Drought and food
Multidisciplinary team looks at impacts of climate shocks on food systems

We're all in this together
NDMC workshop brings together stakeholders in the Southeast’s ACF Basin

Climate smart agriculture in the Middle Rio Grande
NDMC and partners work to enhance resilience with Indigenous producers in New Mexico
Higher-than-usual stream flows after a wet winter in Mineral County, Nev., Mar. 31, 2023. (Photo submitted via CMOR)

It’s amazing what a few months can do! From the end of last year to the middle of April, the extent of drought across the U.S. and Puerto Rico was cut almost in half. The improvement in conditions in the West has been nothing short of unprecedented. Between October and March, 31 distinct atmospheric rivers slammed into the West Coast. Several states broke snowpack records, and drought coverage in California, Utah and Nevada is now as low as it has been in over two years.

At the same time, though, drought intensified in other areas, like Florida and the Mid-Atlantic, and conditions continue to be dangerously dry across the Great Plains, causing significant hardship for communities and agricultural producers. Here in Nebraska, for example, the extent of drought has hardly budged while sitting close to 100% for the last 7 months. You can learn more about how wild these last few months have been, and how that has complicated our drought monitoring efforts, in the winter ‘recap’ on page 17.

As always, though, drought monitoring is just a part of our mission here at the NDMC. Alongside our climatologists, our impressive team of social scientists and planners have been busy this winter engaging with several communities across the U.S. to increase drought resilience.

For example, we recently hosted the first outreach event for our Climate Smart Indigenous Agriculture project. Alongside state, federal and Tribal partners, we’re working to enhance the resilience of Indigenous farmers and ranchers in the Middle Rio Grande Basin in New Mexico. The workshop brought together participants from six different pueblos and several agencies to discuss soil health, drought and climate adaptation (page 13). Other members of our team also recently headed south to facilitate a drought planning workshop in Alabama. Organized by a local stakeholder group, the workshop was an opportunity to plan for drought and build new relationships in the contested Apalachicola-Chattahoochee-Flint River Basin (page 11).

We’re also excited to announce that two NDMC-affiliated researchers are part of a multi-disciplinary, multi-institutional team selected for the competitive NSF Convergence Accelerator program. They’re currently competing to secure $5 million in additional funding to better predict the effects of climate extremes, like drought, on food systems (page 9).

These sorts of collaborative, interdisciplinary efforts are always a priority here at the NDMC. You can read all about them in this action-packed edition of DroughtScape!
First quarter sees significant improvement in West but dry conditions remain in Great Plains and elsewhere

Lindsay Johnson
Climatologist

Drought classifications are based on the U.S. Drought Monitor. Details on the extent and severity of drought are online: droughtmonitor.unl.edu.

The outlook integrates existing conditions with forecasts from the National Oceanic and Atmospheric Administration’s Climate Prediction Center: www.cpc.ncep.noaa.gov.

National Summary

During the first quarter of 2023, drought conditions improved widely across much of the U.S. At the beginning of the year, large areas of long-term drought persisted across California, Nevada, Utah, Oregon and southeastern Wyoming. All those areas have improved significantly since then thanks to several months of heavy snow and rain and a series of consecutive atmospheric rivers that slammed into the West Coast, bringing record precipitation. The extent of drought across the entire West region hit its lowest values since May 2020. California was cleared of severe or worse conditions for the first time since March 2020, and in February, the extent of drought in Nevada dropped below 100% for the first time in over two years. Areas of the Great Plains, Midwest and South-Atlantic also saw improvement, the most significant being a 5-category change in east-central Oklahoma. Hawai’i also saw improvements.

Changes in U.S. Drought Monitor categories between Jan. 3 and March 28, 2023, show how drought improved significantly across most of the western and central U.S. but deteriorated in the Mid-Atlantic, Florida and parts of the South and Northwest over the first quarter. (Map from the U.S. Drought Monitor, droughtmonitor.unl.edu)

At the end of the first quarter, as of March 28, 2023, just 25.7% of the U.S. and Puerto Rico was in moderate drought or worse; the lowest it had been since July 2020. (Map from the U.S. Drought Monitor, droughtmonitor.unl.edu)
across all islands over the course of the first quarter.

