California Climate Action Seed and Matching Awards 2023

Awards listed by applicant institution

(click on a project for additional details)

MATCHING GRANTS

Principal Investigator	Applicant Institution	Project Title
Cynthia Daley	CSU Chico	California Soil Carbon Accrual Project and Workforce Training Program
Megan Jennings	San Diego State	Collaborative of Native Nations for Climate Transformation & Stewardship (CNNCTS)*
Ted Grantham	UC Berkeley	COEQWAL: Equitable stewardship of California's water in a changing climate
Steven Allison	UC Irvine	Community-engaged research to manage fire and water in California landscapes*

SEED GRANTS

Principal Investigator	Applicant Institution	Project Title
Justin Luong	Cal Poly Humboldt	Establishing drought resilient grassland restoration networks in California
Jose Marin Jarrin	Cal Poly Humboldt	Improving climate change resilience by increasing capacity for Northern California Tribal fisheries*
Erin Pearse	Cal Poly San Luis Obispo	Sustainable Land Initiative
Tony Marks-Block	CSU East Bay	Advancing Climate Resilience through Youth-led Action Research in Oakland, CA*
Trent Biggs	San Diego State	Rural heat islands: Mapping and mitigating farmworker exposure to heat stress
Nicolas Lopez-Galvez	San Diego State	Implementing an intervention to reduce heat stress and chemical exposures*
Sonja Brodt	UC Agriculture and Natural Resources	Demonstration network and metrics for accelerating adoption of climate smart farming practices
Helen Fitzmaurice	UC Berkeley	Supporting Teachers in Implementing Justice-Centered Climate Change Pedagogy
Daniel Kammen	UC Berkeley	Climate Action Planning Tools: Empowering Equitable Transitions for CA Communities
Peter Nelson	UC Berkeley	Forging Essential Partnerships in Fire Stewardship to Meet State and Tribal Climate Action Goals
Miranda Redmond	UC Berkeley	Improving Social-Ecological Resilience of California Dryland Forest Agroecosystems to Climate Change
Rebecca Hernandez	UC Davis	Aligning Goals for Solar Energy, Biodiversity Conservation, and Environmental Justice in California
Shehnaz Hussain	UC Davis	Exposure assessment, health monitoring, and cancer control in wildland firefighters
Beth Rose Middleton	UC Davis	Planning Landscape Resilience for California Indian Allotment Lands*

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(click on a project for additional details)

Gregory Pasternack	UC Davis	Resilient and Equitable Urban Stream Corridors
Alejandro Camacho	UC Irvine	Integrated and Equitable Climate Action (IECA)*
Isabella Velicogna	UC Irvine	A fusion outlook product for predicting climate-water variation toward efficient decision making
Scott Brandenberg	UC Los Angeles	Sea Level Rise Impacts on Earthquake-Induced Soil Liquefaction
Rachael Jones	UC Los Angeles	Respiratory Protection for Firefighters Responding to Wildland Fires
Yuzhang Li	UC Los Angeles	Laser-scribed battery electrodes to enable California grid-scale energy storage
Kevin Riley	UC Los Angeles	Improving the health and safety of migrant workers responding to climate-related disasters
Yifang Zhu	UC Los Angeles	Climate Action - Community-driven eLectric vEhicle chArging solutioN (CA-CLEAN)*
Ricardo de Castro	UC Merced	Improving Preparedness of Communities for Evacuations using Zero Emission Vehicles
Emily Moran	UC Merced	Increasing publicly available tools for climate-smart seed sourcing and forest restoration
Ilkay Altintas de Callafon	UC San Diego	Scaling Science-Driven Vegetation Treatments for a Wildfire Resilient California
Shengqiang Cai	UC San Diego	Enhancing Climate Resilience of Small Farms with Waste-Derived Engineered Hydrogels
Patricia Hidalgo-Gonzalez	UC San Diego	Designing California's clean and climate resilient electricity grid for vulnerable communities
Cheryl Briggs	UC Santa Barbara	Enhancing the richness and resilience of California amphibian communities
Ian Walker	UC Santa Barbara	Dunes as nature-based solutions to enhance resilience of California’s beaches to climate change
Elliott Campbell	UC Santa Cruz	Rapid decision support for optimal carbon-nutrient-water benefits from California’s methane policy
Andrew Fisher	UC Santa Cruz	Improving water system resilience to climate change with levee setback to create multiple benefits
Miriam Greenberg	UC Santa Cruz	WUI Research for Resilience: Addressing California’s Climate, Conservation, and Housing Crises*
Rachel Nelson	UC Santa Cruz	An Aesthetics of Resilience: Expanding Knowledge about Climate Change through Art and Science
Matthew Sparke	UC Santa Cruz	Farmworker Community Health Vulnerabilities and Responses Amid Climate Change*

**Indicated awards are also receiving a community engagement supplement funded by the California Strategic Growth Council*

California Soil Carbon Accrual Project and Workforce Training Program

Applicant Institution: California State University, Chico **Application ID:** R02CM7064

Principal Investigator: Cynthia Daley **Award Type:** MATCHING

Collaborating Partner Institutions: Bowles Farming Company; Buzz's Bees; California Association of Resource Conservation Districts; Carbon Cycle Institute; CSU East Bay; Hayday Farms; Honeybee Discovery Center; Modoc Nation

Requested Amount: $5,234,910 **Matching Contribution:** $605,785

Lay Abstract:

Soil erosion, degradation, and diminished water availability are critical issues facing California Agriculture. These issues are rooted in historic land management practices that negatively impact soil health, diminish soil carbon stores, contribute to poor air quality, and allow chemicals to leach into waterways and groundwater tables. These impacts weaken farm resiliency to the impacts of climate change and negatively affect farmworker and community health, safety and well-being. Alternately, research suggests that regenerative farming practices can reduce soil disturbance, increase soil organic matter, improve water-holding capacity, reduce petrochemical crop inputs, enhance soil biological function and microbial diversity, and support soil carbon accrual. The proposed multi-sector, multi-disciplinary project addresses these issues through applied on-farm research, remote sensing modeling technologies, and professional workforce development. Three activities are proposed:

1) The Soil Carbon Accrual Project is designed to holistically compare carbon cycling associated with the standard or conventional farming system (full tillage; herbicide; fertilizers; pesticides; no cover) to a regenerative farming system (cover crops; no-till or conservation till; crop rotations) using Eddy Covariance tower technology and soil microbiological DNA probes to quantify the impacts on soil carbon accrual, soil microbial diversity, water use efficiency, nutrient density, and economic return.

2) The California Resiliency Index uses sustainability factors (e.g., water resources; soil quality; water use; erodibility factors; groundwater recharge value; existing land uses; wildlife habitat potential; endangered species habitat) to predict long-term resiliency for agricultural regions and suitability for diversified farming systems within the State. The model is being collaboratively developed with the Chico State Geographical Information Center.

3) The online Technical Assistance Provider Training and Professional Certificate Program in Climate Smart/Regenerative Agriculture Practices & Implementation is designed to increase the availability of technical assistance to support rapid transition of California farms and ranches to climate-smart agricultural practices. New courses will include Carbon Farm Planning, Pollinator Habitat, and Traditional Ecological Knowledge.

Collaborative of Native Nations for Climate Transformation & Stewardship (CNNCTS)

Applicant Institution: San Diego State University **Application ID:** R02CM7081

Principal Investigator: Megan Jennings **Award Type:** MATCHING

Collaborating Partner Institutions: Acjachemen Tongva Land Conservancy; CSU Long Beach; Climate Science Alliance; La Jolla Band of Luiseño Indians; Native American Land Conservancy; Native Coast Action Network; Pala Band of Mission Indians; Pala Band of Mission Indians; Pauma Band of Luiseño Indians; Sacred Places Institute; UC Riverside; UC Santa Barbara; Viejas Band of Kumeyaay Indians

Requested Amount: $7,100,076 **Matching Contribution:** $1,066,134
**Community Engagement Supplement Recipient*

Lay Abstract:

The suppression of indigenous landscape stewardship and fire practices since colonization have been identified as a root cause of many of the present-day issues associated with ecological health, climate resilience, and community fire risk in California. To address this, we propose a community-based, kincentric approach, leveraging local networks and practices that have demonstrated successes to create a transferable, innovative, and effective model of Indigenous-led land stewardship. Reflecting both the cultural and biological diversity of southern California, the Collaborative of Native Nations for Climate Transformation and Stewardship (CNNCTS) project will build capacity and support tribal communities and provide CSU/UC students with high-impact learning and training opportunities that leverage and transform university preserves into learning laboratories and landscapes. Aligned with and addressing California climate priorities, such as California Climate Adaptation Strategy priorities, 30x30, and the California Climate Dashboard, CNNCTS will also serve to advance applied climate science. CNNCTS partners four universities and six Tribal partners, along with the Climate Science Alliance's Tribal Working Group, a network of representatives from 20+ Tribal governments and organizations in southern California.

CNNCTS represents a paradigm shift in how climate action is visioned, led, and implemented. Our collaborative model embodies equal valuation of Indigenous and academic knowledge, advances Indigenous management practices and stewardship, and innovates shared learning opportunities for CSU/UC students and community members. The project will directly improve California's most impacted communities, strengthening climate resilience and community health. The project will also directly link CSU/UC academic research and teaching with community-led climate action and provide students with real-world climate action training. The community-based model of CNNCTS will serve as a template for university-community partnerships for actionable climate adaptation and action across the U.S.

COEQWAL: Equitable stewardship of California's water in a changing climate

Applicant Institution: University of California, Berkeley **Application ID:** R02CM7222

Principal Investigator: Ted Grantham **Award Type:** MATCHING

Collaborating Partner Institutions: Alliance for Global Water Adaptation; California Department of Water Resources; CSU Sacramento; Delta Stewardship Council; National Oceanic and Atmospheric Administration; State Water Resources Control Board; The Nature Conservancy; UC Agriculture and Natural Resources; UC Davis; UC Los Angeles; UC Merced; UC San Diego; UC Santa Cruz

Requested Amount: $8,199,413 **Matching Contribution:** $901,569

Lay Abstract:

California supplies water to nearly 40 million people, sustains the most productive agricultural region in the US, and is a biodiversity hotspot. However, persistent drought, extreme floods, and widespread environmental degradation are exposing significant vulnerabilities in the state's water management system. Furthermore, decisions over how water is allocated rely on models that consider a limited range of climate and operational scenarios, are constrained by an entrenched system of water rights, and are inaccessible to the public. Building a resilient water future requires new water planning tools that advance sustainable, inclusive, and equitable water stewardship. To meet this need, our project will launch COEQWAL (COllaboratory for EQuity in Water ALlocations), a user-driven framework for water planning that leverages existing models used to operate California's major water supply systems. An overarching goal is to empower end-users, including those historically excluded from decision making. COEQWAL will follow a structured, participatory process to identify user-defined objectives and design alternative operational scenarios using CalSim3, the water resources planning model used to operate infrastructure throughout California's Sacramento-San Joaquin River System. This co-production process will occur through facilitated engagement with researchers and community partners, including disadvantaged communities, environmental organizations, tribes, agricultural groups, municipalities, and water agencies. The project will produce a novel library of scenarios for water system operations under a wide range of climate futures. We will also demonstrate the utility of the data library through use cases focused on safe drinking water access, Chinook salmon recovery, and Delta salinity management. We will evaluate tradeoffs and synergies among end-user objectives and share results with accessible language and state-of-the-art visualization tools. Collectively, our team will advance the underlying science, improve existing planning models, bring into the public domain water allocation information that has previously been inaccessible or nonexistent, and catalyze participatory water resilience planning at local, regional, and statewide scales.

