WATER & ECOSYSTEM QUALITY

- **An integrated hydrology model that helps predict snowmelt patterns.** Runoff, flooding, and drainage all impact hydrology models. The new studies improve watershed modeling.
  X. Chu (xuefeng.chu@ndsu.edu)
- **Report on aquatic species at Baldhill Creek in Barnes County:** The study reviews how climate change may be a factor in changing aquatic species; also how the dragonfly distribution is changing.
  A. DeLorme (andre.delorme@vcsu.edu)
- **Land use changes impact of non-point source pollution**: Water quality changes based upon the changes in land use. The study analyzes the relationship between land use and surface water nitrates in the Red River.
  H. Zheng (haochi.zheng@und.edu)
- **Impact of Devils Lake outlets on Sheyenne River sulfate concentrations:** Study reviews mitigating impact of the Devils Lake flooding on sulfates.
  X. Chu (xuefeng.chu@ndsu.edu)
- **Impact of bats on the agricultural economy:** Analysis of range, habitat, and impact of these pest-eating prairie pollinators.
  E. Gillam (erin.gillam@ndsu.edu),
  M. Guinn (mguinn@uttc.edu), or
  P. Barnhart (paul.barnhart@dickinsonstate.edu)
- **Water quality and plant health on the Turtle Mountain Reservation:** What impacts local water quality? Are local impacts to plant health based in climate change?
  S. Blue (sblue@tm.edu)

RESEARCH FOR ND

For the past seven years, climate-based research has been conducted in ND, relating weather with soil and water through the Center for Regional Climate Studies (CRCS). This National Science Foundation EPSCoR Track-1 sponsored research information is now available. The goal of the research is to improve the predictive capacity of seasonal weather on farm production decisions and on issues related to soil and water that impact the general public.

Access to the researchers is available via email (included), if you want to discuss the research or their findings.

Your local extension agent may also have additional information.

ABOUT ND EPSCOR

Our goal is to help broaden and diversify ND's science, technology, engineering, and mathematics (STEM) workforce pathway from elementary through graduate school; support and grow statewide STEM research capacity and competitiveness at participating institutions of higher education; and convey the impact of STEM research, outreach, and workforce efforts to ND stakeholders.

ND EPSCoR
Established Program to Stimulate Competitive Research

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CENTER FOR REGIONAL CLIMATE STUDIES

Bringing Research on the Interactions of Soil, Water, and Weather to ND Agriculture

Although weather within a year is impossible to predict with absolute certainly, the study of climate and its past interactions with soil, water, and seasonal weather help farmers and ranchers make improved decisions about their agricultural operations. This ND research provides useful information on a host of related topics.

ND EPSCoR

Serving our state

WEATHER & AIR QUALITY

Several researchers have developed new or enhanced weather or air quality models:

- **Regional weather/climate models and analysis:** Making sense of climate changes at the local level, from weather forecasts to blizzard events.
  J. Zhang (jianglong.zhang@und.edu) and
  A. Kennedy (aaron.kennedy@und.edu)
- **Blizzard analysis and Red River blizzard weather patterns:** The ability to evaluate blizzards during and after an event helps to locate areas where visibility may be severely limited. Analysis may help determine what type and where snow removal equipment should be dispatched more cost effectively.
  A. Kennedy (aaron.kennedy@und.edu)
- **Pollution in the Northern Great Plains:** Tracing particulate matter in the atmosphere using specialized processes.
  F. Bowman (frank.bowman@und.edu)
- **Impact of land use on regional weather models:** Using NOAH and other models to study cropland impacts on regional climate.
  A. Kennedy (aaron.kennedy@und.edu)
- **Air quality studies:** From heavy smoke affecting forecasts to atmospheric radiation that may impact agricultural practices.
  J. Zhang (jianglong.zhang@und.edu)
- **Opportunities and challenges of the changing climate in the Northern Plains:** How has ND's climate changes impacted agricultural crop selection and recommended planting dates.
  A. Akyuz (adnan.akyuz@ndsu.edu)

SOIL & CROP ECONOMICS

Soil health, and understanding the economics of crop choices and impact on land uses are part of the CRCS research efforts.

- **Land use, CRP, and pollination in Northern Great Plains:** How do market and policy changes impact the land use; what is the economic value of honeybee pollination.
  H. Zheng (haochi.zheng@und.edu)
- **Supplemental fertilizer use on crops in changing climates:** This study examined the effect of poor, good, and average seasons on corn, sunflower and wheat yields, and the nitrogen rates required to achieve most profitable production. The study concluded that fertilizer nitrogen rate was climate neutral: a similar rate of nitrogen was required to grow the most profitable crop in a poor year as well as a good year. The reason was the relative efficiency of nutrients released from the soil and the ability of a crop to use the nutrients in good, bad and in-between weather years.
  D. Franzen (david.franzen@ndsu.edu)
- **Land use and changes based on economics of 5 ND crops:** This study looks at past climate data (seasonal weather databases) and how it has changed over the past decades. Knowing the variation in seasonal weather between years, the risk in planting longer season crops, or even longer season varieties of crops. Is there a balance between a suite of crops in a given year that would help protect a farmer from major losses in an unusual, but not uncommon season of cool weather or early frost? This economic analysis is ongoing with five major North Dakota crops.
  D. Roberts (david.roberts@ndsu.edu)
- **Soil health properties analyzed, from CRP to no-till:** This study combines an analysis of the past several decades of climate on the change in soil health between tilled land and CRP land, and then the transition from CRP to no-till crop production. The transition from CRP to no-till improves soil health when the no-till system is based on a multi-year rotation of diverse cool season/warm season grass and broadleaf crops, resulting in more diverse and active soil microbial systems.
  E. Brevik (eric.brevik@dickinsonstate.edu),
  J. Steffan (joshua.steffan@dickinsonstate.edu) or
  P. Barnhart (paul.barnhart@dickinsonstate.edu)
- **Crop simulations with economic land-use models:** These studies provide information on how social-economic factors can affect land-use changes as well as improve acreage and yield predictions.
  J. Zhang (jianglong.zhang@und.edu) and
  H. Zheng (haochi.zheng@und.edu)
- **Changes in shelterbelt density and soil erosion:** This study reviews how shelterbelt density has changed, and its impact on eroding soils.
  H. Zheng (haochi.zheng@und.edu) and
  B. Rundquist (brad.rundquist@und.edu)

- **Value of land beyond economics — the importance of family legacy:** This study provided information about the perceptions of farmers and ranchers regarding their family land. Although economics are important, the analysis uncovers the value of stewardship.
  T. Bailey (tambakuii.bailey@und.edu)
- **The affect of changing climate on pollination and yield of juneberries:** This research provides insight on how the changing climate is affecting native pollinators; also a comparison of yields for cultivated and traditional prairie Amelanchier (juneberry) plants.
  K. Hartman (khartm@nhsc.edu)

COMPUTER DATA

Soil health, and understanding the economics of crop choices and impact on land uses are part of the CRCS research efforts.

- **Enhanced computer analysis of remotely sensed data used in various agricultural-related applications:** Various computational studies on comparing satellite and ground-based data to predict sugar beet, spring wheat, corn, and sunflower yields; enhanced topographic models with higher resolution imagery.
  A. Denton (anne.denton@ndsu.edu)