At the other end of the spectrum, a combination of dry weather and warm temperatures led to drought conditions persisting, even intensifying, in several areas, including Kansas, Colorado and Texas. In the Northwest, short-term drought has developed alongside the already present long-term drought due to recent dry weather. This pattern is mirrored in Florida and the Mid-Atlantic. Puerto Rico has also seen drought expansion and intensification in recent months.

**National Drought Stats**

Coverage of drought and abnormal dryness, across every Drought Monitor category, decreased over the first quarter from Jan. 3 to March 28. Overall, the extent of drought and abnormal dryness across the U.S. and Puerto Rico dropped from 58.2 to 43.5%. Moderate or worse drought coverage decreased from 38.7 to 25.7%, the lowest it has been since July 2020. Severe or worse drought coverage was cut almost in half, from 21.9 to 11.6%. Extreme or worse drought coverage declined from 8.2 to 4.4%. Finally, exceptional drought coverage dipped slightly from 1.6 to 1.5%. The extent of drought peaked for the quarter at the beginning of the year, on Jan. 3, before improving significantly in January and early February. In late February, the extent of drought across the contiguous U.S. dropped below 40% for the first time in almost two and a half years.

**National Precipitation**

Over the first quarter, January through March, the driest areas compared to normal were the Northwest, especially northern Idaho, northwest Montana and

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The 3-month Standardized Precipitation Index for January through March 2023 shows deviations from normal precipitation for the same period in previous years, highlighting dry conditions in the Northwest and Mid-Atlantic and along the Gulf Coast. (Map from the High Plains Regional Climate Center)

Temperature anomalies compared to normal values for the first quarter show a clear east-west gradient, with cooler-than-normal temperatures in the West and warmer-than-normal conditions in the East. (Map from the High Plains Regional Climate Center)
western Washington; the Gulf Coast and the Florida Peninsula; and the Mid-Atlantic around Washington, D.C. Virginia, for example, experienced its eighth driest March on record according to NOAA. Delaware and Maryland, meanwhile, experienced their fifth and third driest January-March periods, respectively.

In contrast, most of the Midwest saw above-normal precipitation, particularly along the Ohio and Mississippi rivers. This continued south into Kentucky, all the way down to north-central Georgia and Alabama, as well as into east-central Mississippi, Arkansas and eastern Oklahoma. Parts of Arkansas actually saw up to 12 inches above normal precipitation for the quarter. Wisconsin experienced its third wettest January-March period on record, and its fifth wettest February.

Areas of the Great Plains and West also saw above-normal precipitation, from the Dakotas all the way to Arizona and California. High-elevation areas saw up to 12 inches more than normal precipitation, and, in California, the Sierra Nevada received 20 inches above normal. According to NOAA, California experienced its 10th wettest January and seventh wettest March (wettest since 1995) on record. Utah, meanwhile, had its third wettest March on record, and Nevada its sixth. Similarly, Nebraska experienced its second wettest January on record. Across the contiguous U.S., this quarter was the 23rd wettest on record.

Conditions were more mixed in Alaska during the first quarter of the year. The south-central region, where Anchorage is located, received as little as 12 inches below normal precipitation whereas the southeast received as much as 12 inches above normal. Conditions were also mixed in Puerto Rico. Many spots received 0.75-1.5 inches more than normal precipitation, including around San Juan, but most areas received below-normal precipitation. The western side of the island experienced the largest precipitation deficits of almost 4 inches. In contrast, Hawai’i experienced mostly above-normal precipitation. On the leeward side of the Big Island, for example, they received up to 25 inches more than normal for the quarter. While not as extreme, the other islands also experienced above-normal precipitation apart from a few spots on Oahu, Maui and the Big Island.

**National Temperature**

The first quarter of 2023 began with extremely warm temperatures across the East, particularly in the Northeast where temperatures reached over 10 degrees above normal. Connecticut, Massachusetts, Maine, New Jersey, New Hampshire, Rhode Island and Vermont all experienced their
warmest January on record. Almost every other state in the eastern half of the U.S., including Texas and Oklahoma, had a January in the top-10 warmest. States from the Midwest to Texas saw average temperatures 6-10 degrees above normal for the month.

