



Implementing Nature-based Solutions to tackle the climate crisis, conserve resources, and benefit people and the environment

Climate change is affecting both the natural and built environments, as seen in the increasing intensity and duration of heatwaves, wildfire, floods, and drought. To address the threat, the Department is implementing Nature-based Solutions (NBS) as a key strategy for **climate adaptation and mitigation** and **biodiversity conservation**. NBS strategies are used to protect, sustainably manage, and enhance environmental, cultural, and infrastructure resources, while also providing measurable human well-being and ecosystem **co-benefits**. The Department will invest in high-return NBS projects that connect lands and waters, promote cross-bureau collaboration, leverage partnerships, ensure climate security, incorporate Indigenous Knowledges, and apply evidence-based scientific approaches to predict, monitor, and assess NBS implementation effectiveness. NBS activities within the Department are not new and encompass broad swaths of existing Bureau programs. But the intentional focus on increasing NBS **implementation** by crafting NBS policy to improve coordination and maximize climate change adaptation and mitigation outcomes in support of the Department's mission is new and promises increased effectiveness into the

The Department of the Interior and its bureaus and offices have statutory, regulatory, and policy obligations to protect and manage the Nation's natural and cultural resources. Continuing to do so under a changing climate will be increasingly challenging, requiring coordinated action by the Department and partners across the country. Climate change will impact not only our natural resources, including biodiversity losses and declines in ecosystem health, but also water and food security, human health, and the Nation's infrastructure. Working with, rather than against, nature to mitigate and adapt to climate change impacts has been shown to generate greater, more sustainable outcomes for humans and the environmental systems we depend on. This is where the concept of **Nature-based Solutions** (NBS) has gained prominence as a first order approach for climate adaptation and mitigation, using strategies that mimic, enhance, replicate, or expand natural ecosystem processes.

NBS are often thought of as ecosystem restoration but also include activities which emulate, replenish, or recreate natural systems, including bioswales, permeable pavements, green roofs, and urban tree canopy, as well as sand dunes and rock detention structures. The implementation of NBS is sometimes referred to as either green infrastructure or natural infrastructure.

NBS are an invaluable tool for **climate adaptation**, resilience for disaster and hazard risk **mitigation**, and carbon management to offset GHG emissions. NBS also maintain and restore ecosystems, ensuring delivery of **ecosystem services** for wildlife and people. **Biodiversity** benefits of NBS flow from avoided negative impacts to biodiversity through conserving and protecting priority habitats that enhance resiliency and sequester carbon. For example, wetland restoration efforts not only enhance biodiversity, improve water quality and ecosystem carbon storage, but also improve our infrastructure resilience to sea-level rise and storm surge events.

For the Department of the Interior, NBS are actions which protect, conserve, restore, sustainably use, and manage natural or modified ecosystems to address climate-driven challenges including disaster risk management, improved climate security, and resilient ecosystems. NBS are already deeply embedded in the Department of the Interior's mission, with ongoing and planned projects being implemented across the agency through activities including habitat conservation, ecosystem restoration, and prescribed fire and fuels treatment. In addition, the Department is developing evidence-building activities to demonstrate the efficacy of NBS on the landscape to sequester carbon, improve soil and water quality, mitigate

climate hazards, improve climate security, and provide measurable benefits to both ecosystems and to humans.

NBS actions are intended to provide measurable **benefits to both people and nature**. The potential **co-benefits** from NBS implementation should be assessed during both the design and operational phases of NBS projects. Examples of co-benefits include improved soil health, air quality, urban temperatures, infrastructure protection, ecosystem health, biodiversity and habitat, nutrient cycling, water availability and quality, and human health (Figure 1).

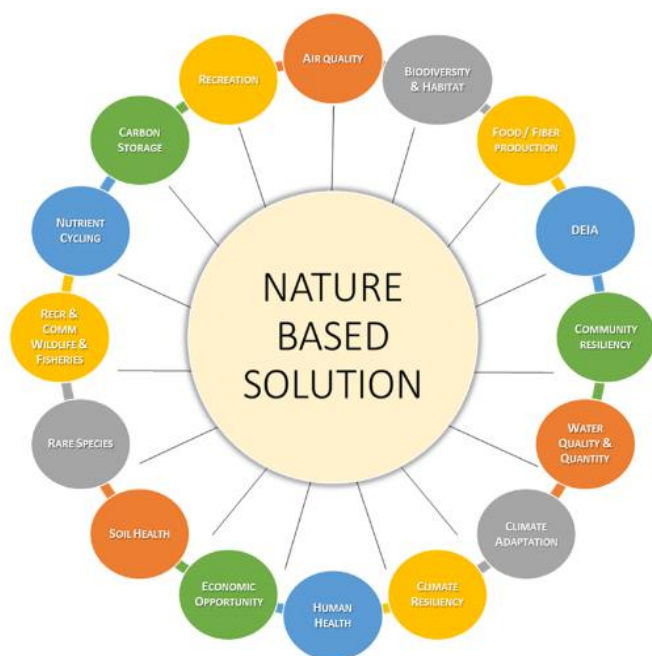


Figure 1. Nature-based Solutions provide a multitude of co-benefits for both people and the environment.

