

DroughtScape

WINTER 2021

QUARTERLY NEWSLETTER

Drought expands, intensifies in 2020

Learn where drought developed last year, and what impacts it created, in our annual summaries

Tell us where you CMOR drought

Updated Conditions Monitoring Observation Reports form allows users to send reports and photos in real-time

Decisions, decisions

Study examines how ranchers with and without drought plans responded to 2016 drought



DROUGHT SCIENCE

PLANNING SENSE

About the cover

Winter western wheatgrass is key forage for South Dakota's livestock industry. National Drought Mitigation Center rural sociologist Tonya Haigh conducted research about how some of the state's ranchers utilized drought plans, and how their experiences differed from those who did not. Photo by Tanse Herrmann, USDA Natural Resources Conservation Services South Dakota.

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From the Director



Mark Svoboda

In this space last year, I wrote that 2019 had been a relatively quiet year for drought. Well, 2020 proved to be a different story in so many ways.

As NDMC climatologist Curtis Riganti details in the annual drought summary (page 5), nearly 41% of the U.S. and Puerto Rico ended the calendar year in drought, an increase of over 30 percentage points from the start of 2020. And as drought spread this past year, it intensified. Over 10% of the country was experiencing extreme (D3) drought at the end of the year. And nearly 8.3% of the country was experiencing exceptional (D4) drought. At its peak on Dec. 8, 2020 (8.27%, to be exact), the area

of the country in D4 was the 18th-largest out of 1,100 USDM maps that have been released, and the largest extent in D4 since 2011.

The NDMC team is closely monitoring the development and intensification of La Niña in the Pacific this winter. Its persistence, coupled with a warm winter, could lead drought to develop or further intensify throughout the southern half of the country, particularly in the Southwest. As NDMC drought impact specialist Denise Gutzmer writes in the annual drought impact summary (page 9), many of those states are already managing water, agriculture and other impacts related to persistent drought.

At our core, developing plans and resources to navigate drought events like these on international, national, state, watershed, local and tribal levels is why the Drought Center was founded in 1995. The NDMC team spent its 25th year at work with our partner agencies and institutions on research and projects that further our mission, even though our team, like yours I'm sure, had to adapt the way we work.

In a normal year, we would have met many of our collaborators at climate and drought planning conferences and workshops around the country and the globe. After this year, it will be hard to type the word Zoom without the capital "Z"! But I believe there were some advantages to making a sudden shift to an all-virtual collaborative environment. In some cases, it led to more frequent calls with project teams. It showed that we can adapt to an abrupt transition that changed how we work, while also reinforcing the purpose of our work.

This issue of DroughtScope features not only annual and quarterly recaps of drought impacts and climatology, but also examples of our efforts to improve existing resources (an update to the CMOR reporting system, page 12), our expansive work with partner agencies (our latest 3-year agreement with USDA, page 15) and our research efforts that help people whose livelihoods are linked with drought (Tonya Haigh's study on ranchers with and without drought plans, page 11).

This past year, and over my 25-year career at the NDMC, I think our team has answered the call. There is certainly plenty of work to do as we begin our 26th year and I'm excited to see what challenges 2021 will bring our way. I hope to see you on the road and/or on Zoom. Stay well and stay in touch.

Drought intensified in the Southwest, but eased in the Northeast

By Denise Gutzmer

NDMC Drought Impacts Specialist

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.

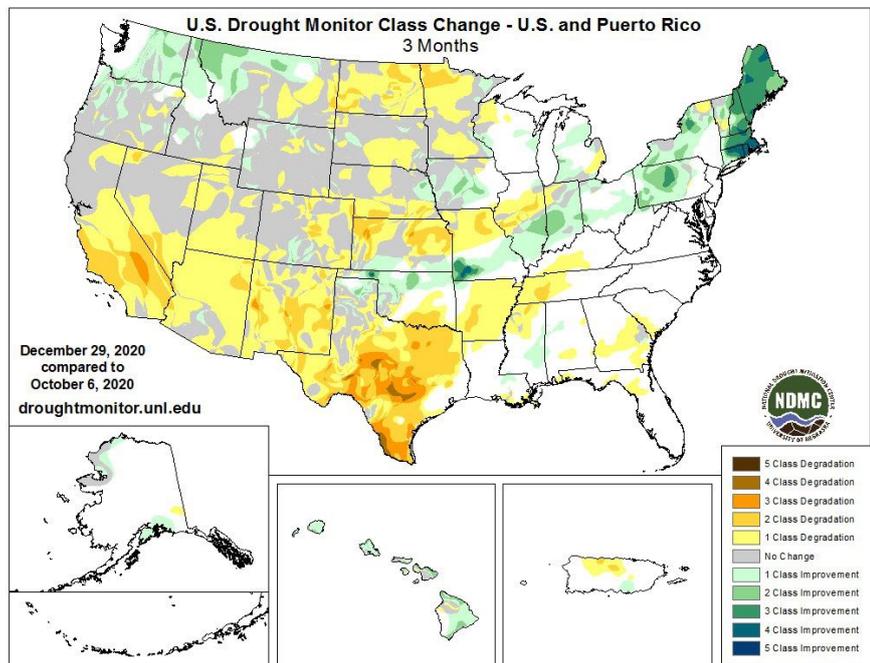
National Summary

In the final quarter of 2020, drought intensified in many areas west of the Mississippi River, particularly the Southwest, but eased dramatically in the Northeast and improved in the Northwest and across a swath of the Midwest as well. Drought abated considerably in the Northeast in October. November was a month of drought intensification in the Southwest and Great Plains, with rapid drought development in Texas. Drought ramped up in southern California in December, while it continued to improve in the Northeast.

Drought

All categories of drought increased in the U.S. and Puerto Rico in the fourth quarter, putting almost 57% of the country in abnormal dryness or some level of drought at the end of December. Exceptional drought (D4) increased by over 6.5 percentage points to cover 8.26% of the country, with most of the coverage affecting the Southwest. Extreme drought or worse (D3-D4) increased by over 5.2 percentage points, affecting about 18.56% of the U.S. Severe drought or worse (D2-D4) increased by about 4.3 percentage points, encompassing 28.6% of the U.S.,

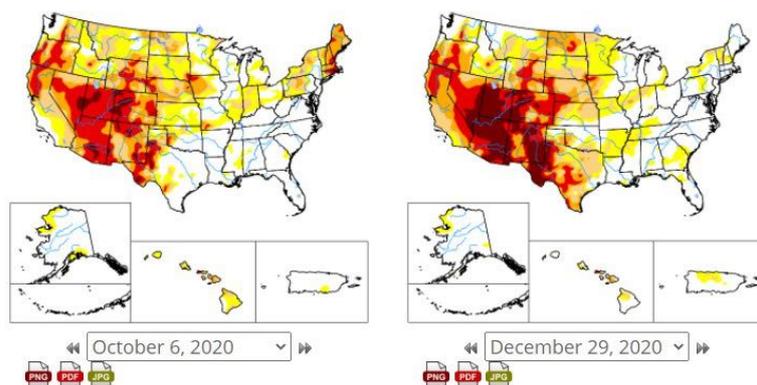
All categories of drought increased in the U.S. and Puerto Rico in the fourth quarter, putting 56.95% of the country in abnormal dryness or some level of drought at the end of December.