That intense heat continued through the quarter. Virginia, for example, had its hottest February on record, while eight other states across the East recorded their second hottest. Georgia experienced temperatures 9-12 degrees above normal for February. Though things cooled a bit in March, five states, from Florida to Virginia, all experienced their hottest January-March period on record.

A swath from Texas and Oklahoma up to western Wisconsin and eastern Minnesota acted as the boundary between these above-normal temperatures in the East and below-normal temperatures in the West. To the West of that boundary, most states experienced temperatures 2-6 degrees below normal. In February, some areas, like northwest Nevada and central Wyoming, saw temperatures as much as 15 degrees below normal for the month. Cold temperatures continued into March. California, Oregon, Nevada and North Dakota all experienced a top-five coldest March on record, in terms of average temperature, and California had its 11th coldest January-March period.

Meanwhile, conditions were mixed in Alaska, Hawai‘i and Puerto Rico. In January, average temperatures in Alaska were generally above normal, with some spots recording temperatures up to 15 degrees above normal, though February and March were mostly colder than usual. Hawai‘i was mostly warmer than normal, or close to it, over the course of the quarter, as was Puerto Rico.

### National Outlook

From April through June, the National Weather Service Climate Prediction Center is forecasting drought improvement (or localized removal) on the periphery of ongoing drought in the West and High Plains, including in parts of southern Nevada, central Oregon, central Utah, eastern Wyoming, Nebraska, western Iowa, central Kansas, central Oklahoma and south-central Texas. The forecast shows that drought removal is also likely in southern California, western Nevada and central Idaho, as well as in scattered pockets around the country from the Dakotas to Louisiana. Florida, in particular, is forecast to see big improvement after a dry first quarter.

Meanwhile, drought conditions are forecast to persist in western Texas, Oklahoma, Kansas, eastern Colorado and New Mexico, with some expansion in western Texas and central New Mexico. The long-term drought conditions skirting Arizona in California, Nevada and Utah are also forecast to persist. In the Northwest, the ongoing drought in western Montana is forecast to extend into the far north of Idaho and into northeastern and north-central Washington. Please note that since this forecast was made on March 31, some of these changes will likely have occurred by the time this summary is published.
While drought conditions eased over much of the U.S. in the first quarter of 2023, 162 impacts were added to the Drought Impact Reporter. Texas had 45 impacts, documenting agricultural challenges and water restrictions. California followed with 29 impacts noting water issues, such as water agencies dialing back restrictions and drought surcharges. Kansas and Utah each recorded 15 impacts, describing struggling winter wheat in Kansas and water supply concerns in Utah.

West’s winter precipitation and rebound from drought

Large swaths of the West, particularly California, were entrenched in drought for three years until the start of the latest water year on Oct. 1. Since then, a series of atmospheric rivers have channeled intense storms and heavy precipitation to the West Coast. The repeated bouts of torrential rain and snow quickly deepened the snowpack and made good progress in quenching the West’s years-long thirst. The snowpack in most of the West exceeded normal seasonal amounts, reaching 200% to 300% of normal in some areas. The abundant precipitation was exactly what was needed to alleviate drought, boost water supplies, replenish soil moisture and refill reservoirs.

Lakes Mead and Powell, however, are too large to benefit much from the tremendously snowy winter, and both reservoirs remain low. The Colorado River Basin states were urged by the U.S. Bureau of Reclamation to devise a way to use 2 to 4 million acre-feet less water to support water levels in the reservoirs (The Associated Press, Flagstaff, Ariz.). The deadline for submitting a proposal to the agency was Jan. 31, but the states could not commit to an agreement by that date. Without consensus among the seven states in the basin, the federal government offered a proposal with several possible courses of action.

California’s sensational swing

As 2023 began, and California was gearing up for a fourth year of drought, storms brought badly needed precipitation. On Jan. 1, the statewide average snow water equivalent was already 16.7 inches, which is 182% of normal for the date and 64% of the April 1 average (California Data Exchange Center, Sacramento, Calif.). By the end of the month, numbers had gone up to 33.7 inches, or 206% of normal for the date and 128% of the April 1
average, making the Sierra Nevada snowpack at that point the largest since 1995. The wet start to the winter offered hope that drought might be nearing an end but also raised concerns about a rapid melt that could cause flooding (The Mercury News, San Jose, Calif.).

