

THE NATIONAL ECOLOGICAL OBSERVATORY NETWORK (NEON) \$65,000,000
-\$8,930,000 / -12.1%

The National Ecological Observatory Network Funding
(Dollars in Millions)

FY 2019 Actual ¹	FY 2020 (TBD)	FY 2021 Request	Change over FY 2019 Actual	
			Amount	Percent
\$73.93	-	\$65.00	-\$8.93	-12.1%

¹ Includes \$8.93 million for continuity of operations into FY 2020.

The most persistent challenges facing the ecological sciences today are a result of our limited understanding of the complex interactions between living and non-living systems operating over large spatial and temporal scales. Critical global challenges such as ecological effects of increasing atmospheric carbon dioxide, land-use change, emerging infectious diseases, and invasive species highlight the complexity of key processes that are connected across large spatial scales and play out over decades. As these and other threats arise more frequently and spread rapidly across continents, it is critical to improved understanding of ecological changes that the short- and long-term effects of these phenomena be systematically monitored and assessed, as well as become more predictable through mathematical and statistical modeling.

Assessment of ecological processes at a continental scale has been hindered by a lack of infrastructure to enable the research required to address complex ecological issues at the necessary spatial and temporal scales. NEON was designed to address this lack of infrastructure and enable vital research. NEON consists of 81 strategically located field sites (47 terrestrial and 34 aquatic), across 20 eco-climatic domains, with instruments, sensors, cameras, and manual biological and chemical sampling networked into an integrated research platform for regional- to continental-scale ecological research. The sensor networks, instrumentation, experimental infrastructure, natural history archive facilities, and remote sensing are linked via the internet to computational and analytical capabilities to create NEON’s integrated infrastructure.

NEON was constructed to revolutionize ecological research and engage the research and education communities in the use of open data. In doing so, it provides over 170 standardized data products including meteorological, soil, organismal, biogeochemical, freshwater and remote sensing data for ecosystems at various temporal and spatial scales across the United States over a 30-year timeframe.

Using NEON data, scientists across the U.S. are now able to conduct regional- to continental-scale research projects on the fundamental biological processes underlying invasive species, emerging diseases, changing biogeochemical cycles, land-use changes, climatic variation, and biodiversity, as well as other grand challenges in ecological science. Researchers can also arrange to use the Observatory’s infrastructure (field sites, instrumentation, airborne remote sensing, etc.) for their own studies to advance understanding of ecological processes.

Current Status

Battelle Memorial Institute (Battelle) is the current awardee for management of NEON. Battelle is a non-profit professional management organization that operates a number of scientific and technical facilities. Construction of NEON was completed in May 2019. NEON is collecting and analyzing biological and chemical samples, measuring physical properties, transmitting sensor data to headquarters, and delivering processed datasets and data products via the NEON data portal. Cyberinfrastructure enhancements are continuing and have improved data volume handling, processing capacity and capability, data

Major Multi-User Research Facilities

discoverability and accessibility, and data security. Battelle is implementing community engagement plans that will support overall use of the data and resources that are now available to the community. The research community is using NEON data and infrastructure in its research as evidenced by the increase in the number of NSF investigator awards in FY 2018 and FY 2019, and the number of presentations at the 2019 Ecological Society of America and the 2018 American Geophysical Union meetings.

Total Obligations for NEON

(Dollars in Millions)

	FY 2019 Actual ^{1,2}	FY 2020 (TBD)	FY 2021 Request	ESTIMATES ³				
			FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	
Operations & Maintenance	\$73.93	-	\$65.00	\$65.00	\$65.00	\$65.00	\$65.00	\$65.00

¹ \$65,000 was obligated from the MREFC account in FY 2019 to complete project construction requirements.

Approximately \$1.35 million in MREFC funds are being held by NSF to mitigate remaining risks.

² includes \$8.93 million for continuity of operations into FY 2020.

³ Outyear estimates are for planning purposes only. The current cooperative agreement ends FY 2021.

For information on continuity of operations funding, see the opening narrative of this chapter.

