USDA California Climate Hub: Activities and Future Directions

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CA-NV DEWS North Central Coast
Drought and Climate Outlook
11 Oct 2016

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The basic challenge and our solution

Climate research

Climatic Change
DOI 10.1007/s10584-007-9367-8

Accumulated winter chill is decreasing in the fruit growing regions of California

Dennis Baldocchi · Simon Wong

Received: 2 August 2006 / Accepted: 5 O
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PLoS one

Climatic Changes Lead to Declining Winter Chill for Fruit and Nut Trees in California during 1950–2099

Eike Luedeling[1,2]*, Minghua Zhang[1]*, Evan H. Girvetz[3]

Climatic Change (2011) 109 (Suppl 1):S317–S333
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California perennial crops in a changing climate

David B. Lobell · Christopher B. Field

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Abstract Perennial crops are among the most valuable of California's diverse agricultural products. They are also potentially the most influenced by information on future climate, since individual plants are commonly grown for more than 30 years. This study evaluated the impacts of future climate changes on the 20 most valuable perennial crops in California, using a combination of statistical crop models and downscaled climate model projections. County records on crop harvests and weather from 1980 to 2005 were used to evaluate the influence of weather on yields, with a series of cross-validation and sensitivity tests used to evaluate the robustness of perceived effects. In the end, only four models appear to have a clear weather response based on historical data, with another four presenting significant but less robust relationships. Projecting impacts of climate trends to 2050 using historical relationships reveals that cherries are the only crop unambiguously threatened by warming, with no crops clearly benefiting from warming. Another robust result is that almond yields will be harmed by winter warming, although this effect may be counteracted by beneficial warming in spring and summer. Overall, the study has advanced understanding of climate impacts on California agriculture and has highlighted the importance of measuring and tracking uncertainties due to the difficulty of uncovering crop-climate relationships.

1 Introduction

Agriculture is an important component of California's economy, landscape, and culture, and is among the human activities most vulnerable to impending climate changes. Two particularly unique and relevant features of agriculture in California are (1) the diversity of crops grown, with California the leading U.S. producer of over 80 crops, and (2) the substantial fraction of agricultural value (roughly one-third

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Intermediate/translational organizations such as the USDA Climate Hubs

Producers

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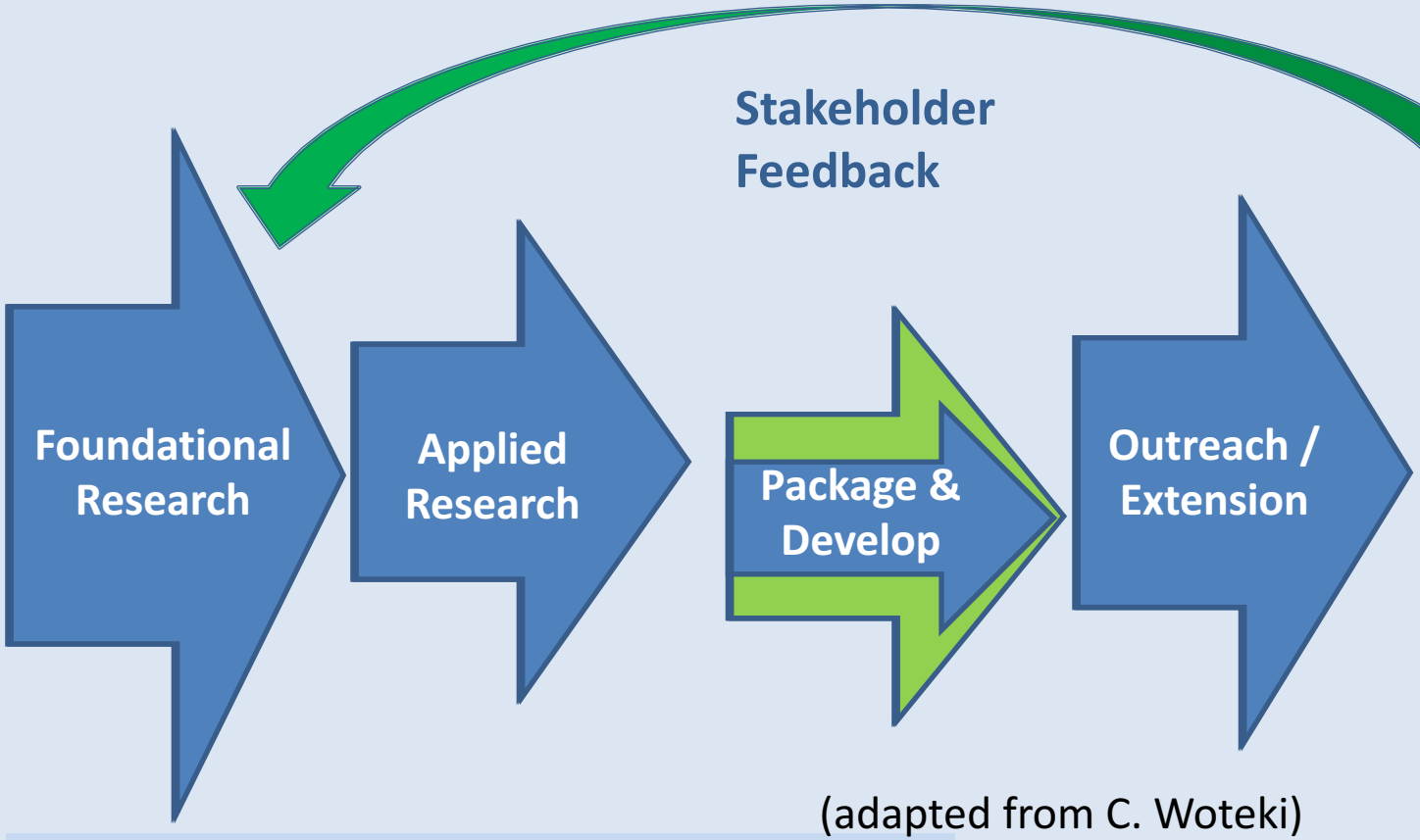
Two-way communication

