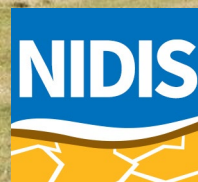


NIDIS ANNUAL REPORT

2023




THE FUTURE OF DROUGHT

Drought has been typically defined as a lack of precipitation. That definition is overly simplistic and requires even more refinement in a warming world. Trends of escalating and record-breaking temperatures are leading to 'hotter droughts,' where higher temperatures increase evaporative demand, causing drought conditions even with normal precipitation.

It's no longer enough to look up at the skies. We must look closely at the water flowing from our rivers and streams into lakes and reservoirs. We must also examine moisture in the dirt below our feet.

Today's droughts are different. Future droughts will be even more so. We need to develop new and updated planning, monitoring, and forecasting products to prepare for the droughts of the 21st century and beyond.

NIDIS is on a mission to make this happen.



Landscape
of dry and
parched land

OUR MISSION

NOAA's National Integrated Drought Information System (NIDIS) mission is to maximize the nation's ability to proactively manage drought related risks by providing those affected with the best available information and resources to assess the potential for drought and to better prepare for, mitigate, and respond to the effects of drought.

Toward that end, NIDIS is developing a drought early warning system for the Nation.

Where the
plains meet the
mountains near
Boulder, Colorado



LETTER FROM DIRECTOR

Drought took an enormous toll on our nation's economy in 2023, and reminded us all that no region of the country is fully spared from the magnitude of its impacts. Drought in the United States expanded and intensified in summer 2023, largely influenced by not only lack of precipitation, but extreme heat and evaporative demand. We saw unhealthy levels of smoke pour into the contiguous United States from record-breaking Canadian wildfires exacerbated by drought, and a wildfire in dry Maui destroyed the town of Lahaina. According to NOAA's National Centers for Environmental Information (NCEI), the costliest of all 2023 billion-dollar events was the Southern / Midwestern Drought and Heat Wave in the spring-fall of 2023, totalling \$14.5 billion. The Lower Mississippi River Basin, an area reliant on healthy inland waterways to fuel our Nation's economy, plunged to new lows, leading to saltwater intrusion and drinking water quality issues in southern Louisiana, along with significant river commerce disruption. Drought across the Southern Plains persisted for a second year in a row, impacting agricultural producers and small communities throughout Texas, New Mexico, Kansas, and Oklahoma.

The need for more localized, targeted, sector-specific drought information integrated into decision-making grows increasingly urgent with each of these drought events. And as I look back on 2023, I am struck by all that NIDIS and our many partners achieved to advance drought early warning capacity and build long term resilience. It was a groundbreaking year for the NIDIS Program, from launching a technical workshop and releasing a NOAA Technical Memorandum that examines drought assessment in a changing climate, to hosting the second Flash Drought Workshop and refining our pursuit of research and actions that helps us better understand rapid onset drought events, to building trusted relationships and important dialogues with tribal partners across the Missouri River Basin and Upper Columbia River Basin in September. Long-standing technological investments and partnerships in research and state-of-the-art cloud computing were harnessed to kick-off the build-out of a drought planning platform in partnership with the US Bureau of Reclamation. The platform will soon provide the nation with a resource for planners to better determine their drought and associated climate risks, and incorporate resilience strategies that prepare their communities for the droughts of the future.

From our partnerships with NOAA's Physical Sciences Laboratory to NOAA's new Cooperative Institute, the Cooperative Institute for Research to Operations in Hydrology (CIROH), we are expanding the work we do and deepening it by leveraging core and strategic partners across the country who are also committed to delivering drought and water information in a timely, relevant, and useful manner.

We look forward to getting to work in this new year, and doing so in partnership with you.

Sincerely,

Veva Deheza
Executive Director
NOAA NIDIS

OUR STAKEHOLDERS AND PARTNERS MADE THIS POSSIBLE IN 2023...



Our regional Drought Early Warning Systems (DEWS) served **42** states and **15,080** stakeholders through webinars, workshops, and email communications.



We provided more than **\$6 MILLION** in funding for research projects to advance drought science and preparedness across the nation.



