INVESTING IN AMERICA:

The Estimated Socioeconomic Impacts and Ecosystem Services Benefits of NOAA Coastal Management and Habitat Restoration Investments

A Preliminary Analysis of Select Bipartisan Infrastructure Law and Inflation Reduction Act Grant-Funded Awards

The Bipartisan Infrastructure Law is a transformational opportunity to tackle the climate crisis across the country through multiple funding opportunities. It provides about $3 billion for NOAA to take action in the areas of coastal resilience and conservation, improved climate service delivery, and fisheries management. The Inflation Reduction Act (IRA) is an historic, federal government-wide investment that furthers NOAA's efforts to build a Climate-Ready Nation. It provides $3.3 billion for NOAA to build on its commitment to help Americans—including Tribes and vulnerable populations—prepare, adapt, and build resilience to weather and climate events; improve supercomputing capacity and research on weather, oceans, and climate; strengthen NOAA's hurricane hunter aircraft and fleet; and replace aging NOAA facilities.

ACKNOWLEDGEMENTS

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Executive Summary

The Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA) represent transformational investments, including about $6.3 billion for the National Oceanic and Atmospheric Administration (NOAA) to stimulate economic development, reduce climate risk, and protect and restore habitat to support the Investing in America Agenda. Coastal counties of the United States are home to 129 million people, or almost 40 percent of the nation's population. NOAA will use about half of its BIL and IRA funding to make these communities climate-ready in coastal states, the Great Lakes, and U.S. territories.

To begin to understand the transformational value of this funding—and to inform future policy and grantmaking decisions related to coastal investments—NOAA is evaluating a number of its BIL and IRA grant-funded programs, working with Ocean Associates, Inc. (OAI), a woman-owned small business, and its partner, Eastern Research Group, Inc. (ERG), to provide evaluation services.

This evaluation covers eight coastal management and conservation funding opportunities in NOAA's National Ocean Service and National Marine Fisheries Service, released and awarded in 2022 and 2023, which represent 173 awards and $717 million in federal funding. The report aims to provide a snapshot, demonstrating the broader economic, social, and ecosystem services benefits NOAA grant-funded investments are expected to generate across coastal and Great Lakes states, as well as U.S. territories. These awards are largely funded by BIL and augmented by IRA, and in some cases by annually appropriated dollars. Given these awards are generally in the early stage of implementation—with a typical duration of about three to five years—NOAA has selected evaluation methods (detailed in the appendices) that enable us to model or estimate anticipated benefits before project completion using

information available from the grant award documents. This evaluation does not include a long-term benefits assessment of reducing climate risk exposure to coastal communities or the benefits of natural hazards preparedness which will provide additional benefits beyond those described in this report.

This report leverages the best available information, largely from approved award documents from the initial round of BIL funding opportunities, to estimate impacts and benefits from awards made in the first two years of multiyear investments. These estimates are derived from proven methods and approaches and are not benefits documented after project completion. NOAA and its evaluation partners will implement different methods to assess outcomes following implementation of these awards in order to further document successes.

The report findings are categorized in three areas highlighting the economic, equity, and ecosystem services benefits these awards are expected to deliver to coastal communities—including to underserved, Tribal, and Indigenous communities, the Great Lakes, and U.S. territories. The report provides a clear picture, via this snapshot, of many of the outcomes and significant benefits these awards are expected to deliver in the years to come—as well as the need and demand across the country for this type of funding. Results may also inform the future direction of NOAA's coastal climate policies and programs.

ECONOMIC IMPACTS

These coastal and habitat management projects are expected to stimulate significant economic activity across coastal America, including the Great Lakes, and U.S. territories. Using input-output modeling in IMPLAN (short for "impacts analysis for planning"), we estimate the economic impacts from proposed project expenditures as a combination of direct, indirect, and induced effects. Direct expenditures (e.g., the purchase of goods and services) stimulate indirect purchases (e.g., business purchases in the regional supply chain) and then spending by employees and their households within the business supply chain (i.e., induced effects).

Most of the awards from the eight funding opportunities could be analyzed using the input-output model. These grants total almost $600 million in federal funding and are anticipated to generate the following economic impacts:

- Award spending is estimated to create more than **7,800 jobs,** with a total labor income of $553 million. For every $1 million in NOAA grant funding, 13.6 jobs will be created.

- These coastal and habitat management investments in the aggregate will stimulate local economies across coastal states, including the Great Lakes, as well as Tribal Nations and U.S. territories, generating an estimated **$1.4 billion in economic output.** For every $1 spent by BIL/IRA awards, $2.40 worth of economic activity will be generated.

Overall, the BIL/IRA awards are estimated to generate significant economic gains through investments that target protection of coastal communities and marine resources.

EQUITABLE ENGAGEMENT AND EXPECTED BENEFITS

Our analysis shows that the eight funding opportunities are anticipated to advance equity and environmental justice benefits across coastal and Great Lakes communities, including Tribal, Indigenous, and underserved communities. Most awards included in this analysis anticipate engaging members of, and providing benefits to, underserved, Tribal, or Indigenous communities. For instance:

- 59 percent of awards plan on engaging Tribal or Indigenous groups, and 55 percent of the awards are expected to have underserved community members and/or Tribal or Indigenous representatives directly involved in planning and/or implementation as part of the project team.

- 50 percent of awards will protect, restore, or enhance culturally significant ecosystems and resources; 42 percent will increase opportunities to participate in traditional Tribal or Indigenous practices, recreation, or environmental education; and 41 percent are expected to provide important community co-benefits in the form of risk reduction benefits such as mitigating flooding, excessive heat, and other climate risks.

- 38 percent of awards are expected to result in economic benefits, especially job creation, for underserved, Tribal, or Indigenous communities.

ECOSYSTEM SERVICES BENEFITS

Ecosystem services are the benefits that people derive from natural systems. For example, coral reefs, mangroves, salt marshes, and dunes provide protection to homes and businesses along the shore. Beaches provide a space for recreation. Wetlands and rivers provide high-quality habitat for spawning and nursery grounds for fish species to grow before migrating to ocean waters, supporting recreational and commercial fisheries. They also serve as floodplains, improve water quality, and help protect communities from wildfires. These services are valuable to human societies and support coastal economies and jobs.

We utilized willingness to pay (WTP) and benefit transfer methods to understand the monetary values of selected ecosystem services. Economists have developed approaches to placing monetary values on these services, reflecting society's WTP for them. Among the awards included in this analysis, we were able to place a monetary value on 93 grant-funded awards ($417 million of federal funding) based on the type of work being funded (e.g., restoration) and the availability of data on the award's scope (e.g., the number of habitat acres). Using a rigorous set of methods called "benefit transfer"—taking information on WTP that has already been obtained in other studies and applying it to BIL/IRA awards—we found that these 93 awards are estimated to generate **$725 million** in annualized benefits over a 20-year period (using a 3.1% discount rate). The total present value (TPV) over those 20 years is estimated to be $11.4 billion. In terms of specific habitats, we found the following expected outcomes from ecosystem improvements:

- Wetlands-related (excluding mangroves) benefits were estimated to result in the largest annualized benefit of $314.7 million.

- Mangrove-related benefits were estimated to be the second largest amount at $124.8 million annually.

- Lake/pond-related benefits were estimated to total $78.2 million annually.

- Forest-related benefits were estimated to total $74.2 million annually.

- Floodplain-related benefits were estimated to total $56.4 million annually.

- Beach/dune benefits were estimated to total $32.3 million annually.

- Submerged aquatic vegetation-related (i.e., seagrass and kelp) benefits were estimated to total $22.7 million annually.

- The largest number of grants involve river/stream-related ecosystem services and were estimated to generate $16.6 million in benefits annually.

- Coral reef-related benefits were estimated to total $2.7 million annually.

- Grassland-related benefits were estimated to total $2.3 million annually.

- Benefits related to oyster reefs and beds were estimated to total $0.4 million annually.

Over time, these investments will create healthier ecosystems that will reap sustainable dividends for years to come, reduce climate risk, and build resilience in underserved communities and Tribal Nations. Long-term evaluation will likely show even greater returns and validate these estimates.

Introduction

Historic Support to Advance Climate-Ready Coasts, Fisheries, and Protected Resources

The Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) legislation represent transformational change in support of the Administration's Investing in America Agenda. The National Oceanic and Atmospheric Administration (NOAA) received about $6.3 billion in BIL and IRA funds to tackle the climate crisis and stimulate economic development and job creation in coastal communities, especially for underserved, Tribal, and Indigenous communities. To begin to understand the impact of this funding—and to inform future policy and grantmaking decisions related to coastal investments—NOAA is conducting robust evaluations of a number of its BIL and IRA grant-funded programs. The Office of Management and Budget defines evaluation as the "systematic analysis of a program, policy, organization, or component of these to assess effectiveness and efficiency." Our goal in this report is to estimate many of the impacts and anticipated benefits flowing from award activities supported through eight funding opportunities (see Table 1), and thus begin to describe the "return on investment" to communities, states, and regions as these projects are fully implemented and the ecosystems' benefits are more fully realized. This evaluation does not include the long-term benefits

Evaluating the "Three Es"

Economic impact estimates changes to economic growth and job creation that these historic investments will bring to the areas where they were awarded.

Equity assesses how these awards engage and provide benefits to underserved communities and Tribes.

Ecosystem services looks at how society would value the expected ecosystem services benefits from these grants and addresses how these awards are contributing to ecosystems and their resilience.

associated with reducing climate risk exposure to coastal communities or quantify the benefits of natural hazards preparedness.

NOAA's BIL and IRA investments address a broad range of issues and are too varied to include in a single evaluation study. As such, PRSSO chose to focus initially on evaluating eight grant-funded coastal and habitat management programs within the National Ocean Service and National Marine Fisheries Service (hereafter NOAA Fisheries) that have already been awarded and are underway—and for which baseline information exists to conduct our analyses. These BIL and IRA investments bolster support for communities in coastal states, the Great Lakes, and U.S. territories to improve resilience to a changing climate, conserve and protect fisheries, and remove marine debris. Coastal counties and U.S. territories[1] are home to almost 40 percent of the nation's population or about 129 million people—with about 22 percent of residents exhibiting characteristics of social vulnerability.[2]

Table 1 describes these eight funding opportunities, released and awarded in 2022 and 2023, which represent 173 awards and $717 million in federal funding. Figure 1 illustrates the geographic distribution of these awards, color-coded by funding opportunity. The advantage of aggregating these investments into one evaluation study is to demonstrate the broader economic, social, and environmental impacts NOAA grant-funded investments are generating mainly across coastal states, the Great Lakes, and U.S. territories. These awards are largely funded by BIL and augmented by IRA funding (as well as, in the case of one program and as Table 1 indicates, fiscal year (FY) 2022 appropriated funding). Appendix B provides a thumbnail description of each award by state. Future NOAA evaluations will address BIL and IRA coastal and habitat management investments made in 2024 and additional components of the BIL and IRA portfolios.

[1] The U.S. Territories included in this analysis are American Samoa, the Commonwealth of Northern Mariana Islands (CNMI), Puerto Rico and the U.S. Virgin Islands. Guam did not receive awards under these funding opportunities.

[2] NOAA Office for Coastal Management, 2024. Note that NOAA drew upon the U.S. Census Community Resilience Estimates to identify components of social vulnerability. These components include factors such as income-to-poverty ratio, lack of vehicle access, communication barriers, and more. Please see the link for more information regarding the social vulnerability components.

Table 1. Programs to Advance Coastal Resilience and Conservation, Manage Fisheries, and Protect Species (FY22 and FY23)[3]

Program	Awards	Funds (Source)	Purpose
NOAA Fisheries			
Restoring Fish Passage Through Barrier Removal	23	$142,358,486 (BIL)	These awards receive technical assistance and funding to restore fish passage by removing dams and other in-stream barriers to restore marine, estuarine, coastal, and Great Lakes ecosystem habitat.
Restoring Tribal Priority Fish Passage Through Barrier Removal	13	$24,891,625 (BIL)	These awards support federally recognized Tribes, Alaska Native Corporations, and Tribal organizations in implementing fish passage work and building Tribal capacity to participate in fish passage efforts.
Transformational Habitat Restoration and Coastal Resilience Grants	37	$289,163,149 (BIL and IRA)	These awards support transformational habitat restoration in marine, estuarine, coastal, and Great Lakes ecosystems, including habitat restoration efforts that help protect coastal communities from the impacts of climate change.
Coastal Habitat Restoration and Resilience Grants for Underserved Communities	35	$25,269,720 (BIL and IRA)	These awards support efforts to advance the habitat restoration and climate resilience priorities of Tribal, Indigenous, and underserved communities, through community-driven habitat restoration and by building the capacity of Tribal, Indigenous, and underserved communities to more fully participate in restoration and coastal resilience activities.
Pacific Coastal Salmon Recovery Fund	19	$95,325,043 (BIL and FY22 Funds)	These awards aim to reverse the declines of Pacific salmon and steelhead, supporting conservation efforts in California, Oregon, Washington, Idaho, and Alaska.
National Ocean Service			
Coastal Zone Management Habitat Protection and Restoration	20	$50,131,725 (BIL and IRA)	These awards will increase the number of acres of coastal wetlands, corals, and natural shorelines protected and restored through direct investment by coastal and Great Lakes states and territories and provide community resilience co-benefits.
National Estuarine Research Reserves Habitat Protection and Restoration	13	$20,222,684 (BIL and IRA)	These habitat conservation and restoration awards will advance the climate and resilience priorities of the research reserve system and result in an increase in the number of acres of coastal ecosystems protected and restored in priority reserve watersheds.
Marine Debris Removal	13	69,712,066 (BIL and IRA)	These awards will advance national goals and priorities of the Marine Debris Act, including marine debris assessment, prevention, mitigation, and removal.
Total	**173**	**$717,074,498**	

[3] Only funding opportunities released in 2022 and 2023 were included in this report. Table 1 data are sourced from NOAA grant award documentation as of September 2023 and confirmed via NOAA financial systems. Updates to these numbers since September 2023 are not reflected in these values.

This evaluation study uses robust quantitative and qualitative methods to provide insights into estimated program impacts. Given that these projects are generally still in the early stage of implementation—with a typical duration of about three to five years in total—NOAA has selected evaluation methods that enable us to model or estimate benefits before project completion using information available from the grant award documents. The objective of this report is to translate the intended purposes of the eight investments (see Table 1) into tangible and quantifiable outcomes to help inform NOAA's partners and the broader public of the return on investment their communities, states, and regions are likely to see as these projects are fully implemented and the ecosystems benefits are more fully realized.

The report is organized into three thematic sections which we call "the three Es"—the economic impact, equity advancements, and ecosystem services benefits these awards are expected to deliver to coastal communities, the Great Lakes, and U.S. territories, including to underserved, Tribal, and Indigenous communities (see Box 1 above for more details). Our goal is to come away with a clearer picture of the estimated outcomes and anticipated benefits these important awards are expected to deliver in the years to come—while also informing the future direction of policies and programs aimed at coastal management and habitat restoration.

Figure 1 maps the counties in which awards occur around the country, color-coded by funding opportunity. For awards with activities in multiple counties, the first county listed in the grant document was selected to illustrate the geographic breadth of the 173 awards. The map is not intended to show the totality of project activities. Please consult Appendix B for a thumbnail description of each award.
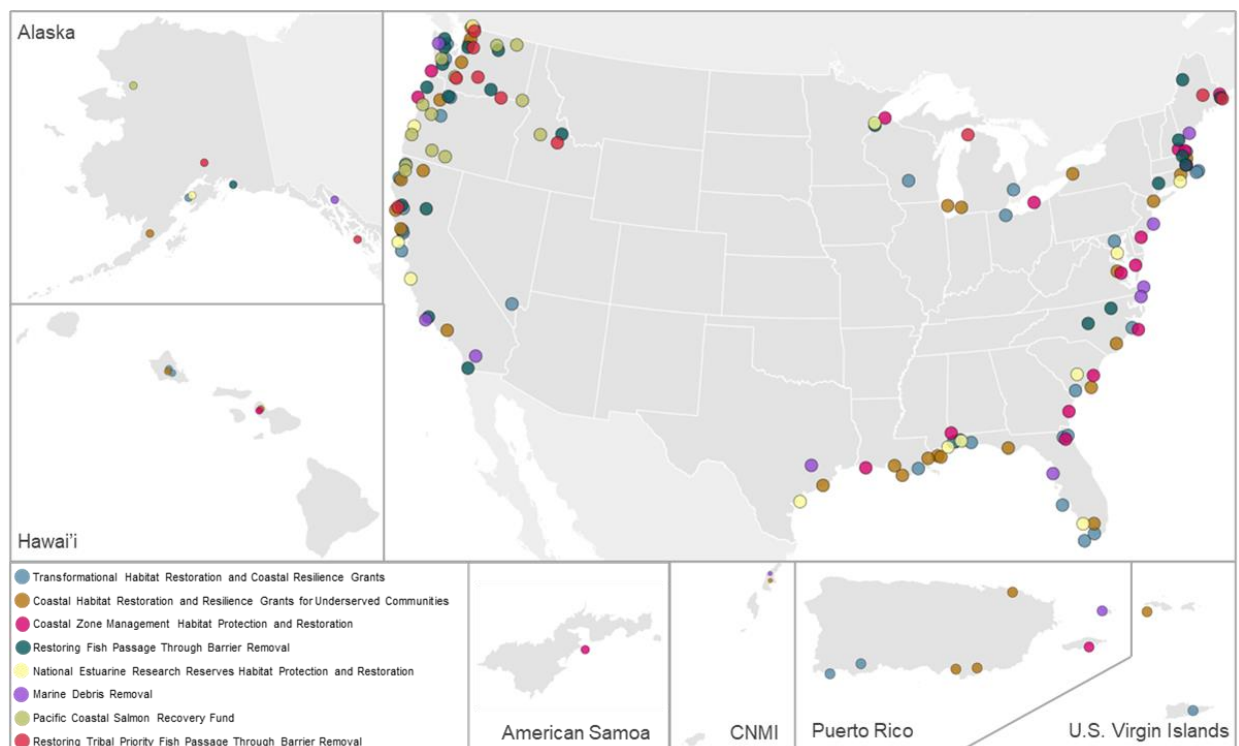
Figure 1. Illustrative Geographic Distribution of Award Activities by Funding Opportunity

This map illustrates the geographic scope of grant activities from over $700 million in NOAA funding, primarily from the Bipartisan Infrastructure Law. The map is for illustration purposes and does not capture all geographic areas in which grant activities will occur.

SCOPE OF THE ANALYSES AND TYPES OF AWARDS EVALUATED

The BIL and IRA awards target a variety of outcomes and reflect various stages of project implementation. Most of the awards funded under these historic investments are focused on restoring or preserving habitats to increase resilience, improving access for migratory species, sustaining fisheries, disposing of marine debris, and engaging communities in project planning, design, and implementation. The implementation of these projects includes activities such as acquisitions, capacity building, site assessments, permitting, and design. As a result of these activities, we expect ecological and economic outcomes, such as improved ecosystem health and increased economic activity. In addition, other awards fund competitions at the state level for to-be-defined awards, giving states control over how these funds are spent.

Figure 2 presents a high-level logic model that connects inputs (i.e., BIL and IRA Coastal Resilience funding) to award activities, outputs, and short-term and long-term outcomes. Award activities have been summarized into four major groupings:

- **Ecosystems.** Projects focused on ecosystem restoration and preservation, such as through land acquisition.

- **Fish passage and species protection.** Projects focused on fish passage restoration through barrier removal and the conservation of salmon, steelhead, and other types of fish.

- **Marine debris removal.** Projects focused on marine debris prevention, interception, mitigation, and removal.

- **Capacity building.** Projects focused on engaging with underserved, Tribal, and Indigenous communities.
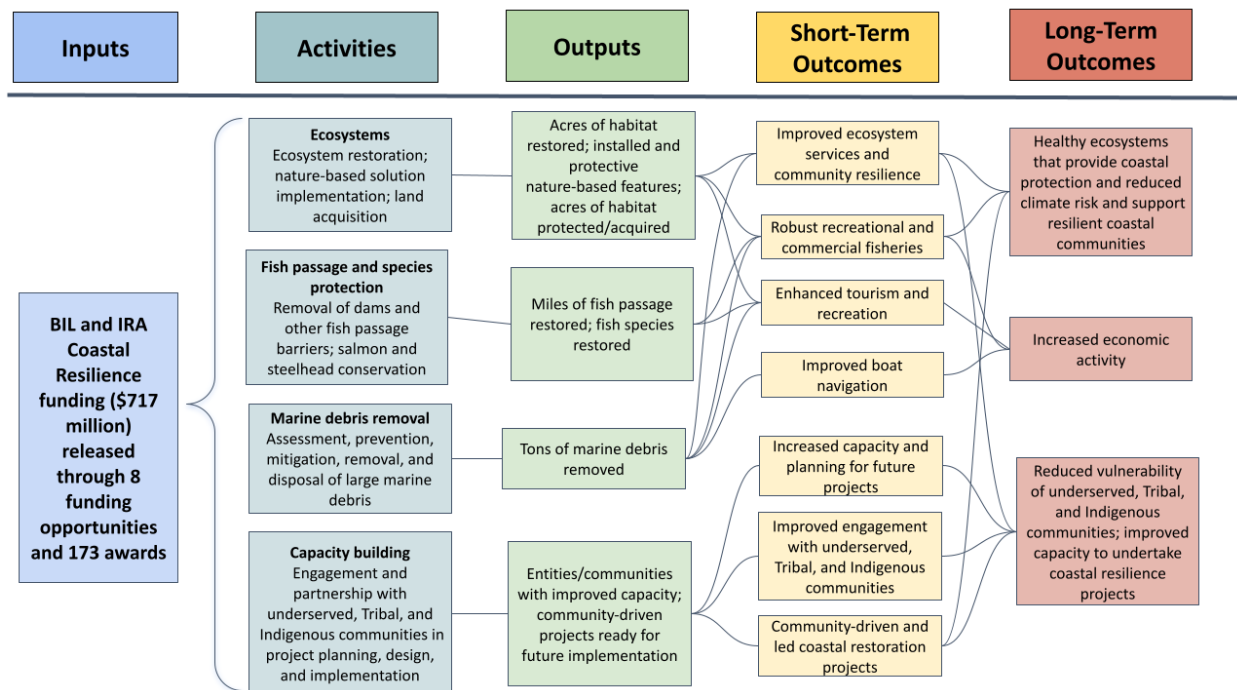
Figure 2. Logic Model on the Intended Effects of NOAA's Coastal Resilience Awards

Award activities are linked to outputs or metrics indicative of immediate project accomplishments (e.g., acres of habitat restored, tons of marine debris removed). These outputs are further linked to short-term outcomes such as improved ecosystem services, boat navigation, and community engagement, as well as long-term outcomes such as improved climate resilience, increased economic activity, and reduced vulnerability of underserved, Tribal, and Indigenous communities. Given that many awards have multiple objectives, the outputs produced often lead to several short- and long-term benefits, as indicated by the connections between the latter three stages in the logic model.

We grouped the 173 awards into four categories for our analysis:

- **Restoration awards** fund projects that enhance or restore habitats.
- **Acquisition awards** fund the purchase of property for conservation or protection.
- **Planning awards** fund actions that seek to build capacity, conduct site assessments, or provide project designs but do not fund substantial restoration work.
- **Competition awards** fund a state or regional grant competition.[4]

Table 2 presents the number of awards in each of these categories and their total federally funded value.

Table 2. Types of Awards and Funding Allocated

Award Type	Award		Funding	
	Number of Awards	Percent	Amount	Percent
Restoration	111	64.20%	$527,376,765	73.50%
Acquisition	11	6.40%	$26,240,900	3.70%
Planning	42	24.30%	$66,017,839	9.20%
Competition	9	5.20%	$97,438,993	13.60%
Total	**173**	**100%**	**$717,074,498**	**100%**

The awards categories determine which of the evaluation methods we can apply to each of the three Es. For example, competition grants cannot be analyzed for economic impacts since investments have not yet been allocated to local economies. Additionally, planning awards cannot be easily analyzed for ecosystem service benefits since the project parameters that may affect the future flow of ecosystem services, such as the extent to which an ecosystem will be restored, are still being defined. Table 3 provides a breakdown of the number and value of awards where we apply the three different Es. The numbers in Table 3 also reflect additional screening criteria we applied to developing the analyses. For example, ecosystem service benefit analyses can only be applied to awards where quantitative information is available.

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[4] This category only includes pass-through grants that were sub-awarded competitively. Non-competitive pass-through grants were classified as implementation.

Table 3. Awards Evaluation Breakdown for the Three Es

Award Type	Economic Impact Analysis		Equity Benefits Analysis		Ecosystem Service Analysis	
	Number of Awards	Funded Value of Awards	Number of Awards	Funded Value of Awards	Number of Awards	Funded Value of Awards
Restoration	105	$507,776,852	111	$527,376,765	84	$399,929,080
Acquisition	8	$1,429,435	11	$26,240,900	9	$17,203,848
Planning	39	$64,343,969	42	$66,017,839	0	–
Competition	0	–	9	$97,438,993	0	–
Total	**152**	**$573,550,256**	**173**	**$717,074,498**	**93**	**$417,132,928**

I. Economic Impact

Estimating the Economic Impacts of Coastal Management and Habitat Restoration Funding Awards

OVERVIEW

Awards administered by NOAA under the BIL and IRA appropriations are expected to generate significant economic activity across the United States and its territories (see Figure 2 for more information on activities and expected outcomes). This economic impact analysis estimates the immediate effects of NOAA-directed funds for eight coastal management and habitat conservation funding opportunities from NOAA's National Ocean Service and NOAA Fisheries, released and awarded in 2022 and 2023. We used input-output modeling to estimate the ex-ante (i.e., pre-implementation) value of economic activities from the proposed budgetary expenditures, and to estimate the change in national or regional output generated by each dollar of budgetary expenditure.

There are three types of economic impacts usually expected from a change in government expenditure: direct, indirect, and induced. As described in the grant proposals received by NOAA, BIL/IRA awardees will purchase goods and services to fulfill their award activities (direct spending). Businesses receive these direct expenditures and create indirect spending by purchasing more goods and services, such as supplies, utilities, and construction services. Households who receive the associated income then create economic activities through using income from grant awards and indirect spending to purchase consumption goods. This last type of activity is thought of as induced economic activity. Through this chain of effects, $1 of direct expenditure can potentially yield more than $1 of additional economic

activity. Summing the direct, indirect, and induced impacts provides a full picture of the overall effect of BIL/IRA funds on the economy. Dividing the sum of direct, indirect, and induced output by the initial direct expenditure yields a multiplier, which can be used as a measure of the impact of the initial expenditure on the economy.

This analysis used the input-output modeling software IMPLAN—originally short for "impact analysis for planning"—to examine the economic impacts of BIL/IRA awards at the county level (reported here using adjusted U.S. Census regions). IMPLAN uses a proprietary database of industry relationships to model initial expenditure and calculate the mixture of materials, equipment, and labor required to produce those goods. It then calculates the needs of the supplying industries to find the expenditure's full effect. IMPLAN offers data sets covering all U.S. counties, as well as Puerto Rico and the U.S. Virgin Islands. Major sources for data used for IMPLAN modeling include the U.S. Bureau of Economic Analysis, U.S. Department of Agriculture, U.S. Bureau of Labor Statistics, and the U.S. Census Bureau. It is important to note that IMPLAN is a static model that treats relationships between industries as unchanging even as new economic activities take place, ignoring competition for the available resources that could change prices (e.g., it does not address market shortages/surpluses of inputs, raw materials, or employment). However, individual BIL/IRA-funded NOAA award expenditures are small compared to the size of the regional economy and are unlikely to engender competition across resource usage.[5]

IMPLAN uses local expenditures by industrial sector to generate four economic impact measures: employment, labor compensation, value added, and output. Employment impacts include changes in full-time, part-time, and summed seasonal employment. Labor income includes the combined total impacts of employee compensation and proprietary income. Value added is the total employee income and proprietary earnings (i.e., profits and opportunity costs of the proprietor) plus taxes and property income. Output equals value added (which includes labor income) plus intermediate inputs and represents the total value of production.

Unlike the benefit transfer analysis (Section III), IMPLAN does not account for the economic values of ecological outcomes. Once BIL/IRA projects are complete, they will yield a stream of benefits over time, such as improved fisheries stocks, enhanced wetlands, and coastal protection. The direct value added that is reported in this section is the expected impact on the economy of direct spending from NOAA-funded BIL and IRA awards over the course of the awards and does not consider benefits related to ecological outcomes.

APPROACH

We estimate the economic impacts of each award using the most recent IMPLAN input-output model, which uses U.S. economic data for the year 2022 to build the underlying U.S.-specific (the 50 states and a few territories) social accounting matrix (see Miller and Blair, 2022) valued at 2024 prices. Across the eight BIL/IRA funding opportunities, 152 of the 173 grant awards were assessed in IMPLAN (see Table 4 below), accounting for $574 million of the cumulative $717 million in coastal and habitat management funding.

A total of 21 grants could not be analyzed for one of the following reasons:

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[5] See Appendix C for empirical literature toward verifying this possibility.

- The awardee will administer its own grant competition or similar subaward, and budgetary details therefore are not yet known.

- The grant entirely funds a land purchase, for which IMPLAN is not equipped to conduct analysis.

- Grant awards will be spent in U.S. territories or other areas where IMPLAN data are unavailable.

Table 4. Awards Included in the Economic Impact Analysis

FY22 and FY23 BIL/IRA Notice of Funding Opportunity Awards Considered	Count
Coastal Habitat Restoration and Resilience Grants for Underserved Communities	32
Coastal Zone Management Habitat Protection and Restoration	16
Marine Debris Removal	9
National Estuarine Research Reserves Habitat Protection and Restoration	12
Pacific Coastal Salmon Recovery Fund	13
Restoring Fish Passage Through Barrier Removal	23
Restoring Tribal Priority Fish Passage Through Barrier Removal	12
Transformational Habitat Restoration and Coastal Resilience Grants	35
Total	**152**

This analysis used proposal information from NOAA's Grants Online database and directly synthesized by the Grants Online Program Management Office. Using proposal documents (applications) from the awardees, such as project and budget narratives, analysts collected expenditures at the county level and by industry in a worksheet using a standardized procedure. Industries were coded using the North American Industry Classification System and then mapped to IMPLAN's Industry Scheme. Some applications indicated work plans with detailed lists of expenditures, while others only stated plans to subcontract work at a later date. The analysis did not consider other matching funds to NOAA BIL/IRA awards, as funding is promissory and not certain.

The leading industrial sectors by expenditure flows through these BIL/IRA awards include Construction of Nonresidential Structures, Environmental and Technical Consulting Services, Architectural and Engineering Services, and Scientific Research and Development Services. Table C-3 in Appendix C provides a list of the top 50 IMPLAN industries by expenditure as found in the approved award applications.

Awards will be implemented over the course of three to five years, and the economic impact from the associated expenditures would occur over each award's implementation period. The linear structure of IMPLAN and its use of the most recent U.S. economic data—the year 2022—allows us to model the entire allocation for any given award as if it takes place in a single year.[6]

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[6] We have modeled the total impact of all of the spending as if it takes place in one year. For most awards, spending patterns are given as the total spending for the entire award, which was not divided across the implementing years. For this reason, discounting was not applied to economic values that could be generated from the implementation activities taking place after 2024. This is explained in greater detail in Appendix C.

Where county-level information was unknown or where budgets specified expenditures at the state or national levels (e.g., online airline ticket purchases), analysts designated appropriate geography (i.e., county, state, or nation) within the model. IMPLAN's Multi-Regional Input-Output (MRIO) functionality was used to attach several regions together and include transactions that might spill over from one region to another (e.g., a construction company in one county renting a cement mixer from a company in a neighboring county or state).[7]

IMPLAN combines the number of full-time, part-time, and seasonal jobs to estimate the total number of employees in the chain of economic activities for a given industry, in keeping with standards used by the Bureau of Labor Statistics and the Bureau of Economic Analysis. If full-time jobs are the industry norm, then IMPLAN calculates and attributes full-time jobs to new economic activity in that industry. If part-time jobs prevail, IMPLAN assumes those jobs prevail among jobs created in that industry.[8]

A discussion of methods encapsulating the use of award information, data protocols, data entry into IMPLAN, and the presentation of results, can be found in Appendix C.

RESULTS

Of the 173 awards evaluated over eight funding opportunities, we analyzed 152 using IMPLAN. The NOAA awards account for $574 million of the total BIL/IRA allocation and are estimated to create over 7,800 jobs with a total labor income of about $553 million (Table 5). The original $574 million in NOAA awards will create an additional value of around $782 million in the U.S. economy. Coastal resilience investments across the United States and its territories will stimulate local economies to generate $1.4 billion in output. In summary, for every $1 million funded through NOAA, 13.6 jobs will be created, and for every $1 spent from BIL/IRA awards, $2.40 worth of spending (direct, indirect, and induced) will be generated.[9]

Table 5. Estimated National Economic Impact of NOAA's Coastal Resilience BIL and IRA Awards

Impact	Employment	Labor Income	Value Added	Output
Direct Total	3,875	$299,629,000	$343,460,000	$573,549,000
Indirect Total	2,044	$144,472,000	$229,419,000	$453,972,000
Induced Total	1,905	$108,909,000	$209,655,000	$351,451,000
Grand Total	**7,823**	**$553,010,000**	**$782,533,000**	**$1,378,973,000**

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[7] The use of MRIO is explained in greater detail in Appendix C. This approach allows us to take account of spillovers, or industries that are not present and that may contain workers from outside the small area where, say, construction work takes place.

[8] All figures presented are for the duration of the project implementation period, which is assumed in the modeling exercise to be one year. The jobs created are only for the year of the modeling period. Expenditures in an input-output model are increases in final demand for goods and services to create economic activities. The assumptions are that these new activities will not take place without the expenditure, and there is enough capacity to provide the goods and services newly demanded. With this assumption, the expenditures create jobs and levels of revenue, or output, in the economy. One can think of a job (lasting one year) not demanded through the absence of a rise in final demand for goods and services as a job year lost or not supported in the economy. See Appendix C for further discussion.

[9] Findings here are compared to those found in other studies in Appendix C.

Figure 3 presents the estimated impacts at state level; for more information on the actual direct, indirect, and induced values, see Appendix A.
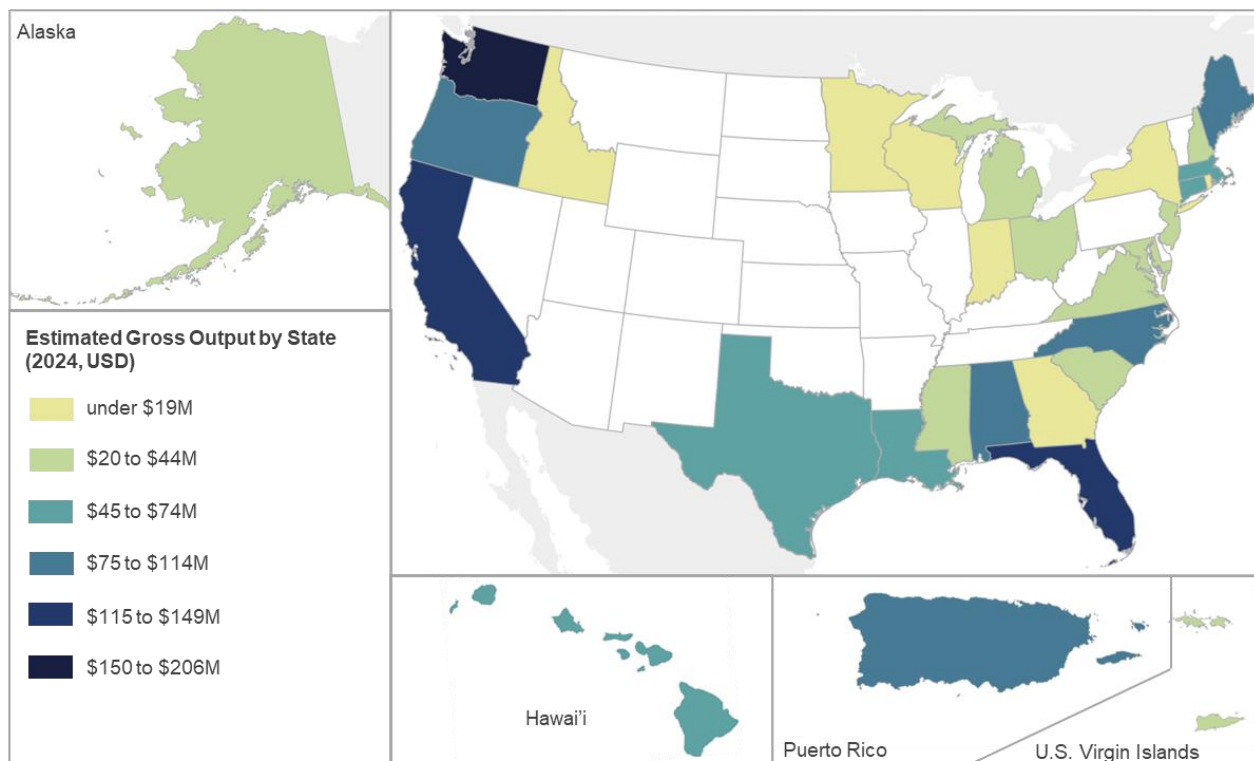
Figure 3. Estimated State-Level Economic Impact by Gross Output (2024 USD)

Using a modification to the U.S. Census Bureau's Census Regions and Divisions of the United States, impacts were collected in Census regions shown in Table 6. The modification to the Census regions identifies Alaska as a standalone region, while the breakouts for the U.S. Pacific territories only include Hawaii, and the U.S. Caribbean territories only include Puerto Rico and the U.S. Virgin Islands. The restrictions in the U.S. Pacific and Caribbean territories are due to IMPLAN data unavailability for other areas. The category "U.S. Non-Specified" captures direct expenditures that cannot be ascribed to a particular county or state, such as conference travel or supplies ordered online, as well as indirect and induced economic activity that spills across state borders.

Table 6. Estimated Regional Economic Impact of NOAA's FY22/23 Coastal Resilience BIL and IRA Awards (2024 USD rounded to the nearest thousand)

Region	Impact	Employment	Labor Income	Value Added	Output[10]
Alaska	Direct	90	$5,172,000	$5,646,000	$10,806,000
	Indirect	22	$1,071,000	$1,624,000	$3,420,000
	Induced	20	$1,049,000	$1,948,000	$3,300,000
Alaska Total		*131*	*$7,292,000*	*$9,218,000*	*$17,525,000*

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[10] Direct output represents original BIL/IRA allocation to each region.
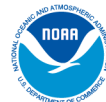
Region	Impact	Employment	Labor Income	Value Added	Output[10]
U.S. Caribbean Territories	Direct	362	$26,768,000	$30,436,000	$36,253,000
	Indirect	94	$4,125,000	$6,022,000	$9,465,000
	Induced	140	$5,460,000	$11,963,000	$18,277,000
U.S. Caribbean Total		*597*	*$36,354,000*	*$48,422,000*	*$63,995,000*
Great Lakes	Direct	105	$6,747,000	$7,726,000	$15,512,000
	Indirect	39	$2,259,000	$3,360,000	$6,780,000
	Induced	40	$2,068,000	$3,911,000	$6,890,000
Great Lakes Total		*183*	*$11,074,000*	*$14,996,000*	*$29,182,000*
Northeast	Direct	547	$43,512,000	$43,772,000	$83,961,000
	Indirect	171	$12,364,000	$18,922,000	$35,526,000
	Induced	226	$13,491,000	$24,982,000	$40,733,000
Northeast Total		*944*	*$69,366,000*	*$87,676,000*	*$160,220,000*
Hawaii	Direct	188	$13,050,000	$14,471,000	$21,319,000
	Indirect	39	$2,665,000	$3,979,000	$7,323,000
	Induced	64	$3,919,000	$7,835,000	$12,692,000
Hawaii, U.S. Pacific Territories Total		*292*	*$19,635,000*	*$26,285,000*	*$41,334,000*
South	Direct	1,140	$88,236,000	$99,323,000	$169,622,000
	Indirect	490	$28,786,000	$44,536,000	$90,134,000
	Induced	448	$23,174,000	$45,544,000	$77,688,000
South Total		*2,078*	*$140,196,000*	*$189,402,000*	*$337,444,000*
West	Direct	1,429	$114,739,000	$139,797,000	$231,933,000
	Indirect	501	$35,817,000	$57,044,000	$106,350,000
	Induced	487	$28,571,000	$56,473,000	$91,137,000
West Total		*2,416*	*$179,127,000*	*$253,314,000*	*$429,421,000*
US Non-Specified	Direct	13	$1,406,000	$2,289,000	$4,143,000
	Indirect	688	$57,385,000	$93,933,000	$194,974,000
	Induced	481	$31,176,000	$56,999,000	$100,734,000
U.S. Non-Specified Total		*1,181*	*$89,966,000*	*$153,220,000*	*$299,851,000*

Region	Impact	Employment	Labor Income	Value Added	Output[10]
Direct Total		3,875	$299,629,000	$343,460,000	$573,549,000
Indirect Total		2,044	$144,472,000	$229,419,000	$453,972,000
Induced Total		1,905	$108,909,000	$209,655,000	$351,451,000
Grand Total		*7,823*	*$553,010,000*	*$782,533,000*	*$1,378,973,000*

For each region, the direct output denotes the anticipated expenditure of funds provided by NOAA through BIL/IRA awards. For example, IMPLAN projects that award funding of $10.8 million in Alaska will create 131 job years with a total payroll of $7.3 million (labor income total). The investments for Alaska are estimated to stimulate the local economy to generate $17.5 million worth of revenues or economic transactions within the state (output total). The new economic value added to this region is estimated to be $9.2 million.

Multipliers will differ across regions due to local prices, the local mix of industries, and the availability of labor, capital, and other goods.

CONSIDERATIONS

This is a preliminary analysis using grant project proposals from the awardees; alterations in scope, project area, or investment may occur as these projects are implemented. More detailed and exact budgets will become available after implementation. This will enable more in-depth analysis.

IMPLAN, as noted above, is a static model that does not account for economic changes that arise from price or behavior change due to the influx of NOAA funding. Further discussion is available in Appendix C.

The data used within IMPLAN for modeling the economies of the U.S. territories differs from the data available for the 50 states. For U.S. territories, the data has a different underlying year, and is not complete enough to account for residual purchases outside the region, so the MRIO modeling approach could not be used.

