



# NATURE-BASED SOLUTIONS RESOURCE GUIDE

COMPENDIUM OF FEDERAL EXAMPLES,  
GUIDANCE, RESOURCE DOCUMENTS,  
TOOLS, AND TECHNICAL ASSISTANCE

NOVEMBER 2022



THE WHITE HOUSE  
WASHINGTON



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Suggested citation: White House Council on Environmental Quality, White House Office of Science and Technology Policy, White House Office of Domestic Climate Policy, 2022. Nature-Based Solutions Resource Guide. Washington, D.C.



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## Summary

The impacts of climate change and the continual loss of nature endanger American communities, ecosystems, and infrastructure. To help us achieve climate, conservation and equity goals, the Biden-Harris Administration is investing in nature-based solutions. These solutions are actions to protect, sustainably manage, or restore natural or modified ecosystems to address societal challenges, simultaneously providing benefits for people and the environment.<sup>1</sup>

Nature-based solutions have been used successfully by many federal agencies. Yet, they are far from reaching their full potential. One challenge to further adoption is limited awareness and skills for using nature-based solutions. This guide provides a compendium of federal and partner cases and resources that can help overcome this challenge.

The guide contains 30 examples of ways that federal agencies have used nature-based solutions to achieve their goals. The diverse set of examples demonstrates that nature-based solutions can provide many different benefits. For example, nature-based solutions have been used to make federal buildings and assets more resilient to natural hazards and climate impacts. These solutions have also been used to reduce operation and management costs, like those for heating and cooling and stormwater management. Federal agencies have also supported communities in their use of nature-based solutions. For example, communities have used federal funding of nature-based solutions to build resilient low-income housing and make roads safer. Wetlands and native plants have been used to capture stormwater, reducing flooding and costs for stormwater management systems. Communities have grown rain gardens and shade trees as part of their journey towards improved public health. Good jobs have been supported for ranchers, renewable energy workers, engineers and other sectors. Shaded fire breaks have reduced the risk of catastrophic wildfires. Roads and homes have been strengthened against future erosion from intense storms and sea level rise. Plants valued by Native communities have been revived, reconnecting people to important cultural practices. Communities that have been denied access to nature in the past have been connected to greenspaces. Science and evidence have been advanced, using these experiences as opportunities to learn. And through all of these efforts, nature has been saved or strengthened.

The guide also contains a summary and links to 177 federal knowledge resources, tools, guidance, and technical assistance on nature-based solutions. Together, these examples and resources provide a starting point for learning about nature-based solutions and effectively implementing them. There are other challenges that slow the deployment of nature-based solutions. These are addressed in a companion report on “Opportunities to Accelerate Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity and Prosperity.”<sup>2</sup>

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<sup>1</sup> United Nations Environment Assembly. 2020. Resolution adopted by the United Nations Environment Assembly on 2 March 2022—Nature-based solutions for supporting sustainable development, UNEP/EA.5/Res.5. <https://wedocs.unep.org/bitstream/handle/20.500.11822/39752/K2200677%20-%20UNEP-EA.5-Res.5%20-%20Advance.pdf?sequence=1&isAllowed=y>.

<sup>2</sup> White House Council on Environmental Quality, White House Office of Science and Technology Policy, White House Domestic Climate Policy Office, 2022. Opportunities for Accelerating Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity. Report to the National Climate Task Force. Washington, D.C.



## Abbreviations and Acronyms

<b>AFB</b>	Air Force Base
<b>BIA</b>	U.S. Bureau of Indian Affairs
<b>BOEM</b>	U.S. Bureau of Ocean Energy Management
<b>CEQ</b>	White House Council on Environmental Quality
<b>DHS</b>	U.S. Department of Homeland Security
<b>DOD</b>	U.S. Department of Defense
<b>DOE</b>	U.S. Department of Energy
<b>DOI</b>	U.S. Department of the Interior
<b>DOT</b>	U.S. Department of Transportation
<b>EDA</b>	U.S. Economic Development Administration
<b>EPA</b>	U.S. Environmental Protection Agency
<b>FEMA</b>	Federal Emergency Management Agency
<b>FHWA</b>	Federal Highway Administration
<b>FWS</b>	Fish and Wildlife Service
<b>GSA</b>	General Services Administration
<b>HUD</b>	U.S. Department of Housing and Urban Development
<b>NFWF</b>	National Fish and Wildlife Foundation
<b>NIDS</b>	Natural Infrastructure in Dryland Streams
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPS</b>	U.S. National Park Service
<b>NRCS</b>	Natural Resources Conservation Service
<b>OIA</b>	U.S. Department of the Interior Office of Insular Affairs
<b>OSTP</b>	White House Office of Science and Technology Policy
<b>ROI</b>	Return on Investment
<b>USACE</b>	U.S. Army Corps of Engineers
<b>USAID</b>	U.S. Agency for International Development
<b>USCG</b>	U.S. Coast Guard
<b>USDA</b>	U.S. Department of Agriculture
<b>USFS</b>	U.S. Forest Service
<b>USGS</b>	U.S. Geological Survey



# Federal Stories: Nature-Based Solutions in Action

Federal agencies have pioneered nature-based solutions on federal lands and waters, in federal facilities, and in partnership with communities, companies, and Tribal, state, local, territorial and other national governments. Examples are available from across the federal family, demonstrating the broad relevance of nature-based solutions to a wide range of American challenges and opportunities.

For example, nature-based solutions have been used to make federal buildings and assets more resilient to natural hazards and climate impacts. These solutions have also been used to reduce operation and management costs, like those for heating and cooling, and stormwater management. Federal agencies have supported communities in their use of nature-based solutions to provide many benefits, including to:

<ul style="list-style-type: none"><li>• build resilient low-income housing</li><li>• improve transportation safety</li><li>• manage stormwater</li><li>• reduce cooling costs</li><li>• reduce heat stress</li><li>• increase the lifetime of infrastructure</li><li>• support good jobs</li><li>• increase community engagement</li><li>• improve worker satisfaction</li><li>• slow climate change</li><li>• adapt to climate impacts</li><li>• reduce wildfire risk</li><li>• provide recreational opportunities</li><li>• reduce flooding, sea level rise, and erosion risk to homes, roads, and other infrastructure</li><li>• slow land subsidence</li><li>• improve mental and physical health</li><li>• provide opportunities for nature education</li><li>• support community values</li><li>• improve water quality, clean water supplies</li><li>• reduce future disaster risks</li><li>• improve knowledge and evidence</li><li>• protect culturally important sites, experiences</li></ul>	<ul style="list-style-type: none"><li>• conserve water supplies, reduce effects of drought</li><li>• provide a beneficial use of dredge material</li><li>• reduce dredge and disposal costs</li><li>• benefit local economies, support incomes</li><li>• reduce business closures from flooding</li><li>• respect Indigenous Knowledge</li><li>• maintain Tribal and Native American practices</li><li>• support practices by private landowners</li><li>• strengthen private landowner social networks</li><li>• create corridors for wildlife and connect landscapes</li><li>• support military operations and readiness</li><li>• improve living conditions for military service members</li><li>• improve water clarity</li><li>• engage volunteers</li><li>• control invasive species</li><li>• recharge groundwater</li><li>• protect threatened and endangered species</li><li>• reduce need for fertilizers, machinery use</li><li>• reduce dust storms</li><li>• improve college campus sustainability</li></ul>
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| <ul style="list-style-type: none"><li>• reduce construction and maintenance costs</li><li>• support food production</li><li>• protect and rebuild natural habitats</li><li>• support wildlife</li><li>• overcome environmental injustices</li></ul> | <ul style="list-style-type: none"><li>• conserve water</li><li>• beautify landscapes</li><li>• create school gardens and outdoor classrooms</li><li>• reduce heat island effects in cities</li></ul> |
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Nature-based solutions applied by federal agencies have included wetland restoration, transportation and facility construction, coral reef protection, farm and forest management, community development, school design, military base management, and beyond. The deployment of nature-based solutions for so many uses by so many agencies with Tribal, state, Territorial and local partners reflects decades of research and experimentation. These examples demonstrate that well-designed nature-based solutions can be cost-effective, outlast conventional options, be more resilient to the effects of climate change, and provide multiple benefits often beyond what conventional options provide. A broad selection of examples of how the federal government has used nature-based solutions follows. These stories are not exhaustive, but rather demonstrate the range of scales and contexts where agencies have adopted nature-based solutions.

## **AmeriCorps**

### **AmeriCorps strengthens the nature-based solutions workforce**

AmeriCorps serves as a modern-day Civilian Conservation Corps focused on tackling 21<sup>st</sup> century challenges, including environmental challenges, through a more diverse and equitable lens. AmeriCorps works closely with other federal agencies, Governor-appointed State Service Commissions, and non-profit partners. More than 16,000 AmeriCorps members and AmeriCorps Seniors volunteers are engaged each year in conservation, renewable energy, and community resilience projects. AmeriCorps is currently researching members' climate knowledge and literacy before and after participating in AmeriCorps' National Civilian Community Corps "Summer of Service." AmeriCorps-funded service is categorized into six focus areas; many members serve in the area of Environmental Stewardship, implementing a variety of nature-based solutions. Across all of AmeriCorps' focus areas, a large majority of members reported higher likelihoods of discussing the effects of political, social, local, or national issues on the community with their peers. Members also reported participating in their communities more after having served in AmeriCorps. Higher confidence in their ability to adequately address community concerns was also seen. These positive trends provide insight on workforce benefits like education, skills-building, and community participation that come with investing in jobs, including those focused on nature-based solutions and environmental stewardship.

