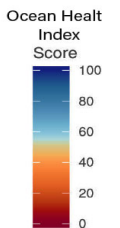
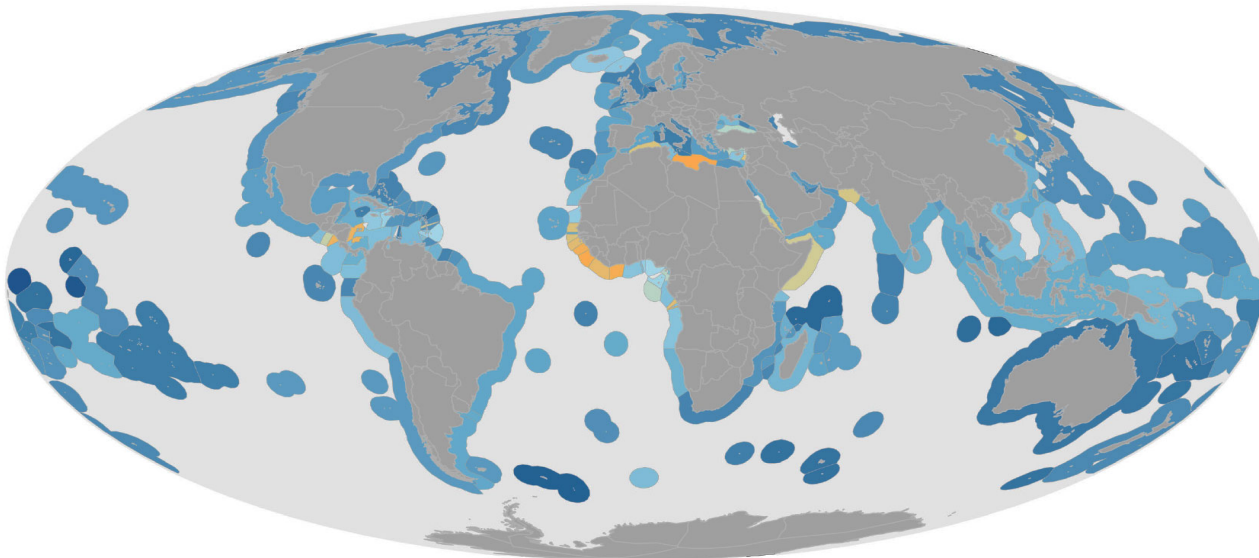
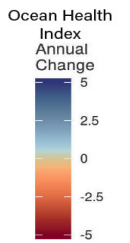
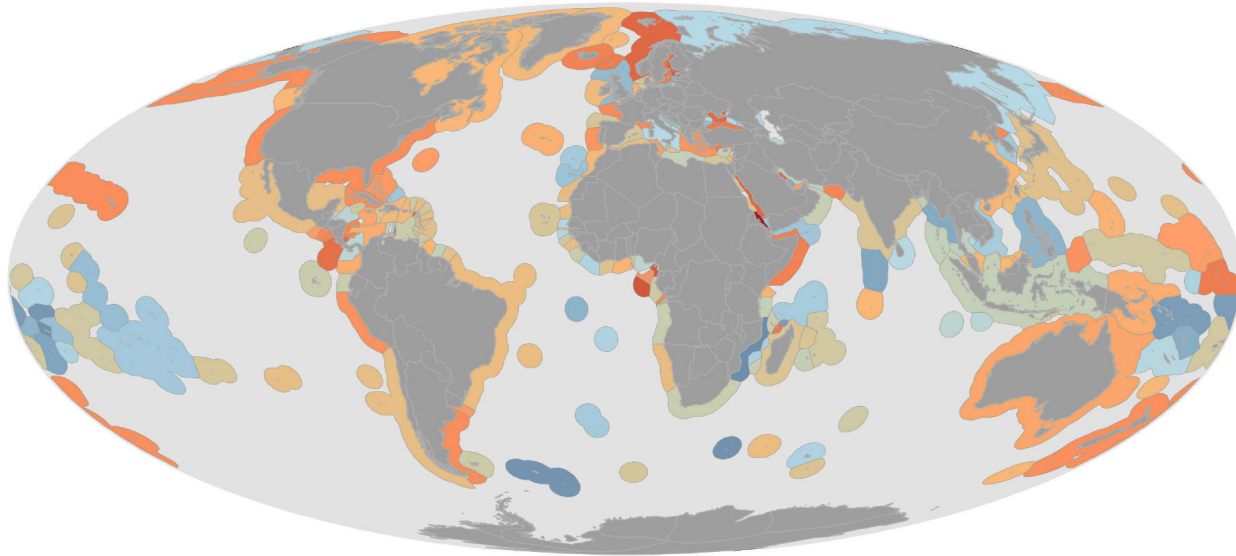




NCEAS

National Center for Ecological Analysis and Synthesis



Annual Report

Fiscal Year 2016-2017

University of California, Santa Barbara

Annual Report

Fiscal Year 2016-2017

University of California, Santa Barbara



National Center for Ecological Analysis and Synthesis

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Cover image (left): These maps show the global Ocean Health Index scores for 2016 (top) and how the scores have changed from the time period from 2012 to 2016 (bottom). Developed by NCEAS researchers and partners, the Index enables scientists to measure ocean health according to the benefits they provide people, evaluations that can guide marine policy and planning. Source: Halpern BS, Frazier M, Afflerbach J, O'Hara C, Katona S, Stewart Lowndes JS, et al. (2017) Drivers and implications of change in global ocean health over the past five years. PLoS ONE 12(7): e0178267. <https://doi.org/10.1371/journal.pone.0178267>.

Cover image (above): Photo by Patrick Hendry.

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Director's Statement



As the National Center for Ecological Analysis and Synthesis (NCEAS) moves into its third decade, it continues to thrive. Since its start, nearly 7,000 researchers from around the world have convened at NCEAS in interdisciplinary working groups to tackle important questions in ecology and the environment in order to advance scientific understanding and benefit society.

NCEAS operates in downtown Santa Barbara in a facility that provides visiting researchers the physical and mental space for creativity and collaboration – important ingredients that foster the level of scientific output for which NCEAS is known. At the same time, NCEAS maintains strong ties to campus. Many working groups include UCSB faculty or researchers, and we employ and train a large cadre of UCSB graduate students in data management, scientific programming, and science communications.

Researchers at NCEAS do not collect new primary data, but pool and integrate existing data to shed new light on ecological patterns and relationships, an approach that enables them to go beyond the scope of any individual research project. Many of our working groups also involve practitioners from outside academia, enabling unique opportunities to apply science to solutions for pressing environmental challenges. In addition, the Center supports a small community of resident researchers that concentrate on synthesis science or the development of computational approaches and tools to support synthesis science. NCEAS staff provides logistical and technical support, training, and outreach services to increase the productivity and impact of our researchers and working groups.

During the past year, NCEAS working groups have published high profile papers spanning a range of topics – from sustainable aquaculture ([Gentry et al, Nature Ecology and Evolution, August 2017](#)) to the basic ecology of an economically important, commercially caught fish species ([Barthem et al, Scientific Reports-Nature, February 2017](#)), and from producing reproducible science using open source, open access tools ([Lowndes et al, Nature Ecology and Evolution, May 2017](#)) to solutions for meeting both the demands for wood products and carbon emissions reduction goals (Griscom et al, Conservation Letters, March 2017). Moreover, the science our working groups produced has had tangible impacts on decision making, such as one working group's influence in the Chinese government's [decision to ban](#) the sale of ivory to help protect elephants.

NCEAS has a robust and diverse set of existing and expanding projects, many in collaboration with practitioner and academic partners:

- The [Science for Nature and People Partnership \(SNAPP\)](#) continues to thrive. A partnership with The Nature Conservancy and Wildlife Conservation Society, SNAPP now has 19 active Working Groups, and 14 postdocs were active in the past year.
- The NSF-funded Long Term Ecological Research (LTER) [Network Communications Office \(NCO\)](#) now operates six working groups focused on synthesis science. This year, the NCO organized US participation in the first open science meeting of an [international LTER network](#), organized a [national symposium](#), and welcomed three [new sites](#).
- NCEAS continued its role as a key partner in the NSF-sponsored [DataONE](#) network for earth observation data, which now includes 42 Member Nodes (8 more than last year) and was awarded over \$700K by the Alfred P. Sloan Foundation to develop infrastructure for the collection of metrics for data objects.



- The NSF-funded Arctic Data Center, an archive for Arctic scientific data and research documents, became a DataONE Member Node, chose a new synthesis working group to begin in 2018, and held its first annual two-day open science training.
- Our two Gulf of Alaska working groups wrapped up their work synthesizing 25 years of data about the effects of the Exxon Valdez Oil Spill. Papers published in the past year include assessments of how the oil spill affected important fish species ([Ward et al, PLOS ONE, March 2017](#); [Shelton et al, ICES Journal of Marine Sciences, June 2017](#)).
- The [State of Alaska Salmon and People Project \(SASAP\)](#) selected five new working groups to deepen its interdisciplinary exploration of Alaska's salmon socio-ecological systems and organized a stakeholder workshop to inform its communication efforts.
- The [TomKat UC Carbon Neutrality Project](#) is wrapping up its research to accelerate progress on the University of California's ambiguous goal to become [carbon neutral](#) by 2025. Their results have already been well received in presentations to the funder, President Napolitano, UCOP's Energy Task Force, UC Regents, and the higher education sustainability community.
- The last year marked the fifth annual global [Ocean Health Index](#) assessment. With financial support from the Gordon and Betty Moore Foundation, the team has also begun regional assessments for British Columbia and the U.S. Northeast to aid the evaluation of marine management actions.
- The Ocean Tipping Points project completed its last year, culminating with the launch of an [online portal](#) containing data and resources to aid marine management and policy.

Last year also saw the launch of several new initiatives that signal new growth for NCEAS:

- We launched the [Data Task Force](#) with generous support from the Moore Foundation. This innovative approach entails collecting inaccessible datasets from agencies, universities, and NGOs and distilling them into usable formats.
- In July 2017, a spinoff initiative of a former SNAPP working group was launched, called the [Conservation Aquaculture Research Team](#), which seeks to fill knowledge gaps around how to develop sustainable aquaculture to help increase global food security.

With my first year as Director behind me, I'm excited about the diversity of synthesis and environmental informatics work we are leading and supporting, and the expanding role we are playing training the next generation of environmental data scientists. It's an exciting time for NCEAS; NCEAS continues to thrive, grow, and innovate. I want to thank the Gordon and Betty Moore Foundation, the National Science Foundation, our partners at The Nature Conservancy and the Wildlife Conservation Society, and our many other sponsors for their generous support. I also want to acknowledge and thank the State of California and the leadership of University of California, Santa Barbara for their continued support of and commitment to NCEAS.

Most Sincerely,

Ben Halpern

NCEAS Mission Statement



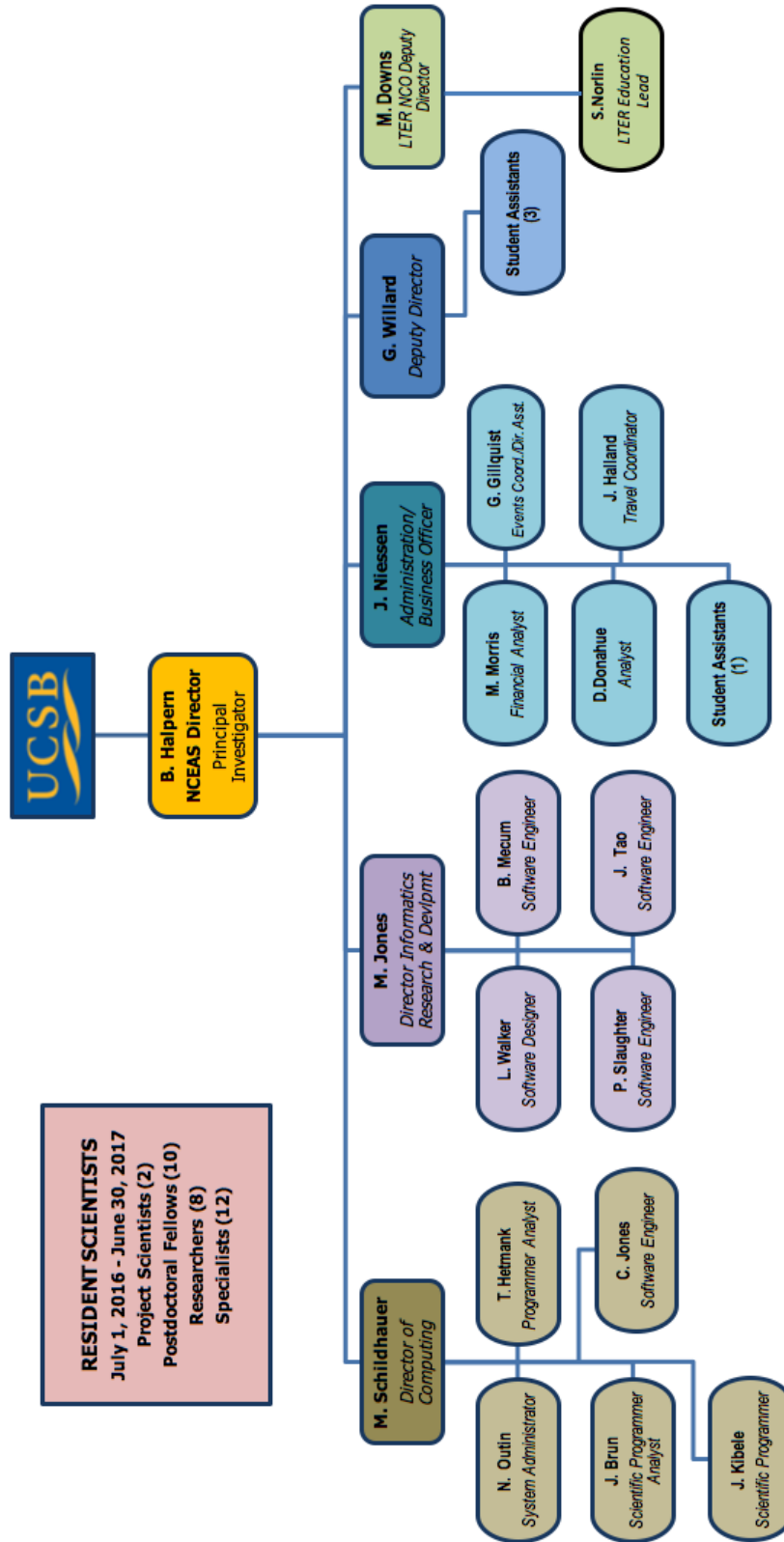
NCEAS rapidly advances ecological knowledge through analysis and synthesis of existing data to address critical environmental challenges for the benefit of nature and the well-being of people. NCEAS provides computing solutions to enable networked scientific collaboration by leveraging NCEAS' innovation and leadership in informatics. NCEAS promotes the skills, knowledge and collaborative culture among scientists, policy-makers, and resource managers necessary for transformative research and to speed application.





The People of NCEAS

Organizational Chart



Principal Investigators



Amber Budden	Visiting Researcher	National Center for Ecological Analysis and Synthesis
Jennifer Caselle	Associate Research Biologist	UCSB Marine Science Institute
Frank Davis	Professor	National Center for Ecological Analysis and Synthesis
Jeff Dozier	Professor	UCSB Bren School of Environmental Science and Management
Benjamin Halpern	NCEAS Director and Professor	National Center for Ecological Analysis and Synthesis
Stephanie Hampton	Director	Washington State University, Center for Environmental Research, Education & Outreach
Krzysztof Janowicz	Associate Professor	UCSB Geography Department
Matthew Jones	Director of Informatics and Research Development	National Center for Ecological Analysis and Synthesis
Carrie Kappel	Associate Research Biologist	National Center for Ecological Analysis and Synthesis
Christopher Lortie	Researcher	National Center for Ecological Analysis and Synthesis
Stacy Rebich-Hespanha	Researcher	National Center for Ecological Analysis and Synthesis
James Salzman	Professor	UCSB Bren School of Environmental Science and Management
Mark Schildhauer	Director of Computing	National Center for Ecological Analysis and Synthesis

Resident Scientists



Postdoctoral Fellows

Rachel Blake	Collaborative data management and holistic synthesis of impacts and recovery status associated with the Exxon Valdez oil spill
Samantha Cheng	SNAPP: Translating Evidence of Causal Pathways between Nature Conservation and Human Well-being to Management and Policy Guidance
Jorge Conejo-Donoso	State of Alaskan Salmon and People (SASAP)
Shelley Crausbay	SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world
Halley Froehlich	SNAPP: Analyzing best practices and standards as a pathway to sustainable and conservation-friendly offshore aquaculture
Skylar Hopkins	SNAPP: Ecological levers for health: Advancing a priority agenda for disease ecology and planetary health in the 21st century
Aaron Ramirez	SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world
Claire Runge	SNAPP: Land-use change and conservation policy in Brazil and the U.S. for biodiversity, ecosystem services and economic returns
Heather Soyka	DataONE: Observation Network for Earth
Colette Ward	Collaborative data management and holistic synthesis of impacts and recovery status associated with the Exxon Valdez oil spill



Professional Researchers

David Auston (<i>visiting</i>)	TomKat, UC Carbon Neutrality Project
Jennifer Caselle	ILTER NCO
Krzysztof Janowicz	Geolink
Carrie Kappel	Ocean Tipping Points
Brandon Kuczenski	SNAPP: Data-Limited Fisheries
Christopher Lortie (<i>visiting</i>)	Shrub Habitat Studies
Stacy Rebich-Hespanha	ILTER NCO; TomKat
Kimberly Selkoe	Ocean Tipping Points

Specialists

Jamie Afflerbach	Arctic options: Holistic integration for arctic coastal-marine sustainability
S. Jeanette Clark	State of Alaskan Salmon and People; Arctic Data Center
Jessica Couture	Gulf of Alaska Studies
Dawn Dougherty	SNAPP: Data Limited Fisheries
Martha Downs	ILTER Network Communications Office
LeeAnne French	Science for Nature and People Partnership
Jesse Goldstein	Gulf of Alaska Studies; Arctic Data Center
Ning Jiang	Ocean Health Index
Sam Norlin	ILTER Network Communications Office
Margaret O'Brien	DataONE Semantics of Measurement; Data Management
Courtney Scarborough	Ocean Health Index ; Ocean Tipping Points
Jenny Seifert	NCEAS Communications
Julia Stewart Lowndes	Ocean Health Index
Geoff Willard	NCEAS Deputy Director; SNAPP Deputy Director

Project Scientists

Courtney Scarborough	Ocean Tipping Points; Ocean Health Index
Julia Stewart Lowndes	Ocean Health Index

Advisory Groups



NCEAS Science Advisors

Jennifer Balch	University of Colorado
Carl Boettiger	University of California, Berkeley
Christopher Costello	University of California, Santa Barbara
John Drake	University of Georgia
Stephanie Hampton	Washington State University
Hillary Young	University of California, Santa Barbara

SNAPP Science Advisory Council

Paul Armsworth	University of Tennessee
Elena Bennett	McGill University
Fabrice DeClerck	Bioersity International
Craig Groves	The Nature Conservancy
Jane Carter Ingram	Ernst and Young
Carrie Kappel	University of California, Santa Barbara
Yuta Masuda	The Nature Conservancy
Jensen Montambault	The Nature Conservancy
Dilys Roe	International Institute for Environment and Development
Mark Schildhauer	University of California, Santa Barbara
Bhaskar Vira	University of Cambridge
David Wilkie	Wildlife Conservation Society
Geoff Willard	University of California, Santa Barbara
James Watson	Wildlife Conservation Society



SNAPP Board

Frank Davis	University of California, Santa Barbara
Ruth DeFries	Columbia University
Adriana Dinu	United Nations Development Programme
LeeAnne French	University of California, Santa Barbara
Craig Groves	The Nature Conservancy
Harry Hagey	Retired Chair of the Board of Trustees, Dodge and Cox Funds
Benjamin Halpern	University of California, Santa Barbara
Peter Kareiva	University of California, Los Angeles
Caleb McClennen	Wildlife Conservation Society
Hugh Possingham	University of Queensland
John Robinson	Wildlife Conservation Society
Cristian Samper	Wildlife Conservation Society
Mark Tercek	The Nature Conservancy
Ward Woods	Wildlife Conservation Society
Cristian Samper	Wildlife Conservation Society
Mark Tercek	The Nature Conservancy
Michael Witherell	University of California, Santa Barbara
Ward Woods	Chair of the Board of Trustees, Wildlife Conservation Society

Arctic Data Center Science Advisory Board

Paul Berkman	Tufts University
Jeff Dozier	University of California, Santa Barbara
Regine Hock	University of Alaska, Fairbanks
Susan Hubbard	Lawrence Berkeley National Laboratory
Mark Parsons	University of Colorado, Boulder
Peter Pulsifer	National Snow and Ice Data Center
Karl Rittger	National Snow and Ice Data Center
Joshua Schimel	University of California, Santa Barbara
Colleen Strawhacker	National Snow and Ice Data Center
Melissa Zweng	NOAA, Ocean Climate Laboratory

Students



Undergraduate Students

Kira Archipov	Administrative Staff
Juliet Bachtel	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Erika Carlos	LTER Network Communications Office
Alex Gordee	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Sarah Heller	Exxon Valdez oil spill - Collaborative data management
Hyun Doh Kim	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Samantha Lee	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Kate McGill	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Chris Meade	Exxon Valdez oil spill - Collaborative data management
Shirley Ng	Exxon Valdez oil spill - Collaborative data management
Timothy Nguyen	LTER Network Communications Office & DataONE
Sharis Ochs	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
J. Steven Raquel	Exxon Valdez oil spill - Collaborative data management
Ling Tan	Exxon Valdez oil spill - Collaborative data management



Graduate Students

Terra Alpaugh	LTER Network Communications Office
Gabriel Antunes Daldegan	SNAPP: Science for Nature and People (Better Land Use & Soil Carbon)
Jo Anna Beck	Scientia Arctica:A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Shannon Boyle	Scientia Arctica:A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Jeffrey Cedarbaum	Case studies of conservation actions
Charlie Diamond	TomKat:The TomKat UC Carbon Neutrality Project
Nathan Emery	Exxon Valdez oil spill - Collaborative data managemet
Joshua Graybiel	Exxon Valdez oil spill - Collaborative data managemet
Sarah Halperin	Scientia Arctica:A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Tova Handelman	Outreach and Development
Madison Harris	LTER Network Communications Office
Alexandra Jamis	LTER Network Communications Office
Amanda Kelley	LTER Network Communications Office
Kara Koenig	SNAPP: Science for Nature and People (Coastal Restoration)
Tia Kordell	LTER Network Communications Office
Justin Kroes	SNAPP: Science for Nature and People (Hydraulic Fracturing & Evidence-based Conservation)
Sara Lafia	DataONE: Opbservation Network for Earth
Naomi Louchouarn	Scientia Arctica:A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Jay McConagha	TomKat:The TomKat UC Carbon Neutrality Project
Ian McCullough	SNAPP: Science for Nature and People (Fire Consensus)
Sarah McCutcheon	SNAPP: Science for Nature and People (Data Limited Fisheries)
Kendall Miller	SNAPP: Science for Nature and People (Coastal Restoration)
Celine Mol	TomKat:The TomKat UC Carbon Neutrality Project
Dominic Mullen	Scientia Arctica:A Knowledge Archive for Discovery and Reproducible Science in the Arctic



Shelby Oliver	Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic
Erin O'Reilly	LTER Network Communications Office
Michael Paccassi	Case studies of conservation actions
Charles Piechowski	Arctic Options: Holistic Integration for Arctic coastal-marine Sustainability
Nicole Poletto	LTER Network Communications Office
Alexander Prescott	Exxon Valdez oil spill - Collaborative data management
Evan Ritzinger	TomKat: The TomKat UC Carbon Neutrality Project
Anna Schiller	Case studies of conservation actions
Devin Spencer	Outreach and Development
Iwen Su	Exxon Valdez oil spill - Collaborative data management
Sonja Alexandra Uribe	LTER Network Communications Office
Alina Werth	LTER Network Communications Office
Haleigh Wright	Data Task Forces for Better Synthesis Studies



NCEAS Programs & Working Groups



Long Term Ecological Research Network Communications Office

Principal Investigator: Frank Davis

Co-PIs: Mark Schildhauer, Jennifer Caselle, Stacy Rebich Hespanha

NCEAS operates the [Network Communications Office](#) for the [Long-Term Ecological Research \(LTER\) Network](#), serving as a hub for the research synthesis, education, and outreach activities of the Network as a whole. The LTER program, launched by the National Science Foundation in 1980, transformed a previous pattern of short-term, unconnected ecological studies by establishing a network of sites that would collect long term data and maintain ecosystem-scale experiments. The LTER sites quickly attracted top-notch researchers and became focal points for training students, testing models, and building collaborative teams.

