PACIFIC ISLANDS
CLIMATE ADAPTATION SCIENCE CENTER

PI-CASC Consortium 2021 Annual Report

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KEY ELEMENTS OF THE USGS-UNIVERSITY OF HAWAIʻI (ET AL.) COOPERATIVE AGREEMENT FOR THE HOSTING OF THE PACIFIC ISLANDS CLIMATE ADAPTATION SCIENCE CENTER

EXPECTATIONS & DELIVERABLES

- Pacific Islands Climate Adaptation Science Center (PI-CASC) lead university will host an annual half to one-and-a-half-day cooperators meeting coordinated by the National Climate Adaptation Science Center (NCASC) to highlight the past year's accomplishments in science, regional dialogue, capacity building, and communications
    - Meetings will also identify and discuss any administrative issues to be addressed
    - The first and third annual cooperator meetings will be conducted in-person in a one or one-and-a-half-day meeting
    - The second and fourth annual cooperator meetings will be conducted via a half-day video teleconference
- A standalone annual report, as required by the cooperative agreement, will be provided two weeks prior to the annual review and include the following elements:
    - Specific examples of actionable science, including quotes, stories, and links to policy- and decision-making, as applicable
    - List of students, post-docs, and Fellows, their major accomplishments during their time associated with the PI-CASC (e.g., publications, presentations), and how their work relates to PI-CASC and DOI priorities and Science Agenda at the time the student, post-doc, or Fellow was engaged.
- All PI-CASC projects will comply with NCASC data management policies [https://casc.usgs.gov/data-policies-and-guidance] and USGS Fundamental Science Practices, where appropriate.
- University of Hawai‘i will report on any federally-funded projects for which data management activities are deficient based on project agreements
- Quarterly meetings, led by the federal science coordinator will be held with the PI CASC Data Steward regarding progress on data management
- All PI-CASC products will comply with the CASC Communication Guidelines
- Work to help implement recommendations as relevant from the prior five-year review report. Five year review report recommendations can be found in Appendix I.
- The University of Hawai‘i will submit the following communication products to NCASC:
    - During the first year of the cooperative agreement:
        - At least three USGS Mission Area Highlights
        - At least three items for the Climate Adaptation Insights Newsletter
    - On a semi-annual basis, beginning the second year of the cooperative agreement onward:
        - At least three Mission Area Highlights
        - At least three items for the Climate Adaptation Insights newsletter
        - At least one resource management--relevant success story from the CASC, to be used in promoting the CASC's work
- PI-CASC University consortium (herein referred to as "consortium") program/communications and/or program staff will attend the majority of monthly CASC Network Staff calls.
- As funding and USGS guidance allows, all PI-CASC University consortium members will attend the annual CASC-wide meeting.
- At the conclusion of the cooperative agreement, the University of Hawai‘i will:

- Produce a final report summarizing actionable science activities, scientific achievements, capacity building accomplishments, and communications highlights from the 5-year period of performance
- Host a multi-day in-person 5-year comprehensive review of the PI-CASC that will be coordinated by NCASC.
- Deliver website and other products to NCASC (in the event of a change in the PI-CASC host at the end of the agreement period)

INSTITUTIONAL ARRANGEMENTS

➢ Leadership Team

- Principal Investigator - University Consortium Director, Darren T. Lerner
- Co-Investigators - University Consortium Deputy Director: Bradley M. Romine
- UHH Lead - Jim Beets
- UOG Lead - Romina King

➢ Management

- The University Consortium Director Lerner, Deputy Director Romine, and Co-leads Beets, and King will serve as the Leadership Management Team (LMT) on the university side responsible for overall administration of the hosting agreement including oversight, budget, reporting, outreach and communications, data management, and supervision of staff.
- The consortium Administrative Support Team (AST), consisting of a co-production coordinator (Laursen), a communications specialist (Lentz), and a program manager, will bring added capacity to the LMT in support of executing programmatic activities.
- The LMT will have monthly teleconference calls to discuss overall project coordination and progress and will include the USGS director, USGS deputy director (proposed), USGS Science Coordinator, and the AST.
- All PI-CASC staff (university and USGS) have a responsibility to provide support and coordination of efforts between the consortium and federal staff to increase cohesion and overall effectiveness of the PI-CASC enterprise.
- The LMT will also hold two formal meetings annually with the Senior Science Advisors (below) consisting of appropriate scientists across UHM, UHH and UOG to set the direction and progress of the university research engagement, student engagements, and co-production activities.
- The LMT, AST, and all activities will be coordinated with federal PI-CASC staff.

➢ Senior Science Advisors

- Senior Science Advisors will serve as subject experts that advise the PI-CASC on the overall science direction within the scope of the Five-Year Science Agenda and support the coproduction of research and engagement.
- Members of the Senior Science Advisors (SSA) will have each demonstrated their capacity to engage in multi-, inter-, and transdisciplinary approaches; have demonstrated their willingness to mentor graduate and undergraduate students in related disciplines; and have shown a commitment to developing actionable science related to the PI CASC Science Agenda.

SCIENCE

➢ Science Agenda Themes - Future Research

- Research activities will address the appropriate PI-CASC Five-Year Science Agenda that is in place at the time of the commitment of funds in support of the research; the science agenda should be approved by NCASC prior to full implementation.
- Funding to meet these needs will be directed toward the generation of climate adaptation science data and information, including:
  - support of graduate student research and undergraduate research;
  - development and execution of co-production workshops bringing researchers and natural and cultural resource managers together to guide and refine research activities;
  - establishment of a regular climate adaptation science symposium series and an annual student research symposium; and communications and outreach products on behalf of the entire PI-CASC.

REGIONAL DIALOGUE AND INFORMATION SHARING

➢ The PI-CASC will continue to bring existing university, government, and community networks together to conduct research and training on climate adaptation challenges identified jointly.

➢ Co-Production Model

- The three-level approach to this work will consist of:

  1) co-produced adaptation research is the core effort conducted in collaboration with partners and resource manager focused on regional adaptation research needs,
  2) those research efforts serve as the base for all capacity building efforts to prepare the adaptation workforce of the future, and
  3) communication and sharing of information across the region will build stronger networks, responses, and strategies to our changing world. Regardless of overall approach, each project will include four overarching principles shown in Figure 2.

  - The goal is to utilize these four elements to build adaptive capacity locally by identifying existing professional networks and expanding them through research projects driven by researcher-manager partnerships and collaborative forums that bring together natural and cultural resource managers, policy professionals, university faculty, and graduate students.

Figure 2. Overarching principles driving research, education and outreach.

EDUCATION, TRAINING AND CAPACITY BUILDING

➢ PI-CASC Graduate Scholars

- Graduate Scholars are expected to participate in research and outreach that provide them with valuable opportunities to further their education and progress toward their degree.
- Graduate Scholars will participate in co-production workshops and other activities to further their understanding and future capacity as climate adaptation scientists serving our nation's resource managers.
- Graduate Scholar opportunities will be developed with the SSA and collaborative partners with a focus on requisite knowledge needed for each specific project.
- The consortium will engage Graduate Scholars in presenting their research at conferences and symposia throughout Hawai‘i and the USAPI as funding allows.
- The PI-CASC federal director will participate in all aspects of the Graduate Scholars Program from selection to matriculation.