Our award-winning website, drought.gov, served **1.7 MILLION** users who viewed over **4.7 MILLION** pages seeking the latest drought conditions, outlooks, and impacts.



Information from drought.gov was used **528 TIMES** by local & national media outlets in their reporting.



4,147 PEOPLE are subscribed to our drought alert emails for locations across the U.S.



Our X community grew to more than **13,900** followers while our Facebook community passed **3,500** friends.



We held **62** webinars and virtual workshops, delivering the latest drought updates and research to thousands of viewers.



The 2023 Western Drought Webinar in May was viewed by **919** people, including **480** who watched it live and another **439** who viewed the recorded version on YouTube.



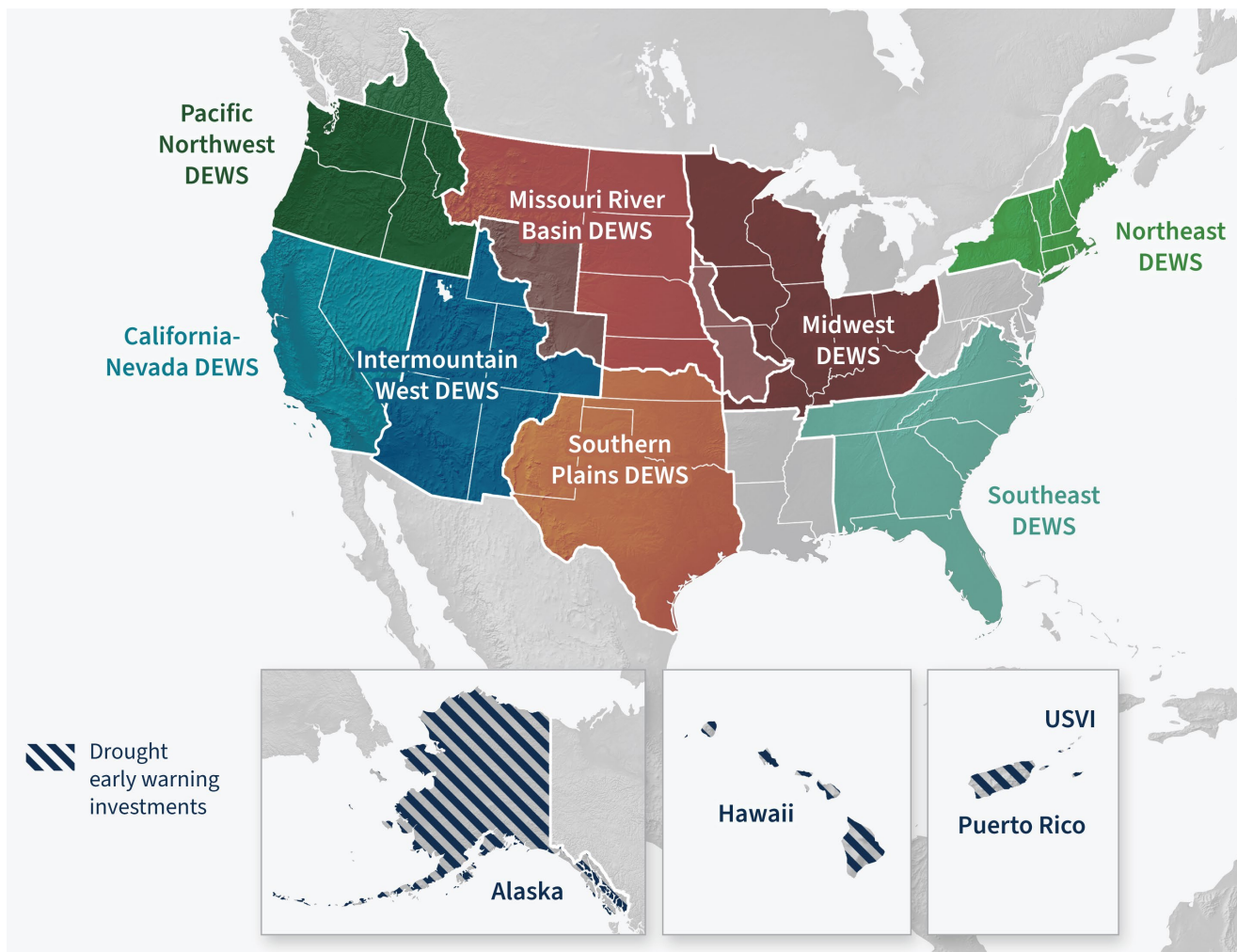
More than **4,600** subscribers received each issue of *Dry Times*, our bi-weekly newsletter.

