



## **Analysis of the President's Fiscal Year 2020 Budget Request for Biological Sciences Research and Education**

**A Report from the American Institute of Biological Sciences  
April 9, 2019**

**Prepared by:  
Jyotsna Pandey, Ph.D., Public Policy Manager  
Robert Gropp, Ph.D., Executive Director**

### **Summary**

On 11 March 2019, President Trump released his proposed budget for fiscal year (FY) 2020. The plan would provide \$1.3 trillion for discretionary spending, of which \$543 billion (-5 percent) would be allocated to nondefense discretionary spending and \$750 billion (+5 percent) to defense spending. Non-defense discretionary spending includes funding for the National Science Foundation, National Institutes of Health, and other non-defense agencies. Most federal science agencies would receive budget cuts in FY 2020 if the President's budget is enacted. The administration proposes \$134.1 billion for federal research and development, 4.6 percent below the FY 2019 level. The proposed budget is subject to congressional appropriations.

Congress completed FY 2019 appropriations on 15 February 2019, five months into FY 2019. Details of program level funding for some agencies for FY 2019 were not available during the preparation of this report. This analysis compares budget allocations in the FY 2020 budget request with FY 2019 enacted spending levels for most programs and FY 2018 enacted spending levels or FY 2019 Continuing Resolution levels for programs for which FY 2019 enacted data were unavailable.

## A Primer on the Federal Budget

Federal spending is broadly categorized as discretionary or mandatory.

Congress determines discretionary spending on an annual basis through the appropriations process. Collectively, twelve pieces of legislation (appropriations bills) fund the federal government—everything from the military to national parks to research. Discretionary spending limits for various programmatic areas are established by a joint budget resolution adopted by Congress. These levels are informed by the recommendations of authorizing committees and political priorities. Each appropriations subcommittee is provided with a budget threshold within which they must fund the programs under their jurisdiction.

Funding for mandatory programs is controlled by laws outside of the appropriations process. Examples include Social Security, Medicare, and certain agriculture programs.

Mandatory spending has been a growing proportion of the federal budget for decades. Approximately 60 percent of the federal budget is allocated to mandatory spending programs.

### *Budget Sequestration*

Spending caps have constrained federal spending since 2013. In November 2015, lawmakers negotiated a deal to increase the spending caps by \$80 billion for two years, which resulted in slight increases in federal spending for FY 2016 and 2017. In February 2018, Congress approved another two-year budget agreement, the Bipartisan Budget Act of 2018, to raise the cap on discretionary spending by \$300 billion over FY 2018 and FY 2019.

The Bipartisan Budget Act of 2018 is set to expire on 1 October 2019, which would result in spending caps dropping by 10 percent. Nondefense spending would decrease by 9 percent or \$54 billion and defense spending would decrease by 11 percent or \$71 billion. Several science agencies, including the National Science Foundation (NSF), the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), and the National Institutes of Health (NIH), could experience cuts if the budget caps are not raised prior to FY 2020.

Only discretionary funding is reported in this document.

Calculations in this report are relative to the FY 2019 enacted level, unless otherwise noted.

## Agency Budget Summaries

### United States Department of Agriculture (USDA)

- *Department of Agriculture request: \$20.8 billion (-\$3.6 billion)*
- *Research, Education, and Economics request: \$2.9 billion (-\$260 million)*

The proposed budget for research, education, and economics is 8.2 percent below the FY 2019 level.

The National Institute of Food and Agriculture (NIFA) partners with academic institutions to conduct research, education, and extension activities. NIFA would receive \$1.4 billion (-5 percent) in FY 2020. Within NIFA, the Agriculture and Food Research Initiative (AFRI) would receive funding at \$500 million (+20 percent) for competitive extramural research grants. Lower priority programs such as Renewable Resources Extension Act (-\$4 million), Animal Health and Disease Research (-\$4 million), Crop Protection and Pest Management Activities (-\$20 million) and the Food and Agriculture Defense Initiative (-\$8 million) would be eliminated. Sustainable Agriculture Research and Education, and Extension is slated to receive \$19 million (-\$18 million) in FY 2020. The Expanded Food and Nutrition Education program would receive a 19 percent cut, and other higher education programs would also be slashed by 67 percent. The Budget provides \$9.5 million to relocate NIFA outside the National Capital Region.

