PACIFIC ISLANDS
CLIMATE ADAPTATION SCIENCE CENTER

PI-CASC CONSORTIUM
2022 ANNUAL REPORT (BY 3)

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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 Hawaiʻi 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 Hawaiʻi 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 Hawaiʻi 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 Noiʻi (research standards) and Manager Climate Corps*
    - The Kūlana Noiʻi 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, 2022
Time covered	October 1, 2021 - July 31, 2022

PURPOSE AND OBJECTIVES

This report describes Year 3 progress made towards objectives agreed upon in "Key Elements of the USGS-University of Hawai'i Cooperative Agreement of the Hosting of the Pacific Islands Climate Adaptation Science Center.

Progress highlights

Despite ongoing challenges with the COVID-19 pandemic, PI-CASC continued to advance its pursuit of actionable science as determined by the Five-year Science Agenda. As anticipated, the funding delays of the previous year caused a handful of projects to be awarded just this year, mainly those receiving federal funding. There are 20 ongoing consortium-funded projects and 19 federally funded projects administered through the consortium ongoing between October 1, 2021 and September 30, 2022. Consortium-led research efforts supported 6 students from the University of Hawai'i at Mānoa (UHM), six students from the University of Hawai'i at Hilo (UHH), and four students at the University of Guam (UOG), in addition to the five students enrolled in the 2022 Summer Undergraduate Research Fellowship (SURF).

PI-CASC continued to strengthen its partnerships, networking, and outreach efforts across several outlets, both online and more recently in person, as pandemic restrictions eased across the Pacific. Such efforts led to a PI-CASC Manager Climate Corps (MCC) project to generate a shoreline inventory for Hawai'i Island being internationally recognized on the COP26 Resilience Hub webinar on November 8, 2021. The project is a collaboration between MCC, the Hawai'i County Planning Department, and the UH Hilo Department of Geography & Environmental Science.

PI-CASC was a sponsor of the 13th UOG Conference on Island Sustainability in Guam, which served as the venue for the Center's Student Research Symposium. Nineteen students from Hawai'i and Guam presented their research and heard from their peers, both in-person and virtually. Staff and administration from both islands finally had the opportunity to connect in person after three years of virtual communication.

A new monthly webinar series called "A Slice of PI-CASC" helped bridge the gap between science and the community by offering a platform for researchers to share key research findings and products via livestream video conferencing. The series completed its first season with one featured speaker per month from October 2021 to May 2022, and the recordings are available on PI-CASC's website and YouTube channel.

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
John Borja	U of Guam	Guam Communications Coordinator	Leads and facilitates communications	.25
Dr. Rachel Lentz	UH Mānoa	Communications Specialist/Undergraduate Research coordinator	Coordinates communications efforts for consortium/ organizes SURF	.60
Una Ching	UH Mānoa	Administrative Officer	Human Resources	.10
Fiscal Support	UH Hilo		Fiscal administration of PI-CASC funding	.20
Dr. Patrick Hart	UH Hilo	Professor, Biology	Co-researcher/advisor of UHH graduate student S. Mladinich, 5-month summer salary, Mosquito, 2022	.04

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, oversees consortium efforts,
Dr. Bradley Romine	UH Mānoa	Coastal Processes Specialist	Climate extension services
Élyse Larsen	UH Mānoa	Program Manager and Liaison	Administrative and fiscal support including processing federal research funding
Dr. Romina King	U of Guam	University Lead UOG	Coordinates PI-CASC UOG efforts; liaises with local and USAPI natural resource managers
John Borja	U of Guam	Communications Lead	Leads and facilitates communications efforts
Dr. James Beets/Dr. Jon Price	UH Hilo	University Lead UHH	Coordinates PI-CASC UHH activities
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 Liaison	Co-production and community engagement
Dr. Elizabeth Lenz	UH Mānoa	Diversity Specialist and Graduate Scholar Program Coordinator	Leads DEI efforts, works with Deputy Director to oversee PI-CASC Scholars activities, and assists with communications
Patrick Grady	UH Mānoa	GIS Specialist	Oversees GIS tools and development and supports ongoing needs in inofrmation tecnhology
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	Co-production, community engagement practices, and fellowships
Max Sundovsky	UH Mānoa	RMI Extension Specialist	Climate extension services
Kelley Tagarino	UH Mānoa	American Samoa Extension Specialist	Climate extension services
Dr. Alyssa Anderson	UH Mānoa	CAP Fellow	Hawaiian Translation Specialist

Consortium Operations

PI-CASC is administered by the University of Hawai‘i Sea Grant College Program (Hawai‘i Sea Grant) at UH Mānoa 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.

PI-CASC UH Hilo Lead James Beets took sabbatical for most of this reporting year, so Dr. Jonathan Price was appointed to assume his roles and responsibilities temporarily. Communication channels to and from UH Hilo continued through Price, and Scott Laursen.

