

Habitat Conservation Opportunities in Natural Hazard Areas

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1. Abstract

The University of North Carolina Institute for the Environment (IE) and the Environmental Law Institute (ELI) jointly conducted a study to identify opportunities to further the implementation of the State Wildlife Action Plans by coordinating habitat conservation and hazard mitigation planning in areas at risk of flooding and other natural hazards, through illustrative mapping of priority habitats, innovative funding, and improved policies that both facilitate wildlife conservation and address the challenges and opportunities posed by climate change. The study found that while many opportunities for coordinated planning and leveraging of funding exist, numerous obstacles must be overcome, including a lack of awareness of, and commitment to, SWAPs. Most local planners interviewed never heard of SWAPs. In addition, while local land use plans contain policies for protecting wildlife, none mention State Wildlife Action plans specifically. Local hazard mitigation plans and planners tend to focus on mitigating the impact of disasters, not on protecting wildlife. Of the 11 federal mitigation and incentive-based programs analyzed, all could contribute to restoration efforts that provide both natural flood damage reduction and habitat conservation benefits. Several of the programs contain guidelines or regulations that explicitly include wildlife conservation as a goal or required outcome of program activities (e.g., wetland compensation under the Clean Water Act). Finally, we analyzed five federal programs that govern floodplain and coastal management. In general, these programs have yet to incorporate climate change in mapping, planning, and risk assessment efforts.

2. Introduction

Implementation of the State Wildlife Action Plans occurs within a broader institutional framework of federal, state and local planning for biodiversity, land use, natural hazards and coastal management. This framework presents opportunities for, and obstacles to, achieving wildlife conservation goals. Federal agencies responsible for wildlife conservation and hazard mitigation could coordinate their planning and investments to prevent development in natural hazard areas while simultaneously preserving or restoring critical wildlife habitat. For example, federal buyout projects, administered by the Federal Emergency Management Agency (FEMA), have been used to remove flood-damaged homes from floodplains and to keep people and property from harm's way. Once the homes are removed, the buyout areas serve as permanent greenways and habitat corridors along rivers.

At the state and local level, disaster mitigation plans could play a crucial role in preserving wildlife habitat. Under the federal Disaster Mitigation Act of 2000 (P.L. 106-390), state and local governments are required to prepare hazard mitigation plans as a condition of receiving federal disaster assistance. The plans must include an assessment of the risks posed by natural hazards, such as flooding and coastal storms, and a strategy to reduce the risks. Strategies may include acquiring or discouraging development in the most hazard-prone lands to reduce risks to people and property. These lands could also serve as valuable wildlife habitat. State and local land use plans and policies might include provisions that could facilitate the protection of wildlife habitat and discourage development in natural hazard areas. State-wide land use policies or goals often include elements that support the goals of State Wildlife Action Plans, such as conservation of natural resources, wildlife, forests, and critical natural areas.

The project consisted of five main parts: (a) identification of where priority habitat overlaps with natural hazards, (b) interviews with state and local land use planners and hazard mitigation planners, (c) analysis of state and local policies and plans for land use and hazard mitigation, (d) analysis of federal mitigation funding opportunities to protect wildlife habitat, and (e) evaluation of federal programs that govern floodplain and coastal management to determine whether they address climate change. We also conducted two case studies to illustrate the potential for using federal mitigation programs to fund conservation or restoration of wildlife habitat. Each of these five parts is described in more detail in Section 4: Approach. Section 6 provides recommendations for improving implementation of the State Wildlife Action Plans.

3. Purpose

The purpose of this project was to identify opportunities for wildlife conservation in areas where priority habitat overlaps with natural hazard areas and to examine whether the habitat conservation goals of the State Wildlife Action Plans are supported by the plans, programs and policies that govern development and fund restoration in such areas. In addition, we sought to identify opportunities to use mitigation funds and public investments to fund restoration projects where priority habitats overlap hazard areas and provide recommendations for changes in federal policies to strengthen support for wildlife conservation in general and the State Wildlife Action Plans in particular, as well to improve the integration of climate science.

4. Approach

This section describes the methods used to collect and analyze the data in the study. Table 1 provides a brief summary of the research questions, methods, and how the data was analyzed. In short, we used a multi-method approach that included interviews with key state and local officials, analysis of state and local land use and hazard mitigation plans, case studies of mitigation funding opportunities and a review of relevant federal policies and programs.

A. Overlap between priority habitat areas and natural hazards

Identifying areas where priority habitat overlapped with natural hazards involved three main steps: selection of states for analysis, selecting sites within those states, and using GIS to overlay maps of priority habitat with natural hazard areas. Each of these three steps is described below.

Table 1: Summary of Questions, Methods and Analysis

Research Question	Method	Data Analysis
Overlap of priority habitat and natural hazard areas	Overlay hazard maps with habitat maps in State Wildlife Action Plans	Compare GIS layers for natural hazard and habitat areas
Level of support of state plans/policies for wildlife conservation	Analysis of state and local land use and hazard mitigation plans in three states	Scoring on plan quality analysis protocol
Level of awareness and commitment to State Wildlife Action Plans	Interviews with state and local officials in three states	Qualitative analysis of interviews
Potential for using mitigation funding	Analysis of programs and investments plus two case studies (including interviews)	Qualitative analysis of interviews and literature
Federal policy changes needed	Analysis of relevant federal policies and plans	Qualitative analysis of interviews and literature

1. Selection of states

We selected three sites, one each in Florida, Washington and Wisconsin, based on the criteria described briefly below as well as input from our advisory panel (Appendix A lists the members of the panel). Figure 1 (page 11) shows the location of the three study sites. None of the sites selected met all of the criteria.

Criteria for selection

State-wide land use plan or goals – We selected from among states with strong land use planning roles so we could examine whether state plans or planning goals support or undermine the goals of State Wildlife Action Plans. At least 13 states have adopted state-wide goals or plans including California, Oregon, Washington, Wisconsin, Florida, Georgia, Tennessee, North Carolina, Maryland, New Jersey, Rhode Island, Vermont, Maine, and Hawaii.

Large scale restoration efforts – We sought states with on-going, large scale, ecosystem restoration projects or initiatives in floodplain and coastal areas in order to develop case studies illustrating opportunities to use mitigation funding and other policy tools for ecosystem restoration.

Quality and availability hazard maps in GIS format – We sought states with updated flood maps along with GIS based maps for other hazards such as forest fires.

Quality of habitat prioritization maps in GIS format – We selected from those states that have detailed SWAP habitat prioritization maps in GIS format. Some states, such as Florida, have very detailed habitat prioritization maps in GIS, while others, such as California, lack such maps altogether.

Diversity of geography and natural hazards – We sought states that together gave us geographic variation within the United States (East, Midwest, West) as well as diversity in the type of natural hazards present, e.g., flooding, forest fires, and liquefaction from earthquakes.

2. Selection of individual sites within states

In selecting a site within each state, we sought places where there was/were: (1) an ecosystem or habitat restoration effort planned or underway, (2) overlap between natural hazard areas and priority habitat, (3) land use and hazard mitigation plans at the county level, (4) county and local governments that were willing to cooperate with us in the study; that is, were willing to share information and be interviewed. Below is a brief summary of each of the three sites selected.

Washington: Snohomish River Basin

The Snohomish River basin spans 1,856 square miles in King and Snohomish Counties and contains about 2,718 miles of perennial streams (see map in Appendix B). There is considerable growth pressure from the Seattle CMSA in the western stretches of the basin and little urban development throughout the remainder of the basin. The dominant natural hazards within the basin are riverine flooding and liquefaction from earthquakes with the greatest risk often overlapping with areas of flood risk where hydric soils are present. Extensive salmon restoration efforts are in progress within the Snohomish River Basin with the focus on rivers, streams, estuaries, riparian areas, and some upland habitat. Areas of elevated SWAP priority habitat are clustered throughout the basin while areas of overlap with natural hazard areas are concentrated along riverine corridors.

We selected the Snohomish River basin as a study site because of the expansive GIS data coverage for hazards and priority habitat, detailed SWAP wildlife prioritization, numerous areas of overlap between multiple hazards and priority habitat, active salmon restoration efforts, and the recommendations of numerous state and local wildlife agencies.

Wisconsin: Jefferson and Waukesha Counties

These two counties lie within the Rock River Basin in Wisconsin (see map in Appendix B). Located in the south central part of the state, the Rock River basin spans 3800 square miles and contains 3900 miles of perennial streams. The basin includes 10 counties and close to 800,000 people; Jefferson and Waukesha counties account for 1163 square miles and 460,000 people. The dominant natural hazard throughout this basin is flooding with numerous wide floodplains from the Rock River and its many tributaries. The basin also contains significant concentrations of degraded wetlands, classified as potentially restorable wetlands (PRW) by the Wisconsin Department of natural resources. Wisconsin is actively restoring PRWs in coordination with federal and local partners. Within the basin, there are a few clusters of SWAP priority habitat, including a significant area of “Global” importance (highest priority) along with several smaller areas of “Upper Midwest” and “State” importance. These priority habitat areas overlap hazard zones as floodplains cross all of these habitat areas. Jefferson and Waukesha Counties are in the southeast portion of this basin in

close proximity to the majority of these priority habitat areas, especially the areas of global significance.

Florida: Osceola and Polk Counties

These counties flank the southern boundary of Orange County where Orlando is located (see Figure 2, page 12). Collectively, the two counties span over 3,500 square miles and include over 800,000 people. The dominant natural hazard throughout the site area is wildfire. The area has one of the larger concentrations of elevated fire susceptibility in the state and the entire South, as determined by the Southern Wildfire Risk Assessment, a spatial risk assessment produced by the Southern Group of State Foresters that identifies wildfire-prone areas in the 13-state region. The area also has one of the largest concentrations of SWAP high priority habitat in the state, of which there is considerable overlap with fire risk. Furthermore, due to the Florida Fish and Wildlife Commission's Upland Ecosystem Restoration Project, there are considerable habitat restoration and fire risk mitigation efforts in Osceola County.

We selected Osceola and Polk Counties as a study site because of the excellent GIS data coverage for hazards and habitat, high concentrations of SWAP priority habitat and areas of elevated fire risk, numerous areas of overlap between fire hazards and priority habitat, numerous municipalities within the vicinity, and active local restoration efforts.

3. Identifying areas where priority habitat overlaps with natural hazards

Using GIS, we determined the extent of overlap between hazard zones and priority habitat for the states we selected. This analysis helped inform our selection of individual study sites as it was critical that each site have significant areas of overlap. These areas are where coordination among state and local offices of emergency management, wildlife agencies, and planning departments would be beneficial. A more detailed description of the GIS analysis is provided in Appendix C.

B. Interviews with State and Local Officials

In order to assess the level of awareness of, and commitment to, the goals and policies of the state wildlife plan at the state and local level in our study areas, we conducted interviews with state and local officials from various agencies and departments. For example, we interviewed local land use planners, state and local hazard mitigation planners, representatives from state wildlife agencies, state planning agencies and local nonprofit organizations.

We developed a questionnaire to examine the level of commitment to wildlife planning and local awareness of the State Wildlife Action Plan (See Appendix E). The interview script provided project background information about the project and explained the purpose of the survey within the larger project goals. Interviews, which generally took 30-45 minutes, were conducted primarily in-person in Washington and Wisconsin and by telephone for the remaining respondents and in Florida.

Interviewees were identified through an iterative process beginning with a web search of the agency's staff listing. If no particular staff member could be identified, we contacted the main agency phone number and used a modified "snowball technique" to identify the appropriate person to interview. We did not tape the interviews, with the exception of a few in-person interviews in Washington. Most interviewees requested that they remain anonymous.

In total, we conducted 30 interviews with 32 individuals—two interviews had two participants. We conducted three interviews with restoration ecologists who were recommended by other contacts, but excluded them from our analysis because they could not be classified as either land use or hazard mitigation planners. These restoration ecologists, however, were helpful in understanding the specific ecological issues at each of our study sites and provided important local context. Of the remaining 27 eligible interviews, 17 were with land use or comprehensive planners and 10 were with hazard mitigation or emergency management planners. The interviews were analyzed by grouping hazard mitigation and land use planner responses. Responses were compared across question categories to assess commitment to wildlife planning, and awareness of, and commitment to, the State Wildlife Action Plan, by profession. These responses were grouped, where appropriate, by categories based upon close-ended or open-ended answers.

We conducted fewer interviews with local officials than we had planned, primarily because many of the small municipalities located within our study areas did not have a planning staff or hazard mitigation specialist to interview. Many municipalities simply adopted their respective county's hazard mitigation plan rather than develop their own. Also, many local officials declined to be interviewed due to additional workloads caused by staff cutbacks. Many people simply could not take the time to be interviewed. The majority of our interviews were conducted by phone, but during the interim-project trip to Seattle, we were able to interview most of our Washington key informants in person. During these interviews, our contacts also made suggestions for additional interviews.

C. Analysis of State and Local Policies and Plans

We developed an instrument or protocol for analyzing (a) hazard mitigation and (b) land use plans (separate instruments for each type of plan) to determine whether they support or undermine the goals of State Wildlife Action Plans. Both plan analysis protocols contain specific questions to assess the level of support (a copy of the protocols is in Appendix F) covering many aspects of plans including goals, policies, coordination, implementation, and supporting factual and background information.

Using the protocol, we analyzed land use and hazard mitigation plans at the local level (county and municipality) within the geographic extent of our study sites. We also analyzed state hazard mitigation plans for the three states we selected. We did not use the two protocols to analyze state land use policies, since these states have only general land use requirements and guidelines for local jurisdictions as opposed to land use plans. Instead, we relied on a simpler and less formal method of analysis that determined whether the state requirements and guidelines undermined or supported the goals of the SWAP. Nearly all of the local jurisdictions within our three study sites have adopted land use plans, but only a portion of them have hazard mitigation plans, as many municipalities simply rely on county plans.

D. Analysis of Federal Mitigation Funding Opportunities

We identified and analyzed eleven federal mitigation and incentive-based programs that could be directed to large-scale restoration in hazard prone areas. The mitigation programs we evaluated include: wetland mitigation under §404 of the Clean Water Act; mitigation for impacts from U.S. Army Corps of Engineers water resources development projects, habitat mitigation/conservation banking under the Endangered Species Act; natural resource damage assessments under the Comprehensive Environmental Response, Compensation, and Liability Act, Oil Pollution Act of

1990, Park System Resources Protection Act, and National Marine Sanctuaries Act; and floodplain management permits under the National Flood Insurance Program. We also included an analysis of two market-based programs: water quality trading and carbon offsets. Finally, we evaluated four types of incentive programs including the Conservation Reserve Program, Wetlands Reserve Program, Emergency Watershed Program Floodplain Easements, and Hazard Mitigation Grants. We discuss the opportunities and challenges for using these programs for restoration in hazard areas (see Appendix G).

E. Evaluation of Federal Programs and Policies

Funding programs

We conducted an analysis of the literature, including ELI's previous research on compensatory mitigation policy, to evaluate each mitigation and incentive program. Where applicable we examined the statutes, regulations, and guidance documents that govern the programs. For the case studies, we conducted interviews with local planners and managers to determine how various mitigation and public investment programs are used to fund ecosystem restoration in the selected locations.

Federal policy analysis

To begin, we conducted a thorough search of all laws and policies that regulate activities in natural hazard areas. We selected the five programs - the National Flood Insurance Program, U.S. Army Corps of Engineers Water Resources Development Program, the Clean Water Act, the Stafford Act, and the Coastal Zone Management Act – that play the largest role in the management and regulation of floodplains and coastal areas. We conducted a qualitative analysis of the relevant literature to evaluate each programs. We also examined the statutes, regulations, and guidance documents that govern the programs. Finally, we spoke with federal agencies representatives from the U.S. Environmental Protection Agency, U.S. Federal Emergency Management Agency, and the U.S. Army Corps of Engineers for insight on the implementation of these policies and programs and to determine the extent to which the agencies place are integrating climate change in their programs.

5. Summary of Results

Below is a brief summary of the results from the five main parts of the study, followed by recommendations for improving implementation of State Wildlife Action Plans. Figure 1 shows the location of the three sites included in the study.

A. Overlap between priority habitat areas and natural hazards

Considerable overlap exists at each of the three study sites

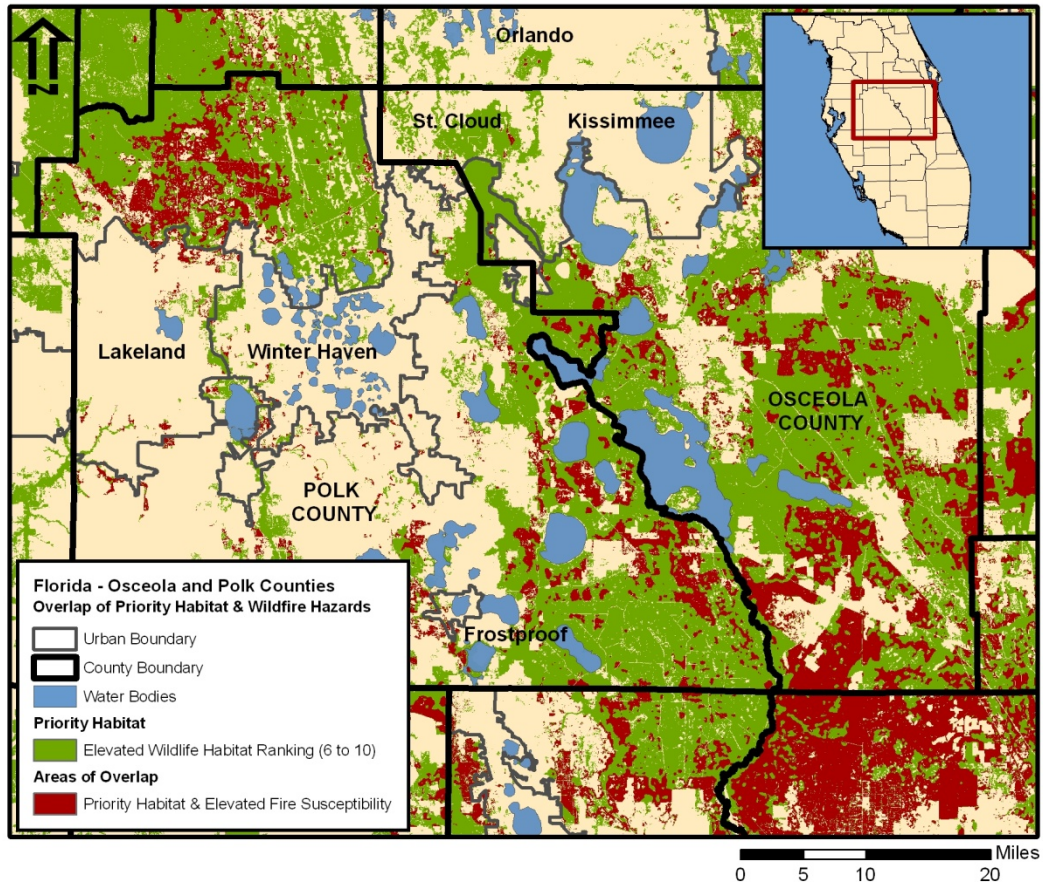
Using GIS, we found numerous areas of overlap between priority habitat, as determined by State Wildlife Action Plans (SWAPs), and hazard zones such as floodplains and areas of elevated wildfire risk. These areas of overlap represent places where state and local planning departments, wildlife agencies, and offices of emergency management could collaborate to protect wildlife habitat and reduce the impact of natural hazards on people and property.

Figure 1: Study Sites



The degree of overlap between priority habitat and natural hazard areas varies among the three sites. At the Wisconsin site, areas of overlap consist of long, narrow bands of land within riparian areas. Similarly, at the Washington site, areas of overlap consist of narrow, fragmented clusters of land along floodplains, especially in the central and western stretches of the Snohomish River Basin. Here, priority habitat is comprised of shorter bands of land intermittently spread throughout the basin and overlapping, in places, with liquefaction zones, often within floodplains. Finally, at the Florida study site, areas of overlap consist of large swaths of land designated as priority habitat occurring in areas prone to wildfire. Figure 2 shows areas of overlap in Osceola and Polk Counties, Florida. Maps showing areas of overlap at the other two study sites can be found in Appendix B.

Figure 2: Areas of Overlap in Osceola and Polk Counties, Florida



B. Interviews with State and Local Officials

Preserving wildlife habitat not part of local planners’ mission

Of the 27 state, county, and municipal land use and hazard mitigation planners who were asked whether preserving wildlife habitat or biodiversity was part of their agency’s mission, only five said yes (Table 2). Some respondents stated that they consider wildlife habitat in their work only if triggered by state or federal law, such as a permit to fill wetlands. Others reported that wildlife concerns were addressed indirectly, e.g., through policies to protect floodplains from development.

Table 2: Agency Mission to Preserve Wildlife Habitat

Is preserving wildlife habitat or biodiversity part of your agency or office's mission?			
	Land Use Planners	Hazard Mitigation Planners	Total
Yes	5	0	5
Per Laws / Regulations	9	2	11
Indirectly	3	5	8
No	0	3	3
Total	17	10	27

In general, hazard mitigation planners viewed their primary responsibilities as the prevention of loss of life and property from disasters, not protecting wildlife habitat. A hazard mitigation planning consultant from Wisconsin stated that wildlife is often a hindrance and will prevent a project from being completed, illustrating the narrow focus of hazard mitigation planners.

Awareness of SWAPs is lacking

Of the 27 people interviewed, only three had heard of State Wildlife Action Plans (Table 3). These three respondents, however, also noted that their respective jurisdictions did not use the SWAP, opting instead for more familiar sources of information on wildlife habitat and species, such as Priority Species and Habitats maps produced by the Department of Fish and Wildlife. A county land use planner from Florida noted that there was no institutional knowledge of the SWAP in her jurisdiction and that the SWAP goals and objectives were not included in their local plans and policies. Local land use planners across the three states mentioned that their respective state wildlife agencies often produced plans as a requirement of federal regulations, but did not share the information with local agencies. All ten hazard mitigation planners interviewed were unfamiliar with the State Wildlife Action Plan, reflecting a need for greater outreach on the part of state wildlife agencies.

Table 3: Awareness of State Wildlife Action Plan

Are you familiar with your state's SWAP?			
	Land Use Planners	Hazard Mitigation Planners	Total
Yes	3	0	3
No	14	10	24
Total	17	10	27

Coordination lacking among wildlife, planning and hazard mitigation planners

Only 8 of the 27 interviewees stated that they coordinated directly with the SWAP implementing agency on a regular basis (Table 4). One county planner from Florida mentioned that the Fish and Wildlife Conservation Commission was on her speed-dial. However, several respondents stated that their coordination with the SWAP agency was situational, project-based, or occurred only when necessary. Four land use planners responded that they did not coordinate with their SWAP agency, mentioning instead another state-level environmental agency.

Table 4: Coordination with the SWAP Implementing Agency

Do you coordinate with the SWAP implementing agency on your plans, projects, or activities?			
	Land Use Planners	Hazard Mitigation Planners	Total
Yes	6	2	8
Somewhat	6	3	9
No	4	4	8
No Answer	1	1	2
Total	17	10	27

Among hazard mitigation planners, only two respondents indicated that they coordinate on flood management and habitat issues with their respective SWAP implementing agency. A municipal hazard mitigation planner in Washington said that while recovery from flood damage is their primary concern, coordination with the Department of Fish and Wildlife would be situational and likely related to projects like floodplain restoration.

C. Analysis of State and Local Policies and Plans

Few local plans contain explicit goals to protect wildlife habitat

Most land use or hazard mitigation plans examined contain vague goals to protect wildlife habitat. In general, the goals do not specifically mention wildlife habitat, but instead discuss protecting ecosystems, natural resources, or sensitive environments. Many of these terms include wildlife habitat in their definitions.

SWAPs not mentioned in local land use or hazard mitigation plans

Of the 24 local land use and hazard mitigation plans examined, none specifically mention the SWAP (nearly all of the local plans were adopted or amended after the SWAP adoption date). This reflects a lack of awareness of SWAPS and the lack of involvement on the part of wildlife agencies in the preparation of land use or hazard mitigation plans. Conversely, few local planners or hazard mitigation planners were involved in the preparation of the SWAPs.

Local plans contain policies to protect wildlife habitat

Although SWAPs were not mentioned specifically, all of the land use plans examined contained policies to protect wildlife habitat and to discourage development in floodplains, wetlands or other natural hazard areas that could be used for wildlife habitat. These plans included specific implementation actions or mechanisms, such as land acquisition or zoning regulations. Table 5 shows the number of plans that included specific policies for wildlife habitat protection out of the 24 plans examined. Policies to protect wildlife habitat were found in only two of the hazard mitigation plans examined. Most (5 of 8) of these plans included policies to discourage development in natural hazard areas.

Table 5: Local Land Use Plan Policies to Protect Wildlife Habitat

Land Use Policy	Count
General protection of Wildlife Habitat	15
Zoning regulations	8
On site transfer of development rights / cluster ordinance	8
Land acquisition	8
Habitat restoration	6
Buffers (general habitat)	6
Preservation of contiguous corridors of habitat	6
Coordination with other jurisdictions	5
General land use regulations	3
Protection of endangered species habitat	2
Open space regulations	2
Incentives to keep land in natural state	2
Lowimpact design ordinance	2
Site assessment and habitat management plan	2
Off site transfer of development rights	2
Compact land use patterns	1

State land use policies support protection of wildlife habitat

Statewide land use policies in the three states included in our analysis either require or encourage local jurisdictions to steer growth away from natural areas that could provide wildlife habitat, such as wetlands, forests and floodplains. For example, Washington requires that local land use plans direct growth away from critical areas, which include wetlands, aquifer recharge areas, hazard zones, and

fish and wild life habitat. Wisconsin has adopted 14 general goals that local jurisdictions should consider when developing comprehensive plans. Two of these goals are designed to protect environmental corridors, which include wetlands, floodplain, forests, and wildlife habitat. The incorporation of these goals into land use plans by local jurisdictions is voluntary, although in 2010 this process will become mandatory. Florida's Growth Management Act requires local governments to include in their land development regulations, policies to protect key natural areas including wildlife corridors, rare native natural systems, areas with high biological diversity, and lands that serve as critical habitats for threatened and endangered species. The coastal management sections of local comprehensive plans in Florida must also include a land use inventory that incorporates wildlife habitat as a basis for coastal land use planning.

D. Analysis of Federal Mitigation Funding Opportunities

Federal programs can be used to restore wildlife habitat

Of the 11 federal mitigation and incentive-based programs analyzed, all could contribute to restoration efforts that provide both natural flood damage reduction and habitat conservation benefits. Several of the programs contain guidelines or regulations that explicitly include wildlife conservation as a goal or required outcome of program activities (e.g., wetland compensation under the Clean Water Act, Wetland Reserve Program, and the Conservation Reserve Program). Others provide indirect benefits for habitat and wildlife conservation, but do not contain program guidelines that specifically include restoration or conservation goals (e.g., Emergency Watershed Program Floodplain Easements and Hazard Mitigation Grant Programs).

