



The Next Generation of Mitigation: Linking Current and Future Mitigation Programs with State Wildlife Action Plans and Other State and Regional Plans

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Executive Summary

The next generation of mitigation is explicitly designed to ensure that emerging resource conflicts arising from energy and other infrastructure development have more beneficial conservation outcomes. This white paper has been prepared by the Environmental Law Institute (ELI) and The Nature Conservancy (TNC). It is designed to define and describe the next generation of mitigation, which entails:

- A more comprehensive approach to application of the mitigation protocol (avoid, minimize, compensate) in existing and potential regulatory processes;
- Use of State Wildlife Action Plans and other plans to create an effective decision-making framework for the application of the mitigation protocol; and
- Allocation of compensatory funds derived from mitigation in a manner that supports lasting and large scale ecological results.

While new habitat protection legislation could improve mitigation, we believe much progress can be made by adjusting existing laws and regulations and using tools already available, if those tools are applied as proposed. The suggested changes can also bring greater efficiencies to the mitigation process, a result especially important at a time of limited financial resources. Guided by these practices, mitigation can benefit both conservation and economic goals by: reducing siting conflicts; increasing mitigation's consistency, transparency, and cost-effectiveness; reducing uncertainty and risks; and ensuring the delivery and durability of higher value conservation

results. This is particularly true if consistent approaches can be taken across multiple jurisdictions.

Background

In the coming years, the U.S. will experience significant loss of natural habitats due to population growth, infrastructure development, energy development, and climate change. In the energy sector, for example, in order to meet low carbon electricity and biofuel production requirements as much as one-fifth of the land area of the U.S. may be needed for energy production and transmission facilities. New or expanded transmission corridors will affect habitats extending beyond the footprint of the right-of-way. In the Mountain West, over 100,000 additional oil and gas wells with a footprint of roughly 2 million acres are anticipated over the next 20 years. Other infrastructure investments are also increasing with the recent passage of economic stimulus legislation that provides \$150 billion for infrastructure including \$50 billion for transportation projects. Climate change and sea level rise will demand new measures to deal with coastal hazards and altered rainfall patterns. These trends will have significant impacts on natural systems including habitat fragmentation and loss of ecosystem function. The effective use of regulatory programs coupled with careful mitigation could reduce and offset this damage, but past experience suggests the need for improvements to our approach to mitigation if this objective is to be achieved.

There are existing tools and precedents allowing us to achieve improved outcomes for the nation's at-risk habitats. In the U.S., we now have decades of conservation planning

experience, more comprehensive ecological data than ever available before, advanced modeling and planning tools, and a wealth of effective on-the-ground conservation efforts. And recent policies, such as the 2008 rule requiring a “watershed approach” to compensatory mitigation for losses of aquatic resources, support a more comprehensive framework for mitigation decision-making.¹

Findings and Recommendations for Action

A more comprehensive approach to mitigation is needed to sustain systems of interconnected, resilient, natural habitats. Such systems provide habitat for plant and animal species and support the resources and processes that underpin human well-being, such as water quality and quantity, pollination of crops, natural hazard mitigation, and recreational opportunities. Ensuring these benefits for future generations will require improvements in landscape and watershed planning, rigorous use of available ecological information, and greater consistency and coordination in applying mitigation strategies.

We find significant opportunities for improving the current mitigation framework to make it more effective in meeting the nation’s conservation and development priorities. In general, we believe mitigation can move beyond what is often a piecemeal response, to a more integrated, consistent, and pro-active approach guided by landscape and watershed planning. Such an approach will deliver more effective conservation outcomes for wildlife, natural landscapes, and the ecosystem services on which communities depend. It will also help business by improving the basis

for project planning, increasing mitigation efficiency, and reducing uncertainty and risks.

Fundamental changes needed:

- (1) Ensure consistent and rigorous application of the mitigation protocol** (avoid, minimize, compensate) for addressing impacts to wildlife habitat under existing, expanded, and future regulatory programs. We stress throughout this paper the primary importance of the avoidance and minimization elements of the protocol.
- (2) Use State Wildlife Action Plans, other federally recognized conservation plans (such as Coastal Zone Management Plans, Forestry Plans, and Endangered Species Recovery Plans), and regional plans as the framework for a more comprehensive approach to making the “avoid, minimize, compensate” decisions required by the protocol.** Use of this planning context will lead to decisions that provide stronger and more resilient protection for whole watersheds and other natural systems for their multiple benefits.
- (3) Give priority in the investment of compensatory funds to projects and activities identified by State Wildlife Action Plans and other plans and that are sufficient in scale and strategic in their location to support the long term health of whole ecosystems.** Further benefits can be achieved by anticipating compensation needs and accomplishing “advance mitigation” when the opportunities for larger ecosystem benefits still exist.

Supporting recommendations:

- Federal and state agencies should play a stronger role in supporting ecologically significant and rigorous mitigation.
 - The President’s Council on Environmental Quality (CEQ) should lead an effort to achieve consistent application of the mitigation protocol across federal agencies and programs.
 - The CEQ and federal agencies should strongly encourage federal agency use of State Wildlife Action Plans, other federally recognized conservation plans, and detailed regional plans, to create a biologically-based framework for decision-making informed by environmental review under the National Environmental Policy Act.
 - State agencies responsible for permitting and decision-making should apply the mitigation protocol and make use of State Wildlife Action Plans, other federally recognized conservation plans, and detailed regional planning in their own decisions and approvals affecting habitat.
- State Wildlife Action Plans should be continuously improved to ensure that they support mitigation opportunities and decision-making. Specifically, they should identify sites or areas appropriate for restoration through compensatory mitigation. Some State Wildlife Action Plans use detailed mapping to convey the intent of habitat conservation in their states, but others lack the kinds of detailed information necessary to make specific resource planning and permitting decisions on the ground. State Wildlife Action Plans can more effectively guide the avoidance of key wildlife habitat, cumulative impact analysis, and the expenditure of compensatory mitigation funds if they set priorities for *protection* of high quality habitat and for *restoration* of important degraded habitat, related natural systems, and connectivity.
- A federal agency or institution should be tasked with assessing the outcomes of existing mitigation actions on landscape and watershed conservation under all federal statutes and should make periodic recommendations on how to improve mitigation across federal agencies. Among the specific issues that should be evaluated are:
 - The appropriate role of §404 of the Clean Water Act in efforts to deal with the permitting of wetland alterations associated with shoreline protection from sea level rise.
 - Use of the mitigation protocol in the location and expansion of military facilities.
 - Use of the next generation of mitigation in the planning and location of transportation facilities.
 - The consistent use and effectiveness of current avoidance and minimization measures employed across all

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- mitigation programs.
 - The availability and quality of the tracking programs (impacts, compensation, monitoring) utilized across all mitigation programs.
 - The effectiveness of current cumulative impact analysis conducted across all mitigation programs applied by multiple political jurisdictions within single watersheds and other landscape units.
 - Federal energy and infrastructure legislation should expressly include requirements to use the mitigation protocol as it is described here in the planning and design of large scale energy facilities on federal lands and waters, in the design and siting of new transmission corridors that involve federal agencies such as the Federal Energy Regulatory Commission (FERC), and in the siting of major energy generating facilities financed through federal programs and loan guarantees. The mitigation protocol should also be incorporated into legislation guiding offshore energy siting for conventional and alternative energy sources.
 - Despite the substantial scale and scope of the nation's current mitigation programs, which primarily protect many wetlands, streams, and the habitat of threatened and endangered species, other high value, natural landscapes remain unprotected. Conservation agencies and organizations should explore opportunities to adopt mitigation requirements for impacts to these key areas.

Proposed Near-Term Actions:

- The President's Council on Environmental Quality should convene a multi-agency workshop on the use of the mitigation protocol and on how mitigation could be used more effectively by federal decision-makers to achieve landscape scale/watershed scale conservation, considering both climate change and the likely impacts of new infrastructure and conservation investments.
- The U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency should undertake an evaluation of the effectiveness of the agencies' approach to avoidance and minimization and cumulative impact analysis. The agencies should consider developing guidance and tools to support the ability of field staff to undertake this analysis.
- The U.S. Fish and Wildlife Service should meet with the Association of Fish and Wildlife Agencies and with other stakeholders to evaluate how State Wildlife Action Plans could be adapted and coordinated with other natural resource plans to better serve as the framework for the effective use of the mitigation protocol in multiple programs.
- U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration should commit resources to developing effective policies and tools to guide mitigation under the Endangered Species Act,² such as: a system to track required mitigation measures, and monitoring; guidance and tools to support

cumulative impact analysis; policy that clarifies the role of habitat mitigation under §7; and research on the ecological effectiveness of the habitat mitigation measures undertaken under the Act.

- Amendments should be considered to the now pending energy legislation to expressly require use of the mitigation protocol for planning energy projects on federal lands and in federal waters, where the approval of transmission corridors directly involve Federal agencies such as FERC, or that affect federally protected resources as a way of both protecting the environment and improving the regulatory process.
- Building on the limited experience with consultation under SAFETEA-LU, the next transportation authorization bill should expressly refer to the State Wildlife Action Plans and other regional plans, where appropriate, in the sections that deal with project-level evaluation, and should expressly require that the mitigation protocol be employed to support the priorities in these plans.

Chapter One

Introduction

a. Purpose of whitepaper

This whitepaper evaluates the potential of a well-designed approach to mitigation to address the impacts to natural habitats from anticipated infrastructure and other development activities. This paper is not intended as an overall analysis and critique of the performance of §404 of the Clean Water Act, nor does it seek to compare or critique specific compensatory mitigation mechanisms (i.e., wetland mitigation banking, conservation banking, etc.). Specifically, it examines opportunities to apply the mitigation protocol (“avoid, minimize, compensate”) more consistently and rigorously to existing, expanded, and any new authorities that regulate activities that affect habitat and species; and opportunities to make mitigation decisions within the context of a more comprehensive vision for conservation. The paper explains how the State Wildlife Action Plans and other federally recognized and regional conservation plans can be used as the framework for this more comprehensive approach to mitigation – the next generation of mitigation. Adopting the next generation of mitigation concepts will help reduce impacts to ecosystems and watersheds from infrastructure construction, energy development, and urbanization; direct these impacts to the least environmentally harmful places; guide cumulative impact analysis; and ensure that funds for offsetting unavoidable impacts will be used more effectively to restore and protect a network of natural areas in the U.S. If implemented and managed properly across whole ecosystems, watersheds, and ecoregions the mitigation of public and private development offers an opportunity

to create a more sustainable economy and a healthier environment for human and natural communities.

b. Increasing infrastructure investments will threaten our natural environment and the human and wildlife benefits of natural habitat if effective mitigation practices are not adopted and implemented

Despite the current economic downturn, there is likely to be extensive investment in infrastructure in the United States over the next ten years and beyond. Analyses undertaken to support the recently passed economic stimulus legislation reveal many roads, bridges, dams, flood control structures, rail transit systems, and water and sewer systems that must be built, rebuilt, or replaced.³ Climate change and sea level rise demand new measures to deal with coastal hazards and altered rainfall patterns. The need to reduce carbon emissions and to achieve energy independence will result in extensive new development of lower carbon energy generation and transmission facilities and further exploitation of conventional energy sources, particularly natural gas reserves. The latest version of transportation legislation soon to be taken up by Congress will increase investment in roads and mass transit. While the housing market is now stalled, our population is still projected to grow, requiring more development within and adjacent to metropolitan centers. Continuing global threats are leading to continuing military investment. As a result of the Base Realignment and Closure (BRAC) process, the global restationing of forces from overseas bases, and planned increases in the size of the Army and the Marine Corps, military units are being relocated and new units are

being created. These actions require new construction and increases in military activity at “gaining bases.” For example, relocation of forces now stationed on Okinawa and elsewhere to Guam in Micronesia will require extensive construction on Guam and additional training and other military activities in the broader Micronesia region, with the associated additional pressure on marine coastal, wetlands (including coral reefs), and terrestrial resources.

All of these trends suggest extensive public and private infrastructure investments over the next ten years. If past development patterns and practices are any indication of our future direction, this will result in widespread fragmentation of and damage to the natural systems that provide essential human benefits and habitat for plant and animal species. Planning for the location and scope of impacts upon the landscape, and coordinating mitigation strategies to maximize conservation benefits at the landscape and watershed scales, will be needed to avoid these outcomes.

c. The importance of the mitigation concept

Recent experience with the administration of our more mature, substantive mitigation programs (§404 of the Clean Water Act (CWA) and the Endangered Species Act (ESA)) has shown that, managed effectively, the mitigation protocol can reduce the environmental impacts of construction projects and produce significant resources for restoration and conservation of the natural environment (see Chapter 4, “Implementation regulations and guidance to support the mitigation protocol.”) Since the mitigation protocol can be made part of project planning, design, and financing process, it is an effective way to influence

the environmental impacts of infrastructure investments and produce significant resources to offset unavoidable damages. Moreover, if mitigation is planned using landscape-level ecological information, it can accomplish meaningful results in coordination with other (mitigation and non-mitigation) conservation actions on the same landscape.

Land and water conservation financed by requiring development projects to avoid environmental damage and offset impacts is likely to receive easier legislative support than the allocation of significant tax revenues for habitat protection and restoration through the appropriation of government funds for conservation purposes. Compensatory mitigation funds often come from long-term public or private financing, are seen as a cost of doing business, and their payment is seen as a way of facilitating the development or infrastructure objective.

d. The role of compensatory mitigation in supporting conservation

Private and public expenditures for compensatory mitigation under the existing major federal programs total approximately \$3.8 billion annually,⁴ and the Clean Water Act §404 program supports the conservation and restoration of approximately 50,000 acres of aquatic resources a year (see Chapter 3, “Scope of current programs”). Despite the expenditure of compensation funds under the mitigation protocol, many projects have fallen short of their potential for achieving habitat protection and restoration (see Chapter 3, “Performance of existing compensatory mitigation programs”). If mitigation is managed in a more comprehensive way, it can have a more widespread and positive impact on America’s

environmental future, as well as on the services provided to people by these ecosystems.

The nation's major mitigation programs are now structured to protect many wetlands, streams, and the habitat of threatened and endangered species. However, uplands (even high quality, intact, and mature areas that harbor multiple at-risk species) outside of existing federal ownership, receive no federal protection, and are rarely the target of mitigation expenditures under state or federal programs. Legal protection and requirements for compensation for species and habitats not yet listed as threatened or endangered are also lacking. Thus, despite the adoption of the new §404 compensatory mitigation regulations and the substantial scale of mitigation overall, the scope of the nation's current mitigation framework is still too narrow. There is real potential, however, to build on this experience as we look at planning and mitigation for future activities that will affect habitats across the nation.

e. Definitions

Several terms will be used in the course of this paper and are defined here:

Compensatory mitigation: The restoration, creation, enhancement, or preservation of natural resources to compensate for impacts pursuant to a regulatory program that: (1) prospectively issues permits or licenses or approvals for activities that affect fish and wildlife habitat or other natural resources; or (2) assesses after-the-fact damages for injury to, destruction of, or loss of habitat or natural resources.⁵

Compensatory mitigation mechanisms: Obligations to provide compensatory mitigation may be satisfied by: purchasing credits from a conservation or mitigation "bank" that is established in advance, making a payment to an "in-lieu fee" program that supports a planned conservation action, or by the regulated entity or actor directly undertaking the compensation actions.

