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Issue 7 of the Southwest Climate Hub Newsletter

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## What's Happening at The Hub:

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### USDA Announces Building Blocks for Climate-Smart Agriculture

Farmers, ranchers, and forest land owners are about to receive more support from the USDA to help cope with climate change, as stated in a [recent release and fact sheet](#). Through these voluntary programs and initiatives, the USDA expects to reduce net emissions and enhance carbon sequestration by over **120 million metric tons of CO<sub>2</sub>** equivalent per year by 2025.

There are [10 climate smart building blocks](#) that will guide the USDA's strategy. They include soil health, nitrogen stewardship, livestock partnerships, conservation of sensitive lands, grazing and pasture lands, private forest growth and retention, stewardship of federal forests, promotion of wood products, urban forests, and



### UPCOMING EVENTS

#### National Adaptation Forum

**May 12 - 14, 2015**

St. Louis, MO

→ [Find out more](#)

#### Using Case Studies to Facilitate Farmer Conservation Decisions (Webinar)

**May 14, 2015 at 2pm EDT**

→ [Find out more](#)

#### Identifying Adaptation Strategies

**May 20 - 21, 2015**

San Bernardino, CA

→ [Find out more](#)

#### European Space Agency Massive Open Online Course: Monitoring Climate from Space

**Starts June 8, 2015**

Course is online, 3 Hrs/Wk

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### Adaptation Tools Database

The SE Climate Hub is leading a national effort across all Hubs to develop an [online database of climate adaptation tools](#). The intention of this database is to inventory tools across the country that can assist in climate change adaptation on working lands (agriculture, forestry, grazing land, and livestock), and to present these tools to the public in a searchable, user-friendly format. The database includes tools that are directly relevant to climate change, as well as tools that assist in managing factors that interact with climate change, such as drought, pests, and extreme weather. The target audience is extension and consultants, but the database could also be useful for land managers, land owners, and researchers. There are now more than 100 tools in the database and we continue efforts to make the database comprehensive. As such, there is a “suggest a tool” option for anyone who works with tools not yet in the database.

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### 13th Annual Climate Prediction Applications Science Workshop (CPASW)

The annual CPASW was originated in 2002 by NOAA National Weather Service Climate Services Division with the purpose of bringing together researchers, climate product producers and users to share developments in research and applications related to the use of climate predictions in societal decision-making. The three day workshop was co-hosted by NOAA National Weather Service Climate Services Division, New Mexico State University, and USDA Southwest Regional Climate Hub in Las Cruces, New Mexico, on March 24th-26th. During this workshop, NOAA discussed the [U.S. Climate Resilience Toolkit](#) which was developed back in 2014 with the partnerships of federal agencies and organizations. By providing scientific tools, information, and expertise, the Climate Resilience Toolkit was designed to help people manage their climate related risks and opportunities, and improve their resilience to extreme events.

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### US Drought Monitor Forum Calls for More Input on Drought Impacts

On April 14-16, the authors of the *US Drought Monitor* – a [weekly map of drought conditions in the US](#) – held a workshop at Reno’s Desert Research Institute to discuss how to make the Drought Monitor more accurate and relevant to land users. The Drought Monitor map is primarily drawn using meteorological and hydrological variables but is fine-tuned according to reported impacts such as rangeland condition, ecosystem health, well levels, and crop stress. The Drought Monitor authors are seeking more such reports from the West, especially from California and Nevada. If interested in participating, contact [Cindy Matthews](#) at NWS

from Space

[Week 2 & 3:](#)

Earth Observations

Techniques and Technology

[Week 4:](#)

Earth Observations in Action

[Week 5:](#)

Managing Earth Observation Data

→ [Find out more](#)

### Indicators of Climate Change in California

**June 16 - 17, 2015**

Sacramento, CA

→ [Find out more](#)

### Climate Change Adaptation Planning

**June 16 - 18, 2015**

Bishop, CA

→ [Find out more](#)



MEET OUR PARTNERS

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In her keynote address, Ann Mills, USDA Deputy Undersecretary for Natural Resources and Environment, called for drought information to focus more on user needs as part of a two-way conversation. Other prominent topics included the importance of “snow drought” in the Western US, where snowpack is a crucial part of our water supply (made more urgent by the fact that California’s 2015 snowpack is the lowest on record); the ongoing difficulties in producing accurate medium-term forecasts (weeks to months) even though such forecasts are highly desired by land users; and the rise of social media in shaping how land users and the public understand drought conditions.

