

Landscape Understanding: Restoring, Protecting, and Managing Ecosystems

FY 2016 President's Proposed Budget
Total requested increase is \$15,569,000

Interior, like most natural resource agencies, manages its resources at the landscape scale, which requires understanding many complex relationships between environmental and human factors. Land uses are also increasingly interconnected and competitive. Scientific knowledge of landscape components and how to balance multiple uses and yet maintain a sustainable, resilient ecosystem is necessary to inform decisions such as siting energy development, allocating water resources, recreational opportunities, habitat conservation, and mitigating development activities. In 2016, the USGS is requesting an increase of \$15.6 million to expand, enhance, and initiate science activities to increase the understanding – and help the effective management of – the Nation's landscapes and how they work. One component of this increase expands science efforts at specific locations: the Arctic, Columbia River, Puget Sound, Upper Mississippi River, Great Lakes, and sage-steppe landscapes. Another component focuses on research related to invasive species and species in decline. The last component builds on Hurricane Sandy research efforts by initiating new work in coastal resilience and emerging contaminants and chemical mixtures.

Critical Landscapes

Ecosystems are essential to the Nation because they supply the natural resources and other goods and services that humans require. Ecosystem science is vital to help resource managers make informed decisions about our lands and waters, to resolve and prevent resource management conflicts, and to support Interior's public trust stewardship responsibilities. Increases in 2016 support research focused in the Arctic, Columbia River, Puget Sound, Upper Mississippi River, and sage-steppe landscapes. In addition, USGS research will continue in other priority ecosystems such as Chesapeake Bay, Everglades, Great Lakes, California Bay Delta, and the Gulf Coast. These projects serve local ecosystem management needs *and* provide knowledge transferable to other ecosystems across the country.



Muir Glacier, Alaska

Critical Landscapes Example: the Changing Arctic

The Arctic, which is warming faster than any other region on Earth, is one example of USGS critical landscape science. The USGS links research and changes in permafrost (thawing and the melting of glaciers) to changes in hydrology and subsequent impacts on habitats and wildlife. In places like Alaska, almost all glaciers are losing mass at an astounding rate, while rapid permafrost loss can be seen from coastal areas to inland forests and tundra. Such changes have resulted in disruption of ocean currents, sea-level rise, and altered streamflow paths and other hydrological changes.

Less understood is how these changes alter downstream ecosystems and the important natural resources they provide. The USGS's whole-system approach to these issues will be driven by stakeholder needs and will clarify linkages among climate, glaciers, and human impacts. The results of this research will allow Arctic managers and policy makers to understand potential changes to glaciers and permafrost, to production of salmon and migratory waterfowl, and to wildfire regimes across Alaska.

Invasive and Declining Species

Nonindigenous invasive plants and animals cause tremendous economic loss and diminish opportunities for beneficial uses of forests, croplands, rangelands, and aquatic resources. Costly effects include clogging of water facilities and waterways; wildlife and human disease transmission; threats to commercial, native, and farmed fisheries; increased fire vulnerability; and adverse effects for ranchers, farmers, and natural areas. The USGS partners with States, Tribes, other Federal agencies, businesses, agriculture, natural resource managers, and the private sector to help solve significant problems posed by invasive organisms in terrestrial and aquatic ecosystems. Increases in 2016 would allow USGS to continue research on controlling brown tree snakes in Guam and enable new and developing detection and control methods for new and emerging invasive species of national concern.

Also in 2016, the USGS, along with the U.S. Department of Agriculture, will study pollinators, those significantly declining insects, birds, and mammals that are critical to agriculture, natural areas, and the economy. Increases will allow researchers to examine land use, land condition, and land cover as they relate to pollinator habitat needs, including restoration efforts; to study the use of pesticides; and to provide data and tools that promote healthy pollinator habitats.

Coastal Resilience and Landscapes

U.S. populations, critical infrastructure, and economies are concentrated in our coastal regions and are at substantial risk from coastal hazards and long-term change. Major storms impact lives and livelihoods with economic costs in the billions, as well as unquantified but equally consequential social and environmental costs. USGS research will help enhance coastal resilience and reduce community and ecosystem vulnerability by providing data, knowledge, and tools to assess coastal vulnerability; by developing effective, sustainable strategies for adapting to coastal change; and by forecasting the impacts of future conditions and processes on environmental and economic health and public safety.



Aftermath of Hurricane Sandy, Fire Island, New York