Issue 5, October 2017

PACIFIC PANDANUS

NAVIGATING WITH THE BEST CLIMATE SCIENCE

Aloha, Hafa adai, Yokwe, Talofa, Alii, Mogethin, Ran allim, Kaselehlia, Hello!

Welcome back to the Pandanus, a newsletter produced by the Pacific Islands Climate Science Center, created to share updates and highlights of our ongoing climate research and continuing efforts toward climate adaptation through community planning and engagement. Recent years have emphasized the urgency of these adaptation efforts, with the impacts of a changing climate becoming disturbingly more noticeable. Record high temperatures locally and globally, increasing numbers of 1000-yr flood events, record high tide levels, record low minimum artic ice coverage—all these signs point to shifting conditions that will affect our communities.

The theme of this issue, then, is "**When extreme becomes routine**." We will begin with a look at two particular extremes many in the Pacific Basin have been experiencing recently: high temperatures (pg 3) and high seas (pg 5). We will also share some of our science and management highlights, and bring you more information about resources, opportunities, and events.

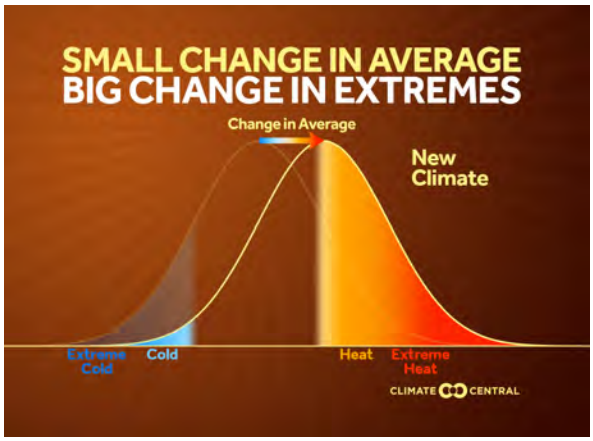
In this issue...

Cows graze in a dry Hawaiian rangeland...

...while flooding plagues the Marshall Islands.

When extreme becomes routine

With the gradually shifting climate as a backdrop, the extreme weather events that we experience have begun to assume a new role. Rather than the rare once-a-century, or once-a-millennium, event to cope with, the extremes have begun to give us an uncomfortable preview of what may all-too-soon become "normal" conditions.

