

Seven take-away messages

Bill Michener

New Mexico EPSCoR

DataONE

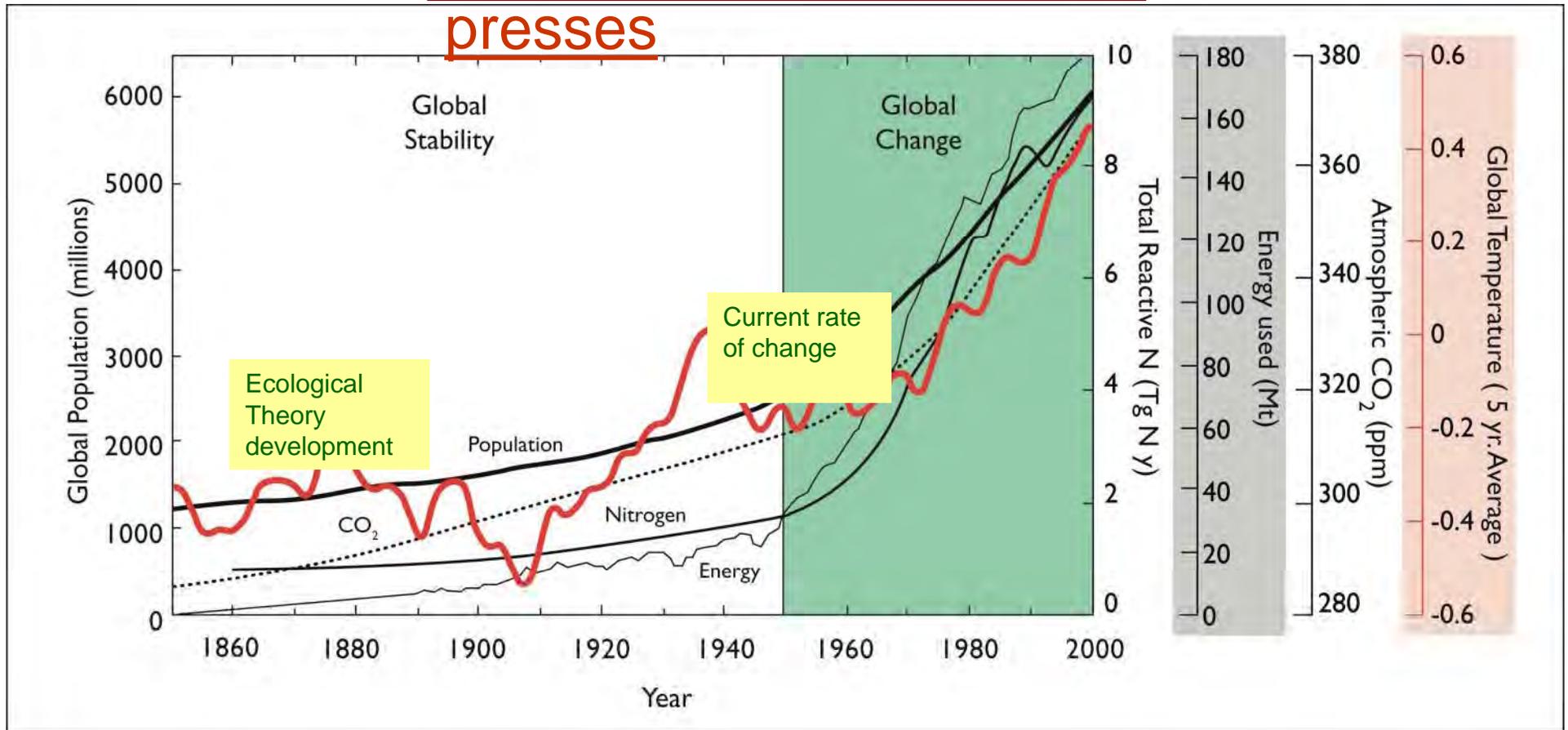


1. Grand challenge ?s dominate science



Social-ecological

presses



Press factor – variable or driver that is applied continuously at rates ranging from low to high (e.g., atmospheric nitrogen deposition, elevated CO₂). Includes changes in rates (increases, decreases) relative to some historical baseline.

