Forward-thinking report addresses environmental research, education

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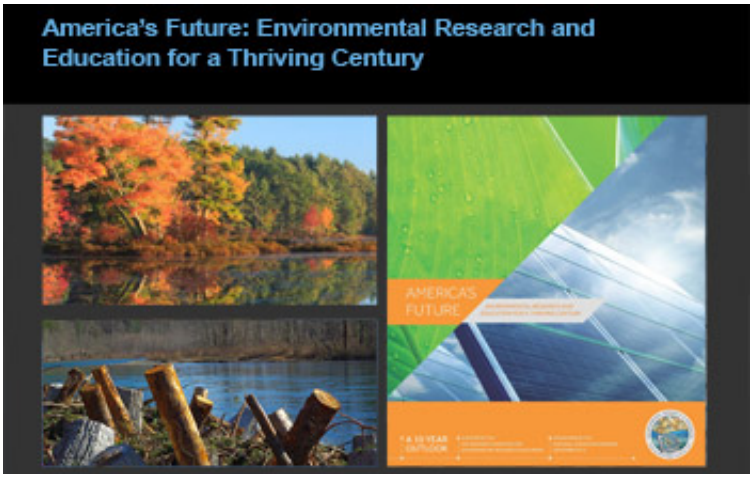


Credit: NSF

The nation is at an environmental crossroads, states a report released today by the National Science Foundation (NSF)'s Advisory Committee for Environmental Research and Education (AC-ERE): "America's Future: Environmental Research and Education for a Thriving Century: A 10-year Outlook."

Climate change in the Arctic, urban growth in Phoenix, West Coast fisheries affected by El Niño, land-use change in New England, nutrients in watersheds in the Midwest—the report finds society is facing a wide array of environmental challenges.

"We're experiencing a time in which human society and technology are increasing the pace and rate of environmental change in ways for which no precedent exists, and which have significant potential consequences," the report states. "Human systems are becoming dominant forces in ecosystems and the environment, resulting in novel landscapes, altered hydrologic and biogeochemical regimes, and new disease pathways."

Importance of environmental science

At the same time those changes are occurring, society has the opportunity to incorporate environmental science as part of the nation's economic engine, improving the welfare of citizens and creating economic opportunities and prosperity for all Americans, AC-ERE members believe.

The report advances the notion that viewing environmental protection and economic prosperity as conflicting goals is outdated. "Environment and development go hand-in-hand with making a nation strong and prosperous," it states.

"Interdisciplinary research and education are essential to carrying out NSF's vision," says James Olds, NSF assistant director (AD) for Biological Sciences and NSF AD coordinator for environmental research and education. "This report is very forward-looking and highlights the current and potential role of science as a catalyst for progress in the coming decades."

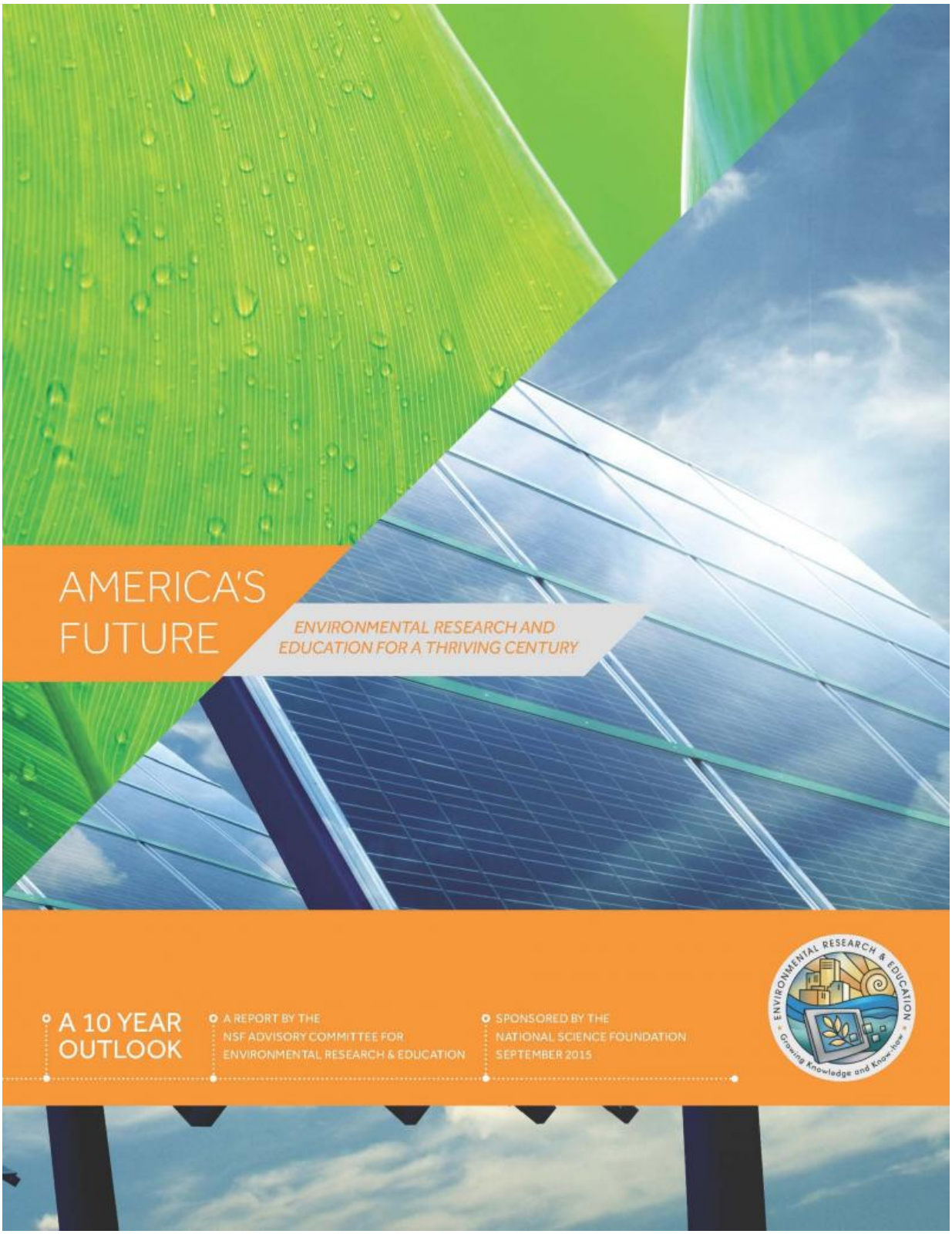
We need to invest in changing the trajectories of current environmental trends away from warming, stress, conflict and vulnerability—and toward resilience, well-being, stewardship and prosperity, the report proposes.