View of the Boulder Flatirons
from South Boulder Road.
Credit: Ami Nacu-Schmidt

BUILDING A NATIONAL DROUGHT EARLY WARNING SYSTEM

The 2006 NIDIS Public Law prescribed a comprehensive, interagency approach for drought monitoring, forecasting, and early warning planning and preparedness to help states and local communities cope with the impacts of drought.

Drought in the summer of 2023 dried out ponds and lakes in East Texas



The 2006 NIDIS Public Law called on NIDIS to develop and provide a national drought early warning system (DEWS). Given the diversity of drought impacts and stakeholder needs across the Nation, and the need to leverage the capabilities of partner agencies on the ground, NIDIS has taken a regional approach since its inception. Around the country, eight regional DEWS:

- support rich networks of researchers, academics, resource managers, and decision-makers who share information and actions that help communities cope with drought;
- integrate five key components of a drought early warning information system: (1) interdisciplinary research and applications; (2) predictions and forecasting; (3) observations and monitoring; (4) planning and preparedness; and (5) communication and outreach; and

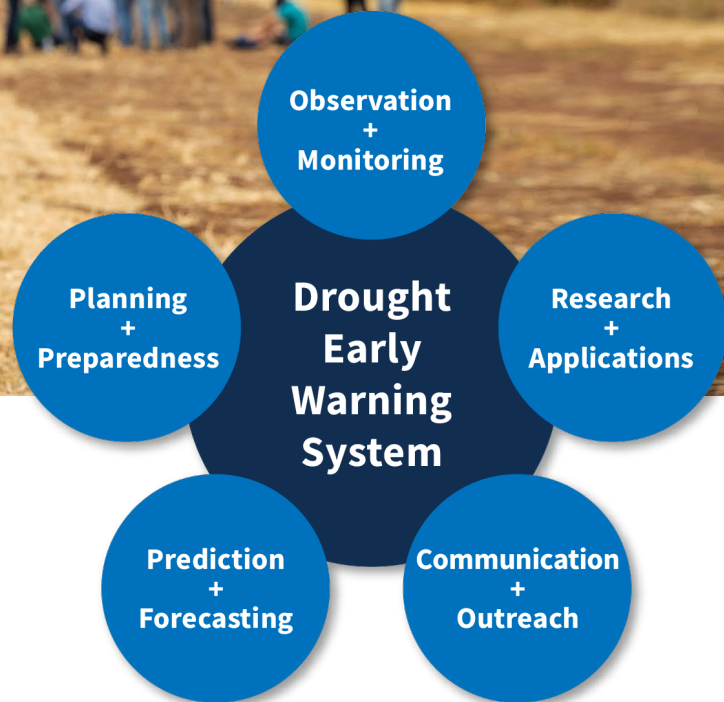
- advance the provision of drought early warning information and science-based drought decision support tailored to the region’s unique characteristics and needs.

▲ Map of regional Drought Early Warning Systems (DEWS). Credit: NOAA NIDIS

Today, each regional DEWS is supported by a multi-year strategic plan that identifies how it can further facilitate drought information delivery and action to reduce the impacts of drought.