Federally recognized and regional conservation plans: In addition to the State Wildlife Action Plans, a wide range of other federally recognized, state-based plans offer important conservation information that can be useful in guiding mitigation decisions. These include, for example, coastal zone management plans, state forestry plans, and endangered species recovery plans. These plans offer value because they are prepared in all or many states; they are constructed according to standards set forth in federal law and therefore offer some consistency; many are referenced in existing federal laws and regulations; and many have been developed through a transparent process with the participation of the public. Other regional, state, and local conservation plans may be appropriate for consideration, including detailed planning that may accompany large scale energy or other infrastructure investments.

Mitigation: Avoiding the impacts of an action; minimizing such impacts by limiting the degree or magnitude of the action or its implementation; rectifying the impact by repairing, rehabilitating or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; and compensating for the impact by

replacing or providing substitute resources or environments.⁶

Mitigation protocol: The mitigation protocol means an approach to the foreseeable impacts of projects that requires first making every effort to avoid damages to environmental resources, then minimizing that damage that cannot be avoided, and only then offsetting the damage that cannot be avoided or minimized.

Next generation mitigation: A more effective, comprehensive approach to existing, expanded, and future mitigation programs, that rigorously and consistently applies the mitigation protocol *and* is guided by landscape- and watershed-based planning informed by the State Wildlife Action Plans and other federally recognized and regional natural resource plans.

State Wildlife Action Plan: A comprehensive wildlife conservation strategy prepared by each state and territory pursuant to the Conservation and Reinvestment Act of 2000.⁷

A New Approach to Making Mitigation an Effective Tool for the Conservation of Natural Systems

- a. The need for a more comprehensive approach to conservation and mitigation

The mitigation program that operates under §404 of the CWA provides an example for the need for a more comprehensive approach to conservation and restoration of habitats and resource lands and waters. Particularly in light of the likely impacts of climate change, we have come to value more fully the services provided by healthy wetlands—storing water in times of flood and metering it out in times of drought, improving water quality, sequestering carbon, and sustaining wildlife. At the same time we now understand that restoring or creating pieces of unconnected aquatic habitats to compensate for losses does not actually sustain these important values over space or time.⁸ A more comprehensive approach – the next generation of mitigation – is needed to maximize the ability of the mitigation protocol to advance the conservation of natural systems. Such an approach is, in fact, reflected in the new Compensatory Mitigation Rule promulgated by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) in 2008, requiring use of a “watershed approach.”⁹ Similarly, the idea of Habitat Conservation Plans (HCPs) adopted pursuant to the ESA involves planning across entire property ownerships or groups of ownerships to save key habitat for specific listed species while allowing the development of other less critical areas. A more comprehensive approach to mitigation will support the conservation of ecological

systems and not just satisfy regulatory requirements through piecemeal actions.

- b. The information basis for a “next generation” of mitigation

Over the years, federal legislation has required and encouraged a variety of state-based plans to guide the use of federal grant funds for natural resource purposes. These plans – as well as regional, state, and local conservation plans – can provide the framework for the next generation of mitigation. The most far-reaching of these plans, State Wildlife Action Plans, have been developed in each of the 50 states and six territories. The plans can offer a framework for a comprehensive consideration of mitigation.

- i. State Wildlife Action Plans

Congress created the State Wildlife Grants Program in 2000.¹⁰ In order to be eligible for these new funds, the states were each required to prepare a State Wildlife Action Plan (the original term was “comprehensive wildlife conservation strategy”), a comprehensive plan addressing eight required elements by October 2005. Those elements are:

1. *Information on the distribution and abundance of species of wildlife;*
2. *Descriptions of extent and condition of habitats and community types essential to conservation of species;*
3. *Descriptions of problems which may adversely affect species or their habitats, and priority research and survey efforts to assist in conservation and research;*
4. *Descriptions of conservation*

- actions proposed to conserve the identified species and habitats and priorities for implementation;*
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 conservation actions to respond to new information or changing conditions;*
 6. *Descriptions of procedures to review the plan at intervals not to exceed ten years;*
 7. *Plans for coordinating the development, implementation, review, and revision of the plan with federal, state, and local agencies and Indian tribes; and*
 8. *Broad public participation in developing and implementing these plans.¹¹*

State Wildlife Action Plans are strategic blueprints that can guide wildlife and habitat conservation on public and private lands and waters. Every state has now completed a first generation State Wildlife Action Plan and some are engaged in revisions that add more comprehensive habitat maps and include specific responses to the projected impacts of climate change. Approximately 31 State Wildlife Action Plans include spatially explicit maps delineating the location of terrestrial, and in some cases aquatic, conservation opportunity areas.¹²

State Wildlife Action Plans can be used as guides for the next generation of mitigation. Because of their focus on habitat, and their provision for public involvement and regular

updating with new information, the Plans offer an important framework for guiding mitigation decision-making. The most comprehensive of the habitat maps can serve as a guide to the areas that should be avoided in infrastructure construction projects. However, if the State Wildlife Action Plans are to be more influential in guiding the expenditure of compensatory mitigation funds, they must be updated to include information and maps identifying restoration priorities. In most cases, in order to guide mitigation and other decisions, the plans must be accompanied by more detailed and finer scale information on critical habitat, species distributions, and habitat connectivity, particularly in areas of likely energy and other infrastructure investment.

- ii. Other federally recognized and regional conservation plans

In addition to the State Wildlife Action Plans, other federally recognized, state-based plans offer important conservation information that can be useful in guiding mitigation decisions. Among these are coastal zone management plans and special area management plans, state forestry plans, endangered species recovery plans, waterfowl and fish management plans, and state conservation and open space plans. Other regional, state, and local conservation plans may be appropriate for consideration as well.

- Coastal Zone Management Plans: Under the Coastal Zone Management Act of 1972 coastal states develop Coastal Zone Management Plans that must identify critical coastal resources and suggest ways of protecting

those resources. The Coastal Zone Enhancement Program of 1990, part of CZMA, now requires coastal states to conduct an assessment of their coastal management activities in nine areas.¹³ These assessments must be carried out every five years.¹⁴ Many of the coastal states have also adopted Special Area Management Plans to address particular conservation needs within their coastal zones.¹⁵

- **State Forestry Plans:** The 2008 Farm Bill added a new section to the Cooperative Forestry Assistance Act of 1978, requiring state foresters to develop a statewide assessment of forest resource conditions and a long-term statewide forest resource strategy. In doing so, the state foresters are required to coordinate with their state wildlife agencies “with respect to strategies contained in the State wildlife action plans” and must “incorporate any forest management plan of the state including...State wildlife action plans.”¹⁶ The State Forestry Plans are used for a variety of conservation purposes, including coordination with the previously existing Forest Legacy Program. Under Forest Legacy, for states to be eligible for funding for the purchase of conservation easements on forest lands, they must develop and receive US Forest Service approval of an assessment of need, which identifies, maps, and describes forest lands that are deemed important and in need of protection from conversion to non-forest uses.¹⁷ The US Forest Service “shall give priority to lands which can be effectively protected and managed, and which have important scenic or

recreational values; riparian areas; fish and wildlife values, including threatened and endangered species; or other ecological values.”¹⁸

- **Endangered Species Recovery Plans:** One of the central goals of the federal Endangered Species Act is the recovery of threatened and endangered species and the ecosystems on which they depend.¹⁹ Once a species is listed by the U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration, the agencies must “develop and implement a recovery plan” that includes 1) “a description of such site-specific management actions” that will support “conservation and survival of the species”; and 2) “objective, measurable criteria” that will support species recovery.²⁰ Recovery plans go out to public comment and after they are finalized, the plans guide habitat protection and restoration.²¹ Recovery plans are also centrally available on a U.S. Fish and Wildlife Service web site.²²
- **Waterfowl Management Plans:** Authorized by the North American Wetlands Conservation Act of 1986,²³ the North American Waterfowl Management Plan relies upon partnerships to implement migratory bird conservation. The partnerships are called “joint ventures,” which include a broad cross section of government at all levels, conservation organizations, and citizens. Joint ventures develop implementation plans, guided by biologically based planning, focused on areas of concern identified in the Plan. There are currently 13 joint ventures in the United States.²⁴

- **Fish Habitat Plans:** Modeled on the North American Waterfowl Management Plan, a coalition of agencies has launched a new initiative aimed at conserving fish habitat. If passed under the National Fish Habitat Conservation Act (first introduced in September 2008 and reintroduced in May, 2009),²⁵ the National Fish Habitat Action Plan²⁶ would rely on the federal agencies working cooperatively with plan partners to identify causative factors for declining fish populations in aquatic systems; use an integrated landscape approach that includes the upstream/downstream linkages of large-scale habitat condition factors; assess and classify the nation’s fish habitats; and support program partners.
- **State Conservation and Open Space Plans:** Many states undertake their own conservation priority setting planning actions, such as New York State’s Open Space Plan and the Florida Forever planning process. Some of these plans combine funding strategies with conservation priorities.²⁷
- **Regional Conservation Plans:** Several regional conservation planning efforts can help to inform mitigation decision-making. For example, in 2007, the Western Governor’s Association launched its Wildlife Corridors Initiative, “a multi-state and collaborative effort to improve the knowledge and management of migratory corridors and crucial habitat.”²⁸ The Association established a Western Wildlife Habitat Council to “identify key wildlife corridors and crucial wildlife habitats in the West and coordinate implementation of needed

The Nature Conservancy’s Ecoregional Planning

To guide its conservation activities, the Nature Conservancy employs ecoregional planning – a comprehensive process for identifying a set of places or areas that, together, represent the majority of species, natural communities, and ecological systems found within a particular eco-region. Ecoregions are large and identifiable (i.e., map-able) landscapes that differ qualitatively from one another in terms of ecology and biological phenomena and are defined by climate, geology, topography and associations of plants and animals. An ecoregional portfolio (i.e., priority sites), the end product of ecoregional planning, is a selected set of areas that represents the full distribution and diversity of these systems. The selection of portfolio sites is guided to a large degree by biological targets. These can be important plants or animals, or biological communities that when conserved result in the preservation of all representative biodiversity. For each of these targets viability goals are established and it is these goals that drive the selection of areas that are needed to meet these goals. Ecoregional portfolios effectively address the fundamental goals of biodiversity conservation:

- Represent all distinct natural communities within conservation landscapes and protected areas networks;
- Maintain ecological and evolutionary processes that create and sustain biodiversity;
- Maintain viable populations of species;
- Conserve blocks of natural habitat that are large enough to be resilient to large-scale stochastic and deterministic disturbances as well as to long-term changes.

policy options and tools for preserving those landscapes.”²⁹ The Nature Conservancy uses ecoregional plans to guide its conservation acquisitions and priorities. (See Box “Ecoregional Planning.”)

iii. The next generation of mitigation: a comprehensive approach

The next generation of mitigation, as described in this paper, depends upon having the biological information and public priority setting needed to make wise landscape-level decisions about mitigation. The State Wildlife Action Plans may be the most advanced tool for accomplishing this goal. A number of other planning authorities can also inform this decision-making. (See Chapter 4, “Landscape-level planning for conservation and ecosystem services,” for a discussion of these authorities.) Ultimately the programs and plans could be used together to yield a vision for conservation that can be used for multiple purposes.

Our proposed approach is to use the State Wildlife Action Plans and other federally recognized and regional conservation plans to guide the mitigation protocol in relation to existing, expanded, and any future authorities that regulate impacts to habitat and species.

The Watershed Approach articulated in the 2008 Compensatory Mitigation Rule provides an excellent example that demonstrates how this integration might occur in future decision-making (see Chapter 3, Box “The Watershed Approach”). The Watershed Approach is an “analytical process” for making compensatory mitigation decisions that relies upon a landscape perspective.³⁰ It acknowledges that

there may be many circumstances under which an existing watershed plan is not available to guide compensatory mitigation, and in these instances, it lays out an approach for using existing plans and information available from other sources to guide the decision-making.³¹

Similarly, we propose that in instances when the State Wildlife Action Plan is sufficiently detailed to guide mitigation decision-making, it should be used. But when detail is lacking or other federally recognized or regional plans provide important information on key habitat and species distribution, these plans should be consulted as well. There may be instances, such as current proposals to increase solar energy production in the Mojave Desert, where additional and more detailed planning (i.e., at a finer resolution), tied to the framework of statewide planning, is needed to inform the location of and mitigation for facility construction in a way that protects and enhances the critical natural resources of the Desert.

The overall objective proposed here is to use appropriate species and habitat plans to avoid and minimize impacts on the most sensitive environmental resources, to guide cumulative impact analysis, and to channel compensatory mitigation funding to the restoration and protection of larger natural systems that will be resilient to the environmental threats we face today. These healthy natural systems will yield numerous ecosystem benefits to the public. Achieving this vision will require adjustments to some existing legislation, regulations, and guidance.

The Disney Wilderness Preserve

The Nature Conservancy's Disney Wilderness Preserve project provides an example of effective mitigation carried out under the §404 Program and represents the kind of results we would hope to achieve more widely from our proposals. In 1994, when the Walt Disney Company was contemplating construction of the Animal Kingdom at Walt Disney World in Central Florida and the development of the residential community named Celebration, it was clear that the projects would damage significant areas of wetlands in the Reedy Creek Watershed at the headwaters of the Everglades ecosystem. Regulatory agencies and the Disney Corporation determined that, while some wetlands damage could be avoided and that some wetlands could be protected on-site, to offset the damage that could not be avoided it was best to select a large mitigation site in the Reedy Creek watershed that was remote from the Disney properties. A 10,000-acre cattle ranch with extensive degraded wetlands was purchased downstream on Reedy Creek at a strategic location adjacent to the Kissimmee chain of lakes. (This area had been identified as important by early planning for Preservation 2000 – a precursor to the Florida

State Wildlife Action Plan.) In exchange for build-out permits, Disney agreed to minimize wetlands loss at their development sites and to provide funding to The Nature Conservancy to buy the ranch, restore its wetlands, and manage the property into the future. Ultimately, other developers contributed to the project to meet their own compensatory mitigation needs, allowing TNC to purchase and restore additional adjoining land.

The compensation project is now complete. The wetlands and adjacent uplands have been successfully restored and the Disney Wilderness Preserve property has become the anchor for the conservation of more than 25,000 acres of land protecting the Everglades headwaters. The Disney Preserve provides both exceptional wildlife habitat and important ecosystem services. It stores extensive amounts of water in times of heavy rainfall, removes excess nutrients from Reedy Creek, meters out water in times of drought, and supports extensive wildlife, including several listed species. Because it has become part of a larger system of protected lands, it has every prospect of enduring in the years to come.

Foundations of Existing Mitigation Programs

a. Legal framework of existing mitigation programs

Mitigation under U.S. law means avoiding, reducing, and offsetting the foreseeable impacts of authorized activities on the environment. Mitigation as currently understood and practiced derives much of its content from definitions in regulations adopted by the Council on Environmental Quality in 1978 to guide federal agencies' implementation of the National Environmental Policy Act (NEPA).³²

National Environmental Policy Act and Mitigation: Under NEPA, federal agencies are required to consider the impacts on the environment of their proposed actions. NEPA requires agencies undertaking major federal actions that significantly affect the human environment (including issuance of permits and licenses) to prepare an Environmental Impact Statement (EIS), which includes analysis of alternatives, identification of impacts, and identification of potential measures to mitigate identified impacts. NEPA regulations define "mitigation" to include:

- (a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- (d) Reducing or eliminating the impact over time by preservation and

maintenance operations during the life of the action.

