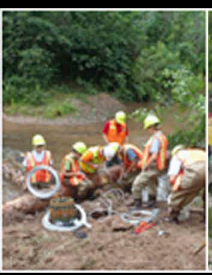
U.S. Fish & Wildlife Service

Restoration Returns

The Contribution of Partners for Fish and Wildlife Program and Coastal Program Restoration Projects to Local U.S. Economies



RESTORATION RETURNS

The Contribution of Partners for Fish and Wildlife Program and Coastal Program Restoration Projects to Local U.S. Economies

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Executive Summary

The Partners for Fish and Wildlife (PFW) Program and Coastal Program are the U.S. Fish and Wildlife Service's premier conservation delivery tools for voluntary, citizen and community-based fish and wildlife habitat restoration activities across the matrix of public and privately owned land. The programs work directly with partners to implement vital on-the-ground habitat restoration projects across the nation and in U.S. territories.

The PFW and Coastal Programs channel government and private dollars to local communities where they create work to support new jobs and provide income to local contractors and other industries. Money spent in support of projects circulates through the economy, creating more jobs and generating economic activity. The impacts of PFW and Coastal Program funds are multiplied in two dimensions. First, the program expertise and funding is able to leverage additional resources from other partners that support projects. Second, spending creates work, generates tax revenues, and stimulates economic activity as wages and purchases flow through the economy. Together these impacts are known as the "multiplier effect." This report focuses on the effects of PFW and Coastal program-related spending on projects completed in fiscal year 2011 to provide an example of the economic impacts of the Programs. This report does not address many other aspects of the PFW and Coastal Programs that improve human welfare, such as ecological services, improved recreational opportunities, land acquisition, in-kind contributions, or the effect of open space on land values.

Methods

The study used input-output analysis techniques to estimate the multiplier effect of program spending as it flows through the regional economy. The first part applies total spending on PFW and Coastal Program projects in FY2011 to models of each state's economy. This yields a snapshot of the overall effects of the program at the state level. The second part of the study consists of analyses of spending for 15 sample projects. Each project illustrates different aspects of the program operation and its impacts on the local regional economy.

State Results

The term "leverage" is used to indicate the effectiveness of PFW or Coastal Program at encouraging others to participate in restoration projects. The leverage ratio is the total project spending divided by PFW or Coastal Program spending. In FY2011, for the PFW Program, the average leverage ratio, weighted by amount of spending, was 8.6. The Coastal Program weighted average leverage for FY 2011 is slightly lower at 6.3. For every dollar spent by the PFW and Coastal Program, $7 to $9 of restoration work is happening on the ground.

As spending flows through a regional economy, it generates additional sales and new jobs, called the multiplier effect. The PFW and Coastal Programs project spending increases output by a multiplier of 1.9 (=output/spending) for most states. That is, for every dollar spent on restoration, the state gains $1.90 of economic activity. California, with a highly diverse and large internal economy, generated a multiplier of 2.1. These results are in the typical range for state multipliers. The number of jobs supported per million dollars spent ranges from 9.6 in Connecticut to 35.7 in South Carolina. The jobs

multiplier depends on both the distribution of spending among economic sectors and the size and characteristics of the state's economy.

Sample Projects

Each sample project shows the different challenges in size, scope, participants, funding, and location. The projects illustrate how the economic stimulus of restoration spending is one element of the benefits from the PFW and Coastal Programs. This report highlights this often ignored element.

Conclusion & Recommendation

The PFW program contributed $18.6 million to local economies, leveraging $142 million with partner contributions, for a combined total of $161 million spent on PFW program projects. For every $1 that the PFW program contributed to a project, the program generated $15.70 in economic returns. In FY 2011 alone, the total economic stimulus created by the PFW program amounted to $292 million in output and 3,500 new jobs. For the Coastal Program, a total of $2.8 million of program funds leveraged $16.4 million for a combined total of $19.2 million spent of Coastal Program projects. For every $1 that the Coastal Program contributed to a project, the program generated $12.78 in economic returns. The total economic stimulus created by the Coastal Program equals $35.6 million in output and 473 jobs. For every dollar spent by the PFW and Coastal Programs, $7 to $9 of restoration work is happening on the ground.

This report drew upon one of the most extensive datasets of habitat restoration work available in the U.S. Fish and Wildlife Service. The results provide an accurate, but limited, analysis of the economic impacts of restoration activities. Further analysis on the impacts **ecological services**, **improved recreational opportunities, land acquisition**, and **proximity to open space** are recommended to highlight the full economic value of habitat restoration activities.

Introduction

The U.S. Fish and Wildlife Service's (Service) mission is, working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The PFW Program and Coastal Program are the Service's premier conservation delivery tools for voluntary, citizen and community-based fish and wildlife habitat restoration activities across the matrix of public and privately owned land. With more than 275 full time staff active in all 50 states and territories, the programs are equipped to work directly with partners to implement vital on-the-ground habitat restoration projects.

Partners for Fish and Wildlife Program

Approximately 72 percent of land in the United States is privately owned. Since 1987, the PFW Program has been furthering the Service's mission beyond the traditional boundaries of the National Wildlife Refuge System and other public lands, working directly with private landowners to restore, protect, and enhance priority fish and wildlife habitats on private lands.

The PFW Program is the Service's primary mechanism to deliver on the ground habitat restoration, technical assistance and financial resources for private landowners. In its over 25 year history, the PFW Program has implemented to date nearly 29,000 restoration and technical assistance projects to restore over 3,167,000 acres of upland, 939,000 acres of wetland, 8,712 riparian miles, and 3,405 structures on private lands across all 50 states and territories. The technical assistance provided by Program staff extends the impact of conservation activities. Technical assistance including habitat assessment, biological inventories, project review and permit compliance, grant writing, and restoration guidance and monitoring, provides a greater benefit to federal trust species. These projects have encouraged landowner stewardship and facilitated the conservation of native habitats for long term benefit for the landowner, fish and wildlife, and the American public.

The success of the PFW Program lies not only in its ability to effectively implement habitat restoration projects, but also in its ability to build trust and credibility with landowners and partners. This is achieved by providing accurate information and assistance in a timely manner, leveraging resources and

helping implement cost efficient and effective projects. Each project is conducted in collaboration with a private landowner as the primary cooperator. Working in concert with over 3,000 partner organizations to date, the PFW Program is able to leverage additional funds, resources, skills and knowledge from other organizations and individuals. The locally-based staff works to bring people together to forge and implement solutions that meet local and regional needs for fish and wildlife stewardship.

Coastal Program

In addition to being home to over half of the U.S. population, our nation's coastal areas also provide important fish and wildlife habitat, with benefits that extend far beyond their limited geographic boundaries. Forty-five percent of all federally listed threatened and endangered species, 85 percent of migratory birds and waterfowl, and many commercial and sport fish and shellfish depend on coastal habitats. These coastal areas are also important to our nation's economy. Twenty-eight million Americans work in the fishing, tourism and recreational boating industries, all of which depend on healthy coastal habitats for their products and customers.

The Coastal Program is one of the Service's most effective tools for voluntary, citizen and community-based fish and wildlife habitat restoration and protection on public and privately-owned coastal lands. Land ownership in coastal watersheds is often a mosaic of public and private entities, which requires a program that has the flexibility to implement landscape conservation on different types of lands. This unique ability allows the Service to deliver landscape conservation, and maintain habitat connectivity and continuity.

With 72 staff located in 24 priority areas, including the Atlantic, Caribbean, Gulf of Mexico, Great Lakes, and the Pacific, the Coastal Program provides valuable technical assistance, and delivers successful and cost-effective habitat conservation projects and activities that benefit federal trust species. Locally-based program staff acquires in-depth knowledge of the community, its natural resources, environmental challenges, potential partners, and political and economic issues. This knowledge enables the Program to develop long-term, diverse, and effective partnerships that deliver landscape-scale conservation efficiently.

Since its beginning, the Coastal Program has partnered with more than 5,000 federal, tribal, state, and local agencies, non-governmental organizations, corporations, and private landowners across the country to restore 300,616 acres of wetland, 135,033 acres of upland, and 2,160 miles of stream habitat, and to protect 2,021,578 acres of coastal habitat.

Providing technical assistance to a diverse range of conservation partners is also an important contribution of the Coastal Program. By supporting restoration planners, decision makers, and other conservation practitioners, the Coastal Program staff provides broader benefits to federal trust species by supporting the development, implementation, and management of habitat conservation policies and projects.

Scope and Limitations of this Report

The PFW and Coastal Programs provide technical expertise and key funding to leverage additional financial resources to deliver conservation activities and coordinate on the ground habitat improvement projects with partners. In the process, government and private dollars are channeled to project sites in the local communities where they create work supporting new jobs and providing income to local contractors and other industries. Monies spent in support of projects circulate through the economy, creating more jobs and generating economic activity. Government funding is a powerful stimulus to local economies since it represents new resources that would not have been present otherwise. The impacts of PFW and Coastal Program funds are multiplied in two dimensions. First, Program funds leverage additional non-federal funds from other partners to support the project. Second, funds create work and stimulate economic activity as wages and purchases flow through the economy. This report focuses on the effects of PFW and Coastal program-related spending on restoration projects for a representative fiscal year (projects completed in 2011) as it flows through the regional economy.

This report **does not address** several other ways that restoration projects contribute to human welfare:

- Healthy fish and wildlife habitat provides many **ecological services** that people use and value. Wetlands filter out pollutants and mitigate the energy of floodwaters, preventing flood damage. Growing vegetation sequesters carbon and provides shade that helps to mitigate climate change impacts, while providing wildlife habitat. At present, such valuation requires detailed GIS analysis and site specific data collection. Techniques are being developed that will make valuation of ecosystem services more generally applicable. We expect to revisit the programs in a few years and provide a more complete economic evaluation.
- Restoring streams and re-vegetating riparian buffers improves fish habitat which leads to better fishing opportunities. Cleaner waterways improve enjoyment of river views and boating which may lead to more and **improved recreational opportunities** and greater tourism in the project area. Assigning value to these kinds of changes requires parsing the benefits of an experience into its components. This is a difficult and contentious area of resource economics. This report does not attempt to quantify these clear benefits of the Programs.
- Although **in-kind contributions** are essential to the success of the PFW and Coastal Programs. They do not provide the same incremental economic stimulus as new cash spending. Those

providing labor as an in-kind service would have been doing something else and would have been paid with or without the project. Therefore, in-kind contributions are not included in this analysis.

- **Land acquisition** protects habitats from future development. It is a vital part of the restoration program that will deliver benefits to society far into the future. However, the purchase price of an acquisition is a change in the medium for holding an asset and not an economic stimulus. The selling landowner had $2 million worth of land and after the transaction has $2 million in cash. Until he or she spends it, the cash is doing nothing more to stimulate the economy than the land was. The transaction costs of the acquisition process provide some stimulus in the real estate and legal services industries but this report does not address land acquisition.
- Studies have shown that **proximity to open space** and undeveloped land increases the value of homes. The Coastal Program frequently provides technical assistance to assist partners to acquire land or a conservation easement on property in order to protect or restore it. Conserved land changes the marketability of adjacent land and the tax base of nearby towns. These changes were not considered in this report.

Data and Methods

PFW and Coastal Program projects involve a planning phase, an implementation phase and a monitoring phase. Although Service staff participates in all three phases and Service equipment can be used during the implementation phase, in general, the Service and its partners plan and monitor the restoration, while private contractors perform the actual construction work on the ground.

When a contractor is paid, the money doesn't just sit in the bank. They must pay the heavy equipment operator who drove the bulldozer. The operator doesn't hold onto the money either. He needs to pay the mechanic who fixes his car, pay the rent, and buy groceries. Thus the original payment from the program becomes income at three different levels – the contractor (direct), the heavy equipment operator (indirect), and the mechanic, landlord and grocery clerk (induced). The three levels can be added together to yield total income impacts of the program spending.