As these eight regional networks have grown and trusted partnerships deepened, common stakeholder priorities and best practices across the regional DEWS have emerged, which informed the launching of several national-level initiatives that cross boundaries, hazards, and disciplines. These programs and key activities are designed to build out the national DEWS, including:

Farming inspection of wheat crop in a field



▲ Components of the Drought Early Warning System (DEWS). Credit: NOAA NIDIS

- National Coordinated Soil Moisture Monitoring Network Strategy
- NIDIS Tribal Drought Engagement Strategy
- Drought Assessment in a Changing Climate: Priority Actions and Research Needs
- Drought Risk and Resilience Planning Platform
- Drought and Public Health Roadmap
- The U.S. Drought Portal (Drought.gov)
- Improving NOAA Climate Prediction Center Drought Outlook Products and Services
- Flash Drought Initiative: Annual Flash Drought Workshops
- The NIDIS Drought and Wildland Fire Nexus Strategy
- Coping with Drought Grant Applied Research Competitions

The implementation of these national-level initiatives and many other recent milestones mark a new phase in the growth of NIDIS; what started as a small program with burgeoning regional pilots in 2006 is now maturing into a fully *national* drought early warning information system. Achieving national coverage will require additional resources to build out new regional DEWS and

tailor existing tools and products to the unique decision contexts of those regions. But today, NIDIS implements national-level initiatives within eight successful regional DEWS. Today, anywhere across the country, any individual can visit Drought.gov to find actionable, shareable drought early warning information by city, county, state, and zip code, as well as sign up to receive regular, up-to-date local drought information alerts.

The completion of a fully operational national drought early warning system is fundamental to creating a more drought resilient nation. Through continued investment, transformational improvements in drought monitoring, forecasting, planning, and research will help reduce drought's catastrophic economic, wildfire, health, and environmental impacts across the country.

Early Warning in Action

Drought Alert Emails

NIDIS drought email alerts provide up-to-date local drought information right to your inbox. Since 2021, NIDIS has partnered with NOAA's NCEI to deliver these alerts with the latest changes to local U.S. Drought Monitor conditions and the latest drought outlooks from the National Weather Service Climate Prediction Center. At the end of 2023, almost 12,000 people have signed up to receive NIDIS drought email alerts.



Impacts and Perspectives on the 2023 Southern US Drought and Heat

Wednesday, November 8, 2023
11 a.m. – 12 p.m. CT

Drought Status Updates and Webinars

NIDIS works with state climatologists and federal partners to issue Drought Status Updates sent to thousands of stakeholders in each regional DEWS facing drought. These updates communicate potential areas of concern for drought development and/or expansion based on recent conditions and the upcoming forecast. NIDIS and partners also host a very popular regional webinar program to provide stakeholders with timely information on current and developing drought conditions; discussions on drought impacts on wildfires, water supplies, and ecosystems; as well as impacts to sectors like agriculture, tourism, and public health. In 2023, NIDIS and its partners issued 61 Drought Status Updates and hosted 62 webinars.

Drought Outlook Products

NIDIS and the National Weather Service Climate Prediction Center (CPC) are teaming up to enhance CPC drought outlook products and services by improving the current deterministic drought outlooks and developing new probabilistic drought outlooks. Improved drought outlooks will provide national and regional users with authoritative, official, operational forecasts for drought conditions at lead times of up to six months. They will also inform and enhance the existing NIDIS DEWS by facilitating more timely decision making to prepare for and mitigate drought related impacts and costs.

Drought Indicators

NIDIS supports research through its *Coping With Drought* competition and with partners like National Aeronautics and Space Administration (NASA) and the Commission for Environmental Cooperation to identify the most effective drought indicators by location, time of year, and sector across the United States. NIDIS and partners are working to communicate the best drought indicators that support the monitoring and management of different drought types, and to integrate the results of this research into decision-making at the regional DEWS scale.

70

NIDIS-funded Coping with Drought projects since 2007

\$6,269,035

in funding for 2-year fiscal year 2022 Coping with Drought projects

16

years since NIDIS began funding the Coping with Drought competition

THE NATION'S TRUSTED SOURCE FOR DROUGHT INFORMATION

Communication around a complex environmental hazard like drought cannot take place in a vacuum. NOAA provides the most accurate and timely information on conditions and outlooks for precipitation, temperature, evaporative demand, and other climate and weather indicators.

View of the Hoover Dam. The Colorado River provides water to almost 40 million people in two countries, seven states, 29 federally recognized Indian tribes, and 4 million acres of farmland. Since 2000, historically dry conditions have added stress to the Colorado River's water resources.