By the start of the second quarter in early April, the statewide snow water equivalent had reached a whopping 61.1 inches, or 237% of average for the date (California Department of Water Resources, Sacramento, Calif.). The April 1 data from the statewide snow sensor network was officially higher than any other reading since the network was established in the mid-1980s. This year also appears to have surpassed the record snow year of 1982-83, when manual snow measurements put the snowpack at 227% of average.

In response to improving conditions, California’s governor, Gavin Newsom, ended some of the state’s most severe drought restrictions on March 24, including his call for a voluntary 15% reduction in water use, issued in July 2021 (Los Angeles Times, Los Angeles, Calif.). Gov. Newsom had declared a statewide drought emergency in October 2021.

The Metropolitan Water District of Southern California also recently rescinded their emergency restrictions enacted in 2022 (KTLA, Los Angeles, Calif.). The three-year period of 2020 to 2022 was the driest period in the state’s history, spurring the district to impose limits on outdoor watering to compensate for reduced water supplies from the Colorado River and other drought impacts.

The East Bay Municipal Utility District likewise ended its drought surcharge on March 1 as winter storms refilled local reservoirs (Berkeleyside, Berkeley, Calif.). The 8% surcharge took effect on July 1, 2022, and was used for expenses and to purchase additional water supplies. Since fall 2022, EBMUD has spent $19 million on supplemental water.

Rising reservoir levels due to the unprecedented storms this winter also allowed the State Water Project to offer 75% of requested supplies, as of the end of March, to its 29 public water agency customers that, together, serve 27 million Californians (Los Angeles Times, Los Angeles, Calif.). The allocation as of late January was just 30%, which already was a big boost from the initial allocation of a mere 5% set last December (California Department of Water Resources, Sacramento, Calif.). Water managers have been reassessing conditions monthly throughout the winter, and will continue to do so in the spring, to determine allocations.

Meanwhile, at the end of March, the Bureau of Reclamation announced an increase in allocations from the Central Valley Project, after setting more conservative allocations just a month earlier. Irrigation water service was set at 80% of the contract total, up from a 35% allocation in February, and municipal and industrial water use...
was raised to 100% of historic use (Bureau of Reclamation, Sacramento, Calif.). The improvements were made possible because of a wet winter that boosted reservoir levels. Shasta Lake, for example, went up from 59% to 81% full since the initial allocation announcement in February.

Years of drought, though, have devastated the salmon fishing industry such that the state Department of Fish and Wildlife issued a ban on salmon fishing along the entire coast on March 12 (KPIX CBS Bay Area, San Francisco, Calif.). The only other time that the entire salmon fishing season was canceled was during 2008-09, another year of intense drought.

At the start of April, the ocean salmon fishing season off California and much of the Oregon coast was also canceled after near-record low numbers of adult fall-run Chinook returned to California’s rivers in 2022 (The Associated Press, San Diego, Calif.). This is the second time in 15 years that the season has been canceled.

Winter wheat crop struggles in the Great Plains

The Southern Plains were in drought during the fall when winter wheat is typically planted. Many farmers planted wheat nonetheless, despite the low soil moisture, hoping that enough precipitation would eventually come to help the crop germinate and grow. Instead, the region remained dry through the winter. Drought, combined with wind and sand storms in late February, led to the loss of most of the wheat crop in the Texas Panhandle (Texas Farm Bureau, Waco, Texas).

Meanwhile, in Oklahoma, wheat growth and development was delayed mainly due to drought, as well as cold temperatures (Oklahoma State University, Stillwater, Okla.). Forage amounts were also down this year, so producers did not get to graze this past fall. Much of Oklahoma’s wheat, especially that intended for forage, was seeded late and was dusted in due to extreme drought.

Some of the winter wheat in northwest Kansas did not emerge, and some may have been lost to winter kill (Brownfield Ag News, Jefferson City, Mo.). In general, Great Plains wheat looks tough, according to a senior grains and oilseeds analyst with Rabobank, and some has been blown out of the ground and hasn’t tillered well. The crop could face challenges this year similar to 2022.

