describes a process for adopting this approach.

As shown on the map, the planned transportation projects are not located within the areas of highest ecological priority. Traditionally, resource agencies³ would be charged with the task of reacting to Projects 1 and 2 individually. This type of narrow review can lead to mitigation on a restricted, project-by-project basis. In the past, the starred mitigation opportunities – the results of which would likely benefit all agencies – might not be seized because:

1. They were not planned; or more importantly,
2. The transportation agency was left asking: “What is in it for us if we contribute transportation dollars to this priority area?”

This does not mean that traditional, project-specific mitigation is not significant or beneficial. It means that without broader program, resource, geographic, and temporal perspectives – that is, without an ecosystem approach – any required on-site mitigation may not go as far as possible toward advancing the highest priority ecological and infrastructure goals.

A similar and common scenario concerns the cumulative impacts stemming from a multitude of projects. Often it is challenging for action agencies to identify the indirect and cumulative impacts of their individual projects as required under the National

³ Resource agency – An agency that has jurisdiction over a resource that may be affected by some activity.

⁴ Off-site – At a location not bordering the impact site. Out-of-kind – Other or different resources or ecological functions than those impacted.

Avoidance, Minimization, and Compensatory Mitigation: The Sequence

CEQ has defined mitigation in 40 CFR 1508.20 to include: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. The Clean Water Act (CWA) Section 404 (b)(1) Guidelines establish environmental criteria that must be met for activities to be permitted under the CWA in order to meet the mandate of restoring and maintaining aquatic resources. CEQ's mitigation is wholly compatible with the requirements of the CWA Guidelines; however, they can be combined to form three general types: avoidance, minimization, and compensatory mitigation.

In evaluating Section 404 applications, the USACE first makes a determination that potential impacts have been avoided to the maximum extent practicable; remaining unavoidable impacts will then be minimized to the maximum extent appropriate and practicable and, finally, compensated for. It is this sequence – avoidance, minimization, and compensatory mitigation – that provides for the adherence to the requirements of the CWA. This allows permit issuance for the practicable alternative least environmentally damaging to the aquatic environment and that does not have other significant, adverse environmental consequences.

For Help Along the Way: Refer to the Appendices of this Document

Appendix A – MOU to Foster the Ecosystem Approach presents the complete interagency MOU that provides the foundation for *Eco-Logical*. The Council on Environmental Quality and the agencies that jointly published this book signed the MOU in 1995 to encourage an ecosystem approach.

Appendix B – Funding and Partnerships introduces concepts for funding and partnerships that can enable integrated planning, ecosystem-based mitigation, and adaptive performance measures. It describes opportunities, presents examples, and provides links to guidance and other resources.

Appendix C – Resource Guide lists and describes:

- Documents and websites referenced in the text of *Eco-Logical*
- Other sources of useful information
- Training opportunities.

Appendix D – Federal Laws and Requirements lists and describes Federal laws and requirements relevant to implementing an ecosystem approach.



Integrated planning helps field-level experts, partners, and the public collaborate to devise one framework that outlines locally appropriate strategies. In the mid-1980s, several counties in a rapidly urbanizing area of Virginia developed a comprehensive land use plan for the Occoquan Reservoir watershed and adopted zoning ordinances regulating the location, type, and intensity of future land uses. (Photo obtained from the Northern Virginia Regional Commission, © 2001 AirphotoUSA, LLC, All Rights Reserved.)

Integrated Planning – The First Steps Toward an Ecosystem Approach

CHAPTER III

“Progress begins with the belief that what is necessary is possible.”

-Norman Cousins

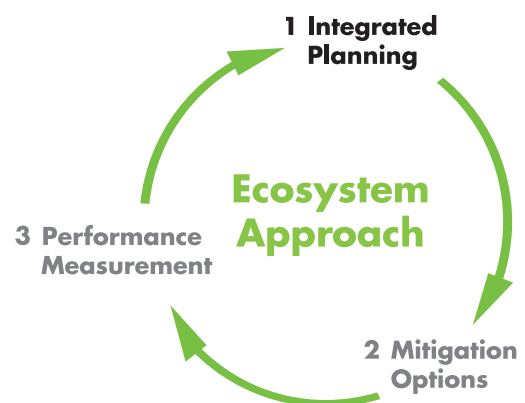
Addressing Common Challenges with Locally Appropriate Strategies

Integrated planning is the foundation for an ecosystem approach to infrastructure development, as well as for any ecosystem-based mitigation agreements. It allows for the formation of open dialogue and mutual objectives. Achieving joint goals requires planning that recognizes agencies’ respective missions and considers stakeholders’ needs.

Integrated planning attempts to provide a method for the collection, sharing, analysis, and presentation of data contained in agencies’ plans. Through the collaborative efforts of field-level experts, partners, and the public, one framework outlining locally appropriate strategies can be devised (See “A Framework for Integrated Planning” on next page).

Some challenges to adopting integrated planning include:

- Conflicting priorities and scales among agencies or field offices, or national, regional, and local concerns;



- Inconsistent terminology and incompatible data and performance measures across agencies;
- Conflicting geographic, ecological, and political boundaries;
- Lack of plans, or plans with differing levels of detail;
- Communication among stakeholders;
- The need for early and long-term involvement;
- Funding procedures (short-term objectives often get funded before long-term objectives);
- Risk aversion and lack of trust among agencies;
- Belief that regulations are inflexible; and
- Political pressures (e.g., mitigate to complete this project in my district).

Specific examples of stumbling blocks identified by the Steering Team include: infrastructure expenditures – highway trust fund expenditures, for example – have many priorities other than large scale ecosystem conservation; and resource agencies may not determine or share their highest priority resources until triggered and/or identified by infrastructure agencies’ environmental review process.

Collaboration is key to overcoming these challenges. Many States have already formed expert-partner-public groups, and their efforts should continue to be encouraged. These groups provide the foundation and perspective necessary to broaden the context in which agencies’ work is done. By going a step further to integrate plans, existing and new groups can establish and solidify common, long-term goals while making better and more inclusive decisions.

A Framework for Integrated Planning

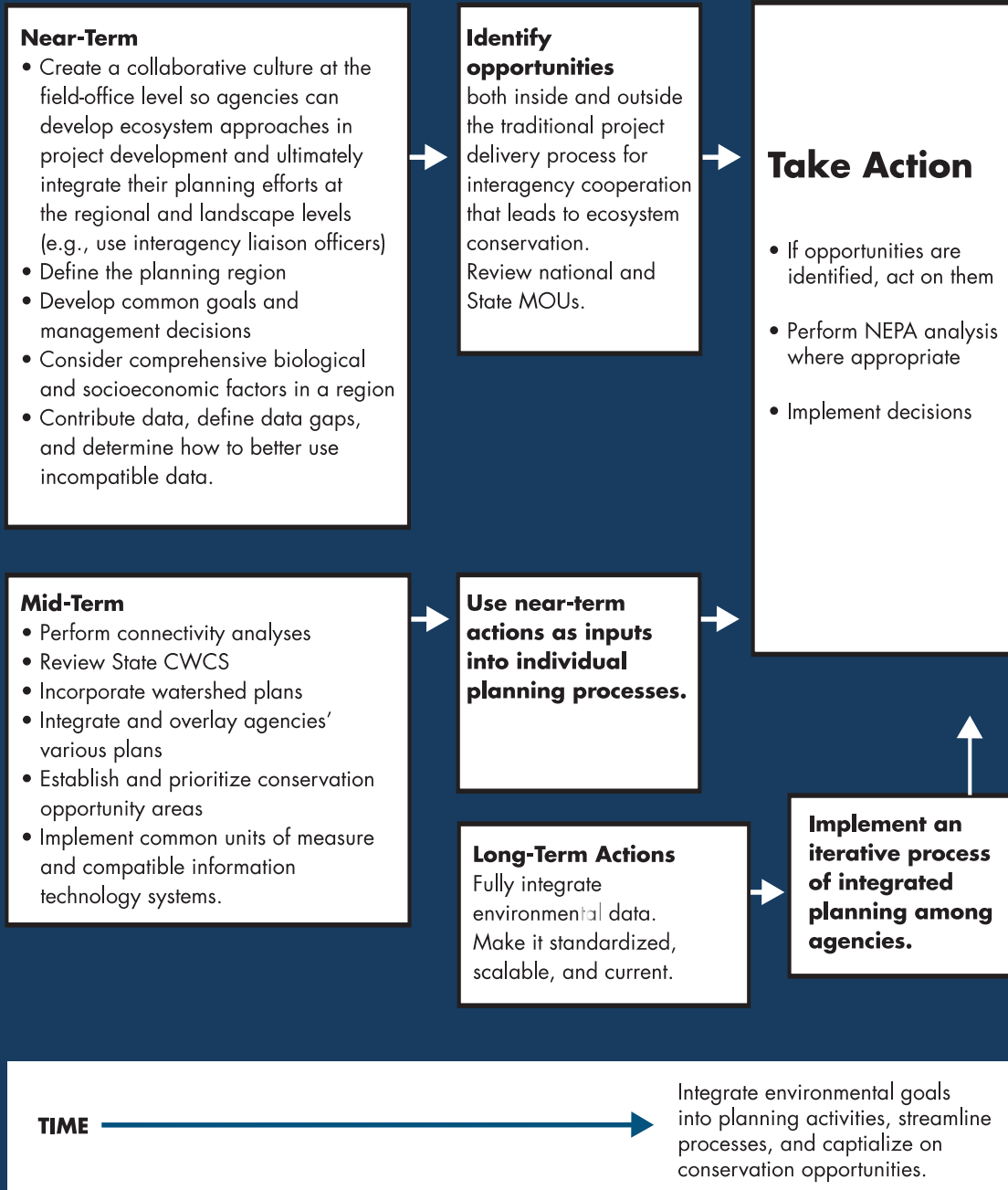
An eight-step framework for integrating interagency planning efforts is presented below. This framework can be modified to accommodate the unique situations and various starting points at which States find themselves. Although the path may vary some, in most cases, integrated planning will be an iterative process that builds on the pursuit of common near-, mid-, and long-term activities (see chart on opposite page). Through each iteration, the rationale for future planning and development decisions is strengthened and the responsiveness to both infrastructure and ecosystem needs is improved.

Eight-Step Framework for Integrated Planning

- 1** Build and Strengthen Collaborative Partnerships
- 2** Identify Management Plans
- 3** Integrate Plans
- 4** Assess Effects
- 5** Establish and Prioritize Opportunities
- 6** Document Agreements
- 7** Design Projects Consistent with Regional Ecosystem Framework
- 8** Balance Predictability and Adaptive Management

Common Integrated Planning Activities

Integrated planning can start immediately.
Arrange the pieces while moving forward.



1 Build and Strengthen Collaborative Partnerships: A Foundation for Local Action

a Identify and Contact Counterparts in Other Federal Agencies

Contact counterparts to learn about their project work. Develop an understanding of their knowledge and expertise. Establish regular communication channels for interagency interaction through periodic meetings, Internet message boards, and/or peer exchanges, for example. Determine existing interagency relationships and available data.

b Build Relationships with State, County, Municipal, and Tribal Partners

State, county, municipal, and tribal partners can participate in long-term landscape conservation and management measures. They offer important services and knowledge and have significant project and mitigation implementation concerns.

c Include the Public and Determine Other Stakeholders

Federal agency staff should act as catalysts for greater and more transparent public and stakeholder participation. By encouraging the early and frequent involvement of all stakeholders throughout the planning process, community concerns can be more fully integrated into decisions. Their involvement can prevent conflict and contribute to creative resolutions if conflicts do arise.

d Formalize Partnerships

Cooperating agencies and organizations can consider formalizing working partnerships. One way to document partnerships is to create an MOU. These agreements outline upfront roles and responsibilities and help to ensure balanced and nonpolarized commitment.

2 Identify Management Plans: A Foundation for a Regional Ecosystem Framework

The next step is to identify management plans that agencies and partners have developed individually. These plans are important sources of information in the integrated planning process. Some types of plans include: recovery plans; resource management plans; forest management plans; USACE's Special Area Management Plans (SAMPS); and community growth plans. Map products from gap analyses and Non-Governmental Organization (NGO) plans – such as the Bird Conservation Plans of Partners In Flight⁵ and the ecoregional plans of The Nature Conservancy – are also relevant plans.

A valuable plan that identifies wildlife and habitat conservation priorities, opportunities, and needs in a planning region is a State Comprehensive Wildlife Conservation Strategy, also known as a Wildlife Action Plan. (See Wildlife Action Plans sidebar on page 14.) To be eligible to receive Federal funds through the State Wildlife Grant (SWG) program and Wildlife Conservation and Restoration Program (WCRP), each State and territory will have developed a Wildlife Action Plan by October 1, 2005, as charged by Congress. A Wildlife Action Plan addresses the conservation of a broad range of wildlife species by identifying their associated habitats and the actions needed to protect and restore the viability of those habitats. The strategies, which focus on the species in greatest need of conservation while addressing the needs of the full array of wildlife in

⁵ For more information on Partners in Flight and Bird Conservation Plans, visit <http://www.partnersinflight.org/>.

each State, can provide a baseline assessment or inventory of current wildlife and habitat resources. They also can give agencies and conservation partners the information necessary to strategically think about both individual and coordinated roles and responsibilities in conservation efforts.

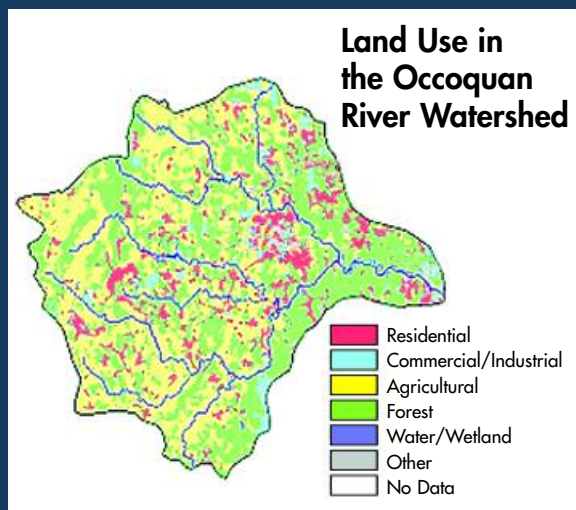
In coastal States, in particular, there will be additional management plans to incorporate that deal specifically with important marine and coastal issues. Examples include (but are not limited to) plans from: State coastal management programs, State coastal nonpoint pollution programs, National Marine Sanctuaries (NOAA Fisheries Service), National Estuarine Research Reserves (NOAA Fisheries Service and States), and National Estuary Programs (EPA). Additionally, fishery rebuilding plans and recovery plans for living marine resources should be included, where appropriate (NOAA Fisheries Service and State fisheries agencies).

Watershed Planning: Occoquan Water Supply Protection

In the mid-1980s, several counties in a rapidly urbanizing area of Virginia developed a comprehensive land use plan for the Occoquan Reservoir watershed and adopted zoning ordinances regulating the location, type, and intensity of future land uses. This was done after maximizing the limits of treatment technology for the wastewater treatment plants discharging into the tributaries upstream of the reservoir and after intensive data collection and model development. Fairfax County took the lead in working with basin partners to study different land use development scenarios and how well they met multiple objectives such as:

- Improved transportation system
- Economic development
- Efficient provision of community services
- No degradation of the Occoquan water supply.

Depending on the sensitivity of land areas in meeting specific objectives, portions of the watershed were strategically upzoned and others downzoned.



In addition, watershed plans can provide a better understanding of the health of aquatic resources. Some watershed planning groups convene to address chronic problems such as degrading fisheries, while others seek to address acute problems such as contaminated mine drainage or heavy erosion along stream banks. Still other planning efforts may bring together citizen groups with local and State agencies to work on plans for community and environmental improvements. Watershed plans should consist of several components, including the identification of broad goals and objectives; a description of environmental problems; an outline of specific alternatives for restoration and protection; and documentation of where, how, and by whom these action alternatives will be evaluated, selected, and implemented. (See Watershed Planning sidebar on this page.)

For transportation, the Long-Range Transportation Plan (LRTP) or Metropolitan Transportation Plan (MTP) states how the region plans to invest, both long-range (over 20 years) and short-range, in the development of an integrated intermodal transportation system. Metropolitan Planning Organizations (MPOs) make special efforts to engage interested parties in the development of this plan. Additionally, the Transportation Improvement Program (TIP) is a financially constrained, three-year program covering the most immediate implementation priorities for transportation projects and strategies from the LRTP or MTP. It is a region's way of allocating its limited transportation resources among the various capital and operating needs of the area, based on a clear set of short-term transportation priorities. The TIP is incorporated into the Statewide Transportation Improvement Program (STIP), a plan that lists high-priority projects that will be approved by the FHWA and the Federal Transit Administration (FTA) to utilize Federal funds.

Wildlife Action Plans

Under the State Wildlife Grants (SWG) Program and the Wildlife Conservation and Restoration Program (WCRP), each State has a Comprehensive Wildlife Conservation Strategy (CWCS) – or Wildlife Action Plan – in place. The Strategies, which have been developed in consultation with local stakeholders and reviewed by a National Advisory Acceptance Team, set a vision and a plan of action for wildlife conservation and funding in each State. While fish and wildlife agencies have led the Wildlife Action Plan development process, the aim has been to create a strategic vision for conserving the State's wildlife, not just a plan for the agency.

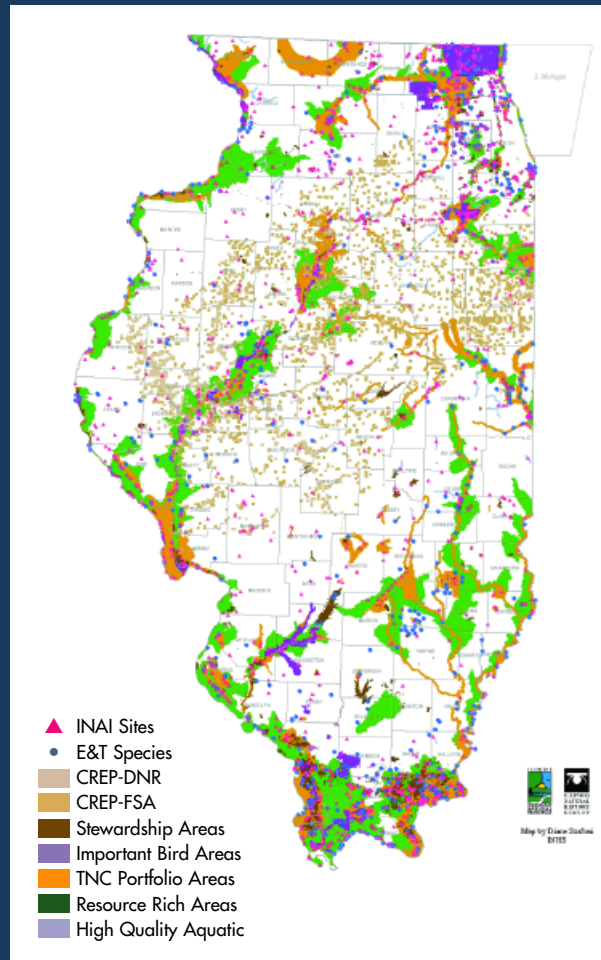
What information does a CWCS include?

