



# North Dakota's use of Condition Monitoring Observer Reports (CMOR) for recommendations to the U.S. Drought Monitor authors

**A**dnan Akyuz, North Dakota State Climatologist, funnels information from the network of Extension specialists to the U.S. Drought Monitor authors each week. He uses the National Drought Mitigation Center's Condition Monitoring Observer Reports (CMOR) system to collect and analyze reports. His recommendations to the USDM authors are based on climate data and other information, including CMOR reports and traffic cameras.

So far, since the CMOR system was established in 2018, North Dakota has been uniquely successful in getting on-the-ground reports about drought-related conditions that are evenly distributed across the state and across the growing season.

## Extension agents make the difference

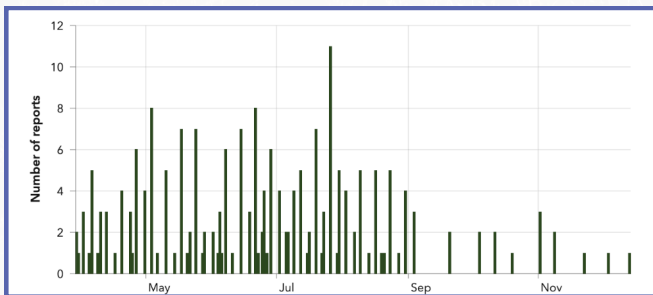
In contrast to traditional citizen science programs such as CoCoRaHS and other users of the NDMC's CMOR system, North Dakota's observers are not volunteers but

Extension agents. Submitting weekly observations during the growing season became a part of their weekly responsibilities, particularly during drought years. Akyuz said that the director of Extension was convinced that county agents should be involved in drought monitoring.

"We wanted to tap mainly into local experts who are well acquainted with local farmers and ranchers, and drought impacts in their operations, and be able to relay that information objectively in CMOR," he said. "This perfectly describes an Extension representative from each county, the NDSU County Extension Agent."

## Evolution of reporting systems

Extension specialists started off a few years before CMOR became operational with weekly Google form entries. The format of these entries was similar to that of CoCoRaHS condition monitoring, to gain a better idea of what signs to look for on the landscape. But that was somewhat



The time series chart from the CMOR dashboard shows observations from North Dakota evenly distributed through the growing season in 2021, with spikes on Mondays, the day that observations were due.



[go.unl.edu/cmor\\_drought](https://go.unl.edu/cmor_drought)

Who Day	Extension	State climatologist	Extension Livestock & Disaster Coordinator	State & fed officials	USDM authors
Monday	Submit CMOR reports by noon	Start evaluating reports	Send CMOR reminder		
Tuesday	Extension drought meeting*	Submit consolidated recommendations by noon			Evaluate evidence
Wednesday					Evaluate evidence
Thursday	ND disaster meeting	ND Ag Disaster meeting*	ND Ag Disaster meeting*	ND Ag Disaster meeting*	Release new map
Friday–Sunday	Take photos		Send drought update		

\*The Ag Disaster Meetings are held every other Thursday throughout the year. When the State Unified Command is activated in response to a drought those meetings occur bi-weekly during the alternate weeks. During a widespread drought North Dakota Extension also holds weekly internal calls with the state climatologist to discuss local impacts and programing needs.

cumbersome, as a new survey and survey link needed to be generated weekly. Akyuz would synthesize their observations and consolidate them into recommendations.

As the state was going into drought in 2021, Akyuz and Miranda Meehan, NDSU Extension livestock environmental stewardship specialist and disaster education coordinator, worked with Extension to switch to the CMOR system, and arranged for Kelly Smith from NDMC to make a virtual presentation on how to use the system. In 2021, NDSU Extension contributed 864 reports out of 2,078 submitted nationwide, and in 2022, when drought was less of an issue in the state, they contributed 372. CMOR received 2 reports from North Dakota in 2018, 5 in 2019, and 12 in 2020.

The CMOR system “eliminates the middleman, me,” as Akyuz said. Reports are automatically visible to U.S. Drought

Monitor authors and others, with photos. “They hit enter and the rest of the world can see it. It’s transparent.”

### Weekly routine

The Extension agents’ deadline for submitting reports is Monday at noon, to give Akyuz time to go through them and incorporate them into his recommendations to the USDM listserv on Tuesdays at noon. He consistently submits his recommendations then, even if it’s “status quo.” Consistency sends the message that the recommendations are reliable. During drought, Extension and the state climatologist also meet to discuss drought status and programming needs.