For more information, visit:

→ [United States Drought Monitor](#)

→ [Drought Monitor Forum](#)

### Liko Nā Pilina – The Hybrid Ecosystems Project

Native Hawaiian forest species are exposed to both climate change and competition for resources with invasive species. Decimated by human activities over centuries, lowland wet forest in Hawai’i is at risk of disappearing altogether. Reducing the impact of invasive species is one step towards restoring these forests and building their resilience to climate change. A research team led by scientists from the University of Hawai’i at Hilo, the USFS Institute of Pacific Islands Forestry and Stanford University are using an innovative technique to restore degraded lowland wet forest at the Keaukaha Military Reservation in Hilo. Instead of trying to restore the forest to its historic composition by removing the invasive species and replanting with natives, these researchers are replanting both native and non- native/non-invasive species. The rationale comes from “functional trait theory” where species are selected for restoration because they have certain functional traits that can positively influence ecosystem services as a whole. One of the goals was to build invasion-resistance into the lowland wet forest by incorporating a greater diversity of functional trait expression. A second dimension to the project lies in the selection of culturally significant non-natives for replanting. In combining contemporary and traditional forest management the Liko Nā Pilina project attracted considerable public interest and is a great example of successful engagement between a local community and scientists. An early view of the research article “*Using plant functional traits to restore Hawaiian rainforests*” by Ostertag, Warman, Cordell, and Vitousek is available from [Wiley Online Library](#). A [short video](#) describing the work is available at the *Journal of Applied Ecology* blog.

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### Cotton in the Southwestern United States

Both upland and pima cotton are grown in the Southwest. While cotton is grown only in 20% of Southwestern counties, it represents the second most lucrative regional field crop (\$924M in 2012). In the Southwest region, cotton is grown in portions of Arizona,

Jeanne Chambers, USFS

Kris Havstad, ARS

Shaun McKinney, NRCS



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## RECENT RESEARCH

## Recent Research

### Projections of Contemporary and Future Climate Niche for Wyoming Big Sagebrush

[Big sagebrush](#) (*Artemisia tridentata*) is one of the most widespread and abundant plant species in western North America. This species occupies an extremely wide ecological niche ranging from the semi-arid basins to the subalpine. In cases of wide-ranging species with multiple subspecies, it can be more practical from the scientific and management perspective to assess the climate profiles at the subspecies level. Bioclimatic model efforts focused on subspecies *wyomingensis*, which is the most widespread and abundant of the subspecies and critical habitat to wildlife. Using absence points from species with allopatric ranges to *wyomingensis* and randomly sampled points from specific ecoregions, we modeled the climatic niche for *wyomingensis* using a multiple-regression tree approach for contemporary and future climates. The results indicate:

- A predicted 39% loss of suitable climate between contemporary and decade 2050 models.
- Predicted suitable climate niche loss will largely occur in the Great Basin where impacts from increasing fire frequency and encroaching weeds have been eroding the *A. tridentata* landscape dominance and ecological functions.
- Predicted suitable climate niche persistence and expansion will largely occur in higher elevations and latitudes.

For further reading, [click here](#).

### Updates to Extension's Role in Disseminating Climate Change Information to Farmers and Ranchers

A May 2015 [article in \*Climatic Change\*](#) highlights the role of U.S. Cooperative Extension Service in working with farmers and ranchers. Authors use survey results from both agricultural producers and cooperative extension agents. Surveys (conducted in the Midwest and Northeast) indicate that in the region, farmers and ranchers are more likely to seek advice from private retailers and consultants than extension. Authors report that a majority of extension educators believe climate change is occurring and that they should help farmers prepare. Because private agricultural advisors trust extension as a source of information about climate change, and farmers seek information from private agricultural advisors, working through advisors is the recommended way to ultimately reach farmers with climate change information. Extension educators must be better informed and trained about climate change.



## Education



## Communications



The following are external tools & resources, not affiliated with the SW Hub.

