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CHANGES IN ARCTIC CLIMATE AND CENTRAL U.S. WEATHER PATTERNS Is There a Link?

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Is There a Link?

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Earlier snowmelt, decreasing soil moisture, decreased corn yields, increasing extreme precipitation events—these are some of the weather effects currently observed in the central United States that might well have their origin in the rapidly warming Arctic. These and other implications of Arctic warming were among the topics discussed at a fall 2015 workshop, Implications of a Changing Arctic on Water Resources and Agriculture in the Central U.S (Wilhite and Morrow 2016).

The United States assumed chairmanship of the Arctic Council in April 2015, making the workshop topic timely. Given the importance of the Midwest and Great Plains region as a breadbasket of the world, the goal of the workshop was to explore how changing Arctic weather patterns may affect agriculture, water resources, and other sectors. The workshop provided an opportunity to identify possible adaptation and mitigation measures in response to these changes in severe weather patterns and extreme climate events, as well as to ascertain future research needs and to discuss how management decisions and policy options may need to be altered in the region in response to a changing climate.

IMPLICATIONS OF A CHANGING ARCTIC ON WATER RESOURCES AND AGRICULTURE IN THE CENTRAL UNITED STATES

What: Over 70 climate and water resource professionals from around the country gathered to discuss how the significant climatic and environmental changes being observed in the Arctic may be affecting changes in midlatitude weather.
When: 10–12 November 2015
Where: Lincoln, Nebraska

Sponsors of the meeting included the National Oceanic and Atmospheric Administration's (NOAA) National Integrated Drought Information System, the U.S. Department of Agriculture's (USDA) Office of the Chief Economist, and numerous entities at the University of Nebraska.

WORKSHOP FRAMEWORK, DISCUSSIONS, AND CONCLUSIONS. The workshop was organized around a series of plenary sessions to discuss the Arctic connection to changes in extreme weather (observed and projected) in the midlatitudes and the implications of these changes on the water regimes and agricultural production systems in the Midwest region. Discussion centered on how to build greater resilience in these systems, and the implications of

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climate change on agriculture and water management in the region. Highlights of the plenary sessions were presentations by Jennifer Francis, Rutgers, The State University of New Jersey, on the Arctic connection to extreme weather in the midlatitudes, and Karen Florini, deputy special envoy for climate change in the U.S. Department of State, on the goals of the Arctic Council while under U.S. leadership, as well as the 2015 United Nations Climate Change Conference (COP 21), held in Paris, France. The program also included a stakeholder panel to discuss management strategies associated with a changing climate from local, regional, and global perspectives. Following breakout sessions directed at identifying adaptation and mitigation strategies in the agricultural and water resources sectors, the workshop concluded with a session that focused on how to engage stakeholders and communicate scientific information to the user community. During the plenary sessions, it was indicated that research suggests a rapidly warming Arctic will favor more persistent weather patterns, leading to longer dry, hot, wet, and cold spells (but cold spells will be weaker), day-to-day weather variability will decrease while extremes causing "weather whiplash" will increase, and Arctic amplification will continue to augment some natural patterns to foster more extreme weather events. Changes observed in the Arctic have been dramatic and it is likely that strong warming and the large variability in sea ice/snow cover in the region could be influencing midlatitude weather. It was noted that Arctic variability influences midlatitude weather through wave interference and/or jet stream characteristics and that sea ice change caused by human-induced greenhouse gas emissions is currently a major climate change driver in the Arctic. Recent research has indicated that late winter/early spring months are trending toward more ridging in the Pacific Ocean and this is independent of ENSO. Ridging is also leading to monthly and seasonal precipitation trends across the United States, especially an increased trend for precipitation in the Midwest during late winter and early spring and a decreased trend for precipitation in the western United States.

From a water management/water regime perspective, the forecasts are for warming temperatures, with more precipitation for some regions and less for others. We can expect more variable weather within and among seasons and a shifting seasonality of precipitation. This is all occurring at a time when we know that we will be facing a higher demand for food, feed, and fiber. However, our ability to predict these climatic extremes with current models is limited. Improved management of recent droughts provides some reason for hope in dealing with potentially longer, more frequent, and more severe droughts in the future. However, we are still relatively low on the learning curve with regard to improving drought management.

From an agricultural perspective, creating a greater resilience to drought and other extreme events requires a soil to supply water and nutrients throughout the life cycle of the plant, a cropping system that can withstand the stresses imposed by more variable and extreme weather, and an integration of genetics and management to offset the environmental impacts. Enhancing soil health will increase the capacity of the agroecosystem to be resilient. Given all of these changes (observed and projected), it is imperative that we improve our ability to match forecasts with decisions. Crop models can help to determine the probabilities of yield under differing climate scenarios.

Agricultural producers want and need reliable and understandable information to make management decisions, assistance with processing the information and management options, financial incentives to help adapt to changing weather patterns (for cropping, equipment, markets, and water use), and private and public sector research that emphasizes drought-tolerant crops, crops that sequester more carbon, improved water use and efficiency, and a greater understanding of changing weather patterns and how to build soil health and livestock management challenges in light of a changing climate. It was also noted that federal crop insurance must provide management tools and products that help manage the increased risk associated with climate change.

The farm bill approved by the U.S. Congress was brought up frequently in discussions during the workshop within the context of changing the focus of the legislation to recognize the importance of adapting to a changing climate and to provide support and incentives for changing current management practices.

The workshop report and key PowerPoint presentations are available online (http://go.unl.edu/arcticclimateworkshop).

REFERENCES

Wilhite, D. A., and K. Morrow, Eds., 2016: Implications of a changing Arctic on water resources and agriculture in the central U.S. Nebraska School of Natural Resources, University of Nebraska–Lincoln, 58 pp. [Available online at http://snr.unl.edu/download/research/projects/arcticchange/ArcticWorkshop2015_FinalRepor_v2.pdf.]