



**SOUTHWEST
CLIMATE ADAPTATION
SCIENCE CENTER**

2018 Highlights

As the Southwest Climate Adaptation Science Center (SW CASC) begins Phase 2, the University of Arizona and consortium partners will add to existing strengths begun in 2011, in close collaboration with USGS leadership.

Current partners are Colorado State University, Desert Research Institute, Scripps Institution of Oceanography at University of California, San Diego, University of California, Davis, University of California, Los Angeles and Utah State University, expanding the core research team to fourteen investigators. They will contribute to our Phase 1 strengths in climate science, ecology, and social science with additional expertise in fire science, program evaluation, hydrology and water management, coastal ecosystem science, aquatic ecology, education in collaborative methods and Native American Studies.

New SW CASC focal components and structures

- Create cross-institutional teams to integrate expertise across four research themes (coastal ecosystems, terrestrial ecosystems, hydrology and water management, and extreme events)
- Integrate collaborative research and actionable science principles and practices with capacity building, engagement with indigenous peoples, and communication
- Develop a Natural Resources Workforce Development (NRWD) Fellowship initiative to build the skills of graduate students and postdoctoral researchers in engaging resource managers to discern adaptation science needs. SW CASC aims to enroll at least one Fellow per year from a tribal community.
- Engage directly with practitioners and decision-makers, and elicit research questions through input from Southwest regional natural resource managers
- Employ rigorous evaluation methods to improve scientific results and production of actionable science

30
GRADUATE STUDENTS



23
CONFERENCE TALKS/
PRESENTATIONS



37
PEER-REVIEWED PUBLICATIONS



22
STAKEHOLDER OUTREACH
& ENGAGEMENT ACTIVITIES



15
RESOURCE TOOLS
PRODUCED



The Southwest Climate Adaptation Science Center (SW CASC) provides objective scientific information, tools, and techniques that land, water, wildlife, and cultural resource managers and other interested parties can apply to anticipate, monitor, and adapt to climate change impacts in the southwestern United States.

RESEARCH THEMES

Coastal ecosystems



Terrestrial ecosystems



Hydrology and water management



Climate extremes



SCIENCE PRIORITIES

Consequences of changing precipitation patterns and extremes

The highly variable precipitation regimes of the Southwest influence key ecological and hydrological processes and outcomes. Understanding the ecological, hydrological, and societal consequences of precipitation extremes will aid resource managers in preparing the region for a future that will likely include changes in the frequency, intensity, and seasonality of precipitation.

Interactions of temperature extremes and precipitation variability

Elevated temperatures have non-linear effects on evaporation and transpiration, and hence can amplify ecological and hydrological effects of precipitation deficits. Higher average and extreme temperatures are projected for much of the Southwest in coming decades. Given the precipitation variability of the region, it is important to understand how temperature extremes are likely to interact with precipitation variability to influence water resources and ecological systems.

Managing in the aftermath of landscape-scale disturbances

Climatic, hydrological, and ecological processes, in the aftermath of landscape-scale disturbances, may determine habitat and landscape configurations that can persist for decades or more. A broad range of observational, experimental, and modeling studies, such as experiments utilizing recent and ongoing disturbances and the application of new and existing tools, can identify alternative scenarios of landscape revegetation and inform management decisions and actions.

Management of upper watersheds and downstream water resources

In the Colorado and San Joaquin/Sacramento River systems, as well as most snow-fed river systems of the Southwest, water captured as winter snowpack is delivered to rivers and reservoirs for agricultural and domestic use. Management decisions in upper basins influence delivery via groundwater and surface streams to the lower basins, and conversely management practices in lower basins can affect water storage and delivery from upper basins. Better understanding of the linkages between headwaters and downstream flows, and between management decisions and water delivery, will improve drought resilience and water and ecosystem management.

SCIENCE SNAPSHOTS

For a comprehensive summary of the Southwest CASC science projects: <https://casc.usgs.gov/projects/#/casc/southwest>.