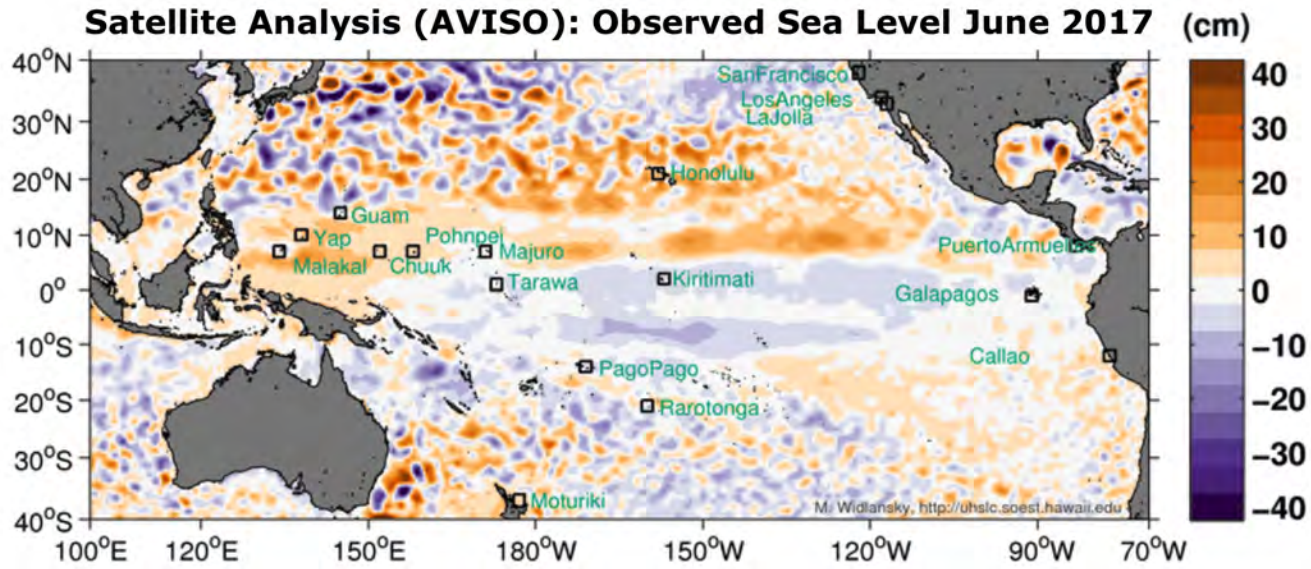


Islands across the Pacific vary in character, from topography (low vs. high islands) and typical rain and wind patterns, to population size, land-use attributes, and infrastructure. But the islands share many common concerns as weather patterns shift and sea levels rise: increased vulnerability to wildfire and droughts, more intense storms and flooding, salt-water intrusion and inundation, threats to freshwater resources, and increasing erosion hazards to coastal properties. In this issue, we focus on the extremes that are impacting our island ecosystems, affecting the land and the coastline.

For example, the elevated temperatures which accompanied the strong El Niño conditions of 2015-2016 hinted at what may become average temperatures in the future. But how soon? Models often predict conditions for 2050 or 2100, but with every passing summer, we notice higher thermometer readings in our backyards and fewer cool tradewind days. In fact, this year, without any El Niño conditions, 2017 is on track to be one of the hottest years on record. And with elevated atmospheric temperatures come warmer oceans, leading to coral bleaching, shifting of marine animal communities poleward looking for cooler waters, all of which are potentially negative effects to ecosystems, tourism, fishing industries, and aquaculture.

This summer saw a confluence of conditions in Hawai'i that brought another extreme to the local public's notice: positive Pacific Decadal Oscillation conditions, a strong southern swell, and the yearly king tides, against the background of gradually rising sea levels, all led to record high tides. Inundation levels around the Hawaiian chain previewed flooding that may someday be typical during even regular tides, illustrating areas of particular vulnerability to further sea level rise.

With predicted climatic changes will come a plethora of side effects, all of which pose great challenges to resource managers and decision makers tasked with preparing for these daunting future conditions. That is what drives PI-CSC and its partners, hoping that together we can all prepare our beautiful islands for whatever is to come.



Hotter Than Hot

Each of the last three years, 2014-2016, set a new record high for the average annual global temperature (land and ocean). Is this a trend, a sign of more to follow, or an anomaly due to other conditions? El Niño certainly played a role in 2015-2016, when the record-tying strongest El Niño conditions caused a string of record high temperatures. Even when climate conditions stabilized in the spring of 2016, record highs continued through August, and fall averages were second only to the temperatures of 2015.

The worst of the El Niño conditions across the western Pacific involved widespread and severe drought. From Fiji to the Marianas, elevated temperatures with low rainfall led to low water supplies and dying crops. Other areas, like the Solomon Islands and Vanuatu suffered crop damage from too little water *and* from cyclone-generated flooding.

Cyclone Pam devastated Vanuatu with flooding and high winds in March 2015. Photo: Roderick J Mackenzie, New Zealand Defence Force

Becoming routine?

A particularly worrying anomaly associated with this recent El Niño is that the attending conditions lingered after the meteorological event itself, with extreme droughts and storms continuing through 2016 and into 2017. Global temperatures, too, have not dropped significantly, despite even a weak La Niña developing in early 2017: the first seven months of 2017 have all weighed in as the second or third hottest example of that month on record. In March, Kiribati was still plagued by drought, and in May, extreme drought was reported across eight atolls of the Marshall Islands. Hawaii Island experienced its third driest March to June period, and its driest July on record--4% of normal! (For a timely study of drought throughout the US-Affiliated Pacific Islands region recently published by a PI-CSC researcher, go **here**.)

Drought-stricken trees on Ailuk Atoll, Marshall Islands Photo: Pacific Adaptation to Climate Change Project

Usually, El Niño conditions end and weather patterns return to "normal." But the temperature anomalies of this past El Niño, along with the shifts in wind and rainfall patterns, give a taste of what may become more permanent conditions with continued global warming. Predictions of climate change effects to the Pacific Basin suggest a seemingly contradictory situation: higher atmospheric temperatures will increase evaporation, making drier land and vegetation, but will also cause greater atmospheric moisture and, thus, more precipitation when rain does form. Most modeling suggests that whether overall precipitation increases or decreases (which varies with the model and location), rain will become more sporadic. This promises longer periods of hotter, drier droughts interspersed with periods of torrential rain storms and flooding. For low-lying islands especially, with little groundwater storage, such conditions would require substantial adaptation efforts.