Similarly, the contractor must buy products from other companies in order to operate. When he or she buys a liter of oil at a gas station to lubricate the bulldozer, part of the money is paying the gas station owner for the retail services he or she provides, such as transporting and storing the oil, and having someone there to manage the transaction. Most of the price of oil goes to the wholesaler and manufacturer who produced the petroleum, refined it, and packaged it for sale. At each stage in the process, an input from one firm is converted to an output of another firm. The output of the contractor is reshaped land; the output of the gas station is retail services; and the output of the manufacturer is packaged oil. The value of these outputs added together is more than the amount paid to the contractor.

This re-circulation of money through the economy is termed the "multiplier effect." Each industry has a unique pattern of spending which depends on its mix of labor and capital and the types of raw materials it uses. Input-output analysis keeps track of these spending patterns and can be used to work out the

flow of money from one industry to another and estimate their multiplier. The size of the multiplier depends on the study area considered. If the contractor needs to leave the study area to buy oil, all of the subsequent transactions take place in other distant economies. The output of the refinery would only be included in the study area multiplier if the area was lucky enough to contain a refinery. This study used the IMPLAN software package and data representing the state of the economy in 2008 as its input-output framework.

IMPLAN (originally an acronym for "IMpact analysis for PLANing", now a trademark for the IMPLAN software and data) was developed by the U.S. Forest Service to facilitate regional economic analysis of forest plans (IMPLAN, 2010). It is the most widely used and flexible input-output analysis package available with the most current data for county-level analysis. IMPLAN divides the economy into 440 different industry sectors and builds regional economic models based on county level data.

The input to the input-output model is a spending pattern reflecting the amount a project spent in each industry. The Service maintains a database of project information, called HabITS, which includes the contributions from the Service and other partners and describes the treatments conducted for each project. The list includes about 130 different restoration treatments, e.g., dike or levee construction, ditch plug removal, livestock crossing construction, fencing, and invasive plant control. Each type of treatment allocates different percentages of its spending to different industries. We developed spending patterns for each restoration treatment by industry from sample budgets of past projects and expert opinion. The spending pattern serves as a "crosswalk" from restoration treatment types to IMPLAN industries. Table 1 shows typical spending patterns used for each class of treatment. The 440 different industry categories used by IMPLAN are broadly defined so many disparate treatment spending patterns are indistinguishable when spending is allocated to IMPLAN industry. For example, all of the earth moving and construction activities must be classified in the IMPLAN industry "Construction of other new nonresidential structures."

Table 1. Treatment types with IMPLAN budget

Treatment Type	Percent Allocated	Sector*	IMPLAN Industry
Assessment	100	Services	Environmental and other technical consulting services
Fencing	15	Services	Environmental and other technical consulting services
	85	Constn	Construction of other new nonresidential structures
Fire Management	100	Ag	Support activities for agriculture and forestry
Fish/Aquatic Species Passage	15	Services	Environmental and other technical consulting services
	85	Constn	Construction of other new nonresidential structures
Grazing/Farm Management	10	Services	Environmental and other technical consulting services
	90	Ag	Cattle ranching and farming
Hazard Removal	100	Services	Waste management and remediation services
Human Use Exclusion	100	Constn	Construction of other new nonresidential structures
Infrastructure Removal	10	Services	Environmental and other technical consulting services
	90	Services	Waste management and remediation services
Instream Modification	15	Services	Environmental and other technical consulting services
	85	Constn	Construction of other new nonresidential structures
Invasive Control	10	Services	Environmental and other technical consulting services
	90	Ag	Support activities for agriculture and forestry
Living Shorelines	10	Services	Environmental and other technical consulting services
	90	Constn	Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying
Planting	10	Services	Environmental and other technical consulting services
	90	Ag	Support activities for agriculture and forestry
Recreation and Education	10	Services	Environmental and other technical consulting services
	90	Constn	Construction of other new nonresidential structures
Species Translocation	10	Services	Environmental and other technical consulting services
	90	Services	Other support services
Vegetation Management	10	Services	Environmental and other technical consulting services
	90	Ag	Support activities for agriculture and forestry
Water Management	10	Services	Environmental and other technical consulting services
	90	Constn	Construction of other new nonresidential structures
Wildlife Habitat Structures	10	Services	Environmental and other technical consulting services
	90	Constn	Construction of other new nonresidential structures

*Ag=Agriculture and related industries, Constn=Construction and mining, Services=All other service industries

Each sector has unique effects on multipliers. Planting projects, for example, use agricultural sectors that tend to use large numbers of relatively low wage workers. Hence, they create more jobs per thousand dollars spent than other projects. Water management projects that build structures generate fewer but better paying jobs. More of their spending is for machinery and supplies that are produced in only a few regions so they tend to have smaller local or regional multipliers. The planning element of a project uses service industries whose primary input is skilled labor so the jobs multiplier is small but the output multiplier can be substantial.

The structure of HabITS dictates a further approximation. In HabITS, a project consists of one or more accomplishments. Each accomplishment consists of one or more treatments. While the treatments describe the work to be done, the financial information is gathered at the accomplishment level. For each accomplishment, we added together the percentage spending patterns for its constituent treatments and divided by the number of treatments. That process gave equal weight to each treatment in allocating the accomplishment spending to industries even though one treatment may have taken a disproportionate share of the achievement's spending.

This study has two parts. The first part of the study addresses impacts by state of FY2011 spending. Most accomplishments were assigned to a state in HabITs. For those that were not identified to a state, we used geographic information system (GIS) data that showed the outline of the project on the ground and identified the state from the geographic location. Several projects had neither GIS information nor state on their HabITS record and were assigned to an "Other" category. All of the accomplishments in each state were given spending patterns and spending was summed by IMPLAN industry to the state level. This provided input to an IMPLAN model of each state. Spending included both the Service and partners' cash contributions. The results should be interpreted as the contribution of projects that involved the PFW and Coastal Programs.

The second part of the study considers eleven sample PFW projects and four sample Coastal Program projects. These projects are representative of several different regions. Each sample project shows different challenges in size, scope, participants, funding, and location. The treatment spending patterns outlined above were circulated to the field project managers. Each manager refined the spending pattern as needed to reflect their view of the project spending in each industry. The economic regions for the sample projects encompassed nearby shopping and marketing areas, usually the county where the project was located and some adjacent counties. All spending and project information was from FY2011 though some project funding may have come from earlier grants and allocations.

State Results

Tables 2 and 3 show PFW and Coastal Programs spending, respectively, across states. For some projects, other Service programs, such as Endangered Species, also contribute to the project. These funds are shown in the "Other Service" column. In most states, spending by other entities exceeds the cash contribution of the PFW and Coastal Programs. Leverage indicates the effectiveness of PFW or Coastal Program spending at encouraging others to participate financially, or otherwise, in restoration projects. The table does not include project funds that were spent on protection activities. Valuing the economic benefits of easements is beyond the scope of this report. The leverage ratio is the total spending divided by PFW or Coastal Program spending shown in the far right column of Tables 2 and 3. There is a wide range of leverage ratios across states due to the variety of funding sources and mechanisms used for each project.

These tables do not include in-kind services from the PFW and Coastal Programs or their partners. In-kind services are often the most important contribution of the programs as they organize design, permitting, and contracting but they are not equivalent to spending in a regional economics context. For the FY2011 PFW Program, the average leverage ratio, weighted by amount of spending, was 8.6. That is, for every dollar that the PFW program spent on a project they were able to have partners contribute $8.65. The PFW program in Connecticut had the highest leveraging ratio. For every dollar that the Connecticut PFW program contributed to a project, a total of $384.96 was also contributed by partners. The PFW Programs in South Carolina, Maine, and West Virginia also commanded high leveraging ratios of 119.09, 118.62, and 92.67, respectively. The Coastal Program weighted average leverage for FY 2011 is slightly lower at 6.28. This translates to partner contributions of $6.28 for every $1 the Coastal Program spends on projects. The Coastal Program in Alaska and Rhode Island had the highest leveraging ratio at 42.96 and 22.04, respectively.

Table 2. Partners for Fish and Wildlife Projects Spending by State, completed in FY2011
($ in thousands, 2011)

	PFW Program	Other Service	Total Service	Project Partners	Total	Leverage (Total/Partners)
Alabama	132	73	206	309	515	3.89
Alaska	883	-	883	3,367	4,250	4.81
Arizona	376	-	376	1,435	1,811	4.82
Arkansas	204	-	204	113	317	1.55
California	1,969	1,981	3,950	19,907	23,857	12.12
Colorado	169	203	372	730	1,102	6.52
Connecticut	25	909	934	8,690	9,624	384.96
Delaware	60	-	60	705	765	12.75
Florida	287	536	823	861	1,684	5.87
Georgia	1,474	104	1,577	537	2,114	1.43
Hawaii	894	2,222	3,116	759	3,875	4.33
Idaho	414	430	844	995	1,839	4.44
Illinois	127	47	174	102	276	2.17
Indiana	203	19	222	168	390	1.92
Iowa	289	91	380	177	557	1.93
Kansas	157	128	285	35	320	2.04
Kentucky	95	-	95	148	243	2.56
Louisiana	194	-	194	287	481	2.48
Maine	82	4,544	4,626	5,101	9,727	118.62
Maryland	1,229	446	1,674	3,513	5,187	4.22
Massachusetts	76	1,030	1,106	1,285	2,391	31.46
Michigan	447	110	557	490	1,047	2.34
Minnesota	482	142	624	1,297	1,921	3.99
Mississippi	198	-	198	936	1,134	5.73
Missouri	58	87	145	252	397	6.84
Montana	247	146	393	1,185	1,578	6.39
Nebraska	245	105	350	1,184	1,534	6.26
Nevada	412	20	432	284	716	1.74
New Hampshire	9	-	9	-	9	1.00
New Jersey	51	-	51	842	893	17.51
New Mexico	166	65	231	54	285	1.72
New York	17	-	17	867	884	52.00
North Carolina	608	15	623	817	1,440	2.37
North Dakota	156	215	371	4,192	4,563	29.25
Ohio	187	5	191	243	434	2.32
Oklahoma	408	100	508	351	859	2.11
Oregon	1,389	1,231	2,619	8,781	11,400	8.21
Pennsylvania	62	2	64	1,956	2,020	32.58
Rhode Island	-	-	-	1,100	1,100	-

	PFW Program	Other Service	Total Service	Project Partners	Total	Leverage (Total/Partners)
South Carolina	193	14	207	22,778	22,985	119.09
South Dakota	447	349	796	607	1,403	3.14
Tennessee	267	8	275	152	427	1.60
Texas	1,000	479	1,479	6,980	8,459	8.46
Utah	84	25	108	229	337	4.01
Vermont	53	39	92	689	781	14.74
Virginia	84	10	94	962	1,056	12.57
Washington	1,249	7,266	8,515	11,361	19,876	15.91
West Virginia	3	-	3	275	278	92.67
Wisconsin	629	132	761	687	1,448	2.30
Wyoming	49	-	49	87	136	2.78
District of Columbia*	-	-	-	20	20	-
Caribbean*	56	-	56	91	147	2.63
Total	18,595	23,328	41,919	118,973	160,892	8.65

*IMPLAN models were not available for these territories so contribution was estimated using the average multipliers of all of the other states.