Awards In Action: Direct Employment to Remove Abandoned and Derelict Vessels in Puerto Rico. Isla Mar Research Expeditions' work supports local economies through direct employment of residents and native Puerto Ricans. The project subcontracts experienced local companies with staff from low-income, underserved communities to remove 70 abandoned and derelict vessels from around the Puerto Rico archipelago. These abandoned boats negatively impact an economy driven by tourism, and their removal will enhance the region's socioeconomic value. The project also supports and promotes local Puerto Rican art culture through large-scale art installations that will incorporate collected vessel debris. *Project title: Setting the Baseline for a Marine Debris-Free Puerto Rico.*

Planning for abandoned and derelict vessel removal in Puerto Rico. Photo credit: Puerto Rico Department of Natural and Environmental Resources.

II. Equity

NOAA Funding Opportunities Enhance Engagement and Anticipate Delivering Significant Benefits to Underserved, Tribal, and Indigenous Communities

OVERVIEW

NOAA's coastal and habitat management funding opportunities prioritize equity for underserved, Tribal, and Indigenous communities, including those disproportionately affected by weather and climate hazards. This emphasis reflects the Administration's priority for equity and environmental justice throughout investments by federal agencies, as underscored in Executive Order 13985 and the Justice40 Initiative. The Justice40 Initiative seeks to ensure "40 percent of the overall benefits of certain Federal climate, clean energy, affordable and sustainable housing, and other investments flow to disadvantaged communities that are marginalized by underinvestment…."

NOAA recognizes that many of the coastal communities vulnerable to climate change impacts are historically underserved. NOAA's Equitable Climate Services Action Plan outlines how the agency is working to center equity across its products, services, and programs—including certain grant funding opportunities. This action plan highlights the necessity for more intentional and equitable outreach, training, workforce development, and overall community partnership. The action plan also seeks to support historically underserved, Tribal, and Indigenous communities through engagement, trust building, and inclusion of their voices and place-based knowledge in the co-creation and delivery of services.

The BIL and IRA investments are catalysts for implementing the Equitable Climate Services Action Plan. The logic model described in the Introduction (Figure 2) shows how more equitable grantmaking and engagement can increase community resilience and produce outcomes more sensitive to the needs of

these communities. Across many of the eight funding opportunities covered in this report, NOAA encouraged awardees to partner with diverse community groups and demonstrate how benefits flow to underserved, Tribal, and Indigenous communities.

In addition, NOAA requested that applicants demonstrate how their organizations incorporate the principles of diversity, equity, inclusion, and accessibility and how these commitments inform their proposals. Many funding opportunities encourage applicants to co-develop projects with underserved partners and coordinate with communities in planning, designing, and/or implementing projects. Two of the funding opportunities made available by NOAA Fisheries focus on underserved, Tribal, and Indigenous communities: the Restoring Tribal Priority Fish Passage Through Barrier Removal program and the FY 2022 Coastal Habitat Restoration and Resilience Grants for Underserved Communities (see Table 1 for more detail). Others in the National Ocean Service, such as the Coastal Zone Management Habitat Protection and Restoration funding opportunity, provide at least 10 percent of the competition funding to underserved communities.

Given the emphasis for underserved, Tribal, and Indigenous communities affected by climate impacts, it is critical to understand the potential benefits of these investments. The sections below provide breakdowns on how the BIL and IRA investments are anticipated to benefit these communities.

Awards in Action: **Protecting Culturally Significant Territory.** The Upper Mattaponi Tribe will preserve and protect 853 acres of culturally significant territory within the Chesapeake Bay watershed, honoring the Tribe's heritage and rekindling its role as an environmental steward. The Tribe, with assistance from local partners, completed the Mattaponi River acquisition, marking its first return to the river that shares its name and ancestral culture. NOAA, through the Virginia Coastal Zone Management Program, awarded the Tribe just over $3 million to support the reacquisition project, which is the second to be completed under the BIL's National Coastal Zone Management Program Habitat Protection and Restoration awards. *Project title: Conservation of Ancestral Lands — Upper Mattaponi Indian Tribe's Return to the River.*

Tribe Chief W. Frank Adams looks over a portion of the 853 acres of ancestral land that is being reacquired by his Tribe. Photo credit: The Upper Mattaponi Tribe.

APPROACH

We reviewed documents related to all 173 awards (e.g., final proposals, award summaries) and extracted narratives from the award documents that specifically describe how awardees will incorporate equity into their planned work. After analyzing relevant equity narratives, a team of analysts qualitatively coded equity narratives to identify which underserved, Tribal, or Indigenous communities the awardee will engage and how they will engage them (e.g., subcontracting, community planning meetings, volunteer

days). The team also identified benefits to underserved, Tribal, or Indigenous communities as a result of the awards (e.g., restoring or protecting culturally significant ecosystems, providing risk reduction benefits). See Appendix D for more details regarding the analysis methods used.

RESULTS

Community Participation in Award Activities

Community coordination in award activities ensures that benefits align with needs and priorities. It creates avenues for incorporating local community knowledge and skills into the funded actions. The evaluation team reviewed award narratives to understand which underserved, Tribal, and Indigenous communities are participating in award activities—more specifically, to quantify the characteristics of the communities engaged, and the types of activities in which they will be involved. Out of 173 awardees, 157 provided specific information about the communities and Tribes they plan to engage (Figure 4 below). Overall, a majority of awardees plan on Tribal or Indigenous outreach and engagement, close to 40 percent will connect with other underserved communities, and some awardees will also engage K-12 and college students within underserved populations.

Underserved, Tribal, or Indigenous Communities Engaged

Group	Percent
Tribal or Indigenous communities	59%
Other community members/residents of underserved community	39%
K-12 students in underserved communities	10%
Community-based groups	8%
College students in or representing underserved populations	2%

Percent of awards engaging group (n = 157)
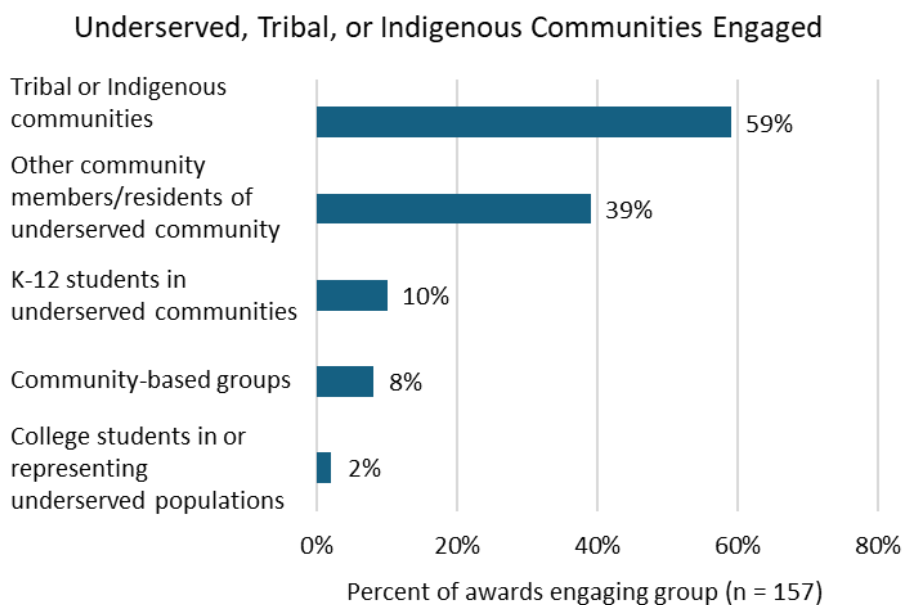
Figure 4. Percent of Projects Engaging Underserved, Tribal or Indigenous Groups (Note that awards can engage multiple groups and therefore percentages may add up to over 100%)

Most awardees (153 out of 173) provided information about who they plan on engaging, and details on their engagement methods. Table 7 describes how awardees will engage underserved, Tribal, and Indigenous communities.

Table 7. Modes of Engaging Underserved, Tribal, and Indigenous Communities (Note: Awards may have multiple modes of engagement conducted in combination; thus, percentages add up to more than 100)

Mode of Engagement	% of Awards (n = 153)	Description of Activities
Underserved community members and/or Tribal or Indigenous representatives will be directly involved in project planning and/or implementation as part of the project team	55%	Projects will be administered by Tribal or Indigenous representatives or members of underserved communities, who will be continuously engaged in the project planning and implementation.
Community planning or input meetings	33%	Project teams will hold meetings to gather direct and specific input and feedback on proposed project activities from community members who will benefit from or be involved in the project.
Educational programming (including project site visits or tours) to inform community members of the project and its anticipated benefits	28%	Project teams will conduct outreach to nearby community members through educational programming, project site visits and tours, and community events to share information about project details and anticipated benefits.
Social media, websites, newsletters, press releases, signage, and other outreach materials	24%	Project teams will disseminate information about the projects through social media, websites, newsletters, and press releases; they will also use signage and educational materials to inform the community of the projects.
Creation of jobs (or internships) for community members	22%	Community members will be employed through jobs or internships as part of the project planning and implementation.
Volunteer days or community work days for activities such as restoration, and cleanup	20%	The project team will invite community members to the project site to assist in project activities such as restoration and site maintenance.
Compensation for participation	7%	The project team compensated Tribal or Indigenous representatives or underserved community members for their participation and/or input through stipends or other support (e.g., childcare, covering transportation costs).
Additional proposed engagement methods	5%	Other methods detailed by awardees included engaging the public through community events such as festivals and celebrations and providing information about the projects to the public in multiple languages.

Benefits to Underserved, Tribal, and Indigenous Communities

Of the 173 awards, 167 provided details on the anticipated benefits to underserved, Tribal, or Indigenous communities. The primary anticipated benefit (noted by 50 percent of projects) is the protection, restoration, or enhancement of culturally significant ecosystems and resources, such as marine plant and animal species or land areas. For example, many projects will restore fish passage for native salmon and steelhead, which are of high economic and cultural importance to Tribes and Indigenous communities in the West Coast and Alaska. The next most commonly cited anticipated benefits for underserved, Tribal,

or Indigenous communities included increased opportunities for outdoor recreation, environmental education, or access to risk-reduction benefits. Table 8 below highlights additional details.

Table 8. Estimated Benefits to Underserved, Tribal and Indigenous Communities (Note: Awards may have multiple types of benefits; thus, percentages add up to more than 100)

Benefits to Underserved, Tribal, or Indigenous Communities	% of Awards (n = 167)	Anticipated Benefits
Project will protect, restore, or enhance culturally significant ecosystems and resources.	50%	Restoration of culturally important resources such as fish species, kelp forests, oyster fisheries, and culturally important ecological areas.
Project will increase opportunities for traditional practices, outdoor recreation, environmental education, or access for underserved, Tribal, or Indigenous communities.	42%	Increased opportunities to participate in traditional practices such as fishing and consumption of salmon or other traditionally consumed fish; creation of areas for underserved, Tribal, or Indigenous communities to engage in environmental education and recreation; and provision of research opportunities for members of these communities.
Project will provide risk reduction benefits to underserved, Tribal, or Indigenous communities.	41%	Reduction of flooding and flood risk for communities and critical assets through natural infrastructure solutions and floodplain enhancements; provision of carbon sequestration benefits and decreased heat island effects.
Project will result in economic benefits for underserved, Tribal, or Indigenous communities.	38%	Creation of job or internship opportunities for underserved, Tribal, or Indigenous communities; support of economic and conservation objectives to establish seafood or aquaculture production.
Project will provide enhanced ecosystem services in or adjacent to underserved, Tribal, or Indigenous communities.	34%	Restoration of critical habitats and enhancement of ecosystem services to provide general ecosystem benefits in addition to enhancing and protecting commercial and subsistence water quality, aquaculture, crops, and fisheries. Habitat restoration will improve water quality.
Project activities will build capacity for underserved, Tribal, or Indigenous communities.	25%	Involvement in project activities such as planning and restoration will build decision-making capacity in addition to general capacity for managing and implementing restoration projects. Involvement in other activities such as monitoring and management will build capacity for the community members involved to participate in other similar work in the future.

CONSIDERATIONS

Awardees—who may themselves be members of an underserved, Tribal, or Indigenous community—demonstrated various ways they will conduct projects in or near these communities, directly engage them, and undertake projects that will provide them benefits. Many of these partnerships are designed to build long-term capacity that will empower underserved, Tribal, and Indigenous communities to strengthen their resilience to climate hazards and ensure their participation in climate solutions. NOAA is enhancing subsequent funding opportunities to further encourage participation by these groups and clarify how applicants can identify communities most in need of assistance. Future evaluations may help ascertain how changes in guidelines for BIL and IRA coastal and habitat management investments may

strengthen coastal resilience and conservation efforts in underserved, Tribal, and Indigenous communities, ultimately leading to reduced climate risk for these already-vulnerable communities.

While the results detailed above highlight the ways in which underserved, Tribal, and Indigenous communities may benefit from BIL/IRA investments, there are a few caveats to this analysis and the interpretations that can be drawn from it, as described in Appendix D. Future evaluations of the NOAA BIL and IRA awards may further assess activities awardees have undertaken, interim/final outcomes achieved, and benefits provided. This additional data collection and analysis (e.g., through review of awardee performance reports, awardee and partner interviews, and analysis of geospatial data) will be instrumental in measuring benefits to underserved, Tribal, and Indigenous communities.

Awards in Action: Working with Tribes to Remove Marine Debris. In Washington State, the National Marine Sanctuary Foundation is removing large derelict structures from the Olympic Coast National Marine Sanctuary, Quileute Usual and Accustomed Treaty Area, and Makah Usual and Accustomed Treaty Area in partnership with the Makah Tribe and Quileute Tribe. The foundation is working collaboratively with both Tribes to remove large debris, including abandoned and derelict vessels and a partially sunken section of what used to be a component of the I-90 floating bridge. The project will have significant positive impacts on these Tribal communities and will improve the overall health of their ancestral waters. *Project title: High-Impact and Large Marine Debris Removal Throughout the National Marine Sanctuary System.*

The I-90 floating bridge segment, which will be removed as part of the NOAA Marine Debris Program's BIL grant award to the National Marine Sanctuary Foundation. Photo credit: NOAA.

III. Ecosystem Services

Estimating How Society May Value NOAA's Investments in Coastal Management and Habitat Restoration

OVERVIEW

Ecosystem services are the benefits that people derive from natural systems. For example, coral reefs and wetlands (such as mangroves, salt marshes, and freshwater marshes) protect homes and businesses along the shore (e.g., through erosion control and flood protection), purify the water, and sequester carbon (Oleson et al. 2020, FEMA, 2022). Beaches provide a space for recreation. Wetlands and rivers provide a nursery for fish species to grow before migrating to ocean waters, supporting recreational and commercial fisheries (Barbier et al., 2011, FEMA 2022). Many of the awards funded by NOAA provide overarching community resilience benefits, such as flood risk[11] and climate risk reduction, that improve and preserve ecosystem health and provide valuable services to human societies. In this section, we provide estimates of the economic value that society will place on expected ecosystem improvements.

The focus of this section differs conceptually and mechanically from the earlier economic impact analysis. In the economic impact section, we provide estimates of how award dollars will result in increased economic activity and create jobs. In contrast, this section estimates the benefit that society will place on ecosystem improvements. These improvements will yield benefits over time, such as improved fish stocks and enhanced wetlands (see Figure 2 for more information on activities and expected outcomes).

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[11] This report has attempted to capture flood risk reduction through benefit transfer by including studies that cover such benefits. However, future work may be needed to fully capture and parse the specific benefits from reduced flood risk.

Different methods are used to calculate economic impact and ecosystem service benefits, and it is not valid to add the two sets of results together to derive a total.

Our analysis does not include all the awards funded under the eight BIL and IRA investments, nor does it include awards that involve capacity building and planning since they are not yet at the stage where ecosystem restoration or improvement will take place. Additionally, competition awards are not yet defined well enough to estimate a benefit value. This section analyzes awards that (1) focus on restoration or acquisition, and (2) have provided an estimate of their quantitative outcomes (e.g., proposed acres of salt marsh to be restored). Overall, 122 awards were classified as restoration or acquisition grants, and 93 of those had quantitative data that could be used to estimate ecosystem service benefits.

To estimate the expected ecosystem service benefits for these awards, we use a process called benefit transfer, which takes information on willingness to pay (WTP)[12] that has already been obtained in other studies and applies it to BIL/IRA awards. NOAA applied a benefit transfer approach over the alternative of developing estimates directly for each award (or group of awards) using primary data collection methods (e.g., surveys); benefit transfer is ideal at evaluation onset when little data are available. One drawback of benefit transfer is that it takes results from one study area and applies them to other areas where the details of the site may differ. To minimize this limitation, we focused on studies that based their estimates on multiple other studies (e.g., meta-analyses or reviews).

The awards funded under BIL/IRA focus on community resilience benefits from improving habitat and reducing climate risk, and many studies we used in the benefit transfer include these benefits as ecosystem service values. For example, flood risk reduction is a key component of studies we used to value floodplain benefits. Additionally, coral reefs and mangroves generate coastal protection benefits that are partly captured in the values used. However, the approach employed in this analysis does not provide estimates of those values independent from a broader ecosystem service value. In other words, some studies used in the benefit transfer approach do not provide separate valuation estimates for particular ecosystem services (such as flood risk reduction) and instead provide an ecosystem service value in the aggregate.

APPROACH

This analysis used a two-part process for estimating the value of ecosystem services. The first part of this process develops estimates for any award involving wetlands (excluding mangroves) using a specific benefit transfer approach. This approach used a study developed by the Environmental Protection Agency (EPA) and the U.S. Department of the Army to value changes in wetlands under the Waters of the United States (WOTUS) rule analysis. For the remaining awards, other studies were leveraged, using a general benefit transfer approach, to apply benefits to other habitats.

The first step in both approaches was to collect quantitative data from the awards that reflect estimated changes in the habitats or ecosystem services (e.g., proposed acres of wetlands being restored). Once these data were extracted, the project team performed quality assurance on them and converted units as needed. Many of the studies listed monetary values on a per-acre or per-mile basis, so the approach required converting data from the awards to ensure compatibility (i.e., that the units could be applied to the studies' monetary values, such as a dollar-per-acre value applied to total preserved acres rather than

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[12] WTP is defined as the maximum amount of money an individual would be willing to give up to acquire a good or service.

hectares or some other measure of area). The wetlands approach required choosing an area around the project to determine the number of impacted households from U.S. Census data. The final step involved collating benefits to estimate a total. In order to ensure that estimated benefits between the approaches could be aggregated we made sure that (1) benefit transfer values were based on WTP studies pertaining to the particular habitats of interest, (2) the same period of analysis and discount rate were used, and (3) there was no overlap in the habitats and ecosystem services analyzed to prevent double-counting.

Wetlands Valuation Using a Meta-Regression Model

The methodological approach employed here for the valuation of wetland-derived ecosystem services[13] is a meta-regression model (MRM). Used in benefit transfer, a MRM's underlying data (or "metadata") and specification is informed by studies from a literature review—in this case, by stated preference studies.[14] MRMs allow for the valuation of resource improvements across a multitude of locations without conducting primary valuation studies at each one. The MRM used for this analysis is the same as that used in EPA's and the U.S. Department of the Army's Economic Analysis for the Final "Revised Definition of 'Waters of the United States'" Rule (the WOTUS Report), though the approach used here differs.

While EPA and the U.S. Department of the Army used the MRM to value changes in protected freshwater wetlands, this analysis uses the MRM to value both preserved freshwater and saltwater wetlands[15] at a local scale across the coastal United States. The MRM estimates household willingness to pay for wetland preservation given the number of wetland acres preserved, the number of wetland acres within a 30-mile radius of project worksites (an estimate of the baseline wetlands), the wetland type (forested or non-forested and freshwater or saltwater), and the provided ecosystem services (provisioning, regulating, and cultural). Additionally, the MRM employs a Bayesian linear meta-regression framework to make the most out of its small 52-observation metadata (i.e., to improve benefit transfer accuracy). The key data for this analysis come from grant application documents and are further supplemented with demographic data[16] taken from the U.S. Census American Community Survey, population projections taken from NASA's Socioeconomic Data and Applications Center, and wetlands data taken from the U.S. Fish and Wildlife Service's National Wetlands Inventory. Additional details regarding the data gathering process, MRM, and this methodology can be found in Appendix E.

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[13] For the purposes of valuation, we only focus on *final* (provisioning, cultural, and regulating) ecosystem services to avoid potential double counting and exclude supporting services. See U.S. EPA for further discussion on double-counting and available tools to ameliorate this issue.

[14] The value of ecosystem services can be difficult to measure, as many of them are public and do not have well-defined markets. Economists often conduct "stated preference" surveys to elicit the public's WTP for some improvement in the quality or quantity of a natural resource. These surveys elicit WTP by describing the current or status-quo condition of the resource and a hypothetical improvement in the resource from a policy or project. Descriptions may also include information about the ecosystem services the resource provides, and how these services will be enhanced by the policy or project (often based on information from biophysical models). Such surveys can provide valuable information for policy or project decision-making; however, they can be time consuming and costly to conduct.

[15] Wetlands are generally described in simpler categorical terms within the underlying surveys in the metadata to make sure that survey respondents clearly understand the valuation exercise. However, the baseline wetland data used to parameterize the model includes all wetland types within the U.S. Fish and Wildlife Service's National Wetlands Inventory–palustrine, lacustrine, riverine, estuarine, and marine wetlands.

[16] Demographic data included information on income and persons per household, which are needed to parameterize the MRM and scale benefits across households. See Appendix E for additional details.

The analysis uses data from 46 awards. Data limitations required a different analysis of ecosystem service benefits from mangrove restoration awards, presented in the following section.

Additional Ecosystem Valuations Using Benefit Transfer Methodology

The awards funded under the BIL and IRA investments cover a variety of ecosystems beyond the wetlands approach discussed above, reflecting the broad reach of these investments to improve resilience in communities. The broader set of ecosystems in this analysis includes:

- Beaches and dunes
- Coral reefs
- Floodplains
- Forests and grassland (near rivers, streams, and coastal areas)
- Grasslands
- Lakes and ponds
- Mangroves
- Oyster beds
- Rivers and streams
- Submerged aquatic vegetation

This aspect of the analysis includes 74 awards that were not covered under the approach described above; each had quantitative data in the award documents and could be linked to a valuation study. Our approach to valuing restoration among these ecosystems is based on unit value benefit transfers (e.g., applying a dollar value from an additional acre of preserved mangroves) from a suite of existing studies.

Identifying Studies

We conducted a literature review of ecosystem service value literature to guide the additional benefit transfer for studies, reviewing over 5,000 titles, 300 abstracts, and 100 full texts. We retained a selection of peer-reviewed and gray literature to guide benefit transfer across the diverse habitat included in the awards and completed a review of the [Ecosystem Service Database (ESVD)](#) and the [Blue Value Database (BVD)](#). These databases provide specific values for individual ecosystem services extracted from valuation literature (e.g., a per-acre value for recreation on lakes located in the Midwest from a single primary valuation study). The studies included in the ESVD and BVD often overlapped with those found in our independent literature review; for any studies not included in the ESVD or BVD databases, the primary valuation data were extracted and included in a larger table.

Finally, we reviewed the Federal Emergency Management Agency's (FEMA's) Ecosystem Service Value Updates report. The report compiled values from the literature over a set of ecosystem services relevant for cost-benefit analyses under FEMA awards. Many of the FEMA ecosystem services and habitats coincide with the needs of this report; the values in the FEMA report are meant to be used similarly to how we are using them: to estimate expected benefits. Because of their relevance and applicability, we used the FEMA values where appropriate, often reflecting an average over several studies from the literature. When the FEMA report did not provide a value for a habitat or service in the awards, we extracted values from other literature reviews. Appendix F provides a full delineation of the values used.

Matching Values to Studies

The final aspect of the benefit transfer process is to match the awards to the study estimates. For most awards, we were able to match quantitative values. The grants included a wide variety of information on award outcomes, including some readily usable spatial measures such as acres, miles, or linear feet restored. Measurements like the number of oysters or corals out-planted, the number of dams removed, and the feet or meters of channel cleared of debris proved difficult, if not impossible, to value because our analysis prioritized quantitative outcomes for which there were readily applicable ecosystem service values. For this valuation work, after studies were matched to awards, we calculated the ecosystem service values for each service where it was possible to develop an estimate.

Calculating Annualized Benefits

For both benefit transfer approaches, we assumed benefits would begin accruing one year after anticipated award completion (provided by awardees), and we calculated a discounted sum of benefits over a 20-year timeframe using a 3.1 percent discount rate. The total discounted sum was converted to an annualized value over the 20 years using a standard annualization factor. Those annualized values were then converted to 2024 dollar values.

Awards in Action: Removing an Obsolete Dam to Increase Fish Migration. American Rivers was awarded $15 million in BIL/IRA funds to support feasibility studies, design work, permitting, and initial construction work to remove a 125-year obsolete old dam. This improvement will benefit migratory fish, increase the safety and resilience of transportation infrastructure, and create educational and recreational opportunities for the community in Milwaukie, Oregon. The work will help threatened Upper Willamette River Chinook and steelhead, lower Columbia River coho, and Pacific lamprey to access upstream spawning and rearing habitat for juveniles. The project will also transform the impoundment pond behind the dam into diverse riverine habitat that will improve water quality, reduce flooding risks, and engage community members in the planning process and provide local high school and middle school students with opportunities to learn about science and habitat restoration. *Project title: Kellogg Creek Restoration and Community Enhancement Project.*

Kellogg Creek Dam. Photo credit: Jodie Robinson/NOAA.

RESULTS

As mentioned, we included 93 awards in this component of the analysis. Table 9 below summarizes the estimated values of the awards by habitat. The estimates reflect an annualized value of ecosystem services in 2024 U.S. dollars (USD). While the studies we used tend to focus on habitat-based benefit estimates, many of the estimated values include benefits specific to fisheries and stemming from the investments made under the NOAA Fisheries programs. Overall, we estimate the 93 awards for which we could develop estimates will result in $725.4 million in annualized benefits. Wetlands-related benefits (excluding mangroves) are estimated to result in the largest annualized benefit: $314.7 million (46 awards). Benefits related to floodplains were estimated to total $56.4 million annually (10 awards), and forest-related benefits were estimated to total $74.2 million annually (13 awards). Lake and pond benefits were estimated to total $78.2 million annually (nine awards), while beach and dune benefits were estimated to be $32.3 million annually (four awards). The largest number of awards, 58 in total, involve river- and stream-related ecosystem services and are estimated to generate $16.6 million in benefits annually, with many of the benefits from this habitat focusing on fisheries-related benefits from NOAA Fisheries investments.

Table 9. Estimated Ecosystem Service Benefits, by Habitat Identified in Awards (Note that many awards addressed multiple habitats; thus, listed awards add up to more than 93.)

Habitat	Total $ in 2024 USD	Ecosystem Services Valued	Sources	Awards
Wetlands (Estuaries, Marshes, etc. – Mangroves excluded)	$314,718,557	Reflects the value of provisioning, regulating, and cultural ecosystem services that come from wetlands.	EPA and U.S. Department of the Army's MRM described in the WOTUS report with adjustments to the BT approach; see Appendix E for additional details	46
Floodplain	$56,374,643	Nutrient cycling, biological control, habitat provision, waste disposal/assimilation, food provision, moderation of extreme events, erosion control, recreation/tourism, cultural/spiritual activities, water supply, water filtration, and raw material for transformation.	Costanza et al. (2014), Hopkins et al. (2018)	10
Forest	$74,215,293	Air quality, climate regulation (e.g., carbon sequestration), moderation of extreme events (e.g. storm surge reduction), erosion control, recreation/tourism, aesthetic appreciation, water supply, water filtration, and existence value. The grants included in this category involve planting trees as well as restoring or acquiring forested areas along coasts, rivers, or lakes to conserve those areas.	de Groot et al. (2012); [tropical and temperate/subtropical forests] FEMA (2022)	13

Habitat	Total $ in 2024 USD	Ecosystem Services Valued	Sources	Awards
Lake/Pond	$78,184,912	Waste disposal/assimilation, food, moderation of extreme events, recreation/tourism, and water supply.	Costanza et al. (2014)	9
Beach/Dune	$32,317,629	Aesthetic appreciation, recreation.	FEMA (2022)	4
River/ Stream	$16,637,293	Habitat, air quality, food, climate protection, moderation of extreme events, erosion control, recreation/tourism, aesthetic appreciation, water supply, and water filtration, nitrogen fixing, and commercial fisheries.	Area of water (e.g., square miles): FEMA (2022) Distance of river/streams (e.g. miles or feet of river shoreline): Hopkins et al. (2023) Fish passage improvements: Knowler et al. (2003)	47
Submerged Aquatic Vegetation	$22,708,794	Waste disposal/assimilation, food, habitat, fisheries, climate protection, erosion control, recreation/tourism, cultural/spiritual activities, and raw material for transformation.	Kelp: Eger et al. (2023). Seagrasses: de Groot et al. (2012)	6
Coral Reefs	$2,727,840	Food, climate protection, recreation/tourism and aesthetic appreciation, information, science, education, and research.	FEMA (2022)	8
Mangroves	$124,813,872	Carbon sequestration, waste disposal/assimilation, recreation, food, climate regulation, moderation of extreme events, erosion control, and raw materials.	Jerath et al. (2016), de Groot et al. (2012)	4
Oyster Reefs/Beds	$375,102	Fisheries, water filtration, and recreation/tourism.	FEMA (2020)	6
Grassland	$2,346,808	Waste disposal/assimilation, food, climate protection, erosion control, recreation/tourism, aesthetic appreciation, water supply, and raw material for transformation.	de Groot et al. (2012)	4
Total	$725,420,742			

Table 10 provides a breakdown of the estimated ecosystem service values by region. The region with the largest estimated benefit value is the West, with $254.6 million accruing annually. The large estimate for the West is based partly on the number of fish passage awards in that region. The Northeast has estimated benefits of $81.3 million annually, while the South has estimated benefits of $182.8 million annually. The Great Lakes has estimated benefits of $27.8 million annually and the U.S. Caribbean Territories have estimated benefits of $157.9 million annually. The estimated benefits for Alaska are $20.5 million annually. Benefits for the Pacific Islands are estimated to be $0.3 million annually, primarily allocated to coral reef restoration awards. The estimated benefits for the Pacific Islands are lower due to the low number of implementation awards in this region (five awards), and the fact that one of those awards is a marine debris removal award that presents challenges for estimating benefits.

Table 10. Estimated Ecosystem Service Benefit Values by Region

Region (States)[17]	Total $ in 2024 USD	Awards
Northeast (Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, and New York)	$81,372,690	9
South (Alabama, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Texas, and Virginia)	$182,825,493	23
Midwest Great Lakes (Indiana, Michigan, Ohio, and Wisconsin)	$27,841,960	5
West (California, Idaho, Oregon, and Washington)	$254,586,246	40
Hawaii and U.S. Pacific Island Territories (Hawaii, American Samoa, and CNMI)	$323,977	2
Alaska	$20,547,399	5
U.S. Caribbean Territories (U.S. Virgin Islands and Puerto Rico)	$157,922,977	9
Total	**$725,420,742**	**93**

CONSIDERATIONS

Although we were able to generate estimates for a large proportion of the awards, there are cases where we could not develop monetary estimates due to the lack of available literature. Nevertheless, we provide a summary of some of non-monetized outcomes in Table 11.

Table 11. Quantified Benefits Estimates

Category	Description
Marine Debris Removal	These awards primarily focused on removing large marine debris, including abandoned and derelict vessels and derelict fishing gear. Based on a review of the information about expected outcomes presented in the marine debris grants, the awards will lead to the removal of more than 350 such vessels and more than 5,000 additional tons of other debris (e.g., traps, nets). These forms of marine debris pose environmental risks, including leaching toxic waste, trapping wildlife, and becoming vectors for invasive species (NOAA, 203, Gárcia-Gómez et al., 2021). They also inhibit recreation and navigation, and they wash up on shorelines, posing a hazard to human health (NOAA, 2013).
Fish Barrier Removal	Awards that involve removing fish barriers (e.g., dams) also posed a challenge for estimation. Most of these awards expressed outcomes in terms of miles or linear feet of river, stream, or creek that would become accessible for diadromous fish by removing barriers or remedying/creating fish ladders. Several awards related to salmon habitat restoration in the Pacific Northwest were viable for benefit transfer based on the available literature. Those outside the Pacific Northwest, or pertaining to other species, were not eligible for benefit transfer. In addition to the estimates included in the River/Stream category (see Table 10, above), awards will result in 115 barriers removed, which will open up 2,205 miles for diadromous fish, and 65 fish passages, one tide gate, and one weir installed or improved, opening up 1,248 miles for diadromous fish.

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[17] The states/territories listed for each region only include those where projects were awarded funding.

Category	Description
Miscellaneous Data	Some awards supplied quantitative data that was captured in the quantitative data extraction period, but which could not be converted to an ecosystem service value estimate. Thirteen awards supplied information that, while indicative of the estimated project impacts, cannot be valued using benefit transfer. These data include measures such as the planned number of invasive urchins removed from a project site or cubic yards of sediment removed from a channel.

Finally, the estimates of monetary values have limitations and caveats:

- Our estimates reflect benefits of expected outcomes and not the benefits of actual outcomes from the awards. We used information from the award documents to generate these values since almost all awards are in the early stages of implementation.

- The estimated benefits reflect improvements in ecosystem services under optimal circumstances. We do not have baseline conditions for each award. Thus, the specific incremental changes in ecosystem service provision cannot be fully assessed. The assumption being made here is that these awards will result in more complete provision of ecosystem service values.

- The estimates are based on using a benefit transfer method that comes with its own set of caveats. First, the studies being used were developed for other regions or areas, and we are applying those estimates to our situation. Second, the source studies will have their own limitations and caveats, and our use of those studies then inherits those limitations and caveats.

Conclusion

Coastal habitats are vital for the resilience of communities that live and depend on the nation's coasts. When NOAA's BIL- and IRA-funded coastal and habitat management projects are completed, they will fulfill important objectives, including restoring and protecting habitat, opening fish passage and protecting commercially and culturally valuable species, removing marine debris, and building the capacity of underserved, Tribal, and Indigenous communities to engage more meaningfully in coastal resilience activities.

To begin quantifying the outputs of several of these coastal management and habitat restoration programs, NOAA has developed performance metrics and made transparent to the public its targets through FY 2025 for completing program milestones related to future funding opportunities, the tons of marine debris certain awards will help remove, and the acres of coastal and Great Lakes habitat select awards will protect and conserve.

The purpose of this report is to take this accountability one step further by not just looking at outputs but also estimating the expected and significant results these investments are expected to achieve. This evaluation does not include an analysis of the long-term benefits associated with reducing climate-risk exposure to coastal communities or a quantification of the benefits of natural hazards preparedness; therefore, we will expect to see additional benefits achieved by these awards as we conduct further evaluations. We estimated outcomes and impacts across three broad categories, the "three Es"— economic impact, equity benefits, and ecosystem services value—to bolster economic development, environmental justice, and coastal and community resilience. Specifically, we found:

- Award spending is estimated to generate **$1.4 billion** in economic output and create **more than 7,800 jobs** in coastal and Great Lakes communities.

- **59 percent** of awardees are committed to engaging Tribes or Indigenous communities, and **41 percent** are expected to provide important resilience benefits to vulnerable populations, such as weather and climate risk reduction activities.

- Ecosystem improvements are estimated to result in **$725 million** in annualized benefits over a 20-year period at a 3.1% discount rate, with wetland ($314.7 million) and mangrove ($124.8 million) benefits yielding the highest values. Over the 20 years, the total present values amount to **$11.4 billion**, with $4.8 billion coming from wetlands (excluding mangroves) and $2 billion coming from mangroves.

BIL and IRA have provided unprecedented funding to coastal communities in the form of competitive awards that are revitalizing long-term ecosystem services, creating jobs, and reducing climate risk. Although these awards are still ongoing, the findings of this report can inform the remaining coastal and habitat management investments NOAA will award in the next one to two years by helping guide programmatic developments, resource management decisions, and where outcomes might be maximized.

This report hopes to influence state, federal, and Tribal and Indigenous leaders to support further coastal and habitat management initiatives after BIL and IRA climate-ready fisheries and climate-ready coasts investments end, no later than FY 2026. Decision-makers and leaders may use this analysis for policy, management, community engagement, or investment decisions that can lead to significant returns on investment for coastal communities, as this report details.

The demand for these programs in the first round of funding greatly exceeded the supply of funds, with fewer than one in four applications receiving an award. Given NOAA's continued emphasis on equitable climate services and solutions—which are also a primary concern for many coastal communities—and the growing pool of first-time applicants, we expect interest in funding to support coastal resilience to remain high. Demand for investments to support coastal resilience and conservation will also grow as coastal conditions worsen due to climate change, as detailed in the Fifth National Climate Assessment. Critically, climate-driven challenges to marine resources—including to the nation's $370 billion fishing industry and the states, communities, and Tribes that depend on it—require further evidence-based support.

These challenges make it essential for NOAA to continue to plan and conduct robust evaluations consistent with Office of Management and Budget guidance and ensure these programs are achieving their intended outcomes so that NOAA can continue to learn and better maximize their intended benefits.

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Appendices

APPENDIX A: RESULTS OF IMPLAN ANALYSIS BY STATE

Table A-1. Estimated State-Level Economic Impact of NOAA's FY22/23 Coastal Resilience BIL and IRA Awards. Note all values are in 2024 USD

State or Territory	Impact	Employment	Income	Value Added	Output
Alabama	Direct	179	$12,935,000	$13,572,000	$24,698,000
	Indirect	65	$3,677,000	$6,082,000	$12,393,000
	Induced	74	$3,555,000	$6,851,000	$11,927,000
Alabama Total		*318*	*$20,166,000*	*$26,505,000*	*$49,018,000*
Alaska	Direct	90	$5,172,000	$5,646,000	$10,806,000
	Indirect	22	$1,071,000	$1,624,000	$3,420,000
	Induced	20	$1,049,000	$1,948,000	$3,300,000
Alaska Total		*131*	*$7,292,000*	*$9,218,000*	*$17,525,000*
California	Direct	506	$38,028,000	$44,878,000	$75,998,000
	Indirect	187	$13,630,000	$20,888,000	$38,570,000
	Induced	179	$11,013,000	$20,858,000	$33,636,000
California Total		*872*	*$62,671,000*	*$86,624,000*	*$148,204,000*
Connecticut	Direct	104	$8,658,000	$7,440,000	$14,998,000
	Indirect	29	$2,354,000	$3,684,000	$6,696,000
	Induced	50	$3,111,000	$5,631,000	$9,052,000
Connecticut Total		*182*	*$14,123,000*	*$16,756,000*	*$30,745,000*
District of Columbia	Direct	1	$214,000	$259,000	$229,000
	Indirect	0	$31,000	$41,000	$64,000
	Induced	0	$21,000	$33,000	$49,000
District of Columbia Total		*1*	*$266,000*	*$333,000*	*$342,000*
Florida	Direct	358	$31,133,000	$34,902,000	$55,072,000
	Indirect	150	$9,176,000	$14,504,000	$29,149,000
	Induced	151	$8,060,000	$15,985,000	$27,077,000
Florida Total		*658*	*$48,369,000*	*$65,391,000*	*$111,299,000*
Georgia	Direct	6	$398,000	$440,000	$866,000
	Indirect	2	$124,000	$220,000	$415,000
	Induced	2	$130,000	$254,000	$422,000
Georgia Total		*10*	*$652,000*	*$913,000*	*$1,702,000*

State or Territory	Impact	Employment	Income	Value Added	Output
Hawaii	Direct	188	$13,050,000	$14,471,000	$21,319,000
	Indirect	39	$2,665,000	$3,979,000	$7,323,000
	Induced	64	$3,919,000	$7,835,000	$12,692,000
Hawaii Total		*292*	*$19,635,000*	*$26,285,000*	*$41,334,000*
Idaho	Direct	13	$740,000	$898,000	$1,711,000
	Indirect	4	$158,000	$262,000	$637,000
	Induced	3	$97,000	$222,000	$424,000
Idaho Total		*20*	*$995,000*	*$1,382,000*	*$2,773,000*
Indiana	Direct	3	$200,000	$229,000	$307,000
	Indirect	1	$26,000	$37,000	$79,000
	Induced	1	$46,000	$84,000	$147,000
Indiana Total		*5*	*$271,000*	*$351,000*	*$533,000*
Louisiana	Direct	116	$7,603,000	$8,596,000	$16,060,000
	Indirect	43	$2,628,000	$4,070,000	$8,173,000
	Induced	45	$2,416,000	$4,492,000	$7,673,000
Louisiana Total		*204*	*$12,646,000*	*$17,159,000*	*$31,906,000*
Maine	Direct	195	$14,221,000	$15,988,000	$31,041,000
	Indirect	76	$4,630,000	$7,059,000	$13,891,000
	Induced	85	$4,662,000	$9,111,000	$15,123,000
Maine Total		*355*	*$23,514,000*	*$32,158,000*	*$60,055,000*
Maryland	Direct	72	$7,147,000	$7,377,000	$11,869,000
	Indirect	26	$1,986,000	$2,894,000	$4,934,000
	Induced	32	$1,925,000	$3,719,000	$5,906,000
Maryland Total		*130*	*$11,058,000*	*$13,990,000*	*$22,709,000*
Massachusetts	Direct	155	$12,037,000	$12,238,000	$23,842,000
	Indirect	38	$3,226,000	$4,879,000	$8,937,000
	Induced	53	$3,359,000	$5,944,000	$9,608,000
Massachusetts Total		*246*	*$18,622,000*	*$23,061,000*	*$42,388,000*
Michigan	Direct	45	$3,222,000	$3,844,000	$6,793,000
	Indirect	19	$1,111,000	$1,601,000	$3,216,000
	Induced	20	$1,126,000	$2,054,000	$3,634,000
Michigan Total		*84*	*$5,460,000*	*$7,499,000*	*$13,644,000*

State or Territory	Impact	Employment	Income	Value Added	Output
Minnesota	Direct	2	$112,000	$125,000	$233,000
	Indirect	1	$33,000	$50,000	$106,000
	Induced	1	$30,000	$58,000	$101,000
Minnesota Total		*3*	*$176,000*	*$233,000*	*$440,000*
Mississippi	Direct	31	$2,394,000	$2,632,000	$4,603,000
	Indirect	21	$928,000	$1,472,000	$3,477,000
	Induced	12	$477,000	$1,065,000	$1,916,000
Mississippi Total		*64*	*$3,799,000*	*$5,169,000*	*$9,996,000*
New Hampshire	Direct	48	$4,250,000	$3,287,000	$6,525,000
	Indirect	13	$1,049,000	$1,522,000	$2,697,000
	Induced	18	$1,112,000	$2,028,000	$3,276,000
New Hampshire Total		*78*	*$6,410,000*	*$6,837,000*	*$12,499,000*
New Jersey	Direct	28	$2,325,000	$2,711,000	$4,928,000
	Indirect	9	$633,000	$1,030,000	$1,967,000
	Induced	11	$693,000	$1,244,000	$2,026,000
New Jersey Total		*47*	*$3,650,000*	*$4,985,000*	*$8,921,000*
New York	Direct	12	$1,300,000	$1,322,000	$1,551,000
	Indirect	4	$302,000	$492,000	$856,000
	Induced	5	$337,000	$632,000	$998,000
New York Total		*21*	*$1,939,000*	*$2,445,000*	*$3,404,000*
North Carolina	Direct	239	$14,633,000	$17,386,000	$34,554,000
	Indirect	109	$5,446,000	$7,963,000	$16,735,000
	Induced	70	$3,298,000	$6,651,000	$11,624,000
North Carolina Total		*417*	*$23,377,000*	*$32,001,000*	*$62,913,000*
Ohio	Direct	38	$1,859,000	$2,097,000	$5,482,000
	Indirect	14	$771,000	$1,181,000	$2,376,000
	Induced	12	$548,000	$1,105,000	$1,933,000
Ohio Total		*64*	*$3,179,000*	*$4,384,000*	*$9,792,000*
Oregon	Direct	228	$18,618,000	$21,627,000	$37,954,000
	Indirect	84	$5,869,000	$8,906,000	$17,038,000
	Induced	94	$5,551,000	$10,027,000	$16,709,000
Oregon Total		*407*	*$30,038,000*	*$40,560,000*	*$71,700,000*

State or Territory	Impact	Employment	Income	Value Added	Output
Puerto Rico	Direct	300	$19,942,000	$22,952,000	$28,257,000
	Indirect	78	$3,260,000	$4,752,000	$7,475,000
	Induced	121	$4,571,000	$9,930,000	$15,427,000
Puerto Rico Total		*499*	*$27,773,000*	*$37,634,000*	*$51,158,000*
Rhode Island	Direct	7	$722,000	$785,000	$1,077,000
	Indirect	3	$171,000	$255,000	$482,000
	Induced	4	$216,000	$393,000	$649,000
Rhode Island Total		*13*	*$1,109,000*	*$1,433,000*	*$2,208,000*
South Carolina	Direct	42	$4,121,000	$5,671,000	$7,683,000
	Indirect	20	$1,159,000	$1,590,000	$3,156,000
	Induced	17	$842,000	$1,683,000	$2,852,000
South Carolina Total		*78*	*$6,122,000*	*$8,944,000*	*$13,691,000*
Texas	Direct	72	$4,931,000	$5,446,000	$10,197,000
	Indirect	42	$2,872,000	$4,530,000	$9,323,000
	Induced	36	$1,980,000	$3,795,000	$6,522,000
Texas Total		*151*	*$9,783,000*	*$13,770,000*	*$26,041,000*
Utah	Direct	0	$0	$0	$1,000
	Indirect	0	$0	$0	$1,000
	Induced	0	$0	$0	$0
Utah Total		*0*	*$1,000*	*$1,000*	*$2,000*
U.S. Virgin Islands	Direct	62	$6,826,000	$7,484,000	$7,996,000
	Indirect	16	$865,000	$1,270,000	$1,990,000
	Induced	20	$889,000	$2,034,000	$2,850,000
U.S. Virgin Islands Total		*98*	*$8,581,000*	*$10,788,000*	*$12,837,000*
Virginia	Direct	24	$2,728,000	$3,042,000	$3,789,000
	Indirect	13	$759,000	$1,170,000	$2,316,000
	Induced	10	$469,000	$1,017,000	$1,722,000
Virginia Total		*47*	*$3,956,000*	*$5,228,000*	*$7,827,000*

State or Territory	Impact	Employment	Income	Value Added	Output
Washington	Direct	681	$57,353,000	$72,393,000	$116,269,000
	Indirect	225	$16,160,000	$26,988,000	$50,104,000
	Induced	211	$11,910,000	$25,366,000	$40,368,000
Washington Total		*1118*	*$85,423,000*	*$124,747,000*	*$206,741,000*
Wisconsin	Direct	17	$1,354,000	$1,430,000	$2,695,000
	Indirect	5	$317,000	$490,000	$1,003,000
	Induced	6	$318,000	$610,000	$1,074,000
Wisconsin Total		*28*	*$1,989,000*	*$2,529,000*	*$4,773,000*
US Non-Specified	Direct	13	$1,406,000	$2,289,000	$4,143,000
	Indirect	688	$57,385,000	$93,933,000	$194,974,000
	Induced	481	$31,176,000	$56,999,000	$100,734,000
US Non-Specified Total		*1,181*	*$89,966,000*	*$153,220,000*	*$299,851,000*
Direct Total		**3,875**	**$299,629,000**	**$343,460,000**	**$573,549,000**
Indirect Total		**2,044**	**$144,472,000**	**$229,419,000**	**$453,972,000**
Induced Total		**1,905**	**$108,909,000**	**$209,655,000**	**$351,451,000**
Grand Total		**7,823**	**$553,010,000**	**$782,533,000**	**$1,378,973,000**

APPENDIX B: AWARD DESCRIPTIONS

This appendix contains descriptions for the 173 awards included in the report as well as regional maps of award locations; descriptions were summarized and adapted based on award documents. Each map contains the legend below, which shows the color coding used for each funding opportunity; the tables also reflect this color coding to show which funding opportunities supported each grant.