Two case studies illustrate how certain mitigation and incentive programs can be used to fund the restoration of priority habitats in floodplains and coastal areas. The two case studies are summarized briefly below and provided in more detail in Appendix H. In both cases, a local or regional habitat restoration plan, along with coordination among regulatory and wildlife agencies, helped to direct mitigation projects to priority sites identified for restoration.

Case Studies of Mitigation Funding Opportunities

Case Study #1: Snohomish River Basin Estuary, Washington

In the Snohomish River Basin Estuary in Washington, habitat restoration is guided by the Snohomish River Basin Salmon Conservation Plan. The restoration efforts outlined in the plan, designed to protect and restore habitat for listed salmon species, have been supported by an array of restoration funding sources. Restoration managers have also creatively sought to use mitigation and incentive funding to support restoration goals. The Salmon Conservation Plan outlined priority sites for conservation and restoration, providing a structure to site mitigation projects in locations identified as priorities for habitat restoration and flood hazard reduction in the Basin.

Case Study #2: Rock River Basin, Wisconsin

The Rock River Basin in Wisconsin is a region of both extensive agriculture (73 percent of the land area in the Basin) and expanding urban areas. The Wisconsin Department of Natural Resources recently developed a map of the potentially restorable wetlands in the Rock River Basin to improve the capacity of the agencies to implement wetland management at the watershed scale. Wetland restoration in the area has been funded by a variety of incentive and mitigation sources, including Farm Bill programs such as the Wetland Reserve Program and the Emergency Watershed Protection Program Floodplain Easement Program and several wetland mitigation banks.

Lessons Learned

The two case studies provide several lessons for the successful implementation of mitigation and incentive funding for large-scale ecosystem restoration in hazard-prone areas:

1. Local or state habitat restoration plans can help guide the siting of mitigation and incentive program projects in areas that have been identified as priorities for providing multiple benefits, including wildlife conservation and flood hazard protection.
2. Coordination among regulatory agencies and wildlife agencies can help to direct mitigation projects to identified priority sites.
3. Knowledgeable local governments and non-profit organizations can help ensure that mitigation or other incentive program projects help meet watershed goals.

E. Evaluation of Federal Programs and policies

Most federal programs do not explicitly address climate change

We reviewed five federal programs, summarized below, that govern floodplain and coastal management and provide recommendations, in Section 5, for changes to these program's policies to help improve the integration of climate change while promoting the conservation of wildlife habitat in hazard prone areas. In general, these programs have yet to incorporate climate change in mapping, planning, and risk assessment efforts. For example, we examined 48 state hazard mitigation plans to assess how each state plan is currently addressing climate change (see Appendix I). Half of the states did not mention climate change in their hazard mitigation plan at all. Eight states gave only brief mention to how climate change may affect natural hazard risk. A few states, however, have begun to explicitly include climate change in their assessment of risk. Several states have developed mitigation strategies to address these new risks (6 states). These states may serve as models for other states on how to incorporate climate change into every part of hazard mitigation planning, including risk assessment, mitigation strategies, and local planning coordination.

Summary of Federal Programs on Floodplains and Coastal Management

The National Flood Insurance Program – The National Flood Insurance Program enables property owners in participating communities to purchase flood insurance through the federal government as financial protection against flood damage. In exchange, participating communities must enact floodplain management ordinances and permit programs to reduce future flood risk to new development in floodplains. The Program has three basic components: 1) floodplain identification and mapping, 2) floodplain management, and 3) flood insurance.

U.S. Army Corps of Engineers Civil Works – Water Resources Management Flood Control Program – The U.S. Army Corps of Engineers Civil Works Program is responsible for planning and implementing structural, and to a lesser extent, non-structural water resources and flood control projects. The “Economic and Environmental Principles for Water and Related Land Resources Implementation Studies” guides all federal water and related land resources planning for the major federal water resources development agencies, including the Corps. The Principles and Guidelines are currently undergoing a congressionally mandated revision.

Clean Water Act: Section 404 – Section 404 of the Clean Water Act is the primary tool used to regulate impacts to the nation's wetlands and aquatic resources. Administration of the 404 program is split between the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. The Corps has responsibility for the day-to-day permitting activity. The 404 program is guided by two national goals: 1) the purpose of the Clean Water Act to “restore and maintain the chemical,

physical, and biological integrity of the Nation’s waters,” and 2) the national goal, set in 1989, to achieve “no net loss” of wetland acres and functions.”

Robert T. Stafford Disaster Relief and Emergency Assistance Act – The Stafford Act provides a means of Federal assistance for state and local governments to mitigate, prepare for, respond to, and recover from major disasters. The Act authorizes the President to issue disaster declarations in response to major disasters. In addition to disaster relief, the Act encourages states and local governments to establish measures to mitigate damage due to natural disasters through a mitigation planning requirement and mitigation grant programs.

Coastal Zone Management Act – The Coastal Zone Management Act (CZMA) establishes a voluntary program to offer cost-share grants to coastal states, including Great Lakes States and U.S. territories, to develop and implement comprehensive coastal zone management programs to coordinate economic development and natural resource protection in the coastal zone. Each program outlines how the state will regulate land and water uses within an identified coastal zone in coordination with local, state, and regional agencies and plans. The Act also give states with approved coastal zone management plans the authority to determine whether federal actions conducted in the coastal zone are consistent with the federally approved state plans.

6. Recommendations

Improve Awareness of SWAPS

Based on our interviews, it appears that local land use and hazard mitigation planners are unaware of State Wildlife Action Plans. Local plans and decisions about land use or natural hazards cannot incorporate information from SWAPS, e.g., about the location of priority habitat, if planners do not even know the SWAPs exist. Agencies implementing the SWAPs need to improve their outreach with local officials and provide information about the SWAPs at seminars, technical workshops, and other venues. One local planning consultant, who hadn’t heard of SWAPs, stated that she would like to learn about the plan because “I am always looking for new information for each plan so they aren’t cookie-cutter.”

Make SWAPs More User-Friendly

It is not uncommon for State Wildlife Action Plans to exceed 1,000 pages, which reduces the likelihood that they will be used. Plans should be more concise and user-friendly and should include model goals, objectives and policies that can be incorporated readily into local land use and hazard mitigation plans. Several interviewees mentioned that they would be interested in best practices, project examples, or success stories of how SWAP priorities have been translated at the local level. Currently, SWAP executive summaries gloss over the wealth of information in several brief pages, failing to provide enough relevant information. A concise executive summary that outlined actionable priorities geared towards professionals would facilitate greater use of the plans. The plans should also include links to where users can access and download maps.

Integrate SWAPs into Local Planning

To improve implementation of SWAPs, local land use and hazard mitigation plans should include policies consistent with their (SWAP) objectives. States such as Florida require local land use plans to be consistent with state policies. States could require that local land use and hazard mitigation plans contain policies consistent with the goals and objectives of SWAPS. In fact, local

governments are required to reference “best available information” when developing their plans. SWAPS could be included or considered best available information on wildlife, a designation that is currently vague and left to the discretion of the local government. In addition, wildlife officials should get involved in land use and hazard mitigation planning efforts at the state and local levels. At a minimum, they could comment on local plans as they are being developed.

Use SWAPs to Identify Opportunities for Collaboration

States could require or create incentives for coordination among wildlife officials, hazard mitigation planners and land use planners. Projects that will achieve multiple objectives--conserve habitat and mitigate the threat of natural hazards--should receive higher priority for state funding. In many cases, protecting wildlife habitat is viewed by local emergency managers as running counter to their mission or objectives. As one hazard mitigation consultant remarked, “I would hate to see mitigation dollars moved to protecting wetlands.” Yet, those responsible for protecting wildlife habitat could coordinate with those responsible for mitigating natural hazards to apply for federal funding, leverage local resources, match grants, and partner on projects of mutual benefit. What is needed is a change of perception about the efficacy of protecting wildlife habitat.

Get the Most Out of Mitigation Programs

In using mitigation funds to further floodplain restoration and wildlife conservation goals, specifically:

1. Ensure that mitigation programs provide meaningful wildlife habitat and sustained ecosystem services.
2. Develop clear guidelines for incentive programs that place emphasis on the restoration of priority habitats and natural floodplain functions to yield multiple benefits.
3. Increase coordination among federal, state, and local agencies to help identify opportunities to leverage alternative sources of funding to meet multiple watershed restoration goals.
4. Increase the capacity of local governments to identify sources of restoration funding and implement restoration activities in hazard-prone areas in a way that meets both local planning/emergency management goals as well as regional conservation goals.
5. Encourage landowner participation in mitigation and incentive programs.

Ensure that Federal Programs Address Climate Change

We provide specific policy recommendations below for each of the five federal programs, but, in general, our recommendations fall under four broad categories:

- Incorporate climate change science in mapping, planning, and risk assessment;
- Keep people and property out of high hazard areas;
- Require equal treatment of environmental benefits in benefit-cost analysis; and
- Encourage planning and decision-making at the watershed scale.

The National Flood Insurance Program

1. Future conditions, including long-term erosion and climate change, should be fully incorporated into floodplain mapping and management;
2. Flood insurance premiums should reflect increasing risk of loss due to sea level rise and climate change;
3. Minimum floodplain management requirements should be strengthened to severely restrict development in high-risk and environmentally sensitive areas; and

4. Regional coordination should be encouraged among local floodplain managers and flood control districts.

U.S. Army Corps of Engineers Civil Works – Water Resources Management Flood Control Program

1. The effects of climate change should be specifically including in the evaluation of all water resource projects;
2. The requirements for consideration of watershed planning should be strengthened in water resource planning; and
3. The bias for structural solutions to water resource problems should be eliminated and environmental benefits and ecosystem services should be treated equally with economic benefits in the benefit-cost analysis.

Clean Water Act – Section 404

1. Floodplain functions and climate change should be considered in all mitigation (i.e., avoid, minimize, compensate) decisions;
2. Upland buffers should be required for wetland compensation projects in areas susceptible to sea level rise; and
3. The effects of sea level rise and climate change should be considered when evaluating coastal armoring projects (permitted under Nationwide Permit 13).

Robert T. Stafford Disaster Relief and Emergency Assistance Act

1. Guidance should be developed to help states incorporate climate change into state hazard mitigation plans;
2. Coordination should be encouraged among state hazard and climate planners; and
3. Funding for pre-disaster mitigation grants and buyout programs is increased and guidance is developed to assist local governments with the restoration and long-term management of property acquired through buyouts to meet both flood reduction and wildlife conservation goals.

Coastal Zone Management Act

1. States should be required to develop coastal zone climate change adaptation plans as a condition of CZMA program approval;
2. Funding is provided to states to develop policies to address the likely impacts of climate change and sea level rise in the coastal zone;
3. An ecosystem-based management approach is applied to coastal management;
4. Special Area Management Plans be used to develop sea level rise or climate change adaptation strategies in coastal areas; and
5. Coastal and Estuarine Land Conservation Plan funding is increased and targeted toward habitat protection and land acquisition in areas facing long-term erosion or sea level rise.

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8. Appendices

Appendix A: Advisory Panel Members

Mike Beck, Senior Scientist, Marine Initiative, The Nature Conservancy

Chris Burkett, Wildlife Action Plan Coordinator, Virginia Department of Game and Inland Fisheries

Larry Buss, Chairman, Nonstructural Flood Proofing Committee, U.S. Army Corps of Engineers

Margaret Davidson, Director, NOAA Coastal Services Center

Judy Francis, NC Dept of Environment and Natural Resources; Chair-Elect, National Association of County Planners

David Gordon, Biologist, U.S. Fish and Wildlife Service

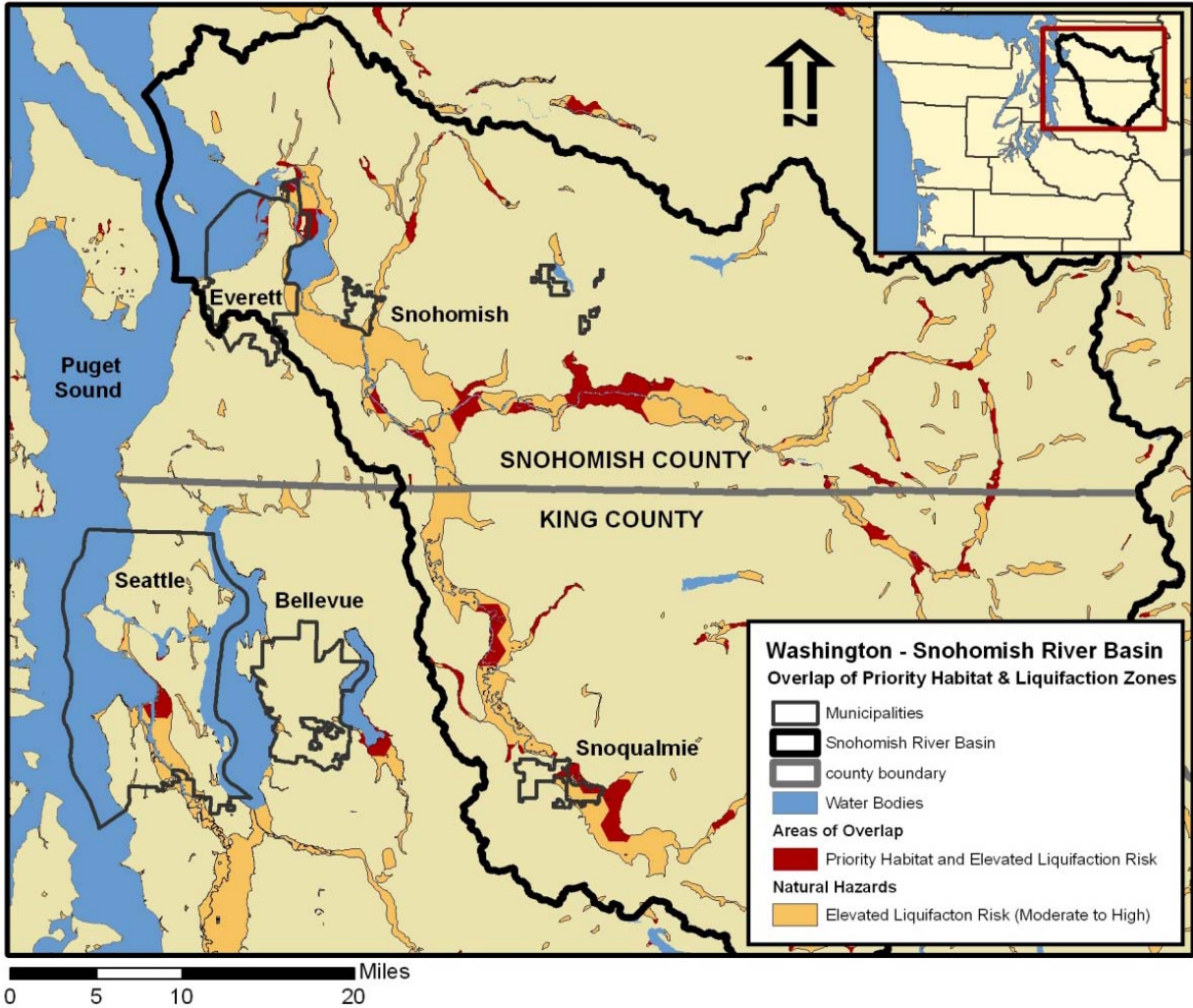
John Kostyack, Executive Director, Wildlife Conservation and Global Warming, National Wildlife Federation

Joe MacDonald, Program Development Senior Associate, American Planning Association

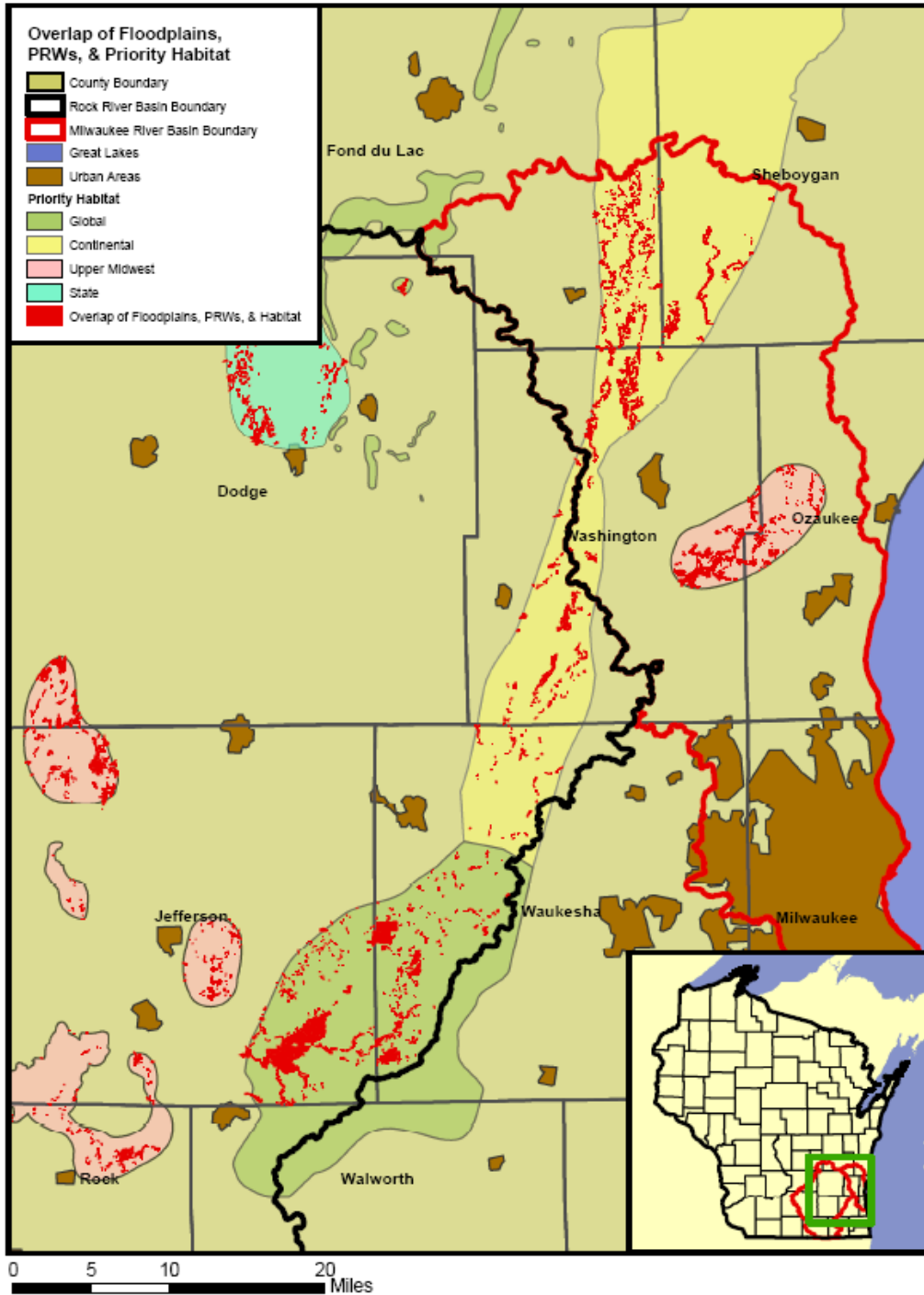
Pamela Pogue, Coastal Issues Committee Co-Chair, Association of State Floodplain Managers

Appendix B: Maps

Overlap of Priority Habitat and Liquifaction Zones
Snohomish River Basin, Washington



Overlap of Floodplains, Potentially Restorable Wetlands and Priority Habitat Rock River Basin, Wisconsin



Appendix C: GIS Analysis Methods

The GIS analysis conducted for this study involves the identification of overlap between priority habitat as determined by State Wildlife Action Plans (SWAPs) and hazard zones such as floodplains. These overlaps represent areas where collaboration among state and local planning departments, wildlife agencies, and offices of emergency management would be mutually beneficial. Central to this process was the identification of minimum thresholds for what is considered a hazard zone and what types of habitat are considered priority. Priority habitat data for Washington and Florida are in the form of indices ranging from 0 to 250 in Washington and 1 to 10 in Florida. Discerning natural breakpoints for these priority habitat indices is not a straightforward process, requiring discretion and an element of subjectivity. The data on hazard zones is also not straightforward. For example, in Florida, data on wildfire risk is in the form of an index ranging from 0 to 1. Deciding which scores constitute priority habitat or natural hazards zones of substantial risk has considerable implications on the results of this analysis. Because of this, we carefully analyzed the data and read the associated technical texts to determine appropriate minimum thresholds for inclusion, but in the end had to make a judgment call. This element of subjectivity is the main limitation of our GIS analysis and associated results. Below, we provide more information about the process and methods of GIS analysis we used for all three sites.

Washington

The predominant natural hazards within the Snohomish River Basin consist of riverine flooding and liquefaction from earthquakes with the greatest risk consistently overlapping floodplains where loose hydric soils are present. We focused our GIS analysis of overlaps on the risk of liquefaction because of the significant potential for loss of life and property damage during earthquakes and because of the extensive geographic coverage of liquefaction data throughout the basin and relative lack of floodplain data. We obtained liquefaction data from the Washington Department of Natural Resources. The data categorizes lands on a 7 point scale from very low to high risk of liquefaction. For the purposes of our study, lands categorized as “moderate to high” and “high” were considered to be hazard zones and were included in our analysis.

We obtained the priority wildlife habitat data used in the SWAP from the Washington Biodiversity Council. This dataset has two separate wildlife indicators including irreplaceability and utility. Irreplaceability is a measure of biodiversity significance that incorporates data concerning species richness, rarity, and representation. Utility is a measure of conservation opportunity, which combines irreplaceability and projected risk from future growth. For our analysis we used the indicator of irreplaceability because we were interested more with the quality and significance of wildlife habitat and less about the affect of growth pressure on conservation priority. Furthermore, irreplaceability is closest to the indicators of priority habitat used in Wisconsin and Florida.

Irreplaceability is an index ranging from 0 to 250 calculated for one to two mile wide hexagons across the state. Values of 250 represent lands that have the highest level of biodiversity significance and values of 0 represent areas with no value. For our analysis we selected only those hexagons that had values of 75 or higher to represent priority habitat. This decision was informed by associated technical texts and meta data for the data.

Using GIS we overlaid areas of “moderate to high” and “high” liquefaction risk with areas with irreplaceability indices of 75 or higher resulting in a patchwork of narrow parcels of land within

riparian corridors with a concentration in the western and central portions of the Snohomish Basin where floodplains are broader (See Appendix B).

Florida

Wildfire is the predominant natural hazard within the central portion of Florida as well as our study site, with areas of elevated risk spanning across large portions of counties. Floodplains are rare within this region and are narrow when present. Thus, we focused our GIS analysis on areas where priority habitat overlapped with areas at risk of wildfire. We obtained wildfire data in the form of the Wildland Fire Susceptibility Index from the Southern Wildfire Assessment, conducted in 2008 by USDA Forest Service and the University of Florida, School of Forest Resources and Conservation.

The Wildland Fire Susceptibility Index (WSFI) is a value between 0 and 1, with 1 representing the highest risk of wildfires. The index integrates the probability of an acre igniting and the final projected fire size determined by the projected rate of spread. Lands with WSFI values at or greater than 0.4 were considered to be fire hazard zones and were included in our analysis. This judgment was made in part because lands with such elevated values are relatively rare in Florida and especially in the southeast.

We obtained priority wildlife habitat data used in the SWAP from the Florida Fish and Wildlife Commission (FWC). The data consists of the Integrated Wildlife Habitat Ranking System (IWHRS), which ranks Florida landscapes based upon the habitat needs of wildlife as a way to identify ecologically significant lands. The system has a scale from 1 to 10, with 10 representing lands that are most important. The ranking system is composed of 10 data layers that represent important ecological aspects for wildlife species. These layers include Spatial Heterogeneity, Roadless Habitat Patch Size, Strategic Habitat Conservation Areas, Listed Species Locations, Species Richness, Florida Natural Areas Inventory (FNAI) Habitat Conservation Priorities, Managed Lands, Distance to Managed Lands, Landscape Connectivity, and Florida Forever Board of Trustees/Save Our Rivers Lands. For the purposes of our analysis, we selected lands with IWHRS scores of 6 or greater to represent priority habitat, because the Florida Fish and Wildlife Conservation Commission considers lands with such scores as having “at least intermediate quality” habitat for wildlife.

Using GIS, we overlaid areas with elevated fire risk (WSFI indices at or greater than 0.4) with areas of priority wildlife habitat (IWHRS scores at or greater than 6) resulting in significant concentrations of overlap in the central and southern portions of Osceola County and the northern stretches of Polk County. The majority of these areas of overlap are in rural areas far from municipalities, with two exceptions. There is a large concentration in Polk County bordering the towns of Lakeland and Winter Haven to the north and a smaller cluster south of Kissimmee in the center of Osceola County (see Figure 2).

Wisconsin

For Wisconsin, our GIS analysis of areas of overlap included natural hazards, priority habitat and potentially restorable wetlands or PRWs. PRWs are lands with hydric soils that are not currently classified as wetlands, but have a land use compatible with restoration (e.g., agriculture). We added this additional element because it helped us identify areas for our case studies that examined the potential for using mitigation funding and other market-based incentives to fund large-scale restoration projects. Furthermore, the Wisconsin Department of Natural Resources (WDNR) felt

that the resulting maps would help them better target their conservation and restoration efforts. We did not include such data in our GIS analysis of other sites because such data was lacking.

We focused our GIS analysis on areas where priority habitat overlapped with flood-prone areas of the Rock River Basin, which is characterized by numerous broad floodplains. We obtained recently updated floodplain data directly from FEMA, where available. The Wisconsin Department of Natural Resources provided us with data where updated data was not available. We selected lands within the 100 year floodplain for our analysis.

We obtained the priority wildlife habitat data used in the SWAP from the Wisconsin Department of Natural Resources. The data broadly categorizes lands as being of “global importance” (highest priority), “continental importance,” “upper Midwest importance”, and “state importance.” We selected all areas with these classifications to represent priority habitat for our analysis.

Using GIS, we overlaid areas within the 100 year floodplain that overlapped with priority habitat, resulting in numerous narrow ribbons of land throughout both counties. The largest concentration of these areas of overlap occurs on the eastern margin of Jefferson County and western margin of Waukesha County, where a large band of global important habitat is located (See Appendix B).