➢ PI-CASC Summer Undergraduate Research Fellowship

- Proposed is the partnership of Summer Undergraduate Research Fellowship (SURF) with Pacific Internship Program for Exploring Science (PIPES) to provide an additional pipeline for students from Hawai‘i and the USAPI to focus on climate adaptation science, adding capacity and partnership for the PI-CASC program.
- Students will be paired with research laboratories and mentors based on their stated interests or provided with rotational experiences as funding and interest allows.
- The consortium will seek to engage ten or more undergraduates annually in research projects for eight to ten weeks each summer.
- PI-CASC university leads and federal staff will meet annually to discuss and provide input into the selection of student projects.
- Fellows will benefit from the hands-on experience of working on climate adaptation research in the field and laboratory, but will work closely with the PIs, PI-CASC graduate students and postdocs, be provided opportunities to engage in co-production workshops, and become part of a cohort of SURF and PIPES undergraduates sharing similar experiences from across the Pacific as conditions permit.

➢ Cross-Disciplinary and Cultural Knowledge Sharing Through Regional Collaboration

- The university and federal PI-CASC staff will work to engage other CASCs in the creation of a summer experiential program that shares science, cultural, and indigenous practices and resource management issues between these two (or more) regions.

➢ Co-Production Trainings, Workshops, and Symposia

- *Kūlana Noi‘i (research standards) and Manager Climate Corps*
  - The Kūlana Noi‘i workshops will utilize the co-production process to bring together university research faculty, students, resource managers, and PI-CASC administration (university and federal) to develop strong partnerships for actionable science research.
  - The Manager Climate Corps will be broadened to other Hawaiian islands and the USAPI to the extent funding permits.
- *Early Career Trainings*
  - All of the interactive forums will involve PI-CASC Graduate Scholars as equal participants alongside natural and cultural resource managers, policy professionals, and researchers.

- *Interactive Co-Production Forums and Workshops*
  - PI-CASC will continue to develop key networking opportunities between managers and researchers in the coming five years.
  - The consortium will seek opportunities/venues (e.g., National Adaptation Forum), to engage and collaborate with other regional CASCs in presenting examples of co-produced research and in leading a panel discussion.
- *Actionable Science Summit*
  - The consortium will organize and execute actionable science summits to bring people together across the region to form and strengthen networks, provide capacity building opportunities for researchers and resource managers, share results, and evaluate progress, challenges, and opportunities in developing, delivering, and utilizing co-developed, actionable science. All activities will be coordinated with the PI-CASC federal staff.
  - At least two actionable science summits will be held during the five-year cooperative agreement and will incorporate presentations from research faculty, students, and resource managers. The summits will feature breakout sessions on targeted issues, and keynote presentations from international and national leaders in climate adaptation science and co-production.
- *Geographic Information Systems (GIS) and Remote Sensing (RS) Workshops*
  - PI-CASC has prioritized the GIS/RS training needs and fulfillment of data gaps to build much needed technical capacity in Guam and the USAPI.
  - The consortium will continue to coordinate with federal and local agencies to organize GIS/RS workshops to fill data gaps (e.g., elevation datasets for the small USAPI atolls).

COMMUNICATIONS AND DATA MANAGEMENT

- The consortium, in coordination with federal PI-CASC staff, will develop, finalize, and execute a Communications strategy as part of an overall PI-CASC strategic plan.
- Each member of the consortium maintains local capacity for communications activities, which will be coordinated by Dr. Rachel Lentz, the PI-CASC communications specialist, in service to the entire regional center. Regular provision and compliance of products with NCASC is necessary as described above.
- The consortium will consolidate and develop a single PI-CASC website.

SPACE

- Hawai‘i Sea Grant will be providing office space for the federal PI-CASC Science Coordinator and proposed federal hire (Deputy Director). UH Mānoa will work with UH Hilo to secure office space for the Federal PI-CASC Director on the UH Hilo campus.
- Proportional space is also provided “in kind” for those members of the Consortium that receive PI CASC funding support (Consortium Deputy Director Romine, Communications Specialist Lentz, Co-Production Coordinator Laursen, HR Specialist Ching).
- Meeting and small conference space will also be provided as needed.
- Total dedicated and shared space at UHM is approximately 850 square feet.
- Space allocations at UHH and UOG as described in the proposal narrative total approximately 150 square feet each.

ADMINISTRATIVE

- The consortium will track and evaluate all outcomes for the PI-CASC inclusive of directed funding from the federal PI-CASC budget to ensure that our collective activities are aligned with

and advance DOI, USGS, NCASC, and PI-CASC priorities established at the onset of the cooperative agreement for each year.

- ➢ UHM will utilize eProjects, an online system developed by Hawai‘i Sea Grant which serves to manage the entire competitive research process from RFP to review and award; data management; project tracking, reporting and evaluation; publications; and as a student, employee, and volunteer alumni and workforce development tracking system. UHM will work with NCASC to upload project information into USGS ScienceBase.
- ➢ All information will be readily accessible to the federal PI-CASC director and staff and for communication to NCASC (see Communications, above).
- ➢ The NCASC requirements for data management planning are understood and the consortium is committed to working with the federal director and staff to implement accordingly.

DIRECT & INDIRECT COSTS

- ➢ The budget will be executed as stated in the proposal's budget narrative submitted and subsequently revised by the University of Hawai‘i. If there is a need by the University to re-budget after an award has been made (see 2 CFR 200.308 Revision of budget and program plans), a revised budget narrative and justification will be submitted to USGS OAG for consideration.

ADMINISTRATIVE DETAILS

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Institution	University of Hawai‘i Systems

Project Title	Pacific Islands Climate Adaptation Science Center
Award #	G19AC00087
Date of Report	July 31, 2021
Time covered	October 1, 2020 - July 31, 2021

PURPOSE and OBJECTIVE

This report describes Year 2 progress made towards objectives agreed upon in "Key Elements of the USGS-University of Hawai'i (et al.) Cooperative Agreement for the Hosting of The Pacific Islands Climate Adaptation Science Center" and in our Five-year Science Agenda including organization and approach, results, outreach and communications, next steps, and budget.

Progress highlights

Despite the ongoing COVID pandemic, and substantial travel restrictions, PI-CASC has continued to pursue actionable science according to focus areas defined in our Five-year Science Agenda, with the continuation of 13 host-funded research projects and support of 18 projects receiving direct federal funding between October 2020 and September 2021 (Appendix A). Consortium-led research efforts at the University of Hawai'i at Mānoa (UHM), University of Hawai'i at Hilo (UHH), and University of Guam (UOG) supported 13 PI-CASC Graduate Scholars, while six undergraduates participated in the 2021 Summer Undergraduate Research Fellowship (SURF) Program, double the number of 2020.