Today, the LTER network encompasses 28 sites and over 2000 scientists working in diverse biomes, including marine and coastal systems, coral reefs, forests, grasslands, deserts, and Arctic and Antarctic ecosystems. The data collected at LTER sites (over 42,000 data packages and counting) is freely available to researchers around the globe through the [Environmental Data Initiative](#) repository and other data repositories and discovery frameworks, such as [DataONE](#).

Programs at the Network Communications Office (NCO) engage LTER investigators in integrating the observations, experiments, and models developed at individual sites into a robust understanding of ecosystem functioning across multiple scales and biomes. [Synthesis working groups](#) (descriptions below) wring new insights from this existing data and expand the scope of LTER science by conducting cross-site comparisons and testing the broader application of results. The LTER NCO is supported by the National Science Foundation.



LTER: A synthesis to identify how metacommunity dynamics mediate community responses to disturbance across the ecosystems represented in the LTER network

Leader: Sokol, Eric

Co-leaders: Swan, Christopher; Wisnoski, Nathan

What factors most affect the stability of ecosystems? Previous research has identified a few major factors (dispersal, niche differentiation, and habitat heterogeneity) as being important in recovery from disturbance. But researchers don't know whether these factors confer stability over long time scales or across ecosystem types. Using datasets from across the LTER Network, the working group is assessing how the strongly each of these factors influences stability at different levels of disturbance and how the relationship changes over space and time.

LTER: Global patterns in stream energy and nutrient cycling

Leader: Wymore, Adam

Co-leaders: Kaushal, Sujay

The working group is comparing stream chemistry data from 19 LTER sites, representing far-ranging biomes including tundra, desert, and tall-grass prairies, as well as boreal, temperate, and tropical rainforests. They aim to identify what factors affect the coupled breakdown and use of carbon and nitrogen in streams. While carbon and nitrogen are inextricably linked, scientists remain stymied by the considerable spatial and temporal variation in the relationships between the two. The unprecedented global database being assembled by the project will allow the team to examine energy and nutrient cycling across seasons and environmental and management gradients.

LTER: Integrating plant community and ecosystem responses to chronic global change drivers: Toward an explanation of patterns and improved global predictions

Leader: La Pierre, Kimberly

Co-leaders: Avolio, Meghan; Wilcox, Kevin

Many global change drivers, such as increasing air and soil temperatures or increased concentrations of carbon dioxide, lead to chronic alterations in resource availability. Scientists anticipate that the magnitude and direction of ecosystem responses to these changes will be non-linear. To predict responses to global change drivers (GCDs) across a wide variety of ecosystems, the working group is taking advantage of 101 similar experiments done across 17 LTER and other network sites, all of which have examined plant community responses to changes in resource availability. The group aims to discover whether changes in plant community structure, productivity, and carbon storage are predictive of shifts in ecosystem function.





ILTER: Scaling-up productivity responses to changes in biodiversity

Leader: Isbell, Forest

Co-leaders: Cowles, Jane; Dee, Laura

It seems like a simple question. Does biodiversity loss cause productivity loss? Most experiments to test the question are done on small plots. Scaling up to natural ecosystems introduces complications that could tip the balance toward a stronger—or a weaker—relationship. Drawing on data from biodiversity experiments at multiple LTERs and global observational and experimental networks, the Biodiversity and Productivity working group asks what role time scales, spatial scales, type of experiment, and ecosystem type have on the strength of this key relationship.

ILTER: Synthesizing population and community synchrony to understand drivers of ecological stability across LTER sites

Leader: Hallett, Laura

Co-leaders: Reuman, Daniel; Suding, Katherine

Populations of plants, animals, and microbes fluctuate all the time. Whether populations rise and fall in tandem, independently or alternately can affect ecological stability. Offset fluctuations between species can enhance ecosystem stability. Or alternate fluctuations of the same species in different regions can support species stability. Building on many sources of long-term data, the LTER Synchrony working group aims to understand the drivers and timescales of synchrony and its effect on ecological stability.



Science for Nature & People Partnership (SNAPP) Program



SNAPP supports trans-disciplinary working groups to fill knowledge gaps and advance solutions for people and nature. NCEAS has partnered with The Nature Conservancy and Wildlife Conservation Society in a collaboration called Science for Nature and People Partnership (SNAPP). SNAPP brings together scientists, policymakers, and field practitioners to bridge the gap between analysis and action. SNAPP Working Groups collaborate and synthesize existing information to address key questions at the intersection of nature conservation, economic development, and human well-being in ways that will provide real world benefits for humankind.

Starting with the NCEAS model of soliciting open scientific Calls for Proposals for collaborative, interdisciplinary Working Groups, SNAPP goes one step further by involving practitioners and decision makers from the start to create a clear and rapid pathway to implementation. The SNAPP Working Groups are currently tackling some of the world's biggest challenges like food, clean water, and energy security by identifying ways in which conserving nature can create a net benefit to human well-being.

SNAPP is generously funded through founding grants by Shirley and Harry Hagey, Steve and Roberta Denning, Seth Neiman, Angela Nomellini and Ken Olivier, the Gordon and Betty Moore Foundation, Ward W. and Priscilla B. Woods, and the David and Lucile Packard Foundation.



SNAPP Water Security and Nature Working Groups



Nearly a third of the world's population faces water shortages on a regular basis. SNAPP seeks innovative management approaches to balance the use of water for industry, agriculture, natural ecosystems, and human consumption.



SNAPP: Water transactions to enhance streamflow, water supply reliability, and rural economic viability in the western United States

Leader: Kendy, Eloise

Co-leaders: Purkey, Andrew; Richter, Brian

Over-allocation of water for agricultural, municipal, and industrial use severely depletes streamflow across the American West, degrading aquatic and riparian ecosystems, and posing economic risk to sectors that depend on reliable water supplies. Voluntary water transactions and agreements present a significant opportunity to restore streamflow and enhance water supply reliability within the prior appropriation system. Although water transactions are taking place in many western watersheds, they have not translated into widespread improvements in ecological or water supply resiliency and, in some cases, have hurt rural economies.

This working group offers a novel approach to incentivize water transactions that collectively restore streamflow and reduce economic risk associated with water shortages, while maintaining agricultural economies. This contrasts with conventional water transaction programs in which environmental water trusts prioritize environmental benefits and municipalities permanently acquire water rights. These approaches benefit buyers and sellers, but not the rural communities from which water rights are obtained. The team hypothesizes that multipurpose, integrated water transaction programs will attract new conservation partners, including urban and industrial water users, to restore streamflow.

The working group will synthesize available ecological, hydrological, water use, regulatory, and economic data in two to four pilot watersheds, to evaluate system benefits generated by different combinations of innovative water transactions. The main outputs will be: 1) a generalized protocol for evaluating the extent to which water transactions meet multiple objectives (e.g., environmental, agricultural, urban), including flow restoration, water supply reliability, and rural economic viability; 2) in the pilot watersheds, a comparison of benefits resulting from multi-objective versus single-objective transaction programs under both existing and ideal regulatory regimes; 3) implementation of pilot program plans to incentivize and manage integrated, multi-objective transactions; and 4) a strategic plan to leverage our work by transferring our technical approach to other watershed groups and by partnering with major water users to finance big, multi-objective transactions.

SNAPP Food Security and Nature Working Groups



As the human population grows, pressure is increasing on global food production. SNAPP searches for science-based strategies to balance fisheries harvest and agricultural intensification with conservation to ensure long-term food security.

SNAPP: Analyzing best practices and standards as a pathway to sustainable and conservation-friendly offshore aquaculture

Leader: Grimm, Dietmar

Co-leaders: Halpern, Benjamin

Aquaculture currently represents 50% of all fisheries products for direct human consumption. This means that aquaculture production exceeds global beef production in terms of protein produced. Aquaculture will continue to be a major source of protein for global consumption, but how can the scientific community help to steer aquaculture towards more environmentally sustainable practices?

This SNAPP project will examine specific dimensions of the "aquaculture problem" and synthesize its findings in a forward-looking prospectus for the emerging offshore open-ocean subsector (versus near-shore fish farming). The four scientific products of this working group will focus on:

- A review of the real and perceived risks of open-ocean aquaculture relative to the near shore approaches. The Working Group will review both grey literature and peer-reviewed articles, as well as interview industry representatives and ecologists who have expertise in geographies where aquaculture operations are either already well-established and/or are rapidly expanding. Drawing upon the array of concerns and impacts that have already been measured in a near shore context, the Working Group will disentangle actual offshore impacts, concerns, and possible improvements that will help clarify the potential of open-ocean aquaculture.
- An analysis of the economic and ecological opportunities for expanding open-ocean aquaculture with an emphasis on approaches that target the most favorable options for jointly meeting economic needs and ecological needs. The Working Group, which includes industry leaders, conservation scientists with expertise in ocean health, and NOAA experts who contributed to the National Strategic Plan for Federal Aquaculture, will identify and map areas with greatest opportunity (hot spots) for smart aquaculture, with high potential aquaculture productivity, and minimal conflict with biodiversity and critical ecosystem services.
- Equally as important is avoiding areas most at risk and/or least viable for open-ocean farming expansion. As such, the Working Group will also analyze areas that should be avoided given a series of important ecological, social, and economic considerations (cold spots).
- Looking towards an expansion of sustainable open-ocean aquaculture requires a quantitative assessment of the needs and conflicts of fish production now and into the future. The Working Group will evaluate open-ocean aquaculture operations and production in 2015 and forecast the potential into the future by exploring and modeling trends in wild fish capture and consumption, climate variability, technological advances, and food security and safety. Critical to evaluating the prospects of open-ocean farming will be involving key stakeholders in the aquaculture industry throughout the process.



SNAPP: Landscape planning for agro-industrial expansion in a large, well-preserved savanna: How to plan multifunctional landscapes at scale for nature and people in the Orinoquia region, Colombia

Leader: Hyman, Glenn

Co-leaders: Da Silva, Mayesse; Forero-Medina, German; Walschburger, Tomas

Population growth and increasing living standards are generating a higher demand for food, driving agricultural production into the last remaining natural lands. Tropical savannas play a key role in water regulation, carbon storage and biodiversity maintenance. They are under increasing pressure by agricultural expansion because of their characteristics (extensive and flat lands, low human density, and high water availability). The Orinoquia region of Colombia constitutes the second largest savanna system in South America and is considered the last agricultural frontier for Colombia. The region is already experiencing a rapid expansion of large-scale agricultural development including palm oil, rubber and eucalyptus plantations, as well as annual crops such as rice, maize and soybeans, mainly to supply a growing domestic demand. Other regions of Colombia have experienced similar agricultural booms, with little or no planning of the land-use changes and associated energy and communications infrastructure. This has resulted in loss of biodiversity and ecosystem services. There is a unique opportunity to avoid a similar development path in the Orinoquia, which is still well preserved, by working out where certain activities could have less impact on ecosystem services and livelihoods and adequately planning for development. This needs to be done urgently and requires the participation and input of multiple sectors, including government, private companies, research institutions and civil society.

One main challenge this Working Group aims to address is to synthesize ecological, social and development information to generate knowledge that can inform assessments on different land use changes and associated infrastructure at the landscape and regional scale and what the consequences are for nature and people. This information will inform governmental and private processes occurring at the moment, initiatives that will ultimately decide the future development of the Orinoquia. These initiatives include the Plan Maestro de la Orinoquia (Orinoquia Master Plan), driven by Colombia's National Planning Department. The process we will undertake will mean that it is not just useful for Colombia, we will create novel frameworks and tools that will support collective decisions on landscape management, practices and policies at multiple scales.



SNAPP: Measuring the status of fisheries and factors leading to success

Leader: Hilborn, Ray

Co-leaders: McClennen, Caleb; Parma, Ana

Around the world, fish provide about 3 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with at least 15 percent of such protein. Unfortunately, the world's best efforts at managing its fisheries are hampered by two distinct, but related challenges: 1) a profound lack of data on the health of global fish stocks, and 2) a lack of a systematic analysis of which elements of fisheries management systems lead to improvements in marine conservation, increases in food security, and reductions in poverty. To fill the gap, this SNAPP Working Group will: 1) increase the coverage of the global fish stock status and management databases and identify major information gaps; 2) provide an evaluation of the status of fish stocks and fisheries for as much of the world as possible; and 3) conduct a systematic analysis linking management and exogenous factors leading to good outcomes in fisheries management.

SNAPP: Finding smart planning solutions in the Southern Agricultural Growth Corridor of Tanzania: What does sustainable intensification look like?

Leader: Kamau, Felix

Co-leaders: Cleary, David, Magembe, Lucy

Small farmers dominate agriculture in developing countries, and many governments and institutions have invested heavily in improving the productivity and sustainability of smallholder farming. However, the growth in export markets, especially to China, poses both risks and opportunities to smallholder farmer livelihoods and conservation. Commercial farming is poised to move into large geographies where proposals exist for significant investment in infrastructure corridors. One such corridor is the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) linking eastern Zambia and the interior of Tanzania to the Indian Ocean.

The development of the SAGCOT corridor, and others like it, could significantly change the economics of farming at all scales and over a large area. This could result in a concentration of land tenure, habitat conversion, the expulsion of smallholders, and the displacement of a moderately diverse production system by large-scale monoculture.

This SNAPP Working Group will address smart planning for sustainable agriculture intensification in the SAGCOT corridor. The development of the SAGCOT corridor is at an early stage of implementation presenting the opportunity to demonstrate to policymakers, planners, and potential investors what sustainable intensification might look like on the ground, with better market access improving agricultural livelihoods, while good planning and responsible investment maintains the ecosystem services provided by healthy soils, water, and natural habitat. The Working Group will: 1) map the critical geographies within the corridor where agriculture intensification is most viable; 2) prepare a cost-benefit analysis for development and ecosystem services; 3) identify investment alternatives and priorities in the context of climate change; and, 4) outline alternative scenarios for sustainable intensification within the critical geographies.



SNAPP: Managing Data Limited Fisheries for Economic and Biological Objectives

Leader: Wilson, Jono

Co-leaders: Revenga, Carmen; Rude, Jeremy

Overfishing threatens the health of many of the world's fish stocks and the millions of people who rely on fish for their food and livelihood. One challenge is that we lack regular assessment data for more than 90% of Earth's fisheries, and reliably assessed fisheries tend to be better managed, thus less overfished. Scientists have developed innovative, inexpensive approaches to assess data-limited fisheries. But there are still significant barriers to widespread implementation of these approaches.

The Data-Limited Fisheries Management project, a project of the Science for Nature and People Partnership (SNAPP) initiative, will convene fish stock assessors, social scientists, ecologists and marine conservation practitioners. Collectively they will: 1) develop a fisheries assessment and management framework that can be applied across geographies, fishery archetypes, data availability, and spatial scales; 2) provide risk-based guidance on the socio-economic and conservation value of improved data collection of stock status; and 3) implement adaptive assessment and management guidelines in collaboration with The Nature Conservancy and Wildlife Conservation Society field programs, and potentially other NGOs.



SNAPP Community Resilience & Climate Change Working Groups



Climate change poses many threats to ecosystems and humans; from long-term drought to sea level rise. SNAPP is developing new evidence-based responses to these challenges that balance conservation and human well-being outcomes.

SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world

Leader: Carter, Shawn

Co-leaders: Cross, Molly; Hall, Kimberly

Drought conditions characterized as extreme or exceptional have been documented across at least 10% of the land area in the western US within 10 of the past 14 years. Recent media attention on drought risks and the creation of multiple regional centers for addressing climate impacts suggests that this project is timely. This working group will synthesize the current understanding of ecological (multi-year) drought risks, prioritize strategies for improving nature and human systems' ability to thrive in the face of climate change-driven drought, and identify a tangible set of research priorities and strategies suited for on-the-ground management applications.

To ground the group's approach and products, they incorporated a partnership with a pilot project in the Upper Missouri River headwaters (UMH) of Montana. SNAPP will add value to the UMH pilot by bolstering their ability to consider ecological impacts of prolonged drought, and raising the profile of drought preparedness strategies that simultaneously provide benefits to natural systems and human communities.

Outcomes include 1) making information about ecological drought and consequences for natural and human systems under future climate conditions more accessible to decision makers; 2) enabling more effectively designed drought preparedness and management efforts that address droughts of the future; and, 3) broader adoption of ecosystem-friendly approaches to drought and climate change preparedness initiatives. The ultimate goal is to lead to human communities that are better prepared to cope with the effects of climate change induced drought, and the adoption of drought management strategies that bolster (rather than degrade) intact, functioning ecosystems.

SNAPP: Aligning coastal restoration with ecological and societal needs

Leader: Grabowski, Jonathan

Co-leaders: Arkema, Katie; DeAngelis, Bryan

Coastal ecosystems play a critical ecological and societal role in coastal communities; yet natural and anthropogenic pressures have led to degradation of habitat quality and a reduction in the extent of wetlands, reefs and coastal forests worldwide. Currently billions of dollars are being put towards reducing the risks of disasters and climate change through coastal habitat restoration. New policies emphasize planning processes that work across sectors and jurisdictions to fund project that provide the greatest returns for people and nature. As a result, governmental and non-governmental agencies, as well as industry, are facing hard decisions about where to invest in coastal restoration and how to set targets to meet the needs of both nature and people.

In response to the needs of agencies, the SNAPP Working Group will scope what drives current restoration decisions and examine what scientific information agencies need to better inform future decisions. The group will assess the degree to which funding efforts are associated with societal and ecological needs in terms of restoration efforts, and they will develop achievable metrics and approaches for guiding future restoration efforts.



SNAPP: Identifying common ground among fire researchers studying mixed conifer forests

Leader: Moritz, Max

Co-leaders: Allen, Craig; Hessburg, Paul; Morgan, Penelope; Odion, Dennis; Topik, Chris; Veblen, Thomas

There is increasingly contentious scientific debate over how much high-severity fire should be considered natural in dry conifer forests across the western U.S. In many policy and management arenas this debate is a frustrating roadblock to effectively integrating science into decision-making, often promoting inaction. Inaction is not a solution to conservation problems. Fire is widely seen as one of the most important conservation uncertainties, and it directly affects the health and well-being of people living near fire-prone landscapes. Resources go toward legal battles instead of toward prioritized activities based on good science. To sustainably coexist with fire in the context of climate change, identifying common ground among fire researchers is crucial. At the same time, there is growing concern over how to best manage fire-prone landscapes in the face of an uncertain future.

This working group will: 1) highlight the core research questions and datasets needed to make progress on these debates; 2) identify and articulate the consensus that already exists among fire scientists on the role of high severity fire in western coniferous forests, particularly in the context of ecosystem resilience under climate change; and 3) focus on policy and management decisions that do not hinge on resolving specific aspects of debate and provide recommendations for how to proceed on issues that do.

SNAPP: Developing targets to manage soil organic matter for environment and people

Leader: Wood, Stephen

The Sustainable Development Goals (SDGs), adopted in 2015, establish a clear mandate to manage the planet for both human and environmental wellbeing. Any viable approach to achieving the SDGs requires addressing soil, which is the foundation of both healthy natural and agricultural ecosystems.