In the final quarter of 2020, drought intensified in many areas west of the Mississippi River, particularly the Southwest, but eased dramatically in the Northeast, and also in the Northwest and across a swath of the Midwest.

Drought Classification

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data



Statistics Comparison

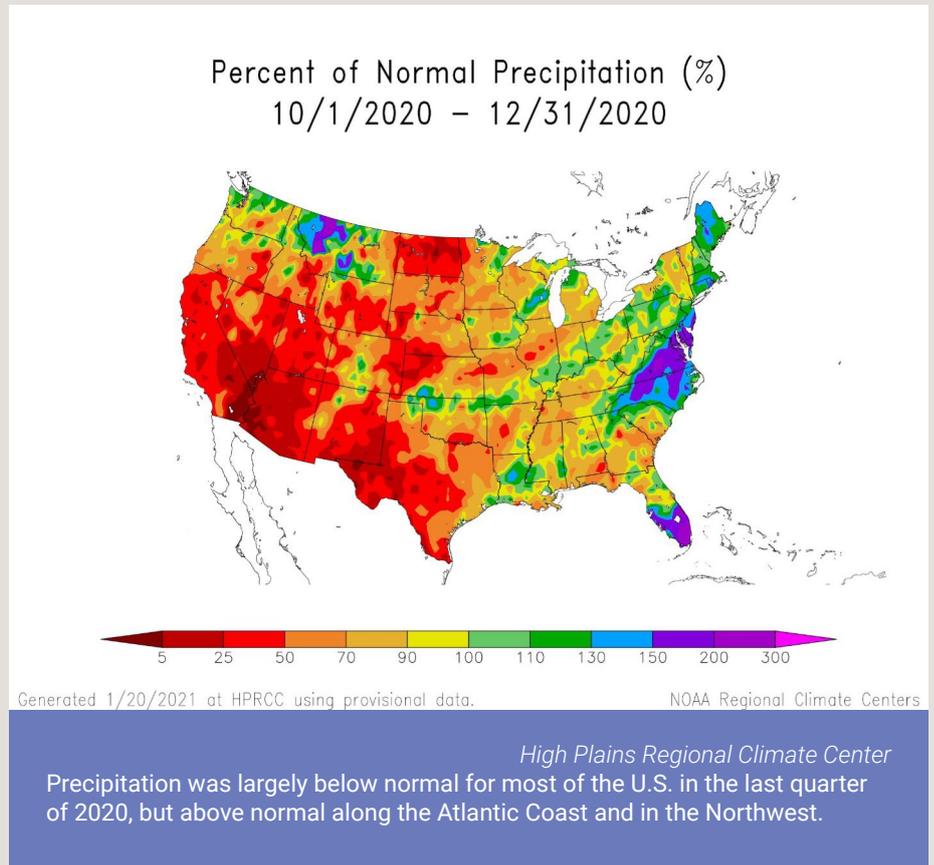
Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
2020-10-06	44.96	55.04	37.20	24.29	13.33	1.73	132
2020-12-29	43.05	56.95	40.97	28.60	18.56	8.26	153
Change	-1.91	1.91	3.77	4.31	5.23	6.53	21

while moderate drought or worse (D1-D4) increased by nearly 3.8 percentage points, covering 41% of the U.S. The population affected by abnormal dryness and drought increased from 120.31 million in early October to 125.78 million at the end of 2020.

Precipitation

Precipitation was largely below normal for most of the U.S. in the last quarter of 2020, but above normal along the Atlantic Coast and in the Northwest. A sizeable portion of the West and the Great Plains received 50% or less of normal rainfall, with the California/Nevada/Arizona border receiving 5% or less of normal precipitation for the quarter. October through December was the eighth driest on record for California, Arizona and Utah.

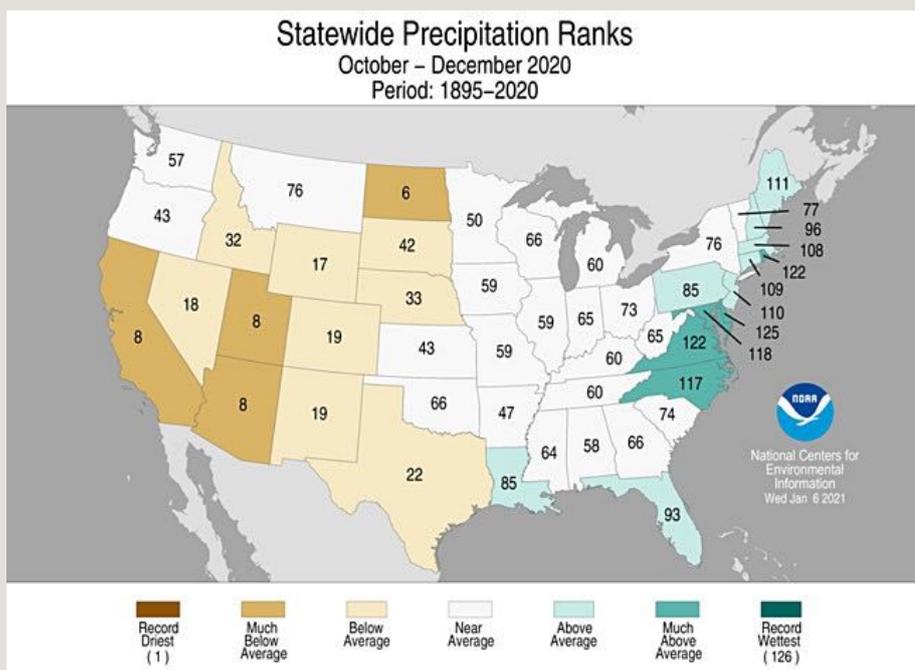
Ample precipitation, on the other hand, fell on the East Coast with much of Maine receiving from 110% to 150% and more of normal precipitation. Parts of New Jersey to North Carolina were doused with 150% of normal with localized higher amounts. South Florida also received more than 150% of normal. The October to December timeframe was the second wettest for Delaware and fifth wettest for Virginia and Rhode Island.



The Northwest saw wetter conditions with some areas receiving more than 110% of normal rainfall, and parts of Montana receiving more than 200% of normal, improving drought conditions. But to the east, North Dakota had its sixth driest fourth quarter.

Temperature

Nearly all of the U.S. was at or slightly above normal for temperature in the last quarter of 2020, except for small pockets from Idaho and western Wyoming down to Arizona, where temperatures ranged from normal to 2 degrees below normal. Temperatures ranged from 2 to 4 degrees above normal in California, Arizona, the northern Great Plains, and along the East Coast. In terms of statewide average temperature ranks, the entire East Coast ranked in the top 11 warmest October through December stretches. California to Texas also ranked much above average, as did Nebraska. ○

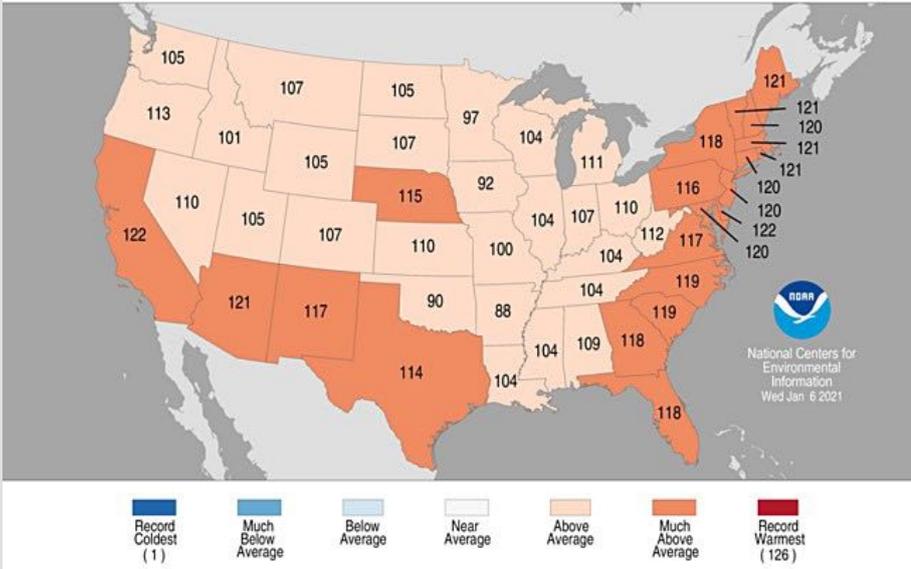


October through December was the eighth driest on record for California, Arizona and Utah.

