



UC **SANTA BARBARA**

Bren School of Environmental  
Science & Management



**Bren PhD Student Symposium**  
February 25, 2022  
1:00 – 4:00 PM

# Symposium Schedule

*This symposium will have short (3 minutes) and long (12 minutes) oral presentations, with one short break (20 minutes).*

**1:00 – 1:05 pm:** Welcome remarks  
**Patrick Hunnicutt,**  
Co-Chair, PhD Symposium Committee

**1:05 – 1:10 pm:** Highlights of PhD research at Bren School  
**Dr. Steven Gaines,**  
Dean and Professor, Bren School

***The Bren School expresses its sincere gratitude to our sponsor of the PhD student symposium:***



**Rincon Consultants, Inc.**  
*Environmental Scientists Planners Engineers*

***And thank you to the Bren School's Corporate and Institutional Partners:***

*AEP Channel Counties Chapter, Bank of America Charitable Foundation, Brownstein Hyatt Farber Schreck, California Homebuilding Foundation, Catena Foundation, Deckers Outdoor Corporation, Eli Lilly, Grove Planting Company, Irvine Ranch Conservancy, Kingfisher Foundation, Latham & Watkins, Lean Green Way, March Limited of Bermuda, Moulton Nigel Water District, O'Melveny & Myers, Professional Environmental Managers Association (PEMA), Protect Our Winters, Rhodium Group, Rincon Consultants, Santa Ynez Band of Chumash Indians Foundation, Scoot Science, Tetiaroa Society, The Nature Conservancy, Toad & Co., Walton Family Foundation*

# Symposium Schedule

(CONTINUED)

## ORAL PRESENTATION I

**1:10 – 1:25 pm: Nākoa Farrant**

*"Assessing vegetation recovery on abandoned agricultural land in Hawai'i"*

**1:25 – 1:30 pm: Anna S Boser**

*"Saving California's water"*

**1:30 – 1:45 pm: Cali Pfleger**

*"Using isotopic fingerprints to investigate changes in the Pacific Walker Circulation over the last millennium"*

**1:45 – 1:50 pm: Chen Xing**

*"Anthropogenic aerosol triggered multi-decadal North Pacific Ocean variability responses in CESM Large Ensemble Project"*

**1:50 – 2:05 pm: Sean Denny**

*"How do changes to food supply affect hunting rates across the global tropics?"*

**2:05 – 2:10 pm: Yifan (Flora) He**

*"Social and environmental impacts of land use restrictions in Indigenous lands in Brazil"*

**2:10 – 2:25 pm: Elliott Finn**

*"This land is our land: County responses to losing autonomy over public land use"*

**2:25 – 2:45 pm: Break** (refreshments available in the courtyard)

# Symposium Schedule

(CONTINUED)

## ORAL PRESENTATION II

**2:45 – 2:50 pm: Gabriela Alberola**

*"The political economy of climate adaptation in Latin America and the Caribbean"*

**2:50 – 3:05 pm: Ignacia Rivera**

*"Designing behavioral experiments to better understand cooperation in the use of natural resources"*

**3:05 – 3:10 pm: Renae Marshall**

*"Advancing bipartisan decarbonization policies: Lessons from state-level successes and failures"*

**3:10 – 3:25 pm: Alberto Garcia**

*"Impacts of Chilean payments for native reforestation"*

**3:25 – 3:40 pm: Patrick Hunnicutt**

*"United Nations Peacekeeping and natural resource concessions in post-war Liberia"*

