

DROUGHT SCAPESCAPE

Summer | 2020

Quarterly Newsletter



See a timeline of significant National Drought Mitigation Center events

Learn what led to the NDMC's founding

Read about the latest updates to the Drought Risk Atlas



NATIONAL DROUGHT
MITIGATION CENTER
UNIVERSITY OF NEBRASKA

Drought Science. **Planning Sense.**

About the cover

The 25-year anniversary badge commemorating the history of the National Drought Mitigation Center



From the Director

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Mark Svoboda

resources for people to use before and in the midst of droughts. And we've been doing it, as you may have heard, for 25 years now! More on that below, but first let me tell you about some of our latest developments.

The NDMC recently completed a significant upgrade to the Drought Risk Atlas (page 12), which allows users to track long-term changes and trends in drought and streamflow levels for specific locations across the U.S. Read about the DRA's enhanced capabilities and then visit droughtatlas.unl.edu to explore how current conditions where you live compare with past ones.

At the NDMC, we seek to build and share not only resources that anyone across the country can utilize, like the DRA, but also products that zero in on specific effects of drought, like the set of Midwest specialty crop decision calendars that are now online (page 13). In drought management outreach, a lot of attention is understandably paid to row crop concerns. But many Midwestern farmers' operations are focused on wine grapes, fruit trees and the like. They deserve resources to provide guidance through drought years, too, so we worked directly with specialty crop growers to develop them.

No matter what crop you're growing, you need water to do it. Last year, Renata Rimsaite joined the NDMC and Daugherty Water for Food Global Institute at the University of Nebraska to examine water markets across the U.S., and how they could be involved in future water management decisions during droughts. Her research is already yielding some surprising findings (page 14), and we're excited to be in partnership with the Water for Food Global Institute on this effort as she works on projects that will benefit drought mitigation and water management policies alike.

These stories highlight some of our latest developments. On page 8, you'll learn how and why the NDMC developed 25 years ago. We originally planned to celebrate the 25th together at a June event, but will have to wait until it's safe to gather. In the meantime, we're providing a sneak peak of a timeline of 25 key events in the NDMC's 25-year history that we were going to display at the celebration. For now, you get to see a Top 10 list (page 10). When we are able to gather, you'll see the rest — if we can ever narrow down the list to 25!

Stay safe, and enjoy the rest of your summer,

Drought develops further in West, Plains, while Gulf Coast improves

By Crystal Stiles

Applied Climatologist,
High Plains Regional Climate Center &
National Drought Mitigation Center

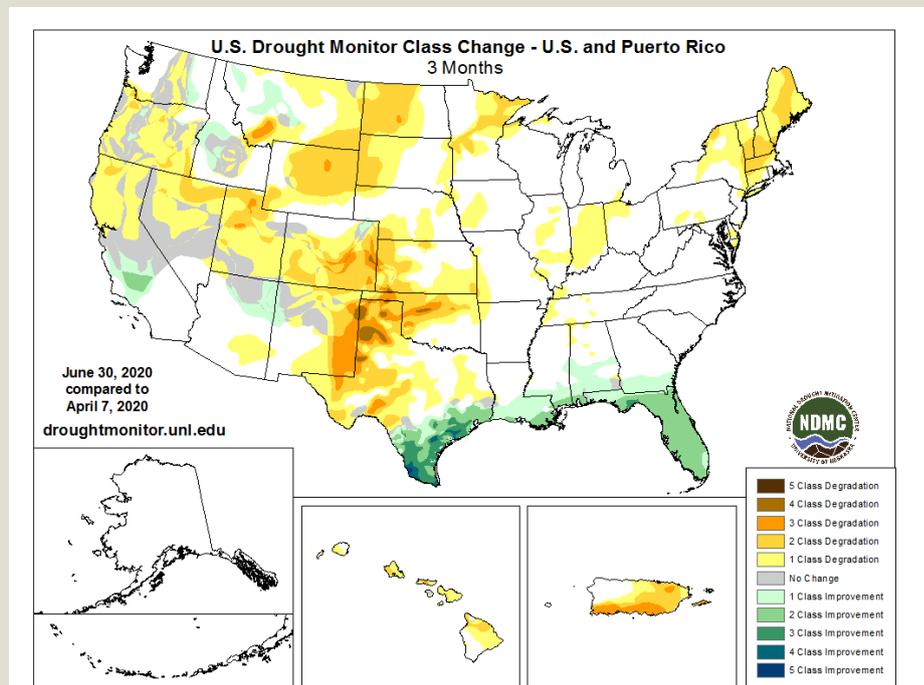
Drought classifications are based on the U.S. Drought Monitor. Details on the extent and severity of drought are online: droughtmonitor.unl.edu.

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

The April–June period was characterized by above-normal temperatures in the West and Florida, and below-normal temperatures in portions of the Midwest and Southeast, with a mixture of wet and dry conditions. The mid-Atlantic and Southeast were generally wet during this period, as was the Gulf Coast region, which vastly improved drought conditions. However, dryness persisted throughout portions of the West, the northern and central Plains and the Northeast, contributing to the development and intensification of drought conditions.

Drought

Drought generally worsened across the U.S. and Puerto Rico during the April–June period. By the end of June, approximately 21% of the country was experiencing moderate to exceptional drought (D1–D4), an increase of 9% since the end of March. Drought conditions increased in severity across areas of the West, largely due to below-normal precipitation and, in some areas, high winds that increased evaporation and accelerated dryness. The worst conditions could be found across southern Colorado, northern New Mexico and southwestern Kansas, where a large area of extreme drought (D3) and a small pocket of exceptional drought (D4) developed. Drought conditions also further



National Drought Mitigation Center
Drought conditions worsened throughout Hawaii, Puerto Rico, much of the Plains, the Northeast and in the West from April–June. Meanwhile, conditions improved along the Gulf Coast, particularly in southern Texas and Florida.

intensified along the West Coast, with pockets of D3 in Oregon and northern California. Drought developed and intensified in the western Dakotas and Wyoming, as well as in the Northeast, Hawaii and Puerto Rico during this period. Meanwhile, drought conditions dramatically improved in southern Texas and along the Gulf Coast, and the area was nearly free of drought and abnormal dryness by the end of June. Numerous episodes of heavy rainfall gradually improved conditions in these areas in April and May. In early June, Tropical Storm Cristobal made landfall in Louisiana, dropping

copious amounts of rainfall across coastal areas of Mississippi, Alabama and Florida, nearly eliminating drought in these areas.