Hubs improve information flow to AND *from* stakeholders to provide feedback to inform research priorities



Stakeholders

- Other USDA Agencies: ARS, USFS, NRCS
- CE and Land Grant Universities
- Farmers
- Ranchers
- Forest owners

(adapted from C. Woteki)

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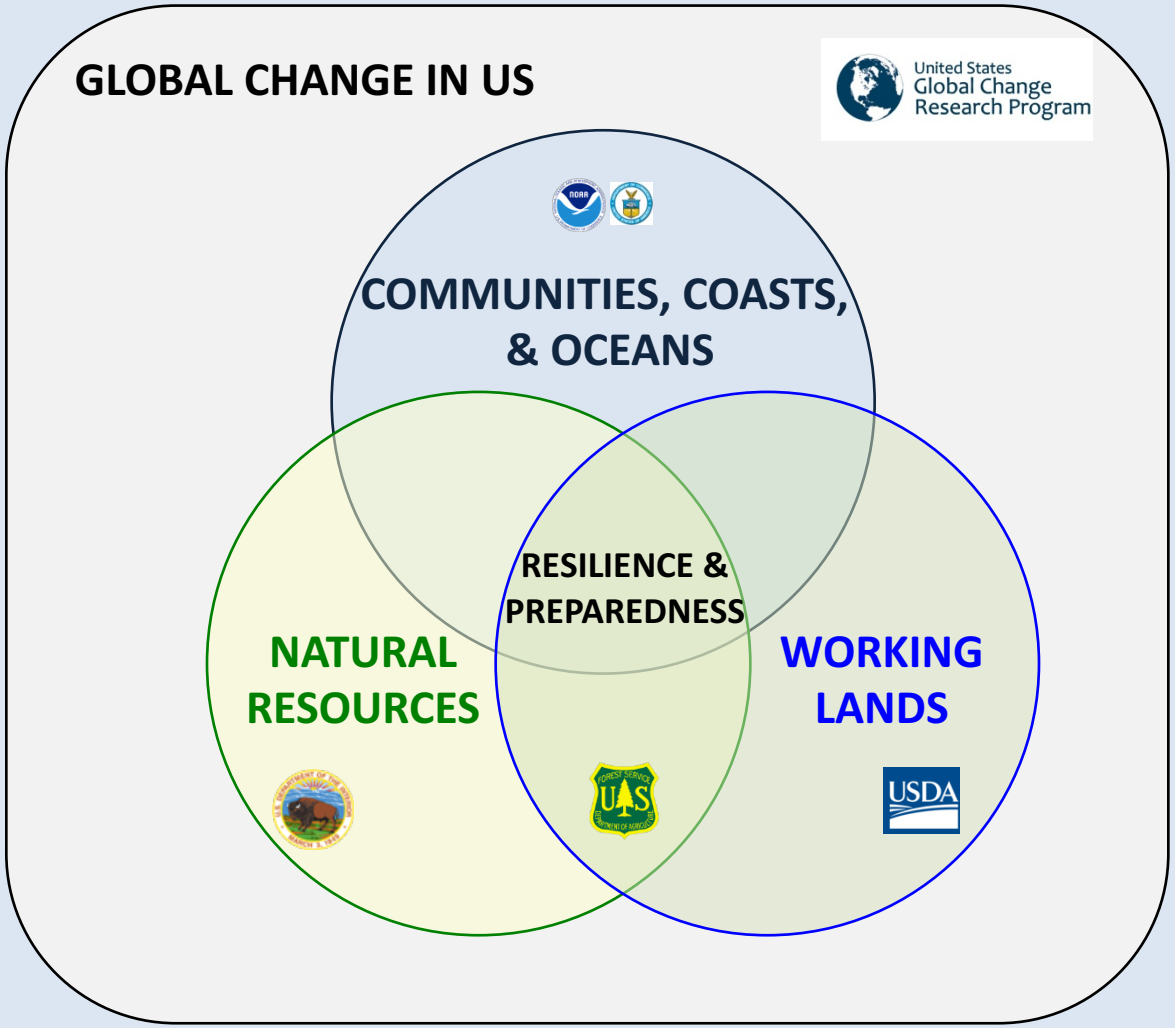
Hubs and other agencies