The strategies have been developed according to requirements laid out by Congress for the WCRP and criteria developed by the USFWS for the SWG Program. Each State's Wildlife Action Plan will include information on priority wildlife species and habitats, the issues that need to be addressed to restore the viability of those species and habitats, and recommendations for addressing those issues. The Wildlife Action Plans have been developed by pulling together a wide range of available data and recommendations from other planning efforts.

Other requirements include:

- (1) Information on the distribution and abundance of species of wildlife, as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife;
- (2) Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1);
- (3) Descriptions of problems, which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors, which may assist in restoration and improved conservation of these species and habitats;

- (4) Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions;
- (5) Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions;
- (6) Descriptions of procedures to review the strategy at intervals not to exceed 10 years;
- (7) Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats; and,
- (8) Provisions to provide an opportunity for public participation in the development of the Strategy. *Source: 16 USC 669c(d); 66 Fed. Reg. 7657 (2001)*



What does a CWCS look like?

While the Strategies are built around a core set of planning requirements, they each reflect a different set of issues, habitats, management needs, and priorities. The States have been in partnership with the USFWS to ensure nationwide and regional consistency and a common focus on targeting resources for conserving declining wildlife and their habitat. However, the specific content and structure of each State's Strategy varies greatly. To identify how to integrate each State's Wildlife Action Plan recommendations and information at the scale appropriate to a particular regional ecosystem framework (REF), see "Integrate Plans," the third step in Integrated Planning.

The Illinois Wildlife Action Plan draws on existing conservation plans and considers the stresses affecting habitats and species in greatest need of conservation to identify conservation priorities at several scales.

Copies of each State's Wildlife Action Plans, overview and summary information, and contacts for each agency can be found at www.wildlifestrategies.org.

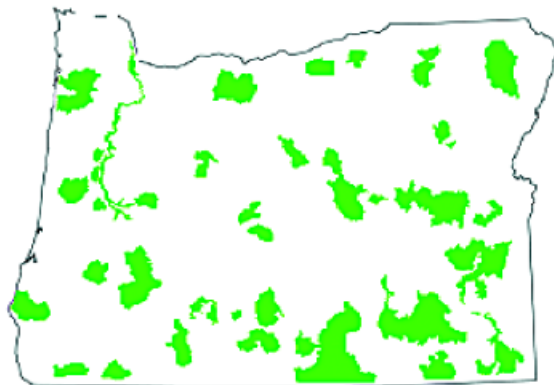
To identify what work is desired and where it will be done, a regional ecosystem framework (REF) will be needed. Although there is no standard for creating a REF, *Eco-Logical* recommends that a REF consist of an “overlay” of maps of agencies’ individual plans, accompanied by descriptions of conservation goals in the defined region(s). A REF can afford agencies a joint understanding of the locations and potential impacts of proposed infrastructure actions. With this understanding, they can more accurately identify the areas in most need of protection, and better predict and assess cumulative resource impacts. A REF can also streamline infrastructure development by identifying ecologically significant areas, potentially impacted resources, regions to avoid, and mitigation opportunities before new projects are initiated.

Since ecosystems do not necessarily follow political boundaries, REFs can cover multi-State regions. Agencies and planning partners should define, case-by-case, the region for which a REF will be created.

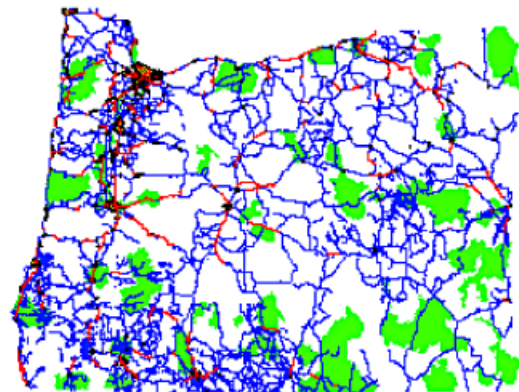
The following steps can assist in REF development.

Conservation Opportunities and Transportation Improvements in Oregon

Map A presents the locations of conservation opportunity areas, while Map B illustrates Oregon’s roads and cities, as well as its Statewide Transportation Improvement Program (STIP) overlaid. Map B shows where planned transportation improvements are located in relation to potential locations for meaningful conservation. This is one type of planning overlay—where conservation plans are extended to include transportation plans and vice versa—that *Eco-Logical* is encouraging.



Map A: Oregon’s Conservation Opportunity Areas



Map B: Oregon’s STIP Overlaid on Map of Conservation Opportunity Areas and Roads/Cities

a Overlay Maps

To start, overlay maps of infrastructure and conservation plans to determine the projects and resources that “link” agencies. An overlay of maps can show how planned projects and objectives might cumulatively impact a region’s resources, as well as how these resources may shape how projects are implemented. In the example in on the previous page, Map A shows potential conservation areas on a base map developed by one statewide planning process. As other maps are overlaid and plans compared, priorities and opportunities for environmental stewardship and conservation of aquatic and terrestrial habitat can be identified (see Map B).

Although not all agencies will have equally developed maps or plans, this should not prevent their involvement. All agencies can contribute to the planning overlay.

b Define Region

With plan maps overlaid, define the region(s) to which the REF will be applied. This key step is a near-term action that can be addressed today. Agencies’ approaches to defining a region differ across the country, and boundaries can be defined by a number of geo-political, socioeconomic and/or biological factors. When creating a REF, boundaries not relating to ecological resources, such as political or jurisdictional boundaries, can be addressed while providing for inter-regional coordination to address broader zones, areas of overlap or gaps, and issues of scale.

c Describe the Regional Ecosystem Framework in Writing

There is no standard for creating a REF. However, *Eco-Logical* recommends that a REF consist of maps accompanied by descriptions of conservation goals in the defined region(s). After overlaying agencies’ plan maps and defining conservation regions, as outlined above, most of the work in this step has been completed. The process of overlaying plans will have yielded new maps, while the process of defining conservation regions will have shown how proposed projects are spatially arranged in relation to ecological resources in an area. The missing step is to document in writing proposed projects, conservation opportunities, and goals. The interagency team that is overlaying plans is likely the most appropriate author of the REF, but other concerned groups, such as local agencies, conservation organizations, and landowners should be invited to participate.

Ecosystem Frameworks and Examples of Components

An ecosystem approach and framework recognizes that the natural environment and natural ecosystems are not defined by political or jurisdictional boundaries. An ecosystem approach proceeds with a priority of considering the ecosystem and its processes. States across the country have begun work related to REF planning and have taken a variety of approaches, reflecting issues of scale, information sources, existing plans, management needs, and local priorities. Examples of components within a REF could be a statewide strategy for wildlife such as Wildlife Action Plan efforts. Because Wildlife Action Plans incorporate a broad range of information on wildlife and habitat conservation needs and opportunities, they can play a central role in the development of a REF. Maps associated with each State’s Wildlife Action Plan can be useful resources for overlaying plans to identify important areas and mitigation opportunities.

Sonoran Desert Regional Ecosystem Monitoring

The Sonoran Institute, an organization that works with communities to conserve and restore important natural landscapes in Western North America, is partnering to create a bi-national, ecosystem monitoring framework for the Sonoran Desert. The framework, which will be implemented by multiple Federal and State agencies, research institutions, and nonprofit organizations in Mexico and the United States, will provide the structure for developing parameters and protocols, linking monitoring to adaptive management, improving data management, and reporting on the condition of the region.

The purpose of monitoring in the Sonoran Desert is to provide an assessment of ecological conditions and trends, and the social factors that may affect them, in order to identify appropriate management and policy actions. To facilitate a coordinated, cross-border, regional monitoring program, the framework will identify a suite of indicators that captures the complexities of the ecosystem, yet remains simple enough to be practically monitored by a wide range of participants. To learn more about the effort, including the strategy used to develop the framework, visit www.sonoran.org/programs/si_sdep_adaptive_info.html.

Montana

In Montana, an interagency team⁶ collaborated to outline a technique for rapidly identifying important wildlife linkage areas along Montana's Highway 93. The team's report, *An Assessment of Wildlife and Fish Habitat Linkages on Highway 93—Western Montana*, describes how data on varying attributes—such as vegetation type; elevation; presence of streams, lakes, and wetlands; land ownership; road-kill; and location of both wide-ranging animals and small animals with limited mobility—can be overlaid. This integrated information can help decisionmakers conclude whether a given highway segment is suitable as an area for wildlife linkage (an area of land that supports or contributes to the long-term movement of wildlife) and for which species it is likely appropriate.

This proactive analysis of linkage areas becomes especially important when project impacts are assessed and the values of wildlife and habitat-aware infrastructure projects and mitigation are assigned. For example, if an infrastructure project overlays a linkage area, the reasons that project is important can be better understood (e.g., increased connectivity and motorist safety, decreased wildlife mortality and economic cost).

Colorado

In partnership with the Colorado Department of Transportation (CDOT), The Nature Conservancy, and Colorado State University, Southern Rockies Ecosystem Project (SREP) has launched the *Linking Colorado's Landscapes* campaign to identify and prioritize wildlife linkages across the State of Colorado. The goal of this work is to provide transportation planners, community leaders, and conservationists with statewide data on the habitats and wildlife corridors that are vital for maintaining healthy populations of native species.

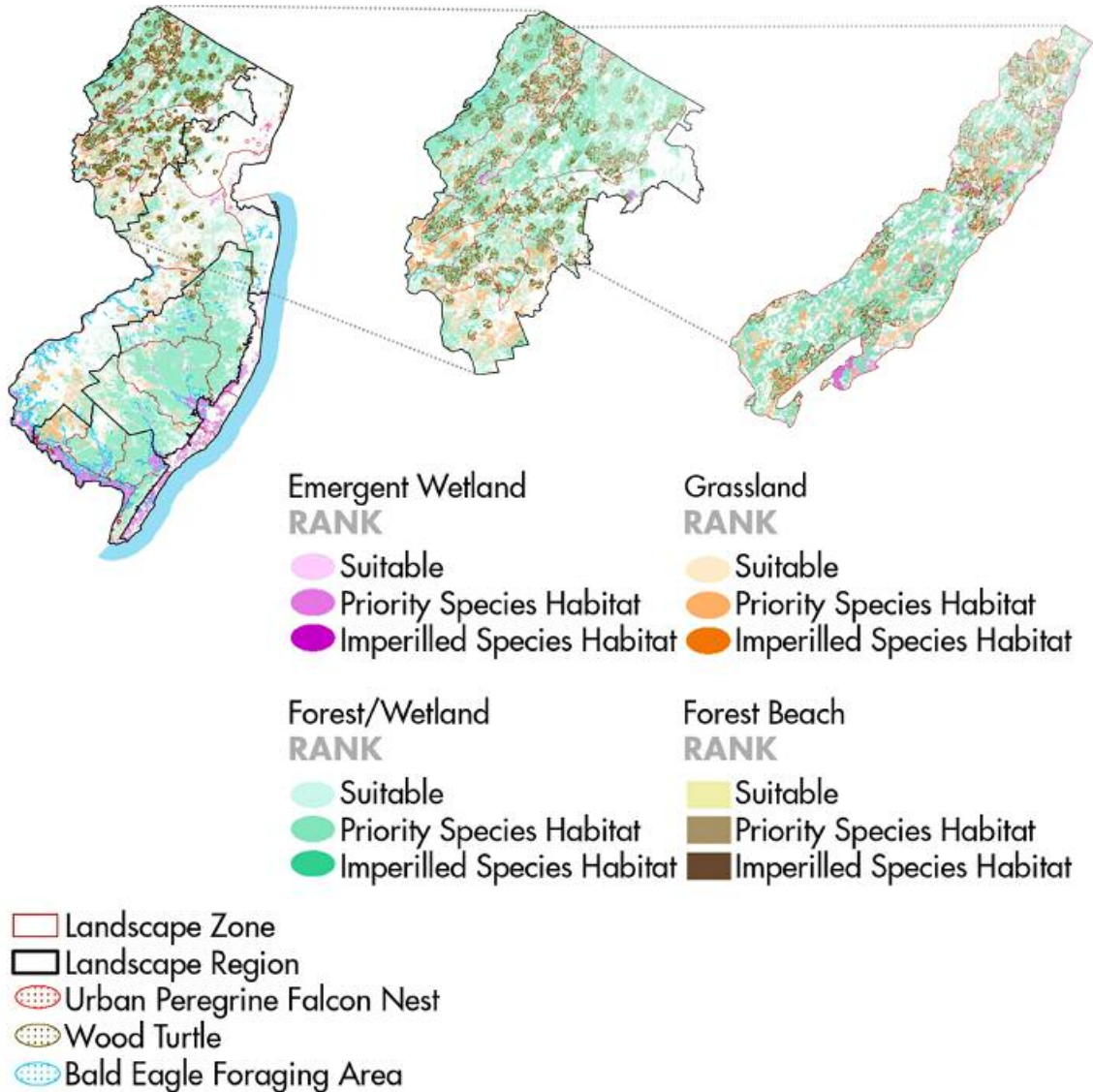
CDOT has completed an analysis of the entire State that identified 13 key wildlife-crossing areas. Through a two-track approach, the SREP expanded upon CDOT's work to analyze connectivity needs. The first track identified both functioning and degraded wildlife corridors that are vital to wildlife populations. The characteristics and existing conditions of each identified linkage were then evaluated. The second track used a geographic information system (GIS) to layer spatial data about the physical characteristics

⁶ Collaborators included the USDA FS; USFWS; USDOT; Montana DOT; Montana Fish, Wildlife & Parks; tribal governments; Rocky Mountain Elk Foundation; GeoData Services Inc.; and the University of Montana. Report citation: Ruediger, et al., Forest Service Publication #R1-04-81, Missoula, MT.

(e.g., topography, rivers and streams) with information about wildlife habitat preferences and movement patterns. This allowed for the modeling of landscape areas key to wildlife movement. The two tracks were then combined for a cross-comparison of the highest priority linkages identified by each. The next phase in the project, Linking Colorado’s Landscapes and Beyond, provided an in-depth analysis to CDOT and FHWA on each top priority linkage. Planners will use the analysis to identify wildlife needs within the top priority linkages.

New Jersey

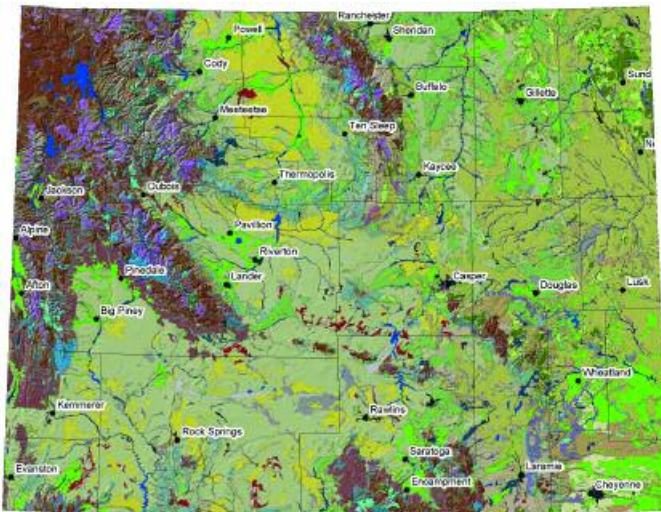
The New Jersey Wildlife Action Plan is built on the foundation of the State’s Landscape Project, a habitat prioritization and mapping framework developed in 1994 by the New Jersey Division of Fish and Wildlife’s Endangered Species and Nongame Program. The Landscape Project identifies critical patches of five habitat types (forest, grassland, forested wetlands, emergent wetlands, and beach/dune) across five landscape regions: the Skylands, the Piedmont/Coastal Plains, the Pinelands, the Atlantic Coastal, and Delaware Bay. Information on wildlife of greatest conservation need, threats, conservation goals, and conservation strategies is linked to each habitat patch, landscape region, and landscape zone through an interactive database.



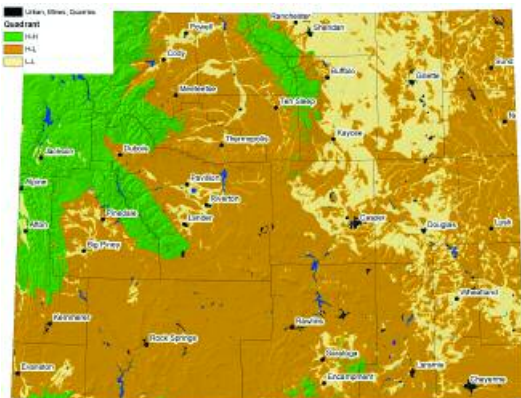
Wyoming

The Wyoming Wildlife Action Plan describes the conservation status and needs of 52 terrestrial ecological systems across 7 ecoregions, aggregated into 7 major community types. By modeling the condition of habitats statewide and reviewing the current level of protection assigned to each habitat, the Wildlife Action Plan identifies which habitats have relatively greater conservation need. Habitat conservation recommendations in the Wyoming Wildlife Action Plan also integrate the Wyoming Strategic Habitat Plan (SHP), a pre-existing agency plan that identifies priority areas for terrestrial and aquatic habitat conservation and management. Future versions of the SHP will be specifically linked to Wildlife Action Plan priorities.