Ongoing efforts to engage with researchers, partners, natural and cultural resource managers, and government representatives were promoted through our 2020 Climate Adaptation Science Summit in mid-November. The event was hosted virtually, over two consecutive afternoons (Hawai'i Standard Time) to enable full participation from across the Pacific region, and garnered over 200 attendees. Meeting goals and objectives were not solely focused on PI-CASC partnerships and climate adaptation efforts, but also illustrated our utility in facilitating dialogue between regional partner organizations and aimed toward building and strengthening partnerships and collaborations across Hawai'i and the US-Affiliated Pacific Islands (USAPI). From a Climate Commissioners Panel to a Science Partners Panel and Research and Management Lightning Talks, these objectives were met via engaging presentations and discussions of the latest science and research needs, all leading to breakout sessions on where attendees participated in meaningful, interactive conversations about research and management needs across six science topical themes. Overwhelming interest in the sea-level rise session led to the development of a series of Pacific Islands Sea-level Rise Adaptation Science Dialogues, co-hosted by PI-CASC and Hawai'i Sea Grant, taking place throughout summer 2021. These involve bringing active sea-level rise researchers and managers together to address the increasing hazards to the region associated with sea-level rise and speak to the development of a national synthesis focus for this topic.

The Pacific Islands and Alaska CASCs (PI-AK) collaboration initiated in year one of the host agreement has continued to progress, with seven collaborative projects selected for funding. Researchers from Alaska and Hawai'i met virtually in April to share their proposed topics and to begin to identify areas of potential synergy. Meanwhile, development and implementation of a website and branding campaign to promote the collaborative work are ongoing. A special session devoted to the collaboration is planned for the February 2022 American Society of Limnology and Oceanography Ocean Sciences Meeting in Honolulu.

Providing and supporting pathways for coordination and communication within the PI-CASC consortium, and between the consortium and federal components of the center, is an essential

goal of this host agreement, and we have continued to meet virtually on a regular basis throughout the year, as a whole center as well as through subsets of personnel, to address ongoing activities and needs. We have also on-boarded several new PI-CASC staff members (see Consortium Operations below for details).

ORGANIZATION and APPROACH

Table 1. Personnel funded by PI-CASC Cooperative Agreement and their roles

Name	Institution	Title	Role/Responsibilities	FTE
Dr. Bradley Romine	UH Mānoa	University Consortium Deputy Director	Award co-PI, assists the director in consortium coordination	.50
Dr. Romina King	U of Guam	University Lead UOG	Leads and Coordinates PI-CASC activities at UOG	.10
Scott Laursen	UH Hilo & UH Mānoa	Climate Adaptation Extension Specialist	Coordinates co-production project development through MCC activities	.50
UHH Fiscal	UH Hilo		UHH fiscal administration	.25
Dr. Rachel Lentz	UH Mānoa	Communications Specialist	Coordinates communications efforts for consortium	.60
John Borja	U of Guam	Guam Communications Coordinator	Collaborates with other PI-CASC comms personnel on website; heads social media efforts	.25
Una Ching	UH Mānoa	Administrative Officer	Human Resources	.15
Dr. Patrick Hart	UH Hilo	Professor, Biology	Co-researcher/advisor of UHH graduate student S. Mladinich, 1 month summer salary, Mosquito	.08

Table 2. Personnel contributing extramurally funded support to PI-CASC efforts

Name	Institution	Title	Role/Responsibilities
Dr. Darren Lerner	UH Mānoa	Consortium Director	Award PI, administers PI-CASC program, coordinates all consortium efforts with Federal partners
Dr. Bradley Romine	UH Mānoa	Coastal Processes Specialist	Climate extension services
Dr. Romina King	U of Guam	University Lead UOG	Coordinates PI-CASC UOG efforts; liaises with local and USAPI natural resource managers
Dr. James Beets	UH Hilo	University Lead UHH	Coordinates PI-CASC UHH activities through work with UHH Research & Community Partnerships office
Darcy Yogi	UH Mānoa	USGS Communications Intern	Supports consortium communications and social media efforts
Scott Laursen	UH Hilo & UH Mānoa	Climate Adaptation Extension Specialist	Coordinates co-production project development through MCC activities
Dr. Hal Richman	UH Mānoa	IT Specialist	IT support for consortium and USGS PI-CASC personnel
Katy Hintzen	UH Mānoa	Climate Adaptation Extension Specialist	Co-production and community engagement practices
Dr. Elizabeth Lenz	UH Mānoa	Diversity and Community Engagement Specialist	Supports communications and DEI efforts?
Dana Tamashiro	UH Mānoa	Hawai‘i Sea Grant Administrative Officer	Administrative and fiscal support including processing consortium research funding

Kristin Pada	UH Mānoa	Hawai‘i Sea Grant Program Management Specialists	Administrative support including scheduling, travel and workshop coordination/support
Dr. Rosie Alegado	UH Mānoa	Assoc. Professor of Oceanography	Co-production and community engagement practices
Dr. Mary Donohue	UH Mānoa	Communications and Partnership Specialist	Supporting the reorganization and management of our communications team and efforts.
Maya Walton	UH Mānoa	Hawai‘i Sea Grant Asst Director for Research and Fellowships	Co-production, community engagement practices, and fellowships
Mr. Max Sudnovsky	UH Mānoa	RMI Extension Specialist	Climate extension services
Ms. Tara Owens	UH Mānoa	Coastal Processes Specialist	Climate extension services
Ms. Kelley Anderson Tagarino	UH Mānoa	American Samoa Extension Specialist	Climate extension services

Consortium Operations

PI-CASC is fiscally administered by the Sea Grant College Program (Hawai‘i Sea Grant) at UHM within the School of Ocean and Earth Science and Technology (SOEST). This enables substantial leveraging of office and meeting space and personnel time, including from the University Consortium Director, administrative officers, and other administrative and extension personnel. This is particularly helpful with the additional capacity needed to meet the requirement that UHM run fiscal management and administration of all federal CASC grants to University of Hawai‘i System and PI-CASC Consortium researchers.

Collaboration and communication throughout PI-CASC has continued through this year to lean heavily on video conferencing due to COVID and travel distances. We hold monthly virtual “all-hands” meetings for full center faculty and staff (USGS, UHM, UHH, and UOG); monthly leadership meetings consisting of the consortium and federal directors, UHH and UOG leads and the consortium deputy director; monthly communications team meetings; and bi-monthly meetings for consortium and federal directors with the deputy director and USGS PI-CASC science coordinator. The federal and consortium directors have a standing weekly meeting. In addition, *ad hoc* meetings occur frequently between the directors and between the consortium director and deputy director, as well as between other staff working on joint efforts.

There has been a substantial increase in personnel during this last year. Scott Laursen’s official position shifted from Program Specialist to Climate Adaptation Extension Specialist, reflecting a broadening of his efforts to expand the MCC model beyond UHH and Hawai‘i Island. He was joined in these efforts by Katy Hintzen, also a Climate Adaptation Extension Specialist with years of extension work experience at Sea Grant. Also working to improve community engagement is Dr. Beth Lenz, our Diversity and Community Engagement Specialist, who has also been helping John Borja, who has returned as the Guam Communications Coordinator, to support UOG communications efforts and collaborate on consortium social media efforts.

RESULTS

Representative activities and results supporting the PI-CASC Five-year Science Agenda are presented below. These activities are reported within the following requested categories: partnerships, science, capacity building, and products/tools. We recognize, however, that many of PI-CASC's activities and engagements fall within multiple categories, successfully integrating these functional areas.

Partnership Highlights

PI-CASC staff facilitate and support diverse and effective partnerships with a wide range of researchers and natural and cultural resource managers, as briefly described below. PI-CASC's capacity to leverage its strong long-term partnerships with regional organizations is also fundamental to the center's success. Not the least of these are our own federal partners at PI-CASC; as such, it can be difficult to tease apart some of the activities as wholly "consortium" vs "federal."