Community-engaged research to manage fire and water in California landscapes

Applicant Institution: University of California, Irvine **Application ID:** R02CM7042

Principal Investigator: Steven Allison **Award Type:** MATCHING

Collaborating Partner Institutions: City of Irvine; Climate Science Alliance; Crystal Cove Conservancy; Harbor Christian Church; Irvine Ranch Conservancy; Irvine Ranch Water District; La Jolla Band of Luiseño Indians; Laguna Canyon Foundation; Laguna Canyon Foundation; Madison Park Neighborhood Association; Orange County Environmental Justice Education Fund; Sacred Places Institute for Indigenous Peoples; UC Riverside; UC San Diego

Requested Amount: $5,538,311 **Matching Contribution:** $3,060,506
**Community Engagement Supplement Recipient*

Lay Abstract:

Communities of people in California are facing many threats from climate change such as drought, wildfire, and extreme weather. This project will make it easier for tribes and community groups to partner with universities and land managers to reduce risks from climate change. A unique network of experts from environmental science, social science, law, and the humanities as well as land managers and tribal leaders will collaborate to form the Wildland-Urban Interface Climate Action Network (WUICAN) with the goal of creating knowledge and climate solutions that ensure a resilient relationship between society and wild landscapes. Three University of California campuses (Irvine, Riverside, and San Diego) will host the network and partner with community groups, tribes, and management agencies to protect and preserve California landscapes experiencing unprecedented climate events. WUICAN will create new opportunities for California residents to have a say in how federal, state, and local agencies can best protect their communities from climate change. Network members will share these innovations to engage communities across California in tackling climate change and maximize the efficiency of state spending on climate programs. WUICAN will fund community leaders to assess needs for climate action and design appropriate solutions in partnership with policy experts. WUICAN will also invest in training academic researchers to build strong connections with Black, Indigenous, and People of Color communities who have unique needs and knowledge. That investment includes providing the next generation of community organizers and students of all ages with the communication and teamwork skills needed to build a climate resilient workforce. By leveraging innovative climate climate research, land stewardship, and educational projects, WUICAN will produce science-based and community-driven best practices for dealing with climate risks. Collaboration on policy development will lead to more effective conservation, restoration, carbon storage, drought resilience, and fire prevention on landscapes across California. Together, these stewardship practices and policies will address many of the official climate priorities named in California's Climate Adaptation Strategy, Pathways to 30x30 conservation strategy, and 2022 Scoping Plan for reducing greenhouse gas emissions.

Establishing drought resilient grassland restoration networks in California

Applicant Institution: Cal Poly University, Humboldt **Application ID:** R02CP7122

Principal Investigator: Justin Luong **Award Type:** SEED

Collaborating Partners: Bureau of Land Management; Cal Poly San Luis Obispo; CSU Chico; California Department of Fish and Wildlife; Hedgerow Farms; Mattole Restoration Council; Pepperwood Preserve and California Native Grassland Association; Point Blue Conservation Science; UC Irvine; UC Santa Barbara; Watsonville Wetlands Watch; Wiyot Tribe

Requested Amount: $1,498,140

Lay Abstract:

Grasslands support ecosystem services like carbon and water storage, flood mitigation, ecotourism and forage production. These biodiverse habitats span 25% of California (CA) and serve as the foundation for the ranching economy. CA grasslands are a biodiversity hotspot and globally unique, but climate change will make it unsuitable for endemic species; so we must innovate restoration that focuses on climate resilience. Yet a key issue remains of how to optimize trade-offs in achieving immediate outcomes vs. restoring climate resilient, species-rich communities. Most restoration practices favor common and easily cultivated species, which can risk biotic homogenization; one response could be to use climate-adapted sourcing from wider areas to bolster success. We propose integrating social, field and greenhouse methods to create a Climate-smart Restoration Toolbox to assist in drought resilient plant selection and site assessment. Our project will increase access to the best available science for restoring coastal CA grassland, inform nature-based solutions, strengthen climate resiliency, and leverage existing resources from Point Blue Conservation Science, Bureau of Land Management, and multiple grassland restoration agencies. Our objectives across three projects are:

1. Promote biodiverse restoration by initiating a CA Grassland Restoration Network for resource and seed sharing

2. Expand trait-based restoration by creating a toolbox for climate-smart grassland restoration, including protocols for site assessment and plant selection informed by site characterizations, greenhouse studies and practitioner surveys

3. Explore trade-offs in plant development with greenhouse drought studies using common and “uncharacterized” CA plants important for the Wiyot tribe.

End-products will be manuscripts, student training, MS theses, a toolbox for climate-smart grassland restoration and a restoration network to promote collaborations and resource sharing to foster climate resilient grasslands. Our work will culminate in an Extension Field Day to share the toolbox and restoration network. The proposal addresses priorities from the CA Climate Adaptation Strategy, 30x30 Pathways and Climate Solutions while supporting the research of two new CSU faculty, their students, and local stewards. Co-PIs will use these seed funds to leverage external proposals for NSF and USDA.

Improving climate change resilience by increasing capacity for Northern California Tribal fisheries

Applicant Institution: Cal Poly University, Humboldt

Application ID: R02CP7104

Principal Investigator: Jose Marin Jarrin

Award Type: SEED

Collaborating Partners: Blue Lake Rancheria; California Department of Fish and Wildlife; National Oceanic and Atmospheric Administration; Resighini Rancheria; Tolowa Dee-Ni' Nation; Trinidad Rancheria; Wiyot Tribe

Requested Amount: $1,112,908 **Community Engagement Supplement Recipient*

Lay Abstract:

For coastal California Native American Tribes, certain marine species are a vital part of their cultural heritage and family traditions, and central to their food security. Climate change threatens California's marine resources through sea level rise, ocean acidification, extreme weather events, ocean warming, and other effects. Despite the vulnerability of these resources and their importance to local communities and California as a whole (through tourism, fishing opportunities and the general benefits of a healthy marine system) fisheries of the far North Coast are patchily monitored due to lack of funding and the area's isolated nature. Development of fisheries research and monitoring capability will provide crucial information on fish species and communities, which will lead to better-informed management of Tribal and State natural resources in the face of climate change.

To improve the climate-resilience of far northern California fisheries, we propose to develop a working group of Tribal, university, state, and federal personnel to carry out fisheries research on species designated as priorities by the Tribes, based on the species' cultural, ecological, and/or economic importance. These are generally high-use and/or low-information/data-limited fisheries species that inhabit oceanic coasts, estuaries and bays in Humboldt and Del Norte counties. Data will be collected analyzed to better understand topics that include population metrics (age, growth), how species use their habitats, urchin predation on kelp, and harvest impact on mussel beds. The California Department of Fish and Wildlife, California Sea Grant, and the National Oceanic and Atmospheric Administration Southwest Fisheries Science Center will provide guidance.

Staff and interns from the Wiyot Tribe, Blue Lake Rancheria, Cher-Ae Heights Indian Community of the Trinidad Rancheria, Resighini Rancheria, and Tolowa Dee-ni' Nation, funded by this project, will conduct specific research and monitoring projects on their lands, with the support of a Cal Poly Humboldt graduate student (one per Tribe), who will conduct their own specific project. Fish community biodiversity will also be assessed in each Tribal area using environmental DNA metabarcoding techniques. The knowledge gained will be shared among the partners, science community and general public following data sharing agreements.

Sustainable Land Initiative

Applicant Institution: Cal Poly University, SLO

Application ID: R02CP7344

Principal Investigator: Erin Pearse

Award Type: SEED

Collaborating Partners: Upper Salinas-Las Tablas Resource Conservation District

Requested Amount: $1,759,870

Lay Abstract:

The Drawdown Project ranks climate-smart agriculture (CSA) among the top climate strategies because it is a solution for both mitigation (by reducing emissions and sequestering carbon) and adaptation (by reducing water consumption and restoring soil health) and Bending the Curve lists CSA among their “10 Scalable Solutions”. Approximately 26 million acres of California is farmland and CSA can sequester 25-60 tons of carbon per acre, so the rapid adoption of these practices is crucial for the state to meet its aggressive targets for natural sequestration (AB 1757).

The agricultural community has always been at the mercy of the elements, and is now on the front lines facing climate impacts. However, in addition to climate benefits, CSA typically increases productivity and has been shown to increase economic yield by up to 78%. Thus, for an agricultural center like the Central Coast of California, CSA provides a bulwark for economic resilience in addition to climate resilience.

The Sustainable Land Initiative (SLI) is a program of the US-LT RCD in partnership with Cal Poly, to (a) help local farmers overcome impediments to the adoption of CSA practices aimed at sequestering carbon, reducing water consumption, decreasing fertilizer use/runoff, increasing economic yield, and making farms more resilient to climate change, and (b) implement precise quantitative monitoring of the effectiveness of these practices. Practices include application of biochar, cover crops, compost and use of no-till drills, keyline plows, and waterjet stingers. Impediments to be overcome include lack of strategy, funds, expertise, equipment, and labor.

There is broad consensus that CSA supports climate objectives, but also that quantification of benefits varies widely across biomes, crops, and climate zones; accurate data are crucial and in short supply. Hence, the SLI includes a monitoring phase to generate precise data on the efficacy of CSA on local agriculture and provide an economic argument for adoption.

This proposal seeks funding to launch the SLI, support regional SLI activity, and scale via other RCDs and campuses statewide.

Fundamental strategy: leverage the human capital of universities and the established community relations of the RCD to accelerate delivery of CSA-based climate solutions at scale, through a structure that respects the administrative structures of both.

Advancing Climate Resilience through Youth-led Action Research in Oakland, CA

Applicant Institution: California State University, East Bay **Application ID:** R02CP7371

Principal Investigator: Tony Marks-Block **Award Type:** SEED

Collaborating Partners: Communities United for Restorative Youth Justice; Frontline Catalysts; Praxis Project; San Francisco State University; UC Berkeley

Requested Amount: $1,939,540 **Community Engagement Supplement Recipient*

Lay Abstract:

The proposed project aims to provide opportunities for youth to lead community-wide, climate-related action research and education efforts in one of Oakland's most climate vulnerable communities. The project will utilize a modified version of a proven effective climate justice and community science research curriculum developed through a collaboration between Frontline Catalysts and UC Berkeley's East Bay Academy for Young Scientists. The curriculum will be adapted and implemented to effectively address climate resiliency and California's climate education priorities.

Youth participants will be enrolled in middle and high schools located in Oakland's Interstate 880 corridor; an area identified by CalEPA as a disadvantaged community with a high pollution burden. Approximately 400 trained youth will serve as community researchers that identify and promote actions to improve climate resilience. Undergraduate interns with the California College Corps at CSU East Bay, UC Berkeley and San Francisco State University will support project facilitation and evaluation efforts alongside community partner staff.