MEETING OUR AUDIENCES WHERE THEY'RE AT

Communication around a complex environmental hazard like drought cannot take place in a vacuum. NOAA provides the most accurate and timely information on conditions and outlooks for precipitation, temperature, evaporative demand, and other climate and weather indicators. Streamflow and groundwater information comes from the U.S. Geological Survey (USGS). The U.S. Bureau of Reclamation tracks reservoir levels in the West. U.S. Department of Agriculture's (USDA) Office of the Chief Economist provides economic and policy-related research and analysis for agriculture across the country. NIDIS gathers information from these and other sources and delivers them to the Nation through drought.gov, email updates, webinars, in-person meetings, and social media. NIDIS also solicits regular feedback from our users, so we can channel our resources into better meeting their needs. The result is that NIDIS delivers reliable, timely information and services that are co-developed with our partners and based on mutual trust with our users.

In 2023, the U.S. Drought Portal (www.drought.gov) served 1.7 million users. The majority of these users are members of the general public who are most interested in learning about drought conditions in their area. Other significant audiences include the media, as well as experts who interpret drought and climate information for others—and these users also value local, high-resolution, timely information. So, to meet these audiences where they're at, we've focused on upgrading the state, county, and local pages on drought.gov. As of the end of 2023, almost 22,000 people were subscribed to receive NIDIS emails. By reviewing data, we've determined that the primary audience for email, including NIDIS webinar announcements, is federal, state, and local governments. To meet the federal, state, and local governments where they're at, we've focused NIDIS emails and webinars on supporting these leaders in drought decision-making. NIDIS is building website and email content for members of tribal nations, based on ongoing dialogues with our tribal partners, and also communicating with tribal nations through meetings and workshops on tribal lands.

NIDIS LAUNCHES IMPROVED AND EXPANDED STATE PAGES ON DROUGHT.GOV

Drought.gov—which NIDIS developed in collaboration with NOAA’s National Centers for Environmental Information and state partners—provides a one-stop shop for state drought information. This includes interactive and easily shareable maps, statistics, and resources for *all 50 states*, as well as *Puerto Rico*, the *U.S. Virgin Islands*, and the *U.S.-Affiliated Pacific Islands*. These state pages make it easier for public- and

▲ **Drought.gov state pages include maps of streamflow, soil moisture, precipitation, and temperature conditions. Pictured above: Kansas streamflow conditions**

private-sector decision-makers, the engaged public, and the media to learn and communicate about drought in their state, access key state drought resources, and make actionable decisions to improve their communities’ long-term drought resilience.

NIDIS AND THE CONFEDERATED SALISH AND KOOTENAI TRIBES (CSKT)

CSKT co-hosted the *Workshop for Building Drought Resilience in a Changing Climate with Upper Columbia and Missouri Basin Tribes*, which was held on the Flathead Reservation in western Montana in September 2023. Over 100 people attended the workshop, representing 16 tribal nations, numerous federal agencies, Montana state government, academic institutions (including Tribal Colleges and Universities), and the private sector. Tribal attendees emphasized the need for greater communication with and from their partners about the programs they offer, and the importance of trusted relationships in building drought resilience. They also discussed challenges in applying for and administering grant funding opportunities offered by federal agencies, and offered suggestions to streamline processes and support accessibility and capacity-building.

“I think for me the big takeaway (of the workshop) was that we are experiencing drought and other climate-related changes that we have not seen before, and this is the ‘new normal,’” said Michael Durglo, Jr., Tribal Historic Preservation Department Head for the Confederated Salish and Kootenai Tribes and member of the workshop planning committee. “We definitely need to do better at collaborating and working together to both prepare and respond to these changes.”

Workshop attendees at Kwataqnuq Resort & Casino in Polson, Montana. Photo credit: Jessica Martinez



NOAA AND CIRES AWARDED BRONZE MEDALS TO NIDIS TEAM MEMBERS FOR “CUTTING-EDGE” DROUGHT.GOV

The Cooperative Institute for Research in Environmental Sciences (CIRES), a research institute sponsored jointly by the NOAA and the University of Colorado Boulder, awarded *bronze medals* for superior performance to eight team members from NIDIS. These medals reaffirm the successful launch of the redesigned Drought.gov website as "a cutting-edge implementation of the NIDIS public law, built on interagency and Department of Commerce partnerships." In 2022, NOAA awarded bronze medals to NIDIS federal team members for Drought.gov—the highest honor that can be granted by the NOAA Under Secretary for Oceans and Atmosphere.