Continued on next page

Dryness persisted throughout portions of the West, the northern and central Plains and the Northeast, contributing to the development and intensification of drought conditions.

Precipitation

Precipitation was a mixed bag across the contiguous U.S. from April to June. Much of the Southeast and mid-Atlantic were wet, with precipitation exceeding 150% of normal in many areas. April to June this year was among the top 10 wettest April to June intervals for West Virginia, Virginia, North Carolina and South Carolina.

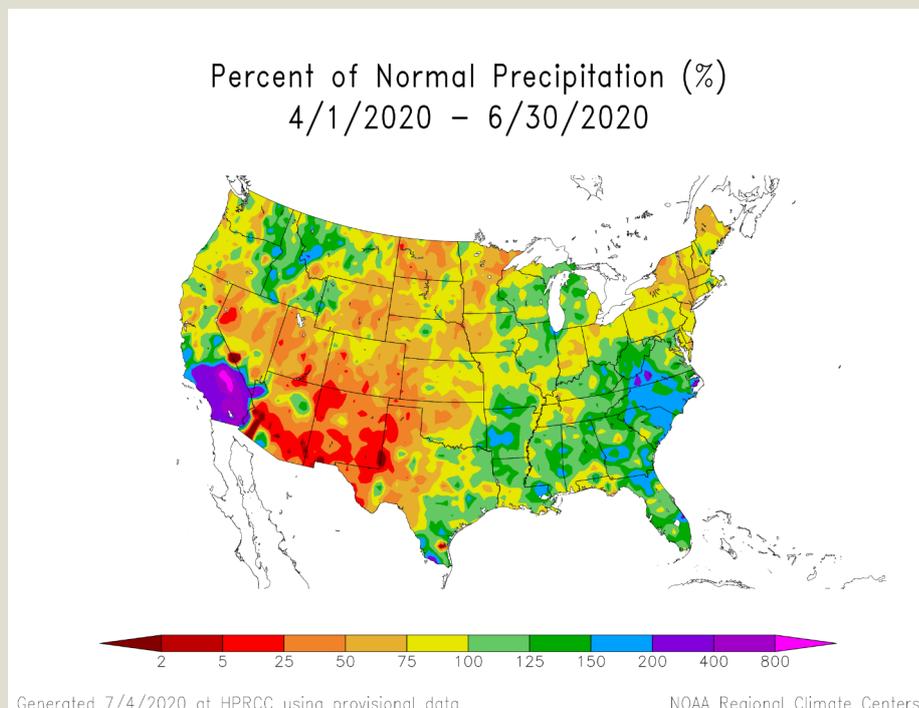
Also, it was extremely wet in southern California, which had at least 200% of normal precipitation, with some areas exceeding 400% of normal. Otherwise, this three-month period was dry, particularly across portions of Arizona, New Mexico, Colorado and western Texas, where precipitation was less than 25% of normal. New Mexico and Colorado had their fourth- and eighth-driest April–June periods on record, respectively.

The stark contrast in precipitation was very pronounced in April, as several states set records for both wetness and dryness. West Virginia, Virginia and Georgia ranked among the top 10 wettest of Aprils, while Nebraska and Colorado were among the top 10 driest. May was dry throughout the Southwest, the northern Plains and the Northeast, while wet conditions could be found in the Pacific Northwest and parts of the Southeast. North Carolina and South Carolina had their third- and fourth-wettest Mays on record, respectively, while Utah had its seventh driest.

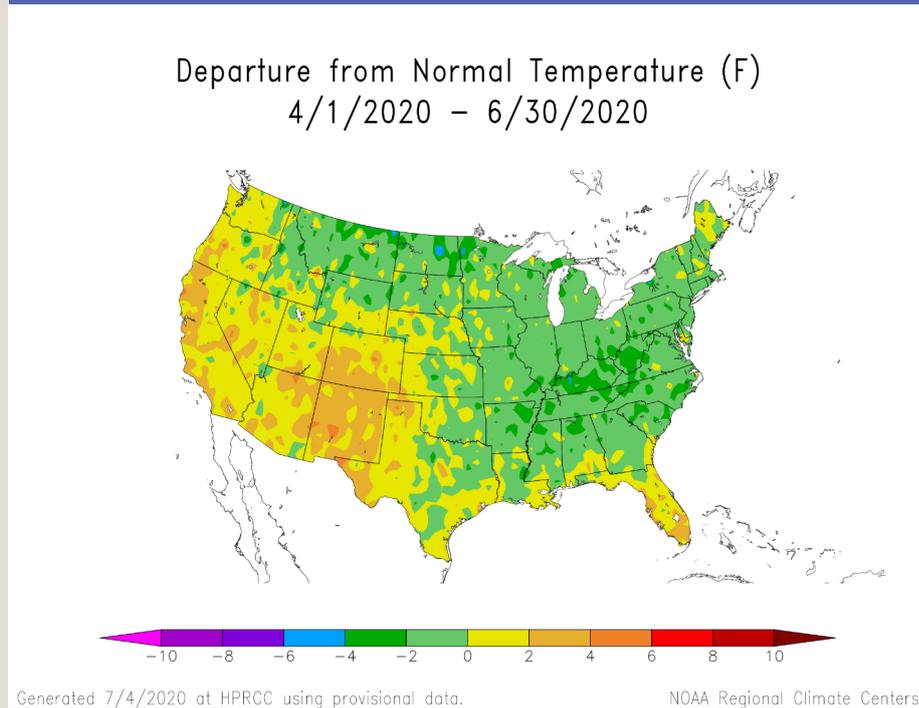
For the most part, June was dry across the U.S., with pockets of wetness in the Interior West, Midwest and Southeast. Tropical Storm Cristobal took a rather rare path for a storm making landfall in Louisiana, tracking farther westward than usual through Missouri, eastern Iowa and western Illinois, Wisconsin and the Upper Peninsula of Michigan, contributing to above-normal monthly precipitation totals in these areas.

Temperature

In general, April–June temperatures were within 2 degrees Fahrenheit of normal across the contiguous U.S. However, temperatures were above normal throughout much of the West and



High Plains Regional Climate Center
From April–June, below-normal precipitation occurred throughout a large part of the western, central and northeastern portions of the contiguous U.S., particularly in the Southwest. However, above-normal precipitation could be found across the Southeast, mid-Atlantic and in Southern California.



