

ANALYSIS OF THE PRESIDENT'S FISCAL YEAR 2022 BUDGET REQUEST FOR BIOLOGICAL SCIENCES RESEARCH AND EDUCATION

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SUMMARY

On May 28, 2021, President Joe Biden released his proposed budget for fiscal year (FY) 2022. The plan would provide \$1.6 trillion for discretionary spending, of which \$769 billion (+16 percent) would be allocated to nondefense discretionary spending and \$753 billion (+1.7 percent) to defense spending. Non-defense discretionary spending includes funding for the National Science Foundation, National Institutes of Health, and other non-defense agencies.

All federal science agencies would receive budget increases in FY 2022 if the President's budget is enacted. The administration proposes \$171 billion for federal research and development, an increase of 9 percent relative to the FY 2021 enacted level. The proposed budget is subject to congressional appropriations.

Congress completed FY 2021 appropriations on December 27, 2020, nearly three months into FY 2021. This analysis compares budget allocations in the FY 2022 budget request with FY 2021 enacted spending levels.

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.

PLEASE NOTE:

Only discretionary funding is reported in this document. Calculations in this report are relative to the FY 2021 enacted level.

Many federal science agencies received additional funding in FY 2021 under economic recovery measures enacted by Congress to address the impacts of the COVID-19 pandemic. This analysis does not include any COVID-19 relief funding.

AGENCY BUDGET SUMMARIES

United States Department of Agriculture (USDA)

- *Department of Agriculture request: \$30 billion (+\$2.6 billion)*
- *Research, Education, and Economics request: \$4.1 billion (+\$747 million)*

The proposed budget for research, education, and economics is 22 percent above the FY 2021 level.

The National Institute of Food and Agriculture (NIFA) partners with academic institutions to conduct research, education, and extension activities. NIFA would receive \$1.96 billion (+24 percent) in FY 2022. Within NIFA, the Agriculture and Food Research Initiative (AFRI) would receive \$700 million (+61 percent) for competitive extramural research grants. Sustainable Agriculture Research and Education is slated to receive \$60 million (+50 percent) in FY 2022. The Expanded Food and Nutrition Education program would receive a flat budget of \$70 million. The budget includes \$250 million for Minority-Serving Institution (MSI) programs to strengthen research, extension, teaching, and facilities programs at these institutions. Certain research programs such as Alfalfa seed and forage systems (-\$3 million), aquaculture research (-\$2 million), and potato research (-\$2.8 million) would be terminated.

The Agricultural Research Service (ARS) conducts intramural research in the areas of natural and biological sciences. It would receive \$1.9 billion in FY 2022, \$366 million (24 percent) above FY 2021. Funding for ARS would include \$92 million for climate science research, \$99 million for clean energy R&D, \$5 million for Climate Hubs, and \$95 million for the Advanced Research Projects Agency–Climate housed at the Department of Energy. Funding for all eight research areas within ARS would increase, resulting in an overall budget of \$1.6 billion (+16 percent). Livestock protection research would receive a 15 percent boost, while crop protection research would grow by 6 percent. Research in support of environmental stewardship would receive \$313 million (+24 percent). The budget would provide \$49 million in new funding for research program improvements and operations at the National Bio and Agro-Defense Facility (NBAF)—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. The request also includes \$45 million for renovations at the Beltsville Agricultural Research Center in Maryland.

USDA Forest Service

- *Forest Service request: \$6.3 billion (+\$905 million)*
- *Forest and Rangeland Research request: \$314 million (+\$55 million)*

Funding for Forest Service (USFS) research would increase by 21 percent, and the agency's overall budget would grow by 17 percent. Research funding at USFS 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 \$300 million in FY 2019 and \$305 million in FY 2020. In FY 2021, however, funding was once again slashed to \$259 million.

The FY 2022 request for USFS prioritizes critical investments to address wildfires, tackle climate change, provide economic relief through job creation, advance racial equity, and further improve environmental work.

Overall, \$626 million would be allocated for the agency's climate agenda. Significant increases are proposed for wildfire risk management (\$400 million) to accelerate restoration of degraded forests and rangelands; climate reclamation (\$100 million) to address orphan oil and gas wells and abandoned mine lands within the National Forest System; climate science (\$37 million); and climate resilience (\$84 million) to increase capacity for carbon sequestration through reforestation, post-fire restoration, mitigating forest pests, and production of sustainable woody biomass for forest products. The plan also includes an increase of \$5 million under Forest and Rangeland Research to support the five USDA Climate Hubs.

The plan describes four priority research areas: applied science to improve forest and grassland conditions, especially science to inform adaptation to climate change and to enhance greenhouse gas mitigation through forest management; forest inventory and trend analysis; wood product and market innovations; and enhanced prediction, planning, decision support, impact assessment, and recovery guidance for the wildland fire system.