● Coastal Habitat Restoration and Resilience Grants for Underserved Communities

● Coastal Zone Management Habitat Protection and Restoration

● Marine Debris Removal

● National Estuarine Research Reserves Habitat Protection and Restoration

● Pacific Coastal Salmon Recovery Fund

● Restoring Fish Passage Through Barrier Removal

● Restoring Tribal Priority Fish Passage Through Barrier Removal

● Transformational Habitat Restoration and Coastal Resilience Grants

Nationwide

Program:	Marine Debris Removal
Award Title:	Leveraging Strategic Partnerships for Removal, Disposal, Prevention and Education
Recipient:	Boat U.S. Foundation
Federal Funding:	$10.0 million
States Involved:	The opportunity will be available to coastal and marine areas of the United States, including Great Lakes, United States territories, and Freely Associated States.
Description:	Boat U.S. Foundation will administer a competitive grant competition for the removal of abandoned and derelict vessels (ADVs); develop a national database of ADV locations and removal efforts; and conduct outreach and education activities to create peer-to-peer relationships between the marine industry, disposal companies, and government entities.

Program:	Marine Debris Removal
Award Title:	Nationwide Lost or Abandoned Fishing TRAP (Trap Removal, Assessment, and Prevention) Program
Recipient:	Virginia Institute of Marine Science
Federal Funding:	$8.0 million
States Involved:	The opportunity will be to coastal and marine areas of the United States where derelict fishing traps are contributing to marine debris.
Description:	The Virginia Institute of Marine Science will administer a national grant competition for derelict fishing trap removal. The award will also support the removal and recycling of abandoned traps from Chesapeake Bay while creating a national database for data collection. With the University of Georgia, the awardee will establish the Derelict Trap Policy Innovation Lab for students and researchers to develop solutions for the impacts of lost gear.

Northeast
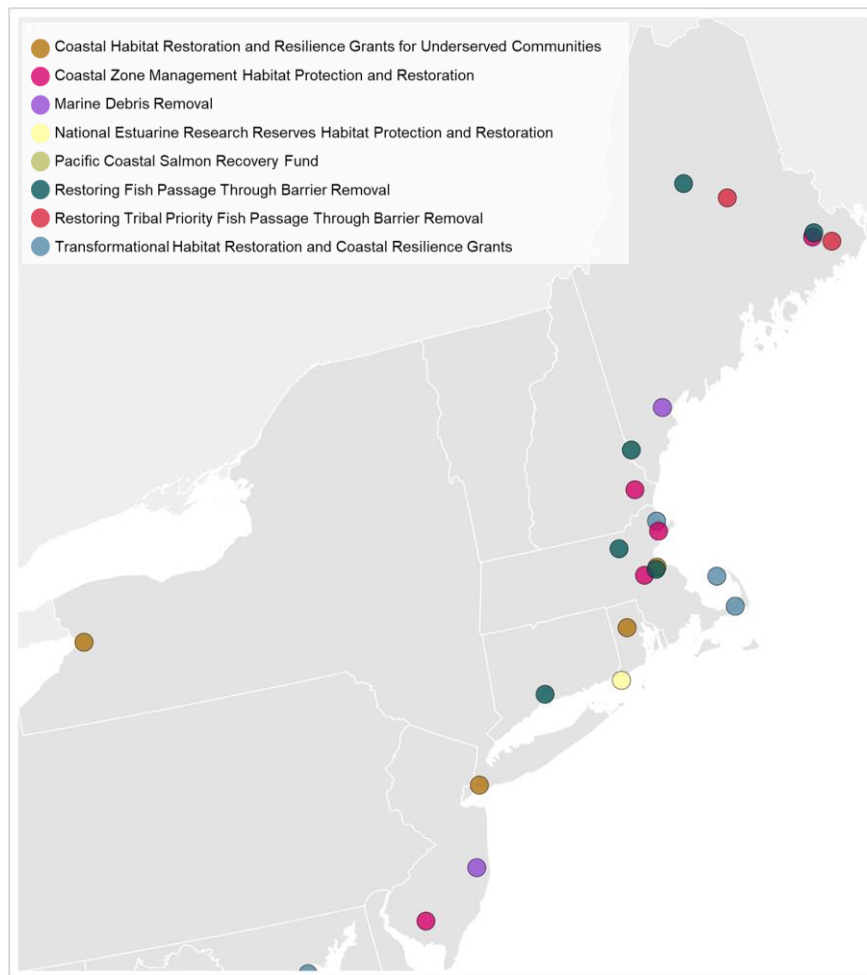
Figure B-1. Map of Northeast Region Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-State Projects

Program:	Marine Debris Removal
Award Title:	New England Regional Derelict Fishing Gear Removal and Response Coalition
Recipient:	Center for Coastal Studies, Inc.
Federal Funding:	$2.7 million
States Involved:	Maine, Massachusetts, New Hampshire
Description:	The Center for Coastal Studies is leading a coalition of nongovernmental organizations and commercial enterprises across the Northeast. This effort will form a network of vendors that will share resources and establish replicable debris collection, data management, and disposal systems. Partners will conduct at-sea sonar surveys; grapple for abandoned, lost, or otherwise discarded fishing gear; support diver-led removals of lost gear; conduct large-scale shoreline debris removals; and facilitate end-of-life gear collection, processing, repurposing, recycling, and disposal.

Connecticut

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	It's About Dam Time: Removing Kinneytown Dam to Restore Fish Passage and Advance Environmental Justice
Recipient:	Naugatuck Valley Council of Governments
Federal Funding:	$15.0 million
Description:	The Naugatuck Valley Council of Governments will remove the Kinneytown Dam Facility on the main stem of the Naugatuck River in Connecticut. The effort will open 29 miles of river for blueback herring, American shad, and alewife, as well as an additional 28 tributary miles for American eel. Dam removal will reduce the flood risk to communities upstream and downstream of the project.

Maine

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Improving Fish Passage at Milltown and Woodland Dams on the International St. Croix River, Maine
Recipient:	Maine Department of Marine Resources
Federal Funding:	$14.8 million
Description:	The Maine Department of Marine Resources will design and build a fish lift at Woodland Dam on the St. Croix River in Maine. The project will provide access to 600 miles for migratory fish species and 60,000 acres of habitat for alewife. The project will directly benefit alewife, American shad, American eel, blueback herring, and sea lamprey by providing habitat for spawning and rearing.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Advancing the Restoration of Sea-Run Fisheries in the Penobscot Watershed
Recipient:	Atlantic Salmon Federation, Inc.
Federal Funding:	$7.6 million
Description:	This award will support and improve the largest Atlantic salmon run in the United States by removing two dams and installing fish ladders at two others. This will open sites that are currently complete barriers to fish passage in the Penobscot River watershed. The award will also support the town of Dover-Foxcroft in conducting a feasibility study to examine options to provide fish passage at Moosehead Dam.

Program:	Restoring Tribal Priority Fish Passage Through Barrier Removal
Award Title:	Restoring Tribal Priority Fish Passage in the Penobscot River Watershed and Building the Penobscot Nation's Resource Management, Stewardship, and Restoration Capacity
Recipient:	Penobscot Indian Nation
Federal Funding:	$3.0 million
Description:	The Penobscot Indian Nation will eliminate five culvert and dam barriers within the East Branch of the Penobscot River to improve passage for Atlantic salmon and other migratory fish species for a 150-mile reach. The Penobscot Indian Nation will build capacity to manage and steward the migratory fish resources both on and off Tribal trust lands by collaborating with partners and funding fishery biologist positions.

Program:	Restoring Tribal Priority Fish Passage Through Barrier Removal
Award Title:	Planning and Capacity to Restore Sea-Run Fish Passage on the St. Croix River—From Still Waters to the Gulf of Maine
Recipient:	Pleasant Point Indian Reservation
Federal Funding:	$2.0 million
Description:	The Passamaquoddy Tribe will identify preferred approaches to enhance upstream and downstream passage across the Grand Falls and Woodland Dams. The project will strengthen the Tribe's capacity to make decisions about restoration and allow the Tribe to conduct important community education and outreach to support future decisions in the watershed.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Applying the CoastWise Approach for Coastal Habitat Resilience and Community Adaptation in Down East Maine
Recipient:	Maine Department of Marine Resources
Federal Funding:	$1.7 million
Description:	This project will apply innovative, science-based approaches (referred to as "CoastWise" approaches) to plan and design coastal infrastructure improvements while strengthening partnerships and regional capacity to manage and implement similar projects throughout Maine. The project features a collaborative, locally led process to produce preliminary designs for barrier removal at six tidal crossings and final designs for four of those.

Massachusetts

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Monatiquot River Restoration Implementation Project
Recipient:	Town of Braintree
Federal Funding:	$2.0 million
Description:	This award will remove two dams in the Monatiquot River watershed to create immediate passage for alewives and other diadromous species as well as increase the flood resilience of a nearby underserved community. The initiative will completely remove the dams and restore the river channel through the former impoundment.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Addressing Priority Barriers in the Watersheds of the Great Marsh, Massachusetts
Recipient:	Ipswich River Watershed Association, Inc.
Federal Funding:	$2.4 million
Description:	The Ipswich River Watershed Association will restore fish passage to 238 miles of priority habitat for river herring, American shad, and American eel in the Ipswich and Parker River watersheds. The project will restore passage at four dams and develop the design and permitting for the removal of the lowest dam in the watershed.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Herring River Restoration Project, Phase 1
Recipient:	Town of Wellfleet
Federal Funding:	$14.7 million
Description:	The town of Wellfleet will support construction of all water control infrastructure needed for full tidal restoration of the Herring River estuary, as well as conduct property impact prevention measures needed to begin implementing tidal restoration. These actions support the first phase of a larger effort to restore 890 acres of tidal wetlands and reconnect a functioning estuary to Cape Cod Bay and the Gulf of Maine.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Making Space: The Southeastern Massachusetts Marsh Migration Initiative
Recipient:	Massachusetts Audubon Society, Inc.
Federal Funding:	$4.5 million
Description:	Massachusetts Audubon Society will restore wetlands degraded from historic cranberry farming. This effort will implement two pilot restoration projects to inform similar, future projects across the region and support sustained cultural land uses for Tribal communities.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Initiating Transformational Habitat Restoration in the Great Marsh Area of Critical Environmental Concern
Recipient:	Ipswich River Watershed Association, Inc.
Federal Funding:	$1.4 million
Description:	This award will fund three tidal barrier removal demonstration projects within the Great Marsh to address specific hurdles many other projects have faced in the Great Marsh and catalyze future project implementation. It will also support planning and construction efforts to address the remaining high-priority tidal barriers in the region.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Mill Creek Community Engagement and Pilot Project: Slade Mill Dam Removal
Recipient:	City of Chelsea
Federal Funding:	$420,000
Description:	The city of Chelsea, Massachusetts, will gather community input and remove Slade Mill Dam on Mill Creek. The city will work to actively engage the local community throughout all phases of planning and construction, including through community meetings, site walks, and educational signage. This project will work in tandem with an ongoing effort to create a park and riverwalk that will increase public access to Mill Creek.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Truro Pamet River Restoration
Recipient:	Massachusetts Executive Office of Energy and Environmental Affairs
Federal Funding:	$2.2 million
Description:	This award will result in a feasibility study and the collection of data necessary to remediate six tidal restrictions within five project focus areas: the Little Pamet River, Lower Pamet, Upper Pamet, Mill Pond, and Eagle Neck Creek Earthen Berm. These efforts will support the greater goal of restoring salt marsh functioning within the Pamet River system.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Manchester Central Street Bridge Replacement and Sawmill Brook Restoration Project
Recipient:	Massachusetts Executive Office of Energy and Environmental Affairs
Federal Funding:	$1.6 million
Description:	This award will support habitat restoration and fish passage while increasing resilience for the town of Manchester-by-the-Sea by replacing a bridge, removing a tide gate structure, upgrading channel walls along a pond, restoring a salt marsh, and creating living shorelines to stabilize the stream banks.

New Hampshire

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Restoration of the Oyster River Herring Run Through Removal of the Mill Pond Head-of-Tide Dam and Installation of Fish Passage on the Oyster Reservoir Dam
Recipient:	Town of Durham
Federal Funding:	$3.5 million
Description:	The town of Durham, New Hampshire, will improve fish passage on the Oyster River by removing the Mill Pond Dam and installing a fish ladder on the Oyster Reservoir Dam. These actions will restore a free-flowing river and increase tidal influence, improving water quality and fish habitat upstream and improving community resilience to flooding.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Resilient Tidal Crossings Project—Building Resilience Through Upgraded Replacements of High Priority Tidal Culverts
Recipient:	New Hampshire Department of Environmental Services
Federal Funding:	$3.0 million
Description:	This effort will result in the replacement of three undersized tidal culverts on state roads in the towns of Stratham and Rye, New Hampshire. This investment will advance the final engineering designs and permitting for these sites and replace the existing culverts with upgraded alternatives to improve ecosystem and infrastructure resilience.

New Jersey

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Beach Restoration to Create Habitat and Protect Tidal Salt Marsh Buffers Within the Bay Point Area of Lawrence Township in Cumberland County, New Jersey
Recipient:	New Jersey Department of Environmental Protection
Federal Funding:	$3.5 million
Description:	This project will help restore the Bay Point shoreline ecosystem and natural processes to better adapt to climate change impacts. The restored shoreline will provide critical spawning habitat for horseshoe crabs and help mitigate flooding and extreme weather impacts, which will help protect human lives and critical infrastructure in the peninsula.

Program:	Marine Debris Removal
Award Title:	Rapid ALDFG/ADV Response and Recovery: Expanding Industry-Led Stewardship of NOAA Trust Resources for Long-Term Sustainability
Recipient:	Stockton University
Federal Funding:	$1.4 million
Description:	Stockton University will conduct removal, research, and education activities in southern New Jersey from Barnegat Bay to Delaware Bay. The award recipient expects to remove up to 25 abandoned and derelict vessels and an estimated 2,000 pieces of derelict fishing gear, while training new partners on how to identify and prioritize derelict fishing gear and preparing students to serve as ambassadors to the crabbing industry.

New York

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Bridging the Gap: A Natural Areas Restoration Training and Professional Development Program
Recipient:	City of New York
Federal Funding:	$650,000
Description:	The New York City Department of Parks and Recreation will establish a paid internship and training program for economically disadvantaged and minority high school and college students. The program will implement habitat restoration projects on parklands in southeastern Queens and provide free and accessible programming to the local community, such as volunteer opportunities and environmental education events.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Community-Driven Restoration Priorities and Meaningful Engagement in the Scajaquada Creek Watershed
Recipient:	Buffalo Niagara Waterkeeper, Inc.
Federal Funding:	$900,000
Description:	This initiative will restore habitat in the highly impaired Scajaquada Creek watershed in New York, collaborating closely with community members in adjacent neighborhoods. The awardee will build a coalition to engage community members, conduct partner outreach to inform the creation of a restoration and resilience plan, and advance efforts to restore habitat along the creek.

Rhode Island

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Catalyzing Citizen Engagement in Port of Providence Habitat Restoration and Climate Resilience
Recipient:	City of Providence
Federal Funding:	$530,000
Description:	The city of Providence will partner with Groundwork Rhode Island and Save the Bay to conduct community engagement, perform a technical evaluation of the existing ecological conditions of the Port of Providence's northern shoreline, and identify shoreline restoration and waterfront access opportunities. The findings of these efforts will be used to design projects that integrate underserved community feedback.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Improving Coastal Wetland Resilience Within the Narragansett Bay National Estuarine Research Reserve
Recipient:	Rhode Island Department of Environmental Management
Federal Funding:	$200,000
Description:	This award will support the design and permitting phases of projects that protect important coastal wetland habitats within the Narragansett Bay National Estuarine Research Reserve on Prudence Island. The restoration designs, which help mitigate sea level rise, will provide room for the habitat to move upland.

Great Lakes
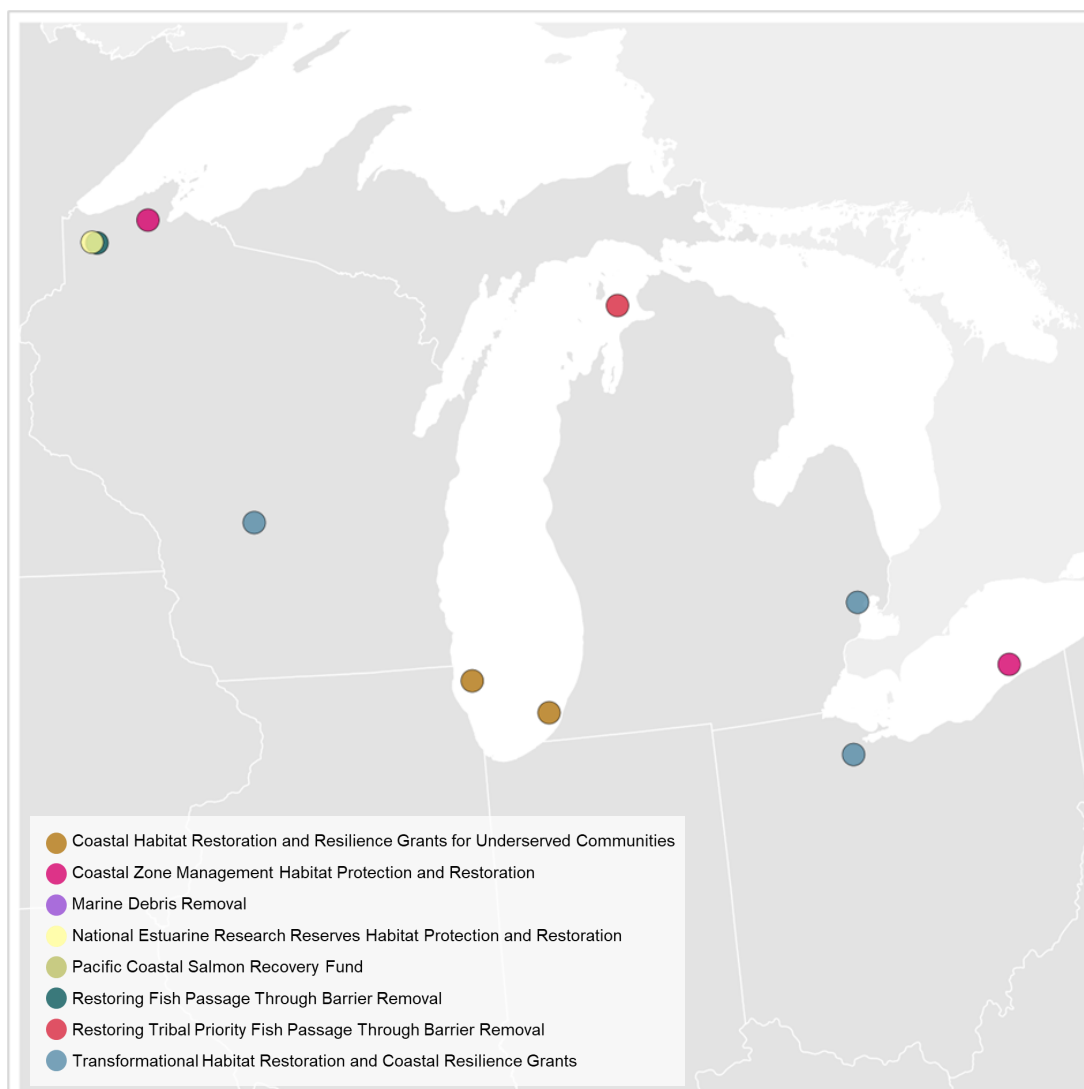
Figure B-2. Map of Great Lakes Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-State Projects

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Reconnecting Stream Habitat in Shared Priority Waters in the Lake Michigan and Lake Superior Basins and Building Local Capacity to Improve Future Fish Passage
Recipient:	Trout Unlimited, Inc.
Federal Funding:	$4.8 million
States Involved:	Wisconsin and Michigan
Description:	Trout Unlimited will remove or replace eight fish passage barriers and open 55 miles of habitat within Great Lakes cold water streams. These projects will create benefits for native migratory and non-migratory fish populations of the Great Lakes and their tributaries. These modifications will also reduce flood risk to nearby Tribal, rural, and underserved communities.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Establishing Regional Restoration Visions and Identifying Projects Within the Lake Superior Headwaters Sustainability Partnership Region
Recipient:	University of Wisconsin System
Federal Funding:	$350,000
States Involved:	Wisconsin and Minnesota
Description:	The awardee will develop habitat restoration visions for congruent geographic regions within the St. Louis River Estuary, with guidance from a diverse group of partners. This approach will result in community-supported habitat conservation and restoration projects that are climate resilient and aligned with a broadly accepted regional vision.

Indiana

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Critical Habitat Restoration and Planning Through Community Engagement in Gary, Indiana
Recipient:	National Audubon Society, Inc.
Federal Funding:	$310,000
Description:	The National Audubon Society will conduct a community-driven planning effort and begin work to restore degraded wetland habitat along the West Branch of the Little Calumet River in Gary, Indiana. They will gather community members' current perspectives and future visions to inform a plan for restoring Marshalltown Marsh and Hatcher Park.

Michigan

Program:	Restoring Tribal Priority Fish Passage Through Barrier Removal
Award Title:	Restoring Tribal Priority Fish Passage Through Barrier Removal Under the IIJA
Recipient:	Grand Traverse Band of Ottawa and Chippewa Indians
Federal Funding:	$3.6 million
Description:	This project will replace 12 road-stream crossings with fish passage infrastructure across six counties and nine rivers and creeks to restore and protect healthy fisheries that support sustainable outdoor recreation and tourism. The project will also investigate fish passage alternatives for two hydropower dams that are up for federal relicensing.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Lower Lake St. Clair Habitat Restoration Project
Recipient:	Edsel and Eleanor Ford House
Federal Funding:	$7.1 million
Description:	The Edsel and Eleanor Ford House will develop design plans and restore habitat along almost 1 mile of Lake St. Clair shoreline. When fully implemented, this project will benefit several native Great Lakes species, reduce impacts from waves and flooding, reduce polluted runoff and nutrient loads, and increase recreational fishing opportunities.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Ox Creek Corridor Ecosystem Restoration
Recipient:	Southwest Michigan Planning Commission
Federal Funding:	$1.0 million
Description:	The Southwest Michigan Planning Commission will coordinate with the city of Benton Harbor to hire an administrator to manage an effort to revitalize the area surrounding Ox Creek. The new project administrator will help build a coalition of residents and local organizations, conduct community outreach, develop a habitat restoration plan that incorporates public input, and implement two pilot habitat restoration projects.

Ohio

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Sandusky Bay Initiative Pickerel Creek East Nature-Based Shoreline
Recipient:	The Nature Conservancy
Federal Funding:	$5.5 million
Description:	The Nature Conservancy will restore shoreline and marsh habitat in Pickerel Creek Wildlife Area along Lake Erie's Sandusky Bay. When fully implemented, construction of an offshore berm will reduce wave energy and exposure, helping to rebuild and protect a historic shoreline that has been impacted by severe erosion. This award will also support the reestablishment of vegetated areas that native Great Lakes species depend upon.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Chagrin River Floodplain Land Conservation Project
Recipient:	Ohio Department of Natural Resources, Office of Coastal Management
Federal Funding:	$1.7 million
Description:	This grant will be used to acquire 105 acres of critical riparian habitat along the Chagrin River for conservation. Conservation of this land will increase climate resilience for urban coastal communities and will contribute to a growing conservation, public access, and recreation corridor along the river from downtown Willoughby to Lake Erie.

Wisconsin

| Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Wisconsin Coastal Management Program/Bayfield County: Sand River Headwaters Acquisition
Recipient:	Wisconsin Department of Administration
Federal Funding:	$2.0 million
Description:	Bayfield County will acquire 2,001 acres of ecologically significant habitat that is vital to the health and functioning of Lake Superior's coastal resources and ecosystem services. The area will provide spawning areas for Great Lakes fish, aesthetic views of Lake Superior, and passive recreation opportunities.

South
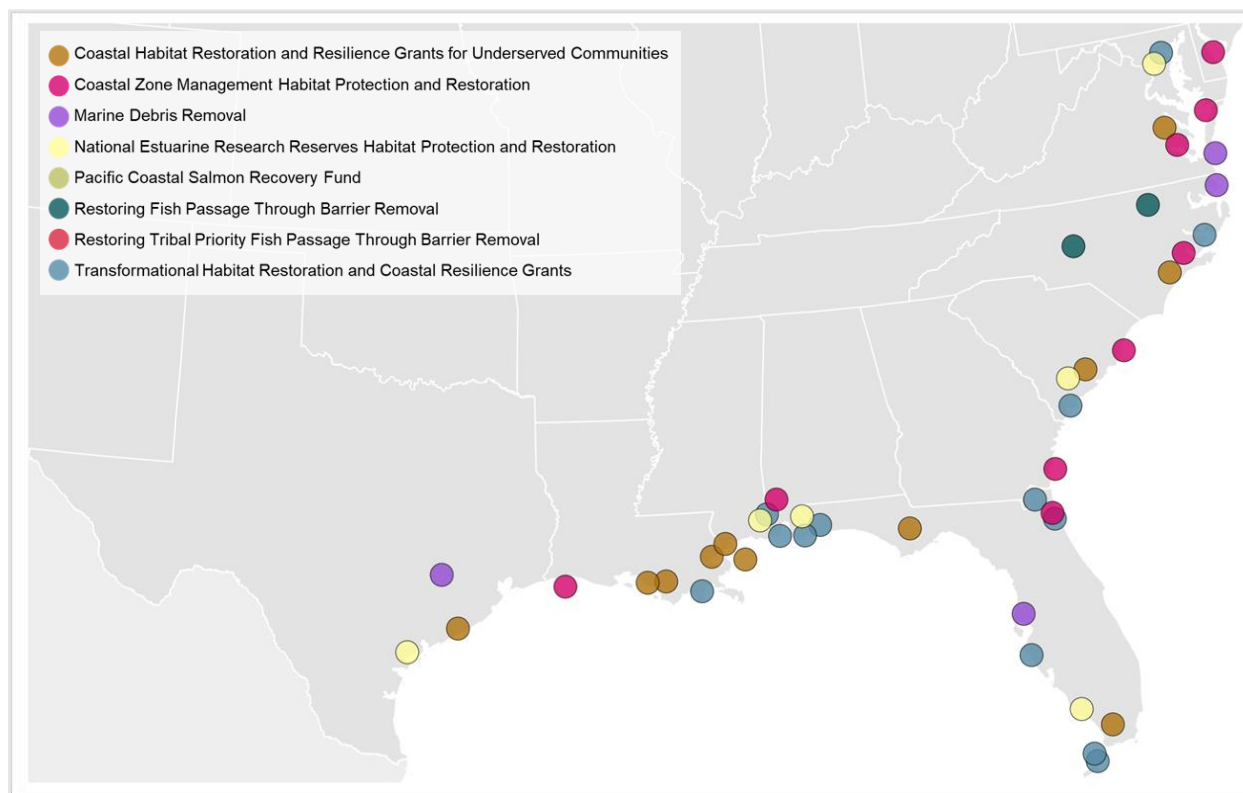
Figure B-3. Map of South Region Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-State Projects

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Perdido Watershed Habitat and Community Resilience Initiative: Incorporating Nature-Based and Hybrid Solutions Across Alabama and Florida
Recipient:	The Nature Conservancy
Federal Funding:	$12.6 million
States Involved:	Alabama and Florida
Description:	The Nature Conservancy will enhance climate resilience in Alabama and Florida as part of the Perdido Watershed Habitat and Community Resilience Initiative. This large-scale, multi-site effort will restore habitat and develop programs to help communities plan for and implement nature-based solutions to climate impacts, such as living shorelines.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Gulf of Mexico Community-Based Oyster Recycling and Reef Restoration Network
Recipient:	Restore America's Estuaries
Federal Funding:	$5.0 million
States Involved:	Texas, Alabama, and Florida
Description:	Restore America's Estuaries will restore oyster reef habitat across the Gulf of Mexico region by implementing shell recycling programs and installing oyster reef restoration sites that are designed to serve local ecosystem and community resilience needs. The restored oyster reefs will provide habitat for a diverse group of species, while protecting shorelines from waves and implementing water quality improvements will benefit communities.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Co-Creating Inclusive Community Resilience Projects with Nature-Based Solutions in the Coastal Carolinas
Recipient:	National Audubon Society, Inc.
Federal Funding:	$500,000
States Involved:	South Carolina and North Carolina
Description:	The National Audubon Society will work with coastal communities to identify and propose nature-based solutions that increase resilience to extreme weather and climate change. They will collaboratively create a suite of proposed projects that address the goals and challenges of Awendan and McClellanville in South Carolina and Columbia and Tyrrell County in North Carolina.

Program:	Marine Debris Removal
Award Title:	Coordinated Large Marine Debris Removal in the Gulf of Mexico
Recipient:	Gulf of Mexico Alliance
Federal Funding:	$7.7 million
States Involved:	Texas, Louisiana, Mississippi, Alabama, and Florida
Description:	The Gulf of Mexico Alliance is working across all five Gulf states to lead a regional competitive grant program to remove large marine debris, remove abandoned and derelict vessels, and assess habitat impacts and recovery. The removals will benefit NOAA trust resources and increase awareness of marine debris impacts.

Program:	Marine Debris Removal
Award Title:	High-Impact and Large Marine Debris Removal Throughout the National Marine Sanctuary System
Recipient:	National Marine Sanctuary Foundation
Federal Funding:	$15.0 million
States Involved:	Washington, California, Texas, and Louisiana
Description:	This project will remove abandoned and derelict vessels, derelict fishing gear, derelict structures, and other large-scale marine debris from five national marine sanctuaries and two Tribal ancestral waters located off the coasts of Washington, California, Texas, and Louisiana. (*Note that due to the multi-state and multi-region nature of this award, this award is also listed under the West region.*)

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Multi-Site Coral Reef Restoration to Build Resilient Communities in Florida, Puerto Rico, and the U.S. Virgin Islands
Recipient:	Coral Restoration Foundation, Inc.
Federal Funding:	$6.9 million
States Involved:	Florida, Puerto Rico, and the U.S. Virgin Islands
Description:	The Coral Restoration Foundation will help rebuild populations of five endangered corals at multiple sites across Florida, Puerto Rico, and the U.S. Virgin Islands. The awardee will use technologies and best practices from the Florida Keys, where practitioners are at the forefront of coral restoration, to increase the capacity for coral restoration in Puerto Rico and the U.S. Virgin Islands by developing and scaling up coral nursery infrastructure. (*Note that due to the multi-region nature of this award, this award is also listed under the Caribbean region.*)

Alabama

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Implementing Nature-Based Solutions for Habitat, Community, and Coastal Resilience in Mississippi Sound
Recipient:	The Nature Conservancy
Federal Funding:	$14.6 million
Description:	The Nature Conservancy will construct a living shoreline breakwater to protect the southeastern shoreline of Coffee Island in Mississippi Sound. The awardee will construct 5,000 feet of large, overlapping breakwaters, which will help protect marshes, seagrasses, and shorelines. Protection of Coffee Island will also provide resilience benefits to nearby coastal habitats and communities on the mainland.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Acquisition of Coastal Pine Savannah and Emergent Marsh Habitat on West Fowl River/ Mississippi Sound in Mobile County, Alabama
Recipient:	Alabama Department of Conservation and Natural Resources
Federal Funding:	$1.1 million
Description:	The awardee will acquire approximately 490 acres of critical habitat and conserve critically imperiled habitats along the northern Gulf of Mexico. The acquisition will protect sensitive habitats and the ecosystem services they provide, including providing habitat and nursery ground for commercially and recreationally important fishery species, coastal flooding protection, and carbon sequestration services.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Fee Simple Acquisition of 40-Acre Maury Tract in the Meadows Unit of the Weeks Bay National Estuarine Research Reserve
Recipient:	Alabama Department of Conservation and Natural Resources
Federal Funding:	$150,000
Description:	This 40-acre acquisition of the Maury tract in the Weeks Bay National Estuarine Research Reserve in Fairhope, Alabama, will complement previous acquisition and management efforts to protect the area's ecological integrity and important ecosystem services. The Maury tract acts as a buffer for storm surge and coastal flooding, provides space for marsh migration, and helps maintain water quality.

Florida

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Sarasota County Alligator Creek Stream Restoration
Recipient:	County of Sarasota
Federal Funding:	$14.6 million
Description:	Sarasota County will remove upstream barriers to low-salinity habitat and increase the floodplain's resilience to sea level rise. Local communities will benefit from increased protection from flooding and enhanced recreational opportunities, while endangered smalltooth sawfish and key recreational species will benefit from improved habitat.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Hogans Creek Restoration Design Project
Recipient:	Groundwork Jacksonville, Inc.
Federal Funding:	$2.9 million
Description:	This planning effort will support the restoration of wetland and upland habitats along Hogans Creek, including removing culverts and adding daylighting sections of the creek that run underground. The design will create habitat for species such as sturgeon, shrimp, crabs, and red drum; improve water quality; and provide opportunities for recreation.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Pensacola Bay System Oyster Restoration Initiative
Recipient:	Pensacola and Perdido Bays Estuary Program, Inc.
Federal Funding:	$11.0 million
Description:	This award will launch an estuary-scale oyster restoration project in Pensacola Bay that will design the restoration of more than 1,000 acres of oyster reefs, initiate construction, and assess conditions to help prioritize locations for oyster restoration sites. Additionally, this project will also complete the early planning stages for the Sandy Hollow Gully restoration, which will address upstream sedimentation sources impacting downstream oyster habitat quality.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	McCoys Creek Restoration Construction—The Branches
Recipient:	Groundwork Jacksonville, Inc.
Federal Funding:	$2.8 million
Description:	Groundwork Jacksonville will restore riparian, wetland, forest, and shoreline habitat to support the food web relied upon by species like red drum and improve community resilience. The work will eliminate or reduce flooding for homes and other structures in adjacent neighborhoods, increase and enhance green space as part of the Emerald Trail system, and improve the water quality of the stream.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Mote Marine Laboratory: Pathways to Transformative Ecological Restoration of Florida's Coral Reef
Recipient:	Mote Marine Laboratory, Inc.
Federal Funding:	$7.0 million
Description:	Mote Marine Laboratory will restore iconic coral reefs at multiple sites in the Florida Keys National Marine Sanctuary. Over five years, Mote will outplant thousands of coral fragments of multiple species, including endangered staghorn and elkhorn corals and massive reef-building corals.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	North Port St. Joe Stormwater Management
Recipient:	City of Port St. Joe
Federal Funding:	$280,000
Description:	A hydrologic and hydraulic study and associated outreach will support the development of nature-based solutions to improve flooding issues in North Port St. Joe, a predominantly African American community within Port St. Joe. The study will improve the understanding of how local water bodies interact hydraulically and inform design solutions to address stormwater flooding issues and future storm surge threats.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Your Shores: Coastal Habitat Restoration with Frost Science's Upward Bound Math and Science Program
Recipient:	Phillip and Patricia Frost Museum of Science, Inc.
Federal Funding:	$610,000
Description:	This initiative will restore coastal habitat in northern Miami-Dade County while providing high school students with paid, immersive opportunities in the restoration field. Students will receive training and hands-on experience in restoring coral reefs, mangroves, and beach dunes in Haulover Park, one of the longest remaining stretches of undeveloped beachfront in the county.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Critical Conservation Land Acquisition for Climate Resilience in the Northeast Florida Blueway
Recipient:	Florida Department of Environmental Protection
Federal Funding:	$6.0 million
Description:	This award will fund the acquisition of a portion of the Northeast Florida Blueway. Acquiring this acreage will protect the waters and shoreline plant communities of the Tolomato and Matanzas Rivers, which provide critical habitat for many native species. This initiative will connect natural areas to form a conservation corridor and watershed buffer along the Northeast Florida Intracoastal Waterway.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Henderson Creek Hydrologic Restoration Project
Recipient:	Florida Department of Environmental Protection
Federal Funding:	$4.0 million
Description:	This award will fund restoration of hydrologic sheet flow and related hydrologic regimes within the Rookery Bay National Estuarine Research Reserve. The project will increase habitat resilience against future climate change impacts by enhancing wildlife habitat, hydrologic connectivity, wildlife corridor connectivity, and water quality, as well as by preserving stormwater receiving areas that help prevent flooding in local communities.

Program:	Marine Debris Removal
Award Title:	Operation TRAP (Trash Reduction for Aquatic Preserves)
Recipient:	University of Florida
Federal Funding:	$750,000
Description:	The University of Florida, in partnership with local governments and Florida's aquatic preserve systems, will implement Operation TRAP to intercept litter before it reaches coastal waterways. Operation TRAP will install interception technologies and engage the community to encourage the reduction of single use items, while physically preventing litter from entering Florida's aquatic preserves in the Big Bend and Nature Coast regions.

Georgia

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Ossabaw Island Living Shoreline: A Collaboration to Model Resiliency Through Ecosystem Restoration
Recipient:	Georgia Department of Natural Resources
Federal Funding:	$830,000
Description:	This award will result in the design and construction of a living shoreline on Ossabaw Island in Georgia. The Georgia Department of Natural Resources will restore functional estuarine habitat and protect natural shoreline ecosystems while preserving unique cultural and archeological resources.