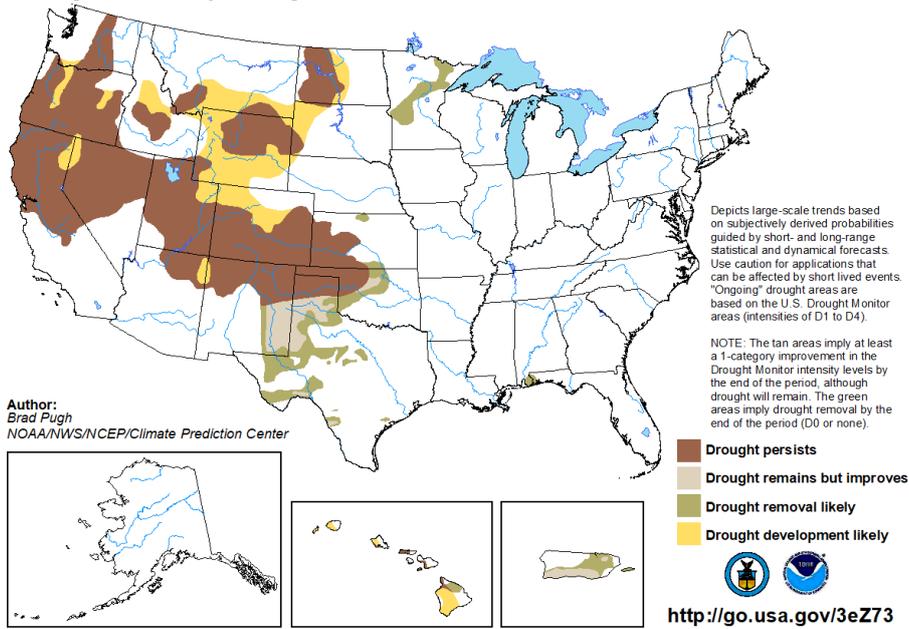
High Plains Regional Climate Center
Temperatures were largely within 2 degrees of normal throughout the contiguous U.S. during the April–June period. Exceptions included areas of the Southwest and southern Florida where temperatures were up to 4 degrees above normal, while pockets of the northern Plains and Midwest experienced temperature departures of up to 4 degrees below normal.

across Florida, with a few areas, including much of New Mexico, southern Colorado and southern Florida, experiencing departures of up to 4 degrees above normal. Florida,

New Mexico, Arizona, Colorado and California experienced a top 10 warmest April–June period. Elsewhere,
Continued on next page

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for June 18 - September 30, 2020
Released June 18



National Drought Mitigation Center
Drought is expected to persist and further develop in the West, High Plains and Hawaii, while drought may improve or be removed in Puerto Rico, portions of the southern Plains and pockets of Minnesota.

temperatures were below normal. Areas of the northern Plains and the Midwest had the greatest departures, which were up to 4 degrees below normal. Breaking it down by month, April was rather cool across the northern Plains and Midwest, while it was warm in the West and along the Gulf Coast. Florida had its sixth-warmest April on record. May temperatures were above normal across the West and mostly below normal elsewhere. May was among the top 10 warmest for New Mexico, Arizona, California, Colorado and Utah, while it was the 10th-coldest May for North Carolina. Temperatures in June were within about 3 degrees of normal except for

the northern and central Plains, where departures generally exceeded 3 degrees above normal. June ranked among the top 10 warmest for several states in the northern and central Plains, as well as in the Northeast.

Outlook

The Climate Prediction Center's Seasonal Drought Outlook indicates that drought is expected to persist through September throughout much of the West, High Plains and portions of Hawaii. Drought is expected to further develop across these areas, especially throughout much of Wyoming, southern Montana, northern Colorado and western

South Dakota. Drought removal or improvement is likely in the southern Plains, particularly across eastern New Mexico, western Texas and central Oklahoma, as well as in Puerto Rico and northern portions of Hawaii's Big Island. Drought removal is also likely in Minnesota and, since the release of this outlook, drought has been removed from coastal Alabama and the extreme western portion of the Florida Panhandle. ○



MONTHLY DROUGHT AND IMPACT SUMMARIES

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

Spring drought leads to 38 reported impacts from Texas, 201 more elsewhere

By Denise Gutzmer

NDMC Drought Impacts Specialist

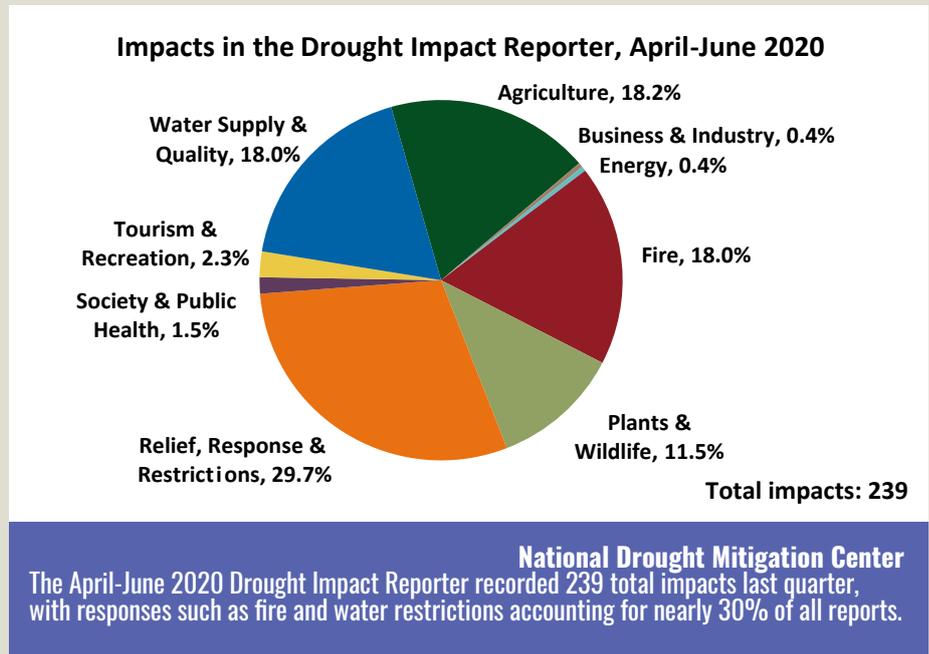
The National Drought Mitigation Center added 239 impacts to the Drought Impact Reporter in the second quarter of 2020, as drought expanded in the West and the Northeast and eased along the Gulf Coast. Texas had the most impacts with 38 for the quarter, documenting largely agricultural concerns. Florida, Colorado and Oregon followed with 33, 30 and 27 impacts, respectively, recording many fire and water restrictions.