Table 3. Coastal Program Projects Spending by State*, completed in FY2011
($ in thousands, 2011)

	Coastal Program	Other Service	Total Service	Project Partners	Total	Leverage (Total/Coastal)
Alabama	84	-	84	76	160	1.90
Alaska	134	-	134	5,623	5,757	42.96
California	335	405	740	1,504	2,244	6.70
Connecticut	33	-	33	326	359	10.88
Delaware	23	-	23	53	76	3.30
Florida	654	9	663	2197	2860	4.37
Hawaii	51	-	51	101	152	2.98
Indiana	47	-	47	7	54	1.15
Louisiana	43	-	43	17	60	1.40
Maine	175	109	284	243	527	3.01
Maryland	22	9	31	31	62	2.82
Massachusetts	20	-	20	-	20	1.00
Michigan	68	65	133	345	478	7.03
Mississippi	40	-	40	-	40	1.00
New Jersey	42	-	42	9	51	1.21
North Carolina	25	-	25	25	50	2.00
Oregon	33	10	43	261	304	9.21
Rhode Island	98	5	103	2,057	2,160	22.04
South Carolina	132	-	132	13	145	1.10
Texas	361	39	400	972	1,372	3.80
Washington	340	-	340	1,886	2,226	6.55
Caribbean	57	-	57	46	103	1.81
Total	2,817	651	3,468	15,792	19,260	6.28

*The table includes only States that received funding in FY2011. Other States are also eligible for Coastal Program funding and may have received in-kind services.

Tables 4 and 5 summarize the results of the state IMPLAN models for the PFW and Coastal Program, respectively. The first column replicates the program specific contributions. The second column duplicates the "total" column, representing the sum of both the program specific contributions and partner contributions from Tables 2 and 3. This is the amount of stimulus provided by the restoration projects in the state. The other four columns are the results of the state IMPLAN model based on the industries present in the state, average wages, and tax rates.

Each of these columns has a specific economic meaning that may not be intuitively clear. "Output" is the overall measure of production in the state economy related to the cascading effect of restoration spending and includes the sum of the 3 levels of economic effects derived from input-output analysis. For example, for the Alabama PFW Program the "direct spending" is the $515,000 spent on projects, which includes $132,000 in PFW program spending and $383,000 in matching partner funds. It generated $849,000 in further rounds of spending by the contractors (direct effect), their suppliers (indirect effect), and their employees (induced effects). "Employment" refers to the number of jobs created and/or supported by the new output. The number of jobs depends on the wages and labor conditions in the industries generating the output. Low wage/labor intensive industries will produce more new jobs than highly paid/capital intensive ones. IMPLAN's definition of "Jobs" includes part-time and limited period jobs so this number should be thought of as a "ball park" estimate rather than a full-time equivalent value. "Labor income" is the increase in wages paid to workers to produce the additional output. In Alabama, $503,000 was paid to 15.2 additional workers. "Indirect Business Taxes" are the combination of excise, sales, and property taxes to businesses. They do not include employer contributions to social security insurance or taxes on income. They provide an indicator of new revenue to government entities from the restoration projects.

Nationally, in FY 2011, the PFW Program contributed $18.6 million, leveraged a total of $142 million for a combined total of $161 million spent on PFW program projects. For every $1 that the PFW program contributed to a project, the program generated $15.70 in economic returns. In FY 2011 alone, the total economic stimulus created by the PFW program amounted to $292 million in output and 3,547 new jobs. For the Coastal Program, a total of $2.8 million of program funds leveraged $16.4 million for a combined total of $19.2 million spent on Coastal Program projects. For every $1 that the Coastal Program contributed to a project, the program generated $12.78 in economic returns. The total economic stimulus created by the Coastal Program equals $35.9 million in output and 475 jobs.

The multiplier effect of restoration spending on output is about 1.9 (=output/spending) for most states. These results are in the typical range for state multipliers. Tables 6 and 7 summarize the state multipliers and distribution of spending by sector. California, with a highly diverse and large internal economy, generated a multiplier of 2.1 for the PFW Program. Washington, Massachusetts, and Oregon also report higher multipliers than other states due to the diversity of its economy. For the Coastal Program, Louisiana had the highest multiplier of 4.03 with the state of California and Washington following.

Table 4. Contribution of the Partners Program in Wildlife Project Spending by State, completed in FY2011

($ in thousands, 2011; except employment)

	PFW Program	Direct Spending	Employment (Jobs)	Labor Income	Output	Indirect Business Taxes
Alabama	132	515	15.2	503	849	26
Alaska	883	4,250	97.5	2,724	6,973	177
Arizona	376	1,811	36.2	1,439	3,204	98
Arkansas	204	317	7.7	272	513	14
California	1,969	23,857	533.6	23,718	51,107	1,589
Colorado	169	1,102	17.2	740	1,739	51
Connecticut	25	9,624	92.1	6,172	15,741	414
Delaware	60	765	8.6	325	723	20
Florida	287	1,684	51.0	1,458	2,967	98
Georgia	1,474	2,114	44.9	1,454	3,727	115
Hawaii	894	3,875	77.0	2,183	4,352	133
Idaho	414	1,839	40.6	1,399	3,196	81
Illinois	127	276	3.8	206	511	15
Indiana	203	390	6.4	253	582	16
Iowa	289	557	9.0	280	682	18
Kansas	157	320	5.1	211	463	13
Kentucky	95	243	4.4	166	368	9
Louisiana	194	481	11.9	404	826	24
Maine	82	9,727	144.4	6,989	18,172	419
Maryland	1,229	5,187	168.6	4,840	8,650	272
Massachusetts	76	2,391	26.7	1,982	4,761	126
Michigan	447	1,047	18.8	743	1,875	53
Minnesota	482	1,921	29.7	1,318	3,407	94
Mississippi	198	1,134	33.7	1,015	1,845	53
Missouri	58	397	4.5	137	399	12
Montana	247	1,578	27.5	1,055	2,732	69
Nebraska	245	1,534	24.3	920	2,429	60
Nevada	412	716	16.3	572	1,197	35
New Hampshire	9	9	0.3	11	16	1
New Jersey	51	893	19.2	802	1,700	48
New Mexico	166	285	7.3	209	429	12
New York	17	884	10.2	658	1,670	45
North Carolina	608	1,440	35.0	1,186	2,543	76
North Dakota	156	4,563	84.1	2,867	6,543	172
Ohio	187	434	9.3	297	733	20
Oklahoma	408	859	21.3	624	1,386	37
Oregon	1,389	11,400	233.0	9,388	22,256	611
Pennsylvania	62	2,020	23.2	1,264	3,439	90

	PFW Program	Direct Spending	Employment (Jobs)	Labor Income	Output	Indirect Business Taxes
Rhode Island	-	1,100	13.7	736	2,005	51
South Carolina	193	22,985	820.6	24,330	39,015	1,308
South Dakota	447	1,403	18.5	821	2,246	52
Tennessee	267	427	47.6	188	701	19
Texas	1,000	8,459	221.6	7,704	15,777	510
Utah	84	337	5.4	208	568	17
Vermont	53	781	17.4	572	1,365	35
Virginia	84	1,056	18.8	573	1,695	49
Washington	1,249	19,876	384.9	17,444	40,315	1,178
West Virginia	3	278	3.5	138	412	8
Wisconsin	629	1,448	30.6	1,082	2,383	65
Wyoming	49	136	1.5	59	202	5
District of Columbia*	-	139	3.3	122	265	8
Caribbean*	56	147	0.2	7	15	0
Total	18,595	160,872	3,547	134,762	291,656	8,521

*IMPLAN models were not available for these territories so contribution was estimated using the average multipliers of all of the other states.

Table 5. Contribution of Coastal Program Project Spending by State, completed in FY2011
($ in thousands, 2011; except employment)

	Coastal Program	Total	Employment (Jobs)	Labor Income	Output	Indirect Business Taxes
Alabama	84	160	3.3	117	242	7
Alaska	134	5,757	146.7	3,664	9,223	240
California	335	2,244	56.5	2,438	4,973	153
Connecticut	33	359	3.8	256	649	17
Delaware	23	76	1.3	55	135	3
Florida	654	2,860	106.0	2,973	5,889	196
Hawaii	51	152	3.4	128	286	8
Indiana	47	54	1.0	39	84	2
Louisiana	43	60	3.3	117	242	7
Maine	175	527	8.0	363	983	23
Maryland	22	62	1.7	56	109	3
Massachusetts	20	20	0.1	9	20	1
Michigan	68	478	5.6	297	829	22
Mississippi	40	40	0.9	29	65	2
New Jersey	42	51	1.2	49	98	3
North Carolina	25	50	1.1	40	89	3
Oregon	33	304	4.6	218	600	15
Rhode Island	98	2,160	55.1	1,702	3,917	108
South Carolina	132	145	3.3	117	242	7
Texas	361	1,372	29.8	1,160	2,650	83
Washington	340	2,226	36.1	1,781	4,432	141
Caribbean	57	103	2.5	84	191	6
Total	2817	19,260	475.3	15,691	35,947	1,050

*The table includes only states that received funding in FY2011. Other states are also eligible for Coastal Program funding and may have received in-kind services.

The "Jobs per $ million" shows the number of jobs created per million dollars of spending. The highest jobs multipliers for the PFW Program were in South Carolina (35.7), New Hampshire (33.3), and Maryland (32.5) where most of the restoration funding went to the agricultural sector. Similarly the highest job multipliers for the Coastal Program were in Louisiana (55), Florida (37.1), and Georgia (35). While the distribution of spending by sector influences the number of jobs created, wage rates in the state and the size of the state economy are also important. The lowest jobs multipliers occur in high wage Connecticut (9.6), New York (11.5), and Pennsylvania (11.5) for the PFW Program. For the Coastal Program the high wage states also had the lowest jobs multipliers and included Massachusetts (5), Connecticut (10.6), and Michigan (11.7).

Table 6. Sector Spending and Multipliers by State, for PFW Projects completed in FY2011.

	% share of spending by sector			Multipliers	
	Agriculture	Construction	Services	Output/ Spending	Jobs per $ million
Alabama	75	12	13	1.65	29.5
Alaska	19	66	14	1.64	22.9
Arizona	33	54	12	1.77	20.0
Arkansas	67	23	11	1.62	24.3
California	41	39	21	2.14	22.4
Colorado	28	39	33	1.58	15.6
Connecticut	-	85	15	1.64	9.6
Delaware	35	49	16	0.95	11.2
Florida	61	29	10	1.76	30.3
Georgia	52	18	29	1.76	21.2
Hawaii	54	34	12	1.12	19.9
Idaho	38	37	25	1.74	22.1
Illinois	33	56	11	1.85	13.8
Indiana	60	29	12	1.49	16.4
Iowa	84	7	9	1.22	16.2
Kansas	72	6	23	1.45	15.9
Kentucky	28	17	55	1.51	18.1
Louisiana	64	27	10	1.72	24.7
Maine	0	0	100	1.87	14.8
Maryland	79	9	12	1.67	32.5
Massachusetts	0	32	68	1.99	11.2
Michigan	26	62	12	1.79	18.0
Minnesota	29	54	16	1.77	15.5
Mississippi	78	13	10	1.63	29.7
Missouri	64	26	10	1.01	11.3
Montana	19	48	33	1.73	17.4

	% share of spending by sector			Multipliers	
	Agriculture	Construction	Services	Output/ Spending	Jobs per $ million
Nebraska	51	22	27	1.58	15.8
Nevada	37	52	11	1.67	22.8
New Hampshire	90	-	10	1.78	33.3
New Jersey	36	51	12	1.90	21.5
New Mexico	51	22	27	1.51	25.6
New York	3	82	14	1.89	11.5
North Carolina	58	26	16	1.77	24.3
North Dakota	83	6	11	1.43	18.4
Ohio	48	41	11	1.69	21.4
Oklahoma	56	34	9	1.61	24.8
Oregon	27	60	13	1.95	20.4
Pennsylvania	3	85	12	1.70	11.5
Rhode Island	-	85	15	1.82	12.5
South Carolina	90	0	10	1.70	35.7
South Dakota	14	53	34	1.60	13.2
Tennessee	32	57	11	1.64	17.8
Texas	65	22	12	1.87	26.2
Utah	16	48	36	1.69	16.0
Vermont	32	56	13	1.75	22.3
Virginia	48	37	15	1.61	17.8
Washington	27	56	17	2.03	19.4
West Virginia	8	73	19	1.48	12.6
Wisconsin	47	37	16	1.65	21.1
Wyoming	30	28	42	1.49	11.0