PI-CASC consortium staff at UHH, Scott Laursen, and consortium lead, Dr. Jim Beets, have continued to work via the Manager Climate Corps (MCC) program with the UHH Research and Community Partnerships Office to create and support new and existing relationships between researchers, resource managers, and Hawai‘i Island community networks. The five new MCC projects initiated last fiscal year, and delayed by pandemic restrictions, continued to progress through year two. Four students and one early professional plunged into working in the field, enhancing their partnerships with collaborators from such organizations as the US Fish and Wildlife Service, USGS Pacific Islands Ecosystems Research Center (PIERC), the Hawai‘i State Division of Forestry and Wildlife, Nā Maka Onaona, and the Ka‘ūpūlehu Interpretive Center at Kalaemanō. Knowledge co-production meetings with students and partnering collaborators from all five projects were held through the spring and summer of 2021.

Last fiscal year, PI-CASC leveraged Hawai‘i Sea Grant's biennial competitive research program by providing funding to support graduate research scholars on four Hawai‘i Sea Grant-funded research projects that are particularly well-aligned with PI-CASC research goals. Two of these projects include substantial interaction with community partners integral to the study topics. In the first, Gina McGuire, working with Dr. Leah Bremer from UHM, is evaluating the potential of restored agroforestry systems to provide erosion control to prevent excess sediment from impacting nearby coral reefs and fish populations. This work, collaborating with the non-profit Kākoʻo ʻŌiwi, has entailed interviews with farmers practicing agroforestry throughout Hawai‘i to incorporate their perspectives into future scenario development. Becca Lensing, working with Dr. Rosie Alegado from UHM, is also working in a culturally important setting, studying the role of microbes in breaking down invasive mangrove leaf litter in Native Hawaiian fishponds to inform management of both invasive mangrove forests and Hawaiian fisheries. The researchers participated in an annual gathering of Hawaiian fishpond practitioners and took part in constituent listening sessions to understand concerns and questions regarding mangrove presence in, and removal from, fishponds. These two examples demonstrate the benefits of the partnership between PI-CASC and Sea Grant in supporting project scopes double and triple the capacity of projects otherwise funded by PI-CASC alone.

Science Highlights

Working with researchers and resource managers across the region, PI-CASC research seeks to understand the impacts of climate change on fish, wildlife, plants, water, land, and people in order to deliver actionable science tailored to regional needs. Thirteen consortium-funded, student-driven projects continued through this year, covering a wide range of local science and resource management concerns (Appendix A). Many focused on examining stressed ecosystems (e.g., forests, badlands, bird populations, marine and terrestrial shorelines) with the goal of defining the best paths for adaptive restoration to shifting conditions that can then be shared with local managers.

For example, Patrick Keeler, working at UOG with Dr. Mohammad Galobi, is exploring the use of biochar to improve soil quality and critical sapling survival in restoration efforts across erosion-prone watersheds in southern Guam, a project that was presented at our fall Science Summit, and will include hosting a workshop in 2022 for natural resource managers to share results and techniques learned. Lauren Kapono, working with Dr. John Burns and Haunani Kane at UHH, is investigating how the habitat of a culturally, ecologically, and economically important limpet intertidal species (‘opihi) will shift with sea-level rise, a project highlighted in a blog and podcast by the US Fish and Wildlife. Kapono is applying years of personal experience of shoreline monitoring with community groups to this new formal research to create maps from models of future locations of ‘opihi habitat, which will be shared with managers to enhance their decision making. Anna McCormick, working with Dr. Kasey Barton at UHM, is determining salinity tolerance in native and invasive coastal plant species to inform beach and dune restoration across Hawai‘i in the face of rising sea levels. Species with high salinity tolerance will be recommended as good candidates for dune restoration efforts.

These consortium efforts nicely complement the 18 ongoing projects selected through direct and competitive federal opportunities, which explore important regional issues such as sea-level rise and coastal flooding hazards, drought and wildfires, and coral bleaching and resilience, many with substantial involvement of natural and cultural resource managers. For example, Dr. Monica Moritsch is exploring new ways to assess coral resilience using time series of coral cover in Guam and American Samoa. While collecting spatial datasets, the team identified gaps in relevant environmental condition information, and communicated these needs to a NOAA Pacific Islands Fisheries Science Center group currently undertaking a data integration and gap analysis in the region.

A new collaboration worth noting grew out of two previous projects. USGS scientist Dr. Curt Storlazzi, with the Pacific Coastal and Marine Science Center, modelled wave-induced flooding in coastal parks and wildlife refuges across the USAPI, while USGS scientist Dr. Karen Thorne, with the Western Ecological Research Center, has been investigating the resiliency of mangrove forests in the face of sea-level rise (SLR). This year, the two teams began a new project combining these aspects, exploring the intertwined hazard of sea-level rise impacts on coral reef systems and adjacent mangrove forests, along with the implications for the coastal protection for the islands of Micronesia. Results later this year should provide important scientific guidance for decision makers in Micronesia and throughout the USAPI.

Sixteen additional federal projects were approved from both fiscal year 2020 (6) and 2021 (10). While at the time of writing this report, the funding awards for these projects are finally beginning to be processed by USGS, extreme delays between project selection and award of funds at the USGS caused significant opportunities lost in progress, leveraged efforts, student support, and funds in this reporting year.

Capacity Building Highlights

PI-CASC focuses its capacity building efforts on undergraduate and graduate students to support a future community of researchers and managers equipped with the tools to work with agencies and communities to address adaptation needs for ecosystems and people through actionable science.

We engaged twice the number of students in the second round of the PI-CASC Summer Undergraduate Research Fellowship (SURF) Program during the summer of 2021. These six SURF projects spanned a wide range of topics, from investigating stream pollutant bioremediation and ecosystem effects from streamflow variability, to analyzing the effects of microplastics on corals and marine heatwaves on herbivorous reef fish, to assessing the tidal variability of phytoplankton in fishponds and the efficacy of perforated structures in reducing beach erosion. Fellows also participated in two workshops (one introducing them to co-production and conducting research within the community, the other offering professional development skills) and rounded out the summer presenting their results at a final (in-person!) symposium.

The PI-CASC Graduate Scholars program also incorporates exposure to the fundamentals of knowledge co-production and building a set of best practices for working with community partners. The 13 Graduate Scholars at UHM, UHH, and UOG are invited to shared experiences as a cohort through the year, including workshops, symposia, and communication opportunities (written and oral).

A new approach to capacity building this year was the focus of one of the partnership projects with Hawai‘i Sea Grant research. Led by Dr. Barbara Bruno with Tineill Dudoit, a PI-CASC Graduate Scholar, the work focused on training UHM faculty in place- and community-based education topics, a practice shown to improve student learning, increase student interest and motivation, and promote strong relationships with local communities. Through the fall and spring, they conducted five workshops, with follow-up individual consultations, that reached nearly 400 UHM faculty and which should lead to greater numbers and diversity of STEM majors at UHM. Workshop presenters, moderators, and organizers tapped into expanded networks within and beyond UHM including the Center for Teaching Excellence, the College of Education, Hawai‘inuiākea School of Hawaiian Knowledge, the School of Ocean and Earth Science and Technology, the UH Economic Research Organization, the Edith Kanaka‘ole Foundation, Oregon Sea Grant, and Sumida Farms.