Hay shortage in Texas, shifting drought areas

Southern Texas remained dry into April and early May, stressing crops and pastures, and forage growth was limited, per [AgriLife Today](#) (College Station, Texas). South Texas ranchers were experiencing a hay shortage with rising hay prices, according to [KRISTV NBC 6 Corpus Christi](#). Ranchers were forced to choose between buying hay from outside the area and selling livestock. As the month wore on, rain fell and improved drought conditions until the area was drought-free by the end of May.

Meanwhile, drought conditions developed in the Texas Panhandle. Dryland cotton farmers waited for rain to plant, as reported in [AgriLife Today](#). Conditions were deteriorating in far West Texas, also, with crops, pastures and rangelands suffering from dry weather and high temperatures.

The western half of Texas dried out in May and June, with mounting agricultural impacts. Grazing conditions deteriorated, leading ranchers to offer supplemental feed and minerals for livestock, as reported in [AgriLife Today](#). Dryland crops were stressed in far West Texas, and pastures had no grass and very few weeds. Nearly all dryland cotton was expected to fail, and sorghum



was not expected to produce much, if anything, per [AgriLife Today](#).

Florida fire danger, wildfires

The winter dry season in Florida was unusually dry for much of the state, leading to increasing fire danger statewide. Numerous wildfires broke out in April and May as the rainy season finally neared. The Five Mile Swamp Fire in the Florida Panhandle was an escaped prescribed burn that ultimately burned over 2,200 acres, consuming more than a dozen homes and 22 other structures, per [ID Supra](#). The 36th Avenue SE Fire began from several Collier County brush fires and charred 8,250 acres, 12 homes and 33 outbuildings before the fire was contained in the latter part of May, according to [WBBH-TV](#) in Fort Myers. The blaze caused the closing of a 20-mile stretch of Interstate 75, according to [Tampa Bay Times](#). With increased fire activity, numerous burn bans were enacted.

Water supplies were also a concern as rainfall was below normal. The [Southwest Florida Water Management District](#) on April 28 announced a Phase I Water Shortage

for central and southern portions of the district to make the public aware that water restrictions could be looming, according to the Southwest Florida Water Management District. The St. Johns River Water Management District in northeast and east central Florida also requested conservation, due to below-normal rainfall, as reported in [Apopka Voice](#). The 18-county district had nearly 6 inches below normal in rainfall in early April.

Colorado crop damage, Task Force activation

The warm, dry spring caused Colorado's snowpack to melt rapidly, hurting crops and increasing the fire danger across the state. Agricultural damage to winter wheat occurred in the eastern part of the state and continued as spring progressed. Some winter wheat failed in the northeast, despite rain in May, while in east central Colorado, concern remained high for [rangeland](#) grass production and the condition of dryland crops, per [Kiowa County Press](#) (Eads, Colo.). Conditions continued to deteriorate as the second quarter progressed and drought worsened.

Continued on next page

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 by [The Denver Channel](#). The task force assessed drought damage and recommended mitigation strategies. An Agricultural Impact Task Force was also activated to examine physical and economic impacts due to drought.

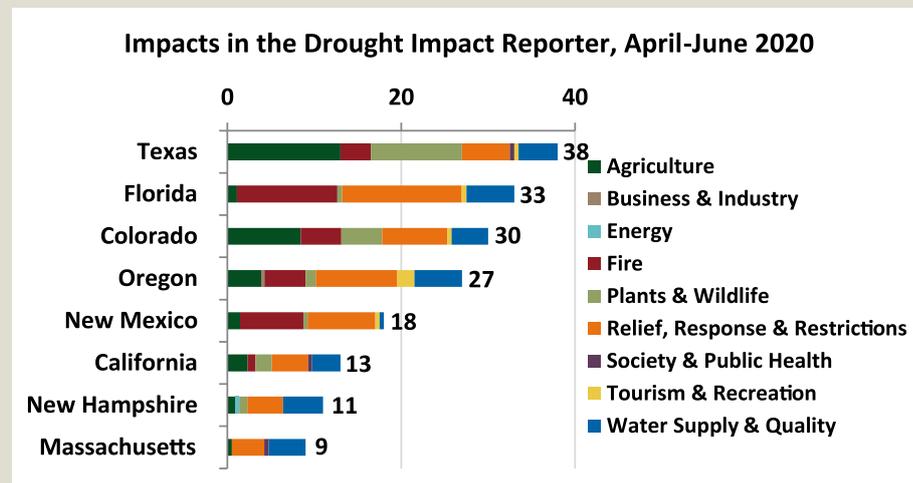
Oregon water shortages, disaster declarations

Dry conditions continued in Oregon from April through June. Low winter snowfall portended water supply shortages in parts of the state, as well as disaster declarations. Irrigation water supplies were low for the Klamath Project in southern Oregon, according to the [Capital Press](#). The district had about 140,000 acre-feet of water for farmers and ranchers, amounting to about one-third of the historical demand.

Several counties made disaster declarations through the spring with the intention of securing help for farmers. Some of the counties making such declarations were Deschutes, Crook, Jefferson, Wasco, Coos and Douglas, which appealed to Gov. Kate Brown for approval as reported by [KTVZ-TV NewsChannel 21](#) in Bend, Ore. The governor signed declarations for Coos, Curry, Jackson and Klamath counties.

Low flows in the Rio Grande River in New Mexico

Rapid snowmelt and poor runoff in Colorado contributed to low flows



National Drought Mitigation Center
Texas agricultural issues, like hay shortage, led to many of the Lone Star State's 38 reports cataloged in the April-June 2020 Drought Impact Reporter.

on the Rio Grande River in New Mexico, leading water agencies to take action to protect the river. On June 30, the Albuquerque Bernalillo County Water Utility Authority announced that water diversions from the Rio Grande River would end to prevent the river from running dry this summer, as reported by the [Associated Press](#). Upstream storage from the San Juan-Chama Project has been used to supplement river flow since April.

