



NCEAS and the power of synthesis for science and solutions

Jan 18, 2025

Ben Halpern, Director

Dialing Progress





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When NCEAS launched

- Researchers worked in their own silos (i.e., their own labs, their own disciplines)
- Data was the currency of intellectual contribution; people hoarded data
- Collaboration was slow and hard
- We were sitting on enormous amounts of existing data

Synthesis science

Analyzing and integrating disparate data, theories and methods to provide new insight



*“We are drowning in information while starving for wisdom. The world henceforth will be run by **synthesizers** -- people able to put together the right info at the right time, think critically about it, and make important choices wisely.”*

-- E. O. Wilson, Consilience (1998)

Synthesis Center

- Unique amalgam of culture, infrastructure, leadership & support
- Lowers requisite 'activation energy' through:
 - logistical support
 - computing capability
 - complex data management
 - informatics expertise
 - group discussion
 - post-doc & senior fellowships
- Neutral meeting place facilitates creative discovery
- The Santa Barbara effect



1st key innovation: working groups



Synthesis working groups provide:

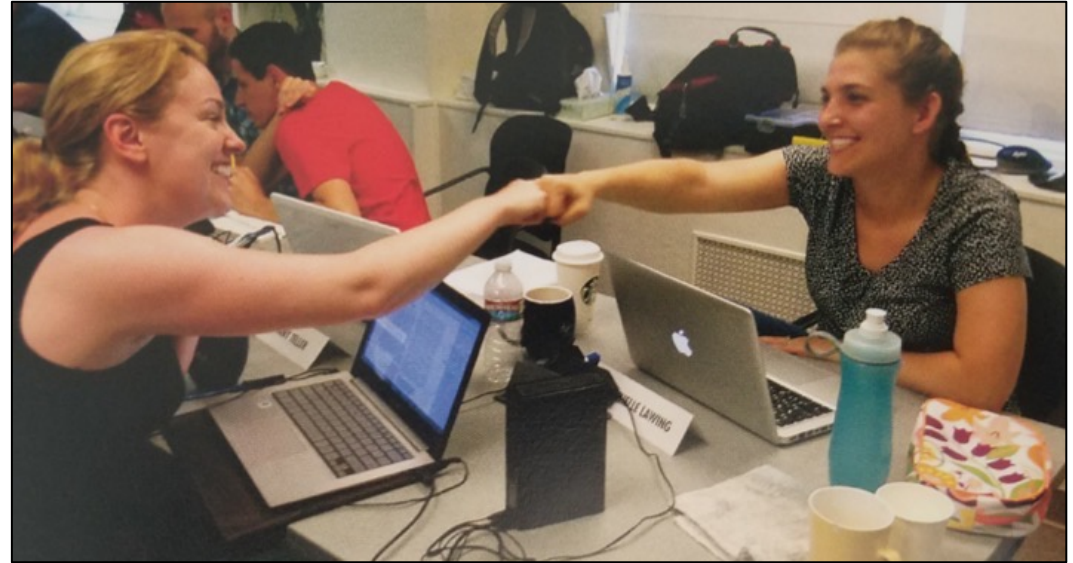
1. Fast, transformative results
2. A key bridge to applied conservation
3. A cost effective way to incubate novel research and take risks

*“A synthesis center is a **cost-effective** vehicle for vetting high-risk, high-impact science.”*

-- Rodrigo et al 2013. PLoS Biology



2nd key innovation: post-doc community



NCEAS post-docs

- Global leaders in ecology and environmental science
- Spreading synthesis science
- Engines for working group productivity



Fio Micheli, Stanford



Elizabeth Borer, UMN



Jordi Bascompte,
U Zurich



Bill Fagan, SESYNC



Jen Balch, EarthLab/ESIIL

NCEAS created a cultural shift

- Data re-use was taboo
 - Synthesis science has since become standard
- Data and idea sharing were rare
 - Now common
- Encouraged shift from basic to applied science



Celebrating 30 years of NCEAS by the numbers

NCEAS is in the top 1% of ecological research institutions worldwide



We have
published over
3,500 scientific
papers



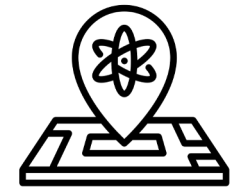
We have
supported nearly
200 postdoc
fellows



Our top ten
papers have over
115,000 citations



We have hosted
over **11,000**
researchers from
70 countries



Our model has
been copied at **30**
global synthesis
centers

Impact

“NCEAS is one of the best things NSF ever did.