Table 7. Sector Spending and Multipliers by State, for Coastal Program Projects completed in FY2011

	% share of spending by sector			Multipliers	
	Agriculture	Construction	Services	Output/ Spending	Jobs per $ million
Alabama	45	45	10	1.51	20.6
Alaska	23	18	59	1.60	25.5
California	47	32	20	2.22	25.2
Connecticut	0	81	19	1.81	10.6
Delaware	20	70	10	1.78	17.1
Florida	66	18	16	2.06	37.1
Georgia	90	-	10	1.74	35.0
Indiana	71	-	29	1.56	18.5
Louisiana	90	-	10	4.03	55.0
Maine	2	26	72	1.87	15.2
Maryland	54	34	12	1.67	26.2
Massachusetts	-	-	100	1.00	5.0
Michigan	-	85	15	1.73	11.7
Mississippi	45	45	10	1.63	22.5
New Jersey	42	24	34	1.92	23.5
North Carolina	45	45	10	1.78	22.0
Oregon	5	83	12	1.97	15.1
Pennsylvania	78	-	22	1.95	30.0
Rhode Island	30	56	14	1.81	25.5
South Carolina	90	-	10	1.67	22.8
Texas	44	45	11	1.93	21.7
Washington	18	47	36	1.99	16.2

Sample Projects

Figure 1 illustrates where both the PFW and Coastal Program projects highlighted in this study were located.

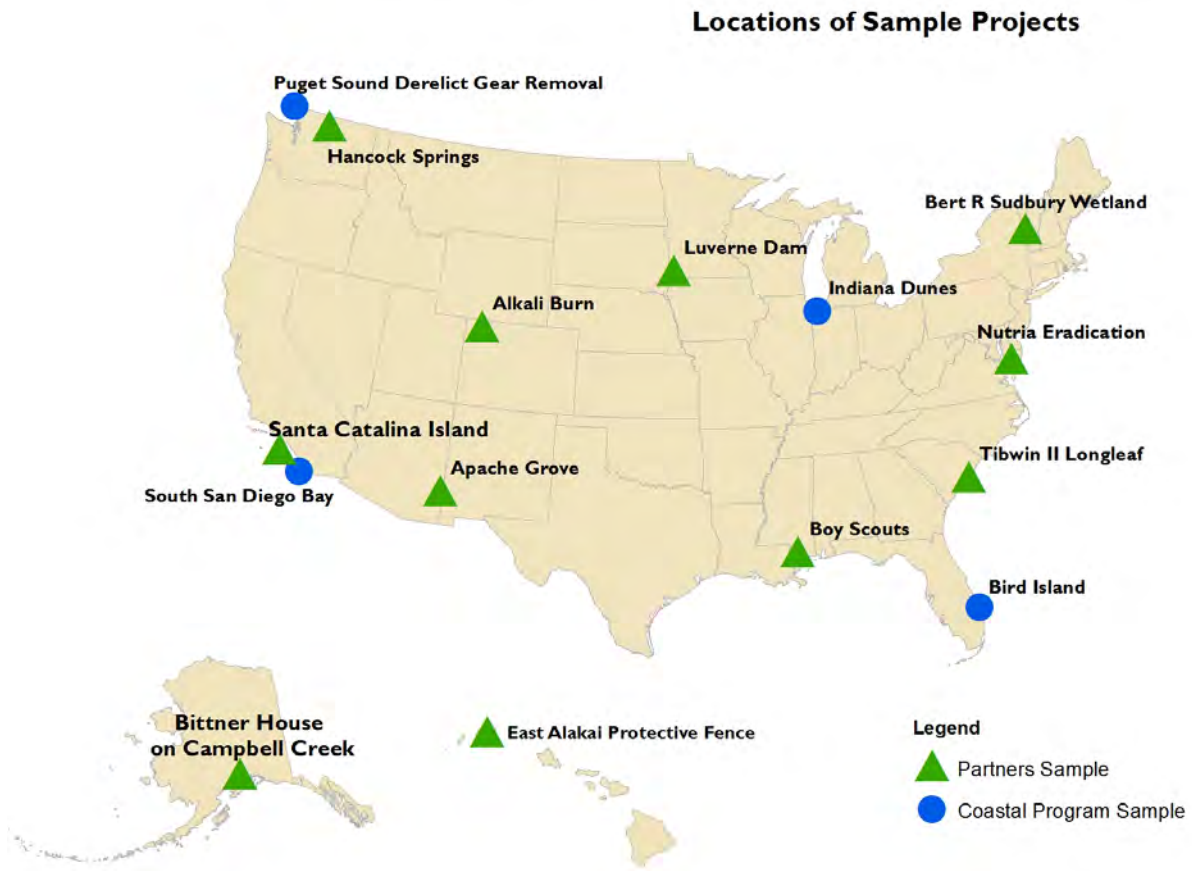

Figure 1: Locations of Sample Projects

Partners for Fish and Wildlife Sample Projects

Ten PFW projects were chosen to illustrate the variation in scope, size, partners, and organization of PFW projects. All of these projects were completed in FY2011. Spending reflects FY2011 expenditures which may have been appropriated or granted in prior years. The projects' spending is included in the state analyses above but here it is applied to a smaller nearby region. These results cannot be added to the state results above. Typically, smaller regions have smaller multiplier effects. Money spent in a small region leaves very quickly since there are fewer industries within the region to recycle it. The money continues to flow in the wider economy but we see fewer of its effects when we focus in closely.

Alkali Wildfire Restoration, Colorado

Sage grouse are considered the marquee species for the sagebrush rangelands. The distribution and abundance of sage grouse has markedly decreased in recent times, and the species has been extirpated from Arizona, Nebraska and British Columbia. Sage grouse populations have declined by one-third over the past 30 to 40 years (Braun 1998). Sagebrush habitats are becoming increasingly degraded and fragmented due to the impacts of multiple threats, including direct conversion, urbanization, wildfire and the change in wildfire frequency, incursion of invasive plants, overgrazing, and energy development. Many of these threats are exacerbated by climate change.

Figure 2: Greater Sage-Grouse.
Photo Credit: Steve Fairbairn / USFWS

In the fall of 2010, the "Alkali" wildfire consumed 8,000 acres of mostly private lands in northwestern Colorado. Some locations that burned extremely hot became open to invasion by noxious vegetation including cheatgrass. Areas dominated by cheatgrass:

- provide low quality habitat for wildlife species reliant upon the sage-steppe,
- increase wildfire frequency, and
- reduce forage quality for all grazing animals.

This project planted 1,249 burned over acres with native forbs, grasses, and brush to stop cheatgrass invasion and enhance habitat conditions. No domestic livestock grazing is permitted in the area for two years after planting to allow the native mix to become established.

The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS), Colorado State Division of Wildlife (CDOW), Rocky Mountain Bird Observatory (RMBO), and the Service worked together on this project as part of the NRCS Sage Grouse Initiative. Table AW-1 shows how $12,961 from the PFW program leveraged $308,000 more funding from the NRCS, the state of Colorado, and the Rocky Mountain Bird Observatory. This project is a great example of building resiliency in the system to adapt to the effects of climate change. The area will serve as a long-term restoration for the sage grouse. Establishment of the native understory will demobilize soil, store carbon, and provide high-quality habitat. As an alternative to a cheatgrass monoculture, the variety of species present offer greater opportunities for the ecosystem to adapt as the climate changes causing wildfires and droughts to become more frequent.

Figure 3: Aerial seeding to restore sagebrush rangelands/Photo: USFWS

This work is likely to improve future grazing opportunities but it also provides an immediate economic stimulus to those who worked on it as shown on Table AW-2. The area around the burn is remote and thinly populated so there is relatively little established business infrastructure to keep spending circulating in the area. Of the $321,600 spent $4,700 left the region immediately so the direct impact was $316,900. The spending in planning services and agriculture-related practices generated 4.8 jobs directly and an additional 0.8 jobs as it flowed through the economy. As the spending passed from business to business, it produced $421,900 in output. Supplies are imported and personal spending quickly flows out of the region so the multiplier effect is quite small.

Table AW-1. Alkali Wildfire Restoration – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
USDA – Natural Resource Conservation Svce	$ 264,847	---
Colorado - Division of Wildlife	35,013	---
Rocky Mountain Bird Observatory	5,827	
U.S. Fish and Wildlife Service		
1121 Program	12,961	40 staff-days
1121 Climate Change	3,001	---
Total	$ 321,649	40 staff-days

Table AW-2. Alkali Wildfire Restoration – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	140.6	145.2	4.0	4.1
Mining	---	0.0	---	---
Construction	---	0.5	---	---
Manufacturing	---	0.3	---	---
Transportation	---	9.7	---	---
Trade	---	22.4	---	0.4
Service	176.3	241.3	0.8	1.2
Government	---	2.5	---	---
Total	316.9	421.9	4.8	5.6

Note: Because of the way labor data is collected, IMPLAN jobs figures represent the number of positions created– full-time, part-time, seasonal, and intermittent. IMPLAN does not estimate full-time equivalent jobs.

Apache Grove Riparian Restoration, Arizona

Figure 4: Revegetation work along the Upper Gila River/ Photo USFWS

The Gila River is one of Arizona's major rivers. It originates in the Gila National Forest of New Mexico, and flows west through Arizona to the Gulf of California. In 2008, American Rivers listed the Gila River as one of the country's most endangered rivers. American Rivers focused on the uppermost reaches of the Gila, where the river still flows freely and where lush riparian areas are comprised of cottonwoods, willows, and sycamores. The upper Gila still harbors a mostly intact native-fish population and is home to an array of wildlife, including the threatened Southwestern willow flycatcher (*Empidonax traillii extimus*). The Gila flood plain is critical habitat for the flycatcher. An action item in its recovery plan is to restore the physical and biological integrity of the riparian zone down river to provide more flycatcher habitat.

Farmers and ranchers living along or near the Upper Gila River have sought ways to enhance the health and vigor of their land. They have tried a number of alternatives with varying degrees of success. In many cases there have been unintended consequences, including lateral migration of the channel, upstream or downstream effects, and erosion.

The cooperator became interested in stabilizing his property along the river after he lost farmland from the lateral migration of the river and erosion during large storms. A regional fluvial geomorphology study specifically referenced the cooperator's property as an area where restoration activities could benefit the stream function by allowing for the seasonal flow variations which preserve and sustain native vegetation. Working with Graham County and the Gila Watershed Partnership, the cooperator developed this project to implement recommendations in the study. In 2007, the group won funding from the Arizona Water Protection Fund Program (AWPF) – a state program which provides funds to restore and enhance riparian areas in Arizona. AWPF provided the majority of funding for this project.

The project is located on the Upper Gila River in York Valley, a few miles upstream of the town of Clifton, Arizona. The Southwestern willow flycatcher is known to breed above and below the project site on the Gila River. The ultimate goal of this project was to restore the natural diversity of fluvial processes which will allow a diverse assemblage of native plants to become established and create better flycatcher habitat. The project accomplished this by:

- restoring the function of the floodplain along the river by removing levees,
- reducing the risk of lateral erosion and land loss to the adjacent private property,

- managing the invasive salt cedar community to improve the riparian habitats and stream function, and
- providing a successful example for other landowners along the upper Gila River.