Dry conditions in Texas hinder agriculture

Ongoing drought in Texas continued to make agricultural activities a challenge, particularly in western Texas where conditions remained particularly dry. The soil in wheat fields in the Texas Panhandle was blowing on windy days (AgriLife Today, College Station, Texas). Wheat and oats were rated very poor to fair, and farmers were irrigating if they could. Even with irrigation, though, the crops were barely getting enough moisture. Winter wheat in the Rolling Plains also looked very poor in the drier areas. Stock tank levels were falling and critically low in parts of Central and West Texas for lack of rain, and, across the Southern Plains, wheat, pasture and rangeland conditions were very poor to fair.

As drought deteriorated across much of Texas, water supplies also dwindled for some municipalities. Wichita Falls water customers, for example, had to conserve water as lakes Kickapoo and Arrowhead fell low enough to trigger restrictions (Wichita Falls Times Record News, Wichita Falls, Texas). Waco residents and businesses were similarly under mandatory water conservation as Lake Waco was just 57.9% full by the end of March (KCEN HD, Temple, Texas).

Just northwest of Austin, the Central Texas Groundwater Conservation District opted to remain in drought Stage 4 (DailyTrib.com, Marble Falls, Texas). Although the county saw slight increases in soil moisture, groundwater was still at historic drought levels. Well levels typically rebound during the winter when there is less pumping, but they haven’t risen much this year.

Along with lower aquifer levels and low stock tanks, Jacob’s Well in Hays County was also closed to swimmers for the “foreseeable future” due to unsafe conditions (KEYE-TV, Austin, Texas). Drought reduced the flow of the stream, affecting water quality.

Drought does occasionally result in some positive impacts, though. For example, the Texas Panhandle has had fewer rabies cases of late due to dry conditions (KFDA-TV, Amarillo, Texas). A veterinarian explained that skunks most commonly carry rabies, but drought has reduced their food supply, which has meant a smaller skunk population and, consequently, fewer cases of rabies.
Multidisciplinary team looks to increase the resilience of food systems to climate shocks like drought

Two NDMC-affiliated researchers got together with colleagues from a multidisciplinary, multi-institutional team for a project kickoff in Santa Barbara, California, in February. (Photo by Tia Kordell, University of California, Santa Barbara)

Two researchers affiliated with the National Drought Mitigation Center at the University of Nebraska-Lincoln are part of a multidisciplinary, multi-institutional team that has received significant funding from the National Science Foundation for a project predicting the effect of climate extremes on the food system. Understanding the vulnerability of food systems to climate shocks like drought is an important step to increasing the resilience of communities and agricultural operations to those shocks.

The team is one of 16 selected for Phase 1 of the NSF Convergence Accelerator program’s Track J: Food & Nutrition Security, an $11 million investment by the NSF into applied research and technology development to advance solutions aligned to this focus.

Led by Kathy Baylis at the University of California, Santa Barbara, team members come from UNL, UCSB, Baylor University, the University of Illinois, Tufts University and the University of Texas. They will be working with a range of nongovernmental and nonprofit organizations on the ground in both the U.S. and Kenya.

Mike Hayes, a professor at the School of Natural Resources at UNL, and former director of the NDMC, is one of the researchers involved. “This project allows us to come together and combine the strengths that all the people involved have,” Hayes said of the team’s diverse disciplinary makeup, with members coming from...
Hayes's own expertise is in climate science. His role in the project, he explains, is to apply new developments in climate science to the challenge of food security and translate the vast amount of climate data that’s out there into something useful and usable for decision-makers. “They’re really emphasizing the broader impacts, rather than just basic research,” he said of the accelerator program’s focus on applied solutions.

“All of the projects are challenged to be user-inspired, user-informed,” added Tonya Haigh, a research assistant professor at UNL who is also involved with the project. Haigh, who leads the NDMC’s social science program, is interested in user interaction. Her role in the project is to better understand what new information on-the-ground partners — whether that’s a food bank, a farm, or an international agency — need to make more informed decisions about food production and distribution.