Youth action research will evaluate the resiliency of existing community infrastructure, such as schools and homes. Through this community assessment, youth will identify opportunities and areas to implement energy, HVAC, and landscape improvements (e.g., drought-tolerant species that reduce urban heat and particulate matter), as well as infrastructural changes that will reduce pollution burdens and increase climate resiliency. Youth also will devise strategies for monitoring indicators of climate-related environmental degradation. Youth will share their results and ideas with residents, local governmental representatives, and education agencies at public events. They also will provide information about existing state and federal programs that subsidize energy efficiency and landscape improvements at these events.

PIs and community partners will use qualitative and quantitative assessment instruments to evaluate the impact of the project's climate training and youth-led research activities on participant self-identification as climate leaders. PIs also will lead undergraduate interns in efforts to evaluate whether youth-led climate research advances the adoption of climate solutions by community stakeholders.

Rural heat islands: Mapping and mitigating farmworker exposure to heat stress

Applicant Institution: San Diego State University

Application ID: R02CP7521

Principal Investigator: Trent Biggs

Award Type: SEED

Collaborating Partners: Organización en California de Líderes Campesinas; UC Santa Barbara

Requested Amount: $1,894,339

Lay Abstract:

Urban heat islands have received much attention in climate change adaptation, but mapping and adapting to rural heat islands (RHIs) is also critical for California's climate action and environmental justice. Farmworking communities are vulnerable to heat stress, especially in the hot desert of the Imperial Valley. In addition to warming caused by greenhouse gases, reduced water supplies across California will reduce evaporation by changing crop types and increasing fallowing rates, which can change the micro- and mesoscale climate and hence exposure to heat stress. While statistical downscaling provides useful information on heat stress (e.g. CalAdapt online tool), agricultural regions pose special challenges, as crop cover, irrigation and therefore microclimate can change rapidly over both space (10s of meters) and time (days to weeks). Finally, little research has directly integrated farmworker communities in to model- and satellite-based assessment of heat stress.

We propose to map rural heat islands and to co-produce knowledge on heat stress exposure and dissemination strategies with the farmworker community of Imperial Valley, California, including six activities: 1) Map rural heat islands using climate models and remote sensing; 2) Identify relationships between heat stress, cropping patterns and Salton Sea extent; 3) Assess farmworker experiences of heat stress using in-situ monitors and participant interviews; 4) Compare heat island maps with the in situ monitored stress in both agricultural fields and farmworker homes, both day and night; 5) Develop tools to distribute climate analysis results that can be accessed by households, managers, government agencies, schools, and the Heat Stress Awareness Program (HSAP); 6) Obtain community feedback on distribution tools, and determine how the farmworker and agricultural community accesses information about heat stress in order to develop effective communication strategies.

We will hold focus groups with community groups, government agencies and non-profits to co-design the study and results dissemination strategies. The outcomes will provide actionable, co-produced knowledge on how the combination of climate change, water scarcity, and cropping changes are likely to impact farmworker heat stress exposure, and will inform future work that provides outreach to this vulnerable community.

Implementing an intervention to reduce heat stress and chemical exposures

Applicant Institution: San Diego State University

Application ID: R02CP7565

Principal Investigator: Nicolas Lopez-Galvez

Award Type: SEED

Collaborating Partners: Lideres Campesinas

Requested Amount: $1,000,000 **Community Engagement Supplement Recipient*

Lay Abstract:

Imperial County's average high temperature is more than 6 degrees warmer than any other California county and it is considered the driest county in the state. Even under the current extreme climate conditions, this county has experienced significant growth in urban population and agricultural activity within the last decades. The large agricultural activity in this county has increased the demand for migrant farmworkers who have moved with their families to this desert region. However, the warm climate in this region can lead to increased heat stress among migrant farmworkers and all residents. In addition, many of the residents in Imperial County live along the southern edge of the Salton Sea, which is the largest manmade contaminated lake in CA, and it has been shrinking drastically because of climate change and now is a major source of air pollution. Previous studies have measured high levels of toxic metals and pesticides including DDT, lindane, and dieldrin in the lake sediment. As the Salton Sea dries, these toxicants have the potential to be carried on particles and be inhaled by residents in this County. In fact, Imperial County has the highest rates of asthma in children compared with the rest of the state. With the prospect of more extreme heat and drought conditions in Imperial County due to climate change, it is necessary to accurately assess exposures and administer immediate interventions that protect farmworkers living in this region. Therefore, in collaboration with our community partner, Lideres Campesinas, we propose a community-based intervention to 1) minimize the exposure to heat stress in order to prevent heat-related illnesses and 2) to reduce exposure to environmental toxic pollutants. The interventions will consist of having trained promotoras/community health workers educate participants (n=60) during workshops on methods to avoid exposure to heat stress (e.g. using validated tools from the Heat Stress Awareness Program), and reduce exposure to chemicals by distributing low-cost air cleaners/Fan Filters that will reduce air pollutants inside their homes. We will conduct a pre and post-intervention assessment of heat stress based on personalized measurements of the physiological heat strain index, and chemical exposure levels using silicone-based wristbands and dust samples that will be analyzed in our lab for thousands of chemicals.

Demonstration network and metrics for accelerating adoption of climate smart farming practices

Applicant Institution: University of California, ANR

Application ID: R02CP6986

Principal Investigator: Sonja Brodt

Award Type: SEED

Collaborating Partners: California Association of Resource Conservation Districts; Community Alliance with Family Farmers; Napa County Resource Conservation District; North Coast Soil Hub; Rodale Center; Sutter County Resource Conservation District; UC Davis; Ventura Country Resource Conservation District

Requested Amount: $1,999,524

Lay Abstract:

Scaling up soil health and other climate-smart agricultural practices to sequester carbon, increase water and nutrient use efficiency, and improve the resilience of farms to climate-related threats like drought and floods is one of the core pillars of California's Natural and Working Lands Climate Smart Strategy (2022). Climate-smart agriculture, however is a systems based approach and requires localized adaptation across the diverse soils, cropping systems, socioeconomic and cultural contexts across California. Moreover, optimizing the climate benefits of practices in different systems requires rigorous but easy-to-implement metrics for monitoring outcomes. Existing soil health metrics were designed for eastern and midwestern agroecosystems and must be adapted to the arid and Mediterranean climates of California, as well as to the needs of farmers.

This project will address these challenges by strengthening the nascent California Farm Demonstration Network (CFDN) for on-the-ground, regionally specific demonstration of a range of climate-smart practices, such as cover cropping, reduced tillage, compost and mulch use, hedgerow planting, irrigation system optimization, and others on commercial farms. It will pilot a participatory partnership extension model, that harnesses social learning to reduce adoption risks and adapt knowledge to an ever-changing environment, increasing the likelihood of farmer success and accelerating long-term uptake of complex, place-specific practices.

Literature review, producer interviews, soil sampling and monitoring of practices on select demonstration farms across regions and climate gradients will be used to assess soil health and climate resilience indicators and measurement methods for relevance to California producers and their ease of use in the field. This assessment will inform soil health and resilience monitoring protocols in future research and extension efforts. Together, these outputs will provide an on-farm extension and research platform (the CFDN) and soil health monitoring guidance that will help thousands of producers to adopt climate-smart practices tailored to their farms. Leveraging the knowledge-sharing capabilities of the CFDN will enhance public impact of existing climate solutions and actionable outcomes within a short time frame.

Supporting Teachers in Implementing Justice-Centered Climate Change Pedagogy

Applicant Institution: University of California, Berkeley

Application ID: R02CP7136

Principal Investigator: Helen Fitzmaurice

Award Type: SEED

Collaborating Partners: Community Resources for Science; CSU East Bay; CSU Monterey Bay; OEA Environmental Justice Caucus / Oakland Teachers Advancing Climate Action; UC Santa Cruz

Requested Amount: $1,396,298

Lay Abstract:

The immediate and multidimensional nature of the climate crisis demands frameworks for transformative action that engage young people across the course of their K-12 public schooling trajectories. However, teachers generally lack the robust curricular, pedagogical, and professional support they need to design and implement what we call “Justice-Centered Climate Change Pedagogy” (JCCCP) in their work: that is, teaching and learning for climate justice that centers students’ lived experiences and supports their continued development as knowledge-creators and sociocritical change-makers at local, regional, and global levels. To empower teachers in this vital work, we are seeking support for professional learning on teachers’ creation of place-based, justice-centered climate action projects in their classrooms. Specifically, by coordinating partnerships across all K-12 grade bands (including formal and informal educational spaces), we hope to address an urgent question in the field: what acute training and longitudinal support do teachers need in order to create opportunities for students to explore vital climate-related knowledges in school and take action toward climate justice in their communities?

Our project will engage both pre-service and in-service teachers and teacher educators (especially BIPOC teachers and teachers serving BIPOC students), along with several community organizations, as we seek to address this question and several actionable outcomes that guide our work. The first of these is the development of a comprehensive template and toolkit that school districts and teacher communities can use to support in-service teachers in implementing JCCCP. The second is a resource guide for practitioners with several rigorously researched case studies of JCCCP implementation. These case studies will span across grade-level experiences, subject-matter backgrounds, and role types (i.e. classroom teacher, professional learning facilitator, community partner, etc.). The third outcome we seek is the development of research on pre-service teacher experiences with JCCCP that California teacher education programs can use to guide and expand their practices around education for climate justice. This research would be novel in the field, and position California teachers to serve as national leaders in climate education.

Climate Action Planning Tools: Empowering Equitable Transitions for CA Communities

Applicant Institution: University of California, Berkeley

Application ID: R02CP7580

Principal Investigator: Daniel Kammen

Award Type: SEED

Collaborating Partners: Alameda County Waste Management Authority (known as StopWaste); CivicWell

Requested Amount: $1,415,353

Lay Abstract:

Local governments are essential to mitigating climate change, yet most lack information on which actions within their control are most effective. As a first step, the CA Air Resources Board encourages local governments to conduct climate action plans (CAPs), yet these plans are costly and labor intensive. Rather than each city and county individually collecting data and conducting quantitative analysis, we propose to centralize and streamline these activities, saving local governments millions of dollars annually in planning costs, and shifting scarce local resources into implementation of equitable climate policies and programs. The project will be particularly useful for small cities and marginalized communities with fewer resources.

UC Berkeley researchers will process and analyze existing GHG data for all California cities and counties, comparing historical emissions to relevant benchmarks and statewide targets. A scenarios tool will quantify the impact of GHG mitigation opportunities. Strategies such as urban infill, land use policy, transportation management, electrification, energy efficiency, building codes (and their enforcement), and behavior change all take place at local levels. The tool will also integrate a number of critical environmental, social, and economic performance indicators, such as historical energy burdens, vulnerable populations, and green jobs. The project will benefit from a full-time climate justice reporting fellowship from the UC Berkeley Graduate School of Journalism to foster greater public understanding of the challenges that local communities face in mitigating and adapting to climate change.