The Agricultural Research Service (ARS) conducts intramural research in the areas of natural and biological science. It would receive \$1.25 billion in FY 2020, \$431 million below FY 2019. Funding for seven out of eight research areas within ARS would decrease, resulting in an overall budget of \$1.08 billion (-\$73 million). Research on livestock protection would increase by 6 percent. Research in support of environmental stewardship would receive \$214 million (-\$5 million). The budget includes \$92.8 million to replace the Plum Island Disease Center with the National Bio- and Agro-Defense Facility, a biocontainment facility for the study of foreign, emerging, and zoonotic animal diseases that pose a threat to United States animal agriculture and public health. This includes an increase of \$33 million for operations and maintenance and other transition costs. The budget includes an increase of \$5 million to expand research on foreign animal diseases.

### USDA Forest Service

- *Forest Service request: \$5.1 billion (-\$947 million)*
- *Forest and Rangeland Research request: \$255 million (-\$45 million)*

Funding for Forest Service research would decrease by 15 percent, and the agency's overall budget would decline by 15.6 percent. Research funding has generally been limited since FY 2010, when program funding hit a high of \$312 million. The trend has

reversed in recent years with Congress allocating \$297 million in FY 2018 and \$300 million in FY 2019.

The plan prioritizes research that identifies practical strategies and tactics to improve forest and rangeland condition, support community economic development, and help save lives and protect property from wildfires.

The budget proposes a new Forest Service National Research Plan (NRP), which re-directs the Forest Service's research mission and identifies five emphasis areas that provide the foundational science to promote stewardship by increasing partnerships, enhancing recreation opportunities, improving access, and sustaining and enhancing the conditions of the Nation's forests and grasslands. These five areas are: Inventory and Monitoring; Water and Biological Resources; Forest and Rangeland Management; Forest Products Innovations; and People and the Environment. Wildland fire would be the primary focus of the Forest and Rangeland Management emphasis area.

Forest Service research would focus on the immediate needs of forest land managers and their partners, which include forest restoration, insect and disease management, wildland fire, and water quality and quantity.

A flat budget of \$77 million is proposed for Forest Inventory and Analysis for the collection, coordination, and assessment of field inventory data across the country. The National Fire Plan (-\$14.8 million) and Joint Fire Sciences Program (-\$3 million) are slated for elimination in FY 2020, with the agency focusing on reducing wildland fire risk, contributing to the improvement of forest and grassland conditions, and contributing to rural economic prosperity.

## **Department of Commerce**

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

- *NOAA request: \$4.5 billion (-\$968 million)*

Under the President's budget, funding for NOAA would be cut by nearly 18 percent. The budget supports reducing the impacts of extreme weather and water events and "maximizing the economic contributions" of ocean and coastal resources.

The Office of Oceanic and Atmospheric Research would receive \$335.1 million, a 41 percent cut from the 2019 enacted level. Climate research activities would be slashed by 45 percent to \$87.5 million. Competitive grants for climate-change research, which received \$60 million in FY 2019, would be terminated, with \$20 million from that account transferred to Laboratories and Cooperative Institutes within Climate Research and the U.S. Weather Research Program to "allow for better alignment of funding."

The plan calls for eliminating NOAA's Air Resources Laboratory in College Park, Maryland (-\$4.8 million), which studies air chemistry and atmospheric transport of

hazardous chemicals. The Unmanned Aircraft Systems Program Office (-\$5.4 million) that supervises the use of aircraft for weather, polar, and marine observations would also be terminated.

The National Marine Fisheries Service would receive an 18 percent reduction in discretionary funding to \$843 million, with significant cuts to Protected Resources Science and Management (-5.2 percent), Fisheries Science and Management (-9 percent), and Habitat Conservation and Restoration (-33 percent).

The FY 2020 budget proposes significantly decreased funding for the National Ocean Service (-36.5 percent). Large cuts are proposed for coastal science and assessment (-43 percent) as well as navigation, observations, and positioning activity (-15 percent).

The request would eliminate \$273 million in grants, including the National Sea Grant College Program (-\$80 million), the National Estuarine Research Reserve System (-\$27 million), coastal zone management grants (-\$75.5 million), and the Pacific Coastal Salmon Recovery Fund (-\$65 million). The National Sea Grant College Program supports more than thirty American universities that conduct research, education, and training programs on ocean-related topics.