Louisiana

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Bucktown Marsh Restoration and Living Shoreline
Recipient:	Jefferson Parish
Federal Funding:	$4.5 million
Description:	Jefferson Parish will construct 1 mile of living shoreline and enhance up to 70 acres of marshes, tidal creeks, and lagoons in Bucktown, part of the Greater New Orleans area in Louisiana. Jefferson Parish will rebuild the previously existing natural first line of defense against storm surge and rising sea levels, and support the restoration of the Lake Pontchartrain shoreline's water quality and ecological functions.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Bayou Bienvenue Wetlands Triangle Habitat Restoration—Planning and Design
Recipient:	City of New Orleans
Federal Funding:	$490,000
Description:	The city of New Orleans will restore the Bayou Bienvenue Wetland Triangle, a large and complex wetland next to the Lower Ninth Ward neighborhood. The city will work closely with partners and the local community to create a restoration prioritization plan. Based on the results of that plan, the city will develop designs to restore a portion of the wetlands.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Enhancing the Resilience of Southeast Louisiana's Asian American Fisherfolk Communities: Collaborative Development of a Multi-Scalar Climate Change Adaptation Plan to Protect Regional Shrimping Activities
Recipient:	Water Institute of the Gulf
Federal Funding:	$820,000
Description:	The Water Institute of the Gulf will partner with community liaisons to directly engage southeast Louisiana's Asian American shrimpers and processors and co-develop a climate change adaptation plan to protect their communities. Through interviews, workshops, and interactive modeling activities, the awardee will develop a comprehensive plan that accounts for the specific needs and experiences of Asian American fishing communities.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Caad Kuujaaminix/Bayou Sale Living Shoreline Design
Recipient:	Wayti Services, LLC.
Federal Funding:	$740,000
Description:	The Chitimacha Tribe, through its business, Wayti Services, LLC, will design a living shoreline to restore and protect areas of the Caad Kuujaaminix (Bayou Sale) that are home to Tribal cultural sites. Funding will support staff and technical experts in their work to conduct a study and plan construction methods for creating marsh habitat, protecting the shoreline, and supporting traditional fisheries.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Restoring Louisiana Marshes: Protecting Sacred Sites, Increasing Tribal Resilience, and Reducing Flood Risk
Recipient:	Terrebonne Parish Consolidated Government
Federal Funding:	$1.0 million
Description:	Terrebonne Parish Consolidated Government, with several Tribal and non-Tribal partners, will conduct feasibility studies and develop an engineering design to reverse canals that were carved into the marshes and wetlands for commercial exploration decades ago. This work will help to reduce flood risk, improve subsistence living, reduce erosion rates, and protect sacred sites.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Restoring Resilience Through Central Wetlands Reforestation Collective
Recipient:	Coalition to Restore Coastal Louisiana
Federal Funding:	$720,000
Description:	The Coalition to Restore Coastal Louisiana will restore habitat in the Central Wetlands Unit, a nearly 30,000-acre marsh bordering communities in the Ninth Ward of Orleans Parish and St. Bernard Parish. The awardee will engage local community members in the project to provide the next generation with skills and hands-on experience related to coastal restoration.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Louisiana Coastal Land Acquisition at Rockefeller Wildlife Refuge (Phase I of II)—Cameron Parish, Louisiana
Recipient:	Louisiana Department of Wildlife and Fisheries
Federal Funding:	$4.0 million
Description:	This purchase of 6,800 acres of critical coastal habitat adjacent to the Rockefeller Wildlife Refuge will reduce coastal flood risks, conserve critical ecosystems, preserve habitats for a variety of coastal resources, and provide much needed public recreational opportunities through the expansion of public lands.

Maryland

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Middle Branch Resiliency Initiative: Patapsco Delta Sustainable Fishery and Ecosystem Resilience Project

Recipient:	South Baltimore Gateway Community
Federal Funding:	$5.6 million
Description:	South Baltimore Gateway Partnership will restore marsh habitat in an urban ecosystem in Baltimore City as part of a larger initiative to reconnect South Baltimore residents to the nearby river. The nature-based infrastructure is expected to reduce erosion and flooding and the restored marshes will be designed to continuously adapt to rising sea levels.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Jug Bay Wetlands Sanctuary Stream and Shoreline Restoration, Phase I
Recipient:	Maryland Department of Natural Resources
Federal Funding:	$1.0 million
Description:	This award will result in the creation of a freshwater tidal marsh living shoreline through the restoration of three headwater streams and implementation of upland stormwater best management practices in the Jug Bay Wetlands Sanctuary. These efforts will enhance the tidal marsh's resilience to sea level rise, significantly reduce sediment and nutrient pollution flow to the Chesapeake Bay, and increase resilience to increased rainfall events.

Mississippi

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Creating a Multi-Beneficial Stormwater Park Using Nature-Based Solutions
Recipient:	Mississippi Department of Marine Resources
Federal Funding:	$320,000
Description:	This award will support the development and planning of a community stormwater park in Moss Point to reduce flooding and nonpoint source pollution while providing recreation opportunities for the nearby underserved communities.

North Carolina

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Removing Barriers and Restoring Connectivity on the Roanoke River
Recipient:	The Nature Conservancy
Federal Funding:	$3.3 million
Description:	The Nature Conservancy will replace six undersized culverts with bridges and remove two earthen barriers in rural areas within the floodplain of the lower Roanoke River. This restoration will support climate and ecological resilience by rehydrating the floodplain, reducing flooding, improving water quality, and benefitting blueback herring directly and other alosines indirectly.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Watershed Restoration of the Upper Cape Fear and Lower Deep Rivers
Recipient:	American Rivers, Inc.
Federal Funding:	$7.4 million
Description:	American Rivers will remove three dams and initiate pre-removal activities for two more dams, opening nearly 100 miles of river and 1,024 miles of streams. These efforts will reduce flooding and flood elevation, restore floodplains, boost recreational and economic opportunities in the region, and restore habitat for several migratory fish species in the Cape Fear watershed.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Completing the Pamlico Sound Oyster Sanctuary and Training the Next Generation of Marine Science Professionals
Recipient:	North Carolina Coastal Federation, Inc.
Federal Funding:	$14.9 million
Description:	This project will restore nearly 120 acres of oyster habitat in Pamlico Sound, completing the 500-acre goal of the Jean Preston Memorial Oyster Sanctuary and directly supporting oyster populations by providing habitat for oyster larvae. Additionally, North Carolina Coastal Federation will provide hands-on opportunities for underrepresented students of marine sciences to engage with K–12 students through education programs.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Capacity Expansion to Support Habitat Restoration and Resilience in the Gullah Geechee Corridor
Recipient:	Gullah Geechee Cultural Heritage Corridor, Inc.
Federal Funding:	$540,000
Description:	This award will create new staff positions at Gullah Geechee Cultural Heritage Corridor, Inc., to expand its work creating a plan for restoration and resilience across the corridor. The new staff members will help build relationships between restoration organizations and Gullah Geechee communities, identify community resilience priorities, and form local advisory committees to support future restoration efforts.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Bay River Coastal Partnership
Recipient:	North Carolina Wildlife Resources Commission
Federal Funding:	$500,000
Description:	This award will fund the purchase and conservation of an ecologically significant coastal property within the over 400-acre Bay River Tract. This effort aims to protect an undeveloped natural shoreline and rare coastal forest communities, minimize loss of life and property by directing development out of a high-risk area, and safeguard coastal water quality along the Bay River.

Program:	Marine Debris Removal
Award Title:	North Carolina Large-Scale Marine Debris and Abandoned and Derelict Vessels Removal
Recipient:	North Carolina Coastal Federation, Inc.
Federal Funding:	$4.5 million
Description:	North Carolina Coastal Federation will remove storm-related construction debris, lost fishing gear, and up to 50 abandoned boats, recycling 25 percent of the materials. The Federation will also improve building standards and maintenance practices to reduce future marine debris. Additionally, this project will engage in public education, including volunteer cleanup activities, to enhance awareness and stewardship of coastal resources.

South Carolina

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Transforming the Scale and Equity of Living Shorelines in South Carolina
Recipient:	The Nature Conservancy
Federal Funding:	$6.8 million
Description:	The Nature Conservancy will construct a living shoreline at Marine Corps Air Station Beaufort as part of a wider effort to implement living shoreline projects in underserved communities and develop statewide resilience using nature-based solutions. These actions will protect eroding marshes, enhance oyster reefs, protect coastal communities, and support habitat for 18 federally managed fish species and their forage species.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Improving the Resilience of Salt Marsh Ecosystems Within the Ashepoo-Combahee-Edisto (ACE) Basin through the Creation of Intertidal Oyster Reef Habitat
Recipient:	Natural Resources South Carolina Department
Federal Funding:	$620,000
Description:	This restoration project will create intertidal oyster reefs in the ACE Basin National Estuarine Research Reserve to address salt marsh erosion and habitat loss and promote salt marsh stewardship through partner engagement.

Program	Coastal Zone Management Habitat Protection and Restoration
Award Title:	South Carolina's Black River State Park—Weyerhaeuser "Andrews Tract"—Land Conservation Project
Recipient:	South Carolina Department of Health and Environmental Control
Federal Funding:	$4.5 million
Description:	The awardee will obtain an 1,800-acre tract of key floodplain properties within two coastal counties, adding to the five riverfront properties already secured to establish the new Black River State Park. This property creates a walkable connection to the rural town of Andrews, which has experienced extreme flood damage and is planning to link its economic development to the park and the Black River.

Texas

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Building Organizational Capacity to Enhance and Supplement Coastal Conservation and Resiliency Efforts in the Matagorda Bay Ecosystem
Recipient:	The Matagorda Bay Foundation
Federal Funding:	$600,000
Description:	The Matagorda Bay Foundation will conduct restoration and resilience planning for Matagorda Bay, one of the largest estuaries on the Texas coast, with the support of new and current staff. The staff members will connect with and empower local communities in Calhoun and Matagorda Counties, collect information for use in strategic conservation planning, and identify priorities for future restoration projects.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Protection and Restoration of the Bird Nesting Island in the Aransas Bay
Recipient:	University of Texas at Austin
Federal Funding:	$4.0 million
Description:	The University of Texas at Austin will protect and restore a 3-acre island in Aransas Bay that provides critical nesting habitat for hundreds of pairs of colonial nesting waterbirds, such as pelicans and egrets. Restoration activities will support the recruitment and growth of oyster larvae, resulting in the development of an oyster reef complex that will create habitat for recreational and commercial fish species.

Virginia

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Environmental Resilience: The Mattaponi Indian Tribe and Reservation Coastal Habitat Restoration
Recipient:	Mattaponi Indian Reservation
Federal Funding:	$1.0 million
Description:	The Mattaponi Indian Reservation will restore approximately 450 linear feet of eroding shoreline, enhancing community resilience and contributing to regional goals for fisheries, water quality, and habitat restoration. This project will increase the Tribe's capacity for regional restoration activities, support staff positions, and engage Tribal members in water quality monitoring.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	A Whole System Restoration of Seagrass, Bay Scallop, and Associated Ecosystem Functions in the Coastal Lagoons of Virginia's Northern Eastern Shore
Recipient:	Virginia Department of Environmental Quality
Federal Funding:	$2.3 million
Description:	Building on previous successes in southern Virginia, the Virginia Department of Environmental Quality will restore eelgrass and bay scallops in Burtons Bay by planting at least 60 acres of eelgrass and releasing over 6 million bay scallops, with long-term monitoring to assess impacts on water clarity, carbon stocks, and commercial species productivity.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Conservation of Ancestral Lands—Upper Mattaponi Indian Tribe's Return to the River
Recipient:	Virginia Department of Environmental Quality
Federal Funding:	$3.0 million
Description:	The Upper Mattaponi Indian Tribe, through the Virginia Coastal Zone Management Program, will acquire and conserve 866 acres of historic Tribal lands along the Mattaponi River within the Chesapeake Bay watershed. This first-time acquisition will enable the Tribe to restore habitat on a former sand and gravel mine, enhancing culturally significant fish, wildlife, and plants for the benefit of both Tribal citizens and the broader community.

Program:	Marine Debris Removal
Award Title:	Removing Abandoned and Derelict Vessels in Virginia and Building Capacity for a Statewide Removal and Disposal Program
Recipient:	Lynnhaven River NOW
Federal Funding:	$2.9 million
Description:	Lynnhaven River NOW will remove up to 100 abandoned and derelict vessels from Virginia's coastal zone and conduct outreach and education to develop a future Abandoned and Derelict Vessel Removal and Prevention Program.

West
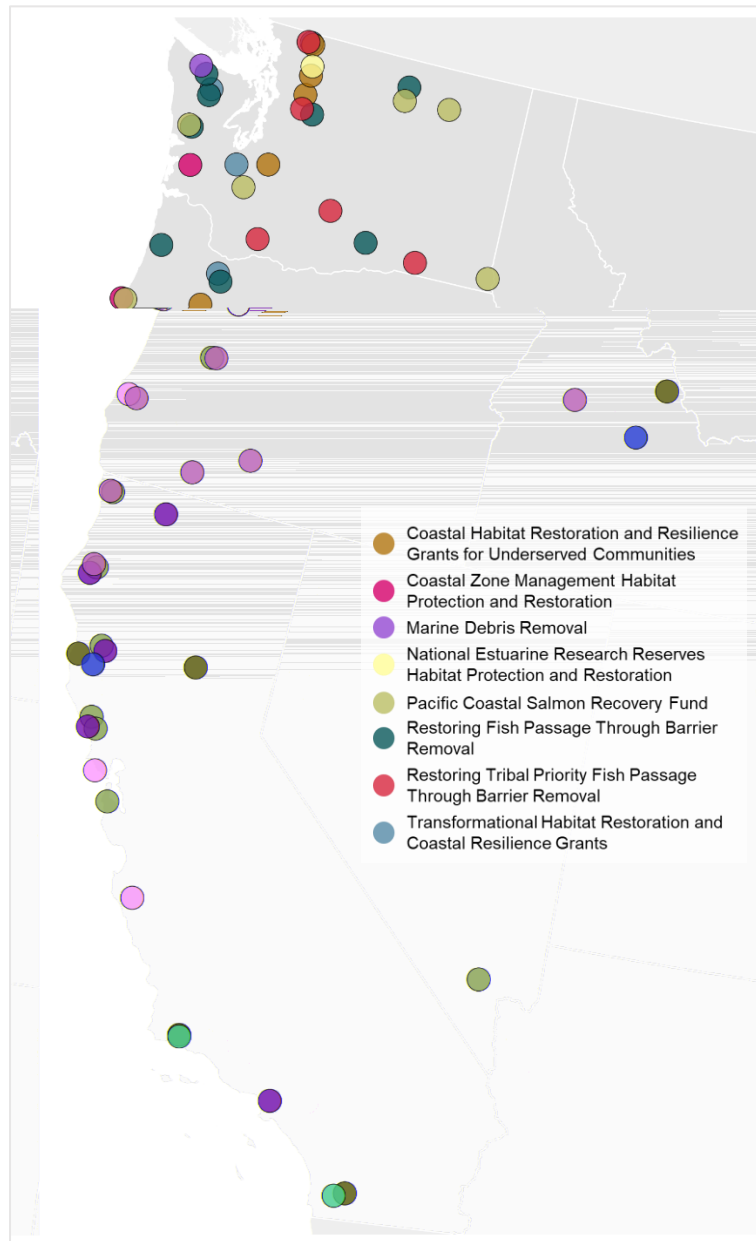
Figure B-4. Map of West Region Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-State Projects

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Umatilla Tribe Ceded Area Juvenile and Adult Passage Improvement Project
Recipient:	Confederated Tribes of the Umatilla Indian Reservation
Federal Funding:	$3.3 million
States Involved:	Washington and Oregon
Description:	The Confederated Tribes of the Umatilla Indian Reservation will remove or remediate physical barriers to migrating juvenile and adult salmonids and other native fish species in three sub-basins within the Tribes' ceded territory. This work will improve or fully provide access to habitat for Endangered Species Act–listed steelhead, bull trout, and spring Chinook salmon.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Restoring Kelp Forest Habitat in Greater Farallones
Recipient:	Greater Farallones
Federal Funding:	$4.9 million
States Involved:	California and Washington
Description:	The Greater Farallones Association will restore 50 acres of bull kelp habitat in the Greater Farallones National Marine Sanctuary by removing purple sea urchins and outplanting bull kelp. This restoration aims to counteract the loss of over 90 percent of bull kelp from the warm water events of 2014–2016, benefiting the broader ecosystem and local fisheries.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	2022 Salmon and Steelhead Recovery Program
Recipient:	Klamath River Inter-Tribal Fish and Water Commission
Federal Funding:	$1.4 million
States Involved:	Oregon and California
Description:	This program will assist commission-member Tribes in conducting biologically sound salmon fisheries and recovery programs. The commission will administer and monitor projects selected to receive funding by providing guidelines for efficient distribution of funds, technical assistance, information sharing, policy coordination, and grant administration.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Shoshone-Bannock Tribes Cultural and Subsistence Fishery Monitoring and Management Program
Recipient:	Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho
Federal Funding:	$40,000
States Involved:	Idaho and Oregon
Description:	This award funds the Shoshone-Bannock's participation in fishery forecasting and in-season management of Tribal Chinook salmon fisheries on the Snake River in spring/summer. The Tribes will set fishing regulations, guidelines, and seasons while coordinating these activities with Tribal, state, and federal co-managers.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Columbia River Basin Salmon Recovery
Recipient:	Columbia River Inter-Tribal Fish Commission
Federal Funding:	$4.1 million
States Involved:	Washington, Idaho, and Oregon
Description:	The Columbia River Inter-Tribal Fish Commission will administer funds to Tribal projects related to salmon habitat restoration, salmon stock enhancement, salmon research, and supporting planning, assessment, and outreach activities. These projects will benefit Pacific anadromous salmonids (Chinook, coho, chum, sockeye, and pink salmon and steelhead) and should ultimately have a beneficial impact on Southern Resident killer whale survival levels.

Program:	Marine Debris Removal
Award Title:	High-Impact and Large Marine Debris Removal Throughout the National Marine Sanctuary System
Recipient:	National Marine Sanctuary Foundation
Federal Funding:	$15.0 million
States Involved:	California, Louisiana, Texas, and Washington
Description:	This project will remove abandoned and derelict vessels, derelict fishing gear, derelict structures, and other large-scale marine debris from five national marine sanctuaries and two Tribal ancestral waters located off the coasts of Washington, California, Texas, and Louisiana. (*Note that due to the multi-state and multi-region nature of this award, this award is also listed under the South region.*)

California

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Lower Jalama Creek Fish Passage Implementation Project
Recipient:	The Nature Conservancy
Federal Funding:	$2.1 million
Description:	The Nature Conservancy and its partners will address two barriers on Jalama Creek that are crucial for the recovery of Southern California steelhead. They will remove a weir, build a roughened channel at Jalama Road Bridge, and provide nearby communities with access to over 12 miles of habitat that will serve as a thermal refugia in a future climate.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	High-Priority Barrier Removal for California North Coast Salmon
Recipient:	Trout Unlimited, Inc.
Federal Funding:	$6.2 million
Description:	Trout Unlimited will remove seven and develop two additional plans that address high-priority barriers in the Eel, Noyo, Navarro, and Big Rivers of coastal northern California. These efforts will benefit endangered and threatened salmon and steelhead species, engage local Tribal governments and communities, improve safety, reduce maintenance costs, and provide jobs and public outreach in disadvantaged areas.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Engaging Community and Reconnecting Anadromy in Ótakim Séwi (Big Chico Creek)
Recipient:	California Trout, Inc.
Federal Funding:	$9.9 million
Description:	California Trout will remove a rockfall barrier and obsolete fishway in California's Big Chico Creek that currently impede Central Valley spring-run Chinook and Central Valley steelhead. California Trout will perform the design, permit, and planning work necessary for the removal.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Santa Margarita River Bridge Replacement and Fish Passage Project
Recipient:	California Trout, Inc.
Federal Funding:	$3.3 million
Description:	California Trout will replace a barrier on the Santa Margarita River with a bridge designed for climate change resilience. This project will allow endangered Southern California steelhead to access 12 miles of upstream habitat, decrease roadway flooding, and restore natural channel processes. It will also engage the nearby communities, including the Pechanga Tribe, through construction, education, and job development efforts.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Salmonid Passage Remediation and Tribal Capacity Building on the Eel River, California
Recipient:	Round Valley Indian Tribes
Federal Funding:	$1.3 million
Description:	The Round Valley Indian Tribes will build capacity for restoration through the decommissioning and removal of the Scott Dam on the Eel River, a historically significant Tribal resource. This project will enhance Tribal participation through equipment purchase and data collection on steam flow management, ensuring that project outcomes align with Tribal objectives.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Mendocino Coast Transformational Habitat Restoration for Coho Salmon Recovery
Recipient:	The Nature Conservancy
Federal Funding:	$8.3 million
Description:	The Nature Conservancy will improve high-priority habitat for Central California Coast coho salmon and California Coastal Chinook on three rivers in coastal Mendocino County by restoring floodplain and stream habitat. Benefits will include enhanced instream complexity, improved floodplain water storage, and employment and engagement opportunities for local and underserved communities and Tribes.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Lower Russian River Watershed Coho Habitat Restoration
Recipient:	Gold Ridge Resource Conservation District
Federal Funding:	$8.5 million
Description:	Gold Ridge Resource Conservation District will lead wetland and floodplain restoration at seven sites in two high-priority tributaries in the lower Russian River watershed. These efforts aim to improve connectivity between streams and their floodplains, restore and reconnect wetlands, and remove barriers to fish migration, advancing recovery efforts for the Central California Coast coho salmon.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Restoring Rearing Habitat for Juvenile Coho Salmon
Recipient:	Smith River Alliance, Inc.
Federal Funding:	$5.4 million
Description:	The Smith River Alliance will restore habitat in the Smith River watershed to support one of California's largest runs of salmon and steelhead. This project will relocate and replace a bridge to withstand stronger storms and restore floodplain connectivity. It will also bring a design for restoring 2 miles of Delilah Creek to shovel-ready status.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Prairie Creek Floodplain Restoration Project Phase 4
Recipient:	California State Coastal Conservancy
Federal Funding:	$7.0 million
Description:	The California State Coastal Conservancy will complete the final downstream phase of work in Humboldt County's Prairie Creek, restoring floodplain rearing habitat for juvenile salmonids. The work aims to support salmon recovery, provide restoration opportunities on ancestral lands of the Yurok Tribe, and improve climate resilience by maintaining cool upstream temperatures and reducing flooding.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Priority Coho Salmon and Steelhead Watershed Restoration, Northern Santa Cruz Mountains
Recipient:	San Mateo County Resource Conservation District
Federal Funding:	$5.2 million
Description:	The San Mateo County Resource Conservation District will restore habitat for Central California Coast coho salmon and steelhead in three severely degraded watersheds in northern California by funding 18 restoration projects to improve fish passage, reconnect floodplains, and create habitat for various salmon life stages. This work will benefit local communities by reducing flooding and enhancing access to a clean, reliable water supply.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Baldwin Hills Parklands Community Connections: Habitat Restoration/Climate Resiliency Program—Phase 1
Recipient:	Nature Nexis Institute
Federal Funding:	$930,000
Description:	The Nature Nexus Institute will engage South Los Angeles community members in habitat restoration through nature hikes, field trips, workshops, and hands-on restoration activities. The institute will restore habitat at two parks in the Baldwin Hills (Baldwin Hills Scenic Overlook State Park and Kenneth Hahn State Recreation Area) which are the closest no-cost, open-space recreational areas available to local residents.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	A Tribal–Scientific Alliance to Restore Red Abalone in Northern California's Kelp Forest Ecosystem
Recipient:	Kashia Band of Pomo Indians of the Stewarts Point Rancheria
Federal Funding:	$1.6 million
Description:	The Kashia Band of Pomo Indians of the Stewarts Point Rancheria will build capacity to participate in and lead abalone restoration on their ancestral lands by establishing a Tribal breeding program for red abalone and by training and employing Tribal divers to conduct ecological monitoring. The Tribe will also pilot experimental removals of purple sea urchins to help improve habitat conditions for red abalone.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Salmon River Tributary Salmonid Habitat Enrichment Project
Recipient:	Salmon River Restoration Council
Federal Funding:	$460,000
Description:	The Salmon River Restoration Council will advance habitat restoration planning for three tributaries of the South Fork and mainstem Salmon River in the Klamath Basin, near the remote rural communities of Sawyers Bar, Forks of Salmon, Cecilville, and Somes Bar, California. Located in the ancestral territory of the Karuk Tribe, the project will involve direct input from the Tribe at all levels.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Ackerman Creek Restoration Design Project
Recipient:	Pinoleville Pomo Nation
Federal Funding:	$800,000
Description:	The Pinoleville Pomo Nation will develop a plan to reconnect Ackerman Creek, a tributary of the Russian River, to its floodplain. Funding will support Tribal staff positions to lead the planning effort and collaborate with partners. Collaboration efforts will engage Tribal members and community members to incorporate their cultural and traditional ecological knowledge.

Program:	**Coastal Habitat Restoration and Resilience Grants for Underserved Communities**
Award Title:	Red Cap Creek Floodplain Restoration Project
Recipient:	Mid Klamath Watershed Council
Federal Funding:	$500,000
Description:	The Mid Klamath Watershed Council will partner with the Karuk Tribe to restore habitat in Red Cap Creek, a Klamath River tributary on the Tribe's ancestral lands. They will implement restoration efforts to recover coho salmon, which are central to local Indigenous diets and culture. The initiative will provide hands-on opportunities for young people to engage the next generation in environmental stewardship.

Program:	**National Estuarine Research Reserves Habitat Protection and Restoration**
Award Title:	A Path Forward: Codesigning Habitat Protection and Restoration and Community Resilience
Recipient:	San Francisco State University
Federal Funding:	$200,000
Description:	This investment will support existing planning efforts by the National Estuarine Research Reserve System Science Collaborative to restore the marsh in California's China Camp State Park by funding wetland delineation, surface archaeological investigations, and pre-restoration monitoring. These assessments will inform a long-standing community engagement process to identify a community-supported project for restoration of the site.

Program:	**National Estuarine Research Reserves Habitat Protection and Restoration**
Award Title:	Enhancing Climate Resilience Through Coastal Ecosystem Restoration in Elkhorn Slough
Recipient:	Elkhorn Slough Foundation
Federal Funding:	$2.2 million
Description:	This project will restore and enhance climate resilience in three key coastal habitats within the Elkhorn Slough Research Reserve: tidal marshes, native grasslands, and oyster beds. The funding will support restoration, monitoring, and community engagement at the Hester Marsh site, including engagement with local Native American Tribal members.

Program:	**Pacific Coastal Salmon Recovery Fund**
Award Title:	Rowdy and Dominie Creek Fish Passage Improvement Project
Recipient:	Tolowa Dee-Ni Nation
Federal Funding:	$2.0 million
Description:	The Tolowa Dee-Ni Nation will remove and replace the Rowdy Creek Fish Hatchery infrastructure, restoring access to 13 miles of habitat for various aquatic species along Rowdy Creek, which is a key tributary for rebuilding the coho salmon population in the Smith River basin.

Program:	**Pacific Coastal Salmon Recovery Fund**
Award Title:	California Department of Fish and Wildlife's Fisheries Restoration Grant Program
Recipient:	California Department of Fish and Wildlife
Federal Funding:	$16.8 million
Description:	Through a competitive grant process, California will continue recovery efforts for endangered and threatened salmon and steelhead species, including Central California Coast coho and Central Valley winter-run Chinook salmon. Funds will target projects addressing factors that limit the productivity of Endangered Species Act–listed Pacific salmonids, aiming to re-establish self-sustaining populations.

Program:	**Pacific Coastal Salmon Recovery Fund**
Award Title:	Building Wiyot Tribe Capacity for Effective Restoration
Recipient:	Wiyot Tribe
Federal Funding:	$150,000
Description:	The Wiyot Tribe will increase its capacity to reclaim its role as stewards of the Tribe's ancestral territory by learning restoration skills through training and conferences, increasing understanding of issues through partner collaborations, and promoting Tribal involvement in restoration planning through participation in current planning efforts. The initiative will also improve the Tribe's capacity to secure funding for future restoration projects.

Program:	**Marine Debris Removal**
Award Title:	Optimizing Interception Technology Through Upgrades, Maintenance, and Outreach at Tijuana River National Estuarine Research Reserve
Recipient:	California Department of Parks and Recreation
Federal Funding:	$270,000
Description:	The California Department of Parks and Recreation will install and evaluate new interventions to an existing trash boom system at the Goat Canyon Sediment Basins to better capture marine debris entering the Tijuana River National Estuarine Research Reserve. The project will also include marine debris removal and monitoring activities and an education component.

Idaho

Program:	**Restoring Fish Passage Through Barrier Removal**
Award Title:	Idaho Fish Passage Program
Recipient:	Idaho Office of Species Conservation
Federal Funding:	$4.2 million
Description:	The Idaho Office of Species Conservation will improve fish passage in four drainages in the Upper Snake River by addressing two culverts in tributaries of the mainstem Salmon River and two culverts in Clearwater Basin. These efforts will connect tributaries that are colder than the mainstem rivers and will provide coldwater refugia for threatened and endangered species.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Yankee Fork Fish Passage Improvement
Recipient:	Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho
Federal Funding:	$1.1 million
Description:	The Shoshone-Bannock Tribes will evaluate, assess, and restore fish passage and connectivity for migratory fish in the Yankee Fork watershed. The initiative will restore passage in a series of ponds and two disconnected tributaries, enhancing the climate resilience of the fisheries and the watershed while supporting Tribal management of cultural and subsistence resources.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Idaho Salmon Species Recovery 2022
Recipient:	Idaho Office of Species Conservation
Federal Funding:	$7.3 million
Description:	This award funds a grant competition for planning and habitat restoration projects that (1) address factors limiting the abundance and productivity of endangered Pacific salmonids, and (2) align with National Marine Fisheries Service Recovery Plans for Chinook salmon, steelhead, and sockeye salmon. The award will also support monitoring in key watersheds and planning facilitation for the Columbia Basin Collaborative.

Oregon

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Reconnecting Fish Passage to Recover Coast Coho in Oregon
Recipient:	Wild Salmon Center
Federal Funding:	$3.6 million
Description:	The Wild Salmon Center will improve fish passage at nine sites within four Oregon coastal watersheds to help recover two threatened evolutionarily significant units of coho salmon. Projects will remove and replace aging infrastructure including old dams, culverts, and tide gates to increase stream channel connectivity and create off-channel and cold-water refugia.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Kellogg Creek Restoration and Community Enhancement Project
Recipient:	American Rivers, Inc.
Federal Funding:	$15.0 million
Description:	American Rivers will design, permit, and begin pre-project construction activities to prepare for removal of Kellogg Creek Dam in Milwaukie, Oregon. Dam removal will remove barriers to fish passage, providing access to high-quality upstream habitat; reduce community flooding; improve safe connections between downtown Milwaukie and the riverfront; and increase opportunities for the local community to use natural areas.

Program:	**Transformational Habitat Restoration and Coastal Resilience**
Award Title:	Clackamas Partnership Native Fish Population Habitat Resilience
Recipient:	Johnson Creek Watershed Council
Federal Funding:	$3.8 million
Description:	The Johnson Creek Watershed Council, in collaboration with the Clackamas Partnership, will restore habitat at 10 sites in the Clackamas and Lower Willamette Rivers in the Portland metro area. These efforts will decrease the effects of extreme weather and flooding while benefiting several threatened salmonid species, including Chinook salmon, coho salmon, and steelhead trout.

Program:	**Transformational Habitat Restoration and Coastal Resilience**
Award Title:	Quartz Creek Ecosystem Resiliency Project
Recipient:	McKenzie Watershed Alliance
Federal Funding:	$7.6 million
Description:	The McKenzie Watershed Alliance will replace an aging, undersized bridge and improve access to over 10 miles of spawning and rearing fish habitat in lower Quartz Creek, benefiting species such as Chinook salmon and cutthroat trout. This project is expected to reduce the risk of further fire and climate impacts by creating landscape-scale fire breaks, buffering flooding, preventing erosion, and creating cold-water refuge habitat.

Program:	**Coastal Habitat Restoration and Resilience Grants for Underserved Communities**
Award Title:	Chankawan Side Channel Restoration
Recipient:	Confederated Tribes of the Grand Ronde Community of Oregon
Federal Funding:	$710,000
Description:	The Confederated Tribes of Grand Ronde will restore habitat for salmon, steelhead, and other species on the Tribally owned Chankawan Wildlife Area property through the removal of culverts and other barriers to fish passage. These improvements will reconnect the North Santiam River to its floodplain and increase the amount of large wood in the river to provide more habitat complexity.

Program:	**Pacific Coastal Salmon Recovery Fund**
Award Title:	The Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians (CTCLUSI) Waite Ranch Project
Recipient:	Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians
Federal Funding:	$3.8 million
Description:	This award will support the continuation of restoration efforts on the Waite Ranch Tidal Wetland Restoration Project in the Lower Siuslaw River estuary. Restoration of these lands will improve habitat and watershed processes for salmonids and other fish species once abundant in the rivers of the Tribal Ancestral Homeland, which will create the opportunity to fish in a manner that honors and maintains Tribal cultural practices.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Rogue River Ranch Side Channel Restoration Project Phase III
Recipient:	Cow Creek Band of Umpqua Tribe of Indians
Federal Funding:	$682,000
Description:	The Cow Creek Band of Umpqua Tribe of Indians will use this award to complete the Tribe's ongoing restoration efforts on the Rogue River Ranch Side Channel Restoration Project. This work will protect ranchlands vital to the Tribe's economic development, as well as protect and enhance important natural and cultural resources and water quality in the Rogue River.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Coaledo Tide Gate Replacement and Beaver Slough Fish Passage Project, and Coquille Sub-Basin Plan Review
Recipient:	Coquille Indian Tribe
Federal Funding:	$2.2 million
Description:	This award will continue restoration and monitoring efforts within the lower Coquille River sub-basin. Restoration activities will improve habitat for Endangered Species Act–listed Oregon Coast coho salmon by increasing salmonid access to habitat, replacing tide gates, implementing a water management plan, completing channel enhancements, enhancing the riparian buffer, and improving water quality.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Siletz River Restoration Actions Phase III (Pilot Tidewater Sites)
Recipient:	Confederated Tribes of Siletz Indians
Federal Funding:	$500,000
Description:	This award will support the creation of enhanced and complex channel habitat within the mainstem Siletz River Estuary channel. This work is designed to support juvenile salmonids and lamprey (specifically Chinook and coho salmon and Pacific lamprey) during key periods of mainstem habitat use, which occur during specific seasons that vary by species and life history stage.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Salmon Recovery and Watershed Restoration and Protection FFY 2022
Recipient:	Oregon Watershed Enhancement Board
Federal Funding:	$18.7 million
Description:	The Oregon Watershed Enhancement Board will support high-priority actions addressing key limiting factors to salmon and steelhead production and habitat through the administration of a grant program that emphasizes large-scale riparian restoration and conservation projects that result in lasting improvements to ecological function and process. The award will also help fund several of the Oregon Department of Fish and Wildlife salmon recovery programs that are integral to the Oregon Plan for Salmon and Watersheds and that align with Pacific Coast Salmon Recovery Fund program goals.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Conservation of Cape Foulweather Headland, an Icon of the Central Oregon Coast
Recipient:	Oregon Department of Land Conservation and Development
Federal Funding:	$2.0 million
Description:	The Confederated Tribes of Siletz Indians will purchase the 27-acre "Cape Foulweather" property, thereby conserving an area that hosts rocky shore habitats rich in marine mammals, a rare salt spray meadow complex suitable for the threatened Oregon silverspot butterfly, and upland forest connections to strongholds of marbled murrelets, spotted owls, and other Pacific Northwest icons.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Wasson Creek Watershed Ridgetop-to-Estuary Restoration Project
Recipient:	Oregon Department of State Lands
Federal Funding:	$3.5 million
Description:	The Oregon Department of State Lands will restore resilient wetlands, streams, tidal forested swamps, and upland forest habitats in the South Slough National Estuarine Research Reserve. These restored systems will provide habitat for a variety of ecologically and culturally important fish species, support sustainable harvesting for Indigenous cultural practices, and provide a seed source for local restoration projects.

Washington

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Enloe Dam Removal Project Planning and Feasibility Assessment
Recipient:	Trout Unlimited, Inc.
Federal Funding:	$2.3 million
Description:	Trout Unlimited will conduct a planning and feasibility assessment for the removal of the Enloe Dam on the Similkameen River, which currently blocks fish passage and does not generate power. Trout Unlimited will coordinate with and reach out to the Confederated Tribes of the Colville Reservation, the Similkameen Indian Band, and the Okanagan Nation Alliance.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Olympic Peninsula Coldwater Connection Campaign—Hoh and Wisen Fish Passage Project
Recipient:	Trout Unlimited, Inc.
Federal Funding:	$7.1 million
Description:	Trout Unlimited will replace eight fish passage barriers with fish-passable structures to improve both the resilience of salmonid populations and transportation infrastructure. This project will open more than seven miles of spawning and rearing habitat for commercially and recreationally important salmon species while also funding staff positions and increasing Hoh Tribal community capacity focused on salmon restoration.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Olympic Peninsula Coldwater Connection Campaign—Quillayute and Quinault
Recipient:	Wild Salmon Center
Federal Funding:	$11.9 million
Description:	The Wild Salmon Center will remove nine culverts to reconnect 125 miles of high-quality salmon and steelhead streams in Washington's coastal areas. The project will improve access to historic ranges for native migratory salmonids while improving the durability of public infrastructure.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Lower Yakima River Fish Passage: Bateman Island Causeway Removal and Prosser Dam Passage Improvement
Recipient:	Confederated Tribes and Bands of the Yakama Nation
Federal Funding:	$3.6 million
Description:	The Yakama Nation will remove the Bateman Island Causeway, a partial barrier at the confluence of the Yakima and Columbia Rivers, and complete hydraulic modeling at the Prosser Dam, a partial barrier on the Yakima River. These projects will improve spawning habitat for Chinook and steelhead in the mainstem river and improve spawning and rearing habitat for Chinook, coho, and steelhead in the tributaries.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Snohomish Cooperative Salmon Barrier Removal Project
Recipient:	Tulalip Tribes of Washington
Federal Funding:	$9.7 million
Description:	The Tulalip Tribes will support planning and construction for 16 fish barrier removal projects that will remove or replace barrier culverts with fish-passable structures designed to withstand climate change. This project will benefit several listed and managed species and will reduce flood risk in Tribal and rural communities.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	West Fork of the Hoquiam River Dam Removal and Groundwater Replacement Preliminary Design and Permitting
Recipient:	City of Hoquiam
Federal Funding:	$1.2 million
Description:	The city of Hoquiam will assess the feasibility of removing the West Fork of the Hoquiam River Dam, which would open 13 miles of habitat for coho salmon, steelhead, and Chinook salmon and would improve instream flows in the watershed. This award will support the development of conceptual designs for dam removal as well as the installation of groundwater wells that will be tested as a potential alternative water source for the city of Hoquiam.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Implementation of the Fish Barrier Remediation Agreement Between the Nooksack Tribe, Lummi Nation, Washington Department of Fish and Wildlife, and the City of Bellingham
Recipient:	Nooksack Indian Tribe
Federal Funding:	$460,000
Description:	The Nooksack Tribe and its partners will develop a plan for addressing city-owned fish passage barriers that meets both city infrastructure needs and fisheries goals, focusing on barriers in estuarine areas. The plan will identify priority sites, corrective actions, and preliminary designs. Project partners will also develop a communications plan to ensure that local and Tribal communities are informed and can provide input to help guide the process.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Skagit Basin Tribal Priority Barrier Correction Program
Recipient:	Skagit River System Cooperative
Federal Funding:	$1.2 million
Description:	The Skagit River System Cooperative will reestablish access to fish habitat by implementing fish passage improvements at three sites. In addition, the project will build capacity to continue and expand a collaborative process aimed at identifying and repairing barriers throughout the Skagit River watershed.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Toppenish Creek Fish Passage Restoration and Lower Tributary Passage Assessment
Recipient:	Confederated Tribes and Bands of the Yakama Nation
Federal Funding:	$1.1 million
Description:	The Yakama Nation will remove two check dams, opening 6 miles of upstream habitat for Endangered Species Act–listed steelhead and increasing steelhead survival rates. Funding will also be directed towards the development of an interactive tool and database for fish passage management, which will enable the Tribe to identify, plan, and execute fish passage improvements on an additional 310 miles of stream.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Kwoneesum Dam Removal
Recipient:	Cowlitz Indian Tribe
Federal Funding:	$2.6 million
Description:	The Cowlitz Indian Tribe will complete efforts to remove the Kwoneesum Dam on Wildboy Creek, restoring fish access to a minimum of 6.5 miles of highly productive habitat. The Tribe will also install 1.2 miles of log structures in the stream to restore habitat complexity and capture sediment.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Lower East Fork Lewis Floodplain Reclamation
Recipient:	Lower Columbia Estuary Partnership
Federal Funding:	$7.6 million
Description:	The Lower Columbia Estuary Partnership will restore habitat along 3 miles of the lower East Fork Lewis River. Activities will reconnect a formerly mined floodplain, remove levees, and improve habitat in and along streams.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Lower Big Quilcene River and Estuary Restoration Project—Moon Valley Reach Construction Phase
Recipient:	Hood Canal Salmon Enhancement Group
Federal Funding:	$9.7 million
Description:	The Hood Canal Salmon Enhancement Group will reconnect the Big Quilcene River to its entire 140-acre floodplain, eliminating flood hazards within the community of Quilcene and creating a highly productive spawning and rearing habitat for the threatened Puget Sound Chinook salmon and other key species.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Transformational Collaborative Chinook Recovery in Whidbey Basin North and South
Recipient:	Washington Department of Fish and Wildlife
Federal Funding:	$23.8 million
Description:	The Washington Department of Fish and Wildlife will conduct large-scale restoration projects at several estuary and marshland sites throughout the North Whidbey Basin and South Whidbey Basin of Puget Sound. The combined efforts will significantly contribute to eliminating estuary habitat as a limiting factor for threatened Puget Sound Chinook salmon and steelhead and reduce flooding on county roadways and Tribal lands.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Lower South Fork Nooksack Chinook Recovery 2023–2025
Recipient:	Nooksack Indian Tribe
Federal Funding:	$5.2 million
Description:	The Nooksack Indian Tribe will address limiting factors that affect priority habitat for salmon and steelhead in the South Fork Nooksack River to enhance their resilience to climate change. These restoration efforts will also help reduce flood risk to the nearby town of Acme through increased water storage and construction of a berm.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	South Fork Nooksack River Restoration Project
Recipient:	Lummi Indian Business Council
Federal Funding:	$4.3 million
Description:	Lummi Nation will advance three high-priority salmon habitat restoration projects along the South Fork Nooksack River that will increase flood resilience, improve water quality, and enhance Tribal fisheries. The effort will include implementation of two projects and the design of a third.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Developing Capacity to Inventory Critical Eelgrass Habitat on Lummi Reservation Tidelands Threatened by Invasion of European Green Crab
Recipient:	Lummi Indian Business Council
Federal Funding:	$870,000
Description:	The Lummi Nation will assess the potential risk that invasive European green crabs pose to eelgrass beds on Lummi Reservation tidelands. The Tribe will build staff capacity, acquire the necessary equipment and training, and engage Indigenous high school and college students to help conduct the assessment.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Building Capacity for the Nisqually Indian Tribe to Integrate Habitat Restoration into the Interstage 5 Redesign Planning Process to Reduce Flood Risk and Increase Climate Resilience
Recipient:	Long Live the Kings
Federal Funding:	$500,000
Description:	This award will build capacity for the Nisqually Indian Tribe to incorporate their vision and voice into restoration in the Nisqually River Delta. The increased capacity will help ensure the Tribe's priorities for habitat restoration and Traditional Ecological Knowledge are reflected in the replacement of an Interstate 5 bridge.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Restoration for All (R4A)
Recipient:	Edmonds College
Federal Funding:	$830,000
Description:	Edmonds College, in partnership with the Latino Educational Training Institute and Snohomish Conservation District, will create a bilingual workforce development program to educate and train members of the Latino community in the restoration field. The program will include paid internship opportunities, providing participants with hands-on experience restoring salmon habitat.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Skagit Estuary Treaty Resource Recovery
Recipient:	Skagit River System Cooperative
Federal Funding:	$650,000
Description:	The Skagit River System Cooperative will restore estuary habitat to support the recovery of Tribal fisheries in the Skagit River. Tribal members will engage in the development of several projects in areas that are a priority for Chinook salmon recovery.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Cispus-Yellowjacket Phase 4 Restoration
Recipient:	Cowlitz Indian Tribe
Federal Funding:	$700,000
Description:	The Cowlitz Indian Tribe will implement instream work that will increase the quality and quantity of spawning, rearing, and adult holding habitat, on site and in downstream reaches, for salmon and steelhead, as specified in the 2010 Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Western Washington Tribal Salmon Recovery
Recipient:	Northwest Indian Fisheries Commission
Federal Funding:	$5.5 million
Description:	The Puget Sound and Washington coastal treaty Tribes will address factors limiting the viability of Endangered Species Act–listed salmonids; restore and protect anadromous salmonid habitat; and conduct essential salmonid and habitat monitoring to promote a meaningful expression of treaty fishing rights and advance the recovery and conservation of listed and non-listed salmon and steelhead.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Washington State 2022 Pacific Coast Salmon Recovery Fund
Recipient:	Washington State Recreation and Conservation Office
Federal Funding:	$24.0 million
Description:	This award will fund up to 120 high-priority, site-based projects that address limiting factors and protect or restore salmon habitat statewide. Funding will also be used to support hatchery reform efforts by the Washington Department of Fish and Wildlife and the Northwest Indian Fisheries Commission. These efforts are a crucial component to salmon recovery and support the exercise of Tribal treaty fishing rights. In addition, the award will support status and trends monitoring, validation monitoring, and statewide project-effectiveness monitoring to track progress and fish response at a watershed scale. Finally, the award will fund hatchery and harvest reform actions that improve the fitness of wild fish and address hatchery operations that limit the productivity of populations essential for exercise of Tribal treaty rights.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Phase 2 Feasibility Studies for Salmon Reintroduction: Evaluation of Downstream Movement and Survival of Juvenile Chinook Salmon in the Upper Columbia Basin
Recipient:	Coeur d'Alene Tribe
Federal Funding:	$522,000
Description:	This project will gather baseline data needed to evaluate the feasibility of salmon reintroduction upstream of the Chief Joseph and Grand Coulee dams. The data collected will include survival and travel time, near-dam behavior, and route-specific passage survival.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Trap and Transport of Adult Salmon and Juvenile Outmigration Studies Upstream of Chief Joseph and Grand Coulee Dams
Recipient:	The Confederated Tribes of the Colville Reservation
Federal Funding:	$394,000
Description:	This award will foster the continued development of Tribal, state, and local partnerships to study and restore Chinook and sockeye salmon in the Upper Columbia River. The award will also help support the implementation of salmon reintroduction projects that will restore native subsistence fishing in the Upper Columbia River.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Graveyard Spit Restoration and Resilience Project
Recipient:	Washington State Department of Transportation
Federal Funding:	$4.0 million
Description:	This project will restore and protect Graveyard Spit through the rehabilitation and revegetation of the historic barrier dune, the construction of a nature-based cobble berm, and the protection and restoration of backshore marsh and tidal embayment environments. This effort will reduce risk to community infrastructure and cultural resources that are threatened by sea level rise and other coastal hazards.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Padilla Bay Samish Conservation Area Protection Project (FY23)
Recipient:	State of Washington
Federal Funding:	$2.3 million
Description:	This award will support the purchase and permanent protection of 74.5 acres of former and current tidal marsh, as part of a larger project to restore tidal marsh in Padilla Bay. The project will collect baseline data and evaluate restoration design alternatives for future restoration to increase climate resilience, restore Tribal cultural connections with the site, improve access to the area, and restore the area's natural resources.