"Whether it's to support sustainable water systems, increased

productivity in natural and managed systems, the design of low-carbon built environments, or reducing risk and increasing resilience in our food and energy systems," says scientist David Skole of Michigan State University and chair of the AC-ERE, "NSF-led environmental science will make significant and lasting contributions to America's future in a thriving century ahead."

Looking to science for answers

Society is increasingly looking to science for answers to help solve current, and prevent future, challenges.



The NSF Advisory Committee for Environmental Research and Education has

released a new report. Credit: NSF

"Scientists are increasingly recognizing the need to work together with decision-makers, educators, community leaders, and other stakeholders to enable research and education that fosters well-being on our dynamic and rapidly changing planet," the report says.

It emphasizes that the environment is a network of complex socio-environmental systems, and stresses the need to integrate our understanding of biophysical processes, social processes and engineered systems.

Following NSF's Science, Engineering and Education for Sustainability (SEES) portfolio, which began in 2010, the scientific community is ready, according to the AC-ERE, for new approaches to research and education that reach across scales and disciplines to provide the basic understanding needed to solve fundamental environmental and societal challenges.

The report states that, of the U.S. federal agencies that fund science, NSF is uniquely poised to establish broad, systems-level approaches needed to understand complex socio-environmental systems at multiple scales and across multiple disciplines.

Advisory committee recommendations

"With the goal of building capacity in environmental problem-solving and design, in the next decade NSF should invest in projects focused on studying best practices and supporting research that will improve methods of connecting science with decisionmaking," the report says.

The AC-ERE recommends that NSF build on its current core and special programs—for example, Dynamics of Coupled Natural and Human Systems (CNH), Innovations at the Nexus of Food, Energy and Water Systems (INFEWS), and Risk and Resilience—to integrate a stable, foundation-wide environmental portfolio across its research and education directorates and programs, creating new programs when needed to address specific research questions and societal-environmental challenges.

Broader impact networks and nodes

Specifically, the AC-ERE proposes creating a program to support Broader Impact Networks and Nodes (BINNs). As envisioned, BINNs would be multi-institutional collaborations to connect education and community engagement professionals with researchers to more effectively accomplish broader impact objectives.

Degraded ecosystems can become more resilient. Credit: WSDOT

BINNs would enable principal investigators (PIs) who receive NSF awards to embed their projects' education and outreach activities in a larger framework. That framework is designed to integrate current learning science and advance innovation in education and outreach, in what the report calls "robust evaluation plans, iterative engagement with adaptive design, long-term relationships with partners, and involvement of underserved populations."

That integrated approach, the report states, "is more likely to have and document significant broader impacts than small-scale and uncoordinated activities of individual investigators. Establishing larger

broader impact frameworks can be achieved through long-term support for networks and nodes which PIs can use in their individual projects."

