



### PURPOSE

The Climate Hubs reduce climate related risks to agriculture, forestry, and rural communities by working with and through USDA agencies and partners. The hubs develop and deliver science-driven strategies and tools so that USDA programs, advisors, and land managers can make informed decisions to manage risk.

### ASSESSMENTS & SYNTHESSES

**Northwest: A suitability mode mapped the almond cultivation's thermal niche.** California's Central Valley remains thermally suitable for almond cultivation through mid-21st century. Opportunities for expansion appear in the Willamette Valley of western Oregon, which is currently limited by insufficient heat accumulation. By mid-21st century, almond phenology in California showed ~ 2 week delay in chill accumulation and 1-2 week advance in bloom and harvest. Although restrictions to almond cultivation exist, these results highlight opportunities for shifts in the geography, which may influence growers' long-term land use decisions, and shape regional water and agricultural industry discussions regarding options for adapting to climate change.

**Caribbean: Held listening session with agriculture and forestry leaders in Puerto Rico and USVI** to engage partners in the upcoming assessments by the Caribbean Hub. The assessment is designed to understand the effects of Hurricanes Irma and Maria, vulnerabilities and costs associated with hurricanes and discover practices that best reduced risk. Submitted proposal-request for support for the assessment work to the Office of the Chief Economist and was accepted, working on interagency agreement. Submitted information collection application to the Office of Budget and Management. Fellow is investigating agricultural losses due to extreme events (drought, hurricanes) and USDA programs effects on climate risks mitigation in the Caribbean.

**Northeast: Published two new studies highlighting climate vulnerabilities and opportunities for farmers in the northeastern US.** "Climate change effects on livestock in the Northeast US and strategies for adaptation" by Alexander Hristov and others focuses on concerns related to manure management given the increasing intensity of rainfall expected. Additionally the concern of increased disease and disease vectors (ticks, mosquitos) is addressed. "Unique challenges and opportunities for northeastern US crop production in a changing climate" by David Wolfe and others finds that water management will be a serious future challenge for Northeast farmers.

**Southwest: Published a paper that included a county-level analysis of eight field crops to show that increased temperatures in the Southwestern USA will affect future crop production via multiple pathways.** By midcentury, cropland area thermally suitable for maize cultivation is projected to decrease, while area suitable for cotton cultivation expands northward and nearly doubles in extent. However, yields from both crops are projected to decrease, compared to potential yield. An empirical model using future temperature, total crop area and crop sensitivity is used to determine viable locations where field crops may be established under future thermal regimes. However, these locations are already occupied by high value specialty crops.

**Southeast Director authored or co-authored three manuscripts examining the effects of climate change on natural resources.** McNulty et al. showed that forest floor processes in spruce-fir ecosystems were slow to return to pre-treatment levels following long-term nitrogen fertilization, and regeneration into the next century seems unlikely despite recent region-wide growth increases. Duan et al. showed how changing climatic drivers would influence runoff across the conterminous US.

## OUTREACH & EDUCATION

**Midwest:** Conducted outreach to specialty crop and other producers to deliver and determine climate needs and how best to serve their needs. In conjunction with the Midwest Regional Climate Center hub staff served a booth at the Great Lakes Expo. They found producers are concerned with climate change impacts including extreme precipitation and pests. The best way to communicate with them was through workshops and 1-page articles. This work aligns with the NDMC-MRCC partnership on specialty crops.

**Northern Plains:** Hosted an interactive booth at the joint meeting of the Wyoming Stock Growers Association & Wyoming Association of Conservation Districts, and at the South Dakota Stock Growers annual convention. In South Dakota, the NPCH had one-on-one conversations with ~30 cattle producers regarding CoCoRaHS and NWS COOP stations near their operation & opportunities to volunteer for these programs to reduce gaps in the network; how to provide input to the Drought Monitor through the Drought Impact Reporter; and where to find NOAA's 8-14 day forecast via the High Plains Climate Dashboard. The booth in WY transferred similar information to producers and conservation district members.

**Northeast:** Co-hosted and led a collaborative cross-border workshop with 47 US/Canada participants. The workshop focus was "Adaptation to Climate Change: Information and Tools for Decision-Making" via three key themes: 1) Addressing Extreme Weather Events, 2) Climate Change, Pests and Diseases, and 3) Weather & Climate Decision Support Tools. The presenters provided thought-provoking data, which stimulated discussions. The meeting resulted in collaborative project ideas with identified future steps for implementation. Proceedings synthesize the content of the workshop, highlight the project ideas that emerged, and lay out a plan to proceed with mutually beneficial cross-border collaborations.

## TECHNICAL SUPPORT

**California:** Presented to Governors tree mortality task force and ongoing participation in the forest health and resilience working group monthly meetings. Supporting information exchange related to efforts to address tree mortality situation and coordinate response and research.

**Caribbean:** Assisted the Forest Service Forest Health Program in the collection of spatial data and on the creation of web based maps for data collection. Assisted the National Drought Mitigation Center with the revision and translation of the USDM Spanish brochure. Provided an entry-level job opportunity to two students through the Juvempleo Program to engage in research and outreach experiences, under the supervision of the Caribbean Hub Fellow and the Coordinator.

**Midwest:** In cooperation with ARS Air Quality National Program, the MCH coordinated purchase of equipment to help create a regional inversion monitoring system in cooperation with the Midwest Mesonet Consortium. Installation of equipment will create the first regional effort at inversion monitoring to help reduce potential drift issues. Planning for a regional science workshop on dicamba is ongoing to help connect drift and monitoring communities to help reduce drift issues.

**California:** Co-coordinated and led CDFCA California - The Netherlands Webinar on Climate Smart Agriculture: Alternative Manure Management. This effort led to a recorded and publically available Webinar on alternative manure management approaches.

**Southern Plains:** Director David Brown co-hosted a Technical Workshop on Drought and Seasonal Forecasting Tools on December 6, 2017 in Austin TX. A follow up training in early 2018 may be organized for interests in northeast Texas and southeast Oklahoma as drought conditions warrant.

**Southeast:** Worked with partners to expand tools to help resource managers make climate-informed decisions. The State Climate Office of NC released an improved version of the Fire Weather Intelligence Portal, a real-time monitoring tool for weather and fire risk information. This new version expands the portal from NC to the 13-state US Forest Service southern region, and includes user-requested databases and parameters, and a mobile-friendly design. The University of FL's AgroClimate group expanded their Chill Hours Calculator for use across the southeast US.

**Northern Forests:** Partnered on applied research that will further our understanding of management options for climate change adaptation at Second College Grant owned and managed by Dartmouth College, NH. This research is part of the Adaptive Silviculture for Climate Change (ASCC) project that collaborates with scientists and land managers to develop experimental silvicultural trials across the United States. Initiated last fall the project began pre-treatment data collection, and is planning summer timber harvests to implement forest management treatments demonstrating the three adaptation options of resistance, resilience, and transition.