- (e) Compensating for the impact by replacing or providing substitute resources or environments.³³

During its 40-year history, NEPA has not been interpreted by the courts to require by itself the adoption and implementation of mitigation measures in connection with federal actions. Rather, NEPA requires that the responsible agency use the NEPA process to *identify* relevant mitigation measures that can address the impacts of the proposed action and its alternatives.³⁴ The mitigation identified in the NEPA process may subsequently serve as the basis for mitigation requirements laid out in a record of decision, a mitigated "finding of no significant impact," permit, license, contract, or other legally binding document; however, the basis for the mitigation requirement is the underlying law being administered by the agency, as informed by NEPA.

For example, private or public users may be required to mitigate impacts on public lands through the Secretary of Interior's duty under the Federal Lands Policy Management Act to prevent "unnecessary or undue degradation"³⁵ or the Secretary of Agriculture's duty under the Forest Service Organic Act to regulate "occupancy and use [of the national forests] and to preserve the forests thereon from destruction."³⁶ Mitigation may also be required by the terms of various permitting programs and regulations, such as §404 of the CWA. The NEPA process helps to identify the kinds of mitigation that may be available.

Mitigation plays a more specific role in NEPA under a particular provision of the regulations that allows a federal agency to

forego preparation of a full EIS where an environmental assessment (EA) results in a Finding of No Significant Impact (FONSI).³⁷ An agency may commit to mitigation as the basis for a “mitigated FONSI” as a way of avoiding the need to prepare the more detailed EIS.³⁸

Part of NEPA requires federal agencies to “interpret and administer” their laws and policies in accordance with the “policies” set forth in NEPA, and further provides that these policies are “supplementary to those set forth in existing authorizations of Federal agencies.”³⁹ Federal agencies could use these provisions to support more holistic or aggressive mitigation requirements and conditions.⁴⁰

Several states have their own “state NEPAs.” Among these, several, including California and Washington, require adoption of mitigation measures. In these states, the environmental impact review process itself can trigger mitigation obligations to compensate for private and state activities subject to such review.⁴¹ (See Box “Compensation for Impacts to California’s Oak Woodlands.”)

Clean Water Act Section 404 Program and Mitigation: The most robust and fully developed mitigation regime is that operating under the CWA’s §404 program, which regulates dredge and fill activities in the waters of the United States.⁴³ In the 1972 law, Congress assigned the day-to-day authority for issuing permits to the Corps, but assigned responsibility for developing the environmental criteria for permitting (the §404(b)(1) Guidelines) to the EPA. In 1980, the §404(b)(1) Guidelines were adopted as final regulations.⁴⁴ In 1986, the Corps adopted

Compensation for Impacts to California’s Oak Woodlands

California’s Environmental Quality Act requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or compensate for them. In 2001, a provision was adopted requiring mitigation for projects that result in the “conversion of oak woodlands that will have a significant effect on the environment.”⁴² The new program allows for several mitigation alternatives, including preserving existing oak woodlands through easements, planting an equivalent number of trees, or contributing funds to the Oak Woodlands Conservation Fund administered by the California Wildlife Conservation Board. Contributed funds may be used for a variety of purposes, including the purchase of conservation easements, land improvement grants and cost-share incentive payments, public education and outreach by local government entities, and for assistance to local governments to encourage the incorporation of oak conservation elements into local general plans.

California’s Oak Woodlands Conservation Program is an example of a state using its existing authorities – here the state NEPA and ESA – to expand the mitigation protocol to a valuable and dwindling habitat type.

See: California Wildlife Conservation Board. “Oak Woodlands Conservation Program.” http://www.wcb.ca.gov/Pages/oak_woodlands_program.asp. (Last visited April 14, 2009.)

a comprehensive mitigation policy that applied to permit actions under §404 and §§9 and 10 of the Rivers and Harbors Act of 1899.⁴⁵ Compensatory mitigation guidelines issued by the Department of the Army and EPA in 1990 set out the process for carrying out mitigation under the program.⁴⁶ These guidelines referenced the NEPA mitigation definitions, described above, but condensed them into three steps and prescribed that the steps be pursued in sequence (“sequencing”). The sequence is: (1) avoidance, (2) minimization, and (3) compensation for impacts that cannot be avoided or minimized.⁴⁷

Avoidance is the first step in the mitigation sequence. During this step, the Corps determines whether or not the proposed project is the least environmentally damaging practicable alternative (LEDPA). The LEDPA is identified by an evaluation of the direct, secondary, and cumulative impacts on the aquatic ecosystem of each alternative under consideration.⁴⁸

In 2008, after many years of practice, studies, outreach, and public comment, the Corps and EPA adopted new compensatory mitigation regulations that supplement, and in some cases replace, the regulations and guidance the agencies had been using for decades. In keeping with past practice, the Compensatory Mitigation Rule states that compensatory mitigation requirements may be achieved through the restoration, enhancement, establishment, and “in certain circumstances” preservation of similar aquatic resources. It specifies, however, that restoration should generally be the first option considered⁴⁹ and that preservation may only be used when five specific criteria are met.⁵⁰

The Compensatory Mitigation Rule explicitly preserves the mitigation sequence.⁵¹ The Rule creates higher standards for measuring compensatory mitigation performance against ecological performance standards and requires mitigation site selection to be carried out using a “watershed approach” (see Box “The Watershed Approach,” below). The watershed approach outlined in the rule states that the Corps must undertake an assessment of information on the “cumulative impacts of past development activities...”⁵² when making decisions about siting compensation projects. The Rule also includes requirements for financial assurances, permanent protection, and other measures intended to ensure the long-term conservation and management of compensatory mitigation sites.

This regulatory compensatory mitigation regime is now on a firmer footing than most other compensatory mitigation regimes. The 2008 Rule is already influencing other existing compensatory mitigation programs, such as compensatory mitigation carried out under the Water Resources Development Act (see Chapter 4, “Civil Works compensatory requirements”). It does, however, have some characteristics that might limit its useful application in other mitigation contexts. The §404 program is distinctly focused on aquatic resources and watersheds; while it allows for the use of preservation of high quality resources as a means for providing compensatory mitigation, it discourages the use of preservation as a sole mitigation mechanism. The 2008 rule does not support double-dipping or credit “stacking” wherein the same conservation action might address multiple disparate impacts of different activities.⁵³

Chart 1: Estimated Annual Compensatory Mitigation Costs Expended or Committed Under Major Federal Regulatory Programs

| <i>Regulatory Program Estimate (in millions)</i> | <i>Cost</i> |
|--|------------------|
| Clean Water Act Section 404 | \$2,947.3 |
| Endangered Species Act Section 10 | \$370.3 |
| Federal Natural Resource Damage Programs | \$87.7 |
| Federal Power Act | \$210.3 |
| Northwest Power Act | \$207.1 |
| Total: | \$3,822.7 |

Reference: Environmental Law Institute. October 2007. *Mitigation of Impacts to Fish and Wildlife Habitat: Estimating Costs and Identifying Opportunities*. Washington, DC: Environmental Law Institute.

ESA, Habitat Conservation, and Mitigation
The federal Endangered Species Act includes two separate provisions that may require mitigation to compensate for allowed impacts to a listed species or its habitat: §7 consultations and §10 incidental take permits.

ESA §7: ESA §7 guides federal activities. Section 7 requires federal agencies to “insure that any action authorized, funded, or carried out” by the agency is not likely to jeopardize the continued existence of listed species or result in the destruction of critical habitat.⁵⁴ Under the provision, federal agencies must consult with either the U.S. Fish and Wildlife Service (FWS) or the National Oceanic and Atmospheric Administration (NOAA) (the “Services”), depending on the species involved. FWS staff estimates that the agency conducts over 2,000 formal

consultations per year.⁵⁵ NOAA conducts close to 400 consultations a year.

Following this consultation, the Services must provide the federal agency with a written statement – known as a “biological opinion” – that outlines how the proposed activities affect the species or its critical habitat.⁵⁶ During the formal consultation process, the Service is required to not only evaluate the effects of the action on the listed species or habitat, but must also consider cumulative effects.⁵⁷ When formulating its biological opinion, the Services are directed to determine whether the action “taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.”⁵⁸

In rare instances the Services find that the activity would jeopardize the species or adversely modify critical habitat (a “jeopardy opinion”). In such a case, the biological opinion must outline “reasonable and prudent alternatives” that should be taken to avoid jeopardy or adverse modification.⁵⁹

FWS estimates that of the 300,000 formal and informal consultations that occurred from 1998-2002, only 420 received a jeopardy opinion. NOAA estimates that it averages between 20 and 50 jeopardy biological opinions each year (between the years 1998 and 2003).⁶⁰ The vast majority of formal consultations, however, result in a determination of no jeopardy or adverse modification. If, however, the Services determine that the action will cause a take of a listed species, even if there is no jeopardy finding, the Services issue a biological opinion that outlines “reasonable and prudent measures” that are “necessary or appropriate

to minimize” impacts of an incidental take of protected species.⁶¹

ESA §10: Section 10 of the act governs non-federal activities. Since 1982, FWS and NOAA have had the authority to permit the taking of a listed species by non-federal entities for activities that may cause incidental harm to a listed species, if the permittee agrees to develop a habitat conservation plan (HCP).⁶² One of the conditions of the permit, known as a §10 incidental take permit, is that the applicant will, “to the maximum extent practicable, minimize and mitigate the impacts of such taking.”⁶³ HCPs must identify the impact on the listed species, the steps the applicant will take to monitor, minimize, and mitigate those impacts, and the funding available to implement the plan.⁶⁴

The HCP process, particularly that developed by FWS, continues to evolve. HCPs were first adopted primarily to allow individual projects that are otherwise lawful but result in the incidental take of a listed species to proceed. More recent HCPs have attempted to address broader-based regional planning issues and, in some cases, multiple species in one plan.⁶⁵ This allows for a more coordinated, proactive, and regional approach to conservation and regulation.

The types of mitigation measures specified in an HCP are as varied as the HCPs themselves. However, an HCP handbook developed by the agencies states that they prefer to see the plans address impacts in the following order:

- *Avoid* the impact (such as changing the timing of the project, relocating the project, and restricting access);
- *Minimize* the impact (such as

modifying land use practices, creating buffer areas, and reducing project size);

- *Rectify* the impact (such as enhancement, restoration, or revegetation of degraded or former habitat);
- *Reduce* or *eliminate* the impact over time (through proper management, monitoring, and adaptive management); or, finally,
- *Compensate* for the impact (such as habitat restoration or protection on- or off-site).⁶⁶

Activities approved under an incidental take permit often involve permanent habitat loss, for which permittees are required to provide “habitat mitigation” by “acquiring, or otherwise protecting, replacement habitat at an onsite or offsite location.”⁶⁷

Other Laws and Mitigation: Other laws require compensatory mitigation for impacts to wildlife and the environment. Among these are the natural resource damages provisions of the federal Superfund law (Comprehensive Environmental Response, Compensation, and Liability Act) and the oil pollution provisions of the Clean Water Act and the Oil Pollution Act.⁶⁸ Natural resources damages may also be recovered for impacts to the national park systems and marine sanctuaries.⁶⁹ These are not offsets in the sense of planned actions to compensate for authorized activities, but rather are restoration and recovery actions meant to restore damaged ecosystems and resources after the fact. There are detailed regulations covering the assessment and implementation of natural resource damage payments, and trustees are designated to assure that recovered funds are spent as necessary to restore the public natural resources.

Compensatory mitigation for hydropower projects may be mandated under the Federal Power Act and the Northwest Power Act.⁷⁰ Environmental measures often include mitigation for impacts to fish and wildlife habitat. Projects authorized under the biennial Water Resources Development Act(s) may also be required to undertake compensatory mitigation activities (see Chapter 4, “Civil Works compensatory requirements”).

Federally supported transportation projects, including highways, bridges, airports, transit, and the like also may give rise to mitigation obligations. Most of these obligations stem from other laws, such as the §404 program or ESA. Transportation legislation has expressly recognized mitigation as an allowable project cost. The Federal Highway Administration (FHWA) has a well-developed environmental program, including research programs, meant to support environmental design, operation, and mitigation for transportation projects.⁷¹ The state of North Carolina created a coordinated program, the Ecosystem Enhancement Program, to harness the stream of anticipated federal transportation mitigation dollars and direct the mitigation toward landscape and watershed-based objectives.⁷²

Finally, the Coastal Zone Management Act (CZMA) allows coastal states to perform a consistency review of federally authorized activities in the coastal zone.⁷³ Section 401 of the CWA allows states to review federally permitted activities to determine whether state water quality standards will be violated by the proposed action.⁷⁴ The federal activities themselves may require compensatory mitigation, but the consistency review gives the state the ability to provide input on the mitigation actions.⁷⁵

b. Scope of current programs: funding and acreage affected

Impacts to the environment from land development and other practices are frequent, widespread, and have a significant cumulative effect on habitat. Although many impacts go unmeasured, five key federal programs (CWA, ESA, federal natural resource damage programs, Federal Power Act, and the Northwest Power Act) do require offsets through monetary or in-kind compensation. In a 2007 report, ELI estimated that private and public expenditures for such compensation under these programs total approximately \$3.8 billion annually (see Chart 1).⁷⁶

About \$2.9 billion of this spending – over 77 percent of the estimated annual amount of funds spent on compensatory mitigation – is generated through the compensatory mitigation requirements of §404 of the CWA. In terms of habitat programs, the next largest is the §10 of the ESA,⁷⁷ which represents an average annual commitment of \$370.3 million per year.⁷⁸

The size of these programs – in terms of acreage of adversely affected habitat and that provided as compensation – is difficult to determine. Some information is, however, available for the §404 program.⁷⁹ The Corps reports that in the seven-year period from 2000 to 2006 the annual amount of wetland acreage permitted for impacts ranged from 18,900 to 24,650 acres, for an average of 20,620 acres a year. Over the same time period, the amount of compensation required varied between 38,727 and 57,820 acres per year, and averaged about 47,384 acres per year.⁸⁰

c. Performance of existing mitigation programs

Because they have the longest track record and are the most active ecosystem-based markets in the U.S., the wetlands mitigation and endangered species programs provide the most relevant lessons for designing future mitigation programs that support the conservation of ecological and biological resources. This section will focus on the lessons learned from these programs to draw conclusions about the design of any future efforts to regulate impacts to key habitat and related natural systems.

i. The deterrent factor

The nation's current laws that regulate impacts to habitat and species have been a positive force for conservation. It is commonly understood that the very existence of these regulatory programs provide a deterrence to impacts and significant avoidance. When project proponents determine that potential sites are home to jurisdictional wetlands or threatened and endangered species, many of them will avoid these locations altogether. However, few, if any, data are available to demonstrate this effect.

ii. The role of avoidance and minimization

§404 Mitigation: One of the central concepts of the §404 program is that before a permit can be issued to fill a wetland or stream, impacts must be avoided as much as possible⁸¹ and those impacts that cannot be avoided must be minimized.⁸² After all of the proposed impacts have been avoided and minimized, the Corps can require the permittee to develop a

compensatory mitigation plan for offsetting the unavoidable impacts.⁸³

Although the Corps' accounting for the number of acres of aquatic resource impacts that permittees have requested and acres that have been permitted is considered accurate, the data on acres that have been avoided is considered far more subjective.⁸⁴ That being said, the agency reports that in the seven-year period of fiscal year 2000 to 2006 project proponents submitted permit requests for impacts that would have led to the loss of, on average, 26,730 acres a year.⁸⁵ During that same time period, the Corps reports that, on average, 5,967 acres a year of those impacts were avoided.⁸⁶ In other words, the sequencing provisions supported the avoidance of 22 percent of the requested acres of impacts on average over this time period.