Hotter Than Hot

Heat in the sea

One of the clearest signs of rising tropical temperatures is the accompanying rise in sea surface temperatures, and the most obvious outward sign of warm waters is coral bleaching. The extra warming associated with El Niño pushes delicate coral reef ecosystems too far: with prolonged elevated warmth, corals can no longer support their symbiotic algae and expel them. Unfortunately, not only does this turn colorful corals ghostly white, it also signals their starvation, since the algae provide up to 90% of a coral's energy through photosynthesis. There were 60 recorded regional bleaching events between 1979 and 1990, but since 1998 there have been three global bleaching events, with the 2014-2017 event most severe and lasting the longest. Regrettably, predictions based on current sea surface temperatures suggest many areas of the Pacific may soon begin to experience bleaching conditions annually. (See the Research Highlight on the PI-CSC-funded work on coral resiliency.)

Images of coral bleaching have become ubiquitous for depicting the effects of warming global temperatures. Photo: SMatsuda, UH Mānoa

Preparing for hotter and drier

From record temperatures and droughts, to increasingly irregular rainfall and stronger storm systems across the Pacific Islands, conditions that were hinted at by anomalous El Niño years, are becoming all too familiar even during El Niño-neutral years. But what does that mean for our communities as temperature extremes are becoming routine?

Water may be a crucial resource underlying our ability to cope. With a decrease in precipitation, we might expect more water usage by people, straining island freshwater systems. Vegetation will be drier, increasing the chances of wildfires, which would use more water to control them. Trade winds may change, increasing the discomfort of people with hotter, muggier weather. In turn, that may lead to increased air conditioner use (for those that have such luxuries!), using even more water.

The recent El Niño event gave us a taste of what the future may bring. Now it is up to us to find the best ways of adapting to these possible conditions.

Resources and Tools

Contact the Expert

Dr. Thomas Giambelluca
Professor of Geography
University of Hawai'i at Manoa

Thomas Giambelluca's research focuses on land-atmosphere interactions especially when there are changes to land cover and climate conditions. He examines how these changes over time affect hydrological processes and terrestrial ecosystems. Visit his website ***here****.*

Explore the Link

US Drought Portal:
www.drought.gov/drought

Explore this portal for updates on drought conditions around the country, including current conditions, seasonal forecasts, snowpack data, soil moisture, drought impacts, wildfire risks, and a host of other tools and interactive, customizable maps. Be sure to access the Mitigation Center to examine suggestions for drought preparation, mitigation, and response strategies.

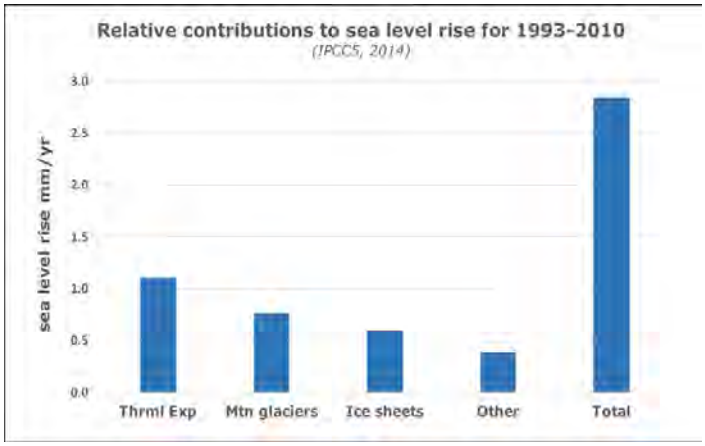
Higher Than High

Our "Big Blue Marble" Earth is a water planet, with 70% of the surface covered in fresh or salt water. However, sea level at any given location is complicated by many geologic factors, at multiple scales: local currents and tides, local coastline geography, post-glacial land rebound, land sinking from crustal cooling, or long-term tectonic uplift as plates collide.

Rising seas

There are two physical factors, though, that cause inevitable rising of global sea level: expansion of the water itself and a net addition of water. Water has a high ability to store heat, and it is estimated that 90% of the extra heat added to the Earth's system over the last 40 years has been absorbed by the ocean. Most materials expand upon heating, and the oceans are no different. The 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC5, 2014) attributes 1.1 mm/yr of sea level rise solely to thermal expansion of the water. That amount may seem trivial, but imagine that tiny layer of water spread across all the world's oceans: it is the equivalent of nearly 160 million Olympic-sized swimming pools! And there are other factors at play, too.