Several personnel were added or changed positions this year. In December 2021, John Borja was named the Communications Lead for the consortium while also maintaining his local role as the Guam Communications Coordinator, increasing his FTE with PI-CASC from .25 to .75 (0.50 FTE additional funding supported through PI-CASC federal funding). In April of 2021, Dr. Beth Lenz was hired by Hawai‘i Sea Grant as their Assitant Director for Diversity and Community Engagement. Dr. Lenz now contributes time and effort to PI-CASC as the Graduate Scholar Coordinator and advisor on matters of diversity, equity, inclusion, justice, and accesability (DEIJA). In September, 2021, Patrick Grady returned to PI-CASC with funding support from PI-CASC Federal and Hawai‘i Sea Grant. In March 2022, Élyse Larsen was brought onto the fiscal team as the PI-CASC fiscal program manager, and in May, we provided administrative support to assist Federal PI-CASC with the hiring of Elliott Parsons who joined Pacific RISCC as its new coordinator, leading the management network through outreach, coordination, and communication.

Our growing team continues to meet virtually on a regular monthly basis, inclusive of general staff meetings, leadership meetings, and communication team meetings. Other gatherings are planned for specific topics as needed, such as website management and professional development workshop planning. PI-CASC leadership also meets on at least a weekly basis in addition to regular meetings among communications staff.

RESULTS

Partnerships

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" and "federal."

To further advance the partnership between the Pacific Islands and Alaska CASCs, A new website was launched for the collaboration on April 15, 2022. This new resource will provide more details, news, and imagery of the unique research being conducted in similarly steep coastal watershed ecosystems with similar management challenges despite the differing climates.

PI-CASC continues to engage with Pacific RISCC and its network throughout the Pacific. With a new coordinator on board, Elliott Parsons, Pacific RISCC has increased frequency in distribution of information and resources with its recently created listserv through the University of Hawai‘i. This tool will provide easier access for members to share research and management techniques for climate change and invasive species impacts. Pacific RISCC has also conducted webinars to engage with community members following the 2021 release of its report, "When Invasive Species & Climate Change Intersect: Survey of Hawai‘i Natural Resource Managers".

Beginning in the spring, PI-CASC partnered with Hawai‘i Volcanoes National Park for a pilot climate change education program sponsored by the National Park Service called "Park for Every Classroom" (PEC). Working with Ke Kula ‘Amakihi, a community-based education program at the Volcano School of Arts and Sciences, the partnership combines knowledge from park staff, teachers, and community partners, offering learning opportunities for local students and community members to explore climate impacts in their area. PI-CASC personnel have already engaged with their project partners and look forward to an upcoming workshop in August at the Great Smoky Mountains National Park where representatives from all eight parks and partners will have a chance to interact and share perspectives and practices.

Katy Hintzen, PI-CASC Climate Adaptation Services Liaison, continues her work started in 2020: bringing together the unique capabilities of NOAA Sea Grant and National and Regional CASCs to identify shared needs and products on key climate adaptation issues and to connect and convene additional partners to increase connectivity and synergistic outcomes. Accomplishments in the past year included convening a national advisory committee and presentations at a national Sea Grant assembly, a PI-CASC cooperators meeting, CASC tribal liaison meeting, and participation in the CASC leadership meeting in Minnesota.

Science

Working with scientists and resource managers across the region, PI-CASC-funded 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. The PI-CASC consortium supported graduate scholars on 20 research projects during the reporting period, covering a wide range of local science and resource management concerns (Appendix A). Projects focused on examining stressed ecosystems in forests, watersheds, coastal and nearshore marine settings with the goal of defining the best paths for adaptive restoration to share with local managers.

The PI-CASC consortium continued to provide administrative support for 19 ongoing research projects selected through direct and competitive federal opportunities, including six awarded through FY21 USGS PI-CASC RFP. These projects explore important regional issues such as sea-level rise and coastal flooding hazards, drought and wildfires, coral bleaching, and changing watershed and forest ecosystems, many with substantial involvement of natural and cultural resource managers. Per our cooperative agreement, PI-CASC leadership and fiscal staff at UHM administer project funding from the USGS to university researchers for these projects. The consortium also engages in highlighting their research through communications features, such as the Pandanus Newsletter, the Slice of PI-CASC Seminar Series, and Science Summits (Fall 2020 and upcoming in Fall 2022).

PI-CASC is supporting a multi-agency partnership of local and federal organizations to produce high-resolution 3D coral reef maps of Guam's priority coral reefs. In particular, PI-CASC's portion of this ambitious collaboration is funding the use of MIDAR technology as a tool for resource managers to monitor coral reefs during bleaching events. The project will determine how well NASA technology can assess the effects of coral bleaching over a wider geographic area, and the effectiveness of restoration efforts. Project researchers Romina King and Ved Chirayath are also the leads for the main grant that initiated this project, from the Department of the Interior Coral Reef Initiative. The team wrapped up its second phase of field work in May and June 2022, collecting data from three of Guam's marine preserves.