Dry conditions and the resulting fire danger led to fire restrictions in New Mexico. Three national forests in the northern part of the state implemented fire restrictions to limit the likelihood of human-caused fires in the Carson, Cibola and Santa Fe forests, per [Associated Press](#). In addition, the New Mexico state forester imposed restrictions on fireworks, campfires and other activities on all non-municipal, non-

federal and non-tribal lands statewide, due to the rising fire danger, as reported by [Associated Press](#).



DROUGHT IMPACT REPORTER

To view all impacts, and reports, please visit:
droughtreporter.unl.edu

NDMC's directors look back at what led to center's founding 25 years ago

By Cory Matteson

NDMC Communications Specialist

In 1995, the National Drought Mitigation Center opened its doors in Chase Hall on the University of Nebraska-Lincoln East Campus. Its founding director, Donald Wilhite, had to tell two of the center's first staff members he hired that funding was only in place to keep the doors open for a year.

"But," he told Michael Hayes and Mark Svoboda, "I'm pretty damn confident that we can turn this first year of funding into long-term support for the Drought Center."

Wilhite said that a series of research projects, workshops and collaborations with state and federal leaders leading up to its founding in 1995 reinforced for him a need to develop a center that would put drought issues front and center for policymakers. He said that discussions regarding preparedness for natural disasters often excluded drought, which is much different from other natural hazards given its slow onset characteristics and often "invisible" impacts compared to hurricanes, earthquakes and floods.

A few massive droughts in the years leading up to the NDMC's founding helped others see the need, too.

"It really addressed a need that the nation had," Hayes said. "Don had done a great job in scoping out what a drought center would look like. He held a national conference in Portland in 1994, where the recommendations for a national drought center were put forward. He really did his homework in setting up the NDMC."

Hayes and Svoboda went on to become Wilhite's successors as directors of the NDMC, which celebrates its silver anniversary in 2020.

"Since 1995, the NDMC has brought attention to the drought problem, and developed and shared resources to proactively address it," said Svoboda, the current NDMC director. "The 25th anniversary of the



From left to right: former NDMC director and founder Donald Wilhite, former NDMC director Michael Hayes and current NDMC director Mark Svoboda at the Center's 20-year anniversary in 2015.

NDMC is a great time to reflect on all that we've done to better detect, prepare and plan for drought before it's too late. It's also a time to thank our many collaborative partners for their support. We still have a lot to do, but we've come a long way."

Now retired, Wilhite's emphasis when he began working at the University of Nebraska was going to be more broadly exploring numerous climate impacts. That too was influenced by a major drought. One hit the Great Plains in 1976 and 1977. Wilhite earned a grant from the National Science Foundation to evaluate state and federal responses to the drought.

"At the end of the study, the basic conclusion was neither federal nor state response to the drought was very effective," he said. "It was mostly poorly coordinated. It was reactive. It was more after the fact, what came to be called crisis management. There was little preparation for a drought."

The results of that study led Wilhite to think about how other countries deal with and prepare for droughts. He received another NSF

grant to evaluate Australia's response to an early 1980s drought tied to a severe El Niño event. Australia's response aligned similarly with the U.S. and Great Plains drought responses he'd analyzed. Both were mostly reactive. He then looked at data from South Africa. Similar reactive response.

"It became a common understanding that droughts affected many countries throughout the world, and governments in general were just poorly prepared to deal with them," he said.

In 1986, Wilhite organized a major international drought symposium and workshop at UNL. The goal was to bring experts and leaders together to explore why governments of all shapes and sizes were typically unprepared once drought took hold. Was it a lack of scientific understanding? Poor policies? No policies?

"The conclusion was that it wasn't that we didn't have a fairly good grasp on the science of drought," Wilhite said. "We had some real deficiencies in terms of policy."

That conclusion shaped what Wilhite sought to improve — the way governments prepare for drought. From monitoring droughts, to creating proactive drought plans that sought to reduce risk in advance of droughts rather than scrambling to react to current droughts, there was plenty of room for improvement in the U.S. alone. In the early 1980s, Wilhite said, only three states had drought plans on file.

Following the symposium, Wilhite founded the International Drought Information Center at UNL. The center's mission was to create a global network to help foster more communication about drought preparedness. Drought Network News, a newsletter edited by Deborah Wood, was published three times annually, providing case studies that showed how different countries tackled drought before and during the events. The IDIC received some significant initial publicity, Wilhite recalled.

Then, in 1988–89, the U.S. experienced more severe drought. A colleague of Wilhite's in the U.S. Department of Agriculture asked him to assess the drought mitigation actions taken by state and federal agencies during those years and recommend future federal policy actions that would help. In a report published in 1992, he proposed two. One of those was to create a more comprehensive drought monitoring and early warning system for the U.S. The other was to create a national or regional drought mitigation center.

The two proposals served as the key topics of two pre-conference workshops held at the invitation-only Portland drought conference funded by NOAA and USDA in 1994, when the region was experiencing severe drought.

"The support was overwhelming," Wilhite said. "Yes, we needed a more comprehensive drought monitoring and early warning system for the country, and secondly, yes it would make a lot of sense to develop a national or regional drought mitigation center to bring the drought issue more front

"What the Drought Center has done has been unbelievable not only nationally, but internationally." - Donald Wilhite, former National Drought Mitigation Center director and founder

"The 25th anniversary of the NDMC is a great time to reflect on all that we've done to better detect, prepare and plan for drought before it's too late. It's also a time to thank our many collaborative partners for their support. We still have a lot to do, but we've come a long way."

- Mark Svoboda, National Drought Mitigation Center

and center with regards to policymakers."

Wilhite met with U.S. Senator Bob Kerrey, whom he'd worked with on Nebraska's drought plan when Kerrey was the state's governor, and the senator agreed to push for federal funding for the National Drought Mitigation Center. NOAA and the USDA each contributed \$200,000 in funding, and Wilhite was able to open the doors with Wood, Svoboda, Hayes, Kelly Smith and Vicki Wilcox on the first NDMC staff. Though NOAA's funding was set to expire after a year, Wilhite felt confident that the NDMC would stay open.

Svoboda said that the NDMC's stance since its inception — that proactive, mitigation-based approaches to drought risk management lessen the effects of drought compared to in-the-moment crisis management — created a sound foundation for the NDMC that the center's growing staff has built upon with partners from local, state, national and international levels.