Simultaneously, the additional atmospheric warmth around the planet has caused net melting of land-based ice packs, both smaller mountain glaciers and large ice sheets in Greenland and Antarctica. Consider the following graph, based on IPCC5-reported values for 1993 to 2010:



The addition of all this water to the oceans, combined with the water's thermal expansion, accounts for over 2 inches (57 mm) of sea level rise over those nearly 20 years. Furthermore, records show that sea level has risen over 8 inches (203 mm) during the last 130 years (1880 to 2009), and these rates imply that the increase in the last 20 years was nearly double that of the preceding 80 years.

Signs of things to come?

Coastal flooding along N. Kihei Road, Maui (left) and groundwater inundation in Mapunapuna, Oʻahu (right) exemplify areas ripe for trouble as sea level continues to rise. Photos: Hawai'i Sea Grant King Tides Project

Results of these slightly higher sea levels are already being seen in coastal regions. In Hawaiʻi, a summer of particularly high King Tides (due to a convergence of factors) illustrated the increased inundation and coastal erosion that are hallmarks of rising sea levels. A higher background sea level means that the effects of common events, like high tides and storm surges, are exaggerated, causing sea water to reach higher elevations or flow further inland than previously. (To exacerbate storm surges even more, increased ocean temperatures cause bigger storm systems with stronger winds.) During the King Tides, coastal roadways and harbors across the Hawaiian island chain saw saltwater inundation from the encroaching ocean. Meanwhile, low-lying areas experienced groundwater back-up through

Higher Than High

storm drainage systems, generated by an ocean-coupled saltwater lens pushing up the overlying fresh terrestrial water table until the land's surface is broached by water.

Increased erosion is also a problem. Higher tides mean waves flow further up beaches and bluffs, damaging protective vegetation through physical wear and saltwater intrusion into root systems, exposing bare rock or earth to further erosion. Wetlands that lose vegetation gradually become open water, reducing their effective protection of the coastline and opening the door to more erosion. Many Hawaiian beaches this summer were swamped with water up to, and sometimes past, backing properties, with heavy surf breaking against walls, walkways, buildings, and beach-bordering vegetation.

Erosion at Kailua Beach Park on Oʻahu is typical of damage from increased wave activity, removing land, threatening vegetation and, ultimately, property. Photo: Hawai'i Sea Grant King Tides Project

Future predictions

For our Pacific communities, the twin threats of inundation and coastal erosion mean loss of beaches and extensive threats to coastal infrastructure like roads systems, sewage systems, airports, energy infrastructure, emergency facilities, and freshwater resources. Whole islands in the western Pacific are at risk, as many atolls are only feet above sea level. Even minimal sea level rise threatens the very livability of these regions by compromising freshwater supplies and agriculture.

So what will the future bring and how do we adapt? Current satellite observations of actual sea level are in line with the IPCC projections from 20 years ago, and unfortunately, most current estimates of future rates suggest even greater increases. If future sea levels continue to rise, knowing when certain heights will be reached--and how far inland the water will flow--is a critical component of our decision-making process for building adequate resiliency. The range of projections in the IPCC5 suggest that by 2100, global sea level will be on the order of 0.5 m to 1 m higher than today. However, the variability in model outputs is primarily due to the uncertainty of how carbon emission levels will evolve over time, which means that our future is still very much in our hands, to use our collective ingenuity to change what is to come and adapt where we must.

Resources and Tools

Contact the Expert

Dr. Matthew Widlansky
Researcher, UH Sea Level Center
University of Hawaiʻi at Mānoa

Matthew Widlansky researches climate and sea level variability on all timescales. He uses global climate models to assess the limits of predicting impacts from sea level extremes. His PI-CSC work generated a predictive tool for managers (below). Contact him at: mwidlans@hawaii.edu

Explore the Link

UH Sea Level Center:
www.uhslc.soest.hawaii.edu/products/slforecasts

This interactive website provides sea level forecasts across the Pacific Basin at monthly intervals, for up to six months. Often extreme sea level anomalies impact low-lying tropical Pacific Islands with little warning. The forecasts presented by this website offer local decision makers the information to plan for coastal impacts associated with high, or low, sea level stands.

Research Highlights

Shallow islands and rising seas: The story of climate-induced migration

The Republic of the Marshall Islands (RMI) is one of the lowest-lying nations in the world, with its five islands and 29 atolls highly vulnerable to the twin climate impacts of sea level rise and increasing temperatures. Freshwater supplies and agricultural production are affected both by salt-water inundation from rising seas and by persistent periods of drought. Many Marshallese, looking for stability, are moving to the larger islands within the RMI or migrating to other less threatened locations, like Hawai'i, Guam, and the continental US.