EFFECTS OF SEA-LEVEL RISE AND EXTREME STORMS ON CALIFORNIA COASTAL HABITATS: PART 2

Coastal wetlands provide wildlife habitat, coastal protection from storms, sequester carbon, and improve water quality. Coastal ecosystems are complex, and their characteristics vary from site to site, making information from regional and global studies difficult to apply to local decision-making. This project provides site-specific information on several coastal ecosystems that managers can consult to assess vulnerability to climate change and develop adaptation strategies. Managers can prioritize management action to maintain these benefits by using information relevant to their specific coastal ecosystem.

Highlighted Results

- Nine peer-reviewed publications
- Climate change will affect the functioning of coastal ecosystems through multiple physical and biological pathways.
- Sea-level rise is likely to reduce vegetated areas in tidal marshes. If no major adaptation actions are implemented, then salt marsh-dependent wildlife may become extinct in the majority of California coastal zones by 2100, based on assumptions of high sea-level rise.

Investigators

Glen MacDonald and Rich Ambrose, University of California, Los Angeles
Karen Thorne, USGS

[Link to Science Base: https://www.sciencebase.gov/catalog/item/52c5bc4be4b05415ea491452](https://www.sciencebase.gov/catalog/item/52c5bc4be4b05415ea491452)

[Link to Project Page: https://casc.usgs.gov/projects/#/project/4f8c6580e4b0546c0c397b4e/52c5bc4be4b05415ea491452](https://casc.usgs.gov/projects/#/project/4f8c6580e4b0546c0c397b4e/52c5bc4be4b05415ea491452)



DEVELOPMENT, DELIVERY, AND APPLICATION OF DATA ON CLIMATE EXTREMES FOR THE SOUTHWESTERN UNITED STATES

Extreme climate can have substantial effects on species, ecological and evolutionary processes, and the health of visitors to public lands. This project aimed to improve the scientific capacity to estimate climate extremes, evaluate their effects on natural resources, and enhance development of and access to customized climate information for the Southwest region.

Highlighted Results

- Ten peer-reviewed publications
- Atmospheric rivers (ARs), which strongly affect precipitation along the Pacific coast and inland, will become wetter as temperatures continue to increase. These changes will likely affect hazards such as floods and debris flows.
- The percentage of precipitation falling as snow has decreased in the past decade in the northern Sierra Nevada, and continued regional ocean warming will likely lead to further decreases. Researchers collaborated with the USDA-Forest Service, to inform USDA-FS management planning, and with a nonprofit organization focused on preserving winter-season recreational activities.
- Across the southwestern U.S., heat waves are likely to become more humid. Greater humidity will increase nighttime temperatures, which will increase stress on vegetation and humans.

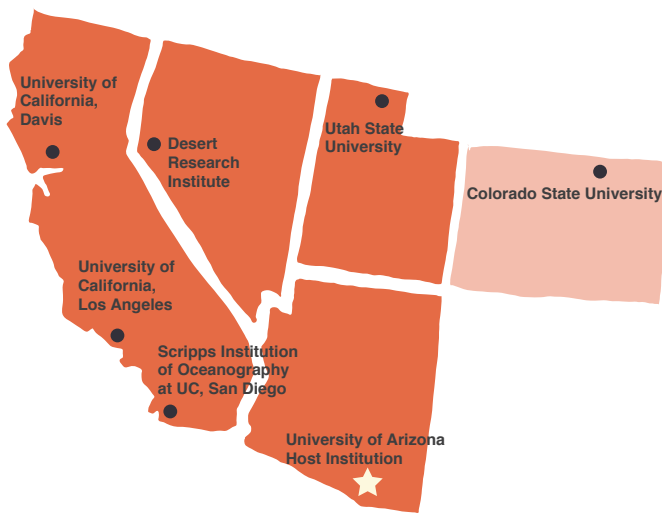
Principal Investigator: Erica Fleishman, University of California, Davis and Colorado State University

Co-Investigators: Dan Cayan and Alexander Gershunov of the Scripps Institution of Oceanography at University of California, San Diego, and Kelly Redmond and Tamara Wall of the Desert Research Institute

Link to Science Base: <https://www.sciencebase.gov/catalog/item/54134768e4b0239f1986bc1c>

Link to Project Page: <https://casc.usgs.gov/projects/#/project/4f8c6580e4b0546c0c397b4e/54134768e4b0239f1986bc1c>





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