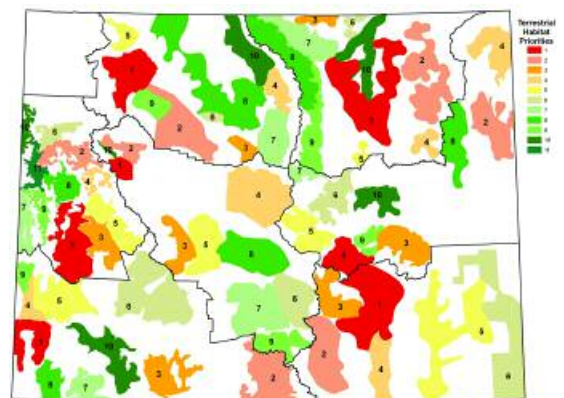
Wyoming Ecological Systems



Habitat Quality v. Protection

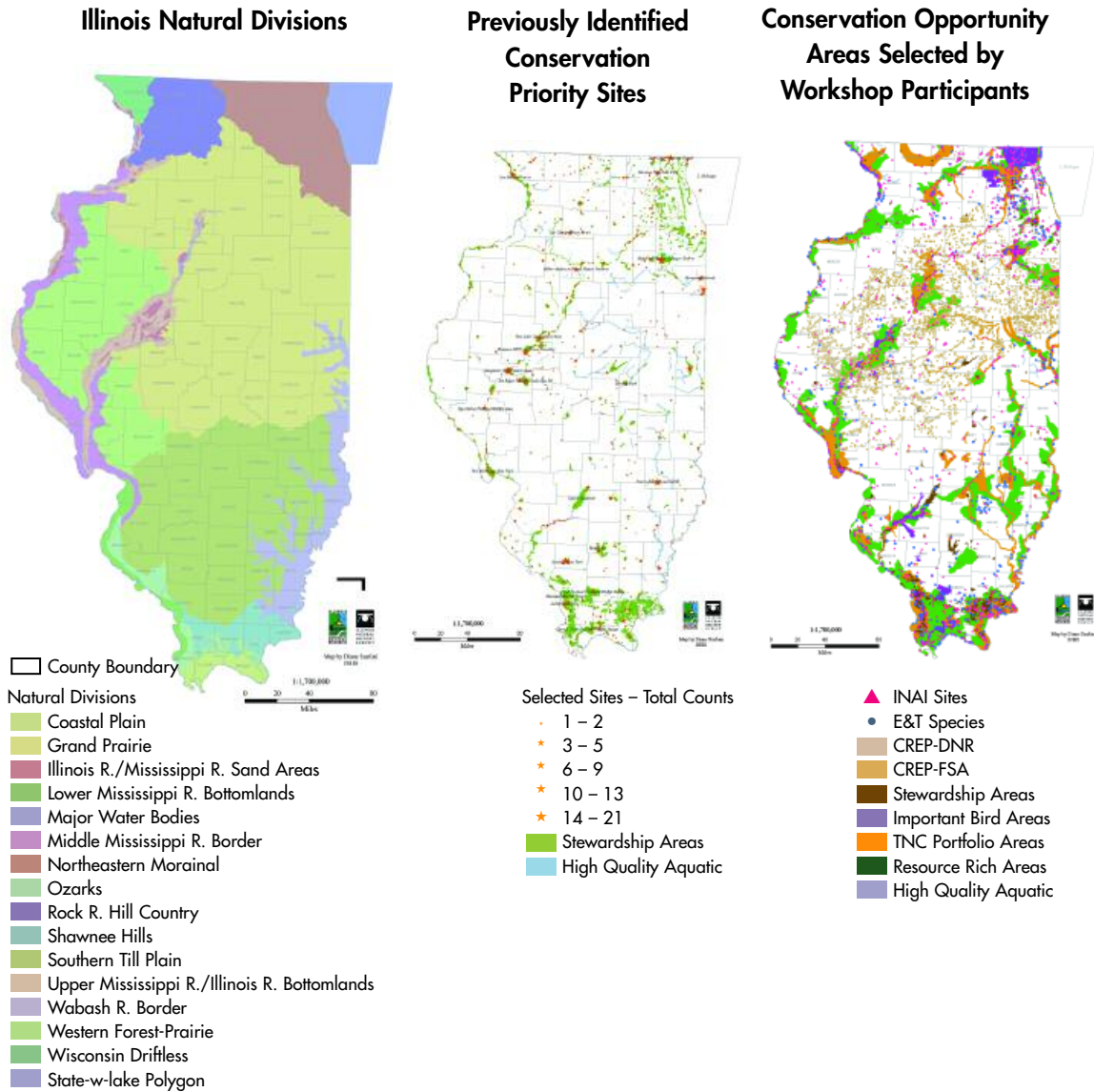


Wyoming Strategic Habitat Plan



Illinois

The Illinois Wildlife Action Plan draws on existing conservation plans and considers the stresses affecting habitats and species in greatest need of conservation to identify conservation priorities at several scales. The Wildlife Action Plan sets 20-year goals for each of 9 key habitat categories, and describes specific priority actions at the statewide scale and for each of the State's 15 natural divisions. In addition, the plan incorporates conservation priority sites and zones, which have been identified by prior planning efforts, including planning workshops where participants selected conservation opportunity areas. All of these actions are drawn together into 7 major "campaigns" for the State's wildlife: streams, forests, farmland and prairie, wetlands, exotic species, land and water stewardship, and green cities.



Maine

Beginning with Habitat is a habitat-based landscape approach to assessing wildlife and plant conservation needs and opportunities. The goal of the program is to maintain sufficient habitat to support all native plant and animal species currently breeding in Maine by providing each Maine town with a collection of maps and accompanying information depicting and describing various habitats of statewide and national significance found in the town. These maps provide communities with information that can help guide conservation of valuable habitats. For additional information on *Beginning with Habitat*, visit www.beginningwithhabitat.org.

4 Assess Effects

An early assessment of the effects of proposed infrastructure projects establishes a basis for project predictability as well as environmental stewardship. The REF relates proposed infrastructure actions to the distribution of terrestrial and aquatic habitat, or resource “hot spots.” It helps agencies and partners to understand the types and distribution of proposed infrastructure projects

so that potential impacts can be listed in advance of their project implementation. In terms of integrated planning, once these impacts are listed, an interagency team should describe and assess these effects.

So what happens if a planned project for an existing highway is not to be implemented until many years into the future? Can the effects of the project still be assessed? As previously mentioned, a transportation agency can outline both the scale and location of projects over a 20-40 year horizon. At this stage, it is not necessary to determine the ecosystem effects of these projects with the thoroughness of a NEPA analysis. Although agencies are accustomed to the NEPA level of detail, there should be no expectation of doing so at this point. A comprehensive NEPA analysis will occur for project decisions.

The level of detail in a REF is likely to be adequate for the early planning phase of the process. With the REF in place, agencies can deduce whether a project is likely to significantly affect important wildlife habitat areas. In turn, locations where infrastructure impacts could be avoided, or mitigation most advantageously sited, would likely be identifiable; the point could be made that spending money to redesign or relocate portions of the project or to move mitigation away from the project area is environmentally preferable.

Saving Time – A Common Need

A shared advantage of integrated planning is the significant timesavings made possible by establishing and prioritizing opportunities. If agencies know beforehand where the most ecologically important areas and resources are, they can work to see that projects avoid these areas as much as possible—thus saving time during planning, scoping, and environmental review. By understanding early on where the mitigation areas most beneficial for wildlife are located, required mitigation can be more quickly implemented, perhaps streamlining permit approval for future projects.

Finally, opportunities for ecosystem-level conservation and/or mitigation that are available now may no longer be available when a project is implemented. Increasing land costs or additional development may prohibit capitalizing on these opportunities at a later date. Act now to benefit from these opportunities.

5 Establish and Prioritize Opportunities

This step combines data from steps 3 and 4 of creating a REF in order to establish and prioritize opportunities. Step 3 (Integrate Plans) helps to provide an understanding of where existing conservation areas are and where additional ones could be best located. The effects assessment from step 4 elevates awareness as to how proposed projects can impact ecologically important areas. By looking at these data together, the relative importance of a State's potential mitigation and/or conservation areas can be established and prioritized. (See Saving Time sidebar.)

Each agency and partner will likely perceive the importance of certain areas and resources differently. Agencies and partners each have varying definitions of importance, some qualitative, others quantitative. In fact, many ecological economists who have tried to value ecosystem resources and functions have encountered difficulty because ecosystem benefits accrue over such a large area to so

many individuals. However, as discussed previously, each agency stands to gain from an ecosystem approach, and work toward common ground is worthwhile.

For this reason, a well-defined process is critical to creating a practical crediting and debiting system. In most cases, the valuation process and outcomes should be based on decisions made earlier in the integrated planning process by the agencies and partners. One way to avoid stumbling blocks would be to define importance based on how much a project contributes to maintaining or increasing connectivity or conservation. Another way would be to consider how a project improves predictability and transparency; a project could be regarded as more important if it raised the level of agencies' trust that commitments will be honored as negotiated (predictability) or that it enhanced public involvement (transparency).

Conservation Assessment and Prioritization System (CAPS)

CAPS, a computer software program developed by the University of Massachusetts, is designed to assess the biodiversity value of every location based on natural community-specific models, and prioritize lands for conservation action based on their assessed biodiversity value in combination with other relevant data. The tool has been used in a pilot effort to evaluate the indirect impacts of a proposed highway project on habitat and biodiversity value for aquatic and wetland communities within the context of other development in the area. For more information, visit www.umass.edu/landeco/research/caps/caps.html.

Examples of Prioritizing Resources

As with the Wildlife Action Plan planning process, some States may already have effective processes for establishing and prioritizing the importance of ecosystem resources; examples include Florida, New Mexico, Oklahoma, and Utah. (Descriptions of each follow.) In these States, an interagency team could use the existing methods and apply them at a landscape level.

Florida's Wildlife Species Ranking Process

Florida's Fish and Wildlife Conservation Commission developed a process that uses a point system to identify habitats of greatest conservation need. The process sums points given to biological, action, and supplemental variables to measure and rank species' statuses. Biological variables measure some facet of the species biology and indicate vulnerability to species extinction. Action variables, such as species distribution and population trend, measure the amount of knowledge regarding the species' status in Florida and indirectly indicate the extent of existing conservation efforts. Supplemental variables answer questions that help sort groups of species, for example, hunted versus nonhunted, or resident versus migratory hunted. Some variables include: population size, population trends, range size, distribution trends, population concentration, reproductive potential, and ecological specialization. Scoring and ranking of these and other species' variables is performed annually.

Similarly, University of Florida researchers used GIS to rank Florida's State roads according to overall environmental impact, producing maps to display the results of the analysis. Primary criteria influencing high-impact rankings included biodiversity hot spots, riparian systems, greenway linkages, rare habitat types, and chronic road-kill sites. The GIS model will likely help Florida DOT integrate the need to improve

transportation with the need to counteract increasing habitat fragmentation by roads. For more information on Florida's Wildlife Species Ranking Process, visit www.wildflorida.org/SWG/grants/default.htm. Download the report on prioritization of interface zones on State highways in Florida at www.icoet.net/downloads/99paper27.pdf.

Identifying Priority Habitats in New Mexico

The New Mexico Department of Fish and Game relied on teams of agency biologists, academics, and other outside experts to prioritize the State's habitats. The Department began by aggregating the State's known land-cover types into 82 individual habitats. These 82 habitats were reviewed by the technical teams on 13 key factors, including the importance of the habitat for priority fish and wildlife, the rarity of the habitat in New Mexico and nationally, the threats facing the habitat, and several other indicators. This review process resulted in 10 priority terrestrial habitat types and 10 priority aquatic habitat types. Terrestrial habitats included several woodlands, riparian, shrubland, and grassland communities. Aquatic priorities ranged from large reservoirs to ephemeral marshes.

Oklahoma's Species of Greatest Conservation Need Approach

Starting with outside sources that identified animal species in special need of conservation, Oklahoma's Department of Wildlife consulted with hundreds of fish and wildlife experts to develop a list of 246 species in greatest need of conservation in Oklahoma. The Department consulted with the State's CWCS Advisory Group to identify the following four ranking criteria:

1. The percent of geographic range found in Oklahoma;
2. National Heritage Inventory ranking;
3. Whether there is existing Federal funding for the species; and
4. Species' population trends over the past 40 years.

These criteria were applied to all the State's fish and wildlife species to identify species in greatest conservation need. To view the final list, visit www.wildlifedepartment.com/CWCS16.htm.

Utah's Habitat Prioritization Approach

The Utah Division of Wildlife Resources relied on a team of agency employees, outside experts, and stakeholders to define five criteria for identifying priority habitats: abundance in Utah; threats; trends (increasing, decreasing, stable); number of CWCS priority species; and overall biological diversity. Each of the State's 25 identified habitat types were reviewed and scored to produce a composite ranking. The final result was a list of 10 "key habitats," including riparian, shrub, grassland, wetland, aquatic, and forested habitats.

6 Document Agreements

To achieve success in integrating plans, including an evaluation of mitigation opportunities, it is important to have administrative records of agreements between agencies. Agreements help ensure commitment by endorsing agencies and can help encourage flexibility in the ways the requirements and intentions of environmental regulations are fulfilled.

The Greater Yellowstone Ecosystem

The NPS has a long and successful history of interagency cooperation to include ecosystems extending through multiple agency jurisdictions. One example is in the Greater Yellowstone Ecosystem. The 18-million acre Greater Yellowstone Ecosystem is composed of 2 national parks, 7 national forests, 3 national wildlife refuges, in 20 counties in 3 States, and active involvement with multiple private organizations all striving to preserve an ecosystem intact on a regional basis. Each year, the coalition collaborates to create a work plan that outlines activities for the coming year. The plan also details the “who, what, where, when, and how” of these actions and includes criteria to measure progress and assure that the greatest possible impact is being gained by contributions made.

Agencies and their partners should not be wary of signing agreements. Authorized agreements will not and cannot supersede NEPA and/or other requirements, such as the CWA or the USFWS Coordination Act. Where agencies agree on a prioritization of wildlife habitat resources (a REF) and/or a system allowing for mitigation in these areas, for example, the NEPA process is used to analyze and disclose the effects of the agreement on any specific proposals for agency action. A documented agreement can serve as a reference point indicating that planning and decisions have a rational basis and are in accordance with applicable law.

Examples of Documented Agreements

Some examples of successful documented agreements that facilitate capitalizing on disappearing ecosystem opportunities are North Carolina DOT’s Ecosystem Enhancement Program, The National Wetlands Mitigation Action Plan, and Colorado DOT’s Shortgrass Prairie Initiative. Each is discussed below.

Memorandum of Agreement to Establish the Ecosystem Enhancement Program in North Carolina

On July 22, 2003, the USACE, Wilmington District, entered into an MOA with the North Carolina Department of Environment and Natural Resources and the North Carolina DOT to establish the Ecosystem Enhancement Program (EEP). The mission of EEP is to protect the natural resources of North Carolina through the assessment, restoration, enhancement, and preservation of ecosystem functions, and compensation for development impacts at the watershed level. The benefits of EEP can include:



The Ecosystem Enhancement Program launched by NCDOT and the North Carolina Department of Environment and the Natural Resources will protect the State’s natural resources by assessing, restoring, enhancing, and preserving ecosystem functions. It will safeguard ecosystems at the watershed level, identifying the highest-quality sites for preservation in collaboration with a network of local, regional, and State conservation organizations and compensating for the unavoidable impacts of highway construction on streams and wetlands.

- Increased protection of North Carolina's natural resources;
- Creation of mitigation strategies that are tailored to the needs of each river basin;
- Additional protection of tens of thousands of acres of ecologically important areas;
- More effective collaboration with the private sector and conservation groups; and
- Reduced cost and improved delivery of transportation projects.

Success stories from EEP can be found at www.nceep.net/services/success/stories.htm.

The National Wetlands Mitigation Action Plan

The National Wetlands Mitigation Action Plan includes 17 tasks that 6 Federal agencies agreed to complete by 2005 to improve the ecological performance and results of compensatory mitigation. Completing the actions in the Plan will enable the agencies and the public to make better decisions regarding where and how to restore, enhance, and protect wetlands; improve their ability to measure and evaluate the success of mitigation efforts; and expand the public's access to information on these wetland mitigation activities. For more information visit www.mitigationactionplan.gov.

Colorado Shortgrass Prairie Initiative

The Colorado DOT's (CDOT) Shortgrass Prairie Initiative will help save one of the most imperiled ecosystems in the Nation – an ecosystem supporting more than 100 threatened, endangered, or declining plant and animal species. Shortgrass prairie makes up approximately one third of Colorado. Much of what's left is degraded because of agriculture, highways, and water projects. The Initiative emerged from a shared vision that public transportation agencies can use funds for environmental mitigation more effectively while making a significant contribution to the recovery of declining ecosystems. It is based on the concept that anticipating and mitigating long-term transportation impacts can reduce both the costs of implementing necessary transportation improvements in the future and the peril to this endangered ecosystem. Acting now to prevent the need for species protection under the Endangered Species Act (ESA) could streamline current consultation requirements and project-specific mitigation, and help avoid them in the future.

In April 2001, concerned scientists from a number of organizations took action to find a solution to the problem. CDOT, FHWA, USFWS, the Colorado Division of Wildlife,



With over 650,000 acres of right-of-way, the Kansas DOT, in cooperation with the Kansas Department of Wildlife and Parks, the Kansas Department of Agriculture, and Audubon of Kansas, implemented a variety of cooperative management and public information activities to help restore and promote roadside ecosystems, including the restoration of native grasses and other prairie plants along highways in the State. (Photo courtesy of Kansas DOT)

and The Nature Conservancy signed a partnership agreement to work with landowners and communities to preserve thousands of acres of shortgrass prairie in eastern Colorado. The Initiative will also improve the efficiency and effectiveness of the environmental measures associated with CDOT's routine maintenance activities, and it will upgrade the priority of bridge replacement and other activities on existing highways in Colorado's shortgrass prairie over the next 20 years. The Initiative will protect both listed and nonlisted species and will mitigate minor as well as major transportation impacts. It calls for predictions of transportation's potential impacts to prairie species over the next 20 years – predictions that will enable early, proactive avoidance, minimization, and mitigation efforts.

7 Design Projects Consistent with Regional Ecosystem Framework

The benefits of integrated planning should be apparent at the project level. With this approach, planned infrastructure projects that go forward should not surprise resource agencies. If an action agency has been involved during REF development and is planning a project consistent with that framework, the resource agency response(s) should be predictable. Although new information about the ecosystem may have become available since the plans were integrated, site-specific project issues can be addressed as they arise (e.g., during the NEPA process); they do not have to slow down the entire project development process.

Agencies would likely need to revisit the analysis of project impacts if the answer to any of the following questions was yes:

- Are there any new endangered or threatened species in the area?
- Is there new and different information available about aquatic resource, wildlife, and/or habitat that could result in impacts that were not previously identified or addressed?
- Have the project plans changed?
- Have natural disturbances changed the region?
- For projects on National Forest System lands and other public lands, is off-site mitigation consistent with the management plans of the USDA FS, BLM, NPS, and others?
- Have there been any major changes in land ownership or land use since the project was approved?
- Have the assumptions or data underlying the REF changed enough to warrant additional public involvement?

8 Balance Predictability and Adaptive Management: Measuring Performance

Predictability – the knowledge that commitments made by all agencies will be honored – is needed at the project level so resources can be allotted appropriately and schedules can be met. Predictability gives agencies assurance that progress over the term of a project can occur. However, while project development can occur over a short time frame, ecosystems typically change over longer periods. For this reason, agencies will need to work to balance short-term project predictability with long-term adaptive management.