Quality of life has been compromised on many Marshall Island atolls, as adequate fresh water and food supplies become compromised by salt water inundation and drought. Photo: K van der Geest

Maxine Burkett of the William S. Richardson School of Law at the University of Hawai'i at Mānoa is leading a project for PI-CSC investigating the role of climate change in driving human migration and the effects of such population shifts on the people themselves, both the communities they leave and those they join.

With increasing changes in climate, particularly rising sea levels and shifting rainfall patterns across the Pacific, migration may become a more commonly employed adaptation strategy as time progresses. Thus, examination of the links between migration and climate events is important for predicting which communities will be most at risk, whether relocation is an effective adaptation strategy for those communities, and how best to accommodate and finance mass community movement, while still maintaining the integrity of the cultures involved.

Migration impacts the young and the old. How best to preserve the future without losing the past? Photo: K van der Geest

"We are pioneering several social science methods to link migration more accurately to the ecological and social variables of climate change and climate variability," Burkett writes. "We believe the research can uniquely contribute to identifying best practices in managing the consequences of potential climate-induced migration, on both human and natural ecosystems."

Preliminary findings from Burkett's team show that while many islanders feel unprepared for the effects of climate change, they resist the idea that they may be forced to leave their home; most believe a better solution will be found in time. Nonetheless, Marshallese migration is widespread, as many search for better education and healthcare: over 90% of those surveyed had a sibling or offspring living elsewhere, either on another RMI island or in the US. Those that remain see migration as harmful to the migrants and their families, and as a threat to their culture and their country's continued development.

Research Highlights

Rising temperatures beneath the sea: The story of coral bleaching

With several years in a row of record-breaking temperatures around the globe, coral bleaching events have, unfortunately, shifted from being an obscure happenstance to global phenomena with which most people are now familiar. With elevated water temperatures, corals become inhospitable to their symbiotic, colorful algae and expel them from the coral structure, leading to the untinted, ghostly reefs depicted in photos. Whether corals can recover depends strongly on how long they are exposed to the elevated water temperatures.

Co-I Jeffrey Maynard examines the health of a finger coral in the waters of CNMI. Photo: LRaymundo

Laurie Raymundo, of the University of Guam Marine Lab, and Jeffrey Maynard, of SymbioSeas and the Marine Applied Research Center, recently wrapped-up a study for PI-CSC on coral bleaching. They investigated when ocean temperatures would be continuously high enough that coral reefs would not have the chance to recover from bleaching events. By developing high resolution models with their collaborator Ruben van Hooidonk (NOAA) of reefs around 87 countries, Raymundo and Maynard were able to show a wide variability in the timing of when corals will be unable to recover. In some locations, like Guam and Saipan, corals will struggle to survive as soon as 20 years from now, while in other regions it will take 30-40 years to reach that point. Such results, along with coral reef resilience assessments, are critical information for resource managers making decisions about reef management strategies. To learn more about their project findings, read their published special report **here**.

PI-CSC Student Research Symposium

One of the goals of the Climate Science Centers is to prepare the next generation of climate scientists and specialists by supporting graduate and undergraduate students in their climate research endeavors. In April, our PI-CSC Student Research Symposium in Guam illustrated the high caliber of students that PI-CSC is sponsoring as they work toward their bachelor's, master's, or PhD degrees.