Beyond disciplinary expertise, the NDMC researchers are also contributing to the project their deep well of connections with agricultural stakeholders and information users across the Southern Plains and Southwest. Haigh and Hayes, for example, both point to the U.S. Department of Agriculture Regional Climate Hubs as a potential project collaborator with which the team might connect. The Climate Hubs are a long-time partner of the NDMC and work right at that intersection of science and agricultural decision-making on which this project is focused.

Using the NDMC’s existing relationships in the region, the project team can begin to test how climate outlooks can inform agricultural and food decision-making. From there, they can take those strategies to Kenya where other project team members have their own longstanding relationships.

In the first phase of the accelerator program, the team will develop an initial proof of concept and engage with the other 15 teams in hands-on learning around human-centered design, use-inspired research and communications. At the end of Phase 1 in August, each team will submit a formal proposal to try to secure $5 million of additional support to further develop their solutions in Phase 2.

“New technologies could play an important role in ensuring that individuals have access to food and water in the coming decades,” said Erwin Gianchandani, NSF assistant director for Technology, Innovation and Partnerships. "Through transdisciplinary, use-inspired and translational research, the projects in which we are investing today have the potential to help the most vulnerable Americans, not to mention billions of people worldwide."
We’re all in this together: Stakeholders work to increase drought resilience of the ACF Basin

Leah Campbell
Communications Specialist

Last month, 60 stakeholders from across Alabama, Georgia and Florida gathered for a day-long workshop to discuss drought management in the Apalachicola-Chattahoochee-Flint River Basin, facilitated by the National Drought Mitigation Center. Working through different drought scenarios and exercises, participants got to learn more about the challenges facing the watershed and how different agencies prepare for, and respond to, drought. Most importantly, though, the workshop provided an opportunity to bring together stakeholders from across the region to collaboratively work toward a more resilient future from the ACF Basin.

Chris Manganiello, the Water Policy Director at Chattahoochee Riverkeeper and one of the event organizers, described it as the first-ever multi-stakeholder drought exercise in the watershed. “We pulled together many participants who have not always worked in the same room together,” he said.

“Over the last 10 years, ACF ‘water wars’ lawsuits have made it difficult to strengthen working relationships,” added Brad Moore, President of the Friends of Lake Eufaula and another workshop organizer. Manganiello and Moore are two of the leaders of ACF Stakeholders Inc., an organization composed of municipal water managers, local governments, power producers, businesses, farmers, conservationists and more from across the river basin. In 2015, ACFS approved the basin’s first comprehensive water management plan, and they continue to work toward unifying stakeholders from across the region.

In recent years, drought has emerged not just as a critical issue for the basin but also a potential pathway, as Moore describes it, “to rebuild these relationships.” Workshop participants included representatives from the U.S. Army Corps of Engineers, the Fish and Wildlife Service and the U.S. Geological Survey, as well as the University of Alabama, Auburn University, the Atlanta Regional Commission, the Georgia Water Policy Center and various stakeholder groups representing seafood, agriculture, business and water supply interests. In addition, several state agencies were involved, such as the Alabama Office of Water Resource Management, the Georgia Department of Natural Resources and the Florida Department of Environmental Protection.

“It was an opportunity for stakeholders from across the ACF basin to begin meeting in-person again and learn about drought in the basin and how state agencies and the Army Corps of Engineers respond to changing conditions,” said Cody Knutson, the planning coordinator for the National Drought Mitigation Center and one of the workshop’s facilitators.

Knutson, alongside Deb Bathke, the Drought Center’s
education and outreach coordinator, and Lindsay Johnson, an NDMC climatologist, walked participants through an interactive scenario exercise to get them thinking about drought. In the exercise, drought intensified over the course of a year before beginning to recover. At critical decision points in the timeline, participants were able to discuss their respective priorities, management options and strategies.

In one assignment, small breakout groups designed their own hypothetical newspaper front page describing an unprecedented drought and efforts that were likely to be underway to address the extreme situation. Front-page ‘stories’ highlighted low lake levels, water restrictions, burn bans and public meetings. Headlines made claims like “Dry on the 4th of July” and “We’re All in this Together.” Knutson says the latter was a common sentiment expressed throughout the day.

The workshop was an important first step in forging new relationships, enhancing old ones and sharing information about the threats facing the watershed and potential strategies to address drought in the future. A follow-up drought scenario exercise is planned for 2024.

