

HOST STEPHANIE HO (SH): If you eat, and I'm guessing you do, then -- whether you think about it or not -- the U.S. Department of Agriculture touches your life every day. USDA owes its existence, and its outlook, to Abraham Lincoln -- not only did he establish USDA in 1862, he later dubbed it the People's Department.

Initially, the nickname may have referred to the fact that about half of all Americans in Lincoln's time lived on farms, compared with about two percent these days. Now, though, even in the 21st century, the nickname, the People's Department, is still appropriate because of the breadth and depth of USDA's work.

I'm Stephanie Ho, with USDA's Office of the Chief Economist, and I'm going to bring you a series of stories that highlight ways USDA continues to carry out Lincoln's vision, by helping improve the lives of all Americans through work on food, agriculture, economic development, science, natural resource conservation and a whole host of other issues. In other words, this series, which is called "USDA -- Now You Know," will focus on ways USDA is still the People's Department.

MUSIC BRIDGE: [Komiku, "Friends, 2018"](#), [CC 1.0 Universal](#)

SH: This episode is about drought and USDA's involvement in the U.S. Drought Monitor. It may seem like a rather dry subject -- pun intended -- but trust me, this will be interesting. As we head toward the end of the year, it may seem like an issue that's not really as urgent as it was a few months ago, especially at the height of the hot and dry summer. However, when USDA meteorologist Brad Rippey talks about the last pasture and rangeland outlook for this year, he notes that only time will tell if the current drought has truly been reversed.

USDA METEOROLOGIST, BRAD RIPPEY (BR): Even though soil moisture has improved, it does take considerable time for the pastures to recover, especially this time of year, where the temps are lower, the days are shorter. We don't expect to see full recovery in our hardest-hit drought areas, until at least the spring of 2022.

SH: So, with that in mind, we're going to jump into the whole issue of drought -- I'm going to give some historical perspective and focus on the U.S. Drought Monitor, which paints a picture of the nation's current drought situation. Drought is a natural disaster whose power cannot be underestimated. USDA's Chief Meteorologist Mark Brusberg points out that hundreds of years ago, severe drought brought devastation to indigenous American groups like the Anasazi and the Mayans.

USDA CHIEF METEOROLOGIST, MARK BRUSBERG (MB): Not only are these droughts significant, but they have had a profound impact on the people who were living in the area at the time. In this case, it was the Anasazi, we have documentation that the Mayans were also impacted – European civilizations also have been impacted by drought. There's an old saying, I forget who said it – flooding kills people, drought kills civilizations.

MUSIC BRIDGE: [Axeltree, "Clothe the Fields With Plenty", CC-BY-4.0](#)

SH: And droughts are not just limited to the distant past -- recent history also has seen many notable drought events. The best-known drought of the 20th century is the Dust Bowl drought of the 1930s.

BR: Which resulted in complete dessication of the Great Plains region, mass migration of people westward to California – and it really just changed the history of the country.

SH: Again, that was USDA meteorologist, Brad Rippey. The Dust Bowl drought got its name because fertile topsoil in the Great Plains dried up and was blown away by the wind -- the huge dust storms darkened the skies and were called "Black Blizzards." USDA jumped in to help by creating the Soil Conservation Service, which later expanded its focus and is today known as the Natural Resources Conservation Service. Meanwhile, the grim reality of the Dust Bowl drought was a big deal in popular culture too, thanks to novels like John Steinbeck's "The Grapes of Wrath," which recounted the Joad family's trials and tribulations as they traveled from Oklahoma to California. The novel was a best seller when it came out in 1939. It also won a Pulitzer Prize, and a major Hollywood studio turned it into a film.

SOUND: Grapes of Wrath film trailer

SH: Ok, so the Dust Bowl drought ended in the early 1940s, but it wasn't long before the next one came along.

BR: There was a second period of excruciatingly long and severe drought that was most severe in the southwestern United States, but in the mid-50s, it expanded as far east as the Corn Belt, with the peak years being 1954 and 1956. That drought, which also lasted almost a decade, about three-quarters of a decade, began in the early 1950s and really wasn't eradicated until we got into the late 50s, with a couple of wet years.

SH: And now we're in the 21st century. Drought doesn't seem to go away, and so experts are calling this multi-decadal event a megadrought.

BR: We've seen some pretty significant droughts at times, in the Southeast. But the real focus for this megadrought has been the West, and in particular, the Southwest, California, and through the Great Basin, into the Four Corners states. Three out of four years, over the last two decades, on average, have been drought years, and that has had a really significant impact on water supply, stream flows, snow pack, and all these critical factors that lead to really life-changing droughts. And that's certainly what we're reaching now in the southwestern United States.

SH: USDA is so involved in trying to monitor drought because the dryness seriously affects farming and agricultural production. Since 1999, USDA has worked with the National Oceanic and Atmospheric Administration -- or NOAA -- the National Drought Mitigation Center -- an academic consortium -- and the Western Regional Climate Center, to produce the U.S. Drought Monitor.

MUSIC BRIDGE: [Axletree, "The Woods", CC-BY-4.0](#)

SH: The Drought Monitor is issued every week and has become the standard for determining drought intensity in the country. It grew out of two measurements that were limited in scope. The first was the Palmer Drought Index, which came out in the 1960s, and the Standardized Precipitation Index, which came out in the 1980s.