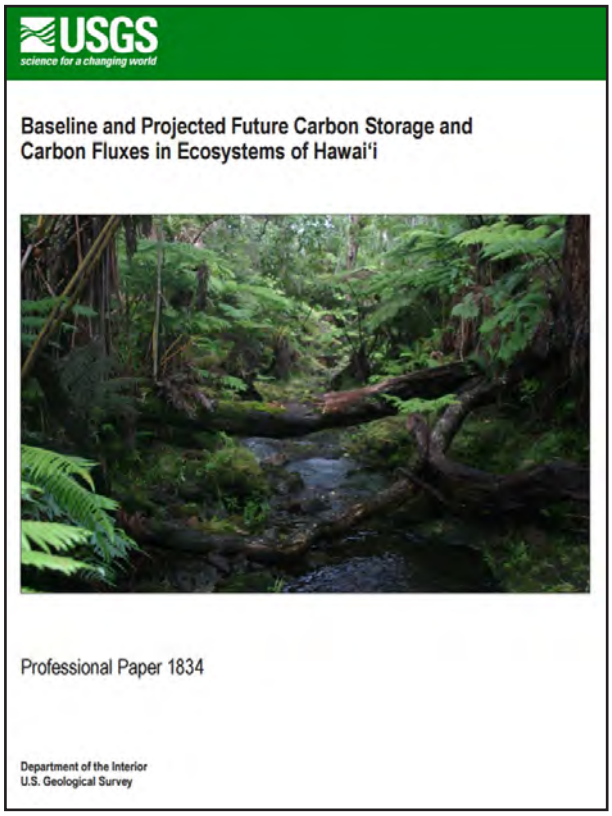
Fourteen students from the University of Hawai'i at Mānoa, the University of Hawai'i at Hilo, and the University of Guam represented nine distinct departments or schools and demonstrated multi-disciplinary perspectives on tackling climate issues. Topics ranged from quantifying groundwater supplies in Hawai'i and Guam to clarifying climate change impacts on fishponds, groundwater quality, and wastewater disposal. There were innovative talks using economic perspectives on evaluating best strategies for coral reef management and climate adapation for small businesses, as well as one about developing a new climate-smart agricultural practice. To learn more about these and other student projects, follow this **link**.

All but two of the students that participated in this year's Student Research Symposium, sponsored by PI-CSC and the Unviersity of Guam's Center for Island Sustainability.

Research Highlights

Hawai'i's Carbon Assessment: Defining the challenge

This spring, the USGS produced a Carbon Assessment for the State of Hawai'i, and USGS's Lucas Fortini contributed significantly to the effort. The **report** looks at carbon storage and fluxes within and between Hawaiian terrestrial and aquatic ecosystems, as they currently function and how they might function under different future scenarios. In addition, the report estimates the capacity of the ecosystems to act as carbon sinks, and evaluates the forces that drive the ecosystem carbon balance. The better the science community and policy makers understand the capacity, storage, and flux of carbon within Hawai'i's ecosystems and how those factors may respond to changes in climate, land-use, and land cover, the better their management decisions can be. This detailed assessment puts our state one step closer to defining our scientific research and policy strategies, which are particularly important in light of Hawai'i's commitment to the Aloha + Challenge of achieving six sustainability goals by 2030.



PI-CSC Summer Research Fellowship

Also this spring, PI-CSC, in conjunction with the Hawai'i Sea Grant College Program, was pleased to award the new Pacific Islands Climate Science Center Summer Research Fellowship to Alyson Char. The fellowship provides an undergraduate or graduate student with the opportunity to gain research experience and skills in climate science and to expand their knowledge of environmental issues in Hawai'i through active research with a university scientist.

Aly, an undergraduate from O'ahu, is studying Geographical Biogeosciences at the University of British Columbia in Vancouver, Canada. This summer, she spent 12 weeks at UH Mānoa working under geographer Tom Giambelluca, supervised by PI-CSC post-doctoral researcher Abby Frazier (US Forestry Service). Aly's research used gridded precipitation maps from 1990 to 2014 to examine in detail the historical trends, in space and time, of consecutive dry days across the Hawaiian Islands.

Beyond developing technical skills in programming and ESRI's ArcGIS, Aly also learned the valuable lesson that "research is not instantaneous, especially when working with very large datasets! Results could take days or months to obtain because, more often than not, you have to go back to the beginning and refine your methods." The experiences and results of her summer project have been so promising that Aly is continuing the work as an independent study project at UBC while she finishes up her last undergraduate year. We wish her the best in her continued studies!

Planning & Engagement Highlights

Adaptation Initiative generates activity on many fronts

In 2015, the PICCC initiated a 5-year Hawaiian Islands Terrestrial Adaptation Initiative (HITAI) to assist bio-cultural resource managers in confronting challenges presented by climate change. To that end, the cooperative has worked with diverse partners to produce vulnerability assessments, adaptation and resilience plans, and more.

EcoAdapt, with the guidance from a working group of 21 partner organizations, facilitated a two-year, state-wide project conducting interviews, literature reviews, and workshops with local stakeholders, resource managers, conservation planners, and scientific experts on all the main Hawaiian islands. The goal is to develop science-based syntheses of climate impacts on terrestrial and freshwater resources on the islands and generate ideas for adaptation options. The end products, coming this fall, will be vulnerability assessments and adaptation summaries for terrestrial and aquatic ecosystems across the Hawaiian islands that will provide valuable information for local resource managers. Visit this **website** for more details on the workshops.