**3:40 – 3:55 pm: Fatiq Nadeem**

*"The political economy of crop fires in South Asia"*

**3:55 – 4:00 pm: Flavio Malagutti**

*"Combating household air pollution with clean energy sources"*

**4:00 – 4:05 pm: Closing Remarks**

**Patrick Hunnicutt,**

Co-Chair, PhD Symposium Committee

**4:05 pm: Reception and Awards Ceremony**

Michael J. Connell Courtyard

# Symposium Abstracts

*In order of appearance*

**Title:** Assessing vegetation recovery on abandoned agricultural land in Hawai'i

**Speaker:** Nākoa Farrant

**Advisor:** Ashley Larsen

**Co-authors:** Carla D'Antonio, Dar Roberts

**Abstract:** Millions of hectares of agricultural land have been abandoned in recent decades, presenting opportunities for secondary vegetation growth. While abandoned fields have the potential to return to ecological communities with similar species diversity to their pre-agricultural state, they alternatively may transition to novel ecosystems or persist in degraded states that may have alternative functions that impact ecological and human communities. We still lack an understanding of how and why revegetation varies on disturbed landscapes. Here we leverage remote sensing data to assess revegetation patterns on former sugarcane land in Hawai'i abandoned between 5 and 100 years ago. Secondary vegetation progresses from grasses to shrubs to trees with time since abandonment, paralleling existing succession theory. Native vegetation represents a higher proportion of the secondary vegetation in the decades immediately following abandonment, but introduced species dominate fields more than 80 years after they were abandoned. Ongoing research aims to evaluate how climate and biophysical properties such as soil type affect the structure, composition, and function of secondary vegetation on abandoned fields. Abandonment is increasingly occurring on high value agricultural land globally, including in California's Central Valley. This work in Hawai'i could provide insight into land management strategies for environmental scientists, policy makers, and land managers concerned with the potential for abandoned land to be managed as a multifunctional resource.

**Acknowledgements:** Ford Foundation, Schmidt Family Foundation

**Title:** Saving California's water

**Speaker:** Anna S Boser

**Advisor:** Ashley Larsen, Kelly Caylor

**Co-authors:** Tamma Carleton, John T Reager, Madeleine Pascolini-Campbell

**Abstract:** Freshwater storage in many vital agricultural regions globally has been steadily declining over the past two decades, raising concerns about the future of food and water security. This is particularly true for California, one of the most productive agricultural regions in the world. Irrigated water can contribute to a variety of water fluxes, either resulting as evapotranspiration (ET) and being lost to the atmosphere, or running off and recharging surface water or groundwater. Measuring ET in situ at farm scales has the potential to elucidate the fraction of irrigated water that is used as ET and how much of a savings potential more efficient irrigation could hope achieve, as well as compare water use across crops to identify which crops are most suitable in water scarce environments. However, measuring ET in complex agricultural landscapes is challenging, making it difficult to estimate water lost to the atmosphere due to agriculture, or how water use varies by crop type. Remotely sensed estimates of ET provide a unique opportunity to observe changes in ET at new temporal and spatial scales. I rely on newly available 70m ET estimates from the ECOSystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) in combination with land cover information from the USGS's 30m Cropland Data Layer (CDL) to conduct a high resolution analysis over the years 2019-2020. I compare ET over different crop types and uncultivated areas over five agriculturally intensive California counties, and find that only 30% of the reported water diverted for irrigation contributes to enhanced ET, suggesting 70% is returning to surface and groundwater sources. This suggests a water savings potential with more efficient irrigation, but it also is relevant for better modeling the effect of irrigation on the water cycle and water resources as these fluxes can affect the amount of water in surface and groundwater, as well as its quality through nutrient leaching. I additionally find statistically significant differences in ET over different crop types. This study highlights the potential of high resolution remote sensing to enable detailed and widespread analysis of the effects of agriculture on the water cycle, with important management implications for California's water saving strategies under the Sustainable Groundwater Management Act (SGMA).

**Acknowledgements:** NSF GRFP

**Title:** Using isotopic fingerprints to investigate changes in the Pacific Walker Circulation over the last millennium

**Speaker:** Cali Pflieger

**Advisor:** Samantha Stevenson

**Co-author:** Andrew Flaim

**Abstract:** Understanding the dynamics of the Pacific Walker Circulation (PWC) is important as it influences both Pacific coastal regions and remote teleconnections around the globe. As the world around us warms, large scale drivers of precipitation, like the PWC, are responding. Over the last millennium, however, there is no consensus on changes in PWC strength. Here we examine the dynamics of the PWC by analyzing its isotopic fingerprint over the last millennium through a multifaceted analysis of climate model simulations along with paleoclimate records. The global climate model used is the Community Earth System Model Last Millennium Ensemble (CESM LME) and associated isotope-enabled simulations (the iCESM) which covers the period 850-2005 CE. Within the CESM-LME are ensemble members with all natural and anthropogenic forcings combined and smaller subsets with single forcing factors (e.g. greenhouse gas emissions and ozone-aerosols), thereby allowing attribution of changes in the PWC to particular external forcings. By comparing the full forcing and single forcing ensembles, we are able to identify the mechanisms for forced changes in the PWC. With these tools we are able to assess the PWC response to both internal variability and external forcing in both the CESM-LME and iCESM. We also perform an initial comparison of output from the iCESM to paleoproxy records covering the last two millennia. This combination of climate model output and data from paleoclimate proxies provides new insights into the underlying changes of PWC dynamics and its implications for the future.