NIDIS-FUNDED CSKT DIGITAL STORY COLLECTION HONORED WITH TEK AWARD

The Digital Story Collection, “Explore Climate Actions on the CSKT Flathead Reservation” clinched the prestigious Esri Native Nations Traditional Ecological Knowledge



(TEK) Award in the 2023 ArcGIS StoryMaps Competition. This project is a central component of the NIDIS-funded Native Drought Resilience Project, a collaborative effort between CSKT, Salish Kootenai College, the Montana Climate Office, and the Wilderness Society.



Eight NIDIS staff received CIRES bronze medal awards for Drought.gov. From left to right: Adam Lang, Britt Parker, Amanda Sheffield, Joel Lisonbee, Elizabeth Ossowski. Not pictured: Kelsey Satalino, Sylvia Reeves, Molly Woloszyn.

DEVELOPING IMPROVED PRODUCTS FOR USERS

Co-development of information, products, and tools is a cornerstone of the NIDIS approach to provide improved decision-support information and services. NIDIS engages with current and potential users of climate, water, and weather information to determine improvements that can be made to existing products, as well as the need for new products.



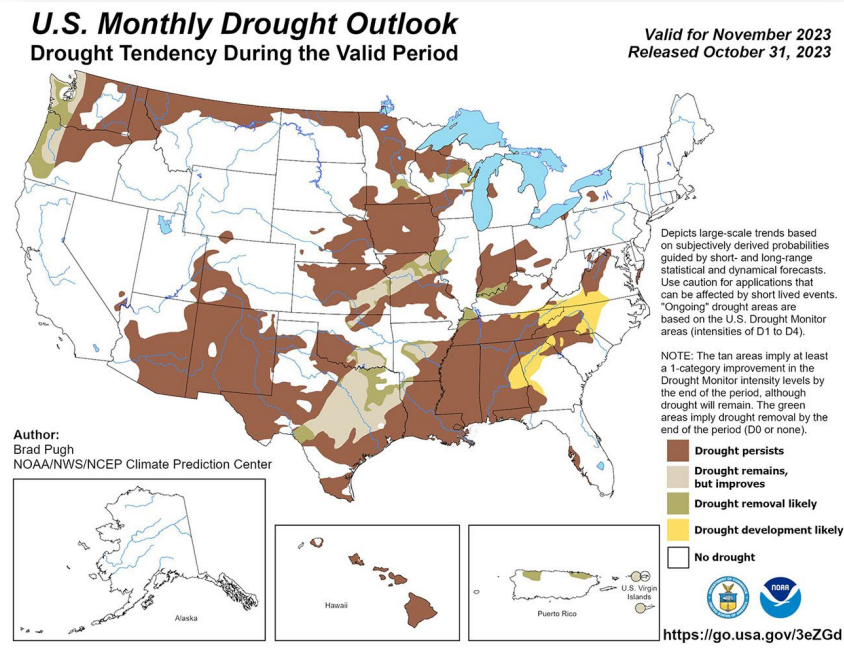
Winter view of snow coated Maroon Bells and crystal clear Maroon Lake, Aspen, Colorado