### **Return on Investment Study: Nevada Conservation Corps**

Since 1999, AmeriCorps has supported the work of the Nevada Conservation Corps, an environmental service program supporting Nevada's communities and public lands by deploying



forestry teams that use “natural infrastructure solutions” to reduce the severity of wildfires, remove invasive species to increase benefits to society from ecosystems, and build and maintain trails that provide health and recreational benefits. The program contributes to capacity building and workforce development related to nature-based solutions. To better understand the impact of the program, AmeriCorps commissioned a Return on Investment (ROI) analysis. Among the benefits to various stakeholders measured in this study are reduced wildfire damage, environmental benefits, and improved trail access. The ROI study also pioneered strategies for monetizing outcomes associated with reduced greenhouse gas emissions and for discounting ecosystem benefits over regrowth periods.

## **U.S. Agency for International Development (USAID)**

### **Natural Infrastructure for Water Security in Peru**

Building on a series of smaller investments, the USAID/Peru Mission launched the Natural Infrastructure for Water Security project in 2017. Multiple emergencies—including drought, forest fires, floods and landslides—demonstrated Peru’s vulnerability to hydrological and climatic extremes. By working with private companies, local authorities and water users, USAID helped to develop a pipeline of natural infrastructure investment projects to ensure reliable, climate resilient water supplies for urban water utilities that are sustainable, cost-effective, and scalable. Through this program, USAID is: supporting nine Integrated Plans for Flood and Landslide Management that will incorporate \$15 million in natural infrastructure investments; facilitating approval of the Lima Region water utility’s five-year Optimized Master Plan including a one percent Payment for Ecosystem Services tariff; and catalyzing \$8 million in regional government investments. It also includes improving capacity and market access for natural infrastructure linked value chains, including honey and dairy production, that improve livelihoods for local communities and also increases the sustainability of nature-based solution investments.

### **Climate-Resilient Ecosystems and Livelihoods in Bangladesh**

The USAID/Bangladesh Mission is working with Bangladesh to address their high vulnerability to climate stressors such as sea level rise, floods, droughts and other extreme weather events. The Mission’s Climate-Resilient Ecosystems and Livelihoods project focused on conserving biodiversity and strengthening ecosystems in four rural, biologically significant regions to help communities adapt to climate change. From 2012-2018, the project helped local communities across 30 protected area sites reduce climate risks to livelihoods and food security through improved management and conservation of forest and wetland ecosystems. Additional nature-based approaches to increase climate resilience of productivity and household livelihoods included agroforestry, the conservation of natural buffers adjacent to farming plots, and improvements in the management of wild fisheries that serve as safety nets during times of crop failure. The activities helped 965 villages develop climate change adaptation and mitigation plans that included nature-based approaches, and led to 17,000 households benefiting from increases in fish catches.





## **U.S. Department of Agriculture (USDA)**

### **Central Sierra Recovery and Restoration Project**

The southern Sierra Nevada in California is famous for iconic places like Yosemite Valley and the giant sequoia groves. In the past several years, this area of the Sierra Nevada has lost tens of millions of trees to wildfire. The USDA Joint Chiefs' Landscape Restoration Partnership invested in several nature-based solutions including prescribed fire treatments and removing hazard trees in the wildland urban interface, a practice that is critical to reducing the threat of catastrophic wildfire to local communities and sensitive habitats. Fuels reduction and prescribed fire treatments were applied to more than 3,100 acres and helped create a defensible space for firefighters to protect four communities during wildfires. The project supported rural economies by reducing fire hazards to help sustain the tourism industry of the Sierra Nevada foothills. These actions also improved habitat for at-risk species like the Pacific fisher, great grey owl, western pond turtle, and foothill yellow-legged frog. In addition, local communities, roads, and active restoration sites were aided by removing hazardous trees. The Landscape Restoration Partnership enables the Natural Resources Conservation Service (NRCS) and U.S. Forest Service (USFS) to collaborate with agricultural producers and forest landowners to invest in conservation and restoration at a big enough scale to make a difference.

### **Life from Soil: The Ranching Sustainability and Viability Planning Network**

The goal of the Life from Soil project is to improve the ecological function of over 500,000 acres of grasslands in Montana, Nebraska, and South Dakota by 2027. Participating ranchers agree to nature-based solutions including zero conversion of their grasslands for ten years. They also develop and implement a written grazing management plan, complete trainings on grazing management, monitoring, and other topics, and participate in on-ranch ecological monitoring. Ranchers are also enrolled in the World Wildlife Fund's Ranch Systems and Viability Planning Network, which creates a support system for ranchers interested in making ecological improvements and enhancing the financial sustainability of their operations. These changes will produce a variety of benefits for ranches including improved soil health and water filtration, increased habitat for wildlife, the potential for reduced emissions through carbon storage and sequestration, improved financial sustainability, and stronger social networks among ranchers. The project leverages almost \$3 million in partner contributions, including eight partner-funded staff conservationists who provide technical assistance to ranchers.

## **U.S. Department of Commerce (DOC)**

### ***National Oceanic and Atmospheric Administration (NOAA)***

#### **Pointe au Chien Oyster Restoration Project**

NOAA's Regional Coastal Resilience Grants program aided the Pointe au Chien Tribe in creating an oyster shell living shoreline, a type of nature-based solution. The living shoreline restores a section of coast and protects a culturally important site along Louisiana's Gulf Coast



from erosion due to wave action, tidal currents, and sea level rise. Several culturally important Tribal earth mounds are located in the vicinity of the project site, which was actively eroding. Many Tribal members make a living from fishing; therefore, a nature-based solutions approach that improves local water quality and provides habitat for fish species is appealing. The area historically supported oyster reefs as well, which have demonstrated effectiveness in stopping or significantly reducing coastal erosion while improving water quality. Additionally, an oyster reef living shoreline is less costly than conventional “hard” shoreline armoring techniques. Additional benefits include improved habitat for fish, shellfish, and birds. The oyster restoration project, installed in 2019, has reduced erosion and has withstood the impacts of multiple hurricanes. The Tribe is pleased with the performance of the living shoreline and is looking to expand on this method to protect other areas of their homeland.

### **Wetland Restoration for Ecosystem and Community Resilience in He’eia O’ahu**

On O’ahu’s Eastern Coast, 405 acres of wetlands and traditional Hawaiian agricultural practices have been restored. These nature-based solutions were supported by NOAA funding, administered by the National Fish and Wildlife Foundation (NFWF) National Coastal Resilience Fund. The project will reestablish ecological function in an area where eight streams once converged and connected to the largest bay in the main Hawaiian Islands. The project aims to minimize flood impacts, reduce sediment and nutrient runoff, create healthy habitat and fish passage for marine and estuarine species, and serve as a source of cultural practice, food, and clean water for the local community. Through the He’eia National Estuarine Research Reserve, The Nature Conservancy, and relationships with partners with local and conventional knowledge, the project is part of a decades-long effort. These partnership efforts ensure the work is locally and culturally grounded and able to engage thousands of volunteers. The project team developed a Before-After-Control-Impact monitoring approach to quantify the impacts of the restoration activities on water and sediment flow, vegetation, and wildlife populations, allowing for adaptive project management now and in the future.

### ***U.S. Economic Development Administration (EDA)***

#### **EDA’s Economic Integrator Catalyzes Interagency Investments in San Diego**

Nestled between Balboa Park and the San Diego International Airport, Maple Canyon is a unique green space that buffers business with nature inside San Diego’s sprawling urban core. When flooding hit the canyon in 2017, a vast ecosystem of interdependent commercial enterprises, transportation networks, and natural habitats was impacted. A \$6 million EDA grant to the city of San Diego was matched with \$6 million in local investment to support the final design, permitting, easement acquisition, and construction of vital infrastructure needed to protect San Diego businesses. The project includes innovative nature-based solutions including upstream improvements to reduce runoff and debris deposited into the city’s stormwater infrastructure. These investments also mitigate the impact of flooding on local industry while enhancing outdoor recreation and economic development opportunities for the region. Thanks to the cooperation of federal, state, and local agencies—working with private sector partners—nearly



2,000 jobs dependent on the commercial-environmental ecosystem have been retained and an important landscape in urban Southern California has been preserved.

## **U.S. Department of Defense (DOD)**

### **Permeable Pavement and Rain Gardens for Stormwater Management**

Permeable pavement was installed at Joint Base Lewis-McChord near Tacoma, Washington and adjacent to Puget Sound. The use of roadside rain gardens and Eco-Priora permeable pavement cleans and filters nearly 100% of stormwater runoff from one million square feet of surrounding hardscape and reduces pollutants discharged into Puget Sound. Limiting runoff from the installation allows Joint Base Lewis-McChord the flexibility to build and manage critical impervious infrastructure as needed to support military operations, like the airfield. The project also expanded a high traffic boulevard to make it more accessible and appealing to residents of the installation. The use of permeable pavement for sidewalks reduces the amount of heat absorbed by 35% and enabled the project to be constructed in winter when it is not feasible to use asphalt. Wider, tree-lined sidewalks are also more appealing to the installation community and visitors. Prioritizing stormwater filtration allowed for the installation to meet their goals of accessibility improvement, livability improvement, and stormwater runoff management more efficiently and sustainably.