Adaptive management offers a process to ensure that the plans developed to address the concerns of today can rise to the challenge of the concerns of tomorrow. Adaptive management involves

continuously learning from the results of previous decisions in order that these decisions can be adjusted to produce even better outcomes. As new information on the changing status of an ecosystem becomes available, agencies can look beyond the project horizon to consider how that information can be applied to promote long-term sustainability; improved understanding of an ecosystem could lead to a revision of REF priorities.

To adaptively manage decisions within an ecosystem approach, performance should be measured. Performance metrics, which can help to distinguish the ecological decisionmaking process from the cost decisionmaking process⁷, outline what constitutes ecological success. They provide the means to evaluate ecosystem status, as well as the success of actions – within some outlined range of acceptability. With agreed upon performance measures, the involved parties are more prepared to change accordingly when project problems or new opportunities are identified.

Adaptive management through performance measures is discussed in greater detail in Chapter V.

Southeast Aquatic Resources Partnership

Southeast aquatic resources protection has taken a positive step forward with formal establishment of the Southeast Aquatic Resources Partnership (SARP). SARP is a coalition of State, Federal, and other conservation agencies that are committed to working together for the benefit of aquatic resources. Initiated in 2001, SARP has been meeting twice per year since that time. However, the partnership was formalized in summer 2004 through signature of an MOU among the 21 partners. The partnership's mission is: "With partners, to protect, conserve, and restore aquatic resources including habitats throughout the Southeast, for the continuing benefit, use, and enjoyment of the American people." No other such comprehensive partnership for aquatic resources currently exists in the country.

Recently, a grant proposal to the National Fish and Wildlife Foundation (NFWF) to integrate the Statewide Comprehensive Wildlife Conservation Strategies into SARP's Aquatic Habitat Plan was approved. Visit SARP's website at <http://sarpaquatic.org/sarp/>.

⁷ In October 2004, the National Research Council of the National Academies published a report, *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*, offering recommendations on valuing ecosystem services. Challenges to successfully integrating ecology and economics are also discussed. Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems. The National Academies Press. Washington, DC. View the report at www.nap.edu/books/030909318X/html/.



When making mitigation decisions, interagency teams are encouraged to select the mitigation approach that not only complies with regulatory requirements, but that also yields the greatest benefit for the ecosystem while remaining economically fitting given the estimate of impacts from planned projects. Before making improvements to the Carolina Bays Parkway, leaders from several South Carolina agencies recognized that traditional highway mitigation has often been a piecemeal effort that does not effectively support ecosystem objectives. The interagency team collaborated to address this challenge from a landscape level, agreeing to preserve, enhance, and expand the Waccamaw River and Lewis Ocean Bay Natural Heritage Preserves in Horry County. (Photo courtesy of South Carolina DOT)

Incorporating an Ecosystem Approach with Mitigation Decisions

CHAPTER IV

“If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering.”

-Aldo Leopold

The integrated planning process and regional ecosystem framework (REF) can help agencies achieve tangible gains for ecosystems. By identifying the specific areas where impacts to species, habitat types, and other important ecological functions could be best offset, agencies can use their integrated plans and REF to more effectively choose from a range of mitigation options, should mitigation be necessary. When making mitigation decisions, interagency teams are encouraged to select the mitigation approach that not only complies with regulatory requirements, but that also yields the greatest benefit for the ecosystem while remaining economically fitting given the estimate of impacts from planned improvements.

A regional ecosystem approach offers a potentially enhanced system for crediting mitigation that can help ensure that regional conservation goals and objectives are accomplished. This system builds on existing banking options that were developed for multiple-project mitigation, specifically, wetlands banking and conservation banking. Using an approach that emphasizes regional ecosystem needs and priorities, and drawing on the lessons learned from previous experience, agencies and the public can explore the opportunities and incentives to maximize prospects for connectivity conservation gains while producing necessary infrastructure. To begin, however, the existing mitigation options should be understood. The following section describes these options, concluding with a discussion of the concept of ecosystem-based mitigation agreements.



Mitigation Options

Mitigation options include:

- Project-specific mitigation
- Multiple-project mitigation
 - Mitigation banking
 - In-lieu fee mitigation
 - Conservation banking
- Ecosystem-based mitigation agreements.

Whichever of these options is used, the goal is to restore, create, enhance, and/or preserve natural resources for the purpose of compensating for unavoidable resource impacts. Mitigation helps ensure that ecosystems, habitats, and species populations remain sustainable and productive over time. The Council on Environmental Quality (CEQ) regulations (40 CFR 1508.20) define mitigation as:

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

Official Reference Documents on Mitigation and Conservation Banking

- Interagency Guidance for Establishment, Use and Operation of Mitigation Banks
www.usace.army.mil/inet/functions/cw/cecwo/reg/mitbankn.htm
- USFWS Mitigation Guidance on Conservation Banking
<http://endangered.fws.gov/policies/conservation-banking.pdf>
- FHWA Regulation on Mitigation Banking (23 CFR 777)
www.fhwa.dot.gov/hep/23cfr777.htm

Existing regulation and guidance on mitigation for wetlands, streams, and other aquatic resources (hereafter described as aquatic resources) expresses CEQ's definition in a three-step approach. Applicant(s) proposing to impact aquatic resources must abide by a specific sequence that directs the applicant to:

- Make efforts to avoid impacts to aquatic resources; then
- Minimize remaining impacts to aquatic resources; and finally
- Provide compensatory mitigation for unavoidable impacts to aquatic resources.

These requirements for sequencing impacts to aquatic resources are required prior to the selection of any type of compensatory mitigation described in the following subsections.

Project-Specific Mitigation

Traditionally, compensatory mitigation has been carried out on a project-by-project basis; specific measures are implemented to mitigate a project's impacts at a site that is usually on or adjacent to the impact site. Project-specific mitigation is usually selected based on the impact-site location, usually does not address landscape or watershed perspectives, and is generally small in scale. During the environmental review and permitting phase of project development, regulatory agencies will assess the expected impacts of the project and set a proposed threshold for mitigation. The applicant or project sponsor is then responsible for developing the mitigation proposal that is presented to the agencies to confirm how project impacts can be mitigated. The mitigation can be on-site or off-site and in-kind (of similar resource or ecological function as the impact) or out-of-kind; however, there has traditionally been a flexible preference for on-site and in-kind compensation.

In some cases, on-site, in-kind mitigation may not yield the greatest benefit to an ecosystem. In 2001, the National Academy of Sciences National Research Council (NAS/NRC) recognized this shortcoming of traditional approaches to mitigation in their report titled *Compensating for Wetland Losses Under the Clean Water Act*.⁸ This report states "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." The NAS/NRC report noted that often there are circumstances in which on-site or in-kind mitigation is not practicable nor is it environmentally preferable under a watershed approach.

Defenders of Wildlife on Conventional Compensation Mitigation

Defenders of Wildlife, a nonprofit organization devoted to the protection of all native wild animals and plants in their natural communities, have described some of the drawbacks of conventional compensatory mitigation. An excerpt from their guide *Second Nature: Improving Transportation Without Putting Nature Second* follows:

The traditional form of compensatory mitigation is conducted on a project-by-project basis. First, a project is planned and designed. Then, during the subsequent environmental review and permit phase, regulatory agencies determine the amount of environmental damage that can be expected and suggest actions that can be taken to mitigate that damage. Often, this mitigation is conducted on-site, by setting aside a portion of the land in the project area Mitigation areas are chosen ad-hoc, rather than as part of a large-scale planning effort. This is often expensive, time-consuming, and rarely effective for the environment.

Source: White, Patricia A. and Michelle Ernst. *Second Nature: Improving Transportation Without Putting Nature Second*, Defenders of Wildlife. Available at www.defenders.org/publications.

The results of project-specific mitigation under the Section 404 regulatory program have been evaluated several times, with the finding that often the mitigation is not fully implemented, is improperly designed and constructed, and in some cases, is never done at all. However, project-specific mitigation projects are an accepted means of providing compensatory mitigation with established administrative

⁸ View the report at www.nap.edu.

procedures. When properly designed and implemented, and appropriately monitored, this approach offers a predictable and tested way of achieving compensatory mitigation as well as the opportunity to protect unique, on-site natural features. In addition, there is a suite of ecological functions that may be best mitigated on or near the project site. For these reasons, project-specific mitigation remains a preferable option in some cases.

Multiple-Project Mitigation

Multiple-project mitigation involves using a single, and typically large, off-site mitigation project to serve as compensation for impacts resulting from multiple projects. Both the 1995 Federal Banking Guidance⁹ and the 2000 Federal In-Lieu-Fee Guidance¹⁰ recognize that for small projects, off-site mitigation, such as that provided by a bank or in-lieu-fee, is often preferable. With off-site mitigation, a number of small projects that would usually result in scattered mitigation can be consolidated into a larger mitigation project, increasing the chances of ecological success.

Wildlife and Habitat Mitigation Examples

In the context of wildlife habitat replacement, mitigation – whether on-site or off-site, in-kind or out-of-kind – might include:

- Physical modification of replacement habitat to convert it to the type lost or a desired type;
- Restoration or rehabilitation of previously altered habitat so that the value of the lost habitat is replaced;
- Provision of wildlife linkage areas (e.g., crossings, underpasses);
- Replacement of meanders;
- Improvement of water quality;
- Replacement of off-site culverts;
- Increased management of replacement habitat so that the value of the impacted habitat is replaced; and/or
- A combination of any of these.

Multiple-project mitigation can be divided into the following categories: mitigation banking, in-lieu-fee arrangements and conservation banking. Each is described below.

Mitigation Banking

Mitigation banks are specifically targeted toward aquatic resource mitigation needs in the CWA Section 404 Regulatory Program and wetland conservation provisions of the Food Security Act. They involve the restoration, creation, enhancement, and – in exceptional circumstances – preservation of aquatic resources expressly for the purpose of compensating for unavoidable aquatic resource losses. This method is used when compensation at the development site cannot be wholly achieved or would not be as environmentally beneficial. Generally, mitigation banking involves the establishment of wetland and aquatic habitat by the bank sponsor in advance of development actions. Infrastructure devel-

⁹ Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, November 28, 1995. View the report at www.usace.army.mil/inet/functions/cw/cecwo/reg/mitbankn.htm.

¹⁰ Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. 2000. View the report at www.epa.gov/owow/wetlands/regs/inlieufee.pdf.

opers can purchase “credits” from the bank sponsor to provide compensatory mitigation for unavoidable impacts at the proposed project site. Mitigation banks are established through a permitting process that includes development of banking agreements signed by the USACE, responsible resource agencies, and the bank sponsor.

The 1995 Federal Banking Guidance further clarifies the policy on mitigation banks for the purpose of providing compensatory mitigation for authorized adverse impacts to aquatic resources. According to the Federal Guidance, “In general, use of a mitigation bank to compensate for minor aquatic resource impacts (e.g., numerous small impacts associated with linear projects; impacts authorized under nationwide permits) is preferable to on-site mitigation.” 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 to be located. The goal will include the need to replace essential aquatic functions that are anticipated to be lost through authorized activities within the bank’s service area. Consistent with this guidance, permittees may use mitigation credits from a bank, approved through the established Mitigation Banking Review Team, as compensation, in whole or in part, for unavoidable losses to the aquatic environment. Mitigation banks will generally reduce uncertainty over the ecological success of the mitigation.

In-Lieu-Fee Mitigation

Another form of multiple-project mitigation is in-lieu-fee mitigation. An in-lieu-fee arrangement provides required compensatory mitigation off site for impacts to wetlands. In-lieu-fee mitigation is cost-based and occurs in circumstances where either an agency seeking a permit, or another party, provides payment for mitigation to a sponsor for future mitigation projects instead of completing project-specific mitigation or purchasing credits from an approved mitigation bank.



To help mitigate historic wetland loss, a statewide, ecoregion-based mitigation banking system was initiated by the Arkansas Highway and Transportation Department in 1996, when a mitigation bank came online in the Mississippi Alluvial Plain ecoregion of eastern Arkansas. Since 1996, AHTD has established one bank in each of the State’s five ecoregions, creating eleven mitigation areas—a total of nearly 3,020 acres. The banks, which are used by egrets and other bird species, were created through collaboration among AHTD, FHWA, USACE, USFWS, the Natural Resources Conservation Service, EPA, the Arkansas Game and Fish Commission, the Arkansas Natural Heritage Commission, and the Arkansas Soil and Water Commission.

Unlike mitigation banks, in-lieu fees do not typically provide compensatory mitigation in advance of project impacts; rather, they are either paid concurrently with a project or after the impacts have occurred. In-lieu-fee programs usually have not acquired or constructed an existing mitigation site when the fee is paid.

A 2001 Government Accountability Office Report¹¹, “Wetlands Protection: Assessments Needed to Determine Effectiveness of In-Lieu-Fee Mitigation” states that USACE has established 63 in-lieu-fee arrangements since the first one was used in the late 1980s. When the report was published, arrangements had been made in 17 of 38 USACE regulatory districts, and at least 8 other districts had planned to establish such arrangements in the future. The report also raised a number of concerns regarding the administration and ecological effectiveness of in-lieu-fee arrangements and provided recommendations for addressing these concerns. Anticipating these concerns, the 2000 Federal In-Lieu-Fee Guidance clarified the need for in-lieu-fee arrangements to be held to standards similar to those used in mitigation banking. This has increased the challenges of establishing viable in-lieu-fee arrangements.

Conservation Banking

Conservation banks are parcels of land containing natural resource values that are conserved and managed in perpetuity for specified listed species and used to offset impacts occurring elsewhere to the same resource values on nonbank lands. These banks, which must be approved by the USFWS and the State agency responsible for protecting State-listed species, are established for the long-term protection of a specific species that is impacted on a project’s site.

Like mitigation banks, 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 for the compensation of their projects’ environmental impacts. When an agency buys conservation bank credits, it is guaranteeing the restoration and/or permanent protection of that bank for its stated purpose.

USFWS 2003 Memorandum regarding “Guidance for the Establishment, Use, and Operation of Conservation Banks”

This memorandum transmits guidance intended to help USFWS personnel evaluate proposals to establish conservation banks. It provides a collaborative, incentive-based approach to endangered species conservation, which, if used in coordination with other tools available to the USFWS, can aid in the recovery of the species. Some sections in the memorandum include the following.

- What is a Conservation Bank?
- Wetland Mitigation versus Conservation Banking
- Principles of Conservation Bank Evaluation
- Policy and Planning Considerations
- Criteria for Use of a Conservation Bank
- Credit System Guidance

¹¹ View the report at www.epa.gov/owow/wetlands/pdf/GAO.pdf.

Characteristics of Mitigation and Conservation Banks

Characteristics of the most successful mitigation and conservation banking scenarios are described below.

- **Net benefits of banks** – Mitigation is initiated earlier, frequently ahead of project impacts, as compared to on-site, project-specific mitigation, which often occurs after the project is underway or complete, resulting in temporal loss of functions and benefits. Banking provides substantially increased assurance of success in the long run; uncertainty of mitigation results is reduced. Habitats are conserved sooner, in better locations, and/or with more consideration for landscape integrity.
- **Credit valuation in existing mitigation banks** – The determination of credits at mitigation banks should reflect the estimated increase in ecological functions resulting from successful implementation of the bank site's restoration plan. The approach can be basic, relying on the measurement of acres impacted and replaced, or on some assessment of function or value. In order to facilitate transactions at a bank, the same assessment technique used to determine the number of credits at the bank is often used to quantify the aquatic resource losses at impact sites.

Different agencies, stakeholders, and partners often view the value of a credit differently. Any particular group may use more than one way of valuing the credit that environmental goods and services have:

- Qualitative ecological value – which may be based on perceived effect on the species of interest, an ecosystem value such as wetland function, or recreation, water quality, etc.
 - Quantitative ecological value – for example, the number of units protected or enhanced, or changes in functional characteristics.
 - Economic value – market value, price, and replacement value are ways of measuring economic value.
- **Ratios** – Under Section 404 of the CWA, most compensatory mitigation is required at some ratio greater than 1:1, relative to impacts. The “no net loss of aquatic resources and wetlands” is a principal goal of USACE and ratios are applied to ensure that this goal is met. In some cases, compensatory mitigation requirements under Section 404 of the CWA include a larger compensation ratio, e.g., a 2:1 ratio that requires 2 acres of mitigation for every 1 acre of impact. Ratios are sometimes used to account for the difference between a fully functional impact site versus a partially functional mitigation site, or to offset the time lag before a mitigation site becomes functional. Compensation ratios should not be used to account for uncertainty, offset a decreased predictability of success, or serve to reflect the lack of clear liability if something goes wrong. Instead, performance bonds, enforceable permit conditions, or other legal mechanisms should be used to assure the success of mitigation sites.
 - **Timing** – The Federal Banking Guidance states that mitigation credits should be released at a rate commensurate with the level of function at that bank, that is, credits should only be sold after they have accrued. However, the Banking Guidance also recognizes that mitigation bankers need to generate income to undertake restoration or enhancement activities. Thus banks are allowed to sell

a limited amount of credits in advance, provided that the bank site has been secured and the bank plan has been approved; in addition, the initial work on the site must begin within one year of selling the credits.

- **Credit recognition** – Banks usually operate under a multi-agency agreement that includes standards and procedures for determining how to certify that mitigation credits are available.

How Conservation Banking Differs from Mitigation Banking

- **Mitigation banking**, which is under USACE jurisdiction, is an aquatic resource mitigation policy based on a “no net loss” goal. It includes a variety of techniques to offset authorized impacts to aquatic resources including aquatic resource restoration, enhancement, creation, and – in certain circumstances – preservation.
- **Conservation banking**, which is under USFWS jurisdiction, is related to endangered species policy and is based on the recovery of specific species. It relies on preservation of intact habitat to mitigate impacts to listed species.

Ecosystem-Based Mitigation Agreements

Existing options for compensatory mitigation are helpful and practical approaches. In some cases, they have significantly contributed to ecosystem health. However, they might not always offer the most effective methods for deriving the greatest environmental benefit and achieving goals of connectivity, conservation, predictability, and transparency. Ecosystem-based mitigation can merge attributes of existing mitigation options to enable agencies to move closer to these goals. Characteristics of ecosystem-based mitigation include the following.