The budget provides a flat budget of \$17.6 million Forest Inventory and Analysis to maintain the continuous forest census covering all 50 States, which provides critical information for forest management planning. The plan proposes \$2.1 billion (+\$170 million) for Wildland Fire Management; \$2.4 billion (+\$583 million) for the management of National Forest System lands; \$148 million (+\$8 million) for Capital Improvement and Maintenance; and \$305 million (+\$37 million) for State and

Private Forestry. The Wildfire Suppression Budget Cap Adjustment is \$2.1 billion, an increase of \$80 million from FY 2021.

Department of Commerce

National Oceanic and Atmospheric Administration (NOAA)

- NOAA request: \$7 billion (+\$1.5 billion)

Under the President's budget, NOAA would receive \$7 billion in FY 2022, an increase of 28 percent. A large portion of that budget increase would be directed toward efforts to address the climate crisis.

The request proposes accelerating NOAA's efforts to research, adapt to, and mitigate the impacts of climate change through \$855 million in targeted investments in the areas of research (+\$149 million), observations and forecasting (+\$368 million), restoration and resilience (+\$259 million), offshore wind (+\$20 million), and enhancing equity (+\$58 million).

The Office of Oceanic and Atmospheric Research would receive \$816 million, a 34 percent increase from the 2021 enacted level. Climate research activities would grow by 62 percent to \$294 million. Competitive grants for climate change research, would receive a more than 100 percent boost to \$131 million. Funding for the Ocean, Coastal, and Great Lakes Research program would be augmented by 28 percent to \$295 million. Support for the National Sea Grant College Program, which supports more than thirty American universities that conduct research, education, and training programs on ocean-related topics, would increase by 47 percent.

The National Marine Fisheries Service would receive a 14 percent boost in discretionary funding to \$1.2 billion, with significant increases proposed for Protected Resources Science and Management (+17 percent), Fisheries Science and Management (+10 percent), and Habitat Conservation and Restoration (+75 percent).

The FY 2022 budget proposes a large boost in funding for the National Ocean Service (+39 percent). Significant increases are proposed for coastal science and assessment (+45 percent) as well as the navigation, observations, and positioning activity (+24 percent). Other programs would also receive significant increases, including the National Estuarine Research Reserve System (+49 percent), coastal zone

management grants (+38 percent), coastal zone management services (+41 percent), and the coral reef program (+31 percent).

The request proposes to expand the Office of Education's budget by 25 percent to \$41 million. The office supports STEM education and training activities across NOAA through competitive scholarships, internships, and professional training programs for post-secondary students.

National Institutes of Standards and Technology (NIST)

- *NIST request: \$1.5 billion (+\$463 million)*
- *Science and Technical Research Services request: \$916 million (+\$128 million)*

NIST is charged with promoting U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. The agency would receive a 45 percent budget increase in FY 2022, with a significant portion of that increase going towards expanding its manufacturing programs.

The Scientific and Technical Research Services (STRS) account would grow by 16 percent. The budget proposes new investments in key priority areas, including climate and energy (+\$20 million), bioeconomy (+\$14 million), artificial intelligence (+\$15 million), quantum science (+\$15 million), advanced communications (+\$12 million), microelectronics (+\$10 million), circular economy (+\$5 million), and equity and diversity in the workforce (\$+5 million). Laboratory programs, which provide industry, academia, and other federal agencies with research capabilities in measurement science, would receive \$806 million (+17 percent).

The Industrial Technology Services account would grow from \$167 million to \$442 million, which translates to a 165 percent budget increase. Major new investments are proposed for its manufacturing programs—Manufacturing USA (+\$150 million) and Manufacturing Extension Partnership (+\$125 million).

The budget further proposes a 75 percent increase for the Construction of Research Facilities account, which would receive \$140 million. An additional \$64 million would be allocated for repair and revitalization of NIST facilities.

Department of Energy (DOE)

DOE Office of Science

- *DOE request: \$46.2 billion (+6.6 billion)*
- *Office of Science request: \$7.4 billion (+\$414 million)*
- *Biological and Environmental Research request: \$828 million (+\$75 million)*

DOE Office of Science is slated to receive a 6 percent boost in FY 2021. The Office of Science supports both scientific research and design, development, construction, and operation of scientific user facilities. Approximately 28,000 researchers located at over 300 institutions and the 17 DOE national laboratories are supported by grants from the Office of Science.

The FY 2022 request proposes increased investments in Administration priorities including basic research on climate change and clean energy, fundamental science to transform manufacturing, biopreparedness, and participation and retention of underrepresented groups in research activities. Among the Office of Science's six research programs, biological and environmental research would receive the biggest boost of 10 percent in FY 2022. The other research programs, including basic energy sciences, advanced scientific computing research, fusion energy sciences, high energy physics, and nuclear physics, would receive smaller increases of 2.5 percent or less.

