Statewide use of CMOR system helps produce clear, stark picture of 2021 North Dakota drought

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From April 1 to Oct. 31 of 2021, no less than 30.2% of the Lower 48 experienced severe drought (D2) or worse. Drought covered scores of states and several regions throughout the growing season, and the spatial scale was evidenced in the 1,550 on-the-ground dispatches submitted to the Condition Monitoring Observation Reports (CMOR) system. Californians, Wyomingites, Minnesotans, Oregonians and residents of other drought-affected areas across the country shared condition reports and photographs to CMOR. But no state submitted reports during the growing season at a rate close to that of North Dakota.

North Dakotans submitted 803, more than half the nationwide total, overlapping with a period when the state experienced the worst drought conditions it has experienced in the 21-year history of the U.S. Drought Monitor. For three weeks in May, nearly 85% of the state was experiencing extreme drought (D3) or worse (the largest D3 coverage on record since 2000). The top 29 weeks of D3 or worse coverage across North Dakota occurred in 2021, according to the Drought Monitor.

A concentrated statewide effort before the start of the growing season encouraged North Dakota Extension specialists to contribute to CMOR, said Adnan Akyüz, North Dakota state climatologist and professor of climatological practice at North Dakota State University. Those 803 CMOR submissions, he said, not only helped provide valuable context that shaped his weekly recommendations to U.S. Drought Monitor authors but also unlocked aid for the state’s producers from federal assistance programs tied to the Drought Monitor.

North Dakota’s season-long, statewide effort to submit on-the-ground drought condition reports shows how the CMOR tool can help researchers better understand localized drought impacts, said National Drought Mitigation Center impacts researcher Kelly Helm Smith.

The CMOR-based process of providing on-the-ground information that Akyüz examined was markedly different from previous efforts to gather data across the 19th-largest state with the fourth-smallest population and email it to USDMAUTHORs. One of those efforts, Akyüz said, involved weekly conference calls with North Dakota’s 53 county Extension agents.

“And I would end up synthesizing that data ... to respond to the Drought Monitor [with] a recommended drought status,” he said. “So, you can imagine that would be very time-consuming.”

From that, the process evolved to having Extension agents submit weekly reports to Akyüz with a Google Forms survey. He would then study the forms and decide which reports to copy and paste into his weekly recommendations.

“And that was better than the previous method, but still it wasn’t good enough. Then CMOR came.”

In early 2021, Akyüz and Miranda Meehan, NDSU Extension livestock environmental stewardship specialist, invited Smith to speak to a virtual meeting of Extension agents about how CMOR works. She provided details on how they could provide valuable information to Drought Monitor authors by completing brief surveys that provide key context about current conditions. When users add written descriptions about the conditions, and submit photos too, the data becomes clearer. CMOR reports appear on an interactive map layer that is visible to the general public and to U.S. Drought Monitor authors and to state experts such as Akyüz.

“She really did a great job in the beginning of the season,” Akyüz said. “We knew 2020 was really bad, especially in western North Dakota, and by the end of 2020, the moisture was depleted and most ranches were overgrazed.”

Plus, with a La Niña winter, climatologists were anticipating a dry start to 2021.

“We knew the trouble had an early start, so we started early,” Akyüz said. “We started having meetings in winter not only with the National Drought Mitigation Center but also with the state’s emergency managers and the North Dakota Department of Agriculture.”

Smith said she appreciated the willingness of the Extension network to adopt a new system. Some downloaded and used a mobile app to

In 2021, North Dakota experienced the most extreme levels of drought reported in the state since the creation of the U.S. Drought Monitor. Here are how some of the 803 Condition Monitoring Observation Reports collected during the growing season described what that looked like on the ground.

**Date:** April 1, 2021

**County:** Golden Valley

**Description:** Grasshoppers feeding on a sunflower.
submit reports, while others sent information from their computers. “The results from North Dakota in 2021 really demonstrated how effective it is to have a well-established network with a clearly defined purpose making use of the system,” Smith said. “Adnan and Miranda did a great job of reminding Extension specialists to submit weekly reports, and they helped with some troubleshooting of the system, too.”

For Akyüz, the CMOR archive would greatly streamline data synthesis while also allowing him to continue pointing out to Drought Monitor authors important descriptions of drought from across the state.

“It’s a mutual benefit really,” Akyüz said. “You’re understanding how the drought is affecting the local conditions that appear on the map, and also to help us identify the areas that need more attention in real time. They also provided the pictures, which is sometimes worth more than a million words.”

When the growing season concluded, county agents informed producers that they could take a break from CMOR, but Akyüz said that they will recommend that they use CMOR in future seasons. And current CMOR reports, he said, will help future county agents calibrate subjective data. They will be able to look at what reports were filed during portions of 2021 when areas of the state were in exceptional or extreme drought. In the middle of the punishing 2021 drought, Akyüz left Fargo to take a driving tour of some of the areas of the state hardest hit by drought. Talking to producers and seeing the drought conditions for himself provided context that other objective data cannot, he said.

“It was a tremendous help,” he said. “I can look at the precipitation departure from normal, for example, I can look at the soil moisture data just like the Drought Monitor author can. But what I cannot see is (what I can learn by) tapping into local resources such as ranchers and farmers. You’ve got to keep in mind that 90% of the North Dakota economy depends on agriculture. We are less than 1 million population, and we are one of the largest states in the union, and agriculture is everything. And listening to these reports allowed me to see what I couldn’t see by objective data. It allowed me to capture the concern of the very same people that are impacted by the drought. It opened up my mind into the minds of the locals. And I think my job at that time was to make sure that the Drought Monitor author feels the same as I do in my office.”

Every time the Drought Monitor status for North Dakota changed, Akyüz created a PowerPoint presentation for county agents that included not just the changed map, but also bullet points that included anecdotal objective data pulled from CMOR reports from a particular county or region where drought status changed. When conditions changed, responses were triggered. Akyüz said that state and federal producer assistance and aid programs were triggered by drought conditions experienced across parts of the state during the 2021 growing season, “and it’s all because of the Drought Monitor map that was driven by CMOR (submissions) and meteorological data,” he said.

“I made a point that their reports made a difference,” he said. “And then it was reinforced by the director of extension services how important their reports are, so they became twice as motivated to participate. I think (telling them) week after week and letting them know that their reports really makes a big difference in their community was the biggest motivation factor for the agents to participate.”