### **MacDill Air Force Base (AFB) Shoreline Stabilization Project**

MacDill AFB's shoreline in Tampa, Florida suffered significant erosion that resulted in the loss of shoreline and several native plant species, including century-old live oaks. It was estimated the base was losing as much as one horizontal foot of shoreline annually. A multi-phase nature-based solutions project is creating over 7,500 linear feet of oyster reefs, consisting of oyster shell and concrete oyster domes, installed along the shoreline since 2003. The project has successfully prevented erosion, attracted wildlife, and increased plant life. One oyster can filter up to five gallons of water per hour, acting as a natural cleanser for the Tampa Bay and making the water clearer and creating better habitat. The project is also cost-effective and is able to leverage volunteer support, resulting in lower costs and enhanced community interest in shoreline protection. Oyster reefs were chosen as the nature-based solution because they went beyond erosion control to create habitats as a living shoreline. The reduced wave energy and accumulated sediment encourages growth of native marsh grasses and mangroves, which further stabilizes the shoreline, creates habitat, and improves the ecosystem.

### **Use of Farm Animals to Control Invasive Species**

Two California-based AFBs (Beale and Travis) are using farm animals to rid base lands of non-native invasive plants not easily managed by annual mowing. The effort is improving wildlife habitat, saving money, and protecting military resources. Grazing leads to shorter grass than mowing, improving habitat for federally-listed threatened species such as the California tiger salamander. The shorter grass also substantially reduces fire risk. There are financial benefits as well—the bases earn money from grazing leases while eliminating mowing costs and the need for herbicides or machinery. This innovative nature-based solution was chosen because it was



cost-effective and beneficial to both the installations and the community, including community ranchers. Bases are saving money, reducing fire risk, and enhancing habitat for threatened and endangered species, all while the community benefits from reduced fire risk, improved habitat, and, for ranchers, access to additional pasture for the animals they lease to the bases.

## ***U.S. Army Corps of Engineers (USACE)***

### **Restoration of Deer Island For Habitat and a Resilient Mississippi Sound**

The Deer Island Restoration project aims to restore the 3.5-mile-long island off the coast of Biloxi, Mississippi and to create long-term disposal capacity for material dredged from the nearby Biloxi Harbor Navigation Project. Dredged material from a navigation channel in the Biloxi Harbor was used at Deer Island to restore marsh, create habitat for terrestrial and aquatic species, and increase resilience in the shoreline for future storm events. The project was implemented using USACE's *Engineering with Nature* principles and actively considered the diverse needs of the community, including habitat health, water quality, safety, recreation, and the economy. Additionally, the project reduces costs by limiting acquisition of new material and the need for future dredging.

### **Santa Clara Pueblo Indigenous Knowledge in Action**

USACE partnered with the Pueblo Tribal government and multiple federal agencies (e.g., FEMA, USDA, DOI, and EPA) to recover from the 2011 Las Conchas Wildfire and to reduce future flood and disaster risk for local residents in the Santa Clara watershed. Indigenous Knowledge was used to select culturally-appropriate approaches such as limiting access to sacred spring locations and using locally available materials like tree transplants, logs, and other woody and rock debris to construct control check dams at key locations in the watershed. Low-impact nature-based solutions were prioritized to reduce the costs and impacts of greenhouse gas emissions associated with using non-native techniques and materials. The solutions, informed by Indigenous Knowledge, reduce flood risk, minimize disruption to fragile ecosystems, and protect cultural resources and practices.

### **Constructing the Oro Loma Horizontal Levee on the South San Francisco Bay Shoreline**

In San Francisco Bay, nature-based solutions were constructed to filter wastewater, enhance the resilience of the shoreline, mitigate flood risk from sea level rise, and improve water quality and habitat for local animals and plants. A new wetland was constructed to serve as a horizontal levee and was designed to dampen wave energy, reduce flood risk, and restore lost habitat. A wet weather treatment basin uses vegetation and soils to help filter nutrients from wastewater through biological uptake of nutrients as water flows through the horizontal levee. The use of nature-based solutions provided a cost-effective means of maintaining the integrity of local waters by refining partially treated wastewater. It also reduced flood risk by promoting a wetland as a horizontal levee, leading to improved shoreline habitats that increase the resilience of coastal communities.



## **U.S. Department of Energy (DOE)**

### **The Southern Appalachian Man and the Biosphere Cooperative**

The Oak Ridge Reservation participates in the Southern Appalachian Man and the Biosphere Cooperative, a collective of land management agencies, scientists, and Tribal leaders that supports sustainability-focused decision-making in the Southern Appalachian region. The Oak Ridge National Environmental Research Park engages in conservation efforts with the Eastern Band of Cherokee Indians through the Cooperative. As part of the partnership, the Culturally Significant Plant Species Initiative helps conserve plants within the Reservation that are culturally significant for the Eastern Band of Cherokee Indians. The Laboratory also provides expertise in regional natural resources, geographic information systems, data science, and networking to plan the Extended Cultural Corridor, where natural area protection, set-asides, and low-impact use are important components.

### **Revitalization of the Fernald Preserve in Hamilton, Ohio**

DOE's Office of Legacy Management manages the 1,050-acre Fernald Preserve, the habitat to more than 245 species of birds and 100 nesting spots. Within the Preserve, the Office maintains 385 acres of grassland and a 7-mile network of trails, making the Preserve one of the largest constructed wetland communities in Ohio. The main objectives in the Preserve are to maintain and improve wetland, prairie, and forest habitats; increase wildlife diversity; improve opportunities for birding; and to educate the public on successful ecological restoration. The Preserve is the site of a former World War II facility that once produced high-purity uranium for nuclear weapons. The Visitors Center, once a warehouse, is Ohio's first Leadership in Energy and Environmental Design (LEED) Platinum facility and includes a ground source heating/cooling system. The restoration of the site improves the natural quality and environmental health of the community and provides educational and recreational opportunities to the general public.

## **U.S. Department of Housing and Urban Development (HUD)**

### **Rebuilding Oysters for “The Town the Oyster Built”**

The Staten Island community of Tottenville, historically known as “The Town the Oyster Built,” was once protected by a series of oyster reefs, which in turn supported a robust oyster farming industry. Siltation, overharvesting, channel dredging, and human pathogens in the water resulted in the reefs' collapse. To build coastal resilience and revive the oyster reefs, the community received \$60 million in Community Development Block Grant—Disaster Recovery funding to construct 2,400 feet of nature-based solutions including near-shore breakwaters, partially submerged stone, and ecologically enhanced concrete structures. These features will dampen waves, reduce and reverse erosion, and provide habitats for oysters, tin fish, and other marine species. These structures form a barrier that protects the existing oyster reefs from storm surge, allowing them to grow and expand. Expanding the oyster reefs increases biodiversity and improves water quality as oysters filter water. In contrast to hard infrastructure like flood walls



and dikes, which displace rising water to nearby vulnerable areas, the project's necklace of breakwaters with oyster reefs and other marine habitats slows water movement (rather than redirect) and mitigates storm surges. The structures and reef area also provide educational and recreational opportunities. Partners have developed a Living Breakwaters curriculum for students in 6-8<sup>th</sup> grade science classes, and the project is seen as a model for community engagement and climate-adaptive green infrastructure. It won both the HUD Rebuild by Design competition in June 2014 and National Planning Achievement Award for Environmental Planning and is featured often in the media.

## **Recreation and Flood Management Through Liberty Green Park**

In Pittsburgh, Pennsylvania, the Housing Authority of the City of Pittsburgh used a \$30 million Choice Neighborhoods grant to transform 14,500 square feet of underutilized land into Liberty Green Park. This greenspace was built to reduce flooding and provide recreation and gathering space for the community. Local community members had long advocated for a safe, high-quality recreational area after suffering from flash floods. The park is located on a plateau, which slopes down to busy nearby thoroughfares where community members have drowned during past flood events. To mitigate flood risk, the park contains a system of green infrastructure with native plants, newly planted trees, and bioswales that absorb 4.5 million gallons of water from the park and surrounding streets. This reduces flooding and slows rainwater such that sewage and roadway toxins do not flow into nearby rivers. The park contains grass-topped play mounds and is called a "super-playground," as it contains the largest play area in Pittsburgh and provides high-quality recreation to local neighborhoods. The park is a great example of how the Choice Neighborhoods program invests in comprehensive neighborhood improvements rather than just brick and mortar housing rehabilitation. It is also an example of how the program effectively integrates community feedback in planning, design, and construction.

## **U.S. Department of Homeland Security (DHS)**

### ***Federal Emergency Management Agency (FEMA)***

#### **Stormwater Management and Recreation: Mirabeau Water Garden**

In New Orleans, Louisiana, a FEMA Hazard Mitigation grant funded the construction of the [Mirabeau Water Garden](#) in the Gentilly neighborhood. This urban stormwater park mitigates flooding while providing additional benefits to the community, which has a high social vulnerability<sup>3</sup> and is located entirely below sea level. This stormwater park integrates bioretention with native vegetation to capture, store, and filter stormwater, thereby reducing flooding and preventing land subsidence. The park has a water storage capacity of over 11 million gallons and should result in a 50 – 60% reduction in flood damages from a 2-year storm event and 30 – 40% reduction in damages from a 10-year storm event. The flood reduction

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<sup>3</sup> Social vulnerability is the "susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood". More information can be found at <https://hazards.fema.gov/nri/social-vulnerability>.



benefits have been calculated at nearly double the value of federal investment. The park features recreation, health, and natural education amenities for the whole community to enjoy; reduces the burden of flood control on local gray infrastructure; protects local homes; reduces heat stress; and provides greenhouse gas mitigation benefits. The use of nature-based solutions also aligns with the values of the community partners who donated the land for the park.