Project partners, Civicwell and Stopwaste, will engage local governments across California in needs assessment, education, training, feedback, policy analysis, climate action planning development and policy implementation. Feedback collected by project partners and journalists will inform development of software tools, recommended policies, narrative and other resources present in the new online climate action planning platform.

Expected short term outcomes include accelerated climate policies and projects with corresponding reductions in GHG emissions, reduced energy and transportation burdens, improved air quality, and enhanced awareness of the equity challenges and opportunities present in communities across the state.

Forging Essential Partnerships in Fire Stewardship to Meet State and Tribal Climate Action Goals

Applicant Institution: University of California, Berkeley

Application ID: R02CP7419

Principal Investigator: Peter Nelson

Award Type: SEED

Collaborating Partners: CSU Chico; CSU East Bay

Requested Amount: $987,503

Lay Abstract:

Climate change is contributing to a wildfire crisis in California with terrible impacts to local populaces and ecosystems, especially to Indigenous peoples who depend on these ecosystems for cultural survival and foodways. To minimize the risk of catastrophic fires, the state of CA and US Forest Service agreed to reduce fire hazards on 1 million acres of land annually by 2025. Prescribed burning and mechanical treatments make up most of these activities. However, only about 150,000 acres are treated annually by prescribed fire as of 2022. This proposal considers how this number of acres treated can be scaled up by including collaborative efforts co-led by Tribal cultural burners, state and federal agencies, Prescribed Burn Associations, and research and training programs as critical elements of the state's treatment portfolio.

Prescribed burning reduces fuel and rejuvenates ecosystems on a relatively "industrial scale," but without guidance from Indigenous peoples, it can be harmful to species of cultural significance, producing climate injustice. While cultural burning varies among Tribes and ecosystems of CA, it involves treatments that maintain specific biotic communities or plants that are essential for the cultural survival of Tribes. These long-standing burning traditions have enhanced the diversity and health of biological communities, decreased fuel loads, and increased resilience to major firestorms and climate variability. Through Tribal leadership and collaboration, efforts can produce more nuanced local outcomes that not only scale up fuel reduction but support the vitality and survival of all peoples, cultures, and ecosystems.

Our plan is to work with Tribal entities in central CA with which our PIs have relationships. These programs will provide case studies that inform the expansion of prescribed and cultural fire to meet state and Tribal climate action goals. Partners include Graton Rancheria, North Fork Mono, and several Miwok and Ohlone peoples. We will consider how organizational attempts at collaboration affect prescribed and cultural fire expansion, climate resilience and Tribal resource enhancement. From our evaluation of these programs, we will develop an adaptive model that can be expanded throughout the state to increase Tribal leadership and inclusivity in fire programs to promote climate justice and state climate action goals.

Improving Social-Ecological Resilience of California Dryland Forest Agroecosystems to Climate Change

Applicant Institution: University of California, Berkeley **Application ID:** R02CP7150

Principal Investigator: Miranda Redmond **Award Type:** SEED

Collaborating Partners: Big Pine Paiute Tribe; Bishop Paiute Tribe; Eastern Sierra Land Trust; Friends of the Inyo; Sierra Business Council; Stanford University; US Forest Service

Requested Amount: $1,998,931

Lay Abstract:

Recent droughts and wildfires have resulted in extensive tree die-off of dryland forests dominated by pinyon pine across eastern and southern California, with tree regeneration often insufficient for replacement. Pinyon pine trees and the edible pine nuts they produce are critical for wildlife, forest sustainability, and carbon sequestration and are culturally and economically important to Tribal Nations and rural communities. Communities have observed reduced pine nut production in association with increases in aridity, even in areas that have not experienced recent tree mortality. These dramatic reductions threaten Tribal members' and other pine nut harvesters' livelihood and adversely affect wildlife habitat that support outdoor recreation economies. Managing for pinyon nut production has thus become an increasingly important priority. Our interdisciplinary team will work together to (1) assess how climate and stand structure collectively influence pinyon pine seed production to guide adaptive management; (2) identify the genetic basis for variation in seed production to select trees that will advance reforestation and support a climate resilient economy; (3) understand how Tribal Nations and rural communities in or adjacent to woodlands value and use these ecosystems for food, fuelwood, silvopasture, recreation, and other cultural and economic uses for landscape prioritization; (4) establish a citizen science monitoring plan and network across California's eastern Sierra Nevada to monitor woodland health and pine nut production; (5) elevate Tribal and community goals for improving climate resilience through public outreach, publications and reports, and a regional conference. This will be accomplished through coupling field surveys that reconstruct cone production with pinyon pine genomic data across eastern and southern California populations. Household surveys, community focus groups, and stakeholder interviews in Mono and Inyo counties will be conducted to understand how forest adjacent communities value and use dryland forest resources for cultural, economic, and subsistence purposes to inform prioritization of management objectives. This seed grant will support important data collection, analyses, and engagement to support climate-adaptive dryland forest management and expanded Indigenous forest stewardship in the eastern Sierra Nevada.

Aligning Goals for Solar Energy, Biodiversity Conservation, and Environmental Justice in California

Applicant Institution: University of California, Davis **Application ID:** R02CP7556

Principal Investigator: Rebecca Hernandez **Award Type:** SEED

Collaborating Partners: BayWa r.e.; Ciel & Terre; Electric Power Research Institute; Emeren (formerly Renesola)

US Geological Survey; Sacramento Municipal Utility District; The Nature Conservancy;

Requested Amount: $2,000,000

Lay Abstract:

Solar energy development is expanding rapidly on land and water throughout the state of California. The rate of development is expected to increase; approximately 65 gigawatts of photovoltaic solar energy (PV) capacity is anticipated to fully decarbonize the state's energy system by 2050. Alongside this critical threshold for addressing climate change stands the need to address biodiversity loss. Native species in the state of California have been reduced by over 20%, and over 600 species are vulnerable to extinction owing to both climate change and habitat loss. For example, the California prairie biome, a vegetation type with high soil carbon sequestration potential that once characterized the Central Valley, has been reduced in area by 95%. Given their interconnectedness, climate change and biodiversity loss are now referred to as the "twin crises," posing an existential threat to nature, people, economic prosperity, and security. The rapid buildout of PV introduces the potential for both adverse consequences as well as remarkable beneficial opportunities for certain species and ecosystem services. For example, while fences surrounding PV facilities may reduce animal movement, they may also protect vulnerable populations (e.g., plants subject to illegal poaching) and confer novel opportunities for assisted migration.

Aligning climate change and biodiversity conservation goals requires evidence-based knowledge of how actions to address these challenges interact. Unfortunately, the effects of ground-mounted PV (GPV) and floating PV (FPV) development on conservation actions (e.g., California's 30 x 30 Strategy) nor the best strategies to mitigate biodiversity loss while simultaneously accelerating PV development are well understood in the U.S. state where the stakes are the highest. The individuals and organizations participating in this proposal stand at the forefront of efforts to understand and optimize interactions among PV, biodiversity conservation, environmental justice, and socio-economic goals in California. The project addresses key gaps in our understanding of the interaction between PV development and biodiversity, assesses the efficacy of biodiversity-friendly mitigation strategies (i.e., methodologies and technologies) and identifies opportunities to reduce costs and regulatory delays associated with PV development (e.g., CARB Scoping Plan).

Exposure assessment, health monitoring, and cancer control in wildland firefighters

Applicant Institution: University of California, Davis **Application ID:** R02CP7431

Principal Investigator: Shehnaz Hussain **Award Type:** SEED

Collaborating Partners: UC Davis Health/Medical Center; UC Los Angeles

Requested Amount: $1,997,940

Lay Abstract:

Occupational health effects of climate change are poorly understood. California's firefighters (CA-FFs) are a climate vulnerable group who experience heightened risk and sensitivity to health effects of climate change due to their heavy burden of exposure to carcinogenic combustion products related to the increased frequency/scale of wildland and wildland urban interface (WUI) fires driven by climate change. CA-FFs are an increasingly important component of the workforce in CA. CA-FFs protect the lives and property of climate vulnerable communities, ensuring the stability of CA's economy and infrastructure. Accordingly, maintaining the health of CA-FFs is crucial to CA's climate resiliency and adaptability. Cancer is the leading cause of death among firefighters. Prior studies focused on cancer risk in municipal firefighters elsewhere in the U.S., whose job tasks and exposures are vastly different compared to CA-FFs. Thus, creating data-driven strategies to reduce cancer risk for CA-FFs, which currently do not exist, are crucial. To bridge these gaps, our UC Davis/UCLA team has partnered with the LA County Fire Dept. and FIRESCOPE, a state entity representing all major CA fire service stakeholders, to establish a community engaged participatory research framework that empowers CA-FFs to address their burden of occupational cancer across the cancer control continuum. We will leverage our partnership to quantify carcinogenic exposures from wildfires, identify epigenetic and immune mechanisms that increase cancer risk, and produce media campaigns to enhance the perceived severity of cancer risk among CA-FFs. We will identify areas where equipment, tactics, and policy can be developed/amended to mitigate cancer risk, improve early detection, and encourage adoption of preventative interventions using data driven strategies. We are not aware of any other epigenome-wide profiling of the behavioral/environmental exposome that is unique to CA-FFs nor campaigns designed to motivate cancer prevention efforts in CA-FFs. Such findings and campaigns may provide novel mechanistic insights into pathological mechanisms and pathways and are likely to identify firefighters who will benefit from targeted prevention and intervention to reduce cancer risk.

Planning Landscape Resilience for California Indian Allotment Lands

Applicant Institution: University of California, Davis **Application ID:** R02CP7261

Principal Investigator: Beth Rose Middleton **Award Type:** SEED

Collaborating Partners: California Indian Legal Services; California Public Domain Allotees Association; UC Berkeley

Requested Amount: $1,602,917 **Community Engagement Supplement Recipient*

Lay Abstract:

"Planning Landscape Resilience for California Indian Allotment Lands" identifies climate and fire risks on California Indian Public Domain Allotments; collaboratively develops culturally-based adaptation strategies through demonstration and monitoring; and effectively communicates critical information to allottees, empowering California Indian communities to acquire needed funding to apply place-based stewardship practices. Public domain allotments are a unique land status that cannot be alienated from California Indian allottees; as such, they are critical sites for California Indian resilience. California Indian people are facing significant climate impacts, as culturally important species necessary for food, medicine, and material culture decline with increased heat, drought, and wildfire. This project brings together California Indian Indigenous knowledge, a baseline ecological dataset from the 1990s, and climate and fire modeling to (1) identify critical sites of vulnerability and potential ecocultural climate refugia on allotment lands; (2) collaboratively develop culturally-based adaptation strategies; and (3) build allottee capacity to acquire public and private funds to implement climate adaptation projects on allotments. "Planning Landscape Resilience for California Indian Allotment Lands" invests in creating accessible climate data, sharing it in searchable web-based and hard-copy formats, and supporting allottees to obtain funding to implement culturally driven adaptation actions. We are committed to bi-directional learning, enacted through workshops and conferences on strategies for creating climate refugia, navigating climate and wildfire predictive data on allotments, developing funding applications, and implementing traditional stewardship to support climate adaptation. "Planning Landscape Resilience for California Indian Allotment Lands" strengthens protections for climate-vulnerable California Indian communities, supports decision making based on the best available climate science, and strengthens climate resilience of natural systems. Our purpose is to improve understanding of the condition and climate risks to California Indian Public Domain Allotments, in order to support Indian allottees to steward and enhance allotments in the face of climate change.