The budget proposes to gut the Office of Education (-97 percent), eliminating the competitive education grants (-\$3 million), an educational partnership program with minority serving institutions (-\$16 million), and watershed education and training programs (-\$7.5 million). The remaining \$1 million would be targeted towards STEM education activities.

### **National Institutes of Standards and Technology (NIST)**

- *NIST request: \$688 million (-\$298 million)*
- *Science and Technical Research Services request: \$611.7 million (-\$112.8 million)*

NIST would receive a 34 percent budget cut, with all of its accounts being significantly reduced.

The Scientific and Technical Research Services account would shrink by 15.6 percent. Laboratory programs would receive \$555 million (-12 percent). Within lab programs, 416 staff positions, including 400 technical positions, would be cut in FY 2020. This represents a 17 percent reduction to the number of scientists and engineers at the agency. Most of the lab program areas would receive a reduced budget, including health and biological systems measurements, which would be reduced by nearly 15 percent.

Supplementary Strategic and Emerging Research Initiatives funding to support the Joint Institute for Metrology in Biology (-\$2 million) would be terminated.

The Industrial Technology Services account would receive \$15.2 million, which is a 90 percent budget cut. The budget further proposes a 44 percent cut to construction of research facilities, which would receive only \$59.9 million.

## **Department of Energy (DOE)**

### **DOE Office of Science**

- *DOE request: \$31.7 billion (-3.8 billion)*
- *Office of Science request: \$5.5 billion (-\$1 billion)*
- *Biological and Environmental Research request: \$494 million (-\$211 million)*

DOE Office of Science is slated to receive a 16 percent cut. The request allocates 40 percent of its FY 2020 budget for research, supporting over 22,000 researchers.

Advanced scientific computing research would receive \$921 million, a decrease of 1.5 percent, with \$464 million targeted to the development of exascale computing. The budget for basic energy sciences would be slashed by \$308 million (14 percent) to \$1.86 billion, with funding directed towards fundamental energy research, development of clean energy technologies, the Energy Frontier Research Centers, two Energy Innovation Hubs, and five research centers for nanoscale science, among others.

Funding for Biological and Environmental Research (BER) would be cut by nearly 30 percent from FY 2019 to \$494 million, with funds directed to research in foundational genomic sciences. The request funds the four bioenergy research centers, core research in earth and environmental sciences, and continued operation of the three BER scientific user facilities: The Joint Genome Institute, the Atmospheric Radiation Measurement Research Facility, and the Environmental Molecular Sciences Laboratory. The proposed level of funding for BER would be the lowest the program has received since FY 2007.

The FY 2020 request for Biological Systems Science prioritizes core research areas of genomic sciences, including new efforts in secure biosystems design, particularly genome-scale engineering tools, ongoing activities in systems biology and environmental genomics, and the four Bioenergy Research Centers. Overall, Biological Systems Science would receive \$327 million, a decrease of 11 percent. The budget for foundational genomics research would increase by 11 percent to \$100 million, which includes \$20 million (+\$16 million) for biosecurity research, an Administration priority for FY 2020. Support would decrease for environmental genomics (-48 percent) and computational biosciences (-50 percent), and the Bioenergy Research Centers would receive a flat budget of \$100 million, resulting in an overall decrease for Genomic Science (-7.9 percent). The Biomolecular Characterization and Imaging Science account would receive a 29 percent cut and Biological Systems Facilities and Infrastructure would receive a 14 percent cut.

The budget would shrink for all three BER scientific user facilities, namely the Joint Genome Institute (-14 percent), the Atmospheric Radiation Measurement Research Facility (-50 percent), and the Environmental Molecular Sciences Laboratory (-11 percent).

Earth and Environmental Systems Sciences, formerly Climate and Environmental Sciences, would receive \$167.6 million (-50 percent) in FY 2020, with funding reduced substantially for all accounts including atmospheric systems research (-\$16 million), environmental system science (-\$43.1 million), earth and environmental systems modeling (-\$59.3 million), and facilities and infrastructure (-\$45.5 million).

Environmental system science supports the study of terrestrial ecosystems, including the Arctic.

Science Laboratories Infrastructure is slated to receive \$164 million, a decrease of 30 percent, with the funds directed towards five new construction projects at the Brookhaven National Labs, Lawrence Berkeley National Laboratory, Thomas Jefferson National Accelerator Facility, Oak Ridge National Laboratory, and the Large-Scale Collaboration Center, and six ongoing construction projects.