Statewide Average Temperature Ranks

October – December 2020

Period: 1895–2020



MONTHLY DROUGHT AND IMPACT SUMMARIES

For a more detailed review of conditions, please visit:
drought.unl.edu/Publications/MonthlySummary.aspx

National Oceanic and Atmospheric Administration

Nearly all of the U.S. was at or slightly above normal temperature for the last quarter of 2020, except for small pockets from Idaho and western Wyoming down to Arizona, where temperatures ranged from normal to 2 degrees below normal.



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Drought in 2020 crept from 10% to 41% of U.S.

By Curtis Riganti

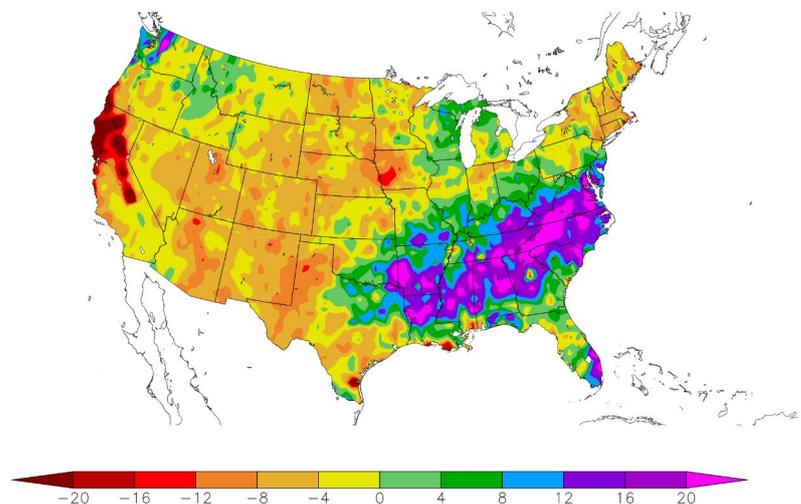
NDMC Climatologist

Over the course of 2020, drought developed and intensified across a wide swath of the western U.S. Smaller droughts came and went in other areas of the U.S., including Hawaii, Puerto Rico, New England, south Texas and parts of the central Great Plains. The area in drought increased from 9.53% to 40.97% during 2020, with much of this increase in the West.

During the first quarter of 2020, dry conditions in California, Nevada, southwest Oregon and south-central Washington led to the development and intensification of moderate and severe short- and long-term drought. Dry conditions along the Gulf Coast led to widespread drought. By the end of March, much of South Texas was covered by severe, extreme or exceptional drought. Drier-than-normal weather also began to envelop coastal areas of the Northeast during January, February and March. Parts of North Dakota and South Dakota, as well as southeast Nebraska and north-central Kansas, were quite dry from January through March.

From April through June, the short- and long-term drought along the Gulf Coast and in south Texas was mostly erased, as near- or above-normal precipitation fell in these areas. In Puerto Rico, very dry weather developed across most of the island in April and May, and the southern coastal areas remained dry in June, leading to widespread moderate and severe short-term drought in southern Puerto Rico. Drought began to intensify and expand in the Four Corners region as warmer- and drier-than-normal weather continued to take hold there. By June, warm and dry weather had begun to take hold in the southern and central High Plains, so moderate, severe and extreme drought spread across the Texas and Oklahoma panhandles, eastern Colorado, western Kansas

Departure from Normal Precipitation (in)
1/1/2020 – 12/31/2020



Generated 1/20/2021 at HPRCC using provisional data.

NOAA Regional Climate Centers

Aside from much of the Southeast and parts of the South, most of the U.S. recorded below-normal precipitation in 2020.

and western Oklahoma through the end of June. A silver lining to the dry late spring and early summer in this region was an unusually inactive period for severe thunderstorms, with tornadoes being particularly sparse in 2020.

Drought coverage ballooned during the remainder of the summer across the West, in New England, in the middle Missouri River Valley and in Puerto Rico. Severe and extreme drought became widespread across much of the West during the summer, covering expanses from Wyoming south to the Four Corners, as well as parts of Nevada, northern California, Oregon and south-central Washington. Warm and dry conditions helped to set the stage for a severe wildfire season in parts of California, Oregon and Colorado, where short- and long-term drought had taken hold. Warmer-than-normal temperatures and a dry summer led to worsening conditions in New England, where moderate and severe short-term drought became widespread by the end of August.

Consistently warm and dry weather in east-central and northeast Nebraska and western Iowa led to the development of moderate, severe and extreme short-term drought in this area in July and August. Severe short- and long-term drought developed in Puerto Rico in June and July, primarily on the southern and eastern sides of the island. These drought conditions quickly improved when rainfall from Tropical Cyclone Isaias impacted the area, and only pockets of abnormal dryness remained in August.

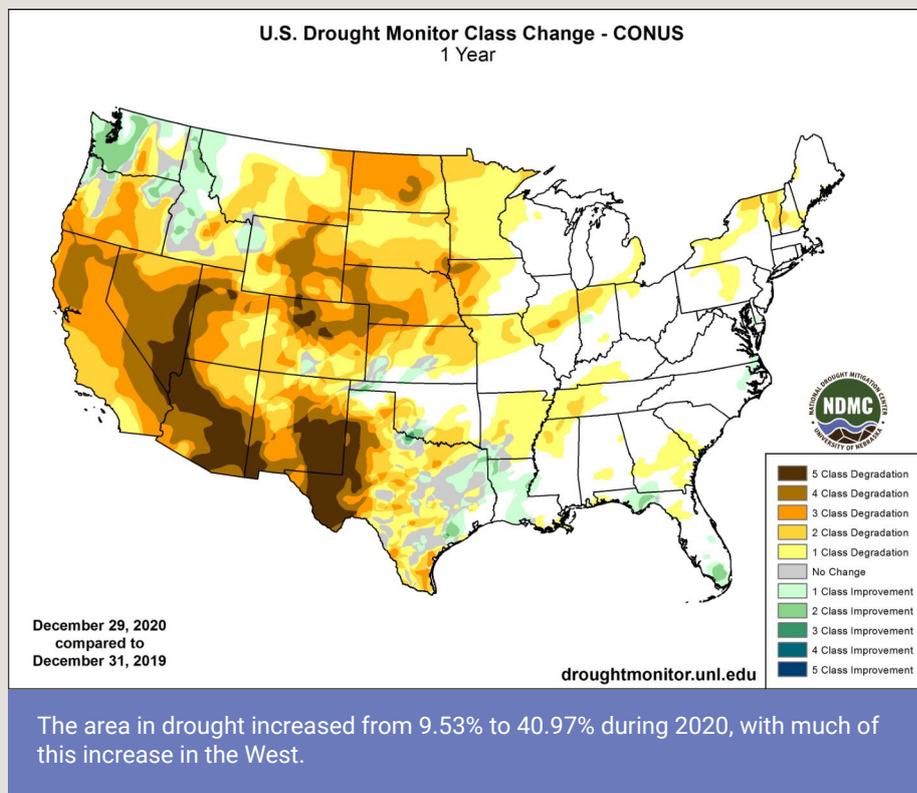
In autumn, swings in weather were common in the central and western U.S., while an active hurricane season along the U.S. Gulf Coast led to above normal precipitation in parts of the South and Southeast. The Southwest and eastern U.S. saw primarily warmer than normal temperatures during the fall. The West and Southwest continued to be quite dry.

