



Annual Report 2013

PICSC Director on Board

The Pacific Islands Climate Science Center is pleased to welcome **David Helweg** as our first permanent Director. Prior to assuming his new role, Dave was the Deputy Director of the USGS Pacific Island Ecosystems Research Center for more than ten years. Since 2002, Dave has put his expertise in multidisciplinary science and experience with strategic program development to work on terrestrial, coastal and near-shore resource management issues.

Before joining the USGS, Dave held positions at the U.S. Navy's Space and Naval Warfare Systems Center in San Diego and the University of Auckland in New Zealand. He is an expert in behavioral biology, ecology, bioacoustics and signal processing.



One of a family of 8 regional centers created by the U.S. Department of the Interior, the Pacific Islands Climate Science Center was established in 2012 as a partnership with the University of Hawai'i at Mānoa, the University of Hawai'i at Hilo, the University of Guam and a number of other institutions.

Our mission is to provide land managers in federal, state and local agencies access to the best science available on climate change and other landscape-scale stressors that impact our region's natural and cultural resources.

Highlights of our activities over the last year include:

- The first graduate degrees to students supported by the Center were awarded by the University of Hawai'i.
- **Secretary of the Interior Sally Jewell** visited Hawai'i and was briefed on the progress of the Center.
- Our first Science Symposium was held with almost 100 participants from Hawai'i and Guam as well as the U.S. mainland.
- A competition resulted in 6 new projects with total funding exceeding \$800,000.
- A 5-year Science Agenda for the PICSC has been developed and is available at www.doi.gov/csc/pacific/science.cfm

New PICSC Website Launched

The Pacific Islands Climate Science Center has a new website hosted at the University of Hawai'i that complements the Federal Government web page managed by the Department of Interior (doi.gov/csc/Pacific). The new site easily reached at tinyurl.com/PacificCSC includes detailed research progress summaries from many of the PICSC supported projects as well as listings of upcoming events and several other features.



Secretary of Interior Jewell Visits

On September 4, **Secretary of Interior Sally Jewell** met with climate change leaders and partners in Honolulu. She was briefed by the staff of the Department of Interior (DOI) Pacific Islands Climate Science Center and the Pacific Islands Climate Change Cooperative (Pacific Islands LCC), two arms of DOI's thrust to understand, anticipate, and prepare for climate change in Hawai'i and the U.S. Affiliated Pacific Islands.

The people, cultures, and ecosystems of the islands are now experiencing and are predicted to experience some of the most dramatic impacts of climate change and variability on both land and the sea. The region is known for its highly collaborative interagency partnerships, and discussions included presentations and input to Secretary Jewell from colleagues in federal, state, and university communities who are developing and applying climate change science to societal and ecological challenges across the region.

Science Review Symposium



The PICSC convened its first science review in partnership with the Pacific Islands Climate Change Cooperative (PICCC). **The First Annual PICSC/ PICCC Science Review Symposium** was held on July 15 on the University of Hawai'i's Mānoa Campus and attracted an audience of nearly 100.

World renowned biogeochemist and ecologist **Peter Vitousek** of Stanford University gave the opening keynote address titled *Atmospheric and Geological Sources of Nutrients for Forests and for Traditional Agriculture: Thresholds and Irreversibilities Associated with Climate and Climate Change*.

Presentations summarizing the achievements of 24 individual projects supported by the PICSC or PICCC then followed.



Graduate Theses Supported by PICSC

In the last year, projects conducted by two graduate students supported by the Center have resulted in graduate theses submitted to, and graduate degrees awarded by, the University of Hawai'i at Mānoa. We congratulate these fine young scientists on their accomplishments and look forward to more graduate theses from the many students now being supported by the Center.

Mallory Barnes, Department of Natural Resources and Environmental Management, College of Tropical Agriculture and Human Resources.

M.S. Thesis: *An Assessment of Diurnal and Seasonal Cloud Cover Changes over the Hawaiian Islands Using Terra and Aqua MODIS*. Advisor: **Tomoaki Miura**

Tiffany Anderson, Department of Geology and Geophysics, School of Ocean Earth Science and Technology.