Soil organic matter (SOM) is an especially important soil property because it is the principle arbiter of soil health and is one of the most responsive soil properties to land management. Management of SOM can increase agricultural productivity, remove carbon (C) from the atmosphere, and ensure water systems that are safe for human consumption and that support thriving aquatic biodiversity. Some forms of land management can degrade SOM, causing release of large quantities of C to the atmosphere, lower soil productivity, contaminate drinking water with excess farm nutrients, and cause eutrophication of aquatic ecosystems, which leads to biodiversity declines. Successfully managing soils for environmental and human wellbeing requires reliable estimates of how much SOM can be built up at any given site and how much SOM is needed to achieve target outcomes for nature and people.

In this project, we will synthesize existing data to develop global estimates of how much SOM can be built up under ideal conditions. We will use these broad-level targets as a starting point to develop site-specific targets for SOM build up, and then quantify the relationship between SOM management and human and environmental outcomes for two projects within The Nature Conservancy—1) carbon sequestration and sustainable livestock production in California rangelands and 2) crop yield and nutrient and sediment retention through the Soil Health Partnership in the U.S. Midwest. We will then develop specific strategies for each program to integrate soil-based targets into their activities.



SNAPP: Developing guidelines for and assessing relationships among biocultural indicators to improve long-term resilience of Pacific social and ecological communities

Leader: Ticktin, Tamara

Co-leaders: Jupiter, Stacy; Mejia, Manuel; Sterling, Eleanor

Biodiversity and food- and water-security throughout the Pacific will be negatively impacted by climate change. Climate change, in combination with local stressors, will lead to the exploitation of resources, habitat transformation, and the spread of invasive species in the Pacific. Enduring these pressures will require practices and policies that best foster resilient and adaptive communities to be adopted. Unfortunately, existing research largely lacks consideration of the factors most critical to Pacific Island community resilience: the linkages between biological, social and cultural connections, otherwise known as biocultural indicators.

What constitutes a biocultural indicator?

A standard biological indicator is the population size of threatened fish species, whereas a standard social/cultural indicator might be the relative abundance of culturally important fish species. Biocultural resilience indicators integrate the feedbacks between people and ecosystems and could look like: Population size of slow-growing (or fast-growing) fish species that has importance to local community in terms of customary beliefs, traditions, or uses.

In order to improve long-term community resilience to these changes, this Working Group will develop a biocultural approach to community planning and monitoring that incorporates the intimate connections of Pacific peoples with the land and sea. On a local scale, the Working Group's results will enhance resilience thinking in existing management plans in Fiji, Hawai'i, and Solomon Islands. Their analysis will consist of three phases: 1) Identifying appropriate biocultural indicators and how they can be measured, 2) Developing methods to scale indicators from local to global levels, 3) Determining the relationships between pressures, the biocultural state, benefits, and management responses in Pacific Island communities.

SNAPP Ecosystem Services & Biodiversity Benefits

Working Groups



Modern conservation challenges require innovative economic approaches. SNAPP is identifying practical solutions to help decision-makers weigh economic development opportunities alongside social and ecological concerns.

SNAPP: Integrating natural capital into system of national accounts: A case study of forestry and wetland landscapes in Rwanda

Leader: Alavalapati, Janaki

Co-leaders: Lange, Glenn-Marie; Masozera, Michel

Most national accounting systems of a country's economic output fail to account for the role of natural capital or ecosystem services in underpinning that country's growth. Rwanda is a Core Implementing Country of the World Bank's Wealth Accounting and the Valuation of Ecosystem Services (WAVES) Global Partnership. Support from SNAPP will provide a model of critical resources for ensuring collaboration and synergies across the different groups who are working on these efforts including research institutions, NGOs, Government of Rwanda, and the World Bank. Within Rwanda, the results will contribute to several important initiatives including the Economic Development and Poverty Reduction Strategy; Biodiversity Strategy and Action Plan; Poverty and Environment Initiative, all aimed at integrating environment into national policy and planning, and budget processes.

This working group will integrate natural capital into the national goals for economic growth of Rwanda. Specifically, the work will focus on non-market ecosystem services (for example, drinking water supplies or nutrient cycling provided by wetlands) from two priority landscapes in Rwanda - the Rugezi wetland and the Nyungwe National Park. In addition to valuing natural capital, this working group will explore economy-wide tradeoffs associated with alternative natural resource management and policy options to support landscape-level conservation and development planning.

The results from the working group will directly support Rwanda's development planning and will serve as a model for other countries seeking to integrate natural capital (i.e., environmental protection and environmental values) into its goals for economic development. Beyond Rwanda, the results will give impetus to efforts by global initiatives like the WAVES, and the UN Green Economy, and provide a pathway for other governments committed to natural capital accounting.

SNAPP: Connectivity across the landscape: Strategies to meet needs for infrastructure and wildlife in India

Leader: Krithi, Karanth

Co-leaders: DeFries, Ruth; Karanth, Ullas

Rapid expansion of transport networks and other infrastructure to meet development needs is occurring throughout the world. This expansion potentially severs connectivity across landscapes and disrupts gene flow for wide ranging endangered species. We propose to assemble data sets that provide options for simultaneously meeting needs for infrastructure development while maintaining connectivity of the landscape, including technological options (e.g. overpasses), planning (e.g. scenarios based on connectivity modeling for siting decisions), and management (e.g. road closures at sensitive times). We will examine these options in two landscapes critical for conservation in India: central India and the Western Ghats. Both of these landscapes are facing severe development pressures from road, rail, dams, energy infrastructure, human settlements and mining projects. We will assemble an advisory group comprised of high-level, key national- and state-level decision makers from the relevant sectors, including highway, mining, and energy sectors, and conservation scientists. A working group will carry out analyses of options for maintaining connectivity based on experiences in India and internationally, including costs and effectiveness of different strategies. The working group will also conduct connectivity modeling to test scenarios based on these strategies. The advisory group will consider the applicability of different strategies for the two landscapes based on input from the working group. We expect that results of the analyses combined with lessons learned from application to these two important landscapes will provide a pathway for decision-making in other landscapes throughout India and elsewhere.

SNAPP: Forest sharing or sparing for conservation and communities in tropical timber landscapes

Leader: Griscom, Bronson

Co-leaders: Ashton, Mark; Putz, Francis

How do we achieve the greatest conservation and human well-being outcomes in tropical timber production landscapes? This is an important question because (i) tropical forests under timber production cover more than twice the area under strict protection, (ii) loggers are the gatekeepers to most of the remaining remote forests, and (iii) forest conversion to timber plantations is a leading driver of deforestation. The urgency of this question is amplified by the emergence of major forest-carbon financing and policy processes that are driving policies in tropical countries to achieve forest conservation outcomes by 2020, in the midst of growing demand for tropical timber. Should countries segregate land use to achieve timber and climate targets in different places (intensification/sparing), or should they integrate (share) land uses for both timber and conservation outcomes? How do our answers change depending on the conservation outcomes we prioritize (i.e. carbon, water, biodiversity), where we are located, and the concerns of local communities (e.g. jobs, equity, flood control, etc.)?

We propose to address these questions with data on carbon, water, biodiversity, timber yield, and human welfare in three geographies where TNC and WCS have large scale conservation programs: Berau, Indonesia; Southern Mexico; and Peten, Guatemala. In each geography we will address this question for two stakeholder groups: 1) forest managers and certifiers and 2) policymakers. We will synthesize a set of best practices across the range from low to high intensity timber production systems and estimate carbon, water, and biodiversity benefits. Results will be fed into landscape modeling analyses of land sharing vs. sparing scenarios. Our written products will be implemented as part of TNC & WCS conservation programs by (i) testing best practices with partnering land managers, and integrating them into certification standards, (ii) advocating for adjustments to forestry and climate policies to achieve an optimal balance of conservation, human well-being, and timber production outcomes.



SNAPP: Documenting, measuring and valuing the ecosystem service and human well-being benefits delivered by Key Biodiversity Areas

Leader: Langhammer, Penny

Co-leaders: Gerber, Leah; Woodley, Stephen

Important biodiversity areas are experiencing extreme pressures from the demand for natural resources. In an effort to support management decisions that account for biodiversity in policy, industry and local communities, the International Union for the Conservation of Nature (IUCN), has led the development of a new standard for the identification of sites that contribute to the global persistence of biodiversity. The standard for identifying these sites, known as Key Biodiversity Areas (KBAs), is based solely on characteristics of the biodiversity they contain. The standard also requests that each identified site includes information on the ecosystem services provided as well as the human well-being benefits that are gained through its protection. A new SNAPP working group is bringing together the exiting efforts on ecosystem service assessment and the emerging KBA standards, with the goal of including ecosystem services and the benefits to human well-being in the KBA identification process.

The SNAPP Working Group will evaluate currently available ecosystem service assessment tools, and determine in what instances those tools could be useful in providing ecosystem service and human well-being information to study sites in Cambodia and Canada. From this evaluation the group will develop standards for documenting ecosystem services generated by KBAs and implement these standards as part of KBA identification at the Cambodia and Canada sites.

SNAPP: Land-use change and conservation policy in Brazil and the U.S. for biodiversity, ecosystem services, and economic returns

Leader: Polasky, Stephen

Co-leaders: Durigan, Carolos; Fargione, Joseph; Pennington, Derric; Plantinga, Andrew

There are tradeoffs and synergies between biodiversity conservation, ecosystem services, and economic productivity that are not usually considered when decisions are made about land use or investments in land protection or policy. Overlooking such tradeoffs often results in low return-on-investment for conservation expenditures and unintended consequences of policy decisions. This project will develop and apply spatially explicit, integrated models of land-use change, habitat for biodiversity, ecosystem service provision and economic productivity in up to five decision contexts in Brazil and the United States. In Brazil, the project has identified pathways to implementation that would help inform the Amazon Region Protected Areas program, certification initiatives regarding Brazil's forest code, and policies to guide agricultural development in the Brazilian Pantanal. In the U.S., they have identified pathways to implementation in agricultural policy in the Northern Great Plains and the Sage Grouse Initiative. By simultaneously considering multiple objectives and alternative spatial arrangements of land use, we will chart a path towards maximizing benefits for both human well-being and nature conservation.

This project will build off of existing land-use change models developed by working group members in both the U.S. and Brazil, and use these models to evaluate alternative scenarios and optimize conservation investments in specific decision-making contexts in both countries. A distinguishing feature from the U.S. models is the explicit incorporation of net economic returns to land for alternative land-uses (crops, forestry, urban, pasture) as a driver of land-use change. In addition, the will incorporate price feedback effects from large-scale land-use changes to account for the fact that such changes (e.g., from forest to crops) will likely shift the supply of key commodities and therefore shift both commodity prices and net economic returns to land. Dollar measures of net returns to land and price feedbacks from land-use changes are not typically incorporated in geographically-based methods. Further, the project will link the land-use change model with ecosystem service provision models (including carbon storage, water provision, water quality, non-timber forest products) as well as habitat for biodiversity.



SNAPP: Evidence-based Conservation to Advance Human Well-being

Leader: McKinnon (Bottrill), Madeleine

Global policy initiatives and international conservation organizations have sought to emphasize and strengthen the link between the conservation of natural ecosystems and human development. While many indices have been developed to measure various human well-being domains of conservation intervention, the strength of evidence to support the effects, both positive and negative, of conservation interventions on human well-being, is still unclear. Rigorous and comprehensive evidence is necessary to enable efficient, defensible and targeted decisions and investment in advancing goals for improved human well-being in conservation. This working group aims to critically appraise existing evidence documenting the linkages between nature conservation, and identify distribution of existing evidence across existing interventions and outcomes. Furthermore, it will design a decision support tool to help projects assess the consequences, and potential risks, of implementing actions and making investments given condition of existing evidence base. The working group will illustrate, through piloting in case studies with WCS and TNC programs, how these data might be translated into guidance for use by project managers, policy makers and social impact investors.

SNAPP: Ecological levers for health: Advancing a priority agenda for disease ecology and planetary health in the 21st century

Leader: Sokolow, Susanne

Co-leaders: Lafferty, Kevin

Our children's and grandchildren's health depends on wise stewardship of natural ecosystems. But even as evidence amasses for links between human health and environmental change, we lack actionable solutions. The UN's Sustainable Development Goals and a new scientific movement, "Planetary Health," are drawing attention to these issues and raising questions about how habitable climate, clean water, fiber, fuel, and natural products, among other services and subsidies, relates to human health. Whereas past efforts have promoted the concept, objective scientific evaluation is lacking. Here, we aim to identify ecological "levers for health." That is, actionable ecological/environmental drivers that lead to win-win outcomes for people and nature. For instance, some of us analyzed historical global health outcomes of various strategies for controlling human schistosomiasis, finding that ecological levers have been more effective than direct health interventions.

To expand this effort, we propose to convene several working groups to analyze existing data on additional disease-environment systems (a goal to identify up to 10) for which evidence exists and opportunities are present to intervene through "ecological levers for health" at a local or regional level. We will also put these concrete examples in context and synthesize how they can advance a "Planetary Health" agenda for the 21st century. Lastly, a key ingredient to moving this field forward is to identify common metrics to report outcomes for health, society, and the environment. We will bring together a cross-disciplinary team to develop candidate metrics to measure health, environment, and economic outcomes in common or comparable currency.

State of Alaska's Salmon and People (SASAP) Program



Principal Investigator: Frank Davis
Co-PI: Ian Dutton

State of Alaska's Salmon and People (SASAP) is a knowledge synthesis that is designed to inform the future of management of Alaska's wild salmon. The SASAP project specifically seeks to:

- Connect knowledge across disciplines and agencies, between cultures and users, and across regions such that we gain a fuller picture of this complex and dynamic system, can set shared research priorities, develop and monitor indicators of system health and drive better management of the system.
- Create new institutional capacity for interdisciplinary salmon knowledge generation and to establish a shared and credible baseline for integrated knowledge that can be built on over time.

The knowledge generated from the SASAP project is expected to play a seminal role informing future salmon management and research in Alaska and more broadly in the North Pacific region. Outputs from the SASAP synthesis will be used by government, education, research, community and commercial interests to strengthen their understanding of salmon systems and prioritize future research, monitoring and management efforts.

NCEAS is collaborating with subawardee and project coordinator, Nautilus Impact Investing (NII), to establish eight working groups which will focus on the wide range of issues associated with Alaska's salmon, including but not limited to, social, legal, cultural, economic and environmental concerns. Summaries of their goals and hypotheses are found below.

All working groups have an opportunity to collaborate and exchange knowledge during two meetings per year. It is expected that many of these groups will be linked with the University of Alaska system and NCEAS will play a key mentoring role for those participants, helping develop their capacity for interdisciplinary research and collaboration.

The Data Task Force, an NCEAS-run group of data scientists and student interns, helps facilitate the collection, documentation, and archival of data used by the SASAP working groups. During synthesis projects, the challenges of synthesizing data from disparate sources are often underestimated by researchers, who typically focus more on questions they want to answer with the final database, rather than the data itself. The Data Task Force was created to help alleviate the challenges associated with data synthesis, utilizing specialized knowledge of metadata standards, data management, and data archival.

Both SASAP and the Data Task Force are generously supported by the Gordon and Betty Moore Foundation.



SASAP: Consistency, causes, and consequences of declining size and age of Alaskan salmon

Leader: Palkovacs, Eric

Co-Leaders: Westley, Peter; Carlson, Stephanie ; Lewis, Bert; Hendry, Andrew; Baskett, Marissa

Decreases in the body size and age of returning adult salmon have been noted for several Alaskan salmon species. Size and age declines have the potential to impact the biomass and stability of salmon populations. Despite evidence for decreased size and age of spawning adult salmon for some species and rivers, a comprehensive synthesis of size and age trends across species and populations is currently lacking. Several potential drivers of size and age shifts have been proposed, including fisheries, climate change, and density dependence at sea. However, the consistency of trait changes across populations and the contributions of the various potential drivers are unknown. Understanding the consistency and causes of age and size changes is important because these traits underlie many important aspects of ecological function and the value of salmon for human use. The aims of this working group are to examine the consistency, causes, and consequences of declining size and age in five species of Pacific salmon in Alaska.

SASAP: Interacting effects of ocean climate and at-sea competition on Alaskan salmon

Leader: Rand, Pete

Co-leaders: Gorman, Kristen; Campbell, Robert

Based on past climate patterns and more recent observations of anomalously warm ocean conditions in the northeast Pacific Ocean, this working group hypothesizes that marine habitat thermally suitable for salmon has been contracting and may exacerbate the density-dependence that has been observed for decades across a number North Pacific salmon populations (Peterman 1984, Kaeriyama et al. 2009; Ruggerone and Conners 2015, Jeffrey et al. 2016; Malick and Cox 2016; Yasumisshi et al. 2016; Ruggerone et al., in press, Shaul and Geiger, in press). Changes in ocean conditions and widespread declining trends in some populations have raised concern about the future of some salmon populations in the Northeast Pacific (Healey 2011; Peterman and Dorner 2012; Rand et al. 2012). Some studies have predicted poleward shifts in the ocean distribution of Pacific salmon as a result of climate change (Welch et al. 1998; Kaeriyama et al. 2012) and others have evaluated how the habitat in the Arctic Ocean could become more favorable to Pacific salmon (Irvine et al. 2009; Dunmall et al. 2013; Yoon et al. 2015). While these studies provide insight, this working group is committed to a different approach that will build on a data synthesis from recent oceanographic studies and long-term, salmon population monitoring. By accounting for the interplay between climate and at-sea competitive processes across broad, ocean domains, the work will help inform decision-makers on potential changes in future salmon production. It is vitally important to understand these changes so fisheries and communities can be in a better position to adapt to change. Finally, the group is drawing on expertise in the working group to evaluate the current gaps in monitoring in the Arctic region and make recommendations on the understanding of salmon range extension and colonization in the Arctic can be improved.



SASAP: Kenai Lowlands Salmon Research Synthesis and Design of Tools for Integrated Watershed Management

Leader: Walker, Claramarie

Co-leaders: King, Ryan; Whigham, Dennis; Simenstad, Charles; Rains, Mark

The Kenai Lowlands watersheds of south-central Alaska support abundant salmon that underpin robust commercial and sport salmon fisheries (valued at over \$80 million per year on the Kenai Peninsula; ADFG 2014, Carson et al. 2009). In addition to the dependence on salmon as an economic mainstay, coastal communities on the Kenai Lowlands rely on salmon as an important local food source and cultural touchstone. While the majority of Alaskans value and feel strongly about salmon (e.g., Earth Economics 2013, Schwoerer 2013, The Salmon Project 2014), these feelings do not necessarily translate into salmon-friendly land-use strategies in landscapes consisting of a complex web of public and private land ownership. A complicating factor in any management strategy is that streams that provide salmon-habitats most often pass through parcels with multiple stakeholders. Thus, maintaining the “natural capital” of salmon-rich ecosystems will require synthesis of scientific research and science-informed land-use decisions made by all stakeholders. The purpose of this project is to develop a place-based investment model for natural capital that creates a bridge between interdisciplinary scientific research and multi-stakeholder decision-making for watershed management to assure the persistence of salmon-bearing streams. A team of collaborators is engaging multiple stakeholders in the Kenai Lowlands, with a goal of identifying how natural salmon capital is valued, and to what degree people are willing to make trade-offs in development activities to benefit salmon resources. Understanding specific trade-offs different stakeholders consider informs not only how best to support decision-making, but also creates a climate of cooperation among multiple stakeholders which facilitates stewardship of critical habitats. The group will present scientific information that establishes the relationships between watershed condition and salmon abundance at multiple scales ranging from landscape level to characteristics of individual streams that relate to salmon species composition and abundance.





SASAP: Using participatory modeling to empower community engagement in salmon science

Leader: Jones, Michael

This working group is comprised of modelers, salmon population dynamics experts (academic and agency), and regional stakeholders from the Arctic-Yukon-Kuskokwim (AYK) region of Alaska who synthesize ideas for community-based monitoring of salmon populations and the fisheries that depend upon them. Salmon management in Alaska is informed by population and fishery assessments which provide the data needed to calibrate models used to determine escapement goals and set within-year harvesting strategies. Because of its remoteness and the absence of highly valuable commercial fisheries, the AYK region suffers from comparatively poor data, but is also home to the largest subsistence salmon fisheries in the world. Since 2008 a series of projects funded by the AYK-SSI (Sustainable Salmon Initiative) have led to development of new models of Kuskokwim and Yukon River salmon populations, the two largest rivers in the AYK region, that explicitly consider uncertainty and provide an objective basis for determining critical information needs to inform salmon management. More recently these projects have led to engagement with regional stakeholders as the group seeks to build local capacity to advise Federal and State managers on regional fisheries management. This work is being extended by bringing the modelers, managers and stakeholders together to synthesize current knowledge and understanding of salmon science in the region and identify strategies wherein local stakeholder groups could create community-based monitoring programs that are optimally informative for salmon management and risk assessment. The modelers and their models will define critical information needs, while the stakeholders will bring practical, local knowledge of monitoring and data collection options. While the focus of the working group will be on the AYK region, the definition of critical information needs that can be met by community-based monitoring strategies has relevance to all areas of Alaska where assessment costs constrain information gathering by management agencies.

SASAP: Well-Being and Alaska Salmon Systems

Leader: Donkersloot, Rachel

Co-Leaders: Carothers, Courtney; Black, Jessica

Human well-being has been widely promoted as an important dimension of sustainability, and is increasingly gaining application in fisheries. At the same time, efforts to measure well-being and incorporate these dimensions into resource governance and decision-making remains hamstrung by availability of data and broad assumptions about important components of quality of life and well-being. This state of the knowledge synthesis project is driven by the overarching goal of identifying and applying well-being concepts to improve the social sustainability and management of Alaska salmon systems. The group is addressing the following questions: 1) How do salmon-dependent individuals and communities define well-being, and how do salmon-human connections contribute to various forms of well-being? 2) What dimensions of human well-being are currently understudied in the context of Alaska salmon systems? 3) How have human well-being concepts been incorporated into fishery management decision-making processes? and 4) What information gaps currently exist? Workgroup members include Indigenous and non-Indigenous researchers, practitioners, and knowledge bearers from diverse communities across Alaska, as well as several national and international experts representing a range of disciplines, organizations, and governmental bodies. Guided by the above questions, the group is engaging in a cross-disciplinary and cross-cultural dialogue with the aim of understanding interdependencies between socio-cultural and ecological systems, salmon-human connections and contributions to well-being in Alaska, and relationships between management and well-being. Special attention is paid to well-being concepts inclusive of Indigenous people's priorities and perspectives.