Alaska
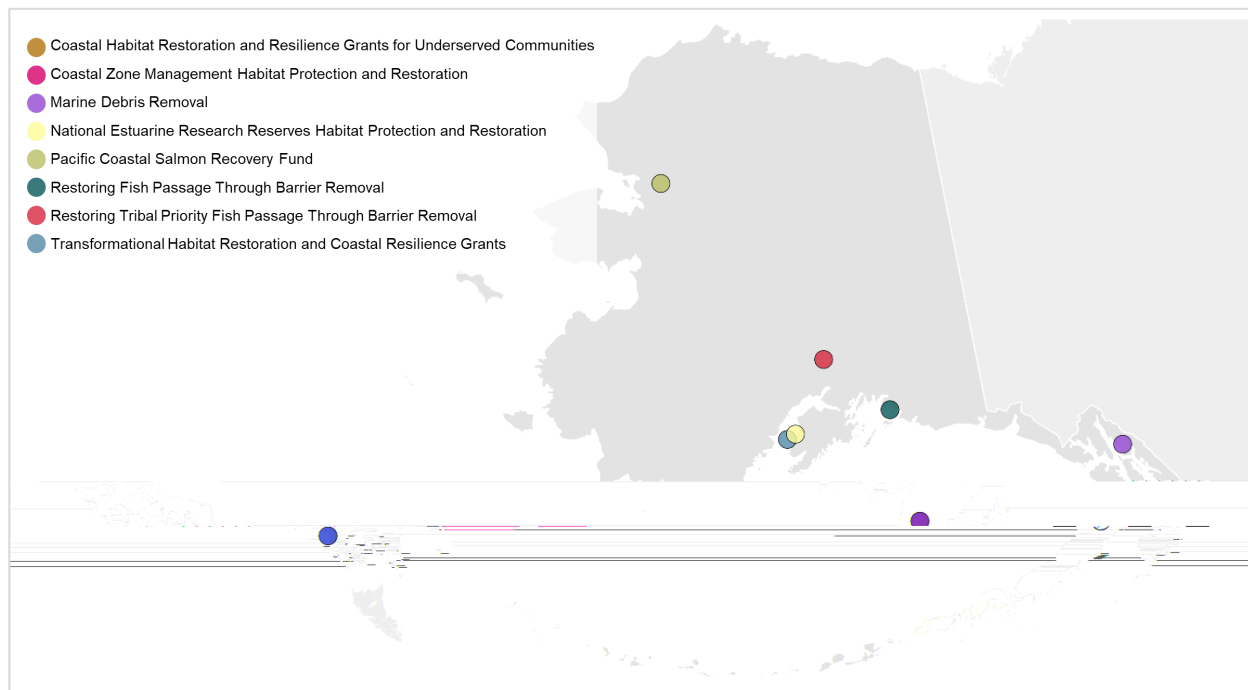
Figure B-5. Map of Alaska Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Program:	Restoring Fish Passage Through Barrier Removal
Award Title:	Basin to Delta: Copper River Watershed Fish Passage Restoration
Recipient:	The Copper River Watershed Project
Federal Funding:	$1.4 million
Description:	The Copper River Watershed Project will remove two culverts in the flood-prone Copper River delta and design seven additional culvert removals. Removing the culverts will reduce the likelihood of catastrophic structure failure and maintain access to emergency services and subsistence resources for Tribal and rural communities.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Sealaska Fish Passage Improvements in Southeast Alaska
Recipient:	Sealaska Corporation
Federal Funding:	$430,000
Description:	Sealaska Corporation will assess parts of the existing road/stream crossing infrastructure network on Sealaska-owned lands in southeast Alaska, improve local capacity for fish passage assessments via training, prioritize identified fish passage projects, and fund shovel-ready engineering designs for up to 10 fish passage improvement projects that can be used to acquire future implementation funding.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	CVTC Tribal Fish Passage Project
Recipient:	Chickaloon Native Village
Federal Funding:	$1.9 million
Description:	This project will remove fish barriers within the traditional ancestral lands of Chickaloon Native Village and develop a Fish Passage Working Group for the Matanuska-Susitna Borough. Through collaboration with its project partners, the Tribe will increase Tribal staff member knowledge and capacity to oversee fish passage restoration planning, design, and implementation.

Program:	Restoring Tribal Priority Fish Passage through Barrier Removal
Award Title:	Eyak Corporation Fish Passage Restoration and Program Development on the Copper River Delta
Recipient:	Eyak Corporation
Federal Funding:	$2.9 million
Description:	The Eyak Corporation will build capacity for planning and implementing fish passage improvement and restoration projects through a partnership with the U.S. Fish and Wildlife Service and the Copper River Watershed Project. Efforts will include professional development, hands-on project management, and evaluating equipment needs.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	The Resurrection: Restoration of a Watershed and Salmon in Alaska
Recipient:	National Forest Foundation
Federal Funding:	$3.8 million
Description:	This project will restore salmon habitat in Resurrection Creek by improving natural stream processes along two miles of creek, reconnecting over 50 acres of historic floodplains and off-channel habitat, and restoring over 70 acres of vegetation. The work will provide many benefits to the small, rural community of the town of Hope and other surrounding Cook Inlet communities, such as flood reduction, outdoor recreation, and job creation.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Developing a Climate Impact Statement for Coastal Erosion and Shoreline Stability in Levelock
Recipient:	Levelock Village
Federal Funding:	$380,000
Description:	The Levelock Village Council will develop a Climate Impact Statement for the Native Village of Levelock. The Climate Impact Statement will assess how future climate scenarios could affect Levelock and provide strategies to improve the village's resilience to hazards like sea level rise and flooding.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Arctic-Yukon-Kuskokwim Tribal Research and Restoration Program
Recipient:	Bering Sea Fishermen's Association
Federal Funding:	$1.4 million
Description:	This award will fund the Arctic-Yukon-Kuskokwim Tribal Research and Restoration Program, which provides competitive funding for projects that research and rebuild salmon populations and bring relief to the resource-dependent people living in the Arctic-Yukon-Kuskokwim Region.

Program:	Pacific Coastal Salmon Recovery Fund
Award Title:	Alaska Sustainable Salmon Fund
Recipient:	Alaska Department of Fish and Game
Federal Funding:	$5.4 million
Description:	The Alaska Sustainable Salmon Fund will support a myriad of projects necessary to maintain healthy salmon populations and to protect or restore their habitats. The projects, selected through a rigorous technical review process, will focus on proactive approaches to habitat conservation and maintenance of salmon populations utilized in subsistence fisheries.

Program:	National Estuarine Research Reserves Habitat Protection and Restoration
Award Title:	Kachemak Drive Peatlands Water Quality Improvement Project
Recipient:	University of Alaska Anchorage
Federal Funding:	$1.3 million
Description:	Through a partnership with the Kachemak Bay National Estuarine Research Reserve, the city of Homer will acquire 55 acres of peatland that provides habitat for moose, bear, and other coastal wildlife and fish while also improving water quality. The peatland will serve as a nature-based solution for stormwater collection, which will recharge water levels in the peat, protect the water quality of Kachemak Bay, and mitigate coastal erosion.

Program:	Marine Debris Removal
Award Title:	Large Debris Removal and the Establishment of a Regional Center for Marine Debris in Alaska
Recipient:	University of Alaska Fairbanks
Federal Funding:	$5.9 million
Description:	The University of Alaska Fairbanks will administer a statewide grant competition for marine debris removal and will establish a long-term Center for Marine Debris. This center will both facilitate and support targeted removal operations. It will work to serve the identified and emergent needs of the marine debris community across the state through activities including debris collection, monitoring, analysis, transport, and disposal.

Hawai'i and U.S. Pacific Island Territories
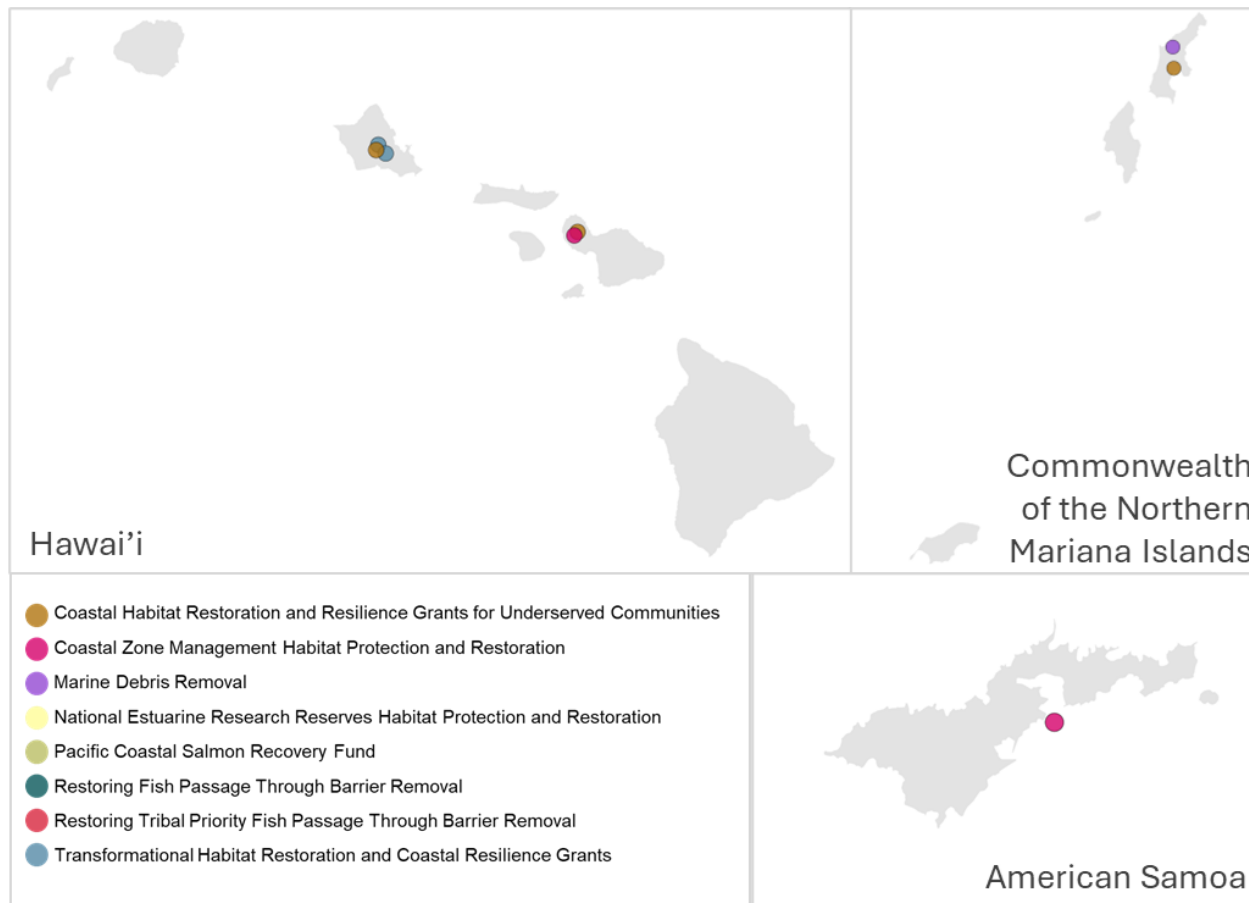
Figure B-6. Map of Hawaii and Pacific Island Territory Awards by Program.

Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-Territory Projects

Program:	Marine Debris Removal
Award Title:	An Abandoned and Derelict Vessel (ADV) and Large Marine Debris Removal Partnership Between the U.S. Territories and Freely Associated States of Micronesia
Recipient:	Pacific Coastal Research and Planning
Federal Funding:	$4.0 million
Territories Involved:	Commonwealth of the Northern Mariana Islands and the Freely Associated State of Palau
Description:	This project will remove large marine debris, including abandoned and derelict vessels, while simultaneously establishing marine debris removal partnerships in the territories and Freely Associated States. Partnership-building efforts will identify local partners, establish a decision-making framework, determine roles and responsibilities, and develop criteria to prioritize abandoned and derelict vessels and large marine debris for removal.

American Samoa

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	American Samoa Wetlands Delineation
Recipient:	American Samoa Government Department of Commerce
Federal Funding:	$200,000
Description:	This award will support continued delineation of all wetlands in American Samoa, plus monthly wetland monitoring, partner training, and community outreach workshops. These efforts will help the coastal zone management program and its partners to better manage, protect, and enhance wetlands and educate the community about the ecosystem services these natural resources provide.

Commonwealth of the Northern Mariana Islands

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Project Site Prioritization, Design, and Implementation for the Priority Watersheds of Achugao and Laolao Bay on Saipan, Commonwealth of the Northern Mariana Islands
Recipient:	Pacific Coastal Research and Planning
Federal Funding:	$1.0 million
Description:	Pacific Coastal Research and Planning will collaborate with partners and communities to restore habitat in the Achugao and Laolao Bay watersheds on the island of Saipan. The project will serve as a demonstration of how habitat restoration and nature-based solutions can address community resilience while increasing the capacity of local resource managers and community partners to apply these practices in other areas.

Hawaii

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Holistic Community-Led Habitat Restoration in a Hawaiian Context
Recipient:	Malama Maunalua
Federal Funding:	$8.0 million
Description:	This project will use a traditional Native Hawaiian-based ridge-to-reef (ahupuaʻa) strategy to address habitat degradation in the Niu, Kuliʻouʻou, and Wailupe watersheds of the Maunalua Bay region. Activities will span from the mountain regions to coral reefs in the bay, with an approach that emphasizes including Native Hawaiian communities and organizations in the restoration work, to build capacity and inspiration for future efforts.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	REEFrame: Restoration of Severely Degraded Coral Reefs in Hawaii via Permanent Coral Nurseries on 3D Printed Concrete Reef Frameworks
Recipient:	Conservation International Foundation
Federal Funding:	$9.0 million
Description:	This project will construct permanent concrete reef framework structures off Waikiki Beach on the island of Oahu. These reef frameworks will serve as in-situ coral nurseries, attracting reef species known to benefit corals and developing over time into natural coral reefs, which in turn will increase the socioeconomic resilience of the local communities that depend on them.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Waihee Coastal Dunes and Wetlands Refuge Kapoho Loko Ia and Loi Kalo Restoration
Recipient:	Hawaiian Islands Land Trust
Federal Funding:	$800,000
Description:	The Hawaiian Islands Land Trust and Native Hawaiians from the Waihee and Waiehu communities will work together to restore the flow of water to the taro fields and fishpond at the Waihee Coastal Dunes and Wetlands Refuge on Maui. They will build a ridge-to-reef model for collaborative land and ocean stewardship by engaging the community through meetings, workshops, volunteer workdays, and educational activities.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Coral Community Dive Program: Restoration, Resilience, Monitoring
Recipient:	Kuleana Coral Reefs
Federal Funding:	$460,000
Description:	Kuleana Coral Reefs will launch a program to engage community members on West Oahu in coral reef conservation and reduce barriers to environmental work for Native Hawaiians. The Community Dive Program will provide professional certifications and training in coral restoration to local residents and conduct on-the-ground coral restoration at community-selected sites to help build coastal resilience.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Resilient Reefs for Maui Nui
Recipient:	The Coral Reef Alliance
Federal Funding:	$3.2 million
Description:	This project will strengthen coastal resilience at two sites in Maui county through the restoration of watershed stream banks and estuarine habitat within two 30-acre fishponds. The project will engage the community in designing a water-quality outreach and education program and will document lessons learned to inform and scale future restoration efforts statewide.

U.S. Caribbean Territories
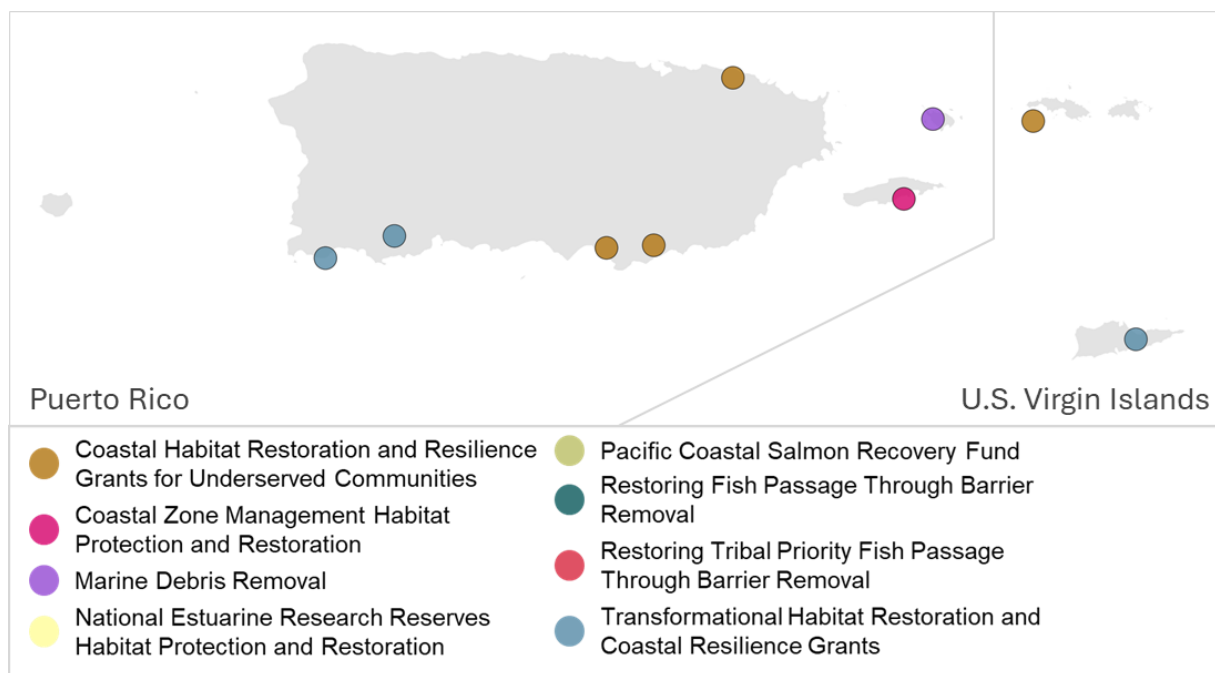
Figure B-7. Map of U.S. Caribbean Territory Awards by Program.
Icons are mapped to the primary project location and are not fully illustrative of the extent of grant activity.

Multi-State and Multi-Territory Projects

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Multi-Site Coral Reef Restoration to Build Resilient Communities in Florida, Puerto Rico, and the U.S. Virgin Islands
Recipient:	The Coral Restoration Foundation, Inc.
Federal Funding:	$6.9 million
States Involved:	Florida, Puerto Rico, and the U.S. Virgin Islands
Description:	The Coral Restoration Foundation will help rebuild populations of five endangered corals at multiple sites across Florida, Puerto Rico, and the U.S. Virgin Islands. The awardee will use technologies and best practices from the Florida Keys, where practitioners are at the forefront of coral restoration, to increase the capacity for coral restoration in Puerto Rico and the U.S. Virgin Islands by developing and scaling up coral nursery infrastructure. (*Note that due to the multi-region nature of this award, this award is also listed under the South region.*)

Puerto Rico

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Multi-Strategic Approaches to Scaling Up Ecosystem-Based Restoration to Improve Coral Reef Recovery and Resilience Around Puerto Rico
Recipient:	Institute for Socio-Ecological Research, Inc.
Federal Funding:	$10.6 million
Description:	This project will construct 5 acres of coral reef at three locations in Puerto Rico: Fajardo, Mayaguez, and La Parguera. This work will strengthen ecosystem resilience by addressing the current state of low coral cover and low reef diversity in Puerto Rico; by addressing the effects of new coral diseases; and by reintroducing slow-growing, massive reef-building coral species, including threatened Orbicella coral species and pillar coral.

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	Restoring the Historic Guánica Lagoon to Reduce Land-Based Sources of Pollution in a Priority Watershed in Puerto Rico
Recipient:	Protectores de Cuencas, Inc.
Federal Funding:	$7.4 million
Description:	Protectores de Cuencas will improve water quality and reduce land-based sources of pollution in Guánica Bay through the restoration of Guánica Lagoon. Efforts will include installation of stormwater and erosion control improvements downstream, including a permeable parking lot. The project will provide recreational opportunities for visitors and increase community resilience to flood events.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	BoriCorps: Strengthening Puerto Rico's Underserved Communities Through Coastal Habitat Restoration and Resilience Building
Recipient:	Franklin's Promise Coalition, Inc.
Federal Funding:	$1.3 million
Description:	Franklin's Promise Coalition will expand BoriCorps, an environmental restoration and workforce training program that engages local young adults in coastal restoration and resilience. BoriCorps participants will use a ridge-to-reef approach to restore habitat from upland forests to coral reefs across southern Puerto Rico while receiving on-the-job training, industry certifications, and leadership skills to become environmental stewards.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Using the Ecological Restoration of Dunes and Mangroves to Improve Coastal Community and Habitat Resilience in Loiza, Puerto Rico (Ecological Restoration of the Coast of Loiza)
Recipient:	University of Puerto Rico
Federal Funding:	$1.0 million
Description:	This project will restore mangroves and dunes in Loiza, Puerto Rico. These habitats have been significantly damaged by past hurricanes and winter storms, which has made local communities more vulnerable to flooding from storm surge and sea level rise. Participating communities will build their capacity to lead restoration, community outreach, and environmental education activities.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Large-Scale Mangrove Restoration and Rehabilitation in the Jobos Bay National Estuarine Research Reserve, Puerto Rico, to Enhance Protection from Coastal Hazards for Underserved Communities
Recipient:	The Ocean Foundation
Federal Funding:	$450,000
Description:	The Ocean Foundation will contribute to the largest mangrove habitat restoration project ever undertaken in Puerto Rico. Members of the local communities of Salinas, Aguirre, and Guayama will work alongside technical experts to gain experience in restoration and monitoring in the Jobos Bay National Estuarine Research Reserve.

Program:	Coastal Zone Management Habitat Protection and Restoration
Award Title:	Mangrove, Seagrass, and Coral Restoration in the Vieques Bioluminescent Bay Natural Reserve
Recipient:	Vieques Conservation and Historical Trust
Federal Funding:	$3.0 million
Description:	This project will restore important interconnected coastal habitats—including mangroves, seagrass communities, and coral reefs—to promote enhanced ecological connectivity and the rehabilitation of important ecosystem functions, as well as to buffer the coastal impacts of storm surge during extreme weather events.

Program:	Marine Debris Removal
Award Title:	Setting the Baseline for a Marine Debris-Free Puerto Rico
Recipient:	Isla Mar Research Expeditions, LLC
Federal Funding:	$4.0 million
Description:	This project will remove up to 70 abandoned and derelict vessels across Puerto Rico. The project will also establish a coordination strategy for abandoned and derelict vessel prevention, management, and response across the territory while supporting the engagement of young, underserved, low-income, minority students in key boating municipalities through a "shadowing a scientist" initiative.

U.S. Virgin Islands

Program:	Transformational Habitat Restoration and Coastal Resilience
Award Title:	U.S. Virgin Islands Transformational Reef Restoration
Recipient:	The Nature Conservancy
Federal Funding:	$6.7 million
Description:	The Nature Conservancy will restore 90 acres of coral reef within the St. Croix East End Marine Park. Coral outplants will be sourced from corals that survived bleaching events and disease in order to increase genetic diversity and support the reef's ability to withstand climate change. This work will contribute to a healthy reef ecosystem that supports tourism and fisheries, benefiting the community of St. Croix.

Program:	Coastal Habitat Restoration and Resilience Grants for Underserved Communities
Award Title:	Residential Erosion Control: Restoration in Vulnerable U.S. Virgin Islands Communities
Recipient:	Executive Office of the Government of the Virgin Islands
Federal Funding:	$880,000
Description:	This initiative, run by the Virgin Islands Clean Coasts Program, will help residents of the U.S. Virgin Islands address stormwater runoff and soil erosion issues on their properties. The project will work to implement recommendations and fix issues that were identified during previously conducted property evaluations for managing runoff and erosion.

APPENDIX C: METHODS FOR THE ESTIMATED ECONOMIC IMPACT OF COASTAL RESILIENCE AWARDS

This appendix describes NOAA's approach to performing an economic impact analysis of awards made under the in-scope funding opportunities using the IMPLAN (Impact Analysis for Planning) modeling software.

1. Data Access and Extraction for Use in IMPLAN

The BIL/IRA evaluation analysis considered eight funding opportunities released and awarded in 2022 and 2023:

- Coastal Zone Management Habitat Protection and Restoration

- Coastal Habitat Restoration and Resilience Grant for Underserved Communities

- National Estuarine Research Reserve System Habitat Protection and Restoration Competition

- NOAA Marine Debris Removal

- Pacific Coastal Salmon Recovery Fund

- Restoring Fish Passage through Barrier Removal

- Restoring Tribal Priority Fish Passage through Barrier Removal

- Transformational Habitat Restoration and Coastal Resilience Grants

A total of 174 awards were originally identified; however, one award was deferred to FY24. Thus, 173 awards were initially reviewed for inclusion in this analysis.

1a. Data Collection

NOAA worked with the Grants Online Program Management Office to obtain access to the Grants Online Web service to access individual grant applications for each of the above funding opportunities for FY22 and FY23. The analysis team was provided an export of structured award information of the following fields:

- GRANTSGOV_NUM: Unique identifier used within federal grant tracking systems

- APPLICANT_NAME: The organizational (or individual) recipient of the grant

- TOTAL_FED_SHARE: The amount awarded by NOAA through the BIL/IRA process

- COMPETITION_NAME: The verbose name of the Notice of Funding Opportunity

- LINE_OFFICE: The NOAA Line Office hosting the opportunity

- NOFO_NUMBER: Unique identifier for the Notice of Funding Opportunity

- APPLICANT_TYPE: Uses the Catalog of Federal Domestic Assistance description to denote the funding status of the applicant (i.e. state government, Tribal government, 501c3 non-profit)

- PROJECT_TITLE: Semi-descriptive title submitted by applicant

- PROJECT_DESCRIPTION: A high-level summary of the project effort

- FUND_FY: First year funding is available for the project

- START_DATE: Start date of the project as established by the grantee

- END_DATE: Expected conclusion of the project

Structured information from Grants Online was reviewed and compared against Line Office information and public releases about the awards and deemed correct and authoritative.

IMPLAN requires information about expenditures, industries, locations, labor, and compensation. We used a standard operating procedure to ensure uniformity in extracting data from project and budget narratives. We first employed the North American Industry Classification System (NAICS) to code expenditures by industry and then mapped NAICS codes to IMPLAN's industry code system. This was done using a customized reference guide and IMPLAN's "2022 NAICS to IMPLAN 546 Industries" crosswalk. A list of the most commonly used IMPLAN industry codes in this analysis (which do not include NAICS) appears later in the appendix.

The IMPLAN component of the worksheets categorized every expenditure uniquely by allocation, location, industry, and funding source (NOAA or other). Employees and compensation attributed to each was also collected for use in IMPLAN. Other information collected through the worksheet captured identifiers to merge upon the structured dataset, project activities and outcomes, and any information discussing the communities that would benefit from the project. An excerpt of the worksheet focused on IMPLAN data collection is featured as Table C-1.

Table C-1. An Example of the IMPLAN Data Collection Worksheet

IMPLAN Analysis	Unique by Code, County, and Funding Source	
IMPLAN Code by County and Source	1	Etc
Notes/Discussion (Max 10 Words)		
IMPLAN Code (Max 3 Digits)		
County Name		
State (Two-Letter Abbreviation)		
Output/Expenditure ($)		
Employee Compensation ($, Salary + Fringe Benefits)		
Employee Count (Whole Number)		
Funding Source (NOAA or OTHER)		
Automation Row		
Location Citation(s) and Analytical Approach	Citation 1	Etc
Document/Website Name		
Page Number/Link/Etc		
Brief description of Analytical Approach		
Concern of Limitations		

Data captured from the worksheets were then merged on the structured dataset provided by the Grants Online team. Discrepancies between the budget information and the authoritative "TOTAL_FED_SHARE" field were captured and brought to the attention of NOAA grant managers for resolution. A review of all

173 worksheets was undertaken to ensure the resolution of errors with consistency and accuracy across our analytical team.

To enter the data into IMPLAN, information was collated and processed into a format usable by IMPLAN's Event Template for uploading of spending activities (correlative with a column in the above table). Expenditures such as land purchases, in-kind contributions, or that occur in locations outside the US and territories other than Puerto Rico and the U.S. Virgin Islands were captured in the dataset but not included in IMPLAN estimation. The data was then assigned to the correct region and analyzed. More on the use of IMPLAN is discussed in the following sections.

1b. Data Limitations and Issues

This is an ex-ante analysis using preliminary grant proposal information obtained through the Grants Online system. The lifecycle for this database concluded in December 2023 and has been succeeded by Grants Enterprise Management System (GEMS). As the study focused on FY22/23 grants, the information was mostly complete by December 2023. To ensure accuracy, information was shared and reviewed by the relevant NOAA Line Office to allow for approval and corrections to the data. At the completion of the IMPLAN analysis, a second round of outreach occurred to resolve newly discovered discrepancies.

Proposal information varied in level of detail and is subject to change during implementation. For most of the awarded projects, information was obtained from revised proposals that are submitted after the grantee is notified of the award. The revisions are approved by the relevant NOAA grant officer for each funding opportunity. Nonetheless, information varied across applicants, with some providing highly detailed budgets and others describing expenditures in broad terms. Analysts used their knowledge about the projects and discretion to apply expenditures to regions and industries using all available information from proposal documents. Interim reports will be provided by the awardee and are expected to include an accounting of actual expenditures but due to timing, interim report information was not included in this analysis.

2. Selection of IMPLAN

The economic impact of funds allocated to NOAA BIL/IRA grants was modeled at the award level. Within each award, our team entered data at the county level, where possible, as well as data at the state level in the worksheet. Budget data, which detailed purchases of goods and services toward the awards' implementation, constituted the primary financial data for modeling. When inputted into the IMPLAN, this type of data makes up the final demand for goods and services.

IMPLAN, an input-output modeling software package, was used to determine the economic effects of NOAA grant expenditures. IMPLAN estimates the value of the chain of economic activities by following the expenditures through a set of fixed input-output relationships between different types of industries. IMPLAN is able to take an initial change, in this example, an increase in spending on goods, and calculate how much of each type of raw materials, equipment, and labor is required to produce those goods. It can further calculate the needs of those supplying industries, as well as consumer purchases by employees now earning more income, thereby capturing the full effects of a particular initial expenditure.

The primary geographic unit for our analyses was at the county level where expenditure will take place. That is, a particular amount of expenditure may take place in a single county or multiple counties or in a county/state other than where the project implementation takes place. For example, an out of state engineering firm in Rhode Island may design a project in Maine. Thus, a basic criterion for choosing any model was that the data can be entered at the county level. IMPLAN builds economic models for the U.S. and local areas using data describing the economies of all counties in the U.S., as well as Puerto Rico

and the U.S. Virgin Islands. All production processes in these areas are captured by categorizing the industries into 546 industries, along with input requirements for the production processes of the industries and final goods to meet varied types of consumer demand. IMPLAN is designed to estimate the local impact from initial economic activities that take place in the area. Thus, IMPLAN is considered to be a regional economic analysis tool. IMPLAN allows multi-regional modeling, which enables analysts to group regions together to map economic transactions more completely, as producers and consumers buy and sell goods across county and state boundaries. The completeness and ease of use have made IMPLAN an industry standard model for economic impact analysis.

Underlying IMPLAN's structure is the assumption that supplies of inputs are available to create all production and consumption. IMPLAN treats the relationships between industries as unchanging, even as new economic activities take place, which might not be accurate if new economic activities compete for available resources (sometimes called the congestion effect). This is in contrast to general equilibrium models, which can respond to increased demand for resources by changing prices and the relationships among supplying industries. If, for example, ten projects in one area require steel at the same time, this could increase the price of steel, causing some manufacturers to cut back on its use in production, and substituting it with some other goods in the production process. BIL and IRA projects may influence the local construction industry. For example, if wages increase, producers may choose to substitute workers (including workers from other regions) in favor of increased mechanization. Within IMPLAN, there is no mechanism that can vary the productivity of inputs used in the production process, although there is a regional constraint, where IMPLAN recognizes limits for labor requirements that exceed the working-age population and specifications for non-existent industries.

We considered alternatives to using IMPLAN within the input-output model framework including the RIMS-II and REMI economic modeling tools. All three models allow users to estimate potential impacts, to model changes in final demands, and to start a chain of economic events.

RIMS-II, like IMPLAN, is designed to model economic changes at the regional level using the input-output approach demands made by final users of goods, and estimate something similar to macroeconomic Keynesian multipliers at the regional level. The RIMS-II model, offered for custom use by the Bureau of Economic Analysis, requires users to specify exact needs in advance to incorporate regions. There is no multi-regional modeling. For IMPLAN and RIMS, there are no supply constraints that affect prices.

REMI allows for prices to change and incorporates local constraints. REMI offers greater complexity where it can adjust prices (congestion effect) and to some extent takes into account agglomeration effects —new economic activities generating extensive local activities through 'crowding in'. These factors are most likely to be minimal for our projects. Additionally, models other than IMPLAN also needed to be adjusted to be modeled at the county level. There is no evidence that any of the models produce any directional differences in comparison to each other (Bartik and Sotherland, 2019).

The use of IMPLAN gives us the added benefit of being able to compare results across IMPLAN studies, knowing that the methodology and definitions will be similar. In particular, we can compare the results to the numerous environmental restoration project evaluations that use IMPLAN.

3. IMPLAN Data, Protocols, and Usage

3a. Coding Grants Online Data into County-Level NAICS and IMPLAN Codes

For modeling at the project level, we used the individual budgets from the award application documents to allocate planned spending to appropriate industry categories. As mentioned above, industry categories

were first coded using NAICS ([North American Industry Classification System](#)) and then mapped to the "2022 IMPLAN 546 Industries" classification system. We compiled the most commonly encountered codes into a short guide (see Table C-3) that permitted the rapid assignment of expenditures to industrial categories.

The proposed project budgets varied in their specificity, as some projects had a short plan of work with very detailed lists of expenditures. Other projects included construction projects that will need to go through contracting processes detailing specialized work, and in those cases, expenditures needed to be assigned to a broad industry category such as "construction" or "environmental restoration." Data extractors had to exercise judgment to assign less commonly encountered expenditures to industry codes.

3b. Time Horizon and Calculation of Multi-Year Grants

We have performed the analysis on each individual proposed project for the total amount of spending awarded to it. Some of the projects have three to five-year timelines, so the economic impact should be assumed to take place over the next five years. An assumption here is that once funding through BIL/IRA awards concludes, these economic impacts will subside.[18]

We did not separate the spending by year. IMPLAN is a linear model, and its results are additive, so spending an amount over two years generates the same impact as spending the whole amount in one year (with small differences for inflation and interest). As the projects all have different number of implementation years, start dates, potential for delays, and levels of detail on the year of expenditure, splitting project expenditure by year would probably not have greatly improved the accuracy of the estimations and would have required many assumptions about the implementation schedule. Our results are based on modeling of the relationships among industries as they were in 2022, using 2024 prices (as IMPLAN's most recent data pertains to 2022). Many applications did not provide yearly spending plans. It would be speculative on our part to note what yearly values would be. The lack of yearly accounting obviates the need for discounting.

3c. Compiling Data for IMPLAN Analysis

Many of the awards involved expenditures in several counties, or even several states, depending on the location of the work and the identified subcontractors. Each award required performing a separate analysis in IMPLAN. Setting up each IMPLAN analysis required specifying a set of counties and assigning the expenditures by industry code to the appropriate county.

For each award, we added both the state (minus the counties with identified expenditures) and the U.S. as a whole as possible regions. In some cases, we also used these regions to allocate proposed budget expenditures that specified the amount and purpose, but not the exact location.

The use of multiple geographic locations and regions within the analysis of each award also enabled us to use IMPLAN's option of multi-regional input-output (MRIO) modeling (discussed further in the following section). This approach allows us to examine impact across multiple regions and allows us to include transactions that might spillover from one region to another; e.g., a construction company in one county might rent a cement mixer from a neighboring county.

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[18] In estimating the expected economic impact of expenditure we are not measuring the impact of the projects once it is in place. It is possible that project expenditure may induce more permanent employment, see [Kahn, McComas and Ravi](#) (2020).

We ensured that direct final demand did not exceed the total NOAA allocated amount for an award in order to observe the effects of the marginal change in spending in the areas where the awards occurred. This step required entering non-wage expenditures as direct output, and entering wage-only expenditures as Employee Compensation equated to Industry Output. Thus, wages stated in grant applications were always considered to be part of the Industry Output. Some project funds were excluded, including money spent on land transfers (not usually counted in GDP and IMPLAN is not equipped to capture such transfer payments) and money allocated to foreign travel or specialized foreign firms. In a few cases, the budget was slightly different from the project award; here the budgeted expenditures were used. For the case that involved a large budget discrepancy, the allocations across industries were adjusted proportionally so that the expected expenditures matched the NOAA allocation.

