Testimony of Mr. Tom Jorling
Interim Chief Executive Officer, National Ecological Observatory Network (NEON), Inc.
before the
UNITED STATES HOUSE OF REPRESENTATIVES
Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
on
The National Science Foundation's (NSF)
Major Research Equipment and Facilities Construction (MREFC) NEON Project
March 22, 2012

Chairman Wolf, Ranking Member Fattah, and Members of the Subcommittee, thank you for the opportunity to testify on the FY 2013 budget for the National Science Foundation. My name is Tom Jorling and I serve as the interim CEO of NEON, Inc., a 501 (c)(3) corporation established to implement the NEON – National Ecological Observatory Network – Project supported by the Major Research Equipment and Facilities Construction (MREFC) program of the NSF. We are deeply appreciative of the support this Subcommittee has provided the MREFC account, and NEON in particular, in previous years and hope it will continue as you consider the FY 2013 budget request for the **NSF MREFC account in the amount of $196.17M**. This funding recommendation is essentially level with the FY 2012 appropriation for this account and will allow the continued construction of NEON consistent with the five-year construction schedule developed by the NSF and NEON, Inc. and approved by the National Science Board.

The Challenge

Maintaining this nation's Science and Engineering (S&E) leadership is increasingly seen as a precondition for maintaining US competitiveness on the world stage. In February 2003 the National Science Board said:

> There can be no doubt that a modern and effective research infrastructure is critical to maintaining U.S. leadership in Science and Engineering (S&E). New tools have opened vast research frontiers and fueled technological innovation in fields such as biotechnology, nanotechnology, and communications...Recent concepts of infrastructure are expanding to include distributed systems of hardware, software, information bases, and automated aids for data analysis and interpretation. Enabled by information technology, a qualitatively different and new S&E infrastructure has evolved, delivering greater computational power, increased access, distribution and shared use, and new research tools, such as data analysis and interpretation aids, Web-accessible databases, archives, and collaboratories. Many viable research questions can be answered only through the use of new generations of these powerful tools.

> ...In an era of fast-paced discovery, it is imperative that NSF's infrastructure investments provide the maximum benefit to the entire S&E community. NSF must be prepared to assume a greater S&E infrastructure role for the benefit of the Nation.

Pushing the frontiers of science requires a sustained effort to ascertain the scientific Grand Challenges that beckon our brightest minds, to determine how science and technology can best addresses emerging challenges, and to develop the leadership in turning knowledge into technologies and benefits for society. In order to conduct basic research in every field of S&E, students, teachers and researchers must have access to powerful, state of the art scientific infrastructure: the type of infrastructure that has a major impact on broad segments of S&E disciplines. Large and up-to-date research equipment and facilities are essential to the fundamental process of basic research. These equipment and facilities may consist of multi-user facilities, large-scale computational infrastructures, or networked instrumentation and equipment.

We are entering an era of large-scale, interdisciplinary science fueled by large data sets that will be analyzed by current and future generations of scientists. The rapid pace of changes around the globe has underscored the value of long-term data sets for understanding the context of scientific observations, and for forecasting future conditions. Natural and human-managed landscapes are subject to events and processes that play out over different scales of time and space. Some are rapid and visible, like extreme precipitation, wind, and wildfire events, while others are subtle and play out over decades, like changing ocean temperatures and pH that affect the world's fisheries. Dealing with these challenges calls for a new generation of tools and observational capabilities.

Rising to the Challenge

There is no better generation to handle these long-term challenges than the cadre of early career scientists, engineers, and educators that we have in this country. These individuals have trained for professional and academic careers in a highly connected, fast changing, digital world. Many are eager and ready to tackle data-intensive, data-driven scientific challenges if provided the opportunity and the requisite data. We need modern scientific tools that will allow this generation of scientists to listen to the heartbeat of an entire continental ecosystem, to observe the changing patterns of large-scale oceanic patterns that affect our weather, and to use powerful scientific analysis and visualization techniques to understand the connectivity between the atmosphere, land, and sea.

The successful nurturing of these capabilities depends on the availability and accessibility of data characterizing the structure and function of natural systems. Publicly accessible data represents a potent democratization of science: it opens up the marketplace of ideas, and enables participation by constituencies that were previously

excluded because of barriers related to the capital costs of scientific infrastructure. The Major Research and Equipment Facilities Construction (MREFC) account funds transformational scientific infrastructure entirely consistent with NSF's vision of science entering into an "Era of Observations" and an"Era of Data and Information".