Appendix D: Project Contacts

Interview Contacts¹

California Department of Fish and Game
City of Everett Office of Emergency Management
City of Everett Planning Department
City of Fort Atkinson
City of Frostproof Planning Department
City of Kissimmee Planning Division
City of Snohomish Planning and Development Services
City of Snoqualmie Planning Department
City of St. Cloud Planning and Zoning Department
City of Waterloo
City of Winter Haven Planning Division
Florida Department of Community Affairs
Florida Fish and Wildlife Conservation Commission
Hazard Mitigation planning consultant from Wisconsin
Jefferson County Emergency Management Office
Jefferson County Planning and Zoning Department
King County Department of Development and Environmental Services
King County Department of Emergency Management
King County Department of Natural Resources and Parks
Maryland Department of Natural Resources
North Carolina Wildlife Resources Commission
Oregon Department of Fish and Wildlife
Osceola County Department of Emergency Management
Osceola County Planning and Zoning Office
Polk County Emergency Management Division
Polk County Long Range Planning Division
Snohomish Conservation District
Snohomish County Planning and Development Services
Snohomish County Public Works Department
State of Wisconsin Division of Intergovernmental Relations
Texas Forest Service, Texas A&M University
The Tulalip Tribes Natural Resources Department
The University of Washington Climate Impacts Group
Virginia Department of Game and Inland Fisheries
Washington Biodiversity Council
Washington Department of Community, Trade, and Economic Development, Growth Management Division
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
Washington Military Department, Emergency Management Division
Waukesha County Planning and Zoning Division
Wisconsin Department of Natural Resources
Wisconsin Emergency Management
Wisconsin Wetlands Association

¹ Many of the people we interviewed did not want to be identified by name, so only the affiliations are shown.

Case Study Contacts

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Snohomish River Basin, Washington

Timothy Walls

Snohomish County Public Works: Surface Water Management

Senior Planner

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Ellie Ziegler

Sound Transit

Senior Environmental Analyst

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Appendix E: Interview Questionnaire

Questions for Key Informants

1. Please tell me about your office or agency.
What are your main goals?
What programs or projects do you administer?
2. Is preserving wildlife habitat or biodiversity a part of your office/agency's mission?
Are there any programs, policies or projects geared specifically toward preserving habitat?
3. How familiar are you with your state's Wildlife Action Plan? If not, then skip to Question 8
4. Did your agency work on the plan (SWAP) while it was being developed?
Did your agency provide comments to the plan?
Were you contacted when the plan was being written?
5. Does your agency ever use the SWAP when formulating your own plans or implementing projects?
Does your agency take the SWAP's goals into consideration in its day to day activities?
Have you referred to the SWAP for a particular project?
6. What are the main obstacles to implementing the SWAP?
Lack of staff/resources
Lack of awareness of the SWAP
Weak commitment to preserve wildlife habitat
7. Are the goals/objectives found within the SWAP required or mandated in local level planning by the state?
8. Do you coordinate with the SWAP agency (varies by state) on your plans/projects/activities?
9. How could the SWAP be made more relevant or useful to your agency?
What would it take to get your agency, and other agencies, to use the plan?
10. Are there any environmental restoration/conservation projects in your jurisdiction? Do you manage them? Do you coordinate with those that do?
11. Have you applied for any wildlife preservation or habitat conservation grants (as a requirement for federal grants, states had to produce SWAP)? What kind of grants?
12. Is there something you'd like to add?

Appendix F: Plan Analysis Instrument

Land Use Protocol

<i>Fact Base - Conservation Science – land use</i>
Does the plan include information on the condition of endangered species?
Yes, detailed
Yes, vague
No
Does the plan include information on the condition of wildlife habitat?
Yes, detailed
Yes, vague
No
Does the plan include information on natural hazards?
Yes, detailed
Yes, vague
No
Are maps of endangered species' ranges included?
Yes
No
Are maps of wildlife habitats included?
Yes
No
Are maps on natural hazard areas included?
Yes
No
Are maps of overlap between wildlife habitats and natural hazard areas included?
Yes
No
Are maps of conservation priorities (areas that are planned or proposed) included?
Yes
No

<i>Goals</i>
Is protecting wildlife habitat one of the goals of the plan?
Yes, goal is detailed
Yes, goal is vague
No
Is protecting natural hazard areas one of the goals of the plan?
Yes, goal is detailed
Yes, goal is vague
No
Is protecting areas where wildlife habitat and hazards overlap a goal?
Yes, goal is detailed
Yes, goal is vague
No
If the plan was adopted AFTER the SWAP, does the plan refer to the SWAP?
Yes
No
Are any of the goals of the SWAP included in the plan?
Yes, most of the goals
Yes, some of the goals
No
Are any of the plan's goals consistent with the goals of the SWAP?
Yes, most of the goals are consistent
Yes, some of the goals are consistent
No
Are any of the plan's goals inconsistent with the goals of the SWAP?
Yes, most of the goals are inconsistent
Yes, some of the goals are inconsistent
No
Is coordination with SWAP implementing agency a goal?
Yes, goal is detailed
Yes, goal is vague
No

<i>Policies</i>
Does the plan contain specific policies to protect wildlife habitat?
Yes, many policies
Yes, some policies
No
Does the plan contain policies that <i>encourage</i> development in floodplains, wetlands or other natural hazard areas that could provide wildlife habitat?
Yes, many policies
Yes, some policies
No
Does the plan contain policies that <i>discourage</i> development in floodplains, wetlands or other natural hazard areas that could provide wildlife habitat?
Yes, many policies
Yes, some policies
No
Does the plan contain policies that <i>discourage</i> , restrict or prohibit development in areas where sensitive habitats and hazard prone areas overlap?
Yes, many policies
Yes, some policies
No
If yes, do these restricted areas coincide with SWAP priority habitat areas?
Yes, mostly
Yes, partially
No
<i>Coordination</i>
Does the plan discuss the importance of coordinating land use planning with conservation planning to protect wildlife habitat?
Yes
No
Is a person or office responsible for inter-agency coordination identified?
Yes, clearly identified
Yes, vaguely identified
No
Were wildlife agencies or organizations involved in the preparation of the land use or

comprehensive plan?
Yes
No
Does the land use or comprehensive plan mention coordination with wildlife agencies?
Yes
No
Does the land use or comprehensive plan mention coordination with emergency management?
Yes
No
<i>Implementation</i>
Does the plan mention specific actions, or mechanisms to protect priority wildlife habitat?
Yes, detailed actions
Yes, vague actions
No
Is there funding for programs to acquire wildlife habitat?
Yes
No
Is there funding for programs to acquire natural hazard areas?
Yes
No
If yes, does the plan include protecting wildlife habitat as one of the criteria?
Yes, detailed criteria
Yes, vague criteria
No
Does the plan identify or designate areas for future urban growth?
Yes
No
Are areas identified (in the plan) as wildlife habitat located within these future urban growth areas? (not low density growth areas)
Yes, mostly
Yes, partially
No
Are areas identified (in the plan) as natural hazards located within these future growth areas?

(not low density growth areas)
Yes, mostly
Yes, partially
No

Climate Change Effects

Does the plan discuss how climate change could affect land use?

Yes, detailed

Yes, vague

No

Does the plan encourage or facilitate land use patterns that could mitigate climate change (e.g., more compact transit-oriented design)?

Yes

No

Does the plan discuss how climate change could affect wildlife habitat?

Yes, detailed

Yes, vague

No

Does the plan discuss how climate change could affect natural hazards?

Yes, detailed

Yes, vague

No

Does the plan make recommendations or outline actions to address increased hazards as a result of climate change?

Yes, detailed

Yes, vague

No

Does the plan make recommendations to reduce the impact of climate change on wildlife?

Yes, detailed

Yes, vague

No

Hazard Mitigation Plan Protocol

Fact Base - Conservation Science	
Does the plan include information on the condition of endangered species?	
Yes, detailed	
Yes, vague	
No	
Does the plan include information on the condition of wildlife habitat?	
Yes, detailed	
Yes, vague	
No	
Are maps of endangered species' ranges included?	
Yes	
No	
Are maps of wildlife habitats included?	
Yes	
No	
Are maps on natural hazard areas included?	
Yes	
No	
Are maps of overlap between wildlife habitats and natural hazard areas included?	
Yes	
No	
Are maps of conservation priorities (areas that are planned or proposed) included?	
Yes	
No	
Goals	
Is protecting wildlife habitat one of the goals of the (hazard mitigation) plan?	
Yes, goal is detailed	
Yes, goal is vague	
No	
Is protecting areas where wildlife habitat and hazard areas overlap a goal?	

Yes, goal is detailed
Yes, goal is vague
No

If the plan was adopted after the SWAP, does the plan refer to the SWAP?
--

Yes
No

If the plan was adopted after the SWAP, are any of the goals of the SWAP included in the plan?
--

Yes, most of the goals
Yes, some of the goals
No

Are any of the plan's goals consistent with the goals of the SWAP?
--

Yes, most of the goals are consistent
Yes, some of the goals are consistent
No

Are any of the plan's goals inconsistent with the goals of the SWAP?
--

Yes, most of the goals are inconsistent
Yes, some of the goals are inconsistent
No

Is coordination with SWAP implementing agency a goal?

Yes, goal is detailed
Yes, goal is vague
No

Policies

Does the plan contain specific policies to protect wildlife habitat?
--

Yes, many policies
Yes, some policies
No

Does the plan contain policies that encourage development in floodplains, wetlands or other natural hazard areas that could provide wildlife habitat?

Yes, many policies
Yes, some policies
No

Does the plan contain policies that discourage development in floodplains, wetlands or other natural hazard areas that could provide wildlife habitat?
Yes, many policies
Yes, some policies
No

If yes, do these restricted areas coincide with priority habitat areas?
Yes, mostly
Yes, partially
No

Coordination

Does the plan discuss the importance of coordinating hazard mitigation planning with planning to protect wildlife habitat?
Yes
No

Is a person or office responsible for inter-agency coordination identified?
Yes, clear identified
Yes, vaguely identified
No

Were wildlife agencies or organizations involved in the preparation of the plan?
Yes
No

Implementation

Does the plan identify programs related to natural hazard areas that would also benefit wildlife habitat protection efforts?
Yes
No

Are there programs for natural hazard areas that will likely undermine efforts to protect wildlife habitat?
Yes
No

Is there funding for programs to acquire natural hazard areas?
Yes
No

If yes, does the plan include criteria used to select sites to acquire, and if so, is protecting

wildlife habitat one of the criteria?
Yes, detailed actions
Yes, vague actions
No
Does the plan mention specific actions or programs to protect priority wildlife habitat?
Yes, detailed actions
Yes, vague actions
No
Climate Change Effects
Does the plan discuss climate change as an important issue?
Yes
No
Does the (hazard mitigation) plan discuss how climate change could affect natural hazard areas?
Yes, detailed
Yes, vague
No
Does the Plan make recommendations or outline actions to address increased hazards as a result of climate change?
Yes, detailed
Yes, vague
No
Does the plan discuss how climate change could affect wildlife habitats?
Yes, detailed
Yes, vague
No
Does the plan discuss how climate change could affect priority species?
Yes, detailed
Yes, vague
No
Does the plan make recommendations to reduce the impact of climate change on wildlife?
Yes, detailed
Yes, vague
No

Appendix G: Mitigation Funding Opportunities

Areas vulnerable to natural hazards in coastal and riverine communities often overlap with priority habitat areas identified in State Wildlife Action Plans and other conservation plans. Habitat restoration in these areas can provide multiple benefits including wildlife conservation as well as natural flood protection functions. The goal of this paper is to identify those federal programs that would support the (long-term or perpetual conservation) of flood prone areas that provide high-quality wildlife functions.

We identified and analyzed eleven federal mitigation and incentive-based programs that could be directed to large-scale restoration in hazard prone areas. The mitigation programs we evaluated include: wetland mitigation under §404 of the Clean Water Act; mitigation for impacts from U.S. Army Corps of Engineers water resources development projects; habitat mitigation/conservation banking under the Endangered Species Act; natural resource damage assessments under the Comprehensive Environmental Response, Compensation, and Liability Act, Oil Pollution Act of 1990, Park System Resources Protection Act, and National Marine Sanctuaries Act; and floodplain management permits under the National Flood Insurance Program. We also included an analysis of two market-based programs: water quality trading and carbon offsets. Finally, we evaluated four types of incentive programs including the Conservation Reserve Program, Wetlands Reserve Program, Emergency Watershed Program Floodplain Easements, and Hazard Mitigation Grants.

All of the identified programs have the potential to contribute to restoration efforts that provide both natural flood damage reduction and habitat conservation benefits. Several of the programs have guidelines or regulations that explicitly include wildlife conservation as a goal or required outcome of program activities (e.g., wetland compensation under the Clean Water Act, Wetland Reserve Program, and Conservation Reserve Program). Others provide indirect benefits for habitat and wildlife conservation but do not have program guidelines that specifically include restoration or conservation goals (e.g., Emergency Watershed Program Floodplain Easements, Hazard Mitigation Grant Programs).

Under each program we discuss the opportunities and challenges for using these programs for restoration in hazard areas. Based on this analysis we have identified several general recommendations for how these programs could further floodplain restoration and wildlife conservation goals, including:

Ensure that mitigation programs provide meaningful wildlife habitat and sustained ecosystem services. A recently released white paper by The Environmental Law Institute and The Nature Conservancy, “The Next Generation of Mitigation: Linking Current and Future Mitigation Programs with State Wildlife Action Plans and Other State and Regional Plans,” describes how current mitigation programs could be implemented to ensure beneficial conservation outcomes. As described in the paper, the “next generation of mitigation” entails: 1) a more comprehensive approach to applying the mitigation protocol (avoid, minimize, compensate), 2) use of State Wildlife Action Plans and other conservation plans to create an effective decision-making

framework for applying the mitigation protocol, and 3) allocation of compensation funds in a manner that supports lasting ecological results at a landscape scale.²

Develop clear guidelines for incentive programs that place emphasis on the restoration of priority habitats and natural floodplain functions to yield multiple benefits. Over the past ten years, the Farm Bill incentive programs have explicitly incorporated wildlife conservation goals as part of their guidelines and procedures. For example, the Wetland Reserve Program now emphasizes “achieving the greatest wetland functions and values, along with optimum wildlife habitat.”³ Hazard area restoration and easement programs have generally not emphasized wildlife habitat goals. Although many of these programs indirectly benefit wildlife conservation, updated guidelines could provide a more direct link.

Increase coordination among federal, state, and local agencies to help identify opportunities to leverage alternative sources of funding to meet multiple watershed restoration goals. Specifically, federal agencies should target state and local hazard planners and emergency managers to help leverage existing resources to meet multiple goals. For example, better coordination is needed among state wildlife agencies and emergency managers and hazard mitigation planners.

Increase the capacity of local governments to identify sources of restoration funding and implement restoration activities in hazard-prone areas in a way that meets both local planning/emergency management goals as well as regional conservation goals. For example, Hazard Mitigation Grant Programs property acquisition program guidelines should be developed to assist local governments with the restoration and long-term management of acquired property to meet both flood reduction and wildlife conservation goals.

Educate landowners to encourage their participation in mitigation and incentive programs. The Farm Bill incentive programs and hazard mitigation grant programs rely on the availability of landowners willing to sell easements on their property or to move out of high hazard areas. Case studies and other educational materials describing the benefits of natural floodplain restoration for property owners and their surrounding communities, along with information about available incentive programs and mitigation funding, may help to encourage more landowners to participate in these voluntary programs.

We have included two case studies to illustrate how many of these programs can be used to fund the restoration of priority habitats in floodplains and coastal areas.

Snohomish River Basin Estuary, Washington

In the Snohomish River Basin Estuary in Washington, habitat restoration is guided by the Snohomish River Basin Salmon Conservation Plan. The restoration efforts outlined in the plan, designed to protect and restore habitat for listed salmon species, have been supported by an array of restoration funding sources. Restoration managers have also creatively sought to use mitigation and incentive funding to support restoration goals. The Salmon Conservation Plan

² Jessica B. Wilkinson, et al., *The Next Generation of Mitigation: Linking Current and Future Mitigation Programs with State Wildlife Action Plans and Other State and Regional Plans* (Washington, DC: Environmental Law Institute and The Nature Conservancy, 2009).

³ Natural Resources Conservation Service (NRCS), “Wetlands Reserve Program,” at <http://www.nrcs.usda.gov/Programs/WRP/>

outlined priority sites for conservation and restoration, providing a structure to site mitigation projects in locations identified as priorities for habitat restoration and flood hazard reduction in the Basin.

Rock River Basin, Wisconsin

The Rock River Basin in Wisconsin is a region of both extensive agriculture (73 percent of the land area in the Basin) and expanding urban areas. The Wisconsin Department of Natural Resources recently developed a map of the potentially restorable wetlands in the Rock River Basin to improve the capacity of the agencies to implement wetland management at the watershed scale. Wetland restoration in the area has been funded by a variety of incentive and mitigation sources, including Farm Bill programs such as the Wetland Reserve Program and the Emergency Watershed Protection Program Floodplain Easement Program and several wetland mitigation banks.

These case studies provide several lessons for the successful implementation of mitigation and incentive funding for large-scale ecosystem restoration in hazard-prone areas;

1. Local or state habitat restoration plans can help guide the siting of mitigation and incentive program projects in priority habitat areas that can provide multiple benefits, including wildlife conservation and flood hazard protection. In Snohomish County, the Snohomish River Basin Salmon Conservation Plan is helping to guide mitigation and other projects to priority sites for restoration that provide both flood reduction and salmon population recovery benefits. If Washington's State Wildlife Action Plan was revised to include restoration priorities, the Plan could provide a statewide "road map" for ecosystem restoration; helping to guide all sources of available funding to priority restoration sites.⁴
2. Coordination among regulatory agencies and wildlife agencies can help to direct mitigation projects to identified priority sites. For example, Wisconsin's Department of Transportation and Department of Natural Resources regularly collaborate on wetland mitigation activities to help meet the wildlife agency's restoration goals. As stated above, in order to meet long-term conservation goals, mitigation regulations should require the use of State Wildlife Action Plans or other restoration plans to create an effective decision-making framework for application of the mitigation protocol.⁵
3. Knowledgeable local governments and non-profit organizations can help ensure that mitigation or other incentive program projects help meet watershed goals. For example, Snohomish County is actively involved in developing wetland mitigation opportunities that help meet local restoration goals.

⁴ Jessica B. Wilkinson, et al., *The Next Generation of Mitigation*.

⁵ Ibid.

ANALYSIS

Mitigation and Incentive Programs

Mitigation and Market-Based Programs

Market: Aquatic resource mitigation

Market driver: Clean Water Act §404

Regulatory agencies: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, State Agencies, Local Agencies

Size of market: Each year more than 45,000 acres of compensatory mitigation are required under §404 of the Clean Water Act to compensate for about 21,000 acres of permitted losses.⁶ Approximately \$2.5 to \$4.4 billion (midpoint = \$3.4 billion) is spent annually on the federal §404 compensatory mitigation market.⁷ Compensation credit costs range from \$3,000 to \$150,000 per acre.⁸

Summary of program: Section 404 of the Clean Water Act (CWA) prohibits the discharge of dredge and fill material into “waters of the U.S.” The program is guided by two national goals: (1) the 1972 CWA’s purpose, “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters,” and (2) the 1989 goal of “no net loss” of aquatic resource acres or functions. The “no net loss” goal is primarily addressed through the sequencing procedures outlined in the Clean Water Act §404(b)(1) Guidelines.⁹ Before the Corps will issue a permit for an impact, the permittee must first demonstrate that steps have been taken to avoid impacts to wetlands and aquatic resources, that potential impacts have been minimized, and that compensation is be provided for all remaining unavoidable impacts.

Aquatic resource compensation is accomplished through one of four mechanisms: restoration, enhancement, preservation, and establishment. Compensatory mitigation regulations state that restoration should be the first option considered and that preservation should be used in only “certain circumstances.”¹⁰ There are three primary mechanisms permittees can use to satisfy compensatory mitigation requirements. These include: 1) permittee-responsible mitigation, 2) mitigation banking, and 3) in-lieu fee mitigation.

Permittee-responsible mitigation is the restoration, creation, enhancement or preservation of a wetland undertaken in order to compensate for impacts resulting from a specific project. Responsibility for completing the work and ensuring success remains with the permittee.

Mitigation banking and in-lieu fee mitigation, on the other hand, are referred to as “third party” mitigation because liability for completing the compensatory mitigation project and ensuring its success transfers from the permittee to a third party (e.g., mitigation banker or in-lieu fee program sponsor). A mitigation bank is a “site or suite of sites, where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts.”¹¹ An in-lieu fee program is a “program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resource

⁶ Jessica Wilkinson and Jared Thompson, *2005 Status Report on Compensatory Mitigation in the United States* (Washington, DC: Environmental Law Institute, April 2006).

⁷ Environmental Law Institute, *Mitigation of Impacts to Fish and Wildlife Habitat: Estimating Costs and Identifying Opportunities* (Washington, DC: Environmental Law Institute, October 2007).

⁸ Jessica Wilkinson and Jared Thompson, *2005 Status Report*.

⁹ 40 C.F.R. § 230

¹⁰ 33 CFR 332.2

¹¹ 33 CFR 332.2

management entity to satisfy compensatory mitigation requirements.”¹² Similar to a mitigation bank, a permittee purchases credits from an approved in-lieu fee program and liability for the project is transferred to the in-lieu fee program sponsor.

Currently, permittee-responsible mitigation satisfies about 60 percent of the mitigation demand nationwide, while about 32 percent of compensation is accomplished by permittees purchasing credits from a mitigation bank and about 8 percent through in-lieu fee mitigation. In 2003 there were 330 active banks in 31 states, with an additional 169 banks pending approval.¹³

The anticipated number of credits that a bank or in-lieu fee project will generate is generally outlined in the Corps-approved bank instrument or in-lieu fee project plan. A credit is a “unit of measure (e.g., a functional or a real measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the amount resources restored, established, enhanced, or preserved.”¹⁴ The same methodology used to evaluate the number of credits available at a bank should be, but is not always, used to determine the debits at the impact site. In practice, however, the Corps often relies on a one-to-one acreage replacement, or some combination of functional assessment, acreage, or best judgment to determine the number of credits necessary to offset impacts. Ratios of higher than one-to-one may be required when preservation is used or when there is some question that the mitigation site will achieve its goal of replacing lost functions.

In 2008, the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency jointly released regulations on compensatory mitigation under §404 of the Clean Water Act.¹⁵ The regulations require equivalent standards for all forms of mitigation and require that all mitigation decisions are made within the context of a watershed approach. The new regulations also establish a hierarchy of mitigation methods with preference given to mitigation banks above the other two methods. The regulations also require that an entity responsible for long-term management and long-term management funding is secured for each compensation site.

Opportunities for large-scale ecosystem restoration in hazard areas: Wetlands and other aquatic resources regulated under §404 are often located in high hazard zones such as coastal and floodplain areas, providing significant natural protection from storms and floods. Many of the historic wetlands in these areas have been lost to or are threatened by conversion for development or agriculture. However, there are still many opportunities to restore the wetlands in these areas. For example, the Wisconsin Department of Natural Resources has determined that 88 percent of the wetlands in one frequently flooded river basin are potentially restorable based on soil type, compatibility with restoration techniques, relative need, and potential opportunity.¹⁶ New compensatory mitigation regulations require that all mitigation decisions are made within the context of a Watershed Approach (described below). The Watershed Approach could provide a structure for evaluating potential compensation sites for multiple benefits, including flood protection functions; steering mitigation funds to the restoration of priority habitats in hazard prone areas.

Opportunities for wildlife conservation: The 2008 compensation rule requires that the Corps use a “Watershed Approach” for approving and siting compensatory mitigation projects. Under the Watershed Approach, decisions about the type and location of compensatory mitigation projects are to be driven by scientific assessments of watershed needs, such as wildlife habitat conservation and restoration of floodplain function, and how specific wetland or stream restoration and protection projects can best address those needs. The compensation rule describes the type of information that may be useful in watershed-based decision-making. The list of items that should be consulted includes “current trends in habitat loss or

¹² 33 CFR 332.2

¹³ Jessica Wilkinson and Jared Thompson, *2005 Status Report*.

¹⁴ 33 CFR 332.2

¹⁵ 33 CFR 332

¹⁶ Brynda Hatch and Tom Bernthal, *Mapping Potentially Restorable Wetlands in the Rock River Basin* (Wisconsin Department of Natural Resources, Final Report to the U.S. Environmental Protection Agency, August 2008), p 2, available at <http://dnr.wi.gov/wetlands/documents/RockRiverPRW.pdf>

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.”

Compensatory mitigation could further wildlife conservation goals if priority in the investment of compensation funds was given to projects identified in State Wildlife Action Plans or other conservation planning efforts and to projects that support large-scale ecosystem benefits. The State Wildlife Action Plans and other conservation plans can also provide a framework for making mitigation decisions (including avoidance, minimization, and compensation decisions).¹⁷

Challenges: A review of the existing literature on wetland compensatory mitigation indicates that a significant proportion of compensation sites are failing to meet administrative and ecological performance standards.¹⁸ The National Academy of Sciences found that only 70 – 76 percent of compensation required in permits is implemented.¹⁹ A 2001 review found that only 21 percent of compensation sites met tests of ecological equivalency to lost wetlands. Further, administrative compliance does not appear to be an accurate indicator of ecological success, indicating that meeting permit standards does not necessarily mean that the project will yield a regulatory wetland.

A second challenge is the fact that mitigation siting decisions are made by the permittee or banker, which may limit the opportunities to steer mitigation sites into priority areas for wildlife conservation or floodplain restoration.

A recently released white paper by The Environmental Law Institute and The Nature Conservancy, “The Next Generation of Mitigation: Linking Current and Future Mitigation Programs with State Wildlife Action Plans and Other State and Regional Plans,” describes how current mitigation programs could be implemented to ensure beneficial conservation outcomes. As described in the paper, the “next generation of mitigation” entails: 1) a more comprehensive approach to application of the mitigation protocol (avoid, minimize, compensate), 2) use of State Wildlife Action Plans and other conservation plans to create an effective decision-making framework for application of the mitigation protocol, and 3) allocation of compensation funds in a manner that supports lasting ecological results at a landscape scale.²⁰

¹⁷ Jessica B. Wilkinson, et al., *The Next Generation of Mitigation*.

¹⁸ Rebecca L. Kihlslinger, “Success of Wetland Mitigation Projects” *National Wetlands Newsletter*, v. 30 no. 2 (Washington, DC: Environmental Law Institute, 2008).

¹⁹ National Research Council, “Compensating for Wetland Losses Under the Clean Water Act” (Washington, DC: Academy of Sciences, 2001).

²⁰ Jessica B. Wilkinson, et al., *The Next Generation of Mitigation*.

Market: Water Resources Development Projects

Market driver: Water Resources Projects, Water Resources Development Act

Regulatory agencies: U.S. Army Corps of Engineers

Size of market: Unknown

Summary of program: The “Economic and Environmental Principles for Water and Related Land Resources Implementation Studies” guide all federal water and related land resources planning for the major federal water resources development agencies, including the U.S. Army Corps of Engineers.²¹ The Principles and Guidelines, published in 1983, outline standards and procedures for calculating and evaluating the benefits and costs of federal water resources development projects. Under the Principles and Guidelines, a series of alternative plans must be developed and evaluated for each project. The alternative plans are evaluated for feasibility, economic benefits and costs, and risks (e.g., flood damage or water supply shortage). Each alternative plan must include a description of any appropriate mitigation for adverse affects, and mitigation costs must be accounted for in the evaluation of the economic benefits of alternative plans. Mitigation for adverse impacts to fish and wildlife and habitat is to be determined in consultation with fish and wildlife agencies in accordance with the Fish and Wildlife Coordination Act of 1958.²² Mitigation for other adverse effects must be determined in accordance with applicable laws, regulations, and executive orders. For impacts to wetlands and other aquatic resources, the Corps is required to comply with §404 of the Clean Water Act and the Clean Water Act §404(b)(1) Guidelines. The Guidelines require that for each proposed project the Corps takes steps to avoid impacts to wetlands and aquatic resources, minimizes any unavoidable impacts, and finally provides compensation for all damage that can not be avoided.