POLICY FORUM

Ecology for a Crowded Planet

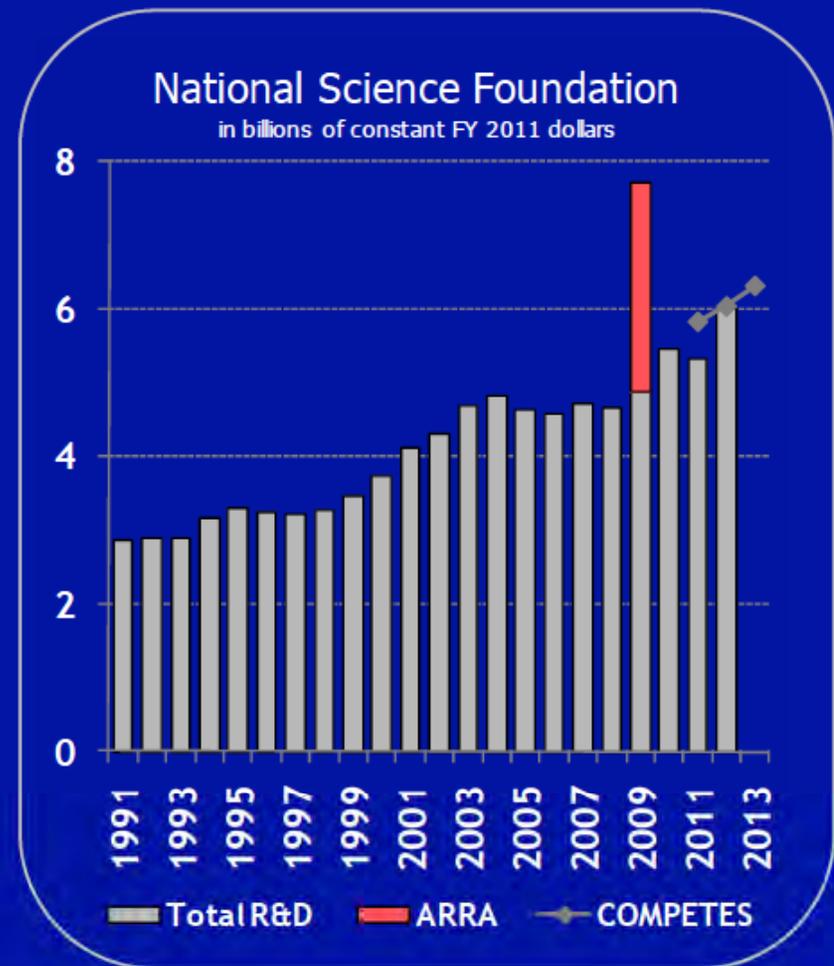
Margaret Palmer,^{1*} Emily Bernhardt,² Elizabeth Chornesky,³ Scott Collins,⁴
Andrew Dobson,⁵ Clifford Duke,⁶ Barry Gold,⁷ Robert Jacobson,⁸ Sharon Kingsland,⁹
Rhonda Kranz,⁶ Michael Mappin,¹⁰ M. Luisa Martinez,¹¹ Fiorenza Micheli,¹²
Jennifer Morse,¹ Michael Pace,¹³ Mercedes Pascual,¹⁴ Stephen Palumbi,¹²
O. J. Reichman,¹⁵ Ashley Simons,¹⁶ Alan Townsend,¹⁷ Monica Turner¹⁸

“Our future environment will largely consist of human-influenced ecosystems, managed to varying degrees, in which the natural services that humans depend on will be harder and harder to maintain. The role of science in a more sustainable future must involve an improved understanding of how to design ecological solutions through conservation, restoration and **purposeful intervention of ecological systems.**”