Resilient and Equitable Urban Stream Corridors

Applicant Institution: University of California, Davis **Application ID:** R02CP6967

Principal Investigator: Gregory Pasternack **Award Type:** SEED

Collaborating Partners: Contra Costa Resource Conservation District; Guadalupe-Coyote Resource Conservation District; Napa Resource Conservation District; SafeR3; San Jose State University; UC Agriculture and Natural Resources

Requested Amount: $2,000,000

Lay Abstract:

Natural hazards, socio-economic wellbeing, and ecological functions all intertwine in California's urban stream corridors, because these pathways are heavily relied on for flood and pollution control, recreation, ecosystem services, education, and residency. As we write, tens of thousands of unhoused people, previously pushed into living and forage along streams, are evacuating streams and losing belongings due to flash flooding. Meanwhile, landslides are destroying homes along the hills above. Yet 5 months earlier, the concern was drought, fire, and overheating. California's climate has always been defined by variability. Climate change synergized with urbanization is amplifying extremes in ways that our urban stream communities and ecosystems are not resilient against. Regional climate models already provide reasonable forecasts that illuminate broader impacts requiring adaptation, but these must be combined with a better understanding of local effects. Local urban managers tend to address crises with small, specific projects absent the context of a whole urban region, with its complex intertwining of multiple types of natural hazards, civil infrastructure, and socio-economic vulnerabilities. To provide climate action in this context, we formed a multi-institutional, transdisciplinary partnership that will carry out integrated applied research and practical action looking at urban stream corridors as a system seeking climate resilience. We will discover landscape patterns that amplify risks and identify locations where nature-based solutions can be most effective, by using a combination of (1) targeted interdisciplinary data collection in local communities and their streams, (2) model-predicted future climate condition maps, (3) remote sensing, and (4) Big Data spatial analysis. Resulting risk and opportunity maps and recommendations will be used by our local nonprofit and conservation district partners to aid decision-making about where to deploy their resources and expertise for community engagement, master planning, community education, and siting shovel-ready projects. We will also use this project, with its training opportunities for diverse students, targeted workshops, and dedicated outreach to strengthen ties across academic, industry, nonprofit, and government sectors leading to subsequent actions that leverage this seed grant.

Integrated and Equitable Climate Action (IECA)

Applicant Institution: University of California, Irvine **Application ID:** R02CP7158

Principal Investigator: Alejandro Camacho **Award Type:** SEED

Collaborating Partners: Azul; California Air Resources Board; Center on Race, Poverty, and the Environment; Central California Environmental Justice Network; Central Valley Air Quality Coalition; City of Buena Park; City of Santa Ana; California Office of Planning and Research; UC Davis

Requested Amount: $1,200,000 **Community Engagement Supplement Recipient*

Lay Abstract:

Integrated and Equitable Climate Action (IECA) builds on UC Irvine School of Law's programs devoted to environmental and land use law, community-based environmental justice research, and public dispute resolution; the Department of Urban Planning and Public Policy's expertise in climate policy and land use and transportation planning; UC Center Sacramento's ability to facilitate communication with the State Legislature and disseminate policy-relevant research; and the Newkirk Center for Science and Society's innovation in community-based participatory research. It leverages the depth of experience and expertise of attorneys, geospatial analysts, and urban and regional planners, in close partnership with community leaders and agency staff. IECA focuses on applied research and policy drafting to align local land use plans with state climate objectives and mandates as well as innovations from other jurisdictions. Our community partners contribute to updates to California climate policy through AB 617 steering committees, Scoping Plan updates under AB 32, carbon sequestration and other nature-based solutions through state conservation commitments, and other programs. They stress that California will fail to achieve economic, environmental, and public health co-benefits of climate investments in disadvantaged communities unless it overcomes two longstanding and self-limiting factors. First, they identify land use integration as the central obstacle to maximizing environmental justice benefits of state climate policy. Second, programmatic staff at city and county agencies lack the means to ensure that those updates comply with civil rights laws, including California Government Code § 11135. Through ongoing research and development of legal inventories, compliance metrics, and model ordinances; comparative research; needs assessment focused on jurisdictions with one or more disadvantaged communities; selection of five jurisdictions per year for collaborative plan design; and ongoing sharing of findings and evaluation, IECA will draft land use plan and policy revisions and design and share strategies to align local land use plans with state climate objectives. IECA will ensure that a growing number of California's 478 municipal governments and 58 counties are at the forefront of state climate policy integration, while assuring compliance with civil rights laws.

A fusion outlook product for predicting climate-water variation toward efficient decision making

Applicant Institution: University of California, Irvine **Application ID:** R02CP7584

Principal Investigator: Isabella Velicogna **Award Type:** SEED

Collaborating Partners: Benchmark Labs; KnoWater; Land IQ; National Aeronautics and Space Administration; National Oceanic and Atmospheric Administration; Rubicon Water; California Department of Water Resources; UC Agriculture and Natural Resources; UC Davis

Requested Amount: $1,990,441

Lay Abstract:

Unprecedented changes in climate and increasingly frequent anomalous events affect water security, agricultural (Ag) production, and local economy and communities. The occurrences and impacts of these changes are difficult to predict, impairing our ability to build resilience into the water management and Ag systems.

Predictability of hydroclimate variability relies on climate models with simplified assumptions. Forecasts for the state of California (CA) based on NOAA's National Multi-Model Ensemble (NMME) forecasts are not directly constrained by real-time observations and show limited skills in predicting sub-seasonal to seasonal (S2S) hydroclimate changes in CA.

Here, we use expertise in Earth Science, remote sensing, and AI modeling to develop a novel fusion outlook product that combines NMME forecasts, in-situ and satellite-based observations for predicting S2S variations of CA hydroclimate. We devise AI techniques to fuse model-based forecasts with NASA satellite observations of changes in precipitation, terrestrial water storage, and soil moisture to enhance forecast capability. The fusion approach employs existing field datasets from CA resources and remote sensing observations to identify and correct dynamic biases in the NMME solutions. The forward-looking deliverables and uncertainties will be updated and distributed in real time. The product development and evaluation will be done in collaboration with UC-Agriculture and Natural Resources extension specialists, partners at the California Department of Water Resources, farmers, and companies who already work with stakeholders. Within this collaborative framework, we will quantify and demonstrate product skills, design, refine product interface, deploy for early adoption, and collect end users' feedback.

The framework constituted by our multidisciplinary team will facilitate the usage of climate science to help decision making in water and Ag management. Our S2S outlook products with enhanced forecast capacity will be incorporated into CA climate toolbox for adoption in water allocation workflows and shared with industrial partners. This work will yield quantifiable savings in water resources and energy due to improved water management efficiency. It will serve CA's overarching climate action research priorities in Climate Adaptation Strategy, Climate dashboard, and Climate solutions.

Sea Level Rise Impacts on Earthquake-Induced Soil Liquefaction

Applicant Institution: University of California, Los Angeles **Application ID:** R02CP7031

Principal Investigator: Scott Brandenberg **Award Type:** SEED

Collaborating Partners: California Geological Survey; California Office of Emergency Services; US Geological Survey

Requested Amount: $517,227

Lay Abstract:

According to the Intergovernmental Panel on Climate Change, sea levels are projected to increase by 0.37 to 1.88 m by 2100 under likely scenarios, and possibly more than 2 m by 2100 and 5 m by 2150. Sea level rise will exacerbate extreme water levels due to spring tides, storm surge, and wave setup that pose multiple interrelated coastal hazards including beach erosion, wave overtopping, and infrastructure damage. More than 600 million people live in coastal areas that are less than 10m above sea level, and potentially at significant risk of the effects of coastal hazards. Furthermore, many coastal communities are low-income and poorly positioned to respond to the increasing threats.

Sea level rise will raise groundwater levels in coastal areas, thereby increasing earthquake-induced liquefaction hazard. Liquefaction is the sudden loss of strength and stiffness of sandy soil that can disrupt infrastructure due to sand flowing up to the ground surface, permanent horizontal ground displacements, and even massive landslides like the one in Sulawesi, Indonesia that killed hundreds of people. Entire communities in Christchurch, New Zealand have been relocated due to liquefaction. Soils must be saturated with water to liquefy during earthquakes. Therefore, soil that is above the groundwater table will not liquefy regardless of the strength of shaking. Furthermore, shallow liquefied soils are more likely to disrupt the ground surface and damage infrastructure. Sea level rise is therefore anticipated to increase the thickness of saturated liquefiable soils, and also the consequences of liquefaction. However, the influence of sea level rise on liquefaction hazard has not been thoroughly quantified state-wide, nor are projections included in regulatory maps that identify liquefaction zones.

The proposed work will integrate groundwater modeling, sea level rise projections, geotechnical site investigation data, seismic hazard analysis, and liquefaction analysis to develop a map of liquefaction hazard severity in California. The map will be coordinated with the California Geological Survey (CGS), the California Seismic Safety Commission, and the US Geological Survey and will inform the zones of required investigation identified by CGS that dictates zones where liquefaction hazard assessments are required when new developments are proposed in California.

Respiratory Protection for Firefighters Responding to Wildland Fires

Applicant Institution: University of California, Los Angeles **Application ID:** R02CP7333

Principal Investigator: Rachael Jones **Award Type:** SEED

Collaborating Partners: California Division of Occupational Safety and Health (CalOSHA); Los Angeles County Fire Department; Public Health Institute; San Jose State University

Requested Amount: $1,978,788

Lay Abstract:

Wildland and wildland-urban interface (W/WUI) fires in CA have increased with climate change. Combustion products of these fires contain myriad toxic agents, and responding firefighters experience a heavy burden of exposure. The International Agency for Research on Cancer classifies occupational exposure as a firefighter as a known human carcinogen. Protecting the health of firefighters is essential to maintaining the effectiveness, resiliency, and adaptability of the fire services; and their ability to protect the health and safety of Californians from climate-exacerbated W/WUI fires.

Respirators are the primary means to protect firefighters from inhaling toxic combustion products. The self-contained breathing apparatus (SCBA) is used for some tasks, but use is limited by air capacity and supply of air bottles at remote fire incidents. As a result, most tasks at W/WUI fires are performed without respirators. While other types of respirators exist, none meet the needs of W/WUI firefighters. This study will fill this gap by performing user-centered evaluation of 2-3 prototype powered air-purifying respirators (PAPRs) and a collect information to support adoption of PAPRs in CA for a broad set of W/WUI firefighting tasks. PAPRs operate by forcing air across an ensemble of filters and into the facepiece of the firefighter, which reduced the work of breathing and stress on the cardiovascular system that occurs with other respirators. PAPRs are an appropriate technological solution.