It has been an astonishing incubator of creativity -- a place where ideas are born, tested, nourished, transformed, and shared.”

-- Dr. Jane Lubchenco, former NOAA Administrator (21 Mar 2012)



Synthesis science: ecosystem services



Bob Costanza

Citations to date: 35,500!



Synthesis science: shifting baselines



Jeremy Jackson



ECOLOGY THROUGH TIME
REVIEW

Historical Overfishing and the Recent Collapse of Coastal Ecosystems

Jeremy B. C. Jackson,^{1,2*} Michael X. Kirby,³ Wolfgang H. Berger,¹ Karen A. Bjorndal,⁴ Louis W. Botsford,⁵ Bruce J. Bourque,⁶ Roger H. Bradbury,⁷ Richard Cooke,² Jon Erlandson,⁸ James A. Estes,⁹ Terence P. Hughes,¹⁰ Susan Kidwell,¹¹ Carina B. Lange,¹ Hunter S. Lenihan,¹² John M. Pandolfi,¹³ Charles H. Peterson,¹² Robert S. Steneck,¹⁴ Mia J. Tegner,^{1†} Robert R. Warner¹⁵

Citations to date: 8,700

Synthesis science: cumulative impacts



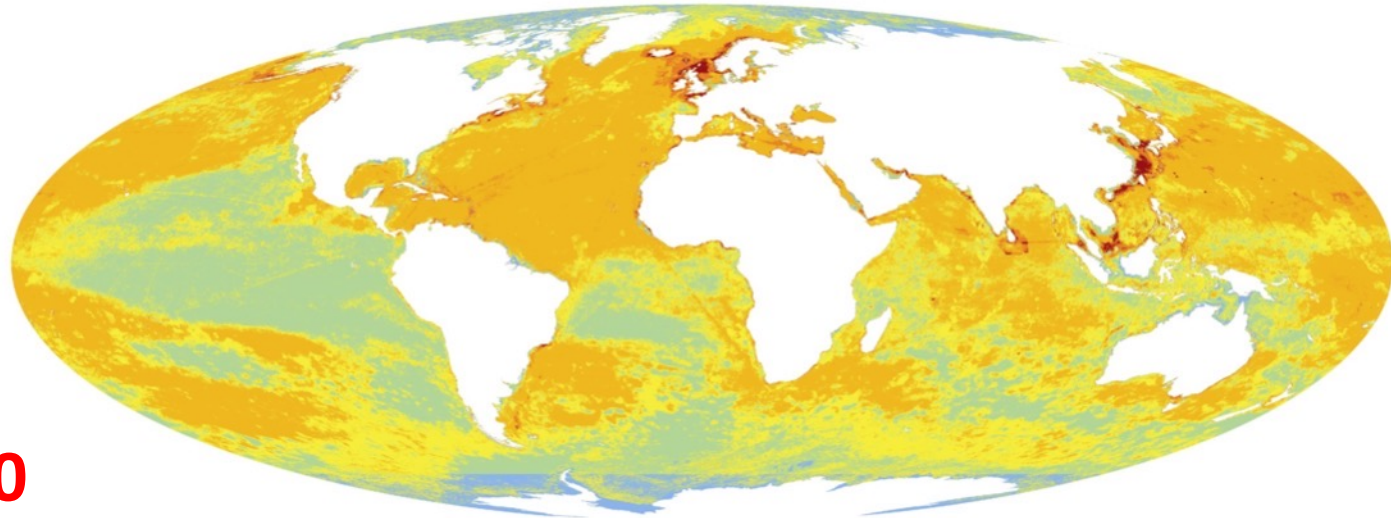
Ben Halpern

Citations to date: 7,700

A Global Map of Human Impact on Marine Ecosystems

Benjamin S. Halpern,^{1‡} Shaun Walbridge,^{1*} Kimberly A. Selkoe,^{1,2*‡} Carrie V. Kappel,¹ Fiorenza Micheli,³ Caterina D'Agrosa,^{4‡} John F. Bruno,⁵ Kenneth S. Casey,⁶ Colin Ebert,¹ Helen E. Fox,⁷ Rod Fujita,⁸ Dennis Heinemann,⁹ Hunter S. Lenihan,¹⁰ Elizabeth M. P. Madin,¹¹ Matthew T. Perry,¹ Elizabeth R. Selig,^{6,12} Mark Spalding,¹³ Robert Steneck,¹⁴ Reg Watson¹⁵