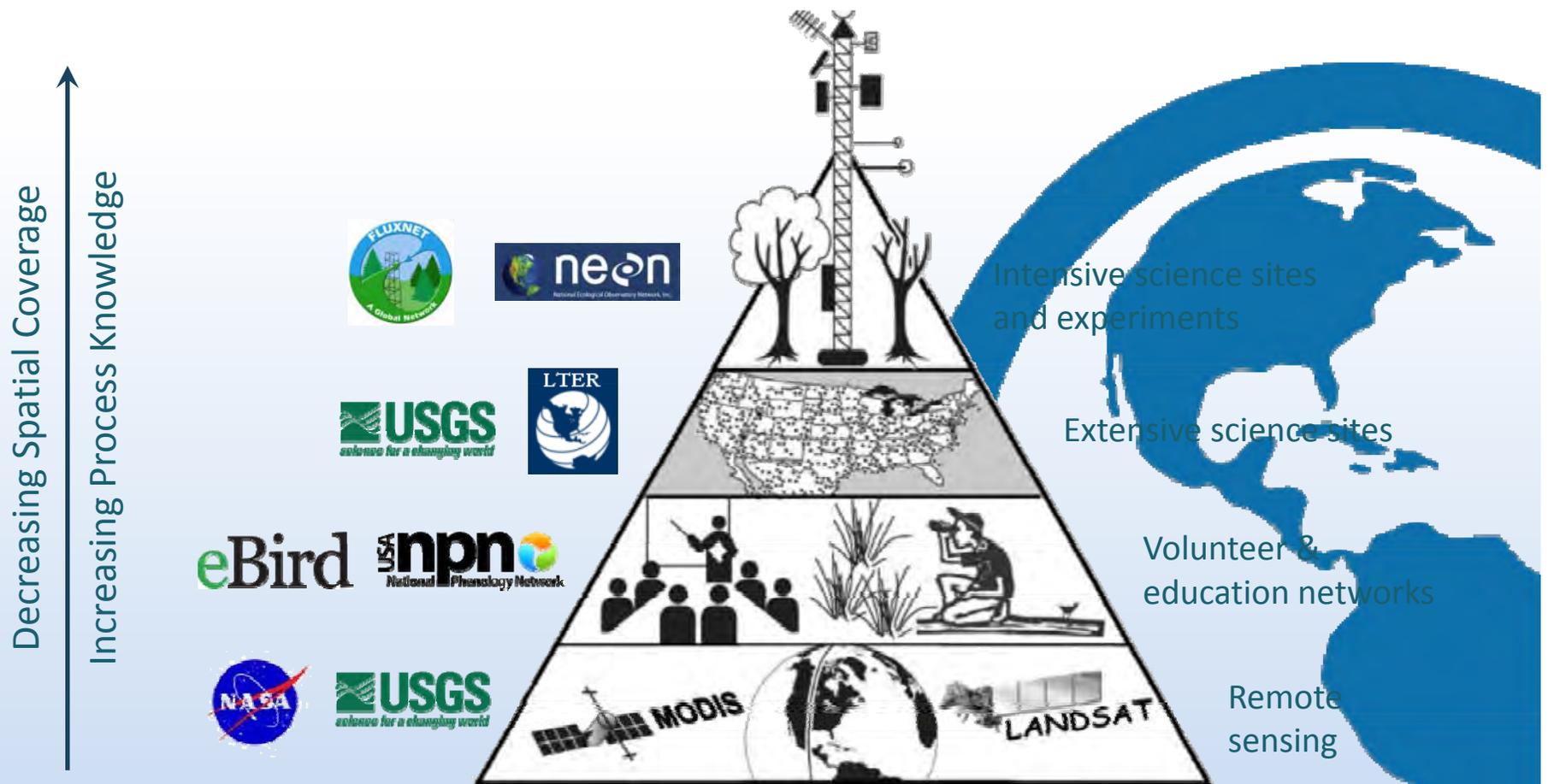


National Science Foundation

- Total Budget
 - FY 11 CR: \$6.8b, -1.0%
 - FY 12 Request: \$7.8b, +14.1%
- Total R&D
 - FY 11 CR: \$5.3b, -1.3%
 - FY 12 Request: \$6.1b, +14.6%
- Clean Energy: \$576m
- Science, Engineering and Education for Sustainability (SEES)
 - \$998m for climate and energy
- Cyberinfrastructure for 21st Century Science and Engineering (CIF21): \$117m



2. Science is becoming a team sport



Adapted from CENR-OSTP



LONG-TERM ECOLOGICAL RESEARCH NETWORK

- Established in 1980
- 26 Sites
- Network Office

LTER CORE AREAS

- Net Primary Production
- Organic matter cycling
- Nutrient cycling
- Population dynamics
- Disturbance