The Water Resource Development Act (WRDA) is the main legislative vehicle authorizing the Corps to study, plan, and construct major water resources projects. WRDA 1986 authorized the Corps to “mitigate damages to fish and wildlife resulting from any water resource project.”²³ The Act requires that mitigation be undertaken prior to, or concurrently with, construction of the project. Mitigation can include the acquisition of lands or interests therein. Under the Act, all proposals for water resources projects must include a plan for mitigating the impacts to fish and wildlife or a determination that the project will have “negligible adverse impact on fish and wildlife.”²⁴ The Act also requires that impacts to bottomland hardwood forests are mitigated in-kind. The Act established an “Environmental Protection and Mitigation Fund” to finance advanced mitigation of water resources projects, including the acquisition of lands.

WRDA 1990 established a goal of no net loss of wetland acres and functions and a long-term goal of a net increase in wetland acres and functions.²⁵

WRDA 2007²⁶ amended the mitigation provisions of WRDA 1986 and established new mitigation requirements for losses to flood damage reduction capabilities and fish and wildlife resulting from water resources development projects, including new requirements for mitigation planning, mitigation monitoring, mitigation success and consultation. The Corps is now required to meet the same standards that the agency’s regulatory program imposes on private developers and other governmental entities under §404 of the Clean

²¹ U.S. Water Resources Council, *Economic and Environmental Principles for Water and Related Land Resources Implementation Studies* (Washington, DC: U.S. Water Resources Council, 1983), available at <ftp://ftp-fc.sc.egov.usda.gov/Economics/priceindexes/Data/PrinciplesAndGuidelinesLocalSite.pdf>

²² Ibid.

²³ 33 USC 2283

²⁴ 33 USC 2283(d)

²⁵ 33 USC 2317(a)(1)

²⁶ 33 USC 2293(d)

Water Act. WRDA 2007 requires the Corps to mitigate impacts to all habitat types to “not less than in-kind conditions.”²⁷ Under the Act, the mitigation plan must include a plan for monitoring the implementation and ecological success of each mitigation project; the ecological success criteria that will be used to evaluate the success of the project for replacing lost functions and values; a description of the land and interests in the land to be acquired; a description of the types and amount of restoration to be conducted, the activities to be undertaken to achieve the mitigation objectives in the watershed, and the functions and values that will result from the mitigation; and a contingency plan for cases where the mitigation site is not achieving ecological success. The Act requires that each mitigation site is monitored until it can demonstrate compliance with the ecological success criteria outlined in the mitigation plan. The Corps is required to consult with the appropriate state and federal agencies to determine whether a mitigation site is meeting ecological success criteria and the projected timeline for meeting the criteria. Finally, the Corps is required to report annually to Congress on the status of project construction, mitigation for impacts due to project construction, and the results of consultation with appropriate state and federal agencies. WRDA 2007 explicitly included provisions for mitigation for impacts to wetlands. The Act requires that, in the case “a water resources project that involves wetlands mitigation and that has impacts that occur within the service area of a mitigation bank, the Secretary, where appropriate, shall first consider the use of the mitigation bank if the bank contains sufficient available credits to offset the impact...”²⁸

Opportunities for large-scale ecosystem restoration in hazard areas: WRDA requires mitigation for flood damage reduction capabilities and fish and wildlife habitat. Because many of the Corps’ projects are constructed in hazard-prone areas (e.g., coastal zones or riverine areas) and because many of these projects can have significant impacts to wetlands that require mitigation to “not less than in-kind conditions,” compensation for impacts due to the Corps’ Civil Works projects may result in a significant demand for restoration opportunities and potentially significant funding for large-scale ecosystem restoration in hazard areas.

Opportunities for wildlife conservation: The Corps Civil Works program is required to conduct mitigation under the same standards imposed by its regulatory program. Therefore, mitigation for water resources projects should be planned and implemented under the Watershed Approach. Under the Watershed Approach, decisions about the type and location of compensatory mitigation projects are to be driven by scientific assessments of watershed needs, which could include wildlife habitat conservation and restoration of floodplain function, and how specific wetland or stream restoration and protection projects can best address those needs. If planned and constructed to meet watershed restoration goals (including fish and wildlife habitat goals), mitigation under this program could help to restore priority habitats for wildlife conservation.

Challenges: Recent evaluations indicate that the Corps has not complied with its historic mitigation requirements.²⁹ A 2002 GAO report found that mitigation plans were not prepared for almost 70 percent of the Corps water resource projects constructed from 1986-2001, even though many of the projects were likely to result in significant impacts according to the EPA and other organizations.³⁰ Where the Corps has developed plans for mitigation, they often call for fewer acres of mitigation than acres of impacts and mitigation sites are often poorly monitored.³¹ The new requirements codified in WRDA 2007 would

²⁷ 33 USC 2293(d)

²⁸ 33 USC 2293(d)

²⁹ Melissa Samet, “Congress Hands the Corps a New Set of Orders on Mitigation” *National Wetlands Newsletter*, vol. 30 no. 3 (Washington, DC: Environmental Law Institute, 2008).

³⁰ U.S. General Accounting Office, “U.S. Army Corps of Engineers: Scientific Panel’s Assessment of Fish and Wildlife Mitigation Guidance” (GAO-02-574, U.S. General Accounting Office, May 2002).

³¹ Melissa Samet, “Congress Hands the Corps”.

strengthen the Corps mitigation program, but Congress has already raised questions about how the Corps is implementing these new requirements.³²

³² Senate letter to Assistant Secretary Darcy, Assistant Secretary of the Army, Civil Works (17 November 2009), *available at* http://mccain.senate.gov/public/index.cfm?FuseAction=PressOffice.PressReleases&ContentRecord_id=0340c38b-b9b6-33c6-5c18-04df3fcfc1f&Region_id=&Issue_id=

Market: Endangered Species Mitigation

Market driver: Endangered Species Act §10, §7

Regulatory agencies: U.S. Fish and Wildlife Service; NOAA National Marine Fisheries Service

Size of market: Between 2003 and 2006, about \$370.3 million was committed annually to mitigation under Section 10 of the Endangered Species Act.³³ According to speciesbanking.com, there are 119 species banks selling 92 types of species credits and 51 types of habitat credits in 12 states. The total area of land protected in species banks is 80,764.74 acres.³⁴

Summary of program: The federal Endangered Species Act (ESA) prohibits the “taking” (killing or harming) of species that are listed as “endangered” or “threatened” under the law or any activities that destroy the habitat necessary for their survival.³⁵ However, Section 10 of the U.S. Endangered Species Act allows the U.S. Fish and Wildlife Service (USFWS) and NOAA National Marine Fisheries Service (NMFS) to permit in advance non-federal activities that may “take” protected species provided the taking is the result of otherwise lawful activity and that the impacts are minimized and mitigated to the maximum extent practicable. In order to receive an incidental take permit, applicants must submit a Habitat Conservation Plan (HCP) that specifies the impacts that are likely to result from the taking; the steps being taken to monitor, minimize, and mitigate such impacts; and the alternative activities that were considered but not adopted. One way to meet the mitigation requirements of the HCP is by purchasing in-kind credits from a conservation bank.

Section 7 of the federal ESA requires that federal agencies consult with the USFWS or NMFS to ensure that their actions will not jeopardize listed species or destroy or adversely modify designated critical habitat. Following consultation, the agencies must issue a “biological opinion,” outlining how the proposed actions, taken together with cumulative effects, will affect listed species or their habitat. If the opinion finds that the actions will jeopardize the species, the biological opinion must outline steps that should be taken to avoid jeopardy. If the agencies determine that the actions will cause a take of listed species, the biological opinion must outline steps to minimize the impacts. Some USFWS offices require conservation measures, such as buying credits from a conservation bank, as an approach to minimizing impacts.

A conservation bank is “a parcel of land containing natural resource values that are conserved and managed in perpetuity, through a conservation easement held by an entity responsible for enforcing the terms of the easement, for specified listed species and use to offset impacts occurring elsewhere to the same resource values on non-bank lands.”³⁶ The goal of a conservation bank should be to “provide an economically effective process that provides options to landowners to offset the adverse effects of proposed projects to listed species.”³⁷ A bank can be created through 1) acquisition of habitat, 2) protection of habitat through easements, 3) restoration or enhancement of habitats, 4) creation of new habitat in some situations, and 5) prescriptive management of habitats for specific characteristics. The USFWS’s guidance on conservation banking states that conservation banks may be used as compensation for activities regulated under §7 and §10 as long as the adverse impacts to the species at the project site are compensated by credits sold by the bank for the same species.

³³ Jessica B. Wilkinson, et al., *The Next Generation of Mitigation*.

³⁴ Ecosystem Marketplace, “Market Snapshot,” at <http://www.speciesbanking.com>

³⁵ 16 U.S.C. §1531 et seq.

³⁶ United States Department of Interior, Fish and Wildlife Service, “Guidance for the Establishment, Use and Operation of Conservation Banks” (Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service, 2 May 2003), available at <http://www.fws.gov/endangered/pdfs/MemosLetters/conservation-banking.pdf>

³⁷ Ibid.

Opportunities for large-scale ecosystem restoration in hazard areas: The first goal of a conservation bank must be to offset adverse effects of proposed projects on listed species through the preservation or restoration of the target species' habitat. There may be opportunity to help fund large-scale ecosystem restoration in areas where listed species habitat coincides with hazard areas. For example, conservation banks for salmonids in Washington are helping to restore salmon habitat as well as natural floodplain function. The Blue Heron Slough Conservation bank in the Snohomish River Basin will provide 354 acres of compensation for impacts to habitat for listed salmon species while also reducing flood hazards in the area. This bank is located in an area that has been given a high priority for restoration in local salmon recovery plans.

Opportunities for wildlife conservation: Potential for conservation banking to contribute to wildlife conservation will be species specific. Conservation banks could further wildlife conservation goals if State Wildlife Action Plans and other regional conservation plans provide a framework for making mitigation decisions.

Challenges/Problems: Although restoration or enhancement of degraded habitats and prescriptive management are allowable ways to generate credits, most conservation banks currently rely on preservation or acquisition to generate credits (resulting in a net loss of suitable habitat for endangered species). This limits the usefulness of compensation funding under the ESA to add to large-scale ecosystem restoration projects. Further, the federal ESA currently does not apply the mitigation protocol (avoid, minimize, compensate) when evaluating potential projects. A greater emphasis on avoidance and minimization may reduce the need for compensation projects.

As for wetland mitigation banks, appropriate measures must be taken to ensure the success of the restoration effort. To date, no comprehensive study on the ecological effectiveness of conservation banks has been conducted.

Market: Natural Resource Damages

Market driver: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Oil Pollution Act (OPA); Clean Water Act (CWA); Park System Resources Protection Act (PSRPA); National Marine Sanctuaries Act (NMSA)

Regulatory agencies: Various, U.S. Environmental Protection Agency, NOAA, Department of Energy, Department of Defense, State Agencies

Size of market: ELI has estimated that approximately \$87.65 million annually in NRD expenditures is recovered under federal law by both state and federal trustees.³⁸

Summary of program: A responsible party may be liable for natural resource damages under one or more federal laws depending on the source of injury and the location (See table below from Environmental Law Institute Report “Mitigation of Impacts to Fish and Wildlife Habitat: Estimating Costs and Identifying Opportunities”).³⁹ Many states have also passed NRD statutes.

NRD Statutory Authority					
	CERCLA	OPA	CWA	PSRPA §19(j)	NMSA
Cause of Injury	Hazardous Substances	Oil	Oil and Hazardous Substances	Any means of Injury	Any means of injury
Location of Event	Any place where hazardous substances are released or have come to be located	Navigable waters (U.S. waters), adjoining shorelines, and Exclusive Economic Zone	Navigable waters of the U.S., adjoining shoreline, contiguous zones	Within a Park Unit	Within a Marine Sanctuary
Trustees	Federal agencies, states, and tribes	Federal agencies, tribes, and foreign governments	Federal agencies, states, and tribes	Secretary of the Interior	Secretary of Commerce

In response to an injury to natural resources, the designated trustee (or federal agency) undertakes a three-step NRD process under federal law: 1. preassessment, 2. injury assessment/restoration planning, and 3. restoration implementation. Responsible parties are liable for assessment and restoration costs, including the temporal losses of use associated with cleanup and restoration.⁴⁰

Opportunities for large-scale ecosystem restoration in hazard areas: There may be opportunities to inform NRD injury assessments and restoration decisions and target restoration in off-site priority restoration areas. For example, after a spilling incident on June 15, 2006, the Port of Everett in Washington was required, under Washington’s Oil and Hazardous Substance Spill Prevention and Response Act, to compensate by paying a fine and undertaking habitat restoration. Along with People for Puget Sound, the Port cleared invasive vegetation, planted native plants, mulched, and maintained previously planted trees in an area that provides wildlife habitat and flood hazard reduction. Additionally, the Port paid \$4761.02 for the 472 gallons of diesel spilled into the harbor.

³⁸ Environmental Law Institute, *Mitigation of Impacts to Fish and Wildlife Habitat*.

³⁹ Ibid.

⁴⁰ This does not include settlements and judgments brought independently by state trustees under federal law.

Opportunities for wildlife conservation: State Wildlife Action Plans and other conservation plans could be used to inform the selection of NRD injury assessments and restoration decisions.⁴¹ The National Marine Sanctuaries Act and Park Service Resources Protection Act both allow for off-site and out-of-kind restoration, but this type of compensation is limited in practice.⁴² Some program guidance requires that NRD trustees consider injuries and assessments in the context of existing plans. For example, the National Park Service has the authority to evaluate restoration under the Park System Resources Protection Act in the context of resources management objectives outlined in planning documents, such as the State Wildlife Action Plans, that cover NPS resources.⁴³

Challenges/Problems: NRD settlements and judgments may be limited by laws, policies, and regulations. Injury assessments must relate to the injury and may be limited to restoring or replacing equivalent natural resources (e.g. acquisition of equivalent lands and waters does not occur in practice).⁴⁴

⁴¹ Jessica B. Wilkinson, et al., *The Next Generation of Mitigation*.

⁴² Environmental Law Institute, *Mitigation of Impacts to Fish and Wildlife Habitat*.

⁴³ Ibid.

⁴⁴ Ibid.

Market: Water Quality Trading

Market driver: Clean Water Act

Regulatory agencies: U.S. Environmental Protection Agency

Size of market: Unknown

Summary of program: Water quality trading is an approach to meeting water quality goals at a watershed scale by controlling pollutants (e.g., nitrogen, phosphorous, and sediment) across multiple sources. Water quality trading works by allowing landowners/facilities to generate credits for pollution reduction activities where pollution control costs may be relatively low (generally upstream) and sell those credits to facilities elsewhere whose pollution control costs may be relatively high. Water quality trading also provides a framework to address non-point sources of pollution by allowing farmers or other landowners to generate water quality credits through best management practices or habitat restoration.

Trading programs are most often established to improve water quality for impaired water bodies (i.e., water bodies that do not meet state minimum water quality standards). States are required to develop Total Maximum Daily Loads (TMDL), or “calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards”⁴⁵ for all state waters identified as impaired by the state. Water quality trading programs may be established to help a state meet TMDL requirements. Trading programs may also be established to meet water quality-based requirements in a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit program regulates point sources of pollution into waters of the United States. In a water quality trading scheme, credit buyers may be holders of NPDES permits who need to reduce pollution to meet stricture permit limits or who will experience high pollutant control costs when expanding their operations.

By 2009, fourteen states had established or are developing some type of statewide water quality trading program. Programs have been established to trade nutrients, oxygen demanding parameters, and temperature.

Opportunities for large-scale ecosystem restoration in hazard areas: Water quality trading projects may provide limited opportunity to help fund large-scale ecosystem restoration in hazard areas. Activities conducted to generate credits could be developed to provide both water quality improvements and flood damage reduction, providing multiple watershed benefits. However, these kinds of restoration activities may not be appropriate for every trading program.

Opportunities for wildlife conservation: Water quality trading does offer some opportunity to fund habitat restoration for wildlife. For example, the Oregon Department of Environmental Quality has developed temperature TMDLs that require those responsible for raising temperatures in the Tualatin Watershed to mitigate these impacts. Treatment options for cooling water at the wastewater treatment plants were limited and expensive. A trading scheme was developed to achieve reductions in temperature through less expensive natural infrastructure that also provide ecological benefits such as habitat, erosion control, and water filtration.⁴⁶ Credits can be generated through improving riparian shade, augmenting base flows in the Tualatin, and using reclaimed water for irrigation.⁴⁷

⁴⁵ U.S. Environmental Protection Agency, “Impaired Waters and Total Maximum Daily Loads,” *at* <http://www.epa.gov/OWOW/tmdl/>

⁴⁶ Oregon Department of Environmental Quality, “Water Quality Credit Trading in Oregon: A Case Study Report” (Oregon Department of Environmental Quality, 2007), *available at* <http://www.deq.state.or.us/WQ/trading/docs/wqtradingcasestudy.pdf>

⁴⁷ Oregon Department of Environmental Quality, “Water Quality Trading Frequently Asked Questions,” *at* <http://www.deq.state.or.us/WQ/trading/faqs.htm#11>

Challenges: Although 48 water quality trading programs have been developed around the country,⁴⁸ there appears to be little practical success overall.⁴⁹ Few pilot water quality trading programs have lasted past the pilot stage, and few programs have been able to demonstrate a significant improvement in water quality or a reduction in water pollution control costs.⁵⁰ Further, restoration efforts undertaken to generate water quality credits would have to be protected in perpetuity to provide long-term wildlife conservation benefits. Although pollution reduction measures must continue to provide water quality benefits in order for credits to be generated over time, permanent protection is not currently required of water quality trading projects.

⁴⁸ U.S. Environmental Protection Agency, “State and Individual Trading Programs,” *at* <http://www.epa.gov/owow/watershed/trading/tradingmap.html>.

⁴⁹ U.S. Environmental Protection Agency, “Water Quality Trading Evaluation, Final Report,” *available at* <http://www.epa.gov/evaluate/wqt.pdf>

⁵⁰ *Ibid.*

Market: Carbon Offsets, Bio-Sequestration

Market driver: Regional Regulatory Markets, CA AB32, Pending Climate Change Legislation

Regulatory agencies: U.S. Environmental Protection Agency, U.S. Department of Agriculture, ?

Size of market: Unknown

Summary of program: Regulatory and voluntary carbon markets provide opportunities for carbon emitters to purchase offsets to meet emissions reductions targets. Offset credits are derived from carbon reduction projects such as low-carbon energy production, energy efficiency measures, or carbon sequestration projects. Carbon sequestration projects could include afforestation, avoided deforestation, soil sequestration, and wetland restoration. To provide reliable carbon emissions reductions offsets must be quantifiable, verifiable, additional, and permanent.

Bills pending in Congress would establish domestic offset programs for greenhouse gas reduction.⁵¹ Both bills include domestic agricultural and forestry sources such as “agricultural, grassland, and rangeland sequestration and management practices and changes in carbon stocks attributed to land use change and forestry activities” among the project types to be considered to be eligible to generate offset credits.⁵² Both bills would also establish an advisory board to develop regulations to govern the offset programs.

The regional greenhouse gas markets also allow emitters to purchase offsets to meet reduction targets. For example, the Regional Greenhouse Gas Initiative, recognizes five offset categories: landfill methane capture and destruction; reduction in emissions from transmission lines; sequestration of carbon due to afforestation; reduction or avoidance of CO₂ emissions due to green building initiatives; and avoided methane emissions from agricultural manure management operations.⁵³ Offset projects are tracked through an offsets module in the REGGI CO₂ Allowance Tracking System (REGGI COATS). The offsets module will be used to register offset projects, track project report submissions and consistency applications, track project regulatory status and distribution of offset allowances, and provide public access to offset project documentation.⁵⁴

Opportunities for large-scale ecosystem restoration in hazard areas: Offset credits for wetland restoration may provide the best opportunity to fund ecosystem restoration in hazard areas (although forestry projects may also provide opportunity). Wetlands are estimated to be a net carbon sink, absorbing about 49 million tons of carbon annually. However, wetlands are a source of methane gas, releasing approximately 9 million tons of the potent greenhouse gas annually.⁵⁵

There is significant uncertainty surrounding these estimate and the net greenhouse gas benefits will vary among wetland type and location. Historically, however, the loss of wetlands is estimated to have caused

⁵¹ The bills would also allow for international offset credits. This section focuses on domestic offsets.

⁵² HR 2454, American Clean Energy and Security Act of 2009, Section 502, at [http://thomas.loc.gov/cgi-bin/query/F?c111:3:./temp/~c111WUZzmt:e1669869:;S.1733,Clean Energy Jobs and American Power Act, Section 733, at http://thomas.loc.gov/cgi-bin/query/F?c111:1:./temp/~c111D6yQ6:e583728:](http://thomas.loc.gov/cgi-bin/query/F?c111:3:./temp/~c111WUZzmt:e1669869:;S.1733,Clean%20Energy%20Jobs%20and%20American%20Power%20Act,Section%20733,at%20http://thomas.loc.gov/cgi-bin/query/F?c111:1:./temp/~c111D6yQ6:e583728:) Eligible projects include afforestation, reforestation, management of wetlands, and improved forest management among others.

⁵³ Regional Greenhouse Gas Initiative, “Offsets,” at <http://www.rggi.org/offsets>. The Regional Greenhouse Gas Initiative (a consortium of ten Northeastern states - Connecticut, Delaware, Maryland, Massachusetts, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) is the first mandatory market for reducing GHG emissions in the United States. The signatory states agreed to reduce emissions from the power sector by 10 percent by 2018 (<http://www.rggi.org/about>).

⁵⁴ Regional Greenhouse Gas Initiative, “Offset Project Tracking,” at http://www.rggi.org/offsets/project_tracking

⁵⁵ U.S. Climate Change Science Program and the Subcommittee on Global Change Research, *The First State of the Carbon Cycle Report (SOCCR) – The North American Carbon Budget and Implications for the Global Carbon Cycle* (Asheville, NC: National Oceanic and Atmospheric Administration, National Climatic Data Center, November 2007), available at <http://www.climatechange.gov/Library/sap/sap2-2/final-report/sap2-2-final-preface.pdf>

the release of 15 million tons of carbon annually, and wetland restoration may help to reduce greenhouse gas pollution. However, there is still a significant amount of uncertainty about the greenhouse gas reduction potential of wetlands and measuring actual carbon reduction in wetlands is extremely complicated. More research is needed before verifiable and quantifiable wetland restoration offset credits could be generated for the carbon market.

Opportunities for wildlife conservation: Wetland restoration and forestry offsets could also provide wildlife conservation benefits and serve as a significant source of funding for habitat restoration and preservation. However, strict standards would have to be developed to ensure that offset projects are permanent and that offset programs include criteria for biodiversity or other wildlife co-benefits.

Challenges: Quantifying offset emissions is very difficult, especially for wetlands, and ensuring that projects actually lead to permanent and verifiable carbon emission reductions is complicated. Issues of ensuring additionality (i.e., ensuring that offset credits are not given for a project that would have been completed anyway), developing activity baselines, and preventing leakage (i.e., generating offsets in one area causes deforestation in another area) will need to be addressed before carbon offsets provide conservation benefits. There is also a need for third party verification and certification to verify emissions reductions in the field. In addition, standards will need to be developed to ensure that offset projects provide multiple benefits, including wildlife conservation.

Market: Floodplain management permits, compensatory floodplain storage capacity

Market driver: National Flood Insurance Program

Regulatory agencies: FEMA, State Agencies

Size of market: Unknown

Summary of program: The National Flood Insurance Act requires that a community adopt and enforce floodplain management criteria in order for property owners to be eligible for federal flood insurance. Communities can incorporate these requirements into their subdivision, zoning, or other land use ordinances, or they can elect to adopt a separate floodplain management ordinance.

The minimum floodplain management criteria required of a community depend on the type of flood risk information that a community has been provided by FEMA. In general, there are four basic components that a community must adopt and enforce in order to participate in the NFIP.⁵⁶ Communities must: 1) adopt a permitting program for development within the regulatory floodplain, 2) ensure that structures built in the floodplain are protected from flood damage, and 3) ensure that buildings classified as “substantially improved” are treated as new buildings and comply with NFIP minimum building standards for new construction, and 4) Communities must designate a regulatory floodway that is designed to carry 100-year floodwater without “increasing the water surface elevation of that flood more than one foot at any point.” Fill, new construction, and other developments are prohibited within the floodway unless hydrologic and hydraulic studies have demonstrated that the proposed developments would not result in an increase in flood levels.

The minimum floodplain management requirements generally focus on building standards rather than addressing overall impacts of proposed development to floodplain function. Floodplain permit review standards do not require evaluation of a project’s impact on flood storage capacity as part of permit approval. However, communities can earn Community Rating System (CRS) credit for the protection of flood storage capacity by prohibiting fill within floodplains or requiring that new developments provide compensatory storage at hydraulically equivalent sites.⁵⁷ The Community Rating System (CRS), introduced in the 1994 National Flood Insurance Reform Act, was established to allow communities to adopt floodplain management standards that go above and beyond the NFIP requirements in exchange for lower premiums (5 – 45 percent reductions) for rate payers. CRS credits can also be awarded for more restrictive regulations, prohibiting fill in the floodway, innovative land development criteria, flood-proofing of flood-prone buildings, stormwater management, preserving open space in a natural state, and for acquiring and clearing buildings and returning the land to open space.

Opportunities for large-scale ecosystem restoration in hazard areas: Requiring compensation under local floodplain management ordinances for reductions in flood storage capacity would help to address some flood hazard impacts of development in the regulatory floodplain. Several communities have adopted floodplain management regulations that include requirements for flood storage compensation.⁵⁸ However, to provide opportunity for large-scale ecosystem restoration in hazard areas, local floodplain management ordinances would have to define acceptable compensation projects to include wetland or aquatic resource restoration or other efforts designed, implemented, and managed to restore natural floodplain function in

⁵⁶ 44 CFR §60.3

⁵⁷ Federal Emergency Management Agency, *National Flood Insurance Program Community Rating System Coordinator’s Manual* (Federal Emergency Management Agency, 2007), available at <http://training.fema.gov/EMIWeb/CRS/2007%20CRS%20Coord%20Manual%20Entire.pdf>

⁵⁸ Planning and Design Services’ LouisvilleLDC.org, “Floodplain Management Ordinance,” at <http://www.louisvilleldc.org/C04/C04A4Gp3of3.asp>; City of Suwanee, “Floodplain Management Ordinance,” available at <http://www.suwanee.com/pdfs/floodplainmanagementordinance.pdf>

perpetuity. These compensation projects could be directed to priority sites for watershed restoration as identified in watershed restoration or other habitat conservation plans (e.g., State Wildlife Action Plans).