"I'd also be remiss if I didn't mention another watershed moment in the NDMC putting down solid roots early on and that was the creation of the U.S. Drought Monitor," he said. "The USDM has become the gold star for drought monitoring and early warning in the U.S. and has become a model for dozens of states and countries around the world in how they track drought. You can't pick up a paper or turn on the Weather Channel without seeing the USDM. It also helped solidify our partnerships with the USDA and NOAA."

Hayes attributes the success and longevity of the NDMC to three Ts — teamwork, trust and tools.

"Don always emphasized the value of a great team," Hayes said. "In those early days, we were six. And there are still four of us (Svoboda, Wood, Smith and Hayes) that are involved with the NDMC."

"The success of the NDMC has centered around the team of individuals that make up the NDMC. That's definitely true during the nine-plus years I was director at the NDMC."

And the NDMC's efforts to develop or collaborate on the development of tools like the U.S. Drought Monitor, Vegetation Drought Response Index and Visual Drought Atlas has helped build a level of trust with current and potential partners, Hayes said.

"When you ask us to do something, we do it," Hayes said. "From 1995 to 2020, we have been that trusted source of drought-related information that people can go to."

"Those three Ts are going to be as important in 25 years as they are today."

Wilhite looks forward to celebrating its 25th anniversary once the NDMC team and its supporters can safely convene.

"What the Drought Center has done has been unbelievable not only nationally, but internationally," Wilhite said. "It's been a great investment for the federal government and the state of Nebraska. It's brought so much visibility to the state and the university to be 'drought central,' globally, on this issue. When I started working with drought in the early 1980s, there were three states in the country that had drought plans. Now there are 47 states. That was a message that I was up on my soapbox, just continuously pushing not only in the U.S. but internationally — you've got to find a way to prepare for future drought events, since they are a normal part of climate." ○



NDMC 25-Year Timeline



This year, the National Drought Mitigation Center celebrates its 25th anniversary. A gathering initially scheduled to take place in June was postponed in an effort to limit the spread of the coronavirus. At that event, the NDMC planned to unveil a timeline that shows the evolution of the Center from a small shop that had one guaranteed year of funding to an institution that partners with universities across the globe, governments big and small and federal agencies from NOAA to the USDA to NASA and beyond in an effort to better track drought's development and prepare for its effects. We'll be showing off that timeline as soon as it's safe to reschedule a gathering. In the meantime, here's a sneak preview of some of the key moments in NDMC history that made the cut. In 1995, six staff members opened the NDMC's doors. In 1995, six staff members opened the NDMC's doors. Now, 22 people work at the NDMC to better prepare populations for drought.

In August, the NDMC, USDA and NOAA – two of NDMC's major supporters to this day – launch the first U.S. Drought Monitor map. The map that tells the current story of drought in the U.S. and, now, all of its territories, has been released weekly ever since and can be found at droughtmonitor.unl.edu, along with associated data.

The NDMC and the U.S. Department of Agriculture's Risk Management Agency (RMA) announce a major new partnership in 2005 to develop a suite of drought management tools, including the Vegetation Drought Response Index (VegDRI), the Vegetation Outlook (VegOUT), the Drought Atlas, the Drought Impact Reporter, and the Ranching Risk Plan.

The NDMC enters into a funding agreement with NOAA's National Integrated Drought Information System (NIDIS), a collaboration that continues to this day.

In October, the NDMC launches an updated Drought Impact Reporter, which provides a much greater range of information on impacts.

In March, NDMC releases its inaugural annual report, highlighting not only the center's 2016 activities, but also its efforts over its first 20 years. The numbers – 188 workshops, 76 events, 24 projects, over 5,000 media contacts and 170 peer-reviewed articles – have only grown.

1995

1999

2000

2005

2008

2011

2012

2017

2019

Building on two decades of drought research, Dr. Donald A. Wilhite establishes the National Drought Mitigation Center at the University of Nebraska-Lincoln. Six members are on staff when it opens.

The NDMC hosts the first annual Drought Monitor Forum meeting in Lincoln.

The NDMC hosts NOAA's Climate Diagnostic Workshop in Lincoln and, in collaboration with NIDIS, a major Drought Early Warning workshop in Kansas City. NDMC leaders and team members have hosted and participated in scores of workshops held in the center's hometown and around the globe during its 25-year existence.

The worst U.S. drought in the 25-year history of the NDMC takes hold in the country's midsection during the summer. NDMC staff fields over a thousand phone calls and other requests from regional, national and international media seeking context about the drought.

The USDM Tutorial is launched. This comprehensive tutorial discusses all aspects of the making of the USDM through text, videos and images. Like many NDMC projects past, present and future, it is a collaborative partnership. The tutorial, created by NIDIS, USDA and the NDMC, can be found here: drought.unl.edu/usdmtutorial/Home.aspx.

Drought Risk Atlas adds trends analysis to growing list of capabilities

By Kelly Helm Smith

NDMC Communications

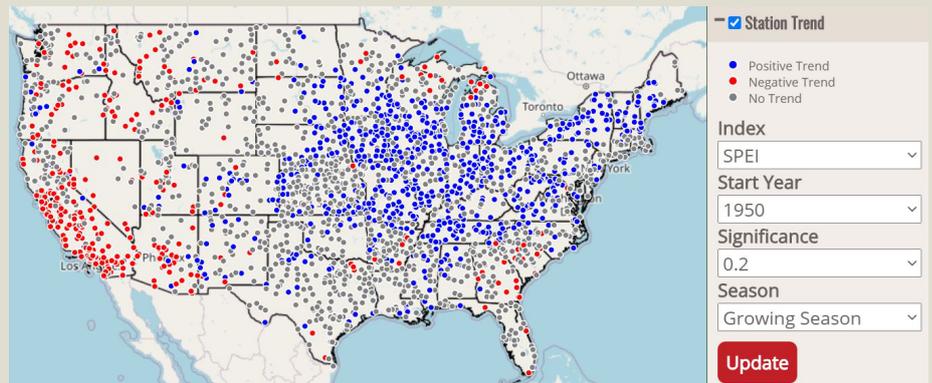
Since it first debuted online in 2014, the Drought Risk Atlas has provided decision-makers with historical drought information and web-based tools to help visualize and assess drought risk. Following a significant upgrade, the Atlas now also tracks long-term changes in drought and streamflow levels for specific locations across the U.S. The National Drought Mitigation Center, based at the University of Nebraska-Lincoln, added trend analysis to the Atlas in July.