For the second consecutive year, the North American monsoon

was very inactive in the Southwest and southern Rocky Mountains, leading to very dry conditions continuing in many areas. Numerous cities experienced their driest monsoon season, which extends from mid-June through September. Flagstaff, Las Vegas, Yuma, Farmington and Roswell were some of the cities seeing a remarkably hot, dry monsoon season with either no rain, as happened in Yuma, or just a trace of precipitation, as occurred in Las Vegas.

More wildfires than usual continued to burn in Oregon, California, Colorado and Wyoming. A few early-season winter storm systems moved through the central Rocky Mountains and parts of the western Great Plains, bringing precipitation (snow in the mountains) and unseasonably cold weather with them, providing temporary relief from otherwise warm and dry conditions. Very dry weather also struck much of North Dakota, where severe drought became widespread. By the beginning of December, extreme and exceptional drought gripped wide swaths of western Texas, western Kansas, eastern Colorado, southwest Nebraska, the Nebraska Panhandle and much of the West, particularly in Nevada, Arizona, Utah, Colorado and New Mexico. Scattered above- and below-normal precipitation occurred in New England, and the drought there retreated somewhat during the fall. By the end of 2020, most drought in the Northeast, with the exception of far northeast New York and parts of Vermont and New Hampshire, had abated. Drought conditions also waxed and waned in Hawaii from September through the end of the year.

The year started with only 9.53% of the U.S. experiencing moderate drought or worse. This percentage dipped to about 8% in mid-February, after which it grew steadily, reaching a peak of 41.46% in late December. Severe drought began 2020 covering



only 2.7% of the U.S., and stayed low until mid-April, after which the percentage climbed all the way to 28.6% near the end of December. Extreme drought coverage was below 1% for the first third of 2020, after which a gradual increase in coverage commenced, followed by a rapid increase starting in late August. By the end of the year, extreme drought coverage had ballooned to 18.56%. Exceptional drought coverage started at none in January and February, briefly developed in early spring to a few hundredths of a percent before dissipating, and then stayed at zero until early autumn, after which it grew all the way to about 8.27% in December and plateaued near there.

The population experiencing moderate drought or worse started the year near 15 million people, increased to about 42 million in early April, decreased to near 23 million in early June, and then skyrocketed for the rest of the year, peaking near 84 million in early December and ending the year near 80 million people. The population

experiencing severe drought or worse started near 2 million, saw a gradual uptick into the tens of millions from April through early August, then increased rapidly from mid-August onward, ending the year with a peak of almost 48 million people. The number of people experiencing extreme drought or worse started at just over 50,000 people and then oscillated between 100,000 and 1 million people until early August. From August onward, the number of people experiencing extreme drought or worse grew rapidly, reaching a peak of almost 24 million people by the end of the year. Exceptional drought population coverage started at zero, increased to about 14,000 people in late March, and went back to zero by late April. About 7,000 people experienced exceptional drought for a week at the end of June, but significant population increases did not occur until the fall. From early September to the end of 2020, population experiencing exceptional drought rapidly grew to about 8.5 million. ○

Drought intensified in Southwest, eased in Northeast

By Denise Gutzmer

NDMC Drought Impacts Specialist

In the last quarter of 2020, drought intensified in the Southwest, the Great Plains, much of Texas and in pockets along the length of the Mississippi River. Drought eased significantly in the Northeast, parts of the Midwest and in the Northwest.

Of the 227 impacts added to the Drought Impact Reporter from October through December, most came from Texas, where our media search and moderation process identified 67 impacts – mostly agricultural issues and relief, response and restrictions as drought intensified. Colorado and Maine followed with 35 and 16 impacts, respectively, documenting a range of drought's effects.

Texas fall planting

Intensifying drought through the last quarter of 2020, but particularly in November, affected agricultural endeavors in much of Texas. Low soil moisture delayed wheat planting in parts of the state in October, according to [AgriLife Today](#), while other growers planted and eagerly hoped for rain to get the crop to germinate. Growers continued to await moisture through November, according to [AgriLife Today](#). Many livestock herds were receiving supplemental feed, as pastures were dry.

Colorado wildfires, ag concerns, full Drought Plan activation

Colorado drought intensified in October as massive wildfires blackened parts of the state. Colorado's three largest wildfires to date, which all occurred in 2020, were the Cameron Peak Fire at more than 208,000 acres, the East Troublesome Fire at more than 193,812 acres and the Pine Gulch Fire at just over 139,000 acres.



In late September, a Visual Drought Atlas user in Ouray County, Colorado, submitted images of “very low reservoir levels” at Ridgway Reservoir. By the end of November, persistent, intense drought led Colorado Gov. Jared Polis to shift from phase two to phase three of the State Drought Mitigation and Response Plan.

In eastern Colorado in November, winter wheat emergence was uneven in areas, as reported by [Kiowa County Press](#). Livestock producers were concerned about poor pasture conditions and were providing supplemental feed. Open cows and heifers were being culled heavily, due to limited grazing and heavy pressure on feed supplies. At the end of the month, winter wheat was struggling as dry, windy weather hampered emergence and condition, per [Kiowa County Press](#).

Persistent, intense drought in Colorado led Gov. Jared Polis to shift from phase two to phase three of its State Drought Mitigation and Response Plan at the end of November, according to the [Colorado Water Conservation Board](#). The Municipal Water Impact Task Force was to convene and coordinate with water providers to prepare for potential water challenges in 2021.

Maine crop production, dry wells

Drought in the Northeast eased in the latter part of fall amid diminished crop production. Drought and increased hay demand in Maine left supplies depleted and prices higher, as reported by [Bangor Daily News](#). Yields were down an estimated 30% to 35%. Many Maine potato growers were also reporting smaller yields, with some down 30% due to the summer drought, according to the executive director of the Maine Potato Board, as reported in [CentralMaine](#).

Water supplies were low in the latter part of the year. In York County in southern Maine, 29 private wells were dry as of Oct. 2, as reported by [Portland Press Herald](#). Increased water conservation was also requested as water reserves were low amid increased demand, per [Seacoast Online](#).