Funding for biological and environmental research (BER) would be augmented by \$75 million to \$828 million. This funding would support research on climate modeling; new activities to examine the global carbon carrying capacity of terrestrial ecosystems; research on novel quantum sensors for biological systems; activities in advanced manufacturing for new biobased materials; and foundational bioenergy research underpinning new biotechnology and the bioeconomy. Under its climate modeling work, BER would initiate new Urban Integrated Field Laboratories to build integrated models and tools that investigate the interdependence of the natural and human components of the climate system. BER would also establish a National Virtual Climate Laboratory, which would serve as a portal to advance access to climate science from the DOE national laboratories. The request also includes funds to initiate planning for a Climate Laboratory, affiliated with a Historically Black College or University (HBCU) or other Minority Serving Institution (MSI).

The FY 2022 request for Biological Systems Science prioritizes core research areas of genomic sciences, including foundational genomics that supports expanded secure biosystems design research to gain the ability to stably and securely modify microorganisms and plants with specific beneficial traits for producing renewable bioenergy, bioproducts, and biomaterials; environmental genomics that supports research focused on understanding soil microbe-plant interactions; new computational bioscience tools; and the four Bioenergy Research Centers. Overall, Biological Systems Science would receive \$407 million, an increase of 1 percent. The budget for Genomic Science would shrink slightly by 0.2 percent, with the Bioenergy Research Centers slated for a flat budget of \$100 million. The Biomolecular Characterization and Imaging Science account would also receive a flat budget, while Biological Systems Facilities and Infrastructure would be allocated a 5 percent boost.

The request for Biological Systems Science includes funds to launch a new Biopreparedness Research Virtual Environment (BRaVE) initiative “to provide a single portal through which a distributed network of capabilities and scientists can work together on multidisciplinary and multiprogram priorities” with the overall goal to understand the function of whole biological systems. BRaVE would receive \$5 million under BER, \$5 million under advanced scientific computing research, and \$9.5 million under basic energy sciences.

The budget would expand funding for all three BER scientific user facilities, namely the Joint Genome Institute (+6 percent), the Atmospheric Radiation Measurement Research Facility (+24 percent), and the Environmental Molecular Sciences Laboratory (+24 percent).

Earth and Environmental Systems Sciences would receive \$422 million (+20 percent) in FY 2022, with funding increases slated for all its accounts, including atmospheric systems research (+8 percent), environmental system science (+36 percent), earth and environmental systems modeling (+7 percent), and facilities and infrastructure (+23 percent). Environmental system science supports the study of terrestrial ecosystems, including the Arctic.

Advanced scientific computing research would receive \$1 billion, an increase of 2.5 percent, with \$404 million (-\$35 million) targeted to the development of exascale computing and \$108 million (+\$9 million) directed to Quantum Information Science (QIS).

The budget for basic energy sciences—which supports research in material physics, chemistry, geosciences, and biosciences—would grow by \$55 million (2.4 percent) to \$2.3 billion. Continued support is proposed for fundamental energy research,

development of clean energy technologies, the Energy Frontier Research Centers, two Energy Innovation Hubs, five research centers for nanoscale science, and the National Quantum Information Science Research Centers. High priority research areas include advanced manufacturing, QIS, critical materials, microelectronics, artificial intelligence, exascale computing, polymer upcycling, biopreparedness, and advancing a diverse, equitable, and inclusive research workforce.

The Science Laboratories Infrastructure account is slated to receive \$295 million, an increase of 23 percent, with the funds directed towards two new construction projects, namely the Critical Infrastructure Modernization Project at Oak Ridge National Laboratory and the Thomas Jefferson Infrastructure Improvements project at Thomas Jefferson National Accelerator Facility, and sixteen ongoing construction projects.

Workforce development for teachers and scientists would grow by 21 percent to \$35 million. The request prioritizes funding for programs that place qualified applicants in STEM learning, training, and research experiences at DOE laboratories. A new activity, Reaching a New Energy Sciences Workforce (RENEW), is proposed to provide workforce training opportunities to underrepresented and underserved groups. The Office of Science would continue supporting the DOE National Science Bowl competition.

Environmental Protection Agency (EPA)

- *EPA request: \$11.2 billion (+\$2 billion)*
- *Science and Technology request: \$830 million (+\$101 million)*

After years of being targeted for budget cuts, EPA is slated for a 22 percent budget increase in FY 2022.

Priorities for the agency include addressing climate change, advancing environmental justice, supporting state, tribal and local partners, and expanding the shrinking agency workforce. According to the request, EPA lost a significant portion of its career staff over the last four years, limiting the agency's ability to effectively carry out its core duties and functions. Under the FY 2022 budget request, the agency would increase the number of full-time-equivalent staff positions by more than 1,000—from 14,297 to 15,324.