For each station in the Atlas with a sufficiently long, uninterrupted record, the Atlas now provides an assessment as to whether it is getting drier or wetter, and if so, whether the change is statistically significant. Trends are visible either as lines for individual stations, or as color-coded dots on a map.

“The new trends analysis is a faster way to help people see if there are long-term changes in drought in their area,” NDMC climatologist Brian Fuchs said.

Curtis Riganti, NDMC climatologist and U.S. Drought Monitor author, led the research, working closely with Mark Svoboda, NDMC climatologist and director and one of the original USDM authors, and Fuchs, who leads NDMC’s Monitoring program area. Riganti presented on the initial concept of trends analysis at the American Meteorological Society meeting in January 2019.

Riganti then worked extensively with Chris Poulsen and Jeff Nothwehr of NDMC’s Information Technology,



Following a significant upgrade, the Drought Risk Atlas now also tracks long-term changes in drought and streamflow levels for specific locations across the U.S.

GIS and web team on the analysis, database structure and web display needed to implement the concept and display the 7,992,610 new calculations and visualizations.

“This is a good example of the research-to-application approach that the NDMC brings to drought science,” Svoboda said. “We are building on the high-quality data in the Drought Risk Atlas and finding more ways to answer the fundamental question that the Atlas is designed to answer: How do present conditions compare with the past?”

Getting to a trend line or map within the Atlas requires several decisions beyond picking a climate station: which drought index to use; whether to look at calendar years, seasons, or the growing season; how far back to start; and what counts as significant change (the p-value on a Mann-Kendall test). Although looking at a longer record produces more meaningful results, it also reduces

the number of stations with uninterrupted data.

New trend tabs appear for climate and hydrological data stations in the Atlas, online at droughtatlas.unl.edu. Trend analyses are for several measures of drought: precipitation, Standardized Precipitation Index, Standardized Precipitation and Evapotranspiration Index, the Palmer and self-calibrating Palmer Drought Indexes, and dry streaks, defined as the number of days in a row without rain. Trend analysis for streamflow is based on the Standardized Streamflow Index, and if in doubt as to which SSI distribution to choose, Riganti recommends the Tweedie over the gamma.

Funding for the Drought Risk Atlas has come from the National Integrated Drought Information System and from the U.S. Department of Agriculture.

Although some stations show trends and some maps appear to show patterns, Riganti cautioned that more research is needed before drawing definitive conclusions. “It’s a wealth of data that we have now,” he said. ○

“We are building on the high-quality data in the Drought Risk Atlas and finding more ways to answer the fundamental question that the Atlas is designed to answer: How do present conditions compare with the past?”

- Mark Svoboda, National Drought Mitigation Center

NDMC releases new tools to help Midwestern specialty crop growers make decisions in times of drought

By Cory Matteson

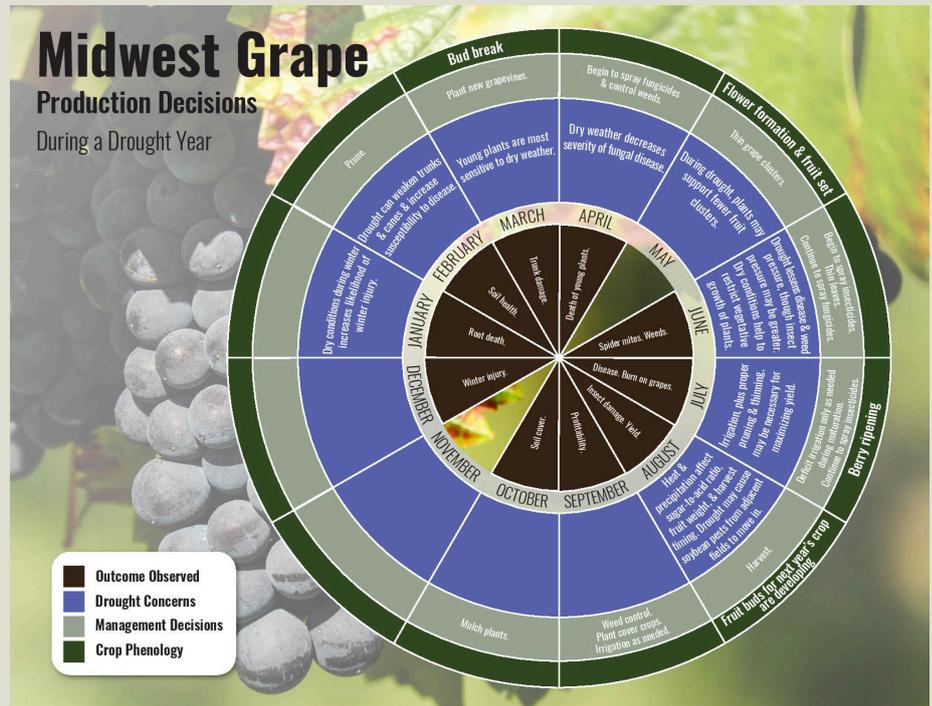
NDMC Communications Specialist

The July 16 U.S. Drought Monitor showed that all nine states included in the Midwest were experiencing abnormal dryness and/or drought. Growers of specialty crops such as wine grapes, fruit trees, cranberries, and vegetables face high risks due to climate extremes such as drought, but are sometimes ignored in drought management outreach. Now, Midwestern specialty crop producers have new resources to turn to in making decisions during drought years, available on the National Drought Mitigation Center website.

The NDMC has released a set of decision calendars that provide month-by-month and seasonal advice on how growers manage production of Midwestern apple, grape, cranberry and irrigated potato crops during drought years. Along with the calendars available on the NDMC site, there are also fact sheets that highlight appropriate drought and climate tools for growers to monitor during the growing seasons and beyond.

“Specialty crop growers have been an underserved group from a drought monitoring perspective,” said rural sociologist and NDMC project manager Tonya Haigh. “Droughts negatively affect specialty crop production, but understanding of the needs of agriculture in the drought monitoring community has to date been largely limited to row crop commodities like corn and soybeans and rangeland livestock production. Since specialty crop production differs in many ways from growing commodity row crops, we wanted to create resources that help those growers in times of drought too.”