Workforce development for teachers and scientists would be cut by \$2.5 million to \$20 million, with funds targeted towards programs that place qualified students in STEM learning opportunities at Department of Energy laboratories as well as the National Science Bowl competition.

## **Environmental Protection Agency (EPA)**

- *EPA request: \$6.1 billion (-\$2.8 billion)*
- *Science and Technology request: \$463 million (-\$255 million)*

Spending at EPA would decrease by 31 percent. The Administration proposed drastic cuts to EPA's budget in FY 2018 and FY 2019 as well. These were rejected by Congress. Under the budget request, the number of full-time-equivalent staff positions would decrease from 14,376 in FY 2018 to 12,415 in FY 2020.

The budget prioritizes reviewing and revising regulations, improving the permitting process, and enhancing collaboration with state, tribal and federal partners.

Scientific research within EPA is slated for a 35 percent cut. EPA Science and Technology, which supports research used to identify and mitigate environmental problems, would receive \$463.

Within the Office of Research and Development, funding for research on sustainable and healthy communities would decline to \$65.5 million (-55 percent). Support would be targeted to research on cleanup of contaminated sites, oil spills, and hazardous substances. Funds would also support technical assistance for states, tribes, and local communities on ecological and human health risk assessment.

The Safe and Sustainable Water Resources account would receive \$70 million (-34 percent) and prioritize research in areas of nutrients, harmful algal blooms, watersheds and water infrastructure. Research on chemical safety and sustainability would be cut by 30 percent, with funding directed towards developing tools that accelerate data-driven chemical evaluations. The air and energy research budget would be reduced by 67 percent.

The budget for the Atmospheric Protection Program would be slashed by 87 percent. The Greenhouse Gas Reporting program would be retained, but other climate-related programs would be eliminated.

Water Quality Research and Support Grants, a congressionally directed competitive grant program to support water quality research, would be eliminated. Congress provided \$20 million in funding for this program in FY 2019, an increase of \$3.2 million from FY 2018.

Other eliminated programs include; Global Change Research, which develops scientific information that allows policy makers, stakeholders, and society to respond to climate change; Science to Achieve Results (STAR) Research Grants, which fund research grants and graduate fellowships in environmental science and engineering; WaterSense, which aims to reduce water-use; and, Marine Pollution and National Estuary programs, which are focused on protecting marine and coastal ecosystems.

## **Department of Health and Human Services**

### **National Institutes of Health (NIH)**

- *NIH request: \$34.4 billion (-\$4.7 billion)*

The President's budget proposes a 12 percent budget cut for NIH, with reductions across the board.

- National Cancer Institute: -8.7 percent
- National Heart, Lung, and Blood Institute: -14 percent
- National Institute of Neurological Disorders and Stroke: -11 percent
- National Institute of Allergy and Infectious Diseases: -14 percent
- National Institute of General Medical Sciences: -14 percent
- National Institute of Environmental Health Sciences: -14 percent
- National Institute of Mental Health: -12.8 percent
- National Human Genome Research Institute: -14 percent
- National Institute of Biomedical Imaging and Bioengineering: -13.7 percent
- National Library of Medicine: -14 percent

The budget proposal would also cut the Office of the Director's budget by 7.3 percent. The buildings and facilities account for NIH would remain flat.



The budget calls for replacing the Agency for Healthcare Research and Quality (AHRQ), an independent agency in the Department of Health and Human Services, with the National Institute for Research on Safety and Quality (NIRSQ) under NIH. The AHRQ received \$338 million from Congress in FY 2019, but the budget would provide \$256 million (-24 percent) for NIRSQ in FY 2020. In the past, Congress has rejected the Administration's efforts to move AHRQ under NIH.

The proposal includes \$50 million for a new pediatric cancer effort at the National Cancer Institute. This initiative would advance drug discovery and clinical trials, understand the biology of pediatric cancers, and create a national data resource for pediatric cancer. This would initiate a 10-year, \$500 million initiative to address pediatric cancer.

The Next Generation Researchers Initiative (NGRI), started in FY 2017 to address challenges faced by early-stage investigators, would receive \$100 million. The plan provides \$6 million for NIH-sponsored Centers for AIDS Research. The budget includes \$1.3 billion for opioids and pain research across NIH, including \$500 million for the Helping to End Addiction Long-Term Initiative, which was launched in April 2018 to combat opioid addiction and perform research on pain and addiction.