The request allocates \$1.8 billion to tackle the climate crisis and directs half of this investment toward advancing environmental justice. The budget includes more than \$930 million in funding across programs to launch a new Accelerating Environmental and Economic Justice initiative to increase the number of new grant opportunities available for community-based organizations, indigenous organizations, states, tribes, local governments, and territorial governments.

Scientific research within EPA is slated for a 14 percent boost. EPA Science and Technology, which supports research used to identify and mitigate environmental problems, would receive \$830 million, an increase of \$101 million. A significant portion of this increase would be targeted to climate research. The request includes an additional \$60 million to conduct research on the impacts of climate change on human health and the environment, which would more than double EPA's climate research portfolio. Approximately half of this increase would fund collaborative research in climate adaption and resilience at the new Advanced Research Projects Agency for Climate (ARPA-C), which will be housed within the Department of Energy.

Funding for the Office of Research and Development (ORD) would grow by 17 percent to \$545 million. Within ORD, funding for research on sustainable and healthy communities would increase slightly to \$137 million (+3 percent). The Safe and Sustainable Water Resources account would receive \$117 million (+4 percent) and would prioritize research on PFAS and lead exposure, climate change, harmful algal blooms, microplastics, and water infrastructure. The Chemical Safety for Sustainability research program, which includes research on toxicity, exposure, human health, ecological health, chemical modeling and prediction, would be allocated a 6.5 percent increase. Air and Energy research would be renamed to Air, Climate and Energy Research and would receive a significant boost of 64 percent.

The request for ORD proposes a restructuring to create a Center for Environmental Social Sciences (CESS), which would address the complex interactions between pollution sources, exposures, non-chemical stressors, and communities. The Center would conduct solutions-focused research, support collaborations with communities on environmental justice concerns, and tailor science-based tools and solutions for communities.

Environmental Programs and Management (EPM) would see a boost of 24 percent to \$3.4 billion. The Atmospheric Protection Program, now renamed to Climate Protection Program, would be augmented by 8 percent. The Environmental Justice program would grow from \$13 million to \$300 million. Environmental Education, which supports environmental education to promote public engagement, would

receive flat funding of \$8.6 million. The National Estuary program, which is focused on restoring estuaries and coastal ecosystems, would also receive a flat budget of \$32 million. The wetlands program, which supports the implementation of the Clean Water Act, will receive an additional \$6 million.

Water Quality Research and Support Grants, a congressionally directed competitive grant program to support water quality research, would be eliminated. Congress provided \$29 million in funding for this program in FY 2021, an increase of \$9 million from FY 2020.

Department of Health and Human Services

National Institutes of Health (NIH)

- NIH request: \$52 billion (+\$9 billion)

The President proposes boosting NIH's budget by 21 percent in FY 2022. The leading biomedical research agency in the world is slated to receive budget increases across the board.

Of the \$9 billion increase proposed for NIH, \$6.5 billion would go towards establishing a new agency—the Advanced Research Projects Agency for Health (ARPA-H)—to spur transformational health research innovation and accelerate medical breakthroughs by addressing ambitious challenges that require large-scale, sustained, and cross-sector coordination. Modeled after the Defense Advanced Research Projects Agency (DARPA), the new agency would fund high risk, high-reward research to deliver cures for cancer, Alzheimer's disease, diabetes, and other diseases.

All NIH centers would see their budgets grow:

- National Cancer Institute: +3 percent
- National Heart, Lung, and Blood Institute: +5 percent
- National Institute of Neurological Disorders and Stroke: +11 percent
- National Institute of Allergy and Infectious Diseases: +3 percent
- National Institute of General Medical Sciences: +3.5 percent
- National Institute of Environmental Health Sciences: +14 percent
- National Institute of Mental Health: +5 percent

- National Human Genome Research Institute: +3 percent
- National Institute of Biomedical Imaging and Bioengineering: +3 percent
- National Library of Medicine: +3 percent

The proposal would also increase the Office of the Director's budget by 5 percent. The buildings and facilities account for NIH would see a boost of 25 percent to \$250 million, with the increased targeted to addressing the backlog of maintenance and repair at the agency. An additional \$30 million would be set aside for renovations at the National Cancer Institute's Frederick, Maryland, facility. In addition to efforts to improve physical infrastructure, NIH would receive a \$100 million increase to enhance agency-wide cybersecurity efforts.

The request proposes a \$100 million increase for research on the human health impacts of climate change. This funding would support extramural research to understand health-related climate vulnerability and building health resilience, with particular emphasis on "populations of concern," including children, the elderly, outdoor workers, and those living in disadvantaged communities.

Another priority for NIH in FY 2022 would be tackling structural racism and racial inequities in the biomedical research enterprise. NIH proposes to increase funding for its Office of Scientific Workforce Diversity by \$16 million to \$22 million. The office leads the agency's UNITE initiative, which aims to identify and address structural racism within the NIH and biomedical research communities and conduct new research into health disparities, minority health, and health inequities. The NIH-wide UNITE initiative will work to attract and retain scientists from underrepresented groups, address racial disparities in grant success rates, and improve the transparency of workforce demographic data.