RESEARCH PARTNERS

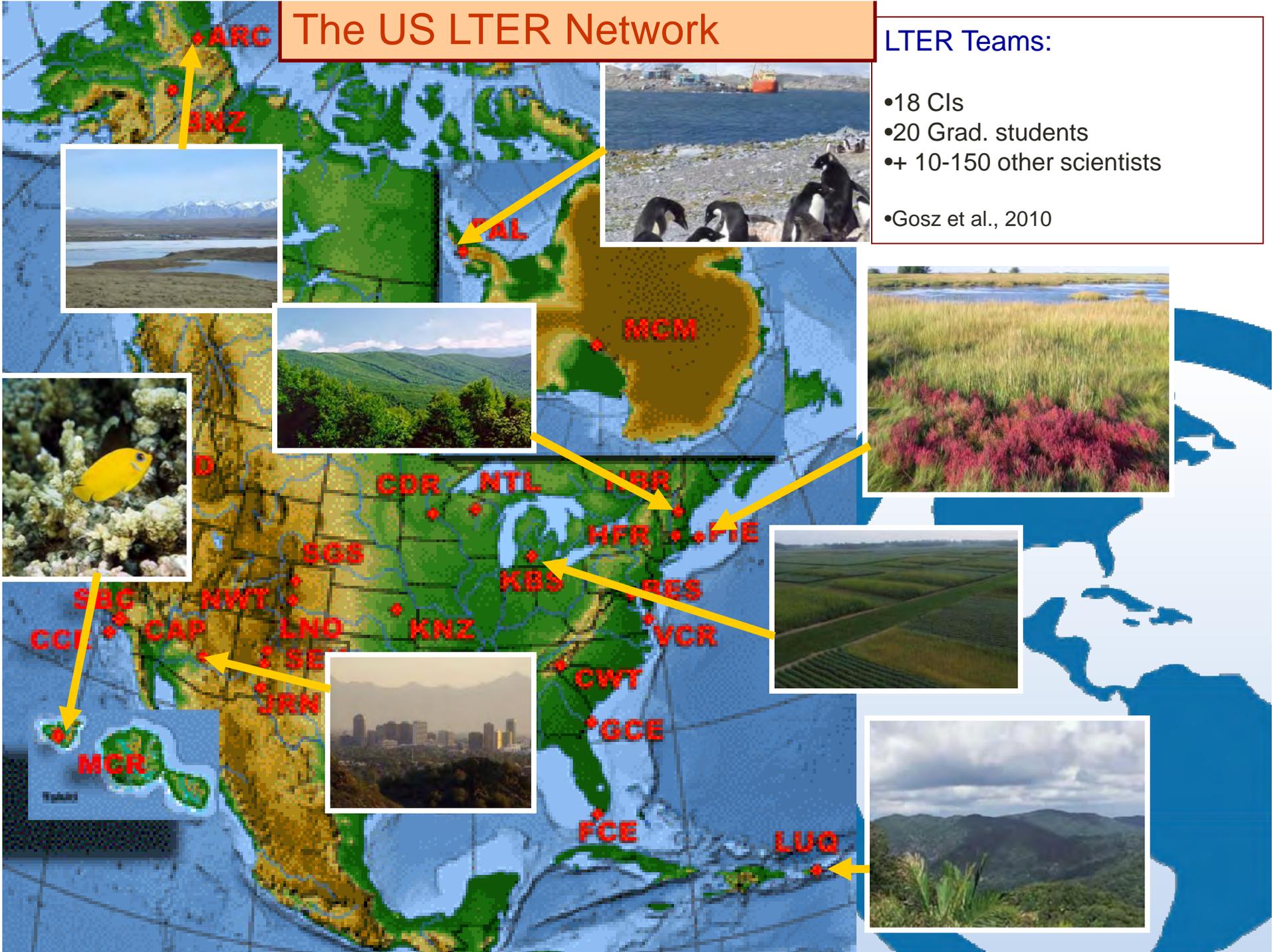
- US Forest Service
- USDA ARS
- Fish and Wildlife Service
- The Nature Conservancy

The US LTER Network

LTER Teams:

- 18 CIs
- 20 Grad. students
- + 10-150 other scientists

- Gosz et al., 2010



Productivity Is a Poor Predictor of Plant Species Richness

Science

AAAS

Peter B. Adler,^{1*} Eric W. Seabloom,² Elizabeth T. Borer,² Helmut Hillebrand,³ Yann Hautier,⁴ Andy Hector,⁴ W. Stanley Harpole,⁵ Lydia R. O'Halloran,⁶ James B. Grace,⁷ T. Michael Anderson,⁸ Jonathan D. Bakker,⁹ Lori A. Biederman,⁵ Cynthia S. Brown,¹⁰ Yvonne M. Buckley,¹¹ Laura B. Calabrese,¹² Cheng-jin Chu,¹³ Elsa E. Cleland,¹⁴ Scott L. Collins,¹¹ Kathryn L. Cottingham,¹⁵ Michael J. Crawley,¹⁶ Ellen I. Damschen,¹⁷ Kendi F. Davies,¹⁸ Nicole M. DeCrappeo,¹⁹ Philip A. Fay,²⁰ Jennifer Firn,²¹ Paul Frater,⁵ Eve I. Gasarch,¹⁸ Daniel S. Gruner,²² Nicole Hagenah,^{23,24} Janneke Hille Ris Lambers,²⁵ Hope Humphries,¹⁸ Virginia L. Jin,²⁶ Adam D. Kay,²⁷ Kevin P. Kirkman,²³ Julia A. Klein,²⁸ Johannes M. H. Knops,²⁹ Kimberly J. La Pierre,²³ John G. Lambrinos,³⁰ Wei Li,⁵ Andrew S. MacDougall,³¹ Rebecca L. McCulley,³² Brett A. Melbourne,¹⁸ Charles E. Mitchell,³³ Joslin L. Moore,³⁴ John W. Morgan,³⁵ Brent Mortensen,⁵ John L. Orrock,¹⁷ Suzanne M. Prober,³⁶ David A. Pyke,¹⁹ Anita C. Risch,³⁷ Martin Schuetz,³⁷ Melinda D. Smith,²⁴ Carly J. Stevens,^{38,39} Lauren L. Sullivan,⁵ Gang Wang,¹³ Peter D. Wragg,² Justin P. Wright,⁴⁰ Louie H. Yang⁴¹



ECOLOGY LETTERS

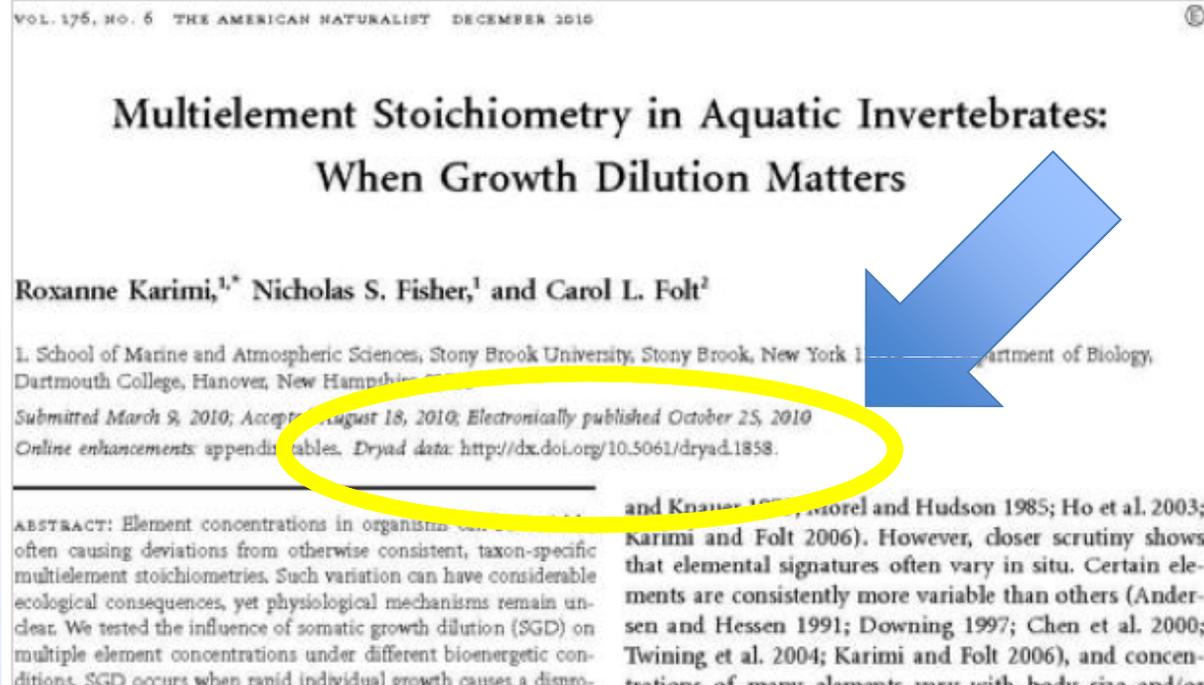
Ecology Letters, (2011) 14: 274–281

doi: 10.1111/j.1461-0248.2010.01584.x

LETTER

Abundance of introduced species at home predicts abundance away in herbaceous communities