- [Weekly Water and Climate Update](#)
- [Public Policy Institute of California \(PPIC\) Drought Video](#)



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## Enhanced Precipitation Variability Effects on Water Losses and Ecosystem Functioning Response of Arid and Mesic Regions

This study by Osvaldo, Gherardi, and Peters seeks to explore the consequences of [increased precipitation variability due to climate change](#) on functioning ecosystems and their ability to provide ecosystem services. The authors simulated water losses and soil-water availability at 35 grassland locations in the Central U.S. using a process-based ecosystem model. The model simulated under four levels of precipitation variability and six temporal scales. Results show that the scale of temporal variability has a larger effect on the availability of soil-water than the magnitude of variability, and that the inter- and multi-annual variability each had larger effects than intra-annual variability. It also shows that the effect of precipitation variability was modulated by mean annual precipitation. Locations receiving less than around 380 mm yr<sup>-1</sup> (arid-semiarid) mean annual precipitation show increases in water availability while locations receiving more than 380 mm yr<sup>-1</sup> (more mesic) show a decrease in water availability in the soil. The beneficial effects of enhanced precipitation variability in arid-semiarid locations were the result of a deepening of the soil-water availability profile and reduction in bare soil evaporation.

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## Sustainable Small-Scale Agriculture in Semi-Arid Environments

This study done by Spielmann et al., published in 2011, used archaeological and paleoclimatic records in two regions of the American Southwest, spanning from A.D. 900-1600, to explore the nature of variation in the availability of water for crops, and strategies that enhanced the resilience of prehistoric agriculture to climatic variation. These strategies, historically, helped small-scale farmers to reduce their vulnerability shortfalls in their food supplies. Based on the results of the study, the authors suggest that the risk coping and mitigation strategies that have been in use for millennia have relevance to the enhancement of contemporary agricultural producers to environmental changes.

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## Understanding Farmer Perspectives on Climate Change Adaptation and Mitigation: The Roles of Trust in Sources of Climate Information, Climate Change Beliefs, and Perceived Risk

This study by Arbuckle, Morton, and Hobbs, published in January 2015, examined the relationships between Iowa farmers' trust in agricultural and environmental interest groups as sources of climate information, climate change beliefs, perceived climate risks to agriculture, and support for adaptation and mitigation responses. The results of the survey conducted by the authors found that producers' beliefs varied with trust, and beliefs, in turn, had a direct

- [Yale Opinion Climate Map](#)
- [SMAP Mission Site](#)
- [The California Drought](#)
- [Climate Science Library](#)
- [U.S. Climate Resilience Toolkit](#)
- [Global Climate Change by NASA](#)
- [California Climate Data Archive](#)
- [Rangelands West](#)
- [Tech Resources Pledged to Support Climate Data Initiative](#)
- [California Climate & Agriculture Network](#)
- [Climate Adaptation Knowledge Exchange \(CAKEx\)](#)
- [NCA Videos](#)
- [NCA Impacts - SW](#)
- [NCA Impacts - Hawaii](#)
- [NCA Impacts - Ag](#)
- [Data.gov Food Resilience Theme Datasets](#)
- [Climate.gov NCA Teaching Resources](#)
- [COMET Climate Variability and Change Course Material](#)
- [Climate Change Resource Center](#)

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greenhouse gas (GHG) reduction were mainly associated with variation in beliefs. The survey showed that most farmers were supportive of adaptation responses, but few supported GHG reduction. This suggests that “outreach should focus on interventions that have adaptive and mitigative properties.”

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## RECENT NEWS

### Coronado National Forest Announces Proposal to Establish a Research Natural Area Dedicated to Studying Climate Change

*Submitted by Jennifer Ruyle, Natural Resource and Planning Staff Officer, Coronado National Forest. Email: [jruyle@fs.fed.us](mailto:jruyle@fs.fed.us).*

The Coronado National Forest (CNF) is on the verge of establishing a new Research Natural Area (RNA) dedicated to the study of climate change. The Forest Service RNA network protects some of the finest examples of natural ecosystems for the purposes of scientific study, education and for maintenance of biological diversity. The unique opportunity to designate a RNA for the purpose of studying climate change came about as part of the process to revise the CNF Land and Resource Management Plan. The proposed Finger Rock Canyon RNA covers 1,103 acres and includes an entire drainage that is representative of deeply-incised south-facing canyons in the sky island region of southeast Arizona. The plant communities represented have affinities with Madrean, Cordilleran, Sonoran, Californian, and Intermountain floristic provinces, making this region one of the most diverse floristic parts of the country.