3d. The Use of Multi-regional Input Output Modeling

Expenditures within IMPLAN were input at the county level where possible, and either averaged among multiple counties, or specified at the state or U.S. level where information is not given. IMPLAN allows for multi-region analysis to allow for expenditure that might occur in neighboring counties or other specified regions (i.e., a county over from the specified location), for example, the possibility that construction workers may not live in a county where work takes place, as stated in IMPLAN support material.

MRIO modeling is a technique that allows several regions to be grouped together, using data on the past frequency of interdependent economic activity among the regions, to evaluate the effects of a particular set of expenditures. This technique enables analysts to account for transactions that might take place in other areas as a result of the initial expenditure (Fataray et al, 2020; Cabernard and Pfister, 2021). MRIO allows the full effect of a transaction to be traced and summed up. For example, if a construction project takes place in Monroe County, Florida, a Florida construction firm might order replacement parts for their backhoe from a company in another part of Florida or in another state. This company, in turn, might then have to order more raw materials or printer paper from yet a third location. MRIO allows the latter impacts to be added into the total.

MRIO models can have aggregation bias (de Koning *et al.*, 2015). Creating regions made up of large numbers of counties and states might result in the use of average (mean) relationships among industries, which might actually be very different across localities. Tests of the size of this bias vary, with some studies finding small effects (de Koning et al, 2015; Park, 2005), and others finding larger effects, particularly for international studies and sectors involving raw materials (Marin et al., 2012; Pinero et al, 2015).

In order to create our multi-regional model, we included 1) the rest of the state beyond the counties where expenditure is documented (see IMPLAN Support, 2017) and 2) the rest of the U.S. minus the specified states as possible regions in the analysis for each project. These captured indirect and induced expenditures that might spill over from counties where project work takes place.

A category "U.S. Non-specified" captures two types of economic activities. First, as noted above, the U.S. residual has some level of direct spending, as for many projects, budgets cannot attribute some of the individual expenditures to a particular county or state. Secondly, some indirect and induced expenditure might take place outside of the counties where the initial expenditure takes place. If a NOAA awardee buys some shipping services in Florida, the shipping company might, in turn, hire another employee and order a uniform for that employee from Wisconsin. MRIO allows us to track these expenditures along their path throughout the U.S. and to include these out of county and out of state transactions taking place in the rest of the U.S. in our estimate of the total impact. These U.S. expenditures are not included in the state or regional totals, because we simply don't know where they will take place, but this impact

does form part of the NOAA grant expenditures total economic impact on the U.S. Because of this, we can also think of the U.S. residual value as the total impact of the award activities minus state level impact.

These impacts, therefore, are considered an upper bound for the effects of the award expenditures, as the effects are inclusive of all possible U.S. transactions. It also means that this analysis can more accurately be compared with analyses that use the MRIO modeling technique.

3e. An Example of Application of MRIO

To show how MRIO affected our results, we illustrate the differences through contrasting the impact estimated through MRIO with those obtained without using MRIO for the same award information. For the estimations without MRIO, we will be confined to knowing the impact only for areas where the expenditures took place. The example project activities, as described in the application, will take place in two counties of a western state. The extraction of data showed that purchases of inputs will take place only within the two counties; further, as we could not distinguish in which of the counties different types of expenditure will take place, all spending was allocated to both counties.

For modeling MRIO in IMPLAN, one must determine which areas, other than the areas where purchases will be made, will be affected in terms of increased economic activities by the award spending. One can specify surrounding counties, the entire state and/or the entire U.S. For the example estimations with MRIO below, aside from the two counties where direct spending occurs, we listed the entire state without the two counties (to avoid double counting) and the entire U.S. (excluding the state again to avoid double counting). The project will spend a total of $4,257,785.

There are five sets of calculations in Table C-2, showing the results in five subsections. There are two results whose differences we will focus on. The first set of calculations shows the results without MRIO. There is only one set of areas to be considered, the areas where direct project spending occurs. The result is that, Subsection 1, the input of nearly $4.26 million in use of goods and services yields a total of $7.09 million economic activities and these occur only in the two counties, a single specified region. MRIO requires the specification of at least two regions.

Subsections 2 through 4 present estimates of regional effects where MRIO is used. For this example, two more regions are introduced: the state without the two counties and the entire U.S. without the state. Total MRIO result (sum of subsections 2-4) is offered for the values under Subsection 5, all areas combined. Aside from the total result, MRIO offers three more calculations as we specified three distinct regions. The calculations labeled "Local" show the impact on the counties, which is very close to the estimations for the county level where no MRIO is used. This is as expected, since this table gives us the changes in economic activities that take place only within the local area. Subsections 3 and 4 illustrate the impacts that spillover into the state and the U.S. As no direct expenditure at the state or local levels took place, direct spending should be zero, but there are indirect impacts. Indirect impact arises because many inputs required for the project implementation are produced outside, in areas across the United States, not just within the two counties. The subsection U.S. Residual (see Section 3d) shows values of economic activities across the U.S. outside of the western state; it is called residual as we do not know the physical location of the generated activities. We conclude that a focus on local impact leaves out much of the impact that comes from the backward linkage of production of the inputs. We may also note that there are impacts outside of the U.S. due to imports, but IMPLAN does not enable us to capture those.

The final value, using MRIO, of the economic activities is $10 million, amounting to a difference of $3 million between use and non-use of MRIO. The lower bound of the impact is the local impact while the total that includes the national impact is the upper bound. For the two counties, Subsections 1 and 2 show that, for both MRIO and non–MRIO estimation, in the local area, expenditure of $1 generates $1.66 (= $7,089,005/$4,257,786) of economic activities. Adding in results from other regions in the MRIO estimation indicates that overall across the United States, $1 worth of project expenditure generates $2.35 (= $10,047,596/$4,257,786) economic activities. For IMPLAN, regional outcomes are additive; thus, values from the subsections 2,3 and 4 add up across the rows to the figures in the Estimation set 5 to give the total impact across all regions.

Table C-2. Comparing Results from Using IMPLAN With and Without MRIO

No MRIO: Modeled only for the areas where expenditure takes place (local) Subsection 1			
Type of Impact	**Employment**	**Labor Income**	**Value Added**	**Output**
1. Local Area, two counties, no MRIO				
1 - Direct	25.92	$2,203,102	$2,410,183	$4,257,786
2 - Indirect	5.28	$341,068	$663,693	$1,253,500
3 - Induced	8.45	$454,514	$961,094	$1,577,719
Total	39.66	$2,998,683	$4,034,971	$7,089,005
MRIO: Local, State and US Subsections 2, 3, 4 and 5				
Type of Impact	**Employment**	**Labor Income**	**Value Added**	**Output**
2. Local Area, two counties				
1 - Direct	25.92	$2,203,102	$2,410,183	$4,257,786
2 - Indirect	5.29	$341,449	$665,575	$1,259,428
3 - Induced	8.45	$454,790	$961,679	$1,578,679
Total	39.66	$2,999,341	$4,037,437	$7,095,894
3. State, without the two counties				
2 - Indirect	2.17	$234,939	$383,896	$692,556
3 - Induced	1.41	$99,677	$198,492	$310,119
Total	3.58	$334,616	$582,388	$1,002,675
4. US Residual				
2 - Indirect	4.17	$340,228	$577,770	$1,339,496
3 - Induced	2.89	$188,455	$343,230	$609,531
Total	7.06	$528,683	$921,000	$1,949,027

No MRIO: Modeled only for the areas where expenditure takes place (local) Subsection 1			
5. All Areas combined			
1 - Direct	25.92	$2,203,102	$2,410,183	$4,257,786
2 - Indirect	11.63	$916,616	$1,627,241	$3,291,480
3 - Induced	12.76	$742,922	$1,503,400	$2,498,330
Total	**50.31**	**$3,862,640**	**$5,540,825**	**$10,047,596**

4. Results and Regionalization

4a. Results Categories

Three types of impacts are generated through IMPLAN: the impact of direct spending on goods and services to support implementation (direct), the impact from the production of the goods and services used in implementation of the project (indirect) and the impact of consumption from labor income minus savings and taxes (induced). As noted above, direct spending is the allocated NOAA award, i.e., the project expenditure. Indirect spending represents purchases that businesses make from other businesses as a result of the expenditure and jobs created as a result of that activity. An expenditure to hire a construction firm might result in utilities purchased, which creates jobs at the utility company. The utility company will purchase additional supplies, resulting in further job creation. Induced expenditure looks at purchases that workers make with their increased income, and these can be anything from groceries and clothing to educational and pet care expenditures.

There are four types of economic indicators provided by IMPLAN:

1. Output: Output is the value of production by industry in a given year. It is also commonly known as revenue or sales from providing goods as inputs and consumption demands for the final goods, for industries that do not hold inventory (a basic assumption of many input-output analyses). Our estimation methods start by increasing sales by the amount of the project expenditure for goods and services an industry produces.

2. Value Added: Valued Added represents the difference between output and the cost of inputs that are required to produce that good. It includes labor income, other property income, and taxes on production and imports.

3. Labor Income: Labor Income is composed of all compensations paid to employees and proprietor income.

4. Employment: Employment in IMPLAN is an industry-specific mix of full-time, part-time, and seasonal employment. Here, IMPLAN follows the definition of employment used by the U.S. Bureau of Economic Analysis and Bureau of Labor Statistics.

4b. Regionalization

IMPLAN provides results for each award at each of the specified levels of geography: county, state residual, and the United States residual. Results presented here for the state level are county results added to the results for the rest of the state. Further aggregating state results into regional totals yields the data in the body of the report.

We present the results for regions in the body of the report for ease of presentation. We present results at the state level in Table A-1 of Appendix A, to provide a more local perspective. Aggregating results across states and regions enables the evaluation of the effects of NOAA projects as a whole. In particular, it allows us to add together the effects of many different kinds of projects, from fish passage restoration to marine debris removal, and prevents outliers or unique projects from distorting the overall effects.

To condense the analysis in the main body of the report, a regionalization of multiple states and territories was identified as a way to present information while making the report digestible. NOAA maintains many sets of regions, including Fisheries Regions, US Climate Regions, or its Collaborative Regions. As this study is focused on socioeconomic impacts to communities throughout the U.S., and the analysis generated state level impact calculations, none of these region selections were an ideal fit. The U.S. Census Bureau provides a regionalization that groups the 50 states into large units similar in terms of population, economy, and historical development. This was selected as the standard but was modified to break out Alaska, U.S. Caribbean Territories, and Hawaii and U.S. Pacific Territories.

5. IMPLAN Industry Codes Reference Guide and Allocation by Expenditure

5a. IMPLAN Reference Guide for BIL/IRA Evaluation

Table C-3 provides examples (but not an exhaustive list) of IMPLAN industry codes often used in **Pacific Coastal Salmon Recovery**, **Marine Debris Removal**, **Coastal Habitat Restoration** and **Fish Passage Restoration** projects.

Columns 1 and 2 list IMPLAN's industry codes and descriptions, respectively. Column 3 provides examples of activities extracted from the corresponding NAICS (and a few from U.S. Census Bureau) industry descriptions. Air and ground travel was coded using a bespoke mixture of codes.

Table C-3. IMPLAN Code Reference Guide for BIL/IRA Evaluation[19]

IMPLAN Industry Code	IMPLAN Industry Description	Examples of Activities
15	Forestry, Forest Products, And Timber Tract Production	Forest Nurseries For Reforestation, Growing Trees; Weeds, Revegetation
16	Commercial Logging	Timber, Logging, Pulpwood
19	Support Activities For Agriculture And Forestry	Planting, Seeding, Native/Wild Seeding
49	Water, Sewage And Other Systems	Canal, Irrigation; Water Distribution (Except Irrigation); Water Treatment And Distribution
56	Construction Of Other New Nonresidential Structures	Conservation And Development Construction; Reservoirs, Pump Stations, And Water Pipeline Construction; Fencing; Pipeline Construction Other Than Sewer And Water; Other Non-Building Construction; Water Storage Tanks And Towers
122	Hosiery And Sock Mills	Most Clothing
152	Printing	Business Forms, Manifold, Printing; Labels, Commercial Printing (Except Screen), On A Job-Order Basis; Newsletters Screen Printing Without Publishing

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[19] Built upon "2022 NAICS to IMPLAN 546 Industries" (IMPLAN Group LLC)

IMPLAN Industry Code	IMPLAN Industry Description	Examples of Activities
207	Other Concrete Product Manufacturing	Concrete Products, Precast (Except Block, Brick And Pipe), Manufacturing; Poles, Concrete, Manufacturing; Posts, Concrete, Manufacturing;
234	Hand Tool Manufacturing	Hammers, Hand Tools, Manufacturing; Pliers, Hand Tools, Manufacturing; Shears, Non-electric, Tool-Type (e.g., Garden, Pruners, Tinsnip), Manufacturing
262	Construction Machinery Manufacturing	Dredging Machinery Manufacturing; Crushing, Pulverizing, And Screening Machinery, Portable, Manufacturing
312	Search, Detection, And Navigation Instruments Manufacturing	Search And Detection Systems And Instruments Manufacturing; Sonar Systems And Equipment Manufacturing; Fish Finders (i.e., Sonar) Manufacturing; Flight And Navigation Sensors, Transmitters, And Displays Manufacturing; Navigational Instruments Manufacturing; Radar Systems And Equipment Manufacturing
314	Industrial Process Variable Instruments Manufacturing	Chromotographs, Data Loggers, Display Instruments, Electrolytic Conductivity Instruments, Industrial Process-Type, Electromagnetic Flowmeters, Fluidic Devices, Circuits, And Systems For Process Control
354	Drones, Aviational Manufacturing	
393	Wholesale - Professional And Commercial Equipment And Ff	Instruments, Professional And Scientific, Merchant Wholesalers; Cameras, Video (Except Household-Type), Merchant Wholesalers; Computer, Peripheral Equipment, Data Storage Devices And Printers Merchant Wholesalers; Computer Software, Packaged, Merchant Wholesalers, Computers
394	Wholesale - Household Appliances And Electrical And Electronic Goods	Construction Materials, Electrical, Merchant Wholesalers
395	Wholesale - Machinery, Equipment, And Supplies	Agricultural Implements Merchant Wholesalers; Agricultural Machinery And Equipment Merchant Wholesalers; Hydraulic Pumps And Parts Merchant Wholesalers; Pneumatic Pumps And Parts Merchant Wholesalers
396	Wholesale - Other Durable Goods Merchant Wholesalers	Buildings, Prefabricated Non-Wood, Merchant Wholesalers; Prefabricated Buildings (Except Wood) Merchant Wholesalers; Culvert Pipe, Metal And Plastics, Merchant Wholesalers; Iron And Steel Architectural Shapes Merchant Wholesalers; Silt Fence And Other Fabrics (e.g., For Erosion Control) Merchant Wholesalers; Structural Assemblies, Prefabricated (Except Wood), Merchant Wholesalers
400	Wholesale - Other Nondurable Goods Merchant Wholesalers	Plants, Potted, Merchant Wholesalers; Trees Merchant Wholesalers; Seeds (e.g., Field, Flower, Garden) Merchant Wholesalers; Mulch Merchant Wholesalers; Office Supplies (Except Furniture, Machines) Merchant Wholesalers; Computer Paper Supplies Merchant Wholesalers; Desk Accessories, Office, Merchant Wholesalers
408	Retail - Gasoline Stores	Any Retail Service That Services Petrol And Other Fuels; Convenience Food With Gasoline Stations

IMPLAN Industry Code	IMPLAN Industry Description	Examples of Activities
410	Retail - Sporting, Camping Goods, Books And Music	Camping, Hunting, Pottery, Music Shop Etc.
411	Retail - General Merchandise Stores	Supercenters (e.g., Walmart); General Stores; Auctions; Dollar Stores
412	Retail - Miscellaneous Store Retailers	Office Supply Stores; Stationary Stores
413	Retail - Nonstore Retailers	Diving Equipment Stores; Emergency Preparedness Supply Stores; Art Supply Stores; Architectural Supply Stores
414	Air Transportation	Air Passenger Carriers
418	Transit And Ground Passenger Transportation	Local Transit Systems, Mixed Mode (e.g., Bus, Commuter Rail, Subway Combinations); Rural Bus Services
420	Scenic And Sightseeing Transportation And Support Activities For Transportation	Cargo Salvaging, Marine; Marine Salvaging Services; Radio Beacon (I.E., Ship Navigation) Services; Piloting Services, Water Transportation; Ship Dismantling At Floating Drydock; Wrecker (Demolition) Services (I.E., Towing Services), Motor Vehicle; Tugboats Included
433	Wired Telephone Carriers	Land Line, Internet, Cable, Satellite Television
435	Satelite, Telecommunication Etc.	Cellphones, Radar Station Operations, Satellite Tracking Stations
436	Data Processing, Hosting, And Related Services	Cloud Services, Computational Processing, Web Hosting, Data Storage Services; Data Capture Imaging Services; Data Entry Services; Data Processing Computer Services; Data Processing Services (Except Payroll Services, Financial Transaction Processing Services)
444	Insurance	Underwriting, Homeowners
447	Other Real Estate	Renting Space For Meetings
450	Automotive Equipment Rental And Leasing	Car Rental; Car Rental Services; Passenger Car Rental; Passenger Truck (Light Duty) Rental; Car Leasing
453	Construction Rental And Purchase	Bulldozer Etc.
455	Legal Services	Legal Aid Services, Paralegal, Law Offices, Notary
457	Architectural, Engineering, And Related Services	Erosion Control Engineering Services; Drafting Services; Building Inspection Services; Aerial Geophysical And Geological Surveying Services; Geophysical Mapping And Surveying Services; Construction Surveying Services; Land Surveying Services; Environmental And Geotechnical Testing Laboratories Or Services; Electrical Engineering Services
458	Specialized Design Services	Art Installation, Graphic Designer
459	Custom Computer Programming Services	Applications Software Programming Services, Custom Computer; Web (I.E., Internet) Page Design Services, Custom

IMPLAN Industry Code	IMPLAN Industry Description	Examples of Activities
462	Management Consulting Services	Logistics Management Consulting Services; Utilities Management Consulting Services; Administrative Management Consulting Services; Site Location Consulting Services; Strategic Planning Consulting Services; Site Selection Consulting Services; Utilities Management Consulting Services
463	Environmental And Other Technical Consulting Services	Ecological Restoration Consulting Services; Wetland Restoration Planning Services; Site Remediation Consulting Services; Environmental Consulting Services; Environmental Reclamation Planning Services; Site Remediation Consulting Services; Biological Consulting Services; Economic Consulting Services
464	Scientific Research And Development Services	Environmental Research And Development Laboratories Or Services (Except Biotechnology And Nanotechnology Research And Development); Fisheries Research And Development Laboratories Or Services (Fish Habitat Biologist, Fisheries Biologist); Biotechnology Research And Development Laboratories Or Services In Biology (Except Nanobiotechnology Research And Development); Archeological Research And Development Services; Historic And Cultural Preservation Research And Development Services; Sociological Research And Development Services; Grant Giving-Part Of University
465	Advertising, Public Relations, And Related Services	Advertising Agencies And Consulting Services; Digital, Internet, Or Online Advertising Agencies; Public Relations Agencies; Public Relations Services; Public Relations Consulting Services
466	Photographic Services	Commercial Photography Services; Photographers Specializing In Aerial Photography; Video Taping Services, Special Events; Photography Services, Commercial; Photography Studios, Commercial
468	Marketing Research & All Other Miscellaneous Professional, Scientific, & Technical Services	Marketing Research, Analysis Services; Opinion Research Services; Public Opinion Polling, Research Services; Statistical Sampling Services; Marine Forecasting Services; Meteorological Services; Weather Forecasting Services;
470	Office Administrative Services	Office Management Services; Administrative, Business Management Services
473	Business Support Services	Call Centers, Phone Answering, Secretarial Services, Word Processing, Document Preparation
478	Other Support Services	All Other Professional, Scientific, And Technical Service; Diving Services On A Contract Or Fee Basis

IMPLAN Industry Code	IMPLAN Industry Description	Examples of Activities
479	Waste management and remediation services	NOTE: IMPLAN code 457 is more appropriate for the planning of waste removal. This sector focuses on the actual waste removal process and includes the below examples: Remediation and cleanup of contaminated buildings, mine sites, soil, or ground water; Brush collection, removal, hauling services; Debris removal services; Dump trucking of rubble or brush with collection or disposal; Rubble removal services; Waste (except solid and hazardous) collection, hauling services; Other Waste Collection includes: the clean-up crew and applies to the contractors who will be cleaning up debris, mostly from buildings or structures, and entities involved in brush or rubble removal services; Hazardous waste disposal facilities combined with collection and/or local hauling of hazardous waste: Hazardous waste disposal facilities combined with collection and/or local hauling of hazardous waste; Refuse collecting, disposal and operating solid waste landfills; Environmental remediation services; Oil spill cleanup services; Site remediation services; Soil remediation services; Toxic material abatement, removal services; Materials recovery facilities (MRF); Recyclable materials recovery facilities; Removal of recyclable materials from a waste stream; Waste recovery facilities; Beach maintenance and cleaning services; Disaster recovery services (i.e., cleanup, salvaging), without providing remediation services; Lake, pond and reservoir maintenance and cleaning services; Sewer cleaning and rodding services; Storm basin cleanout services; Disposing derelict marine vessels. Part of abandoned and derelict vessels (ADV)
481	Junior College and Higher Education	Research universities, Law Schools, Undergraduate education, Medical Schools and all Professional Higher Education
482	Other educational services	Education specialist; Education consulting; computer software training; management development training; professional development training; quality assurance training, aviation training
501	Museums, historical sites, zoos, and parks	Nature preserves; Nature reserves; wildlife sanctuaries
507	Hotels and motels, including casino hotels	Auto courts, lodging; Automobile courts, lodging; Hotels, Motels, Motor inns, Motor lodges
509	Full service restaurant	Meals and incidentals from full service restaurants
522	Grantmaking, giving, and social advocacy organizations	Conservation advocacy organizations; Environmental advocacy organizations; Natural resource preservation organizations; Community action advocacy organizations
531	Other State Government Enterprises	For use in state government administration of competition or awards.

5b. Leading IMPLAN Industry Codes by Expenditure

Table C-4 provides an account of the leading allocations by industry expenditure and provides an overview of the sectors that contribute to economic activity. By understanding the most used economic codes, analysts may better understand how BIL/IRA funding for coastal resilience compares against other investments.

Table C-4. Top 50 IMPLAN Industry Codes Used Sorted by Expenditure Percentage

Code	IMPLAN 546 Industry Description	% of Total Expenditure
56	Construction of other new nonresidential structures	24.41%
463	Environmental and other technical consulting services	19.63%
457	Architectural, engineering, and related services	14.69%
479	Waste management and remediation services	7.56%
464	Scientific research and development services	5.27%
462	Management consulting services	4.05%
478	Other support services	4.02%
522	Grantmaking, giving, and social advocacy organizations	2.96%
393	Wholesale - Professional and commercial equipment and supplies	1.84%
396	Wholesale - Other durable goods merchant wholesalers	1.47%
470	Office administrative services	1.19%
420	Scenic and sightseeing transportation and support activities for transportation	1.18%
455	Legal services	1.10%
207	Other concrete product manufacturing	1.07%
242	Metal tank (heavy gauge) manufacturing	1.03%
19	Support activities for agriculture and forestry	1.01%
54	Construction of new highways and streets	0.82%
482	Other educational services	0.58%
49	Water, sewage and other systems	0.40%
15	Forestry, forest products, and timber tract production	0.38%
465	Advertising, public relations, and related services	0.35%
416	Water transportation	0.26%
435	Satellite, telecommunications resellers, and all other telecommunications	0.25%
481	Junior colleges, colleges, universities, and professional schools	0.22%
408	Retail - Gasoline stores	0.21%
400	Wholesale - Other nondurable goods merchant wholesalers	0.21%

Code	IMPLAN 546 Industry Description	% of Total Expenditure
531	Other state government enterprises	0.20%
468	Marketing research and all other miscellaneous professional, scientific, and technical services	0.20%
453	Commercial and industrial machinery and equipment rental and leasing	0.20%
447	Other real estate	0.17%
451	General and consumer goods rental except videotapes and discs	0.17%
512	Automotive repair and maintenance, except car washes	0.16%
507	Hotels and motels, including casino hotels	0.16%
395	Wholesale - Machinery, equipment, and supplies	0.14%
385	Sign manufacturing	0.13%
450	Automotive equipment rental and leasing	0.12%
312	Search, detection, and navigation instruments manufacturing	0.12%
414	Air transportation	0.11%
509	Full-service restaurants	0.11%
262	Construction machinery manufacturing	0.11%
252	Valve and fittings, other than plumbing, manufacturing	0.10%
14	Animal production, except cattle and poultry and eggs	0.10%
418	Transit and ground passenger transportation	0.10%
429	Motion picture and video industries	0.09%
298	Electronic computer manufacturing	0.09%
394	Wholesale - Household appliances and electrical and electronic goods	0.09%
444	Insurance carriers, except direct life	0.08%
523	Business and professional associations	0.07%
6	Greenhouse, nursery, and floriculture production	0.07%
516	Personal and household goods repair and maintenance	0.07%

6. Comparing BIL/IRA Estimated Economic Impacts to Results of Other Studies

NOAA used IMPLAN modeling to calculate the expected economic outcomes arising from spending that would be undertaken to implement the BIL/IRA projects. This section compares our results to findings in related academic literature and U.S. government agency studies.

Our aim is to investigate if:

1) The results are comparable to findings that examine impact of spending on ecosystem restoration through input-output type modeling exercises;

2) The results found are also in line with general economics literature that have examined local impacts of government funding using empirical econometric methods; and

3) The expected result at the national level falls within the acceptable range that shapes debates surrounding impact of government spending.

6a. Economic Impact of Spending on Ecosystem Restoration: Input-Output Modeling

In this section, the estimated economic impacts from BIL/IRA project funds are compared to analyses for other similar projects. The comparison in this section is restricted to ecosystem restoration related projects – projects similar to those funded through BIL/IRA funding. All analyses reviewed here used data collected after the completion of projects, in contrast to the budget data used for the current analyses. The studies reviewed are summarized in Table C-5 presenting figures for the output multiplier or the Keyensian multiplier[20] and job years (jobs) created per million dollars spent. All values are reported in 2024 dollar values.

The studies reviewed reports from data covering years the period of 2009 to 2017; many projects were from the American Recovery and Reinvestment Act of 2009 (ARRA) funding. Only one study was able to use data that reported actual spending patterns. The other methods are detailed below. Some of the estimations include the impact of both federal expenditure and matched funding; and one adds private including non-profit spending. Mostly, the studies used information on the expenditure patterns to estimate the economic impact; only one study seeks to verify empirically what the project achieved. All studies use modeling methods, either REMI or IMPLAN, to estimate a likely impact. Studies modeling a broader region are closer to our results, as we used Multi-Region Input-Output (MRIO[21]) modeling from IMPLAN, which allows us to input data at the project locality while accounting for leakages and indirect spending leaving the project area.[22]

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[20] Explanation for the multiplier is found in Annex C.2.

[21] See Annex C.3 MRIO allows us to input data at the local level, but adjust for leakages and indirect spending outside the county level.

[22] When spending at the regional level is used as input into IMPLAN modeling, certain amounts may not be spent in that region for various reasons. This can happen both for direct and indirect spending (See Annex C.2 and C.3).

Table C-5. Economic Impacts from Related Restoration Projects

Project/Study and Year	Estimation Methods	Economic Output per $ Invested	Jobs Created per $ 1 million	Modeling Unit
Current NOAA BIL/IRA Projects (2024)	IMPLAN modeling. Estimated using final demand as the model input. Method followed by all models below. Expected industry spending for 23-27.	National level multiplier: 2.4, State-level multiplier: 1.89.	National level: 13.6. State level: 11.7	County input, MRIO used for State to National-level IMPLAN expected economic values
GLRI University of Michigan (2018)	REMI for project implementation impact. Industry code through consultation and document survey. Employment and housing impact through econometric methods. Extended period estimation through REMI.	1.4 to 1.7 project implementation duration: 2010-16 Long-term (2017-36) impact 3.35	14.2, for a longer period than the implementation period - 2010-36.	All estimations are generated for the Great Lakes region only. Govt. funding 2010-16 with matched funding. Value is discounted at 3% from 2017-36.
NOAA ARRA projects Samonte et al. 2019	IMPLAN, employed only at the project areas. Data on NAICS (industry) code collected from implementers ex post, cumulative costs were inputted.	1.7 Aggregated local changes	10.8 Aggregated local value	County-level estimates of 47 NOAA projects funded through ARRA
High-level National Study BenDor et al. (2015) and (BenDor, Lester et al, 2015)	IMPLAN is modeled at the national level using key industry codes. Industry code obtained through consultations and documents analyses. Project types varied widely with different ecological concerns and types of implementers. Less than half of the projects were government. Some for private firms.	1.69 to 2.65 from different projects. Projects from 2009-11. Total output multiplier for 2014, 2.62.	1.14 to 24.3. Wide range of projects gave a wide array of results.	Measured at the national level. Total expenditure modeled for years around 2014, US$9.5 billion. Total expenditures were divided by different types of ecosystems projects, and IMPLAN simulations were run by these types.
21 projects from Dept. of Interior, Culinane Thomas et al, (2016). ARRA funding.	IMPLAN, local level modeling; leakages are modeled outside the project area for each project. Data obtained on industry code through ex-post analysis of project implementation.	2.2 to 3.4, project duration varied	10 to 24	Measured at the National level or 17 Western states combined. MRIO not used. Two steps: local and/or two distinct regions – all US or Western States). Separate models for local and non-local.

6b. Economic Impact of Local Fiscal Expenditure: Empirical Economics Literature

This section compares the estimated economic impacts for the NOAA BIL/IRA awards to the economic impacts of government expenditure estimated in the economics literature using econometric methods.

IMPLAN and REMI type models estimate the economic impact for regions of interest relative to the status quo (i.e., current regional economic activities without the funding for project implementation) for funded regions. Many empirical studies use the fact that government spending varies across jurisdictions to compare outcomes for regions with different levels of funding. The recent literature tries to show, using cross-sectional data, that spending at the local level does improve the local economy and somewhat beyond the local spending area.[23] There is recognition that government spending can crowd out private investments or even raise prices to yield an impact of a multiplier of less than one. However, the pervasive thinking is that at particular times when private investment level is low and unresponsive to interest rate changes, government expenditure can yield a positive multiplier (Chodorow-Reich, 2019). Such a situation prevailed during the ARRA spending. This section provides a background to understanding the level of multiplier value we obtained through our IMPLAN MRIO estimation.

Similar to the indicators shown in Table C-5, above, economists have estimated two closely related measures to describe the impact of local spending:

1) The impact on job generation by measuring jobs created per unit of expenditure (jobs created per million or $100,000 of government expenditure – referred to as the job multiplier)[24] and

2) The impact on output: the value of economic activities generated by $1 of government expenditure, as noted above (often referred to as the multiplier or the output multiplier).

Chodorow-Reich (2019) finds that the regional jobs multipliers from ARRA spending, as estimated by various studies, have a mean of 2.1 and median of 1.9 jobs per $100K in spending—mostly at the state level. A county level study of ARRA spending showed a smaller job multiplier; the same data measured at larger geographic areas show increasing values of multiplier, consistent with other findings. An estimation, typical of results found for ARRA spending, showed a job year was created at a cost of $71,726 (2024 US$) at the state level; this is comparable to the value for NOAA BIL/IRA funding at $85,715 per job year at the state level. Chodorow-Reich estimates for the US 2009 data that a job multiplier of 2 at the state level is roughly equivalent to an output multiplier of 1.7.[25]

Other empirical estimates of local output multipliers for government spending have found similar values using a variety of methodologies. Nakamura and Steinsson (2014) use time series defense spending data and estimate impact at the state level from a panel data set that included data beyond the ARRA period. Taking advantage of the fact that changes in defense spending are not distributed in any uniform way across the states, they find a state level output multiplier to be 1.4 and a regional level output multiplier of 1.9. Taking advantage of variations across time in population-based federal funding allocations at the

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[23] Economists have tried to verify that improved regional income from regional spending represents an increased income for the overall economy (see Chodorow-Reich, 2019 for a review), and that the regional spending impact is part of the larger impact from the given source of spending.

[24] The job multiplier and the output multiplier are related; local employment figures (state or county levels) are more accurately reported; Chodorow-Reich (2019) has an explicit derivation of the relation.

[25] The state-level job multiplier we find is 1.7 ($100,000/$58,690 adjusting $85,715 to 2009 US$) while the output multiplier is 1.89. It is possible that NOAA funding is oriented toward higher paying jobs, as one of the components used in calculating the relation is income generated by an employee.

county level, Suarez Serrato and Wingender (2016) find output multipliers from 1.7 to 2.0. Using panel data, Auerbach et al. (2019) have found a composite state (local plus state effects) level multiplier of 1.5 for local defense spending. Looking outside the U.S., Corbi et al. (2019), studying Brazil, and Kameda et al. (2021), studying Japan, use variations in local government spending to find regional multipliers of 2.0 and 1.7, respectively.

Local job multipliers from input-output type models (for example, IMPLAN) have been compared to empirical estimations from the literature by Bartik and Sotherland, 2019. Simulation models which incorporate empirical findings, they suggest, show that job multipliers from input-output estimations have increasing upward biases as the reported number is higher, perhaps a multiplier of 1.7 from IMPLAN could actually be 1.25. The simulations only take into account the fact that input-output models ignore congestion effects (see Annex C.3)[26]. Chodorow-Reich has noted, however, that local price effects may be minimal when local government expenditures rise. The empirical multipliers may also be higher than simulation models indicate, because the empirical models also incorporate agglomeration, which is omitted in IMPLAN.

6c. Economic Impact of Spending at the National Level

The Congressional Budget Office (CBO) frequently estimates the impact of policy changes through direct spending or tax policy (that may either increase or decrease taxes) – the national fiscal multiplier. What is the size of the fiscal multiplier, the change in a nation's economic output generated by each dollar of change in fiscal policy (Whalen and Reichling, 2015, CBO working paper)? Mostly this is calculated through time series analyses, macroeconomic forecasting models or dynamic general equilibrium models.

National fiscal multipliers can vary a great deal depending on the model chosen, according to an international meta-study of fiscal multipliers (Gechert and Will, 2012). Models of the business cycle, general equilibrium models, and econometric models based on empirical data yield different multipliers.

Whalen and Reichling observed different assumptions regarding the structure of the economy and the incidence of the spending can affect the size of the multiplier. The estimated multiplier is the result of the combined direct effect on demands on goods and services due to government spending and the indirect effect on output that arises when the direct effects propagate throughout the economy. The indirect effect enhances the direct effect; however, if an increase in taxes funds the decrease and reduces disposable income, there is no major change in direct spending, and then one should not expect any indirect effect. These countervailing forces affecting the economy as a whole are among the chief differences between local and national multipliers. Gechert and Will (2012) find that the effects of public spending are larger than the effects of tax cuts. Additionally, CBO estimates that a dollar increase in periods when the economy is below its potential increases output over four quarters, and the multiplier can be as high as 2.5. When the economy is already at its potential there may not be much of an impact, and the multiplier could be less than zero, implying there may be significant crowding out of non-governmental activities. Although NOAA spending is modeled at the local level, BIL/IRA estimation implies a national fiscal multiplier of greater than 2; this figure is not outside the ranges economics literature has indicated.

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[26] Price rise due to higher demand on goods and wages stemming from higher spending due to, for example, increased government spending.

6d. Expected Economic Outcomes from NOAA projects: how did they compare?

The IMPLAN modeling exercise produced two important and commonly reported outcomes using the anticipated spending patterns from the NOAA BIL/IRA projects as reported by the grantees: output per dollar spent (output multiplier) and job years created per million dollars (employment or jobs multiplier). We conclude that the expected estimations reflect values that are similar to those found in the literature that examine the impact of government expenditure on the economy.

The expected output multiplier estimation at the national level is in line (Table C-5) with those found for expenditure on ecosystem projects when impacts on areas outside the project area (at the regional/national level) are taken into account. This expected estimation for BIL/IRA projects is higher from those found for general government spending at the local level in studies using econometric methods. However, the estimation aggregated at the state-level from NOAA projects is very similar to the findings in those studies (Table C-5 and footnote 8). The national-level output multiplier expected for the proposed NOAA BIL/IRA projects is within the higher values for the range of multipliers reported by CBO.

The expected employment multiplier found for the NOAA BIL/IRA projects is smaller than those seen in the literature except for the value reported at the local level from a study that considered local level impact from NOAA ARRA projects (Table C-5 and footnote 8). It is possible that NOAA projects are more scientific oriented and generate employment where productivity is higher; this would result in a lower employment multiplier while showing a higher output multiplier.

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APPENDIX D: EQUITY ANALYSIS METHODS

The appendix describes the techniques used to analyze the equity considerations and benefits to underserved, Tribal, and Indigenous communities proposed through the 173 BIL/IRA awards. This appendix also provides more detail on caveats and limitations of the analysis.

Equity-Related Data Extraction and Thematic Development

To understand community involvement and environmental resilience benefits to underserved, Tribal, and Indigenous communities as described in approved application narratives, we took the following steps in analyzing award applications:

- We reviewed data from the award recipient proposals extracted from Grants Online data. Prior to the equity analysis, we performed an initial review of the award documents to extract information related to planned engagement activities with underserved, Tribal, and Indigenous communities.

- We then conducted a second independent review of applications—with a focus on components of the narrative related to equity and underserved, Tribal, and Indigenous communities.

- We extracted the following information from grant documents:
  - Underserved, Tribal, or Indigenous communities engaged
  - Type of engagement
  - Expected benefits to underserved, Tribal, or Indigenous communities

- Within each of the three broad typologies above, we identified the most prevalent components based on the narratives and conducted inductive coding to extract more detailed information. The coding categories we identified are as follows:
  - **Underserved, Tribal, and or Indigenous groups engaged**
    - Tribal or Indigenous groups
    - Other community members/residents of underserved community (e.g., general adult community population)
    - K-12 students in underserved community
    - Community-based groups
    - College students from underserved communities.
  - **Type of engagement**
    - Underserved community members and/or Tribal or Indigenous representatives are directly involved in project planning and/or implementation as part of the project team
    - Community planning or input meetings
    - Educational programming (including project site visits or tours) to inform community members of the project and its anticipated benefits
    - Creation of jobs (or internships) for community members
    - Volunteer days or community work days (for restoration, clean up, etc. activities)

- Social media, websites, newsletters, press releases, signage and educational materials

- Underserved community members and/or Tribal/Indigenous representatives compensated for their participation directly related to project activities through stipends and/or other support (e.g., childcare, transportation, etc.)

- Broader community events (e.g., festival or celebration)

- Multilingual educational and outreach materials (e.g., social media, websites, newsletters, press releases, signage and educational materials) to assist in reaching non-English speaking populations

  o **Benefits to underserved, Tribal, or Indigenous communities**

  - Project will protect, restore, or enhance culturally significant ecosystems and resources (e.g., plant and animal species, land areas)

  - Project will result in economic benefits for the underserved or Tribal communities

  - Project will provide enhanced ecosystem services in or adjacent to underserved or Tribal communities

  - Project activities will build capacity for underserved, Tribal, or Indigenous communities (e.g., increased organizational capacity, increased capacity for restoration projects, etc.)

  - Project will provide risk reduction benefits to the underserved, Tribal, or Indigenous communities (e.g., reduced flood risk, reduced urban heat island effects, etc.)

  - Project will increase opportunities for outdoor recreation, environmental education, or access for underserved, Tribal, or Indigenous communities

Following data review and analysis to determine the coding categories listed above, we reviewed the relevant equity-related content and then identified and summarized the relevant information to include in each category. This analysis led to the production of the descriptive statistics presented in Chapter 2.

Equity Analysis Limitations

The methods used for analysis of equity-related award data represent standard approaches used in qualitative research and evaluations; however, the robustness of the analysis is dependent on the quality of the data available. In this analysis, we relied solely on information provided in the final and approved award applications. Below, we list the caveats to our analysis based on the available data:

- **The analysis relies on proposed activities.** Our analysis relies on award documents and information provided by awardees when submitting their applications; we do not report on achieved outcomes related to advancing equity. In implementing their awards, it is possible that awardees may encounter roadblocks or setbacks related to their planned engagement or other project activities that could limit benefits to communities. Additionally, even when an activity is underway and awardees are able to engage underserved, Tribal, or Indigenous communities, it may take years to assess the long-term and transformative nature of investments.

- **Awardees self-reported the characteristics of communities they will work with.** In identifying communities with whom awardees are working, we relied on the applicants to self-report whether these communities are considered underserved. Project coordinates or polygons

were not available consistently across grants; thus, we did not conduct geospatial analysis using publicly available socio-demographic datasets (e.g., the Climate and Economic Justice Screening Tool, American Community Survey data) to determine which communities meet pre-existing defined characteristics of being underserved, disadvantaged, or vulnerable. Please also note, these datasets are excellent first steps, but do not necessarily capture all aspects of underserved, disadvantaged, and vulnerable communities.

- **Applications included varying levels of detail regarding underserved, Tribal, and Indigenous communities.** The level of detail that grant documents provided regarding the underserved, Tribal, and Indigenous communities they will work with, how they are engaging these communities, and project benefits for communities varied greatly across grant documents. This evaluation projects anticipated benefits; this assessment may not fully represent the degree to which these grants may provide benefits to underserved, Tribal, and Indigenous communities.

APPENDIX E: BENEFIT TRANSFER FOR WETLANDS

The benefit transfer approach used to estimate potential wetland-derived ecosystem service benefits from BIL/IRA grant funded projects differs from the benefit transfer approach used to estimate potential ecosystem service benefits from other (i.e., non-wetland) habitats. The approach involves the use of a meta-regression model (MRM), which has the advantages of being able to modify willingness to pay (WTP) benefit transfer values to better adhere to policy site or project worksite environmental characteristics. For example, this specific MRM can adjust WTP values based on (1) the region within the U.S. (South-Atlantic/Gulf, Northeast/mid-Atlantic, and North/Midwest) the project worksite is located, (2) the type of wetlands affected (freshwater or saltwater, forested or non-forested), (3) the number of acres preserved, (4) whether the project worksite is local to beneficiaries of wetland-derived ecosystem services, and (5) the specific ecosystem services obtained (cultural, regulating, and provisioning) from wetland restoration/preservation. Furthermore, the model's functional form allows for the adding-up of property where the value of preserving some number of wetland acres will roughly equal the sum of the values from the preservation of smaller amounts of wetland acres which total that sum. Lastly, the model was recently employed in EPA and the Department of the Army's Economic Analysis for the Final "Revised Definition of 'Waters of the United States'" Rule (henceforth, the 'WOTUS report') and hence, has previously been vetted by expert economists at EPA. This approach is not without shortcomings, for example, requiring the collection of relatively large amounts of data related to the project worksites. For this reason, ecosystem service valuation estimates for non-wetlands habitats (described in Appendix F) employ simpler, unit value benefit transfers.