BR: The idea is to be an improvement over the Palmer Drought Index, which was really based on one soil type across the Great Plains, and an improvement over the Standardized Precipitation Index, which has no incorporation of anything else except precipitation -- there's no temperature, no evaporation -- there's nothing except just rainfall data, precipitation data.

SH: These limitations prompted climatologist Mark Svoboda and meteorologist Douglas LeComte to try to figure out how to do it better and provide a more comprehensive picture.

BR: We're not going to rely on a single set of equations, like the Palmer Drought Index, or the Standardized Precipitation Index, but instead, we're to grab everything but the kitchen sink -- throw it all together into a mix, and then try to sort it out and come up with a single snapshot of drought, from all of that info -- whether it's rainfall data, stream flow, reservoir levels,

groundwater information, vegetation health – I could go on and on, but if you throw it all together, try to mix it up and see what comes out.

SH: And what came out was the current Drought Monitor.

BR: A couple of things were determined very early on. Number one is that we should have a sliding scale of drought that was kind of like what people recognized for tornado intensity or for hurricane intensity.

SH: Rippey has been with the Drought Monitor pretty much since the beginning. He says the process involves a convergence of evidence approach that involves analyzing many different sources of information.

BR: As long as we're able to turn that data into percentile rankings, then we could look at it in the sense of a Drought Monitor intensity – D-0 through D-4. And by doing so, we could look and see which parameters, which data sets agreed – which ones disagreed. And today, we look at dozens and dozens of different layers and time scales, when we're making each Drought Monitor map each week.

SH: The final product also includes input from hundreds of experts around the country – many of them are from state or regional offices.

BR: We do rely on these boots on the ground reports to provide ground truthing, impact reports, and help us to fine tune the map, which is mathematically based, but in the end, it's hand drawn lines.

MUSIC BRIDGE: [Lobo Loco, "Follow the Little Creek", CC-BY-NC-SA-4.0](#)

SH: The Drought Monitor classifies dryness and drought across the nation, according to five different intensity rankings.

BR: And, so, with the D-0 dryness, that is the type of dryness you would expect to occur once every three to five years. D-1 would be a one-in-five to one-in-10-year occurrence. D-2 is a one-in-10 to one-in-20-year occurrence. D-3 is a one-in-20 to one-in-50-year occurrence. And then finally D-4 is a one-in-50 to a one-in-100 year occurrence.

SH: The scale is technically open-ended, but it only goes back 100 years, at this point, because that's as far back as there is reliable data.

BR: A lot of times, people talk about 100 or 500-year floods, and just because you have a 100-year flood doesn't mean that that won't occur the following year. They're somewhat independent events. And the same thing is true with drought – in that just because you've had a D-4, say five years ago, doesn't mean that you won't see another one for 50 years – and especially in the face of changing climate, with a hotter, and in some parts of the globe, a dryer climate, that does mean we might see some of these high-end drought events more frequently.

SH: In other words,

BR: Changing climate can change the way we look at the drought intensities. And certainly over the last two decades, we have seen more drought than not across the western part of the United States. And over time, that does change the percentile rankings for that region. So, D-3s and D-4s, that are high ends of drought, have become more common in parts of the western United States, particularly from California through the central and southern Rockies. And just the sheer definition of how we compute the Drought Monitor, and create the lines, means that it will be somewhat harder to achieve these higher levels of drought, going forward, just because of the percentile rankings. And I know that might bother some people, but that's the nature of these calculations is that we're looking at percentile rankings – how frequently do these events occur? And as long as we're keeping right up to date with the data sets, it should indicate that, that the D-3s and D-4s are becoming more common, so going forward, it will be harder to achieve that threshold.

MUSIC BRIDGE: [Komiku, "The Road We Used to Travel When We Were Kids", CC 1.0 Universal](#)

SH: Since the Drought Monitor began, USDA has increasingly relied on it in times of disaster. It was not only referenced in the droughts of 2002-2003 and 2006, its authority was enshrined in the 2008 Farm Bill.

BR: It has been a very important tool for livestock producers, which don't have that safety net of row crop producers, and so there have been well over seven billion dollars in payouts, just in the last dozen years alone, based solely on the drought monitor depiction.

SH: Evolving technology helps make the product better, but there also is still plenty of need for human input -- especially for measuring soil moisture, on the ground.

BR: When you get right down to it, that's kind of what drought is all about, is soil moisture. And so, we use our limited number of soil probes, measuring soil moisture. We have to combine that with both modeled and satellite-derived products to try to fill in the gaps. And, so that's kind of the future of drought monitoring, is improving our soil moisture monitoring networks, to be able to have a better picture of what drought really is, how it's affecting the soils.

SH: And, there's also a need for human expertise in synthesizing all of the information that goes into each week's Drought Monitor.

BR: All nine of us that are involved in the authorship – we're all – I mean, it's all top notch people. And you're not going to find any big mistakes, but at the same time, just that simple fact that you can't replicate each weekly map, knowing exactly what was looked at, is a problem for some people. And I think it's just human nature to wrap your mind around something that is – there's a little bit of art blended with the science.

MUSIC BRIDGE: [Axletree, "The Silent Grove", CC-BY-4.0](#)

SH: That's all we have time for today. We hope you have found this story about drought, and USDA's involvement in helping to improve how we describe it, enlightening. Please stay tuned for more stories that take you behind the scenes at USDA. This is Stephanie Ho, with the Office of the Chief Economist -- thanks so much for listening.