Opportunities for wildlife conservation: Currently, opportunities for wildlife conservation are limited. However, floodplain compensation projects could involve restoration of priority sites for habitat conservation, as long as they also provide compensatory flood storage capacity and the restored habitats are preserved in perpetuity.

Challenges: Compensation for floodplain impacts is not required under federal minimum floodplain management regulations. Under CRS, communities can develop and adopt amendments to their floodplain management ordinances that require compensation for lost flood storage capacity. Federal floodplain regulations could be revised to require compensation of flood storage capacity for any permits issued in the floodplain and to require that natural floodplain restoration activities (e.g., wetland restoration) are considered first when evaluating flood storage compensation options.

Incentive Programs

Incentive Program: Wetland Reserve Program

Mechanism: Rental Payments, Cost-Share Agreements

Management agencies: Natural Resources Conservation Service

Size of program: Almost 2 million acres were enrolled in WRP as of 2008.⁵⁹ The program cap is 3,041,200 acres.⁶⁰ The WRP budget for FY 2009 is \$181 million.⁶¹

Summary of program: Administered by the Natural Resources Conservation Service (NRCS), the Wetlands Reserve Program (WRP) is a voluntary program that offers permanent, 30-year conservation easements, or restoration cost-share agreements to willing private or tribal landowners to protect and restore wetland habitat. In exchange for purchasing the easement, NRCS requires that the landowner retires the eligible land from agriculture.

The program offers three enrollment options, including 1) permanent easement, 2) 30-year easement, and 3) restoration cost-share agreement.⁶² Under the permanent easement USDA pays 100 percent of the easement value and administrative costs and up to 100 percent of restoration costs. Under the 30-year easement, which expires after 30 years, USDA pays 75 percent of the easement value and up to 75 percent of restoration costs. In both cases, the value of the easement is the lower of the fair market value of the land, the geographic area rate cap, or the landowner's offer. Under restoration cost-share agreements, USDA pays up to 75 percent of restoration costs. In this case no easement is placed on the enrolled acres, and restoration payments can not exceed \$50,000 per year.⁶³ Enrolled land may be leased for undeveloped recreational activities or other compatible uses of the land, such as fishing or hunting, that do not impact restrictions in the warranty easement deed.

Qualified landowners must hold title to land that maximizes wildlife benefits and wetland values and functions. Eligible lands include wetlands farmed under natural or converted conditions and adjacent lands functionally dependent on wetlands; prior converted cropland; farmed wetland pasture; land that has become a wetland as a result of flooding; range land, pasture, or production forest, or other former/degraded wetlands being used to produce food and fiber; land where the hydrology has been significantly degraded and can be restored; riparian areas that link protected wetlands; lands adjacent to protected wetlands that contribute significantly to wetland functions and values; and previously restored wetlands that need long-term protection.⁶⁴

The program emphasizes "achieving the greatest wetland functions and values, along with optimum wildlife habitat."⁶⁵ For enrolled properties, consideration is given to the conservation benefits of easement, cost effectiveness, availability of matching funds, extent to which the purposes of the easement program would be achieved on the land, productivity of the land, and on-farm and off-farm environmental threats if the land were to remain in production. Permanent easements are given priority over shorter-term easements.⁶⁶ Further, easements protecting and enhancing habitat for migratory birds and other wildlife are

⁵⁹ U.S. Department of Agriculture, Natural Resources Conservation Service, "Farm Bill 2008, At a Glance: Wetlands Reserve Program," available at http://www.nrcs.usda.gov/farmbill/pdfs/WRP_At_A_Glance_062608final.pdf

⁶⁰ Ibid.

⁶¹ U.S. Department of Agriculture, "FY 2009 Budget Summary and Annual Performance Plan," Available at <http://www.obpa.usda.gov/budsum/fy09budsum.pdf>

⁶² U.S. Department of Agriculture, "Farm Bill 2008".

⁶³ 7 C.F.R. §§ 1467.9

⁶⁴ 7 C.F.R. §§ 1467.6

⁶⁵ Wetlands Reserve Program Webpage, at <http://www.nrcs.usda.gov/Programs/WRP/>

⁶⁶ 7 CFR §§1467.6(a)(1)-(a)(6)

given priority consideration. NRCS may also put higher priority on certain geographic regions of the state where restoration of wetlands may contribute to state and regional goals.

Opportunities for large-scale ecosystem restoration in hazard areas: By targeting wetlands, WRP has a significant potential to help fund large-scale ecosystem restoration efforts in hazard areas. More than 3 million acres of wetland habitat may be restored under the program; many of these acres may be allocated to areas that maximize the flood protection function of wetlands. Areas of floodplain that were converted to agriculture would be target sites for WRP restoration funding in hazard areas.

Opportunities for wildlife conservation: WRP has a significant potential to fund conservation of priority habitats. Program eligibility and prioritization criteria emphasize optimizing wildlife habitat in enrolled properties. Further, priority is given to restoration techniques that maximize wildlife and wetland functions and values. For example, project ranking in Wisconsin includes criteria like connectivity with satellite projects, presence of threatened and endangered species and species of concern, location within areas identified as habitat restoration areas or within the WI Joint Venture, or added value to existing WRP easement or other protected areas.⁶⁷

Challenges/Problems: Although priority is given to permanent easements, enrolled acres are not all permanently protected. Further, the program relies on voluntary participation by willing landowners, making it more difficult to direct this funding source to priority habitats, as identified in the State Wildlife Action Plans or other regional conservation plans, or to connect enrolled properties to meet regional conservation goals. Eligibility and prioritization criteria could emphasize properties within or adjacent to identified priority habitats. WRP projects will also be limited to agricultural areas.

⁶⁷ “Wisconsin Wetlands Reserve Program Site Ranking Sheet,” see ftp://ftp-fc.sc.egov.usda.gov/WI/wrp/wrp_manual/exhibit_06.xls.

Program: Conservation Reserve Program(CRP)/ Conservation Reserve Enhancement Program (CREP)/ State Acres for wildlife Enhancement (SAFE)

Mechanism: Rental Payments, Cost-Share Assistance

Management agencies: Farm Services Agency, Natural Resources Conservation Service

Size of market: In 2008, enrollment in the Conservation Reserve Program was 34.7 million acres. USDA distributed \$1.8 billion in rental payments in 2009.⁶⁸ In 2008, 380,000 contracts (4.1 million acres) were enrolled under CRP's continuous sign-up and 386,000 contracts (30.6 million acres) were enrolled under the general sign-up program.⁶⁹ In 2008, the CRP-SAFE approved contracts on 420,000 acres of habitat.⁷⁰ The national goal is to restore or enhance 500,000 acres of wildlife habitat through the SAFE program.

Summary of program: The Conservation Reserve Program, established by the Food Security Act of 1985 and reauthorized in subsequent Farm Bills, offers financial and technical assistance to farmers who establish resource-conserving cover (e.g., native grasses, wildlife plantings, trees, filterstrips, wetlands, or riparian buffers) on environmentally sensitive lands to improve the quality of water, control soil erosion, and enhance wildlife habitat.⁷¹ Farmers can receive annual payments based on the agricultural rental value of the land and cost-share assistance for up to 50 percent of costs of conservation practices (paid by the Commodity Credit Corporation (CCC)). Maintenance incentive payments may also be included in the CRP annual payment.⁷² CRP sites may also provide habitat for waterfowl, upland game birds, grassland songbirds and many other species of grassland wildlife.

The Conservation Reserve Program provides farmers the opportunity to covert highly erodible cropland or pasture that might not be commercially profitable to resource-conserving cover.⁷³ Lands eligible for CRP include cropland that is planted or considered planted in 4 of the previous 6 crop years and which is physically and legally able to be planted, as well as certain marginal pastureland suitable for use as a riparian buffer. In addition, the cropland must have a weighted average erosion index of 8 or higher, be expired CRP acreage, or be located in a national or state CRP priority area.

CRP projects are ranked based on the environmental benefits of the land using a tool called the Environmental Benefits Index. Environmental benefits criteria include wildlife habitat benefits, water quality benefits from reduced erosion and runoff, on-farm benefits from reduced erosion, long-term benefits, air quality benefits from reduced wind erosion, and cost.⁷⁴

General enrollment in CRP is only open during designated sign-in periods. Some types of environmentally desirable lands that will be devoted to certain conservation practices may be enrolled at any time in the continuous sign-up program. Continuous sign-up contracts have a duration of 10 – 15 years. Practices eligible for continuous sign-up include riparian buffers, wildlife habitat buffers, wetland buffers,

⁶⁸ U.S. Department of Agriculture, "USDA Issues \$1.8 Billion in Conservation Reserve Program Rental Payments," at http://www.usda.gov/wps/portal/lut/p/s.7_0_A/7_0_1OB?contentidonly=true&contentid=2008/10/0251.xml

⁶⁹ Ibid.

⁷⁰ U.S. Department of Agriculture, "Fact Sheet – State Acres for wildlife Enhancement Approved Projects II" (U.S. Department of Agriculture, Farm Service Agency, February 2008), available at http://www.fsa.usda.gov/Internet/FSA_File/safepr208.pdf

⁷¹ U.S. Department of Agriculture, "Conservation Reserve Program," at <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp>.

⁷² Ibid..

⁷³ Ibid.

⁷⁴ Ibid..

filter strips, wetland restoration, grass waterways, shelterbelts, living snow fences, contour grass strips, silt tolerant vegetation, and shallow water areas for wildlife.⁷⁵

The CRP wetland restoration initiative aimed to restore the functions and values of wetland ecosystems (where the hydrologic function had been lost) that are entirely within the 100-year floodplain. The FSA enrolled properties with 10-15 year annual rental payments and provided a 75 percent cost share for restoration activities. As of July 2004, the program had restored 1.8 million acres of wetlands and wetland buffers nationwide.⁷⁶ Approximately \$200 million was estimated to be allocated for payments under this initiative through 2007.

The Conservation Reserve Enhancement Program (CREP) is a partnership between States and the federal government to use CRP payments and contracts to encourage enrollments and practices that may address particularly pressing environmental needs. CREP contracts are 10-15 years in duration and provide producers with annual rental payment and cost-share for eligible projects.

State Acres for Wildlife Enhancement is a cooperative effort with CRP to restore and enhance wildlife habitat for threatened, endangered, and other high priority species (e.g., species that have experienced dramatic population loss or species that are of economic or social value to the community). Through this voluntary program, producers within an identified SAFE area can receive rental payments, incentives, or cost-share assistance for undertaking approved conservation practices that benefit the habitat of high-priority wildlife. Project proposals must be approved by wildlife professionals and include a wildlife monitoring and evaluation plan. Farmers sign up for 10-15 year contracts.⁷⁷

Opportunities for large-scale ecosystem restoration in hazard areas: In total, CRP's FY 2009 payments totaled \$1.8 billion dollars, which makes the program one of the most significant habitat conservation and restoration funding sources in the country. CRP offers some opportunity to specifically fund ecosystem restoration in hazard areas. Approved restoration methods for enrolled lands include planting filterstrips or wetland and riparian buffers, as well as providing a mechanism to restore habitats that contribute to flood protection in hazard areas. Although not all CRP funding is used to support projects in hazard areas, the wetland restoration initiative allocated an estimated \$200 million in payments through 2007 for wetland restoration in the 100-year floodplain for restoration.⁷⁸ To increase opportunities for multiple benefits in flood hazard areas, eligibility and prioritization criteria could be modified to target properties that will maximize flood protection as well as wildlife conservation.

Opportunities for wildlife conservation: At 34.7 million acres of enrolled habitat, CRP is the largest public-private partnership for conservation and wildlife habitat in the United States. CRP and CREP programs prioritize contracts that will maximize wildlife habitat. Specifically, the SAFE program targets essential habitat of state and regional high-priority wildlife and provides funding for approved conservation practices that benefit wildlife habitat.

Challenges: As with the Wetland Reserve Program and other Farm Bill conservation programs, acres enrolled in CRP/CREP are not all permanently protected. In fact, easements are limited to 10-15 years. Further, the program relies on voluntary participation by willing landowners, making it more difficult to direct

⁷⁵ U.S. Department of Agriculture, "Fact Sheet - Conservation Reserve Program Continuous Sign-up" (U.S. Department of Agriculture, Farm Service Agency, June 2006), *available at* http://www.fsa.usda.gov/Internet/FSA_File/crpcont06.pdf

⁷⁶ U.S. Department of Agriculture, "Fact Sheet - Conservation Reserve Program Wetlands Restoration Initiative" (U.S. Department of Agriculture, Farm Service Agency, August 2004), *available at* http://www.fsa.usda.gov/Internet/FSA_File/nonfloodwet04.pdf

⁷⁷ U.S. Department of Agriculture, "Fact Sheet - Conservation Reserve Program State Acres for wildlife Enhancement (SAFE)" (U.S. Department of Agriculture, Farm Service Agency, January 2008), *available at* http://www.fsa.usda.gov/Internet/FSA_File/safe08.pdf

⁷⁸ U.S. Department of Agriculture, "Fact Sheet - Conservation Reserve Program Wetlands Restoration Initiative".

this funding source to priority habitats as identified in the State Wildlife Action Plans or other regional conservation plans or to ensure connectivity among enrolled acres.

Program: Emergency Watershed Program Floodplain Easement

Mechanism: Acquisition

Management agencies: Natural Resources Conservation Service

Size of program: The 2009 American Recovery and Reinvestment Act allocated \$145 million for floodplain easements (\$30 million for any one state).⁷⁹

Summary of program: The 1996 Farm Bill⁸⁰ authorized the Emergency Watershed Program (EWP) to purchase floodplain easements from willing landowners. Floodplain easements allow the Natural Resources Conservation Service (NRCS) to purchase, restore, and enhance floodplain functions, conserve natural values (fish and wildlife habitat, water quality, floodwater retention, ground water recharge, open space), reduce long-term disaster assistance, and protect people and property from floods, drought, and the products of erosion.⁸¹ Landowners maintain rights to quiet enjoyment, to control public access, and to undeveloped recreational use such as hunting and fishing.

Eligible properties include floodplain lands that were damaged by flooding at least once in the previous year or at least twice within the previous 10 years; other floodplain lands that may contribute to the restoration of flood storage and flow, erosion control, or that would improve the practical management of the easement; or land that would be inundated as a result of a dam breach. NRCS has the full authority to restore, protect, manage, maintain, and enhance the functions and values of the floodplain land under easement.⁸²

In exchange for selling a permanent floodplain easement to NRCS, the landowner receives an easement payment that is the lower of the fair market value of the land, the geographic area rate cap, or the landowner's offer.⁸³

NRCS may provide up to 100 percent of the cost of the restoration and enhancement costs of the easements. NRCS actively restores the natural floodplain features of the land through "recreating the topographic diversity, increasing the duration of inundation and saturation, and providing for the re-establishment of native vegetation."⁸⁴ Structures within the easement may be demolished or removed out of the 100-year floodplain. Restoration is accomplished through an agreement with the landowner or another third party. Restoration can include both structural and non-structural activities.

Opportunities for large-scale ecosystem restoration in hazard areas: Floodplain easements may provide significant opportunity to fund restoration in areas that have experienced recent or frequent flooding. Floodplain easements are permanent, offering opportunities to both reduce flood hazard and fund sustainable ecosystem restoration. The 2009 American Recovery and Reinvestment Act allocated \$145 million for Emergency Watershed Program Floodplain Easements nationwide. Wisconsin, for example, received 23 easements throughout the state covering approximately 4,000 acres.⁸⁵ Project applications in nearby areas

⁷⁹ U.S. Department of Agriculture Natural Resources Conservation Service, "NRCS Information Related To the American Recovery and Reinvestment Act of 2009, NRCS Recovery Programs," at http://www.nrcs.usda.gov/recovery/#NRCS_RECOVERY_PROGRAMS:

⁸⁰ 7 USC 7201 §359

⁸¹ U.S. Department of Agriculture, Natural Resources Conservation Service, "Emergency Watershed Protection - Floodplain Easement," at <http://www.nrcs.usda.gov/programs/ewp/floodplain/index.html>

⁸² 7 CFR 624 §, available at <http://www.nrcs.usda.gov/programs/ewp/floodplain/ewpfinalrule4405-A.pdf>

⁸³ U.S. Department of Agriculture, "Emergency Watershed Protection".

⁸⁴ U.S. Department of Agriculture, "Emergency Watershed Protection".

⁸⁵ U.S. Department of Agriculture, Wisconsin Natural Resources Conservation Service, "Wisconsin NRCS News – NRCS Announces Floodplain Easement Assistance for Landowners," at <http://www.wi.nrcs.usda.gov/news/newsreleases/fperel3.html>

were grouped together to maintain contiguity and increase benefits to the watershed as a whole. In addition, applications for floodplain easements received higher priority if the area experiences frequent flooding or provides habitat for threatened and endangered species.⁸⁶

Opportunities for wildlife conservation: Floodplain easements are permanent easements on land and may provide multiple benefits including wildlife conservation. Although the conservation of natural values, including fish and wildlife habitat, is a goal of the easement program, there are no requirements for maximizing wildlife benefits in the criteria for eligible lands. Further, there is no requirement that the easement is managed for wildlife benefits in the long-term.

Challenges: This program may be able to direct funds to priority areas or large-scale restoration efforts; however it is driven by the availability of landowners willing to sell easements on their property. Further, floodplain easements allow structural flood control solutions that may not align with the restoration of natural floodplain function or the conservation of wildlife habitat. In addition, the easements do not include provisions for long-term management of wildlife habitat (as well as the other floodplain functions). In contrast to some other NRCS programs, floodplain easements are a permanent means of protecting land in the floodplain and can be purchased on non-agricultural land.

⁸⁶ Personal communications with Alison Pena, Wisconsin NRCS, Floodplain Easements Program and John Ramsden, Wisconsin NRCS, State Conservation Engineer, 14 September 2009; *see also* "FPE Ranking Sheet for Wisconsin," available at <http://www.wi.nrcs.usda.gov/programs/EWP/ewppranking.xls>

Program: Hazard Mitigation Grants

Mechanism: Cost-share programs

Management agencies: Federal Emergency Management Agency, State Agency, Local Government

Size of program: From 2003 – 2009, appropriations for the Pre-Disaster Mitigation Grant program have varied from a low of \$50 million in 2006 to a high of \$150 million in 2003 and 2004.⁸⁷ FY 2009 appropriations were \$90 million. In 2009, 138 grants were awarded in 43 states, 1 territory, and to 1 tribal government. Fifty-two grants were also earmarked in the 2009 appropriation. Funding for the Hazard Mitigation Grant Program exceeded \$1 billion dollars in FY 2008.⁸⁸ Funding in FY 2009 for the Repetitive Flood Claim program and Severe Repetitive Loss program was \$10 million and \$80 million respectively. In total, mitigation grant programs awarded more than \$444.2 million to 1,050 projects in FY 2007.⁸⁹

Summary of program: The Pre-disaster Mitigation Grant Program (PDM), authorized in its current form by the Disaster Mitigation Act of 2000, provides funding for technical and financial assistance to States or local governments to develop hazard mitigation plans and implement mitigation projects prior to a disaster. Federal funds, up to 75 percent of the total cost of the project, are provided to assist State and local governments to implement cost-effective, pre-disaster mitigation measures designed to reduce the damage of natural disasters. Assistance can be used for activities designed to improve vulnerability assessments, establish hazard mitigation priorities, support effective public-private natural disaster hazard mitigation partnerships, and disseminate information on mitigation techniques. In addition to mitigation planning, grants may also be given for property acquisition and structure demolition or relocation, structural elevation, floodproofing of structures, soil stabilization or wildfire mitigation.⁹⁰

The Hazard Mitigation Grant Program (HMGP) was established by the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 and funds mitigation measures after the declaration of an emergency. HMGP funds become available to eligible communities after the President has declared a major disaster. The purpose of the program is to take the opportunity during the aftermath of a disaster to assist State, tribal, and local governments to implement long-term hazard mitigation measure and ensure that the risk of losses from future disasters is reduced. The primary emphasis of the program is on non-structural measures for flood control. Eligible projects include acquisition of high-risk properties, elevation of properties, retrofitting existing buildings, vegetation management/soil stabilization, stormwater management, some structural flood control projects, and post-disaster code enforcement activities.⁹¹

Eligible applicants for HMGP funding include state and local governments, private non-profit organizations, and Indian tribes for tribal organizations. State agencies are awarded funding and then pass the funds to local governments or individuals through state-administered programs. Federal cost-share for HMGP activities is 75 percent.

HMGP funds for acquisition and removal of flood-prone homes requires that the property be permanently converted to open space. Properties eligible for acquisition under these programs include those where there is a voluntary seller, that may or may not have had damages, where easements or encumbrances can be extinguished, and that do not contain hazardous materials. The local government becomes the owner of the flood-prone property and the land is restricted in perpetuity to open space purposes consistent with

⁸⁷ Congressional Research Service, “FEMA’s Pre-Disaster Mitigation Program: Overview and Issues” (Washington, DC: 10 July 2009).

⁸⁸ U.S. Department of Homeland Security, Federal Emergency Management Agency, *Hazard Mitigation Assistance Program Guidance* (Washington, DC: 19 June 2008), p 6.

⁸⁹ *Ibid.*, p 6.

⁹⁰ Congressional Research Service, “FEMA’s Pre-Disaster Mitigation Program”.

⁹¹ Congressional Research Service, “FEMA’s Hazard Mitigation Grant Program: Overview and Issues” (25 March 2009).

natural floodplain functions (e.g., recreation, nature reserves, cultivation, grazing, camping, or wetlands in perpetuity). There can be no intention to use the property for uses inconsistent with the required open space deed restrictions and FEMA acquisition requirements. Land uses cannot include walled buildings, flood control structures, paved surfaces, bridges, cemeteries, or placement of fill materials. In addition, future disaster relief expenditures are prohibited on properties acquired through buy-out programs.⁹²

Other major voluntary federal buyout programs include the Flood Mitigation Assistance Program, Severe Repetitive Loss program, and Repetitive Flood Claim program. All three programs fund acquisition and relocation of properties, floodproofing of structures, and minor flood reduction projects. Properties eligible for the SRL program must be identified on a FEMA severe repetitive loss properties list. RFC grants are only given for properties that have received one or more NFIP flood insurance payments.⁹³

Opportunities for large-scale ecosystem restoration in hazard areas: Hazard mitigation grant funds may be of some use for large-scale ecosystem restoration in hazard areas. Property acquisition funding under all of the hazard mitigation grant programs requires that the property be permanently converted to open space upon removal of flood-prone structures. Because land uses on the property are restricted to purposes consistent with natural floodplain functions (e.g., recreation, nature reserves, cultivation, grazing, camping, or wetlands in perpetuity), these sites may provide opportunities for ecosystem restoration if connected with other restoration projects. Additional funding is needed to finance restoration activities on the property. For example, in 1997 the Portland Bureau of Environmental Services (BES) developed the Johnson Creek Willing Seller Land Acquisition Program. The goal of the program is to move people and property out of high risk areas, minimize repetitive losses, increase flood storage capacity, improve fish and wildlife habitat, restore wetlands, and provide recreational opportunities. In addition to HGMP grants, the program has raised almost \$10 million dollars from HUD Community Development Block Grant, BES Capital Improvement Program, and several bond measures to acquire and restore the properties.⁹⁴

Opportunities for wildlife conservation: The conservation of wildlife habitat is not a stated goal of the hazard mitigation grant program. However, properties acquired through buyout programs may provide indirect benefits for wildlife conservation.

Challenges: Buyout programs require that the property be permanently converted to open space, but there is little guidance for local governments on how to manage the property over the long-term. Local governments would likely have to identify funding for the restoration of natural floodplain functions or wildlife habitat on the properties. Further, buyouts are limited to willing sellers and thus acquired properties may not be located in priority sites and it may be more difficult to connect properties. However, if priority is given to acquisition sites that overlap with priority habitats identified in the State Wildlife Action Plans or other regional conservation plans, there may be more opportunity to provide multiple benefits under the hazard mitigation grant programs. For example, the Johnson Creek Willing Seller Land Acquisition Program is now included as an implementation strategy under the 2001 Johnson Creek Restoration Plan and the 2004 Watershed Action Plan. The plans offer an opportunity to address multiple objectives, including flood protection and wildlife conservation, at a watershed scale. The acquisition program is helping the watershed planners to meet these objectives.⁹⁵

⁹² Congressional Research Service, "FEMA's Hazard Mitigation Grant Program".

⁹³ U.S. Department of Homeland Security, Federal Emergency Management Agency, *Hazard Mitigation Assistance Program Guidance*.

⁹⁴ The Oregon Partnership for Disaster Resilience, "Johnson Creek Floodway Acquisition," available at <http://www.oregonshowcase.org/stories/pdf.cfm?id=43>

⁹⁵ Portland Bureau of Environmental Services, "Willing Seller Program," at <http://www.portlandonline.com/BES/index.cfm?c=33213&a=106234>

Appendix H: Case Studies

Rock River Basin, Wisconsin

I. Introduction

Considering how financial incentives and mitigation funding have been employed in Wisconsin's Rock River Basin and nearby counties offers insight into opportunities to protect and restore wildlife habitat in hazard-prone areas elsewhere. Located in south-central Wisconsin, the Rock River Basin spans approximately 2.3 million acres, encompassing all or a portion of eleven counties.⁹⁶ A region of both extensive farmland and expanding urban areas, the Basin faces many challenges including water quality deterioration, habitat loss, and flooding and storm damage. Innovative approaches within the area have striven to incorporate wildlife habitat goals into farming incentive programs and mitigation as an important means to maintain key ecosystem services, protect species of concern and threatened and endangered species, and reduce flood hazards.

II. Background

A. Rock River Basin

The Rock River Basin contains an array of ecosystems including wetlands, deciduous forests, prairies, and grasslands.⁹⁷ The Basin supports many species native to Wisconsin, and serves as a part of an important bird migration route. Of particular note, the Rock River Basin's Horicon Marsh has been designated a "Wetland of International Importance," and sustains over 265 species of birds.⁹⁸ The Basin's rivers and lakes also provide important habitat for native fish species such as small and large-mouthed bass and walleye.⁹⁹

Approximately 73 percent of land within the Basin is devoted to agriculture.¹⁰⁰ Although agriculture comprises the majority of land use in the region, urban development in areas like the city of Madison is steadily increasing. Within the Rock River Basin, approximately 43 percent of wetlands have been lost due to agriculture and urban development.¹⁰¹ In addition, only eight percent of the Basin's deciduous forests remain, and much of this habitat has become fragmented.¹⁰² Once comprising 20 percent of the Basin, now only 0.5 percent of grassland acres remain throughout the state.¹⁰³ This habitat loss and fragmentation has resulted in the listing of approximately 130 species of animals, invertebrates, and plants in the Basin as either endangered, threatened, or a species of concern.¹⁰⁴ As a result, there is growing recognition of the connection between biodiversity preservation and large-scale ecosystem restoration.¹⁰⁵

⁹⁶ Brynda Hatch and Tom Bernthal, *Mapping Potentially Restorable Wetlands*, p 1.