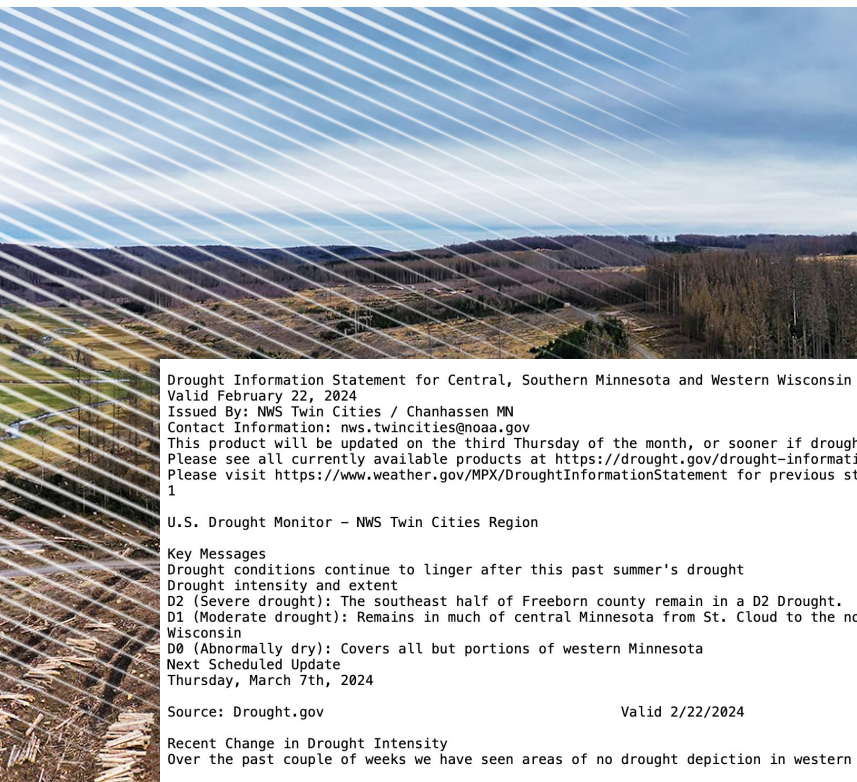
Boat uncovered as water level dropped along Mississippi River. Looking towards Memphis, HWY 55 bridge.

IMPROVING NOAA CLIMATE PREDICTION CENTER DROUGHT OUTLOOK PRODUCTS AND SERVICES

Improving NOAA’s Drought Outlook Products is a key step in developing a national drought early warning system. Currently, NOAA’s Climate Prediction Center (CPC) produces and issues monthly and seasonal drought outlooks. These outlooks are deterministic and produced subjectively by CPC drought forecasters based on their expert assessments. At the request of users, *NIDIS is funding a project* that includes improving CPC’s existing deterministic drought outlooks, developing new probabilistic drought outlooks, and using social science findings to improve expert and public understanding of these products. These outlook products will provide national and regional users with new and improved official NOAA forecasts of future drought conditions of up to 6 months and facilitate their decision-making to prepare for and reduce drought-related impacts.



▲ November 2023 Drought Outlook by the National Weather Service Climate Prediction Center



Drought Information Statement for Central, Southern Minnesota and Western Wisconsin
 Valid February 22, 2024
 Issued By: NWS Twin Cities / Chanhassen MN
 Contact Information: nws.twincities@noaa.gov
 This product will be updated on the third Thursday of the month, or sooner if drought conditions change significantly.
 Please see all currently available products at <https://drought.gov/drought-information-statements>
 Please visit <https://www.weather.gov/MPX/DroughtInformationStatement> for previous statements.

U.S. Drought Monitor - NWS Twin Cities Region

Key Messages
 Drought conditions continue to linger after this past summer's drought
Drought intensity and extent
 D2 (Severe drought): The southeast half of Freeborn county remain in a D2 Drought.
 D1 (Moderate drought): Remains in much of central Minnesota from St. Cloud to the northern Twin Cities metro, across portions of south-central and southeast Minnesota, and a small portion of north-central Rusk county in Wisconsin
 D0 (Abnormally dry): Covers all but portions of western Minnesota
Next Scheduled Update
 Thursday, March 7th, 2024

Source: Drought.gov Valid 2/22/2024

Recent Change in Drought Intensity
 Over the past couple of weeks we have seen areas of no drought depiction in western Minnesota and 9-month percent of normal precipitation

Precipitation Departures
 Since heavy rains around Christmas, we have slipped back into a generally dry pattern. Long term deficits going back to the spring and summer of 2023 remain. Though we are in a pronounced snow drought this winter, heavy winter rains have led



◀ (Top left) NWS Drought Information Statement for Central, Southern Minnesota and Western Wisconsin, Text Version. (Bottom left) NWS Drought Information Statement for Central, Southern Minnesota and Western Wisconsin, Modernized Version