“For a region known for legal conflict over water, this was a welcome step in the direction of more collaboration,” said Manganiello.

During the drought scenario exercise, teams were asked to sketch out hypothetical newspaper front pages to highlight the sort of impacts affecting the ACF Basin, and strategies that might be implemented, during a drought. Participants put together headlines like, “We’re all in this together” and mentioned response strategies like public meetings, water restrictions and burn bans.
Like many western states, New Mexico has benefited from a healthy snowpack this winter, boosting reservoir storage and saturating soils before the scorching heat of the spring and summer. But what if that snowpack melts too fast and leads to widespread flooding? What can farmers do when the irrigation ditches are full, but they’re not yet ready to plant? What can Tribal farmers, in particular, do on smaller plots of land where the available options for boosting water supplies are more limited?

These were just a few of the questions raised in a recent workshop on soil health, drought and climate change co-facilitated by the National Drought Mitigation Center and hosted by the Santa Ana Pueblo. The workshop, held on the Santa Ana Pueblo in New Mexico at the end of March,
brought together 20 participants from six different pueblos from across the Middle Rio Grande Basin. It provided an opportunity for Tribal producers and resource managers to engage with state and federal representatives to learn about technical assistance resources, soil health programs and funding opportunities. It was also a chance for agency staff to meet with producers and, together, brainstorm concrete projects for drought and climate resilience on Tribal land in the Southwest.

“The goal of the workshop was really introductory in nature,” said Maddie Goebel, a social scientist at the NDMC and one of the workshop’s organizers. “It was a chance to bring technical service providers, pueblo resource management folks and farmers together in one room, to build a foundation for future outreach.”

The March workshop was the first of a series of outreach programs planned as part of the Climate Smart Indigenous Agriculture Project, a collaborative effort of the NDMC, the Santa Ana Pueblo, the U.S. Department of Agriculture Southwest Climate Hub, Southwestern Indian Polytechnic Institute and the Intertribal Agricultural Council. It’s funded by the USDA’s Natural Resources Conservation Service. Together, the team is working to enhance agricultural resilience to drought and encourage climate adaptation in Middle Rio Grande pueblos by better understanding the needs of Indigenous farmers and ranchers and leveraging their traditional knowledge and practices.

To that end, the recent workshop incorporated several educational sessions and field trips with plenty of opportunity for discussion and relationship building. After a presentation on current conditions and climate change trends, led by the New Mexico State Climatologist, Dave DuBois, presenters from the New Mexico Department of Agriculture, the Intertribal Agricultural Council and the NRCS took turns discussing the resources they offer to agricultural producers, from funding for healthy soil projects to grant-writing workshops.
Participants also had an opportunity to collectively brainstorm on-farm projects to increase climate and drought resilience, spurring valuable discussion about monitoring, community outreach and funding. (Photo from NDMC)

“Our goal is to get people thinking about projects they would be interested in doing on their farms and encourage pueblo staff to reach out to farmers to begin brainstorming tangible plans,” said Goebel. “It was interesting to me, and hopefully participants, to see the range of opportunities and services available.”

The workshop was an invaluable opportunity to bring together Tribal and government partners. Participants were able to ask questions about accessing resources and highlight the unique opportunities and challenges on each pueblo. On the flipside, workshop organizers got tangible feedback for future outreach activities and could begin strategizing how to disseminate information from the workshop to a broader audience across the region.

Educational workshops like the Soil Health, Drought and Climate Change Tribal Workshop in March are just one component of the Climate Smart Indigenous Agriculture project. Since last year, NDMC staff have been conducting interviews with farmers, ranchers, agricultural producers and natural resource managers from across the Middle Rio Grande Basin. Later this year, the team will be working with Southwestern Indian Polytechnic Institute, a Tribal community college in Bernalillo County, New Mexico, to develop an internship program for pueblo students. The project will run for two years, through next spring.

USDA is an equal opportunity provider, employer and lender.