Massachusetts drought declaration, crop losses

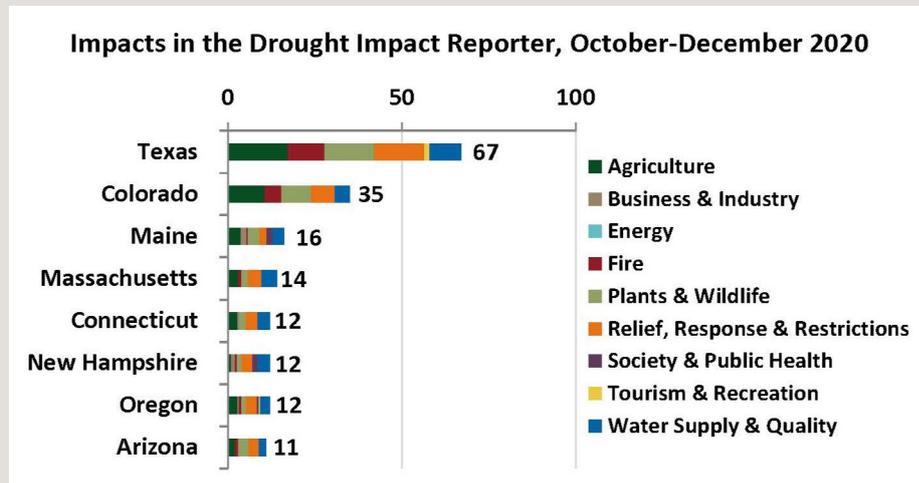
Drought eased in Massachusetts in October, but impacts continued after a dry summer and early autumn. The Massachusetts Executive Office of Energy and Environmental Affairs on Oct. 9 issued a level-three drought declaration, or critical drought, for southeast Massachusetts, per [NBC Boston](#). The other six regions in the state remained at level two, or significant drought. In November and December, easing drought allowed the drought status of much of the state to be improved, according to [Mass.gov](#).

Drought affected Massachusetts crops as some growers did not have irrigation or adequate water supplies. On Martha's Vineyard, pumpkin stocks were depleted, due to demand, drought and deer, as reported by [Vineyard Gazette](#). Pumpkins did not grow as large as they typically do. Drought also reduced food supplies for deer, leading them to consume pumpkins. In the eastern part of the state, a Christmas tree grower near Mendon lost 500 to 600 of the 1,500 seedlings he planted in the spring due to drought, according to [WFXT-TV Fox Channel 25 Boston](#).

Low water supplies, smaller crops in Connecticut

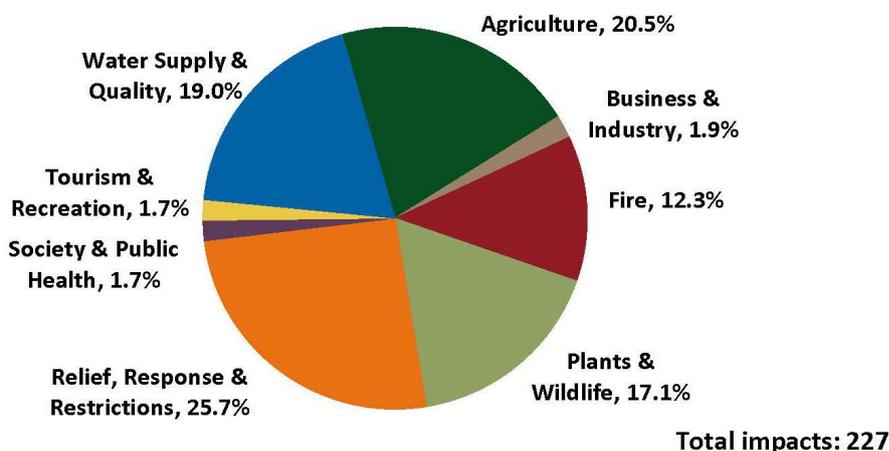
Summer and fall drought in the Northeast depleted water supplies. In Connecticut, a mandatory watering ban was in effect for some Aquarion customers, as reported by [Greenwich Time](#), and those in lower Fairfield County were urged by health officials to conserve, according to [Connecticut Post](#). Bristol residents dealt with mandatory water restrictions as the city's reservoir levels fell to 53% of capacity in early October, per [The Bristol Press](#).

Farmers strove to protect their crops amid a dry summer. Pumpkins



Of the 227 impacts added to the Drought Impact Reporter from October through December, most came from Texas, where the DIR media search and moderation process identified 67 impacts. Colorado and Maine followed with 35 and 16 impacts, respectively.

Impacts in the Drought Impact Reporter, October-December 2020



Drought relief, response and restrictions (25.7%) was the top impact category in the October-December 2020 Drought Impact Reporter.

were smaller in Connecticut as farmers resorted to irrigation to compensate for the lack of rain, according to [NBC Connecticut](#). Apples were smaller and the yield lower, as reported by [Journal Inquirer](#), as the crop suffered from drought, a hurricane and strong winds during the growing season. Christmas tree seedlings were another drought casualty as 5,000 died on a tree farm in Southington, per [NBC Connecticut](#).

The Connecticut Interagency Drought Work Group met on Oct. 5 and worsened the drought status for four northeastern counties to stage

three, per [Associated Press](#). Other parts of the state remained at lesser stages of drought. By mid-December, the Connecticut drought workgroup voted to improve the drought status of six of the state's eight counties, putting them all, except New London County, in the first stage, or below-normal conditions, as reported by [WTNH](#). New London County was in the second stage.

For more details, please visit the [Drought Impact Reporter](#).

Increasing drought leads to 913 impacts recorded in Drought Impact Reporter during 2020

By Denise Gutzmer

NDMC Drought Impacts Specialist

2020 was a year of increasing drought across the U.S. It developed in the Four Corners region and grew to encompass much of the western U.S., with particular intensity in the Southwest by the end of the year. Summer drought developed in the Northeast and flared in the fall before easing at the end of the year.

The National Drought Mitigation Center added 913 impacts to the Drought Impact Reporter in 2020. Texas and Colorado had the most impacts with 192 and 124, respectively. These states frequently have more impacts than other states because agricultural reports for those states are published weekly and are useful in uncovering drought's effects.

Texas crops, pastures

Drought shifted across Texas throughout 2020, initially in the southern and eastern parts of the state. It later moved to the west and central, and encompassed much of the state by the end of the year. Poor pasture conditions and a lack of grass challenged ranchers in various parts of the state throughout the year, forcing producers to provide supplemental feed.

Crops struggled in the western part of the state through the summer. Livestock and wildlife continued to receive supplemental feed as conditions were too dry to support the animals, per [AgriLife Today](#). In some areas, irrigation could not meet crop demand. With dry conditions, hay supplies were dwindling and prices were rising, according to [AgriLife Today](#).

Toward the latter part of the year when winter wheat is planted, low soil moisture delayed planting from October into November as nearly all of the state was abnormally dry or in



"Conditions have been extremely dry," a Visual Drought Atlas user reported in September in Converse County, Wyoming. "We have already been supplementing feed for our horses. The grass breaks off when you walk over it."

drought. Some growers awaited rain, while others planted into dry soil and hoped for rain toward the end of November, according to [AgriLife Today](#).

Colorado Drought Task Force, wildfires

The warm, dry spring caused Colorado's snowpack to melt rapidly, hurting crops and increasing the fire danger across the state. The worsening drought conditions prompted Gov. Jared Polis to activate the state's Drought Task Force and drought plan for 40 counties on June 22, as reported in [The Denver Channel](#). An Agricultural Impact Task Force was also activated to examine physical and economic impacts due to drought. The state's drought plan was fully activated by the end of November.