Thus the avoidance provisions clearly help to direct projects to locations that have fewer impacts to aquatic resources. It is difficult to deduce, however, how effective the Corps avoidance and minimization procedures are, as there has been little objective evaluation of them. In addition, in many Corps districts, some amount of avoidance and minimization may take place during a "preapplication" consultation phase with the Corps before an application for a §404 permit is submitted.⁸⁷

ESA Mitigation: Under §7, biological opinions outline "reasonable and prudent measures" to minimize impacts of an incidental take of protected species.⁸⁸ We were unable, however, to identify readily available data on how effective these minimization measures are in practice – in terms of acres of impacts or number of species affected. Nor were we

able to evaluate how effective avoidance and minimization measures are under §10.

iii. The role of compensatory mitigation

§404 Mitigation: Compensatory mitigation in the §404 program is the third and final step in the mitigation sequence. Offering to undertake compensatory mitigation does not, however, guarantee that a permit will be issued. The new Compensatory Mitigation Rule clearly states that the Corps may determine that a permit cannot be issued if the compensation that the permittee offers is not considered “appropriate and practicable.”⁸⁹ However, it is difficult to determine how many permit requests are denied on the grounds that the offered compensatory mitigation is unlikely to successfully replace lost resources. In 2003, the Corps denied less than one percent of those permits requested.⁹⁰

Unlike many of the other compensatory mitigation programs reviewed here and elsewhere,⁹¹ the Corps does strive to track the number of acres of aquatic resources that are impacted through the §404 program and the amount of compensatory mitigation that is required. The database the Corps uses throughout its 38 district offices is referred to as the OMBIL Regulatory Module, or “ORM.” Although ORM is being used nationwide, the Corps has yet to release updated data on acres of impacts and acres of mitigation required in recent years.

ESA Mitigation: There remains considerable uncertainty whether or not the minimization provisions of the §7 consultation process give the Services the authority to require compensation as a minimization measure. The

1998 FWS *Final ESA Section 7 Consultation Handbook* advises that “it is not appropriate to require mitigation for the impacts of incidental take,” and that minimization measures should only occur within the action area, and only to minimize the impacts on specific species or habitat.⁹²

Some FWS offices, however, have taken a different approach and have determined that impacts to listed species may be “minimized” by requiring conservation measures. The Sacramento field office of FWS, for example, secures compensation for most, if not all, of the consultations that end in take.⁹³ Moreover, FWS’s 2003 guidance on the use of conservation banks acknowledges that “activities regulated under Section 7 or Section 10 of the ESA may be eligible to use a conservation bank, if the adverse impacts to the species from the particular project are offset by buying credits created and sold by the bank.”⁹⁴ The feeling of most FWS staff, however, is that the authority provided to the Service under §7 and the consultation process emphasizes the minimization or avoidance of project impacts through design and project changes, rather than compensatory measures.

Section 7 consultations conducted by NMFS rarely if ever result in compensatory mitigation as a requirement in an incidental take statement. NMFS instead relies on avoidance and minimization measures.

Our research revealed that the Services do very little in the way of tracking the nature or amount of compensatory mitigation required under §7 of ESA. This conclusion is supported by a 2009 report by Government Accountability Office and ELI’s 2007 compensatory mitigation study.⁹⁵

Unlike §7, §10 of ESA clearly states that permittees are required to minimize and mitigate the impacts to species “to the maximum extent practicable.”⁹⁶ FWS does maintain a centralized database of Incidental Take Permits, HCPs, and other FWS agreements with non-federal landowners. The database, the Environmental Conservation Online System (ECOS),⁹⁷ provides information on the species covered by the HCP, the size of the HCP, and the duration of the HCP.

1. Replacement of functions and services and the need for effective ecological performance standards

§404 Mitigation: A review of the existing literature on the administrative and ecological performance of compensatory mitigation reveals that in many separate studies, a significant percentage of the compensatory mitigation projects across the country fail to comply with their permit conditions and, even more frequently, fail to replace lost wetland acres and functions.⁹⁸ In its comprehensive national study on compensatory mitigation for wetland losses, the National Research Council reported that between 70 to 76 percent of mitigation required in permits is actually implemented.⁹⁹ Several other studies have had similar results.¹⁰⁰ In a 2001 review, researchers found that an average of only 21 percent of mitigation sites met various tests of ecological equivalency to lost wetlands.¹⁰¹

The lessons that wetland compensatory mitigation and wetland mitigation banking offer must be viewed not only in the context of the health of the ecosystem *market* it has spawned, but also in the health and resilience of the *habitats* they were designed to conserve. In the §404 program, market success has not,

to date, been shown to translate into consistent ecological success.¹⁰²

The ecological success of compensatory mitigation hinges on many factors, including whether or not the mitigation project is measured against performance standards that are ecologically based and adequately designed such that, if met, they will yield the desired aquatic resource functions. To date, the §404 program has fallen short in this regard.¹⁰³ Several field-based studies have concluded that compliance with permit conditions is a poor indicator of whether or not mitigation projects are adequately replacing the appropriate habitat types and ecological functions of wetlands.¹⁰⁴ In many cases, compensatory mitigation sites meet all of their permit standards, but still have not yielded a wetland that meets the federal definition for jurisdiction.

The Compensatory Mitigation Rule issued by EPA and the Corps in April 2008,¹⁰⁵ did not prescribe “one size fits all” ecological performance standards to be included in mitigation plans.¹⁰⁶ In recognition that “ecological performance standards will vary depending upon aquatic resource type, geographic region, and compensation method,” the Rule describes “general criteria” or “principles” for establishing appropriate ecological performance standards,¹⁰⁷ and requires that they be “based on the best available science that can be measured or assessed in a practicable manner.”¹⁰⁸

Developing science-based ecological performance standards remains a challenge for the regulatory agencies.¹⁰⁹ Although getting this part of the program right has proven to be essential, several problems remain. In some instances, the science is currently lagging

behind the regulatory requirements. In others, some reviewers have contended that the Corps has not effectively incorporated the “best available science” into performance standards.¹¹⁰

ESA Mitigation: In contrast to wetland compensatory mitigation, there is very little in the way of research or literature on either the compensatory mitigation measures that are being required of permittees under §7 or §10 or on the ecological effectiveness of these compensatory mitigation practices or conservation banking.

In 1998, Defenders of Wildlife sought to analyze a sample of HCPs to determine their effectiveness.¹¹¹ The report concluded that few of the plans reviewed were adequately based on science; nor were the plans consistent with species recovery. In 1999, the National Center for Ecological Synthesis (NCEAS) and the American Institute of Biological Sciences (AIBS)¹¹² undertook a study of the use of science in the development of 43 habitat conservation plans (HCPs). Although the study did not seek to evaluate the implementation of these HCPs, it did attempt to assess the likelihood of success of the mitigation measures. The authors concluded that “although HCPs most often identify the primary threat to the affected species, only a little more than half of the time do mitigation plans adequately address that threat.”¹¹³ Neither of these studies, however, were designed to determine if species compensatory mitigation measures are achieving their intended biological results.

One mechanism for the agencies to evaluate the ecological effectiveness of the compensatory mitigation provisions required

under the Act is through the 5-year review process. The ESA requires the agencies to conduct a review of all listed species at least once every five years.¹¹⁴ This might be the appropriate opportunity for a summary of compensatory mitigation measures required and their ecological outcomes. In 2005, the services released guidance on “the scope and role” of the 5-year review, as well as a template for what should be included in the review. The guidance, however, makes no mention of summarizing or assessing the ecological outcomes of minimization or compensatory mitigation requirements.¹¹⁵

2. The need for adequate monitoring

In order for regulatory agencies and the public to determine whether or not individual compensatory mitigation projects are being carried out and if those that are carried out are replacing lost resources, it is essential that the permittees be required to monitor the outcomes of the required mitigation measures. Such monitoring should be directly tied to ecological performance standards outlined in the §404 permit or biological opinion.

§404 Mitigation: Under the 2008 compensatory mitigation rule, all compensatory mitigation projects are required to have a mitigation plan.¹¹⁶ All mitigation plans must address 12 elements, including monitoring requirements. This section must lay out the parameters that will be monitored in order to determine if the compensatory mitigation project is on track to meet its objectives, as well as a schedule for monitoring and providing monitoring reports to the Corps.¹¹⁷

As some members of the 2001 NRC panel on wetland mitigation recently noted, “The manner in which Corps districts implement the ecological performance standards (§332.6/230.95) and the related monitoring section (§332.6/240.96) may well spell the ultimate success of the regulation.”¹¹⁸

ESA Mitigation: Under §7 of the ESA, biological opinions should contain provisions for the permittee to monitor the effects of its action on listed species. A recent report by the Government Accountability Office (GAO) found that “The extent to which the [Fish and Wildlife] Service includes monitoring and reporting requirements in its biological opinions varies considerably.”¹¹⁹ The report also notes the importance of the information provided in monitoring reports to the FWS’s ability to assess the cumulative effects of the given take on the species.¹²⁰

3. The need for rigorous oversight and enforcement

Performance standards and monitoring provisions cannot guarantee ecological success on the ground unless compensatory mitigation projects are rigorously measured against such appropriately designed standards and the regulatory agencies provide adequate oversight and enforcement.

§404 Mitigation: Many of the administrative and ecological deficiencies of the §404 program can be attributed to the insufficient resources provided to the Corps for oversight and enforcement.

In 2005, GAO released a report on the Corps’ oversight and enforcement track record¹²¹ that concluded that the Corps districts “performed

limited oversight to determine the status of required compensatory mitigation.”¹²² GAO found that the agency provided “somewhat more” oversight for compensatory mitigation satisfied through mitigation banks and in-lieu fee mitigation than permittee-responsible compensation¹²³ (the most frequent type of compensatory mitigation employed).¹²⁴ However, “oversight was still limited...” for mitigation banks and in-lieu fee compensation.¹²⁵

GAO concluded that many of the deficiencies in oversight were due to “conflicting guidance, which notes that compliance inspections are crucial yet makes them a low priority,” and the agency’s limited resources.¹²⁶ In its response, the Department of Defense concurred and noted that the agency was working on revising their Standard Operating Procedures (SOP), which outlines the agency’s priorities, to clarify discrepancies and provide more clear guidance on mitigation oversight. The agency hoped to finalize the revised SOP by the fall of 2005,¹²⁷ but Corps officials state that the revised SOPs are not yet available but should be released in the coming weeks.¹²⁸ With regard to enforcement, several different enforcement options are available to the Corps if the agency determines that required compensatory mitigation is not being performed or not meeting performance standards, the mitigation provider fails to submit monitoring reports, or there are other infractions. These include “issuing compliance orders and assessing administrative penalties, requiring the permittee to forfeit a bond, suspending or revoking a permit, and implementing the enforcement provisions of agreements with third parties to perform mitigation on permittees’ behalf.”¹²⁹ The Corps may also bring legal action against permittees in federal district court.

GAO found, however, that Corps districts rarely rely upon the enforcement measures at their disposal and instead rely “primarily on negotiation with permittees or third parties...”¹³⁰

ESA Mitigation: The 2009 GAO report on §7 consultations concluded that “The [Fish and Wildlife] Service lacks a systematic means of tracking the monitoring reports it requires in biological opinions...and does not know the extent of compliance with these requirements.¹³¹ The study reports that in the field offices included in the study, GAO found that of the consultations that had reporting requirements, FWS “could not fully account for required monitoring reports in 40 of the 54 consultation files (63 percent)...”¹³² The 5-year review developed for the Valley Elderberry Longhorn Beetle in 2006 supports this finding. In the report, FWS estimates how much habitat has been restored as a result of §7 consultations and acknowledges that its estimate is “likely very inaccurate” because “due to staff and workload constraints, the [FWS] has been unable to determine which compensation measures were actually implemented and their success.”¹³³

Much like the situation encountered by the Corps’, FWS field staff get conflicting messages about how much of a priority they should place on tracking monitoring reports. FWS staff reported that “responding to requests for consultations often takes a higher priority than following up on monitoring reports...”¹³⁴ Part of this is due to the fact that tracking monitoring reports is not an agency performance measure.¹³⁵

Very little information was readily available on the Services’ oversight of compensatory

mitigation measures that are required through HCPs under §10.

- iv. The need for connectedness to a conservation vision

For several decades, federal §404 policy has stated a clear preference for compensatory mitigation to be carried out on-site and in-kind.¹³⁶ Lingering concerns over the ecological effectiveness of this approach, as well as its failure to take into consideration a wider view of conservation priorities, led the agencies to allow increasing flexibility in siting compensatory mitigation projects, by shifting their focus to locating these projects where they are more likely to be ecologically successful. In 1995, the agencies released guidance on mitigation banking that encouraged the use of the off-site option, when it could be demonstrated that doing so was “environmentally preferable.”¹³⁷ In 2001, the National Research Council (NRC) issued its influential study, *Compensating for Wetland Losses Under the Clean Water Act*.¹³⁸ In it, the NRC Committee recommended that the federal wetland mitigation program make site selection decisions that “follow from an analytically based assessment of the wetland needs in the watershed” rather than through an automatic preference for on-site and in-kind compensation.¹³⁹ The Compensatory Mitigation Rule issued by EPA and the Corps in 2008 reversed the agencies’ previously held position and established a “preference hierarchy” for selecting compensation options that favors off-site mitigation banks and in-lieu fee programs that are designed using a watershed approach, over on-site compensation. The “Watershed Approach” is described in the box below.

The Watershed Approach

The 2008 Compensatory Mitigation Rule defines the watershed approach as an “analytical process” for making compensatory mitigation decisions that involves consideration of watershed needs and relies upon a landscape perspective.¹⁴⁰ It incorporates many of the comprehensive conservation concepts laid out in this paper.

The agencies first state that if an existing, “appropriate” watershed plan is available, it should be used to guide compensatory mitigation decision-making. If such a plan is not available, as will be the case in the vast majority of instances, the watershed approach should be used.

The Rule outlines the “*considerations*” that must be a part of the watershed approach:

A watershed approach to compensatory mitigation considers the importance of landscape position and resource type of compensatory mitigation projects for the sustainability of aquatic resource functions within the watershed. Such an approach considers how the types and locations of compensatory mitigation projects will provide the desired aquatic resource functions, and will continue to function over time in a changing landscape. It also considers the habitat requirements of important species, habitat loss or conversion trends, sources of watershed impairment, and current development trends, as well as the requirements of other regulatory and non-regulatory programs that affect the watershed, such as storm water management or habitat conservation programs. It includes the protection and maintenance of terrestrial resources, such as non-wetland riparian areas and uplands, when those resources contribute to or improve the overall ecological functioning of aquatic resources in the watershed.¹⁴¹

The approach also acknowledges that the compensatory mitigation program does not focus solely on specific functions of aquatic resources, such as water quality or habitat for certain species, but rather, “should provide, where practicable, the suite of functions typically provided by the affected aquatic resource.”¹⁴² In other words, the program is meant to take into consideration the full range of ecosystem services provided by aquatic resources.