⁹⁷ Wisconsin State Department of Natural Resources, "The State of the Rock River Basin," pp 40-50, available at http://dnr.wi.gov/org/gmu/lowerrock/imp/05_rrb_landag_2002.pdf

⁹⁸ *Ibid.*, p 82, available at http://dnr.wi.gov/org/gmu/lowerrock/imp/07_rrb_wildliferecreation_2002.pdf

⁹⁹ *Ibid.*, p 86.

¹⁰⁰ *Ibid.*, p 40, available at http://dnr.wi.gov/org/gmu/lowerrock/imp/05_rrb_landag_2002.pdf

¹⁰¹ Brynda Hatch and Tom Bernthal, *Mapping Potentially Restorable Wetlands*, p 1.

¹⁰² Wisconsin State Department of National Resources, "The State of the Rock River Basin," p 44, available at http://dnr.wi.gov/org/gmu/lowerrock/imp/05_rrb_landag_2002.pdf

¹⁰³ *Ibid.*, p 45.

¹⁰⁴ *Ibid.*, p 43.

¹⁰⁵ *Ibid.*, p 43.

B. Hazards

As noted above, over 70 percent of land within the Rock River Basin is used for agriculture. Conversion of habitat for agriculture in combination with an increase in urban development has resulted in the loss of approximately 43 percent of the basin's wetlands. Among the many ecosystem services offered by wetlands, this habitat absorbs water and regulates water flow, helping to protect against flooding. Wetlands loss has contributed to an increase in the risk of flooding and other storm damage within the basin.

Preceded by heavy rainfall in August 2007 and more than 100 inches of snow over the 2007-2008 winter, southern Wisconsin experienced severe flooding in June 2008. Lasting for seven days, rainfall surpassed 12 inches in some parts of south-central Wisconsin. All eleven counties in the Rock River Basin were included in the state declared disaster areas.¹⁰⁶ Damage costs from the flooding have been estimated at over 1.5 billion dollars.¹⁰⁷

In addition to 2008, portions of the Rock River Basin have experienced severe flooding in 2007, 2004, 2000, 1996, and 1993.¹⁰⁸ Notably, Columbia, Dodge, Fond du Lac, and Jefferson counties were all Presidential declared disaster areas during flooding in 2004.¹⁰⁹ During the 1993 Midwest Flood, Wisconsin experienced two to three times the normal rainfall over the course of January through July, and every major river in the state flooded during a June storm. Crop and soil damages resulting from the flooding exceeded 800 million dollars and residential damages were estimated to be 46 million dollars.¹¹⁰

III. Conservation and Restoration

A. Potentially Restorable Wetlands Survey

Through a U.S. Environmental Protection Agency (EPA) funded project, the Wisconsin Department of Natural Resources (WDNR) developed a methodology to map potentially restorable wetlands in three watersheds. The Rock River Basin is the third and largest watershed mapped using this approach. The Rock River Basin Potentially Restorable Wetlands Survey strives to improve "the WDNR's capacity for wetland management at the watershed scale."¹¹¹

In this study, a "potentially restorable wetland" must meet certain criteria such as soil type and compatibility with restoration techniques. A potentially restorable wetland can be scored on its "relative need," a value which compares relative amount of wetlands lost to prevalence of original wetlands within a subwatershed, and on its "potential opportunity," a value which identifies the land's ability to be restored. The study's analysis found that about 88% of wetlands lost in the Rock

¹⁰⁶ U.S. Geological Survey and U.S. Department of Interior, *Flood of June 2008 in Southern Wisconsin*, p 1, available at <http://pubs.usgs.gov/sir/2008/5235/pdf/sir20085235.pdf>

¹⁰⁷ U.S. Geological Survey Wisconsin Water Science Center Webpage, at <http://wi.water.usgs.gov/surface-water/flood2008/damages.html>

¹⁰⁸ Personal communication, Susan Josheff, Wisconsin Department of Natural Resources, Lower River Basin Supervisor, 19 October 2009.

¹⁰⁹ Federal Emergency Management Agency (FEMA), "Federal Register Notice [FEMA-1526-DR]," at <http://www.fema.gov/news/dfrn.fema?id=2284>

¹¹⁰ Wisconsin Historical Society Webpage, at http://www.wisconsinhistory.org/dictionary/index.asp?action=view&term_id=14907&search_term=flood.

¹¹¹ Brynda Hatch and Tom Bernthal, *Mapping Potentially Restorable Wetlands*, p 2.

River Basin have at least some potential for restoration.¹¹² The methodology of the study can be utilized to target where wetland restoration in the Rock River Basin, and more broadly throughout the state, can most improve key ecosystem services, protect wildlife, and reduce flood hazard.

B. Rock River Basin Total Maximum Daily Load

The Clean Water Act requires that states identify impaired waters that do not meet water quality standards, and prioritize these listed waters. States are additionally responsible for developing a Total Maximum Daily Load (TMDL) for each impaired water body, defined by U.S. EPA as “a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.”¹¹³ With over 40 bodies of water in the Rock River Basin on the Clean Water Act 303(d) impaired waters list, WDNR is creating a TMDL for the entire basin to address sediment and phosphorus pollution. The TMDL targets both point and nonpoint sources of these pollutants.¹¹⁴

In light of increased flooding events in the Rock River Basin, the TMDL will look at how a water quality plan can address flood hazards. As a means to restore water quality in the Basin, the TMDL will also take into account the ways in which habitat restoration, particularly of potentially restorable wetlands identified in WDNR’s study, can reestablish natural values in a floodplain.¹¹⁵ For example, WDNR will consider how floodplain restoration and planting native grass buffers along stream corridors can improve water quality.¹¹⁶ Although not centrally focused on wildlife habitat restoration and conservation, the Rock River Basin TMDL can offer an overall vision for ecosystem restoration in the area by helping to guide restoration priorities and more comprehensively considering natural function.

IV. Funding Through Incentives

A. Wetlands Reserve Program

Most land in the Rock River Basin is privately owned and in agriculture.¹¹⁷ Thus, voluntary programs targeting private land owners provide an essential mechanism for funding wildlife habitat restoration and protection. Administered by the Natural Resources Conservation Service (NRCS), the Wetlands Reserve Program (WRP) offers permanent, 30-year conservation easements or restoration cost-share agreements to private landowners. The program emphasizes “achieving the greatest wetland functions and values, along with optimum wildlife habitat.”¹¹⁸

In the Rock River Basin, many organic basins have been drained for agriculture. These areas tend to become more difficult to drain over time, decreasing their value as agricultural land. In instances

¹¹² Ibid., p 1.

¹¹³ U.S. EPA, “Impaired Waters and Total Maximum Daily Loads,” *at* <http://www.epa.gov/OWOW/TMDL/intro.html>

¹¹⁴ Wisconsin Department of Natural Resources, “Rock River Total Maximum Daily Load (TMDL),” *available at* <http://dnr.wi.gov/org/water/wm/wqs/303d/RockRiverTMDL/>

¹¹⁵ Personal communication with James Congdon, Wisconsin Department of Natural Resources, Upper Rock River Basin Supervisor, 15 September 2009.

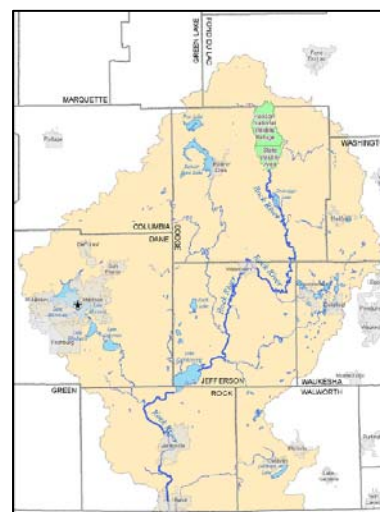
¹¹⁶ Personal communication with Susan Josheff, Wisconsin Department of Natural Resources, Lower River Basin Supervisor, 28 September, 2009.

¹¹⁷ Wisconsin Department of Natural Resources, “The State of the Rock River Basin” (April 2002), pp 40,43, *available at* http://dnr.wi.gov/org/gmu/lowerrock/imp/05_rrb_landag_2002.pdf

¹¹⁸ Wetlands Reserve Program Webpage, *at* <http://www.nrcs.usda.gov/Programs/WRP/>

like these, WRP provides a beneficial partnership. In the state of Wisconsin, 55,000 acres are under permanent WRP easement, and many of these acres are located within the Rock River Basin. Projects are scored on a 100-point scale, and funded projects usually receive point values in the 80s or 90s. Project ranking depends upon criteria like connectivity with satellite projects, presence of threatened and endangered species and species of concern, and value added to existing WRP easements or other protected areas.¹¹⁹ By considering wildlife objectives and seeking to increase the connectivity and size of areas enrolled in the program, WRP offers an opportunity to fund large-scale wildlife habitat protection.

The Zeloski Marsh in Jefferson County provides important example of how the Wetlands Reserve Program has contributed to both habitat preservation and reduction of flood hazards in the Rock River Basin. When increased development resulted in runoff from large storm events flooding his cropland, Dennis Zeloski decided to enroll his 1,496-acre muck farm in the NRCS WRP.¹²⁰ NRCS purchased an easement on the land, and the Madison Audubon Society purchased the property with the assistance of the Wisconsin Knowles-Nelson Stewardship Program, a program administered by WDNR that funds ecosystem conservation and restoration. The Madison Audubon Society later donated the property to WDNR, and the Zeloski Marsh became incorporated into the Lake Mills State Wildlife Area.¹²¹



B. Conservation Reserve Program State Acres For wildlife Enhancement Practice

A part of the Farm Service Agency’s (FSA) Conservation Reserve Program (CRP), State Acres For wildlife Enhancement (SAFE) practice targets essential habitat of state and regional high-priority wildlife. Through this voluntary program, producers within an identified SAFE area can receive rental payments, incentives, or cost-share assistance for undertaking approved conservation practices that benefit the habitat of high-priority wildlife. Project proposals must be approved by wildlife professionals and include a wildlife monitoring and evaluation plan. In this way, SAFE strives to be “results-oriented” and to improve the habitat of multiple species through a regional approach.¹²²

Two CRP SAFE areas span counties of the Rock River Basin. The Southwest Wisconsin Grassland SAFE area includes parts of Dane, Green, Iowa, and Lafayette counties. This SAFE area seeks to restore and conserve the grassland and prairie habitat. The restoration focuses on producing a

* Map of Rock River Basin, in Brynda Hatch and Tom Bernthal, *Mapping Potentially Restorable Wetlands*, p 3.

¹¹⁹ Personal communication with Don Baloun, Wisconsin Assistant State Conservationist, Wetlands Reserve Program, 14 September 2009 & Wisconsin Wetlands Reserve Program Site Ranking Sheet, see ftp://ftp-fc.sc.egov.usda.gov/WI/wrp/wrp_manual/exhibit_06.xls

¹²⁰ Mark Martin, “Dedication at Zeloski Marsh Unit- Lake Mills Wildlife Area,” *Madison Audubon Society Newsletter* (December 2007), p 10, available at <http://www.madisonaudubon.org/audubon/news/2007December.pdf>

¹²¹ Personal communication with Mark Martin, Natural Area Specialist, Wisconsin Department of Natural Resources, 24 September 2009.

¹²² Farm Service Agency, *Fact Sheet: Conservation Reserve Program State Acres For wildlife Enhancement (SAFE)* (January 2008), available at http://www.fsa.usda.gov/Internet/FSA_File/safe08.pdf

range of habitat for Wisconsin's bird species of greatest conservation need.¹²³ Although it ultimately will consist of a maximum of 4,000 acres, the area identified for potential projects encompasses much of Military Ridge Prairie Heritage Area,¹²⁴ grassland habitat for 14 rare and declining bird species.¹²⁵

Located in Winnebago, Fond du Lac, Dodge, and Columbia counties, the Glacial Habitat Restoration SAFE Area establishes "a mosaic of grasslands and wetlands" to benefit bird species such as bobolinks, eastern meadowlarks, grasshopper sparrow, Henslow's sparrows, and ring-necked pheasant.¹²⁶ The SAFE area will cover a maximum of 2,250 acres¹²⁷ and coincides with a priority habitat area targeted through the Wildlife Habitat Incentives Program (mentioned below).

These two areas identified for CRP SAFE projects not only include counties deemed disaster areas in the 2008 June flood, but also cover a larger amount of habitat. The CRP SAFE areas take into account contiguity with already protected lands such as the Military Ridge Prairie Heritage Area and lands targeted through other wildlife habitat programs. By seeking to restore the natural function of lands in flood-prone areas, the CRP SAFE initiative additionally reduces the risk of flooding in the basin. Focused on restoration and conservation, the CRP SAFE practice areas offer an opportunity to preserve land that not only serves as important wildlife habitat, but also reduces flood hazards.

C. Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is another voluntary initiative administered by NRCS. WHIP strives to expand or enhance wildlife habitat through both technical and financial assistance. Under the 2008 Farm Bill, WHIP now applies only to private and Tribal lands. The program offers to reimburse land owners up to 75 percent of the cost to develop conservation practices in priority fish and wildlife habitat and reimburses up to 90 percent of the cost for long-term projects.¹²⁸

Initially allocating just over 500,000 dollars for the WHIP state program, Wisconsin recently received an additional 470,000 dollars that will allow the state to take on 27 more terrestrial habitat projects and 8 more aquatic habitat projects.¹²⁹ Prioritized by the type of habitat being restored, the Wisconsin program focuses specifically on four kinds of habitat: driftless riparian area, early successional habitat, pollinator habitat, and Conservation Reserve Program (CRP) State Acres For wildlife Enhancement (SAFE) areas. In the Rock River Basin, a CRP SAFE area spanning Fond du Lac, Dodge, and Columbia counties has been identified as a WHIP priority.¹³⁰ When prioritizing project applications, WHIP takes into account factors such as benefit to at-risk, threatened, and

¹²³ Wisconsin Farm Service Agency, *Fact Sheet: Southwest Wisconsin Grassland Area SAFE* (March 2008), available at http://www.fsa.usda.gov/Internet/FSA_File/safe_fact_sheet_southwest_wi.pdf

¹²⁴ Ibid.

¹²⁵ The Nature Conservancy, "Military Ridge Prairie Heritage Area," at <http://www.nature.org/wherewework/northamerica/states/wisconsin/preserves/art9039.html>

¹²⁶ Wisconsin Farm Service Agency, *Fact Sheet: Glacial Habitat Restoration Area SAFE* (March 2008), available at http://www.fsa.usda.gov/Internet/FSA_File/safe_fact_sheet_ghra.pdf

¹²⁷ Ibid.

¹²⁸ Natural Resources Conservation Service, "Wildlife Habitat Incentives Program" (Natural Resources Conservation Service, U.S. Department of Agriculture, March 2009), available at http://www.nrcs.usda.gov/programs/farmland/2008/pdfs/whip_factsheet.pdf

¹²⁹ "NRCS Announces Additional Funds for Wildlife Habitat Program" (31 March 2008), available at <http://wisconsinagriculturist.com/story.aspx?s=16500>

¹³⁰ "WHIP 2009 Priority Areas," available at <ftp://ftp-fc.sc.egov.usda.gov/WI/whip/whip09.pdf>

endangered species; inclusion of any of the key habitats listed above; and connectivity with other protected habitat.¹³¹ Wisconsin's Wildlife Habitat Incentives Program offers an important opportunity to fund wildlife habitat enhancement on CRP SAFE lands in the Rock River Basin.

D. Floodplain Easements

The 1996 Federal Agriculture Improvement and Reform Act expanded the Emergency Watershed Protection Program (EWPP) to allow for the purchase of floodplain easements. These easements serve as a protective measure by restoring and enhancing floodplain functions. A voluntary program administered by NRCS, the Floodplain Easements Program (FPE) focuses on preservation of fish and wildlife habitat, water quality, and flood water retention. Through permanent conservation easements, NRCS restores natural floodplain function on these lands to the extent possible.¹³²

Funded through the 2009 American Recovery and Reinvestment Act, Wisconsin received 23 easements throughout the state. Nine of these easements are located within the Rock River Basin, and the easements span an area of approximately 2,400 acres. In order to increase benefits to the watershed as a whole, project applications in nearby areas were grouped together to maintain contiguity. In addition, applications for areas experiencing frequent flooding or providing habitat for threatened and endangered species received higher priority.¹³³ With the recent 2008 flooding in southern Wisconsin, FPE offers an opportunity to both reduce flood hazard and fund large-scale ecosystem restoration.

V. Funding Through Mitigation

A. Incorporating Wildlife Goals into Wetland Compensatory Mitigation

Wisconsin's Department of Natural Resources carried out a pilot study in southern Wisconsin that evaluated potential wildlife monitoring methodologies. The study sought to determine the feasibility and effectiveness of different monitoring strategies and ways in which wildlife objectives can be incorporated into wetland compensatory mitigation performance standards.¹³⁴

When developing wildlife monitoring methods, the study recommends focusing on fewer species that are also conservation priorities.¹³⁵ The study additionally suggests that mitigation performance standards incorporating wildlife presence maintain flexibility and recognize the strong correlation between floristic quality and wildlife abundance.¹³⁶ Wildlife goals incorporated into performance standards should take into account planned characteristics of the restoration site and should focus on target species likely to use the restoration site, particularly as breeding habitat.¹³⁷ The study also

¹³¹ Natural Resources Conservation Service, "FY 09 WHIP Statewide Application Ranking Summary," available at <ftp://ftp-fc.sc.egov.usda.gov/WI/whip/whipranking09.pdf> and personal communication with Thomas Krapf, Assistant State Conservationist, 11 September 2009.

¹³² U.S. Department of Agriculture, Natural Resources Conservation Service, "Emergency Watershed Protection - Floodplain Easement," at <http://www.nrcs.usda.gov/programs/ewp/floodplain/index.html>

¹³³ Personal communications with Alison Pena, Wisconsin NRCS, Floodplain Easements Program and John Ramsden, Wisconsin NRCS, State Conservation Engineer, 14 September 2009; see also "FPE Ranking Sheet for Wisconsin," available at <http://www.wi.nrcs.usda.gov/programs/EWP/ewppranking.xls>

¹³⁴ Julia Wilcox, Thomas Bernthal, Patricia Trochlell, and Joanne Kline, *Improving Wisconsin's Wetland Compensatory Mitigation Program: Factors Influencing Floristic Quality and Methods for Monitoring Wildlife* (March 2009), p 18.

¹³⁵ *Ibid.*, p 22.

¹³⁶ *Ibid.*, p 24.

¹³⁷ *Ibid.*, pp 26-27.

recommends that wildlife performance standards take an “either/or” approach (either a few primary species or several secondary species) in order to meet standards.¹³⁸ An important resource for future compensatory mitigation banks throughout the state, the study highlights growing emphasis on wildlife protection in mitigation site construction.

B. Wisconsin Department of Transportation Wetlands Mitigation Bank

The largest wetlands mitigation banking system in the state, the Wisconsin Department of Transportation (WisDOT) wetlands mitigation banking program consists of one bank with approximately 35 bank sites.¹³⁹ WisDOT engages in wetlands mitigation to offset environmental impacts from transportation projects. In an effort to integrate best practices, WisDOT may consider using an ecosystem approach “to integrate management of land, water and living resources.”¹⁴⁰ Of particular note, WisDOT’s mitigation work on land adjacent to the Zeloski Marsh in Jefferson County highlights an innovative way to apply mitigation funding to wildlife habitat restoration.

As noted above in the Wetlands Reserve Program section, the Zeloski Marsh ultimately became incorporated into the Lake Mills State Wildlife Area. WisDOT chose a 209-acre compensatory wetlands mitigation site adjacent to the west end of the marsh. A Memorandum of Understanding (MOU) between WisDOT, Madison Audubon Society, and NRCS explains that the WisDOT mitigation site will be included in the Zeloski Marsh restoration project in order to “improve the restored wetland function and habitat.”¹⁴¹ The site’s goal was to “provide wetland function within the existing landscape,” and performance criteria included, among other objectives, flood storage and attenuation and wildlife diversity and abundance.¹⁴² The DOT wetlands mitigation site will be donated to the WDNR in about three years.¹⁴³ Since the restoration of the additional, adjacent habitat, Rock River Coalition bird monitors have noted increases in bird species, particularly shorebirds.¹⁴⁴ This collaborative effort emphasizes how compensatory mitigation can be used to augment wildlife habitat restoration and conservation and protect key ecosystem services in hazard-prone areas.

C. Wisconsin Waterfowl Association Walkerwin Mitigation Bank

Located on the Fox and Rock River watersheds in Columbia County, the Walkerwin Mitigation Bank site is positioned near to the Rock River Basin between the Swan Lake State Wildlife Area and the French Creek State Wildlife Area. The bank sponsor, Wisconsin Waterfowl Associates Wetland Mitigation Group LLC, chose this site because of its proximity to state wildlife areas, its potential to alleviate sedimentation and increased nutrient loading in the Fox River, and its diverse land composition. Composed of approximately 130 acres, the mitigation site was for general use,

¹³⁸ Ibid., p 27.

¹³⁹ Wisconsin Department of Transportation, *Final Draft Connections 2030 Long-Range Multimodal Transportation Plan*, Chapter 10: Preserve Wisconsin’s Quality of Life, p 20, available at <http://www.dot.wisconsin.gov/projects/state/docs/2030-chapter10.pdf>

¹⁴⁰ Ibid., p 3.

¹⁴¹ Memorandum of Understanding between Wisconsin Department of Transportation and the Madison Audubon Society and the U.S. Department of Agriculture Natural Resources Conservation Service.

¹⁴² Personal communication with Mark Martin, Natural Area Specialist, Wisconsin Department of Natural Resources, 24 September 2009.

¹⁴³ Ibid.

¹⁴⁴ Nolan Kollath, “Zeloski Marsh- Year 2,” *Madison Audubon Society Newsletter* (December 2008), pp 7-8, available at <http://www.madisonaudubon.org/audubon/news/2008December.pdf>

available to both public and private sector individuals compensating for wetland impacts in the state.¹⁴⁵

The bank strived to “maximize[e] the likelihood of mitigation success through intensive site analysis, planning, design, construction and monitoring ...[and to] accommodate diverse plant and animal communities.”¹⁴⁶ Restoration efforts employed an ecosystem approach, taking into account the connectivity of different wildlife habitat in order to fully integrate the area into the surrounding landscape. In addition, the Wisconsin Waterfowl Associates Wetland Mitigation Group used mitigation banking profits to help fund wildlife habitat restoration projects undertaken by the Wisconsin Waterfowl Association. Thus, this partnership enabled the bank to use the mitigation bank’s profits to restore wetlands in an 85:1 ratio, rather than the typical 1.5:1 ratio required of most mitigation projects. After the June 2008 floods, staff visited a site restored through the ecosystem approach. They noted that while everything above and below the site was damaged, the restored area had dissipated a great amount of the flow energy and a nearby farmer’s land did not get flooded out.¹⁴⁷

Through their collaboration with the Wisconsin Waterfowl Association, the Walkerwin Mitigation Bank funded restoration throughout the state, including many projects within the Rock River Basin. By partnering with conservation efforts in the state and taking a holistic approach to restoration, the bank offers an innovative example of how to fund larger-scale ecosystem preservation and bolster key ecosystem services in hazard-prone areas.

D. Rock River Basin Water Quality Trading Pilot Project

Under Wisconsin Act 27, WDNR initiated pilot projects to evaluate the potential for a water quality trading framework. One of the three watersheds selected to serve as pilot project areas, the Rock River Basin focused on the opportunities for and obstacles to establishing a phosphorus trading system. Considering issues such as local participation and cost effectiveness, the Rock River Watershed Partnership (now the Rock River Coalition) led the effort to develop a work plan for the Basin. The Partnership carried out monitoring and modeling studies, examined best management practices, and created a trading framework.¹⁴⁸

Although no trades occurred before the end of the pilot project in 2001, work within the Rock River Basin offers important insight into the factors influencing a water quality trading system’s success. The pilot projects highlighted the need for a trading broker, an agreed-upon set of assessment tools, and performance requirements such as a Total Maximum Daily Load (TMDL).¹⁴⁹ By taking a watershed approach to water quality trading, the Rock River Basin pilot project offers an example of how to use market-based funding to holistically restore ecosystem health in a hazard-prone area.

¹⁴⁵ Wisconsin Waterfowl Associates Wetlands Mitigation Bank Prospectus and Operating Agreement for Walkerwin Wetland Bank Site (Effective 29 March 1996), pp 10-1 to 11, *available at* [http://www.eli.org/pdf/wmb/WI.WMB.WI_Waterfowl_Association_Bank_\(Walkerwin_Bank\).pdf](http://www.eli.org/pdf/wmb/WI.WMB.WI_Waterfowl_Association_Bank_(Walkerwin_Bank).pdf)

¹⁴⁶ *Ibid.*, p 11.

¹⁴⁷ Personal communication with Jeff Nania, Wisconsin Waterfowl Association Walkerwin Bank, 24 September 2009.

¹⁴⁸ Wisconsin Department of Natural Resources, *Fourth Progress Report on the Trading of Water Pollution Credits* (October 2002), *available at* <http://www.dnr.state.wi.us/runoff/pt/pt2002.htm>.

¹⁴⁹ *Ibid.*

E. Fox River Natural Resource Damage Assessment and Restoration

Although located outside of the Rock River Basin, restoration in the Lower Fox River and Green Bay Area illustrates how natural resource damage assessment and restoration payments offer an important opportunity to fund large-scale ecosystem restoration. Over the course of about 20 years, paper mills in the Fox River Valley discharged an estimated 690,000 pounds of polychlorinated biphenyls (PCBs) into the surrounding environment. Through bioaccumulation and sediment discharge, a portion of the PCBs released into the Lower Fox riverbed sediment ended up in fish tissue and the Green Bay, respectively.¹⁵⁰ The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Clean Water Act (CWA), authorize the Trustees of the Lower Fox River and Green Bay ecosystem to work with the liable paper mills to restore natural resources damaged by PCB contamination.¹⁵¹ Liable parties have engaged in mitigation projects such as wetland restoration within the Duck Creek watershed and conservation of significant wetland and associated upland habitat in Door County.¹⁵²

VI. Analysis

Many initiatives in the Rock River Basin and nearby counties offer informative examples of ways to fund comprehensive approaches to wildlife habitat restoration and conservation in hazard-prone areas. As an area with a large agricultural community, incentive programs for private land owners administered by the Natural Resource Conservation Service and the Farm Service Agency provide an essential mechanism for funding wildlife habitat protection. These voluntary programs mutually benefit land owners and wildlife, and are increasingly taking into account important ecological concepts such as connectivity and contiguity of wildlife habitat, presence of threatened and endangered species and species of concern, and key ecosystem services such as flood protection. The Conservation Reserve Program State Acres For wildlife Enhancement (SAFE) initiative additionally incorporates requirements like wildlife monitoring and an evaluation plan approved by wildlife professionals as a means to improve the habitat of multiple species through a regional approach. Incentive programs like WHIP also have considered ways to synergize conservation efforts with other programs, identifying CRP SAFE areas as one of the key habitats its program strives to protect.