### **Nature-Based Mitigation to Adapt in an Era of Megafires**

In Sonoma County, California, a FEMA Building Resilient Infrastructure and Communities grant is supporting three pilot projects across 5,400 acres of the county to increase wildfire resilience. The nature-based solutions in this project expand on a set of conventional approaches like fuel reduction, building material choices, and preparedness and response planning typically applied at a neighborhood or town scale. It combines outreach and engagement with individual property owners to develop and implement a nature-based, landscape-scale approach to vegetation management and fire fuel reduction. This includes trimming undergrowth, fuels reduction for safe ingress and egress of emergency vehicles, and the creation of shaded green belts to serve as fire breaks. The project will apply an innovative systems approach of “Inside-out, Outside-In” that defines an inner core where property owners create and maintain defensible space and an outer vegetated buffer to reduce the risk of catastrophic wildfire losses in the Wildland Urban Interface through prevention and suppression. It is estimated that nearly 6,500 structures could be protected across Sonoma County through this project, which is piloting a comprehensive, holistic, landscape-scale approach that could be scaled into other high wildfire-risk areas.

### **Protecting Puerto Rico’s Rebuilt Roads with Nature-Based Solutions**

In Puerto Rico, FEMA is working with the Puerto Rico Department of Transportation and Public Works to enhance road resilience in the wake of Hurricane Maria. Using Public Assistance mitigation funding, Vetiver grass, a non-invasive species, was planted alongside some of the damaged roads across Puerto Rico to stabilize adjacent slopes and provide protection from future erosion and landslides. FEMA staff created a template for this type of mitigation project to be easily replicated for other damaged roads across the island. This nature-based solution was used as an alternative to retaining walls, gabion baskets, and other conventional “gray infrastructure” and provides environmental benefits, including water quality improvement and erosion control. Cost-effective disaster resilience measures enable future risk reduction without large investments from communities that lack time, money, or capacity for other projects. This nature-based solution offers a relatively easy solution to mitigate road damage from natural disasters and provides a cost-effective alternative to a conventional hard infrastructure solution for erosion control that can be scaled across the Caribbean and in other flood-prone areas of the United States.

### ***U.S. Coast Guard (USCG)***

#### **Incorporating nature-based solutions into the USCG Headquarters**

The USCG headquarters complex was the first phase of a broader consolidation of the DHS headquarters at St. Elizabeth’s West Campus. A number of nature-based solutions were deployed



in the construction of the complex, including green roofs, bioswales, rain gardens, wetland shelves with a large retention pond, and the replication of local ecosystems through constructed soils and native plant palettes. The USCG notes several environmental and social benefits that informed its use of nature-based solutions in the headquarters' design, including increased biodiversity with woody shrubs and tree planting; reduced heat island effect by upwards of 15-degrees Fahrenheit; conservation of nearly 520,000 gallons of potable water from the District of Columbia reservoir; a 400% increase in carbon sequestration; and increased worker satisfaction for individuals working in the complex.

## **U.S. Department of the Interior (DOI)**

### ***U.S. Fish and Wildlife Service (FWS)***

#### **Delaware River Basin Restoration Program**

In 2016, Congress authorized the Delaware River Basin Restoration Program, implemented by FWS, to advance collaborative partner conservation to support the Delaware River and its watershed. The Program provides funding for individual projects with a focus on reducing flooding and runoff, restoring fish and wildlife habitats, improving water quality, and enhancing public recreational access. As a pilot for increasing equity, the projects also address racial and economic disparities in access to nature and conservation outcomes by ensuring that 47 percent of these projects will impact a community in which residents have been denied access to natural resources in the past. In just five years, the Program has become a model for voluntary, incentive-driven approaches to landscape conservation that builds upon and strengthens existing partnerships. In recognition of the Program's success, the Bipartisan Infrastructure Law provided another \$26 million to FWS available over five years for implementation of the Delaware River Basin Restoration Program. In 2022, the program expects to fund 12 additional projects totaling \$4.7 million and leverage an approximately equal amount of matching funds. These projects will support innovative uses of nature-based solutions to improve wildlife habitat, sustain ecological functions in the face of climate change, and directly engage communities.

### ***U.S. Geological Survey (USGS)***

#### **Restoration Collaborative Rehydrates Arid Landscapes and Conserves Biodiversity**

The U.S. Geological Survey (USGS) is working with a bi-national, community-based collaboration of government and non-governmental organizations, private landowners, ranchers, students, volunteers, scientists, and land managers to improve restoration outcomes across the Madrean Sky Islands. This is a 56-million acre mountainous, pine-oak woodland region stretching across the border between Arizona and Mexico. The disadvantaged “Colonias” neighborhoods within 150 miles of the US-Mexico border have inadequate housing, lack sewer and water infrastructure, and subsist on below average household incomes. The USGS investigated the restoration benefits of low-cost, low-tech, rock detention structures installed in dryland streams. Rock detention structures, as well as beaver dams, are nature-based solutions





that can restore natural watershed dynamics and nutrient cycles in arid ecosystems, creating and restoring wetland-like environments. Such examples of Natural Infrastructure in Dryland Streams (NIDS) have been shown to provide flood regulation, new and restored habitat, stream flow regulation, water purification, erosion control, groundwater recharge, and carbon sequestration and storage. NIDS also supports adaptation to and protection from climate-related disturbances and stressors such as drought, water shortages, flooding, heatwaves, dust storms, wildfire, and biodiversity losses, while also addressing aspects of food and water insecurity.

### **Wildfire and Climate Resilience on the San Carlos Apache Reservation**

USGS is working with the San Carlos Apache Tribe (SCAT) to identify parts of the SCAT reservation more vulnerable to wildfire. The collaboration has worked to identify restoration activities to improve climate resilience. The USGS used satellite imagery and watershed modelling to help the Tribe's natural resource managers prioritize areas for firebreak and water detention installations along large rivers. The results have demonstrated that such nature-based solutions can boost resilience to wildfire by increasing water availability and reducing water stress, while also preventing post-fire flooding and erosion. The Forest Resources Department within the San Carlos Apache Tribe is engaged in preventative thinning of vegetation and resource-benefit burns, which USGS has also shown to reduce wildfire intensity. The USFS is now using this guidance to consider expanding similar nature-based practices to Ancestral Lands in collaboration with the Bureau of Indian Affairs (BIA).

## **U.S. Department of Transportation (DOT)**

### ***Federal Highway Administration (FHWA)***

#### **Building Nature-based Resilience for Coastal Highways through Federal and State Partnerships**

FHWA sponsored a pilot project with the Delaware Department of Transportation to increase the resilience of coastal highways using nature-based solutions. The project focused on State Route 1, a 17-mile stretch of highway already experiencing flooding and erosion due to sea level rise. The Delaware Center for the Inland Bays worked with private designers and contractors to complete a resilience project that included nature-based solutions: a living shoreline, upgraded storm drain outfalls, and a permeable pavement installation. These nature-based solutions reinforced one of Delaware's major transportation arteries, protecting both critical transportation infrastructure and the drivers who use State Route 1. The FHWA has also scaled up work on nature-based solutions through strategic partnerships with federal and state agencies to sponsor and promote additional research and technical information. A FHWA partnership with NOAA on the Effects of Sea Level Rise Program couples the best coastal science on nature-based solutions with the best science on pavement deterioration from inundation and assesses the effectiveness of coastal nature-based solutions on increasing resilience for highway pavements. This partnership improves the understanding of how nature-based solutions can be deployed to protect critical transportation infrastructure and the drivers who use it.



## **U.S. Environmental Protection Agency (EPA)**

### **Engaging Students with the Campus RainWorks Challenge**

Since 2011, the Campus RainWorks Challenge, a green infrastructure design competition, has sought to engage young environmental professionals at American colleges and universities by promoting and showcasing innovative stormwater management techniques and the benefits of green infrastructure. Green infrastructure practices advanced by the Campus RainWorks Challenge have included green roofs, permeable materials, tree plantings, restored habitat areas, rain gardens, and rain harvesting systems. Beyond water quality benefits, these solutions provide benefits including climate resilience, greenhouse gas sequestration, water conservation, reduction of heat island effects, and the beautification of campus landscapes. The competition has engaged over 800 multi-disciplinary teams from over 270 colleges and universities to foster collaboration and, in some cases, implement real design changes to campuses that improve community access to green space. For example, in 2020, a team from the University of Pennsylvania proposed a design for greenspace which included raised garden beds and an outdoor classroom that was constructed at a West Philadelphia elementary school.