In one workshop session, participants had the opportunity to brainstorm on-farm projects to increase climate and drought resilience, spurring valuable discussion about monitoring, community outreach and funding. (Photo from NDMC)
The 13th biennial U.S. Drought Monitor Forum was April 11–13 in Boulder City, Nevada. The meeting, organized by the National Drought Mitigation Center, the U.S. Geological Survey and the U.S. Bureau of Reclamation, focused on the processes and inputs behind the map. The last day included a trip to Hoover Dam. The U.S. Drought Monitor is a weekly map showing the extent and severity of drought, jointly produced by the U.S. Department of Agriculture, the National Oceanic and Atmospheric Administration and the NDMC. Look for an announcement in coming weeks about a workshop page where presentations will be posted.
Drought monitoring through a winter of wild weather and big changes

Leah Campbell
Communications Specialist

The big story this winter was drought relief. Over and over, headlines from papers across the country asked, “Is the drought over?” and celebrated when their region was cleared on the U.S. Drought Monitor map. There were reports of ski resorts closing from too much snow, wildflower blooms visible from space and Tulare Lake reemerging from the agricultural fields of the San Joaquin Valley.

On March 28, the extent of drought in the West hit 35.6%, the lowest it had been since May 2020. It has continued to improve since then. California, Utah and Nevada were all cleared of extreme and exceptional drought during the first quarter (California was then cleared of severe drought in early April) and hit some of the lowest values for drought coverage those states had seen in two-plus years. In February, the extent of drought in Nevada dropped below 100% for the first time in 105 weeks.

But the simplicity of declaring “Drought is over” for a newspaper headline isn’t quite so simple for the authors of the Drought Monitor, and most experts agree that it will take more than a few months of rain and snow to erase years of bone-dry conditions.

“Deficits have been years in the making,” wrote Drought Monitor author and NDMC education and outreach coordinator Deb Bathke in the summary for the Jan. 17 USDM.

Just look at California. Despite the state being in as good a shape as it has been in years, the offshore salmon fishing season has been canceled for 2023 because of how few fish have returned to the state’s rivers and streams. Or look at Lakes Powell and Mead. While the Upper Colorado River Basin has been inundated with snow, and some of it was declared drought free this winter, the reservoirs themselves remain at historically low levels.

Timing is a major challenge for Drought Monitor authors, especially when the long- and short-term indicators are telling different stories. For example, the Northern Plains and Rockies received ample snowfall this winter. But much of it fell after soils had already frozen in late fall, and, in some cases, it began melting this spring before those soils had thawed. In that situation, it’s more difficult to know what impact any recent snow will have on long-term deficits in groundwater and soil moisture. In the Southwest, meanwhile, soils might not be frozen, but they are parched after years of dry conditions. In that case, all that water can be quickly absorbed into the soil, reducing the amount that runs off into rivers and, ultimately, into the reservoirs on which the region depends.

Large swings from dry to wet (or wet to dry as was the case in some places this winter like Puerto Rico) can also complicate efforts by state officials to communicate with the public and make drought response decisions. How can one encourage people in the Colorado River Basin to conserve water while their communities flood? How can one explain to those in California or Oregon that heavy snow in December doesn’t mean there will be a healthy snowpack by April?
How can one decide when to declare drought in Alaska in regions that flip from melt season to fire season in the span of just a few weeks?

These are all questions that climatologists, water suppliers and land managers must grapple with every year. The complex, nuanced information required to answer them highlights the value of the network of on-the-ground experts that contribute to the Drought Monitor and the database of crowdsourced observations that authors use to understand local conditions.

It also highlights the importance of the convergence-of-evidence approach that forms the backbone of the USDM. “The USDM process is based upon the percentiles of various inputs and where the current data compare to the various timescales of the hundreds of inputs used each week,” explained Brian Fuchs, a Drought Monitor author and the NDMC’s monitoring coordinator. “We are not looking for the best/worst indicator to base the maps off but determining where the majority of indicators are pointed.”

Condition Monitoring Observer Reports reflect the range of conditions experienced across the country this winter, from places that continued to struggle with long-term drought, those that saw significant improvement and those where the Drought Monitor swung rapidly back and forth. From L to R: Morton County, Kan., Mar. 8; Mariposa County, Calif., Feb. 24; and Guayama, Puerto Rico, Mar. 26. (Photos submitted via CMOR).