Drought worsened in northern and western Colorado during the summer, causing crop damage and depleting water supplies, as several large wildfires that eventually grew to historic proportions burned in the state. Statewide, continuing drought

hurt crops, the establishment of winter wheat and pasture conditions, and required ranchers to provide supplemental feed.

California wildfires

The 2020 California wildfire season set new records as nearly 10,000 wildfires blackened more than 4.2 million acres, or more than 4% of the state, per [CalFire](#). The August Complex fire alone burned more than 1 million acres from mid-August through early November and was termed a "gigafire." On Aug. 19, firefighters were battling 367 fires, many of which ignited during the Aug. 16-17 thunderstorms. Six of the state's top 20 largest wildfires occurred in 2020 as drought increased in the spring and intensified through the rest of the year.

Massachusetts drought declaration, fire activity

Persistent drought and heat in Massachusetts over the summer led to calls for water conservation as

fire activity increased and crop damage continued. A state drought declaration and a request for water conservation was enacted in August, per [WBUR-FM Boston Public Radio](#). Numerous water restrictions took effect throughout the state as supplies became depleted.

Drought led to an uptick in wildfires in the Northeast, and dry conditions made fires more difficult to extinguish. Massachusetts had more than 1,000 wildfires in 2020, compared to 2019 when there were just over 250, or in 2018 when there were just over 1,000 fires for the entire year, according to [WesternMassNews.com](#).

Agricultural concerns mounted with the drought and heat. Fruits, such as peaches and apples, were smaller in western Massachusetts, [WesternMassNews.com](#) reported.

New Hampshire water shortages, restrictions

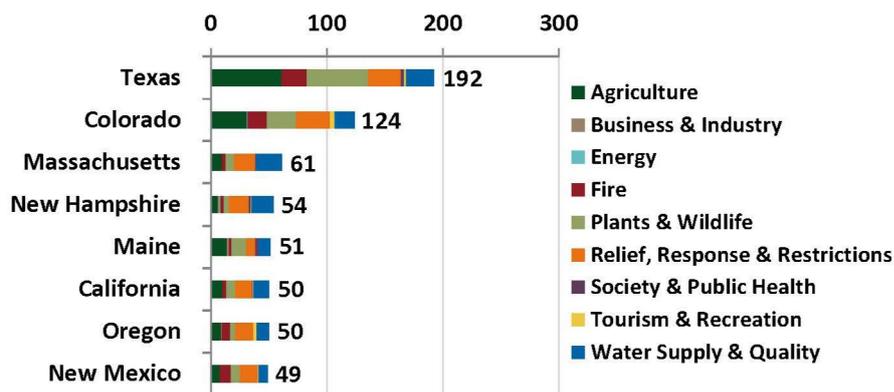
Water shortages and restrictions on water use were the most common impacts in New Hampshire as dry conditions developed in May and persisted into autumn. As drought lowered lake levels and stream flows, state officials repeatedly urged residents to conserve and carefully monitor their wells through the fall, as reported by [The Conway Daily Sun](#).

Hay production declined by 50%, leaving producers wondering where to find hay to sustain herds through the winter, as reported by [Monadnock Ledger-Transcript](#). In the southern part of the state, irrigation was not sufficient to save some crops, per [WMUR-TV ABC 9 Manchester](#).

In early November, more than 1,000 residential wells in New Hampshire were affected by drought, according to a phone survey conducted by the state Department of Environmental Services, according to [Associated Press](#). Many in the well drilling and pump industry reported backlogs of several weeks as people coped with low and dry wells.

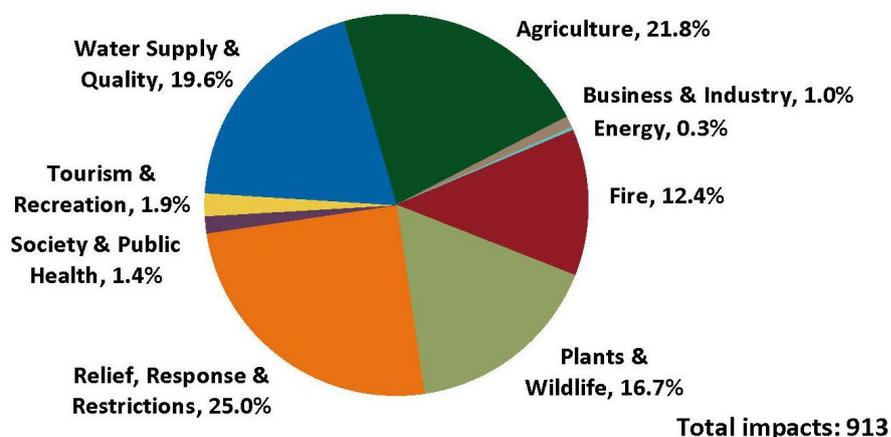
Precipitation eased drought in New Hampshire, but as of Dec. 10,

Impacts in the Drought Impact Reporter, January-December 2020



Texas led the nation with 192 impacts recorded in the Drought Impact Reporter, but impacts were recorded from coast to coast during a year where coverage across the U.S. and Puerto Rico surpassed the 40% mark.

Impacts in the Drought Impact Reporter, January-December 2020



In 2020, 913 impacts were recorded in the Drought Impact Reporter.

several dozen public water utilities and some communities around the state continued to have outdoor water bans due to concern about the water table, per [Concord Monitor](#).

Maine wildfires, blueberries

Maine's annual wildfire total in 2020 was the highest in 35 years as 1,150 fires burned 1,030 acres, per [Bangor Daily News](#). Many of the fires stemmed from campfires that spread or were not properly extinguished. The state's chief forest ranger said drought was the dominant factor in the increased wildfire activity.

The Maine wild blueberry crop was roughly halved from the five-year average of 84 million pounds due to drought and other factors, as reported by [CentralMaine](#). Other crops did poorly also. A farmer without irrigation in northern Maine stated that he lost all of his strawberries, raspberries and blueberries, per [WAGM](#). A Knox farmer stated that some crops, such as beans, were at half production, according to [VillageSoup](#).

One drought perk that Mainers and other New Englanders experienced was that there were fewer insects, as reported by [WMTW Portland](#), leading to fewer mosquito- and tick-borne diseases. ○

Decisions, decisions — study shows ranchers with drought plans in place make some pivotal moves sooner than those who don't

By Cory Matteson

NDMC Communications Specialist

Once a drought develops, ranchers must make decisions in rapid succession to prevent problems from compounding. Do you cull cows or send home contracted grazers from other operations? Do you purchase more feed to make up for the herd's lack of grazing options? Do you graze fall or winter pastures earlier than you previously planned?

To manage not only the operation but also the stress of running it when water is lacking, many ranchers are developing drought plans in advance. Based on research by Tonya Haigh, a rural sociologist with the National Drought Mitigation Center, those plans allow ranchers to make decisions based on specific "if-then" circumstances and triggers. The journal *Rangeland and Ecological Management* recently published an article by Haigh detailing the results of a survey of ranchers. She led a team that surveyed a collection of Northern Plains ranchers who endured a 2016 flash drought that significantly altered forage production in the area. Some had drought plans on file. Others did not.