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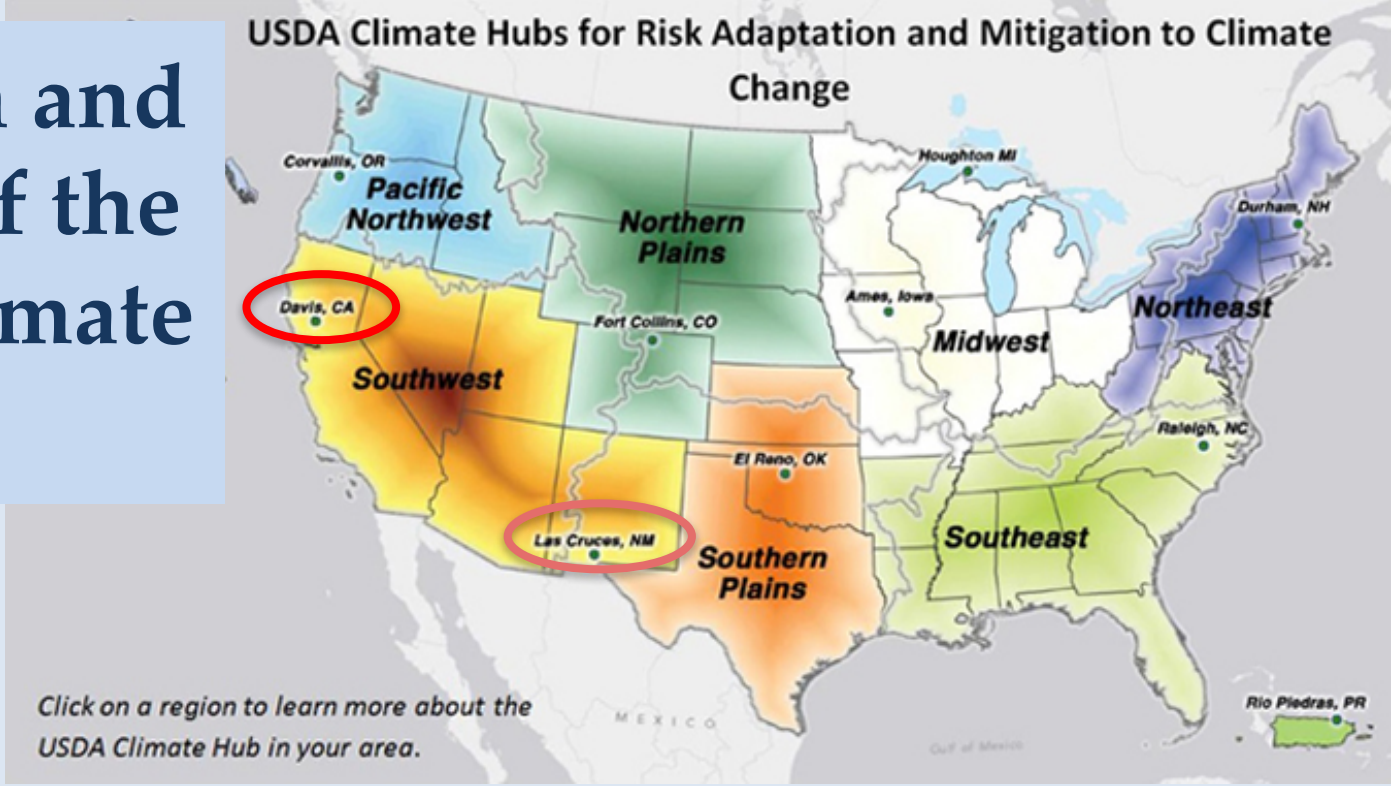
Formation and location of the USDA Climate Hubs