Product and Tool Highlights

PI-CASC delivers actionable science by supporting research that generates knowledge and information that can directly improve the ability of local managers and decision-makers to affect positive changes in ecosystem and community adaptation to climate change.

Dr. Christian Giardina leads a project, with Dr. Abby Frazier and Dr. Ryan Longman, to develop a Pacific Drought Knowledge Exchange (PDKE) that encourages researchers and managers across Hawai‘i and the USAPI to partner in sharing drought information. These co-production partnerships have led to over 70 site-specific drought “portfolios” that present useful drought and climate metrics in accessible formats applicable and tailored to managers’ needs. The consortium will host and roll out an interactive website portal this fall to increase the availability of these portfolios, as well as more general drought fact sheets, for managers across the region.

An important product released in fall of 2020 that grew out of an FY18 funded project led by Dr. Rosie Alegado was the Loko I‘a Needs Assessment. This report is the first to compile the research needs from the community of Hawaiian fishpond managers, landowners, and stewardship organizations as they decide how best to address impacts of climate change. This living document will evolve as needs shift, but the conversations and collaborations that generated the effort will promote enriched relationships and partnerships between academic institutions, policy advocates, funders, food system workers, and volunteer organizations as they revitalize loko i‘a across the state.

Another important resource rolled out this year, developed by the Bruno/Dudoit project mentioned above, was the Place-based education (PBE) Lending Library housed within UH Mānoa’s Center for Teaching Excellence. The library has begun small, but is growing, currently housing 19 books. Interested UH faculty can request books through the lending library website, while remote users can explore the recommended titles.

OUTREACH and COMMUNICATION

Published articles

Please see Appendix C for a list of peer-reviewed journal publications and non-peer reviewed technical publications from this period.

Presentations and workshops

PI-CASC personnel hosted or collaborated on a number of workshops during the year, as well as presenting at events hosted by other organizations, including Marianas Terrestrial Conference, TCBES Symposium on Biocultural Stewardship, International Tropical Islands Water Conference, AGU Ocean Visions Summit 2021. These and presentations by researchers on PI-CASC-funded work are listed in Appendix D.

Several workshops this year were structured around the PI-CASC Graduate Scholars, providing professional development opportunities and project support. In particular, an emphasis on educating students on community-research partnerships, building equitable and mutually beneficial relationships, developing a set of personal research ethics, and conducting knowledge co-production. In addition, scholars were provided instruction and training on structuring accessible and engaging research talks for the general public and writing a research blog entry for a public website.

PI-CASC staff at UOG partnered with a network of agencies and organizations to coordinate a three-part climate education workshop series titled "Teaching Climate Science on Our Islands" targeted to 5th-12th grade teachers in Hawai‘i, American Samoa, Guam, and CNMI. Free and virtual, the workshops were designed to encourage educators from across the region to build relationships and acquire tools, resources, and confidence to teach about climate science.

Major engagements with partners

With the continuing pandemic restrictions on travel and in-person meetings, primary interactions with science and management partners were limited to virtual events. The major events held virtually have been described elsewhere: the Pacific Islands Climate Adaptation Science Summit, the Sea Level Rise Adaptation Science Dialogues, etc.

The Pacific Regional Invasive Species and Climate Change (Pacific RISCC) management group, co-led by PI-CASC, continued to be active in its goal of supporting management efforts to address threats posed by the interaction of climate change with invasive, non-native species. Pacific RISCC held a forum session at the fall 2020 Hawai'i Conservation Conference and in the spring, hosted a webinar on the development of the PDKE as a model for co-production practices.

PI-CASC was forced to postpone our annual major engagement with west Pacific communities, resource managers, and researchers at the 12th University of Guam Conference on Island Sustainability, which was again held as a virtual event April 6-9, 2021. Local PI-CASC UOG personnel, though, did cohost a pre-conference workshop with NASA Guam EPSCoR on Lidar Remote Sensing. The 44 registrants, primarily from Guam and the CNMI, represented natural resource managers, government workers, UOG employees, and students.

Websites and social media

This year PI-CASC launched its new content management website on the WordPress platform. With a new, fresher look, there is information on our ongoing and historical consortium and federal projects, products and tools, as well as news and events, publications, funding opportunities, and background information on our research and student programs.

Social media efforts were reinvigorated this spring when we combined separate Guam and UHM accounts on Facebook, Instagram, and Twitter into one account for each platform, all with the same handle. With this relaunch of social media efforts and increased posting activity, our following and engagement is growing significantly. Facebook follower numbers increased by 66%, with posts typically reaching over 500 people, while Instagram and Twitter now have 133 and 90 followers, respectively, with some tweets reaching over 2100 people. We will continue to monitor our social media engagement from this baseline.

Other products

Several new communications products were generated or updated during this period. Following the fall science summit, a "Summit Synthesis and Resource Guide" digital booklet was developed. This included summary information about the event and its outcomes: highlights of the panel presentations and discussions, summaries of lightning talks and topical breakout sessions, selected questions and answers (from the online Q&A), a speaker's contact list, and more. An advantage of the event being virtual was the ease of acquiring videos of all the summit sessions, which were shared at the website for free viewing.

Associated with the International Tropical Islands Water Conference, we provided a video virtual field trip, a compilation of funded projects centered on water and water resources. Annual updates were also made to standard PI-CASC fact sheets and the 2020-2021 Research Portfolio, and we continue to provide our monthly Pacific Pandanus newsletter, to an audience of over 500 subscribers, featuring news stories and links to research and resource management efforts and other related information and opportunities throughout our region.

NEXT STEPS

Due to extraordinary delays in receiving research funding in Year 2, Year 3 of our cooperative agreement is expected to be especially busy with the execution and management of research awards. As of July 2021, we have six FY20 awards in process through the university consortium; another ten FY21 projects, selected by USGS/PI-CASC, are in process, pending awards. USGS/PI-CASC are currently selecting four or five FY22 awards to be made this year, with university researcher awards coming through the consortium. In partnership with Hawai‘i Sea Grant, we will share an additional hire (new and under development at the time of this report writing) focused on fiscal administration and executive planning to help keep pace with the significant increase in funded research, the growing congressional appropriations for the CASCs, and the resultant growth of our center’s activities.

The current 13 ongoing consortium-funded student projects are expected to finish in the middle of Year 3, and the Graduate Scholars will continue to be offered opportunities for professional development through workshops and symposia as we ramp up for the next cohort. Likewise, we will continue to engage undergraduate students through the SURF program in summer 2022, building on the success of the previous two years by including more students and opportunities to engage in research and increase their understanding of the benefits of co-production, as conditions permit.

We will continue to build on our PI-AK partnership, including developing a shared website and branding to highlight both regional CASCs’ involvement. Also under development are a fall/winter workshop in Hawai‘i and a summer 2022 workshop in Alaska for program coordinators and scientists from seven funded research projects. Pending FY22 funds, we also anticipate selecting more collaborative research projects.