3. Data are valuable products of the scientific enterprise



When using this data, please cite the original article:

Ally D, Ritland K, Otto SP (2008) Can clone size serve as a proxy for clone age? An exploration using microsatellite divergence in *Populus tremuloides*. *Molecular Ecology* 17(22): 4897-4911.
doi:10.1111/j.1365-294X.2008.03962.x

Additionally, please cite the Dryad data package:

Ally D, Ritland K, Otto SP (2008) Data from: Can clone size serve as a proxy for clone age? An exploration using microsatellite divergence in *Populus tremuloides*. Dryad Digital Repository. doi:10.5061/dryad.7898

Data discovery is paramount

Data ONE

Search For:
"soil organic carbon"

Results/Page
10

SEARCH

Your search found: 33 documents.
Query: text : soil organic carbon

Filter by parameter

- carbon (15)
- organic matter (9)
- soil moisture/water (8)
- soil ph (5)
- nitrogen (4)
- soil bulk density (4)
- soil chemistry (4)

GLOBAL DATA SET OF DERIVED SOIL PROPERTIES, 0.5-DEGREE GRID (ISRIC-WISE) 01/01/1950 - 12/31/1995

Datasource: ORNL DISTRIBUTED ACTIVE ARCHIVE CENTER FOR BIOGEOCHEMICAL DATA

The World Inventory of Soil Emission Potentials (WISE) database currently contains data for over 4300 soil profiles collected mostly between 1950 and 1995. This database has been used to generate a series of uniform data sets of derived soil properties for each of the 106 soil units considered in the Soil Map of the World (FAO-UNESCO, 1974). These data sets were then linked to a 1/2 degree longitude by 1/2 degree latitude version of the edited and digital Soil Map of the World (FAO, 1995) to generate GIS raster image files for the following variables: Total available water capacity (mm water p...

[View full metadata](#) [Find similar data](#)

SOIL CARBON SEQUESTRATION AND LAND-USE CHANGE PROCESSES AND POTENTIAL 01/01/1883 - 01/01/2010

Datasource: REGIONAL AND GLOBAL DATA

When agricultural land is no longer used for cultivation and allowed to revert to natural vegetation or replanted to perennial vegetation, soil organic carbon can accumulate. This accumulation process essentially reverses some of the effects responsible for soil organic carbon losses from when the land was converted from perennial vegetation. We discuss the essential elements of what is known about soil organic matter dynamics that may result in enhanced soil carbon sequestration with changes in land-use and soil management. We review literature that reports changes in soil organic carbon after...

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SOIL CHEMICAL PROPERTIES FROM CATTLE PASTURE CHRONOSEQUENCES ON SANDY AND CLAYEY SOILS 09/01/1997 - 12/31/1999

Datasource: LARGE SCALE BIOSPHERE-ATMOSPHERE EXPERIMENT IN AMAZONIA (LBA)

INFLUENCE OF AGRICULTURAL MANAGEMENT ON SOIL ORGANIC CARBON (A COMPENDIUM AND ASSESSMENT OF CANADIAN STUDIES) 01/01/1801 - 01/01/2010

Datasource: REGIONAL AND GLOBAL DATA

To fulfill commitments under the Kyoto Protocol, Canada is required to provide verifiable estimates and uncertainties for soil organic carbon (SOC) stocks, and for changes in those stocks over time. Estimates and uncertainties for agricultural soils can

Filter by Data Provider

- Regional and Global Data (1)
- Large Scale Biosphere-Atmosphere Experiment Amazonia (LBA) (6)
- Long Term Ecological Research (LTER) Network (4)
- International Long Term Ecological Research (ILTER) Network (3)
- ORNL Distributed Active Archive Center for Biogeochemical Data (3)
- Forest and Rangeland Ecosystem Science Center (1)

thru

[Help](#) | [clear](#)

List Areas in:

