

## Biological and Ecological Sciences in the FY 2014 Budget

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### HIGHLIGHTS

- ***National Science Foundation (NSF)***. Funding for biological research would increase by \$48.3 million.
- ***National Oceanic and Atmospheric Administration (NOAA)***. Intramural and extramural research would both increase.
- ***United States Geological Survey (USGS)***. Biological and ecosystems research would receive a 14.2 percent increase.

### INTRODUCTION

Biological and ecological research provides the scientific basis to address the nation's most challenging issues. These include food security and energy needs, maintaining vital resources such as freshwater, and coping with emerging wildlife diseases that also affect people. The biological sciences (e.g. botany, zoology, microbiology, ecology, molecular and cellular biology, systematics, and taxonomy) inform our understanding of these issues while inspiring innovative research and new economic opportunities.

Numerous federal agencies conduct and support biological and ecological research. Intramural research is conducted at mission-driven agencies such as the Environmental Protection Agency (EPA), the National Oceanic and

Atmospheric Administration (NOAA), the U.S. Department of Agriculture (USDA), and the U.S. Geological Survey (USGS).

Federal agencies also support extramural research programs that complement the work government scientists conduct. The National Science Foundation (NSF) is the primary funder of fundamental, non-medical biological science, supporting 64 percent of this research at universities and non-profit research institutions.

### **NATIONAL SCIENCE FOUNDATION (NSF)**

NSF's Directorate for Biological Sciences (BIO) funds research upon which our understanding and response to complex issues, such as climate change, food safety and security, bio- and nanotechnology, and human well-being, is built. In short, biological systems, including entire organisms, increasingly inspire research and innovation in other disciplines.

The budget request for BIO is \$760.6 million, an increase of 6.8 percent or \$48.3 million over the 2012 enacted level. At this funding level, BIO forecasts that the number of research grants awarded and average award size would increase relative to FY 2012. The directorate-wide funding rate would increase, largely due to the implementation of a new proposal submission and review process in 2011. Two of the four divisions within BIO changed from two deadlines a year for full proposals to an annual funding cycle. Pre-proposals are also required prior to invitation to submit a full proposal.

BIO supports research through five divisions. Molecular and Cellular Biosciences would grow to \$136.4 million (+8.6 percent). Integrative Organismal Systems would increase by 6.1 percent to \$225.4 million. Environmental Biology and Biological Infrastructure would receive increases of 4.5 percent and 5.7 percent, bringing these areas to \$149.0 million and \$133.7 million, respectively. Funding for Emerging Frontiers would grow by 10.4 percent to \$116.2 million.

Funding priorities for FY 2014 reflect Administration and NSF-wide initiatives. BIO's contribution to NSF's Science, Engineering, and Education for Sustainability (SEES) initiative would receive \$8.5 million in new funding. BIO's contribution to the Research at the Interface of the Biological, Mathematical and Physical Sciences (BioMaPS) program

would also receive \$18.1 million in new funding. BIO support for clean energy research would grow by \$7.0 million.

Within the Integrative Organismal Systems division, a \$5.0 million increase would focus on mapping circuits that drive behavior in a variety of organisms. Additionally, \$4.5 million in new funding is proposed for software infrastructure for sustained innovation and cyberinfrastructure in the life sciences. NSF requests \$2 million to support a new program to link long-term planetary biodiversity data with biological specimen and collections data.

NSF has requested \$98.2 million, an increase of \$37.9 million, for continued construction of the National Ecological Observatory Network (NEON). This request is included in the Major Research Equipment and Facilities Construction account. An additional \$21.0 million from BIO is requested for NEON operations. NEON is continental-scale infrastructure that will collect data on the impacts of climate change, land use change, and invasive species on natural resources and biodiversity. Construction is underway or completed at 12 sites; 106 sites are anticipated.

#### **DEPARTMENT OF AGRICULTURE (USDA)**

As in recent years, the Administration is again proposing a significant boost (a \$119 million increase over FY 2012) to USDA's competitive, peer-reviewed research program, the Agriculture and Food Research Initiative (AFRI). AFRI's priorities include research on plant-based renewable energy, animal and plant diseases that can threaten human health, and research to minimize the transmission of antibiotic resistance in the food chain.

The R&D budget of USDA's intramural scientific research agency – the Agricultural Research Service (ARS) – would receive a \$184 million increase. The agency's mission includes research on monitoring the nation's agricultural ecosystems and predicting crop responses to changing environmental conditions. Discretionary spending for the Animal and Plant Health Inspection Service would decline by \$38 million. Funding for the Natural Resources Conservation Service would drop by \$254 million.