Due to federal funding delays, no new federally-funded projects were awarded to consortium PIs during the reporting period. At the time of writing this report, funding awards for four new projects approved from a FY22 USGS PI-CASC RFP are in process at USGS.

Funding delays and travel restrictions also affected pacing in some ongoing PI-CASC-funded projects. For example, Christopher Shuler's project to develop an American Samoa Climate and GIS Data portal, which was awarded in September 2021, faced a barrier in conducting research activities and engaging with stakeholders due to a halt in travel in and out of the island nation. On the bright side, Shuler was able to bring onboard a graduate research assistant, and they will be heading to American Samoa in August for two weeks of stakeholder interaction and data collection.

Capacity

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

progress has been made on developing a robust and connected Graduate Scholars program across the consortium, with five new students onboarded at UH Mānoa, a re-branding of the UOG program, and several interactive professional development opportunities and workshops for the students held throughout the year.

A particular highlight for the Graduate Scholars was a professional development workshop on "Science to Management and Policy" which brought in four professionals who pursued non-academic tracks, describing their individual pathways to their current management and planning positions. PI-CASC Graduate Scholars participated in a Kūlana Noiʻi workshop and watershed restoration workday in June focused on equitable and reciprocal partnerships with communities, run by Katy Hintzen and Rachel Lentz.

PI-CASC at UOG developed a new name and branding for its fellowship program, now called the Climate Adaptation for Resource Management (CARM) program. Through this program, PI-CASC works with local natural resource agencies and adjacent organizations to seek out individuals with substantial field experience who are willing to receive advanced education and further build technical capacity of their respective agency. This is unlike the traditional fellowship approach, where undergraduate students typically would be bridged into a graduate program with a research opportunity. With a more established program, UOG PI-CASC will be connecting with more agencies and organizations in Micronesia to determine suitable candidates for the program.

For summer 2022, the Summer Undergraduate Research Fellowship (SURF) program was able to place five students (of 20 applicants) with university mentors pursuing climate adaptation-related research. Alongside learning new lab, field, and analytical skills, the SURFers have also had professional development experiences through a Kūlana Noiʻi workshop and several modules offered by the UH Mānoa UROP SURE program. They will complete their fellowships with symposium presentations next month (August 2022).

PI-CASC supported a Pacific Internship Programs for Exploring Science undergraduate in summer 2022 to work with Ryan Perroy and the County of Hawaiʻi on his ongoing shoreline erosion collaborations. This is in addition to two other PIPES interns who are participating on two other MCC projects.

Communications

The PI-CASC Communication Plan, which began development in 2019, was finalized and published in December 2021, marking the beginning of a more strategic approach to overall communication efforts, outreach, and brand development for the organization. This framework includes seven components: cross-cutting elements, key messages, audiences, goals and objectives, a toolkit, and evaluation. With clearer guidance, the communications team is working on an accompanying implementation plan, which will provide more specific actions and initiatives in order to fulfill the commitments as laid out in the Communication Plan. And with the new Communication Lead position, PI-CASC has been working towards a more unified approach in establishing pathways and organizational structure for internal and external purposes.

OUTREACH

Published articles

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

Presentations and workshops

Personnel, researchers, and students under PI-CASC either hosted or presented at a number of events throughout the year (see Appendix C), with major events including the 13th UOG Conference on Island Sustainability, the Hawai‘i Conservation Conference, and the annual Botany Conference.

Many of the outward presentations focused on the student experience. The PI-CASC Student Research Symposium in Guam hosted nineteen students from UH Mānoa, UH Hilo, and UOG to present their projects in-person or virtually. A professional development seminar with a panel of science policy and management experts was coordinated for the benefit of PI-CASC Scholars and other graduate students within the network. This seminar encouraged discussion on more opportunities for students to engage with professionals as they consider their careers. PI-CASC students were also invited to present at external events, such as the TCBES Symposium in Hilo and the UOG STEM Conference in Guam.

Other presentations displayed the expertise and professionalism of our personnel and research leads. For example, UOG Lead Romina King was invited to appear on a local radio show, K57, to discuss sea-level rise in the region. Kasey Barton, a PI-CASC and Hawai‘i Sea Grant researcher, spoke at the Botanical Society of America’s Botany Conference with her presentation, “Life on the Edge: Coastal Plant Resilience under Sea Level Rise in Hawai‘i.”

Certain workshops not only advanced technical capacity, but also strengthened local partnerships between science and the community. Researcher Yoshimi Rii and local partners conducted a workshop in July 2022 for place-based stewards to explore how eDNA technology can be applied in fishpond management, work partly funded by PI-CASC. The workshop included hands-on demonstrations of eDNA sampling and an opportunity for researchers and stewards to connect with each other and share interests and challenges in using eDNA. This event was part of a larger collaborative project with the He‘eia National Estuarine Research Reserve, Hui Mālama Loko I‘a, and Kua‘aina Ulu ‘Auamothat seeks to understand how sea-level rise will impact shifts in fish communities in the He‘eia ahupua‘a.