### **Greening America's Communities**

The Greening America's Communities program provides design assistance to communities wanting to use nature-based solutions to develop a vision for neighborhood design that protects the environment, public health, and the economy while inspiring changes to better support sustainable growth. Since 2010, the program has assisted 41 communities in funding nature-based solutions, including nearly \$1 million spent on green street improvements that spurred downtown redevelopment in Lincoln, Nebraska and \$1.3 million invested in transforming blighted areas of Selma, Alabama into the urban Montgomery Trail. Frankfort, Kentucky is coupling a \$1.5 million Greening America's Communities grant with an \$8 million TIGER grant from DOT to invest in green infrastructure. Austin, Texas will invest \$2 billion over the next 15 years in nature-based solutions around the city. The nature-based solutions invested in through the Greening America's Communities program include rain gardens, shade trees, permeable paving, and other green street designs that support all modes of transportation. This program boosts local economies and resilience to climate change while reducing stormwater runoff and heat island effects.

### **San Francisco National Estuaries Program: Transforming Shorelines**

In the San Francisco Bay Area, Transforming Shorelines is a project that is advancing nature-based solutions and building capacity for innovative approaches linked to wastewater treatment as a way to create resilience to sea level rise. Wastewater treatment plants, typically built at the bottom of watersheds to allow gravity to bring in the influent, are at extreme risk of sea level rise and are facing potential nutrient pollution caps on their discharges under the Clean Water Act. In the San Francisco Bay Area, the wastewater treatment sector as a whole has collectively invested in data gathering to maximize investment in nutrient control technologies and invested in innovative approaches to attempt to build horizontal levees on the shorelines in front of their systems to provide flood protection, habitat restoration, and nutrient removal through subsurface



discharges. This effort has created a forum for practitioners and experts on nature-based solutions, including representatives from wastewater treatment, resiliency and nutrient managers, regulators, and experts involved in habitat restoration. Project partners are supporting permit applications for the first full-scale application of a multi-benefit vegetated levee receiving nitrified secondary-treated wastewater in the City of Hayward. Project partners with the City of San Leandro are preparing designs, permit applications, and environmental documentation for the restoration of a 4.3-acre wastewater storage basin to create a multi-benefit treatment wetland. They are also developing a community-based shoreline resilience and tidal marsh restoration vision for the surrounding area.



# Current Federal Resources, Tools, Guidance, and Technical Assistance

Through a call to agencies, a wide range of current federal resources on nature-based solutions, developed by federal agencies, entities, and their collaborators, were identified and categorized by the benefits addressed and by resource type (Table 1). Inclusion of these resources does not signify endorsement of the product, but agencies and partners are encouraged to consider them as potential tools. Each federal resource was identified as a form of knowledge, guidance, tools, and/or technical assistance.

- **Knowledge resources** provide summaries of the current scientific understanding of nature-based solutions and their benefits.
- **Guidance resources** provide specific information on how to design and execute nature-based solutions projects.
- **Tools** are any interactive media used for the advancement of nature-based solutions projects.
- **Technical assistance** resources help work through administrative and technical aspects of nature-based solution projects, including permitting and funding applications.

Based on the resource review (Figure 1), most existing resources provide general knowledge like case studies and process overviews. Fewer resources provide the tools, guidance, and technical assistance needed for implementation. Most of the available federal resources address risk reduction and resilience, with a primary focus on coastal flooding. Gaps remain for other increasingly frequent catastrophic events (e.g., inland flooding, fire, drought, extreme heat).



Figure 1. Summary of federal resources available to support the use of nature-based solutions for several benefits.



**Table 1. Current federal resources on nature-based solutions, categorized by their resource type and stated benefit(s)**

Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>AmeriCorps</b>	<a href="#"><u>Impact Evaluation on EarthCorps Restoration Methods</u></a>	Knowledge	Jobs, Water, Nature
<b>AmeriCorps</b>	<a href="#"><u>Impact Evaluation on WA Conservation Corps Restoration Methods</u></a>	Knowledge	Nature
<b>CEQ/GSA</b>	<a href="#"><u>Supporting the Health of Honey Bees and Other Pollinators</u></a>	Knowledge, Guidance	Community Development, Food, Nature
<b>Cities of Service/AmeriCorps</b>	<a href="#"><u>What Does Effective Engagement Look Like? Lessons from Resilience AmeriCorps</u></a>	Knowledge	Jobs, Inland Flood Reduction, Heat Risk Reduction, Adaptation, Resilience, Community Development, Water
<b>DHS (FEMA)</b>	<a href="#"><u>Building Community Resilience with Nature-Based Solutions: A Guide for Local Communities</u></a>	Guidance	Jobs, Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Infrastructure Resilience, Community Development, Water, Recreation, Health, Nature
<b>DHS (FEMA)</b>	<a href="#"><u>Compiled Resources on Future Conditions and Nature-based Solutions, Including from NOAA and EPA</u></a>	Knowledge	Jobs, Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Community Development, Water, Recreation, Health, Nature
<b>DHS (FEMA)</b>	<a href="#"><u>Nature-based Solutions Website</u></a>	Knowledge, Guidance	Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought



Author(s)	Resource Title	Resource Type	Benefits Addressed
			Risk Reduction, Infrastructure Resilience, Adaptation, Resilience
<b>DOC (NOAA)</b>	<a href="#"><u>Coastal County Snapshots</u></a>	Tools	Coastal Flood Reduction, Inland Flood Reduction
<b>DOC (NOAA)</b>	<a href="#"><u>Coastal Flood Exposure Mapper</u></a>	Tools	Coastal Flood Reduction, Infrastructure Resilience, Equity, Water, Nature
<b>DOC (NOAA)</b>	<a href="#"><u>Coral reef restoration monitoring guide: Methods to evaluate restoration success from local to ecosystem scales</u></a>	Guidance	Coastal Flood Reduction, Recreation, Nature
<b>DOC (NOAA)</b>	<a href="#"><u>Digital Coast Peer to Peer Case Studies</u></a>	Knowledge, Guidance, Tools, Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Equity, Community Development, Water
<b>DOC (NOAA)</b>	<a href="#"><u>Economic Guidance for Coastal Management Professionals</u></a>	Tools, Technical Assistance	Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Adaptation, Resilience, Equity, Community Development, Water, Food & Products, Recreation, Health
<b>DOC (NOAA)</b>	<a href="#"><u>Economic Valuation of Shoreline Protection within the Jacques Cousteau National Estuarine Research Reserve</u></a>	Knowledge	Coastal Flood Reduction



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOC (NOAA)	<a href="#">Economic Valuation Self-Guided Module and Associated guidance documents</a>	Knowledge, Guidance, Technical Assistance	Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Adaptation, Resilience, Equity, Community Development, Water, Food & Products, Recreation, Health
DOC (NOAA)	<a href="#">Fast Facts on Natural Infrastructure</a>	Knowledge	Coastal Flood Reduction, Inland Flood Reduction, Water
DOC (NOAA)	<a href="#">Funding and Financing Coastal Resilience Webinars</a>	Knowledge, Technical Assistance	Coastal Flood Reduction
DOC (NOAA)	<a href="#">Funding and Financing: Options and Considerations for Coastal Resilience Projects</a>	Guidance	Coastal Flood Reduction, Water, Nature
DOC (NOAA)	<a href="#">Green Infrastructure Effectiveness Database</a>	Tools, Knowledge	Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Water, Food & Products
DOC (NOAA)	<a href="#">Green Infrastructure Mapping Guide</a>	Guidance, Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Water
DOC (NOAA)	<a href="#">Green Infrastructure Options to Reduce Flooding</a>	Guidance	Coastal Flood Reduction, Inland Flood Reduction, Drought Risk Reduction, Infrastructure Resilience, Water, Recreation, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOC (NOAA)	<a href="#">Guidance for Considering the Use of Living Shorelines</a>	Guidance	Coastal Flood Reduction, Nature
DOC (NOAA)	<a href="#">How to Map Open Space for Community Rating System Credit</a>	Knowledge, Guidance, Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction
DOC (NOAA)	<a href="#">NOAA Restoration Center: Monitoring and Evaluation for Restoration Projects</a>  <a href="#">Providing Technical Support for Habitat Restoration Efforts</a>	Guidance, Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction, Water
DOC (NOAA)	<a href="#">Nature-Based Solutions for Coastal Hazards</a>	Guidance, Technical Assistance	Coastal Flood Reduction
DOC (NOAA)	<a href="#">Nature-Based Solutions for Coastal Hazards: The Basics</a>	Knowledge, Tools	Coastal Flood Reduction, Water, Recreation, Nature
DOC (NOAA)	<a href="#">Nature-Based Solutions: Benefits, Costs, and Economic Assessments</a>	Knowledge, Guidance	Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Water, Recreation, Health, Nature
DOC (NOAA)	<a href="#">NOAA Living Shorelines Project Map</a>	Knowledge	Coastal Flood Reduction, Nature
DOC (NOAA)	<a href="#">Oyster Reef Habitat Conservation</a>	Guidance, Tools	Coastal Flood Reduction, Water, Food & Products, Nature