**Title:** Anthropogenic aerosol triggered multi-decadal North Pacific Ocean variability responses in CESM Large Ensemble Project

**Speaker:** Chen Xing

**Advisor:** Samantha Stevenson

**Co-authors:** John Fasullo, Matt Newman, Emanuele Di Lorenzo, Antonietta Capotondi

**Abstract:** Kuroshio-Oyashio Extension (KOE) plays a crucial role in air-sea interaction in the North Pacific (NP) Ocean. The influence of external forcing on KOE is investigated in historical simulations of the large ensembles run with the Community Earth System Model versions 1 and 2 (CESM1 and 2), and CESM1 all-but-one-forcing and CESM2 single forcing experiments. The results show that CESM models are able to capture ocean patterns of KOE over the NP. In the CESM1 and CESM2 ensemble mean, there is a consistent decadal phase variation in KOE, with a phase shift near 1990. Through single forcing experiments, we found that anthropogenic aerosols are the main driver of the trend changes of KOE index, while contributions of other external forcings are small. Anthropogenic aerosols decrease surface shortwave radiation by scattering incoming solar radiation and producing more clouds. There is a positive sea level pressure anomaly closed to Alaska associated with anomalous cooling sea surface temperature. Correspondent surface wind stress tends to suppress the NP gyre and mass transport in the KOE. This study shows that anthropogenic aerosol emissions are a major driver of historical forced NP oceanic dynamics in CESM models, but understanding if it is real or just a model bias needs further investigation.



**Title:** How do changes to food supply affect hunting rates across the global tropics?

**Speaker:** Sean Denny

**Advisor:** Bruce Kendall

**Abstract:** Across the global tropics, hundreds of millions of people rely on hunting terrestrial wildlife for their food and livelihoods. However, overhunting is a major and persistent threat to vertebrate wildlife. Rates of overhunting were historically thought to be driven mainly by food insecurity and subsistence, but recent studies suggest that increasing demand for wild meat in urban areas, where people consume wild meat as a luxury item, may be overtaking subsistence needs as the dominant driver of overhunting. Understanding when and where hunting rates are driven by food needs versus a luxury market can provide insights about where, how, and when interventions focused on food security and biodiversity conservation (e.g., aquaculture initiatives) may be most effective and prioritized. I am using regional- and global-scale datasets on wildlife abundances and food supply to explore under what socioeconomic and geographic conditions changes in populations of hunted species are most likely to be related to changes in per capita food supply. I will present an update on my work in this talk.

**Acknowledgement:** Chancellor's Fellowship

**Title:** Social and environmental impacts of land use restrictions in Indigenous lands in Brazil

**Speaker:** Yifan (Flora) He

**Advisors:** Robert Heilmayr, Mark Buntaine

**Abstract:** Land governance by Indigenous communities is increasingly hailed as a solution to global environmental challenges such as biodiversity loss and climate change. Meanwhile, the land rights held by Indigenous communities often come with restrictions on how they manage and use the land. My proposed research aims to understand how such land use restrictions impact social and environmental outcomes for Indigenous communities in Brazil.

**Acknowledgement:** Arnhold Foundation

**Title:** This land is our land: County responses to losing autonomy over public land use

**Speaker:** Elliott Finn

**Advisor:** Sarah Anderson

**Abstract:** What explains the surprisingly intense resistance to Federal land policy decisions that have minimal economic or management implications in rural Western communities? I argue that the degree and extent of historical changes to local land management policy against the desires of communities who traditionally shaped federal land management agencies' policy explains contemporary resistance to the Federal government. The Bureau of Land Management's precursor and U.S. Forest Service regulated roughly 70% of the U.S.'s federal public lands as of the late 19th century. Both agencies initially privileged the use of public lands by rural communities according to local preferences, encouraging natural resource extraction, grazing, and public access. During the mid-20th century, new public land users emerged and pushed for increased restrictions on traditional public land use. Communities that had long shaped local land policy viewed these changes in agency policy and implementation as status threats because of elite framing and local organizing. Communities that historically experienced more status threats due to changes in federal land management policy are the most likely to both react strongly and negatively to Federal land management policy changes and to the Federal government today. I leverage exogenous variation in geographic characteristics associated with National Park and Monument designation and Wilderness Area Reviews to examine the effects of these land management changes on a county's likelihood of electing a constitutional sheriff between 1995 and 2015. In response to the perceived status threat of land management changes counties have elected Constitutional sheriffs who contend that federal and state authorities are subordinate to the local authority. I conduct a case study of Southern Utah counties to demonstrate the process through which federal land management changes shape communities' stances towards the Federal government. This research helps clarify that political attitudes in particular communities are functions of historical interactions with government institutions.