Ocean Health Index



Principal Investigator: Benjamin Halpern

The first time the world had a holistic, global picture of ocean health was in 2012 with the launch of the Ocean Health Index (OHI). From its beginnings as an NCEAS working group, 65 international scientists worked together for three years to amass and synthesize over 100 data sets to develop the OHI methods and use them to quantify the health of all coastal nations and territories around the world. Since 2012, the OHI core team at NCEAS and Conservation International has worked to improve data collection and synthesis efforts while working openly and reproducibly and has reached another milestone in 2017: we can now track how global ocean health has changed over the last 5 years.

While the effort to measure global ocean health from year to year is a big part of what the OHI team does, there are other ways the team is working to improve how much we know about our oceans so we can better manage them for the future. The OHI team is continually working to improve the way synthesis science is done by utilizing the best, new, open data science tools and resources, and have published studies to quantify uncertainty in global OHI data, examine marine species range data to better serve science and conservation, improve estimates of global fisheries populations, and discuss how the OHI fits in the greater landscape of marine assessment tools.

OHI assessments at smaller spatial scales can give a picture of ocean health and help inform local management. The OHI team is leading assessments in British Columbia and the US Northeast and is engaging with regional planning bodies to understand how past actions have affected overall health. Additionally, the OHI team trains independent groups to lead their own assessments within their jurisdictions. There are now over twenty groups leading their own assessments from Indonesia to Ecuador to the Baltic Sea. More information about the OHI project, as well as all ongoing assessments, instruction, computer code, and information about our partners and funding is available through ohi-science.org.

The OHI is generously funded by the Gordan and Betty Moore Foundation and Conservation International.



Ocean Tipping Points

Principal Investigator: Carrie Kappel
Co-PIs: Benjamin Halpern, Kimberly Selkoe



Crossing an ecosystem tipping point creates dramatic change. From collapsed fisheries and coastal dead zones, to melting sea ice and dying coral reefs, the consequences are often devastating to both the environment and the people who depend on it. The Ocean Tipping Points Team has spent the last four years studying ecosystem tipping points to improve our ability to predict where and when they may occur in order to develop practical tools to help managers predict, avoid or recover from these dramatic ecosystem shifts.

Over the course of the Ocean Tipping Points project, this large, interdisciplinary research team has worked to synthesize data on when and where ecosystem tipping points have been crossed around the world, quantify threshold responses in ecosystems to key stressors, and analyze what leads to better ecological outcomes in management that accounts for tipping points. From this innovative research we have developed key take-homes and lessons learned and are working in close partnership with resource managers to implement these new ideas in our two case study regions: Hawaii and Haida Gwaii, British Columbia.

Now in the final year of the project, we are also working to more broadly share the knowledge we have gained with the marine resource management community in interactive and novel ways. We have recently launched a new portal on the Ocean Tipping Points website (oceantippingpoints.org/portal/otp) that houses the project's accumulated knowledge, resources, and guidance about ocean tipping points science. Here we provide concrete analytical tools, guidance and resources to help ocean managers keep ecosystems healthy and resilient in the face of ocean change. We are also hosting a 3-day "Community of Practice" workshop aimed at bringing resource managers together to help them understand and apply this newly developed suite of scientific tools and methods to support effective management in their own ecosystems.

The Ocean Tipping Points project is supported by the Gordon and Betty Moore Foundation, Fisheries and Oceans Canada (DFO), the National Center for Ecological Analysis and Synthesis, the University of California, Santa Barbara, and the State of California. Our partners include Stanford's Center for Ocean Solutions, the Environmental Defense Fund, the National Oceanographic and Atmospheric Administration (NOAA), the California Polytechnic State University, San Luis Obispo, Parks Canada, Fisheries and Oceans Canada, Council of the Haida Nation, and the State of Hawaii.

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Gulf of Alaska Working Groups



Applying portfolio effects to the Gulf of Alaska ecosystem: Did multi-scale diversity buffer against the Exxon Valdez oil spill?

Leader: Marshall, Kristin

Co-leaders: Hunsicker, Mary; Beaudreau, Anne; Brenner, Richard; Ward, Eric; Shelton, Andrew

Understanding how ecosystems respond to environmental variability and large perturbations is a central problem in ecology. The Exxon Valdez oil spill was an extremely large perturbation to the Gulf of Alaska (GOA) ecosystem. However, because species and populations differ in the timing and magnitude of response to perturbations, the effects of the oil spill may be difficult to detect. We propose an NCEAS working group centered on the application of portfolio theory in the GOA using novel spatiotemporal modeling approaches. We will synthesize time-series from the GOA ecosystem and fisheries. Our goals are to:

1. Synthesize the temporal and spatial scales of biomass, growth, and recruitment variability for herring, salmon, groundfish, and crabs, and compile existing studies on climate forcing on these taxa in the GOA
2. Examine the role of diversity in stabilizing a) temporal dynamics of plankton and focal fish species, and b) catch portfolios in the GOA pre- and post-oil spill
3. Investigate evidence for changing species interactions and community resilience using multispecies models applied to plankton, fish, and Steller sea lions in Prince William Sound and the GOA.

We will use recently developed multivariate spatiotemporal models to build on previous syntheses of GOA data and investigate the role of climate drivers and ecological interactions. We will evaluate the effects of the oil spill after accounting for these other drivers. Our synthesis will improve understanding of the role of multiple sources of variability in structuring GOA communities and advance new methods in spatiotemporal modeling. The methodology we develop will be broadly applicable to exploited marine ecosystems around the world.

Understanding changes in the Coastal Gulf of Alaska Ecosystem: Analysis of Past Dynamics to Improve Prediction of Future Response to Natural and Anthropogenic Change

Leader: Okey, Thomas

Co-leaders: Ruzicka, James; Klinger, Teresa

How will the structure, the productivity, and the dynamics of the coastal Gulf of Alaska ecosystem respond to anticipated changes in environmental conditions and human disturbances within coastal waters? Our proposed working group will take an integrated two-pronged approach to examining the past 25-years of data from the Gulf of Alaska for insights into the present state and future changes in the region, both anthropogenic and natural. Statistical analysis of observed states and changes among physical and biological ecosystem components will highlight sensitivities to changes in the physical environment across trophic levels. Model analyses will characterize sensitivities to environmental variability and estimate the effects of future oceanographic changes and management and policies on both ecological and human dimensions. Experts in social-ecological systems will guide research and activities towards the examination of the consequences of ecosystem change to human needs and activities.



TomKat UC Carbon Neutrality Project



Director: David Austin

The TomKat UC Carbon Neutrality Project seeks to develop and deploy solutions to mitigate climate change by capitalizing on the vast resources and researchers within the University of California (UC) system. The goal of the Project is to support innovative multidisciplinary research projects that will substantially accelerate progress of the University of California Carbon Neutrality Initiative. The TomKat UC Carbon Neutrality Project was launched by UC Santa Barbara's Institute for Energy Efficiency (IEE) in partnership with the National Center for Ecological Analysis and Synthesis (NCEAS) to help advance the University of California's system-wide goal to achieve zero net scope 1 and 2 greenhouse gas emissions by 2025. Funding for this project was made possible by a gift from the TomKat Foundation together with supplemental funding from the University of California Office of the President.

The TomKat project solicited proposals for working groups to address topics such as technology assessments, energy efficiency, communications strategies, economic incentives, behavior modification, and other potentially high impact topics. Two working groups were chosen to work on this initiative. The first working group focuses on transitioning UC away from natural gas as an energy source by performing techno-economic analyses of natural gas alternatives. The second focuses on using strategic communication to build stakeholder support for the necessary actions and changes that are needed to meet the ambitious goals of the University of California Carbon Neutrality Initiative.

The TomKat UC Carbon Neutrality Project is unique, because it has a specific local goal -- creating a pathway for achieving carbon neutrality at the University of California -- which can then be replicated at other large institutions. The teams will identify solutions and strategies that the members of the University of California community can deploy to achieve its sustainability targets. Ultimately, this effort will serve as an example for transitioning larger energy systems away from fossil fuel dependence.

The project draws on the extensive intellectual resources of the ten campuses and the affiliated national laboratories of the University of California system. The complex and multifaceted nature of climate change mitigation requires a dynamic interdisciplinary approach that is both synergistic and interactive. Tackling big challenges like transitioning off natural gas, introducing renewable energy, electrifying transportation, and strategically communicating these initiatives will mandate an integrated approach where technologists, policy experts, economists, behavioral scientists, and communications specialists work together to forge solutions. During fiscal year 2017, NCEAS had three active Working Group projects supporting the TomKat efforts (described below).



TomKat: Communication for mitigation: Reaching carbon neutrality by 2025 through strategic environmental communication

Leader: Bales, Roger

Co-leaders: Forman, Fonna; Leombruni, Lisa

The Net-Zero Comm Strategy working group will develop a strategic communication and outreach plan to help the University of California (UC) reach its goal of carbon neutrality by 2025. Bringing together a diversity of experts in communication, political science, psychology, engineering, and social policy, the working group will develop UC system-wide and campus based communication strategies, including designing and testing communication interventions. A critical component of this research will be to identify and research key audiences and stakeholders through campus-wide surveys, exploring potential pathways to change and barriers to engaging with carbon neutrality solutions. The group will also apply cutting-edge socialscience research to advance and test novel pathways to engagement with and messaging about the carbon neutrality initiative with select audiences. During a 5-month period, the group will deliver three white papers on the strategies, findings, and recommendations for communications within the UC, including how these may be scalable beyond the UC.

TomKat: Reaching the other side of the bridge: Challenges in eliminating natural gas as an energy source

Leader: Davis, Steven

Co-leaders: Victor, David

The Working Group proposes to systematically evaluate options for eliminating natural gas as an energy source on UC campuses, specifically as a fuel for on-site combined heat and power plants as well as power imported from off-site generators. Our assessment will encompass technological, economic, behavioral, and institutional aspects of natural gas alternatives. Although the results of analyses will be highly-relevant to decision-making at the UC in pursuit of the goal of campus carbon neutrality, our findings will ultimately address the challenges of the energy system more broadly and its transition away from natural gas in the future.

TomKat: Natural gas exit strategies for the University of California

Leader: Meier, Alan

Co-leaders: Davis, Steven; Mezic, Igor; Victor, David

65% of the UC's scope 1 and 2 greenhouse gas emissions currently come from six cogeneration power plants. In order for the campuses to meet their carbon neutrality goals, this infrastructure must be retrofitted or overhauled completely to remove natural gas combustion. While a 2014 report investigated methods of mitigating the natural gas problem, it did not go far enough to completely remove it. We propose to conduct a technical and economic survey of methods of completely removing natural gas use for electricity, heating, and cooling systems for each of the campuses using cogeneration. The outcome of this project will be a recommended pathway for each campus to proceed in infrastructure overhaul to meet this objective.

More Science Projects



BLM CA CESU Panoche Plateau Leopard Lizard Shrub Habitat Study at Cencal District, Hollister FO

Leader: Lortie, Christopher

With increasing desertification of the San Joaquin Basin and Imperial Valley in California, tractable, novel programs need to be developed to efficiently manage this changing and impacted landscape. The primary objective of this study is to contrast the direct and indirect plant and seed effects of shrubs at Panoche Hills Management Area on all major ecological species within the region. In the Panoche Hills Management area, Mormon Tea (*Ephedra californica*) is the dominant shrub species and a potential refuge or nurse for annual plants, native seeds, lizards, and kangaroo rats. Preliminary surveys in early 2013 showed a positive effect of *Ephedra* on the annual understory similar to many other semi-arid systems. Lizards and kangaroo rats depend on shrub-lands for their habitat, however their association with *Ephedra* has never been tested.

In this study, funded by the Bureau of Land Management, the direct, indirect, and trophic effects of a foundation shrub species will be used as an anchor to examine dynamics at multiple scales and for numerous taxa. Trophic interactions and gradients effects within the Panoche system will also be examined to ascertain whether the beneficiary annual plants also impact critical community dynamics. These datasets will then be geo-referenced and linked to Kangaroo Rat and Leopard Lizard abundance and diversity datasets collected in parallel. Dispersal and foraging studies will also be included in subsequent seasons to more directly couple resource and habitat effects between shrubs and animals within this region. This study will advance the restoration ecology of semi-arid ecosystems and provide an assessment of shrub dynamics of this ecosystem that will elucidate the capacity for direct and simple management/restoration strategies to maintain and enhance native species diversity and abundance.





Case studies of conservation actions

Leader: Davis, Frank

Conservation actions have potential to maintain or increase populations of threatened, candidate, and endangered species. These actions are important for preserving populations of sensitive flora and fauna. There are many types of conservation actions. Nationwide, there have been 142 Habitat Conservation Plans (HCPs), six Safe Harbor Agreements (SHAs), nine Candidate Conservation Agreements (CCAs), and three Candidate Conservation Agreements with Assurances (CCAAs) in the utility and infrastructure sectors. There are many important features of each of these types of conservation actions, as well as different species, drivers, outcomes, and results. Extending the work of the P55 Supplemental Tech Report titled, "Voluntary conservation actions: Approaches to cost-effectively protect multiple candidate species and to avoid listing," this study will examine several case studies of conservation actions for non-listed species, as well as delisting.

The team will examine specific conservation plans in detail, comparing, contrasting, and identifying pros and cons of each of the conservation tools and plans mentioned above from a practical perspective, emphasizing design, implementation, and evaluation. This study will focus on qualitative issues such as flexibility and collaboration with agencies, as well as quantitative issues such as spatial extent, habitat suitability, population (as assessed following a conservation action), costs, and economic incentives, among others. An evaluation of how some of the key species impacts are quantified (such as breeding habitat, take of individuals, reduced productivity, etc.) The results will be a technical report on the lessons learned from the existing case studies from the utilities/ infrastructure sector. This project is funded by the Electric Power Research Institute.

A study of endangered blunt-nosed leopard lizard-shrub dynamics at the Carrizo Plain National Monument

Leader: Lortie, Christopher

Carrizo National Monument is home to many endemic, rare, and federally listed plant and animal species. The blunt-nosed leopard lizard is one of these instances. We are using radio telemetry, detailed observation, and habitat surveys to identify potential ecological drivers critical to their persistence and survival within this region. Excellent progress has been made in tracking in particular with nearly 30 individuals monitored in 2016. There is also preliminary evidence that foundation plant species are needed for this and many other animal species within the region. This study is funded by The Nature Conservancy.

Marine debris: Scale and impact of trash in ocean ecosystems

Leaders: Gaines, Steven; Lavender Law, Kara

Ocean pollution by plastic and other man-made debris is a pressing environmental problem that has captured the attention of marine conservationists, anti-plastic activists, the media and the general public. While this problem is not new - plastic debris in the ocean was first reported in the 1970s - a rigorous scientific evaluation of the problem has lagged behind the increasing attention from a diverse set of stakeholders. Only recently has "marine debris" begun to emerge as a recognized field of scientific inquiry, with novel research efforts underway in tandem with new interest by major funding agencies and foundations.

The Marine Debris Working Group consists of a team of international experts in fields including oceanography, marine ecology, toxicology, polymer, science and waste management, who have been synthesizing existing information across these disciplines to answer fundamental questions about the sources, amount, behavior, and impacts of man-made debris in the marine environment. The results of this two-year working group will become available in 2014, providing a much-needed scientific grounding to the subject that will inform the public, industry stakeholders and policymakers, in addition to the scientific community. This project is supported by the Ocean Conservancy and NCEAS.



Scoping Study for a Biodiversity Field Campaign

Leader: Davis, Frank

Frank Davis will participate in all Project Working Group meetings and will assume primary responsibility for project activities that occur at NCEAS. As a Working Group participant, he will contribute to scoping and design activities to identify 1) key measurements, 2) needed measurements, 3) candidate regions and in situ cal/val strategy, and 4) modeling approaches. Davis will serve as the primary point of contact for UCSB and NCEAS for the duration of the project.

For the duration of the project, which is funded by the Jet Propulsion Laboratory, NCEAS will support scoping activities including the following: (1) logistical support for Working Group meetings held at NCEAS in Santa Barbara, including communications related to meeting planning, participant support for travel to and from meetings, hotel accommodations, and meals while in Santa Barbara, and incidental expenses such as ground transportation to and from the meeting; (2) grant accounting and administration for the UCSB sub-contract; (3) technical support for the Working Group including access to NCEAS computing facilities, virtual collaboration between face-to-face meetings, as well as programming and analytical advice and support during as well as between meetings in Santa Barbara; and (4) support of project communications and outreach activities. These include establishment and maintenance of a project website through the NCEAS domain (www.nceas.ucsb.edu); and, in collaboration with the PIU and Co-I's, development of a project communication strategy, including production of press releases for working group products.

Synergies between NEON and LTER

Leader: Davis, Frank

As the operator of the LTER Network Communications Office (LTER-NCO), the National Center for Ecological Analysis and Synthesis (NCEAS) has a strong interest in the success and outcome of the LTER-NEON Synergies Workshop. Network Communications Office Director Frank Davis will participate in the workshop, which aims to identify research synergies and complementarities between these two national-scale networks. The LTER-NCO will also be a key participant in any resulting implementation plan. The project is generously funded by the Cary Institute of Ecosystem Studies.

Workshop: MacroMycoFunc - Forming an integrated understanding of function across fungi

Leaders: Schildhauer, Mark; Zanne, Amy

Fungi are critical components of our world, contributing to ecosystem function and the global economy. As many fungi live out their lives at sizes smaller than can be perceived with the naked eye, there are large gaps in our knowledge related to the ecology and evolution of fungal diversity and function. It has only been in recent years with the advent of next-generation sequencing that we have begun to understand how fungal communities function in different ecological settings and how they have been structured over evolutionary time. Fungi are known to live their lives in different ways (i.e., ecological guilds) including as pathogens, endophytes, saprobes, and mycorrhizae, and the important functional traits they employ may differ within and across ecological guilds. However, there is frequently little discourse among biologists studying different fungal guilds. Finally, although next-generation sequencing is increasingly one of the main tools we use to study these organisms, we do not yet have community-approved standards and protocols, meaning it can be difficult to compare findings across studies. The objective of our working group is to use this emerging data stream to address previously unanswerable questions in fungal ecology and evolutionary biology at refined taxonomic and expanded spatial scales. The two workshops proposed here will bring together a diverse group of fungal ecologists and evolutionary biologists, as well as plant biologists who bring interdisciplinary expertise on ecological theory from a closely related field. This project is supported by the National Science Foundation.



Informatics

Informatics



NCEAS' Informatics Program has been a leader in creating new informatics research collaborations, bringing together the best science and technology minds to create new tools to enhance our ability to discover, access, integrate, and appropriately apply the growing body of ecological and other data. NCEAS [team members](#) are [widely published](#) on the latest in data management and informatics. Ultimately, these advances in informatics will have a large impact on our knowledge and understanding of ecosystems and our ability to apply that understanding to the world's most pressing conservation and resource management issues.

Data sharing and access to technology are crucial elements in arriving at new frontiers in ecology and new solutions to environmental problems. The [NCEAS Data Policy](#) requires scientists to document and publish their datasets and code for robust, reproducible science. Many of NCEAS' Informatics [projects](#) and [tools](#) are focused on facilitating data sharing, and all of the tools developed at NCEAS are freely available and open source. In addition, we maintain the public [KNB Data Repository](#), which houses thousands of freely accessible datasets, generated at NCEAS and elsewhere.



Informatics Projects



Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic

Leader: Jones, Matthew

Co-leaders: Dozier, Jeff; Budden, Amber; Baker-Yeboah, Sheekela ; Schildhauer, Mark

Investigators at the University of California Santa Barbara, DataONE, and NOAA will build and operate a multi-institutional knowledge archive serving diverse Arctic disciplines, including ecology, earth science, atmospheric science, oceanography, anthropology, archaeology, and social and political science. The Scientia Arctica archive will provide unprecedented capabilities to reproducibly preserve and discover all products of NSF-funded science in the Arctic, including data, metadata, software, documents, and provenance that link these in a coherent knowledge model, using infrastructure from the successful NSF-sponsored DataONE federation of data repositories. Storage will utilize the KNB Data Repository for its strong versioning and accessioning to enable an effective archive. Data will be replicated to administratively diverse institutions (NCEI and the Amazon cloud), as this is critical to long term preservation. DataONE researcher-facing tools will be adapted to provide convenient pathways to document and archive diverse data formats as part of scientist's normal workflows (e.g., both through the web and via analytical tools such as Matlab, R, and IDL). This infrastructure will be supported with an outstanding set of community services, including data discovery tools, metadata assessment and editing, data cleansing and integration, data management consulting, and user help-desk services. A data recovery team will engage the community to prioritize and rescue critical Arctic data from past NSF research that is currently inaccessible. In addition to the traditional functions of a data archive, modern cloud-based data facilities will support detailed provenance tracking of the science process, data usage and citation reporting, linkages among heterogeneous disciplines, and direct linkages between the literature, investigators, and funding programs through the use of DOI, ORCID, and FundRef identifiers. Usability and outreach specialists will engage an interdisciplinary Arctic Science Advisory Board and the broader polar science communities to drive continuous improvement by evaluating tools and services, gathering requirements and use cases, and prioritizing improvements to infrastructure and service offerings of the archive. Usage data and usability studies will drive an iterative cycle of assessment and development to improve operations. A sustainability model will be vetted and phased in to provide long-term curation and preservation of research that ultimately has a broad impact on science and societally critical policy issues in the Arctic.