On Thursdays (bi-weekly or weekly, as needed), the Extension agents participate in a call to talk about how the USDM changed and the impact that each agent had in each county, and how their reports were used in decision-making. The regular meetings include

the state departments such as Emergency Services and Agriculture, the governor's office, and congressional representatives. These calls provide accountability, feedback and incentive to provide consistent and accurate information. They started out as "North Dakota Drought" meetings but are now "North Dakota Ag Disaster" meetings, covering a broader spectrum of environmental hazards, from avian influenza to flooding. North Dakota Drought meetings occur weekly if the State Unified Command is activated in response to drought, alternating with North Dakota Ag Disaster meetings.

The county Extension agents' hearing that a report prompted Akyuz to draw authors' attention to an area for a potential change "is a great reward for county agents to hear."

The meetings are also learning opportunities. "The beauty of going back to the same group of people is that they can calibrate themselves," Akyuz said. "It gets better each year." For example, they are learning not to recommend a specific USDM level. Instead, they should provide a description of what they are seeing.

### Regular reminders

Before the start of each growing season, Meehan sends out information about CMOR and how the data is used. She also sends a recording of the tutorial on how to submit a report, and encourages the Extension agents to reach out for technical support.

Each week during the growing season, following the release of the USDM map and the interagency meetings, Meehan sends out a

drought update email highlighting the latest map and any drought-related resources and/or programs. In this email she stresses the importance of the CMOR reports to help ensure the map accurately reflects conditions in the counties they serve. This is followed by a reminder email on Monday morning. Extension agents have a lot of responsibilities within the counties and communities they serve and these communications drive response rates.

### Verification

Even with a network of well-trained, unbiased observers, North Dakota conducts independent evaluation of reports. Akyuz credited Alan Schlag, a hydrologist at the National Weather Service in Bismarck, and Brad Hopkins, National Weather Service Office in Grand Forks, with providing expert opinion across the state.

Now, Akyuz said, he has no formal authority for onboarding new agent-observers, but he trusts the Extension network to bring new members up to speed. He said the capacity Extension developed over time now allows them to serve collectively as "gatekeepers and validators."

*By Kelly Helm Smith, National Drought Mitigation Center, University of Nebraska-Lincoln*



The CMOR system and this case study were developed in partnership with the U.S. Department of Agriculture Office of the Chief Economist and the National Integrated Drought Information System.

**State/Territory:** ND  
**County:** Steele

**Date:** 6/21/2021

**Description and/or caption information:**

These two photos showcase how delayed emergence in HRSW [Hard Red Spring Wheat] occurred due to lack of soil moisture during the planting season. Until rain was received, there were areas of this field that did not have seedling emergence so you are seeing plants at the 5–6 leaf stage in comparison to plants that are beginning to head out. This will cause reduced yields and uneven harvest times because of delayed emergence due to the lack of soil moisture.



**How dry or wet is it?** Moderately Dry

**U.S. Drought Monitor Intensity:** D2 (Severe Drought)

**How much experience do you have with conditions there?** 10\_20\_years

**How many times in the past have you seen it like this?** Never

**How localized or widespread are the conditions you are reporting?**

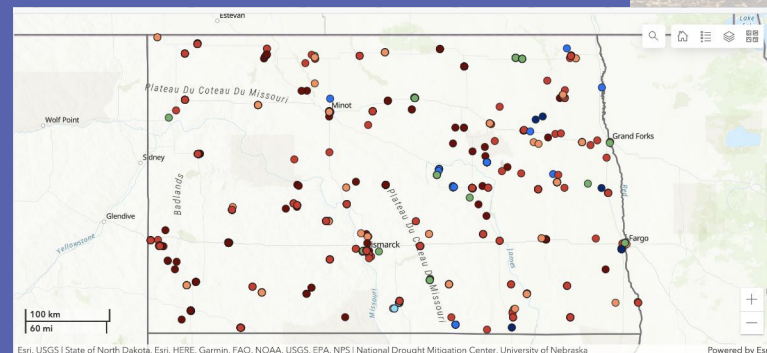
Conditions north of Finley and the western side of the county are the worst. There are also poor crop stands and pasture conditions following state highway 200 east of Finley in branches of the Goose River. Pastures have 75% or more in forage reduction in the western side and northeast corner of the county. Crop emergence extremely spotty due to lack of moisture, so crop staging is inconsistent across fields.

**Crop production:**

plant\_stress,increased\_irrigation,erosion,less\_water

**Livestock production:**

reduced\_pasture\_forage,more\_invasive\_species\_plants\_, less\_water



Each dot on the CMOR map represents a report, and you can read the full text by clicking on a dot. For example, at left is the text of a CMOR report submitted from Steele County, North Dakota, on June 21, 2021, with accompanying photos at top right. The U.S. Drought Monitor intensity is added separately in an overnight process, and appears on the tab called 2018-yesterday.