In early 2014, USDA created 10 Climate Hubs

CA Hub is at **University of California, Davis**

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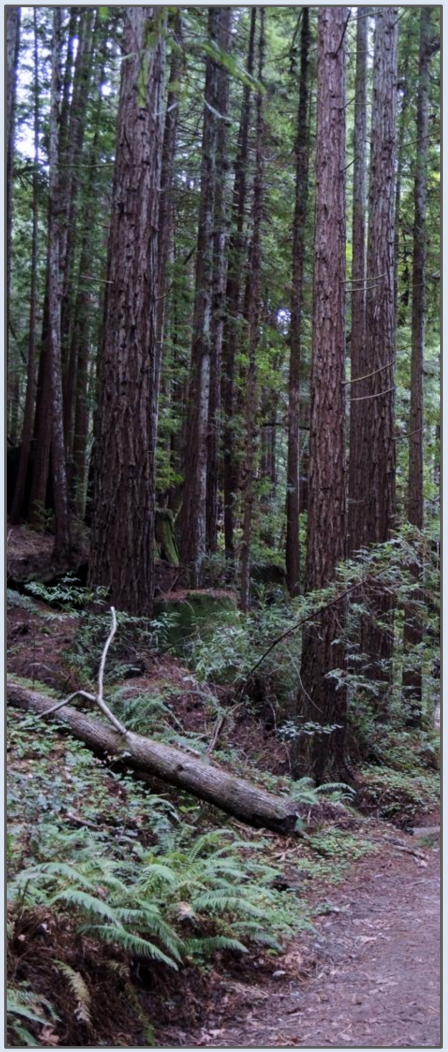
Focus areas of the California Hub

Specialty crops

Forests



Rangeland

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We depend on our partners

Partners are essential to our work. We define three types of partners:

1. **Key partners** (organizations with whom we coordinate closely and from whom we draw core members);
2. **Subject experts** (usually individuals, e.g. from universities, national labs, etc);
3. **Information-sharing partners** (with whom we cross-post announcements and events).

- California Department of Food and Agriculture (CDFA)
- California Landscape Conservation Cooperative (CA LCC)
- California Natural Resources Agency
- California Nevada Climate Applications Program (CNAP)
- Southwest Climate Science Center (SWCSC)
- USDA Agricultural Research Service (ARS)
- USDA Forest Service (Pacific SW Region and Pacific SW Research Station)
- USDA Natural Resources Conservation Service (NRCS)
- University of California Agriculture and Natural Resources (UCANR)
- UC Davis College of Agriculture and Environmental Sciences
- UC Davis John Muir Institute of the Environment (JMIE)
- Western Regional Climate Center (WRCC)

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Extension: our key link to producers

- Rather than work with individual land users, we create and disseminate climate-relevant information in **partnership with extension agencies**.
  - **UC Cooperative Extension**
  - **USDA Natural Resources Conservation Service**
  - Resource Conservation Districts?

- Extension is our **key link back *from* producers**, to help us craft relevant, practical outputs.