In April 2022, Executive Order 14072 directly called for the deployment of nature-based solutions to improve the resilience of our lands, waters, wildlife, and communities in the face of a changing climate. The subsequent White House Council on Environmental Quality's Nature-based Solutions Roadmap, published in November 2022, provided 5 high level priorities to guide NBS throughout the federal government. These priorities included 1) updating policy 2) unlocking funding 3) leading with federal facilities and assets 4) training the workforce and 5) prioritizing research and evidence building for NBS. Overall, the goal is to implement NBS in a more coordinated, standardized,

systemic, and collaborative manner across the federal government, to better optimize delivery and maximize **co-benefits**.

To meet this challenge, the Department has undertaken the development of a new, cohesive, umbrella policy for NBS. Many existing Department policies provide underpinning for NBS policy including adaptive management (522 DM 1), landscape level management (604 DM 1), climate change science (526 DM 1), climate change adaptation (523 DM 1), environmental systems management (515 DM 1), environmental auditing (515 DM 2), and environmental justice implementation (525 DM 1). The Department's NBS policy will coalesce these existing policies and associated reporting structures, serving as a guiding framework for future NBS implementation and to capture existing NBS activities across our bureaus and offices. The goal is to promote the consideration of NBS first in future climate change adaptation and mitigation activities and in facilities improvements and new construction.

Following guidance from the November 2022 NBS Roadmap, successful implementation of NBS within DOI should be founded on several key principles, including: 1) starting with NBS, 2) ensuring benefits to both people and nature, 3) interweaving equity, 4) using evidence, 5) continually improving, and 6) advancing collaboration. NBS will be considered first, where possible, either solely or in combination with more traditional gray infrastructure. NBS strategies (Table 1) must clearly identify and estimate expected ecological, human, and socio-economic benefits and plan for continuous monitoring to determine co-benefits across scales. This may be aligned with the emerging system of emerging federal **system of environmental-economic statistics and natural capital accounts**. NBS will intentionally focus on equity and environmental justice to ensure that implementation does not increase existing inequities, and, where possible, helps reverse inequities. NBS should be grounded in the best available evidence, science, climate models, and knowledge sources, to effectively scale NBS across landscapes. Implementation of NBS will require continuous learning and adaptive management approaches. Coordination with federal, Tribal, regional, state, non-governmental, private, and local partners will be essential to advancing NBS across the Department.

Several key concepts are often missing from NBS frameworks and implementation strategies, according to the literature. These include the use of adaptive management over time, measuring implementation effectiveness, incorporating uncertainty, utilizing knowledge co-production and stakeholder participation, and consideration of temporal scale (Cohen-Shacham et al. 2019). As a result, DOI policy on NBS implementation will

specifically address each of these often-missed opportunities to ensure they are addressed in the design, installation, and monitoring of NBS activities. Policy guidance to support the successful implementation of NBS activities incorporating these concepts will result in better mission area outcomes across the Department.

Table 1. Potential Nature-based Solutions Strategies

Invasive plant species removal	Thinning	Integrated pest management
Invasive wildlife removal	Sustainable timber management	Small island creation
Invasive pest removal	Prescribed burns	Sediment removal
Restoring watershed habitat	Coastal wetland restoration	Beach nourishment
Planting native grasses	Oyster bed restoration	Beach dune remediation
Avoided conversion	Coral reef protection	Erosion control
Peatland rewetting	Coral reef restoration	Rain gardens
Peatland restoration	Mangrove afforestation	Bioswales
Coastal ecosystem restoration	Seagrass planting	Culverts
Non-tidal wetland restoration	Upslope marsh migration	Rainwater harvesting
Wildlife corridors	Pollinator restoration	Permeable pavement
River barrier removal	No till Agriculture	Tree trenches
Riparian detention structures	Native flora re-integration	Waterfront parks
Built wetlands	Two-stage ditches	Constructed wetlands
Protecting beavers	Reforestation	Green roofs
Fish passage	Prescribed fire	Rain gardens
Stream restoration	Greenbelts/firebreaks	Urban forestation
Floodplain reconnection	Rotational grazing	Vegetated swales/bioswales
Rewild watersheds	Cover crops	Green space
Riparian buffers	Water storage on agriculture fields	Neighborhood greening
Avoided loss	Soil improvements	

For more information about NBS, see the White House Council on Environmental Quality-led [NBS Roadmap](#). For more information about NBS policy at Interior, feel free to write: ppa@ios.doi.gov