**Title:** The political economy of climate adaptation in Latin America and the Caribbean.

**Speaker:** Gabriela Alberola

**Advisor:** Mark Buntaine

**Abstract:** Is climate adaptation funding reaching those who need it the most? The UN Framework Convention on Climate Change establishes that priority in the allocation of international funds should be given to the most vulnerable developing countries. However, this broad prioritization goal raises questions about the way in which funds should be further prioritized at sub-national levels within countries. Because climate change risks are not distributed equally within countries, it is critical to ensure that climate adaptation funding is reaching the most vulnerable and not staying exclusively within the richer areas of recipient countries. This research follows the allocation of international climate adaptation funds to sub-national units within countries in Latin America and the Caribbean. The goal is to produce a map of hot and cold spots of international adaptation funding and to use this map to answer questions about equity, politics, and access to adaptation funding in municipalities in the region.

**Title:** Designing behavioral experiments to better understand cooperation in the use of natural resources

**Speaker:** Ignacia Rivera

**Advisor:** Steve Gaines

**Co-authors:** Stefan Gelcich, Carlos Rodriguez-Sickert, Ricardo Guzman

**Abstract:** Understanding cooperation in the use of natural common-pool resources is crucial to support sustainable development. Behavioral lab experiments use incentivized decision tasks to assess cooperation behaviors in such settings. If the research goal is to understand environmental outcomes and derive policy recommendations, behaviors displayed in the task should reflect users' behaviors in the field. Yet, previous studies comparing experimental results with outcomes in the field show mixed results. Identifying experimental designs that improve the ability of behavioral experiments to capture outcomes in the field is therefore needed. We ran a behavioral experiment with small-scale fishers in Chile that face a cooperation dilemma in their fishing activities. In the experiment, fishers played a game that recreated the cooperation dilemma they face in the field. We collected data on fishers' decisions regarding how much to comply with an extraction rule and whether to enforce it. We test how different design features including participants' field experience, the wording of the task, and the presence of peer enforcement interact to determine fishers' experimental behaviors and their ability to reflect outcomes in the field.

**Acknowledgement:** Latin American Fisheries Fellowship

**Title:** Advancing bipartisan decarbonization policies: Lessons from state-level successes and failures

**Speaker:** Renae Marshall

**Advisor:** Sarah Anderson

**Co-author:** Matthew Burgess

**Abstract:** U.S. political polarization is at a high point since the Civil War, and is a significant barrier to coordinated national action addressing climate change. To examine where common ground may exist, here we comprehensively review and characterize successes and failures of recent state-level decarbonization legislation, focusing especially on bipartisanship. We analyze 418 major state-government-enacted bills and 450 failed bills from 2015-2020, as well as the political contexts in which they were passed or defeated. We use bivariate analyses and regressions to explore correlations and partial correlations between the policy characteristics and political contexts of bills, and: their passage or failure, their bipartisanship, and vote shares they received. Key results include: (i) Nearly one third of these state-level decarbonization bills were passed by Republican-controlled governments. (ii) Bipartisan or Republican co-sponsors disproportionately passed financial incentives for renewable energy, and legislation that expands consumer or business choices in context of decarbonization goals; Democrat-only sponsors disproportionately passed bills that restricted consumer and business choice, such as mandatory Renewable Energy and Efficiency Portfolio Standards (REEPS) and emissions standards. (iii) Bipartisan bills were disproportionately proposed in 'divided' states, did not restrict consumer and business choice, had environmental justice components framed economically, and lacked environmental justice components framed either using academic social-justice jargon or non-neutrally with respect to immutable characteristics such as race. (iv) Bills that expand consumer or business choice were disproportionately enacted. Though climate change is a polarized issue, our results provide tangible insights for future bipartisan successes.