Haigh said that, while the NDMC and other drought preparedness agencies stress the importance of developing plans for drought, there is not much data that quantifies the difference between having one and not. This survey, the final piece of Haigh's dissertation research, was



USDA NRCS South Dakota

The journal *Rangeland and Ecological Management* recently published an article detailing the results of a survey of western South Dakota ranchers who endured a 2016 flash drought that significantly altered forage production in the area.

an opportunity to examine the differences in an isolated area, western South Dakota, following a localized drought event. The survey was part of a National Oceanic and Atmospheric Administration (NOAA) Sectoral Applications Research Program-funded project designed to improve agricultural drought early warning capabilities in the Missouri River Basin.

Of the 250 ranchers who responded to a mail-in survey, 59% reported having an if-then plan for drought. Haigh said that there was no education or experience-based

discrepancy between those who had a plan on file and those who did not, but ranchers with drought plans tended to run larger-scale operations. The survey, Haigh wrote, found that having a drought plan increased the likelihood that ranchers took some actions during drought, but not others.

"Ranchers with drought plans were more likely than others to destock through some means due to drought conditions in 2016, controlling for operational factors, drought severity, and any type of use of drought early warning information," Haigh wrote. "However, ranchers with a drought plan were no more or less likely than others to purchase supplemental feed, early graze fall/winter pastures, or cull their breeding herds because of the drought."

Haigh said the survey results also showed that having a drought plan was linked with keeping a watchful eye on drought conditions.

"As ranchers in the region contemplate current dry conditions and wonder what 2021 will bring, this study shows that it would be worthwhile to spend time putting together or updating their plan for drought."

– Tonya Haigh, NDMC project manager rural sociologist

Ranchers with drought plans reported increased use and influence of on-farm rain gauges, of National Weather Service reports and of their own assessments of conditions on the land.

Having a drought plan in place, and monitoring for conditions that would lead them to utilize if-then strategies, led many ranchers with drought plans to destock early enough to take advantage of better market prices or secure more forage for their core herds.

“As ranchers in the region contemplate current dry conditions and wonder what 2021 will bring, this study shows that it would be worthwhile to spend time putting together or updating their plan for drought,” Haigh said. “And it also suggests that by monitoring drought and the conditions on the ranch over the winter and into the spring, ranchers can be ready to implement their plans if needed and not be caught unprepared.”

The study was led by Haigh. Co-authors included Michael Hayes of the UNL School of Natural Resources, Jolene Smyth of the UNL

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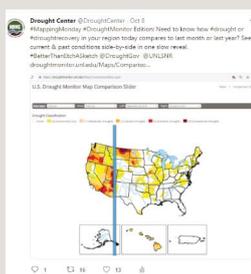
Department of Sociology, Linda Prokopy of the Department of Forestry and Natural Resources at Purdue University, Charles Francis of the UNL Department of Agronomy & Horticulture and Mark Burbach of the Conservation and Survey Division at the UNL School of Natural Resources.

To learn more about the development of drought plans on ranches, visit the National Drought

Mitigation Center’s collection of rancher case studies at drought.unl.edu/ranchplan/Overview.aspx.

Read the publication: doi.org/10.1016/j.rama.2020.09.007. ○

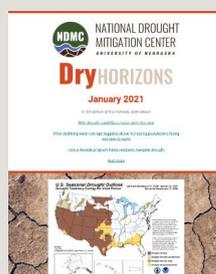
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Updates to 2021 CMOR reporting will help everyone see more drought

NDMC Communications

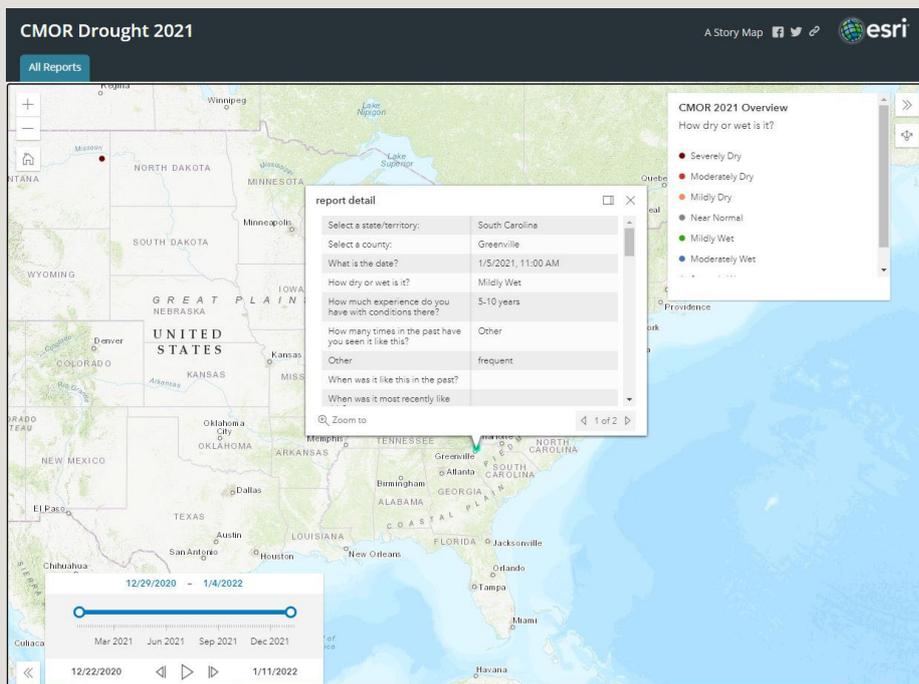
Submitting drought-related photos and observations is easier in 2021, with the Condition Monitoring Observer Reports (CMOR, pronounced “see more”) form now available via a web app that allows users to view the form in English or Spanish. Reports and photos appear in real-time on interactive maps. The National Drought Mitigation Center is developing CMOR reporting with support from the National Integrated Drought Information System (NIDIS) and the U.S. Department of Agriculture (USDA).

CMOR reports show how all kinds of weather affect different activities, with an emphasis on conditions related to drought. Anyone, anywhere in the U.S. or its affiliated territories can use CMOR reporting to submit photos, check off drought-related conditions and impacts and provide their assessment of how dry or wet conditions are.

The NDMC took advantage of evolving technology in 2018 and replaced its Drought Impact Reporter user reports with CMOR reports, making use of ESRI’s Survey123 forms and associated interactive maps. CMOR reporting also builds on other recent experiences with citizen science and crowdsourced data.

A mobile app has been at the top of users’ wish lists. “The geo-location with mobile is really slick,” said Kelly Helm Smith, NDMC assistant director and drought impacts researcher. “It totally nails the location all by itself, and that’s an improvement over the map marker widget in the web browser version. We’re hoping the app will make it that much easier for someone to snap a photo with their phone and then use the form to upload it.”

To recognize drought impacts, we need context on how dry conditions differ from normal or wet



This report from South Carolina is an example of an observer reporting during “mildly wet” conditions and includes a photo of a stream with normal flow. The observer has submitted photos of the same stream over time.

conditions. The CMOR report form uses a seven-point condition monitoring scale bar, asking observers to rate conditions from severely dry to severely wet. The scale was developed by the

Carolinas Integrated Sciences and Assessment (CISA) in cooperation with the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS), with input from the drought center.

“We don’t just want people to tell us when drought is really bad. We also want to know what their fields or yards or parks look like in normal conditions, and when it’s wet. It would be great if people would get in the habit of submitting reports at regular intervals, once a month or once a week, year-round, wet or dry.”