Collaborative Research: ABI Development: A toolbox for analysis of long-term ecological dynamics using the Kepler Workflow System

Leader: Jones, Matthew

Co-leaders: Gries, Corinna; Collins, Scott

As ecologists continue to gather long-term data at site, regional, continental and global scales, there will be an increasing need for tools to measure the pattern and rate of change in plant and animal communities in response to multiple environmental drivers. The National Science Foundation (NSF) Advances in Biological Informatics (ABI) program has recently funded the NCEAS Informatics team and collaborators to gather together multiple metrics of ecological dynamics into one toolbox that will provide ecologists with a new set of tools for quantifying how communities change over time. Their approach builds upon many recent informatics developments (Kepler, DataONE, and Ecological Metadata Language) to advance ecological research. The toolbox will make community analysis more accessible, expose a variety of indices to wider use, and, with existing workflows, will help reduce data preparation efforts and foster unprecedented potential for collaboration.



DataONE: Observation network for Earth

Leader: Jones, Matthew

Co-leaders: Hampton, Stephanie

DataONE (Observation Network for Earth) is building cyberinfrastructure for open, persistent, robust, and secure access to well-described and easily discovered Earth observational data. Supported by the U.S. National Science Foundation, DataONE will ensure preservation and access to multi-scale, multi-discipline, and multi-national science data. DataONE will transcend domain boundaries and make biological data available from the genome to the ecosystem; make environmental data available from atmospheric, ecological, hydrological, and oceanographic sources; provide secure and long-term preservation and access; and engage scientists, land-managers, policy makers, students, educators, and the public. DataONE is a collaboration between NCEAS/UCSB, the University of New Mexico, the Oak Ridge National Laboratory, the California Digital Library, NESCent, and a number of other organizations.



Collaborative data management and holistic synthesis of impacts and recovery status associated with the Exxon Valdez oil spill

Leader: Jones, Matthew

Following the Exxon Valdez Oil Spill in 1989, the oil-impacted areas of the Gulf of Alaska have been extensively monitored to examine impacts of the spill on the ecosystem and to assess and promote recovery of impacted species. Gulf Watch Alaska is a long-term monitoring program in the Gulf of Alaska region that is expected to be 20 years in total length but planned and funded in five-year increments. The project includes 25 principal scientists who seek to provide data to identify and help understand the impacts of multiple ecosystem factors on the recovery of injured resources.

Gulf Watch Alaska builds upon more than 20 years of restoration research and monitoring by the Exxon Valdez Oil Spill Trustee Council (EVOSTC) and federal and state agencies. This long term monitoring program includes sites in Prince William Sound, lower Cook Inlet and the outer Kenai Peninsula coast. Map of study region.

To facilitate a thorough understanding of the effects of the oil spill, the NCEAS Informatics team has collaborated with investigators from Gulf Watch Alaska and the Herring Research and Monitoring program to collate historical data from a quarter century of monitoring studies on physical and biological systems impacted by the spill. The 25 years of historical data NCEAS has collated and documented is available for use by a wide array of technical and non-technical users

In March 2014, NCEAS issued a Call for Proposals for two cross-cutting synthesis Working Groups and two Postdoctoral Associates to do a full-systems analysis of the effects of the 1989 oil spill on Prince William Sound and the state of recovery of the affected ecosystems.

The Gulf Watch Alaska project is funded by Exxon Valdez Oil Spill Trustee Council (EVOSTC) and state and federal agencies.

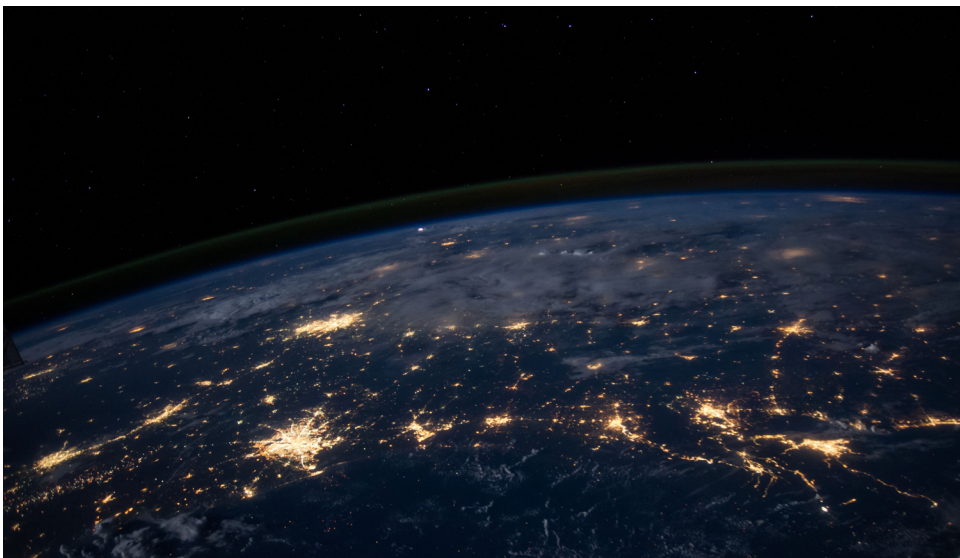


INTEROP: Data Task Forces for Better Synthesis Studies

Leaders: Jones, Matthew

The Data Task Force will support data collection and management for the newly launched State of Alaskan Salmon and People (SASAP) synthesis working groups, and in the process, will assess the efficacy of this approach for synthesis research in general. SASAP researchers plan to engage the entire salmon stakeholder community to assess the current state and plan for the future sustainability of salmon and the people of Alaska who rely on them. To support the SASAP working groups, the Data Task Force will collect currently inaccessible data from state agencies, universities, and NGOs and “wrangle” it into useable formats.

By designing a user-friendly and easily maintained repository, the Data Task Force will give the public access to scientific, ecological, economic, and social data on Alaskan salmon, enabling holistic analysis of salmon system management. The task force will include an ethnographer, David Ribes from University of Washington, to study the process from beginning to end, including how the data and synthesis teams interact, the ease of data sharing with various groups, choices that have to be made in the data integration process, and ultimately, what knowledge begins to emerge out of the data once it is in use.



EarthCube Building Blocks: GeoLink -- leveraging semantics and linked data for data sharing and discovery in the geosciences

Leader: Schildhauer, Mark

Co-leaders: Jones, Matthew

A key challenge for EarthCube is to enable data discovery, access, and integration in a sustainable way. Existing data repositories and networks must be linked, while retaining their independent missions and services to existing disciplinary communities.

In this project, we propose to develop an EarthCube Building Block, GeoLink, based on: 1) digital publication of geoscience data and knowledge as Linked Open Data combined with 2) semantic integration using design patterns and vocabularies shared among federated repositories; and 3) an underlying cyberinfrastructure extendable in both depth and breadth, that can become a central building block for EarthCube data harmonization.



Meetings



Meetings

Replenish-collaborative Data Platform	25 Jul - 26 Jul 2016
SNAPP Management Team	26 Jul - 27 Jul 2016
SNAPP:Advisory Board	19 Sep - 20 Sep 2016
iDigBio geoNHC	4 Oct - 7 Oct 2016
LTER Open Science Meeting	9 Oct - 13 Oct 2016
Long-term Challenges to Alaska's Salmon and Salmon-dependent Communities	1 Nov - 3 Nov 2016
Connectivity Climate Assessment	9 Nov - 10 Nov 2016
LTER Synthesis Proposal Panel	18 Nov 2016
LTER: Schoolyard Book Series	7 Feb - 9 Feb 2017
SNAPP:Advisory Board	9 Feb 2017
SNAPP: Management Team	10 Feb 2017
Connecting Geodiversity and Biodiversity Across Scales	20 Feb - 24 Feb 2017
LTER-NEON Synergies	29 Mar - 31 Mar 2017
LTER NCO, EDI, and DataONE Coordination	11 Apr - 13 Apr 2017
Arctic Data Center: Science Advisory Board	16 May - 17 May 2017
LTER: Science Council	16 May - 19 May 2017
Building a Semantic Vocabulary for the Arctic Data Center	30 May - 2 Jun 2017



Training and Outreach

Community Roundtables



Open to the public, Roundtable is an informal discussion on current research pursuits with NCEAS, UCSB, and visiting scientists, as well as, other science-related topics.

Date	Speaker	Affiliation	Topic
06 Jul 16	Dr. Michael Clark	La Trobe University, Australia	<i>Catering for wildlife in fire-prone Australian mallee habitats: it's not rocket science, it's more complex than that!</i>
13 Jul 16	community discussion		<i>Early Career Researchers - Fostering Science Community at NCEAS: Welcome Site for Newcomers</i>
20 Jul 16	Dr. John Parker	Arizona State University	<i>This, That, and The Other: Three Remarks on the Sociology of Creativity</i>
07 Sep 16	Dr. Alenda Y. Chang	UCSB	<i>Greening Games</i>
14 Sep 16	Ben Best	UCSB	<i>Interactive Tradeoffs to Support Anticipatory Marine Spatial Planning</i>
28 Sep 16	community discussion		<i>Discussion on embarking on an advanced degree</i>
05 Oct 16	community discussion		<i>Discussion on Chronicle article titled "The Changing Face of Scientific Collaboration"</i>
12 Oct 16	Dr. Eric Harvey	University of Zurich, Switzerland	<i>Species interactions as biotic filters of global change</i>
19 Oct 16	Dr. Ben Halpern	NCEAS Director	<i>NCEAS Updates</i>
9 Nov 16	Dr. Yiwei Wang	San Francisco Bay Bird Observatory	<i>The Day After: Bird Conservation in [Insert President-elect's name]'s America!</i>
16 Nov 16	Celine Mol, Charlie Diamond, Evan Ritzinger, & Jay McConagha	UCSB	<i>Carbon Neutrality at UC: The TomKat Project</i>
29 Nov 16	Dr. Meghan Avolio	LTER Working group; National Socio-Environmental Synthesis Center (SESYNC)	<i>Plant Community Responses to Global Change Drivers</i>
30 Nov 16	Julien Brun	NCEAS	<i>Intro to Python using Jupyter notebooks</i>
07 Dec 16	Jai Ranganathan	NCEAS	<i>Using social media to advance your research career</i>
14 Dec 16	Julie Stewart Lowndes	NCEAS	<i>Personal website with R and RMarkdown</i>
15 Dec 16	Dr. Ray Hilborn, Mike Melnychuk, & Maite Pons	School of Aquatic and Fishery Sciences (SAFS), University of Washington	<i>Measuring the status of fisheries and factors leading to success</i>
11 Jan 17	Dr. Peter Westley, Jessica Black, Courtney Carothers, & Tobias Schwoerer	University of Alaska, Fairbanks	<i>Alaska's salmon and people in the (rapidly changing) 21st century</i>



Date	Speaker	Affiliation	Topic
25-Jan-17	Dr. Nathan Emery	UCSB, Dept. of Ecology, Evolution, & Marine Biology	<i>Summer fog patterns of Santa Barbara County</i>
1-Feb-17	Dr. Jonathan Grabowski	Marine Science Center, Northeastern University	<i>Aligning coastal restoration with ecological and societal needs</i>
8-Feb-17	Bren School Rocket Outfall team	UCSB	<i>Obstacles to Groundwater Treatment at Santa Susana Field Laboratory: Assessing Water Management Options and Ecosystem Questions</i>
15-Feb-17	Dr. Greg Ruggerone	Natural Resource Consultants, Inc.	<i>Evidence of competitive interactions among salmon in the North Pacific Ocean</i>
22-Feb-17	Dr. Eleanor Sterling, Rachel Dacks, & Stacy Jupiter	Am. Museum of Natural History; Wildlife Conservation Society; Univ. of Hawai'i at Manoa	<i>Biocultural approaches to indicator development and use from local to global</i>
2/29/2017	Dr. David Schimel	Jet Propulsion Laboratory	<i>Observing carbon-climate feedbacks from space</i>
8-Mar-17	Dr. Kam Dahlquist	Bioethics Institute, Loyola Marymount University	<i>GRNmap and GRNsight: Open Source Software for Dynamical Systems Modeling and Visualization of Medium-Scale Gene Regulatory Networks</i>
15-Mar-17	Alexa Fredston-Hermann	UCSB, Bren School	<i>Non-climate processes and 'species on the move'</i>
29-Mar-17	Peter Groffman	City University of New York, Cary Institute	<i>Synergies between LTER and NEON: A discussion</i>
5-Apr-17	Chris Jerde	UCSB, Marine Science Institute	<i>Inferring species presence using environmental DNA</i>
12-Apr-17	Jai Ranganathan	NCEAS	<i>The real war on science: It's not what you think</i>
19-Apr-17	Dr. Krista Oke	McGill University	<i>(Non)parallel evolution in salmon</i>
17-May-17	Casey O'Hara	NCEAS	<i>Aligning marine species range data to better serve science and conservation</i>
24-May-17	Julie Stewart Lowndes	NCEAS	<i>Better science in less time: How the Ocean Health Index is transforming marine science for management</i>
31-May-17	Dr. Ben Halpern	NCEAS Director	<i>The story of NCEAS: impact, opportunities and the future of NCEAS</i>
14-Jun-17	Dr. Forest Isbell	University of Minnesota	<i>Human dependence and influence on biodiversity</i>

Training



Training: Telling the Right Story to the Right People, at the Right Time

Instructors: Marty Downs and Jai Ranganathan

Date: Jan-May 2017

This hands-on online training for LTER communicators offered step-by-step guidance for indentifying key audiences, learning about their information needs, and developing a measurable, sustainable plan for addressing them.

Training: Arctic Data Best Practices

Instructors: Matthew Jones, Amber Budden, and Chris Lortie

Date: 28 Mar 2017

This workshop provided researchers with concrete steps and methods for more easily documenting and uploading data to the Arctic Data Center.





Awards and Funding

Award Sponsors



Organizational Funders

Bioversity International
Cary Institute of Ecosystem Studies
Conservation International
Electric Power Research Institute
Gordon and Betty Moore Foundation
Jet Propulsion Laboratory
Johannson Family Foundation
NASA Washington, D.C. Headquarters
National Academy of Sciences
National Science Foundation
Ocean Conservancy
Parks Canada
Prince William Sound Science Center
The HDF Group
The Nature Conservancy
University of California Berkeley - UCB
University of Illinois, Urbana Champaign
University of New Mexico
USDI Bureau of Land Management
USDI Geological Survey (Incl Natl Biological Service)

Individual Donors

Mr. and Mrs. Mike Gentry
Mr. and Mrs. Amine G. Khechfe
Mrs. Cynthia R. Stebbins

Awards Administered



Bioversity International

F. Davis		\$131,806
Science for Nature And People Partnership (SNAPP): Making Ecosystems Count in the Sustainable Development Goals (14/111)		
Oct 1, 2014 - Dec 31, 2016	Subtotal	\$131,806

Cary Institute of Ecosystem Studies

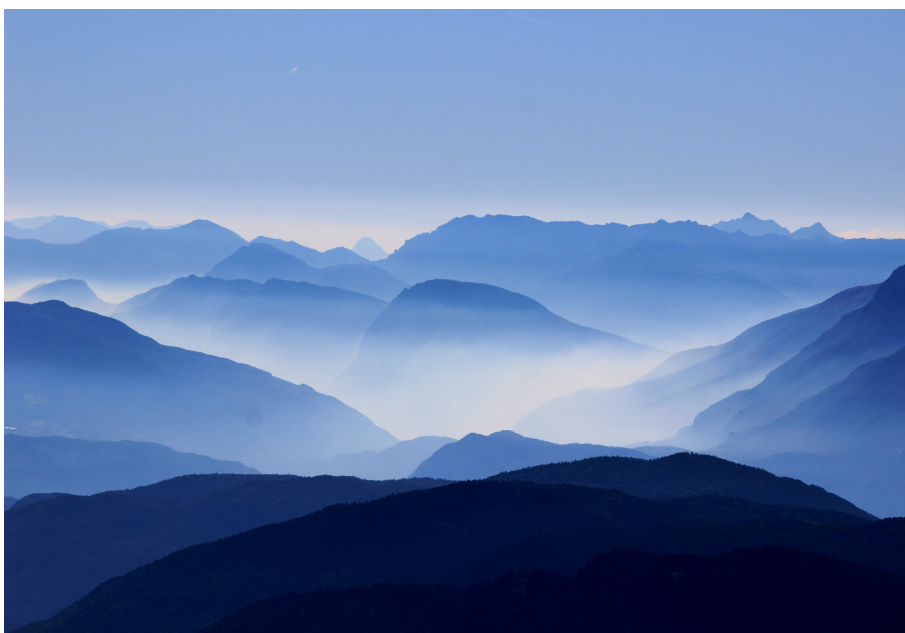
F. Davis		\$45,193
Workshop-NEON: Synergies Between NEON and LTER (2017PR0448)		
Jan 1, 2017 - Jun 30, 2017	Subtotal	\$45,193

Conservation International

B. Halpern		\$ 148,746
Global Ocean Health Index Assessment - NCEAS CY2017 (6002745)		
Jan 1, 2017 - Dec 31, 201		
B. Halpern		\$713,023
Global Ocean Health Index Assessment (6000024)		
Jan 1, 2015 - Mar 31, 2017	Subtotal	\$861,769

Electric Power Research Institute

F. Davis, J. Salzman		\$90,000
Case Studies of Conservation Actions (including delisting) (10006899)		
Sep 1, 2016 - Dec 31, 2017	Subtotal	\$90,000





Gordon and Betty Moore Foundation

B. Halpern	\$ 1,534,725
Regional application of the Ocean Health Index in Moore MCI priority areas (3538.01)	
Oct 24, 2014 - Dec 31, 2018	
C. Kappel	\$3,073,140
Ecosystem Thresholds and Indicators for Marine Spatial Planning (renamed to Ocean Tipping Points) (2897.01)	
Aug 17, 2012 - Oct 31, 2017	
F. Davis	\$2,473,305
Nature Lab: NCEAS core support and capacity building (3530)	
Dec 20, 2012 - Dec 31, 2016	
F. Davis	\$2,415,000
State of Alaskan Salmon and People (formally Salmon Connect) (5124)	
Nov 21, 2015 - Jun 30, 2018	
F. Davis	\$292,190
Science for Nature and People Partnership (SNAPP): Land-use Change and Conservation Policy in Brazil and the US for Biodiversity, Ecosystem Services and Economic Returns (4641)	
Dec 8, 2014 - Dec 15, 2017	
M. Jones	\$2,123,200
Data Task Forces for Better Synthesis Studies (5451)	
Aug 18, 2016 - Sep 1, 2018	
Subtotal	\$11,911,560

Jet Propulsion Laboratory

F. Davis	\$87,575
Scoping Study for a Biodiversity Field Campaign (1564273)	
Jan 19, 2017 - Sep 24, 2017	
Subtotal	\$87,575

Johansson Family Foundation

B. Halpern	\$233,000
Baltic Sea Ocean Health Index (SB150110)	
Mar 1, 2015 - Dec 31, 2016	
Subtotal	\$233,000

NASA Washington, D.C. Headquarters

F. Davis	\$77,992
Prospects and priorities for satellite monitoring of global terrestrial biodiversity: A proposal for an interdisciplinary synthesis working group (NNX14AN31G)	
Jul 10, 2014 - Sep 30, 2016	
Subtotal	\$77,992



National Academy of Sciences

M. Jones, A. Budden, C. Lortie	\$319,700
Open Science training enabling synthetic science within the Gulf Research Program (2000007396)	
Oct 1, 2016 - Sep 30, 2017	
Subtotal	\$319,700

National Science Foundation

F. Davis, M. Schildhauer, J. Caselle, S. Rebich Hesperha	\$ 3,514,189
Long Term Ecological Research (LTER) National Communications Office (LNCO) (1545288)	
Oct 1, 2015 - Sep 30, 2019	
F. Davis, S. Hampton	\$49,990
Planning Workshop: Increasing capacity for data-intensive research in environmental biology (EF-1358900)	
Sep 1, 2014 - Aug 31, 2017	
M. Jones	\$86,443
Collaborative Research: ABI Development: A User-friendly Tool for Highly Accurate Video Tracking (1564678)	
Aug 1, 2016 - Jul 31, 2019	
M. Jones, Dozier, M. Schildhauer	\$5,909,063
Scientia Arctica: A Knowledge Archive for Discovery and Reproducible Science in the Arctic (1546024)	
Feb 15, 2016 - Jan 31, 2021	
M. Jones, M. Schildhauer	\$472,188
Collaborative Research: ABI Development: A toolbox for analysis of long-term ecological dynamics using the Kepler Workflow System (DBI-1262463)	
Apr 1, 2013 - Mar 31, 2018	
M. Schildhauer	\$72,501
Workshop: MacroMycoFunc - Forming an integrated understanding of function across fungi (DEB 1623040)	
Apr 1, 2016 - Mar 31, 2018	
M. Schildhauer, K. Janowicz, M. Jones	\$481,214
EarthCube Building Blocks: Collaborative Proposal: GeoLink-Leveraging Semantics and Linked Data for Data Sharing and Discovery in Geosciences (ICER-1440139)	
Sep 1, 2014 - Aug 31, 2018	
Subtotal	\$10,585,588



Ocean Conservancy

F. Davis, S. Hampton	\$355,488
Marine Debris: Scale and Impact of Trash in Ocean Ecosystems (SBI20078)	
Dec 1, 2011 - Dec 31, 2017	
Subtotal	\$355,488

Parks Canada

C. Kappel	\$ 192,743
Ocean Tipping Points (VCA9 / GC-703)	
Nov 12, 2014 - Apr 30, 2017	
Subtotal	\$192,743

Prince William Sound Science Center

M. Jones, M. Schildhauer	\$1,590,748
Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill (12- 81-01)	
Feb 1, 2012 - Jan 31, 2017	
Subtotal	\$1,590,748

The HDF Group

M. Jones	\$544,539
Beyond Data Discovery: Shared Services for Community Metadata Improvement (05-15)	
May 20, 2015 - Apr 30, 2018	
Subtotal	\$544,539