The specific on-the-ground activities to accomplish these goals used local heavy equipment operators and other contractors to complete the following components:

- Removal of the existing earthen levees: An estimated 3,000 feet of existing earthen levee were mechanically excavated, returning the ground to its natural grade, and re-vegetated with native species.
- Install overbank hedgerows: A series of vegetative "hedgerows" were planted in the agricultural fields perpendicular to the stream flow. The hedgerows consist of relatively stiff but supple woody vegetation that filters and slows overbank flood flows and prevents erosion. The rows are laid out so crops grown there can still be harvested efficiently.
- Stabilize stream banks: Approximately 2,000 feet of stream bank was actively eroding or at risk. Vertical or steep banks in these areas were re-sloped to a lesser angle and treated with structural and bioengineering practices. Native riparian vegetation was used to stabilize the upper portions of the stream banks providing wildlife habitats.

Figure 5: Southwestern willow flycatcher/ Photo: Dave Menke USFWS

- Invasive Species Management: The existing riparian vegetation along the Gila River within the project area is a mix of native species and the invasive, non-native salt cedar (*Tamarix* ssp). To minimize impacts to the existing native species, the salt cedar was removed by hand crews using chain saws and treated with an herbicide applied to freshly cut stumps.
- Re-vegetation: Re-vegetation with native riparian plant species is an important component of all project activities. A variety of bioengineering practices were used to stabilize stream banks and enhance wildlife habitats. Bioengineering practices are generally installed manually. Local willow and other species are harvested and used to stabilize banks. All disturbed areas within the project were reseeded using native grasses.
- Construction: Heavy equipment was used for sloping banks, removing levees, and other earth-working tasks during construction. Every effort was made to minimize the impacts of construction equipment on the site.

The project was funded by $796,700 from private individuals and supported by six days of in-kind work from the PFW program. All of these activities employ local workers with a variety of skills. Their income flows through the local economy providing additional income and creating more jobs.

Table AG-1. Apache Grove – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
Arizona Water Protection Fund Program	$ 796,700	---
U.S. Fish and Wildlife Service		
1121 Program	---	6 staff-days
Total	$ 796,700	6 staff-days

This project required considerable earth moving which is classified under the construction sector in Table AG-2. Heavy equipment uses a great deal of fuel. Since no oil is produced in the region all of it is imported. This creates a large drain on the amount of money that recirculates locally, reducing the direct spending from $796,700 to $698,800. In addition, construction uses more equipment and higher paid workers than agriculture, for example, so the number of jobs produced is less per $100,000 of spending. If construction produced jobs at the same rate as agriculture, the project would have produced 14.7 direct construction jobs instead of 4.2. The additional jobs added as output grows to $874,100 are added in industries outside of construction and agriculture since they primarily serve the needs of the added families and not construction or agriculture.

Table AG-2. Apache Grove – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	83.6	85.5	2	2
Mining	---	0	---	0
Construction	615.3	617.2	4.2	4.2
Manufacturing	---	1.6	---	0
Transportation	---	9.5	---	0.1
Trade	---	35.4	---	0.4
Service	---	119.2	---	1.1
Government	---	5.7	---	0
Total	698.8	874.1	6.2	7.8

Bert R. Sudbury Wetland, Vermont

Otter Creek is Vermont's longest river and its drainage includes important habitat for a variety of species. The wetlands associated with Otter Creek provide breeding or migratory habitat for black ducks, blue-winged teal, wood ducks, solitary sandpipers, American woodcock, golden-winged warblers and black-crowned night herons. Many of the wetlands in the area have been cleared, ditched and drained. Over the last five years, the Service has worked closely with NRCS, Ducks Unlimited and the State of Vermont to preserve and restore wetlands along Otter Creek. These projects represent a strategic effort to improve wildlife habitat in Vermont through partnerships and a holistic approach to conservation.

The floodplain site was ditched and drained for agriculture many years ago. The project restored the microtopography of the site by creating a depression, filling in the ditches and plugging an outlet. By restoring the hydrology of the wetland and discontinuing the agricultural use of the site, the historic wetland vegetation and functioning of the site can be restored. Migratory birds, including waterfowl, shorebirds, wading birds and passerines, amphibian habitat and overall water quality benefited from this restoration.

Figure 6: Wetland restoration work at Sudbury Wetland/ Photo: USFWS

The Service worked closely with the USDA NRCS through the Wetland Reserve Program (WRP) to recover the site. The WRP compensates farmers who convert marginal farmland back to wetlands. The Service provided technical assistance for the project that included an initial site visit and assessment, elevational survey, wetland determination, review of historic maps and files, project design, state and federal permitting, project layout, construction oversight, consultation with NRCS engineers and an initial planting plan.

Table BRS-1. Bert R. Sudbury Wetland – Resources.

	Monetary	In-Kind
Partners		
USDA/Natural Resource Conservation Service	$27,000	---
U.S. Fish and Wildlife Service		
1121 Program	---	7 staff-days
Total	$27,000	7 staff-days

Although small in area, the Bert R. Sudbury wetland project was key to improving the habitat in the region. It also provided a small boost for agricultural workers in the area. The original $27,000 in spending recirculated through the economy to generate nearly $44,000 in output and 0.9 jobs.

Table BRS-2. Bert R. Sudbury Wetland – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	15.2	15.5	0.6	0.6
Mining	---	0.1	---	0.0
Construction	9.0	9.2	0.1	0.1
Manufacturing	---	1.4	---	0.0
Transportation	---	1.5	---	0.0
Trade	---	2.5	---	0.0
Service	2.7	13.1	0.0	0.1
Government	---	0.5	---	0.0
Total	26.9	43.8	0.7	0.9

Bittner House on Campbell Creek, Alaska

Campbell Creek supports a popular recreational fishery for coho salmon in the heart of Anchorage, Alaska. It supports a greenbelt of parks and provides habitat for five species of Pacific salmon. Fishing trails along the banks had compacted soils and destroyed bankside vegetation and juvenile salmon rearing habitat. The creek eroded the banks until an outside bend came within 50 feet of the historic Bittner House and nearby recreation facilities owned by the Municipality of Anchorage, Department of Parks and Recreation. A common solution to this type of erosion is to rip-rap the stream bank, i.e. line the bank with fist size stones, which prevents further erosion but also destroys any remaining fish habitat. Something needed to be done to protect both the fishery and the city's facilities.

Figure 7: Juvenile Coho Salmon/ Photo: Roger Tabor, USFWS

The Municipality could fund the project but needed advice on meeting its multiple goals of providing juvenile salmon habitat, natural streambank restoration with fishing access, and protecting a historic site and infrastructure. They turned to the PFW Program for financial and technical assistance. The Service contracted with a local engineering firm to survey, design, and obtain permits for a bank restoration project. The goal was to construct woody **fish habitat and stabilize the streambank** near the park infrastructure. The design consisted of 100 feet of rootwads (rootballs from fallen trees), a brush layer and other bioengineering treatments that both enhanced near bank habitat and provided erosion protection. The Municipality of Anchorage managed the construction of the project.

Completion of the project provided enhanced juvenile salmon rearing habitat as well as protection for the Parks and Recreation building in close proximity to the creek. In this example, the PFW Program played a key role in enhancing salmon habitat in an urban area by providing technical expertise and access to the most up-to-date bank stabilization techniques. A relatively small investment by the Service leveraged a large impact on the resource.

Table BH-1. Bittner House – Campbell Creek – Resources.

	Monetary	In-Kind
Partners		
Municipality of Anchorage, AK	$50,000	
Alaska Department of Fish and Game		
U.S. Fish and Wildlife Service		
1121 Program	15,000	2 staff-days
Total	$65,000	2 staff-days

The Bittner House portion of the Campbell Creek project was completed in 2011. Service spending for this project focused on the consultants developing the design and navigating the permitting process. In addition to contracting, the Service was also the lead for project design, as well as outreach to the city's Salmon in the City initiative. The Municipality of Anchorage hired contractors to do the earth moving, place the rootwads, and replant the area. This spending created work in the community. Although projects of this small size do not generate long careers, they keep consultants and contractors employed. As shown in Table BH-2, direct spending generated three tenths of a job in the construction industry and about six tenths of a job in all industries as the spending circulated in the Anchorage economy. Direct spending was focused in the construction and services sectors. These industries also gained the most as spending flowed through the economy. Trade and manufacturing also gained from circulation of the added income. Ensuring good fish habitat sustains fish production, resulting in gains in the fishing industry service economy, an extremely important sector of Alaska's economy.

Table BH-2. Bittner House – Campbell Creek – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	---	0.1	---	---
Mining	---	1.2	---	---
Construction	58.5	58.7	0.3	0.3
Manufacturing	---	3.8	---	---
Transportation	---	3.1	---	---
Trade	---	4.7	---	---
Service	6.5	28.3	---	0.2
Government	---	0.8	---	---
Total	65.0	100.7	0.4	0.6

Boy Scouts, Mississippi

Figure 8: Longleaf pine habitat/ Photo: S. Miller, USFWS

Much of the Gulf coastal plain was originally longleaf pine forest. Clearing for agriculture and timber production greatly reduced this key habitat. Timber production is the most important land use in southern Mississippi. Following the initial harvest of native longleaf pine, much of the area was reforested to fast growing short rotation pine including improved varieties of loblolly and slash pine. Without the open grown, fire-dependent stands of longleaf pine, several wildlife species including gopher tortoise, black pine snakes, gopher frogs, and red-cockaded woodpeckers have lost their critical habitat.

The Southeast Louisiana Council of the Boy Scouts of America owns the 1,600 acre Salmen Scout Reservation/Camp V-Bar near Sellers, Mississippi. The Reservation is largely second growth forest after logging. The Council had inaugurated a project to restore the area to longleaf pine for the benefit of trust species. The Service provided technical expertise and funding, while the Scouts provided the bulk of the funding and labor to plant the replacement trees.

In 2011, the project addressed restoration of longleaf on 46 acres of timber land. The site required an herbicide treatment and a burn prior to planting. Burning or planting cannot be conducted within 60 days of herbicide application. Containerized longleaf seedlings were then hand planted with an 8 foot by 10 foot spacing.

Figure 9: Gopher Tortoise/ Photo: Randy Browning, USFWS

Table BS-1. Boy Scouts – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
Boy Scouts of America	$ 17,980	---
Mississippi Fish and Wildlife Foundation	2,157	---
Fish and Wildlife Service		
1121 Climate Change	4,378	3 staff-days
Total	$ 24,515	3 staff-days

Almost all of the spending for this project occurred outside of the local region so direct impacts are $9,000 less than spending and the multiplier is less than 1. Similarly, the jobs results indicate no multiplier effect. While the economic benefits of this project are smaller in comparison to other projects, the true value of this project was the involvement of Boy Scout Youths, the local community and the habitat benefit to the local wildlife.

Table BS-2. Boy Scouts – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	13.5	13.7	0.4	0.4
Mining	---	0.0	---	0.0
Construction	---	0.1	---	0.0
Manufacturing	---	0.2	---	0.0
Transportation	---	0.6	---	0.0
Trade	---	1.3	---	0.0
Service	1.6	6.4	0.0	0.1
Government	---	0.2	---	0.0
Total	15.1	22.4	0.4	0.4

East Alakai Protective Fence, Hawaii

The Hawaiian Islands are more than 2,000 miles from the nearest land mass. Before human discovery, they were among the most isolated ecosystems in the world. The island habitats range from tropical rain forest to high altitude volcanoes. Isolation combined with a wide variety of habitats led to a uniquely adapted fauna and flora with an incredible number of species found only in Hawaii. Since European settlement, a wide variety of plants and animals have been introduced to the islands competing with native species and changing the ecosystem. Kauai has more single island endemic plant species (225) than any other island in the Hawaiian archipelago and is also a hotspot for avian diversity with eight endemic forest species. In 2010 the Service determined endangered status for 48 species and designated 26,582 acres of critical habitat on the island of Kauai using an ecosystem-based approach. Feral ungulates and invasive plants are the primary threats to rare and endangered species and overall ecosystem health. Fortunately, researchers have found that endemic ecosystems recover quickly once these threats are removed.