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Climate Vulnerability Assessments

- All Regional Climate Hubs were required to complete a Vulnerability Assessment in 2014-15
  - **review existing knowledge**
  - **identify regional priorities**

- **Vulnerability assessment for the Southwest** completed Dec 2014
  - **forestry, specialty crops, field crops, rangeland**

- Tailored for **three different audiences**:
  - A **50-page report** for the Climate Hubs national office
  - **Peer-reviewed articles** for the academic community
  - **Fact sheets** on each topic for stakeholders

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CA rangelands vulnerability assessment

- CA rangelands are economically, ecologically, and culturally important, and distinct from rangelands of the arid SW.
- Climate Vulnerability Assessment in partnership with SW Hub and CA Rangelands Conservation Coalition
- Process includes review by academics, government agencies, extension, NGOs, and ranchers
- Estimated completion date: October 2016

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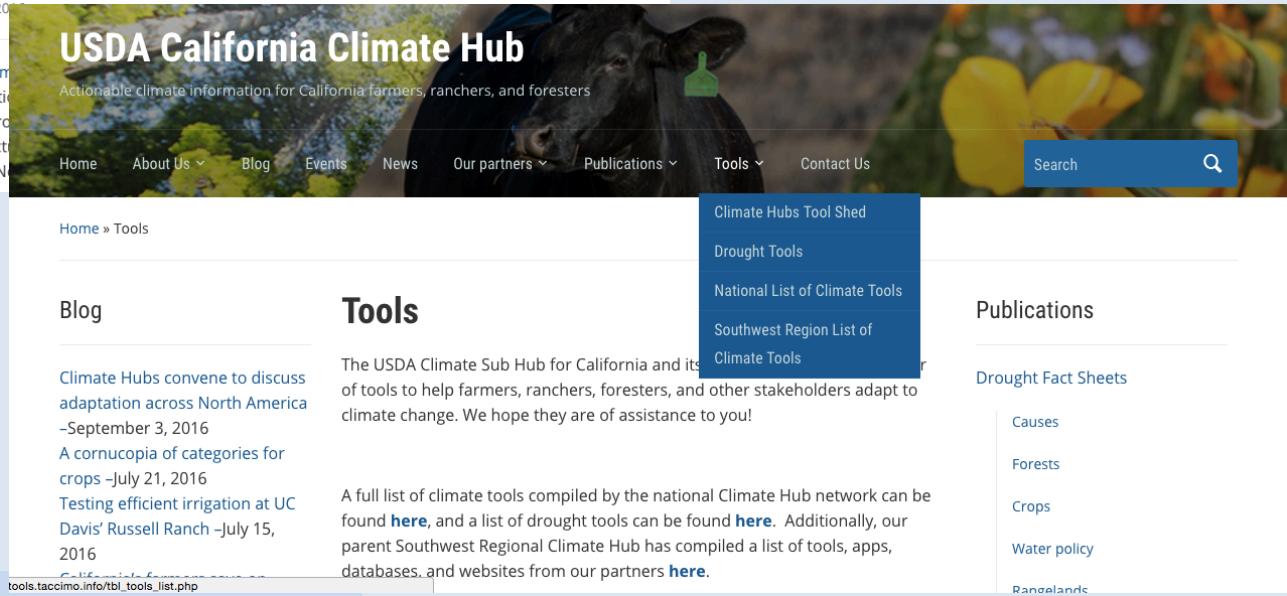
CA Hub Website

caclimatehub.ucdavis.edu



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UC ANR Forest Stewardship Series update

- Collaboration with UC-Berkeley
- Two new 12-page briefs for for the UC ANR Forest Stewardship serie, for owners of CA forestland, on climate adaptation and mitigation
- Evaluating the existing 24 briefs in the series for updates related to climate change