The Nature Conservancy

B. Halpern	\$ 67,348
SNAPP: Landscape Sensitivity to Ecological Drought: The Knowns, Needs, and Solutions for the Real World (OCS-NCEASE-USGS-12062016)	
Jan 1, 2017 - Jul 15, 2018	
C. Lortie, F. Davis	\$30,000
A study of endangered blunt-nosed leopard lizard-shrub dynamics at the Carrizo Plain National Monument (TNC-08262015-3179)	
Jan 4, 2016 - Jun 30, 2018	
C. Lortie, F. Davis	\$62,907
Plants, lizards, and shrubs as key responders to global change in Santa Barbara County: micro-environmental change and biotic interaction buffers (TNC-120120150-3414)	
Jan 4, 2016 - Jun 1, 2017	
F. Davis	\$800,000
SNAPP Administrative Support (SNAP_NCEAS2016)	
Jan 1, 2016 - Jun 30, 2017	
F. Davis	\$1,900,000
Science and Nature for People - TNC (SNAP 2013-2014)	
Nov 1, 2013 - Jun 30, 2016	
F. Davis	\$288,675
SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world (OCS-NCEAS-02012016)	
Mar 1, 2016 - Jul 31, 2017	
Subtotal	\$3,148,930

University of California Berkeley-UCB

M. Jones	\$108,679
Codemeta: A Rosetta Stone for Metadata in Scientific Software (8966)	
Oct 1, 2015 - Sep 30, 2017	
Subtotal	\$108,679



University of California, Office of the President (UCOP)

M. Jones	\$ 208,479
Making data count: Promoting a new normal (G-2017-9735-UCSB)	
May 1, 2017 - Apr 30, 2018	
Subtotal	\$ 208,479

University of Illinois, Urbana Champaign

M. Jones	\$500,000
CC*DNI DIBBS: Merging Science and Cyberinfrastructure	
Pathways: The Whole Tale (078343-15668)	
Mar 1, 2016 - Feb 28, 2021	
Subtotal	\$500,000

University of New Mexico

M. Jones, M. Schildhauer	\$2,706,715
DataNetONE: Observation Network for Earth - Renewal (063045-873R)	
Oct 1, 2014 - Sep 30, 2019	
Subtotal	\$2,706,715

USDI Bureau of Land Management

C. Lortie, F. Davis	\$80,000
BLM CA CESU Panoche Plateau Leopard Lizard Shrub Habitat	
Study – Cencal District, Hollister (L15AC00219)	
Aug 25, 2015 - Sep 30, 2019	
Subtotal	\$80,000

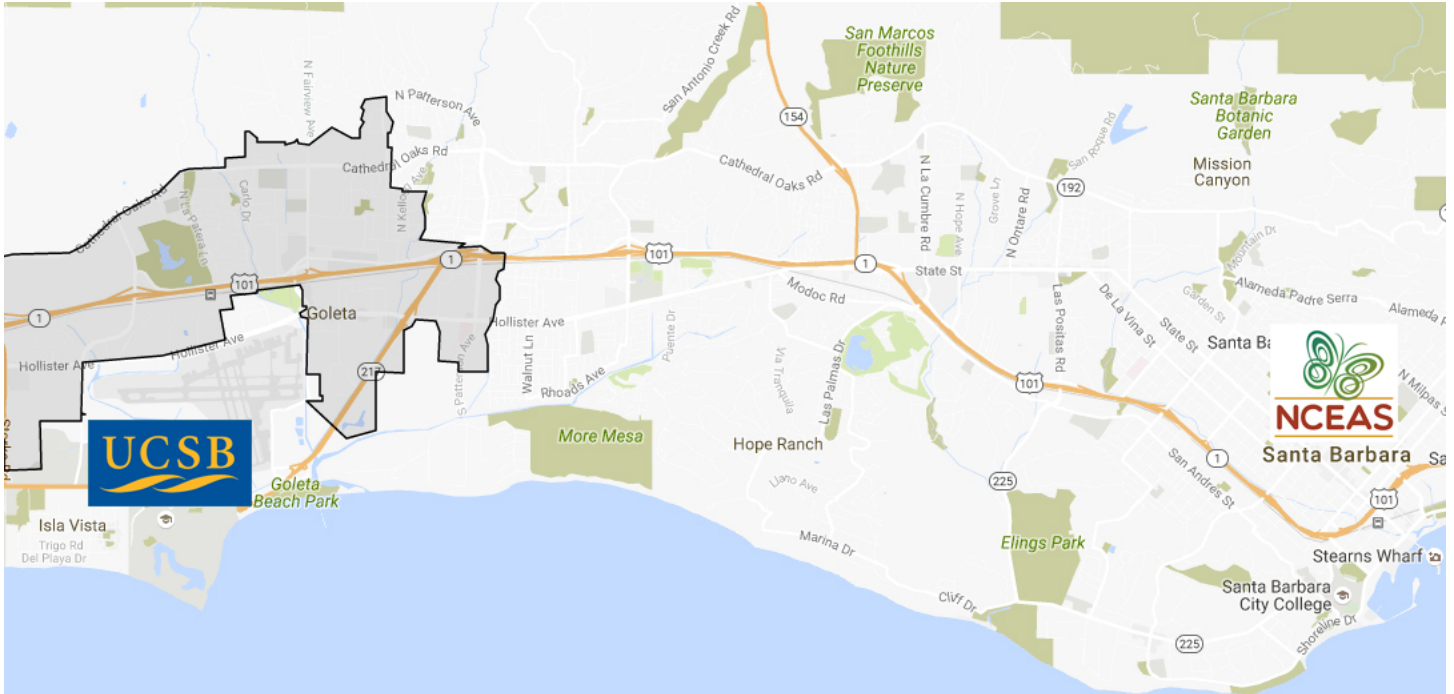
USDI Geological Survey (Incl Natl Biological Service)

F. Davis	\$35,851
The theory and practice of translational ecology (G15AC00534)	
Oct 1, 2015 - Sep 30, 2016	
Subtotal	\$35,851

TOTAL 2016-2017 AWARDS: \$33,816,355



Location



National Center for Ecological Analysis and Synthesis

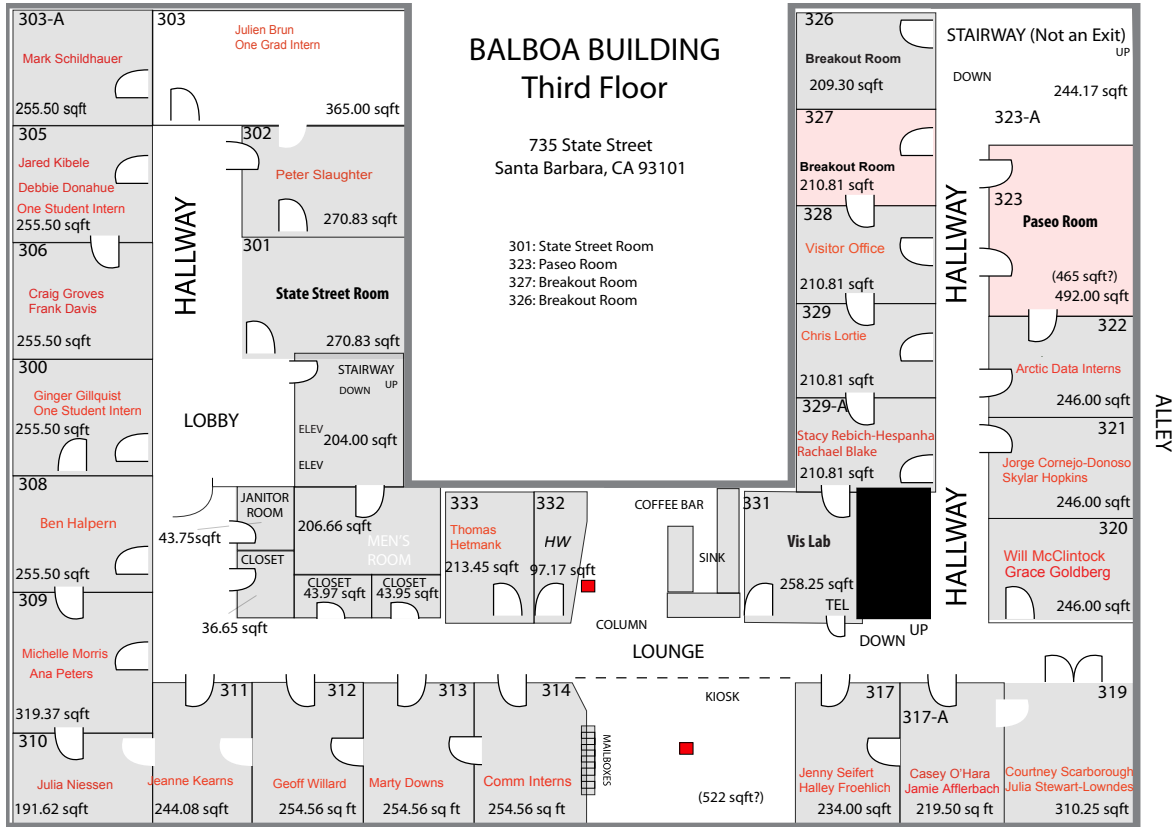
is located in downtown Santa Barbara, approximately 8.5 miles from the main UCSB campus:

735 State Street, Suite 300

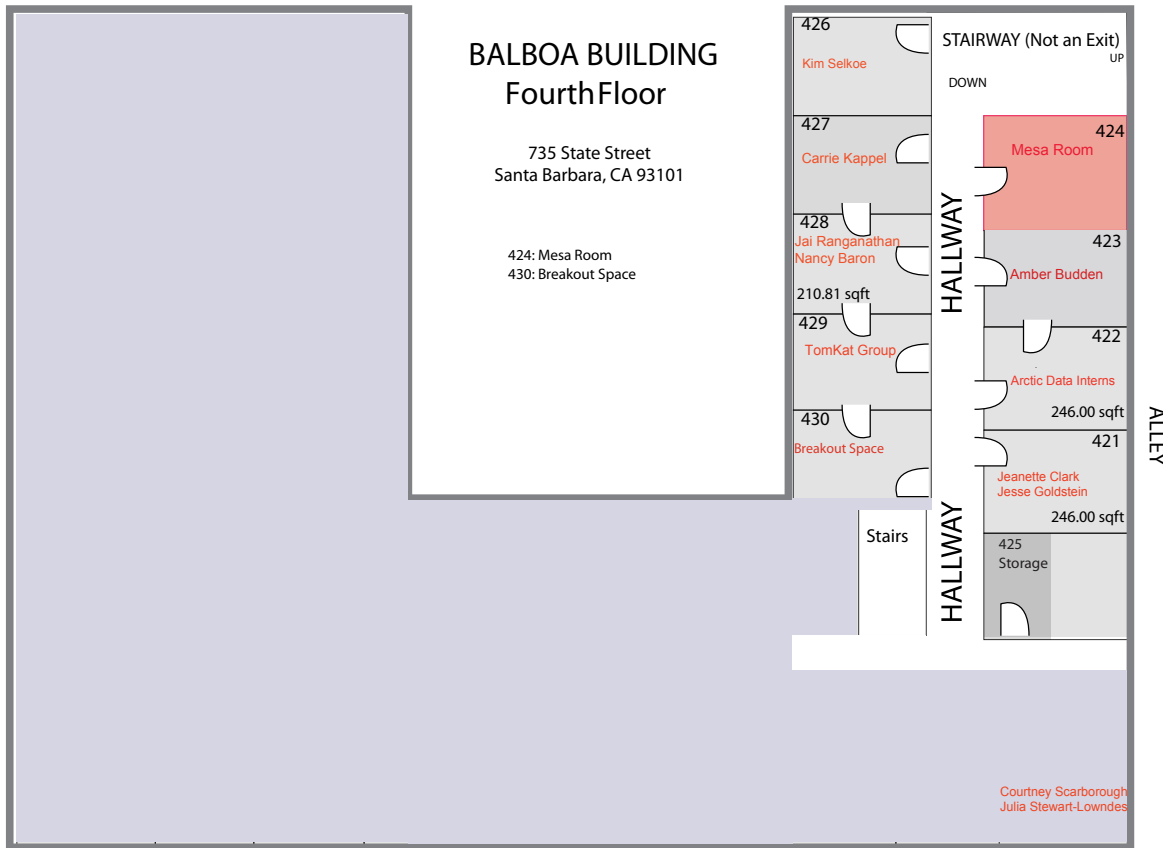
Santa Barbara, CA 93101-5504

Telephone: (805) 893-2500

Email: nceas@nceas.ucsb.edu



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Statistical Summary

Statistical Summary



1. Academic personnel engaged in research

a. Faculty	2
b. Professional Researchers (including visiting)	8
c. Project Scientists	2
d. Specialists	12
e. Postdoctoral Scholars	10
f. Postgraduate Researchers	0

Total **34**

2. Graduate Students

a. Employed on contracts and grants	32
b. Employed on other sources of funds	5
c. Participating through assistantships	0
d. Participating through traineeships	0

Total **37**

3. Undergraduate Students

a. Employed on contracts and grants	12
b. Employed on other funds	3
c. Volunteers and unpaid interns	0

Total **15**

4. Participation from Outside UCSB

a. Academics (without Salary Academic Visitors)	6
b. Other (Center Associate from COMPASS)	5

Total **11**

5. Staff (University and Non-University Funds)

a. Technical	18
b. Administrative/Clerical	7

Total **25**

6. Seminars, symposia, workshops sponsored

52

7. Proposals submitted

18

8. Number of different awarding agencies

25

9. Number of extramural awards administered

38

10. Dollar value of extramural awards

\$33,816,355

11. Number of Principal Investigators

13



12. Dollar value of other project awards	\$0
13. Number of other project administered	0
14. Total base budget for the year (as of 30 June 2017)	\$597,848
15. Dollar value of intramural support	\$96,152
117. Dollar value of awards for year	\$6,258,567



Products and Publications

The following lists include publications that have been reported to NCEAS during fiscal year 2016-2017, though actual publication dates may precede this period.



Book Chapters

Halpern, Benjamin S.; Frazier, Melanie; Best, Benjamin D.; Longo, Catherine S.; Stewart Lowndes, Julia. (2016). Chapter 7.8: Ocean Health Index for the world's large marine ecosystems. *IOC-UNESCO and UNEP 2016 Large Marine Ecosystems: Status and Trends* (pp. 239-249). Nairobi, Kenya: United Nations Environment Programme.

Maguire, Lynn A. (2016). Using concepts of biodiversity in structured decision-making. (Justin Garson, Anya Plutynski, Sahotra Sarkar, Eds.). *The Routledge Handbook of Philosophy of Biodiversity*. Routledge.

Selkoe, Kimberly A.; Scribner, Kim T.; Galindo, Heather M. (2015). Waterscape genetics - applications of landscape genetics to rivers, lakes and seas. *Landscape Genetics: Concepts, Methods, Applications* (pp. 220-246). Wiley & Sons Press.



Journal Articles

Althor, Glenn; McKinnon (Bottrill), Madeleine; Cheng, Samantha; Klein, Carissa J.; Watson, James E. M. (2016). Does the social equitability of community and incentive based conservation interventions in non-OECD countries, affect human well-being? A systematic review protocol. *Environmental Evidence*, doi: 10.1186/s13750-016-0078-3.

Anderson, James L.; Anderson, Chris ; Chu, Jingjie; Meredith, Jennifer; Asche, Frank; Sylvia, Gil; Smith, Martin D.; Anggraeni, Dessy; Arthur, Robert; Guttormsen, Atle; McCluney, Jessica K.; Ward, Tim; Akpalu, Wisdom; Eggert, Håkan; Flores, Jimely; Freeman, Matthew; Holland, Daniel; Knapp, Gunnar; Kobayashi, Mimako; Larkin, Sherry; MacLauchlin, Kari; Schnier, Kurt; Soboil, Mark; Tveteras, Sigbjorn; Uchida, Hirotsuga; Valderrama, Diego. (2015). The fishery performance indicators: a management tool for triple bottom line outcomes. *PLoS ONE*, 10(5). doi: 10.1371/journal.pone.0122809.

Anderson, Sean C.; Cooper, Andrew; Jensen, Olaf P.; Minto, Coilin; Thorson, James T.; Walsh, J. C.; Afflerbach, Jamie; Dickey-Collas, Mark; Kleisner, Kristin; Longo, Catherine S.; Osio, Giacomo Chato; Ovando, Daniel; Mosqueira, I.; Rosenberg, Andrew A.; Selig, Elizabeth R. (2017). Improving estimates of population status and trend with superensemble models. *Fish and Fisheries*.

Atkinson, Scott; Jupiter, Stacy D.; Adams, Vanessa M.; Ingram, Jane Carter; Narayan, Siddharth; Klein, Carissa J.; Possingham, Hugh P. (2016). Prioritising mangrove ecosystem services results in spatially variable management priorities. *PLoS ONE*, doi: 10.1371/journal.pone.0151992.



Baron, Jill; Specht, Alison; Garnier, Eric; Bishop, Pamela; Campbell, Andrew; Davis, Frank W.; Fady, Bruno; Field, Dawn; Gross, Louis J.; Guru, Siddeswara M; Halpern, Benjamin S.; Hampton, Stephanie E.; Leavitt, Peter R.; Meagher, Thomas R.; Ometto, Jean; Parker, John N.; Price, Richard; Rawson, Casey H; Rodrigo, Allen; Sheble, Laura A; Winter, Marten. (2017). Synthesis centers as critical research infrastructure. *BioScience*, doi: 10.1093/biosci/bix053.

Barthem, Ronaldo; Goulding, Michael; Leite, Rosseval G; Cañas, Carlos; Forsberg, Bruce R.; Venticinque, Eduardo; Petry, Paulo; Ribeiro, Mauro; Chuctaya, Junior; Mercado, Armando. (2017). Goliath catfish spawning in the far western Amazon confirmed by the distribution of mature adults, drifting larvae and migrating juveniles. *Scientific Reports*, doi: 10.1038/srep41784.

Battista, Willow; Kelly, Ryan P; Erickson Reineman, Ashley L.; Fujita, Rod M. (2016). A comprehensive method for assessing marine resource governance: case study in Kane'ohe Bay, Hawaii. *Coastal Management*, 44, 295-332. doi: 10.1080/08920753.2016.1135277.

Beger, Maria; Selkoe, Kimberly A.; Treml, Eric; Barber, Paul H.; von der Heyden, Sophie; Crandall, Eric D.; Toonen, Robert J.; Riginos, Cynthia. (2014). Evolving coral reef conservation with genetic information. *Bulletin of Marine Science*, 90, 159-185. doi: 10.5343/bms.2012.1106.

Borja, A.; Elliott, Michael; Andersen, Jesper H; Berg, Torsten; Carstensen, Jacob; Halpern, Benjamin S.; Heiskanen, Anna-Stiina; Korpinen, Samuli; Stewart Lowndes, Julia; Martin, Georg; Rodriguez-Ezpeleta, Naiara. (2016). Overview of integrative assessment of marine systems: The ecosystem approach in practice. *Frontiers in Marine Science*, doi: 10.3389/fmars.2016.00020.

Bowen, B. W.; Shanker, Kartik; Yasuda, Nina; Malay, Machel; von der Heyden, Sophie; Paulay, Gustav; Rocha, Luiz; Selkoe, Kimberly A.; Barber, Paul H.; Williams, Suzanne T.; Lessios, Harilaos A.; Crandall, Eric D.; Bernardi, G.; Meyer, Christopher P.; Carpenter, Kent E.; Toonen, Robert J. (2014). Phylogeography unplugged: comparative surveys in the genomic area. *Bulletin of Marine Science*, 90, 13-46. doi: 10.5343/bms.2013.1007.

Bremer, Leah; Auerbach, Dan; Goldstein, Joshua; Vogl, Adrian; Shemie, Daniel; Kroeger, Timm; Nelson, Joanna; Benitez, Silvia; Calvache, Alejandro; Guimarães, João; Herron, Colin; Higgins, Jonathan; Klemz, Claudio; León, Jorge; Lozano, Juan S.; Moreno, Pedro H.; Nuñez, Francisco; Veiga, Fernando; Tiepolo, Gilberto. (2016). One size does not fit all: Natural infrastructure investments within the Latin American Water Funds Partnership. *Ecosystem Services*, 17, 217-236. doi: 10.1016/j.ecoser.2015.12.006.

Broitman, Bernardo R.; Halpern, Benjamin S.; Gelcich, Stefan; Larides, Marco A; Vargas, Cristian A; Vasquez-Lavin, Felipe; Widdicombe, Stephen; Birchenough, Silvana N. R. (2017). Dynamic interactions among boundaries and the expansion of sustainable aquaculture. *Frontiers in Marine Science*, 4. doi: 10.3389/fmars.2017.00015.

Brown, Christopher J.; Jupiter, Stacy D.; Albert, Simon; Klein, Carissa J.; Mangubhai, Sangeeta; Maina Mbui, Joseph; Mumby, Peter J.; Olley, Jon; Stewart-Koster, Ben; Tulloch, Vivitskaia J.; Wenger, Amelia. (2017). Tracing the influence of land-use change on water quality and coral reefs using Bayesian model. *bioRxiv*, doi: 10.1101/112250.



Burgass, Michael J.; Halpern, Benjamin S.; Nicholson, Emily; Milner-Gulland, E. J. (2017). Navigating uncertainty in environmental composite indicators. *Ecological Indicators*, 75, 268-278. doi: 10.1016/j.ecolind.2016.12.034.

Buttigieg, Pier Luigi; Pafilis, Evangelos; Lewis, Suzanna E.; Schildhauer, Mark P.; Walls, Ramona L.; Mungall, Chris. (2016). The environment ontology in 2016: bridging domains with increased scope, semantic density, and interoperation. *Journal of Biomedical Semantics*, 57. doi: 10.1186/s13326-016-0097-6.

Cabral, Reniel B.; Halpern, Benjamin S.; Costello, Christopher; Gaines, Steven D. (2016). Unexpected management choices when accounting for uncertainty in ecosystem service tradeoff analyses. *Conservation Letters*, doi: 10.1111/conl.12303.

Campos, Fernando A.; Morris, William F.; Alberts, Susan; Altmann, Jeanne; Brockman, Diane; Cords, Marina; Pusey, Anne E.; Stoinski, Tara S.; Strier, Karen B.; Fedigan, Linda M. (2017). Does climate variability influence the demography of wild primates? Evidence from long-term life-history data in seven species. *Global Change Biology*, doi: 10.1111/gcb.13754.