To create the resources, the project team met with specialty crop growers in three Midwestern states (Iowa, Wisconsin and Missouri) and conducted focus groups to learn what they considered to be the most important decisions they made, when they made them and how those



The National Drought Mitigation Center created a set of resources to help Midwestern specialty crop producers make decisions during drought years.

decisions led to better vegetable and fruit production outcomes during drought. Discussing those issues and other related topics helped lead to the development of decision calendars and fact sheets.

The decision calendars feature up to four categories — crop phenology, management decisions, drought concerns and outcome observed — of information per month. The June slice of the Midwest apple calendar, for instance, advises that the cell division stage of development has concluded (crop phenology) and that it’s time to begin thinning the fruit and focusing on pest management (management decisions) because drought-stressed trees may be more susceptible to borers (drought concerns).

The associated fact sheet on drought and climate tools for perennial fruit production provides growers with information on using tools such as the U.S. Drought Monitor (USDM), Evaporative Stress Index (ESI), and maps of soil moisture, soil temperature, and snowfall at appropriate times

throughout the year to inform decision-making. The fact sheet also highlights new tools that can help growers of perennial crops imagine future growing conditions in their region and plan strategically using that information.

The project was funded by the National Oceanic and Atmospheric Administration’s Sectoral Applications Research Program. The set of decision calendars and fact sheets can be found at: drought.unl.edu/Projects/Detail.aspx?id=41.

To help farmers better prepare for drought, Rimsaite analyzes water markets for NDMC, Water for Food

By Cory Matteson

NDMC Communications Specialist

In 2012, in the midst of the worst U.S. drought this century, corn growers in Nebraska, Colorado and Kansas heavily irrigated their crops in an effort to compensate for sustained dryness and lack of rain. In the eastern portions of Nebraska and Kansas, where producers don't rely heavily on irrigation, demand increased significantly, from about 4 to 8 acre-inches during an average year to 17 to 20 acre-inches. In Colorado and the arid, western portions of Nebraska and Kansas, where irrigation is a more prevalent method and water more scarce, irrigation demand skyrocketed, from 12 to 17 acre-inches during an average year to over 30 inches.

For someone with a background in economics like Renata Rimsaite, a water market analyst with the National Drought Mitigation Center and Daugherty Water for Food Global Institute at the University of Nebraska, the region where water is scarcest over a period of drought is where it would seemingly hold its highest value. That did not turn out to be the case during the 2012 drought, according to an analysis by Rimsaite and a team of researchers that included Justin Gibson, Data Scientist at Corteva Agriscience and Nicholas Brozovic, Director of Policy at Daugherty Water for Food Global Institute.

The findings offered the kind of surprising results that led Rimsaite to study water markets for the NDMC and Water for Food well after being assigned to do so in pursuit of her PhD in agricultural and environmental economics at Penn State University. At the two Nebraska-based centers, Rimsaite is working to better understand how the U.S. Drought Monitor, water markets and

incentive-based water management techniques can be used together to improve water scarcity management policies for farmers.

"When I saw the job description, I said, 'That's just for me,'" Rimsaite said. "My dissertation research focused on looking at water markets as a potential solution to water management issues, whether that could be an adaptation strategy to managing drought or adapting to a changing climate where we are expecting to see more frequent and more severe drought events. This ties everything together that I was working towards. I engage with policy researchers at the Water for Food Institute, and the background of the story is drought and the changing climate, and that's what I'm getting at the NDMC."

As a water market analyst for the two centers, Rimsaite's research often looks at how drought events affect the valuation of water across a variety of American markets where buyers and sellers trade water through sales and leases of their water rights. Water markets differ substantially from region to region. You have to piece together where certain rules apply, Rimsaite said, and the job can involve some detective work.

In some studies, Rimsaite and other researchers purchased water market data. But in this one, they estimated the value of water by using publicly available U.S. Department of Agriculture data on corn production in Nebraska, Kansas and Colorado. They started by looking at the difference in bushels-per-acre yield between irrigated and non-irrigated production in the same geographic location. That difference alone, she said, represents a value of water, showing how much more corn production benefited from irrigation. Then they multiplied that difference



As water market analyst with the National Drought Mitigation Center and Daugherty Water for Food Global Institute at the University of Nebraska-Lincoln, Renata Rimsaite's research often looks at how drought events impact the valuation of water across a variety of American markets.

in yield by the dollars per bushel price of corn, which expressed the total water value in monetary terms. To get a water per unit average, they divided the results by the irrigation water requirement.

In July 2012, the contiguous U.S. experienced its second-hottest month on record, trailing only July 1936, and the 2012 drought persisted through the fall. The dependence on irrigation in Colorado and the western portions of Nebraska and Kansas was never greater during the 2010-2017 timeframe than it was in 2012. During a recent presentation of her research for the UNL School of Natural Resources Summer Speaker Series, Rimsaite said that a chart showing the western dependence on irrigation in 2012 allowed her to speculate that the value of water should have been highest there during that time. But it wasn't.

Instead, the highest average value of water that the research team calculated was found in eastern Nebraska and Kansas, where producers drew more heavily from groundwater sources in the region's thin aquifers. Though corn growers there used less irrigated water in 2012 than their western counterparts, the predominantly rainfed eastern

"When I saw the job description, I said, 'That's just for me.'"

- Renata Rimsaite, Water Market Analyst, National Drought Mitigation Center and Daugherty Water for Food Global Institute

operations shifted gears more dramatically. While they didn't utilize more irrigated water than the west, they did deviate from their standard practices more than western farmers did. And the value of water spiked.

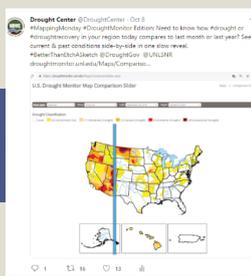
Future climate predictions show shifts in weather patterns and conditions that could lead to more hydrological stress in rainfed production areas in Iowa and Illinois,

for instance, Rimsaite said. If they need to start irrigating more, then more water sustainability issues will emerge not only for farmers but for the municipalities in those regions as well.

“(We need to) focus on rainfed crop areas, where stakes are high and water conflicts are more likely and there aren't institutions in place to manage water scarcity,” Rimsaite

said. “These stories are going to increase in areas where they are least expected. It's time to start doing things now, because it's going to be cheaper to deal with it now than dealing with it during the crisis.”

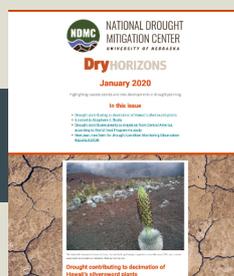
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