

## U.S. GLOBAL CHANGE RESEARCH PROGRAM (USGCRP)

### Total Funding for USGCRP

(Dollars in Millions)

	FY 2016 Actual	FY 2017 (TBD)	FY 2018 Request
Biological Sciences	\$103.63	-	\$94.00
Geosciences	185.94	-	140.00
Mathematical and Physical Sciences	8.00	-	-
Social, Behavioral and Economic Sciences	17.98	-	14.98
Office of Polar Programs	15.15	-	15.15
<b>Total, USGCRP</b>	<b>\$330.70</b>	<b>-</b>	<b>\$264.13</b>

NSF addresses global-change issues through investments that advance frontiers of knowledge, provide state-of-the-art instrumentation and facilities, develop new analytical methods, and enable cross-disciplinary collaborations while also cultivating a diverse, highly trained workforce and developing educational resources. NSF's global change-related programs support the research and related activities to advance fundamental understanding of physical, chemical, biological, and human systems and the interactions among them. NSF's existing programs encourage interdisciplinary approaches to studying Earth system processes and the consequences of change, including how humans respond to changing environments and the impacts on ecosystems and the essential services they provide. The Foundation's programs promote the development and enhancement of models to improve understanding of integrated Earth system processes and to advance predictive capability. NSF supports fundamental research on the processes used by organizations and decision makers to identify and evaluate policies for mitigation, adaptation, and other responses to the challenge of a changing and variable environment, as well as the antecedents of and consequences for human behavior. Long-term, continuous, and consistent observational records are essential for testing hypotheses quantitatively and are thus a cornerstone of global change research. NSF supports a variety of research observing networks that complement, and are dependent on, the climate monitoring systems maintained by its federal partners.

### **FY 2018 Areas of Emphasis**

NSF funding for the U.S. Global Change Research Program (USGCRP) in the FY 2018 Request is \$264.13 million. NSF's investments will continue to support research that contributes to the USGCRP Goal Areas to 1) Advance Science and 2) Inform Decisions. In FY 2018, NSF will continue to engage with other USGCRP agencies on priorities from intra-seasonal to centennial predictability, predictions, and projections; water cycle research; understanding the impacts of global change on the Arctic region and effects on global climate; and fundamental research on actionable science. In addition, NSF will further seek the greater integration of social-science research, methodologies, and insights into understanding and supporting responses to global change, improving computing capacity, and maintaining needed observational capabilities over time. The major USGCRP foci for NSF include:

### **Goal 1: Advance scientific knowledge of the integrated natural and human components of the Earth system**

Earth System Understanding: Improving our knowledge of Earth's past and present climate variability and change through Multidisciplinary Earth and Human System Understanding—NSF participates in the Earth System Understanding objective through activities to document and understand long-term climate cycles across the globe, as well as to better understand the natural variability of climate and the processes responsible for global changes using a range of paleoclimate and instrumental data and modeling approaches. NSF also supports activities to improve our understanding of the frequency and intensity of

extreme climate events, particularly wet and dry extremes of the water cycle, their causes, and how those may be manifested in the future. Upgrading and expanding critical environmental observing systems are vital to these efforts.

NSF also supports Earth System Understanding through activities spanning a broad range of disciplines and topics that seek to better understand the physical, geological, chemical, biological, and human components of the Earth system and their interactions. Examples of major foci include fundamental research on all aspects of the carbon cycle, the water cycle, atmospheric composition and greenhouse gas processes, marine and terrestrial ecosystems, and ocean and atmospheric circulations that both drive and respond to climate and global change. Human drivers of change include urbanization, population growth, and economic and technological development over a range of temporal scales. NSF has a strong commitment to fostering new interdisciplinary research approaches that allow exploration of the interdependencies across these areas.

**Integrated Observations and Integrated Modeling:** Improving our capability to model and predict future conditions and impacts—NSF contributes to the Integrated Observations and Modeling objectives through its advanced capabilities to observe the physical, chemical, biological, and human components of the Earth system over multiple space and time scales. Facilities such as the Academic Research Fleet and the National Ecological Observatory Network (NEON) assist the Nation in gaining a fundamental scientific understanding of the Earth as well as monitor important variations and trends that allow the research community to examine major feedback processes between the climate and natural and human systems. Since there is increasingly deep interplay among observations and modeling at multiple spatial and temporal scales, a high priority will be given to developing more complete representations - models of coupled interactive atmospheric chemistry, terrestrial and marine ecosystems, biogeochemical cycling, and middle atmospheric processes. NSF will continue to devote significant resources to advancing climate modeling capabilities from global and centennial to regional and decadal scales. In addition, NSF is encouraging the development of ecosystem and water models at regional scales, as well as models that integrate human system components such as risk, vulnerability, and decision-making.

**Goal 2. Inform Decisions: Provide the scientific basis to inform and enable timely decisions on adaptation and mitigation**

**Inform Adaptation and Mitigation:** Assessing the Nation's vulnerability to current and anticipated impacts of global change through the Science of Adaptation and Science to Inform Adaptation Decisions—A key focus of the USGCRP is developing better means of assessing and responding to the impacts of global change as well as the vulnerability and resilience of both human and natural systems to those changes, particularly in highly sensitive regions such as the Arctic. NSF supports the Inform Adaptation and Mitigation objectives through research contributing to science of adaptation and science to inform adaptation decisions. NSF will support fundamental research regarding the science of adaptation, defined as the adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects. This research ranges from developing the theoretical framework for evaluating adaptation options (and avoiding unintended consequences of adaptation choices) to risk assessment and decision making. NSF will continue interdisciplinary research (including human factors) in water sustainability, resiliency, biodiversity, ocean acidification, and vulnerable areas, particularly in the rapidly changing Arctic.

*U.S. Global Change Research Program*

**USGCRP Funding**

(Dollars in Millions)

	FY 2016 Actual	FY 2017 (TBD)	FY 2018 Request
Integrated Observations	\$80.56	-	\$110.00
Multidisciplinary Earth and Human System Understanding	197.61	-	114.60
Integrated Modeling	36.78	-	26.78
Science of Adaptation and Science to Inform Adaptation Decisions	15.75	-	12.75
<b>Total, USGCRP</b>	<b>\$330.70</b>	<b>-</b>	<b>\$264.13</b>