A new highlight for PI-CASC this year was the creation of a monthly seminar series, called “A Slice of PI-CASC,” which offered well-received presentations by researchers and managers discussing their work on climate adaptation challenges and solutions associated with important topics like sea-level rise and its effects on coastlines and native dune plants, fire and drought in the Pacific, planning tools, and student capacity building. The eight virtual seminars of this season drew 30 to 100 non-PI-CASC registrants, 35-55% of whom attended the live events. Uploaded videos of the presentations received on average another 25 views. We plan to broaden the style of presentations this fall and hope to reach more viewers.

Major engagements with partners

PI-CASC was finally able to coordinate its attendance and participation at the UOG Conference on Island Sustainability after two years of postponement, allowing major engagement with partners in the Western Pacific. The weeklong conference was opportune for PI-CASC personnel and students to exchange experiences and ideas with regional communities, resource managers, researchers, and educators.

International recognition of a PI-CASC project at the United Nations Climate Change Conference highlighting Hawai‘i Island’s vulnerability to climate change and sea-level rise helped emphasize the importance of community partnerships. The project, co-developed by UH Hilo geography professor Ryan Perroy and Hawai‘i County Planner Bethany Morrison, sought to generate a comprehensive inventory for Hawai‘i Island’s coastline, collecting high-resolution aerial imagery and ground surveys of its steep sea cliffs, rocky coastal lava fields, and white, black and green sand beaches. A video highlighting this effort was shown to an international audience and even garnered the attention of Hawai‘i Senator Mazie Hirono, who complimented the team via social media.

As in years past, PI-CASC personnel participated in episodes of *Voice of the Sea* (the award-winning Hawai‘i Sea Grant-produced series about ocean and climate science broadcast around the region) to broaden our profile across the Pacific. One episode, “Hilo Loko I‘a,” explores traditional Hawaiian fishponds and the community efforts and partnerships that make their restoration successful, featuring Kamala Anthony and her research partner Cherie Kauahi, former PI-CASC Manager Climate Corps graduate students. Another episode, “North Shore Coastal Erosion,” looks at the extreme erosion impacting the North Shore of O‘ahu, and includes a segment with Deputy Director Brad Romine talking about his coastal geology work.

Websites and social media

PI-CASC’s website continues to be a vital resource to the consortium and its audiences, and is regularly updated with user-friendly performance improvements, news and events, and new entries for projects, resources, and opportunities. Additionally, the PI-CASC communications team holds new roles for the PI-AK website, providing more utility and support for the collaboration. The team will assist with contributions to this page while also maintaining the organization’s main website.

Social media following has increased tremendously since the last annual reporting. Last July, follower numbers for Instagram and Twitter were 133 and 90, respectively. The current followers to date are now 411 and 334 — a 309% and 371% increase for the platforms. Facebook has also seen an increase in likes — though at a more relaxed pace — to 586, or a ~13% increase from the previous year. The average reach for Facebook posts is around 300 people. PI-CASC’s social media strategy has focused more on networking and collaborating with partners by reciprocally sharing each other’s content on our platforms. Content on monthly themes have also been crafted to maintain relevance with followers. For example, PI-CASC teamed up with USGS Climate for Asian American and Native Hawaiian/Pacific Islander Heritage Month, to produce five posts on Instagram highlighting research in Hawai‘i, Guam, the Commonwealth of the Northern Mariana Islands, American Samoa, and the Federated States of Micronesia.

This collaboration boosted awareness of some of the research being conducted in the Pacific to USGS Climate's 1,201 followers.

With the pandemic forcing most events over the past year to be virtual, PI-CASC's YouTube page has housed recordings of a handful of presentations, events, and webinars, most notably the Slice of PI-CASC seminar recordings.

Products and tools

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.

Drought is playing an increasingly important role in the Pacific Islands, and PI-CASC has supported several projects exploring angles of the challenges of drought to resource managers. A pair of projects led by Christian Giardina and Abby Frazier, with Ryan Longman, led to the development first of a Hawai'i Drought Knowledge Exchange and then an expanded Pacific Drought Knowledge Exchange (PDKE), both designed to bring researchers and managers together to co-produce site-specific drought data products and encourage a collaborative network the share information relevant to addressing regional drought. This year, PI-CASC personnel have been instrumental in developing a website with these researchers for the PDKE (due to officially launch in the early fall), to act as an online hub for managers, with site-specific factsheets and portfolios, resources, and other drought information and links.

For the past couple of years, PI-CASC has been supporting efforts to develop K-12 curricular materials aligned with science standards and focused on communicating science and climate research relevant to Hawai'i and the USAPI. A project initiated by Dr. Sheree Watson and managed by Emily Sesno and Cherryle Heu has borne fruit in the form of an interactive K-12 Education Hub website, with lesson plans, tools, and online resources for students, teachers, and researchers. In fact, one of the first set of shared tools focuses on the drought work that produced the PDKE.