The primary end user is Cal/OSHA, which is initiating a rulemaking process to require greater use of PAPRs by firefighters responding to W/WUI fires, pursuant to AB2146 (signed into law 2014). This research will develop the evidence-base that a PAPR can meet the needs of firefighters at W/WUI fires, and generate technical information for the rulemaking process.

This work will be conducted in partnership with the Los Angeles County Fire Department (LACoFD). Co-I Urwin is a career firefighter with LACoFD and also Chief Science Advisor to the International Association of Firefighters. Already, Drs. Wilson (Cal/OSHA) and Urwin have conducted several focus groups with a PAPR prototype from TDA Research with LACoFD, and firefighters are enthusiastic about access to new respirators. LaCoFD and other organizations of the CA fire service are key end users of this study.

Laser-scribed battery electrodes to enable California grid-scale energy storage

Applicant Institution: University of California, Los Angeles

Application ID: R02CP7008

Principal Investigator: Yuzhang Li

Award Type: SEED

Collaborating Partners: Not Applicable

Requested Amount: $1,000,000

Lay Abstract:

California's climate action priority of establishing a carbon-free electric grid depends critically on battery technologies that can store energy from renewable yet intermittent sources (e.g. solar, wind). Although Li-ion batteries dominate the portable electronics and electric vehicle markets, their advantages don't align well with the requirements of grid-scale energy storage. As an alternative, Zn chemistry can potentially offer the cheap, long-lasting, and safe battery technology needed for grid storage, if some significant challenges can be overcome. Here, we propose to create a breakthrough battery technology based on Zn chemistry by combining the unique expertise and capabilities of the two lead PIs: (1) commercially proven materials synthesis methods developed by PI Kaner (Science 335, 1326, 2012) and (2) state-of-the-art characterization tools developed by Co-PI Li (Science 358, 506, 2017; Science 375, 66, 2022). We will engineer a high-capacity cathode material using laser-scribed synthesis and reveal its fundamental working and failure modes using cryogenic electron microscopy (cryo-EM). Indeed, our preliminary results (unpublished) demonstrate the longest cycling performance of vanadium-based cathodes that simultaneously exhibit the highest cycling rate and capacity reported to date. Our proposed scope of research will pursue three Aims:

Aim 1: Materials engineering for optimizing the cathode material

Aim 2: Electrochemical evaluation and testing in large format batteries

Aim 3: Pilot scale demonstration in battery packs for grid scale use

In addition to developing a commercially relevant and critical battery technology, this high-impact collaboration will also provide substantial scientific value in elucidating the molecular-scale operating principle(s) of our cathode material. We expect initial outcomes supported by the CA Climate Action Seed Grant to attract future investments from both industry and federal agencies. Finally, our project benefits from the balanced leadership of a pioneering leader in carbon nanoscience (PI Kaner) and a junior faculty member who has already made significant contributions to energy research (Co-PI Li), establishing a fruitful and lasting collaboration for this research and beyond.

Improving the health and safety of migrant workers responding to climate-related disasters

Applicant Institution: University of California, Los Angeles **Application ID:** R02CP7263

Principal Investigator: Kevin Riley **Award Type:** SEED

Collaborating Partners: California State University Long Beach; Instituto de Educacion Popular del Sur de California; National Day Laborer Organizing Network

Requested Amount: $2,000,000

Lay Abstract:

Migrant workers have played an increasingly prominent role in climate-related disaster response and recovery efforts in the U.S. These workers often function as “second responders” to wildfires, earthquakes, severe storms, and floods, filling the gaps in formal disaster response systems by helping residents confront disaster risks and undertaking demanding and dangerous work like removing debris and demolishing damaged structures. This workforce has proven critical for maintaining and restoring the health and wellbeing of disaster-impacted communities. Yet workers are frequently exposed to unique job-related hazards that are poorly characterized and can pose significant risks to health and life. These exposures and health risks are exacerbated by limited legal protections for workers, economic insecurity, and labor exploitation.

The goal of this project is to improve the health, safety and wellbeing of this underserved, at-risk workforce on the frontlines of climate-disaster response and recovery. The initiative represents a novel collaboration between day labor worker centers and multi-disciplinary occupational health researchers. The primary outcomes of this project will be research findings regarding the hazards and stressors facing migrant disaster workers; materials to educate and inform workers and to support future disaster-related research; and tools to establish a community-based infrastructure for protecting the safety, health and wellbeing of this workforce in California. These outcomes are intended to both confront the disparate impacts of climate-related disasters on a vulnerable population and promote the resiliency of California communities by fortifying a workforce that is expected to continue serving as the backbone of disaster response and recovery into the future.

Climate Action - Community-driven eLectric vEhicle chArging solutioN (CA-CLEAN)

Applicant Institution: University of California, Los Angeles

Application ID: R02CP6948

Principal Investigator: Yifang Zhu

Award Type: SEED

Collaborating Partners: CSU Northridge

Requested Amount: $1,999,249

**Community Engagement Supplement Recipient*

Lay Abstract:

The reduction of greenhouse gas (GHG) emissions achieved through transportation electrification is crucial for mitigating climate change in California. However, many factors limit the adoption of electric vehicles (EVs) among residents of disadvantaged communities (DACs), who account for one-third of Southern California's population. A key barrier is the lack of access to EV charging stations (EVCS) at home and work. This is partly due to the significant knowledge gap between regional planning efforts and local community deployment which has hindered the equitable distribution of EVCS infrastructure and broader EV adoption. DAC residents have rarely been involved in EVCS siting decision-making processes, and most existing public EVCS planning efforts have only focused on single quantitative metrics, such as minimizing costs or distance traveled by vehicles.

To address these challenges, an interdisciplinary team of scholars from University of California Los Angeles (UCLA) and California State University Northridge (CSUN) proposes a scalable, equitable, and evidence-based solution for transportation electrification efforts in DACs through the following tasks: (1) identifying community needs and barriers to EV adoption and EVCS deployment by engaging with residents and community-based organizations, (2) empowering DAC residents by improving their knowledge and awareness of EV/EVCS through targeted outreach activities, (3) Integrating transportation and power systems to optimize demand and supply for EVCS, (4) co-designing EVCS deployment plans and piloting EVCS installation in DACs, (5) forecasting the impacts of EVs on electric vehicle miles traveled (eVMT), GHG emissions, near-roadway air quality, and health effects, and (6) examining attitudes towards EV/EVCS in comparison to other clean transportation options. The proposed project aims to develop best practices to inform current and long-term EV adoption strategies and EVCS deployment efforts. Our long-term goal is to bring positive climate, environmental, and public health outcomes to all Californians by improving equitable accessibility to EVCS, and increasing EV adoption among DACs.

Improving Preparedness of Communities for Evacuations using Zero Emission Vehicles

Applicant Institution: University of California, Merced

Application ID: R02CP6996

Principal Investigator: Ricardo de Castro

Award Type: SEED

Collaborating Partners: EVEN Recharge; UC Berkeley; UC Davis; UC Santa Cruz

Requested Amount: $1,150,215

Lay Abstract:

California is quickly embracing zero emission vehicles (ZEVs) as a means to decarbonize the transportation sector. According to Executive Order N-79-20, ZEVs will be the only new vehicles allowed to be sold in the state by 2035. At the same time, the state is at high risk of severe weather phenomena, such as wildfires, floods and earthquakes. For example, more than 1 million people were ordered to evacuate in California between 2017-2019 due to wildfires. These extreme events might disrupt the electric grid, introducing blackouts and limiting ZEVs recharging; in the worst-case scenario, lack of charge accessibility might compromise safe evacuation of communities using ZEVs, especially if the evacuation needs to be performed on short notice. There is an urgent need to revisit evacuation strategies of California communities, which were originally designed around vehicles with internal combustion engines and are unprepared to cope with large-scale adoption of ZEVs.

Our project will create new knowledge and insights that can deepen our understanding on how to prepare and respond to emergency evacuations using ZEVs. We will provide actionable outcomes that can be quickly transferred to communities in California. These actional outcomes include resources, decision-aid tools, policy recommendations and education materials that will be used by communities and government officials to improve their preparedness for emergency evacuations using ZEVs.

We will build several real-world case studies using data from the Office of Emergency Services of Merced and Mariposa Counties. These counties are at high risk of flooding and wildfires, and often need issue evacuation order in respond to extreme weather events. The tools developed during the project will help Merced and Mariposa communities understand vulnerabilities in their charging infrastructure, learn best strategies for deploying mobile chargers to support overloaded EV charging stations, and select evacuation routes that minimize travel time for ZEVs. We expect the knowledge and lessons learned in this project can then be translated to other California communities that are currently transitioning toward a ZEV-based transportation ecosystem and that need to revise their evacuation preparedness to support clean vehicles.

Increasing publicly available tools for climate-smart seed sourcing and forest restoration

Applicant Institution: University of California, Merced **Application ID:** R02CP6995

Principal Investigator: Emily Moran **Award Type:** SEED

Collaborating Partners: Bureau of Land Management; California Department of Forestry and Fire Protection (CAL FIRE); Climate and Wildfire Institute; UC Davis; US Forest Service

Requested Amount: $904,252

Lay Abstract:

Healthy forests are a major carbon sink and provide many ecosystem services, but intensifying large-scale fires and droughts are creating areas where natural tree regeneration is limited. Moreover, climate change is reducing performance of seed sources that were historically adapted to their local climates. Replanting damaged forests with climate-adapted seedlings is key to restoring ecosystem function. Challenges include identifying seed sources that can thrive in future conditions and obtaining enough of the appropriate seed. We aim to: 1) test whether the publicly available Climate-Adapted Seed Tool (CAST) can predict the early results of ongoing operational-planting-style assisted migration experiments, 2) assess how “bet-hedging” by replanting with seeds from multiple sources may improve restoration success, and 3) develop a new set of tools to prioritize seed collection areas to ensure that climate change-adapted seeds are available.

CAST currently includes three species with detailed predictions; we are in the process of updating it to include up to 11 more. To test the predictions of seedling performance based on CAST, we will make use of several post-fire experiments using seedlings from multiple source areas. Our preliminary analyses indicate that the performance of ponderosa pine seed sources over 2-5 years in one such planting roughly matches the ranking suggested by CAST for the next 20 years.

Uncertainty in climate projections necessarily lead to uncertainty in which will be the “best” seed source. We aim to develop a tool to calculate how different mixes of seed sources for a given species may improve the reliability forest growth and carbon sequestration outcomes by “bet hedging” to reduce uncertainty. This tool could be used to guide seed collection priorities as well as planting strategies.

To identify priority areas for seed collection we will first, for species included in CAST, build on current efforts to map areas of high climate exposure and areas likely to produce seed crops most adapted to changing climates across California. Collecting seed from these areas and storing it in seed banks will help buffer against the risk of loss of genetic potential. Second, using the Mastif model, we will create projections of seed production to help time seed collection efforts effectively. These maps will be made available to end-users online.