## **Department of the Interior**

### **United States Bureau of Land Management (BLM)**

- *BLM request: \$1.2 billion (-\$143 million)*
- *Management of Lands and Resources request: \$1.1 billion (-\$103 million)*

The budget for BLM would be cut by 10.7 percent in FY 2020. Support for Management of Lands and Resources would also be reduced by 8.7 percent.

In FY 2019, BLM proposed restructuring programs to increase efficiency. Congress approved the plan in the FY 2019 appropriations. The restructuring created a new Wildlife and Aquatic Habitat Management activity and divided the Soil, Water and Air Management sub-activity within the Land Resources function into Rangeland Management and the new Aquatic Habitat Management activity. Additionally, Riparian Management from Land Resources activity moved into the new Wildlife and Aquatic Habitat Management activity.

The Wildlife and Aquatic Habitat Management activity would receive \$118.4 million (-35 percent) in FY 2020, with \$81.7 million for wildlife habitat management and \$36.7 million for aquatic habitat management. The new activity combines the former Riparian Management portions of Soil, Water and Air Management, Wildlife Management, Fisheries Management, and Threatened and Endangered Species Management programs.

The Land Resources activity would be cut by 8.5 percent. Under Land Resources, a climate change program (-\$15 million), which was formerly part of the Soil, Water and Air Management, would be eliminated. Additionally, \$10 million from Soil, Water and Air Management would be transferred to Rangeland Management, which would receive an overall 11.5 percent cut from FY 2019. Public Domain Forest Management would receive a flat budget and Wild Horse and Burro Management would receive a 1 percent boost.

National Monuments and National Conservation Areas would receive \$37.1 million (-6.8 percent). The Resource Protection and Maintenance activity would receive a 14 percent cut, with its Abandoned Mine Lands account (\$20 million) and Hazardous Materials Management account (\$15.5 million) being consolidated with \$31.3 million (-\$4.1 million) in funding.

### **United States Fish and Wildlife Service (USFWS)**

- *USFWS request: \$1.3 billion (-\$250 million)*

The proposed budget includes a 16 percent overall cut for the United States Fish and Wildlife Service. The USFWS is the federal agency responsible for the management of biological resources. It protects endangered species, migratory birds, marine mammals, and other fish and wildlife species.

The Resource Management account would receive \$1.3 billion (-\$34.9 million), with ecological services being cut by 4.7 percent. Ecological Services Listing uses scientific information to identify plant and animal species that are in danger of extinction or likely to become extinct and therefore require protection under the Endangered Species Act. The Listing activity would receive \$11.1 million, a reduction of \$7.2 million.

The USFWS budget for Science Support would be eliminated (-\$17.3 million). Habitat conservation (+4.3 percent), National Wildlife Refuge System (+4.3 percent), and Conservation and Enforcement (+1.4 percent) would receive small increases. Fish and Aquatic Conservation would receive a 7 percent cut.

### **United States Geological Survey (USGS)**

- *USGS request: \$983.5 million (-\$197 million)*
- *USGS Ecosystems Activity request: \$141 million (-\$15.8 million)*

*(use of \* in this section indicates funding comparisons to FY 2019 Continuing Resolution)*

The budget for the USGS would be cut by 16 percent. Funding decreases have been proposed for USGS programs across the board, with the exception of Science Support and Facilities.

The budget proposes to consolidate the agency's seven mission areas into five new mission areas to reflect stakeholder-focused priorities. The five new mission areas would be: Ecosystems, Energy and Mineral Resources, Natural Hazards, Water Resources, and Core Science Systems. Programs formerly under the Environmental Health area would be moved into the Ecosystems and Water Resources areas and programs formerly under Land Resources would be transferred to Ecosystems and Core Science Systems.

Water Resources would be slashed by nearly 22 percent, with the Water Resources Research Act program (-\$6.5 million) terminated. Support for the Natural Hazards program would also be reduced by nearly 13 percent. This includes programs to monitor earthquakes (-23 percent) and volcanoes (-7 percent). Core Science Systems faces an 8.6 percent cut, but its Science Synthesis, Analysis, and Research Program would receive an 8 percent boost. The plan would provide \$73.4 million to support satellite operations, including continuing ground system development for launching Landsat 9 in partnership with the National Aeronautics and Space Administration in 2021.

