Our Changing Climate: Focus on Nebraska

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A Little Bit About Me

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Accumulated Winter Season Severity Index

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What the National Climate Assessment Says for Nebraska

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Figure 22.7, National Climate Assessment. https://nca2018.globalchange.gov/chapter/22/
Big Heat Will Increase

Change in the Number of Days Above 90°F
Mid 21st Century

Lower Scenario (RCP4.5)

Higher Scenario (RCP8.5)

Figure 22.2, National Climate Assessment. https://nca2018.globalchange.gov/chapter/22/
Big Cold Will Decrease

Change in the Number of Days Below 28°F
Mid 21st Century

Lower Scenario (RCP4.5)  
Higher Scenario (RCP8.5)

Change in Number of Days
-55  -50  -45  -40  -35  -30  -25  -20  -15

Figure 22.2, National Climate Assessment. https://nca2018.globalchange.gov/chapter/22/
Big Rain Will Increase

Change in the Number of Days with Precipitation Exceeding 1 Inch Mid 21st Century

Lower Scenario (RCP4.5)  

Higher Scenario (RCP8.5)

Figure 22.2, National Climate Assessment. [https://nca2018.globalchange.gov/chapter/22/](https://nca2018.globalchange.gov/chapter/22/)
Snowpack Will Change

Average March Snow Water Equivalent, Historical (1976–2005)

Change in March Snow Water Equivalent, Mid 21st Century, Higher Scenario (RCP8.5)

Figure 22.3, National Climate Assessment. https://nca2018.globalchange.gov/chapter/22/
Streamflow Will Change

Figure 22.3, National Climate Assessment. [https://nca2018.globalchange.gov/chapter/22/](https://nca2018.globalchange.gov/chapter/22/)
Box 2.6: Severe Weather

Observed trends and projections of future changes in severe thunderstorms, tornadoes, hail, and strong wind events are uncertain.

Observed and projected future increases in certain types of extreme weather, such as heavy rainfall and extreme heat, can be directly linked to a warmer world. Other types of extreme weather, such as tornadoes, hail, and thunderstorms, are also exhibiting changes that may be related to climate change, but scientific understanding is not yet detailed enough to confidently project the direction and magnitude of future change.172

For example, tornado activity in the United States has become more variable, particularly over the 2000s (e.g., Tippett 2014, Elsner et al. 2015239,240), with a decrease in the number of days per year with tornadoes and an increase in the number of tornadoes on these days.241 Although the United States has experienced several significant thunderstorm wind events (sometimes referred to as “derechos”) in recent years, there are not enough observations to determine whether there are any long-term trends in their frequency or intensity.242

Modeling studies consistently suggest that the frequency and intensity of severe thunderstorms in the United States could increase as climate changes,177,243,244,245 particularly over the U.S. Midwest and Southern Great Plains during spring.177 There is some indication that the atmosphere will become more conducive to severe thunderstorm formation and increased intensity, but confidence in the model projections is low. Similarly, there is only low confidence in observations that storms have already become stronger or more frequent. Much of the lack of confidence comes from the difficulty in both monitoring and modeling small-scale and short-lived phenomena.
Key Message 1: Water

• Water is lifeblood; effective management is critical.

• Small changes can have big impacts, making management a challenge.

• Future changes are very likely to exacerbate these challenges.

Key Message 2: Agriculture

- Agriculture is an integral component of economy, history, and culture.

- Rising temperatures and changes in extreme weather events are very likely to have negative impacts on parts of the region.

- Adaptation will likely require transformative changes in management, including regional shifts of agricultural practices and enterprises.

Conservation Practices Reduce Impact of Heavy Rains

Integrating strips of native prairie vegetation into row crops has been shown to reduce sediment and nutrient loss from fields, as well as improve biodiversity and the delivery of ecosystem services. Iowa State University’s STRIPS program is actively conducting research into this agricultural conservation practice. The inset shows a close-up example of a prairie vegetation strip. Photo credits: (main photo) Lynn Betts, (inset) Farnaz Kordbacheh.

