



NORTH CENTRAL
CLIMATE
SCIENCE
CENTER

UNIVERSITY CONSORTIUM

North Central Climate Science Center 2015 Annual Report

2015 Highlights

- Held Open Science Conference at Colorado State University in May
- Adaptation Team Leads co-authored Great Plains Regional Technical Input Report
- Hosted El Niño Webinar to explain drivers and impacts of climate pattern in the north central region
- Welcomed research teams working on five new management-focused projects
- Enhanced focus on drought initiatives and published multiple drought reports

The North Central Climate Science Center is one of eight regional centers created to help meet the changing needs of land and resource managers across the United States. The Center brings together the latest data, tools, and knowledge on the impacts of climate change and works directly with resource managers to promote climate-informed conservation and provides university and USGS researchers the opportunity to work with an engaged and proactive applied-management community. The NC CSC is a collaborative effort between USGS personnel, the North Central University Consortium, and a stakeholder advisory committee made up of federal resource managers and tribal leaders.

ReVAMP

The NC CSC serves as a Resource for Vulnerability Assessments, Adaptation, and Mitigation Projects (ReVAMP). The ReVAMP model serves as a centralizing theme for coordinated research that is responsive to stakeholder needs by focusing on the interconnections between climate drivers, impacts of change, and the capacity of communities to adapt to a number of future climate scenarios.

New 2015 Management Focused Projects

- Scaling climate change adaptation in the north Great Plains through regional climate summaries and local qualitative-quantitative scenario planning workshops
- Forecasting changes in sagebrush distribution and abundance under climate change: Integration of spatial, temporal, and mechanistic models
- Informing adaptation strategies for maintaining landscape connectivity for Northern Rockies wildlife in the face of climate change
- The Wind River Indian Reservation's vulnerability to the impacts of drought and the development of decision tools to support drought preparedness
- Understanding dynamics of land use switching with satellite and field level data in the context of climate variability

Climate Drivers Foundational Science Area:

The Climate Drivers FSA spent much of 2015 enhancing its understanding of evapotranspiration (ET) across the north central region and the role that ET will play in future drought scenarios. The research team, led by Joe Barsugli and Imtiaz Rangwala, has been compiling daily historic and climate model data to explore the relationship between evaporative demand and drought, and plan to use this data in the future to compare the relationship between evaporative demand and actual evapotranspiration. The team also analyzed the use of the Evaporative Demand Drought Index (EDDI) as a tool to assist management focused projects organized by the NC CSC. Among other ongoing projects in 2015, the Climate FSA also hosted a webinar in July on the 2015-2016 El Niño event and potential impacts in the north central region.

Ecological Impacts Foundational Science Area:

The Ecological Impacts FSA focused attention in 2015 on mapping land-use land-cover change throughout the north central region for the period from 2000-2010. Their models utilized Protected Areas Centered Ecosystem delineations that focused on federal, tribal, and private lands. They found that the biggest area of transition in the north central region was in the conversion of forests and grasslands into developed lands, shrublands, and cultivated lands. While land in the central US was fragmented into nine sections for their analysis, the team, led by Andy Hansen and Arjun Adhikari, focused most closely on the Rocky Mountain region to illustrate the impact of land use change locally.

Adaptation Foundational Science Area:

In 2015, the Adaptation FSA focused its efforts on developing understanding of drought vulnerabilities, risks, and responses in the Missouri River Basin. The research team, led by Dennis Ojima and Shannon McNeeley, has been working to produce quarterly climate summaries in partnership with the Wind River Indian Reservation that include current seasonal conditions and future outlooks. Other adaptation work in 2015 has focused closely on the local context of drought, including the importance of managing for endangered fish species in Colorado and managing for bison well-being in southwest South Dakota. The adaptation team also began work this year with Bureau of Land Management Offices to learn more about climate indicators for people whose livelihoods depend upon public land.

The 2015 Open Science Conference

In May of 2015, the North Central Climate Science Center held an Open Science Conference at Colorado State University, which offered research scientists and stakeholders the opportunity to actively engage with the NC CSC. The conference brought together the topics of western science, indigenous perspectives, and land management needs to assess what the North Central Climate Science Center has achieved over the past five years and chart a path forward to build on successes and fill gaps in our current understanding of climate.

A number of key themes emerged from the conference, including: producing actionable science and making research useful for and usable by resource managers; collaboration that incorporates the end user from the first stages of research; creating climate-smart plans for drought planning and management in partnership with our indigenous counterparts; recognizing and working through climate uncertainty; and understanding the context that management on the ground occurs inside of. Products coming out of the conference included a report and video summarizing key points from the conference.

In addition to the conference, the NC CSC offered a two-day training session, May 18th & 19th, for graduate students, postdocs, and early career scientists and managers from the North Central region. This training introduced the 20 attendees to the foundational science areas and tools used at the Climate Science Center, and fostered an atmosphere of interdisciplinary research in the climate science field.

BY THE NUMBERS

Open Science Conference
May 20-22, 2015

- 120 attendees
- 70 representatives from Colorado
- 50 representatives from other states
- 46 attendees from resource management, government agencies, non-governmental organizations
- 27 student attendees



Publications

- Rangwala I., E. Sinsky and J. Miller (2015). Potential Drivers for Projected Elevation Dependent Warming in Boreal Midlatitude Winter in CMIP5 Climate Models. *Climate Dynamics*,
- Mountain Research Initiative Working Group* (2015). Elevation-Dependent Warming in Mountain Regions of the World. *Nature Climate Change*, 5: 424-430,
*<http://mri.scnatweb.ch/en/projects/global-campaign-to-understanding-elevation-dependent-warming>
- Rangwala I., N. Pepin, M. Vuille and J. Miller, (2015). Influence of Climate Variability and Large-Scale Circulation on Mountain Cryosphere. In *"The High-Mountain Cryosphere: Environmental Changes and Human Risks"*, edited by C. Huggel, J. Clague, A. Käab and M. Carey. Chapter 2. Cambridge University Press. [Book Chapter]
- Rangwala, I., Bardsley, T., Pescinski, M., and J. Miller (2015). SNOTEL sensor upgrade has caused temperature record in homogeneities for the Intermountain West: Implications for climate change impact assessments. Western Water Assessment Climate Research Briefing. http://www.colorado.edu/publications/reports/snotel_report.pdf
- Rangwala, I., M. Hobbins, J. Barsugli, and C. Dewes (2015). EDDI: A Powerful Tool for Early Drought Warning. Western Water Assessment. Doc.
- Hansen, A. J., and L. Phillips. 2015. Which tree species and biome types are most vulnerable to climate change in the US Northern Rocky Mountains? *Forest Ecology and Management* 338:68-83.
- Miller, B., F. Leonardo, T. Chang, N. Piekielek, A. Hansen, and J. Morrisette. 2015. Combining state-and-transition simulations and species distribution models to anticipate the effects of climate change. *AIMS Environmental Science* 2(2): 400-426.
- Piekielek, N., A.J. Hansen, T. Chang. 2015. Using custom scientific workflow software and GIS to inform protected area climate adaptation planning in the Greater Yellowstone Ecosystem. *Ecological Informatics* 30:40-48.
- Chang, T., A. J. Hansen, and N. Piekielek. 2014. Patterns and variability of projected bioclimatic habitat for *Pinus albicaulis* in the Greater Yellowstone Area. *Plos One* 9.



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