**Title:** Impacts of a Chilean payments for native reforestation

**Speaker:** Alberto Garcia

**Advisor:** Robert Heilmayr

**Abstract:** Widespread reforestation has become an important part of global efforts to address the intertwined challenges posed by climate change, biodiversity loss, and rural poverty. In response to concerns that plantations of exotic species may undermine objectives of increased carbon storage, biodiversity, and community involvement, some policies have sought to reforest with native species. We evaluate land cover impacts of a Chilean federal program that pays landowners to reforest their property with native species and prioritizes program co-benefits such as the engagement of smallholders, indigenous peoples, and rural communities. Panel data for program beneficiaries and comparable unawarded properties allow us to control for fixed differences and time trends affecting both groups using difference-in-differences methods that avoid concerns surrounding heterogeneous treatment effects. We find that the program increased vegetation cover on the properties of both smallholders and larger landowners, however, program compliance was rather low. Whether a program's targeting strategy enhances or undermines carbon benefits depends on the underlying correlation between prioritized characteristics and both non-compliance and landowners' costs of providing those benefits. In this context, we find that while prioritized groups provided additional forest cover benefits, they also suffered from the highest levels of non-compliance, undermining true win-wins.

**Title:** United Nations Peacekeeping and natural resource concessions in post-war Liberia.

**Speaker:** Patrick Hunnicutt

**Advisor:** Mark Buntaine

**Abstract:** Attracting foreign direct investment (FDI) to post-conflict states is difficult. After conflict ends, the state and its agents can struggle to perfectly enforce the institutions which otherwise shield investors from expropriation, extortion, and violence. Reflecting this governance problem, this article presents new theory linking United Nations (UN) peacekeeping personnel to FDI at the local level. Contemporary UN peacekeeping missions function as de-facto rating agencies who monitor and respond to the same political risks that shape firms' investment decisions. I specifically argue that UN peacekeeping police encourage FDI because they signal to firms where local protections against expropriation are credible, whereas UN peacekeeping troops discourage FDI because they signal where local security conditions are poor. Data from post-conflict Liberia's extractive sector support my argument. While UN troops are associated with a marginal reduction in extractive sector investment, UN police encourage additional extractive sector investment, particularly in areas where the rule of law is weak.



**Title:** The political economy of crop fires in South Asia

**Speaker:** Fatiq Nadeem

**Advisor:** Kelsey Jack

**Co-authors:** Saad Gulzar, Gemma Dipoppa

**Abstract:** Air pollution from crop residue burning is a leading cause of mortality in developing countries. While governments have adopted legislation preventing it, this practice remains widespread, suggesting that its continuation depends on the level of scrutiny that politicians and bureaucrats devote to prevent it. We study the political economy foundations of fighting crop burning as well as the impacts this practice has on health outcomes. We test if politicians and bureaucrats strategically tolerate crop burning when the cost of doing so is largely borne by other jurisdictions. Using detailed spatial data on administrative and political jurisdictions, fire occurrence, and wind direction in India and Pakistan, we show that fires are more likely to occur at the border with other jurisdictions and in periods when winds blow the smoke towards the neighbors. Free riding on air pollution can disproportionately harm peripheral communities, who tend to be already more deprived economically. Our findings have important policy implications for the reduction of air pollution and of social inequalities in access to clean air.

**Title:** Combatting household air pollution with clean energy sources

**Speaker:** Flavio Ariza Malagutti

**Advisor:** Kelsey Jack

**Co-authors:** Kelsey Jack, Darby Jack, Kwaku Poku Asante

**Abstract:** Approximately 3 billion people around the world rely on traditional fuels (wood, kerosene, animal and crop waste, and coal) for cooking, resulting in millions of premature deaths each year, unsustainable drawdown of forest resources, and climate warming emissions (primarily CO<sub>2</sub> and black carbon). In Ghana, air pollution from cooking ranks as the second-highest risk factor of death and disability (GBD 2010). In a recent nationally representative survey conducted by our team, we learned that currently 80% of the Ghanaian population cooks primarily with these polluting fuels. The burden of traditional fuels falls heavily on women and children, who both gather the firewood in rural areas and cook in an enclosed area where they are exposed to harmful emissions. In Ghana, the primary alternative to traditional biomass fuels is LPG. Barriers to adoption and sustained use of LPG include cost of the stove and fuel, distance to suppliers, the need to purchase LPG in bulk, and high supply costs to rural areas. In spite of ambitious policy goals targeting LPG use and numerous programs to increase adoption, dependence on traditional fuels remains high, particularly in rural and peri-urban areas. We are currently working with private and governmental actors to assess households' energy needs and understand their behavior around energy consumption, with the goal of incentivizing their transition to using cleaner, more sustainable fuels.

# **The 2022 Bren PhD Student Symposium Committee**

Gabriela Alberola

Allie Caughman

Nākoa Farrant

Leonardo Feitosa

Flora He

Patrick Hunnicutt (co-chair)

Ignacia Rivera (co-chair)

Sandy Sum

Aleah Van Woert