Figure 10: East Alakai Forest/ Photo: USFWS

The purpose of this project was to protect and restore 2,000 acres (1,405 acres private land and 595 acres State land) of forested watershed in the Alakai region of the island of Kauai. Known as *wao akua* or "realm of the gods," the Alakai plateau has always been a sacred and important place for the people of Kauai, and is the primary source of the island's freshwater. These forested wetlands and bogs are crucial for the survival of Kauai's remaining forest birds.

The restoration project entailed the installation of 26,400 feet of fence to restrict feral pigs from accessing the forest and allow natural regeneration of native plants. PFW funding paid for 10,000 feet of fence traversing private lands in the Alakai Wilderness Preserve. Endangered Species Recovery funding, also from the U.S. Fish and Wildlife Service, paid for fencing on adjacent State lands, listed in Table EA-1. An adaptive management strategy to remove feral pigs and goats will be implemented in the project area. Invasive plants will be controlled to the greatest extent possible using the latest technologies in weed mapping, hand and aerial treatment.

This project implements a portion of the Kauai Watershed Management Plan, a larger project to address threats on over 8,000 acres of native habitat. The Kauai Watershed Alliance is a public-private partnership of landowners whose mission is to protect the upper watershed of the island of Kauai. A total of 29 threatened and endangered species benefited from the project, including several rare plants with only a few individuals left in the wild.

This project was conducted from 2009 through 2011. The Nature Conservancy matched Service PFW funding, as shown in Table EA-1. Funding was also drawn from the Service Endangered Species program. About $492,000 of the spending occurred in 2009. By 2011, the habitat was already improving. For

simplicity, we consider all of the spending and impacts over the three-years of the project. Fencing is classified as a construction activity while invasive species control is primarily agricultural, so those two categories receive the majority of the spending in Table EA-2. As the spending flows through the economy, trade, transportation, and other services also gain. Jobs are measured in terms of positions created over the three year period. Most jobs are in the relatively low paying agricultural sector. Kauai has 1,100 agricultural workers and 7% unemployment (U.S. Census Bureau, 2011). Even a few more jobs are useful to the economy. The $964,164 spent on this project generated $1,554,100 in output into the economy.

Figure 11: East Alakai summit & fencing/ Photo: USFWS

Table EA-1. East Alakai Fence – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
The Nature Conservancy	$ 336,082	---
U.S. Fish and Wildlife Service		
1121 Program	336,082	30 staff-days
1113 Endangered Species Recovery	292,000	---
Total	$ 964,164	30 staff-days

Table EA-2. East Alakai Fence – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	574.1	592.2	21.0	21.2
Mining	---	2.6	---	---
Construction	273.9	281.5	1.7	1.7
Manufacturing	---	23.7	---	0.1
Transportation	---	48.8	---	0.3
Trade	---	86.5	---	1.0
Service	110.7	501.9	0.9	4.4
Government	---	17.0	---	0.1
Total	958.7	1,554.1	23.6	28.8

Hancock Springs, Washington

Hancock Springs is a mile long spring creek in the upper Methow River Basin of central Washington. Hancock Springs was a highly productive salmonid stream before it was degraded due to unrestricted livestock grazing. No anadromous fish were found in the stream in 2005 when Yakama Nation Fisheries staff first surveyed the property. In 2006, a project of the Yakama Nation, PFW, and the private landowner produced immediate results. It consisted of fencing the stream from livestock and deer, placing logs to increase riffle velocity, and planting native shrubs in the riparian zone. Soon Hancock Springs was producing the highest density of steelhead spawning nests in the entire Methow Basin. In 2010, the Methow Conservancy brokered a riparian and agricultural easement which included a restoration agreement with the landowner.

The objectives of the project were to completely restore the historical form and function of the channel and adjacent wetlands to provide habitat for steelhead, spring chinook, and riparian wildlife species. Typical of most spring-fed streams, Hancock Spring has a relatively constant discharge rate of 3 - 10 cubic feet per second and its annual temperature profile is very stable in the mid-40°F's. In addition, the stream has a low-gradient, with an average slope of approximately 0.1% and has almost no sediment supply. The lack of sediment deposition from upstream severely limits the springs' natural ability to rebuild streambanks once they have eroded. Compared to the adjacent mainstem Methow River, Hancock Springs contains cool summer temperatures, warm winter temperatures, steady spring flows, and accessible rearing and spawning environments that make it superior salmonid habitat. Almost no other opportunity like this exists in the Methow Basin.

Figure 12: Hancock Springs, after restoration work
Photo: USFWS

Figure 13: Steelhead (Oncorhynchus mykiss)
Photo: USFWS

Service staff were involved in every aspect of project development and completed construction of the project in early-September 2011. Service assistance included all topographic survey and complete engineering design work, native seed collection, completion of all permits and environmental compliance documents, contract development, contractor selection, and hundreds of hours of manual labor and supervision during construction. When the temporary fish exclusion barrier was removed on September 1, 2011, four Endangered Upper Columbia spring Chinook Salmon immediately swam upstream into the restored reach.

Juvenile and adult usage by salmon and steelhead has been measured at record high densities since the reconstruction work was completed. In addition, threatened bull trout have now been observed utilizing the stream in considerable numbers for the first time ever.

Biological, hydrologic and physical monitoring will continue as the newly restored wetland and channel provide long-term benefits to fish and wildlife. Building on success, Service and Yakama Nation staffs hope to pursue additional funding to continue this work into downstream degraded reaches in the coming years.

Table HS-1 shows resources for both the 2006 and 2011 restoration projects.

Table HS-1. Hancock Springs – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
Methow Conservancy	$ 690,000	---
Bonneville Power Administration	412,676	---
WA Salmon Recovery Funding Board	128,351	---
Yakama Nation	158,666	$ 10,000
U.S. Fish and Wildlife Service		
1121 – Partners Program	55,708	$81,114 100 staff-days
Total	$ 1,445,401	$ 91,114 100 staff-days

Note: Includes Yakama Nation 2006 project and 2011 reconstruction work.

Early funding from the PFW program leveraged funding from four other contributors. Total spending for the project, including in-kind contributions, was $1,536,500. Earth moving falls under the construction industrial category so most of the direct spending is in that category. Fencing and planting are agricultural activities. As spending by construction and agricultural workers flows through the economy, they demand retail trade and other services. Hence, the trade and services sectors have large indirect impacts. Overall, the project generated $2,048,500 in output and 28.4 jobs. In the future, improved habitat conditions will boost recreational fishing in the area. The added activity will lead to more fishing trips and added sales of bait, tackle, and other equipment.

Table HS-2. Hancock Springs – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	326.8	332.7	12.6	12.8
Mining	12.6	13.3	0.1	0.1
Construction	779.4	784.8	5.7	5.7
Manufacturing	11.5	23.3	0.0	0.1
Transportation	---	31.0	---	0.1
Trade	---	108.6	---	1.5
Service	317.7	719.7	4.3	7.9
Government	---	35.2	---	0.1

Total	1,448.0	2,048.5	22.7	28.4

Luverne Dam Removal, Minnesota

Low head dams are common structures in the rivers of southern Minnesota. The six foot raised concrete structure creates a smooth pond and inviting swimming hole while degrading fish habitat and impeding their movement up and downstream. The dams also remove beneficial riffle areas that help put oxygen into the water and create microhabitats for fish. The shape of the dam creates a turbulent, suction zone on the downstream side. Swimmers can be pulled underwater, become disoriented, and drown. Deaths are so common the dams have been called "drowning machines."

Figure 14: Luverne Dam prior to removal
Photo: USFWS

The Rock River dam at Luverne in the southwest corner of Minnesota had taken two lives when the city and county decided to remove it. Removing the dam and installing rock riffles that direct the stream's erosive energy away from the banks solved both the safety and habitat issues. Removal of the dam opened approximately 62 miles of the main stem Rock River channel to fish movement. The Rock River is part of the former range of the Topeka Shiner (*Notropis topeka*), an endangered minnow. The rock riffles provide pooling habitat for fish spawning and rearing. The pooling also helps ground water recharge the city's well system which lies close to the river.

Partner funding for the project came from Minnesota Department of Natural Resources and the City of Luverne. Rock County Soil & Water Conservation District contributed in kind. The Service financial contribution came from the fish habitat restoration program. The PFW program role was to facilitate environmental and licensing reviews necessary for the project to go forward.

With the hazard removed and habitat improved, the City of Luverne and Rock County plan to promote more kayaking and fishing on the river. This cooperative project of Federal, State, and local entities helped resolve two significant issues in the community.

Figure 15: Dam Removal
Photo: USFWS

Table LD-1. Luverne Dam Removal – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
Minnesota Department of Natural Resources	$ 260,000	$ 7,000
Rock County Soil & Water Conservation District	---	25,000
City of Luverne, Minnesota	24,000	20,000
U.S. Fish and Wildlife Service		
1121 – Partners	---	6,000 10 staff-days
1334 – Habitat Restoration	80,000	---
Total	$ 364,000	$ 58,000 10 staff-days

Note: Staff-days are monetized in this example.

Dam removal and reshaping the river bed is a complex process that requires a great deal of heavy construction machinery. As we have seen in other projects, heavy construction has a lower multiplier effect and produces fewer jobs per $100,000 spent than other sectors. The Luverne Dam project funded three jobs directly and one more with the multiplier effect. The output multiplier is also small; the project generated $529,200 in new output.

Table LD-2. Luverne Dam Removal – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	---	0.4	---	0.0
Mining	---	0.0	---	0.0
Construction	368.9	369.7	2.8	2.9
Manufacturing	---	2.6	---	0.0
Transportation	---	10.4	---	0.1
Trade	---	27.0	---	0.3
Service	52.0	115.8	0.3	0.9
Government	---	3.2	---	0.0
Total	420.9	529.2	3.1	4.2

Maryland Nutria Project

Nutria (*Myocastor coypus*) are invasive, semi-aquatic, South American rodents first released into Dorchester County, Maryland, in 1943, to encourage trade in its furs. Nutria did not evolve in the Chesapeake Bay ecosystem, so there are no natural controls on its population. Since their release, nutria numbers have increased dramatically, invading at least eight Maryland counties and unknown portions of Delaware and Virginia. Populations on 10,000 acres of the Blackwater National Wildlife Refuge grew from less than 150 animals in 1968 to as many as 50,000 in 1998. Nutria feed on plant roots in marshlands. Their feeding destroys the root mats that hold wetland grasses in place. Once the grasses are gone the marshland is eventually converted to open water and results in the loss of vital habitats for many aquatic species, including the juvenile habitats of many commercial species like striped bass (*Morone saxatilis*) and blue crabs (Callinectes sapidus). Blackwater alone has lost half its wetlands since the introduction of nutria.

Figure 15: Nutria/Photo: USFWS

The Nutria Eradication and Control Act of 2003 is the culmination of many years of research into nutria's effects on the environment and methods to control them. It authorizes the expenditure of $4 million per year for five years to eradicate nutria from the Chesapeake and Delaware Bays.

The Maryland Nutria Project is administered by the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office (CBFO). This project is a working partnership between 27 federal, state, and private partners with a management team comprised of Service, Maryland Department of Natural Resources, U.S. Department of Agriculture Animal Plant Health Inspection Service Wildlife Services (APHIS/WS), U.S. Geological Survey, and University of Maryland Eastern Shore. The related missions of these agencies provide opportunities to mutually support and enhance the effectiveness of federal wildlife related services. The project's goal is to eradicate or suppress nutria populations to a point where local populations are no longer self-sustaining and coastal wetland degradation is so vastly reduced as to allow coastal marshes to be restored.