Management and Oversight

NSF Structure

The NEON program is managed in BIO, with the Office of the Assistant Director (BIO/OAD) providing policy and programmatic guidance. Oversight resides within the Division of Biological Infrastructure (DBI) and Division of Environmental Biology (DEB). The NEON Program team within BIO consists of DBI and DEB senior managers, program officers, and a project manager. The Integrated Project Team (IPT), chaired by the NEON cognizant program officer and which includes representatives from the BFA Large Facilities Office (LFO) and the BFA Division of Acquisition and Cooperative Support, with additional participation from the Office of Legislative and Public Affairs, BFA Division of Institution and Award Support-Cost Analysis and Pre-Award Branch, Office of General Counsel, Office of International Science & Engineering, and the Office of the Director, as necessary, provides guidance and advice in the review and oversight of the project.

External Structure

In the Spring of 2016, leadership and management of the NEON project was transferred to Battelle, which oversees all aspects of project implementation and coordinates observatory operations. Within Battelle, the observatory director/chief scientist (OD/CS) provides overall scientific leadership and interfaces with the science community and other entities to support the scientific priorities and operations of NEON. A Science, Technology, and Education Advisory Committee (STEAC), composed of members of the NEON user community, provides oversight and guidance to the project and helps ensure that NEON will enable frontier research and education. The work of the STEAC is complemented by several Technical Working Groups that advise Battelle on the technical aspects of the project.

Reviews

The construction close-out review in April 2019 documented the completion of NEON construction scope and transition to operations. External evaluators were tasked with reviewing project documentation and confirm delivery of observatory capacity. Reviews of full operations and maintenance (O&M) are held annually. The 2019 review of O&M emphasized evaluation of data availability, accessibility, and quality; user community engagement; Battelle's cost performance; and the facility's cyberinfrastructure. Progress against the annual program plan and towards implementation of review recommendations is also monitored by BIO via biweekly teleconferences, bimonthly operations reports, and site visits as needed. In addition to these scientific and technical reviews, there are periodic reviews by organizations within BFA. To evaluate

the suite of business systems that support the management of NEON, a Business Systems Review was conducted in FY 2019 and included desk reviews of Battelle's policies, procedures, and technologies as well as site visits to Battelle Headquarters in Columbus, Ohio and NEON Headquarters in Boulder, Colorado.

Operations Costs

Operations and maintenance support began in FY 2014. In August of 2017, a supplemental operations award was authorized. For planning purposes, costs are held constant by BIO at the projected annual operations ceiling of \$65.0 million.

Community Engagement

Battelle's community engagement efforts are led by the OD/CS. The community engagement programs facilitate increased awareness and understanding of ecological change and familiarize people with large, complex datasets. Staff are educating NEON users and the public through a YouTube channel,¹ presentations at local and national meetings, workshops and data institutes, and online learning modules. The data science team is facilitating access to and use of the data with open-source software packages and utilities. BIO and its Advisory Committee have assembled a subcommittee, composed of members of the research community, to evaluate engagement models that will inform a community-based strategy for mobilizing and sustaining NEON users. BIO also engages with other federal stakeholders, including Defense Advanced Research Projects Agency, Department of Energy, Department of Interior (DOI)/National Invasive Species Council (NISC), Department of Agriculture (USDA), DOI National Park Service, USDA Agricultural Research Service, United States Geological Survey, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, and the Smithsonian Institution. Federal stakeholders are engaged through the NEON Interagency Working Group to help maximize the scientific impact of NEON through coordination when advantageous to the project.

Renewal/Recompetition/Termination

In July 2019, the NSF notified NSB of its intention to exercise the option to provide funding to Battelle for a fourth year. Therefore, the current O&M award to Battelle which began in November 2017 now ends in October 2021. Following the notification to NSB, a Dear Colleague Letter was released announcing NSF's intention to openly compete the management of NEON operations and maintenance and encouraging organizations to submit requests for information. The solicitation for the management of NEON operations and maintenance (NSF 20-530)² was released on December 23, 2019. BIO anticipates the timeline of the competition to be somewhat less than two years.

¹ www.youtube.com/neonscience

² www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=505747&ods_key=nsf20530