The budget for NIH also includes \$496 million (+23 percent) in funding made available through the 21st Century Cures Act. NIH will continue to support research to improve influenza vaccines. The plan would also provide \$3.1 billion, a small increase of \$10 million from FY 2021, for the NIH-sponsored Centers for AIDS Research.

The request includes \$2.2 billion to address the opioid crisis, an increase of \$627 million over the FY 2021 enacted level. \$405 million (+\$135 million) would go towards the Helping to End Addiction Long-Term (HEAL) 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: \$1.6 billion (+\$312 million)*
- *Management of Lands and Resources request: \$1.5 billion (+\$272 million)*

The budget for BLM would increase by 24 percent in FY 2022. Support for Management of Lands and Resources would grow by 23 percent.

BLM's budget request would support the Administration's priorities by strengthening climate resilience and conservation partnerships, overseeing the development of clean energy on public lands, creating jobs, and enhancing recreational opportunities. The request includes \$24 million in new investments to conserve and restore public lands to improve land stewardship and resiliency and also help mitigate the impacts of climate change. An increase of \$25 million is proposed for efforts to promote and facilitate renewable energy development.

The Wildlife and Aquatic Habitat Management activity would receive \$237 million (+26 percent) in FY 2022, with \$157 million for wildlife habitat management and \$80 million for aquatic habitat management. Overall, the aquatic habitat management sub-activity would be augmented by \$24 million. An increase of \$5 million under aquatic habitat management would target invasive species control and eradication. \$4.5 million would be allocated to land restoration efforts to combat climate change.

The wildlife habitat management sub-activity would see an increase of \$24 million. Of that increase, \$6 million would go towards efforts to identify, protect, conserve, and restore wildlife migration for big game, migratory birds, pollinators, and at-risk species. A \$3 million increase would support postfire restoration and identify habitat areas with the potential to be restored to achieve climate resilience and increase carbon sequestration.

The Land Resources activity would receive a significant boost of 25 percent. Rangeland Management would grow by 18 percent and Cultural Resource Management would increase by 8 percent. Funding for Public Domain Forest Management would expand by 45 percent, while Wild Horse and Burro Management would receive a 32 percent boost to support the health and resilience of rangelands.

National Monuments and National Conservation Areas would receive a budget of \$68 million (+48 percent). The Resource Protection and Maintenance activity would receive a 42 percent boost, with its Abandoned Mine Lands and Hazardous Materials Management account receiving \$65 million (+70 percent) in funding.

United States Fish and Wildlife Service (USFWS)

- USFWS request: \$1.9 billion (+\$331 million)

The proposed budget includes a 21 percent overall increase 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 \$1.7 billion (+22 percent), with funding for Ecological Services being augmented by 23 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 \$22.3 million, an increase of 7 percent. The Conservation and Restoration account would grow by 60 percent to \$55 million.

Funding for habitat conservation would increase by 15 percent to \$81 million. The National Wildlife Refuge System would receive an increase of 16 percent. The account for Conservation and Enforcement would grow by 21 percent to \$190 million, with \$66 million going towards migratory bird management. Fish and Aquatic Conservation would receive a 23 percent boost to \$255 million. The USFWS budget for Science Support would more than double to \$36 million.

The request includes an increase of \$240 million above the FY 2021 enacted level for programs that will contribute to minimizing the impacts of climate change and increase carbon sequestration through conservation. The agency also requests \$14 million to support the Administration's Civilian Climate Corps program.

United States Geological Survey (USGS)

- USGS request: \$1.6 billion (+\$327 million)
- USGS Ecosystems Activity request: \$358 million (+\$99 million)

The budget for the USGS would be augmented by 25 percent. Funding increases have been proposed for USGS programs across the board.

The Ecosystems Mission Area—the primary biological science organization of the Department of the Interior—provides the science needed to achieve sustainable management and conservation of biological resources in wild and urban spaces. The Ecosystems account, which now includes Environmental Health programs, Land Change Science, and the Climate Adaptation Science Centers, would receive \$358 million in FY 2022, 38 percent above FY 2021 enacted levels.

Other mission areas are also slated for budget boosts. Water Resources would receive a nearly 10 percent increase to \$288 million, with the Water Resources Research Act program receiving flat funding of \$11 million. Support for Natural Hazards would grow by 18 percent. This includes programs to monitor earthquakes (+8 percent) and volcanoes (+11 percent). Core Science Systems is slated to get a 35 percent increase, with most of its new funding going to the Science Synthesis, Analysis, and Research Program, which would be funded at \$99 million (+280 percent). The plan would provide \$117 million (+9 percent) for the National Land Imaging Program, including \$32 million to support the launch of Landsat 9 and continue developing sustainable land imaging with Landsat Next in partnership with the National Aeronautics and Space Administration.