Data Extraction and Cleaning

The following section describes the steps taken to collect, process, and clean the data used to generate aggregate wetland-derived ecosystem service benefits from BIL and IRA grant funded projects.

BIL Grant Funded Project Wetland Data

The key data used in this analysis stems from the documentation on the 173 BIL and IRA grant funded projects. This data was extracted from GrantsOnline. GrantsOnline contains all documentation that applicants submitted to request grant funding. This includes application review reports (which contain project narrative descriptions), maps, resumes for key staff, budget information, and other supplementary materials. The following data was extracted from these documents:

- GRANTSGOV_NUM: an identifier for the project applicant

- PROJ_ID: an identifier that was created to represent a specific work site for a given project

- Wetland Preservation/Restoration: an indicator for whether the project involves, at least in part, wetland preservation, restoration, and/or creation

- Saltwater: an indicator for whether the project involved saltwater wetland preservation

- Forested: an indicator for whether the project involved forested wetland preservation

- Acres: the number of wetland acres preserved

- Prov: whether provisioning ecosystem services were mentioned in project narrative descriptions

- Reg: whether regulating ecosystem services were mentioned in project narrative descriptions

- Cult: whether cultural ecosystem services were mentioned in project narrative descriptions

- Latitude: the latitudinal coordinate of project work sites

- Longitude: the longitudinal coordinate of project work sites

- State and County FIPS: State and County Federal Information Processing Series (FIPS) codes for the project work site location

- End_Date: the project end date

Of the 173 BIL grant funded projects 78 (45 percent) were determined to be 'wetland projects' which included a wetland preservation, restoration, and/or creation component. For some projects, wetland preservation, such as through the purchase of existing wetlands or other types of land that could become wetlands in the future through marsh migration, was the primary objective. For other projects wetland preservation was a secondary objective. Examples include fish passage restoration projects which, in some cases, involved wetland restoration following the removal of fish passage barriers (such as dams). Lastly, due to data limitations (e.g., missing latitude and longitude project work site coordinates, wetland acreage information, county-level median income, county-level population projections) aggregate benefits could only be assessed for 46 of the 78 (59 percent) wetlands projects.

Baseline Wetland Data

The baseline wetland acreage was estimated using data from the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI). The NWI includes wetland GIS shapefiles at the State level classified by Cowardin Code (Cowardin, 1979). Since the MRM requires a simpler classification of wetlands (forested or non-forested, saltwater or freshwater) the Cowardin categories were aggregated, as appropriate, to serve model needs. Table E-1 below summarizes this process.

Table E-1. NWI Wetland Classification to Simplified Wetland Classification for MRM

Type		Classification	Codes
Freshwater	Forested	-Palustrine, forested	PFO
Freshwater	Non-forested	-Palustrine (class = all except forested) -Lacustrine (class = all) -Riverine (class = all)	PUB, PAB, PSS, PEM, PRB, PUS, PML L R
Saltwater	Forested	-Estuarine, forested	E2FO
Saltwater	Non-forested	-Estuarine (class = all except forested) -Marine (class = all)	E1, E2 M1, M2

Once the wetland type was summarized as either forested or non-forested and saltwater or freshwater the acreage was aggregated over a 30-mile radius of project work sites. The 30-mile radius extent was chosen to be in keeping with the setting of the *local* variable to one (i.e., local wetland ecosystem service benefits). This process is illustrated in Figure E-1 below.
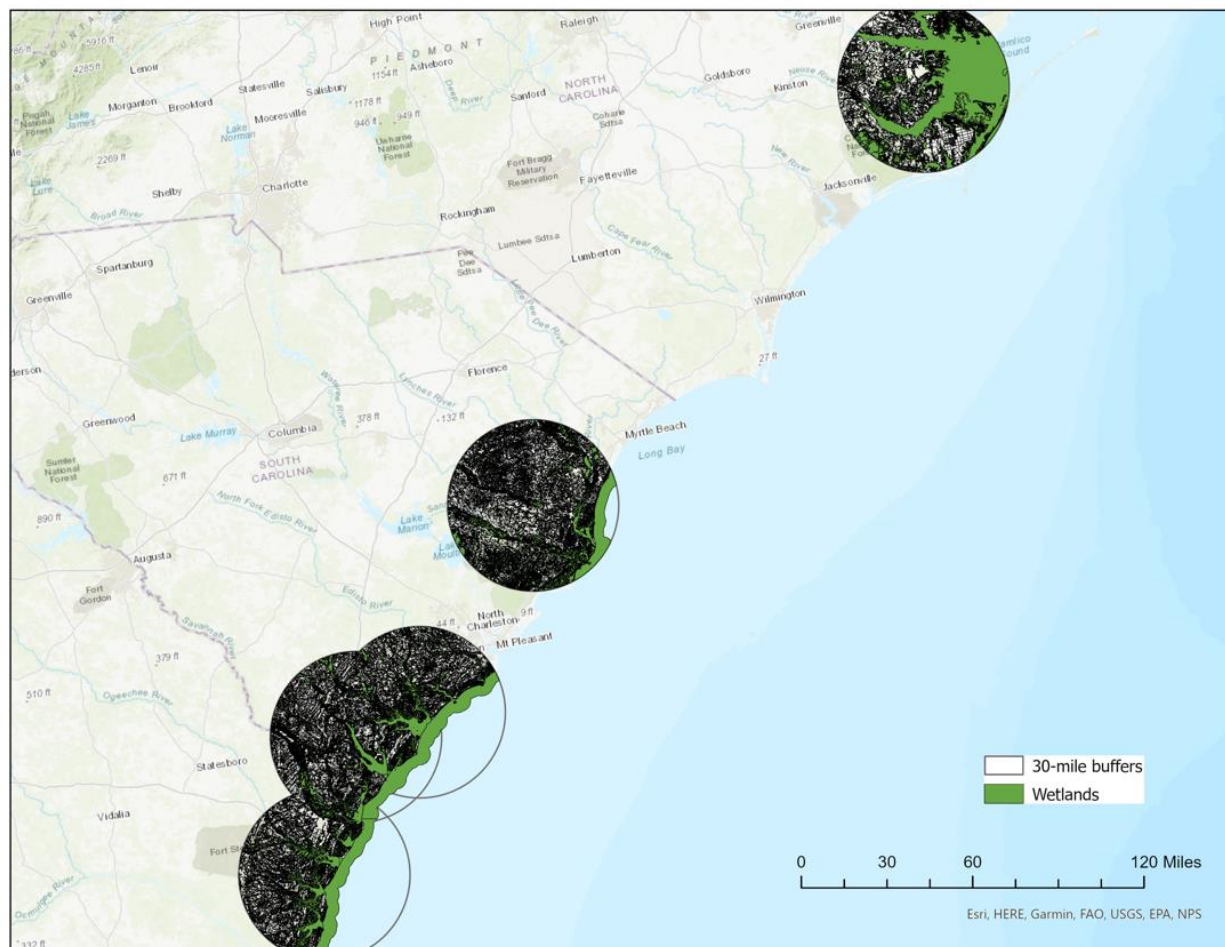
Figure E-1. Illustration of wetland data extraction within 30-mile buffers of project worksites.

Population and Demographic Data

To estimate aggregate benefits by county, data is needed on income and household counts at the county level. The former is needed as a parameter for the MRM to generate HH WTP estimates while the latter is needed to aggregate HH WTP across households.

Data on the median income at the county level is taken from the U.S. Census 2022 American Community Survey (ACS) 5-year estimate. Household projections for years 2024 to 2043 rely on two data sources: (1) persons per household information at the county level from the U.S. Census' 2022 ACS and (2) population projections at the county level from the NASA Socioeconomic Data and Applications Center (SEDAC) (Hauer, 2021).[27] Hauer (2021) provides population projections from 2020 to 2100 under several climate change scenarios represented in Shared Socioeconomic Pathways (SSPs). The SSP2 climate change scenario was chosen as providing the most reasonable population projections for the analysis. SSP2 represents the "middle-of-the-road" scenario where emissions result in 3-3.5C of warming by 2100. Population projections are provided on a quinquennial basis and a linear trend is assumed to impute population levels for the in-between years. The U.S. Census provides persons per household for renters

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[27] Hauer, M. E. 2019. Population Projections for U.S. Counties by Age, Sex, and Race Controlled to Shared Socioeconomic Pathway. Scientific Data 6: 190005. https://doi.org/10.1038/sdata.2019.5.

and owner-occupied units, as well as the number of rental units and owner-occupied housing units. Given this information, a weighted average of the persons per household is calculated. Finally, the number of households is projected by dividing projected population estimates by persons per household.

Data Quality Assurance and Control Steps

Several steps were taken to QA/QC the extracted data from GrantsOnline:

- **Determining whether a BIL grant funded project was a wetland project**: Documents pertaining to BIL grant funded applications were extracted (application review reports, maps, supplementary materials) from GrantsOnline and reviewed. Key terms such as "wetlands", "marshland", "saltwater wetland", "freshwater wetland", "swamps", "floodplains" and others were searched within these documents and used to flag a project for further review. Among flagged projects, projects were excluded if they only involved capacity building (e.g. hiring more staff to potentially conduct wetland restoration work at some point in the future). Additionally, since wetlands may or may not reside in floodplains, projects that described floodplain restoration without specific mention of wetlands were also excluded. Lastly, some projects described supporting wetlands indirectly (such as through the construction of an oyster reef living shoreline) without specifying key information on the type or acreage of wetlands supported. Although such projects were included amongst those considered wetland projects they were dropped in later steps required to generate aggregate benefits due to missing data.

- **Determining latitude and longitude project work site locations**: Project work site coordinates were extracted directly from project narratives and maps. These coordinates were double-checked in Google Maps and modified when found to be incorrect. For example, in some cases coordinates had been mistakenly reversed or the cardinal direction was incorrect. In other cases, coordinates were not provided but maps of project work site locations were and Google Maps was used to fill in the missing information.

- **Determining the type of wetland preserved**: In most cases the type of wetland (forested or non-forested, saltwater or freshwater) was clearly described in project narrative documentation. In rare cases, project narratives described salinity levels around the wetlands. Freshwater (saltwater) wetlands were assumed with salinity levels below (above) 0.5 pp. In other cases, not enough information was provided to distinguish between freshwater and saltwater wetlands. In these cases, project work site maps were examined and wetlands along the coasts were considered saltwater. Similarly, if narrative documents lacked the information needed to specify whether a wetland was forested or non-forested, Google Maps was used along with project work site locations to determine this visually. As a further QA measure, wetland type was adjusted given data on surrounding baseline wetlands taken from the NWI. If the acres of wetlands restored of a specified type was greater than the acres of that type that existed within 30-miles of the project, the type was adjusted based on the wetlands predominant in the area.

- **Determining the number of wetland acres preserved**: Project narrative documents described wetland restoration both in terms of acres restored and linear feet (along a shoreline or river). Since the MRM requires the acres of wetland as its input, for the latter case linear feet was translated into acres. Following the WOTUS report, a conservative 50-foot buffer was assumed to convert linear feet to square feet and then multiplied by $\frac{1}{43,560}$ to convert to acres.

Methodology

Meta-regression Model Overview

The MRM used to estimate aggregate benefits for the ecosystem service values attributed to preserved wetlands is taken from the WOTUS report—an updated version of the original "MRM2" linear regression model in Moeltner (2019).[28] The model is based on stated preference studies (choice experiments or contingent valuation) that provide data on the public's WTP for wetland preservation. More specifically, the studies described hypothetical scenarios that elicited the publics' WTP (often in the form of increased taxes) to either avoid complete and permanent wetland losses, ensure the restoration of existing wetlands, or ensure the creation of new wetlands. The metadata includes 52 observations—20 observations from 8 saltwater wetland studies and 32 observations from 16 freshwater wetland studies. See Appendix B of the WOTUS report for additional details on the metadata.

The MRM employs a Bayesian linear meta-regression framework with vague prior settings for all coefficients and the error variance. Prior settings are taken from an OLS regression model which are then updated via Bayesian posterior simulation based on Gibbs Sampling. Vague priors place the bulk of the information burden on the data when updating of the priors occurs at each successive step of the sampling procedure. See Moeltner (2019) for additional details related to the Gibbs Sampling procedure.

The model specification is:

$$ln\left(y_{js}\right) - ln\left(q_{1,js} - q_{0,js}\right) = x'\beta + \gamma \frac{\left(q_{1,js} + q_{0,js}\right)}{2} + \epsilon_s$$

where y_{js} represents HH WTP to preserve wetland acres for observation j in study s and $(q_{1,js} - q_{0,js})$ represents the change in acres before $(q_{0,js})$ and after $(q_{1,js})$ preservation. HH WTP per acre is a function of explanatory variables, x', which includes context-defining variables (e.g., provided ecosystem services, whether the wetland is saltwater or freshwater, forested or non-forested, etc.) and moderating variables (e.g., study-specific variables that account for methodological differences such as the year of data collection), as well as the midpoint of the number of wetland acres before and after preservation $[\frac{(q_{1,js}+q_{0,js})}{2}]$. $[\frac{(q_{1,js}+q_{0,js})}{2}]$ accounts for diminishing returns to the additional preservation of wetland acres when large amounts of wetlands already exist in the baseline. Lastly, ϵ_s is a standard error term with zero mean and variance of σ_ϵ^2.

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[28] Moeltner, K., et al. (2019). "Waters of the United States: Upgrading wetland valuation via benefit transfer." Ecological economics 164: 106336.

Model Variable Definitions

The variables included in the MRM and their definitions are provided in Table E-2.

Table E-2. Meta-regression Model Variable Definitions

Variable Name	Description
Dependent Variable	
ln(WTP)	natural log of WTP in 2024 USD[29]
Independent Variables	
ln(year)	natural log of year of data collection
ln(inc)	natural log of income, 2024 USD[29]
sagulf	1 = South-Atlantic/Gulf (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA)
nema	1 = Northeast/mid-Atlantic (CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT)
nmw	1 = North/Mid-West (AK, IA, IL, IN, KS, MI, MN, MO, MT, NE, ND, OH, SD, WI)
can	1 = Canadian study, 0 = otherwise
local	1 = wetland is within 30 miles, on average, of counties in the State, 0 = otherwise
prov	1 = provisioning function affected, 0 = otherwise
reg	1 = regulating function affected, 0 = otherwise
cult	1 = cultural function affected, 0 = otherwise
forest	1 = forested wetland, 0 = non-forested
$(q_0 + q_1)/2$	the midpoint between baseline (q_0) and policy (q_1) acres
volunt	1 = payment is a voluntary contribution, 0 = otherwise
lumpsum	1 = single payment, 0 = annual payment
salt	1 = saltwater wetland, 0 = freshwater wetland
ln(year)*salt	
ln(inc)*salt	
sagulf*salt	
local*salt	
prov*salt	
reg*salt	
cult*salt	
$(q_0 + q_1)/2$ *salt	

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[29] Following the application of the model, all dollar values have been adjusted for inflation to 2024 USD using the Bureau of Labor Statistics' (BLS) Consumer Price Index for All Urban Consumers (CPI-U). Inflation for the year 2024 is based on the most current data available and includes the months between January 2024 and June 2024.

Model Results

Model results are presented in the Table E-3 below. These results include variable coefficient and variance posterior means, posterior standard deviations, and the percentage of the probability mass greater than zero in columns 1-3, respectively. To clarify, results from column 3 reveal whether the variable coefficient provides a clear signal of its effect on HH WTP. A p(>0) close to 1 provides a clear signal of a positive effect on HH WTP (i.e., most of the probability mass is to the right of zero) whereas a p(>0) close to 0 provides a clear signal of a negative effect on HH WTP (i.e., most of the probability mass is to the left of zero). In contrast, a p(>0) close to 0.5 provides an ambiguous signal of a coefficient's effect on HH WTP (i.e., half of the time the coefficient is negative and half of the time the coefficient is positive). This is salient when parameterizing the model in the BT process as variables with strong signals will have a relatively larger influence on HH WTP than variables with weak ones.

A brief summary is provided on key results. First, the wetland type has a significant influence on HH WTP. For example, given the posterior mean coefficient estimate, forested wetlands (*forested*) are valued 6.78 times as much as non-forested wetlands.[30,31] Additionally, ecosystem services from saltwater wetlands are valued more than ecosystem services from freshwater wetlands. Freshwater wetlands providing provisioning (*prov*), regulating (*reg*), and cultural (*cult*) services influence HH WTP by factors of -0.97, 0.41, and 2.39, respectively. In contrast, saltwater wetlands providing these same services influence HH WTP by factors of 3.46 (*prov* and *prov*salt*), 859.91 (*reg* and *reg*salt*), and 38.25 (*cult* and *cult*salt*). Second, a greater number of baseline wetlands reduces HH WTP for additional wetland acres. For freshwater wetlands, the effect is by a factor of -0.001 and for saltwater wetlands the effect is by a factor of -0.002. Third, local wetlands are worth more than non-local wetlands—by factors of 23.14 and 32.1 for freshwater and saltwater wetlands (although the larger effect for saltwater wetlands has a somewhat ambiguous positive signal with p>0=0.66). Fourth, the region where wetland preservation occurs matters. For example, freshwater wetlands preserved in the South Atlantic/Gulf Coast (*sagulf*) are worth 6.37 times more than wetlands preserved in the Arid or semi-Arid West and Pacific North-West, the omitted base category. Similarly, saltwater wetlands preserved in this region (*sagulf* and *sagulf*salt*) are worth -0.12 times less. In general, differences both in the magnitude and directional effect of these factors across wetland types significantly impact HH WTP and, in turn, aggregate benefits.

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[30] These factors are calculated using the formula e^(beta - 1).

[31] Due to identification issues, differences in the effect of forested wetlands between saltwater and freshwater wetlands on HH WTP could not be determined. The model, in effect, assumes the same effect across these wetland types. This is also the case for regional indicators *nema* and *nmw*.

Table E-3. Meta-regression Model Results

Variables	post. mean	post. std	p(>0)
Constant	-0.441	3.040	0.444
ln(year)	-1.261	0.398	0.002
ln(inc)	0.216	0.289	0.771
sagulf	1.998	1.378	0.925
nema	-1.617	1.157	0.079
nmw	1.177	1.078	0.861
CAN	3.078	1.638	0.966
local	3.184	0.576	1.000
prov	-3.458	0.694	0.000
reg	0.346	0.596	0.716
cult	1.211	0.733	0.947
forest	2.052	0.577	0.999
(q0+q1)/2	-0.001	0.001	0.090
volunt	-2.095	0.828	0.009
lumpsum	2.234	0.563	1.000
const*salt	-0.430	2.056	0.433
ln(year)*salt	-0.095	0.767	0.425
ln(inc)*salt	-0.120	0.302	0.340
sagulf*salt	-2.122	1.762	0.141
local*salt	0.342	0.699	0.657
prov*salt	4.954	0.926	1.000
reg*salt	6.412	1.154	1.000
cult*salt	2.459	2.356	0.837
(q0+q1)/2*salt	-0.001	0.001	0.145
σ^2	0.767	0.232	1

Benefit Transfer Approach

Benefit Transfer Overview

The benefit transfer involves the following steps:

1. Apply parameter settings to each of the 100,000 MRMs estimated by the Gibbs Sampler to generate 100,000 HH WTP estimates.

2. Take an "ecosystem service combination" weighted average of HH WTP using the ecosystem service probabilities generated from the metadata. For each project work site there will be 8 different specifications for each of the ecosystem service combinations.

3. Truncate HH WTP results at the 95th percentile.[32]

4. Compile summary statistics of HH WTP (mean, median, min, max, 5%, 95%).

5. Choose either the mean or median HH WTP and aggregate this value across projected households at the county-level for each year over the 20-year analysis period (2024 to 2043).[33]

6. Estimate total present value (TPV) and annualized benefits using a 3.1% discount rate.[34]

Benefit Transfer Settings

The HH WTP estimates generated from the MRM depend on the chosen variable settings. Some variables were fixed across all projects [ln(year), CAN, local, volunt, and lumpsum], others varied depending on the characteristics of the project [ln(inc), sagulf, nema, nmw, forest, (q0+q1)/2, and, expect for ecosystem service indicators, all interactions with salt], and still others were used in a mixing procedure with multiple settings applied (prov, reg, cult ecosystem service indicators and their interactions with salt).

Regarding the fixed settings:

- *ln(year)* is set to the logged difference between the year of data collection for the most recent and oldest study included in the metadata.

- *CAN* is set to zero since all projects take place in the United States.

- *local* is set to one since all project work sites occur within their respective counties. This is appropriate because the model defines 'local' as wetlands that are within a 30-mile average of counties in a state. The average county land area when including the 50 U.S states, D.C., and U.S. territories is 1,090.69 square miles. A circle of this size would imply a radius of 18.63 miles. Therefore, it is a safe assumption that wetlands located within a county would also be within 30-miles of the county centroid.

- *volunt* is set to zero since voluntary payments are not incentive compatible. In other words, individuals' WTP responses to stated preference surveys elicited using a voluntary payment mechanism will not reveal their true WTP preferences.

- *lumpsum* is set to zero. In other words, payments for ecosystem services are assumed to be made annually.

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[32] As a sensitivity test, HH WTP results were also truncated at the 99th percentile. This produced inflated aggregate benefit estimates, especially when based on the mean HH WTP, due to a long tail at the upper extreme of the HH WTP distribution. The effect was more pronounced for saltwater wetland WTP predictions given the sizeable effect of ecosystem services on WTP, especially for *reg*salt*, as shown above.

[33] Benefits are assumed to begin following a 1-year delay from the project completion date (i.e., End_Date). If the project was set to finish in the middle of a year, the delay is taken from the following year. For example, a project that is set to end on 3/12/2025 would have benefits beginning in 2027.

[34] Following OMB Circular A-94, the analysis applies a risk-adjusted social discount rate of 3.1%. Specifically, a 2.0% risk-free discount rate is adjusted upwards to incorporate a default risk premium of 1.1%.

https://www.whitehouse.gov/wp-content/uploads/2023/11/CircularA-94.pdf

Table E-4. Benefit Transfer Settings

Variables	Setting for Benefit Transfer	Source (if applicable)
Constant	1	
ln(year)	ln(2021-1988) = 3.4965	
ln(inc)	ln(median income)	U.S. Census 5-year ACS 2022
sagulf	1 = South-Atlantic/Gulf (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA)	BIL Application Review Reports
nema	1 = Northeast/mid-Atlantic (CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT)	BIL Application Review Reports
nmw	1 = North/Mid-West (AK, IA, IL, IN, KS, MI, MN, MO, MT, NE, ND, OH, SD, WI)	BIL Application Review Reports
CAN	0	
local	1	
prov	various (used in mixing procedure)	
reg	various (used in mixing procedure)	
cult	various (used in mixing procedure)	
forest	project-specific	BIL Application Review Reports
(q0+q1)/2	project-specific	BIL Application Review Reports; USFWS National Wetland Inventory
volunt	0	
lumpsum	0	
const*salt	project-specific	BIL Application Review Reports
ln(year)*salt	project-specific	
ln(inc)*salt	project-specific	
sagulf*salt	project-specific	
local*salt	project-specific	
prov*salt	various (used in mixing procedure)	
reg*salt	various (used in mixing procedure)	
cult*salt	various (used in mixing procedure)	
(q0+q1)/2*salt	project-specific	

Ecosystem Services Mixing Approach

The benefit transfer uses a mixing approach where HH WTP is generated given the fixed settings as described above and the 8 combinations of settings for the ecosystem service indicators—in the case of freshwater wetlands, *prov*, *reg*, *cult*; and in the case of saltwater wetlands *prov*salt*, *reg*salt*, *cult*salt*.

Then an ecosystem service-weighted average of HH WTP is taken given sample proportions of the wetland ecosystem service indicators. For example, HH WTP for freshwater wetlands providing provisioning, regulating, and cultural ecosystem services would have the settings *prov*=1, *reg*=1, *cult*=1, *prov*salt*=0, *reg*salt*=0, *cult*salt*=0 and be given a weight of 0.20. HH WTP for saltwater wetlands providing the same set of ecosystem services would have the settings *prov*=1, *reg*=1, *cult*=1, *prov*salt*=1, *reg*salt*=1, *cult*salt*=1 and be given a weight of 0.02. Table E-5 below presents each of these ecosystem service combinations and the weights applied.

Table E-5. Ecosystem Service Combinations

Probabilities for Provisioning, Regulating, and Cultural Ecosystem Services[35]		
	Freshwater	Saltwater
p(prov=1)	0.40	0.25
p(reg=1)	0.73	0.31
p(cult=1)	0.67	0.29
Probabilities for Combinations of Provisioning, Regulating, and Cultural Ecosystem Services		
	Freshwater	Saltwater
p(prov=0, reg=0, cult=0)	0.05	0.37
p(prov=1, reg=1, cult=0)	0.11	0.15
p(prov=0, reg=1, cult=0)	0.14	0.16
p(prov=0, reg=1, cult=1)	0.29	0.07
p(prov=1, reg=0, cult=0)	0.04	0.12
p(prov=1, reg=0, cult=1)	0.07	0.05
p(prov=1, reg=1, cult=0)	0.10	0.05
p(prov=1, reg=1, cult=1)	0.20	0.02
Total	**1.00**	**1.00**

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[35] Probabilities shown above are based on sample proportions in the metadata. Ecosystem services are not mutually exclusive so do not sum to 1.

Ecosystem Services-Weighted HH WTP Per Acre Summary Statistics

Table E-6 presents ecosystem services-weighted HH WTP per acre summary statistics at the project work site level,[36] as well as settings for the wetland acres preserved, wetland type, baseline wetlands acres (in thousands), median income at the county-level (in thousands 2024 USD), and region. It can be seen that (mean and median) HH WTP for saltwater wetlands are much larger than HH WTP for freshwater wetlands. This is primarily driven by the large effects of the ecosystem services interaction terms in the MRM, especially for *reg*salt* which has an effect size of 859.91. As a result, the HH WTP distribution at the upper extreme for saltwater wetlands has a long tail (which is also evident in their relatively large std HH WTP estimates). Note that this is after the effect has been dampened through the ecosystem services mixing procedure (combinations of ecosystem service settings where *reg*salt* is set to 1 are given weights that range between 0.02 and 0.16) and truncation of HH WTP at the 95 percent level.[37] As such, median HH WTP results, which are not as heavily impacted by the tails of the distribution, are employed to estimate a conservative lower bound for aggregate benefits. Similarly, mean HH WTP results are employed to estimate an upper bound for aggregate benefits.

Table E-6. Ecosystem Service-Weighted WTP per Acre (2024 USD) Summarized at the Project Work Site Level

County FIPS	County	Mean WTP/Acre	Median WTP/Acre	Std WTP/Acre	Saltwater	Forested	q1-q0	q0 (1,000s)	Income (1,000s)	Region
01003	Baldwin	$3.53	$1.17	$5.53	1	0	3.0	443.5	$76.3	sagulf
01003	Baldwin	$3.55	$1.17	$5.58	1	0	1.0	439.8	$76.3	sagulf
01003	Baldwin	$3.89	$1.33	$5.99	1	0	9.7	376.9	$76.3	sagulf
01003	Baldwin	$0.38	$0.29	$0.30	0	1	40.0	166.8	$76.3	sagulf
01097	Mobile	$2.35	$0.63	$4.03	1	0	22.8	744.1	$59.4	sagulf
01097	Mobile	$2.36	$0.63	$4.05	1	0	100.0	740.0	$59.4	sagulf
02122	Kenai Peninsula	$8.43	$6.06	$7.28	1	0	20.0	301.9	$81.9	nmw
06023	Humboldt	$0.08	$0.05	$0.09	0	1	15.7	2.3	$62.1	
06053	Monterey	$2.96	$2.07	$2.67	1	0	119.0	258.9	$97.7	

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[36] In order to avoid the identification of specific grant applicants GRANTSGOV_NUM and PROJ_ID information are suppressed.

[37] A sensitivity analysis where aggregate benefits were estimated using a less restrictive truncation of HH WTP at the 99th percentile produced significantly inflated results. Similarly, another sensitivity analysis that removed the ecosystem services mixing procedure and instead employed settings based on descriptions extracted from project narrative documents produced unreasonably large HH WTP estimates and, in turn, inflated aggregate benefits.

County FIPS	County	Mean WTP/Acre	Median WTP/Acre	Std WTP/Acre	Saltwater	Forested	q1-q0	q0 (1,000s)	Income (1,000s)	Region
06081	San Mateo	$0.10	$0.06	$0.11	0	1	72.0	1.4	$160.9	
06097	Sonoma	$3.61	$2.56	$3.20	1	0	12.0	163.3	$106.6	
06097	Sonoma	$3.60	$2.56	$3.19	1	0	90.0	163.9	$106.6	
06097	Sonoma	$3.72	$2.64	$3.30	1	0	3.0	147.9	$106.6	
06097	Sonoma	$3.79	$2.69	$3.36	1	0	7.0	139.7	$106.6	
12021	Collier	$0.35	$0.27	$0.28	0	1	33.0	284.0	$88.0	sagulf
12031	Duval	$0.32	$0.24	$0.26	0	1	10.0	335.4	$70.4	sagulf
12033	Escambia	$3.79	$1.19	$6.06	1	0	10.0	400.0	$66.2	sagulf
12086	Miami-Dade	$68.81	$24.24	$104.91	1	1	2.5	2.1	$68.9	sagulf
12115	Sarasota	$4.28	$1.50	$6.48	1	0	1.7	310.2	$82.9	sagulf
12115	Sarasota	$67.33	$24.71	$100.21	1	1	11.1	10.6	$82.9	sagulf
12115	Sarasota	$0.05	$0.04	$0.03	0	0	0.2	112.0	$82.9	sagulf
13051	Chatham	$2.86	$0.86	$4.67	1	0	1.5	594.1	$71.0	sagulf
18089	Lake	$0.01	$0.01	$0.01	0	0	5.0	930.3	$71.3	nmw
22023	Cameron	$3.50	$1.15	$5.50	1	0	850.0	450.4	$75.0	sagulf
22051	Jefferson Parish	$1.93	$0.49	$3.37	1	0	70.0	882.8	$67.9	sagulf
22071	Orleans	$1.39	$0.30	$2.60	1	0	26.8	1142.0	$54.9	sagulf
22071	Orleans	$1.35	$0.28	$2.56	1	0	10.0	1166.3	$54.9	sagulf
22087	St. Bernard	$1.03	$0.20	$2.00	1	0	53.6	1374.0	$60.0	sagulf
22087	St. Bernard	$0.37	$0.28	$0.30	0	1	33.3	140.1	$60.0	sagulf
22087	St. Bernard	$1.06	$0.21	$2.04	1	0	30.0	1351.3	$60.0	sagulf
24003	Anne Arundel	$0.01	$0.01	$0.01	0	1	0.6	75.1	$124.5	nema

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County FIPS	County	Mean WTP/Acre	Median WTP/Acre	Std WTP/Acre	Saltwater	Forested	q1-q0	q0 (1,000s)	Income (1,000s)	Region
24005	Baltimore	$0.37	$0.32	$0.23	1	0	9.0	330.8	$94.6	nema
25001	Barnstable	$0.19	$0.16	$0.13	1	0	890.0	668.3	$97.1	nema
25009	Essex	$0.25	$0.22	$0.16	1	0	1.0	522.6	$101.3	nema
25009	Essex	$0.00	$0.00	$0.00	0	0	9.1	99.7	$101.3	nema
25025	Suffolk	$0.35	$0.30	$0.22	1	0	26.0	355.3	$94.1	nema
26163	Wayne	$0.17	$0.13	$0.13	0	1	4.0	30.1	$61.4	nmw
26163	Wayne	$0.02	$0.01	$0.01	0	0	5.5	169.6	$61.4	nmw
33015	Rockingham	$0.28	$0.24	$0.18	1	0	62.4	474.1	$118.3	nema
33015	Rockingham	$0.31	$0.26	$0.19	1	0	7.7	432.2	$118.3	nema
33015	Rockingham	$0.31	$0.26	$0.19	1	0	11.0	432.0	$118.3	nema
34011	Cumberland	$0.29	$0.25	$0.19	1	0	1.1	435.0	$66.9	nema
37137	Pamlico	$0.33	$0.25	$0.27	0	1	20.0	261.4	$60.0	sagulf
37137	Pamlico	$0.04	$0.03	$0.03	0	0	30.0	97.0	$60.0	sagulf
39085	Lake	$0.18	$0.14	$0.13	0	1	42.0	48.9	$82.5	nmw
39143	Sandusky	$0.01	$0.01	$0.01	0	0	16.0	569.1	$65.3	nmw
41005	Clackamas	$0.09	$0.06	$0.10	0	1	7.0	6.7	$102.8	
41005	Clackamas	$0.09	$0.06	$0.10	0	1	6.0	20.1	$102.8	
41005	Clackamas	$0.09	$0.06	$0.10	0	1	82.0	15.2	$102.8	
41005	Clackamas	$0.09	$0.06	$0.10	0	1	1.5	19.7	$102.8	
41005	Clackamas	$0.09	$0.06	$0.10	0	1	42.4	14.6	$102.8	
41005	Clackamas	$0.09	$0.06	$0.10	0	1	3.5	28.1	$102.8	
41011	Coos	$3.57	$2.45	$3.32	1	0	8.0	156.3	$61.8	
41011	Coos	$3.50	$2.40	$3.26	1	0	35.0	166.0	$61.8	

County FIPS	County	Mean WTP/Acre	Median WTP/Acre	Std WTP/Acre	Saltwater	Forested	q1-q0	q0 (1,000s)	Income (1,000s)	Region
41011	Coos	$0.01	$0.01	$0.01	0	0	490.0	69.8	$61.8	
41039	Lane	$3.64	$2.52	$3.34	1	0	180.0	147.8	$69.9	
41041	Lincoln	$3.58	$2.45	$3.33	1	0	14.0	155.0	$62.0	
41057	Tillamook	$3.38	$2.31	$3.14	1	0	3.0	184.5	$67.7	
45029	Colleton	$3.12	$0.92	$5.19	1	0	2.0	546.6	$50.2	sagulf
45043	Georgetown	$0.29	$0.21	$0.23	0	1	575.0	461.4	$64.2	sagulf
51101	King William	$0.41	$0.31	$0.32	0	1	0.5	111.7	$85.2	sagulf
53009	Clallam	$0.09	$0.05	$0.09	0	1	2.0	7.4	$71.0	
53009	Clallam	$0.08	$0.05	$0.09	0	1	15.0	11.7	$71.0	
53009	Clallam	$0.09	$0.05	$0.09	0	1	2.0	7.4	$71.0	
53011	Clark	$0.09	$0.06	$0.09	0	1	100.0	28.8	$96.7	
53031	Jefferson	$0.08	$0.05	$0.09	0	1	7.9	5.9	$69.6	
53049	Pacific	$2.61	$1.74	$2.49	1	0	63.2	314.0	$63.2	
53049	Pacific	$0.01	$0.01	$0.01	0	0	2.2	61.9	$63.2	
53057	Skagit	$1.60	$1.06	$1.53	1	0	220.0	573.6	$88.1	
53057	Skagit	$1.56	$1.03	$1.50	1	0	270.0	585.5	$88.1	
53057	Skagit	$1.24	$0.80	$1.23	1	0	120.0	708.1	$88.1	
53057	Skagit	$1.08	$0.68	$1.09	1	0	17.0	783.0	$88.1	
53057	Skagit	$0.09	$0.06	$0.09	0	1	22.0	12.2	$88.1	
53057	Skagit	$0.09	$0.06	$0.09	0	1	13.1	12.1	$88.1	
53057	Skagit	$1.45	$0.95	$1.41	1	0	74.5	624.7	$88.1	
55007	Bayfield	$0.16	$0.13	$0.12	0	1	180.0	110.5	$72.2	nmw
55007	Bayfield	$0.16	$0.13	$0.12	0	1	180.0	105.8	$72.2	nmw

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55007	Bayfield	$0.17	$0.13	$0.13	0	1	180.0	68.9	$72.2	nmw
55007	Bayfield	$0.17	$0.14	$0.13	0	1	180.0	40.7	$72.2	nmw
55007	Bayfield	$0.17	$0.13	$0.13	0	1	180.0	55.2	$72.2	nmw

Figure E-2 further illustrates the effect wetland type has on the distribution of ecosystem services-weighted HH WTP. The figure presents ecosystem services-weighted HH WTP results using illustrative data where, for comparison purposes, all settings excluding wetland type are identical. WTP results are for the preservation of 100 acres of wetland in the South-Atlantic/Gulf region, with a baseline of 10,000 acres, for households with a median income of $80,000. The WTP for freshwater, non-forested wetlands (top left panel) can be seen to have the least right-skewed distribution (i.e., with the shortest tail). The distribution becomes further skewed for forested freshwater wetlands (bottom left panel) and even more so—by several orders of magnitude—for forested saltwater wetlands (bottom right panel).
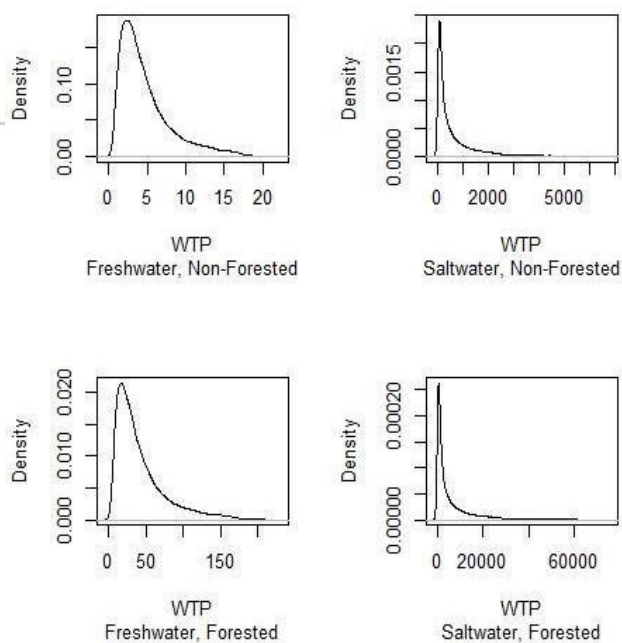
Figure E-2. Kernel Density Plots of Ecosystem Service-Weighted HH WTP

Results

Aggregate Benefits Summarized by U.S. Census Region

Table E-7 presents total present value (TPV) and the annualized benefits (in millions 2024 USD) over a 20-year period at a 3.1-percent discount rate, summarized at the U.S. Census Region level. Lower bound annualized benefits are estimated using median HH WTP values. Upper bound annualized benefits are estimated using mean HH WTP values. Focusing on the lower bound of annualized benefits, it can be seen that the largest share of benefits (96 percent) accrues to the West and South regions at $131.7 million and $165.6 million (2024 USD), respectively. In contrast, the Alaska and Midwest Regions have substantially smaller shares at $2.3 million and $1.3 million (2024 USD), respectively.

Table E-7. TPV and Annualized Benefits by Region using a 3.1% Discount Rate (in millions 2024 USD)

Region[38]	Awards	Worksites	Acres[39]	Households[40]	Total Present Value (Low)	Total Present Value (High)	Annualized Benefits (Low)	Annualized Benefits (High)
Alaska	1	1	20	25,453	$35.10	$48.81	$2.31	$3.21
Midwest	5	10	973	977,989	$20.12	$25.87	$1.32	$1.70
North-east	6	8	1,008	991,174	$208.46	$249.06	$13.72	$16.39
South	18	28	1,957	3,331,811	$2,002.24	$5,740.90	$131.75	$377.88
West	16	33	2,120	1,425,245	$2,517.11	$3,646.84	$165.62	$240.47
Total	46	80	6,078	6,751,672	$4,783.04	$9,711.48	$314.72	$639.66

Limitations and Uncertainties

This section discusses the various limitations and uncertainties inherent in the valuation of wetland-derived ecosystem service benefits. Sources of uncertainty stem both from (1) limited data (e.g., on the BIL projects themselves, baseline wetlands, and household counts), (2) the MRM used to generate benefits estimates (e.g., limited metadata on the value of saltwater wetlands), and (3) uncertainty regarding the timing over which wetland-derived ecosystem service benefits are expected to occur. The table below summarizes the sources of uncertainty, their expected directional effects on benefits, and a brief explanation of the reasoning behind it.

Table E-8. Summary of Limitations and Uncertainties of Wetlands Ecosystem Service Benefits

Source	Effect on Benefits	Explanation
Uncertainty of wetland-derived ecosystem services	Uncertain	Predicted ecosystem service benefits provided by wetlands are uncertain. The rigor of the pre-restoration analyses of potential benefits described in BIL/IRA grant funded project documents varies from simple qualitative descriptions to complex modeling (e.g., sea-level and marsh migration or SLAMM models). The aggregate benefits generated by the MRM uses a mixing procedure that produces a weighted average of WTP based on the combinations of ecosystem services. This averaging out may serve to underestimate (overestimate) the total value of actual ecosystem services in cases where many (few) are provided. This uncertainty is exacerbated when considered across all 46 awards. Hence, the net effect on aggregate benefits is unclear.

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[38] The U.S. Census region 'West' was adjusted to exclude Alaska and Hawaii which are treated as their own distinct regions for the purposes of this analysis.

[39] Acreage counts include the number of restored, protected, and improved wetlands.

[40] The total number of households across all counties within a region where project activities take place.