Author(s)	Resource Title	Resource Type	Benefits Addressed
DOC (NOAA)	<a href="#">Planning for Sea Level Rise in the Northeast: Considerations for the Implementation of Tidal Wetlands Habitat Restoration Projects; workshop report</a>	Guidance	Coastal Flood Reduction, Recreation, Nature
DOC (NOAA)	<a href="#">Science-Based Restoration Monitoring of Coastal Habitat Volume 1 (2003): Framework for Monitoring Plans Under the Estuaries and Clean Water Act of 2000</a>	Guidance, Technical Assistance	Coastal Flood Reduction, Water, Food & Products, Recreation, Nature
DOC (NOAA)	<a href="#">Science-Based Restoration Monitoring of Coastal Habitat Volume 2 (2005): Tools for Monitoring Coastal Habitats</a>	Guidance, Technical Assistance	Coastal Flood Reduction
DOC (NOAA)	<a href="#">Sea Level Rise Viewer Marsh Migration Data</a>	Tools	Coastal Flood Reduction
DOC (NOAA)	<a href="#">Restoration Atlas</a>	Tools	Nature
DOC (NOAA)/EPA	<a href="#">Coastal &amp; Waterfront Smart Growth</a>	Knowledge, Tools	Jobs, Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Community Development, Water, Food & Products, Recreation, Health, Nature
DOC (NOAA)/DOI (USGS, FWS)	<a href="#">Federal Interagency Nature-like Fishway Passage Design Guidelines for Atlantic Coast Diadromous Fishes</a>	Guidance	Jobs, Food & Products, Recreation, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>DOD</b>	<a href="#"><u>Highlights and Examples for the Department of Defense Climate Adaptation Plan</u></a>	Knowledge	Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience
<b>DOD</b>	<a href="#"><u>Readiness and Environmental Protection Integration Program (REPI) Climate Resilience Resource Library</u></a>	Knowledge, Guidance, Tools, Technical Assistance	Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Nature
<b>DOD</b>	<a href="#"><u>Building Resilience to Climate Change Through Off-Base Natural Infrastructure Solutions: A REPI guide for installations and partners</u></a>	Guidance, Tools	Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Nature
<b>DOD (USACE)</b>	<a href="#"><u>Engineering with Nature: Supporting Mission resilience and infrastructure value at Department of Defense installations</u></a>	Knowledge	Infrastructure Resilience, Nature
<b>DOD (USACE)</b>	<a href="#"><u>Engineering with Nature: An Atlas Series (Volumes 1 and 2)</u></a>	Knowledge, Guidance, Tools	Jobs, Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Community Development, Water, Food & Products, Recreation, Health, Nature
<b>DOD (USACE)</b>	<a href="#"><u>Flood Plain Management Services</u></a>	Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>DOD (USACE)</b>	<a href="#"><u>Natural Infrastructure Opportunities Tool</u></a>	Tools	Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Adaptation, Resilience, Water, Nature
<b>DOD (USACE)</b>	<a href="#"><u>Planning Assistance to States, U.S. Army Corps of Engineers, New England District</u></a>	Technical Assistance	Drought Risk Reduction, Water
<b>DOD (USACE)</b>	<a href="#"><u>Use of Natural and Nature-based Features (NNBF) for Coastal Resilience</u></a>	Knowledge, Guidance	Jobs, Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Community Development, Water, Food & Products, Recreation, Nature
<b>DOD (USACE)</b>	<a href="#"><u>USACE Sand Availability and Needs Determination (SAND)</u></a>	Knowledge	Jobs, Coastal Flood Reduction, Infrastructure Resilience, Recreation, Nature
<b>DOD (USACE)/ DOI(USGS) (with the State of Alabama)</b>	<a href="#"><u>Alabama Barrier Island Restoration Assessment</u></a>	Knowledge, Guidance	Coastal Flood Reduction, Health, Nature
<b>DOE</b>	<a href="#"><u>Energy Communities IWG</u></a>	Technical Assistance	Jobs, Equity, Community Development
<b>DOI</b>	<a href="#"><u>Office of Insular Affairs Technical Assistance Program</u></a>	Technical Assistance	Infrastructure Resilience, Adaptation, Resilience, Community Development, Nature
<b>DOI (BIA)</b>	<a href="#"><u>Tribal Climate Resilience</u></a>	Technical Assistance	Adaptation, Resilience



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (BOEM)	<a href="#">BOEM Marine Minerals Information Systems (MMIS)</a>	Knowledge, Tools	Coastal Flood Reduction, Water, Nature
DOI (BOEM)	<a href="#">Fact Sheet: Marine Minerals Information System (MMIS)</a>	Knowledge	Coastal Flood Reduction, Water, Nature
DOI (BOEM)	<a href="#">BOEM Marine Minerals Overview</a>	Knowledge	Coastal Flood Reduction, Water, Nature
DOI (BOEM)	<a href="#">BOEM Marine Minerals Program</a>	Knowledge	Coastal Flood Reduction, Nature
DOI (BOEM)	<a href="#">Marine Mineral Studies</a>	Knowledge	Health, Nature
DOI (BOEM)	<a href="#">Economic and Geomorphic Comparison of OCS and Nearshore Sand for Coastal Restoration Projects</a>	Knowledge	Coastal Flood Reduction, Nature
DOI (FWS)	<a href="#">The Beaver Restoration Guidebook</a>	Knowledge, Guidance, Technical Assistance	Climate Mitigation, Inland Flood Reduction, Fire Risk Reduction, Nature
DOI (FWS)	<a href="#">Biological Carbon Sequestration Accomplishments Report</a>	Knowledge	Climate Mitigation, Fire Risk Reduction, Resilience, Nature
DOI (FWS)	<a href="#">Coastal Program</a>	Technical Assistance	Climate Mitigation, Coastal Flood Reduction, Resilience, Nature
DOI (FWS)	<a href="#">Culvert Design Guidelines for Ecological Function</a>	Knowledge, Guidance, Technical Assistance	Climate Mitigation, Inland Flood Reduction, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (FWS)	<a href="#">Farm Bill Conservation Programs Brochure</a>	Knowledge, Guidance, Technical Assistance	Climate Mitigation, Drought Risk Reduction, Resilience, Food & Products, Nature
DOI (FWS)	<a href="#">National Fish Passage Program</a>	Technical Assistance	Nature
DOI (FWS)	<a href="#">Partners for Fish and Wildlife Program</a>	Technical Assistance	Climate Mitigation, Coastal Flood Reduction, Resilience, Nature
DOI (FWS)	<a href="#">USFWS Pollinator Initiative</a>	Guidance Knowledge	Climate Mitigation, Fire Risk Reduction, Drought Risk Reduction, Resilience, Food & Products, Nature
DOI (FWS)	<a href="#">Urban Wildlife Conservation Program</a>	Knowledge, Technical Assistance	Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Equity, Food & Products, Recreation, Health, Nature
DOI (FWS)	<a href="#">Salt Marsh Sediment Augmentation to combat sea-level rise</a>	Technical Assistance	Coastal Flood Reduction, Nature
DOI (FWS, USGS)	<a href="#">Report: Impacts of Sediment Removal from and Placement in Coastal Barrier Island Systems</a>	Knowledge	Coastal Flood Reduction, Nature
DOI (NPS)	<a href="#">Coastal Adaptation Strategies Handbook</a>	Knowledge, Guidance	Coastal Flood Reduction, Infrastructure Resilience, Nature
DOI (NPS)	<a href="#">Fire Island National Seashore Breach Management Plan/EIS</a>	Knowledge	Equity, Water, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (NPS)	<a href="#"><u>National Park Service Beach Nourishment Guidance</u></a>	Guidance	Coastal Flood Reduction, Inland Flood Reduction, Recreation, Nature
DOI (NPS)	<a href="#"><u>Northeast Coastal and Barrier Network Geomorphological Monitoring Protocol</u></a>	Guidance	Nature
DOI (NPS)	<a href="#"><u>Planning Tools for Green Infrastructure</u></a>	Guidance, Tools	Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Water, Nature
DOI (NPS)	<a href="#"><u>Planning for a changing climate</u></a>	Guidance	Coastal Flood Reduction, Infrastructure Resilience, Nature
DOI (USGS)	<a href="#"><u>A geological perspective on the degradation and conservation of western Atlantic coral reefs</u></a>	Knowledge	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#"><u>Ancient Methods of Preventing Desertification and Recovering from Drought</u></a>	Knowledge, Guidance, Tools	Drought Risk Reduction, Infrastructure Resilience, Water, Nature
DOI (USGS)	<a href="#"><u>Biological Carbon Sequestration (Western U.S.)</u></a>  <a href="#"><u>Biological Carbon Sequestration (Eastern U.S.)</u></a>	Knowledge	Climate Mitigation
DOI (USGS)	<a href="#"><u>Coastal Storms - Prediction of Flooding Now and Into the Future</u></a>	Tools	Jobs, Coastal Flood Reduction, Infrastructure Resilience