The Rule also describes the *type of information* that should be utilized in watershed-based decision-making. It suggests that this information may be contained in existing plans or in information from other sources, including wetland and soil maps; U.S. Geological Survey topographic and hydrographic maps; aerial photographs; information on rare, threatened, and endangered species; local ecological reports or studies, etc.¹⁴³ The list of items that should be consulted includes “current trends in habitat loss or conversion; cumulative impacts of past development activities, current development trends, the presence and needs of sensitive species site conditions that favor or hinder the success of compensatory mitigation projects; and chronic environmental problems such as flooding or poor water quality.”¹⁴⁴

The watershed approach to compensatory mitigation decision-making fully contemplates the selection of sites that contribute to maintaining habitat diversity, connectivity, and the appropriate proportions of habitat types needed to enhance the long-term stability of watersheds. In most cases, such information is readily available in the State Wildlife Action Plans and other state and regional conservation plans.¹⁴⁵

A Framework for Advancing The Next Generation of Mitigation

This section sets forth a more detailed discussion of how the next generation of mitigation can be applied to existing, expanded, and new authorities that regulate impacts to habitat and species.

a. Essential components of the next generation of mitigation

The structure of and lessons from current mitigation programs suggest several essential components for an effective, comprehensive mitigation framework – the next generation of mitigation. These include:

- Extend mitigation concepts to all habitat types;
- A clear policy goal;
- Landscape-level planning for conservation and ecosystem services;
- Regulatory drivers;
- A defined mitigation protocol; and
- Implementation guidance to ensure that the mitigation protocol is consistently and rigorously applied and that accountability for results is assured.

These fundamental elements should be addressed by any regulatory program seeking to apply, expand, or extend protections to habitat and species through mitigation.

i. Policy goal

A policy goal for compensatory mitigation, such as the “no net loss” policy for wetlands¹⁴⁶

or the policy to offset adverse impacts to threatened and endangered species under habitat conservation banking,¹⁴⁷ greatly influences how regulatory agencies make mitigation decisions and how regulations and guidance evolve over time. Establishing such a goal is essential for any regulatory program aiming to ensure the long-term conservation of wildlife habitat. Without it, we are left with a regulatory program that allows habitat loss without any effort to avoid or minimize impacts and without at least equivalent habitat gains. Ideally this goal will encourage more proactive, comprehensive efforts to conserve wildlife before it becomes threatened or endangered (and thereby more costly to protect and ensure survival). This would be in line with the State Wildlife Grants Program,¹⁴⁸ which was designed to prevent wildlife from becoming endangered and encourages improvements in conservation planning through the development of State Wildlife Action Plans.

ii. Landscape-level planning for conservation and ecosystem services

Mitigation programs should move away from piecemeal, project-by-project mitigation approaches, which often result in a patchwork of isolated, disconnected, and difficult-to-manage protected or restored habitats that fail to deliver effective conservation. Mitigation should be based on conservation planning developed in a landscape context to ensure mitigation contributes to the long-term conservation goals of a specified geographic area – a watershed for wetlands or a recovery unit for species. For example, under the Watershed Approach, the compensatory mitigation step is now required to take a

landscape-scale perspective (see Box “The Watershed Approach”). Under the approach, compensatory mitigation sites must be located within the same watershed as the impact site and where it can most successfully replace lost functions and services.¹⁴⁹ The approach requires that siting decisions take into account watershed scale features such as aquatic habitat diversity, habitat connectivity, relationships to hydrologic sources, land use trends, ecological benefits, and compatibility with adjacent land uses.¹⁵⁰ Such landscape-level planning is essential for effective mitigation. It can support effective avoidance of impacts to critical resources, cumulative impact analysis, and the expenditure of compensatory mitigation funds in a manner that contributes to broader conservation goals for wildlife habitat and resilience to future stresses.

A framework is needed to guide landscape-level conservation planning and ensure coordination among the range of mitigation programs operating under different regulatory authorities. State Wildlife Actions Plans could serve this role, as they currently identify critical wildlife habitat and threats to that habitat in a landscape context. While in some cases State Wildlife Action Plans will need further development, additional data, and wider conservation planning input,¹⁵¹ such improvements could make them a vital guide for effective mitigation. In addition to the State Wildlife Action Plans, there are also a wide range of other federally recognized and regional conservation plans that offer important conservation information that can be useful in guiding mitigation decisions. (These are outlined in Chapter 2, “The information basis for the next generation of mitigation.”)

Taken together, these plans may provide the necessary information on species, ecological communities, and habitats regarding their biodiversity significance, irreplaceability and vulnerability, historic and existing conditions, trends in loss and conversion, immediate and long-term conservation needs, and priorities for restoration, establishment, enhancement, and preservation activities. In some cases additional planning and analysis are needed to provide the detailed information required to make site-based choices concerning avoidance of habitat loss and to identify the best locations for habitat replacement through compensatory mitigation.

To be effective, landscape-level planning needs to more fully account for sources of, and threats to, “ecosystem services.” Ecosystem services refer to the benefits that nature provides to people, such as a forested watershed’s contribution to drinking water quality. In 2008, ecosystem services were for the first time explicitly integrated as one of the decision-making factors in the regulatory permitting process of the wetlands compensatory mitigation program.¹⁵²

To support this decision-making, more landscape-level information on ecosystem services will be needed, including the types of services, service stocks and production flows, service delivery pathways, service beneficiaries, service values, effects of cumulative service losses, and projections of service changes.¹⁵³ With such information, it will be possible to identify important areas for ecosystem services. And where ecosystem services can be integrated into landscape-level conservation plans, such as State Wildlife Action Plans, there will be the opportunities for compensatory mitigation to deliver both

wildlife and ecosystem service benefits. For more on ecosystem services, see Chapter 5.

iii. Regulatory drivers

Appropriate legal and regulatory drivers are needed to support mitigation programs. For example, regulations under §404 of the CWA support the goal of “no net loss” of wetlands. Likewise, mitigation carried out through conservation/habitat banking is driven by provisions of the ESA. Section 9(a)(1) prohibits the “take” of endangered fish and wildlife species and §4(d) extends this to threatened species. Implementation of regulatory approvals under §§7(a)(2) and 10(a) provide the basis for compensatory mitigation. For other programs, it may be necessary to strengthen existing regulatory drivers in order to expand mitigation for wildlife habitat.

iv. Mitigation protocol

All compensatory mitigation programs should follow the same mitigation protocol applied for wetlands and conservation banking. Referred to as “sequencing” in the §404 context, mitigation is generally a step-wise process designed to first avoid and minimize impacts as much as possible and then require compensation for residual impacts. (For a description of the origins of this protocol and its application in legal contexts, see Chapter 3, “Legal framework of existing programs.”) This mitigation framework is broadly accepted and has been adopted around the world (e.g., European Union, Australia). The aim is to ensure compensatory mitigation is used as an option of last resort, after appropriate efforts have been made to avoid and minimize impacts, and that compensatory mitigation

is not used to make a potentially avoidable project appear more acceptable.

v. Implementation regulations and guidance

Regulatory agencies need clear implementation rules and guidance to advance the next generation of mitigation, especially with regard to ensuring conformance to the mitigation protocol. On-the-ground results from current programs, such as wetlands mitigation under the §404 program, suggest there is room to improve guidance on avoidance and minimization.¹⁵⁴ Specific issues to address include:

- Clear provisions on how to implement the mitigation protocol to ensure effective avoidance and minimization;
- Consistent guidance providing for sufficient resources to support implementation of avoidance and minimization steps;
- Guidance and resources for oversight and enforcement supporting meaningful deterrence for non-compliance.

Improvements in implementation are also needed for compensatory mitigation – the third step of the mitigation protocol. To date, compensatory projects have not delivered consistent and effective outcomes for conservation (for a full discussion, see Chapter 3, “Performance of existing compensatory mitigation programs”). Based on lessons from wetlands compensatory mitigation, to advance compensation under the next generation of mitigation, further implementation guidance is needed to address the following issues:

- Types of compensatory mitigation (restoration, establishment, enhancement, preservation) that qualify as compensation;
- Basis for determining a new contribution to conservation (“additionality”);
- Basis for determining equivalence between the impact site and the value of the compensation provided;
- Science-based replacement ratio requirements (amount of compensatory mitigation required per unit of impact);
- Location of compensatory mitigation sites relative to the impact site;
- Timing of project impacts vs. functionality of compensatory mitigation benefits, with adequate consideration of “advance” mitigation;
- Science-based performance standards or success criteria that, if met, will yield the intended ecological outcomes;
- Provisions for monitoring of compensatory sites that is directly tied to the ecologically based performance standards and measured against the impact sites; and defined length of monitoring periods;
- Provisions for protection of sites in perpetuity;
- Provision of adequate financial resources and legal assurances to support long-term stewardship; and
- Provisions for built in buffers to guard against failure, such as requiring compensation ratios above 1:1 or requiring preservation of intact habitat in addition to restoration, to guarantee a net gain in natural habitat functions.

Finally, measures should be in place to ensure that if independent field-based research

demonstrates that the compensatory mitigation program is not achieving the replacement of habitat area *and* functionality, or if the offered mitigation does not promise success, the regulatory agency has a clear avenue for denying the action and/or the mitigation approach. Mitigation that is based on a plan, particularly an ecologically based plan, can more readily be assessed and adjusted when results are not being achieved.

b. Existing or expanded provisions for next generation mitigation

Existing U.S. laws and programs offer a substantial basis for the next generation of mitigation. In this section we consider ways to improve implementation of these programs and offer opportunities to expand upon existing authorities in view of anticipated infrastructure developments and related activities.

i. Clean Water Act §404 mitigation

In the §404 program, the vast majority of the agencies’ attention over the past 20 years has been paid to improving the third step in the mitigation process – compensatory mitigation. Very little attention, on the other hand, has been paid to more consistently and rigorously applying the first two steps – avoidance and minimization.¹⁵⁵ (For more, see Chapter 3, “The role of avoidance and minimization.”) Particularly in light of the mixed track record of compensatory mitigation, the agencies should develop further tools, guidance and/or regulations to ensure the rigorous application of avoidance and minimization.¹⁵⁶

The regulations that guide the mitigation sequence state that the Corps may not issue a permit “if there is a practicable alternative

to the proposed discharge which would have less adverse impact on the aquatic ecosystem...¹⁵⁷ The permittee is required to submit documentation to the Corps on the alternatives that were considered. However, the Corps does not currently have the tools at their disposal to adequately evaluate whether or not all of the legitimate alternatives were considered. Developing a new tool or making an existing tool available that would allow the agency to check real estate records of available properties would go a long way to helping them evaluate whether or not the alternatives outlined reflect a consideration of all of the available properties.

The minimization provisions of the §404(b)(1) Guidelines are satisfied through procedures described in Subpart H of the Guidelines.¹⁵⁸ The section provides a broad array of possible methods for minimizing the impacts of a proposed activity. The regulatory agencies, however, do not have the in-house expertise they would need to effectively evaluate whether the minimization measures proposed are adequate or reasonable. Developing standards for how impacts can be minimized in broad categories – such as mining, port development, residential development, etc. – would improve the regulators’ ability to evaluate whether impacts have been adequately minimized.

The ability of §404 compensatory mitigation to achieve the objectives of broad, non-aquatic resource conservation plans does have its limitations.¹⁵⁹ Given the nation’s historic loss of wetlands and streams, this is a wise approach. The Corps has limited ability to force compensation providers – either permittees or bankers – to locate compensation projects in areas that are deemed

ecologically desirable in a watershed plan or more comprehensive conservation plan. The 2008 Compensatory Mitigation Rule, however, provides a significant opportunity to link the §404 compensatory mitigation program to a broader habitat conservation vision.¹⁶⁰ Under the Watershed Approach outlined in the rule (see Box “The Watershed Approach”), the agencies state that compensatory mitigation decisions should be made in the context of a watershed plan, if one is available, and if one is not, should consider, among other things, “habitat requirements of important species” and “habitat loss or conversion trends.”¹⁶¹ In addition, the rule states that the watershed approach should consider “the requirements of other regulatory and non-regulatory programs that affect the watershed, such as...habitat conservation programs.”¹⁶²

Thus, the rule opens the door for viewing compensatory mitigation site selection within the context of whole watersheds. This approach will help the agencies more effectively identify the most critical sites to avoid, undertake cumulative impact analysis, and identify the most ecologically strategic sites to compensate for those impacts that cannot be avoided. The overall objective can then be to reinforce the health and resilience of the whole watershed.

ii. Federal Endangered Species Act

The federal Endangered Species Act does not apply the mitigation protocol in the same manner as the CWA § 404 program (see Chapter 3, “Legal framework of existing mitigation programs”). In order to clarify the mitigation protocol under §7, the agencies should develop rules or guidance outlining the process for avoidance and minimization

and should clarify that compensation is an appropriate measure to minimize impacts to species, particularly when the take leads to permanent habitat loss. As noted earlier (see Chapter 3, “ESA, Habitat Conservation, and Mitigation”), inconsistencies in FWS policy currently create uncertainty with respect to whether or not the minimization provisions give the Services the authority to require compensation as a minimization measure.

In addition, the Services should develop adequate tools for field staff to track impacts authorized through §7 consultations, migration measures required, and monitoring. The agencies should also provide clear signals and incentives for field staff to devote time to oversight. Tracking monitoring and undertaking oversight of mitigation measures will support more effective cumulative impact analysis. Nonetheless, the agencies should consider developing cumulative impact analysis guidance and tools to support field staff.

The §10 HCP process also specifically requires review of alternatives, minimization of impacts, and mitigation (see Chapter 3, “ESA, Habitat Conservation, and Mitigation”).¹⁶³ It too provides a basis to implement the mitigation protocol. Over the past ten years, HCP planning efforts have evolved from predominantly small-scale, project-by-project planning efforts to more large-scale or multi-species plans. These regional HCPs can cover hundreds of thousands of acres and numerous species. If based on the best available science, these larger-scale, more regional plans can allow for a more coordinated, proactive, and regional approach to mitigation. Regional HCPs can identify priority habitats for conservation and mitigation, while also prioritizing where to develop and what kinds

of development should take place where. These larger scale plans may ensure that species and their habitats are preserved in a regional context and facilitate preservation of habitat connectivity and wildlife corridors.

As with the wetland program, federal agencies cannot require that mitigation carried out under the ESA be sited in a particular location, but the mitigation action must satisfy FWS or NOAA. In addition, because mitigation is targeted to offset impacts to a specific listed species, any compensation must contribute to supporting the preservation and recovery of that particular species.

However, compensatory mitigation carried out under ESA can support landscape-scale conservation, primarily by siting and managing conservation banks in support of more comprehensive conservation goals. When developing §7 and §10 minimization and mitigation measures, FWS and NOAA are required to gather all available data on surrounding habitat. Having a comprehensive conservation framework could also provide strategic guidance for HCP development. Comprehensive conservation plans could help support the development of multi-species HCPs that address broad-based, landscape-level planning issues.

But even apart from regional HCPs, the availability of detailed conservation information can help the Services determine how best to target mitigation in the context of individual HCPs as well as §7 consultations with federal agencies.

iii. The operation of the National Environmental Policy Act on federal lands and elsewhere

NEPA requires consideration of mitigation in the context of evaluating environmental impacts of major federal actions. There is no required sequence of mitigation that requires avoidance and minimization in advance of compensatory mitigation. However, alternatives and their impacts must be identified, including reasonable mitigation measures. The mitigation protocol can be applied by federal agencies in their NEPA evaluations.