Source	Effect on Benefits	Explanation
Exclusion of climate regulating ecosystem services[41]	Underestimated	Due to limitations in the studies underlying the metadata of the MRM, aggregate benefits exclude wetland's climate regulating (e.g., carbon sequestering) ecosystem service value. To the extent that these services are actually provided (wetlands absorb carbon dioxide but emit methane so their net effect on GHGs must be determined on a case-by-case basis), the aggregate benefits will be underestimated.
Exclusion of awards preserving wetlands due to missing data	Underestimated	Out of the 173 BIL grant funded projects, 78 were determined to include either a wetland preservation, restoration, and/or creation component. Due to missing data (including data on worksite locations, wetland acreage impacted, and population counts at the county level) 32 projects were excluded from the analysis. The exclusion of these projects underestimates benefits.
Uncertainty regarding the time period over which ecosystem service benefits occur	Uncertain	The timing over which ecosystem services provided by wetlands occur involves a great deal of uncertainty. Although GrantsOnline project information includes project completion dates, these dates may not accurately represent the starting point of ecosystem service benefits. Such benefits depend on when wetland functionality is fully restored which itself depends on surrounding environmental factors (e.g., land cover, topography, ecological connectivity or fragmentation, elevation, wave energy, sedimentation, the presence of armored structures) and expected impacts of climate change (e.g., rate of sea level rise). As such the timing of ecosystem service benefits will vary across projects. The assumed one-year delay starting point from project completion dates will underestimate benefits if they occur earlier and overestimate aggregate benefits if they occur later. Similarly, it is unclear how long benefits will be maintained. The 20-year time frame will underestimate (overestimate) benefits if they occur over a longer (shorter) time horizon.
Uncertainty regarding household beneficiaries of ecosystem services	Uncertain	Aggregate benefits are assumed to accrue over all households in the county the project resides in. Although a reasonable assumption (considering the local and relatively small-scale nature of many of these projects) actual benefits may extend beyond this range over a larger number of households. Additionally, given the lack of information on the location of households relative to project work sites (i.e., within a 30-mile radius of work site coordinates) the actual number of households benefiting from these projects may be over- or under-estimated.
Uncertainty regarding household projections	Uncertain	Household projections rely on county-level population projections that assume a middle-of-the-road SSP2 climate change scenario and persons per household based on estimates from the 2022 American Community Survey. Actual population counts may be larger or smaller, depending on more or less optimistic climate change pathways, migration patterns, and changes in net births. Additionally, persons per household is assumed constant over the 20-year time frame. Increases (decreases) in persons per household will lead to aggregate benefits being overestimated (underestimated).

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[41] As stated in the WOTUS report on page 83, "Original studies included in the meta-data provide the total WTP value of wetland preservation and implicitly account for a range of ecosystem services provided by wetlands. However, not all studies specifically mentioned different ecosystem services in the survey instruments. For example, 83 percent (15 studies) valued flood protection, 56 percent (10 studies) valued water purification, and only 22 percent (4 studies) valued carbon sequestration."

Source	Effect on Benefits	Explanation
Uncertainty regarding HH WTP for the preservation of forested saltwater wetlands	Uncertain	The saltwater wetland stated preference valuation studies underlying the MRM do not include values for forested saltwater wetlands. As such, the model assumes the effect of forested wetlands, whether freshwater or saltwater, on HH WTP is the same. A larger (smaller) effect would lead to HH WTP and, therefore, aggregate benefits being underestimated (overestimated). Similarly, the metadata does not include saltwater wetland valuation studies outside of the South Atlantic/Gulf and Northeast/mid-Atlantic regions. There may be regional variation in HH WTP for saltwater wetlands, for example in the North/Mid-west, that differs from that of freshwater wetlands. A larger (smaller) effect would lead to HH WTP and, therefore, aggregate benefits being underestimated (overestimated).

Appendix E References

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APPENDIX F: BENEFIT TRANSFER FOR HABITATS NOT ACCOUNTED FOR IN APPENDIX E

This Appendix covers the literature review, benefit transfer approaches and detailed results for the following habitats across 74 awards selected following expert review: Beaches/dunes, Coral Reefs, Floodplains, Forests, Grasslands, Lakes/ponds, Mangroves, Oyster reefs, Rivers/streams, and Submerged aquatic vegetation[42]. The wetlands benefits approach outlined in Appendix E assesses only wetlands benefits, but excluded several awards focused on mangroves due to data availability constraints. This appendix explores all other habitats, as well as mangrove benefits that have been applied to the awards excluded from the wetlands analysis. A discussion on the environmental benefits of marine debris removal is also included in lieu of ecosystem service benefits due to the lack of transferable estimates. Last, a brief discussion of the inherent limitations and gaps is also included.

Data Source and Approach

Literature Review

The Literature Review featured two approaches. First, searches for applicable ecosystem services values via two databases where values from the academic literature have already been vetted and categorized by trained reviewers were completed. The two databases include the Ecosystem Service Value Database (ESVD) and the Blue Value Database (BVD). Both databases provide values on ecosystem services extracted from primary studies. The Ecosystem Service Value Database was developed to expand on The Economics of Ecosystems and Biodiversity (TEEB) database and contains thousands of value records— individual values for measured ecosystem service provision from hundreds of sources (see de Groot, Brander, & Solomonides, (2020), for more details). The Blue Value Database is a global scale repository similar to the ESVD in that it contains value records, but it is different in that it focuses strictly on marine habitats. The BVD is managed by the Harte Research Institute for Gulf of Mexico Studies at the Texas A&M University Corpus Christi campus (Harte Research Institute for Gulf of Mexico Studies, 2020).

Second, a rapid systematic literature review sought to include additional resources in order to assess the available academic literature as comprehensively as possible. Two literature search databases were selected for this section of the review: Web of Science and Proquest. These databases were chosen for two reasons. First, these are very comprehensive databases, providing access to hundreds of millions of articles across many smaller metadata services, aggregated databases, and collections. Second, the bulk download features of these two databases are faster and provide more metadata than some other databases, e.g., Google Scholar. These databases allowed for a comprehensive and rapid search and download of information for the literature review.

Eligibility Criteria

Resources were vetted based on their applicability to the project and potential for benefit transfer. Several key parameters served as eligibility criteria for the literature search: publication date, geography, and topic. Resources published before 2000 were excluded and valuations or studies pertaining to the United States and U.S. territories were specified. These criteria applied to both the valuation database search and literature search. Habitats identified as the focus of each of the grant programs were included in search criteria when possible, or in the case of the valuation databases, related or similar habitats were selected.

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[42] As discussed below, awards were included if they (1) were focused on implementation of a project, (2) had quantitative data reflecting the desired habitat outcome, and (3) could be matched to a reliable study for valuation purposes.

Duplicates between the ESVD and BVD were removed, favoring the entry with more information, most often the ESVD. If recorded valuations from the same study for the same ecosystem service differed, We performed a review of both studies to determine the cause of the difference and to select the entry to retain. Duplicates across the literature database results were removed prior to the title review, and articles for which values were already extracted from the valuation databases were flagged to prevent unnecessary review. See Table F-1 and Table F-2 for a summary of the valuation and literature searches.

Table F-1. Summary of valuation database searches

Literature Review Phase	Database	Filters or Search Term	No. of valuations
Valuation database search	Ecosystem Services Database	Filters: United States, United States Virgin Islands, United States Minor Outlying Islands, Guam, American Samoa, Commonwealth of Puerto Rico, Commonwealth of the Northern Mariana Islands	181
Valuation database search	Blue Value Database	Filters: United States, Guam, American Samoa, Commonwealth of the Northern Mariana Islands, USA, Florida; Beach/Dunes, Beach, Dunes, Coastal wetlands, Estuary, Mangroves, Marine/open water, Oysters, Seagrass	210

Table F-2. Summary of literature searches

Literature Review Phase	Database	Filters or Search Term	No. of resources
Academic literature database search	Web of Science[43]	(((TI=("Salt marsh*" OR "Oyster reef*" OR "Chenier ridge*" OR "Forest*" OR "Forested wetland*" OR "Freshwater wetland*" OR "Riparian*" OR "Stream*" OR "Grassland*" OR "Savanna*" OR "coastal meadow*" OR "Seagrass*" OR "Coral reef*" OR "Dune*" OR "Freshwater marsh*" OR "Lake*" OR "Lagoon*" OR "Estuar*" OR "Shoreline*" OR "Wetland*" OR "Floodplain*" OR "Urban floodplain*" OR "Brackish marsh*" OR "Coastal marsh*" OR "Coastal chaparral" OR "Coastal sage scrub" OR "Eelgrass*" OR "Mangrove*" OR "Oyster bed*" OR "River*" OR "Soil*" OR "Submerged Aquaculture vegetation" OR "River Delta" OR "Coastal wetlands" OR "Shoreline*" OR "Fish Passage*" OR "Beach*" OR "fishpond*")) AND ALL=("Ecosystem service*" OR "Natural capital" OR "Nature* contribution to people")) AND PY=(2000-2024)AND CU=(United States OR USA OR U.S.A OR U.S.))	4,594

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[43] TI=Title, PY=Publication Year, CU=Country/Region

Literature Review Phase	Database	Filters or Search Term	No. of resources
Academic literature database search	ProQuest[44]	TITLE("Salt marsh*" OR "Oyster reef*" OR "Chenier ridge*" OR "Forest*" OR "Forested wetland*" OR "Freshwater wetland*" OR "Riparian*" OR "Stream*" OR "Grassland*" OR "Savanna*" OR "coastal meadow*" OR "Seagrass*" OR "Coral reef*" OR "Dune*" OR "Freshwater marsh*" OR "Lake*" OR "Lagoon*" OR "Estuar*" OR "Shoreline*" OR "Wetland*" OR "Floodplain*" OR "Urban floodplain*" OR "Brackish marsh*" OR "Coastal marsh*" OR "Coastal chaparral" OR "Coastal sage scrub" OR "Eelgrass*" OR "Mangrove*" OR "Oyster bed*" OR "River*" OR "Soil*" OR "Submerged Aquaculture vegetation" OR "River Delta" OR "Coastal wetlands" OR "Shoreline*" OR "Fish Passage*" OR "Beach*" OR "fishpond*") AND SUMMARY("Ecosystem service*" OR "Natural capital" OR "Nature* contribution to people") AND SUMMARY(United States OR USA OR U.S.A OR U.S.)	776

Following the initial database searches and data downloads, valuation data from the ESVD served as the template and data from the BVD was fit to ESVD categorization. The literature review process outlined in Table F-3 sequentially reduced the number of resources that were included in assessments of ecosystem services. We reviewed studies and categorized them into three groups: primary valuations, general guidance, and reviews.

Primary valuations are studies that collected data and developed estimates based on those data. These studies provided estimates for ecosystem services that were extracted and aligned with the ESVD categorization scheme, including information such as author, title, reference, habitat type, ecosystem service, location, value, currency, value year, publication year, value per hectare, and DOI. The ESVD and BVD also include a large array of metadata that was not extracted from primary valuations. These include but are not limited to the protection status of the habitat, the CICES[45] and TEEB[46] ecosystem service classification, and publication title. Studies classified as general guidance were those which did not provide valuations of ecosystem services, but which could be reviewed for guidance on the ecosystem services of a specific habitat or region. Lastly, review studies were classified as such if the study was a meta-analysis or systematic review[47]. The references from these studies were reviewed and compared to those already in the Literature Review. Six primary valuation studies were added from review study references. Following the full-text review stage, remaining gaps were explored on an ad hoc basis via Web of Science and Google Scholar to find ecosystem service studies that matched the habitats in question.

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[44] SUMMARY: searches both formal scholarly abstracts and non-scholarly/informal summarizing texts.

[45] Common International Classification of Ecosystem Services

[46] The Economics of Ecosystems and Biodiversity

[47] Meta-analyses are studies that combine statistical results from two or more existing studies. Systematic reviews entail the collection, appraisal, and synthesis of evidence and studies.

Literature Review Results

Table F-3. Summary of literature review process

Stage	No. of resources	Description
Title Review	5,370	Searched for U.S.-based ecosystem service focused studies and determined whether they provided (1) monetary estimates, (2) general guidance on benefit transfer for a given habitat, or (3) a review of primary valuation studies.
Abstract review	303	Searched for U.S.-based ecosystem service focused studies and determined whether they provided (1) monetary estimates, (2) general guidance on benefit transfer for a given ecosystem, or (3) a review of primary valuation studies. The studies are further categorized as either retained or not, and organized based on habitat, ecosystem service, and valuation method.
Full text review	118	Monetary estimates were pulled out of primary valuations at this phase and organized within the literature review, and review study references were pulled and reviewed as primary valuations where applicable. Studies that provided guidance on benefit transfer were identified and pulled into a special folder, to be reviewed following the primary valuation and review study reviews.
Assessing Gaps and Ad hoc search	7	For any habitat or grant category classification (e.g., Marine Debris), where applicable sources were lacking, we searched for these specific gap areas, reiterating the prior three steps based on the results.

Table F-4. Summary of studies retained for benefit transfer use

Resource Type	Count	Retained	Excluded
Review	21	6	13
Primary Valuation	82	27	45
Total		33	59

Thirty-three resources were downloaded and retained for inclusion in the literature review. These included six reviews and 27 primary valuation studies. Seventeen resources were categorized as guiding resources, and while these were not downloaded, the bibliographic information was retained to inform future aspects of the project or to address valuation challenges for specific habitats.

Seven resources provided the values used to estimate the outcomes for grants. Those resources that were not selected for application to grant outcomes were excluded due to a) double counting if those studies were already incorporated into meta-analyses or systematic reviews, or b) if the context such as a very limited geographic scope or unique circumstance of the valuation (e.g., a per hectare value for ecosystem services under a very specific type of restoration) made benefit transfer impractical. Included in the seven resources were three core resources which provided a synthesis of multiple other studies, and which we relied on for many ecosystem service estimates across multiple habitats. These resources were de Groot et al., (2012), Costanza et al., (2014), and FEMA (2022). These studies were each a broad synthesis of either global or U.S. ecosystem services across an array of habitats. The FEMA 2022 Ecosystem Service Update provided U.S. focused estimates at a similar scale to the present project. Much of the literature sourced in these three resources was already included in our literature review and these

three resources provided a convenient and consistent treatment of the literature for use in this work. The methodologies used in the FEMA (2022) report varied based on the ecosystem service, habitat, and source material, but were deemed rigorous and reliable for this project based on expert judgment. Gaps at this stage were covered by de Groot et al., (2012) and Costanza et al., (2014).

Although these studies are global in scale, both rely on the international dollar (Int$), or the Geary–Khamis dollar, which was used to correct values included in their assessments to the Purchasing Power of the US dollar in order to make values comparable[48]. Costanza et al., (2014) is recognized as a seminal publication in the ecosystem services field while de Groot et al., (2012) was developed in tandem with one of the core ecosystem service frameworks, The Economics of Ecosystems and Biodiversity (TEEB) project (Costanza et al., 2017). As such, these studies were the second choice for benefit transfer. Additional sources were included to cover key habitats and services and are detailed in the Results section along with values from de Groot et al., (2012), Costanza et al., (2014) and FEMA (2022). Remaining gaps are due to the inapplicability of ecosystem services to certain habitats, e.g., air quality regulation is unlikely to be connected to coral reefs, or due to the lack of applicable estimates from the literature at this time.

Benefit Transfer Approach

Extracting quantitative outcome data from grants

Quantitative award outcomes were assessed via award application narrative reviews. First, we searched for examples of quantitative outcomes of any kind, and identified whether a) the award had quantitative outcomes or not, b) which habitat those outcomes pertained to, and c) what those quantities were. For each instance of a quantitative outcome the quantity and unit were extracted and organized on an award by habitat/category crosstab. This allowed for multiple outcomes per award across multiple habitats. For example, if an award addressing a coastal area focused on both 10 acres of mangrove and 2 acres of coral reef restoration, these outcomes could each be considered. In total, out of 122 awards, 74 were included in this analysis, with awards that did not provide adequate quantitative outcome information excluded. Quality control was an ongoing aspect of the data extraction. Initial outcome categorizations were assessed for accuracy and recategorized, removed, or changed as needed. Subsequent quality control occurred as estimates were being applied to awards.

Habitat and grant categories

The habitats that defined the Literature Review were narrowed for the assessment of quantitative outcomes in the awards, with most wetlands being excluded to avoid double counting with the wetlands specific benefit transfer approach (see Appendix E). The only wetland included in this appendix was the mangroves which were not part of Appendix E (their exclusion was due to data limitations related to those particular projects). The categories developed in the grant-data extraction phase (Table F-5) were based on a preliminary categorization informed by the literature, and subsequent reorganization to fit the grants. Marine debris grants were categorized separately from other habitats due to the specific nature of those outcomes. Miscellaneous outcomes were those that could not be categorized. For example, some grants detailed their outcomes in highly specific or unique terms such as the number of oyster shells salvaged from restaurants or the cubic feet of sediment removed. These values provided no basis for valuation at this stage but were identified and retained for potential future work.

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[48] 1 Int$=1 USD.

Table F-5. Number of awards by habitat. Note that many grants addressed multiple habitats; thus, listed numbers add up to more than 74.

Habitat or Category	Number of Awards
Beach/dune	4
Coral reef	8
Floodplain	10
Forest	13
Grassland	4
Lake/pond	9
Mangroves	3
Marine Debris	10
Oyster reefs/beds	6
River/Streams	47
Submerged aquatic vegetation	6

Applying Ecosystem Service Estimates

In keeping with the Literature Review approach that deferred to prior Federal government products, the Environmental Protection Agency (EPA) National Ecosystem Services Classification System (NESCS) was chosen as the primary ecosystem service classification system. Other ecosystem services (see Table F-6) are those defined within literature review cornerstone studies (FEMA, 2022; de Groot et al., 2012; and Costanza et al., 2014) and were subcategorized into the appropriate NESCS category. In alignment with the wetlands valuation approach in Appendix E, supporting services (e.g., nutrient cycling, habitat, etc.), or those defined as intermediary services within the NESCS framework, are omitted.

Table F-6. Ecosystem service sources and adapted definitions

Selected NESCS Services	Source, and Literature Review defined subservices		Adapted Definitions
Support of plant or animal cultivation	EPA, 2015		Extracted or harvested, or used in-situ to support human cultivation of plant or animal life
	Nitrogen fixing	Hopkins et al., 2018	Value of trapping sediment bound nitrogen based on the cost of nitrogen removal.
Waste disposal/assimilation	EPA, 2015		Used in situ as a sink for assimilating and disposing of waste
Protection or support of human health and life	EPA, 2015		Used in situ to protect against damages or otherwise support human health and life
	Carbon sequestration	Jerath et al., 2016	"The rate of removal of atmospheric carbon per unit of time by plants and soils", (Chapin et al., 2006 as cited in Jerath et al., 2016, p 160).

Selected NESCS Services	Source, and Literature Review defined subservices		Adapted Definitions
	Climate regulation	FEMA, 2022	Supporting a stable climate at global and local levels through carbon sequestration and other processes
	Air Quality	FEMA, 2022	Providing clean, breathable air
Support of human health and life or subsistence	EPA, 2015		Extracted or harvested, or used in-situ and directly used by humans for subsistence, health, or other life support
	Food Provisioning	FEMA, 2022	Producing crops, fish, game, and fruits
	Erosion control	FEMA, 2022	Retaining arable land, slope stability, and coastal integrity
Protection of human property	EPA, 2015		Used in situ to protect against damages to human property
	Hazard Risk Reduction	FEMA, 2022	Preventing and mitigating natural hazards such as floods,
Recreation/tourism	EPA, 2015		Extracted or harvested, or used in-situ as part of an outdoor recreational or nature tourist activity
Cultural/spiritual activities	EPA, 2015		Extracted or harvested, or used in-situ as part of a non- recreational cultural or spiritual activity
Aesthetic appreciation	EPA, 2015		Used in situ for aesthetic (visual and other senses) appreciation, separate from outdoor/nature recreational, tourist, cultural or spiritual activities.
Information, science, education, and research	EPA, 2015		Extracted or harvested, or used in-situ to directly support scientific research or education.
Other in-situ use	EPA, 2015		Used in situ for other purposes
	Water Supply	FEMA, 2022	Regulating the rate of water flow through an environment and ensuring adequate water availability for all water users
	Water filtration	FEMA, 2022	Removing water pollutants via soil filtration and transformation by vegetation and microbial communities
Raw material for transformation	EPA, 2015		Extracted or harvested and transformed into other commercial products
Existence value	EPA, 2015		Ecological End-Product is of value to people simply because it exists. It is neither used nor directly experienced. People simply value the knowledge that it exists.
Other extractive use	EPA, 2015		Extracted or harvested and transformed into other commercial products

Valuations for specific ecosystem services for specific habitats were organized in one Google Sheet file, where the original value was adjusted for a) dollar per acre or dollar per mile (applying a spatial unit conversion ratio), and b) inflation to 2024 USD using the Bureau of Labor Statistics' (BLS) Consumer Price Index for All Urban Consumers (CPI-U), consistent with the inflation adjustment used in Appendix E. Inflation for the year 2024 is based on the most current data available and includes the months between January 2024 and June 2024.

Ecosystem service value = (Original study $ value)(June 2024 CPI index)*Spatial unit conversion ratio*

Outcome values within the grants were tabulated on an outcome-by-outcome basis and spatial units were converted to acres or miles if necessary, e.g., study values presented as per hectare were multiplied by 2.47 to convert to per acre values. The Ecosystem service values based on the literature were then multiplied by the spatial outcome values in the grants (policy sites) (e.g., 12 acres of restored mangroves) and summed on a per habitat (Table F-7) and per region basis (Table F-17, below).

Results

Table F-7 presents the totals by habitat, along with the number of grants and aggregated spatial unit outcomes. Table F-8 through Table F-18 present the annual per acre values for each service and habitat. Table F-19 presents the totals for each region, excluding the wetlands totals, differentiating this table from Table 9 in the Main Report.

Table F-7. Total ecosystem services by habitat. Note that many awards addressed multiple habitats; thus, listed award totals add up to more than 74

Habitat	Number of awards	Aggregated outcome totals	Outcome units	Total Ecosystem Service Estimates 2024 USD-Annualized using a 3.1% Discount Rate[49],[50]
Beach/dune	4	99	acres	$32,317,629
Coral reef	8	512.9	acres	$2,727,840
Floodplain	10	988.1	acres	$56,374,643
Forest	13	5,065.4	acres	$74,215,293
Grassland	4	404	acres	$2,346,808
Lake/pond	9	4,842.2	acres	$78,184,912
Mangroves	3	185.9	acres	$124,813,872
Oyster reefs/beds	6	125.3	acres	$375,102

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[49] The discount rate used was based on the OMB Circular A-94

[50] Benefits are assumed to begin following a 1-year delay from the project completion date (i.e., End_Date). If the project was set to finish in the middle of a year, the delay is taken from the following year. For example, a project that is set to end on 3/12/2025 would have benefits beginning in 2027.

Habitat	Number of awards	Aggregated outcome totals	Outcome units	Total Ecosystem Service Estimates 2024 USD-Annualized using a 3.1% Discount Rate[49,50]
River/Stream	47	682.7, 354.5	miles, acres	$16,637,293
Submerged aquatic vegetation	6	1,44.6	acres	$22,708,794
Total	N/A	6,82.7, 12,721.9	miles, acres	$410,702,185

Ecosystem Service Value by Habitat

Table F-8. Ecosystem service values of Beaches/Dunes

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Aesthetic Value	$223,840.00	per acre	$259,530	$259,530	99.0	$24,061,190
FEMA, 2022	US	Recreation/ Tourism	$76,809.00	per acre	$89,056	$89,056	99.0	$8,256,438
Total								$32,317,629

FEMA's (2022) aesthetic value for beaches and dunes is informed by the average value of two hedonic models[51] that determined the aesthetic values of various beach and dune features in North Carolina (Gopalakrishnan et al., 2011, cited in FEMA, 2022) and Georgia (Landry et al., 2003 cited in FEMA, 2022). FEMA's (2022) recreation value is informed by the median recreation value from 9 studies covering multiple U.S. regions. FEMA, (2022) does not provide justification for using the median in this case, but the range of values within the studies used for this estimate was from $2,801 to $6.2 million, with most values under $500,000, so it is likely the median was used to prevent a value that skewed too high.

Table F-9. Ecosystem service values of Coral Reefs

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Aesthetic Value	$327	per acre	$379	$379	512.9	$182,048
FEMA, 2022	US	Hazard Risk Reduction	$3,269	per acre	$3,790	$3,790	512.9	$1,820,481
FEMA, 2022	US	Food	$18	per acre	$21	$21	512.9	$10,087
FEMA, 2022	US	Recreation/ Tourism	$1,261	per acre	$1,462	$1,462	512.9	$702,254

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[51] Estimate influence of environmental characteristics on price of marketed goods (Brander et al., 2018).

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Research and Education	$23	per acre	$27	$27	512.9	$12,969
Total								$2,727,840

FEMA's (2022) values for coral reefs are based on four studies, and all but Hazard Risk Reduction services rely at least in part on Brander and van Beukering's (2013) meta-analysis of coral reef studies throughout the United States. Theirs was a function transfer of 69 observations across multiple services. Other key studies include van Beukering et al.'s (2011) analysis of economic value for coral reefs in USVI (aesthetic value, food, and recreation), Cesar and van Beukering's (2004) study of economic value in Hawaii (food provisioning via commercial fishing), and Storlazzi et al.'s, (2019) study of the hazard risk reduction value of U.S. coral reefs.

Table F-10. Ecosystem service values of Floodplains

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
Constanza et al., 2014	Global	Raw Materials	$539	per ha	$753	$1,859	988.1	$1,720,183
Constanza et al., 2014	Global	Food	$614	per ha	$858	$2,118	988.1	$1,959,843
Constanza et al., 2014	Global	Erosion Control	$2,607	per ha	$3,641	$8,994	988.1	$8,322,391
Constanza et al., 2014	Global	Water Supply	$408	per ha	$570	$1,408	988.1	$1,302,860
Constanza et al., 2014	Global	Water Regulation	$5,606	per ha	$7,830	$19,340	988.1	$17,895,843
Constanza et al., 2014	Global	Hazard Risk Reduction	$2,986	per ha	$4,171	$10,301	988.1	$9,531,794
Constanza et al., 2014	Global	Climate Regulation	$488	per ha	$682	$1,684	988.1	$1,558,251
Constanza et al., 2014	Global	Recreation/Tourism	$2,211	per ha	$3,088	$7,628	988.1	$7,058,395
Constanza et al., 2014	Global	Cultural	$1,992	per ha	$2,782	$6,872	988.1	$6,358,847
Hopkins, et al., 2018	Virgina	Nutrient Fixing	$233	per ha	$292	$720	988.1	$666,235
Total								$56,374,643

Ecosystem service values for floodplains from Costanza et al. (2014) are averages updated from their 1997 global estimate of aggregated ecosystem service case studies. In the 2014 publication, values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with Costanza et al., (2014) for more details. Hopkins et al., (2018) utilized a replacement cost[52] approach to monetize nutrient (nitrogen and phosphorus) and sediment trapping on a per hectare per year basis for the Difficult Run tributary in Virginia.

Table F-11. Ecosystem service values of Grasslands

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
De Groot et al., 2012	Global	Recreation/ Tourism	$26	per ha	$39	$97	404.0	$36,698
De Groot et al., 2012	Global	Climate Regulation	$40	per ha	$61	$150	404.0	$56,750
De Groot et al., 2012	Global	Erosion Control	$44	per ha	$67	$165	404.0	$62,425
De Groot et al., 2012	Global	Raw Materials	$53	per ha	$80	$198	404.0	$74,910
De Groot et al., 2012	Global	Water Supply	$60	per ha	$91	$225	404.0	$85,125
De Groot et al., 2012	Global	Waste Treatment	$75	per ha	$114	$281	404.0	$106,312
De Groot et al., 2012	Global	Aesthetic Value	$167	per ha	$253	$625	404.0	$236,459
De Groot et al., 2012	Global	Food	$1,192	per ha	$1,807	$4,462	404.0	$1,688,128
Total								$2,346,808

Ecosystem service values for grasslands from de Groot et al., (2012) are averages from their global estimate of aggregate ecosystem service case studies. Values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with de Groot et al., (2012) for more details.

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[52] Estimate the cost of replacing an ES with a man-made service. (Brander et al., 2018)

Table F-12. Ecosystem service values of Lakes/Ponds

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
Constanza et al., 2014	Global	Waste Treatment	$918	per ha	$1,282	$3,167	4842.2	$14,360,957
Constanza et al., 2014	Global	Recreation/ Tourism	$2,166	per ha	$3,025	$7,472	4842.2	$33,882,245
Constanza et al., 2014	Global	Food	$106	per ha	$148	$366	4842.2	$1,659,650
Constanza et al., 2014	Global	Water Supply	$1,808	per ha	$2,525	$6,237	4842.2	$28,282,061
Total								$78,184,912

Ecosystem service values for lake/pond from de Costanza et al., (2014) are averages updated from their 1997 global estimate of aggregated ecosystem service case studies. In the 2014 publication, values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with Costanza et al., (2014) for more details.

Table F-13. Ecosystem service values of Mangroves

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
Jerath et al., 2016	Everglades	Carbon Sequestration	$18,793.50	per ha	$24,912	$61,531	185.9	$10,709,337
De Groot et al., 2012	Global	Food	$1,111	per ha	$1,684	$4,159	185.9	$723,865
De Groot et al., 2012	Global	Raw Materials	$358	per ha	$543	$1,340	185.9	$233,224
De Groot et al., 2012	Global	Climate Regulation	$65	per ha	$99	$243	185.9	$42,294
De Groot et al., 2012	Global	Hazard Risk Reduction	$5,351	per ha	$8,110	$20,031	185.9	$3,486,352
De Groot et al., 2012	Global	Waste Treatment	$162,125	per ha	$245,710	$606,903	185.9	$105,630,147
De Groot et al., 2012	Global	Erosion Control	$3,929	per ha	$5,955	$14,708	185.9	$2,559,895
De Groot et al., 2012	Global	Recreation/ Tourism	$2,193	per ha	$3,324	$8,209	185.9	$1,428,759
Total								$124,813,872

Jerath et al.'s (2016) value for carbon sequestration services provided by mangroves in the Everglades accounts for both above ground and root carbon. Estimates were developed using the marginal abatement cost ($56/ton C), essentially the cost of lost carbon storage, which Jerath et al., (2016) suggest is suitable for protected areas like the everglades. Values for mangroves from de Groot et al., (2012) are averages from their global estimate of aggregate ecosystem service case studies. Values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with de Groot et al., (2012) for more details.

Table F-14. Ecosystem service values of Oyster Reefs/Beds

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Food	$1,905	per acre	$2,209	$2,209	125.3	$259,090
FEMA, 2022	US	Water Filtration	$600	per acre	$696	$696	125.3	$81,642
FEMA, 2022	US	Recreation/Tourism	$253	per acre	$293	$293	125.3	$34,370
Total								$375,102

FEMA's (2022) values for food, water filtration, and recreation/tourism relied on average values from various studies assessing these services across the U.S. Many of these studies were included in the Literature Review, but individual values are not included in the final benefit transfer to avoid double counting.

Table F-15. Ecosystem service values of Rivers/Streams

Note italicized figures were converted to per mile from per kilometer.

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Aesthetic Value	$767	per acre	$889	$889	354.5	$295,129
FEMA, 2022	US	Air Quality	$254	per acre	$294	$294	354.5	$97,602
FEMA, 2022	US	Climate Regulation	$96	per acre	$111	$111	354.5	$36,850
FEMA, 2022	US	Erosion Control	$13,823	per acre	$16,027	$16,027	354.5	$5,320,627
FEMA, 2022	US	Hazard Risk Reduction	$6,052	per acre	$7,017	$7,017	354.5	$2,329,497
FEMA, 2022	US	Food	$736	per acre	$853	$853	354.5	$283,178
FEMA, 2022	US	Recreation/ Tourism	$6,215	per acre	$7,206	$7,206	354.5	$2,392,241

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
FEMA, 2022	US	Water Filtration	$6,239	per acre	$7,234	$7,234	354.5	$2,401,536
FEMA, 2022	US	Water Supply	$272	per acre	$315	$315	354.5	$104,573
Costanza et al., 2014	Global	Waste Treatment	$918	per ha	$1,282	$3,167	354.5	$1,051,377
Hopkins et al., 2023	Mid-Atlantic	Nitrogen Fixing	$926.67	per km	$995	*$618*	54.1	$31,314
Knowler et al., 2003	Pacific Northwest (Canada)	Food	$2,957.86	per km	$6,270	*$3,896*	628.6	$2,293,369
Total								$16,637,293

FEMA's (2022) values for rivers and streams are based on their assessment of Riparian habitats, which is why other sources were included to account for a broader array of services. FEMA (2022) values are the average of a variety of studies for each service.

Hopkins et al., (2023) and Knowler et al., (2003) provided values on a per mile basis, which allowed for several key grant categories such as fish passages to be valued in the linear distance units used by grantees to describe outcomes. The Hopkins et al., (2023) value is the average net nitrogen retention benefit for the Potomac River, James River, and Delaware River. Knowler et al., (2003) used a bioeconomic model based on the change in fish habitat quality from restoration and its impacts on downstream commercial salmon catch in British Columbia. The per kilometer value was converted to miles.

The value for waste treatment from Costanza et al., (2014) is an average from their global estimate of aggregate ecosystem service case studies, updated from their 1997 value. In the 2014 publication, values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD.

Table F-16. Ecosystem service values of Submerged Aquatic Vegetation

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
De Groot et al., 2012 (seagrasses)	Global	Raw Materials	$12	per ha	$17	$41	97.6	$3,748
De Groot et al., 2012 (seagrasses)	Global	Food	$2,384	per ha	$3,330	$8,225	97.6	$751,943
De Groot et al., 2012 (seagrasses)	Global	Erosion Control	$25,368	per ha	$35,432	$87,517	97.6	$8,000,947
De Groot et al., 2012 (seagrasses)	Global	Climate Regulation	$479	per ha	$669	$1,652	97.6	$151,029
De Groot et al., 2012 (seagrasses)	Global	Recreation/Tourism	$256	per ha	$358	$883	97.6	$80,725
De Groot et al., 2012 (seagrasses)	Global	Cultural	$43	per ha	$60	$148	97.6	$13,530
Eger et al., 2023 (kelp forests)	Global	Waste Treatment	$73,800	per ha	$89,587	$221,280	47.0	$9,739,449
Eger et al., 2023 (kelp forests)	Global	Carbon Sequestration	$163	per ha	$198	$489	47.0	$21,511
Eger et al., 2023 (kelp forests)	Global	Food	$29,900	per ha	$36,296	$89,651	47.0	$3,945,912
Total								$22,708,794

Eger et al.'s, (2023) global scale values represent the value provided to fisheries, from carbon sequestration, and for waste treatment (nitrogen and phosphorous removal) by several forest-forming species of kelp: Ecklonia, Laminaria, Lessonia, Macrocystis, Nereocystis, and Saccharina. Fisheries values were determined based on the contribution of kelp forests to the sustainable harvestable fisheries biomass produced each year. Carbon sequestration value was based on a 10% sequestration rate applied to all species, meaning that 10% of net primary production is assumed to be permanently removed from the water column and stored in the deep sea (Krouse-Jensen & Duarte, 2016 cited in Eger et al., 2023, see the Supplementary Data in Eger et al., 2023 for more details), and the social cost of carbon (~$45/ton C). Nitrogen removal values were based on the replacement cost of engineered nutrient removal in water treatment plants.

Values for seagrasses from de Groot et al., 2012 are averages from their global estimate of aggregate ecosystem service case studies. Originally represented as Coastal Systems, this habitat considers shelf areas, seagrasses, and estuaries but excludes wetlands, indicating only submerged resources. Costanza et al., (2014) also presents these same values but labels them as seagrasses. Values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with de Groot et al., (2012) for more details.

Table F-17. Ecosystem service values for Temperate Forests

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
De Groot et al., 2012	Global	Climate Regulation	$152.00	per ha	$230	$569	5005.4	$2,667,148
De Groot et al., 2012	Global	Research and Education	$1.00	per ha	$2	$4	5005.4	$18,750
De Groot et al., 2012	Global	Erosion Control	$5.00	per ha	$8	$19	5005.4	$89,061
De Groot et al., 2012	Global	Food	$299.00	per ha	$453	$1,119	5005.4	$5,245,235
De Groot et al., 2012	Global	Raw Materials	$181.00	per ha	$274	$678	5005.4	$3,178,078
De Groot et al., 2012	Global	Recreation/Tourism	$989.00	per ha	$1,499	$3,702	5005.4	$17,352,869
De Groot et al., 2012	Global	Waste Treatment	$7.00	per ha	$11	$26	5005.4	$121,873
De Groot et al., 2012	Global	Water Supply	$191.00	per ha	$289	$715	5005.4	$3,351,513
FEMA, 2022	US	Cultural Value	$7,531	per acre	$8,732	$8,732	5005.4	$40,929,662
Total								$72,954,190

Values for temperate forests from de Groot et al., (2012) are averages from their global estimate of aggregate ecosystem service case studies. Values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with de Groot et al., (2012) for more details.

Cultural values (existence value) from FEMA, (2022) are based on the replacement cost of trees across eight locations throughout the US.

Table F-18. Ecosystem service values of Tropical Forests

Source	Study Scale/ Location	Ecosystem Service	Original Value (per year)	Original Spatial Unit	Adjusted Value (2024 USD)	Per Acre, (2024 USD)	Aggregate Acreage	Annualized Value (2024 USD)
De Groot et al., 2012	Global	Air Quality	$12.00	per ha	$18	$45	60.0	$2,528
De Groot et al., 2012	Global	Climate Regulation	$2,044.00	per ha	$3,098	$7,652	60.0	$429,953
De Groot et al., 2012	Global	Disturbance Moderation	$66.00	per ha	$100	$247	60.0	$13,879
De Groot et al., 2012	Global	Erosion Control	$15.00	per ha	$23	$56	60.0	$3,147
De Groot et al., 2012	Global	Food	$200.00	per ha	$303	$749	60.0	$42,085
De Groot et al., 2012	Global	Raw Materials	$84.00	per ha	$127	$314	60.0	$17,643
De Groot et al., 2012	Global	Recreation/ Tourism	$867.00	per ha	$1,314	$3,246	60.0	$182,387
De Groot et al., 2012	Global	Water Regulation	$342.00	per ha	$518	$1,280	60.0	$71,921
De Groot et al., 2012	Global	Waste Treatment	$6.00	per ha	$9	$22	60.0	$1,262
De Groot et al., 2012	Global	Water Supply	$27.00	per ha	$41	$101	60.0	$5,675
FEMA, 2022	US	Cultural Value	$7,531	per acre	$8,732	$8,732	60.0	$490,624
Total								$1,261,103

Values for tropical forests from de Groot et al., (2012) are averages from their global estimate of aggregate ecosystem service case studies. Values were represented in 2007 (Int$/ha/year). Int$, the international dollar, or the Geary–Khamis dollar, is used to correct values to the Purchasing Power of the US dollar. 1 Int$=1 USD. See the Supplementary materials published with de Groot et al., (2012) for more details.

Cultural values (existence value) from FEMA, (2022) are based on the replacement cost[53] of trees across eight locations throughout the US.

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[53] Estimate the cost of replacing an ES with a man-made service. (Brander et al., 2018)

Table F-19. Regional totals (These totals exclude the wetlands totals detailed in Appendix E)

Region	Number of Awards	Total Ecosystem Service Estimates 2024 USD- Annualized using a 3.1% Discount Rate (2024 USD)[54]
Northeast	9	$67,656,200
South	23	$51,080,139
Midwest	5	$26,517,783
West	40	$88,963,362
Pacific Islands	2	$323,977
Alaska	5	$18,237,747
Caribbean	9	$157,922,977
Total	93	$410,702,185

Regional totals were determined by summing the product of the ecosystem service values and award spatial outcome data. For example, each award within the Northeast has an individual ecosystem service benefit total based on the habitat outcomes or the sum of its habitat outcomes if multiple habitat types are being improved. The benefits from these 9 awards totals to $67,656,200.

Marine Debris Removal

Grants that focused on the removal of marine debris (nets, traps, refuse, abandoned vessels, etc.) presented challenges for benefit transfer. Nine out of the ten grants categorized as involving the removal of marine debris focused on or included the removal of abandoned derelict vessels (ADVs). No studies were found that could provide a value for removal of ADVs, but the benefits of ADV removal include reducing navigational hazards and threats to public health and commerce, and reducing the environmental impact of toxins and the breakdown of hazardous materials (NOAA, 2013). Estimating the value of abandoned trap removal has been explored in the academic literature, but few applicable values were found, and those that were found relied on the impacts to specific commercial fisheries impacted by abandoned traps. Grants included in this analysis did not align with any trap removal valuation studies that assessed impacts to Northeastern fisheries.

Fish Barrier Removal

Awards related to fish barrier removal pertained to various species and regions. Pacific Northwest awards focused on salmon habitat restoration were included in the benefit transfer approach per Knowler et al.'s (2003) estimates for the commercial fishery benefits associated with salmon habitat restoration. Other outcomes, such as those related to herring, eel, shad, sturgeon, and Atlantic Salmon could not be included in the benefit transfer approach due to the lack of literature related to these specific contexts. Table F-20 provides more information about the fish barrier awards that were excluded in the benefit transfer approach.

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[54] Benefits are assumed to begin following a 1-year delay from the project completion date (i.e., End_Date). If the project was set to finish in the middle of a year, the delay is taken from the following year. For example, a project that is set to end on 3/12/2025 would have benefits beginning in 2027.

Table F-20. Fish barrier outcomes not included in benefit transfer estimates

Region	Number of Awards	Barriers Removed	Fish Passage Improvements	Miles of Habitat Improved
Northeast	7	48	1	1436
South	2	8	8	1128.9
Midwest Great Lakes	2	8	12	115.6

Limitations and Gaps

The primary limitation of this benefit transfer approach is that there are missing services on a habitat by habitat basis. As mentioned in the Literature Review Results, this is due to the lack of research (e.g. marine debris removal as discussed above), the inapplicability of study units to grant outcome units (e.g., estimates as total area values for an unspecified geographic area, or units within grants that have not been assessed such as number of oyster shells recycled)[55], the inapplicability of services to habitats (e.g., water supply for coral reefs), or the fact the available research was not captured during the literature review stage. Forty-eight grants did not provide information that could be assessed via benefit transfer, of those, twenty-nine were also excluded in the wetlands-specific benefit transfer effort (see Appendix E). Additional data on the spatial extent of intended outcomes across focal habitats might increase the number of estimable data points.

Further limitations inherent in benefit transfer include the appropriateness of applying the study estimates to the projects in question. In this case, the applicability of national and global scale estimates to highly context-specific projects present a limitation due to uncertainty surrounding the accuracy of the estimate (Costanza et al., 2014). The case studies used to develop aggregate ecosystem service value estimates often represent a wide range, so using averages as is done by FEMA (2022), de Groot et al., (2012) and Costanza et al., (2014) is an inexact approach but one that allowed for rapid estimate development for this project. The supplemental material and appendices for these studies contain tables with the complete studies and value ranges used to determine their estimates.

Due to the scope of this work and project team capacity, peer reviewed global or national scale estimates were deemed appropriate to use in lieu of context specific or baseline ecosystem service estimates developed in-situ for each grant. Further, these estimates represent the ecosystem service provision in a nominal or best-case scenario. Since the baseline ecosystem service provision in each grant context is not known, these values do not represent the difference between current and future ecosystem service provision and should not be communicated or presented as such.

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[55] See the Miscellaneous category within the main report. Thirteen awards supplied information that could not be valued using benefit transfer.

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