Energy and Mineral Resources would receive a 3.3 percent cut overall, with its Mineral Resources program slated for a nearly 6 percent increase and its Energy Resources program receiving a 13 percent cut. The Science Support account at USGS would remain essentially flat at \$102.9 million. The Facilities account would receive \$121.3 million (+0.7 percent), with the increase allocated to maintenance operations and relocation of some activities from the Menlo Park campus to Moffett field, California, a part of the NASA Ames Research Center to facilitate collaboration between the agencies.

Under the new structure, the Ecosystems mission area would receive \$141 million in FY 2020, 35 percent below FY 2019 enacted levels. The plan restructures the Ecosystems account to include programs formerly under Land Resources and Environmental Health mission areas, specifically the National and Regional Climate Adaptation Science Centers, significant portions of Land Change Science, and Contaminant Biology. \$44.4 million would be allocated to Species Management Research, \$43.8 million would be targeted to Land Management Research, and \$29 million would go to Biological Threats Research.

The plan proposes reductions for several research programs within Ecosystems, including species-specific research (-\$6.6 million\*), research on toxicological and pathogenic diseases (-\$10.1 million\*), White-nose syndrome, the Whooping Crane restoration program (-\$1.5 million\*), habitat research (-\$1.5 million\*), and biological carbon sequestration (-\$5 million). Support for ecosystems research in the Chesapeake Bay (-\$2.6 million\*), Everglades (-\$4.3 million\*), and the Arctic (-\$0.5 million\*) would also decline.

Devastating cuts have been proposed to climate research. Under the new structure, the National and Regional Climate Adaptation Science Centers' (CASCs) account would also include funding for climate research that was formerly under the Land Change

Science program. The CASCs are responsible for developing the science and tools to address the effects of climate change on land, water, wildlife, fish, ecosystems, and communities. The account is slated for an overall 46 percent budget cut, with climate research and development reduced by \$6.1 million.

The request once again proposes the elimination of the Cooperative Research Units (CRUs), which are located on 40 university campuses in 38 states. The CRUs allow USGS to leverage research and technical expertise affiliated with these universities to conduct research, provide technical assistance, and develop scientific workforces through graduate education and mentoring programs. Congress has rejected the Administrations repeated attempts the shutter this program in the past and provided CRUs with a \$1 million increase in FY 2019.

Funding for Museum collections, which supports the Biological Survey Unit (BSU), a group of USGS scientists stationed at the Smithsonian Institution's National Museum of Natural History, would also be zeroed out under the proposal. Established in 1885, the BSU maintains an extensive collection of bird, reptile, and mammal specimens.

### **National Science Foundation (NSF)**

- *NSF request: \$7.1 billion (-\$1 billion)*
- *Research and Related Activities request: \$5.7 billion (-\$857 million)*
- *Major Research Equipment and Facilities Construction request: \$223.2 million (-\$72.5 million)*
- *Education and Human Resources request: \$823.5 million (-\$86.5 million)*
- *Biological Sciences Directorate request: \$683.4 million (-\$73.2 million\*)*

*(use of \* in this section indicates funding comparisons to FY 2018 enacted levels)*

The President's budget request proposes a 12.5 percent cut to NSF.

All the research directorates across the agency would receive decreased funding: Biological Sciences Directorate (BIO) would receive \$683.4 million (-9.7 percent\*); Geosciences would get \$787 million (-13.3 percent\*); Office of Polar Programs would receive \$403.4 million (-20 percent\*), and Integrative Activities would get \$491 million (+4.2 percent\*).

NSF would accelerate its progress on its "10 Big Ideas for Future Investments," allocating support to high-priority areas that integrate science and engineering fields and create partnership opportunities with industry, private foundations, other federal agencies, and the education sector. The agency would provide \$30 million to each of the six research-focused Big Ideas, that include Understanding the Rules of Life (URoL) - Predicting Phenotype; Navigating the New Arctic (NNA); The Future of Work at the Human Technology Frontier (FW-HTF); and Harnessing the Data Revolution (HDR), among others, for a total of \$180 million. The remaining four, aimed at enhancing processes to improve U.S. science and engineering, would receive \$117.5 million; this

includes funding for NSF INCLUDES, Growing Convergence Research at NSF, Mid-scale Research Infrastructure, and the NSF 2026 Fund. Additionally, NSF would invest \$60 million in two Convergence Accelerators directed towards HDR and FW-HTF in FY 2020 to leverage resources across the agency to accelerate discovery and innovation. The request also states that each Convergence Accelerator track will seek to leverage \$20 million in external partnerships.