Another engaging tool developed with PI-CASC support and launched this year was the Sea-Level Rise AR Visualizer. This app developed for both apple and android phones uses augmented reality technology to create a virtual model of Pu'uhonua o Hōnaunau National Historical Park, on Hawai'i Island, allowing the user to view the effects of sea-level rise on this cultural site at various moments in the future. This kind of outreach tool helps to engage the public and conveys important information about the future hazards of sea-level rise.

NEXT STEPS

As of July 2022, PI-CASC has four FY22 awards in process at USGS and the university consortium that should be initiated in the next month or two. The selected projects include research on coral reef resilience, community resilience in the USAPI, climate adaptation in agroforestry, and changing flow regimes in watersheds. PI-CASC is participating in the USGS CASC FY23 Project Solicitation and the consortium will assist in administering any projects awarded to university PIs under the priority topics of indigenous climate adaptation, human migration impacts on natural and cultural resources, managing tourism and climate change adaptation, advancing the PI-AK collaboration, and synthesis and vulnerability assessments.

The current 13 ongoing consortium-funded student projects are expected to finish in the middle of Year 3, and the Graduate Scholars will be offered opportunities for professional development through workshops and symposia as we ramp up for the next cohort. We will again engage undergraduate students through the SURF program in summer 2023, building on the success of the previous three years by including more students and opportunities to engage in research and increase their understanding of the benefits of actionable science and community engagement.

Three new MCC projects have been selected to start in the fall. One project aims to develop new monitoring tools and protocols that will provide managers with information on changes in bird and mosquito abundance across the Hakalau Forest National Wildlife Refuge at larger scales. Another project will use an existing SLR model for West Hawai‘i, and extend it southwards from Kailua-Kona to Keauhou, a priority 1 area for cesspool conversion, to identify areas where planning, management, and conservation are needed relative to coastal onsite sewage disposal systems and wastewater infrastructure. The third project engages a strong collaboration to explore whether a new approach of sequentially combining structured decision-making models with the Restoring Ecosystem Services Tool (REST) can yield forest assemblies that will be resilient to future climates in Hawai‘i. This project will be co-funded by USFWS Science Applications.

PI-CASC will broaden its PI-AK partnership with new research funding through the USGS PI-CASC FY23 Project Solicitation (one of the five priority topics, projects pending selection and funding). Also under development are a series of three meetings to further develop research and research partnrships including PI-AK researchers and CASC administration: PI-CASC Science Summit (Fall 2022), CIS Guam (Spring 2023), and Alaska (Fall 2023).

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 Hawai‘i Sea Grant, replete with decades of experience in extension work. Climate extension specialist Scott Laursen will broaden his work with scientists and resource managers regionally, extending the MCC model beyond Hawai‘i Island. Climate extension specialist Katy Hintzen will continue her work developing and coordinating partnerships, extension, and outreach activities throughout our region, and nationally between the CASC and Sea Grant College Program networks. Consortium Deputy Director Brad Romine will also pursue climate extension services in Hawai‘i and the Pacific Islands related to coastal resource management and sea-level rise vulnerability and adaptation along with his administrative role for the consortium. The consortium also

looks to pathways by which extramural funding can provde capacity for engaging and hiring local candidates to work in pace-based support of PI-CASC efforts across the islands in our region

PI-CASC has endeavored to engage postdoctoral fellows and research mentors under the Climate Adaptation Postdoctoral (CAP) fellowship program. “Future of Fire in the Pacific Islands” CAP fellow Dr. Alyssa Anderson will continue working 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. Dr. Anderson’s research is utilizing native Hawaiian language newspaper archives, dating back almost 200 years, to understand better historical changes and indigenous perspectives of wildfire regimes. PI-CASC and USGS are currently processing funding to support research PI Yinphan Tsang and a postdoctoral fellow (to be selected) for the 2nd CAP national synthesis theme, “Future of Aquatic Flows”.

The consortium continues to support USGS PI-CASC’s leadership role in the Pacific Regional Invasive Species and Climate Change (Pacific RISCC) Management network, including through shared administration of an interagency agreement with the U.S. Fish and Wildlife Service that funds Pacific RISCC coordinator Elliott Parsons at UHM.

PI-CASC is implementing priority next steps identified in a series of Sea-Level Rise Adaptation Science Dialogues, which brought together focus groups of scientists and resource managers in an initial series of three dialogues in 2021 with the aim of improving awareness, consistency, and collaboration of sea-level rise impact research products, and to meet ongoing and emerging science information needs. A page describing the dialogues was added to the PI-CASC website, and work is ongoing to add a storymap describing the dialogues and sea-level rise research projects. We aim to establish and expand a Pacific Islands Sea-Level Rise Science-to-Action Network in the coming year through further dialogues and information sharing.

We are currently planning for a Fall 2022 Pacific Islands Climate Adaptation Science Summit, building on the virtual summit held in 2020. The event is intended for researchers, resource managers, officials, practitioners, and other science-users working on climate change impacts and adaptation for ecosystems and communities in Hawai‘i and the USAPI. Like the 2020 event, the summit will highlight PI-CASC-funded research projects as well as science and resource management partner organizations. Scheduling and program details are in discussion at the time of writing this report. We plan to host a hybrid in-person and online summit in Honolulu over two afternoons, to include participants throughout our region.