In the west, vast federal ownerships makes mitigation under NEPA at the landscape scale possible, but in the east where there is far less federal land ownership, there are fewer opportunities to use NEPA to drive the mitigation protocol. Even in the west, many critical valley areas and their riparian zones are outside of federal ownership and may not be directly subject to NEPA evaluations and consideration for mitigation actions, absent the need for a federal permit.

Impacts from mining, siting of renewable energy projects, rights-of-way, and other activities are subject to permitting, licensing, leasing, or other kinds of approvals. NEPA can serve as a means of identifying the mitigation that will be needed and that may be incorporated in such approvals.

Dealing with these issues on a landscape or ecosystem basis is supported by several provisions of the NEPA regulations. The first is the use of “programmatic” Environmental Impact Statements to address the likely impacts, alternatives, and mitigations of a

whole federal program (such as solar leasing on Bureau of Land Management lands). The programmatic statements provide an opportunity to conceptualize both impacts and mitigation at a macro scale. Then the preparation of leasing plans and approval of specific projects have their own NEPA reviews, which can rely on the programmatic statement to guide the more fine-grained analysis in a subsequent plan or project EIS or EA.¹⁶⁴ The NEPA regulations note that when preparing statements on “broad actions,” agencies may find it useful to evaluate the proposals in one of several different ways, among which are “geographically, including actions occurring in the same general location, such as body of water, region, or metropolitan area,” by generic type of action or impact or subject, or by stage of technological development or activity.¹⁶⁵

Thus, a programmatic EIS could address the likely impact of a particular technology on a broad area of public lands and waters and identify likely bases of mitigation and sources of information that could best inform such mitigation. At the project level, this broader analysis would shape the specific mitigation responses considered in the project EIS or EA. NEPA regulations also provide for consideration of cumulative impacts,¹⁶⁶ so that even if a programmatic EIS is not prepared, each project EIS will need to address the foreseeable impacts of the project and future projects. This too can serve as a basis for integrating broader-scale conservation plans into mitigation – rather than treating each project’s mitigation requirement as an independent decision. Reliance on State Wildlife Action Plans and other federally recognized and regional plans will result in better predictions using NEPA, and may well help projects with avoidance of key habitats,

development of mitigated FONSI (Finding of No Significant Impact), and design of useful compensatory mitigation measures for unavoidable impacts at the project level.

iv. Specific activities and circumstances under existing law

1. Energy development

U.S. energy demand is expected to increase by 0.5 percent annually through 2030,¹⁶⁷ requiring large investments in energy generation and transmission. This demand, in combination with broader aims to reduce carbon emissions and achieve energy independence, signals the potential for a dramatic expansion in the “footprint” of impacts from the energy sector. Consider the following projections:

- About one-fifth of the land area of the U.S. may need to be dedicated to energy production and transmission facilities to meet low carbon electricity and biofuel production requirements.¹⁶⁸
- The Department of Energy’s 20 percent wind goal will cause the fragmentation of approximately 12 million acres of land from the siting of wind turbine facilities and 11,000 miles of new transmission lines in the grasslands and forests of Central and Western U.S.¹⁶⁹
- Solar energy is considered economically viable on about 35 million acres of land. With more than 100 permit applications for solar projects already pending, there is high potential for fragmentation of millions of acres of sensitive deserts in the Southwest U.S.¹⁷⁰
- Over 100,000 additional oil and gas wells with a roughly 2 million-acre

footprint are anticipated over the next 20 years in the U.S. Mountain West.¹⁷¹

- The need to transmit such energy to market and the demand for a so-called smart grid will result in the construction of new energy transmission lines that will also fragment important wildlife habitat

In light of this potentially large energy development footprint, a more comprehensive planning approach is needed. This approach should provide consistency and specificity to the application of the mitigation protocol for these impacts, with primary attention to avoidance and minimization of impacts to priority habitat and compensatory mitigation for unavoidable residual impacts. Currently, mitigation policy varies depending on the type of energy generation (oil and gas, wind, solar, and so on) and jurisdiction (e.g., Bureau of Land Management, USDA Forest Service, and federal and state endangered species policies).

A more comprehensive and consistent approach to mitigation planning would help in meeting federal mandates specified in the Federal Land Policy and Management Act of 1976 (FLPMA), the National Forest Management Act of 1976,¹⁷² the National Environmental Policy Act of 1969, and CEQ Regulations for Implementing the National Environmental Policy Act.¹⁷³ These programs can already support a consistent and rigorous use of the mitigation protocol and a reliance on comprehensive landscape-scale planning as a basis for mitigation decisions. For example, §202(c) of FLPMA calls for land use planning to “(2) use a systematic interdisciplinary approach to achieve integrated consideration of the physical, biological, economic, and other sciences” and “(3) give priority to the

designation and protection of areas of critical environmental concern.”

In addition to planning, there may be opportunities to strengthen guidance for compensatory mitigation under some programs, such as Bureau of Land Management’s (BLM) Offsite Mitigation Policy¹⁷⁴ issued September 30, 2008. The guidance states:

Offsite mitigation may be offered voluntarily by a project proponent, incorporated into the project proposal, and approved by the BLM as a condition of the permit authorization. In certain other cases, the BLM may find it necessary to advise the applicant that the project proposal cannot be approved without additional onsite modification or additional mitigation, including offsite mitigation. There may be a need for offsite mitigation when:

- Impacts of the proposal cannot be mitigated to an acceptable level onsite; and
- It is expected that the proposed land use authorization as submitted would not be in compliance with law or regulations or consistent with land use plan decisions or other important resource objectives.¹⁷⁵

This guidance would be strengthened by requiring the use of information from comprehensive landscape-level conservation plans, such as State Wildlife Actions Plans, to provide a clear basis for determining when onsite mitigation is insufficient and the “certain other cases” when compensatory mitigation is needed.

Application of the Next Generation of Mitigation to Oil & Gas Development

In the intensive natural gas development areas of south/central Wyoming, The Nature Conservancy worked with the Bureau of Land Management and the British Petroleum Company to employ new strategies for mitigation for oil and gas development. Using regional biological assessments from its ecoregional planning the Conservancy first advised BP about the best locations to mitigate the impacts on important sage brush habitat of its exploration activities and, then, used the same ecoregional data to advise BP and the BLM about the most important places to avoid the direct impacts of drilling. This approach incorporates both more rigorous use of the mitigation protocol and viewing mitigation in a regional planning context to minimize and compensate for ecological impacts.

2. Transportation and infrastructure

In 2005, Congress enacted the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) to govern transportation policy and funding through 2009. A new federal transportation bill will need to be enacted to guide the next set of transportation expenditures and plans.

Section 6001 of SAFETEA-LU requires metropolitan and state transportation agencies to consider conservation, including landscape conservation relevant to wildlife. Under this section, each metropolitan planning organization (MPO) and state department of transportation (DOT) must “consult” with state, tribal, and local agencies “responsible for land use management, natural resources,

wildlife, environmental protection, conservation and historic preservation” when developing the required long range (20-year) transportation plans that govern planning and decision-making. This consultation “shall involve comparison of transportation plans to State and tribal conservation plans or maps, if available, and comparison of transportation plans to inventories of natural or historic resources, if available.”¹⁷⁶ The conservation plans that must be consulted and compared should include, but are not limited to, State Wildlife Action Plans.

The law also requires long range transportation plans to include a discussion of the type and location of “potential environmental mitigation activities and potential areas to carry out these activities, including [mitigation] activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.” This “discussion” must also be developed “in consultation with federal, state, and tribal wildlife, land management, and regulatory agencies.”¹⁷⁷ Once again, these requirements present a significant opportunity to integrate mitigation for transportation projects with landscape scale, ecologically significant conservation plans, where these exist or are under development.

Under current law, preparation of the long-range transportation plans by MPOs and state DOTs are not major federal actions subject to NEPA. Thus, the consultation, discussion, and comparison requirements that lend themselves to landscape-scale conservation *do not* include the evaluation of alternatives or rigorous environmental analysis that NEPA requires. Thus, even though the §6001 planning process offers significant opportunities for coordination and integration of conservation objectives with

transportation infrastructure, it is not until the project level that the connection of actions to actual mitigation types and locations receives detailed consideration.

Moreover, with one exception, the transportation laws as they currently stand do not themselves specify compensatory mitigation of any particular type or form. Such obligations arise under other laws, including the ESA and §404 of the CWA.

The DOT does have one compensatory mitigation requirement under a section commonly known as “§4(f),” which refers to the section where it originally appeared in 1966 legislation.¹⁷⁸ This section prohibits federally supported transportation projects that require the use of “any *publicly owned* land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance as determined by the Federal, State, or local officials having jurisdiction thereof, or any land from an historic site of national, State, or local significance as so determined by such officials *unless* (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreational area, wildlife and waterfowl refuge, or historic site resulting from such use.”¹⁷⁹ Essentially this requires avoidance and minimization of impacts on public park land. The Federal Highway Administration interprets this provision to include compensatory mitigation.¹⁸⁰

Minimization of harm entails both alternative design modifications that lessen the impact on 4(f) resources and mitigation measures that compensate for residual impacts. Minimization

and mitigation measures should be determined through consultation with the official of the agency owning or administering the resource. Neither the Section 4(f) statute nor regulation requires the replacement of 4(f) resources used for highway projects, but this option is appropriate under 23 C.F.R. 710.509 as a mitigation measure for direct project impacts. Mitigation measures involving public parks, recreation areas, or wildlife and waterfowl refuges may involve a replacement of land and/or facilities of comparable value and function, or monetary compensation, which could be used to enhance the remaining land.

Thus, where a transportation project unavoidably affects §4(f) resources, compensatory mitigation might be guided by a landscape scale mitigation plan or conservation plan that the relevant conservation agency has adopted or recognized.

3. Response to sea level rise

Section 404 is by no means the only or controlling response to sea level rise. It is one of many regulations, programs, and responses likely to be needed. But §404 and the watershed or regional approach can have an important function in mitigating the impacts of the infrastructure investment that may be employed to respond to rising sea levels.

The likelihood of significant sea level rise in response to global climate change presents special circumstances for the application of §404 in coastal areas. Current projections suggest increased sea levels of 1 to 1.5 meters by the end of the century, with the potential for

Advance Mitigation

Another framework that is gaining popularity is regional advance mitigation. Proactive regional advance mitigation planning allows state and federal agencies to anticipate the environmental impacts of several planned infrastructure projects at once, and to identify regional conservation opportunities that will satisfy anticipated mitigation requirements before the projects are in the final stages of environmental review, when the need to identify specific mitigation measures can delay project approvals. The result is cost-effective and efficient mitigation for infrastructure project delivery and more viable conservation investments by pooling mitigation needs across agencies over larger areas.

By addressing biological mitigation needs early in the projects' timelines, during project design and development, planners can reduce the cost of mitigation and integrate natural resource conservation in the project design and achieve more effective conservation. The benefits to natural resources and ecosystems are many, including better alignment of mitigation with existing conservation priorities, larger scale conservation allowing for protection of ecosystem function, buffering and securing past conservation investments and providing the resources to adaptively manage these lands in the face of accelerating change.

an even faster rate of increase. Rises of this magnitude would expose a number of large U.S. cities, such as Miami and Boston, to storm damage and, ultimately, inundation of low lying areas. It is unlikely that our society will abandon this level of investment, so engineers are already designing protection schemes. While non-structural “natural” protection measures may help at some locations, structural solutions will be required at others. As has been the case in the Netherlands, such solutions would likely involve extensive dredging and filling of coastal wetlands and alteration of other natural coastal features. In the U.S., such activities would trigger §404. Given the risks to human and natural communities from sea level rise, a comprehensive approach to such measures would help to identify which areas of coastline can adapt to changing sea levels, where non-structural measures can be employed, where engineered protection must be put in place and how the impacts of such construction can be mitigated.

Such analysis can only be done on a regional basis and, given the long term character and high costs of such investment decisions, a specific process within the context of §404 should be adopted to ensure the widespread application of the mitigation protocol and application of mitigation criteria that takes into account regional issues. Using State Wildlife Action Plans and Coastal Zone Management Plans can guide this process.¹⁸¹

4. Department of Defense/Homeland Security applications

Military installations occupy approximately 30 million acres in the U.S. and are often located in rural or coastal areas that include or

are adjacent to important natural resources. In many instances, military installations contain some of the largest unfragmented habitat in the area. For a variety of reasons, including their location, size, active ecosystem-based management,¹⁸² and the loss and degradation of habitat and wetlands resulting from development on non-military lands in the vicinity, military installations contain the highest density per acre of ESA listed species of any federal lands.¹⁸³

In addition to generally applicable statutes such as the ESA, CWA, and NEPA, management of natural resources on military lands is governed by the Sikes Act.¹⁸⁴ The Act includes requirements for the military to prepare Integrated Natural Resource Management Plans (INRMPs) that address the management of natural resources on Department of Defense (DoD) lands and waters. These plans are prepared in coordination with, and subject to the concurrence of, FWS and the relevant state fish and wildlife agencies, a requirement unique to DoD. Importantly, the Sikes Act also requires that INRMPs provide for “no net loss in the capability of military installation lands to support the military mission of the installation.”¹⁸⁵ DoD has for some time been exploring the desirability of fully integrating its own natural resource management plans with the relevant State Wildlife Action Plans in order to maximize the “ecological return on investment” of their own natural resource management activities.

In the past, compensatory mitigation actions under NEPA, §7 of ESA, and §404 of the CWA, have largely been undertaken within the boundaries of the same military installation where the action requiring compensation occurs. However, several factors have limited

the number of viable compensatory mitigation opportunities on DoD's own lands and waters. In response, the 2009 National Defense Authorization Act provided new authority to DoD to satisfy their compensatory mitigation requirements through the purchase of credits from conservation banks and participation in in-lieu-fee programs outside the borders of its own installations,¹⁸⁶ paralleling similar authority provided previously for DoD to participate in wetland mitigation banks and in-lieu-fee programs.¹⁸⁷

The Department of Homeland Security (DHS), and specifically Customs and Border Protection (CBD) within DHS, has undertaken significant infrastructure construction and other activities at or in the vicinity of the international borders of the U.S., especially the border with Mexico.¹⁸⁸ Under the "Real ID" provisions¹⁸⁹ of the Illegal Immigrations Reform and Responsibility Act of 1996,¹⁹⁰ the Secretary of Homeland Security received, and has exercised, sweeping and unprecedented authority to "waive all legal requirements," including environmental laws, that the Secretary deemed necessary in order to expeditiously complete construction of pedestrian fencing, vehicle barriers, and roads along the borders. Accordingly, for actions within the scope of the exercise of this waiver authority, application of the mitigation hierarchy is arguably not required as a matter of law. However, under a January 2009 Memorandum of Agreement between DHS and the Department of the Interior (DOI),¹⁹¹ compensatory mitigation action is being planned for impacts of activities covered by the waivers, with an initial focus on compensatory mitigation action that otherwise would have been required under the ESA, especially on federal lands.