The Energy and Mineral Resources Mission Area is looking at a significant increase of 56 percent, with its Mineral Resources program slated for a 44 percent increase and its Energy Resources program receiving a 78 percent boost. The Science Support programs at USGS would receive a 27 percent increase, while the Facilities account would get a 3 percent increase.

All research programs are slated for budget increases relative to FY 2021, including species management research (+\$13 million), biological threats and invasive species research (+\$5.7 million), land management research (+\$18.6 million), water use and availability science (+\$11.5 million), and environmental health research (+\$1 million). Cooperative Research Units (CRUs), which are located on 40 university campuses in 38 states, would receive a small increase of 2 percent. 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.

Major investments have been proposed for climate research. Overall, the budget includes \$205 million in new climate science investments. The National and

Regional Climate Adaptation Science Centers are slated for a 104 percent (+\$43 million) increase in budget to \$84.4 million, with \$10.5 million (+\$10 million) set aside for Tribal Climate Adaptation Science. The Climate Adaptation Science Centers are responsible for developing the science and tools to address the effects of climate change on land, water, wildlife, fish, ecosystems, and communities.

The USGS requests \$60 million to invest in a collaborative climate research partnership with the new Advanced Research Projects Agency for Climate (ARPA-C) housed at the Department of Energy. This collaboration would support high-risk, accelerated research “to achieve transformational advancement in climate adaptation and resilience.”

The proposal includes funding for a new program—Assessment of Biodiversity (+\$5 million)—split equally between the Climate Adaptation Science Centers and Science Synthesis, Analysis, and Research accounts to understand the key linkages between climate change and biodiversity, develop scientific approaches to help reverse the decline of biodiversity, and conduct the first National Assessment of Biodiversity and Ecosystems. Other new climate investments include \$5 million for research on climate-driven biological threats and invasive species, \$10 million to improve resilience to coastal hazards, and \$10 million to improve water prediction and water availability assessments. The budget also proposes a \$20 million increase to study biologic, geologic, and coastal blue carbon sequestration, a \$20 million increase to support the inventory of greenhouse gases, and a \$5 million increase to provide decision tools to support clean energy deployment.

National Science Foundation (NSF)

- *NSF request: \$10.2 billion (+\$1.7 billion)*
- *Research and Related Activities request: \$8.1 billion (+\$1.2 billion)*
- *Major Research Equipment and Facilities Construction request: \$249 million (+\$8 million)*
- *Education and Human Resources request: \$1.3 billion (+\$177 million)*
- *Biological Sciences Directorate request: \$949 million (+\$130 million)*

The President’s budget request proposes increasing NSF’s budget by 20 percent in FY 2022 and creating a new commercialization focused directorate at the science agency.

The President proposes investing \$50 billion over eight years in a new technology directorate at NSF that will collaborate with other directorates and offices within the agency, as well as with other research, innovation, and education stakeholders to “advance science and engineering research and innovation leading to breakthrough technologies as well as solutions to national and societal challenges, sustaining and enhancing U.S. competitiveness on a global stage” and “accelerate the translation of fundamental discoveries from lab to market.”

Overall, the new Technology, Innovation, and Partnerships (TIP) Directorate would receive \$865 million, of which \$200 million would be set aside for new regional innovation accelerators to help expand innovation capacities in communities across the country and \$50 million would go towards the operational budget for an office aimed at accelerating public and private partnerships. The TIP Directorate’s proposed budget includes \$350 million in funding transferred from existing programs.

The Administration requests \$100 million (+50 percent) in FY 2022 for programs aimed at increasing participation in science and engineering of individuals from underrepresented groups. The plan also includes \$1.20 billion for climate and clean energy-related research, including research on atmospheric composition, water and carbon cycles, computational modeling of climate systems, renewable energy technologies, materials sciences, and social, behavioral, and economic research on human responses to climate change. In FY 2022, NSF support for the U.S. Global Change Research Program (USGCRP), which coordinates federal research on climate change and its impacts, would increase by 47 percent to \$762 million.

NSF will continue to invest in its Big Ideas and Convergence Accelerator. Among the research-focused Big Ideas, Understanding the Rules of Life (URoL), Navigating the New Arctic (NNA), Harnessing the Data Revolution (HDR), Future of Work at the Human Technology Frontier, and Windows on the Universe would each receive flat funding of \$30 million in FY 2022. Quantum Leap stewardship activities, which are now managed under the broader Quantum Information Science (QIS) portfolio, would also receive \$30 million. The Convergence Accelerator would receive a flat funding of \$70 million and would be transferred to the TIP Directorate.