We again plan to attend the University of Guam Center for Island Sustainability Conference in Spring 2023, holding a pre-conference early career research symposium for our Graduate Scholars and conducting meetings with available Western Pacific science partner organizations and resource managers.

UOG’s CARM program intends to increase its number of professional fellows through the next reporting year, seeking more candidates by working with local natural resource agencies. The program is developing another feature that will allow workers to take college-level courses that do not require enrolling into a graduate program. These continuing education and professional development educational opportunities will be available to professionals who can benefit from more in-depth topics in marine

biology, environmental science, agriculture, and other related focuses. PI-CASC plans to launch this new feature under the CARM program within the next reporting year.

Following the completion of the Communication Plan, PI-CASC has been working regularly to develop an implementation plan to carry out communication goals and objectives. The team is currently approaching this by addressing each goal outlined in the Communication Plan and assessing tasks, products, strategies, and pathways attached to them. This process, which will carry through the remainder of this reporting year, will eventually form a master document that will clearly define communication roles and responsibilities.

BUDGET

Budget Year 3 (BY3) began October 1, 2021, still in the midst of the global COVID-19 pandemic. PI-CASC did continue to encounter some obstacles in using funds, but there was a significant improvement in expenditures from the previous year due to easing restrictions across Hawai‘i and the USAPI and increases in research and staff capacity. Notably, funds for domestic travel of five (5) PI-CASC staff and five (5) Graduate Scholars from Hawai‘i to Guam were allocated to support participation in the 13th UOG Conference on Island Sustainability. PI-CASC was a co-sponsor of the conference and hosted its Student Research Symposium at the event. There was a $56,356 deviation from the budget to accommodate salary, benefits, and work equipment for John Borja to support his position change to Communications Lead. With the projected spending continuing through September 30, 2022, the BY3 remaining balance is currently projected to be ~4%.

Table 3. BY3 budget projection of spending through September 30, 2022

Title: *Pacific Islands Climate Adaptation Science Center Year 3*
Funding Award No. *G19AC00087*
Project Period: *10/01/2021 - 9/31/2022*
BSR Period: *10/1/2021 - 05/31/2022*

Description	Budget	Expenditures	Encumbered	Projected Balance 9/30/2022
Salaries/Wages	350,247	134,216	216,031	-
Salaries/Wages Overload	-	-		
Casual	-	-		
Student Help - Regular	-	-		
Student Help - Wrk Std	-	-		
Fringe Benefits	85,477	37,919	47,558	-
Equipment	-	-		
Materials & Supplies	12,500	462	470	11,568
Services-Fee Basis (UOG)	140,000	15,846	180,510	(56,356)
Travel Domestic	45,648	27,528	5,265	12,855
Travel International	10,492	15	-	10,477
Printing & Publication	9,498	-	-	9,498
Utilities & Comm				
Rentals				
Repairs				
Tuition				
Scholar & Fellow	32,886	-	-	32,886
Others		958		(958)
				-
Direct	686,748	216,944	449,834	19,970
Indirect @ 41.5%	213,252	83,406	111,770	18,077
Total	900,000	300,350	561,603	38,047

APPENDICES

Appendix A: Research Projects

Table 1: Consortium-funded projects ongoing during the reporting period, in order by university

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*
2021-2022	Examining how ridge-to-reef governance in Palau can enhance coastal food security in a changing climate	Kirsten Oleson	Michelle Harangody	UHM*
2021-2022	Connecting ecosystems from mountain to the sea with changing climate	Yinphan Tsang	Maxime Gayte	UHM*
2021-2022	Generating a shoreline inventory for Hawai‘i Island to increase resilience in the face of rising sea levels	Ryan Perroy	Aloha Kapono	UHM*

2/22 – 1/24	Genetic assessment of giant clam stocks in American Samoa	Rob Toonen	Paolo Marra-Biggs	UHM*
2/22 – 5/23	Preliminary investigation of machine learning approaches to improve projections of future climate in Hawai‘i	Tom Giambelluca	Yusuke Hatanaka	UHM*
2/22 – 10/23	Sea level rise viewer for American Samoa: a co-visualization and planning tool	Phil Thompson	Carla Baizeau	UHM*
8/22 – 1/24	Using natural capital accounting to embed climate impacts into routine decision-making	Kirsten Oleson	Louis Chua Bing Chao	UHM*
2020 - 2023	Equity in natural resource management in the Pacific: A case study from southern Guam	Romina King	Marybelle Quinata	UOG
2019 -2023	Biochar as a mitigation tool for soil rehabilitation in Guam’s badlands and savannah grasslands	Mohammad Golabi	Patrick Keeler	UOG
2019 -2022	Comparing arbuscular mycorrhizal diversity among different life stages of Intsia bijuga (Colebr.) Kuntze in Guam’s Limestone Forests	Alexander Kerr	Charles Paulino	UOG
2019 -2023	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 Pigao	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 Pu‘uwa‘awa‘a Community-Based Subsistence Forest Area, North Kona, Hawai‘i	Jon Price	David Russell	UHH
2021-2023	Coral response to land-to-ocean freshwater flux: a ridge to reef perspective	John Burns	Walter Boger	UHH