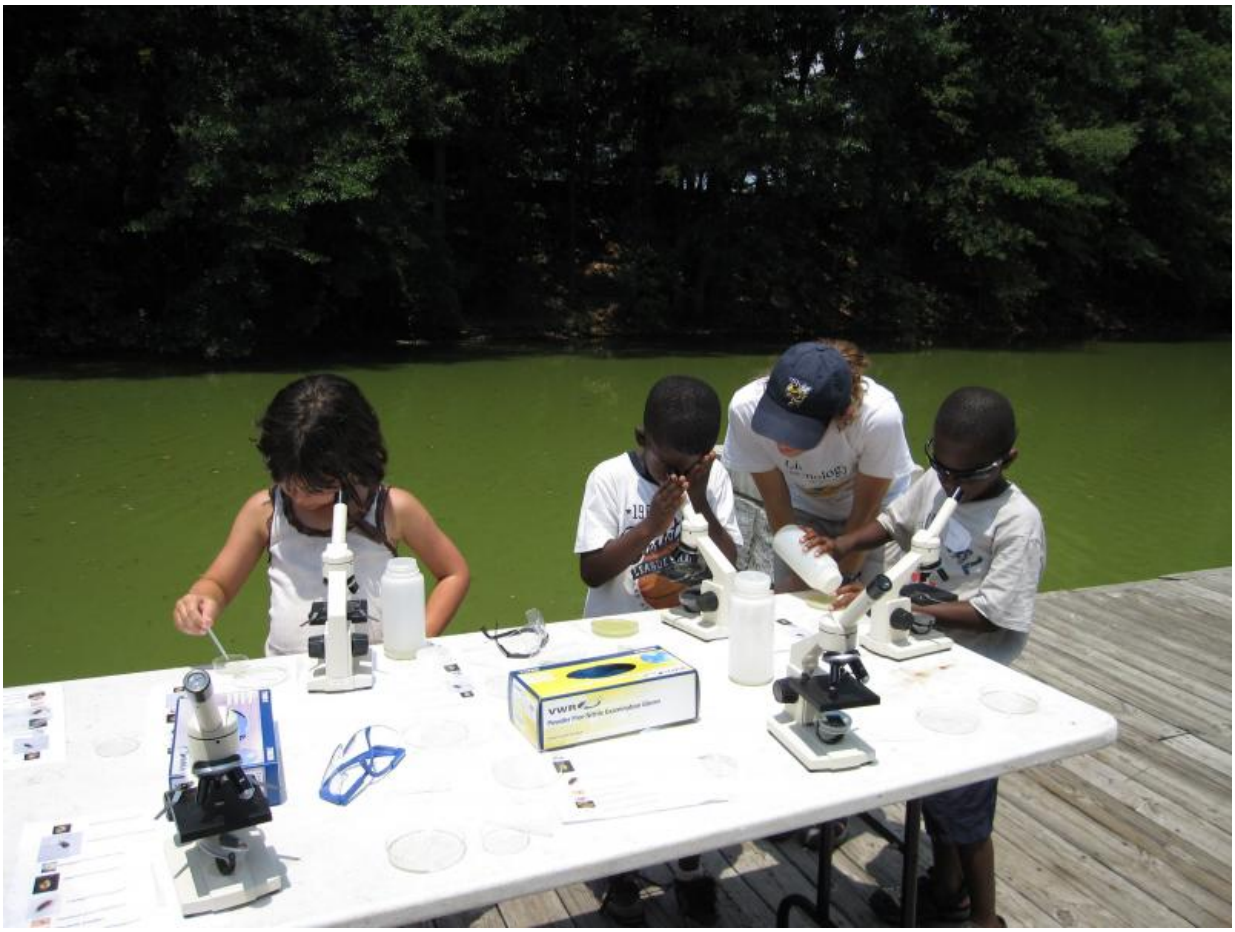
A program that supports BINNs, AC-ERE members believe, "would accelerate transfer of knowledge to the public to create a scientifically literate nation, integrate current learning in science and advance innovation in education and outreach, establish long-term relationships with broader impact partners, target underserved populations, and allocate sufficient funding levels and terms to have the impact that is needed to address these challenges."

Modeled on the NSF Science and Technology Centers, Centers for Ocean Science Education Excellence, and Research Coordination Networks, BINNs could be thematic, regional, or institutional, the AC-ERE envisions.

Researchers are creating new materials from coconut fibers once considered "waste." Credit: Essentium Materials Inc.

Environmental challenges and opportunities

The AC-ERE acknowledges that the vision is broad, the challenges enormous, and with current resources that pale in comparison.



Next-generation researchers integrate social science with natural and physical sciences. Credit: Meghan Duffy, University of Michigan

"Our recommendation is to build on the environmental education and research programs developed over the first decade and a half of this century," the report states, "but strategically increase investments through 2025."

The time to begin, say AC-ERE members, is now.

More information: The report is available here: www.nsf.gov/geo/ere/ereweb/ac- … thriving_century.pdf