Growing Convergence Research at NSF would receive a 51 percent boost, while Mid-scale Research Infrastructure would receive an increase of 53 percent compared to FY 2021. NSF INCLUDES, which supports education and career pathways to help broaden participation in science and engineering and build a diverse and skilled American workforce, would receive \$46.5 million (+133 percent). The NSF Innovation Corps, which improves researchers’ access to resources that help transfer

knowledge to downstream technological applications, would receive flat funding of \$40 million.

Research funding at NSF would be overall augmented by 18 percent. The Research and Related Activities account would receive \$8.1 billion in FY 2022, \$1.3 billion above FY 2021. All research directorates, with the exception of Integrative Activities, would see growth in their funding:

- Biological Sciences Directorate (BIO): \$950 million (+16 percent)
- Computer and Information Science and Engineering Directorate (CISE): \$1.1 billion (+11 percent)
- Engineering Directorate (ENG): \$917 million (+20 percent)
- Geological Sciences Directorate (GEO): \$1.2 billion (+19 percent)
- Mathematical and Physical Sciences Directorate (MPS): \$1.7 billion (+7 percent)
- Social, Behavioral and Economic Sciences Directorate (SBE): \$320 million (+14 percent)
- Office of International Science and Engineering: \$75 million (+47 percent)
- Office of Polar Programs: \$506 million (+5 percent)
- Integrative Activities: \$505 million (-4 percent)
- U.S. Arctic Research Commission: \$1.65 million (+3 percent)

The Education and Human Resources Directorate (EHR) would operate at \$1.3 billion, 16 percent above FY 2021. Within EHR, the Division of Undergraduate Education would see their budget increase by nearly 5 percent, while the Division of Graduate Education would receive an 11 percent boost compared to FY 2021. EHR would allocate \$9 million for biotechnology through research and workforce development programs. The Graduate Research Fellowship Program would be consolidated within EHR in FY 2022 and would receive a funding increase of 12 percent to \$319 million. Funding for the NSF Research Traineeship program would remain flat at \$58 million.

Support for Major Research Equipment and Facilities Construction (MREFC) would receive a small increase of 3 percent to \$250 million in FY 2022. Agency Operations and Award Management would receive a 25 percent boost, while support for the National Science Board would increase by 2 percent.

Cross-cutting programs at NSF would also receive funding increases in FY 2022. The Long-Term Ecological Research (LTER) network is slated to receive \$33.5 million, nearly 4 percent above FY 2021. The Research Experiences for Undergraduates program would be funded at \$85 million (+3 percent). Support for Faculty early

career development programs or CAREER grants would grow by 10 percent compared to FY 2021.

NSF's Biological Sciences Directorate

Overall, the BIO directorate is slated for a 16 percent increase compared to FY 2021.

The number of BIO research grants awarded and the median award size would increase slightly from FY 2021. The funding rate for BIO research grants is expected to increase from 35 percent in FY 2021 to 37 percent in FY 2022, 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.

Within BIO, which provides about 66 percent of federal funding for fundamental non-medical biological research at academic institutions, funding boosts would be allocated to each of its five divisions as follows:

- Molecular and Cellular Biosciences: \$171 million (+10 percent)
- Integrative Organismal Systems: \$227 million (+10 percent)
- Environmental Biology: \$196 million (+10 percent)
- Biological Infrastructure (DBI): \$205 million (+23 percent)
- Emerging Frontiers: \$150 million (+37 percent)

The FY 2022 request for BIO recognizes biotechnology as a major research priority. BIO proposes increasing investments in support of the bioeconomy to \$130 million (+18 percent) through research funding programs in synthetic biology, genomics, bioinformatics, biotechnology, and training fellowships to help build the U.S. workforce in this area. Other research directorates within NSF will work together with BIO to make investments in biotechnology, including ENG (\$102 million), GEO (\$10 million), CISE (\$6 million), MPS (\$52 million), and TIP (\$69 million). Overall, biotechnology is slated to receive an investment of \$382 million (+32 percent) in FY 2022. These investments will be coordinated by programs under the TIP Directorate “to translate knowledge and tools into applications that promote the U.S. bioeconomy in public health, agriculture, energy, climate change, and security.”

BIO would prioritize investments in climate change, by increasing support for research to “understand the critical feedbacks between Earth’s biota and the climate system” and to improve predictive models for how climate change will impact critical ecosystems and human communities in urban and rural areas. BIO would

also support research to advance clean energy biotechnologies and practices through fundamental research in systems and synthetic biology, plant genomics, and ecosystem sciences.