Scaling Science-Driven Vegetation Treatments for a Wildfire Resilient California

Applicant Institution: University of California, San Diego **Application ID:** R02CP7317

Principal Investigator: Ilkay Altintas de Callafon **Award Type:** SEED

Collaborating Partners: California Department of Forestry and Fire Protection (CAL FIRE); UC Berkeley; UC Davis; University of San Francisco

Requested Amount: $1,997,050

Lay Abstract:

In 2020, California and the USDA Forest Service announced the Agreement for Shared Stewardship of California's Forest and Rangelands, which includes a commitment to treat one million acres annually to reduce the risk of catastrophic wildfire. Scientists and practitioners agree on the use of prescribed fires for vegetation treatments as a way to achieve this commitment. This unprecedented increase in prescribed fire represents a fundamental shift in vegetation management. Responsible implementation of this strategy requires an adequate science-basis to achieve desired risk reduction and ecosystem benefits while avoiding fire escapes, ecosystem damage, and smoke exposure. Thus, while the use of prescribed fire as a management tool is well supported, it is imperative that an increase in prescribed burns be accompanied by new science-driven tools for planning and training.

We built the BurnPro3D platform with NSF support to enable our public sector partners to take advantage of next-generation fire science to optimize prescribed burns. BurnPro3D is a web-based tool for planning and implementing prescribed burns that uses high resolution 3D vegetation models and fire models. We propose to work with the California Department of Forestry and Fire Protection (CAL FIRE) to support the agency's mandate to increase prescribed fire activities by (1) creating 3D fuel models for California through a process involving multi-modal vegetation data fusion and (2) enabling scenario-specific 3D modeling of prescribed burns and monitoring of ecological effects. Through a demonstration network at CAL FIRE sites, we will apply these approaches to real California landscapes in BurnPro3D. In addition, we will contribute to CAL FIRE's prescribed fire training capacity by creating digital training modules.

Four of the six priorities within the California Climate Adaptation Strategy are related to scaling prescribed burns. Prescribed fire is an effective approach to reducing the intensity of wildfires when they do occur, thereby protecting both ecosystems and vulnerable communities under changing climate conditions. This proposal takes a use-inspired approach to integrating next-generation science into existing systems for wildfire mitigation to help California carryout prescribed burns at the scale required to increase climate resilience.

Enhancing Climate Resilience of Small Farms with Waste-Derived Engineered Hydrogels

Applicant Institution: University of California, San Diego

Application ID: R02CP7256

Principal Investigator: Shengqiang Cai

Award Type: SEED

Collaborating Partners: UC Agriculture and Natural Resources; UC Davis

Requested Amount: $1,737,390

Lay Abstract:

Southeast Asian, Latino, and Black farmers in Fresno and Tulare Counties grow specialty produce for both California farmers markets and state and national wholesale markets. In 2020, farmers in Fresno County produced Asian specialty vegetables valued at $35 million on about 1400 acres of diversified small-scale farms. These socially-disadvantaged growers have unique vulnerabilities, opportunities, and needs under conditions of periodic drought, regional groundwater overdraft related to less reliable surface water resources, and the Sustainable Groundwater Management Act, specifically related to irrigation, resource access, and drought resilience. Large areas of these counties have sandy soils with limited water holding capacity, requiring frequent irrigation to maintain plants. In this project, we will develop low-cost agricultural-waste derived hydrogels as an autonomous water retention measure for small farmers, aiming to combat drought and thus enhance the climate resilience of their farms. Our project will directly strengthen protections for climate-vulnerable communities, which has been identified as one of California Climate Action Priorities by California Climate Adaptation Strategy.

Hydrogels are a special type of polymers that can harvest and store water with extraordinary capacity (over 100 times of its own volume). They are widely used in consumer products such as diapers. Previous studies have already demonstrated the feasibility of using hydrogels for smart, sustainable agriculture such as water retention and controlled release of nutrients. However, synthetic hydrogels are typically nondegradable and may leave biologically toxic residues. On the other hand, biodegradable hydrogels are often too fragile to maintain their integrity for water retention. Herein, we propose to develop agricultural waste-derived degradable, mechanically durable hydrogels with optimized forms for autonomous water retention. Moreover, agricultural wastes are abundant in cellulose, which will be extracted to make hydrogels in this project, thus providing a nature-based solution that increases California's circular economy. We will further leverage the University of California Cooperative Extension Small Farms Program network, resources, and capacity to fine-tune and coproduce this climate-smart technology with through extension activities and on-farm partnerships.

Designing California's clean and climate resilient electricity grid for vulnerable communities

Applicant Institution: University of California, San Diego **Application ID:** R02CP7302

Principal Investigator: Patricia Hidalgo-Gonzalez **Award Type:** SEED

Collaborating Partners: GridLab; Lawrence Berkeley National Laboratory; UC Berkeley; UC Santa Barbara

Requested Amount: $1,998,557

Lay Abstract:

Deeply reducing energy use emissions while ensuring reliable infrastructure is critical to meet California's carbon neutrality goals by 2045 (California Air Resources Board 2022 Scoping Plan). Extreme weather events, such as wildfires and heavy precipitation, have increased the complexity of meeting this goal while maintaining reliable electricity services, as evidenced by public safety power shutoffs (California Climate Solutions, Goal 3). Disadvantaged communities (DACs) have been disproportionately affected by load shedding and restoration prioritization decision-making, exacerbating the persistent economic and health inequities these communities face. Adoption of end-use electrification and distributed energy resources (DERs, such as PV) at the household and community level are key strategies for a resilient carbon neutral grid. Adoption rates for these technologies have been lower across DACs. Achieving resiliency in California's electricity grid will not only require a technical redesign of our grid's infrastructure and operation but also a nuanced understanding of the barriers to climate action and local resilience for communities.

The outcome of this project is to support electric utilities and DACs to achieve resilient distribution networks against climate impacts. There are four interconnected thrusts, all informed by an advisory board of community-based organizations, electric utilities, the California Public Utilities Commission and the Electric Power Research Institute. First, we will characterize consumer perspectives on electrification and DERs via surveys and quantify the propensity of adoption of residential electrification, rooftop PV, battery storage, electric vehicles (EVs), and demand response with an emphasis on DACs. In the second thrust, we will use the survey results to examine possible spatial distributions of electrified load adoption and compare these to constraints on infrastructure (e.g., feeder capacity, roof and land suitability) to inform feasible configurations of microgrids. In the third thrust, we will study how DERs can ensure climate resilience. In the final thrust, we will examine how economic incentives (e.g., new vehicle-to-grid tariffs) can benefit DAC customers, the transmission network, and electric utilities, by enabling DERs to generate revenue from engaging in the wholesale electricity market (FERC 2222).

Enhancing the richness and resilience of California amphibian communities

Applicant Institution: University of California, Santa Barbara **Application ID:** R02CP7252

Principal Investigator: Cheryl Briggs **Award Type:** SEED

Collaborating Partners: East Bay Municipal Utility District; East Bay Regional Park District; UC Berkeley

Requested Amount: $1,563,281

Lay Abstract:

California's ponds and wetlands provide critical habitat for many sensitive species while also performing vital ecosystem services, such as nutrient cycling, pest control, and water provisioning. Yet these systems and their inhabitants are disproportionately vulnerable to the dramatic fluctuations in water availability increasingly experienced in California, including both extreme drought and severe flooding. The core objectives of this proposal are to quantitatively identify wetland characteristics that promote resilience in aquatic communities and combine this information with climate forecasting to enhance habitat suitability in an uncertain future. We focus on native communities of amphibians, which are now the most imperiled group of vertebrates globally, and in particular on Species of Greatest Conservation Need such as the California red-legged frog and the California tiger salamander. Our approach involves three components: leveraging a uniquely long-term (13 years) and large-scale (85 continuously sampled wetlands and 400 opportunistically sampled wetlands) dataset in the East Bay region to isolate the drivers of resilience to extreme climate events. This will include extending the dataset to capture responses following recent flooding (new sampling in 2023-2024) and the installation of an integrated sensor network on a strategically selected subset of 30 sites to provide high-resolution data on hydroperiod, water chemistry, temperature, phenology, and wildlife activity. Analyses of new and long-term data will be integrated with climate forecast scenarios to identify key management actions that maximize landscape-level richness and enhance resilience in ponds across the East Bay, with a focus on hydroperiod alteration, invasive species removal, reintroductions, and disease mitigation. By forming collaborative partnerships among universities, park management districts, and municipal water agencies, this work has a direct influence on >800 ponds distributed across 50,000 hectares of habitat and offers management insight relevant to amphibian populations across much of the state. Alongside direct outcomes, results from this seed grant will be leveraged to undertake scientifically-informed restoration efforts across managed properties, facilitating the capacity of aquatic wildlife to durably persist in the face of climate variability.

Dunes as nature-based solutions to enhance resilience of California's beaches to climate change

Applicant Institution: University of California, Santa Barbara **Application ID:** R02CP7113

Principal Investigator: Ian Walker **Award Type:** SEED

Collaborating Partners: Coastal Ecosystems Institute of Northern California; Mobile Bay National Estuary Program; Point Blue Conservation Science; UC Los Angeles; UC San Diego; US Fish and Wildlife Service; US Geological Survey

Requested Amount: $1,988,077

Lay Abstract:

California's beaches are iconic, highly valued spaces that provide many co-benefits to our communities, economies, and coastal ecosystems.The vulnerability of our beaches to climate change and need for viable adaptation strategies is stated in many state policies. Nature-based Solutions (NbS) using beach and dune restoration have been implemented at multiple sites statewide. Projects vary in extent, design and purpose and many are not fully informed by current science on beach-dune geomorphology, ecology, coastal hazards or future forecasts. We are a team of scientists, practitioners and land managers with expertise and experience with restoration projects that span the diversity of the coast. To improve understanding and success of NbS for enhancing beach resilience we will: 1) conduct a state-wide inventory and risk assessment to identify sites where protective dunes exist(ed), their current condition and status of resilience or resistance to erosion and sea-level rise. 2) develop and evaluate a suitability assessment and performance framework to identify opportunities for restored dunes to improve shoreline resilience. 3) compile existing data and extend monitoring beyond the 5 years required by permits to assess performance of selected dune projects across a range of scales/types spanning the geographic and social-economic diversity of the state, and 4) develop state-wide guidance for monitoring, implementation, maintenance, and performance assessment of protective dunes using collaborator workshops, outcomes, and lessons from dozens of existing projects statewide. We will use historical aerial photography, satellite imagery, land surveys, project results, and the USGS CoSMoS-COAST model to address these objectives. Communities/end users will be engaged via established research collaborations and beach networks, such as the California Dune Science Network (resource managers, local governments, consultants, academics, Tribal members, non-profits, state/federal coastal management agencies), BEACON (local governments) and the Beach Ecology Coalition (resource and beach managers, regulators, equipment operators). Our project will identify sites and support beach-dune restoration as a viable, scientifically informed, locally accessible adaptation strategy for improving resilience of California's sandy beaches and ecosystem services to climate change impacts.