Also within the USDA budget, the Forest Service (FS) would see its discretionary funding slightly increasing compared to FY 2012. The Forest

and Rangeland Research program focuses on developing the knowledge and technology needed to improve the economic and environmental value of national forests. The program is slated to receive \$310 million, a 5.1 percent increase from FY 2012. Budget increases are proposed for watershed restoration and science, and forest management and production systems. Also included in the budget is nanotechnology research for additional uses of wood, as well as developing new ways to manage harmful species introduced into U.S. forests.

### **ENVIRONMENTAL PROTECTION AGENCY (EPA)**

EPA is the primary regulatory agency for the environment. Its portfolio includes science research into energy production, chemical safety, watershed management, and climate change. For the fourth consecutive year, the White House's proposed budget request includes decreased funding for EPA. Under the FY 2014 request, the agency would receive \$8.2 billion in FY 2014, \$296 million less than in FY 2012. This includes an \$11.5 million reduction to EPA's research program.

Priority areas for EPA research include climate change impacts on human health and ecosystems, and environmental impacts of hydraulic fracturing and biofuels. Funding for ecosystem research would decline to \$60.0 million (down 1.2 percent).

The White House again proposes to zero out funding for EPA's environmental education program. In accordance with the Administration's plans to reorganize STEM education initiatives, the \$16.4 million STAR Graduate Research Opportunity Fellowship would be eliminated.

Programs that focus on several of the nation's most important waterways would see funding increases. The Chesapeake Bay program would receive a \$15.7 million increase over FY 2012. The Great Lakes Restoration Initiative would receive a \$500,000 increase and wetlands programs would go up by \$6.5 million.

### **NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)**

NOAA R&D activities are supported through a combination of intramural and extramural research related to the agency's mission to understand and forecast environmental changes and conserve and manage coastal and

marine resources for economic, social, and environmental purposes.

Cost containments for the acquisition of weather and climate satellites have resulted in larger funding requests for NOAA's research and natural resource management activities. Ocean, coastal, and Great Lakes research would increase by \$22.5 million. Two programs that had been eliminated in FY 2012 would be restored: the International Research Assistance Project, which provides grants to link climate research to management, and the Earth System Science activity, which makes extramural awards for climate modeling and prediction.

Competitive research through the National Ocean Service would rise by 67 percent over FY 2012 to \$15 million. Ecological stressors including harmful algae, bacteria, and hypoxia are among the research priorities. The National Marine Fisheries Service would significantly increase support for scientific consultations for recovery of threatened and endangered species. Several NOAA education initiatives would end, including the \$4 million Sea Grant Education program, as part of the Administration's proposed reorganization of STEM education programs.

NOAA recently released a draft five-year R&D plan to guide its research portfolio, which includes ways to transition research outcomes to applications.<sup>1</sup>

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

The USGS is dedicated to providing reliable and objective scientific information to describe and understand the Earth, minimize loss of life and property from natural disasters, and assist others in managing water, biological, geological, geographical, and other natural resources.

According to USGS budget documents, the FY 2014 budget request would increase research and development funding by \$87.7 million (13.0 percent). The total budget for the agency would grow to \$1.2 billion – an increase of 9.3 percent above the FY 2012 enacted appropriation.

The Ecosystems area would receive \$180.8 million, an increase of 14.2 percent or \$22.5 million. The new funding would be distributed across all

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<sup>1</sup> Available at <http://nrc.noaa.gov/CouncilProducts/ResearchPlans.aspx>

six programmatic areas: Status and Trends (up 0.6 percent); Fisheries (up 21.0 percent); Wildlife (up 8.1 percent); Environments (up 23.1 percent); Invasive Species (up 42.3 percent); and the Cooperative Research Units (up 0.7 percent).

The proposed budget would prioritize ecosystem restoration science in eight major aquatic environments and implement a recommendation by the President's Council of Advisors on Science and Technology to integrate information on the condition of U.S. ecosystems.

#### **DEPARTMENT OF ENERGY**

The Biological and Environmental Research program within the Department of Energy Office of Science supports genomic research, studies the drivers of climate change, and furthers foundational knowledge of ecology, biology, and biogeochemistry.

The Office of Science discretionary budget would receive a 4.4 percent increase in FY 2014. Funding for Biological and Environmental Research would grow at a slightly higher rate (+5.6 percent), with proposed funding of \$625.3 million.

Terrestrial ecosystem science would receive an increase of \$4.8 million for field research related to the development of predictive models on the relationships between tropical ecosystems and climate change. Genomics science would receive a 7.1 percent increase (+\$13.0 million). Nearly \$10 million in new funding would be devoted to research on the scaling properties of biological processes.

Although the average research grant size would not change, the Biological and Environmental Research program expects to award 10 more grants than in FY 2012.