The innovative approaches of mitigation banks in the Rock River Basin and nearby counties augment the restoration and conservation of voluntary incentive programs. The WisDOT's work on land adjacent to the Zeloski Marsh highlights the way in which mitigation funding can contribute to ongoing ecosystem protection efforts in flood prone areas. In a collaborative effort, WisDOT's mitigation site was included as a part of the marsh's overall restoration in order to improve the natural function of the habitat. Among other objectives, the site's performance criteria included ecological concepts such as flood storage and attenuation and wildlife diversity and abundance. The restoration work of the Wisconsin Waterfowl Association Walkerwin Mitigation Bank also provides an important example of how mitigation funding can help facilitate larger-scale and more comprehensive ecosystem preservation. The Wisconsin Waterfowl Associates Wetland

¹⁵⁰ Wisconsin Department of Natural Resources, "History of PCBs in the Fox River," at <http://www.dnr.state.wi.us/org/water/wm/foxriver/pcbhistory.html>

¹⁵¹ Wisconsin State, Michigan State, the Menominee Indian Tribe of Wisconsin, the Oneida Tribe of Indians of Wisconsin, the U.S. Department of Interior, and the U.S. Department of Commerce, *Joint Restoration Plan and Environmental Assessment for the Lower Fox River and Green Bay Area* (June 2003), p 5, available at <http://www.fws.gov/midwest/foxrivernrda/documents/restorationplan/finaljune2003.pdf>

¹⁵² Wisconsin Department of Natural Resources, "Fox River/Green Bay NRDA Selected Restoration Projects," available at http://www.dnr.state.wi.us/org/water/wm/foxriver/sites/NRDA_Selected/

Mitigation Group chose its bank site because of its proximity to state wildlife areas, its potential to alleviate sedimentation and increased nutrient loading in the Fox River, and its diverse land composition. Taking an ecosystem approach to habitat restoration, the Wisconsin Waterfowl Associates Wetland Mitigation Group strove not only to integrate the site into the existing landscape, but also utilized bank profits to restore wetlands in an 85:1 ratio. In addition, an area restored through the ecosystem approach withstood the June 2008 floods, successfully dissipating a great amount of flow energy and protecting a nearby farmer's land.

While these banks' objectives take necessary steps toward incorporating flood hazard and wildlife concerns into mitigation work, a recent pilot study carried out by WDNR further outlines methodologies mitigation banks could undertake in the future to include wildlife in bank performance standards. The study emphasizes how flexibility in performance goals and consideration of planned characteristics of the restoration site can enable successful protection of wildlife.

Despite the diverse number of initiatives taking place in the Rock River Basin and surrounding areas to restore and conserve wildlife habitat in a way that takes into account key ecosystem services and protects biodiversity, the area lacks an overarching vision for large-scale ecosystem protection and a comprehensive plan to implement these goals. Although individual efforts have been made to collaborate and synergize conservation efforts, large-scale ecosystem restoration in the Rock River Basin and nearby counties would benefit from agreed-upon priorities intended to guide preservation work and an outline of how to fund wildlife protection. The WDNR Potentially Restorable Wetlands study could provide a strong foundation for an implementation plan by helping to inform the identification of key areas that provide essential wildlife habitat and flood reduction potential.

Snohomish River Basin Estuary, Washington

I. Introduction

Restoration efforts in the Snohomish River Basin Estuary provide insight into where and how mitigation funding and other policy tools can help to fund large-scale restoration of wildlife habitat in hazard-prone areas. Located in the Puget Sound approximately thirty miles north of Seattle, the Estuary is at the center of one of Washington State's largest salmon habitat restoration efforts. For several decades, large parcels of land have been acquired in the Snohomish River Estuary for habitat preservation, flood hazard reduction, and ecosystem restoration. The multi-million dollar acquisition and restoration projects have been supported by an array of restoration funding sources, including the Washington Estuary and Salmon Restoration Program, National Fish and Wildlife Foundation's Community Salmon Fund, and the Salmon Recovery Funding Board. In addition, restoration managers have sought to incorporate mitigation projects and funding from other local, state, tribal, and federal matching programs to ensure that Basin restoration goals are achieved. County, city, and tribal restoration and mitigation projects have not only improved habitat for fish and wildlife, but also have increased flood storage and hazard protection for farmlands and developments in the Estuary.

II. Background

A. Snohomish River Basin Estuary

The second largest watershed draining to the Puget Sound, the Snohomish River Basin is one of the producers of anadromous salmonids in the region.¹⁵³ At 1,856 square miles and with over 2,700 miles in stream length, the Snohomish River Basin provides habitat for nine salmonid species; is a major source of municipal water for the cities of Everett and Seattle, southwest Snohomish County, and other areas; and provides water to support a range of land uses including agriculture, forestry, recreation, and mining.¹⁵⁴

As population in the Snohomish River Basin steadily increases, urban development comprises a growing proportion of land use in the area. By 2030, the population within the Basin is projected to increase by approximately 60 percent.¹⁵⁵ As a result of changing land uses, only one-sixth of the historical tidal marshes in the Snohomish River Estuary remain intact and accessible to salmonids and about 85 percent of tidal marshes in the Estuary have become fragmented from tidal influence.¹⁵⁶

¹⁵³ Snohomish County Department of Public Works, Surface Water Management Division, "Snohomish River Basin Salmon Recovery Plan: Executive Summary" (Snohomish County, WA: June 2005), *available at* http://www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SWM/Work_Areas/Habitat/Salmon/Snohomish/Snohomish_Basin_Salmon_Conservation_Plan.htm

¹⁵⁴ Snohomish County Department of Public Works, Surface Water Management Division, "Snohomish River Basin Salmon Recovery Plan: Snohomish Basin Salmon Recovery Overview" (Snohomish County, WA: June 2005), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/surfacewatermanagement/snohomishsalmonplanfinal/section3.pdf

¹⁵⁵ *Ibid.*, p 3.

¹⁵⁶ Snohomish County Department of Public Works "Phased review/Expanded SEPA Checklist: Smith Island Restoration Project, Detailed Project Description" (Snohomish County, WA: April 2009), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/AquaticHabitat/Salmon/SmithIsFinalProjDescr043009.pdf

B. Hazards

Over the past 25 years, severe floods in Snohomish County have taken place in 1980, 1986, 1990, 1995, 1996, and 1997. The second of two floods in 1990, known as the Thanksgiving Day Flood, was the largest flood on record and resulted in damage throughout the entire county. Federal Emergency Management Agency (FEMA) damage survey reports for the 1990 floods total approximately 9,750,000 dollars.¹⁵⁷

Amidst a patchwork of farmland and industrial and commercial developments, many of the wetlands in the Snohomish River Estuary are no longer subject to daily tidal inundation and seasonal river flooding. These wetlands have become disconnected from the Union Slough and mainstem of the Snohomish River by a system of dikes, tide gates, and linear ditches. Snohomish County, City of Everett, Port of Everett, Tulalip Tribes, City of Marysville, and WA Dept. of Fish and Game have acquired land in the Estuary for flood hazard reduction, preservation, recreation, and restoration and mitigation.¹⁵⁸ The County began acquiring lands in the late 1980s primarily for flood abatement. In the late 1990s, with the creation of the Snohomish Estuary Wetland Integration Plan and ESA listings, motivation for land acquisition became more multi-faceted.¹⁵⁹

III. Conservation and Restoration

A. Snohomish River Basin Salmon Conservation Plan

In the mid-1990s, local governments and community stakeholders began to address the decline of salmon populations in Puget Sound. The listing of the Chinook salmon and Puget Sound bull trout as threatened under the federal Endangered Species Act (ESA) prompted the development of a regional recovery plan for the two species. The Snohomish River Basin Salmon Recovery Forum (the Forum), a 39-member voluntary group of citizens, businesses, tribal representatives, farmers and elected officials, was founded to guide these conservation efforts. The Forum created and now promotes, leverages resources to support, and monitors implementation of the Snohomish River Basin Salmon Conservation Plan (the Plan).

Approved in 2005 by the Forum, the Plan guides protection and restoration actions in the Basin. Using the two ESA-listed species as well as the non-listed coho as proxies for all salmonids in the basin, the Plan outlines actions for habitat, harvest, and hatchery management to restore wild salmon populations to healthy stocks.¹⁶⁰

¹⁵⁷ Snohomish County Department of Public Works, Surface Water Management Division, "Flood Hazard Management Issues in Snohomish County" (Snohomish County, WA: August 2001), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/surfacewatermanagement/flooding/200108FloodHazMgmtIssues.pdf

¹⁵⁸ Snohomish County Department of Public Works, Surface Water Management Division, "Phased review/Expanded SEPA Checklist: Smith Island Restoration Project, Detailed Project Description" (Snohomish County, WA: April 2009), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/AquaticHabitat/Salmon/SmithIsFinalProjDescr043009.pdf

¹⁵⁹ Personal Communication with Tim Walls, Lead Staff, Snohomish River Basin, Snohomish County Salmon Program Lead, 16 June 2009.

¹⁶⁰ Snohomish Basin Salmon Recovery Forum, Snoqualmie Watershed Forum, "Snohomish River Basin, Building a Healthy Watershed: Snohomish River Basin Three Year Work Program" (22 April 2008), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/surfacewatermanagement/aquatichabitat/salmon/snohomish/snohomishbasin_3-yearworkplan_2008_final.pdf

The 2008-2010 Snohomish River Basin Three-Year Work Plan (3WP) “supports goals laid out in the ten-year *Plan* by protecting current intact habitat, filling habitat gaps through restoration efforts, and improving the integration of harvest and hatchery management to effectively and efficiently recover listed salmonids and prevent the listing of new species.”¹⁶¹ The 3WP outlines the potential actions necessary in the next three years to achieve the Snohomish Basin Salmon Recovery Forum’s 10-year milestones (e.g., 1,237 acres of estuary tidal marsh restored, for a total of 2,720 intact functional acres at the end of the 10 years).¹⁶² The 3WP is designed to aid with the implementation of the Snohomish Basin Salmon Recovery Plan through 218 separate projects. The Plan seeks to address what the National Marine Fisheries Service calls the “Viable Salmonid Population parameters,” including abundance (# fish returning), productivity (# fish escaping to spawning beds/fish spawned), spatial structure (how extensively fish use the basin compared to historic use), and life history diversity (genetics and how fish use the watershed – e.g., some juveniles move to the estuary quickly, while others rear longer in the mainstems).¹⁶³ The plan covers areas such as nearshore, estuary, mainstream-primary, other basins, and basin-wide capacity building.¹⁶⁴

Major restoration projects described in the 3WP are in various stages of implementation. The Smith Island Restoration Project, for example, involves the restoration of 475 acres of tidal marshes and 10,500 feet of edge habitat. The project, designed by the Snohomish County Department of Public Works Division of Surface Water Management, aims to restore the tidal marsh ecosystem for salmon recovery and to support other fish, wildlife, and plant species.¹⁶⁵ Project restoration efforts, estimated to cost a total of \$10 million,¹⁶⁶ will include the removal of a segment of an existing dike along Union Slough as well as construction of a new setback dike west of the existing one.¹⁶⁷ The County acquired wetlands for the project site using an array of funding sources, including the Washington Wildlife Recreation Program, Snohomish County Conservation Futures Fund,¹⁶⁸ and the Salmon Recovery Funding Board (SRFB). Additional funding from the Estuary and Salmon Restoration Program and individual property donations have also supported the project. A portion of the restoration has been developed to potentially provide compensation opportunities for the Washington Department of Transportation, diking districts, and other third parties to mitigate

¹⁶¹ Snohomish Basin Salmon Recovery Forum, Snoqualmie Watershed Forum, “Snohomish River Basin”.

¹⁶² Email communication with Tim Walls, Lead Staff, Snohomish River Basin, Snohomish County Salmon Program Lead.

¹⁶³ Ibid.

¹⁶⁴ Snohomish Basin Salmon Recovery Forum, Snoqualmie Watershed Forum, “Snohomish Watershed Update” (22 April 2008) *available at* http://www.psp.wa.gov/downloads/SALMON_RECOVERY/UPDATE_2008/2008_Snohomish_Watershed_Update.pdf

¹⁶⁵ Snohomish County Department of Public Works, Surface Water Management, “Smith Island Restoration Project” (April 2009), *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/Downloads/smithislandNL309web.pdf

¹⁶⁶ Personal communication with Tim Walls, Lead Staff, Snohomish River Basin, Snohomish County Salmon Program Lead, 16 June 2009.

¹⁶⁷ Snohomish County Public Works, Surface Water Management, “Smith Island Restoration Project”.

¹⁶⁸ The Snohomish County Conservation Futures fund matches USDA “grant funds for the purpose of initial acquisition of development rights” under the county’s PDR program. *See* Snohomish County Council Ordinance No. 06-028; Relating to the Procurement of Conservation Futures Funds fore the Purchase of Development Rights; Amending SCC 4.14.080, SCC 4.14.090, and SCC 4.14.100, *available at* <http://www.mrsc.org/ords/S61o06-028.pdf>

project impacts, providing a non-traditional source of funding for at least part of the restoration project.¹⁶⁹

A second major restoration effort, the City-Corps Union Slough Restoration Project, is an estuary project to restore 93 acres of marine wetlands on the Union Slough. The project is a joint effort the US Army Corps of Engineers and City of Everett have undertaken to off-set wetland impacts from improvements to its water pollution control facility. The project is intended to restore intertidal salmon rearing habitat and convert 4,600 feet of the Union Slough dike into a pedestrian trail that will also serve as riparian habitat.¹⁷⁰ The project is projected to cost \$500,000 between 2008 and 2010.¹⁷¹ The restoration is divided into a 35-acre Corps site and 58-acre City mitigation project. In addition to the federal cost-share from the Corps, the City of Everett has utilized state funding from the Estuary and Salmon Restoration Program to restore the estuarine wetlands.¹⁷² Monitoring efforts have indicated that fish and wildlife, including endangered Chinook juvenile salmon, shorebirds, and Dungeness crab, have benefitted from the improved habitat.¹⁷³

B. Puget Sound Recovery Plan

The Snohomish River Basin Salmon Conservation Plan is part of a larger, regional framework – the Puget Sound Salmon Recovery Plan. This regional and collaborative initiative engages local citizens; tribal, state, and local governments; businesses; and conservation groups to protect and restore salmon runs across Puget Sound. Unlike most recovery plans for ESA-listed species in which the federal government directs decisions and prescribes actions, the Puget Sound Recovery Plan built off of ongoing watershed efforts. Endorsed by NOAA Fisheries and the USFWS,¹⁷⁴ the Recovery Plan is composed of local chapters submitted by the fifteen watershed planning units and implemented by local and regional stakeholders.¹⁷⁵

C. Other

A number of other plans and programs shape conservation and restoration efforts in the Snohomish River Estuary. Under Washington's Shoreline Management Act, local governments must develop Shoreline Management Programs that, in balancing land use and preservation, ensure a no-net-loss of the shoreline's ecological function. These programs include a system of environmental designations, with classifications that outline permitted developments and land uses.¹⁷⁶ The City of

¹⁶⁹ Public Works, Surface Water Management, "Smith Island Restoration Project" (April 2009), *available at* http://www1.co.snohomish.wa.us/Departments/Public_Works/Divisions/SWM/Work_Areas/Habitat/Salmon/smith_island.htm

¹⁷⁰ City of Everett Public Works Department, "Smith Island Restoration," *available at* <http://www.everettwa.org/default.aspx?ID=1111>.

¹⁷¹ Snohomish County Public Works, Surface Water Management, "Three Year Work Plan" *available at* http://www.co.snohomish.wa.us/documents/Departments/Public_Works/surfacewatermanagement/aquaticahabitat/salmon/snohomish/snohomishbasin_3-yearworkplan_2008_final.pdf

¹⁷² *Ibid.*

¹⁷³ People for Puget Sound, "Union Slough Wetlands Restoration," *available at* http://www.pugetsound.org/explore/current_projects/current-project-union-slough

¹⁷⁴ Endangered and Threatened Species: Recovery Plans, 72 Fed. Reg. 12, 2493-2495 (Jan. 17, 2007). *See also* Final Supplement to the Shared Strategy's Puget Sound Salmon Recovery Plan (Nov. 2006), p 4, *available at* <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/upload/PS-Supplement.pdf>

¹⁷⁵ Shared Strategy for Puget Sound, "An Introduction to the Shared Strategy: Shared Strategy for Puget Sound," *available at* <http://www.sharedsalmonstrategy.org/files/Intro%20to%20SSPS.pdf>

¹⁷⁶ NOAA Ocean and Coastal Resource Management, "Shoreline Management Plans – Case Studies," *available at* http://coastalmanagement.noaa.gov/initiatives/shoreline_ppr_planning.html#1.

Everett’s plan, for instance, designates 200-foot buffers adjacent to portions of Smith Island as an aquatic conservancy. It also calls for the preservation and enhancement of high-quality aquatic vegetation west of the Island when structural flood hazards reduction measures are needed to protect development inland.¹⁷⁷

The Puget Sound Partnership, created by the state legislature in 2007, has also played a major role in restoration efforts throughout Puget Sound. The Partnership has developed an Action Agenda that describes the strategy for cleaning up, restoring, and protecting the Sound. The Action Agenda is comprised of immediate and long term actions and relies on an ecosystem approach and public input. Focusing on issues specific to seven geographic action areas within the Sound, the Action Agenda addresses obstacles through collaboration with local watershed groups, tribes, cities, counties, special purpose districts, and the private sector.¹⁷⁸ Prioritized in the Action Agenda as a near-term ecosystem restoration action, the Snohomish River Estuary is identified as an area important to re-establishment of ecosystem function.¹⁷⁹

Funding for the Basin comes from a variety of federal, state, and local sources, as well as through mitigation. Of the approximately 10 million dollars dedicated to projects in the Basin, the Snohomish River Basin Salmon Recovery Forum estimates that the area derives 58 percent of project funding from local sources and local mitigation. Federal sources provide 19 percent of project funding, and tribal and state sources offer an additional 13 percent and 7 percent, respectively.¹⁸⁰ This funding comes from an array of programs and institutions, including—but not limited to—Washington Fish and Wildlife, the Snohomish County Marine Resources Committee, the Tulalip Tribes, and the City of Everett.¹⁸¹

IV. Mitigation efforts

With one of the largest marinas on the West Coast, a transecting Interstate highway, and expanding railways, the Snohomish River Estuary has significant development pressure resulting in the need for mitigation opportunities. Many of these mitigation efforts have the potential to significantly contribute to ongoing, large-scale restoration efforts, helping the Basin to reach the restoration goals outlined in the Snohomish Basin Salmon Recovery Plan. In fact, many of the ongoing mitigation projects are located in sites identified in various Basin restoration plans. In addition to wetland mitigation banks, other mitigation options include private endangered species conservation banks and a proposed County in-lieu-fee program that would provide opportunities to offset transportation, flood infrastructure, and other project impacts.

A. Snohomish County Smith Island Estuarine Mitigation

As part of the 475-acre Snohomish County Smith Island Restoration Project (see Sect. III-A), the County is considering the use of a 100-acre parcel for compensatory mitigation. The parcel,

¹⁷⁷ City of Everett, “Everett Shoreline Master Program. Section 3: General Goals, Objectives, Policies, and Regulations,” *available at*

http://www.everettwa.org/cityhall/upload_directory/Shoreline%20Master%20Program/Section3GeneralGoals.pdf

¹⁷⁸ Puget Sound Partnership, “Puget Sound Action Agenda” (2008), *available at*

http://www.psp.wa.gov/downloads/AA2009/Action_Agenda_FINAL_063009.pdf

¹⁷⁹ Puget Sound Partnership, “Puget Sound Action Agenda” (2008), *available at*

http://www.psp.wa.gov/downloads/ACTION_AGENDA_2008/Action_Agenda.pdf

¹⁸⁰ “Snohomish River Basin, Building a Healthy Watershed: Snohomish River Basin Three Year Work Program” (April 2007) p 8.

¹⁸¹ *Ibid.*, pp 28-41.

identified in the County's Priority Lands Acquisition Program¹⁸² as having the county's highest ESA priority, was purchased in 2001. The 100-acre compensatory mitigation parcel will provide opportunities for the Washington Department of Transportation, diking districts, and other third parties to mitigate project impacts. While several other banks exist in the county (e.g., Blue Heron Slough Conservation Bank and Skykomish Habitat Mitigation Bank), this property would be the only bank that provides estuarine-related mitigation opportunities.¹⁸³

The project is in the midst of the State Environmental Policy Act review and is proposed to commence construction in 2011. Currently, the County is considering several possible alignments for a new setback dike; each of the proposed alignments varies as to how much land it will provide for restoration versus agriculture and other uses (i.e. where it would transect the 100-acre parcel). In addition to offering opportunities for mitigation, the new setback dike will also provide greater flood storage and protection for farmland and other developments in the estuary.¹⁸⁴

The project not only provides a large, consolidated area for compensation of wetland impacts, but it also strives to avoid additional farmland fragmentation and loss in the Snohomish River Estuary.¹⁸⁵ The County and regulatory agencies are discussing other possible mitigation opportunities with BNSF Railroad Company and WSDOT in the Smith Island Restoration project area. Other ongoing discussions are geared toward the possibility of establishing an In-Lieu Fee Mitigation Program and exploring opportunities to partner with the City of Everett to physically connect restoration projects for a larger and contiguous tidal marsh.¹⁸⁶

B. Skykomish Habitat Mitigation Bank

The Skykomish Habitat Mitigation Bank (SHMB) provides mitigation credits for project impacts to wetlands and other critical habitat.¹⁸⁷ The farmland that was converted into SHMB contains a flood-control dike that Snohomish County's Department of Surface Water Management identified for partial removal. By flooding the river-side property, the partial dike removal provided flood-control benefits for the surrounding working landscape. The SHMB service area spans Snohomish and King Counties and provides a large-scale opportunity to restore off-channel and side channel habit.¹⁸⁸

B. The Port of Everett Mitigation Properties

The Port of Everett is situated at the mouth of the Snohomish River on Smith Island. Created in 1918, the Port owns and operates three shipping terminals, the largest marina on the West Coast

¹⁸² The Priority Lands Acquisition Program "designated local funding to acquire properties with high quality Chinook/bull trout habitat and additional public benefits such as flood hazard reduction and recreational opportunities." *See*

http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/AquaticHabitat/Salmon/SmithIsFinalProjDescr043009.pdf

¹⁸³ Snohomish County Public Works Surface Water Management, "Smith Island Restoration Project".

¹⁸⁴ *Ibid.*

¹⁸⁵ "Phased review/Expanded SEPA Checklist: Smith Island Restoration Project, Attachment 1: Detailed Project Description," p 5, *available at*

http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/AquaticHabitat/Salmon/SmithIsFinalProjDescr043009.pdf

¹⁸⁶ *Ibid.*

¹⁸⁷ Skykomish Habitat, LLC Webpage, *available at* http://www.skykomishhabitat.com/about_intro.html (accessed Nov, 9, 2009).

¹⁸⁸ *Ibid.*

(providing moorage for over 2300 boats), and industrial and commercial properties. The Port has also purchased several properties for mitigation, including the Union Slough Saltmarsh Mitigation Site and the Blue Heron Slough (Biringer Farm) Mitigation Bank.

The Union Slough Saltmarsh Mitigation Site, constructed in 2001 to compensate for habitat function losses resulting from the Port's Marine Terminal Improvement project, required converting approximately 20 acres of diked agricultural land to tidal estuarine marsh and mudflats; excavating a dendritic channel system before breaching an existing dike to restore tidal circulation; and constructing a dike to protect Interstate 5. In 2005, the Port expanded the bank to a 24-acre estuarine marsh mudflat habitat.¹⁸⁹ Partnering with the People for Puget Sound, a citizens' group that relies on education and advocacy, the Port continued to monitor mitigation efforts and to promote local volunteer stewardship—particularly weeding and planting native vegetation.¹⁹⁰

Permits for constructing the Blue Heron Slough Bank have all been received and tidal habitat restoration efforts are scheduled to be completed in 2010. Due to its location within the watershed (i.e., how it will impact others sloughs in the area), this project “has a high potential for providing tremendous regional environmental benefits and has been given a high priority for restoration in local salmon recovery plans.”¹⁹¹ Blue Heron Slough currently operates as a habitat mitigation bank, but once online it will be able to receive mitigation funds for some estuarine impacts.¹⁹² The bank, which is located in the lower Snohomish River Estuary, will be developed by Wildlands of Washington, Inc.,¹⁹³ and will provide ESA conservation credits for Chinook salmon and bull trout in Puget Sound and the Snohomish River Estuary.

C. City of Everett Mitigation for Water Pollution Control Facility

After making improvements to its water pollution control facility on Smith Island just south of Snohomish County's restoration project area, the City of Everett is off-setting the project's wetlands impact with the aforementioned Union Slough Restoration Project. In addition to providing habitat for a range of species, the tidal marsh restoration effort also provides—via a new setback dike—a higher level of flood protection for the City's water pollution control facility.¹⁹⁴

D. WA Department of Ecology Natural Resource Damage Assessments

The state legislature, in passing the Oil and Hazardous Substance Spill Prevention and Response Act, created the Resource Damage Assessment (RDA) program Committee in 1989 “to oversee the protection and restoration of natural resources when damaged by oil spills or other incidents.” Under state law, parties responsible for spilling oil into state waters are liable for cleanup costs and resource damages.¹⁹⁵

¹⁸⁹ Port of Everett website, at <http://www.portofeverett.com/home/index.asp?page=45>

¹⁹⁰ People for Puget Sound, “Current Project: Union Slough”, at http://www.pugetsound.org/explore/current_projects/current-project-union-slough

¹⁹¹ “A Guide to the Port of Everett's Comprehensive Scheme of Harbor Improvements,” (Port of Everett, December 2008), available at http://www.portofeverett.com/docs/user-friendly_comp_scheme_guide.pdf

¹⁹² Email from Tim Walls, Lead Staff, Snohomish River Basin, Snohomish County Salmon Program Lead.

¹⁹³ “A Guide to the Port of Everett's Comprehensive Scheme of Harbor Improvements”.