Cao, Yang; Jones, Christopher; Cuevas, Victor; Jones, Matthew B.; Ludaescher, Bertram; McPhillips, Timothy; Missier, Paolo; Schwalm, Christopher; Slaughter, Peter; Vieglais, David A.; Walker, Lauren; Wei, Yaxing. (2016). ProvONE: extending PROV to support the DataONE scientific community.

Connolly, Brian M.; Orrock, John L.; Witter, Martha S. (2016). Soil conditions moderate the effects of herbivores, but not mycorrhizae, on a native bunchgrass. *ACTA Oecologica-International Journal of Ecology*, 77, 100-108. doi: 10.1016/j.actao.2016.09.005.

Crausbay, Shelley; Ramirez, Aaron; Carter, Shawn; Cross, Molly; Hall, Kimberly R.; Bathke, Deborah; Betancourt, Julio L.; Colt, Steve; Cravens, Amanda; Dalton, Melinda; Dunham, Jason B.; Hay, Lauren; Hayes, Mike; McEvoy, Jamie; McNutt, Chad; Moritz, Max A.; Nislow, Keith; Raheem, Nejem; Sanford, Todd. (2017). Defining ecological drought for the 21st century. *Bulletin of the American Meteorological Society*, doi: 10.1175/BAMS-D-16-0292.1.

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De Leo, Giulio; Sokolow, Susanne H.; Garchitorena, Andres; Ngonghala, Calistus; Lund, Andrea; Barry, Michele; Burke, Katherine; Mordecai, Erin A.; Daily, Gretchen; Jones, James H.; Andrews, Jason; Bendavid, Eran; Luby, Steve; LaBeaud, Desiree; Seetah, Krish; Guegan, Jean-Francois; Lafferty, Kevin D.; Wood, Chelsea L.; Jones, Isabel; Bonds, Matthew H. (2017). A novel framework to account for ecological drivers in the control and elimination of environmentally transmitted disease: a modelling study. *The Lancet*, doi: 10.1016/S0140-6736(17)31117-0.



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Frazier, Melanie; Longo, Catherine S.; Halpern, Benjamin S. (2016). Mapping Uncertainty Due to Missing Data in the Global Ocean Health Index. *PLoS ONE*, doi: 10.1371/journal.pone.0160377.

Fredston, Alexa; Brown, Christopher J.; Albert, Simon; Klein, Carissa J.; Mangubhai, Sangeeta; Nelson, Joanna; Teneva, Lida; Wenger, Amelia; Gaines, Steven D.; Halpern, Benjamin S. (2016). Where does river runoff matter for coastal marine conservation?. *Frontiers in Marine Science*, doi: 10.3389/fmars.2016.00273.

Froehlich, Halley; Gentry, Rebecca; Rust, Michael; Grimm, Dietmar; Halpern, Benjamin S. (2017). Public perceptions of aquaculture: Evaluating spatiotemporal patterns of sentiment around the world. *PLoS ONE*, 12(1). doi: 10.1371/journal.pone.0169281.

Froehlich, Halley; Smith, Alexandra; Gentry, Rebecca; Halpern, Benjamin S. (2017). Offshore aquaculture: I know it when I see it. *Frontiers in Marine Science*, doi: 10.3389/fmars.2017.00154.

Garnier, Eric; Stahl, Ulrike; Laporte, Marie-Angelique; Kattge, Jens ; Mougnot, Isabelle; Kühn, Ingolf; Laporte, Baptiste; Amiaud, Bernard; Ahrestani, Farshid; Bonisch, Gerhard; Bunker, Daniel E.; Cornelissen, Hans; Diaz, Sandra; Enquist, Brian J.; Gachet, Sophie; Jaureguiberry, Pedro; Kleyer, Michael; Lavorel, Sandra; Maicher, Lutz; Perez-Harguindeguy, Natalia; Poorter, Hendrik; Schildhauer, Mark P.; Shipley, Bill; Violle, Cyrille; Weiher, Evan; Wirth, Christian; Wright, Ian J.; Klotz, Stefan. (2016). Towards a thesaurus of plant characteristics: an ecological contribution. *Journal of Ecology*, doi: 10.1111/1365-2745.12698.

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Griscom, Bronson W.; Ellis, Peter; Putz, Francis E. (2014). Carbon emissions performance of commercial logging in East Kalimantan, Indonesia. *Global Change Biology*, 20(3), 923-937. doi: 10.1111/gcb.12386.

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Meetings and Workshops Resulting from Working Group Efforts

Ellis, Peter; Putz, Francis E.; Proust, Sebastien ;Ward, Dawn; Palmas Perez, Sebastian; Ellis, Eddie. (2016). Best forestry practices and alternative silvicultural systems.

Jiang , Ning. (2016). Indonesia OHI Workshop.

Kappel, Carrie V.; Selkoe, Kimberly A. (2016). Conversation on ecosystem based management of Hawaiian reefs. International Coral Reef Symposium (ICRS), Honolulu Hawaii.

Ocean Health Index. (2016). Baltic Health Index Workshop at the Stockholm Resilience Centre, University of Stockholm.

Stewart Lowndes, Julia. (2016). Software Carpentry Workshop at Oxford University: Reproducible Science with RStudio and GitHub.



Other Products

The following lists include other products that have been reported to NCEAS during fiscal year 2016-2017, though actual product dates may precede this period.

Afflerbach, Jamie. (2017).Aligning marine species range data to better serve science and conservation Shiny Application. http://ohi-science.nceas.ucsb.edu/plos_marine_rangemaps/.

Best, Barbara; Stewart Lowndes, Julia. (2016). Shiny Applications.

Cheng, Samantha. (Reported FY17). Colandr.

Cope, Jason M.;Wilson, Jono R.; Dougherty, Dawn; Parma, Ana Maria; Rude, Jeremy; Dowling, Natalie M.; Revenga, Carmen;Waweru Maina, George; Caillaux, Matias. (2015). Implementer cultivation: Peru and Kenya.

Cross, Molly. (Reported FY17). Implementer cultivation: Upper Missouri Headwaters Drought Resilience Partnership.

Halpern, Benjamin S.; Frazier, Melanie ;Afflerbach, Jamie; O'Hara, Casey; Katona, Steven K.; Stewart Lowndes, Julia; Jiang , Ning; Pacheco, Erich; Scarborough, Courtney E.; Polsenberg, Johanna. (2017). Drivers and implications of change in global ocean health over the past five years website.

Karant, Krithi. (2016). Cultivator implementation: Google's Geo for Good Summit.



Kendy, Eloise; Ziemer, Laura; Leoniak, Lain. (Reported FY17). Cultivator implementation: City of Bozeman.

Langhammer, Penny; Woodley, Stephen; Ray, Justina. (2017). Implementer cultivation: Canada and Myanmar.

Leoniak, Lain. (Reported FY17). Implementer cultivation: Lain Leoniak.

Martinez, Maria Christina; Cortez, Rane. (2016). Timber production & Go-No Go; map. <http://www.eredplus.com/Informativa/Zonificacion>.

Mejia, Manuel. (2016). Cultivator implementation: Kua'aina Ulu Auamo.

Popkin, Gabriel. (2016). Forests of the future.

Ray, Justina; Woodley, Stephen; Langhammer, Penny. (2016). Implementer cultivation: Environment Canada and Canadian Council on Ecological Areas.

Revenge, Carmen; Wilson, Jono R.; Dowling, Natalie M.; Cope, Jason M.; Rude, Jeremy. (2016). Implementer cultivation: Institute of Oceanography of Federal University of Rio Grande, the Association of Southeast Asian Nations, and the Hawai'i TNC program.

Rude, Jeremy; Wilson, Jono R.; Cope, Jason M.; Dowling, Natalie M.; Waweru Maina, George. (2016). Implementer cultivation: Kenya.

SNAPP: Aligning coastal restoration with ecological and societal needs. (Reported FY17). Implementer cultivation: AP.

- (Reported FY17). Cultivator implementation: Ben Scaggs and Ron Howard.
- (Reported FY17). Implementer cultivation: NFWF and the Gulf Coast Ecosystem Restoration Council.
- SNAPP: Developing guidelines for and assessing relationships among biocultural indicators to improve long-term resilience of Pacific social and ecological communities. (2016). Implementer cultivation: Griffith University PhD student

SNAPP: Evidence-based Conservation to Advance Human Well-being. (Reported FY17). Cultivator implementation: Margaret A. Cargill Philanthropies.

SNAPP: Finding smart planning solutions in the Southern Agricultural Growth Corridor of Tanzania: What does sustainable intensification look like? (Reported FY17). Agricultural constraints and opportunities.

- (Reported FY17). Analysis of constraints to sustainable agricultural intensification
- (Reported FY17). Crop suitability maps.
- (Reported FY17). Environmental and social performance investment screen
- (Reported FY17). Implementer cultivation: SAGCOT Centre.
- (Reported FY17). Implementer cultivation: Technical personnel hire.



SNAPP: Finding solutions to the ivory crisis: What would an economically rational Chinese ivory trade policy look like? (2016). Cultivator implementation: CITES CoP17 and IUCN World Conservation Congress.

- (2016). Cultivator implementation: Conference on Illegal Wildlife Trade.
- (Reported FY17). Cultivator implementation: Conservation Department of State Forestry Administration and CITES.

SNAPP: Impacts of hydraulic fracturing on water quantity and quality for nature and people: Are we prepared for the future? (2017). Visualizing spills data from unconventional oil and gas activity. http://snappartnership.net/groups/hydraulic-fracturing/webapp/spills_materials.html.

SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world. (Reported FY17). Cultivator implementation: Dixie Porter.

- (Reported FY17). Implementer cultivation: DroughtNet.
- (Reported FY17). Implementer cultivation: DroughtNet.
- (Reported FY17). Implementer cultivation: NCCSC.
- (2016). Implementer cultivation: John Nordgren, Noah Matson, Tom Iseman, Lynn Scarlet.
- (Reported FY17). Implementer cultivation: USGS Fort Collins Science Center.

SNAPP: Land-use change and conservation policy in Brazil and the U.S. for biodiversity, ecosystem services and economic returns. (Reported FY17). Implementer cultivation: Dave Naugle.

- (Reported FY17). Implementer cultivation: Gilberto Camara.
- (Reported FY17). Cultivator implementation: Sage Grouse Initiative (July).
- (Reported FY17). Cultivator implementation: Sage Grouse Initiative (September).
- (Reported FY17). Cultivator implementation: Sage Grouse Initiative (July).
- (Reported FY17). Cultivator implementation: Sage Grouse Initiative (September).

SNAPP: Making ecosystems count in the Sustainable Development Goals. (Reported FY17). Implementer cultivation: Ministries.

SNAPP: Prioritizing investments in green infrastructure to meet urban water security needs in Latin America. (Reported FY17). Implementer cultivation: Mayors.

- (Reported FY17). Implementer cultivation: Monterrey Water Fund.
- (2016). Implementer cultivation: TNC North American Risk Reduction and Resilience program and workshop participants.
- (2015). Watershed conservation screening tool.



SNAPP: Water transactions to enhance streamflow, water supply reliability, and rural economic viability in the western United States.

- (Reported FY17). Implementer cultivation: Purchasers of mitigation credits.
- (Reported FY17). Water sharing dashboard. (Reported FY17). Peruvian Ministry of Environment (MINAM) guidelines.

Sterling, Eleanor J. (Reported FY17). Cultivator implementation: Marshall Islands.

Stewart Lowndes, Julia; Best, Benjamin D.; Scarborough, Courtney E.; Afflerbach, Jamie; Frazier, Melanie; O'Hara, Casey; Jiang, Ning; Halpern, Benjamin S. (2017). Better science in less time website. http://ohi-science.org/betterscienceinlesstime/our_story.html.

Stewart Lowndes, Julia; Halpern, Benjamin S. (2016). Ocean Health Index Website. <http://ohi-science.org/>.

Tellman, Elizabeth. (Reported FY17). Conserving nature for water security dashboard.

Tickin, Tamara; Dacks, Rachel. (2016). Cultivator implementation: University of the South Pacific.

Wilson, Jono R.; Dougherty, Dawn; Parma, Ana Maria; Rude, Jeremy; Dowling, Natalie M.; Caillaux, Matias; Ovando, Daniel. (2016). Implementer cultivation: Peru.

Wilson, Jono R.; Revenga, Carmen. (2016). Implementer cultivation: Steven Victor.

Zhang, Li (Aster). (Reported FY17). Implementer cultivation: Dr. Aster Zhang and government agencies.

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Education Resources

SNAPP Gaming the future: designing video games that change the way that people think about climate change. (Reported FY2017). College course: *Climate change & games - gaming the future*.



Datasets

The following lists include datasets that have been reported to NCEAS during fiscal year 2016-2017, though actual dataset dates may precede this period.

Ellis, Peter. (2016). Lidar and RDMs for 5 logging concessions in East Kalimantan, Indonesia. KNB Data Repository.

Froehlich, Halley; Gentry, Rebecca; Rust, Michael; Grimm, Dietmar; Halpern, Benjamin S. (2017). Public perceptions of aquaculture: Evaluating spatiotemporal patterns of sentiment around the world. KNB.

Griscom, Bronson W. (2015). Forest carbon flux data for Berau, Indonesia. KNB Data Repository.

McDonald, Robert I. (2016). City Water Map (version 2.2). KNB Data Repository.

Narayan, Siddharth. (2016). Effectiveness, Costs and Benefits of Nature-based Defences for Wave Reduction.

Patterson, Lauren. (2016). Unconventional oil and gas spills: risks, mitigation priorities and state reporting requirements. KNB.

Patterson, Lauren; Konschnik, Kate; Wiseman, Hannah; Fargione, Joseph E.; Maloney, Kelly O. (2017). Unconventional oil and gas spills: risks, mitigation priorities and state reporting requirements (raw data). KNB.

Tellman, Elizabeth. (2016). Riverine Flood Mitigation Opportunity Indicators for 70 Latin American Cities. KNB Data Repository.

Tellman, Elizabeth. (2016). Floodsheds shapefile for 70 Latin America cities. KNB.

Venticinque, Eduardo; Forsberg, Bruce R.; Barthem, Ronaldo; Petry, Paulo; Hess, Laura; Mercado, Armando; Cañas, Carlos; Montoya, Mariana; Durigan, Carlos C.; Goulding, Michael. (2016). SNAPP Western Amazon Group - Amazon Aquatic Ecosystem Spatial Framework. KNB Data Repository.

SNAPP: Western Amazonia: Balancing Infrastructure Development among Conservation of Waters, Wetlands and Fisheries. (Reported FY2017). Legal and illegal ivory sales.

SNAPP: Prioritizing investments in green infrastructure to meet urban water security needs in Latin America. (Reported FY2017). Tailored top 25 cities database.

SNAPP: Finding smart planning solutions in the Southern Agricultural Growth Corridor of Tanzania: What does sustainable intensification look like? (Reported FY2017). Hydrological flows for the Great Ruaha River.



SNAPP: Finding solutions to the ivory crisis: What would an economically rational Chinese ivory trade policy look like? (Reported FY2017). 30 most important fish lifecycle database.

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Presentations

The following lists include presentations that have been reported to NCEAS during fiscal year 2016-2017, though actual presentation dates may precede this period.

Battista, Willow. (2016). Reducing illegal fishing using behavior change interventions. ICES MSEAS, Brest France 6-1-16.

Beck, Michael W.; Narayan, Siddharth; Sanchirico, James N. (2015). Ecology, economics, and engineering of nature-based coastal defenses. AAAS 2015 Annual Meeting; San Jose, CA; February 2015.

Davis, Frank W. (2013). Connecting microclimates to plant species' range dynamics in a changing climate. Distinguished Miller Lecturer, Department of Geography, Penn State University, March 2013.

Davis, Frank W. (2013). From microclimates to macroecology: modeling plant species range dynamics in a changing climate. Invited research seminar, Department of Geography and Environmental Engineering, The Johns Hopkins University, April 2013.

Davis, Frank W. (2014). Changing windows of opportunity for tree seedling establishment in California's mountain landscapes. Environmental Studies Seminar Series, UC Santa Cruz, May 2014.

Davis, Frank W. (2014). From microclimates to macroecology: Modeling plant species range shifts in a changing climate. Hugh Hanson Seminar Speaker, Arizona State University, February 2014.

Davis, Frank W. (2015). Changing windows of opportunity for tree seedling establishment under 21st Century climate change. 45th Ontario Ecology, Ethology and Evolution Colloquium (OE3C), Toronto, May 2015.

Davis, Frank W. (2015). Changing windows of opportunity for tree seedling establishment under 21st Century climate change. Sierra Nevada Research Institute, UC Merced, February 2015.

Davis, Frank W. (2016). From microenvironments to macroecology: Modeling tree species range shifts in a changing climate. Korean National Institute of Ecology Symposium on Climate Change And Ecosystems, Seoul, February 2016.

Donovan, Mary. (2016). Ecosystem regimes and resilience of Hawaiian coral reefs. International Coral Reef Symposium (ICRS), Honolulu Hawaii.



Donovan, Mary. (2016). Tipping points and ecosystem based management in Hawai'i. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.

Downs, Martha (2016). Supporting Collaboration with Effective Communication: The USLTER Network Communication Office. ILTER Open Science Meeting. Kruger National Park, South Africa. October 12, 2016.

Erickson Reineman, Ashley L. (2016). Ecosystem-based management (EBM) roundtable. AGU Ocean Sciences in New Orleans.

Erickson Reineman, Ashley L. (2016). Highlighting and expanding opportunities for application of tipping points science within existing US law and policy. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.

Falinski, Kim. (2016). Development of a subtropical, volcanic geology-specific model for sediment delivery in the Hawaiian Islands. International Coral Reef Symposium (ICRS), Honolulu Hawaii.

Halpern, Benjamin S.; Molinos, Jorge Garcia ; Schoeman, David S.; Brown, Christopher J.; Kiessling, Wolfgang; Moore, Pippa J.; Pandolfi, John M.; Poloczanska, Elvira; Richardson, Anthony J.; Burrows, Michael T. (2016). Reshuffling of global marine biodiversity under climate change. International Coral Reef Symposium, Hawaii, 20 June 2016.

Hunsicker, Mary. (2015). Identifying leading indicators of shifts in marine ecosystem. Coastal and Estuarine Research Federation, Portland, OR.

Hunsicker, Mary. (2016). Identifying leading indicators of shifts in marine ecosystem. American Fisheries Society Meeting, Portland OR.

Jouffray, Jean-Baptiste. (2016). Disentangling the role of human and natural drivers of multiple reef regimes across the Hawaiian archipelago. International Coral Reef Symposium (ICRS), Honolulu Hawaii.

Kappel, Carrie V. (2016). Ecosystem-based management (EBM) roundtable. AGU Ocean Sciences in New Orleans.

Kappel, Carrie V. (2016). Tackling ocean tipping points: an experiment in science-to-action. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 8-3-16.

Lenton, Tim. (2016). The social and policy implications of climate tipping points. American Association for the Advancement of Science (AAAS) Conference, Washington D.C. 2-2-16.

Levin, Phillip. (2016). Can changes in the distribution of one fish lead to irreparable harm to a culture?. American Association for the Advancement of Science (AAAS) Conference, Washington D.C. 2-2-16.

Levin, Phillip. (2016). Ecosystem-based management (EBM) roundtable. AGU Ocean Sciences in New Orleans.



Levin, Phillip. (2016). Integrating the concept of tipping points into US Federal fisheries management. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.

Narayan, Siddharth; Beck, Michael W.; Reguero, Borja; Ingram, Jane Carter. (2015). Reviewing the evidence for risk reduction by natural coastal habitats world-wide: When and where they have worked. 36th IAHR World Congress: Deltas of the Future; The Hague, Netherlands; June 2015.

Oleson, Kirsten. (2016). Predictive models and trade-off analysis for guiding cost-effective land-based management actions for conserving coral reefs. International Coral Reef Symposium (ICRS), Honolulu Hawaii.

Poe, Melissa. (2016). Implications of spatial and temporal tipping points in herring populations on cultural practices and identity in Haida Gwaii, British Columbia. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.

Poe, Melissa. (2016). The importance of Herring to social and cultural wellbeing in Haida Gwaii. Society for Applied Anthropology, Vancouver, British Columbia, CA.

Samhuri, Jameal. (2016). The next generation of ecosystem based fishery management. American Fisheries Society Meeting, Portland OR.

Scarborough, Courtney E. (2015). Gwaii Haanas rapid marine indicator assessment. MaPP EBM Indicators Workshop, Vancouver, Canada.

Selkoe, Kimberly A. (2014). Variation in population genetic structure across 37 Hawaii reef species. Workshop on Statistical Genetics, Gottingen, Germany.

Selkoe, Kimberly A. (2015). Predicting and protecting genetic diversity of whole communities: a case study of Hawaiian reefs. "Integrating genetics into the Important Marine Mammal Area (IMMA) identification process." Workshop at the Society for Marine Mammalogists, San Francisco, CA.

Selkoe, Kimberly A. (2015). Predicting and protecting genetic diversity of whole communities: a case study of Hawaiian reefs. NCEAS Roundtable.

Selkoe, Kimberly A. (2015). Relating larval traits and genetic traits: perspective from Hawaiian reefs. Larval Fish Conference, Vienna Austria.

Selkoe, Kimberly A. (2015). Seascape drivers of community-wide genetic diversity across Hawaiian reefs. International Association of Landscape Ecologists, Portland, OR.

Selkoe, Kimberly A. (2015). The DNA of Biodiversity. Western Society for Naturalists, Sacramento, CA.



Selkoe, Kimberly A. (2016). Defining and maintaining a safe operating space for people and reefs in Hawaii. American Association for the Advancement of Science (AAAS) Conference, Washington D.C. 2-2-16.

Selkoe, Kimberly A. (2016). Protecting and predicting genetic diversity of whole communities: a case study of Hawaiian reefs. University of Queensland, Brisbane, Australia.