- **Builds on existing banking systems** – Ecosystem-based mitigation builds upon the experience of mitigation banks and conservation banks. Wetland mitigation banks were initially developed to improve mitigation practices. Conservation banks expanded this idea to allow limited impacts to the habitat of threatened and endangered species. Ecosystem-based mitigation could combine these concepts – instead of looking at wetland mitigation and species mitigation as separate activities, ecosystem-based mitigation agreements could look at these and other resource functions of the ecosystem holistically and look for synergistic opportunities – adding a cumulative 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 will enable the protection of ecological functions, values, and processes that are believed to be most important for the regional ecosystem.
- **Is an outgrowth of integrated planning** – In an ecosystem-based mitigation system, the process of integrated planning will have produced a regional ecosystem framework, or REF, identifying a hierarchy of important resources in a region and their locations. 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 ecosystem banks

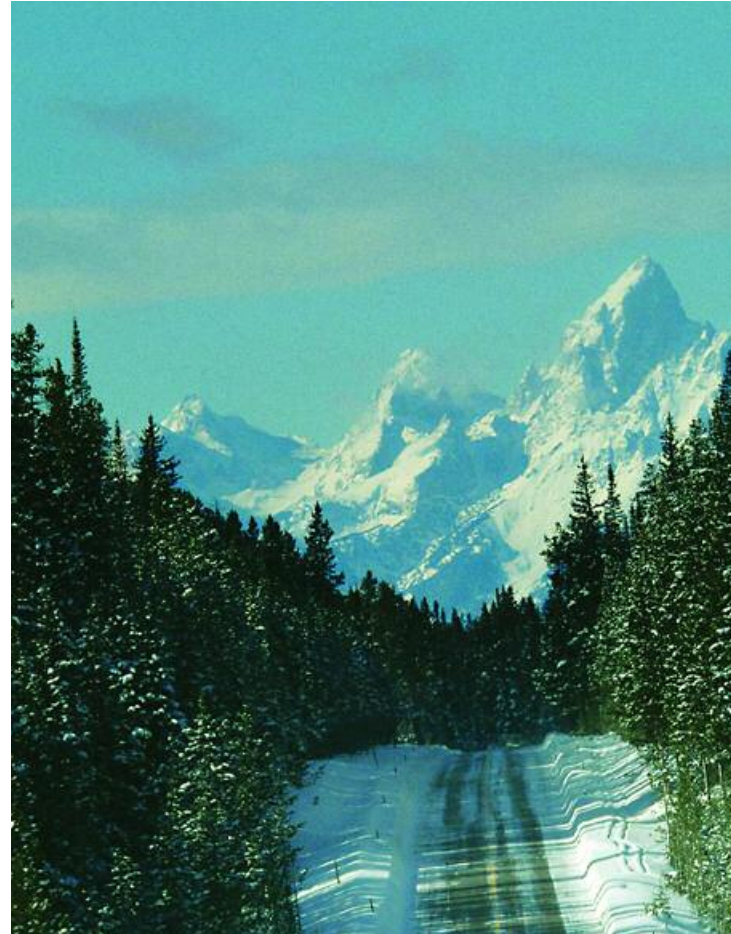
may differ from those of mitigation banks and conservation banks. Depending upon the nature of the ecosystem mitigation proposal, the range of impacts for which it provides mitigation may be larger or smaller than the service areas of mitigation and conservation banks in the same region, and the impacts may be defined with reference to ecological areas and resources identified during integrated planning. Ultimately, CWA and ESA regulators must approve the service area of an ecosystem bank if it is used to offset impacts authorized under these statutes.

In addition, potentially impacted resources will have been prioritized during integrated planning. A multi-agency steering group can then guide the development of a regional mitigation plan, based on the REF, that establishes a system of accountability and how it will be measured.

- **Is consistent with Federal legislation –**

Ecosystem-based mitigation is an approach to long-term conservation similar to those already encouraged in laws and regulations. In existing Federal guidance on mitigation, mitigation banks are considered an appropriate way to satisfy compensatory mitigation requirements off site when 1) on-site compensation is not practicable, or 2) use of the mitigation bank is environmentally preferable to on-site compensation. Similarly, the 2000 Federal In-Lieu-Fee Guidance states that in-lieu-fee mitigation is appropriate in circumstances when on-site compensation is not available, practicable, or is less environmentally desirable. Concerning in-kind versus out-of-kind mitigation, a 1990 MOA between EPA and the Department of the Army states that acceptable out-of-kind compensatory mitigation may occur in the use of a mitigation bank where it is environmentally preferable.¹²

The last two Federal transportation acts have included provisions that explicitly encourage the use of mitigation banks to compensate for



Concerns with potential habitat fragmentation by proposed highway improvements resulted in studies by the Wyoming DOT (WYDOT) to collect primary data about wildlife crossing zones and wildlife-vehicle collisions. The information collected will be used to identify mitigation opportunities and accommodate wildlife crossings into design plans, based on landscape-level habitat needs. To oversee the study, a steering committee was formed with representatives from USDA FS, the Wyoming Game and Fish Department, the Jackson Hole Alliance, FHWA, and WYDOT. (Photo courtesy of WYDOT)

¹² Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines. 1990.

impacts to aquatic resources associated with Federal-aid highway projects. The 2003 Federal guidance on the use of the TEA-21 preference for mitigation banking clarifies the application of this preference consistent with CWA requirements.¹³

Ecosystem-based mitigation agreements can also be used to promote interagency cooperation as prescribed under Section 7 of the ESA, as amended. The development of a REF and its requisite plans can offer a way to quantify restoration efforts that promote minimization of impacts and avoidance of jeopardy. Quantification of resource values could facilitate equitable or improved comparison between proposed ecological restoration activities and the impacts to those values by a proposed project.

- **Takes advantage of vanishing opportunities** – Many involved in the development of infrastructure projects have been faced with a “vanishing opportunity” – where there was a need to act in a timely way on a situation that could yield outstanding ecological benefits. Delay could lead to a loss of the opportunity, perhaps never to see another one like it. These circumstances are becoming increasingly common as pristine or critical ecological resources are developed, many permanently. This is the crux of ecosystem-based mitigation – to take advantage of these vanishing opportunities before they are lost. It is difficult, if not impossible, to “turn back the clock” and restore ecological functions and benefits of natural landscapes, communities, and habitats that have been severely altered or have experienced land-use change. Taking an ecosystem approach to mitigation can help maintain large-scale functionality, with the realization that total preservation is not an option and that tradeoffs are necessary.

Ecosystem-based mitigation takes a broad, “landscape-integrity,” view of compensating for impacts of infrastructure projects, while still meeting the regulatory mandates of the applicable laws and regulations. The watershed or regional scope of such mitigation would encompass large ecosystems with critical functions in need of protection or augmentation. Examples of such a scale are the Northern Continental Divide Ecosystem in Montana as defined by the International Grizzly Bear Committee, the Salmon River Ecosystem, and the Greater Yellowstone/Grand Teton Ecosystem in Montana and Wyoming. These large ecosystems, although covering vast expanses of land, can be tightly tied into functional wholes by the need for large-scale landscapes to support the diverse requirements of their respective plants and animals.

Disappearing Conservation Opportunities

“There is strong agreement that agencies should work together to find a way to save the rapidly disappearing conservation opportunities that have a high benefit to cost ratio. However, these conservation/mitigation opportunities require upfront financial support and regulatory flexibility. The cost of some of these opportunities is high. It has been agreed that agencies have to get mitigation credit for their contributions. One of the major challenges is developing a method to assign credit for impact mitigation measures, in essence, banking of mitigation credits.”

Source: USDA FS Region One Highway 93 Environmental Banking Memo (Sept. 13, 2004)

¹³ Federal Guidance on the Use of the TEA-21 Preference for Mitigation Banking to Fulfill Mitigation Requirements under Section 404 of the Clean Water Act, 2003. View the report at www.epa.gov/owow/wetlands/pdf/TEA-21Guidance.pdf.

Accountability in Ecosystem-Based Mitigation

One aspect of accountability in mitigation and conservation banking is the establishment of a scientifically sound debiting and crediting system. One reason is that the impacts of infrastructure projects often affect more than just the ground they occupy. Effects such as habitat fragmentation/isolation, noise, visual disturbance, increased animal mortality, and pollutant emissions are often more difficult to evaluate and quantify than the acres of wetlands filled or habitat disturbed. The concept of ecosystem-based mitigation attempts to take these and other effects into account, and balances gains and losses of ecological functions, benefits, and values.

Building on the REF, ecosystem-based mitigation focuses on the ecosystem-level ecological priorities determined as a “desired future condition.” Among others, this 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.¹⁴

To determine the specific actions needed to achieve goals for an ecosystem, the following questions should be asked:

- Are resources where they need to be for sustainable functions to occur?
- Are ecosystems adequately linked to allow movement of animals and genetic information and to maintain productivity, structure, and diversity?
- Are some communities and habitat types under-represented in a region?

Some regions are beginning to answer these and other questions in efforts to develop ecosystem-based credits and debits. One example is discussed below.

An Interagency Team Develops Ecosystem-Based Credits and Debits

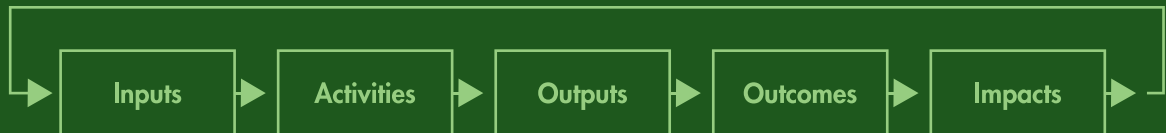
The Carolina Bays Parkway (Parkway) is located in Horry County, South Carolina, home to several rare and endangered species and pristine natural areas. Specifically, the Waccamaw River and Lewis Ocean Bay Natural Heritage Preserves (NHPs), which total more than 20,000 acres and are owned and managed by the South Carolina Department of Natural Resources (SCDNR), are two of the county’s last remaining undisturbed natural areas.

The Parkway needed additional interchanges to meet current and anticipated traffic demands. This created the difficult challenge of determining how to accommodate additional demands on the transportation system in ways that sustain the county’s natural features. Recognizing that traditional highway mitigation has often been a piecemeal effort that does not effectively support ecosystem objectives, key leaders from several South Carolina agencies collaborated to address the challenge from a landscape level. The interagency team first looked at maps describing where development was planned. They then studied natural resource maps illustrating habitat patterns of species of interest and maps of undisturbed wetlands. The team eventually agreed on a prioritization approach that focused on the protection and enhancement of the wildlife linkage corridors connecting the Preserves while allowing needed transportation projects to move forward.

¹⁴ Hauffer, J.B., et al. 2002. View the report at www.wildlife.org/index.cfm.

In 2003, the interagency team, which had searched for opportunities to preserve, enhance, and expand the Lewis Ocean Bay NHP and the wildlife linkage corridor, signed an agreement outlining steps to accomplish these goals. South Carolina DOT (SCDOT) and the FHWA put \$2.5 million into an escrow account to be spent on the preservation and expansion of Lewis Ocean Bay and the wildlife linkage zone. This Federal-aid money was agreed upon as partial mitigation for two new interchanges to be added to the Parkway. A management system was also put in place for the funds, with members of the USFWS, SCDNR, USACE, and NOAA Fisheries Service forming an Ecosystem Committee to oversee the expenditure of those funds on projects that will enhance, preserve, or expand the Lewis Ocean Bay NHP and protect the Waccamaw River wildlife linkage corridor. Additionally, SCDOT purchased access control of a public road, which limited growth opportunities in that area and protected some of the land adjacent to the Preserves. SCDOT also invited private landowners to become part of the solution. In exchange for one of the new interchanges on the Parkway, the private landowners are donating to SCDNR a 320-acre tract of land. This tract was a privately owned in-holding within Lewis Ocean Bay NHP that could have been developed.

In the end, all partners agreed to preserve and expand the area's most important ecosystem values while allowing responsible infrastructure growth to occur.



A logic model can be used to visually present and share the mutual understanding of a project's purpose and intended results. It is a map describing the sequence of related events and how they support specified goals. The extent to which the outcomes and impacts described in the logic model reach those goals can help provide a basis for evaluating a given action.

Adaptive Management Through Performance Measures

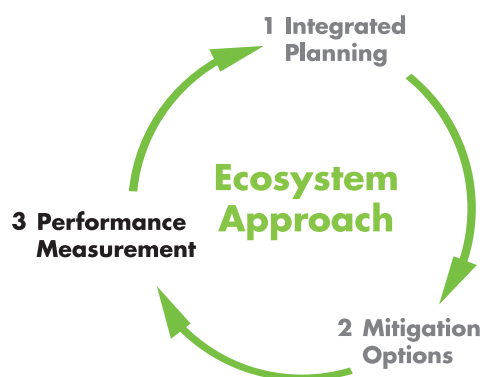
CHAPTER V

To ensure that work is being done eco-logically – for example, to ensure that a project has increased connectivity and promoted conservation – performance measures, monitoring, and adaptive management are necessary. Using these methods, status and trends can be tracked, analysis and accountability facilitated, and decisions adapted so that the intended balance among social, economic, and ecological concerns is achieved.

Ecosystem Performance Measures

Performance measures can provide a quantitative basis for evaluating how well actions under the REF (regional ecosystem framework) are meeting stated objectives. (See Chapter III.) Ways to evaluate the effectiveness of these actions should be considered throughout all stages of planning and implementation of a project, however, agencies, stakeholders, and the public can identify many of the factors for evaluating ecosystem performance during integrated planning.

Performance measures allow for continuous learning, which broadens understanding about how ecosystems and projects function. In turn, infrastructure



proponents can be better equipped to design environmentally sensitive projects, while resource agencies can be more trusting of these projects because they maintained a larger role in the decisionmaking process. To some, performance measures may represent the “currency” used to monitor the success of a mitigation project over an extended period of time, or to fund an ecosystem bank – providing a way to see that credits are properly allotted and concerns effectively addressed.

There are many approaches to evaluation, and no one approach is appropriate for all projects. As a starting point, performance measures should specifically address management goals and objectives and should:

- Be quantifiable, expressing status and trends of specific resource values of concern, such as endangered species, unique ecosystem types, and wetlands;
- Address the landscape, ecosystem, and individual species while maintaining applicability over varying scales in time;
- Be established in cooperation with partners and knowledgeable resource experts;
- Be used to quantify and track changes from baseline measurements; and
- Be usable for all projects in a planning region, so that the relationships between specific actions and the measures of success may be shown in a single balance sheet.

Stated objectives are also necessary to determine whether a project has been successful. For projects with ecosystem-based mitigation, the performance measures selected to monitor effectiveness are directly linked to the REF’s outlined vision and objectives. Resources or project outcomes determined in the REF to be important will likely be the resources monitored for performance after project implementation. Both short-term and long-term efforts and projects could occur within the framework and vision of the REF. During the planning stages of those projects, a clear understanding of what a project does and is intended to accomplish must be developed.

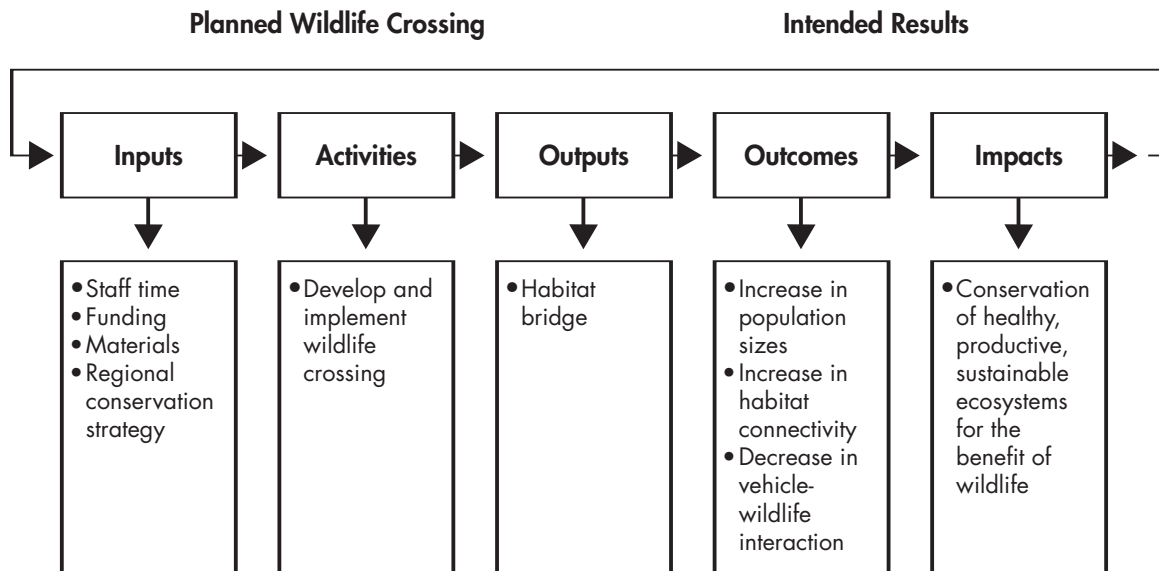
Performance Measures Effective Practices

- Customize the evaluation approach to the project.
- Use several indicators to assess performance.
- Set an appropriate time frame for resource assessment.
- Develop data management systems early during integrated planning.

Logic Models Can Link Objectives with Performance Measures

A logic model can be used to visually present and share the mutual understanding of a project’s purpose and intended results. A logic model uses words and images to illustrate how project activities are linked and how they are intended to effect change. It is a map describing the sequence of related events and how those events support specified goals. A basic logic model for assessing the effectiveness of a wildlife crossing, as an example component within a REF, is found in the figure on page 47.

Example Logic Model for a Wildlife Crossing¹⁵



The extent to which the outcomes and impacts described in the logic model reach the goals and milestones determined as inputs during planning can help provide information about the crossing's value as well as strengthen support for future investment and vision of the REF. The following four steps summarize the development of an appropriate logic model and performance measures.

1 Identify Resources to Monitor and Inputs Needed

The resources for which performance data will be collected – species' population size, water quality, or connectivity, for example – should be identified. These resources likely correspond to those recognized as priorities or as significant during REF planning.

2 List Possible Outputs and Outcomes

It is necessary to list ways that project performance can be appraised. Evaluation(s) can occur at the various steps in the logic model: Were all the **outputs** realized? To what degree were the expected **outcomes** achieved? In the long run, has the project created the desired **impact**?

Some potential ecosystem performance goals and outcomes/impacts for projects existing as components within a REF are suggested in the table on the following page.

¹⁵ Adapted from W.K. Kellogg Logic Model Development Guide. December 2001, updated January 2004. View the report at www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf.