¹⁹⁴ “Phased review/Expanded SEPA Checklist: Smith Island Restoration Project, Attachment 5: County's Response to Snohomish County Agricultural Advisory Board September 9, 2008 Proposed Conditions Paper,” available at http://www.co.snohomish.wa.us/documents/Departments/Public_Works/SurfaceWaterManagement/AquaticHabitat/Salmon/attch5-AgBoardResp042709.pdf

¹⁹⁵ WAC 173-183

Composed of six state departments, the RDA Committee determines whether to work with the liable party to develop a restoration project, enhancement project,¹⁹⁶ or compensation schedule that adequately offsets damage to public resources.¹⁹⁷

The Department of Ecology uses the compensation schedule to collect damages based on a \$1 to \$100 per gallon formula that considers oil toxicity, environmental sensitivity and vulnerability, and proactive actions taken by the liable party to cleanup and minimize spill damage. These compensations, which have varied from under 100 dollars to several hundreds of thousands of dollars, are deposited into the state Coastal Protection Fund (CPF).

The CPF is divided into three regional accounts. It supports an array of activities, including: restoration and enhancement projects; development and implementation of an aquatic land computer geographic information system; and research of the causes, effects, and removal of oil spill pollution.

A CPF Steering Committee determines how the funds should be used and oversees restoration and enhancement projects.¹⁹⁸ Each of the three CPF regional areas—South Puget Sound/Hood Canal, North Puget Sound/Strait of Juan de Fuca, and the Columbia River/Outer Coast—has a separate CPF account. Funds must be used in the same region in which the spill occurred and support projects that are prioritized based on a number of criteria, including whether they are ready to proceed (in terms of having permits, personnel, project design and budget); to provide for monitoring and maintenance; and to support or enhance biodiversity. While the CPF Steering Committee’s Requirements and Guidelines for Restoration Project Proposals do not explicitly require or encourage coordination with other regional or watershed recovery efforts, they do prioritize projects with “statewide or regional significance” and those with “funding or support from other sources.”¹⁹⁹ On-site, in-kind mitigation is the prioritized form of mitigation, followed by off-site/in-kind, on-site/out-of-kind, and off-site/out-of-kind.

The RDA Committee may also work with the liable party to develop an acceptable restoration or enhancement project or study. The Port of Everett, for example, contributed to the Union Slough Salt Marsh Mitigation Project after a 2006 spilling incident in Everett Harbor. Along with People for Puget Sound, the Port cleared invasive vegetation, planted native plants, mulched, and maintained previously planted trees.²⁰⁰ Additionally, the Port paid \$4761.02 for the 472 gallons of diesel spilled into the harbor.²⁰¹

¹⁹⁶ WAC 173-183-260

¹⁹⁷ WAC 173-183-300

¹⁹⁸ “Focus on Assessing Oil Spill Damage: Spill Prevention, Preparedness, and Response Program” (Washington State Department of Ecology, July 2008), *available at* <http://www.ecy.wa.gov/pubs/0208004.pdf>

¹⁹⁹ Washington State Department of Ecology, “Requirements and Guidelines for Restoration Project Proposals Submitted to the Coastal Protection Fund Steering Committee” (Washington State Department of Ecology, Spills Program, provided by Dale Davis, 2008 version).

²⁰⁰ Washington State Department of Ecology, “Washington Oil Spill Resource Damage Assessments: 1991-2009” (Washington State Department of Ecology, Spills Program), *available at* http://www.ecy.wa.gov/programs/spills/preparedness/RDA_web_page_report-by%20account.pdf

²⁰¹ *Ibid.*

E. Washington Department of Transportation – Watershed Mitigation

Between 2008 and 2020, the Washington Department of Transportation (WSDOT) will invest over \$1 billion in improving highways, including the stretch of I-5 that transects Smith Island in Snohomish County.²⁰² One project, the replacement of the eighty-four-year-old, two-lane Ebey Slough Bridge, requires wetland mitigation. WSDOT is considering two options for mitigating impact to wetlands. The first would entail using in-lieu fee credits from the ILF program currently being considered by Snohomish County, the Corps, and Department of Ecology for the Smith Island Restoration project. The alternative form of mitigation would involve working with BNSF “to re-establish 6 acres of estuarine wetland and tidal channel adjacent to Union Slough specifically for this project.”²⁰³ Both of these mitigation efforts to remove dikes and restore hydrologic processes would result in improved flood flow alteration; fish, bird, and mammal habitat; and sediment removal.

WSDOT has also engaged a number of partners to examine watershed-based mitigation, rather than the traditional site-by-site approach. Using local jurisdictions’ data and recovery priorities for mitigation, WSDOT and partners have developed a watershed characterization methodology which “outlines a scientific framework and set of procedures for identifying, screening and prioritizing a suite of options for mitigating environmental impacts on large projects with complex environmental issues.”²⁰⁴ The Watershed Characterization Tool has been tested several times, including in Snohomish County, to identify and evaluate mitigation sites for transportation projects. Doing so may improve the ecological outcome and, in aligning with priorities outlined in plans like the Puget Sound Recovery Plan, increase likelihood for and amount of project funding.

A Watershed Based Mitigation Subcommittee, under the Transportation Permit Efficiency and Accountability Committee, was created “to achieve ‘transportation permit reform.’” Co-chairs from WSDOT and Department of Fish and Wildlife led this collaborative committee, comprised of local, state, tribal, and federal agency personnel, as well as members of associations and NGOs. Outputs included technical tools, multi-agency watershed mitigation policy guidance, field tests, and a “road map” for developing a watershed approach to environmental mitigation. The committee notes that, with limited funding, linking mitigation needs with restoration projects targeting salmon recovery may enhance watershed plan implementation.²⁰⁵

F. BNSF Railway & Sound Transit Mitigation

The Burlington Northern Santa Fe Railway (BNSF) is the “product of some 390 different railroad lines that merged or were acquired during more than 150 years.” The lines, which spread as far east

²⁰² Washington Department of Transportation, “Snohomish County Projects,” *at* <http://www.wsdot.wa.gov/Northwest/Snohomish/Projects/>

²⁰³ U.S. Army Corps of Engineers, WA Department of Ecology Joint Public Notice: WSDOT SR529 Ebey Slough Bridge Replacement Application for a Dept. of the Army Permit and a Washington Dept. of Ecology Water Quality Certification and/or Coastal Zone Management Consistency Concurrence, NWS-2009-22, *available at* <http://www.ecy.wa.gov/programs/sea/fed-permit/pdf/NWS-2009-22-PN.PDF>

²⁰⁴ Shared Strategy for Puget Sound, “Stories of Progress: WSDOT Uses Local Priorities to Identify Mitigation Sites,” *at* <http://www.sharedsalmonstrategy.org/progress/progress-WSDOT-local-priorities.htm>

²⁰⁵ Washington State Department of Transportation, “Final Report: How is the Watershed Mitigation Subcommittee helping TPEAC improve the environmental permitting process?” (Washington State Department of Transportation, Watershed Mitigation Subcommittee 2006), *available at* <http://www.ora.wa.gov/spotlight-series/TPEAC/docs/Watershed%20Status%20Report%20Update%203-10-06.pdf>

as Alabama and Illinois, run from the Gulf Of Mexico, along the Puget Sound, through Smith Island, and up to Vancouver.²⁰⁶

An ongoing effort by BNSF and the Central Puget Sound Regional Transit Authority (Sound Transit) will add a second line of additional commuter trains along the Puget Sound. As part of the agreement, Sound Transit took on planning for environmental mitigation to offset impacts to marine and freshwater wetlands. With limited on-site mitigation options—due in part to steep, unstable slopes—Sound Transit examined a number of off-site mitigation options, identifying the Qwuloolt Estuary Restoration site as the most suitable place for mitigation.²⁰⁷

The Qwuloolt project, led by a group of trustees including the Tulalip Tribes, NOAA Fisheries, USFWS, the Corps, and several state and local partners, consists of approximately 360 floodplain acres in the Snohomish River Estuary. The project strives “to restore the historic and natural influences of the river and tides and restore a functional estuary wetland complex that is connected to the broader estuary system.”²⁰⁸ Working with the trustees, Sound Transit acquired a key property for the Qwuloolt project “to mitigate the functions that will be adversely affected by the project in both freshwater and saltwater habitats.” Acquisition of the adjacent property not only enhanced ongoing restoration efforts, but also eliminated the need for Sound Transit to construct a new and independent estuarine mitigation site.²⁰⁹

Another BNSF project, the Everett Delta Yard Improvement project, has been proposed to expand the Yard by developing additional siding tracks and other infrastructure. To compensate for the 11.2 acres of wetlands that would be filled in the project, BNSF has proposed restoring 14 acres of estuarine wetlands in Snohomish County’s Smith Island Restoration Project.²¹⁰

V. Analysis

With locally-driven and collaborative efforts like the Puget Sound Recovery Plan and innovative partnerships between tribes, the private and non-profit sectors, and local, regional, and state agencies, stakeholders in the Snohomish River Estuary are finding ways to synergize their efforts. Pairing compensatory mitigation with proactive restoration efforts provides opportunities to increase flood storage and protection; to create larger, more contiguous habitats; and to facilitate a more efficient and less costly permit process.

Washington State’s investment of funding and staff resources in watershed science and assessments has driven planning for water, salmon, and fish and wildlife. However, a separation between natural resource planning and natural resource regulatory programs exists. With regulations not requiring mitigation actions to be consistent with watershed-based plans and priorities, development project

²⁰⁶ BNSF Website at <http://www.bnsf.com/index.html>

²⁰⁷ Herrera Environmental Consultants, Inc., “Conceptual Nearshore Marine, Estuarine, and Wetland Mitigation Plan: Everett-to-Seattle Commuter Rail Project Third Easement – King and Snohomish Counties, Washington” (Herrera Environmental Consultants, Inc., August 2005).

²⁰⁸ Qwuloolt Estuary Restoration, “History and Mission,” available at <http://www.tulalip.nsn.us/qwuloolt/about.html>

²⁰⁹ Herrera Environmental Consultants, Inc., “Addendum to Conceptual Nearshore Marine, Estuarine, and Wetland Mitigation Plan: Everett-to-Seattle Commuter Rail Project Third Easement – King and Snohomish Counties, Washington” (Herrera Environmental Consultants, Inc., January 2008).

²¹⁰ Letter from Geoff Tallent, Department of Ecology, to Dan MacDonald, BNSF railway Co, “RE: Water Quality Certification Order #6353 for U.S. Army Corps of Engineers Reference #NWS-2008-1099-NO, Everett delta Yard Improvement Project, Wetlands, Snohomish County, Washington” (Registered Mail RB 670 439 890 US, 2 March 2009)

sponsors—who are responsible for identifying mitigation alternatives—may not know of these plans or have clear guidance. Further, the “permitting process can be inefficient because regulators must react to a project application, rather than anticipate potential project impacts and mitigation alternatives. This inefficiency may result in conflict, delays, and uncertain outcomes, causing development project costs to rise.”²¹¹

Chapter 8 of the Puget Sound Recovery Plan (Recovery Plan) addresses financing of Puget Sound salmon recovery. Noting that, in order to “provide dependable sources of funds needed to address the highest priority actions identified in the regional recovery plan,” the Recovery Plan suggests a strategy that includes “Draw[ing] on additional existing sources that could be, but have not been, used for salmon recovery priorities (e.g. mitigation, federal farm bill, public and private grant programs).”²¹² In fact, mitigation funding is cited as the “principal untapped source that could be used for salmon.”²¹³

The financing strategy, which emphasizes using existing mitigation funding more effectively rather than new or increased mitigation funds, proposes to use one-tenth of the money from mitigation projects for off-site salmon restoration. The Recovery plan notes, however, that there are a number of administrative and policy issues for applying mitigation funding to salmon recovery on a watershed scale.

Although mitigation funding is cited as part of the financing strategy, the Recovery Plan cautions in two separate instances that mitigation for variances is done “at a site-specific scale, which has the potential to cause, over time, significant losses to habitats and the processes that support salmon.”²¹⁴ Redirecting mitigation funding to align with watershed priorities may require additional, concerted and collaborative efforts. Despite these obstacles, a number of completed and ongoing estuarine mitigation efforts in the Snohomish River Basin have already illustrated improvements in fish and wildlife habitat—as well as flood storage and protection—by adding to larger-scale restoration efforts.

²¹¹ “Mitigation Optimization: A Vision for Improving the Performance of Environmental Permitting Programs” (Washington Department of Fish and Wildlife, in cooperation with the Washington State Department of Ecology, 15 April 2005 Draft).

²¹² Shared Strategy Development Committee, “Financing Puget Sound Salmon Recovery,” in *Puget Sound Salmon Recovery Plan* (plan adopted by the National Marine Fisheries Service, 19 January 2007), ch 8, p 462.

²¹³ *Ibid.*, p 463.

²¹⁴ Shared Strategy Development Committee, “Regional Salmon Recovery Strategies,” in *Puget Sound Salmon Recovery Plan*, ch 6, p 358-372.

Appendix I – State Hazard Mitigation Plans and Climate Change²¹⁵

State	Date	Risk Assessment	Mitigation Strategy	URL
Alaska	Oct-07	The plan's hazard vulnerability section describes the potential impacts of climate change in Alaska on weather, including increase in storm frequency and intensity and increased coastal flooding, inundation, and erosion; potential of sea level rise to exacerbate the flooding and erosion problem; and the potential hazard that inland permafrost thaw will pose for State transportation infrastructure.		http://www.ak-prepared.com/plans/pdf_docs/StateHazardMitigationPlan07/2007%20SHMP%20Master.pdf
Alabama	Sep-07	The plan's risk assessment indicates that global warming may have an effect on the relative consistency of the probability and severity of hurricanes in Alabama.		http://ema.alabama.gov/Organization/Preparedness/Mitigation.cfm
Arizona	Nov-07	The plan' risk assessment acknowledges the potential impacts of climate change, including drought and increased rainfall and possible flooding.		http://www.dem.azde ma.gov/operations/mitigation/hazmitplan/hazmitplan.html
Arkansas	Aug-07			http://www.adem.arkansas.gov/documents/portal/Mitigation/approved.html
California	Oct-07	The 2007 plan's Hazard, Vulnerability, and Risk Assessment section classifies climate-related hazards as a new class of hazards and describes potential impacts of climate change, including increases in avalanches, coastal erosion, flooding, and sea level rise; extreme heat and prolonged drought; mudslides and landslides; severe weather and storms; and wildland fires. In the plan's risk assessment, climate change is recognized somewhat as a place-holder, with more refined understanding of impacts to be forthcoming during the next three-year standard hazard mitigation plan planning cycle. In the mean time, the 2007 plan recognizes climate impacts as having an effect on primary hazards such as flooding and wildfires; secondary hazards such as levee failure and landslides; and other climate-related hazards. The plan also discusses California's greenhouse gas emission reduction measures.	The plan indicates a need for a more consistent and rigorous assessment of sea level rise. The plan identifies sources of sea level rise data (e.g., modeling efforts initiated by the BCDC and those being developed through the U.S. Climate Change Science Program and the 2006 Report from the California Climate Change Center) that can be used as the basis for future mitigation planning. California is contemplating how to incorporate climate change in the next revision of its multi-hazard mitigation plan. The plan also describes California's FloodSafe Program as an opportunity for enhanced flood hazard mitigation. The FloodSafe is a strategic initiative to improve flood protection and is designed to achieve five main goals: reduce the chance of flooding, reduce the consequences of flooding, sustain economic growth, protect and enhance ecosystems, and promote sustainability. One of FloodSAFE's guiding principles is to adapt flood management systems to cope with	http://hazardmitigation.calema.ca.gov/docs/SHMP_Final_2007.pdf

²¹⁵ We acquired the most recent hazard mitigation plan from all states except Oklahoma and Tennessee. Each plan or plan section was downloaded and key word searched for climate change, sea level rise, and global warming.

State	Date	Risk Assessment	Mitigation Strategy	URL
			climate change.	
Colorado	2007		The plan suggests that the State evaluate potential impacts from climate change to determine the effects of drought on state assets.	http://www.dola.state.co.us/dem/mitigation/plan_2007/2008_plan.htm
Connecticut	Dec-07	The plan's natural hazards identification and evaluation section devotes an entire section to climate change. The plan describes potential impacts of climate change and acknowledges the increasingly significant impact of climate change on the occurrence and intensity of natural disasters. The plan also addresses the effects of sea level rise on the risk of flooding. The plan states that the State and municipalities must consider scientists' projections of climate impacts on sea level, precipitation, storm intensity, flooding, drought, and other natural disasters in future plans.	Connecticut has developed several strategies directly related to addressing impact of climate change. The State will develop sound floodplain management policies to address climate change adaptation scenarios, including modeling of IPCC climate change data sets to determine floodplain changes associated with potential sea level rise and restricting development within inundation areas identified by modeling studies. The plan also states that policies should address disinvesting federal and state mitigation monies in inundation zones. Another goal of the plan is to increase research and planning activities for natural hazards mitigation on a state and local level. The State will encourage communities and state agencies to pursue funding opportunities to develop advanced research and plans in the area of natural hazards mitigation, including the development of a State Climate Change Science plan to measure the rate of climate change impacts and climate change adaptation planning.	http://www.ct.gov/deep/lib/deep/water_inland/hazard_mitigation/plan/hazardmitigationplan.pdf
Delaware	2007			Not Online (Received email copy from DEM)
Florida	Aug-07	The Plan mentions global warming as a possible cause of beach-erosion.		http://www.floridadisaster.org/Mitigation/State/Index.htm
Georgia	Mar-08			http://www.gema.ga.gov/ohsgemaweb.nsf/1b4bb75d6ce841c88525711100558b9d/f05196b7de9db746852573c60059e6c7/\$FILE/2008%20Georgia%20Hazard%20Mitigation%20Strategy.pdf
Hawaii	Oct-07	The 2007 plan's hazard identification chapter includes a separate section that specifically deals with issues of climate change and sea level rise and the potential impact on other hazard occurrence. However, Climate Variability and Climate Change are not categorized as "hazards,"	The plan suggests that decision-makers in coastal communities need short- and long-term information on coastal inundation and erosion in order to reduce their vulnerability. The mitigation policy and action recommendations in the plan's	http://www.mothernature-hawaii.com/hazmit_planning_toc2007.htm

State	Date	Risk Assessment	Mitigation Strategy	URL
		as are the other more traditional natural hazards. The plan's risk assessment chapter outlines some of the potential risks of climate change and states that more data and assessment are needed to understand the full reach of the impacts from climate change, and discusses the role of the several programs working in the Pacific (e.g., The Pacific ENSO Applications Center, the Pacific Regional Integrated Science and Assessment, and the Pacific Climate Information System) in undertaking projects to understand risk and vulnerability associated with changes in climate.	mitigation strategy chapter include three specific to climate change: 1) downscale global climate information to better understand how to prepare mitigation and adaptation plans for the impacts of climate change in Hawaii, 2) conduct socio-economic impact assessments on climate impacts for Hawai'i, and 3) integrate climate risk management scenarios into development policies and adaptation strategies. The plan also calls for ongoing research on sea level rise and coastal impacts. The plan suggests that aerial images and sea level rise projections developed by the Hawai'i Coastal Geology Group are used in discussions with policy and decision makers in State and County governments to inform mitigation actions and ensure that new development is discouraged in areas that may be significantly impacted.	
Idaho	Nov-07	The plan mentions the potential effects of climate change on wildland fire.		http://bhs.idaho.gov/Resources/PDF/SHMPFinalw-signatures.pdf
Illinois	Oct-07	The plan discusses the role of climate change in increasing the frequency and severity of floods and heat waves.		http://www.state.il.us/iema/planning/documents/Plan_III_MitigationPlan.pdf
Indiana	2008			http://www.in.gov/dhs/3181.htm
Iowa	Sep-07			http://www.iowahomelandsecurity.org/Portals/0/CountyCoordinators/Planning/2007HazMitPlanFINAL.pdf
Kentucky				
Kansas	Nov-07			http://www.kansas.gov/kdem/pdf/mitigation/Kansas_Hazard_Mitigation_Plan_2007.pdf
Louisiana	Apr-08	The plan explicitly does not address human-impacted natural hazards, stating that the hazard effects that must be mitigated present themselves through essentially natural processes. Such human-impacted natural hazards include sea level rise, coastal land loss, subsidence, wildfire, storm surge, and other flood events. The hazard identification and profile section does identify subsidence and sea level rise as two processes that are significantly influencing hazard risk.		http://www.ohsep.louisiana.gov/mitigation/statehazmitplan_08/hazmitgatpln_08.htm

State	Date	Risk Assessment	Mitigation Strategy	URL
Maine	Oct-07	Maine's risk assessment includes a section on sea level rise, indicating that sea level rise has resulted in increased flooding, coastal erosion, and landslides and may increase the intensity of coastal storms.	As a mitigation strategy the State will continue to track changes in sea level and evaluate future projections. The State will also recommend priorities to FEMA for updating inundation maps and provide information to municipalities, utilities and the public on the implications of sea level rise.	http://www.maine.gov/tools/whatsnew/attach.php?id=44656&an=1
Maryland	Aug-08	The Mitigation Capability Section of the plan discusses the factors that influence sea level rise, including global warming and the sinking of land in the Chesapeake region. These factors as well as steady population growth and continuing near-shore development will increase the vulnerability of coastal areas to storm surge. Sea level rise is also mentioned in the risk assessment section of the plan as a factor contributing to coastal erosion.		On Disk
Massachusetts	2007	The plan includes a section on global warming impacts on Massachusetts. The plan states that climate change will likely cause an increase in intensity and frequency of storms, which will likely increase the likelihood of severe erosion episodes along the coast of Massachusetts.	The plan describes the state's strategies to reduce greenhouse gas emissions.	http://www.mass.gov/Eeops/docs/mema/diaster_recovery/state_plan_2007_rvn4.pdf
Michigan	Mar-08			On Disk
Minnesota	Apr-08			http://www.dps.state.mn.us/dhsem/uploadedfile/state_mitigation_plan.pdf
Mississippi				http://www.msema.org/mitigation/
Missouri	May-07			http://sema.dps.mo.gov/State%20HMP%20-%20Enhanced.pdf
Montana	Aug-07			http://dma.mt.gov/de s/Library/2007_PDM_Plan_Update/State_PDM_Plan.htm
Nebraska	2008			http://www.nema.ne.gov/content/operations/content/operations/hazmitplan.pdf
Nevada	Oct-07			http://dem.state.nv.us/Hazard_Mitigation.shtml
New Hampshire	Oct-07	The hazard analysis section includes the potential impact of predicted, human-induced climate change, including increased coastal flooding and loss of coastal wetlands through sea level rise and possible changes in the nature, frequency, and magnitude of coastal storms. The plan also mentions that climate change may increase vulnerability to invasive flora and fauna in the State.	One of the goals of the State plan's mitigation measures and action plan section is to address the challenges posed by climate change as they pertain to increasing risks in the State's infrastructure and natural environment. The plan includes several activities designed to meet this goal including supporting efforts to characterize and identify risks posed by climate change	http://www.nh.gov/safety/divisions/hsem/HazardMitigation/hazmit_plan.html

State	Date	Risk Assessment	Mitigation Strategy	URL
			especially as it relates to changing precipitation patterns, storm event frequency, and sea level rise by supporting studies which examine changing hydrology in rivers due to altered precipitation patterns and watershed development; supporting mapping studies; and protecting of natural systems that provide natural protection against coastal flooding. The State also will support strategies for adaptation to climate change by supporting NHDES Coastal Program and other organizations' efforts to develop adaptation strategies and disseminating results of climate change studies for the purpose of better floodplain planning and changing infrastructure standards (e.g., Recommendations on culvert sizing and stormwater volumes).	
New Jersey	2007	The plan describes a possible effect of global warming on frequency of droughts.		http://www.ready.nj.gov/pdf/mitigation/mitplan_sec1-9.pdf
New Mexico	Oct-07	The plan describes a possible effect of global warming on frequency of droughts.		http://nmdhsem.org/cms/kunde/rt/nmdhsemorg/docs/439032715-11-19-2007-10-45-16.pdf
New York	2007		In the risk assessment section, the plan recommends that local jurisdictions should take into account the affect that climate change may have on their vulnerability to each hazard, for example increased frequency of occurrence and/or severity. The plan also states that the State is working on establishing statewide mitigation collaboration, including NYS Dept of State, division of Coastal Resources working in conjunction with DEC's Climate Change Office to formulate priorities for research, policy initiatives and mitigation activities addressing the spectrum of climate change impacts.	http://www.semo.state.ny.us/programs/planning/hazmitplan.cfm
North Carolina	Oct-07	The plan states that additional factors involved in coastal erosion include human activity, sea-level rise, seasonal fluctuations, and climate change.		http://www.nccrimecontrol.org/Index2.cfm?a=000003,000010,001623,000177,001563
North Dakota	Jan-08			On Disk
Ohio	May-08	The risk assessment states that global climate change may have an impact on the probability of future winter storm events, droughts, and floods. The potential increase in these hazards is a great concern for the State given the stresses being		http://ema.ohio.gov/Mitigation_OhioPlan.aspx

State	Date	Risk Assessment	Mitigation Strategy	URL
		placed on water resources and the high costs resulting from recent hazards.		
Oklahoma	N/A			
Oregon	Mar-09			http://www.oregonshowercase.org/index.cfm?mode=stateplan&page=planindex
Pennsylvania	Oct-07	The plan addresses the possible effect of climate change on drought.	The plan encourages local communities to consider climate change in the implementation of mitigation measures. PEMA suggests reading, thoughtful analysis and discussion of the following recent document concerning the potential impact on Pennsylvania: http://www.climatechoices.org/assets/documents/climatechoices/confronting-climatechange-in-the-u-s-northeast.pdf	On Disk
Rhode Island	Mar-08	The hazard identification section states that sea level rise is one factor increasing the risk exposure for developed coastal lands.	Since the 2005 plan was adopted, the CRMC (Coastal Resource Management Council) has completed a new study of sea level rise taking into account the effects of global warming.	http://www.riema.ri.gov/preporenw/RI%20Hazard%20%20Mitigation%20Plan%20Final.pdf
South Carolina	Oct-07			http://www.scemd.org/plans/miti_plan.html
South Dakota	Mar-05			http://www.oem.sd.gov/Publications/mitigation/sdmhmp.pdf
Tennessee	N/A			
Texas	Oct-07			ftp://ftp.txdps.state.tx.us/dem/mitigation/tx_mitigation_plan_2009.pdf
Utah	Nov-07			http://site.utah.gov/dps/homelandsecurity/MitigationPlan_MMt mp24d95a3b/MitigationPlan.html
Vermont	Oct-07	The plan discusses the risks of climate change including effects on water supplies, crops, forest and ecosystems, and invasive species.		
Virginia	Nov-06			http://www.vdem.state.va.us/library/plans/coveop/mitplan.cfm
Washington	Jan-08			http://www.emd.wa.gov/plans/washington_state_hazard_mitigation_plan.shtml

State	Date	Risk Assessment	Mitigation Strategy	URL
West Virginia	Sep-07			http://www.wvdhsem.gov/mitigation/2007WVHMP_Sept_2007.pdf
Wisconsin	Dec-08			http://67.199.109.246/wemftp/WEM/State_of_Wisconsin_Hazard_Mitigation_Plan.pdf
Wyoming	Jun-08			http://wyohomelandssecurity.state.wy.us/mitigation_plan.aspx