SA WORLD

Select from list

Search Area:

enlaps encloses

North

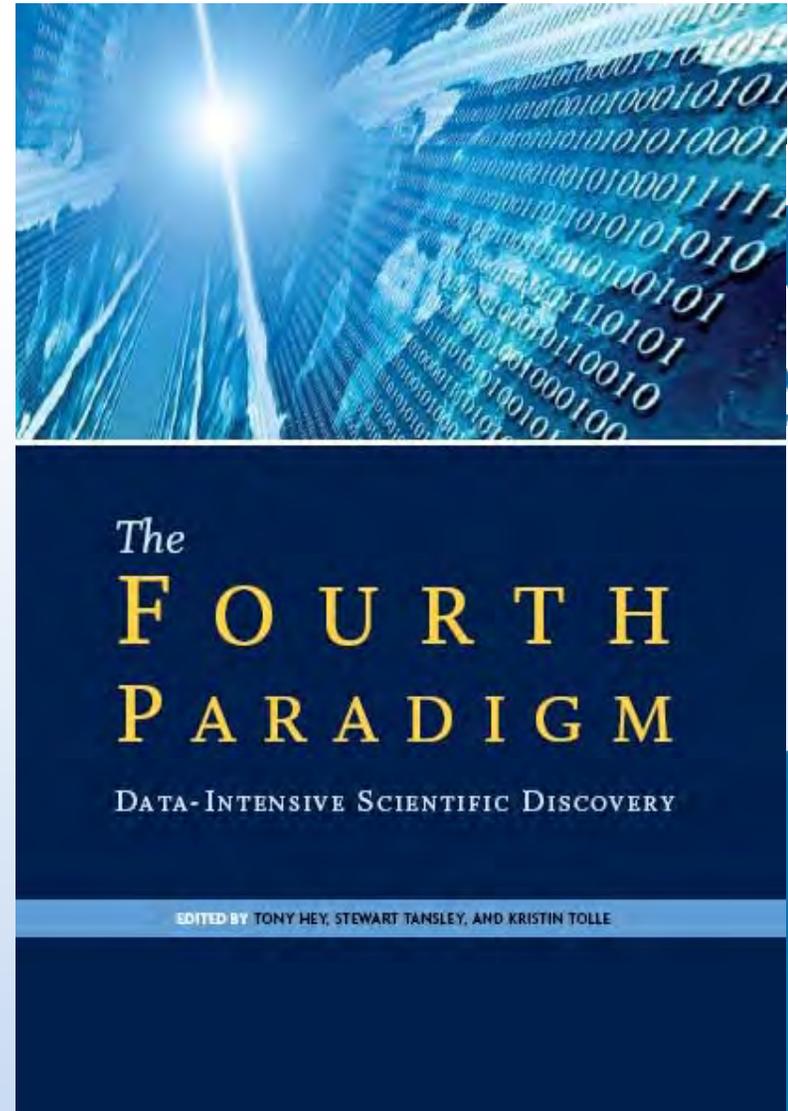
West East

South

4. Data-intensive science reigns

The Fourth Paradigm:

1. Observational and experimental
2. Theoretical research
3. Computer simulations of natural phenomena
4. Data-intensive research
 - **new tools, techniques, and ways of working**



Sensors are everywhere

Sensors, sensor networks,
remote sensing platforms;
humans (citizen scientists)

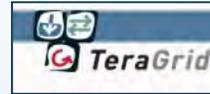


Photo courtesy of www.carboafrika.net

Data discovery, semantic mediation tools, and advanced visual analytics are key



Diverse bird observations and environmental data from 300,00 locations in the US integrated and analyzed using High Performance Computing Resources



$$f(x, y, z) = \frac{1}{n(x, y)} \sum_{i=1}^n f_i(x, y, z) \quad (x, y \in \mathcal{S}_i)$$

Spatio-Temporal Exploratory Model identifies factors affecting patterns of migration



Model results

Occurrence of Indigo Bunting (2008)



- Examine patterns of migration
- Infer how climate change may affect bird migration

eBird



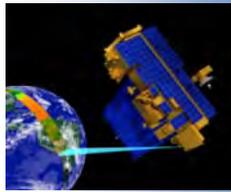
Land Cover



Meteorology



MODIS – Remote sensing data



5. Data management is the new “statistics”



The image shows the cover of a report. At the top left is the DataONE logo, and next to it is the UNM University Libraries logo. On the top right, it says 'Made possible by generous support from Dr. Walter E. Dean'. The main title 'Environmental Information Management Institute' is centered in a large white serif font. Below the title, a photograph shows a grassy field with a stream in the foreground and a forested hill in the background. Two people are visible in the field, one sitting and one standing. The bottom left of the cover contains the dates 'May 23 through June 10, 2011' and the location 'University of New Mexico'. On the right side of the cover, there is a blue silhouette of the United States map.

