Taking the long view: US scientists affirm value of long term research

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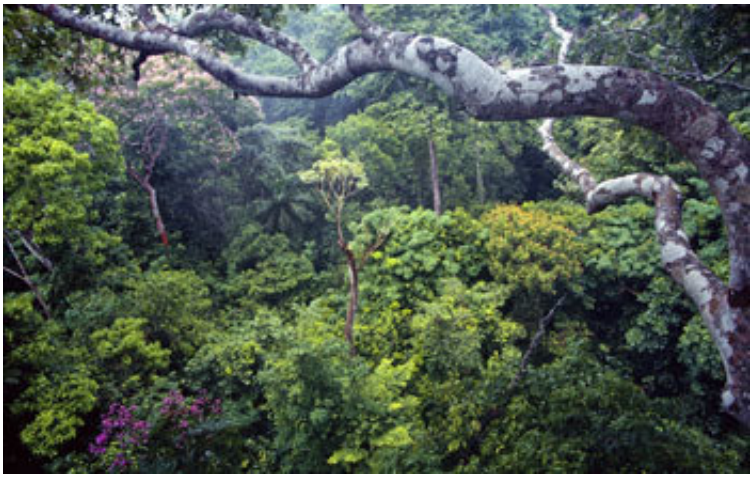

Credit: Yale University

For many years, long-term research has played a key role in revealing the planet's complex ecological and evolutionary dynamics. But some scientists argue that there's a need to revise strategies for long-term research to fill gaps in research, better examine underrepresented fields, and address limits in design and data collection.

What's more, many contend that the benefits and failings of long-term research are typically argued only by a limited number of scientists who have published reports in the field.

A Yale-led survey of 1,179 ecological and evolutionary scientists,

published in the journal *Ecological Monographs*, provides a detailed glimpse into how the U.S. ecological community views the direction of long-term research, the important role it plays in the advancement of knowledge, and specific research areas scientists believe should be treated as priorities. (The researchers defined "long-term research" as projects lasting at least five years.)

According to the survey, which was done in collaboration with polling experts from the Yale Program on Climate Change Communication, nearly 80 percent of respondents believe that long-term experiments have contributed a "great deal" to improved ecological understanding.

In fact, multi-site, long-term research—in comparison with, for instance, short-term, single-site, modeling, or lab experiments—was by far the most highly ranked approach for developing new theory. Observational research methods (monitoring) and experimental approaches were considered equally important.

Respondents also called for a more supportive research environment and funding structure, including stronger institutional acknowledgement of the contributions of long-term research and greater support during the establishment and maintenance of research programs.

When asked which topics or questions should be targeted in future long-term research, respondents most commonly identified the impacts of global change—including climate change, invasion by non-native species, and anthropogenic disturbance.

"Long-term research has been a primary tool for being able to understand how global changes are happening on the ground, particularly as a result of climate change," said Sara Kuebbing, a postdoctoral associate at the Yale School of Forestry & Environmental Studies (F&ES) and lead author of the study. "Almost everyone agrees that it is

critically important and needs to be continued."

That most ecologists and evolutionary scientists believe long-term research is important might not be surprising, said Mark Bradford, a professor of soils and ecosystem ecology at F&ES and co-author of the paper. But he didn't expect that its importance would be rated above all other research approaches.

"There are many different kinds of research going on—including lots of short-term experiments and single-site experiments," he said. "But what came out of this survey is that long-term, multi-site, observational and experimental research was the approach that is generating the most knowledge."

That sentiment stands in notable contrast to some recent research funding decisions. For instance, the U.S. Department of Energy in the past decade pulled the funding on large-scale—and expensive—open-air projects that were aimed to produce a better understanding of how increased carbon dioxide concentrations were affecting tree growth in forests. It was estimated that DOE was spending $3 million annually at an individual site.

"One argument at the time was that we'd learned as much as we could so it was time to redirect the funding, to put it toward other problems," said Bradford. "I think that is a fair justification and a number of scientists were arguing that all these long-term experiments have caveats, so the longer you do them the more they become devalued over time."

"But overwhelmingly the responses that came back in the survey did not support this view. The response for the most part was that experiments don't decrease in value over time, and that caveats don't undermine that long-term value."

Critically, these long-term research projects sometimes yield answers to questions that scientists didn't even know to ask, Kuebbing said. Monthly readings of atmospheric levels of carbon dioxide at the Mauna Loa Observatory in Hawaii, begun in 1958, would eventually provide critical clues about the changing global climate. At the Hubbard Brook Ecosystem Study in New Hampshire during the 1970s, Yale scientists monitoring the long-term effects of deforestation on ecosystems accidentally discovered the impacts of acid rain.

"In this context they had data to show the accumulation of what was happening—and not because they had set out to discover acid rain," said Kuebbing." "This is one of the benefits that many respondents to the survey talked about; long-term research can yield surprise findings that you wouldn't have been able to discover until it was too late."

More information: "Long-term research in ecology and evolution (LTREE): A survey of challenges and opportunities." DOI: 10.1002/ecm.1289 , onlinelibrary.wiley.com/doi/10 … 02/ecm.1289/abstract

Provided by Yale University

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