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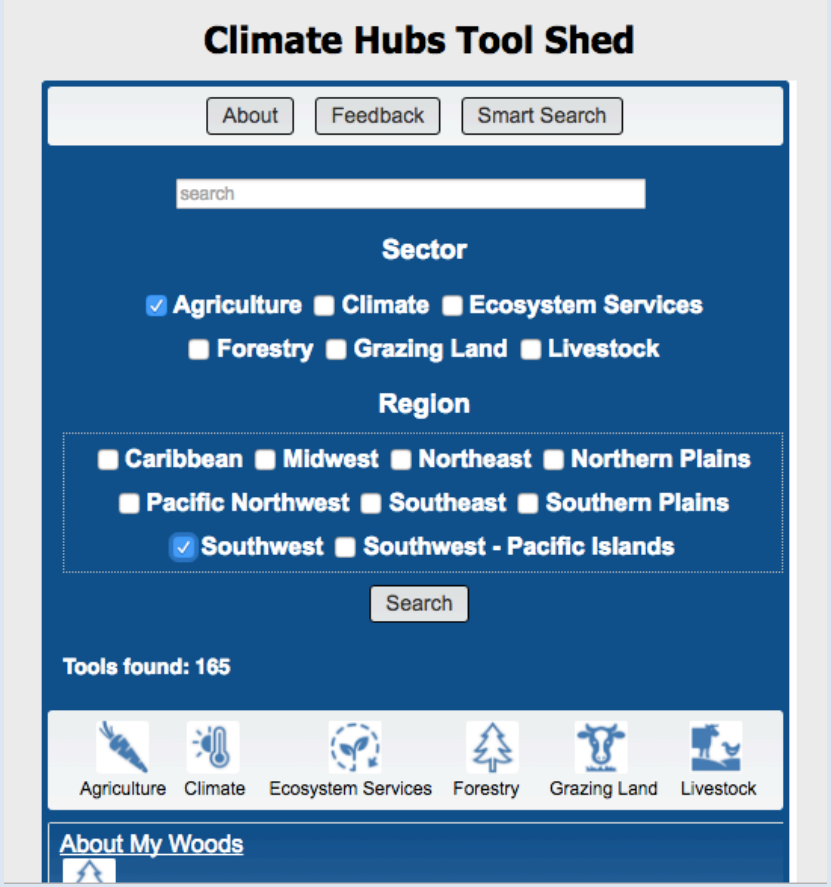
Climate Hubs Tool Shed

Database of existing tools to adapt to and mitigate climate change
tools.tacclmo.info/tbl_tools_list.php



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Other upcoming Hub projects

- **Physiological impacts of climate change on California specialty crops** (with LBL)
- **Climate-based decision making by California almond farmers (with UCB, UCM)**
- **Parameterizing COMET-Farm greenhouse gas accounting model for CA specialty crops** (with CDFA, CU Boulder)
- **2016 Natural Areas Conference** 17-20 October in Davis
- **Building Blocks of Climate Smart Agriculture workshop in Sacramento, Feb 2016**

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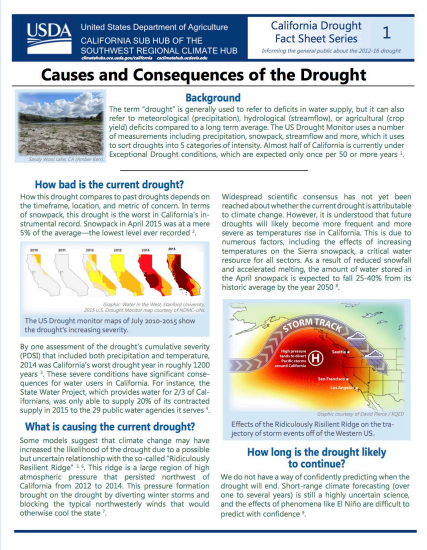
Our focus on drought in 2015-2016

- **Current drought** has profoundly affected of our sectors
- **Six drought fact sheets** for the general public published at caclimatehub.ucdavis.edu
- **Your ideas** on other drought-related projects welcome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CALIFORNIA SUB HUB OF THE SOUTHWEST REGIONAL CLIMATE HUB
California Drought Fact Sheet Series 1
Informing the general public about the 2012-16 drought

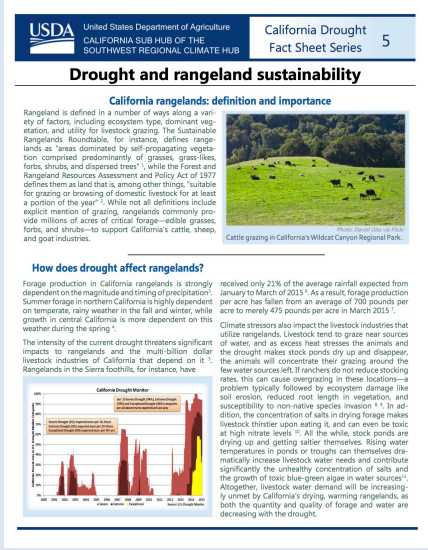
Causes and Consequences of the Drought

Background

How bad is the current drought?