Recognizing the impacts of security infrastructure and operations along the border, legislation has been drafted and is pending introduction in the 111th Congress.¹⁹² Under that Act, DHS would be required to develop and implement¹⁹³ a "comprehensive mitigation plan to address the ecological and environmental impacts of border security infrastructure, measures, and activities along the international land borders of the United States." The mitigation measures contemplated by the proposed legislation would be based on a broader approach than the ESA and similar statutes, and would be aimed at preserving the ecological health of natural communities as a whole, include maintaining and if necessary restoring wildlife migration corridors. In addition, the legislation would require provisions for monitoring the effectiveness of actions taken and provide for adaptive management and additional measures determined to be required on the basis of such monitoring.

5. Civil Works compensatory requirements¹⁹⁴

The Water Resources Development Act (WRDA) is the biennial legislation that is the main vehicle for funding the Corps to study, plan, and carry out water resource development and restoration projects. WRDA 1986 required the Corps to "mitigate damages to fish and wildlife resulting from any water resources project under [its] jurisdiction."¹⁹⁵ Although the §404 program's Watershed Approach was still nine years away, the Corps' regulations guiding this provision of WRDA acknowledges the need to plan compensatory mitigation projects within a landscape perspective: "Ecosystem restoration projects should be formulated in a systems context to improve the potential

for long-term survival of aquatic, wetland, and terrestrial complexes as self-regulating, functioning systems.”¹⁹⁶ The regulations also note that when planning the ecological restoration, the Corps must comply with the Fish and Wildlife Coordination Act by giving full consideration to, among other things, “the appropriate head of the State agency exercising administration over the fish and wildlife resources.”¹⁹⁷

The 2007 version of the bill, for the first time, requires the Corps to consider the use of a mitigation bank if the bank is within the same service area as the impact and has the appropriate number and type of credits available.¹⁹⁸ Guidance issued in support of the Act in November 2008 states that when using a bank to compensate for impacts, the bank must “be approved in accordance” with the 2008 Compensatory Mitigation regulations.¹⁹⁹

6. Federal Energy Regulatory Commission licensing²⁰⁰

The Federal Power Act (FPA) may require compensatory mitigation for impacts due to non-federal hydropower projects. The Federal Energy Regulatory Commission is the lead federal agency responsible for issuing licenses and renewals under FPA and for making the final determination about license conditions, including protection, mitigation, and enhancement requirements. There are currently around 1,000 licensed non-federal hydropower projects (projects licensed to private or public agencies rather than federally-operated); FERC granted about 350 licenses (mostly renewals) from 1993 through 2005.²⁰¹ Given the life of the permit, 30 – 50 years, many of the projects up for re-licensing today were granted prior to the passage of modern environmental law

- with few environmental requirements. New conditions set forth today may not be reviewed or revised for decades.

Several sections of the FPA relate to mitigation requirements. Section 4(e) requires FERC to consider competing objectives when issuing licenses or re-licenses. The law requires that “in addition to the power and development purposes for which licenses are issued” FERC “shall give equal consideration”, but not necessarily equal treatment,²⁰² “to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.”²⁰³

To receive a license, re-license, or to surrender a license applicants must comply with development, safety, and any environmental mitigation requirement set by FERC. Section 10(j) of the FPA requires that “in order to adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and habitat) affected by the development, operation, and management of the project, each license issued... shall include conditions for such *protection, mitigation, and enhancement*.”²⁰⁴ The law also requires that hydropower projects must be:

best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and

enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in [Section 4(e)].²⁰⁵

Further, environmental conditions specified by FERC in hydropower licenses are based on recommendations from fish and wildlife agencies (e.g., U.S. Fish and Wildlife Service, National Marine Fisheries Service, and state fish and wildlife agencies).²⁰⁶ The wildlife agencies provide information to help determine the damage to fish and wildlife resources and the means and measures to be adopted to mitigate the damage.²⁰⁷ Resource agencies can also impose mandatory licensing conditions in some cases, which can include compensatory mitigation requirements. These include mandatory conditions for projects 1) within a defined “reservation”²⁰⁸ area, imposed by the overseeing agency under §4(e) of the FPA²⁰⁹ or 2) prescribed as “fishways” by FWS or NOAA’s National Marine Fisheries Service under §18 of the Federal Power Act. The FPA recognizes impacts (e.g., fragmenting rivers, preventing up- and downstream movement of fish) to fishways²¹⁰ as separate from other habitat and fish and wildlife impacts.

These mitigation requirements provide an opportunity for FERC and the fish and wildlife agencies to use State Wildlife Action Plans, or other comprehensive conservation plans, as a reference for understanding state fish and wildlife diversity, threats, and priorities; helping the agencies to assess protection, mitigation, and enhancement measures and mandatory conditions in relation to the

priorities of the conservation plans as well as the other goals of the FPA under §4(e) and 18.

The best available data on compensatory mitigation required by hydropower licenses come from Environmental Assessments (EAs) and Environmental Impact Statements (EIAs) issued by FERC during the licensing process. For the years 2003 to 2006, FERC issued 70 EAs and final EIAs that itemized mitigation measures. In total, the EAs and EIAs recommended an annual commitment of \$210.3 million to compensatory mitigation annually.²¹¹

7. Natural resource damages

Assessment and compensation for natural resources damages under federal²¹² can be considered another form of compensatory mitigation. While outside the scope of this paper, the use of State Wildlife Action Plans and the other plans referenced here can and should inform the selection of activities to offset the harm caused by spills and other environmental insults.²¹³ Such activities, however, cannot be anticipated and so they are outside the use of the overall mitigation protocol described in this paper.

c. Potential new authorities

i. On-shore energy development

New energy bills are likely to be introduced in the 111th Congress that provide incentives and/or a framework for the siting of conventional and alternative energy facilities on public and private lands. It is conceivable that environmental requirements could be added to this legislation that while facilitating siting

could also include requirements for evaluating environmental impacts and for mitigation.

There is the prospect for reform of electric power transmission in the U.S., both to bring more sources of renewable energy into the power grid, and to take advantage of improvements in technology and efficiency. If Congress adopts legislation to promote or facilitate siting of high voltage transmission across the landscape, it may also decide to impose mitigation requirements (in addition to those already applicable under ESA, §404, and identified under NEPA review). Congress could specify that as a condition for siting and approval of these large-scale, linear infrastructure facilities, habitat avoidance, minimization, and compensation would be required. It would be logical to have such mitigation coordinate with existing large-scale conservation plans. Because much of the existing approval of transmission is under state law (or would require a federal override of state law under new authority), referencing state conservation plans has an attractive logic.

ii. Offshore energy/marine spatial planning

With likely increases in offshore oil and gas and alternative energy (wind, wave) development, there is increasing interest in comprehensive marine spatial planning driven by energy uses. As a result, the federal government and the states might be amenable to supporting legislation that, rather than using a case by case approach to locating offshore energy facilities, would evaluate environmental resources and human uses in coastal waters, identify areas of critical concern, and plan or allocate uses in ways that maximize public benefit while accommodating

energy development. Such a system of marine spatial planning could incorporate elements of the mitigation protocol described here. Most State Wildlife Action Plans do not include consideration of off-shore and marine resources. Organizations such as The Nature Conservancy and some state governments have been creating marine ecoregional assessments that identify critical biological resources in marine waters. These could be used as the basis for marine conservation plans that could guide marine spatial planning. Rhode Island has initiated an Ocean SAMP under the Coastal Zone Management Plan.

iii. Transportation legislation

As noted above, Congress is due to consider a new transportation bill to govern transportation planning and investment for the next six years. In the previous legislation, SAFETEA-LU, Congress built in references to conservation planning in the context of the preparation of long range transportation plans by MPOs and state DOTs.

The next transportation legislation could build on the prior experience by building the mitigation protocol and landscape-based mitigation into project decisions – thus providing accountability for the SAFETEA-LU §6001 planning efforts, which were intended to lead to greater care for state wildlife and conservation priorities when planning new and replacement transportation infrastructure. The legislative basis has been laid by the current authorization legislation.

iv. Habitat regulatory authority

The existing mitigation authorities discussed in preceding sections above afford habitat

protection to aquatic resources including freshwater and tidal wetlands (§404 of the CWA), critical habitat for listed species (federal ESA), impacts to the environment on public lands where required by federal agencies after review (NEPA), and various other habitats (e.g. Federal Power Act). They do not, however, afford specific protection to wildlife habitat overall or even to areas of critical or exceptional habitat that do not support listed species. Nor do they, except in the §404 “Watershed Approach” example, seek to make decisions about avoidance, minimization, and compensation in the context of a larger conservation vision. There have been proposals advanced to create a new regulatory authority, perhaps tied expressly to State Wildlife Action Plans, which would afford protection of general habitat or key habitat identified in State Wildlife Action Plans from impacts from various land uses. Were such legislation to be adopted, it could then be tied to the mitigation protocol and with the next generation of mitigation proposed here. The introduction and passage of such broad legislation, however, does not seem likely in the near future. More targeted legislation tied to energy, marine spatial planning, or transportation offers a more likely prospect for mitigation improvements and expansions.

Incorporating Ecosystem Services

Natural ecosystems provide more than biodiversity values; they support resources and processes that underpin human well-being. These “ecosystem services” – water quality and quantity, pollination of crops, flood mitigation, and recreation opportunities to name a few – have real value. But when such ecosystem benefits are not included in conservation planning, we lose the opportunity to optimize conservation decision-making for nature and people.

According to the comprehensive Millennium Ecosystem Assessment,²¹⁴ ecosystems around the world have declined rapidly and extensively over the past 50 years, primarily as a result of human actions that cleared forests, plowed grasslands, dammed rivers, and overtaxed marine ecosystems. While this use of our natural capital supported significant increases in crop, livestock, and aquaculture production, it has also had a range of negative impacts. The Millennium Ecosystem Assessment estimates that 60 percent of ecosystem services are currently degraded or at risk of collapse, including freshwater, capture fisheries, wild foods, erosion regulation, genetic resources, pollination, and natural hazard mitigation. And pressure on these services is expected to continue. Over the next 50 years demand for food crops is projected to increase by 70-85 percent and demand for water by 30-85 percent. Without a course correction in the management of our natural capital, this will lead to continued conversion of lands and waters and further loss of ecosystem services and biodiversity.

An important step toward addressing impacts to ecosystem services is recognizing their value. For example, a study by Defenders of Wildlife²¹⁵ provides a “first-order approximation” of expected service benefits – from recreation, water supply, water quality, and a range of other services – that would be generated by establishing a national habitat conservation system. This system would focus on conserving unprotected areas identified in State Wildlife Action Plans. The study compares the expected costs of conserving this national system under different approaches (i.e., fee simple, easement, and rental costs) to the system’s expected ecosystem service benefits and finds that benefits outweigh costs under all but one conservation strategy (fee simple plus management option under the low benefit scenario). This suggests that, due to ecosystem service values, conservation investments can result in net public economic benefits and that these investments can be competitive with other types of public investments.

Another important step is the integration of services into regulatory frameworks for planning and mitigation. The wetlands Compensatory Mitigation Rule issued in 2008 takes this step, defining services as “the benefits that human populations receive from functions that occur in ecosystems”²¹⁶ and requiring the consideration of services in mitigation decision-making.²¹⁷ Although the 2008 Compensatory Mitigation Rule requires consideration of services as one of many factors in mitigation determinations, guidance on how to implement this requirement is limited. This reflects the lack of baseline information and assessment methods for ecosystem services. As the Rule’s preamble notes: “Although the services provided by

aquatic resource functions are important to consider when determining the type and location of compensatory mitigation projects, there are few methods available for assessing services. Therefore, in most cases consideration of services will be conducted through best professional judgment.”²¹⁸

Noting the limitations of the Compensatory Mitigation Rule’s guidance and current reliance on “best professional judgment,” Ruhl et al. (2009)²¹⁹ put forward a research agenda for developing a more robust foundation for assessing services. The aim is to: (1) identify the key questions that the Corps and EPA must address under the new ecosystem services provisions; (2) determine the information and methods the Corps and EPA will need to competently answer those questions; and (3) design research to compile information and develop methods. The steps aim to support the “co-evolution of policy and science” for addressing ecosystem services in wetlands mitigation.

In line with the agenda recommended by Ruhl et al. (2009), there is an opportunity to expand our understanding about ecosystem services beyond wetlands, to the wider role wildlife habitat plays in delivering services. Several efforts already underway seek to improve understanding about the service benefits of conservation. For example, the Natural Capital Project – a joint venture of Stanford University, The Nature Conservancy, and World Wildlife Fund – is developing decision support tools to assess the contributions of natural systems to human well-being, including carbon sequestration, drinking and irrigation water, flood mitigation, native pollination, agricultural crop production, and recreation and tourism.²²⁰

Connecting this information to mitigation planning, the Nature Conservancy is advancing a landscape-level planning approach called “Development by Design,” and applying it at a number of pilot project areas. The approach integrates conservation planning and ecosystem services information into the mitigation process, with the aim of more effectively avoiding impacts to priority areas for conservation and services, and identifying opportunities for more resilient, higher value compensatory mitigation.²²¹ Development by Design and the Natural Capital Project are just two of many initiatives that can support improvements in conservation planning frameworks, encouraging the incorporation of ecosystem services and providing a better basis for determining mitigation priorities.

State Wildlife Action Plans are not specifically structured around ecosystem services, but they identify many of the habitats and areas that are important for the function of the natural systems upon which both humans and animals rely. A key feature for improvement of State Wildlife Action Plans will be the identification of important areas for ecological restoration. Restoration priorities can, if well-targeted, result in the support of multiple ecosystem services and synergies with preserved habitats, rendering the latter more effective for both wildlife and other values.

A Vision for the Next Generation of Mitigation in the U.S.

a. Overall conclusions

Our evaluation suggests that (1) a wider application of the mitigation protocol (avoid, minimize, compensate) to existing and future regulatory programs, and (2) a more comprehensive approach to mitigation informed and guided by State Wildlife Action Plans and other federally recognized and regional conservation plans (the next generation of mitigation), can yield more effective conservation outcomes for natural landscapes and whole watersheds than the current piecemeal approach to mitigation. Likewise, (3) reliance on ecologically-meaningful conservation plans allows existing and future compensatory mitigation funds to be directed efficiently and effectively toward restoration and protection priorities, including appropriate mitigation in advance of impacts. Such an integrated approach will more effectively provide meaningful wildlife habitat and sustained ecosystem services.

Findings:

- Infrastructure investments for a growing population and the development and transmission of new sources of energy, will result in extensive impacts on natural systems.
- Between \$3.5 and \$4.5 billion are now spent annually on compensatory mitigation in the U.S., making it one of the largest sources of conservation outlays. Not all of the compensatory mitigation follows the mitigation

protocol, nor is it all guided by regionally specific planning.

- Several of the nation's existing regulatory programs (such as §404 of the CWA and ESA) can provide valuable lessons for the next generation of mitigation.
 - Mitigation programs must set aside sufficient funding to ensure adequate regulatory oversight, planning, and enforcement. These programs must also have a high degree of transparency and accountability to the public for outcomes. Without such components compensatory mitigation is unlikely to achieve its desired objectives.
 - Mitigation programs are evolving to take landscape, ecosystem, and watershed considerations into account. Larger conservation objectives will be difficult to achieve if there continues to be a piecemeal approach to mitigation.
- Impacts can be reduced and ecosystem-scale conservation objectives supported if government programs:
 - Employ the mitigation protocol (avoid, minimize, compensate) when locating, designing, and approving new development and infrastructure; and
 - Use State Wildlife Action Plans and other federally recognized and regional conservation plans to avoid key habitats and to guide compensatory mitigation for unavoidable habitat loss.