The Education and Human Resources (EHR) Directorate would receive a 9.5 percent budget cut. Within EHR, the Division of Graduate Education would receive \$244 million (-5.5 percent\*) and the Division of Undergraduate Education would receive \$219.4 million (-13.8 percent\*). Support for human resource development would increase by 9.6 percent\* to \$178.3 million. NSF's investments in the STEM workforce would be cut by 15 percent\* to \$393 million.

Support for Major Research Equipment and Facilities Construction (MREFC) would be decreased by 24.5 percent as a result of completion of the construction of the National Ecological Observatory Network (NEON), the Daniel K. Inouye Solar Telescope, and three Regional Class Research Vessels, which provide scientific infrastructure to enable better understanding of the impacts of storm surges and tsunamis; natural resource identification and extraction; and fisheries and aquaculture. The request for MREFC includes funding to continue construction on two projects: The Large Synoptic Survey Telescope and the Antarctic Infrastructure Modernization for Science (AIMS). Funding is also included for the Mid-scale Research Infrastructure project for facility upgrades.

Support for Agency Operations and Award Management would receive a 2.2 percent boost. Office of the National Science Board would receive a 6 percent budget cut and the Office of the Inspector General would receive flat funding.

Funding for NSF's cross-disciplinary initiatives would remain flat or decline in FY 2020. Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS), which supports research on the natural, social, and human-built factors involved in these interconnected systems, would receive \$15 million, a 55 percent decrease from FY 2018. This is because NSF plans to end formal investment in INFEWS at the end of FY 2020 and determine which aspects of INFEWS should be supported through core programs. The NSF Innovation Corps, which improves researchers' access to resources that help transfer knowledge to downstream technological applications, would receive \$33 million (+0.5 percent). Understanding the Brain (UtB), which improves scientific understanding of the complexity and function of the brain, would receive \$123.4 million in FY 2020, 22 percent below FY 2018.

Cross-cutting programs would receive funding cuts all across the board. The Long-Term Ecological Research (LTER) network would receive \$28.4 million, 3.5 percent below FY 2018. The Research Experiences for Undergraduates program would be slashed by 12.7 percent compared to FY 2018. Graduate Research Fellowships would be cut by 10 percent compared to FY 2018 to \$257 million and support for NSF's Research Traineeship program would be decreased by 8 percent below FY 2018 to

\$49.5 million. Support for Faculty early career development programs would also be cut by 13.2 percent compared to FY 2018.

### *NSF's Biological Sciences Directorate*

Overall, the BIO directorate is slated for a 9.7 percent cut compared to FY 2018.

The number of BIO research grants awarded would decrease slightly and the median award size would increase slightly from FY 2018. The funding rate for BIO research grants is expected to decrease from 24 percent in FY 2018 to 21 percent in FY 2020, a figure that does not include the pre-proposal review process, where some NSF program solicitations require submission of a preliminary proposal in advance of submission of a full proposal.

NSF's request would provide \$683.4 million in spending for BIO, which provides 69 percent of federal funding for fundamental non-medical biological research at academic institutions. Within the request for BIO, funding would be allocated to the five divisions as follows:

- Molecular and Cellular Biosciences: \$125.8 million (-12.1 percent\*)
- Integrative Organismal Systems: \$169 million (-12.1 percent\*)
- Environmental Biology: \$141.7 million (-8.6 percent\*)
- Biological Infrastructure: \$163.2 million (-10 percent\*)
- Emerging Frontiers: \$83.8 million (-1.5 percent\*)

Major Investments for BIO in FY 2020 include stewardship for Understanding the Rules of Life (URoL), Advanced Manufacturing, Artificial Intelligence, Quantum Information Sciences (QIS), and Understanding the Brain (UtB), which includes the BRAIN initiative. URoL, first introduced in 2017, would continue to emphasize research on how complex traits of organisms emerge from the interaction of its genetic makeup with the environment. BIO would support Advanced Manufacturing in collaboration with the Directorate for Engineering, by supporting advances in synthetic biology. BIO would also support investments in Artificial Intelligence through the Division of Biological Infrastructure by applying machine learning and genetic algorithms in biological research to solve problems such as genome sequence alignment, prediction of protein structure, reconstructing evolutionary relationships, and predicting species distributions. BIO would increase funding for QIS through investments in fundamental research in biophysics to understand quantum phenomena within living systems.