With shifts in the US Administration’s priorities, we anticipate more focus on climate change impacts in the Pacific Islands, bringing even more opportunities for collaboration, partnering, and growth of all aspects of the center. PI-CASC will continue to expand climate extension services in the region, to provide a leading example for the CASC network and further leverage our partnership with Sea Grant, replete with decades of experience in extension work. Climate extension specialist Scott Laursen will broaden his work with scientist and resource managers regionally, extending the MCC model beyond Hawai‘i Island, while climate extension specialist Katy Hintzen will develop and coordinate partnership, extension, and outreach activities throughout our region, and between the CASC and Sea Grant College Program networks nationally. Consortium Deputy Director Brad Romine will continue to conduct climate extension services in Hawai‘i and the Pacific Islands related to coastal resource management and sea-level rise vulnerability and adaptation while serving a critical administrative role coordinating our research portfolio, among other duties.

PI-CASC has endeavored to engage postdoctoral fellows and research mentors under the national synthesis platform, through a dual competitive process. Thus far, this has yielded an incredibly strong research team and postdoc for the first national synthesis effort focused on the future of fire. “Future of Fire in the Pacific Islands” postdoctoral fellow Dr. Alyssa Anderson will continue to work with PI mentors and regional and national CASC network partners to produce a

national synthesis of science, information, and tools to inform adaptation strategies to wildland fire under a changing climate. To date, Dr. Anderson is already diving into the native Hawaiian language archives, dating back almost 200 years, to understand better the historical indigenous practices and knowledge about fire regimes. For the "Future of Aquatic Flows" national synthesis theme, through its unique competitive process, PI-CASC has just recruited a research PI and will soon be hiring a postdoctoral fellow. In addition, PI-CASC is slated to lead the third national synthesis and postdoctoral fellowship opportunity.

Year 3 will include more regional workshops and symposia, beginning with wrapping up the Sea Level Rise Adaptation Science Dialogues in August 2021 and producing a reference paper on sea-level rise impacts and adaptation research, products, and needs for Hawai‘i and the USAPI. In spring 2022, COVID conditions allowing, we plan to once again attend the University of Guam Center for Island Sustainability Conference, holding a pre-conference early career research symposium for our Graduate Scholars and conducting meetings with available Western Pacific partners.

PI-CASC will continue to hold a leadership role in the Pacific Regional Invasive Species and Climate Change (Pacific RISCC) Management network, growing capacity in partnership with the U.S. Fish and Wildlife Service Science Applications through an inter-agency agreement to provide funding to hire a Pacific RISCC coordinator.

On loan from Hawai‘i Sea Grant, Dr. Mary Donohue will provide increased capacity and strategizing in communications. As we continue to expand our communications strategy, we will continue to increase communications outreach to the communities of Hawai‘i and the Pacific region, with a diverse set of digital products, a greater social media presence, and (when safe) more in-person events. A new monthly seminar series is planned for the fall (hybrid format), capitalizing on regional partnerships to encourage participation from researchers, natural and cultural resource managers, and other important players in regional adaptation to climate change.

Last, but certainly not least, in joining our team in April 2021, Dr. Beth Lenz will be applying her expertise and specific talents in areas of diversity, equity, inclusion, and social justice to interweave better understanding and processes into all functional areas of our center's programming. She will lead our effort to help us move away from institutional racism and colonialist policies that have unfortunately been a significant part of our collective history in Hawai‘i and the Pacific region.

APPENDICES

Appendix A: Research Projects

Table 1: Consortium-funded projects ongoing during the reporting period

Start/ End dates	Title	PI/Co-I	Student	Consortium member sponsor
2/20 - 1/22	Microbial biogeochemical cycling across a chronosequence of mangrove introductions across Hawai‘i	Rosie Alegado	Becca Lensing	UHM*
2/20 - 1/22	Vulnerability of Coastal Ecosystems to Increased Salinity from Climate Change	Kasey Barton	Anna McCormick	UHM*
2/20 - 1/22	Enhancing social-ecological resilience and ecosystem services through restoration of coastal agroforestry systems	Leah Bremer	Gina McGuire	UHM*
2/20 - 7/20	Fostering a SOEST culture of place-based and community-based pedagogy in support of coastal sustainability in Hawai‘i	Barbara Bruno	Tineill Dudoit	UHM*
12/19 - 8/21	Equity in Natural Resource Management in the Pacific: A case study from southern Guam	Romina King	Marybelle Quinata	UOG
9/19 - 8/21	Biochar as a Mitigation Tool for Soil Rehabilitation in Guam’s Badlands and Savannah Grasslands	Mohammad Galobi	Patrick Keeler	UOG
9/19 - 8/21	Comparing arbuscular mycorrhizal diversity among different life stages of Intsia bijuga (Colebr.) Kuntze in Guam’s Limestone Forests	Alexander Kerr	Charles Paulino	UOG
9/19 - 8/21	Working with managers to mitigate the impacts of drought and wildfire	Christine Fejeran, Abby Frazier	Farron Taijeron	UOG
8/20 - 7/22	The Path Near the Sea; Adapting to Climate Inflictions Upon Intertidal Shoreline	John Burns	Lauren Kapono	UHH**
8/20 - 7/22	Development of an early warning system for climate-change related invasion by mosquitoes into Hakalau Forest NWR	Patrick Hart	Stephanie Mladinich	UHH
8/20 - 7/22	Optimizing forest restoration techniques to increase endangered species habitat and mitigate future drought: Kanakaleonui Bird Corridor	Jon Price	Amberly Pigeo	UHH

8/20 - 7/22	How will changing reefscapes affect the prevalence of ciguatera on Hawaiian reefs?	Tim Grabowski	Nikola Rodriguez	UHH**
8/20 - 7/22	Understanding Plants of the Past to Inform Community Reforestation Efforts in the Future: A Place-Based Approach for Promoting Resilience in the Puʻuwaʻawaʻa Community-Based Subsistence Forest Area, North Kona, Hawaiʻi	Jon Price	David Russell	UHH

* PI-CASC is funding the graduate student on these projects, leveraging the research activities funded by Hawaiʻi Sea Grant.
** USFWS Science Applications via the Hawaiʻi Cooperative Fishery Research Unit is partially supporting for these projects.