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

Table 2: Ongoing federally funded projects passed through consortium

Start/End dates	Title	PI/Co-I	Affiliation

10/21 – 9/22	Making regional climate model output for Hawai‘i more accessible to a diverse user community	Tom Giambelluca	Geography, UHM
9/21 – 8/24	A collaborative approach to enhancing data availability and adaptation capacity: Developing the AS Climate and GIS Data Portal	Chris Shuler	WRRC, UHM
9/21 – 8/23	Linking models to outcomes – how do Hawai‘i stakeholders use and contribute to land-to-sea ecosystem service analysis	Clay Trauernicht	NREM, UHM
9/21 – 8/23	Coral response to land-to-ocean freshwater flux: A ridge-to-reef perspective	John Burns	Marine Sci., UHH
8/21 – 7/24	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 CNMI	Romina King/ Ved Chirayath	Geography, UOG NASA Ames
8/21 – 2/24	Ecological and socio-cultural responses to transplanting coral to enhance reef resilience on O‘ahu.	Crawford Drury	HIMB, UHM
8/21 – 8/23	Effect of extreme tidal events as future sea-level rise scenarios on He‘eia fish communities for ahupua‘a restoration	Yoshimi Rii (Claborn)	He‘eia NERR; HIMB, UHM
8/21 – 8/23	Field surveys for vanishing species: Closing data gaps to save biodiversity (endemic land snails) in the face of a changing climate	Jon Price	Geography, UHH
7/21 - 7/24	Impact of extreme events on native and nonnative fauna on HI stream ecosystem	Yinphan Tsang/ Tim Grabowski	NREM, UHM USGS/UHH
7/21 - 7/23	Preliminary investigation of machine learning and advanced statistical approaches to improve projections of future climate in Hawai‘i	Tom Giambelluca	Geography, UHM
6/21 – 10/23	Sea-Level Rise Viewer for American Samoa: A co-developed visualization and planning tool	Phil Thompson	Oceanography, UHM
6/21 - 6/22	Examining how ridge-to-reef governance in Palau can enhance coastal food security in a changing climate	Kirsten Oleson	Economics, UHM

6/21 - 6/23	Connecting ecosystems from mountain to the sea upon changing climate	Yinphan Tsang	NREM, UHM
6/21 - 6/23	Generating a shoreline inventory for HI Island to increase resilience in the face of rising sea levels	Ryan Perroy	Geography, UHH
2/21 – 1/23	Future of fire in the PI: Towards a national synthesis for wildland fire under a changing climate	Christian Giardina/ Alyssa Anderson	USFS UHM
9/20 - 6/22	Scaling up the Hawai‘i Drought Knowledge Exchange: Expanding stakeholder reach and capacity to address climate change, variability, and drought	Christian Giardina/ Abby Frazier	USDA Forest Service
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	Clark University
5/20 - 4/22	Predicting the effects of climate change on the spread of fire-promoting plants in Hawai‘i: assessing emerging threats to rare native plants and ecosystems	Curt Daehler	Life Sciences, UHM
2/19 - 6/22	Working with natural resource managers to co-produce drought analyses in Hawai‘i	Christian Giardina/ Abby Frazier	East-West Center, UH Manoa

Appendix B: Publications

Faccenda, K., & Daehler, C.C. (2022). A screening system to predict wildfire risk of invasive plants. Biol Invasions 24, 575–589. doi: 10.1007/s10530-021-02661-x

Fandrich, K.M., Elison Timm, O., Zhang, C., & Giambelluca, T.W. (2021) Dynamical downscaling of near-term (2026-2035) climate variability and change for the Main Hawaiian Islands. JGR Atm., doi: 10.1029/2021JD035684

Fortini, L. B., P. Krushelnycky, D. Drake, F. Starr, K. Starr, and C. Chimera. Complex demographic responses to contrasting climate drivers lead to divergent population trends across the range of a threatened alpine plant. Global Ecol. Conserv., 33, e01954. doi: 10.1016/j.gecco.2021.e01954

Longman, R.J., Peterson, C.L., Baroli, M., Frazier, A., Cook, Z., Parsons, E.W., Dinan, M., Kamelmela, K.L., Steele, C., Burnett, R., Swanson, C., & Giardina, C.P. (2022). Climate adaptation for tropical island

land stewardship: Adapting a workshop planning process to Hawai‘i. Bull. Amer. Meteor. Soc. 103(2), E402-E409. doi: 10.1175/BAMS-D-21-0163.1