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (USGS)	<a href="#">Coastal Wetlands Synthesis</a>	Knowledge	Climate Mitigation, Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#">Estuary Restoration and Wildlife/Carbon Storage Co-Benefits</a>	Knowledge	Climate Mitigation, Nature
DOI (USGS)	<a href="#">Evaluating tidal saline wetland migration along the U.S. Gulf of Mexico coast under alternative sea-level rise and urbanization scenarios</a>	Knowledge	Coastal Flood Reduction, Infrastructure Resilience, Nature
DOI (USGS)	<a href="#">USGS Coastal Change Hazards Portal</a>	Tools	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#">U.S. Geological Survey monitor barrier islands</a>	Tools	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#">Green infrastructure in the Great Lakes</a>	Knowledge, Guidance	Infrastructure Resilience, Water, Nature
DOI (USGS)	<a href="#">Green Infrastructure Projects</a>	Knowledge, Guidance, Tools	Inland Flood Reduction, Drought Risk Reduction, Adaptation, Resilience, Water, Health, Nature
DOI (USGS)	<a href="#">Green Stormwater Infrastructure to Reduce Suburban Runoff</a>	Knowledge	Inland Flood Reduction, Adaptation, Resilience, Water, Health, Nature
DOI (USGS)	<a href="#">Hazards Exposure and Reporting Analytics</a>	Guidance, Tools	Inland Flood Reduction, Infrastructure Resilience, Equity, Community Development, Water, Recreation, Health, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (USGS)	<a href="#"><u>Impacts of Sediment Removal from and Placement in Coastal Barrier Island Systems</u></a>	Knowledge	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#"><u>Improving Wildlife Habitat by Restoring Wetland Invertebrates</u></a>	Knowledge	Nature
DOI (USGS)	<a href="#"><u>Assessing pollinator habitat services to optimize conservation programs</u></a>	Knowledge	Food & Products, Nature
DOI (USGS)	<a href="#"><u>Marshes and Mangroves as Nature-Based Coastal Storm Buffers</u></a>	Knowledge	Coastal Flood Reduction
DOI (USGS)	<a href="#"><u>National Assessment of Geologic Carbon Dioxide Storage Resources—Results</u></a>	Knowledge, Guidance	Climate Mitigation
DOI (USGS)	<a href="#"><u>National Climate Change Viewer</u></a>	Knowledge, Tools	Fire Risk Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Water, Food & Products, Recreation, Health, Nature
DOI (USGS)	<a href="#"><u>National Shoreline Change - Exploring Shoreline Positions of the United States From the 1800s To the Present</u></a>	Tools	Coastal Flood Reduction
DOI (USGS)	<a href="#"><u>Natural Infrastructure to Enhance Fire and Climate Resilience in Tribal Lands and Watersheds</u></a>	Knowledge	Fire Risk Reduction, Adaptation, Resilience, Water, Nature
DOI (USGS)	<a href="#"><u>Natural Infrastructure in Dryland Streams to Reverse Desertification</u></a>	Knowledge	Drought Risk Reduction, Equity, Water, Health





Author(s)	Resource Title	Resource Type	Benefits Addressed
DOI (USGS)	<a href="#"><u>Natural Solutions to Ecological and Economic Problems Caused by Extreme Precipitation Events</u></a>	Knowledge	Inland Flood Reduction, Adaptation, Resilience, Water
DOI (USGS)	<a href="#"><u>Protected Areas Database of the United States (PAD-US)</u></a>	Knowledge, Tools	Jobs, Recreation, Health, Nature
DOI (USGS)	<a href="#"><u>Real-time Forecasts of Coastal Change</u></a>	Tools	Coastal Flood Reduction
DOI (USGS)	<a href="#"><u>Rigorously Valuing the Potential Coastal Hazard Risk Reduction Provided by Coral Reef Restoration in Florida and Puerto Rico</u></a>	Knowledge	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#"><u>Sea-Level Change: An Interactive Guide to Global and Regional Sea Level Rise Scenarios for the United States</u></a>	Tools	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#"><u>The Role of U.S. Coral Reefs in Coastal Protection</u></a>	Knowledge	Coastal Flood Reduction, Nature
DOI (USGS)	<a href="#"><u>Reducing Urban Heat with Tree Canopy</u></a>	Knowledge	Climate Mitigation, Adaptation, Resilience, Equity, Health
DOI (USGS)	<a href="#"><u>Restoration of Freshwater Mussels to Improve Water Quality</u></a>	Knowledge	Water, Health, Nature
DOI (USGS)	<a href="#"><u>Restoring America's Sagebrush Biome</u></a>	Knowledge, Guidance	Adaptation, Resilience, Recreation, Nature
DOI (USGS)	<a href="#"><u>Restoring Coastal Wetlands to Enhance Climate Change Mitigation</u></a>	Knowledge	Climate Mitigation, Coastal Flood Reduction



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>DOI (USGS)</b>	<a href="#"><u>River Restoration to Mitigate Shoreline Erosion</u></a>	Knowledge, Guidance, Tools	Jobs, Coastal Flood Reduction, Inland Flood Reduction, Water, Health, Food & Products, Nature
<b>DOI (USGS)</b>	<a href="#"><u>Traditional Landscape Management Contributes to Wildfire Resilience</u></a>	Knowledge	Climate Mitigation, Fire Risk Reduction, Nature
<b>DOI (USGS)</b>	<a href="#"><u>U.S Geological Survey Wildland Fire Science Strategic Plan</u></a>	Knowledge	Climate Mitigation, Fire Risk Reduction
<b>DOI (USGS)</b>	<a href="#"><u>USGS Integrated Drought Science</u></a>	Knowledge, Tools	Drought Risk Reduction, Infrastructure Resilience, Water
<b>DOI (USGS, FWS)</b>	<a href="#"><u>Monitoring Habitat Restoration Projects: U.S. Fish and Wildlife Pacific Region Partners for Fish and Wildlife Program and Coastal Program Protocol</u></a>	Guidance	Nature
<b>DOT (FHWA)</b>	<a href="#"><u>White Paper: Nature-Based Solutions for Coastal Highway Resilience</u></a>	Knowledge	Coastal Flood Reduction, Infrastructure Resilience, Nature
<b>DOT (FHWA)</b>	<a href="#"><u>Nature-Based Solutions for Coastal Highway Resilience: An Implementation Guide</u></a>	Knowledge, Guidance	Coastal Flood Reduction, Infrastructure Resilience, Nature
<b>DOT (FHWA)</b>	<a href="#"><u>Case Studies in Realizing Co-Benefits of Multimodal Roadway Design and Gray and Green Infrastructure</u></a>	Knowledge	Inland Flood Reduction, Infrastructure Resilience, Water, Recreation, Health
<b>DOT (FHWA)</b>	<a href="#"><u>Peer Exchange Summary Report - Nature-Based Solutions for Coastal Highway Resilience</u></a>	Knowledge	Coastal Flood Reduction, Infrastructure Resilience, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
EPA	<a href="#">Brownfields Technical Assistance, Training, and Research</a>	Technical Assistance	Equity, Community Development, Recreation, Health, Nature
EPA	<a href="#">Build Green Infrastructure</a>	Guidance, Tools	Climate Mitigation, Inland Flood Reduction, Infrastructure Resilience, Water, Nature
EPA	<a href="#">Clearinghouse for Environmental Finance</a>	Tools	Adaptation, Resilience, Water, Food & Products, Nature
EPA	<a href="#">Community-Based Public-Private Partnerships and Alternative Market-Based Tools for Integrated Green Stormwater Infrastructure: Guide for Local Governments</a>	Guidance	Infrastructure Resilience, Water
EPA	<a href="#">Drinking Water State Revolving Fund Eligibility Handbook</a>	Guidance	Infrastructure Resilience, Water
EPA	<a href="#">Financing Alternatives Comparison Tool</a>	Tools	Water
EPA	<a href="#">Financing Options for Nontraditional Eligibilities in the Clean Water State Revolving Fund Program</a>	Guidance	Infrastructure Resilience, Water
EPA	<a href="#">Getting to Green: Paying for Green Infrastructure, Finance Options and Resources for Local Decision-Makers</a>	Guidance	Inland Flood Reduction, Infrastructure Resilience, Water
EPA	<a href="#">EPA Green Infrastructure Resources</a>	Knowledge, Guidance, Tools,	Climate Mitigation, Coastal Flood Reduction, Heat Risk Reduction, Infrastructure Resilience, Community



Author(s)	Resource Title	Resource Type	Benefits Addressed
		Technical Assistance	Development, Water, Recreation, Health, Nature
<b>EPA</b>	<a href="#"><u>Green Infrastructure Funding Opportunities</u></a>	Guidance	Infrastructure Resilience, Water
<b>EPA</b>	<a href="#"><u>Green Infrastructure Modeling Toolkit:</u></a> <a href="#"><u>Storm Water Management Model;</u></a> <a href="#"><u>National Stormwater Calculator;</u></a> <a href="#"><u>Green Infrastructure Wizard;</u></a> <a href="#"><u>Watershed Management Optimization Support Tool;</u></a> <a href="#"><u>Visualizing Ecosystems for Land Management Assessment Model;</u></a> <a href="#"><u>Green Infrastructure Flexible Model; Community-enabled Lifecycle Analysis of Stormwater Infrastructure Cost Tool;</u></a> and <a href="#"><u>Integrated Decision Support Tool</u></a>	Tools	Inland Flood Reduction, Adaptation, Resilience, Water, Health, Nature
<b>EPA</b>	<a href="#"><u>Financing Green Infrastructure: A Best Practices Guide for the Clean Water State Revolving Fund</u></a>	Guidance	Infrastructure Resilience, Water
<b>EPA</b>	<a href="#"><u>Including Watershed Planning and Green Infrastructure into State Hazard Mitigation Plans</u></a>	Guidance, Technical Assistance	Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Water, Recreation
<b>EPA</b>	<a href="#"><u>Overview of Clean Water State Revolving Fund Eligibilities</u></a>	Guidance	Infrastructure Resilience, Water, Food & Products, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>EPA</b>	<a href="#"><u>Tools, Strategies and Lessons Learned from EPA Green Infrastructure Technical Assistance Projects</u></a>	Knowledge, Technical Assistance	Climate Mitigation, Adaptation, Resilience, Infrastructure Resilience, Community Development, Water, Health
<b>EPA</b>	<a href="#"><u>Water Infrastructure and Resiliency Finance Center</u></a>	Tools, Technical Assistance	Infrastructure Resilience, Water
<b>EPA/ DOC (NOAA)</b>	<a href="#"><u>Green Infrastructure for Coral Conservation</u></a>	Knowledge	Water, Recreation, Nature
<b>GSA</b>	<a href="#"><u>Facilities Standards for the Public Buildings Service (P100)</u></a>	Knowledge, Technical Assistance	Infrastructure Resilience, Water, Nature
<b>GSA</b>	<a href="#"><u>Planted Roofs</u></a>	Knowledge	Heat Risk Reduction, Infrastructure Resilience, Equity, Health, Water, Nature
<b>HUD</b>	<a href="#"><u>HUD Climate Resilience Implementation Guide – Nature-based Solutions</u></a>	Guidance	Climate Mitigation, Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Equity, Community Development, Recreation, Health
<b>HUD</b>	<a href="#"><u>HUD Community Resilience Toolkit</u></a>	Tools	Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Community Development