Another valuable project within the HITAI endeavor is a one-year analysis by Keven Brough, focusing on barriers to conservation in Hawai‘i. He is examining current policies, mandates, and institutional practices that affect decisions and actions by conservation affect decisions and actions by conservation entities. The analysis considers legal barriers and incentives to adaptation, the formal planning processes of conservation organizations, their current use of climate change information in planning, and the perceptions of managers to adaptation barriers. Results will suggest ideas to consider in overcoming these barriers to acting on climate change in Hawai‘i.

EcoAdapt workshop on Kauai asking stakeholders about vulnerability of local ecosystems and plotting adaptation measures. Photo: PForeman

Breathtaking aerial view of Waikiki and Honolulu. Photo: WMiles.

To wrap up HITAI efforts in 2019, the **Resilient Hawaiian Communities** (RHC) initiative was developed in response to a request from the Department of the Interior (DOI) to assist two communities in Hawai‘i to develop resilience plans in partnership with Native Hawaiian, State, and Federal organizations. The project is funded by the DOI’s Service First Authority, and is co-led by staff from the PICCC, the DOI’s Office of Native Hawaiian Relations, the National Park Service Pacific Islands Office, and Ka Huli Ao Center for Excellence in Native Hawaiian Law at the University of Hawai‘i at Mānoa. Using existing DOI-supported projects, the initiative will continue the effort to articulate the resilience and adaptive capacity of Hawai‘i’s ecosystems, providing a biocultural framework for resilience planning, informed by both traditional ecological knowledge and cutting-edge science.

Planning & Engagement Highlights

Telling tales of adaptation through video

The Pacific Islands Climate Change Cooperative has been working with partners around Hawai'i and Orig Media on six short climate adaptation videos, which highlight examples of resource managers currently adapting to climate change. At the Hawai'i Conservation Convention in July, we shared one of the O'ahu films called "Ho'okele i ka huliau: Navigating change." Ka Honua Momona showed their video featuring local kapuna describing changes they have seen on Molokai over their lifetimes. Share **these videos** to spread the stories.

Jeff Orig filming Sierra McDaniel at Hawai'i Volcanoes National Park. Photo: PForeman

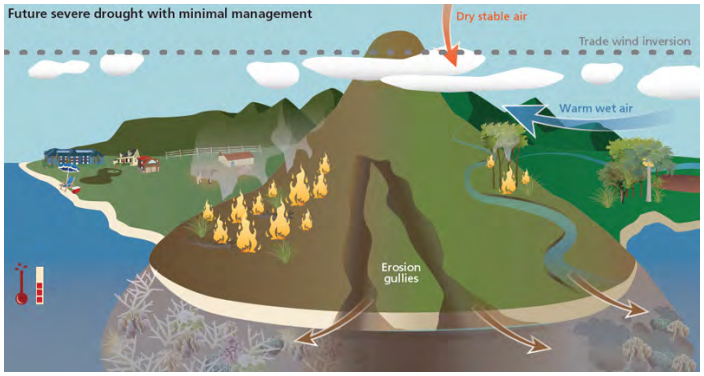
Office of Insular Affairs Report on Climate Change Adaptation Planning for USAPI

The Department of the Interior's Office of Insular Affairs engaged the PICCC to assist members of the US Affiliated Pacific Islands in planning for localized impacts of climate change. With key cross-sector decision makers and stakeholders, staff from the PICCC helped develop long-term adaptation plans as well as identify near-term priorities for funding. For all six jurisdictions--the Commonwealth of the Northern Mariana Islands, the Territory of Guam, the Territory of American Sāmoa, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Republic of Palau--the report outlines the current capacity to begin adaptation planning endeavors by highlighting existing climate-related activities, priorities, and institutional frameworks for implementing climate change adaptations. The hope is that the document will aid in future planning and funding requests to governmental and non-governmental organizations. Read the report **here**.

Droughts aren't just for deserts anymore! Ecological drought across the nation

When the issue of drought arises, most people think "hot, dry, and in the southwest." But climate change generated drought is being expressed in a multitude of forms affecting landscapes and water resources from the tundra of Alaska to the cities of the southeast. The Integration and Application Network (IAN), out of the University of Maryland Center for Environmental Studies (UMCES), has been tasked by the National Climate Change and Wildlife Science Center (NCCWSC), the managing entity for the CSCs, to assess and synthesize the current state of knowledge about the ecological effects of drought across the country. For over the past year, workshops at each of the eight CSCs, including PI-CSC, have provided the opportunity to delve into the impacts of ecological drought specific to each region, related research activities being conducted, and management options to disseminate locally. Read the results of our local workshop **here** and **here.**

To synthesize all this information, a national workshop was held in June in Annapolis, MD, with the goal of generating materials that summarize and integrate the information collected from the eight CSC workshops. PI-CSC participated in this national gathering and will help distribute the final products as they appear this fall. Check our **website** for updates.