APHIS/WS Wildlife Specialists apply various nutria control techniques under many different conditions to eradicate nutria from the Chesapeake Bay region. This project funds a portion of salaries, equipment and supplies required for 19 Wildlife Specialists, a part-time administrative assistant, a project supervisor, and additional technicians. Since 2000, nutria have been eradicated from over 150,000 acres of private and public land in Dorchester County, Maryland – a good start.

Figure 16: USFWS and partners work with private landowners on nutria eradication projects Photo: USFWS

Trapping and other wildlife management activities are included in the agricultural industry category. These are highly labor intensive tasks so spending generates a substantial number of jobs. In addition, spending by workers and their families are recycled in the local economy. Families spend more of their money on services and retail goods than businesses do which results in large gains in indirect spending for services, trade, and manufacturing and generates a substantial multiplier effect. The project contributed $2,560,000 in new output to the Eastern Shore and generated 55.1 much needed jobs.

Table MN-1. Maryland Nutria Project – Resources.

	Monetary	In-Kind
Partners		
Maryland Department of Natural Resources	---	$ 12,000
U.S. Fish and Wildlife Service		
1121 Program	$1,183,720	---
1124 Coastal Program	---	20 staff-days
1261 Refuge Operations	252,751	10 staff-days
Total	$ 1,436,471	$ 12,000 30 staff-days

Table MN-2. Maryland Nutria Project – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	1,309.4	1,325.9	45.5	45.8
Mining	---	1.5	---	0.0
Construction	---	10.4	---	0.1
Manufacturing	---	110.3	---	0.1
Transportation	---	84.8	---	0.3
Trade	---	178.7	---	2.1
Service	146.9	825.8	0.9	6.5
Government	---	23.1	---	0.1
Total	1,456.3	2,560.5	46.4	55.1

Tibwin II, South Carolina

Figure 17: Red-cockaded Woodpecker/Photo: USFWS

Much of South Carolina's uplands were historically dominated by a longleaf pine ecosystem. Clearing for agriculture, development, and suppression of the natural fire cycle has left scattered tracts of longleaf forest throughout its former range. Longleaf pine plant communities and associated isolated wetlands provide important habitat for many South Carolina priority species. For the Service, a primary goal is restoration of the federally endangered Red-cockaded Woodpecker (*Picoides borealis*).

In 2007, The Nature Conservancy acquired the Tibwin II tract from International Paper which had managed it as a loblolly pine plantation. The Tibwin II tract is 907-acres of upland pine and forested wetlands in ridge-and-swale settings. The tract abuts U.S. Forest Service lands that are managed for longleaf pine. There are two active clusters of Red-cockaded Woodpeckers within 0.3 miles of the tract. The Nature Conservancy is restoring the native longleaf pine ecosystem that previously dominated the upland coastal plain. This restoration project takes advantage of mature loblolly pine already on the property to integrate the tract into the larger expanse of longleaf pine forest maintained by the Forest Service. The major steps include:

- Thin 364 acres of mature loblolly pine stands.
- Thin 250 acres of younger loblolly stands
- Apply herbicide to reduce hardwood competition, and apply prescribed fire.
- Under plant in longleaf pine.
- Eliminate sapling loblolly pine and hardwoods from 183 acres and replant in longleaf pine.
- Treat hardwoods invading the isolated wetlands with herbicides.
- Use prescribed fire on a 1 to 3 year cycle to maintain longleaf plantings.

Figure 18: The Nature Conservancy Tibwin II Tract after prescribed fire /Photo: TNC

Table T-1. Tibwin II – Resources.

	Monetary	In-Kind
Partners		
The Nature Conservancy	$39,242	
U.S. Fish and Wildlife Service		
1121 Program	25,000	10 staff-days
Total	$64,242	10 staff-days

Forestry activities are classified under agriculture in industrial classification schemes, so most of the spending for Tibwin II falls in the agriculture category. Agriculture is relatively labor intensive so this spending flows directly to families. As with other labor intensive industries, spending by workers and their families are spent and recycled through the local economy. Families spend more of their money on services and retail goods than businesses do which results in large gains in indirect spending for services, trade, and manufacturing and generates a substantial multiplier effect. Overall the multiplier effect almost doubles the contribution of project spending to the output of local firms to $113,900 and added 3.3 new jobs.

Table T-2.Tibwin II – Impacts.

	Output (2011 $ thousands)		**Jobs** (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	54.9	55.2	2.9	2.9
Mining	---	0.2	---	---
Construction	---	0.5	---	---
Manufacturing	---	10.1	---	---
Transportation	---	4.4	---	---
Trade	---	7.8	---	0.1
Service	3.2	34.6	---	0.3
Government	---	1.0	---	---
Total	58.1	113.9	2.9	3.3

Santa Catalina Island, California

Santa Catalina Island (Catalina Island) is a semi-arid, Mediterranean-type island 22 miles southwest of Los Angeles, California. The island is approximately 48,000 acres in size. The island is rugged and dominated by coastal sage scrub and island chaparral plant communities. Its isolation has preserved much of its native flora and fauna. The island has eight endemic plant taxa found nowhere else and five species of endemic land mammals, including the endangered Santa Catalina Island Fox (*Urocyon littoralis catalinae*). The Catalina Island Conservancy (CIC) owns and manages 90 percent of the island. Its purpose is to protect and preserve Catalina Island's wild character. In cooperation with the Service, other agencies, and private landowners, CIC restores and improves fish and wildlife habitat on the island. Invasive non-native plant species introduced many years ago are spread around the island by seeds dispersed by cars, trucks, and bicycles along the dirt roadways on the island. The CIC restricts travel in the unsettled parts of the island but invasive plants continue to travel along the road network as a dispersion corridor through road maintenance and occasional vehicle traffic.

Figure 24: Endangered Santa Catalina Island Fox/ Photo: Catalina Island Conservancy

The CIC initiated its invasive plant program to conduct manual and chemical control of invasive plant species along Catalina Island's 223 miles of roads and trails. To implement this project, the CIC employed two contracted Invasive Plant Biological Technicians, each with a three or four person crew, which supported existing CIC staff and volunteers from American Conservation Experience. This project was funded by Coastal Program funds and implemented by staff of the PFW Program. The PFW staff provided technical support to the CIC on the best restoration practices to employ and assists with regards to wildlife that benefit from the project.

The CIC, along with the American Conservation Experience, treated a 200-foot buffer along all roads and transportation corridors with herbicides and manual control methods to remove invasive plant species. The project created a weed-free buffer zone between the transportation corridors and the native habitat on the island. The project encompasses approximately 10,000 acres along the 223 miles of roads and trails on the island. The entire island benefits from this project via prevention, eradication, and control of invasive plant species. The total project cost is $629,730. CIC was awarded $211,000 of American Reinvestment and Recovery Act (ARRA) funds from the Service. ARRA accounting estimated that this project will create jobs for 14 people.

Table CI-1. Santa Catalina Island – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
Catalina Island Conservancy		$ 83,480
USDA Natural Resource Conservation Service	$ 101,000	
American Conservation Experience		234,250
U.S. Fish and Wildlife Service		
4135 Coastal Program – ARRA funding	211,000	8 staff-days
Total	$ 312,000	$317,730 8 staff-days

This project illustrates the difference between the remote, isolated economies near many projects and a diverse, integrated economy. While Catalina Island is isolated, it is offshore from the Los Angeles-Orange County metropolitan area. Most of the spending related to this project would occur in this mainland area. The multiplier effect is much greater than in more rural sites since services and retail trade largely stay within the metropolitan area. Like the ARRA estimate, IMPLAN estimates that about 14 jobs were created by project spending. In addition, the multiplier is greater than two so the project also generates $1,075,000 in new output.

Table CI-2. Santa Catalina Island – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	Total	Direct	Total
Agriculture	420.2	421.4	10.7	10.7
Mining	---	2.8	---	0.0
Construction	---	3.9	---	0.0
Manufacturing	---	77.8	---	0.1
Transportation	---	56.4	---	0.2
Trade	---	79.7	---	0.7
Service	62.9	423.1	0.4	2.9
Government	---	9.8	---	0.0
Total	483.1	1,075.1	11.1	14.7

Coastal Program Sample Projects

Five Coastal Program projects were chosen to illustrate various aspects of the program and the input-output method. The projects represent a diversity of restoration techniques, size and scope, and partnerships. All of these projects were completed in FY2011. Spending reflects FY2011 expenditures unless otherwise noted. The projects' spending is included in the State analyses above but here it is applied to a smaller nearby region. These results cannot be added to the State results above.

Bird Island, Florida

The MC-2 Island is the most important colonial water bird rookery island in Martin County in southeast Florida. It provides habitat to hundreds of nesting and roosting birds, including little blue herons, snowy egrets, tri-colored herons, white ibis, black-crowned night herons and brown pelicans. In 2012, over 8,400 records of 46 species of birds were observed on or in the vicinity of the island with 15 species successfully nesting. Of the 240 pairs of birds nesting successfully, 100 were wood storks, a federally listed endangered species.

Figure 19: Wave break installation at Bird Island /Photo: USFWS

The eastern shoreline of the Island is only 500 feet away from the Intracoastal Waterway so erosion from boat wakes is constant. During the 2004 and 2005 hurricane seasons, many of the mature mangroves were uprooted and did not survive the storms. Biologists estimate that more than 50 percent of the canopy cover of the island has been lost.

Figure 20: Wood storks /Photo: USFWS

Prior attempts to stabilize the eastern shoreline have focused on removing invasive vegetation and planting native species. This project provided a permanent wave break structure to stabilize approximately 800 feet of shoreline. It also restored native mangrove vegetation throughout 1.5 acres of the two acre island. In a few years, the mangroves will grow to the height that is preferred by wood storks and other colonial water birds. Interpretive signage has also been placed to educate boaters of the importance of the island and delineate it as a "Closed" area. Roseate spoonbills and great white herons nested successfully on Bird Island in 2012 - the first recorded nesting of either species in Martin County, Florida.

Figure 21: Spartina planting on Bird Island /Photo: USFWS

Table BI-1. Bird Island – Resources.

	Monetary
Partners	
South Florida Water Management District	$ 100,000
Florida Inland Navigation District	150,000
Martin County, FL - Parks	76,000
Indian River Lagoon National Estuary Program	88,000
U.S. Fish and Wildlife Service	
1124 Coastal Program	76,000
Total	$ 490,000

Table BI-1 shows the contributions of each partner to the project. (None listed in-kind contributions.) In addition to the stimulus provided by $490,000 in spending, the restoration of Bird Island will enhance the experience of birdwatchers touring the area. Tour boat operators that rely on this island will be able to offer an improved product with more diverse species. If the number of visits increases, economic benefits will be realized by tourism support businesses, such as hotels and restaurants that stimulus was not considered in this analysis

The Bird Island project tapped a more diverse set of industries than most others. Intensive planning contributed to the service sector while moving sand and soil for the wave break structure added to mining. Construction workers improved the erosion protection of the island and agricultural workers removed invasive species. Overall, the project added $742,600 in output to the local economy and 8.8 new jobs.

Table BI-2. Bird Island – Impacts.

	Output (2011 $ thousands)		Jobs (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	109.7	111.2	4.6	4.6
Mining	36.8	39.0	0.1	0.1
Construction	163.5	165.2	1.1	1.1
Manufacturing	16.3	33.9	0.0	0.1
Transportation	1.9	29.3	0.0	0.1
Trade	---	33.2	---	0.3
Service	153.1	328.3	1.0	2.3
Government	---	2.6	---	0.0
Total	481.3	742.6	6.9	8.8

Indiana Dunes, Indiana

Indiana's Lake Michigan coastal ecosystems support exceptional plant and animal diversity, including dunes and adjacent oak savannas that are home to the threatened Pitcher's thistle and endangered Karner blue butterfly. Approximately 30 other State-listed species also occur in these important coastal habitats within Indiana Dunes National Lakeshore.