Rapid decision support for optimal carbon-nutrient-water benefits from California's methane policy

Applicant Institution: University of California, Santa Cruz **Application ID:** R02CP7069

Principal Investigator: Elliott Campbell **Award Type:** SEED

Collaborating Partners: BioFiltro; Community Water Center; California Department of Resources Recycling and Recovery (CalRecycle); UC Davis; UC Merced; USDA Natural Resources Conservation Service

Requested Amount: $1,999,948

Lay Abstract:

California's landmark policy on methane emissions (SB 1383) mandates the diversion of 75% of organic waste from entering landfills by 2025. This policy will result in unprecedented use of compost, manure, and other organics for application to lands. Given the short time-frame for implementation and the massive scale of these activities, there is now an urgent need to develop decision support that can optimize the benefits of organics land application in the form of carbon sequestration, nutrient delivery, and water management while avoiding impacts, particularly to air and water quality in disadvantaged communities. The optimization is complicated by trade-offs between the carbon, nutrient, and water systems. Analyzing any one of these system alone is likely to, at best, result in sub-optimal performance and, at worst, cause significant unintended consequences. Due to these complex trade-offs, the development of robust decision support will require the integration of knowledge across multiple fields of expertise including agroecology, economics, soil science, and hydrology. To address this immediate challenge for California climate policy, we propose a research and end-user engagement project, combining resources across four UC campuses (Santa Cruz, Merced, Davis, and Berkeley). Research will be organized around three inter-related areas: (1) landscape model development to provide decision support for farmers and other land managers to apply organics with optimal carbon-water-nutrient benefits; (2) geospatial life-cycle model development for policy decision support to minimize distribution costs and life-cycle greenhouse gas emissions; and (3) field experiments to fill gaps in knowledge on organics management across a diverse range of feedstocks, soil types, climates, and crop varieties. Our team has a record of public impact research with stakeholders from local and state government, as well as industrial and agricultural businesses, that are tasked with implementation of this policy. By integrating activities across research labs and end-user partners, with professional stakeholder facilitation from our NGO partner, we will develop decision support tools that will help realize the full benefits of California's methane emissions policy, while creating a framework for sustainable organic management in communities more broadly.

Improving water system resilience to climate change with levee setback to create multiple benefits

Applicant Institution: University of California, Santa Cruz **Application ID:** R02CP7145

Principal Investigator: Andrew Fisher **Award Type:** SEED

Collaborating Partners: California Department of Water Resources; CSU Monterey Bay; Pajaro Regional Flood Management Agency; Resource Conservation District, Santa Cruz County; U.S. Army Corps of Engineers; UC Berkeley; UC Davis; Water Innovation Services

Requested Amount: $1,995,831

Lay Abstract:

Disruption of the hydrologic cycle - including more frequent and extreme droughts and floods - is part of climate change in California. Adapting resilient water systems for the future requires innovative solutions, including simultaneous technical, institutional, and cultural advances. We propose to leverage a federal- and state-funded, flood-control project on the lower Pajaro River, central coastal California, to benefit groundwater supply, water quality, and aquatic habitat. This will provide a template for other projects in California (and other states) to adapt to impacts of larger and more frequent floods, while improving aquatic and ecosystem system resilience.

The flood-control project will raise and shift levees along the Pajaro River and Corralitos Creek, incorporating ~200 acres of flood plain. The project area overlies the Pajaro Valley Groundwater Basin, an over-drafted aquifer system that supplies >90% of freshwater demand for high-value farmland and nearby communities, and is adjacent to the largest remaining wetland system on Monterey Bay, a critical habitat for numerous migrating, endemic, and threatened species. The project region includes areas that are suitable for managed aquifer recharge, including coarse soils and connection with underlying aquifers that can store more water. The Pajaro River is prone to flooding the surrounding valley, home to multiple disadvantaged communities, and is also impaired by heavy sediment load, salts, and nutrients.

We propose to measure and model how increases in flood flow capacity can be linked to: enhanced riverbed recharge to benefit groundwater supplies, improved water quality through greater surface water – groundwater exchange, and improved aquatic habitat, including thermal regulation. We will evaluate legal and institutional challenges impacting multi-benefit flood-control projects, and assess how permitting for environmental improvements can be streamlined. We will survey, sample, map, and model dynamic river and flood-plain conditions; identify "hot spots" to prioritize for enhancing conditions between and outside levees; and collaborate with agencies, NGOs, and community stakeholders to enhance system benefits as levee setbacks are implemented. This pilot work will generate actionable results, initiate longer-term benefits, and demonstrate generalizable technical and policy solutions.

WUI Research for Resilience: Addressing California's Climate, Conservation, and Housing Crises

Applicant Institution: University of California, Santa Cruz **Application ID:** R02CP7634

Principal Investigator: Miriam Greenberg **Award Type:** SEED

Collaborating Partners: Alliance for Housing and Climate Solutions; Community Bridges; Conservation Biology Institute; Ember Fire Consulting; Monterey Bay Central Labor Council; Santa Cruz County; Trust for Public Land; UC Agriculture and Natural Resources

Requested Amount: $1,606,688 **Community Engagement Supplement Recipient*

Lay Abstract:

Housing development in the Wildland Urban Interface [WUI] is the fastest growing land use in California, and a leading cause of wildfire, natural area loss, and climate change. Yet there is no systematic research on who is moving there and why, or their related socio-environmental impacts and vulnerabilities, and thus how to integrate WUI growth in climate resiliency planning. Led by experts in the social and natural sciences, emergency management and land stewardship, this project will offer new ecological and equity related approaches to resiliency policy and planning. Centered on the Central Coast, findings will apply to regions across California and beyond.

We develop a novel framework to analyze the "3 Ds": drivers, demographics, and dynamics of WUI growth. Combining census and GIS analysis with a survey and interview-based "affordability-desirability nexus" study, we explore push-pull factors of WUI migration, including housing cost pressures in proximal urban areas alongside lifestyle motivations. We then explore associated dynamics for affordability migrants in terms of social vulnerability, hazardous land use, and widening commute sheds. We combine select 3D variables with ecological and biophysical variables to develop distinct and significant "WUI typologies." These will be applied to map-based case studies of fire risk and habitat fragmentation in our region using ecological surveys, integrated step selection analysis, ethnography, and stakeholder interviews. Finally we combine the 3 D's, typologies, and case study data in a novel, scalable, user-friendly web-based tool, the "WUI Equity Atlas." Integrating land use, ecological, and equity-oriented research, the Atlas informs regional planning decisions that weigh the costs, benefits, and tradeoffs of different locations for housing, conservation, and mitigation. We will also use the Atlas in regional stakeholder gatherings, including indigenous tribes, public lands, labor, agriculture, housing, and social and emergency services. Working together we will inform approaches to equitable resiliency planning at the nexus of California's housing, conservation, and climate crises. This will advance state goals to "prioritize which indicators to include" in addressing climate change, as well as to "identify quantifiable measures to assess and identify vulnerable communities."

An Aesthetics of Resilience: Expanding Knowledge about Climate Change through Art and Science

Applicant Institution: University of California, Santa Cruz **Application ID:** R02CP6944

Principal Investigator: Rachel Nelson **Award Type:** SEED

Collaborating Partners: California Ocean Alliance; Caleb Duarte, independent artist; Carolina Caycedo, independent artist; San Jose Museum of Art; Stanford; UC Berkeley

Requested Amount: $2,000,000

Lay Abstract:

We propose a creative public scholarship initiative designed to shift social norms and promote climate resilience through art and science collaborations. This project addresses a central challenge in confronting the realities of the rapidly changing climate in California: while it is evident that scientific and technological solutions are urgently needed to mitigate the impacts of the climate crisis, a large-scale psychological adaptation is equally imperative to contend with knowledge structures and challenge trajectories of societal development that have left some communities particularly vulnerable to climate change. “An Aesthetics of Resilience” catalyzes social and cultural change by aligning the resources and research of the Friedlaender Lab, which focuses on using technology to study the impacts of environmental change on marine mammals, with those of the Institute of the Arts and Sciences (IAS), UCSC’s premier art and research galleries, to innovate new ways to improve understanding and problem solving around the disparate community impacts of climate change. Produced with postdoctoral scholars and graduate students with specialities in art and science, the outcome of the project will be a traveling art exhibition program for university and public art museums, events featuring the recipients of California Climate Action Grants, and publications of new research designed to transform understanding about the cascading—and connected—series of social, economic, political, and environmental challenges affecting our livelihoods. The initiative will also provide proof of concept as we seek additional funding for a long-term program of art and science exhibitions and programming promoting climate resilience aimed at the education of university students, lifelong learners, and the broader public. With an attention to adult learning unusual for art and science collaborations, and thinking beyond the illustrative function of art, we plan to provide a sustained platform for artists and museums working together with scientists and other researchers to reshape cultural and social values, aiding the public and decision makers alike in interpreting climate science for the good of all.

Farmworker Community Health Vulnerabilities and Responses Amid Climate Change

Applicant Institution: University of California, Santa Cruz **Application ID:** R02CP7378

Principal Investigator: Matthew Sparke **Award Type:** SEED

Collaborating Partners: Agriculture and Land-Based Training Association (ALBA); Community Action Board of Santa Cruz County (CABinc); Center for Community Advocacy; City of Santa Cruz; CSU Monterey Bay; Environmental Coalition for Water Justice (EJCW); Latino Equity Advocacy & Policy Institute (LEAP); Mujeres en Acción & Action Council of Monterey County; Salud Para La Gente; Santa Cruz Community Ventures; UC Berkeley; UC Riverside; UC San Francisco

Requested Amount: $1,996,863 **Community Engagement Supplement Recipient*

Lay Abstract:

Our team will research and help develop responses to the health vulnerabilities of Californian farmworker communities who increasingly face dire threats linked to climate change. We will map where pathways of climate vulnerability intersect in these communities, and, based on this research, we will: create public dashboards and an app for sharing the synthesized data; develop and disseminate an environmental health vulnerability checklist; produce and pilot a curriculum for training community health workers (CHWs) to understand and address the environmental vulnerabilities using the data tools; evaluate agro-ecological responses in relation to farmworker livelihoods and wellbeing; and contribute directly to preparations for resilience by organizing community response teams.

We propose 7 main outcomes of the project:

1) A data synthesis app providing public access to climate vulnerability maps and health risk data designed to pin-point where multiple pathways of risk - extreme heat, flooding, polluted air and water, and livelihood and disease threats - intersect to create 'hotspots' of especially pronounced environmental vulnerability for farmworkers.
2) An environmental health vulnerability checklist (made available in multiple languages) that farmworkers and their employers can use to identify the resources available (or needed) in their workplaces and communities to mitigate climate change harms.
3) The production and piloting of a research-based and multidisciplinary CHW training curriculum on farmworker health vulnerabilities in the face of climate change.
4) Facilitated focus groups (n=6) designed to share app, maps and knowledge of hotspot risks.
5) The training and piloting of community climate risk assessment and mitigation teams (n =10 teams of 4).
6) Agro-ecological pilots to examine the effectiveness of different climate-adaptive strategies for farmworkers.
7) The mentoring of students to foster a climate-aware health workforce to support state and local climate risk assessment and mitigation efforts.

Our approach is distinguished by our team's capacity to bridge between natural science and social science research, at the same time as bridging between university and community. We aim in these ways to build new bridges towards resilience for Californian communities that face some of the most extreme risks from climate change.

The information provided in this document, including the list of collaborating partner institutions, is compiled from the original application submission and is subject to verification and may be incomplete.