National Ecological Observatory Network (NEON) would receive \$62.6 million in FY 2020, a decrease of almost 8 percent from FY 2018, with their operations and maintenance funding included in the budget for the Division of Biological Infrastructure.

Workforce development programs within BIO would receive decreased support. Support for CAREER grants to support young investigators who excel as educators would decrease by 9.8 percent relative to FY 2018.

## Smithsonian Institution

- *Smithsonian Institution request: \$978 million (-\$64.7 million)*

Federal support for the Smithsonian Institution would decrease by 6.2 percent. The decrease in support is accounted by the fact that in 2019, Congress allocated additional funds for the renovation of the National Air and Space Museum that are not requested in FY 2020. Smithsonian is also funded by private donations and a trust fund.

Facilities Capital account would receive \$219 million (-28 percent), including \$118.4 million for the National Air and Space Museum; \$27.5 million for the National Zoo's ongoing infrastructure work; \$9.7 million for the Hirshhorn Museum and Sculpture Garden; and \$17 million for the future renovation of the Smithsonian Institution Building. The National Museum for Natural History (NMNH) would receive \$1.5 million under the Facilities Capital account to continue major revitalization work. Under the Salaries and Expenses account NMNH would receive flat funding of \$49.8 million.

Essentially level funding is proposed for most of ongoing activities, including the research programs, public programs for dissemination of information, exhibitions, and educational programs.

Funding for preservation of collections would remain essentially flat at \$70 million. Digitization of collections to make them accessible online would remain a priority and would receive an increase of \$1.5 million in funding.

The Smithsonian Environmental Research Center (SERC) conducts research on land and water ecosystems in the coastal zone and would receive \$4.5 million (+6 percent). The Smithsonian Tropical Research Institute (STRI), which works towards understanding the biological and cultural diversity in the tropics would also receive a slight boost of \$216,000 to \$14.7 million. STRI is also slated to receive \$1.7 million under Facilities Capital towards revitalization work. The Marine Global Earth Observatories (MarineGEOs), which assess the health of coastal areas and the oceans to determine how to manage these resources, have six new sites scheduled to be added to the network in FY 2019. This would bring the total number of active Marine GEO sites to 15.

## What's Next?

The President's budget request is only a proposal; it does not have binding authority. Congress uses the President's budget request as a starting point for their budget negotiations. Congress has already begun their consideration of the FY 2020 budget, although it will be several months before any final decisions are made.

## **About AIBS**

The American Institute of Biological Sciences (AIBS) is a scientific association working to increase understanding of all life. The mission of AIBS is to promote the use of science to inform decision-making and advance biology for the benefit of science and society.

AIBS works with individuals and organizations to advance biology through a shared commitment to scientifically informed decision-making. We partner with organizations and individuals to synthesize and integrate the life sciences, identify high quality research for funding, communicate matters of common concern, and connect with their communities for idea and information exchange. AIBS has individual members, member societies, and member organizations that contribute to our work, as well as clients that represent governmental and non-governmental organizations. For more information, please visit [www.aibs.org](http://www.aibs.org).



### **More Resources**

AIBS will continue to report on significant developments in federal science funding, including Congressional appropriations, through the *AIBS Public Policy Report*. To subscribe, please visit [www.aibs.org/public-policy-reports](http://www.aibs.org/public-policy-reports).

Other budget resources are available on the AIBS website, including information on the federal budget process and factsheets on funding for the biological sciences. Please visit [www.aibs.org/public-policy/budget\\_source.html](http://www.aibs.org/public-policy/budget_source.html) for more information.

For questions related to this publication, please contact the AIBS Public Policy Office at [publicpolicy@aibs.org](mailto:publicpolicy@aibs.org).

### **Help Us to Help You**

Financial support from individuals and organizations makes it possible for AIBS to serve the biological sciences community and to help advance a common agenda. Please consider making a contribution to AIBS.

To learn more about AIBS membership visit <http://access.aibs.org/individual.html>. To make a donation that will help us *Bring Biology to Life*, please visit <http://access.aibs.org/donate.html>.