Selkoe, Kimberly A. (2016). Seascape Genetics Webinar. Landscape Genetics Distributed Graduate Seminar.

Selkoe, Kimberly A. (2016). The DNA of Biodiversity: Predicting and protecting genetic diversity of whole communities. International Coral Reef Symposium, Honolulu, Hawaii.

Selkoe, Kimberly A. (2016). The science and management of ecosystem tipping points. Australian Rivers Institute Seminar Series in Queensland, Australia.

SNAPP: Analyzing best practices and standards as a pathway to sustainable and conservation-friendly offshore aquaculture. (2016). Aligning conservation and seafood production: potential and barriers of offshore aquaculture expansion. International Marine Conservation Congress, St. John's NL.

- (2016). Potential barriers of offshore aquaculture. Invited speaker to the Bren School of Environmental Science & Management, Santa Barbara, CA.
- (2017). Cal Academy of Sciences presentation. Cal Academy of Sciences; San Francisco, CA; March 2017.

SNAPP: Developing guidelines for and assessing relationships among biocultural indicators to improve long-term resilience of Pacific social and ecological communities. (2016). Convention on Biological Diversity COP 13 SNAPP Presentation. Convention on Biological Diversity COP 13; Cancun, Mexico; 2016.

- (2016). World Conservation Congress Session. World Conservation Congress; Honolulu, Hawaii; 2016.

SNAPP: Evidence-based Conservation to Advance Human Well-being. (2015). Bren School for Environmental Science and Management presentation. Bren School for Environmental Science and Management; Santa Barbara, CA; November 2015.

- (2015). Ecological Society of America presentation. Ecological Society of America; Baltimore, MD; August 2015.
- (2015). International Conservation Biology Congress presentation. International Conservation Biology Congress; Montpellier, France; August 2015.
- (2015). Webinar to Chevron. Chevron; online; December 2015.
- (2016). Co-development of science symposium. Society for Conservation Biology; Madison Wisconsin; July 2016.



- (2016). Collaboration for Environmental Evidence Symposium presentation. Collaboration for Environmental Evidence Symposium; Stockholm, Sweden; August 2016.
- (2016). Evidence map and ongoing work presentation. USAID BRIDGE Project; Washington D.C.; November 2016.
- (2016). NCEAS roundtable talk. NCEAS; Santa Barbara, CA; March 2016.
- (2016). SNAPP postdoc training.
- (Reported FY17). American Association of Geographers presentation. American Association of Geographers.
- (Reported FY17). Systematic map on conservation and human well-being impacts.

SNAPP: Finding solutions to the ivory crisis: What would an economically rational Chinese ivory trade policy look like? (2016). CITES CoP 17 presentation. CITES CoP 17; Johannesburg, South Africa; September-October 2016.

- (2016). Hanoi Conference on Illegal Wildlife Trade presentation. Hanoi Conference on Illegal Wildlife Trade; Hanoi, Vietnam; November 2016.
- (2016). IUCN World Conservation Congress presentation. IUCN World Conservation Congress; Honolulu, HI; September 2016.
- (2016). Wildlife Demand Reduction Efforts in China seminar. Wildlife Demand Reduction Efforts in China seminar; May 2016.
- (Reported FY17). Policy recommendations presentation.

SNAPP: Forest sharing or sparing for conservation and communities in tropical timber landscapes. (2016). WWF REDD+ community webinar.

SNAPP: Impacts of hydraulic fracturing on water quantity and quality for nature and people: Are we prepared for the future? (2016). Shale oil and gas and surface waters: identifying potential contamination pathways through evaluation of state notice of violation and spill reports. Association of Mid-Atlantic Aquatic Biologists Annual Meeting; Berkeley Springs, WV; 2016.

- (2016). Spills and high volume hydraulic fracturing: an analysis of state data from Colorado, North Dakota, New Mexico, and Pennsylvania. Penn State University Shale Network Workshop; State College, PA; 2016.

SNAPP: Integrating natural capital into system of national accounts: A case study of forestry and wetland landscapes in Rwanda. (2016). Conversations on Conservation presentation. Conversations on Conservation; Rwanda; August 2016.

- (2016). TNC board meeting presentation. TNC; October 2016.
- SNAPP: Integrating natural defenses into coastal disaster risk reduction. (2015). Building with Nature. Coastal Structures and Solutions to Coastal Disasters, Boston, MA.



- (2015). ICE Coastal Management Conference Presentation. ICE Coastal Management Conference; Amsterdam; September 2015.
- (Reported FY17). Guidelines for coastal and marine ecosystem accounting: Incorporating the protective service values of coral reefs and mangroves in national wealth accounts. World Bank.

SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world. (2016). Co-development of science symposium. Society for Conservation Biology; Madison Wisconsin; July 2016.

- (2016). Congress briefing.
- (2016). Ecological drought in the anthropocene. Ecological Society of America; Ft. Lauderdale, FL; 2016.
- (2016). The Nature Conservancy's National Science Council. TNC National Science Council; February 2016.
- (2016). TNC's Conservation Scientists (February 2016). TNC; February 2016.
- (2016). TNC's Conservation Scientists (May 2016). TNC; February 2016.
- (2016). WCS's Conservation Scientists. WCS; March 2016.
- (2017). Drought workshop.
- (Reported FY17). Regional Climate Response Collaborative. Regional Climate Response Collaborative; Nederland, CO; June.

SNAPP: Making ecosystems count in the Sustainable Development Goals. (2016). Co-development of science symposium. Society for Conservation Biology; Madison Wisconsin; July 2016.

SNAPP: Managing Data Limited Fisheries for Economic and Biological Objectives. 2 (2016) 016. FishPath: Co-development of a fisheries management framework for data limited fisheries. Society for Conservation Biology; Madison Wisconsin; July 2016.

SNAPP: Measuring the status of fisheries and factors leading to success. (2015). Canadian Fisheries Council presentation. Canadian Fisheries Council; Ottawa, Canada; October 2015.

- (2015). COSTCO Headquarters presentation. COSTCO Headquarters; Issaquah, WA; May 2015.
- (2015). European Commission Joint Research Center presentation. European Commission Joint Research Center; June 2015.



SNAPP: Measuring the status of fisheries and factors leading to success. (2015). Food and Agriculture Organization of the United Nations presentation. Food and Agriculture Organization of the United Nations; June 2015.

- (2015). Ocean prosperity and the effects of fishery recovery. Webinar; December 2015
- (2015). Oregon State University presentation. Oregon State University; Corvallis, OR; November 2015.
- (2015). Shanghai Ocean University presentation. Shanghai Ocean University; Shanghai Shi, China; September 2015.
- (2015). Upside analysis presentation. The Economist Global Ocean Summit; Portugal; June 2015.
- (2016). Aligning conservation and seafood production: Potential barriers of offshore aquaculture expansion. International Marine Conservation Congress; St. John's, NL; August 2016.
- (2016). Brussels Seafood Show presentation. Brussels Seafood Show; Brussels; April 2016.
- (2016). European Parliament presentation. European Parliament; April 2016
- (2016). French Parliament presentation. French Parliament; May 2016.
- (2016). Industry leader presentation. France; May 2016.
- (2016). Keynote: Opportunities and challenges in sustainable offshore aquaculture. British Ecological Society; London, UK; July 2016.
- (2016). Lecture: Opportunities and challenges in sustainable offshore aquaculture. Huntsman Award; Halifax, NS; November 2016.
- (2016). Opportunities and challenges in sustainable offshore aquaculture. Oxford University; Oxford, UK; July 2016.
- (2016). Opportunities and uncertainties of sustainable offshore aquaculture. University of California Santa Barbara Foundation Board of Trustees; Santa Barbara, CA; October 2016.
- (2016). Potential and barriers of offshore aquaculture. University of California Santa Barbara; Santa Barbara, CA; October 2016.
- (2016). Sea-Web Seafood Summit presentation. Sea-Web Seafood Summit; Barcelona, Spain; June 2016.
- (2016). Seafood Summit presentation. Seafood Summit; New Zealand; February 2016.
- (2016). Spain presentation. Spain; June 2016.



SNAPP: Prioritizing investments in green infrastructure to meet urban water security needs in Latin America. 2015. Decision-relevant science for water security: An iterative process for targeting and evaluating impacts of watershed investments. Our Common Future Under Climate Change Conference; Paris, France; July 8, 2015.

- (2015.) Evaluation of flood mitigation strategies for the Santa Catarina watershed using a multi-model approach. ASU; Tempe, AZ; November 12, 2015.
- (2015). Identifying opportunities for natural infrastructure to improve urban water security in Latin America. Arizona State University, School of Geographical Sciences and Urban Planning Colloquium Series; Tempe, AZ; April 10, 2015.
- (2015). Investing in source water conservation: Why and where it makes sense for cities. International Water Association; Sweimeh, Jordan; October 20, 2015.
- (2015). Natural infrastructure: An opportunity for water security in 25 cities in Latin America. Inter-American Development Bank, Cities Week; Washington DC; October 1, 2015.
- (2015). Natural infrastructure: An opportunity for water security in 25 cities in Latin America. World Water Week; Stockholm, Sweden; August 24, 2015.
- (2015). Securing clean water and reducing flood risk for cities with investments in watershed services. Ecological Society of America; Baltimore, MD; August 2015.
- (2015). SNAP Water Security Working Group. TNC Policy and Practice Conference; Nashville, TN; November 17, 2015.
- (2015). Watershed conservation screening tool live demonstration. International Water Association; Sweimeh, Jordan; October 20, 2015.
- (2016). Co-development of science symposium. Society for Conservation Biology; Madison Wisconsin; July 2016.

SNAPP: Water transactions to enhance streamflow, water supply reliability, and rural economic viability in the western United States. (2016). SNAPP indicators of multi-objective water transaction benefits. TNC North America Water Transactions Quarterly Webinar; November 2016.

Stewart Lowndes, Julia; Best, Benjamin D. (2016). The Ocean Health Index and Shiny. RStudio's Shiny Developer's Conference in San Francisco.

Stewart Lowndes, Julia. (2016). Better science in less time using data science tools. Western Society of Naturalists, Monterey, California.

Stewart Lowndes, Julia. (2016). Improving reproducibility, collaboration and communication in marine science using open science tools. Hopkins Marine Station of Stanford University Seminar Series.

Stier, Adrian C. (2016). No smoking gun? The potential roles of people, place, and environment in the loss of a portfolio effect International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.



Stier, Adrian C. (2016). The value of information: adaptive monitoring and trade off between monitoring costs and precision in ecosystem assessment. American Fisheries Society Meeting, Portland OR.

Thorpe, Hilary. (2016). Incorporating tipping points science into decision-making takes relationships and time. International Marine Conservation Congress (IMCC), ST. John's Newfoundland 7-31-16.

White, Crow. (2016). Tradeoff analysis for balancing multiple objectives in ocean management. International Coral Reef Symposium (ICRS), Honolulu Hawaii.

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Proposals and Grants

The following lists include proposals and grants that have been reported to NCEAS during fiscal year 2016-2017, though actual proposal and grant dates may precede this period.

Burivalova, Zuzana. (2016). Acoustic biodiversity sampling.

Langhammer, Penny; Brooks, Thomas. (2016). Post-doctoral associate at ASU.

Palmas Perez, Sebastian. (2016). Field work and pilot program.

Putz, Francis E. (2016). Tree planting in enlarged felling gaps workshop.

Revenge, Carmen; Wilson, Jono R.; Rude, Jeremy. (2015). Global oceans team.

Schimel, David W. (2016). Scoping study for biodiversity airborne campaigns. NASA 2016.

SNAPP: Aligning coastal restoration with ecological and societal needs. (2016). NOAA RESTORE Act Science Program.

SNAPP: Analyzing best practices and standards as a pathway to sustainable and conservation-friendly offshore aquaculture. (Reported FY17). Post-doctoral position.

SNAPP: Developing guidelines for and assessing relationships among biocultural indicators to improve long-term resilience of Pacific social and ecological communities. (2016). Australian Research Council Linkage Grant. ARC Linkage Grant.

- (Reported FY17). National Science Foundation Catalyzing New International Collaborations (CNIC) grant. NSF CNIC.
- (Reported FY17). American Museum of Natural History's Niarchos Fund. American Museum of Natural History's Niarchos Fund.



SNAPP: Documenting, measuring and valuing the ecosystem service and human wellbeing benefits delivered by Key Biodiversity Areas. (2017). Canadian Council of Ecological Areas.

- (2017). WCS Canada and the criterion C workshop.

SNAPP: Evidence-based Conservation to Advance Human Well-being. (Reported FY17). International Impact Initiative.

- (Reported FY17). World Bank.
- (Reported FY17). Conservation International and IUCN.
- (Reported FY17). NERC-ESPA.
- (Reported FY17). Conservation International.
- (Reported FY17). Cargill Foundation.
- (Reported FY17). Margaret A Cargill Foundation.

SNAPP: Finding smart planning solutions in the Southern Agricultural Growth Corridor of Tanzania: What does sustainable intensification look like? (Reported FY17). CGIAR Water, Lands and Ecosystems Nile Basin/Eastern Africa Region Research Program.

SNAPP: Finding solutions to the ivory crisis: What would an economically rational Chinese ivory trade policy look like? (2016). Liz Claiborne and Art Ortenberg Foundation.

- (Reported FY17). Beijing Normal University.
- (Reported FY17). South Africa Institute of International Affairs.
- (Reported FY17). UK Government's Illegal Wildlife Trade Challenge.
- (Reported FY17). U.S. Fish & Wildlife Service grant.
- (Reported FY17). Stop Ivory.
- (Reported FY17). Doodod Technology Co Ltd.

SNAPP: Forest sharing or sparing for conservation and communities in tropical timber landscapes. (2016). Review of Yucatan Peninsula RIL-CVCS module.

- (2016). Tree re-measurement in Quintana Roo, Mexico.
- (2016.) Mexico REDD+ Alliance (\$5,000).
- (Reported FY17). Doris Duke Charitable Trust Foundation (\$300,000).

SNAPP: Integrating natural defenses into coastal disaster risk reduction. (2015). Global Resilience Challenge. USAID/Rockefeller Foundation/SIDA 2015.

- (Reported FY17). Post-Doctoral Fellowship. LTRF Research Foundation.



- (Reported FY17). The role of coastal habitats in managing natural hazards and risk reduction: A multidisciplinary approach across ecology, economics and engineering. Lloyds of London.

SNAPP: Land-use change and conservation policy in Brazil and the U.S. for biodiversity, ecosystem services and economic returns. (Reported FY17). Post-Doctoral Fellowship.

SNAPP: Landscape sensitivity to ecological drought: The knowns, needs, and solutions for the real world. (Reported FY17). USGS funding.

SNAPP: Managing Data Limited Fisheries for Economic and Biological Objectives. (2017). Marine Stewardship Council.

SNAPP: Measuring the status of fisheries and factors leading to success. (Reported FY17). Packard Foundation.

- (Reported FY17). Individual donor.
- (Reported FY17). Co-funding for UCLA and CalAcademy events.
- (Reported FY17). EDF grant.
- (Reported FY17). Fishing industry collective.
- (Reported FY17). Walton Family Foundation.
- (Reported FY17). Post-doctoral position.

SNAPP: Water transactions to enhance streamflow, water supply reliability, and rural economic viability in the western United States. (Reported FY17). NFWF.

SNAPP: Western Amazonia: Balancing Infrastructure Development among Conservation of Waters, Wetlands and Fisheries. (Reported FY17). Gordon and Betty Moore Foundation (\$1,990,000).

- (Reported FY17). WWF/IADB.
- (Reported FY17). John D. and Catherine T. MacArthur Foundation, USAID/ICAA, and the Gordon and Betty Moore Foundation.
- (Reported FY17). Gordon and Betty Moore Foundation (\$1,000,000).
- (Reported FY17). Mitsubishi Foundation.
- (Reported FY17). John D. and Catherine T. MacArthur Foundation.

SNAPP: Gaming the Future: Designing video games that change the way people think about climate change. (Reported FY17). University of Washington grant for mobile app.



Sterling, Eleanor J. (2016). National Science Foundation Catalyzing New International Collaborations Grant. National Science Foundation Catalyzing New International Collaborations Grant.

Ticktin, Tamara. (Reported FY17). NSF Coastal SEES Grant. NSF Coastal SEES Grant.

Venter, Oscar. (2016). Post-doctoral position.

Venture: Understanding how land-use change impacts the dynamics of vector-borne and water borne infectious disease of humans and domestic livestock. (2016). Dynamics of zoonotic systems: human-bat-pathogen interactions. NSF coupled natural-human systems.

Ward, Dawn. (Reported FY17). Mexico REDD+ Alliance (\$15,000).

Wells, Jessie. (2016). Doris Duke Charitable Trust Foundation (\$19,000).

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Reports and White Papers

The following lists include reports and white papers that have been reported to NCEAS during fiscal year 2016-2017, though actual report and white paper dates may precede this period.

Banerjee, Onil; Cicowiez, Martin; Ochuodho, Thomas; Masozera, Michel; Wolde, Bernabas; Lal, Pankaj; Dudek, Sebastian; Alavalapati, Janaki R. (2017). Financing the sustainable management of Rwanda's protected areas. CEDLAS.

Beck, Michael W.; Lange, Glenn-Marie. (2015). Guidelines for coastal and marine ecosystem accounting: Incorporating the protective service values of coral reefs and mangroves in national wealth accounts.

Beck, Michael W.; Pontee, Nigel. (2015). Coastal risk reduction: Integrating natural defenses into a sustainable coastal risk management framework.

Cheng, Samantha; Robinson, Janine E; Cox, Neil A.; Biggs, Duan; Olsson, Annette; Mascia, Michael; McKinnon (Bottrill), Madeleine. (2017). Mapping the evidence: Effectiveness of international wildlife trade practices and policies. Conservation International.

Ellis, Peter. (2016). VM0035: Methodology for improved forest management through reduced impact logging (RIL-C). Technical guidelines.

Enquist, Brian J.; Condit, Richard; Peet, Robert K.; Schildhauer, Mark P.; Thiers, Barbara. (2016). Cyberinfrastructure for an integrated botanical information network to investigate the ecological impacts of global climate change on plant biodiversity. PeerJ.



Kamau, Felix; Nijbroek, Ravic; Girvetz, Evan H.; Maina Mbui, Joseph; Ingram, Jane Carter. (2016). Encouraging green agricultural development in the SAGCOT region of Tanzania.

Katona, Steven K.; Polsenberg, Johanna; Stewart Lowndes, Julia; Halpern, Benjamin S.; Pacheco, Erich; Mosher, Lindsay; Kilponen, Anna; Papacostas, Katherine; Guzman-Mora, Ana Gloria; Farmer, Ginny; Mori, Luca; Andrews, Olive; Tai, Sue; Carr, Sarah. (2017). Navigating the seascape of ocean management: waypoints on the voyage toward sustainable use.

Marthinus, Delon; Ellis, Peter; Griscom, Bronson W. (2015). Protokol Audit Performa Emisi Karbon Dari Pembalakan Pada IUPHHK-HA.

Martin, Season; Aylward, Bruce; Colby, Bonnie; Dicharry, Will B; Grantham, Ted; Kendy, Eloise; Powell, Emily; Richter, Brian; Sanchez, Leslie; Ziemer, Laura. (2017). Indicator guidebook for water transaction programs.

McDonald, Robert I.; Shemie, Danie. (2014). Urban Water Blueprint: Mapping conservation solutions to the global water challenge.

Moritz, Max A.; Topik, Chris. (2016). Project charter: Fire research consensus project.

Moritz, Max A.; Topik, Chris. (2017). Summary of fire research consensus project phase 2 questionnaire responses.

Narayan, Siddharth; Beck, Michael W.; Wilson, Paul S.; Thomas, Christopher; Guerrero, Alexandra; Shepard, Christine; Reguero, Borja; Franco, Guillermo; Ingram, Jane Carter; Trespalacios, Dania. (2016). Coastal wetlands and flood damage reduction: Using industry-based models to assess natural defenses in the northeastern USA.

Olander, Lydia P.; Characklis, Gregory W; Comer, Patrick; Efron, Micah; Gunn, John; Holmes, Thomas P; Johnston, Robert J.; Kagan, Jimmy; Lehman, William; Loomis, John; McPhearson, Timon; Neale, Anne; Patterson, Lauren; Richardson, Leslie; Ross, Martin; Saah, David; Sifleet, Samantha; Stockman, Keith; Urban, Dean; Wainger, Lisa A.; Winthrop, Robert; Yoskowitz, David. (2016). Data and modeling infrastructure for national integration of ecosystem services into decision making: Expert summaries.

Revenge, Carmen; Sweeney, Michael; Wilson, Jono R. (2017). TNC's global coastal fisheries strategy.

Shemie, Daniel; Vigerstol, Kari; Quan, Mu; Karres, Nathan; Longzhu, Wang. (2016). China urban water blueprint.

SNAPP: Planning for the impacts of landuses on coral reef fisheries and livelihoods under different climate scenarios. (Reported FY17). A guide to modelling land-based impacts to coastal ecosystem services by integrating tools across disciplines and ecosystems. Technical guidelines.



SNAPP: Prioritizing investments in green infrastructure to meet urban water security needs in Latin America. (Reported FY17). Natural Infrastructure: An opportunity for water security in 25 cities in Latin America.

- Reported FY17). Quantifying the role of natural infrastructure in mitigating flood peaks: Case study of the Santa Catarina watershed upstream of Monterrey, Mexico.

SNAPP: Developing guidelines for and assessing relationships among biocultural indicators to improve long-term resilience of Pacific social and ecological communities. (Reported FY17). Handbook for community engagement and process for co-creation of resilience indicators.

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Software

The following list includes software that has been reported to NCEAS during fiscal year 2016-2017, though actual software dates may precede this period.

Frazier, Melanie ; Stewart Lowndes, Julia. Ocean Health Index. ohicore R package.

SNAPP: Making ecosystems count in the Sustainable Development Goals. Mapping ecosystem services to human well-being (MESH).

Stewart Lowndes, Julia; Best, Benjamin D. Ocean Health Index. ohirepos R package.