Recommendations:

- Federal and state agencies should play a role in supporting the wider application of the mitigation protocol and the ecologically comprehensive approach to mitigation on the landscape.
 - The President’s Council on Environmental Quality (CEQ) should lead an effort to support consistent application of the mitigation protocol across federal agencies and programs.
 - The CEQ and federal agencies should strongly encourage federal agency use of State Wildlife Action Plans and other federally recognized and regional conservation plans for decision-making informed by environmental review under the National Environmental Policy Act.
 - State agencies responsible for permitting and decision-making should apply the mitigation protocol and make use of State Wildlife Action Plans and other federally recognized and regional conservation plans in their own decisions and approvals affecting habitat.
- State Wildlife Action Plans should be continuously improved to ensure that they support mitigation opportunities and decision-making. These Plans can more effectively guide the avoidance of key wildlife habitat, cumulative impact analysis, and the expenditure of compensatory mitigation funds if they set priorities for *protection* of high quality habitat and for *restoration* of important degraded habitat, related natural systems, and connectivity. They can also be improved by incorporating the findings of and referencing other federally recognized state plans.
- Over the long run, federal energy and infrastructure legislation should expressly include requirements to use the mitigation protocol as it is described here in the planning and design of large scale energy facilities on federal lands and waters, in the design and siting of new transmission corridors that involve federal agencies such as the Federal Energy Regulatory Commission (FERC), and in the siting of major energy generating facilities financed through federal programs and loan guarantees. The mitigation protocol should also be incorporated into legislation guiding offshore energy siting for conventional and alternative energy sources.
- A federal agency or institution should be tasked with assessing the outcomes of mitigation on landscape and watershed conservation under all federal statutes and should make periodic recommendations on how to improve mitigation across federal agencies. Among the specific issues that should be evaluated are:
 - The appropriate role of §404 of the Clean Water Act in efforts to deal with the permitting of wetland alterations associated with shoreline protection from sea level rise.
 - Use of the mitigation protocol in the location and expansion of military facilities

- Use of the new generation of mitigation in the planning and location of transportation facilities
- The extent and effectiveness of current avoidance and minimization measures employed across all mitigation programs.
- The availability and quality of the tracking programs (impacts, compensation, monitoring) utilized across all mitigation programs.
- The effectiveness of current cumulative impact analysis conducted across all mitigation programs.
- Despite the substantial scale and scope of the nation’s current mitigation programs, which primarily protect many wetlands, streams, and the habitat of threatened and endangered species, other high value, natural landscapes remain unprotected. Conservation agencies and organizations should explore opportunities to adopt mitigation requirements for impacts to these key areas.

b. Benefits and risks of a more comprehensive approach to mitigation

Employing a landscape or watershed approach to mitigation has several important benefits:

- Understanding the ecological character of whole landscapes or watersheds can provide the framework for understanding what critical resources to avoid when planning for infrastructure development.
- Offsetting damage through mitigation

projects that are of sufficient scale and are located in pivotal locations helps to ensure the successful restoration of those sites and reinforces the health and sustainability of the larger system. This kind of mutual resilience is particularly important given the pressures of climate change.

- Large and connected projects are easier to maintain, manage, and monitor than small mitigation projects or sites scattered across the landscape unconnected by any plan.
- Smaller projects can be more readily maintained, managed, and monitored, including those surrounded by urban land uses, if they are part of an ecological plan that addresses outcomes and relates the parcels to one another in terms of function and landscape.
- Truly functional systems can produce ecosystem services more effectively than fragmented mitigation.
- Comprehensive use of the mitigation protocol and using statewide and landscape scale plans to guide the siting of infrastructure can actually facilitate construction of alternative energy facilities and other infrastructure because it can help to avoid protracted siting conflicts stemming from inadequate scientific information and ill-informed siting decisions.

There are, however, also risks in the more comprehensive approach that should be addressed: Among these is the possibility that development of an effective overall mitigation framework could lead to by-passing the first two steps in the mitigation protocol: avoidance

and minimization. Next generation mitigation approaches will also need to guard against the sacrifice or loss of smaller habitat patches that may be locally important, in the quest for large ecosystem results. In particular, in urban areas, small wetlands and other areas of natural habitat may have particularly important functions including providing the opportunity for urban area residents to experience nature. The new approach should not be used as a justification for the elimination of such sites in favor of larger, more remote blocks of habitat.²²²

Next Steps: A Plan of Action

We propose that the following short term actions be taken to begin the process of moving toward the next generation of mitigation:

- The President's Council on Environmental Quality should convene a multi-agency workshop on the use of the mitigation protocol across federal agencies and on how mitigation could be used more effectively to achieve landscape/watershed scale conservation, considering both climate change and the likely impacts of new infrastructure and conservation investments.
- The U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency should undertake an evaluation of the effectiveness of the agencies' approach to avoidance and minimization and cumulative impact analysis. The agencies should consider developing guidance and tools to support the ability of field staff to undertake this analysis.
- The U.S. Fish and Wildlife Service should meet with the Association of Fish and Wildlife Agencies and with other stakeholders to evaluate how State Wildlife Action Plans could be adapted and coordinated with other natural resource plans to better serve as the framework for the effective use of the mitigation protocol in multiple programs.
- U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration should commit resources to developing effective policies and tools to guide mitigation under the Endangered Species Act, such as: a system to track required mitigation measures, and monitoring; guidance and tools to support cumulative impact analysis; policy that clarifies the role of compensatory mitigation under §7; and research on the ecological effectiveness of the compensatory mitigation measures undertaken under the Act.
- Amendments should be considered to the now pending energy legislation to expressly require use of the mitigation protocol for planning energy projects on federal lands and in federal waters, where the approval of transmission corridors directly involve Federal agencies such as FERC, or that affect federally protected resources as a way of both protecting the environment and improving the regulatory process.
- Building on the limited experience with consultation under SAFETEA-LU, the next transportation authorization bill should expressly refer to the State Wildlife Action Plans, and other regional plans where appropriate, in the sections that deal with project-level evaluation, and should expressly require that the mitigation protocol be employed to support the priorities in these plans.

Chapter Eight

Conclusion

At a time when the resources for conservation in the U.S. are limited and there are many competing needs, the strategic use of the mitigation protocol can save natural habitat by directing development away from sensitive areas and can use compensatory payments in a more targeted and effective way to accomplish restoration on a watershed or landscape scale that would not otherwise be accomplished. Given the real dollars involved, mitigation can be an important tool in restoring and conserving large ecosystems that will be resilient to climate change and to other environmental pressures. While new legislation might be useful in accomplishing this, much progress can be made by adjusting existing laws and regulations and better using the tools already available. And, importantly in today's economic crisis, mitigation used correctly can facilitate investment by helping to avoid environmental conflicts and adequately offset the conflicts that cannot be avoided.

ENDNOTES

- 1 Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19,593, 19,594 (Apr. 10, 2008) [hereinafter Mitigation Rule (2008)] (to be codified at 33 C.F.R. pt. 325). §332.2.
- 2 See Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (2006).
- 3 See American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009) (appropriating about \$150 billion for infrastructure spending, including \$50 billion for transportation infrastructure).
- 4 Environmental Law Institute. 2007. Mitigation of Impacts to Fish and Wildlife Habitat: Estimating Costs and Identifying Opportunities [Hereinafter ELI (2007)].
- 5 ELI (2007).
- 6 40 C.F.R. § 1508.20 (2008). This definition of mitigation has been highly influential on federal agency practice and procedure, although it applies primarily to evaluation of impacts under NEPA.
- 7 16 U.S.C. § 669c (2006).
- 8 See: Ruhl, J. B. and James Salzman, 2006. “The Effects of Wetland Mitigation Banking on People.” *National Wetlands Newsletter*. Vol. 28, No. 2:1. The authors argue that banking facilitates the redistribution of wetland resources from urban to rural areas, reallocating the important environmental services wetlands provide human communities. With no overall framework, important services (flood control, water quality) provided by wetlands can be lost from more urban areas, i.e., these values are not maintained over space. Also, see: Cooke, S.S. 1992. Wetland Buffers: Use and Effectiveness. Appendix A: Wetland buffers – A Field Evaluation of Buffer Effectiveness in Puget Sound. Washington Department of Ecology. Publication No. 92-10. The report shows that 18 of 21 buffers were subjected to a reduction in size over the eight year study period, likely resulting in reduced buffer functions and changes in wetland water quality over time.
- 9 Mitigation Rule (2008).
- 10 16 U.S.C. § 669c.
- 11 See: Association of Fish and Wildlife Agencies, *State Wildlife Action Plans: Eight Required Elements*, http://www.wildlifeactionplan.org/pdfs/eight_elements_handout.pdf (listing eight elements required by Congress).
- 12 Lerner, Jeff. January 2009. “Identified Conservation Opportunity Areas for the Lower 48 States.” Unpublished map.
- 13 The nine “coastal zone enhancement areas” are: wetlands, coastal hazards, public access, marine debris, cumulative and secondary impacts, special area management plans, ocean/Great Lakes resources, energy and government facility citing, and aquaculture.
- 14 For more on the Coastal Zone Enhancement Program, see: NOAA. “Coastal Zone Enhancement Program.” <http://coastalmanagement.noaa.gov/enhanc.html>. (Last viewed April 15, 2009.)
- 15 16 U.S.C. §§ 1453(17), 1455 (2006).
- 16 Food, Conservation, and Energy Act of 2008, 16 U.S.C. § 2101a (2006).
- 17 16 U.S.C. § 2103c (2006).
- 18 *Id.* § 2103c(e).
- 19 U.S. Fish and Wildlife Service, Sacramento Fish & Wildlife Office. “Recovery Planning.” <http://www.fws.gov/sacramento/es/recovery.htm>. (Last viewed June 11, 2009.)
- 20 16 U.S.C. §1533(f)(1)(B).
- 21 U.S. Fish and Wildlife Service, Sacramento Fish & Wildlife Office. “Recovery Planning.” <http://www.fws.gov/sacramento/es/recovery.htm>. (Last viewed June 11, 2009.)
- 22 U.S. Fish and Wildlife Service. “Species reports.” http://ecos.fws.gov/tess_public/SpeciesRecovery.do?sort=1. (Last visited June 11, 2009.)
- 23 16 U.S.C. § 64 (2006).
- 24 Ducks Unlimited. “North American Waterfowl Management Plan.” <http://www.ducks.org/Conservation/GovernmentAffairs/1623/NAWMP.html>. (Last viewed April 15, 2009.)
- 25 H.R.7150, 110th Cong. (2008); S. 3552, 110th Cong. (2008).
- 26 For more, see: National Fish Habitat Action Plan. “National Fish Habitat Action Plan.” <http://fishhabitat.org>. (Last visited April 15, 2009.)

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- 27 Environmental Law Institute. 2006. The Nature of Open Space Programs: Linking Land Protection and Biodiversity Conservation, available at: http://www.elistore.org/reports_detail.asp?ID=11190.
- 28 Western Governors' Association. "Western Governors' Wildlife Council." <http://www.westgov.org/wga/initiatives/corridors/index.htm>. (Last visited April 24, 2009.)
- 29 Western Governors' Association. June 29, 2008. "Wildlife Corridors Initiative Report."
- 30 Mitigation Rule (2008), §332.2.
- 31 Mitigation Rule (2008), §332.3(c)(1).
- 32 42 U.S.C. § 4321 (2006).
- 33 40 C.F.R. § 1508.20.
- 34 *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 332-52 (1989) ("There is a fundamental distinction, however, between a requirement that mitigation be discussed in sufficient detail to ensure that environmental consequences have been fairly evaluated, on the one hand, and a substantive requirement that a complete mitigation plan be actually formulated and adopted.").
- 35 43 U.S.C. § 1732(b) (2006).
- 36 16 U.S.C. § 551 (2006).
- 37 40 C.F.R. § 1508.13.
- 38 *See, e.g., Cabinet Mountains Wilderness/Scotchman's Peak Grizzly Bears v. Peterson*, 685 F.2d 678 (D.C. Cir. 1982) (mitigating FONSI).
- 39 42 U.S.C. §§ 4332(1), 4335.
- 40 J. Mintz, "Taking Congress's Words Seriously: Towards a Sound Construction of NEPA's Long Overlooked Interpretation Mandate," 38 *Env'tl. Law* 1031 (2008); see also Environmental Law Institute. 1995. *Rediscovering the Environmental Policy Act: Back to the Future*, available at http://www.elistore.org/reports_detail.asp?ID=376&topic=NEPA
- 41 D. Mandelker. 1993. *NEPA Law & Litigation* (2d. ed.) Clark Boardman Callaghan.
- 42 CAL. PUB. RES. CODE § 21083.4 (2005).
- 43 33 U.S.C. § 1344 (2006).
- 44 40 C.F.R. § 230 (2008).
- 45 33 C.F.R. 320.4(r).
- 46 Memorandum of Agreement Between the Environmental Protection Agency and the Department of Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines," Feb. 6, 1990.
- 47 Compensatory mitigation had long been recognized under §404 as well as other programs but assumed even greater importance after the senior George Bush's administration's commitment to "no net loss" of wetlands was announced in 1989.
- 48 U.S. Corps of Engineers, San Francisco District. "Mitigation Sequence: Avoidance, Minimization, then Compensation." <http://www.spn.usace.army.mil/regulatory/amc.htm>. (Last visited May 28, 2009.)
- 49 Mitigation Rule (2008), §332.3(a)(2).
- 50 Mitigation Rule (2008), §332.3(h).
- 51 Mitigation Rule (2008), §332.1(c).
- 52 Mitigation Rule (2008), 332.3(c)(3)(i).
- 53 "Under no circumstances" may the "same" compensation credits be used to provide mitigation for more than one permitted activity, but where appropriate mitigation projects may be designed to "holistically address requirements under multiple programs for the same activity" such as compensatory mitigation under the Endangered Species Act for the activity (Mitigation Rule (2008), §332.3(j)(1)(ii)(3)). Moreover, "credits for compensatory mitigation projects on public land must be based solely on aquatic resource functions provided by the compensatory mitigation project, over and above those provided by public programs already planned or in place" (Mitigation Rule (2008), §332.3(a)(3)).
- 54 16 U.S.C. § 1536(a)(2).
- 55 Personal communication with U.S. FWS staff, Section 7 Consultations, U.S. FWS, in Arlington, Va. (May 2006).
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76 ELI (2007).
77 There are no specific data available for mitigation expenditures that may get undertaken as part of the vast scope of ESA Section 7 consultations. Data on mitigation costs associated with Section 10 habitat conservation plans and incidental take permits (HCP/ITPs) are available and more thorough, although they are not complete.
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79 Although the Corps makes available statistics on the acreage of wetland impacts permitted and the amount of compensatory mitigation it requires on an annual basis, the last year for which these data are available is FY2003. In addition, although the Corps reports the acreage of compensatory mitigation that was *required* as part of its permit and project approvals, these numbers do not provide any insight into whether the amount of wetland compensation required was actually *carried out*, or whether, if carried out, it met performance standards and proved to be sustainable. Moreover, the Corps’ own data do not include statistics on the total amount of *stream* compensation required or conducted, in FY2003 or in any other year – a significant data gap.
80 Note that the Corps states that “The values for FY 01, FY 02, and FY 04-06 requested acres are estimates only, errors in data reporting are being investigated.” U.S. Army Corps of Engineers. 2007. “Wetland Impacts and Mitigation.”
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