The main objective of the Finger Rock Canyon RNA is to build upon decades of flora and fauna inventories and phenological observations in an area of very high biodiversity. Incredible research potential exists for analysis and expansion of this extensive long-term multi-taxa record spanning an elevation gradient. The RNA is an ideal outdoor laboratory for increasing understanding of natural ecological processes and change along a diverse elevation gradient. With significant baseline data, the RNA can facilitate measurement of short- and long-term ecological changes in response to climate change. The area could also serve as a reference for monitoring resource management techniques and practices (e.g., eradication of invasive, non-native species; determining monitoring protocols to assess biological diversity and ecosystem condition, etc.). Designation of this RNA is highly consistent with the Forest Service’s climate change framework: this special management area can both encourage and direct research efforts, focus efforts to facilitate adaptation, provide opportunities for public education, and enable CNF to expand existing partnerships and to develop new ones.

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### REQUEST FOR SUBMISSIONS

Do you have a newly published article you would like to share in the Southwest Climate Hub newsletter?

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*Many thanks to those who have provided material for this edition!*

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According to a [recent report](#) released by the UN, residents of countries around the world could suffer a [40% shortfall in water availability](#) unless water usage trends undergo a dramatic change. As the world's population continues to grow and precipitation patterns become more erratic, the availability of water, primarily groundwater for urban and agricultural use, will decrease while the demand for water will increase.

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### California Drought: Sierra Nevada Snowpack Hits Historic Low

Snowpack in California's Sierra Nevada range hit an [unprecedented low](#) in March, falling below the historic lows for both 1977 and 2014. The effects of this [smaller-than-normal amount of snowpack](#) will reach farther than just the ski slopes, as the snowpack in a normal year provides roughly 30% of the water that California uses during the summer and fall.

### California Governor Orders 25% Reduction in Water Usage Statewide

Jerry Brown, governor of California, ordered the [first statewide mandatory water restrictions](#) on April 1st, calling for a 25% reduction in water usage in communities statewide. This order comes as a response to the [devastating drought](#) that has been plaguing the state for several years. These restrictions, which come as California reports record low snowpack levels, "would save some 1.5 million acre-feet of water over the next nine months."

### Bark Beetles Ravaging Drought-Stricken Forests in California

Thousands of acres of trees in private and public lands, in national parks, wilderness areas, and managed forests alike in Southern California are being [ravaged by hordes of bark beetles](#). The epidemic is a result of trees being drought-stressed and weakened.

### National Institute of Food and Agriculture Awards Funds for Water and Agriculture Research

Four universities in the southwestern region have recently been awarded grants to support critical water problems in agriculture and rural watersheds across the United States. These grants were awarded through the National Institute of Food and Agriculture (NIFA)'s Agriculture and Food Research Initiative (AFRI) Water for Agriculture challenge area and the National Integrated Water Quality Program.

*University of California, Riverside, CA*

UCR's project aims to develop a decision-support model that will facilitate decision making pertaining to choices in technology regarding agricultural drainage water (ADW) and treated wastewater (TWW), as well as increase understanding of technology use implications.

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research and participatory engagement with American Indians to assess the impacts of climate change on future water supplies, evaluate and prioritize actions to enhance the climate resiliency of tribal agriculture, and identify barriers and solutions to changing practices.”

*University of Texas at El Paso, El Paso, TX*

The CAP at UTEP, aims to provide stakeholders and water resource professionals with dynamic systems models that illustrate climate scenarios and their impacts, and to train stakeholders and professionals with these systems.

*Utah State University, Logan, UT*

USU's project aims to decrease knowledge gaps and facilitate interaction between water researchers, agency representatives, and other stakeholders, and to distribute information about the necessary tools for water managers to address these challenges.

For more information on the grants, or to read about projects by universities outside the southwest, [click here](#).

### **Mighty Rio Grande Now a Trickle Under Siege**

After more than a decade of increasing temperatures and decreasing snow pack, an already scarce resource has become even more important to farmers and cities alike along the upper Rio Grande. This has led to, among other hardships, a [Supreme Court case between New Mexico and Texas](#) over water rights.

### **Yale Climate Opinion Maps**

While 63% of Americans believe climate change is occurring, this belief is not uniform across the country. [View public opinion on topics related to climate change](#), based on congressional district, State, and at a national level.

### **Dollars and Drops Per California Crop**

When it comes to water, California's irrigated agriculture is always under the public magnifying glass because it is the largest managed water use in the state and the economic base for many rural areas. Here is a [table examining the crops that use the most water](#) and which crops provide the most "pop per drop."

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