– Kelly Helm Smith, NDMC assistant director and communications coordinator

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Consistent reporting over time provides context that makes it easier to see the effects of drought. Information about drought-related conditions such as poor pasture growth can also help anticipate drought impacts, such as having to buy hay or reduce herd size.

CMOR reports are one of the many sources of information that U.S. Drought Monitor (USDM) authors sometimes consult. Some state climatologists who synthesize information about conditions in their state for the USDM also make use of CMOR reports.

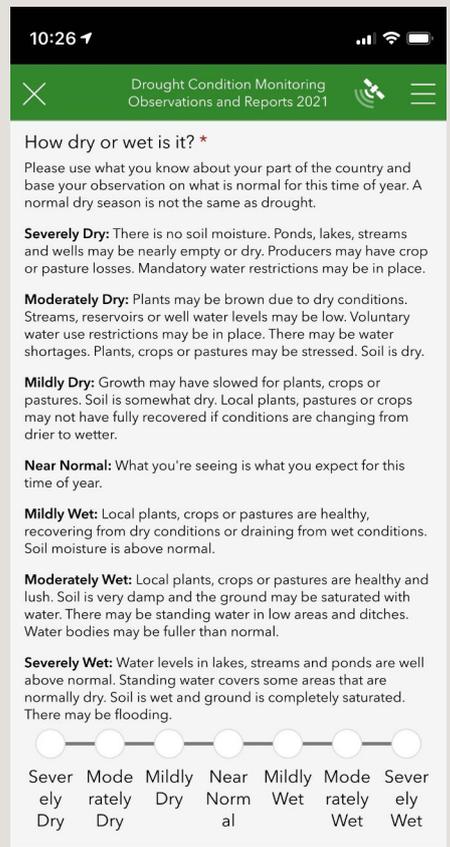
Some of the grassroots interest in CMOR reporting has been driven by the USDM’s use as a trigger for benefits under the Livestock Forage Disaster Program (LFP). An article recently published in *Weather, Climate and Society* details the connections between the LFP incentive and people’s motivation to submit a CMOR report.

“We see these spikes in numbers of reports when people have a financial incentive to participate,” Smith said. “That actually makes it harder to evaluate the information in the reports. What we want to do is turn some of that crisis energy into sustained attention, and flatten the curve. We don’t just want people to tell us when things are terrible, we need to know what they are seeing over

time, so that we have a record of their experience in normal and wet conditions, too.”

Smith stressed that the NDMC is working with state and regional partners to develop an optimal reporting process. The NDMC provides infrastructure for CMOR reporting, but currently, the most active recruitment of participants is through in-state agencies and organizations. “As we’ve talked about this with the state and federal partners who are using CMOR reports, some of the most consistent feedback has been that they want to know who is reporting,” Smith said. “That might seem like a no-brainer, but we also want to protect users’ privacy, given that the information appears on publicly visible maps.” As of 2021, CMOR reports let people publicly identify themselves as Extension specialists, water providers or other user types, with names and email addresses available via separate maps to professionals who are assessing drought.

They also stressed the value of photos, Smith said, particularly a series of images over time for a single location. ○



The CMOR report form, seen here on a small mobile phone, asks observers to rate conditions on a seven-point scale from severely dry to severely wet.

Learn more about CMOR reporting
go.unl.edu/CMOR_drought

Read the Weather, Climate and Society article 

Whose ground truth is it? Harvesting lessons from Missouri’s 2018 bumper crop of drought observations, by Kelly Helm Smith, Mark E. Burbach, Michael J. Hayes, Patrick E. Guinan, Andrew J. Tyre, Brian Fuchs, Tonya Haigh, and Mark D. Svoboda.
 DOI: doi.org/10.1175/WCAS-D-19-0140.1

National Drought Mitigation Center enters into 3-year USDA agreement

By Cory Matteson

NDMC Communications Specialist

Since the National Drought Mitigation Center was founded 25 years ago at the University of Nebraska-Lincoln, the U.S. Department of Agriculture has provided funding and support on research and projects that have led to deeper understandings of how droughts behave, how Americans can better prepare for them, how they can best recover from them and more. That partnership continues to develop and deepen. On Oct. 1, the NDMC began a new three-year, \$2.4-million cooperative agreement with the USDA.

With support from the USDA, the NDMC will continue to take a leading role in the production, web hosting and distribution of the U.S. Drought Monitor. The Drought Monitor is a weekly synopsis of drought conditions across the U.S. and its territories that is produced jointly by the NDMC, USDA and National Oceanic and Atmospheric Administration (droughtmonitor.unl.edu). Produced each week by authors who examine over 50 data sources and compare them with on-the-ground sources, the USDM has triggered billions of dollars in federal aid and low-interest loans, including for the USDA Livestock Forage Disaster Program. Federal, state, tribal, local and basin-level decision makers use it to detect emerging droughts.

Along with contributing to production and the continued improvement and refinement of the Drought Monitor, cooperative agreements between the NDMC and USDA have recently led to the expansion or development of several data resources that are used by experts and the general population alike. Recent products include the development of a Drought Learning Network, where communities learn from other communities about drought management and mitigation strategies, as well as the creation and

What is the U.S. Drought Monitor?

The U.S. Drought Monitor (USDM) is a map released every Thursday, showing parts of the U.S. that are in drought. The map uses five classifications: abnormally dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought: moderate (D1), severe (D2), extreme (D3) and exceptional (D4). It is produced jointly by the National Drought Mitigation Center (NDMC) at the University of Nebraska-Lincoln, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of Agriculture (USDA).

The National Drought Mitigation Center at the University of Nebraska-Lincoln recently launched a new three-year, \$2.4 million cooperative agreement with the U.S. Department of Agriculture.

expansion of Grass-Cast, a tool developed in collaboration with the NDMC, Colorado State University, University of Arizona and several USDA Climate Hubs that uses nearly 40 years of data to produce forecasts of likely rangeland vegetation growth at 30-, 60- and 90-day intervals. NDMC staff members are also developing a method of monitoring drought conditions in American forests, and are learning from U.S. ranchers how the development of drought plans have eased financial and emotional stress in times of drought and more.

"The USDA, along with NOAA, was supportive of the NDMC and its mission right from the start," Drought Center director Mark Svoboda said. "Our cooperative agreements with the USDA have improved efforts to better understand and respond to drought across the country and to tailor information and tools to the needs of USDA staff and the ranchers, producers and constituents they work with. The latest agreement will continue that collaborative process."

The three-year USDA-NDMC agreement will lead to enhancements of the U.S. Drought Monitor and continued collaboration with USDA Climate Hubs, a set of 10 networks that provide region-specific, science-based information to agricultural and nature resource managers that help them make climate-informed decisions (www.climatehubs.usda.gov).

The Drought Center is headquartered at the University of Nebraska-Lincoln School of Natural Resources. University chancellor Ronnie Green recently congratulated Svoboda and the NDMC on the \$2.4-million cooperative agreement.

"This major accomplishment demonstrates the impact and reach of your research and creativity," Green wrote. "I wanted to let you know how much our university community recognizes and values your important work. Indeed, we all appreciate how important national recognition is to scholarship and the academy — this recognition from the USDA reflects the excellence of your work to date and the ongoing potential of your research moving forward." ○