Graphic illustration of drought consequences on a high-island setting with minimal management. A similar graphic illustrates an alternative future with postiive management steps taken. Composed from input during the Pacific Islands workshop and drawn by IAN at UMCES.

Calendar

Recent events...

June

5&6	EcoAdapt Adaptation Workshop, Kauai
13-15	NCCWSC-UMCES National EcoDrought Synthesis Workshop
13&14	EcoAdapt Adaptation Workshop, Hawai'i

July

12	Raymundo/Maynard Webinar: Assessing the sustainability of culturally important marine sites in Guam and CNMI
18-20	Hawaii Conservation Conference, Honolulu

August

6-11	2017 Ecological Society of America Meeting, Portland, OR
20-24	American Fisheries Society Meeting, Tampa, Florida

September

11-15	National All-hands CSC Meeting, Fairbanks, AK

Upcoming events...

October

11	1st Hawai'i Climate Change Mitigation & Adaptation Commission
25	Danielson Webinar: Creating a high-resolution digital elevation model for Majuro Atoll, RMI
26-27	Guam Extension Climate Forum, Tumon, Guam

November

9-14	Climate Synthesis Demonstrations, Hawai'i
13-17	Pacific Judicial Coundil Environmental Conference, Tumon, Guam

December

8-13	9th National Summit on Coastal & Estuarine Restoration and Management

Opportunities

- **Wildlife Conservation Society's Climate Adaptation Fund**: Competitive grants for 1-2 years, awarded to non-profit conservation organizations for applied projects focused on implementing priority conservation actions for climate adaption at a landscape scale. Application guidelines to be distributed in February 2018. Go to **wcsclimateadaptationfund.org** for more information.

- **Resilient Hawaiian Communities (RHC)**: Initiative to support community resilience planning through a collaborative process supported by a working group of organizations and individuals who are leaders in natural and cultural resource management, Native Hawaiian law, climate change science, and planning in Hawai'i. Expression of interest **meeting November 3rd**, 2-3 pm. Application deadline Nov 14.

- **KR Foundation Grant Program**: The KR Foundation mission is to help provide answers to, stimulate mind shifts about, and encourage action on, the long-term challenges faced by current and future generations living on a planet with finite resources, fragile ecosystems, and climate change. Letters of inquiry are currently being accepted for **its grant program** until Jan 31.

Staff In Focus

Patrick Grady
GIS and Data Manager

For four years, Patrick has been the GIS manager for PICCC and the data manager for both PICCC and PI-CSC. After earning a degree in earth science, he honed his skills in Geographic Information Systems (GIS) and its application to environmental sciences. For more than ten years, he traveled the world and applied his GIS skills to projects including natural resource management, threatened species, wildfires, and ecological modeling. When he finally landed in Hawai'i, he spent a couple years doing conservation work on Kauai before moving to the big city of Honolulu, where he has been able to put his passion for the environment to work tackling conservation and climate change adaptation across the Pacific Basin.

Scott Laursen
Technical Project Specialist

For the last two years, Scott has been a technical project specialist with PI-CSC, co-developing a manager-based research program, the Manager Climate Corps, at UH Hilo. He began in ecosystem ecology in Wyoming and studied climate science, vegetation ecology, and wildlife ecology across the Rocky Mountains. For six years, he also led ecotourism expeditions in northern Canada, Alaska, and Yellowstone, focusing on indigenous ways of knowing, land-use change, climate change, and ecosystem function. Scott brought his enthusiasm of indigenous knowledge and experiential learning to Hawai'i, where he has created strong community-university networks in support of local adaptation, resilience, and sustainability.

Who Are We

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John Peterson, University Consortium Lead, University of Guam
Romina King, Climate Science Coordinator
Maria Kottermair, GIS Coordinator

Check out our websites for more information on our stakeholders and partners and their sites:
PI-CSC University website
PI-CSC Federal website

Do you have work you would like us to highlight in our next issue? Send submissions or subscription requests to:
rlentz@hawaii.edu