Other major BIO investments include stewardship for URoL, advanced manufacturing, artificial intelligence, quantum information sciences (QIS), and improving undergraduate STEM education. In its support for NSF's URoL Big Idea, BIO would invest in multi-disciplinary, team science approaches to achieve a predictive understanding of how complex traits of an organism emerge from the interaction of its genetic makeup with the environment. In collaboration with the Engineering Directorate, BIO would support advanced manufacturing through investments in synthetic biology. Investments in artificial intelligence through DBI would focus on applying machine learning and genetic algorithms in biological research to solve problems such as genome sequence alignment, predicting species range distributions, and predicting protein structure. BIO would also increase funding for QIS through investments in fundamental research in biophysics to understand quantum phenomena within living systems.

The National Ecological Observatory Network (NEON) would receive a total of \$70 million in FY 2022 through DBI, an increase of \$5 million from FY 2021. Support for NSF's fourteen Biology Integration Institutes (BII) would be augmented by 43 percent to \$36 million. The BII program supports collaborative research on frontier questions about life that span multiple disciplines within and beyond biology. The FY 2022 request includes \$4 million for a new center in environmental science and eco-forecasting to leverage data being provided by the NEON, LTER, and other environmental observatories and databases to support community efforts in ecological modeling to enable national eco-forecasting efforts.

Smithsonian Institution

- *Smithsonian Institution request: \$1.1 billion (+\$69 million)*

Federal support for the Smithsonian Institution would grow by 7 percent. This increase includes the congressionally mandated pay raise, funds to continue major renovation projects at the National Air and Space Museum and the Smithsonian Institution Building, and support for establishing two new museums. Smithsonian is also funded by private donations and a trust fund.

The Facilities Capital account would receive \$230 million (+7 percent), including \$56 million to continue the major renovation project at the National Air and Space Museum; \$18 million for the National Zoo's ongoing revitalization work; \$7 million for the Smithsonian Environmental Research Center; \$0.7 million for the Smithsonian Tropical Research Institute; \$11 million for the Suitland Collections Center; \$18 million for the Hirshhorn Museum and Sculpture Garden; and \$9 million for ongoing renovations at the Smithsonian Institution Building or the Castle.

The National Museum for Natural History (NMNH) would receive \$14 million under the Facilities Capital account to continue major revitalization work. Under the Salaries and Expenses account NMNH would receive \$53 million (+4 percent).

Small funding increases are proposed for most ongoing activities, including public programs for dissemination of information (+\$1.6 million), exhibitions (+\$2.4 million), and educational programs (+\$1.3 million). Interdisciplinary research programs are slated to receive an increase of \$11 million. Of that increase, \$4 million would be targeted to biodiversity research, including increased support for the Global Earth Observatory networks and climate change coordination and monitoring.

Funding for the preservation of collections would increase by 6.5 percent to \$80.5 million. Digitization of collections to make them accessible online would remain a priority and would receive an increase of \$7 million or 41 percent in funding. According to the request, "the Institution has insufficient staff to provide optimal care for its collections, and is hindered in strengthening and sharing its collections with diverse national and international audiences." As such, the request includes an increase of \$1.9 million for collections support to rebuild curatorial and collections management staffing and support collections research.

The Smithsonian Tropical Research Institute (STRI), which works towards understanding the biological and cultural diversity in the tropics, would receive a slight boost of 2.5 percent to \$15.6 million. The Smithsonian Environmental Research Center (SERC) conducts research on land and water ecosystems in the coastal zone and would receive \$4.8 million (+3 percent). In 2022, SERC will continue to collaborate with the National Ecological Observatory Network (NEON) and lead in the development of the Marine Global Earth Observatories (MarineGEO) initiative, which tracks changes in near-shore marine ecosystems.

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 2022 budget, although it will be several months before any final decisions are made.

ABOUT AIBS

The American Institute of Biological Sciences is the national scientific organization dedicated to advancing the biological sciences to promote an increased understanding of all life. Our mission is to promote the use of scientific information to inform decision making and advance biology for the benefit of science and society.

AIBS initiatives are unified by a commitment to promoting informed decision-making.

Our strategic priorities include:

- **Publications and Communications** including reliable reports, analyses, and the peer-reviewed journal *BioScience*, which is a forum for integrating the life sciences and educating the public about biological sciences.
- **Scientific Peer Advisory and Review Services** for research proposals and programs sponsored by funding organizations, including the federal government, state agencies, private research foundations, and other non-government organizations, and to educate the community about the science of peer review.
- **Community Programs** that advance the field and profession of biology while promoting and providing leadership, with a particular emphasis on public policy and advocacy, education and professional development, as well as public awareness of science.

AIBS works with any stakeholder that advances the broad field and profession of biology. Organizations partner with us on initiatives, work with us to identify and communicate matters of common concern, and help connect us to their communities for idea and information exchange – particularly regarding public policy, education, public understanding of science, and matters of professional concern.

AIBS has member societies and organizations that support our work financially. AIBS has clients from government agencies to biological societies and other nonprofits that use our expert services for a fee.

More Resources

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For questions related to this publication, please contact the AIBS Public Policy Office at publicpolicy@aibs.org.

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