

Expanding the Integration and Application of Long-Term Ecological Research

Author: Foster, David R.

Source: BioScience, 62(4) : 323

Published By: American Institute of Biological Sciences

URL: <https://doi.org/10.1525/bio.2012.62.4.1>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

PUBLISHER
Richard T. O'Grady

EDITOR IN CHIEF
Timothy M. Beardsley

MANAGING EDITOR
James M. Verdier

BOOK REVIEW EDITOR
PEER REVIEW / PRODUCTION COORDINATION
Jennifer A. Williams

MANUSCRIPT EDITOR
Nathan N. True

Editors: Eye on Education: Beth Baker (educationoffice@aibs.org); Feature articles: Beth Baker (features@aibs.org); Washington Watch: Robert E. Gropp (publicpolicy@aibs.org).

Editorial Board: Agriculture: Sonny Ramaswamy; Animal Behavior: Janice Moore; Animal Development: Paula Mabree; Botany: Kathleen Donohue; Cell Biology: Randy Wayne; Conservation: Nick Haddad; Ecology: Scott Collins, Daniel Simberloff; Ecology and Conservation: David Wilcove; Ecotoxicology: Judith S. Weis; Education: Charlene D'Avanzo; Environmental Microbiology: Rita R. Colwell; Environmental Policy: Gordon Brown, J. Michael Scott; Evolutionary Biology: James Mallet; Genetics and Evolution: Martin Tracey; History and Philosophy: Richard M. Burian; Human Biology: David L. Evans; Invertebrate Biology: Kirk Fitzhugh; Landscape Ecology: Monica Turner; Mammalogy: David M. Leslie Jr.; Microbiology: Edna S. Kaneshiro; Molecular Biology: David Hillis; Molecular Evolution and Genomics: David Rand; Neurobiology: Catherine E. Carr; Plant Development: Cynthia S. Jones; Policy Forum: Eric A. Fischer; Population Biology: Ben Pierce; Professional Biologist: Jean Wyld; Remote Sensing and Computation: Geoffrey M. Henebry; Statistics: Kent E. Holsinger; Vertebrate Biology: Harvey B. Lillywhite.

BioScience (ISSN 0006-3568; e-ISSN 1525-3244) is published 12 times a year by the American Institute of Biological Sciences, 1900 Campus Commons Dr., Suite 200, Reston, VA 20191, in collaboration with the University of California Press. Periodicals postage paid at Berkeley, CA, and additional mailing offices. **POSTMASTER:** Send address changes to *BioScience*, University of California Press, Journals and Digital Publishing, 2000 Center Street, Suite 303, Berkeley, CA 94704-1223, or e-mail customerservice@ucpressjournals.com.

Membership and subscription: Individual members, go to www.aibs.org/aibs-membership/index.html for benefits and services, membership rates, and back issue claims. Subscription renewal month is shown in the four-digit year-month code in the upper right corner of the mailing label. Institutional subscribers, go to www.ucpressjournals.com or e-mail customerservice@ucpressjournals.com. Out-of-print issues and volumes are available from Periodicals Service Company, 11 Main Street, Germantown, NY 12526-5635; telephone: 518-537-4700; fax: 518-537-5899; Web site: www.periodicals.com.

Advertising: For information about display and online advertisements and deadlines, e-mail adsales@ucpressjournals.com. For information about classified placements and deadlines, contact Jennifer A. Williams, AIBS (jwilliams@aibs.org).

Copying and permissions notice: Authorization to copy article content beyond fair use (as specified in sections 107 and 108 of the US Copyright Law) for internal or personal use, or the internal or personal use of specific clients, is granted by the Regents of the University of California on behalf of AIBS for libraries and other users, provided that they are registered with and pay the specified fee through the Copyright Clearance Center (CCC), www.copyright.com. To reach the CCC's Customer Service Department, call 978-750-8400 or e-mail info@copyright.com. For permission to distribute electronically, republish, resell, or repurpose material, use the CCC's Rightslink service on JSTOR at <http://www.jstor.org/rucal/bio>. Submit all other permissions and licensing inquiries through the University of California Press's Rights and Permissions Web site, www.ucpressjournals.com/reprintInfo.asp, or e-mail journalspermissions@ucpress.edu.