Possible Performance Goals and Outcomes

Possible Performance Goal	Possible Outcomes
Sustain Population Ecology	Maintained or Increased Population Size and Density Balanced Population Sex and Age Structure Reduced Mortality and Sustained Viability Maintained or Increased New Growth
Maintain Species Distribution and Abundance	Sustained Direct and Indirect Presence
Preserve Prevalence of Indicator Species	Increased Population Size Long-term Wildlife Crossing Use
Maintain Number of Species with Improved Population Status	Species Counts Reduced Take of Migratory Birds
Maintain Fish and Wildlife Connectivity	Removal of x-Number of Linear Feet of Barriers Improved Habitat Suitability Index (HSI) Scores Maintained or Increased Number of Adjacent Habitat Areas Improved Foraging Conditions
Streamline Regulatory Compliance	Reduced Time for ESA Section 7 Consultation
Reduce Vehicle-Wildlife Collisions No New Critical Habitat Modification	Reduced Number of Collisions (Monthly, Seasonally, Annually) Minimized Maintenance Costs
Restoration of Native Vegetation	Amount of Land Managed for Native Vegetation
Ensure Stream Integrity	Sustained Water Temperature Improved Floodplain or Riparian Buffer Protection
Public Awareness	Increased Participation, Creation of Shared Regional Vision
Coordinate Scientific Data	Shared GIS Data Shared Ecosystem Assessments Shared Monitoring Data
Improved Recreation	Increased Wildlife Populations for Viewing, Hunting, Fishing, and other Activities

3 Match Measures to Expected Outcomes

Once a comprehensive list of potential performance goals and outputs/outcomes has been compiled, choose activities that will measure and yield data most closely matching the purpose of those outputs/outcomes. The activities should be clearly defined, and the calculation methodology, including required equations and key term definitions, should be described. The data-gathering protocol for the monitoring activities should also be logical, understandable, and repeatable.

The Riverside County (California) Multi-Species Conservation Plan offers an example of a multi-species conservation plan within an ecological context that the plan defines by vegetative communities. Conservation outcomes are defined for each species in variety of ways, including acres of suitable habitat protected, numbers of reserve or core areas protected, and linkage areas or mechanisms between reserves, among others. The plan identifies management and monitoring objectives, as well as anticipated levels of effort and estimated costs. For more information, see <http://rcip.org/mshcpdocs/vol1/mshcpvol1toc.htm>.

4 Reach Agreement

After choosing and agreeing on activities that will measure effectiveness through outputs/outcomes defined in the REF, it is necessary to reach agreement on the following:

- **Time before outputs and outcomes are to occur** – Should the project have immediate effects? Will the anticipated results happen after three months? Six months? A year?
- **Frequency of monitoring and other activities** – How often will data be collected? Continuously? Is it important to collect data year-round or during certain time periods? A monitoring plan developed in conjunction with the selection of performance measures can help ensure that activities selected are affordable, feasible, and adequately represent the stated objective.
- **Frequency of reporting** – Once data have been collected, how often will performance be reported? What will the format of the performance measurement report look like?
- **Review of performance** – Who will review the performance reports? Stakeholders? The crediting agency? Agencies commenting on environmental documents? Some agencies require adaptive management monitoring evaluations to be available for public review. The cycle of integrated planning allows a process that supports planning and implementation of remedies and refinements.

Environmental Management Systems

Environmental Management Systems (EMSs) comprise a set of procedures to ensure that an organization's daily operations comply with environmental regulations and commitments to support environmental stewardship objectives. An EMS addresses identified operational and management issues, such as energy conservation, efficient water use, vehicle emission reduction, materials recycling, and hazardous materials management. Organizations that have implemented EMSs are better able to manage their environmental obligations, and they report cost savings, improved bond ratings, reduced insurance premiums, and better community relations.



Economic, environmental, and social needs and objectives can be harmonized, while infrastructure project approvals are streamlined in compliance with applicable laws. By working to ensure that acknowledged priorities are maximized, tax dollars are effectively spent, public safety is improved, and infrastructure development is streamlined. Some examples of work accomplishing multiple objectives include Alabama's Protection of the Gopher Tortoise, Colorado's Programmatic Ecosystem Approach, and Arizona's Missing Linkages effort, among others. (Photo courtesy of David Sell, FHWA)

What Success Looks Like

CHAPTER VI

A mitigation and conservation banking industry is emerging and providing opportunities for infrastructure development and ecosystem conservation to move forward in parallel. Economic, environmental, and social needs and objectives can be harmonized, while infrastructure project approvals are streamlined in compliance with applicable laws. With the process presented in this document, agencies and their partners can further interagency collaboration, enrich public involvement, and consider ecosystem-based mitigation possibilities. By working to ensure that acknowledged priorities are maximized, tax dollars are effectively spent, public safety is improved, and infrastructure development is streamlined – success looks eco-logical.

Successful Examples with Potential REF Components

Examples of efforts to accomplish multiple objectives follow; such efforts could occur as components within a regional ecosystem framework (REF). These cases have successfully gone beyond traditional, project-specific approaches. As integrated planning efforts proceed and REF approaches are developed, exemplary endeavors are certain to emerge in the future.

Alabama's Protection of the Gopher Tortoise

In January 2003, the Alabama DOT (ALDOT), the FHWA Alabama Division, and USFWS finalized a plan to protect habitat for the threatened gopher tortoise in southwest Alabama. Gopher tortoise habitat is impacted by a number of proposed highway projects and encroaching development. Rather than working on a project-by-project basis, ALDOT acquired more than 600 acres for a gopher tortoise

conservation bank. Conservation banking will allow ALDOT to protect the large and viable habitat needed to support a thriving gopher tortoise population. USFWS has reviewed and approved the site, and ALDOT, FHWA, and USFWS have begun to implement a plan to enhance the area as a long leaf pine habitat. In addition, the three agencies have developed maintenance procedures and criteria for capturing, testing, releasing, and monitoring the species.

Alaska Habitat Connectivity Project

The following is excerpted from *A Scoping Analysis to Assess the Effects of Roads in Alaska on Habitat Quality and Connectivity*. The final report is available at www.akhcp.org./docs/Final-report.pdf.

Habitat fragmentation caused by highway development is a serious concern throughout the U.S., and the world. Since the mid-1990s, State and Federal transportation officials and land and wildlife management agencies have been looking for ways to address this problem, which occurs when a highway alters habitat and impedes movement in the landscape. The purpose of the Alaska Habitat Connectivity Project was to build a toolbox of information that will enable the Alaska Department of Transportation and Public Facilities to assess the effects of existing and proposed roads on habitat quality and connectivity.

To build this toolbox, members of the project team assembled (1) a list of individuals interested in the effects of roads on habitat quality and connectivity in Alaska, (2) literature related to this issue and pertinent to Alaska, and (3) GIS data sets and methods useful to transportation planners for project development. Additionally, two workshops were conducted to (1) inform research by taking the collective pulse of the community with regard to this issue, (2) identify research gaps, and (3) gather other related information.

Arizona's Missing Linkages

The Nation's fastest-growing State is developing its open space at a rapid rate. Arizona's exploding human population has necessitated additional roads, wider highways, urban development, and other related structures and activities that create barriers and prevent the movement of wildlife. To reduce these impacts, roads and highways throughout the State are being designed or modified to include overpasses and underpasses to allow for safe wildlife passage. Identifying the effective location of overpasses and underpasses statewide requires a blueprint of where the remaining wildlife habitats and corridors are located.

Such a blueprint was initiated during Arizona's first "Missing Linkages" conference. The workshop resulted from a cooperative effort coordinated by the Arizona Game and Fish Department, Arizona DOT, USFWS, USDA FS, FHWA, BLM and key persons from the Wildlands Project, and Northern Arizona University. The conference demonstrated the urgency and need to cooperatively address wildlife connectivity on a statewide level. The workshop featured prominent speakers who emphasized the importance of the subject and included examples of wildlife overpasses, underpasses, and other highway-crossing structures that exist in Europe, Canada, and elsewhere in the United States.

The statewide linkage map, although needing further refinement and analysis, was one of the conference's notable successes. This map, when fully developed, will greatly assist Arizona's future highway planning, construction, and maintenance activities in tandem with the State's wildlife management goals. Working groups will identify corridors connecting wildlife habitat throughout the State.

California's Multiple Project Conservation for Species of Concern

FHWA, California DOT (Caltrans), and several local transportation agencies are planning five interchange improvements on Interstate 10. These improvements will impact sand dune habitat that houses two listed species of concern: the Coachella Valley fringe-toed lizard and milk vetch. Rather than develop discrete conservation measures for each project, the participating agencies have developed a mitigation strategy for the five interchange projects that will be carried out as each project goes through the environmental process. As a result, the USFWS will issue a Programmatic Biological Opinion for the five interchange projects, which will expedite project delivery. Participating agencies are preparing a draft cooperative agreement and will begin acquiring land from willing sellers as soon as each project completes its environmental document. Approximately 1,800 acres will be conserved for the five projects.

Colorado's Programmatic Ecosystem Approach

In November 2002, Colorado DOT (CDOT), FHWA, and USFWS began implementing a programmatic ecosystem approach to streamline Section 7 consultation for transportation projects that may impact the Preble's meadow jumping mouse. The jumping mouse was listed as a threatened species in 1998 due to habitat degradation caused by development and impacts from transportation projects. Since 2001, CDOT has built nine check dams to restore a degraded riparian ecosystem in conjunction with several transportation projects near East Plum Creek. This area is part of the Front Range of the Southern Rockies, where the jumping mouse is known to exist within Colorado. The check dams raised the water table enough to maintain the riparian vegetation necessary for quality jumping mouse habitat. In addition, CDOT and FHWA restored nearly one mile of East Plum Creek as part of a bridge construction project. Today, this restored habitat is part of a Preble's meadow jumping mouse habitat conservation bank. In return for its mitigation work, CDOT received credits for future projects to occur in a defined service area.



Indiana's Habitat Conservation Plan for the Indiana Bat

In April 2002, the Indiana DOT, the FHWA Indiana Division, and four local government agencies finalized a habitat conservation plan (HCP) for the endangered Indiana bat as part of the improvement of transportation facilities around Indianapolis International Airport. These highway improvements will occur in an area of known Indiana bat habitat that is predicted to experience nearly \$1.5 billion in economic development during the next 10 years. Under the HCP, approximately 3,600 acres will be protected, including 373 acres of existing bat habitat. In addition, approximately 346 acres of hardwood seedlings will be planted for new habitat, and an outreach program and a 15-year monitoring program will be developed.

Oregon Department of Transportation (ODOT) has developed a geographic information system-based sensitive resource inventory along nearly 6,000 miles of State highway. The ambitious project is part of ODOT's Salmon Resources and Sensitive Area Mapping Project – an effort to provide accurate resource-protection maps to highway maintenance crews so mowing, pesticide application, and other activities don't harm listed salmon species and other sensitive environmental resources. The maps were key to a formal agreement between ODOT and the NOAA Fisheries Service under which ODOT is allowed to perform routine road maintenance without having to consult with NOAA Fisheries.



Eco-Logical is a starting point for identifying and addressing the greatest conservation needs associated with the development of infrastructure projects. Using this guide, infrastructure improvements can be advanced in productive harmony with the restoration of fragmented habitats, reduction of wildlife mortality, and other cooperative conservation goals. (Photo courtesy David Sell, FHWA)

Glossary

Action agency

An agency whose actions may impact the quality of the human and/or natural environment.

Adaptive management

The integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn.

Ecosystem

An interconnected community of living things, including humans, and the physical environment in which they interact.

Ecosystem approach

A method for sustaining or restoring ecological systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

Ecosystem-based mitigation

An outgrowth of integrated planning, ecosystem-based mitigation is the mitigation of impacts at a landscape or ecosystem scale. It enables the protection of ecological functions, values, and processes that are believed to be most important for the regional ecosystem.

Habitat

The ecosystems, plants, and interactions that support wildlife.

Infrastructure

The basic facilities needed for the functioning of a community or society, such as transportation and communications systems, utilities, and public institutions.

In-kind mitigation

Mitigation for impacts with the same or similar resources or ecological functions as those impacted.

Integrated planning

A course of action agencies and partners take to combine planning efforts, to understand where programmed work will interact, and to define ecological resources of supreme concern.

Linkage

An area of land that supports or contributes to the long-term movement of wildlife.

Mitigation

CEQ regulations (40 CFR 1508.20) define mitigation as:

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

Off-site mitigation

Mitigation for impacts at a location not bordering the impact site.

On-site mitigation

Mitigation for impacts adjacent to the impact site.

Out-of-kind mitigation

Mitigation for impacts with other or different resources or ecological functions as those impacted.

Regional ecosystem framework

An element of integrated planning that likely consists of an overlay of maps of agencies' individual plans, accompanied by descriptions of conservation goals in the defined region.

Resource agency

An agency that has jurisdiction over a resource that may be affected by an activity.

Wildlife

Terrestrial and aquatic animals, and invertebrates.

Appendices

- Appendix A – Memorandum of Understanding to Foster the Ecosystem Approach
- Appendix B – Funding and Partnerships
- Appendix C – Resource Guide
- Appendix D – Federal Laws and Requirements

Appendix A

Memorandum of Understanding to Foster the Ecosystem Approach

MEMORANDUM OF UNDERSTANDING
TO FOSTER THE ECOSYSTEM APPROACH
between the
COUNCIL ON ENVIRONMENTAL QUALITY
DEPARTMENT OF AGRICULTURE
DEPARTMENT OF THE ARMY
DEPARTMENT OF COMMERCE
DEPARTMENT OF DEFENSE
DEPARTMENT OF ENERGY
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF JUSTICE
DEPARTMENT OF LABOR
DEPARTMENT OF STATE
DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

I. DEFINITIONS

An ecosystem is an interconnected community of living things, including humans, and the physical environment within which they interact.

The ecosystem approach is a method for sustaining or restoring ecological systems and their functions and values. It is goal driven, and it is based on a collaboratively developed vision of desired future conditions that integrates ecological, economic, and social factors. It is applied within a geographic framework defined primarily by ecological boundaries.

The goal of the ecosystem approach is to restore and sustain the health, productivity, and biological diversity of ecosystems and the overall quality of life through a natural resource management approach that is fully integrated with social and economic goals.

II. POLICY

The Federal Government should provide leadership in and cooperate with activities that foster the ecosystem approach to natural resource management, protection, and assistance. Federal agencies should ensure that they utilize their authorities in a way that facilitates, and does not pose barriers to, the ecosystem approach. Consistent with their assigned missions, Federal agencies should administer their programs in a manner that is sensitive to the needs and rights of landowners, local communities, and the public, and should work with them to achieve common goals.

III. BACKGROUND

In its June 1995 report entitled, *The Ecosystem Approach: Healthy Ecosystems and Sustainable Economies*, the Interagency Ecosystem Management Task Force set forth specific recommendations with respect to how Federal agencies could better implement the ecosystem approach. The task force recommended that member agency representatives sign a memorandum of understanding affirming their intent to implement the recommendations.

IV. THE ECOSYSTEM APPROACH

Healthy and well functioning ecosystems are vital to the protection of our nation's biodiversity, to the achievement of quality of life objectives, and to the support of economies and communities. The ecosystem approach recognizes the interrelationship between healthy ecosystems and sustainable economies. It is a common sense way for Federal agencies to carry out their mandates with greater efficiency and effectiveness. The approach emphasizes:

- Striving to consider all relevant and identifiable ecological and economic consequences (long term as well as short term).
- Improving coordination among Federal agencies.
- Forming partnerships between Federal, State, and local governments, Indian tribes, landowners, foreign governments, international organizations, and other stakeholders.
- Improving communication with the general public.
- Carrying out Federal responsibilities more efficiently and cost-effectively.
- Basing decisions on the best science.
- Improving information and data management.
- Adjusting management direction as new information becomes available.

V. THE COOPERATORS AGREE TO THE FOLLOWING:

- A.** Each Federal agency that is a party to this Memorandum of Understanding shall designate an individual who will be responsible for coordinating the agency's internal and interagency activities in support of this Memorandum of Understanding to implement the recommendations of the Task Force report as appropriate. Such designation shall be reported to the Interagency Ecosystem Management Task Force within 30 days of signature. The collective agency designees will serve as an Implementation Committee. The Committee will meet regularly to share information on progress in implementing this Memorandum of Understanding, problems encountered, and solutions proposed in resolving them. The Committee shall provide reports at meetings of the Interagency Ecosystem Management Task Force. Such reports should include any unresolved issues that may require the attention of the Task Force.
- B.** Each signatory agency shall examine the specific recommendations made in the report of the Interagency Ecosystem Management Task Force in light of its authorities, policies and procedures, and identify recommendations that may apply to its programs. Based on this review, agencies shall determine what changes or interagency actions are necessary or desirable, undertake appropriate actions, monitor accomplishments, and report their findings and actions through the Implementation Committee to the Interagency Ecosystem Management Task Force, on a schedule to be determined by the Task Force.
- C.** The Interagency Ecosystem Management Task Force shall encourage regional directors or comparable executives of the Federal agencies in the various regions to have regular and systematic exchanges of information about plans, priorities, and problems. The purposes are to eliminate inefficiencies and duplication of effort, to keep executives informed about Federal Government ecosystem activities of Federal agencies with varying missions (such as land technical assistance, and funding), and to strengthen executive-level support for the interagency ecosystem activities of field personnel.
- D.** Each signatory agency shall participate, as appropriate to its mandates, in ecosystem management efforts initiated by other Federal agencies, by State, local or tribal governments, or as a result of local grassroot efforts. Members of the Implementation Committee shall identify their ongoing ecosystem efforts and other efforts that come to their attention, share information about those efforts, discuss appropriate agency actions with regard to participating in those efforts, and identify successful and unsuccessful components of those efforts. Signatory agencies shall also look for opportunities in new geographic areas for Federal efforts in collaboration with stakeholders.
- E.** The Interagency Ecosystem Management Task Force will propose, as appropriate, new regional ecosystem demonstration initiatives. These initiatives will build upon the knowledge gained from evaluating the seven ecosystems that were the subject of the Task Force reports.
- F.** The Interagency Ecosystem Management Task Force will evaluate the potential for joint training programs for the ecosystem approach, in which all signatory agencies could participate, and in which personnel from all signatory parties could receive training. The Implementation Committee members will share information on agency training programs related to the ecosystem approach, and signatory agencies are encouraged to accommodate trainees from other agencies in such courses as appropriate.

VI. IT IS MUTUALLY AGREED AND UNDERSTOOD BY AND AMONG THE COOPERATORS THAT:

- A. Specific work projects or activities that involve the transfer of funds, services, or property among the Cooperators will require the execution of separate interagency agreements, contingent upon the availability of funds as appropriated by Congress. Each subsequent agreement or arrangement involving the transfer of funds, services, or property among the Cooperators must comply with all applicable statutes and regulations, including those states and regulations applicable to procurement activities, and must be independently authorized by appropriate statutory authority.
- B. This Memorandum of Understanding in no way restricts the Cooperators from participating in similar activities or arrangements with other public or private agencies, organizations, or individuals.
- C. Nothing in this Memorandum of Understanding shall obligate the Cooperators to expend appropriations or enter into any contract or other obligations.
- D. This Memorandum of Understanding may be modified or amended upon written request of any party hereto and the subsequent written concurrence of all of the Cooperators. Cooperator participation in this Memorandum of Understanding may be terminated with the 60-day written notice of any party to the other Cooperators. Unless terminated under the terms of this paragraph, this Memorandum of Understanding will remain in full force and in effect until September 30, 1999.
- E. This Memorandum of Understanding is intended only to improve the internal management of the executive branch and is not intended to, nor does it create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any person.
- F. The terms of this Memorandum of Understanding are not intended to be enforceable by any party other than the signatories hereto.