Ph.D. Thesis: *Identifying and modeling shoreline trends*. Advisor: **Neil Frazer**

Tree Rings Help Establish Hawai‘i’s Climate “Prehistory”

Recent work in UH Hilo’s Tropical Conservation Biology and Environmental Science program demonstrated for the first time that some Hawaiian trees exhibit annual rings and has established tree ring climatologies for the island of Hawai‘i back to the 1920s. Graduate student **Tishana Ben** is now trying to build a tree ring chronology that goes even further back in time by cross-dating live trees with those of long-dead māmane trees.

The ultimate goal is producing the best annually resolved record of how climate has varied in Hawai‘i and across the Eastern Pacific over the last several centuries. Tishana is working with two undergraduates on cross-dating other subalpine tree species, including naio and ‘akoko.



Climate Change Impacts on Coral Reef Ecosystem Services

Economist **Kirsten Oleson** of UH Mānoa’s Department of Natural Resources and Environmental Management is leading a team of postdoctoral researchers and graduate students who are applying and adapting a dynamic, ecosystem-based decision-support tool to aid decision makers, non-profits, and community alliances. As an initial application they are developing a pilot decision-support tool for coral reef management in West Maui, which can map, assess, value, and simulate changes in ecosystem service flows under alternative global climate change scenarios and adaptation strategies.

The valuation study is focusing on West Maui communities, translating climate change potential impacts into measures of human wellbeing and making recommendations for adaptation and management.



Climate Change and the Long-Term Viability of Haleakalā Silverswords

The Haleakalā silversword is a threatened, yet dominant, component of the sparsely vegetated alpine ecosystem at the top of the Haleakalā volcano on the island of Maui. This charismatic plant is viewed by 1–2 million visitors to Haleakalā National Park each year, but unfortunately is exhibiting evidence of decline from changing climatic conditions. Specifically, decreasing rainfall, particularly in the summer dry season, is associated with substantial mortality and severely decreased seedling recruitment over the past 10–20 years.

A project led by **Paul Krushelnycky** of UH Mānoa’s Department of Plant and Environmental Protection Sciences is clarifying the causes of the elevational pattern in mortality. The project uses greenhouse experiments to examine factors affecting seedling drought tolerance, combined with outplanting experiments to verify seedling performance in the field.



PICSC Funded Projects

In competitions held in spring 2012 and spring 2013 a total of 11 projects were funded by the PICSC. All are now underway and are answering key questions about climate change impacts in the unique environments of the Pacific Islands.

Vulnerability of Hawaiian Forest Birds to Climate Change Using Models to Link Landscape, Climate, Disease, and Potential Adaptation.

Michael D. Samuel, USGS, Wisconsin Cooperative Wildlife Research Center

Modeling Climate-Driven Changes to Dominant Vegetation in the Hawaiian Islands.

Jonathan Price, UH Hilo

Understanding How Climate Change is Affecting Hawai'i's High-Elevation Ecosystems: an Assessment of the Long-Term Viability of Haleakalā Silverswords and Associated Biological Communities.

Paul D. Krushelnycky, UH Mānoa.

Climate Change Research in Support of Hawaiian Ecosystem Management: An Integrated Approach.

Oliver Ellison Timm and **Thomas Giambelluca**, UH Mānoa

21st Century High-Resolution Climate Projections for Guam and American Samoa.

Yuqing Wang, UH Mānoa

Coral Reef Resilience to Climate Change in CNMI; Field-based Assessments and Implications for Vulnerability and Future Management.

Laurie Raymundo, U Guam

Expanding a Dynamic Model of Species Vulnerability to Climate Change for Hawai'i and Other Pacific Island Ecosystems.

Lucas Fortini, USGS Pacific Island Ecosystems Research Center

Future Coral Reef Community Projections of DOI-Managed Coastal Assets in the Hawaiian Islands.

Erik Franklin, UH Mānoa

Understanding the Response of Native and Non-native Forests to Climate Variability and Change to Support Resource Management in Hawai'i.

Thomas Giambelluca, UH Mānoa

Valuing Climate Change Impacts on Coral Reef Ecosystem Services (Aloha InVest).

Kirsten Oleson, UH Mānoa

Very Fine Resolution Dynamical Downscaling of Past and Future Climates for Assessment of Climate Change Impacts on the Islands of O'ahu and Kaua'i.

Yuqing Wang, UH Mānoa



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