Science
AAAS





community engagement & inclusion

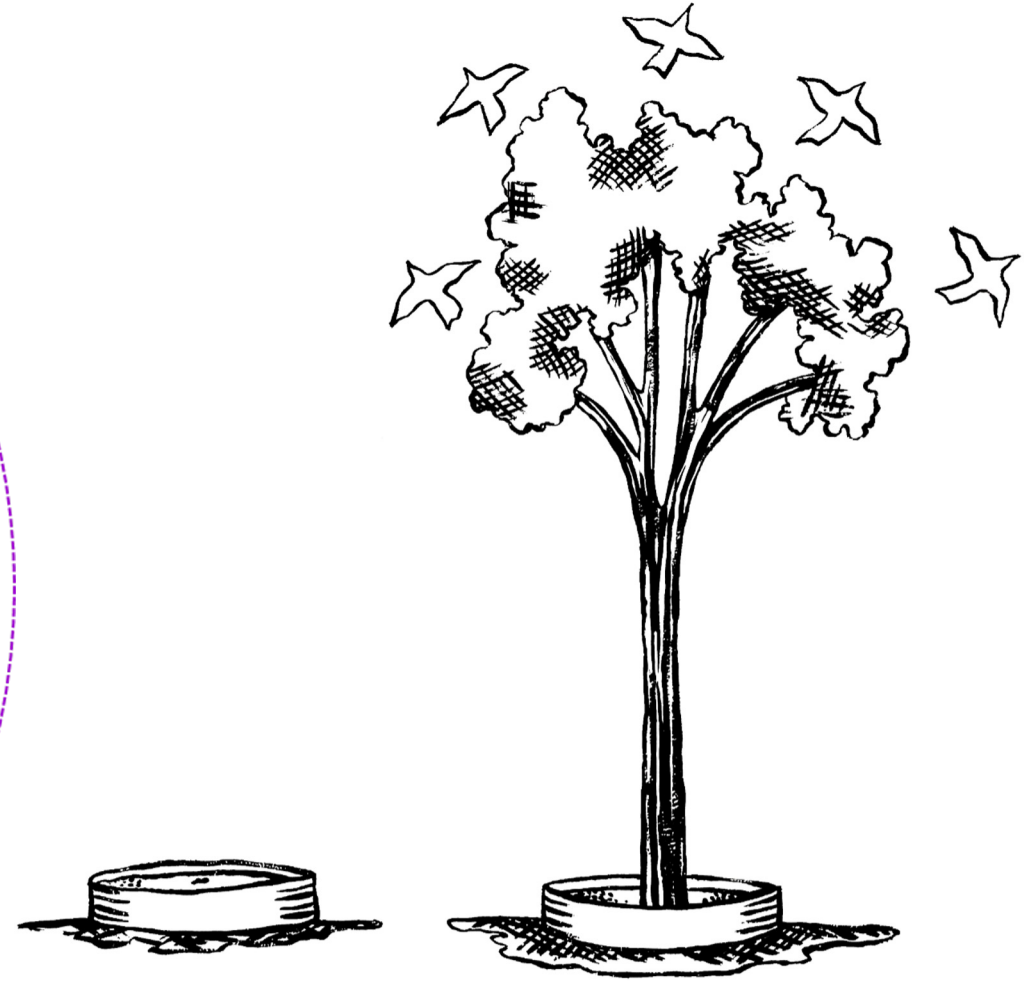
training



data science



synthesis research



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ECOLOGY & ENVIRONMENTAL
SCIENCE



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Aquatic Thiamine
Deficiency



Restoration Impacts
on Fisheries



Climate Change
Driven Fish Shifts



Grassland Bird
Conservation



Prescribed &
Cultural Burns



Pollinators &
Native Landscaping



Kelp Restoration
Framework



Sustainable Fuel
Breaks



Fisheries and
Offshore Wind



Fisheries and
Severe Weather

Research



Synthesis Working Groups and SPARCs

- Since 2016, 17 WGs and 4 SPARCs
- 79 publications
- Annual calls for new WGs and/or SPARCs
- In 2024, launched a year-long, cross-site training and practicum in conducting synthesis ([SSECR](#))



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- ❖ 9 full weeks of training
- ❖ 200+ participants in total;
6 Director's Scholars Awardees
- ❖ Launched new working group series, Cyber2A machine learning

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future**

**thriving
biodiversity**

**healthy
oceans**

**sustainable
food systems**

QUESTIONS?