The Major Research and Equipment Facilities Construction (MREFC) Account

The challenges before us represent a unique opportunity for the United States to demonstrate scientific leadership by paving the way forward and building a new generation of powerful tools that are designed to address today's challenges.

NSF describes the NSF Major Research and Equipment Facilities Construction (MREFC) account as providing "unique, transformational research capabilities at the frontiers of science and engineering". Such multi-user facilities are identified through extended engagements with the scientific community, designed using processes that NASA, DOE, and others have developed over decades, and constructed using state-of-the-art technology. As Members of this Subcommittee are aware, Congress, the NSF Inspector General, the National Science Board, and NSF provide stringent oversight of the planning, construction, and operations of all MREFC projects to ensure that taxpayer dollars are spent wisely.

We would like to applaud NSF's stewardship of these facilities. The agency has defined processes that it requires all MREFC projects, including NEON, to follow. These defined processes and an expectation of the timeframes allow us to engage with our user-communities to prepare them for the use of the facility as it gets built, and for when it comes on-line. This allows universities to strategize their hiring strategies, and for our early career scientists to acquire the necessary skills that will allow them to participate in these new scientific enterprises.

One such enterprise that we wish to highlight in this testimony is NEON.

Why NEON

Living systems interact with each other and with the rest of the Earth System at many scales. At a small scale, individual plants exchange energy and matter with the atmosphere to support growth. At a large scale, like that of an entire continent, exchange between biotic components, the atmosphere, and surface water affects climate and hydrology.

NEON is the nation's and the world's first science facility designed to enable (1) understanding and predicting the way ecosystems work and respond to changes, especially at large scales; (2) understanding how ecosystem processes feed back to alter Earth system processes, including climate and hydrology; and (3) understanding the implications of these processes and feedbacks for the human endeavor.

The project is designed to fill a void in observing systems that collect the range of variables needed for a complete view of ecosystem responses to multiple interacting environmental stressors, essential if we are to maintain the ecosystems that support humans and all life.

The concept for the ecological observatory was initiated in 1998 by the National Science Board's Task Force on the Environment. This was followed by workshops conducted by a large segment of the ecological community and a succession of competitive planning grants from NSF. This process culminated in a proposal to construct what was to become the NEON project. There followed a multi-year process involving more than a dozen outside expert review panels convened by NSF, including a Conceptual Design Review, Preliminary Design Reviews and a Final Design Review in 2010. These successful reviews led to approval by the National Science Board and finally authorization for construction from Congress in 2010 as part of the Major Research Equipment Facilities Construction (MREFC) program of NSF.

NEON in the FY 2013 Budget Request to Congress

The total NSF MREFC request for NEON for FY 2013 is $91M. This level of funding would support continuation of civil and facility construction and instrumentation deployment across six geographical regions, and commissioning of the infrastructure in three others. Biological sampling and analysis activities will commence in all constructed and accepted Observatory sites. The funds will also support continuation of the NEON cyberinfrastructure in preparation for serving the freely accessible data to the scientific community. The first NEON airborne remote sensing platform is expected to be completed, fully instrumented, and flight-tested in preparation for delivery to Observatory operations in FY 2014.

The NEON project received its first funding from the MREFC program, $12.58M in FY 2011 and $60.3M in FY 2012. The National Science Board approved plan for the full construction of the Observatory calls for $98.2M in FY 2014, $91.0M in FY 2015, and $80.66M over FY 2016. The National Science Board approved total cost for the construction of the Observatory is $433M.

Summary

We strongly support the FY 2013 appropriations request for the MREFC account, including the request for NEON, because the cutting edge infrastructure is an essential component of the national effort to keep US scientific enterprise at the leading edge. This is vital for advancing science and maintaining the US as the leader in understanding the natural world and all the benefits that can flow from that understanding. Long-term observational data generated by MREFC facilities will open up new opportunities for innovation and discovery that will benefit scores of scientists, engineers, and educators

by lowering barriers to participation at the very edges of science. We appreciate the constraints within the budget process, but urge the Subcommittee to consider the NSF investment in major research equipment and related facilities construction as a critical investment in the future health and well being of the research enterprise -- an enterprise that will fuel this Nation's long term economic competitiveness.

Thank you for this opportunity to present these views. I will be happy to answer any questions or provide additional information.