What is causing the current drought?

How long is the drought likely to continue?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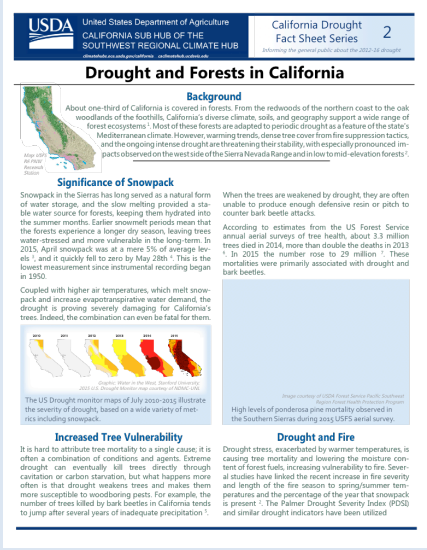
California Drought Fact Sheet Series 5

Drought and rangeland sustainability

California rangelands: definition and importance

How does drought affect rangelands?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California Drought Fact Sheet Series 2
Informing the general public about the 2012-16 drought

Drought and Forests in California

Background

Significance of Snowpack

Increased Tree Vulnerability

Drought and Fire

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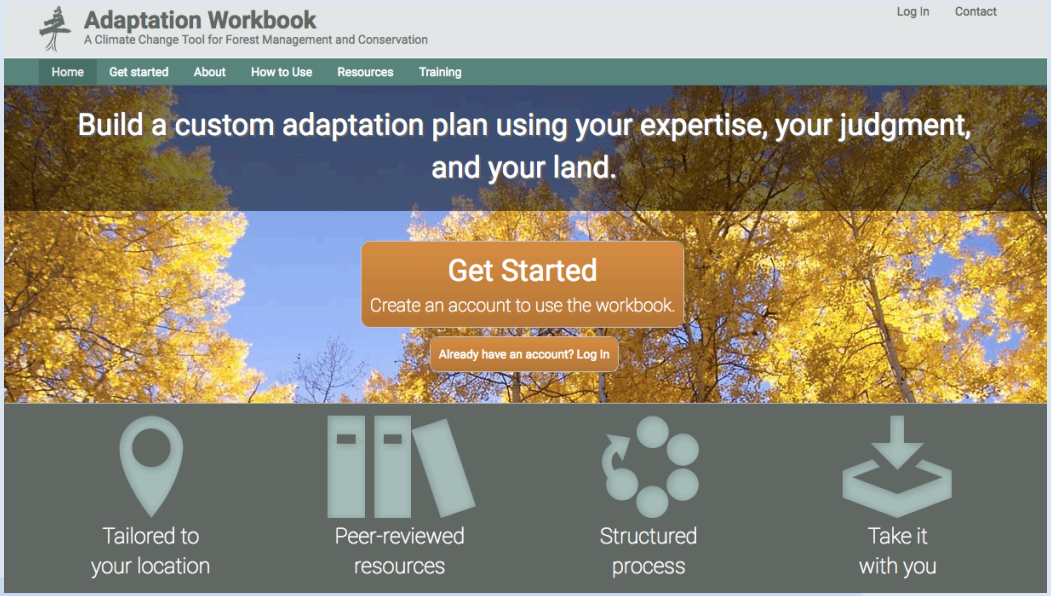
Forest Adaptation Workbook

- With Northern Forests Hub
- www.adaptationworkbook.org and **USFS NRS-GTR-87-2**
- Voluntary adaptive management framework
- Encourages organized decision-making rather than overwhelm or avoidance



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Next steps: Improving our process

- Developing our workplan for 2017 and beyond
- Continuing to facilitate communication among USDA personnel and partners via our stakeholders committee

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Acknowledgements and photo credits

Thank you to all of our partners and collaborators.

Contacts

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All photos by Amber Kerr except as specified:

- Slide 2 (Tom Cooper, Michigan cherry farmer): USDA NRCS (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023447
- Slide 3 (Climate Hub regions): http://www.usda.gov/oce/climate_change/regional_hubs.htm
- Slide 10 (tools database screenshot): http://tools.taccimo.info/tbl_tools_list.php
- Slide 11 (cornucopia): Louise Jackson, UC Davis
- Slide 12 (lettuce, Salinas Valley): Kerri Steenwerth, USDA/ARS