Table 2: Federal direct-funded projects ongoing during the reporting period

Start/End dates	Title	PI/Co-I
7/21 - 7/23	Preliminary investigation of machine learning and advanced statistical approaches to improve projections of future climate in Hawaiʻi	Tom Giambelluca
4/21 - 10/23	The impact of climate change and sea-level rise on the future flooding of coastal parks and refuges in Hawaiʻi and the US Affiliated Pacific Islands	Curt Storlazzi
10/20 - 9/21	Maloʻo ka lani, wela ka honua (When the sky is dry, the earth is parched): Investigating the Cultural Dimensions of Indigenous Local Knowledge Responses to Changing Climate Conditions	Christian Giardina/Katie Kamelamela
9/20 - 6/22	Scaling up the Hawaiʻi Drought Knowledge Exchange: Expanding Stakeholder Reach and Capacity to Address Climate Change, Variability, and Drought	Christian Giardina/ Abby Frazier
8/20 - 8/22	Identifying locations for coral reef climate resilience	Monica Moritsch
8/20 - 1/22	Develop, coordinate, and build capacity for educational and community outreach opportunities for PI-CASC	Sheree Watson
7/20 - 9/21	Enhancing Stakeholder Capacity for Coastal Inundation Assessment in the Marshall Islands	Dean Gesch
6/20 - 6/21	Visualizing Sea-level Rise at Pu'uhonua O Honaunau National Historic Park with Interactive, Virtual Technology	Phil Thompson
5/20 - 4/22	Climate change, variability, and drought in the US-Affiliated Pacific Islands: Working with managers to mitigate the impacts of drought and wildfires	Abby Frazier
5/20 - 4/22	Predicting the effects of climate change on the spread of fire-promoting plants in Hawaiʻi: assessing emerging threats to rare native plants and ecosystems	Curt Daehler
10/19 - 6/22	Assessing mosquito populations in Kauaʻi to help limit the spread of avian disease and inform the conservation of Hawaiian forest birds	Dennis LaPointe
7/19 - 7/21	The future resiliency of mangrove forests to sea-level rise in the western Pacific: Initiating a national assessment approach	Karen Thorne
6/19 - 6/21	The impact of climate change and sea-level rise on future flooding of coastal parks and refuges in Hawaiʻi and the US-Affiliated Pacific Islands	Curt Storlazzi
3/19 - 2/21	Science needs assessment to support management of loko iʻa (Hawaiian fishpond) resources and practices critical to Native Hawaiian communities	Rosie Alegado

2/19 - 6/22	Working with natural resource managers to co-produce drought analyses in Hawai‘i	Christian Giardina/ Abby Frazier
10/18 - 7/21	Supporting sea-level rise preparedness in Hawaiian National Parks	Phil Thompson
8/18 - 9/21	Managing non-native game mammals to reduce future conflicts with native plant conservation in Hawai‘i	Steve Hess/Lucas Fortini
6/18 - 9/21	Identifying the risk of runoff and erosion in Hawai‘i's National Parks	Lucas Fortini
9/16 - 9/21	Effects of Drought on Soil Moisture and Water resources in Hawai'i	Alan Mair

Table 3: Projects awarded but awaiting federal funding

FY awarded	**Title**	**PI/Co-I**
FY20	Using cutting-edge NASA technology to assess coral reef bleaching events and measure recovery rates of dominant coral taxa at priority reef areas in Guam and the Commonwealth of the Northern Mariana Islands (CNMI)	Romina King
FY20	Examining how ridge-to-reef governance in Palau can enhance coastal food security in a changing climate	Kirsten Oleson
FY20	Generating a shoreline inventory for Hawai‘i Island to increase resilience in the face of rising sea levels	Ryan Perroy
FY20	Sea-level rise viewer for American Samoa: A co-developed visualization and planning tool	Phil Thompson
FY20	Connecting ecosystems from mountain to the sea upon changing climate	Yinphan Tsang
FY20	Impact of extreme events on native and nonnative fauna on Hawaii stream ecosystem	Yinphan Tsang
FY21	Coral response to land-to-ocean freshwater flux: A ridge-to-reef perspective	John Burns
FY21	A Prioritization Plan for Coastal Wetland Restoration on Molokai	Judith Drexler
FY21	Ecological and Socio-cultural responses to transplanting coral to enhance reef resilience on Oahu	Crawford Drury
FY21	Making regional climate model output for Hawai‘i more accessible to a diverse user community	Tom Giambelluca
FY21	Field surveys for vanishing species: Closing data gaps to save biodiversity (endemic land snails) in the face of a changing climate	Jon Price
FY21	Effect of extreme tidal events as future sea-level rise scenarios on He‘eia fish communities for ahupua‘a restoration	Yoshimi Rii
FY21	A Collaborative Approach to Enhancing Data Availability and Adaptation Capacity: Developing the American Samoa Climate and GIS Data Portal	Christopher Shuler
FY21	Impact of SLR on Coral/Mangrove Interactions and the Resulting Coastal Hazard Flooding	Curt Storlazzi/Karen Thorne
FY21	Linking models to outcomes – how do Hawai’i stakeholders use and contribute to land-to-sea ecosystem service analyses.	Clay Trauernicht
FY21	Predicting and mitigating the threat of avian disease to forest birds at Hakalau Forest NWR	Gordon Tribble/Dennis LaPointe

Appendix B: Publications

Buffington, K.J., MacKenzie, R.A., Carr, J.A., Apwong, M., Krauss, K.W., & Thorne, K.M. (2021). Mangrove Species' Response to Sea-Level Rise Across Pohnpei, Federated States of Micronesia. *US Geological Survey Open-File* (Report 2021-1002), 44 p., doi: 10.3133/ofr20211002

Elison Timm, O., Li, S., Liu, J., & Beilman, D.W. (2020). On the changing relationship between North Pacific climate variability and synoptic activity over the Hawaiian Islands. *Int. J. Climat.*, doi: 10.1002/joc.6789.

Fortini, L.B., Leopold C.R., Perkins, K.S., Chadwick, O.A., Yelenik, S.G., Jacobi, J.D., Bishaw, K. II, & Gregg, M. (2021). Landscape level effects of invasive plants and animals on water infiltration through Hawaiian tropical forests. *Biol. Invasions*, doi: 10.1007/s10530-021-02494-8

Fortini, L. B., C. Leopold, K. Perkins, O. Chadwick, S. Yelenik, J. Jacobi, K. Bishaw, II, M. Gregg, and S. Rosa. (2020). Local to landscape-level controls of water fluxes through Hawaiian forests: Effects of invasive animals and plants on soil infiltration capacity across substrate and moisture gradients. Hawai`i Cooperative Studies Unit Technical Report HCSU-TR095, University of Hawai'i at Hilo, Hilo. Available: http://hdl.handle.net/10790/5282.

Longman, R.J., Elison Timm, O., Giambelluca, T.W., & Kaiser, L. (2021). A 20-year analysis of disturbance-driven rainfall on O'ahu, Hawai'i. *Mon. Weather Rev., 149*, 1767-1783. doi: 10.1175/MWR-D-20-0287.1

King, R., Higgs III, M., Bautista, K., & Leon, E. (2020). Using Local Early Action Planning (LEAP) to inform Climate Change Vulnerability Assessments - Guam 2019. P*ac. Asia Inquiry, 11*(1), 107-119.