Key Message 2: Agriculture

- Increase soil water availability in the north; decrease it in the south
- Increase the number of extreme warm temperature events
- Increase temperatures, causing decreased yields
- Increase weeds, pests, and invasive species
- Alter plant phenology
- Decrease the quality of forage
- Increase livestock production
- Lengthen growing seasons
Key Message 2: Agriculture

- Increase vulnerability to early spring frost/freeze damage
Key Message 3: Recreation and Tourism

- Ecosystems provide recreational opportunities and other valuable goods and services that are at risk in a changing climate.
- Impacts are already evident for local economies that depend on winter or river-based recreational activities.
- Climate-induced land-use changes in agriculture can have cascading effects on closely entwined natural ecosystems, such as wetlands.
- Federal, tribal, state, and private organizations are undertaking preparedness and adaptation activities.
Key Message 4: Energy

• Fossil fuel and renewable energy production and distribution infrastructure is expanding.

• Climate change put this infrastructure and supply of energy at risk.

• The energy sector is also a significant source of gases that contribute to climate change and ground-level ozone pollution.

Flooding at Fort Calhoun Nuclear Station

Floodwaters from the Missouri River surround the Omaha Public Power District's Fort Calhoun Station, a nuclear power plant just north of Omaha, Nebraska, on June 20, 2011. The flooding was the result of runoff from near-record snowfall totals and record-setting rains in late May and early June (NWS 2012). A protective berm holding back the floodwaters from the plant failed, which prompted plant operators to transfer offsite power to onsite emergency diesel generators. Cooling for the reactor temporarily shut down, but spent fuel pools were unaffected. Photo credit: Harry Weddington, U.S. Army Corps of Engineers.

Key Message 5: Indigenous Peoples

- Indigenous peoples are at high risk from a variety of climate change impacts.

- These changes are already resulting in harmful impacts to tribal economies, livelihoods, and sacred waters and plants used for ceremonies, medicine, and subsistence.

- Many tribes have been very proactive in adaptation and strategic climate change planning.

Thank you!

For questions and discussion, ask here or contact:

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Symptoms of Climate Change
The stratosphere (up here!) is cooling

Ten Indicators of a Warming World

- Air Temperature Near Surface (Troposphere)
- Humidity
- Temperature Over Oceans
- Sea Surface Temperature
- Sea Ice
- Sea Level
- Ocean Heat Content
- Temperature Over Land
- Glaciers
- Snow Cover

Seven of these indicators would be expected to increase in a warming world and observations show that they are, in fact, increasing. Three would be expected to decrease and they are, in fact, decreasing.
How the Averages Affect the Extremes

(a) What is an Extreme?
- Temperature
  - Cold temperature extremes
  - Hot temperature extremes

(b) Increase in Probability of Extremes in a Warmer Climate
- Temperature
  - Previous climate
  - New climate
  - More hot weather

- Precipitation
  - Less light precipitation
  - More heavy precipitation
  - New climate
Credible Information Sources
Sources of Information: NCEI

• State of the Climate report
  ♦ Published in the Bulletin of the American Meteorological Society every summer
  ♦ Led by NCEI
  ♦ Hundreds of authors from dozens of countries

• Monthly State of the Climate summaries from NCEI
  ♦ Updated online around the middle of the month

http://www.ncdc.noaa.gov/bams-state-of-the-climate/
http://www.ncdc.noaa.gov/sotc/
Latest report released in 2018!

Focus on impacts in different regions and sectors of the U.S.

PDFs, images, and PowerPoint presentations for each chapter

http://www.globalchange.gov/
1. Sun is primary energy
2. Climate is complex
3. Life affects climate; climate affects life
4. Climate is variable
5. Our understanding of climate
6. Humans affect climate
7. Climate change has consequences

Sources of Information:
Principles of Climate Literacy

Sources of Information: IPCC

- IPCC = Intergovernmental Panel on Climate Change
- UN chartered group of leading scientists charged with assessing the state of climate change science and its impacts
  - Involved more than 130 governments, over 450 lead authors and scientists, and over 2500 scientific reviewers
- Synthesizes reproducible peer-reviewed research
- Contributors must agree on every word of the document


http://www.ipcc.ch/
Sources of Information: State and Regional Climate Centers

- 6 Regional Climate Centers
- Almost every state has a state climatologist

http://www.ncdc.noaa.gov/customer-support/partnerships/regional-climate-centers

http://www.stateclimate.org/
Sources of Information: NWS

- 122 local NWS offices
- Each has a website with contact information
- If seeking contact about climate, be specific about request

http://www.weather.gov/