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>HUD</b>	<a href="#"><u>Green Infrastructure and the Sustainable Communities Initiative</u></a>	Knowledge	Jobs, Climate Mitigation, Inland Flood Reduction, Heat Risk Reduction, Infrastructure Resilience, Community Development, Water, Recreation, Health, Nature
<b>NFWF/ DOC (NOAA)</b>	<a href="#"><u>Coastal Resilience Evaluation and Siting Tool (CREST)</u></a>	Tools	Coastal Flood Reduction, Nature
<b>NFWF/ DOC (NOAA)</b>	<a href="#"><u>Regional Coastal Resilience Assessments</u></a>	Knowledge	Coastal Flood Reduction, Nature
<b>NFWF/ DOC (NOAA)</b>	<a href="#"><u>Targeted Watershed Assessments</u></a>	Knowledge	Inland Flood Reduction, Coastal Flood Reduction, Nature
<b>OSTP (U.S. Global Change Research Program)</b>	<a href="#"><u>Climate Resilience Toolkit</u></a>	Knowledge, Guidance, Tools	Fire Risk Reduction, Coastal Flood Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Equity, Water, Food & Products, Recreation, Health, Nature
<b>OSTP (U.S. Global Change Research Program)</b>	<a href="#"><u>Second State of the Carbon Cycle Report, Chapter 15 Tidal Wetlands and Estuaries</u></a>	Knowledge	Climate Mitigation, Nature
<b>OSTP (National Science and Technology Council)</b>	<a href="#"><u>Research Needs for Coastal Green Infrastructure</u></a>	Knowledge	Jobs, Climate Mitigation, Coastal Flood Reduction, Inland Flood Reduction, Infrastructure Resilience, Water, Recreation, Health, Nature
<b>Plant Conservation Alliance Federal Committee (12 Federal Agencies)</b>	<a href="#"><u>National Seed Strategy</u></a>	Knowledge, Guidance, Tools	Climate, Mitigation, Drought Risk Reduction, Fire Risk Reduction, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
USDA	<a href="#"><u>Adaptation Resources for Agriculture</u></a>	Guidance, Tools, Technical Assistance	Adaptation, Resilience, Food & Products
USDA	<a href="#"><u>Adaptation Resources for Agriculture: Case Studies using the Adaptation Workbook</u></a>	Knowledge, Guidance, Tools, Technical Assistance	Adaptation, Resilience, Food & Products
USDA	<a href="#"><u>After Fire: Toolkit for the Southwest</u></a>	Guidance, Tools, Technical Assistance	Fire Risk Reduction, Water, Food & Products, Nature
USDA	<a href="#"><u>Air and Water Database</u></a>	Tools	Water, Food & Products, Nature
USDA	<a href="#"><u>Climate Adaptation Actions for Urban Forests and Human Health</u></a>	Knowledge, Guidance	Fire Risk Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Equity, Health, Nature
USDA	<a href="#"><u>Climate Adaptation Tools for Wetland Conservation and Management</u></a>	Guidance, Technical Assistance	Drought Risk Reduction, Infrastructure Resilience, Water, Nature
USDA	<a href="#"><u>Climate Quick Reference Guides</u></a>	Knowledge, Tools	Food & Products, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
USDA	<a href="#"><u>Conservation Technical Assistance Program</u></a>	Technical Assistance	Climate Mitigation, Food & Products, Nature
USDA	<a href="#"><u>Conservation Concerns Tool</u></a>	Tools	Equity, Food & Products, Nature
USDA	<a href="#"><u>NRCS Field Office Technical Guide</u></a>	Guidance	Food & Products, Nature
USDA	<a href="#"><u>A Guide to USDA Resources for Historically Underserved Farmers and Ranchers</u></a>	Guidance	Equity, Food & Products, Nature
USDA	<a href="#"><u>Hurricane Preparation and Recovery Commodity Guides</u></a>	Guidance	Coastal Flood Reduction, Inland Flood Reduction, Water, Food & Products
USDA	<a href="#"><u>Identification, Mitigation, and Adaptation to Salinization on Working Lands in the U.S. Southeast</u></a>	Knowledge, Technical Assistance	Coastal Flood Reduction, Food & Products
USDA	<a href="#"><u>National Water and Climate Center: Water and Climate Information System</u></a>	Tools	Adaptation, Resilience, Water, Food & Products, Nature
USDA	<a href="#"><u>Native Plants for Coastal Dune Restoration: What When and How for Florida</u></a>	Knowledge, Guidance	Coastal Flood Reduction, Nature





Author(s)	Resource Title	Resource Type	Benefits Addressed
USDA	<a href="#"><u>Plant Materials Technical Note: Coastal Shoreline and Dune Restoration</u></a>	Knowledge, Guidance	Coastal Flood Reduction, Nature
USDA	<a href="#"><u>Plants for Coastal and Shoreline Protection and Restoration</u></a>	Knowledge, Guidance	Coastal Flood Reduction, Nature
USDA	<a href="#"><u>Plant List of Attributes, Names, Taxonomy, and Symbols (PLANTS Database)</u></a>	Tools	Food & Products, Nature
USDA	<a href="#"><u>2022 Strategic Pollinator Priorities Report</u></a>	Knowledge	Equity, Food & Products, Nature
USDA	<a href="#"><u>Win-PST (Windows-based Pesticide Screening Tool)</u></a>	Tools	Water, Food & Products, Health, Nature
USDA	<a href="#"><u>Wind Erosion Prediction System (WEPS)</u></a>	Tools	Food & Products, Nature
USDA	<a href="#"><u>Water Erosion Prediction Project (WEPP)</u></a>	Tools	Inland Flood Reduction, Water, Food & Products, Nature
USDA	<a href="#"><u>Water Quality Index (WQI)</u></a>	Tools	Water, Food & Products, Nature
USDA (and non-federal partners)	<a href="#"><u>Conservation Webinar Portal</u></a>	Technical Assistance	Jobs, Climate Mitigation, Fire Risk Reduction, Drought Risk Reduction, Water, Food & Products, Health, Nature



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>USDA (and non-federal partners)</b>	<a href="#">Grass-Cast</a>	Tools	Drought Risk Reduction, Food & Products, Nature
<b>USDA (and non-federal partners)</b>	<a href="#">Rangeland Hydrologic Erosion Model (RHEM)</a>	Tools	Inland Flood Reduction, Water, Food & Products, Nature
<b>USDA (and Colorado State University)</b>	<a href="#">COMET-Farm</a> <a href="#">COMET-Planner</a>	Tools	Climate Mitigation, Food & Products, Nature
<b>USDA (and New Mexico State University)</b>	<a href="#">Ecosystem Dynamics Interpretive Tool</a>	Tools	Food & Products, Nature
<b>USDA (and University of California - Davis)</b>	<a href="#">Soil Survey Web Tool</a>	Tools	Nature
<b>USDA (USFS)</b>	<a href="#">Climate Change Resource Center: Tools</a>  <a href="#">CCRC: Compendium of Adaptation Approaches</a>	Guidance, Tools	Fire Risk Reduction, Inland Flood Reduction, Heat Risk Reduction, Drought Risk Reduction, Infrastructure Resilience, Water, Food & Products, Recreation, Health, Nature
<b>USDA (USFS)</b>	<a href="#">Forest Adaptation Resources</a>	Knowledge, Guidance, Tools	Fire Risk Reduction, Infrastructure Resilience, Nature
<b>USDA (USFS)</b>	<a href="#">Forest Management Handbook for Small-Parcel Landowners in The Sierra Nevada and Southern Cascade Range</a>	Knowledge, Guidance, Tools, Technical Assistance	Adaptation, Resilience, Food & Products, Nature
<b>USDA (USFS) (and non-Federal partners)</b>	<a href="#">i-Tree</a>	Tools	Climate Mitigation, Heat Risk Reduction, Infrastructure Resilience



Author(s)	Resource Title	Resource Type	Benefits Addressed
<b>USDA (USFS) (and non-Federal partners)</b>	<a href="#"><u>Vibrant Cities Lab</u></a>	Knowledge, Guidance, Tools	Adaptation, Resilience, Equity, Community Development, Water, Recreation, Health, Nature
<b>USDA (USFS) (and non-federal partners)</b>	<a href="#"><u>The Adaptation Workbook</u></a>	Tools	Climate Mitigation, Adaptation, Resilience, Nature