VII. SIGNATURES

KATE MCGINTY, Chair
Council on Environmental Quality

JOHN ZIRSCHKY, Assistant
Secretary for Civil Works,
Department of the Army

SHERRI W. GOODMAN, Deputy Under
Secretary for Environmental Security,
Department of Defense

ANDREW M. CUOMO, Assistant Secretary
for Community Planning and Development,
Department of Housing and Urban
Development

LOIS SCHIFFER, Assistant Attorney
General for Environment and Natural
Resources, Department of Justice

DAVID A. COLSON, Acting Assist. for
Secretary for Oceans and International
Environmental and Scientific Affairs,
Department of State

FRED HANSEN,
Deputy Administrator
Environmental Protection Agency

JAMES R. LYONS, Undersecretary for Council
on Natural Resources and Environment,
Department of Agriculture

DOUGLAS HALL, Assistant Sec. for
Oceans and Atmosphere, Department of
Commerce

DAN W. REICHER, Acting Assistant Secretary for Policy, Planning and Program Evaluation, Department of Energy

BONNIE COHEN, Assistant Sec. for Policy, Management and Budget, Department of the Interior

JOSEPH A. DEAR, Assistant Secretary for Occupational Safety and Health, Department of Labor

FRANK KRUESI, Assist. Sec. for Transportation Policy, Department of Transportation

JACK GIBBONS, Director, Office of Science and Technology Policy

Dated: December 15, 1995

For an electronic version, visit: www.fhwa.dot.gov/legsregs/directives/policy/memoofun.htm.

Appendix B

Funding and Partnerships

Funding and partnership mechanisms are available to accomplish integrated planning, development of a regional ecosystem framework (REF), and implementation of planned efforts and projects. Several authorities and public funding appropriations exist and have been utilized within partnerships to accomplish larger efforts than could occur independently. In fact, many public programs have been established from the onset with cost-sharing responsibilities that include a funding match or in-kind contributions. It is important to consider strategies for funding and partnering to implement infrastructure and land management projects. Opportunities offer a role for both the public and private sectors. Strategies that include watershed plans, comprehensive plans, and regional plans can be capitalized upon to pursue ecosystem approaches. The most effective strategies include annual and multi-year funding needs. Funding availability and use can vary by organization and fiscal year. This Appendix introduces concepts and examples for funding and partnering. Several factors need to be included within an overall strategy to meet short-term and long-term needs.

What Opportunities Exist for Funding and Partnerships?

Instruments and programs exist for the Federal, regional, State, tribal, and local levels of government and the private sector. Success stories commonly draw upon the participation of the private sector including nonprofit and for-profit organizations. As an overview, tools and techniques for funding the development of infrastructure projects can include:

- Federal Program Funding
- Funding Matches through Partnering
- Innovative Financial Tools
- Special Funding and Use of Funds within Programs

Guidelines for Federal-aid Participation in the Establishment and Support of Wetland Mitigation Banks, October 24, 1994

www.fhwa.dot.gov/legsregs/directives/policy/memo55.htm

FHWA Memorandum: Federal-aid Eligibility of Wetland and Natural Habitat Mitigation, March 10, 2005

www.fhwa.dot.gov/environment/wetland/wethabmitmem.htm

Examples of Federal Program Funding

Often, Federal funding programs require a non-Federal matching share. A variety of mechanisms exist for fulfilling non-Federal cost-share responsibilities based on program requirements. A blend of cash and in-kind contributions are typically available as opportunities that count toward the non-Federal share. Within Federal programs that require non-Federal cost sharing, matching funds and in-kind contributions are quantified, tracked, and reported. Public sector participation could include Federal, state, tribal, and local levels of government and typically includes coordination with the private sector.

As an example, historically, Federal funding with FHWA oversight has financed highways covering up to 80 percent of project costs coupled with cost-sharing mechanisms and partnerships. Traditional Federal funding for highways is project specific. It is important to note that it does not offer a particular funding category for mitigation. (See “Mitigation and Funding” under “Special Funding and Use of Funds within Programs” later in this Appendix.) Other examples include:

- Federal aid funds are described as Federally aided and state administered. Mitigation must be linked to projects eligible for Federal funding.
- “Banking” for compensatory mitigation (as with wetlands banks) is possible.
- Technology transfer funding can provide education/lessons learned.
- “4r” Provisions allow restoration of impacts due to past projects under current Federal aid highway projects.

Examples of Matches through Partnering

Strategies that use multiple funding sources and organizations can accomplish larger efforts and multiple benefits than could be accomplished alone. The foundation for developing these strategies is integrated planning. Public and private partnering occurs in various ways. Cost-sharing is common within many efforts that support infrastructure and land management. Examples of matches and cost-sharing include contributions toward: preparation of plans, conducting studies, developing designs, planting material, construction, and operation and maintenance activities. For example, within some programs,

if a nonprofit, private, or local organization is willing to provide cash, materials, or land to a project, that contribution could serve as part of the required non-Federal match. This example underscores the value of creating partnerships with other stakeholders.

The short-term and long-term activities of various entities can be capitalized upon to accomplish common goals. Coordination has been beneficial between various Federal, State, tribal, and local agencies and the private sector. Some examples of strategies and cooperative match possibilities include:

- A local landowner donates a permanent easement facilitating crossing for wolves, so they can avoid a highway crossing that divides their habitat;
- A foundation provides partial funding for creation of a wildlife crossing;
- Site selection for compensatory wetland mitigation for a Federal project is strategically located adjacent to a habitat area that is locally owned. Compensatory mitigation is fulfilled and a larger, more sustainable habitat area is established;
- A watershed plan, comprehensive plan, or regional plan is completed and is capitalized upon as an already existing investment for integrated planning.

Examples of Innovative Financial Tools

FHWA oversees several funding programs that offer innovative financial tools and are dedicated to special uses. Two innovative financial tools for funding wildlife projects are State Infrastructure Banks (SIBs) and Grant Anticipation Revenue Vehicles (GARVEE). Both can be used only for projects that would be eligible for direct Federal-aid funding, but for which funding is not immediately available.

State DOTs often have access to SIBs, which are a source of low-cost financing for eligible projects. The maximum loan term is 35 years, and the interest rate is set by the State. Loans from SIBs can make a large project affordable for a nonprofit or local community (e.g. \$100,000 over 30 years at 5 percent interest is equal to a mortgage payment).

GARVEEs permit States to borrow against future Federal-aid funding. States pay debt payments with Federal aid. GARVEEs allow States to distribute the costs of expensive projects over many years.

For more information on FHWA Innovative Financing, visit www.fhwa.dot.gov/innovativefinance/ and www.fhwa.dot.gov/innovativefinance/garguid1.htm.

Special Funding and Use of Funds within Programs

A variety of funding programs are dedicated to specific uses that involve agencies within various levels of government and the private sector. Some examples are summarized below.

National Recreational Trails Fund

These funds are allocated to the States to provide and maintain recreational trails and trail-related projects. Trails and trail-related projects that are identified in, or further a specific goal of, a trail plan included or referenced in a Statewide comprehensive outdoor recreation plan, as required by the Land and Water Conservation Fund Act qualify for these funds. The project sponsor applies to the State, and the FHWA approves spending for the project. The State may be a project sponsor. Assured access

to funds is given for motorized, non-motorized, and discretionary recreation uses. States shall give preference to projects with diversified uses, such as multiple-use trails for human and wildlife use. These trails can often provide corridors for wildlife. The FHWA oversees this program.

Compensatory Mitigation and Funding

FHWA's authority to fund mitigation for project impacts is outlined in FHWA's environmental regulations at 23 CFR Part 771.105(d). The provision reflects FHWA's responsibility to incorporate appropriate mitigation into transportation projects and provide the funding necessary to mitigate the impacts that are actually caused by FHWA funded projects, provided the funding represents a reasonable public expenditure. Other aspects of the reasonableness of the public expenditure are addressed in 777.7(a), including: (1) the importance of the impacted natural habitats, (2) the extent of highway impacts as determined through an appropriate, interdisciplinary impact assessment, (3) actions necessary to comply with the CWA, ESA, and other relevant Federal statutes, and (4) input from the appropriate resource management agencies through interagency cooperation. Information on environmental mitigation is also contained in 23 CFR Part 710.513. The mitigation included as a commitment in an environmental document becomes an integral and essential part of a transportation project decision. FHWA is responsible for ensuring that mitigation measures identified as commitments in environmental documents are implemented.

Both the National Highway System and Surface Transportation Programs in the current transportation legislation allow states to use Federal aid funds for wetlands and habitat mitigation of impacts due to Federal-aid highway projects. These provisions allow the expenditure of Federal-aid highway funds towards efforts to conserve, restore, enhance, and create wetlands, and to establish habitat and wetland mitigation banks in advance of projects, as well as concurrently or after projects are completed.

A March 2005 memorandum from FHWA Headquarters reiterates and "emphasizes 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." The memo clarifies that "...in the case of wetland or other mitigation banks, the State DOT and FHWA division office should identify potential future wetlands and habitat mitigation needs for a reasonable time frame and establish a need for the mitigation credits. The transportation planning process should guide the determination of future mitigation needs." For specific details within this memo, visit: www.fhwa.dot.gov/environment/wetland/wethabmitmem.htm.

Transportation Enhancement Activities

Transportation Enhancement (TE) activities benefit the traveling public and help communities to increase transportation choices and access, enhance the built and natural environment, and provide a sense of place. To be eligible for funding, a TE project must fit into one or more of 12 eligible categories and relate to surface transportation (see 23 U.S.C. 101(a)(35)). Mechanisms exist for the use of in-kind contributions to meet the non-Federal cost-share requirements. FHWA oversees the program. A project eligible for TE funding must meet Federal environmental, project administration, and right-of-way requirements. State TE managers administer the program and establish eligibility specifics at the State level that might be more detailed than FHWA guidance. A summary by FHWA is available at the source of this information: www.fhwa.dot.gov/environment/te/guidance.htm.

Private Lands and Private Landowners

Successful efforts and strategies have involved privately owned land. Multiple mechanisms exist for private landowners to implement conservation and habitat objectives. These mechanisms are available within the public and private sectors. A few examples of Federal programs that offer incentives for private landowners are offered through the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service, and the Forest Service, as well as the U.S. Department of Interior, Fish and Wildlife Service. These programs offer incentives as property tax benefits, income tax credits, technical assistance, and direct funding. Partnerships can include multiple entities. As a specific example, USDA mentions working with multiple participants for a USDA program that supports conservation planning and conservation practices by private landowners by summarizing: “When appropriate, the conservation plan may be used to pool or group participants to accommodate resource conservation practices that overlay lands owned or controlled by more than one participant. All program beneficiaries must agree to develop the area wide conservation plan.” Source: http://policy.nrcs.usda.gov/scripts/lpsiis.dll/M/M_440_505_A_00.htm.

Other examples of Federal incentive programs focusing on private landowners are highlighted at www.biodiversitypartners.org/incentives/programfed.shtml#USFWs.

Future Success Stories

Partnerships between the private and public sectors have been the foundation of proven successes for infrastructure and land management efforts. Considerations of funding and partnerships have proven essential to short-term and long-term activities. Participation has included various agencies at the Federal, State, tribal, and local levels working with private for-profit and nonprofit entities. Looking beyond a project-specific approach through integrated planning along with the sharing of responsibilities between stakeholders has accomplished larger initiatives with long-term multiple benefits. This Appendix highlights funding and partnering for accomplishments within an ecosystem approach. Emerging and future endeavors are certain to serve as future successes.

Appendix C

Resource Guide

This Appendix compiles a wealth of resources for partner agencies and other stakeholders interested in implementing the ecosystem approach. Resources include published reports and plans, Federal guidance, training opportunities, and organizations that are successfully implementing some of the methods described in *Eco-Logical*.

Web Links

Alaska DOT&PF Report: “A Scoping Analysis to Assess the Effects of Roads in Alaska on Habitat Quality and Connectivity” - The purpose of this project was to build a “toolbox” of information that may be used by the Alaska DOT&PF to assess the effects of existing and proposed roads on habitat quality and connectivity. As a subtext, the project focused on the ability of GIS to assist transportation planners with project development: www.akhcp.org/docs/Final-report.pdf.

Conservation Assessment and Prioritization System (CAPS) - CAPS is a computer software program designed to assess the biodiversity value of every location based on natural community-specific models, and prioritize lands for conservation action based on their assessed biodiversity value in combination with other data relevant to their prioritization: www.umass.edu/landeco/research/caps/caps.html.

Enlibra Principles - The Enlibra Principles outline a philosophy for solving environmental problems across the country: www.oquirrhinstitute.org.

Federal Conservation Incentive Programs with the USFWS – Programs described include the Landowner Incentive Program, the North American Wetlands Conservation Act Grants Program (www.fws.gov/birdhabitat/NAWCA/act.htm), Partners for Fish and Wildlife (www.fws.gov/partners/index.htm), and the Private Stewardship Program (www.fws.gov/endangered/grants/private_stewardship). Other agencies' incentive programs are described at <http://www.biodiversitypartners.org/incentives/programfed.shtml>.

Federal Guidance on the Use of In-Lieu-Fee Arrangements for Compensatory Mitigation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act –

Memorandum clarifying the manner in which in-lieu-fee mitigation may serve as an effective and useful approach to satisfy compensatory mitigation requirements: www.epa.gov/osow/wetlands/regs/inlieufee.pdf.

Federal Guidance on the Use of the TEA-21 Preference for Mitigation Banking to fulfill Mitigation Requirements under Section 404 of the Clean Water Act, July 11, 2003 –

Document providing interagency guidance on applying the preference for wetlands banking mandated in TEA-21 to compensatory mitigation requirements under Section 404 of the CWA: www.epa.gov/osow/wetlands/pdf/TEA-21Guidance.pdf.

FHWA Final Guidance on Transportation Enhancements Activities – This guidance provides information and assistance in the delivery of nontraditional transportation related activities that make a tremendous contribution to FHWA's and the Department of Transportation's commitment to community preservation and enhancement: www.fhwa.dot.gov/environment/te/guidance.htm.

FHWA Innovative Financing – www.fhwa.dot.gov/innovativefinance.

FHWA Memorandum: Federal-aid Eligibility of Wetland and Natural Habitat Mitigation, March 10, 2005 –

The purpose of this memorandum is to reiterate and clarify previous FHWA guidance on wetland and natural habitat mitigation. Specifically, it emphasizes 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: www.fhwa.dot.gov/environment/wetland/wethabmitmem.htm.

FHWA Regulation on Mitigation Banking (23 CFR 777) – Regulation providing policy and procedures for the evaluation and mitigation of adverse environmental impacts to wetlands and natural habitat resulting from Federal-aid projects funded pursuant to provisions of title 23, U.S. Code: www.fhwa.dot.gov/hep/23cfr777.htm.

Florida's Wildlife Species Ranking Process – The Florida Department of Transportation has recently started a program to integrate road projects with Statewide conservation objectives by installation of underpasses or culverts on a Statewide level designed to restore landscape connectivity and processes. Through identification of priority ecological interface zones highway officials can program mitigative measures needed on State highways to counter negative impacts on wildlife and wildlife habitat and for restoration of important landscape-level processes: www.wildflorida.org/SWG/grants/default.htm.

Download the report on prioritization of interface zones on State highways in Florida at www.icoet.net/downloads/99paper27.pdf.

Guidelines for Federal-aid Participation in the Establishment and Support of Wetland

Mitigation Banks, October 24, 1994 – Guidelines for Federal-aid participation in establishment and support of wetland mitigation banks that provides State transportation agencies with the flexibility to meet the need to manage mitigation of wetland impacts now and in the future:

www.fhwa.dot.gov/legisregs/directives/policy/memo55.htm.

Interagency Guidance for Establishment, Use and Operation of Mitigation Banks – The purpose of this guidance is to clarify the manner in which mitigation banks may be used to satisfy mitigation requirements of the CWA Section 404 permit program and the wetland conservation provisions of the Food Security Act: *www.usace.army.mil/inet/functions/cw/cecwo/reg/mitbankn.htm.*

Maine’s Beginning with Habitat – Beginning with Habitat is a habitat-based landscape approach to assessing wildlife and plant conservation needs and opportunities. The goal of the program is to maintain sufficient habitat to support all native plant and animal species currently breeding in Maine by providing each Maine town with a collection of maps and accompanying information depicting and describing various habitats of statewide and national significance found in the town: *www.beginning-withhabitat.org.*

National Wetlands Mitigation Action Plan – In response to independent critiques of the effectiveness of wetland compensatory mitigation for authorized losses of wetlands and other waters under Section 404 of the CWA, the EPA, the USACE, and the Departments of Agriculture, Commerce, Interior, and Transportation released the National Wetlands Mitigation Action Plan on December 26, 2002: *www.mitigationactionplan.gov.*

National Research Council (NRC) Report: “Valuing Ecosystem Services: Toward Better Environmental Decision-Making” – This report discusses several challenges to valuing ecosystem services: *www.nap.edu/books/030909318X/html/.*

Natural Resources Conservation Service Conservation Planning Manual – This document establishes the Natural Resources Conservation Service policy for providing conservation planning assistance to clients: *http://policy.nrcs.usda.gov/scripts/lpsiiis.dll/M/M_440_505_A_00.htm.*

North Carolina’s Ecosystem Enhancement Program (EEP) – The EEP combines an existing wetlands-restoration initiative by the North Carolina Department of Environment and Natural Resources with ongoing efforts by the NCDOT to offset unavoidable environmental impacts from transportation-infrastructure improvements. The USACE joined as a sponsor in the historic agreement: *www.nceep.net/services/success/stories.htm.*

Oklahoma’s Species of Greatest Conservation Need – Starting with outside sources that identified animal species in special need of conservation, Oklahoma’s Department of Wildlife consulted with hundreds of fish and wildlife experts to develop a list of 246 species in greatest need of conservation in Oklahoma: *www.wildlifedepartment.com/CWCS16.htm.*

Partners in Flight – In 1990, Partners in Flight was formed in response to growing concerns about declining land bird populations: *www.partnersinflight.org.*

Sonoran Desert Regional Framework for Ecosystem Monitoring – The Sonoran Institute, an organization that works with communities to conserve and restore important natural landscapes in Western North America, is partnering to create a bi-national, ecosystem monitoring framework for the Sonoran Desert: www.sonoran.org/programs/si_sdep_adaptive_info.html.