Abstracting and indexing: For complete abstracting and indexing information, please visit www.ucpressjournals.com. © 2012 American Institute of Biological Sciences. All rights reserved. Printed at Allen Press, Inc.

BioScience®

A Forum for Integrating the Life Sciences
American Institute of Biological Sciences

Expanding the Integration and Application of Long-Term Ecological Research

In 1980, the National Science Foundation boldly funded six Long Term Ecological Research (LTER) sites to pursue sustained ecological studies. Although they were far sighted, the founders could not anticipate the critical role that their imaginative program would play in meeting twenty-first century demands posed by rapid environmental change. That message, and others, emerges from the six articles in the special section in this issue. The US LTER Network has become a globally important scientific asset; it provides critical site- to regional-scale science to promote continental understanding, and its scenario science, cross-site syntheses, and engagement with decisionmakers are valuable resources for meeting environmental grand challenges.

The first three articles highlight the breadth and application of LTER. Robertson and his colleagues meld historical perspective with vision to demonstrate that the LTER Network is uniquely positioned to leverage the capacity of other existing and emerging programs and observatories by adding biome-specific science, mechanistic understanding, experiments, and socioecological insights (p. 342). In their article beginning on page 354, Driscoll and colleagues show that the LTER Network is addressing environmental challenges by building decisionmaker relationships that engage science in local- to national-scale policy and management issues, integrate local knowledge in research, and promote adaptive management that generates new scientific discoveries. Likewise, Thompson and colleagues cite the contributions of LTER sites to the Millennium Ecosystem Assessment, the Northwest Forest Plan, and the city of Phoenix's water planning to highlight the LTER Network's engagement of regional stakeholders in scenario research that articulates and evaluates alternative socioecological futures (p. 367). The scenarios draw from LTER Network data, regional science, and forecasting to advance science synthesis while increasing the saliency of research.

The mechanistic understanding of ecological processes from LTER science provides key assets for forecasting and many national programs. Knapp and colleagues review the pioneering efforts of LTER scientists in advancing ecosystem manipulations and conclude that major results often emerge only after years of study promoting conclusions that are dramatically different from initial results; that like long-term measurements and well-managed data streams, ecosystem-scale experiments create research platforms for studies and disciplines not part of the original design; and that there is a pressing need for multisite, multifactor experiments across ecosystems (p. 377).

The power of cross-LTER-site integration to yield major insights is revealed by the two final articles. In the first, which begins on page 405, Fountain and colleagues examine the cryosphere—that portion of Earth's surface where water forms ice annually—to compare the impact of climate change on disparate ecosystems. Consistent responses include trophodynamic alterations that cause habitat loss and major shifts in biogeochemical cycles. Jones and colleagues present an integrated and powerful example of comparative long-term studies in which they use the information-management collaborative ClimDB/HydroDB (the Climate and Hydrology Database Projects) to investigate a half-century streamflow from small watersheds across North America (p. 390). Their synthesis confirms that hydrologic responses to climate change have been muted as a consequence of widespread and region-specific ecosystem processes.

Over three decades, the LTER Network of 26 sites has built the capacity across marine, coastal, polar, terrestrial, and aquatic ecosystems for multidecadal measurements; the world's largest collection of large-scale ecological experiments; and comprehensive information management. Guided by a new strategic implementation plan, it will advance basic science and build partnerships with decisionmakers at all levels of society to offer scientific insights and guidance into complex socioecological challenges.

DAVID R. FOSTER

Director, Harvard Forest, Harvard University

doi:10.1525/bio.2012.62.4.1