Lucas, M.P., Longman, R.J., Giambelluca, T.W., Frazier, A.G., McLean, J., Cleveland, S.B., Huang Y.-F., & Lee, J. (2022). Optimizing automated Kriging to improve spatial interpolation of monthly rainfall over complex terrain. J. Hydrometeor 23(4), 561-572. doi: 10.1175/JHM-D-21-0171.1

Mandeep, A., Longman, R.J., Giambelluca, T..W., Lee, C.N., & He, Y. (2022). Climate change impacts shifting landscape of the dairy industry in Hawai‘i. Translational Animal Science, 6, 1–11. doi: 10.1093/tas/txac064

Appendix C: Presentations

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

Date	Event	Presenter(s)	Audience(s)
7/7/22	eDNA community outreach workshop	Yoshimi Rii/Kaleolani Hurley	Researchers and place-based stewards
6/24/22	Kūlana Noi‘i training	Katy Hintzen	SURF students, PI-CASC Scholars, Hawai‘i Sea Grant Rappa Fellows
5/11/22	Big trouble on little islands: Challenges for species conservation in the Northern Marianas	Pacific RISCC	Natural resource managers, researchers, public
5/3/22	Slice of PI-CASC: Using a novel spatial prioritization technique to support climate-resilient conservation planning for rare species in Maui Nui	Lucas Fortini and Scott Fretz	Public
4/5/22	2022 PI-CASC Student Research Symposium	PI-CASC Graduate Scholars (19)	Students, university faculty, public

4/5/22	Slice of PI-CASC: The Pacific Drought Knowledge Exchange: A co-production approach to deliver climate resources to user groups	Abby Frazier	Public
3/31/22	Indigenous Pacific Islander and Native Hawaiian Climate Engagement Opportunity Informational Webinar	Mari-Vaughn Johnson	Graduate students, post-docs, researchers, natural resource managers
3/2/22	Science to Management & Policy: Professional Development Workshop for PI-CASC Scholars	Ann Barlow, Shellie Habel, Patrick Keeler, Victoria Keener	PI-CASC scholars and external graduate fellows
3/1/22	Slice of PI-CASC: Life on the edge: Coastal plant resilience under sea-level rise in Hawai‘i	Kasey Barton	Public
2/1/22	Slice of PI-CASC: Big Island, big coastline: Generating a shoreline inventory for Hawai‘i Island to increase resilience in the face of rising sea levels	Ryan Perroy	Public
1/11/22	CARM and Go: Bridging the gaps between natural resource management and higher learning on Guam	Romina King	Public
12/7/21	Slice of PI-CASC: From the moon’s “wobble” to augmented reality: Understanding and communicating the impacts of sea-level rise in Hawai‘i	Phil Thompson	Public
12/7/21	Ridge-to-Reef and Icefield-to-Ocean: Collaborative Research in Extreme Environments	PI-AK leadership	Researchers, faculty, students, public

11/2/21	Slice of PI-CASC: Using fire and landscape ecology to understand social-ecological resilience on Pacific Islands	Clay Trauernicht	Public
10/5/21	Slice of PI-CASC: An Introduction to PI-CASC	Mari-Vaughn Johnson	Public

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

Date	**Event**	**Presenter(s)**	**Title**
7/27/22	Botany Society of America Botany Conference	Kasey Barton	Life on the Edge: Coastal Plant Resilience under Sea Level Rise in Hawai‘i
7/20/22	Hawai‘i Conservation Conference	Pacific RISCC	Strategizing Pacific Islands Adaptation through Federal Inter-Agency Partnership
7/20/22	Hawai‘i Conservation Conference	Pacific RISCC	Building Connections and Addressing Adaptation with the Pacific Regional Invasive Species and Climate Change Management Network
6/20/22	Presentation with Guam governor, lieutenant governor, natural resource agencies	Romina King and Ved Chirayath	3D Coral Reef Mapping Technical Presentation
6/18/22	Outreach with National Park Service	Ved Chirayath	Citizen Science Presentation
6/17/22	Outreach at University of Guam	Ved Chirayath	UOG Summer Program Presentation

6/16/22	Outreach at SIFA Learning Academy	Ved Chirayath	NeMO-Net Workshop
5/6/22	Center for Plant Conservation Annual Meeting	Dustin Wolkis	Recent advances in seed conservation physiology in the Hawaiian flora
4/28-29/22	UH Hilo Tropical Conservation Biology and Environmental Science (TCBES) Virtual Symposium	Amberly Pigao, Nikola Rodriguez, Walter Boger, David Russell, Stephanie Mladinich	PI-CASC Grad Scholars presentations (individual)
4/22/22	UOG STEM Conference	Farron Taijeron and Patrick Keeler	PI-CASC CARM Program
3/2/22	K-57 Radio Interview	Romina King	Sea-level rise discussion
11/4/21	Science by the Sea seminar series	Anna McCormick	In the Zone: How Salinity Research Can Aid Native Hawaiian Plants
11/4/21	Science by the Sea seminar series	Gina McGuire	The Secret in the Soil