Southeast Aquatic Resources Partnership (SARP) – SARP was initiated in 2001 to address the myriad issues related to the management of aquatic resources in the southeastern United States. The intent of the SARP is to develop State and Federal partnerships that will extend beyond the traditional boundaries of fishery resource management agencies and will establish a commitment to truly work together for the benefit of the resource: <http://sarpaquatic.org/sarp/>.

Wildlife Action Plan – In order 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. The plans will provide a foundation for the future of wildlife conservation: www.wildlifestrategies.org. See also the State Wildlife Grants Program: <http://federalaid.fws.gov/swg/swg.html>.

USFWS Memorandum to USFWS Directors “Guidance for the Establishment, Use, and Operation of Conservation Banks” May 2, 2003 – The memorandum transmits guidance that helps the USFWS evaluate proposals to establish conservation banks. It provides a collaborative incentive-based approach to endangered species conservation, which if used in coordination with other tools available to the USFWS, can aid in the recovery of the species: <http://endangered.fws.gov/policies/conservation-banking.pdf>.

USFWS Mitigation Guidance on Conservation Banking – Guidance providing a collaborative incentive-based approach to endangered species conservation, which if used in coordination with other tools available to the USFWS, can aid in the recovery of the species: <http://endangered.fws.gov/policies/conservation-banking.pdf>.

Valuing Ecosystem Services: Toward Better Environmental Decision-Making – This report offers recommendations on valuing ecosystem services. Challenges to successfully integrating ecology and economics are also discussed: www.nap.edu/books/030909318X/html/.

Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) – The MSHCP is a comprehensive, multi-jurisdictional Habitat Conservation Plan (HCP) focusing on Conservation of species and their associated Habitats in Western Riverside County. It is one of several large, multi-jurisdictional habitat-planning efforts in Southern California with the overall goal of maintaining biological and ecological diversity within a rapidly urbanizing region: <http://rcip.org/mshcpdocs/vol1/mshcpvol1toc.htm>.

Wetlands Protection: Assessments Needed to Determine Effectiveness of In-Lieu-Fee Mitigation – This May 2001 GAO Report raises concerns regarding the administration and ecological effectiveness of in-lieu-fee arrangements and provides recommendations for addressing these concerns: www.epa.gov/oroww/wetlands/pdf/GAO.pdf.

W.K. Kellogg Logic Model Development Guide – This guide describes the underlying principles of “logic modeling” as a tool to help demonstrate the effectiveness of program activities:

www.wkkf.org/Pubs/Tools/Evaluation/Pub3669.pdf.

Other Helpful References

Guidance for Selecting Compensatory Wetlands Mitigation Options, NCHRP Report 482 – This report presents guidance on selecting the most appropriate compensatory strategies to mitigate the effects of transportation projects on wetland habitats. Based on a comprehensive review of mitigation practices in the United States, the report discusses the advantages and disadvantages of various approaches and presents guidelines that an agency can use to select mitigation options that will have the greatest chance of success. Case studies are used to illustrate the process used by a number of State DOTs to mitigate unavoidable wetland losses:

http://gulliver.trb.org/publications/nchrp/nchrp_rpt_482.pdf.

Second Nature - *Second Nature: Improving Transportation Without Putting Nature Second* profiles innovative programs that seek to improve transportation infrastructure while protecting biodiversity:

www.defenders.org/habitat/highways/secondnature.html.

Training Opportunities

Green Infrastructure: A Strategic Approach to Natural Resource Planning and Conservation

Through lecture, case studies, and class exercises, this course will introduce participants to the concepts and values of green infrastructure; to innovative tools and techniques for planning, designing, and implementing green infrastructure networks; and to successful approaches for integrating green infrastructure into local, regional, State and national land use plans, policies, practices, land protection strategies, watershed planning, and community decisions. For more information, visit

<http://training.fws.gov/>.

FHWA GIS for Environmental Streamlining – GIS Use for Improved Decisionmaking

GIS and other geospatial data tools are playing bigger roles in both transportation and environmental programs. They have become a key element in the efforts of many States to streamline their environmental review process and develop cooperative efforts with environmental resource agencies. This Workshop is intended to share information on how GIS is being used within existing environmental programs and to support streamlining initiatives with some examples from the 2003 TRB Peer Review on environmental spatial data as well as the state of the art around the country. Sessions are flexible enough to support State discussions of cooperative efforts with Resource Agencies. The workshop is held by itself or with other environmental or GIS workshops.

Appendix D

Federal Laws and Requirements

This Appendix lists and briefly describes Federal laws and regulations relevant to implementing the ecosystem approach.

Anadromous Fish Conservation Act (16 USC 757a-757g; 79 Stat. 1125)

This Act authorizes the Secretaries of the Interior and Commerce to enter into cooperative agreements with the States and other non-Federal interests for conservation, development, and enhancement of anadromous fish, including those in the Great Lakes, and to contribute up to 50 percent as the Federal share of the cost of carrying out such agreements.

Bald Eagle Protection Act of 1940 (16 USC 668-668d, 54 Stat. 250)

This law provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1978 amendment authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations.

Clean Air Act (CAA) of 1972 (42 USC ss/7401 et seq)

President Lyndon B. Johnson signed the CAA into law in 1963. It was amended in 1970, 1975, 1977, and 1990. Health-based Federal air quality standards that set the maximum acceptable levels of pollution for outdoor air were the strategic basis of the CAA. The standards were to be met through the application of control technology that would reduce pollutants continuously and result in improved air quality, as measured by air quality monitoring stations.

The CAA requires that State governments develop State Implementation Plans (SIPs), which set out measures to achieve acceptable air quality. Under Section 176(c) of the 1990 Amendments to the CAA, Federal agencies may not take actions that do not conform to the SIP for the attainment and maintenance of Federal air quality standards in areas not meeting those standards or that are in maintenance periods for those standards.

Clean Water Act (CWA), Section 401 (33 USC ss/1251 et seq)

Section 401 of the CWA, the State Water Quality Certification program, requires that States certify compliance of Federal permits or licenses with State water quality requirements and other applicable State laws. Under Section 401, States have authority to review any Federal permit of license that may result in a discharge to wetlands and other waters under State jurisdiction, to ensure that the actions would be consistent with the State's water quality requirements.

CWA, Section 402 (33 USC ss/1251 et seq)

The National Pollutant Discharge Elimination System (NPDES) program - required by Section 402 of the CWA - regulates discharges from point sources to waters of the United States. Point source is defined by the CWA as "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or floating craft, from which pollutants are or may be discharged."

CWA, Section 404 (33 USC ss/1251 et seq)

The Federal Water Pollution Control Act, known as the Clean Water Act, is a comprehensive statute aimed at restoring and maintaining the chemical, physical and biological integrity of the Nation's waters. Primary authority for the implementation and enforcement of the Clean Water Act now rests with EPA and USACE for wetlands.

Important for wildlife protection purposes are the provisions requiring permits to dispose of dredged and fill materials into navigable waters. Permits are issued by USACE under guidelines developed by EPA. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem are defined at Sec. 404 Subpart D, and for threatened and endangered species in particular at Sec. 404 230.30.

Coastal Barrier Resources Act (COBRA) (96 Stat. 1653; 16 USC 3501 et seq)

This legislation intends to minimize the loss of human life, wasteful expenditures of Federal revenues, and the damage to fish, wildlife, and other natural resources by designating a coastal barrier resources system of units needing protection. Agencies consult maps that depict the boundaries of each coastal barrier unit and conduct required coordination with the USFWS regional director if the project crosses or is in close proximity to a unit.

Coastal Zone Management Act (CZMA) of 1972 (16 USC 1456)

The Coastal Zone Management Improvement Act of 1980 (P.L. 96-464) established a new system of Resource Management Improvement grants related to preservation of certain coastal areas, redevelopment of urban waterfronts, and public access to beaches. The Act declares "the national policy to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations." The NOAA provides the requisite Federal approvals for Coastal Zone Management Plans and oversees subsequent implementation of the programs.

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

The program was designed to assist non-attainment and maintenance areas in the reduction of transportation-related emissions. The provisions apply to transportation programs or projects that are likely to contribute to the attainment or maintenance of the national air quality standards in non-attainment areas and areas redesignated to maintenance. The project sponsor (transit operator, municipal office, etc.) develops a formal proposal to improve air quality. This is submitted to the MPO(s) and the State for evaluation and approval. The project is then included in the Transportation Improvement Plan (TIP) and approved as eligible by the Federal Transit Administration (FTA) and FHWA in consultation with the EPA.

Emergency Wetlands Resources Act of 1986 (16 USC 3901-3932)

The purpose of the Act (16 U.S.C. 3921 to 3931) is to promote wetlands conservation for the public benefit and to help fulfill international obligations in various migratory bird treaties and conventions.

Endangered Species Act (ESA) (USC 136; 16 USC 460 et seq)

The ESA provides broad protection for species of fish, wildlife and plants that are listed as threatened or endangered in the U.S. or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The Act outlines procedures for Federal agencies to follow when taking action that may jeopardize listed species, and contains exceptions and exemptions. The ESA prohibits the “taking” of listed animals and, under certain circumstances, regulates destruction of habitat needed for feeding, reproduction, and shelter.

Section 7(a)(1) of the ESA of 1973 (USC 136; 16 USC 460 et seq)

The goal of the ESA is “to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved,” thereby conserving the associated species of fish, wildlife, and plants threatened with extinction. The act requires consultation on Federal actions with the secretary of the interior or commerce, as appropriate. Responsible agencies include the USFWS and the NOAA Fisheries Service.

Executive Order 11990: Protection of Wetlands DOT Order 5660.1A

This EO requires the avoidance of direct or indirect support of new construction in wetlands wherever there is a practicable alternative. The EO requires evaluation and mitigation of impacts on wetlands.

Executive Order 11988: Floodplain Management

The intent of the EO is to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to restore and preserve the natural and beneficial values served by floodplains. All construction of Federal or Federally aided buildings, structures, roads, or facilities, which encroach upon or affect the base floodplain, requires the following: (1) assessment of floodplain hazards and (2) specific finding required in final environmental document for significant encroachments.

Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC Sec. 1701)

Under Section 102 of FLPMA, the BLM will manage public lands “in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resources,

and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use.” Under FLPMA, the BLM strives to achieve its mission, “To sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.”

Federal-Aid Highway Act—Economic, Social, and Environmental Effects

(23 USC 109(h), (P.L. 89-574, §§ 5(a), 14, 80 Stat. 767, 771; Dec. 31, 1970)

This statute was passed to ensure that possible adverse economic, social, and environmental effects of proposed highway projects and project locations are fully considered and that final decisions on highway projects are made in the best overall public interest. It is applicable to the planning and development of proposed projects on any Federal-aid highway system for which the FHWA approves the plans, specifications, and cost estimates or has the responsibility for approving a program.

Identification of economic, social, and environmental effects; consideration of alternative courses of action; involvement of other agencies and the public; and a systematic interdisciplinary approach are required.

Fish and Wildlife Coordination Act

(16 USC 661-667e; the Act of March 10, 1934; Ch.55; 48 Stat. 401)

The Act authorizes the Secretary of the Interior to provide assistance to and cooperate with Federal, State, and public or private agencies and organizations in the development and protection of wildlife resources and habitat; make surveys and investigations of the wildlife in the public domain; and accept donations of land and funds that will further the purposes of the Act.

Land and Water Conservation Fund Act of 1965 *(16 USC 4601-4-4601-11)*

This Act (16 USC 460) regulates admission and special recreation user fees at certain recreational areas and establishes a fund to subsidize State and Federal acquisition of lands and waters for recreational and conservation purposes. “The purposes of the Act are to assist in preserving, developing and assuring accessibility to outdoor recreation resources and to strengthen the health and vitality of U.S. citizens by providing funds and authorizing Federal assistance to states in planning, acquiring and developing land and water areas and facilities, and by providing funds for Federal acquisition and development of lands and other areas.”

Marine Protection Research and Sanctuaries Act of 1972

(Public Law 92-532; October 23, 1972; 86 Stat. 1052 and 1061)

This Act regulates dumping of material into U.S. ocean waters. Any transportation of materials and dumping into the open sea is covered under this act. The Act requires application for a permit in accordance with procedures. The responsible agencies are the EPA and the USACE if there are dredge materials. In this instance, the relationship to wildlife comes when demolition materials are disposed of in marine waters or used as artificial reefs.

Magnuson-Stevens Fishery Conservation and Management Act *(16 USC 1801 et seq)*

The Magnuson Stevens Fishery Conservation Management Act of 1975 governs how much of the Nation’s fish can be harvested. In 1996, an amendment to the act strengthened the link between habitat rebuilding and fisheries sustainability. Until the Magnuson-Stevens Act, no regulations existed that required other agencies to consider adverse effects on Essential Fish Habitat (EFH), to identify EFH

for managed species, or measure the effectiveness of conservation efforts to enhance the habitat fish species need.

Section 305(b)(2) of the Act requires all Federal agencies to consult with NOAA Fisheries Service regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect EFH, regardless of whether the action is land-based or directly within waters designated as EFH.

Migratory Bird Conservation Act of 1929 (16 USC 715-715r)

This Act established a Migratory Bird Conservation Commission to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds. The Secretary of the Interior is authorized to cooperate with local authorities in wildlife conservation and to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges. Specific provisions in the statute include establishment of a Federal prohibition, unless permitted by regulations, to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird.”

National Trails System Act (16 USC 1241-1249)

This Act provides for outdoor recreation needs and encourages outdoor recreation. Projects affecting national scenic or historic trails designated by Congress, and the lands through which such trails pass, require coordination. National recreation trails and side or connecting trails are proposed by local sponsors and approved by the DOI and USDA. DOI (NPS) and USDA (USFS) administer the trail system, but other Federal land management agencies may apply for designation.

National Environmental Policy Act of 1969 (42 USC 4321-4347)

The purpose of this Act is to declare a national policy that encourages productive and enjoyable harmony between humans and their environment and to promote efforts to prevent damage to the environment. The Act requires Federal agencies to include a detailed statement of the environmental impact in every recommendation or report on proposals for major Federal action significantly affecting the quality of the human environment; requires Federal agencies to study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources; and requires Federal agencies to initiate and utilize ecological information in the planning and development of resource-oriented projects.

National Park Service Organic Act of 1916 (16 USC 1 2 3, and 4)

This Act established the National Park Service to promote and regulate national parks and other NPS-designated Federal areas, whose purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of those resources in such a manner as will leave them unimpaired for the enjoyment of future generations.

Noise Standards (23 USC 109(i), (P.L. 91-605), (P.L. 93-87). 23 CFR 772)

This law promulgates noise standards for highway traffic. All Federally funded projects for the construction of a highway on a new location, or the physical alteration of an existing highway, which significantly changes either the vertical or horizontal alignment or increases the number of through-traffic lanes require the following: (1) noise impact analysis, (2) analysis of mitigation measures, and (3) the incorporation of reasonable and feasible noise abatement measures to reduce or eliminate noise impact. Noise standards are generally aimed at human receptors. The FHWA administers this law.

Partnerships for Wildlife Act (16 USC 3741-3744)

This Act establishes a Wildlife Conservation and Appreciation Fund to receive appropriated funds and donations from the National Fish and Wildlife Foundation and other private sources to assist the State fish and game agencies in carrying out their responsibilities for conservation of non-game species and authorizes grants to the States for programs and projects to conserve non-game species, with administrative requirements very similar to those contained in the Federal Aid Wildlife (Pittman-Robertson) and Sport Fish (Wallop-Breaux) Restoration programs.

Rivers and Harbors Act of 1899 (33 USC 403)

The Act is designed to protect navigable waters in the United States. Any construction affecting navigable waters (over, under, or in) and any obstruction, excavation, or filling is covered. Applicant must obtain approval of plans for construction, dumping, and dredging permits (Sec. 10), as well as bridge permits (Sec. 9). The Act also protects important estuarine and marine habitats. USACE, U.S. Coast Guard, EPA, and State agencies each have responsibilities to administer.

Section 4(f) of the Department of Transportation Act (49 USC 1563(f)) – 23 CFR 771.135)

This section of the Act requires the preservation of publicly owned parklands, waterfowl and wildlife refuges, and significant historic sites. There is a specific finding required for significant publicly owned parklands, recreation areas, wildlife and waterfowl refuges, and all significant historic sites “used” for a highway project. This specific finding requires that 1) the selected alternatives must avoid protected areas, unless not feasible or prudent, and 2) the project includes all possible planning to minimize harm. Coordination with the DOI, USDA, Housing and Urban Development, State or local agencies having jurisdiction, and the State Historic Preservation Officer (for historic sites) is required.

Solid Waste Disposal Act (42 USC 82)

This Act provides for the recovery, recycling, and environmentally safe disposal of solid wastes. It applies to all projects that involve the recycling or disposal of solid wastes. Proper disposal of solid wastes is important to terrestrial and aquatic habitats and their associated wildlife. Additionally, recycling prevents further resource extraction in wildlife habitat. The EPA administers the provisions of this Act.

Wild and Scenic Rivers Act (16 USC 1271-1287)

This Act establishes a National Wild and Scenic Rivers System for the protection of rivers with important scenic, recreational, fish and wildlife, and other values. The Act contains procedures and limitations for control of lands in Federally administered components of the System and for disposition of lands and minerals under Federal ownership.

Wilderness Act of 1964 (16 USC 1131-1136)

This Act established the National Wilderness Preservation System “[i]n order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.”

Wildflowers, 23 USC 319(B), (P.L. 100-17). 23 CFR 752

This statute is meant to encourage the use of native wildflowers in highway landscaping. Native wildflowers are to be planted on any landscaping project undertaken on the Federal-aid highway system. At least one-quarter of 1 percent of funds expended on a landscaping project must be used to plant native wildflowers on that project. The FHWA works with State transportation agencies on these programs.

Collaborating on Eco-Logical

The Steering Team collaborating on the Guide includes representatives from the Federal Highway Administration, Bureau of Land Management, Fish and Wildlife Service, US Army Corps of Engineers, US Department of Agriculture Forest Service, Environmental Protection Agency, NOAA Fisheries, National Park Service, and several State Departments of Transportation (DOT) including Alaska DOT and Public Facilities, North Carolina DOT, Vermont Agency of Transportation (VTrans), and Washington DOT (WSDOT).

Understanding that the missions of individual agencies are sometimes at odds, the Steering Team developed a shared vision for maintaining the Nation's fish and wildlife resources while meeting each agency's unique mission. In October 2002, the Team began drafting the Guide. Participating agencies agreed to work to better understand each other's roles, responsibilities, and processes; share information and data; and, establish wildlife- and aquatic-related priorities. Through this learning process, the Steering Team produced the Guide to document a vision of how infrastructure development decisionmaking can be integrated with conservation, restoration, and protection processes.