DataONE

UNM UNIVERSITY LIBRARIES

Made possible by generous support from Dr. Walter E. Dean

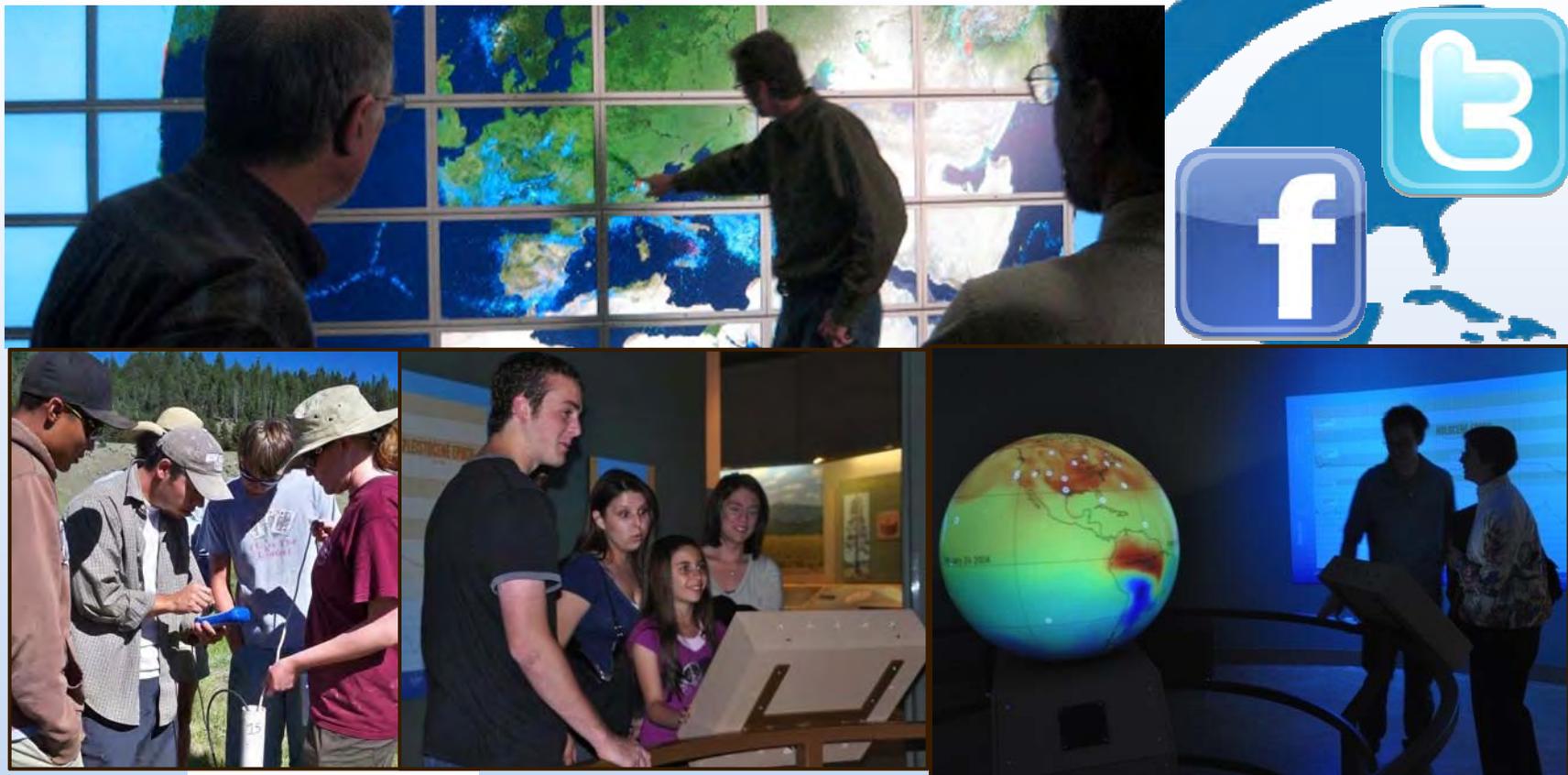
Environmental Information Management Institute

May 23 through June 10, 2011
University of New Mexico

6. New modes of communicating and knowing will/must emerge

“Earth stewardship: Science that facilitates the active shaping of trajectories of social-ecological change to enhance ecosystem resilience and human well-being...a new cutting-edge science that blends disciplinary traditions, diverse ways of knowing, and new ways to identify scientific priorities ”

Chapin et al. 2011 Ecosphere



7. EPSCoR is contributing to understanding and improving



The State of the
Earth 2020