Manner, H.I., Friday, K.S., Haws, M., & Rufus, L. (2020). Agroforestry in the Climate of the Marshall Islands (Green Dashboard): An Interactive Website. *Pac. Asia Inquiry*, *11*(1), 45-77

Steinbach, R.M., Brock, K.C., & Daehler, C.C. (2020) New Island Record for *Ochna serrulata* on O'ahu (Ochnaceae). Records of the Hawaii Biological Survey for 2020 (Ed. Evenhuis, N.L.) *Bishop Museum Occasional Papers*, *137*, 3-5. ISSN (online) 2376-3191

Appendix C: Presentations

Table 1. Workshops/forums/webinars hosted by PI-CASC and partners

Date	Event	Presenter(s)	Audience(s)
8/13/21	SURF Final Symposium	SURF students	PI-CASC, SURF mentors, students' family/friends
7/28/21	Guam Soil and Water Educators Symposium	Romina King	Teachers, professional development trainers, natural resource managers
7/28/21	Multispectral Remote Sensing: Basic Image Processing and Analysis Workshop	Jose Aben (UOG PI-CASC) with NASA Guam EPSCoR and NASA Guam Space Grant	Undergrad/grad students in STEM programs, natural resource managers, professionals in hazard assessment
7/26/21	Sea-level Rise Dialogues #2: Stakeholder-Researcher Discussion	Select researchers and science and management partners	Focus group of researchers and science and management partners
July 2021	Teaching Climate Science on Our Islands (3 workshop series)	PICASC UOG with network of agencies and organizations	5th-12th grade teachers in Hawai'i, American Samoa, and CNMI
7/1/21	SURF Workshop on Community-Researcher Relationships	Katy Hintzen, Scott Laursen	SURF students
6/16/21	Blog Writing Workshop	Christie Wilcox, Maya Walton, Rachel Lentz	PI-CASC Graduate Scholars (with Hawai'i Sea Grant Graduate Fellows)
5/17/21	Sea-level Rise Dialogues #1: Initial Researcher Focus Group Sharing and Discussion	Select researchers and science partners	Focus group researchers and science partners
5/6/21	(Pacific RISCC Webinar) The Pacific Drought Knowledge Exchange: What co-production can look like	Ryan Longman, Sierra McDaniel	Pacific RISCC membership (natural resource managers, researchers, etc.)
4/6/21	Lidar remote-sensing Workshop	PI-CASC UOG with NASA Guam EPSCoR	Pre-conference attendees from 12th UOG Conference on Island Sustainability
Jan-Mar 2021	Community Researcher Partnerships and Kulana Noi'i	Scott Laursen	PI-CASC Graduate Scholars (with Hawai'i Sea Grant Graduate Fellows)
11/11/20	MCC Pandemic Support Workshop	Scott Laursen	MCC Graduate Scholars
10/22/20	(Graduate Scholars Workshop) Makawalu Perspectives: Recognizing, Honoring, and Engaging 'Ano Across Worldviews	Scott Laursen, Darcy Yogi; Ulu Ching, Cheyenne Perry	PI-CASC Graduate Scholars

9/15/20	Hanauma Bay Outreach Talk Prep Workshop	Maya Walton, Gavin Iwai	PI-CASC Graduate Scholars (with Hawai'i Sea Grant Graduate Fellows)

Table 2. Presentations by PI-CASC or funded personnel at other events

Date	Event	Presenter	Title
Aug/Sept 2021	Presentations to resource management agencies, Guam/American Samoa	Monica Moritsch	Resilience analysis results and data product delivery
7/13/21	National CASC Webinar	Mari-Vaughn Johnson, Stephen Gray	Ridge to Reef and Ice to Ocean: Collaborative research in extreme environments
7/1/21	Hawai'i Ecosystems Meeting	Stephanie Mladinich	Monitoring mosquito invasion into Hakalau Forest NWR: Methods and preliminary results
7/1/21	Hawai'i Ecosystems Meeting	Patrick Hart	Development of an early warning system for climate change-related invasion by mosquitoes into Hakalau Forest NWR
6/15/21	Marianas Terrestrial Conservation Conference, Guam	Romina King	Climate Change Planning in the Mariana Islands
6/17/21	Marianas Terrestrial Conservation Conference, Guam	Farron Taijeron	Perceptions of wildfire and wildfire management in Guam
5/20/21	COVID-19 Island Insights Engage Workshop	Romina King	Guam insights on sustainability, climate response
5/20/21	Sea Grant Sea-level Rise Dialogues (UOG Workshop)	Romina King	Using GIS and participatory GIS to assess potential impacts of SLR on Guam's infrastructure
5/18/21	AGU Ocean Visions Summit 2021	Heather Kerkering	PI-CASC: Developing applicable sea-level rise adaptation science and strategies through partnerships (abstract)
4/2021	US Army Task Force Oceania	Curt Storlazzi	The impact of climate change and sea-level rise on future flooding in Guam, Saipan, Tinian, and the Hawaiian and American Samoan Islands
4/22/21	Simon Sanchez High School, Guam	Romina King	Climate change impacts on Guam and in the region
4/15/21	TCBES Symposium on Biocultural Stewardship	Mari-Vaughn Johnson	The Pacific Islands Climate Adaptation Science Center (PI-CASC)

4/15/21	International Tropical Islands Water Conference	Han Tseng/Tom Giambelluca	Cloud water interception on Hawai‘i: Climate vs. vegetation influences
4/14/21	International Tropical Islands Water Conference	Oliver Elison Timm	Progress made and hurdles to overcome in producing more robust downscaled climate change scenarios for Hawai‘i
4/13/21	International Tropical Islands Water Conference	Lucas Fortini	Landscape level effects of invasive plants and animals on water infiltration through Hawaiian tropical forests *and* Evaluating and bias correcting globally downscaled climate projections for regional climate impact studies
4/12/21	International Tropical Islands Water Conference	Abby Frazier	The Pacific Drought Knowledge Exchange
4/12/21	International Tropical Islands Water Conference	Darcy Yogi	Virtual Field Trip: Adaptation Research in our Waters, from Clouds to Coast
4/7/21	American Association of Geographers Annual Meeting	Abby Frazier	A century of spatial and temporal patterns of drought in Hawai‘i across hydrological, ecological, and socioeconomic scales (abstract)
4/7/21	American Association of Geographers Annual Meeting	Ryan Longman	The Hawai‘i Drought Knowledge Exchange: Co-producing climate and drought portfolios with resource managers (abstract)
3/8/21	World Forum for Women in Science	Mari-Vaughn Johnson	Science-based decision making in managing climate change adaptation
3/5/21	13th Asia-Oceania Group on Earth Observations (AOGEO)	Dean Gesch	Climate change resilience planning: Integrated coastal mapping for improved hazard exposure assessment
12/16/20	American Geophysical Union Annual Meeting 2020	Han Tseng/Tom Giambelluca	Cloud water interception by different types of montane vegetation in Hawai‘i (abstract)
12/16/20	AGU 2020	Tara Seely/Lucas Fortini	Examining the impact of invasive tree Psidium cattleianum on canopy structure in tropical wet forests of Hawai’i Island:

			An application of terrestrial LiDAR (abstract)
12/10/21	AGU 2020	Oliver Elison Timm	Dynamical downscaling of near-term internal climate variability and change for the main Hawaiian Islands using WRF ensemble simulations (abstract)
12/7/20	AGU 2020	Ryan Longman	The Hawai‘i Drought Knowledge Exchange: Co-producing site-specific climate and drought portfolios with resource managers (abstract)
12/7/20	AGU 2020	Karen Thorne	The future resiliency of mangrove forests to sea-level rise in the Western Pacific: Initiating a national assessment approach (abstract)
12/7/20	AGU 2020	William Kastka/Karen Thorne	More resilient mangrove forests for more resilient people (abstract)
Nov/Dec 2020	Hanauma Bay Talks	Graduate Scholars	various
10/16/20	Texas State University Department of Geography Colloquium Series	Dean Gesch	Coastal hazard assessment in the Marshall Islands: Application of high-accuracy elevation models
Sept/Nov 2020; Mar, May, June 2021	UH Faculty Workshops (through the UH Center for Teaching Excellence)	Barbara Bruno	5 workshops on place-based teaching techniques and applications