Figure 21: Invasive Species Removal on Lake Michigan coastal dunes /Photo: USFWS

These rare plant and animal communities are at great risk. Invasive plants have become well established throughout much of Indiana Dunes and recent surveys confirm invasive species are quickly overtaking the habitat. Invasive plants force out native flora and fauna through competition, resulting in degradation and eventual loss of rare communities such as oak savanna, wetland, prairie, and foredune.

This project used Coastal Program funding to remove invasive plants and improve habitat for the Karner blue butterfly and Pitcher's thistle. Field staff searched for invasive plants in Pitcher's thistle and Karner blue butterfly habitat. When found, invasive plants were hand pulled or cut and herbicide was applied. Wild lupine is the sole food source for larval Karner blue butterflies. The project improved butterfly habitat by cutting trees and shrubs to thin the canopy and increase light levels needed by wild lupine. The project staff searched and treated approximately 68 acres for non-native plants. Four acres of Karner blue butterfly habitat were improved through selective thinning of trees and shrubs.

Table ID-1. Indiana Coastal Dunes – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
National Park Service	---	$ 8,000
U.S. Fish and Wildlife Service		
1124 - Coastal Program	$ 15,000	5 staff-days
Total	$ 15,000	$8,000 5 staff-days

Unlike the PFW Program, the Coastal Program can fund projects on federal lands. This National Lakeshore project is an example where all of the participants are Federal agencies. This small project involved little cash and so shows a small economic contribution using the input-output method. The removal of invasive plants, however, is crucial to the survival of the Karner blue butterfly. In addition, restoration efforts that keep the park healthy and viable for wildlife may also stimulate additional visitors to the park which would boost the local service economy.

Figure 21: Karner Blue Butterfly /Photo: Phil Delphy, USFWS

Table ID-2. Indiana Dunes – Impacts.

	Output (2011 $ thousands)		**Jobs** (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	9.7	10.0	0.1	0.1
Mining	---	0.0	---	0.0
Construction	---	0.1	---	0.0
Manufacturing	---	0.1	---	0.0
Transportation	---	0.5	---	0.0
Trade	---	1.0	---	0.0
Service	9.1	15.0	0.1	0.1
Government	---	0.1	---	0.0
Total	18.8	26.7	0.2	0.2

Puget Sound Derelict Fishing Gear Removal, Washington

Figure 22: Removing derelict fishing net
Photo: USFWS

Derelict fishing gear consists of the nets, lines, pots, and other equipment that has been lost or abandoned in the marine environment. Modern synthetic materials take decades to degrade in the water and have posed a real threat to not only wildlife but to humans. Abandoned nets continue to catch fish, mammals, and birds wounding or killing them. Divers have become entangled and drowned. Propellers and rudders can be snagged. Since 2002, the Northwest Straits Foundation (Foundation) has implemented a comprehensive program to remove derelict fishing gear from Puget Sound and other Washington state waters.

A first step was to train a cadre of Navy divers to safely and efficiently remove derelict fishing nets. The training was conducted at the National Oceanic and Atmospheric Administration's (NOAA) Diving Center and on actual sites of detected nets in area waters. The divers were from Explosive Ordnance Disposal Mobile Unit 11 stationed at Whidbey Island's Seaplane Base. They practiced on nets in Lake Washington, and completed the training by removing two nets from the Strait of Georgia.

The Foundation conducts derelict fishing gear removal in all areas of Puget Sound, the majority being in the San Juan Islands. In one year, the Foundation removed 84 gillnets, five purse seines, one huge aquaculture net, and four crab pots. Removal of the nets and pots restored 45.6 acres of marine habitat. Found in the gear: seven mammals (all dead), 53 birds (all dead), 148 fish (mostly dead), 12,466 invertebrates (many dead). Surveys each year determine high priority areas to focus on in future efforts. The Foundation follows state-approved guidelines for the safe and environmentally-sensitive removal of derelict fishing gear. Recycling companies and public and private disposal companies are used to dispose of the net materials on shore.

Table PS-1. Puget Sound Derelict Fishing Gear Removal – Resources.

	Monetary	In-Kind
Partners		
NOAA Marine Debris Program	$ 20,000	
U.S. Fish and Wildlife Service		
1124 Coastal Program	20,000	2 staff-days
Total	$ 40,000	2 staff-days

Diving and waste disposal have little in common but both fall under the services industrial category. Most of the multiplier effect also fell in the services category. Overall the project generated $51,000 in local economic output and 0.3 new jobs.

Figure 23: Removing derelict crab pot in Puget sound/ Photo: USFWS

Table PS-2. Puget Sound Derelict Fishing Gear Removal – Impacts.

	Output (2011 $ thousands)		**Jobs** (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	---	0.1	---	0.0
Mining	---	0.0	---	0.0
Construction	---	0.1	---	0.0
Manufacturing	---	1.7	---	0.0
Transportation	---	1.1	---	0.0
Trade	---	1.3	---	0.0
Service	36.4	45.9	0.2	0.2
Government	---	0.8	---	0.0
Total	36.4	51.0	0.2	0.3

South San Diego Bay, California

Over the past 150 years, dredging and filling operations to accommodate maritime and urban developments have resulted in the loss of 42 percent of San Diego Bay's historic shallow subtidal habitat, 84 percent of the intertidal mudflat habitat, and 70 percent of the salt marsh habitat. Most of the native upland and wetland/upland transition habitat also has been lost to development. The purpose of the South San Diego Bay project was to reverse this trend of habitat loss by restoring and enhancing 300 acres of estuarine habitats at three different locations in South San Diego Bay.

The project restored tidal ecosystems, expanded and improved avian nesting habitat, created and enhanced roosting and foraging habitat for seabirds, improved water quality, and created community stewardship events. The largest project undertaking occurred at the San Diego Bay National Wildlife Refuge managed Western Salt Ponds. Ponds previously used for making salt were taken out of salt production, dredged to create elevations suitable to support 223 acres of subtidal, intertidal, and wetland-upland transitional habitats, breached to restore tidal exchange, and then planted with native plants. At the Port of San Diego (Port) managed Chula Vista Wildlife Reserve, 11 acres of salt marsh habitat was created and 30 acres of intertidal habitat was enhanced by excavating degraded uplands to establish tidal channels and salt marsh elevations, and then planted with salt marsh plants. At the Port managed Emory Cove, non-native vegetation and debris were removed from 28 acres of wetland/upland transitional habitat and then planted with native vegetation.

Figure 25: San Diego Bay Levee breach to reconnect waterway / Photo: USFWS

South San Diego Bay has been designated a Western Hemisphere Shorebird Reserve Network Site and a Globally Important Bird Area by the American Bird Conservancy, because it supports an abundant and diverse array of migratory and resident birds. More than 90 species of migratory and coastal dependent birds are currently benefitting from this project. The project has expanded nesting, foraging, and roosting areas for shorebirds, seabirds, waterfowl, other migratory species, and resident wetland birds. Federally and/or state listed species such as California least tern, light-footed clapper rail, western snowy plover, and Belding's savannah sparrow are also benefitting from the recently created shallow subtidal and intertidal habitats. The expanded fish habitat has created new spawning and feeding grounds, thereby improving the foraging opportunities for fish-eating birds. Within days of construction being complete, tens of thousands of shorebirds (avocets, black-necked stilts, semi-palmated plovers, pelicans, red-necked heron, etc.) immediately started utilizing the newly exposed intertidal habitat for

roosting and foraging, thereby demonstrating how significant this habitat restoration project was for San Diego Bay and the region.

The project was completed as a result of a collaboration from 11 different federal, state and local agencies, and nonprofit organizations providing either funding, in-kind services, and/or technical expertise. In summary, project implementation was funded by $7,702,000 in grant or matching funds. The Service's Coastal Program played an important role in project planning and implementation. The Coastal Program worked with the project partners in successfully applying for grants to finance the project, drafted portions of the Environmental Assessment to fulfill NEPA requirements, provided Coastal Program funds to implement the project prior to grant funds being available, and participated as a member of the Project Team for restoration at the Western Salt Ponds to finalize project design and guide project implementation.

Figure 26: Aerial View of completed excavation to create wetlands

Table SSD-1. South San Diego Bay – Resources.
(2011 $)

	Monetary	In-Kind
Partners		
California Coastal Conservancy	$ 1,200,000	---
National Coastal Wetlands Conservation Grant	1,000,000	---
San Diego National Wildlife Refuge	50,000	---
National Oceanic and Atmospheric Administration	2,975,000	---
US Environmental Protection Agency	1,000,000	---
Port of San Diego	1,300,000	25,000
San Diego Audubon Society		15,500
San Diego Oceans Foundation		15,500
Ocean Discovery Institute		15,500
Coronado Cays Homeowners Association		15,500
U.S. Fish and Wildlife Service		
1124 - Coastal Program	90,000	91 staff-days
Total	$ 7,615,000	91 staff-days $87,000

The modifications to South San Diego Bay required planning, earth moving, and planting treatments which fall into the services, construction, and agriculture industry categories, respectively. San Diego

County has a diverse integrated economy so the multiplier effect is significant, particularly in the service sector. The $7.7 million project generated $13.4 million in additional output and added 130 jobs.

Table SSD-2. South San Diego Bay – Impacts.

	Output (2011 $ thousands)		**Jobs** (jobs)	
	Direct	**Total**	**Direct**	**Total**
Agriculture	2,396.7	2,438.2	60.8	61.4
Mining	---	11.4	---	0.1
Construction	4,121.2	4,167.5	23.7	24.1
Manufacturing	---	401.2	---	1.0
Transportation	---	521.4	---	1.4
Trade	---	924.6	---	8.7
Service	809.6	4,887.3	4.4	32.9
Government	---	102.2	---	0.6
Total	7,327.4	13,453.9	89.0	130.0

Observations from the Sample Projects

The sample projects illustrate how the economic stimulus of restoration spending is one element of the benefits from the PFW and Coastal programs. This report highlights this often ignored element. Projects like the East Alakai Fence and Maryland Nutria Eradication inject work into depressed areas. Using the skills of unemployed agricultural workers in Kauai and watermen on the Eastern Shore of Maryland provides a clear stimulus for the region's future.

While spending provides a quick stimulus, projects may also create or improve local businesses. The improved Bird Island is becoming a destination for eco-tours in the area. The improved fishery provided by the Apache Grove and Hancock Spring projects will add to anglers' enjoyment in their regions. The Luverne Dam removal opened up the river to better, and safer, water-based recreation.

Partnerships are truly key to PFW and the Coastal Program's success. The Bert R. Sudbury wetland project was made possible by the USDA Wetland Reserve Program. Invasive plant removal on Santa Catalina Island was partially funded by the American Recovery and Reinvestment Act (ARRA) program and used volunteer conservation workers. The Campbell Creek restoration was motivated by Anchorage city government's need to address an imminent threat to its buildings.

The immediate economic benefit of small projects with small economic multipliers may not be obvious, but projects like clearing invasive plants at Indiana Dunes National Lakeshore and enhancing pine forests at Tibwin maintain future opportunities for the region and habitat. Other projects like the Boys Scouts Project in Mississippi engage and educate local youth on the environment, and the benefits of this go beyond creating environmental stewards and are hard to enumerate. In addition, the PFW and Coastal Program provide intangible benefits such as job training and placement opportunities for community youth, elderly, disabled and ex-offenders, ultimately stimulating local economies through career development.

An overarching goal of the PFW program is to restore resiliency to ecosystems made more vulnerable by human interference. Similarly, an economy works better with a diverse interconnected web of industries and sources of income. PFW and the Coastal Program contribute to society in many ways.

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