Drought Information Statement for Central, Southern Minnesota and Western Wisconsin
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U.S. Drought Monitor - NWS Twin Cities Region
 Link to the latest U.S. Drought Monitor

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Next Scheduled Update
 Thursday, March 7th, 2024

U.S. Drought Monitor

Abnormally Dry (D0) Moderate Drought (D1) Severe Drought (D2) Extreme Drought (D3) Exceptional Drought (D4)

Source: Drought.gov Valid 1/30/2024
 National Weather Service Twin Cities/Chanhassen MN

NATIONAL WEATHER SERVICE DROUGHT INFORMATION STATEMENTS

National Weather Service (NWS) Drought Information Statements provide up-to-date reports on the current drought situation for regional Weather Forecast Offices' (WFOs) county warning and forecast areas. These timely statements summarize recent weather and hydrologic conditions, discuss local drought impacts, and provide a local drought outlook. In 2023, NIDIS, NWS, and the U.S. Drought Portal team at NCEI partnered to develop *modernized drought information statements* as a replacement for the existing text-based format, including creating customized regional map graphics that WFOs can use within these statements to support their drought messaging, as well as an *interactive map of all Drought Information Statements*.

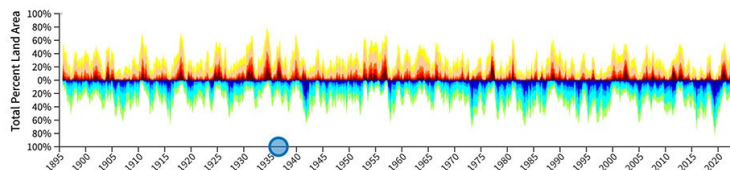
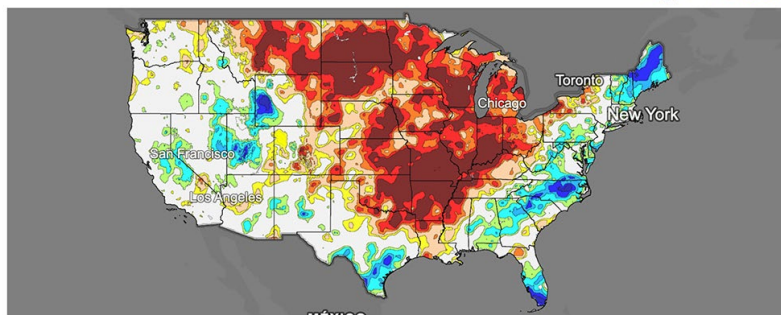


A cleared forest. Drought, heat, storms and bark beetles have damaged many conifers.

EXPANDED DROUGHT.GOV TOOL VISUALIZES HISTORICAL DROUGHT CONDITIONS BY COUNTY, STATE

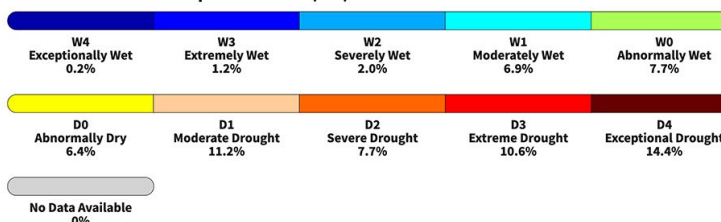
The U.S. Drought Portal’s Historical Data and Conditions Tool allows users to visualize historical drought data for their state or county through an interactive map and time series graph. In 2023, NIDIS partnered with NCEI to *expand and improve this interactive tool*—making it easier to visualize and share historical data for use in communications, research, or decision-making. The improvements to this tool make historical drought data more accessible and easier to share, whether communicating drought updates in a newsletter or social media, updating a drought plan for a region, or making decisions for a business.

Standardized Precipitation Index



Map Valid: July 1936

9-Month Standardized Precipitation Index (SPI)



▲ The time series graph shows the progression of drought across the lower 48 states during the 1930s. In July 1936 (shown in the map), more than 24% of the lower 48 states were in exceptional drought (D4), according to a 9-month Standardized Precipitation Index (SPI) from NCEI. Image courtesy of the Drought.gov Historical Data and Conditions Tool

MONITORING AND PREDICTING DROUGHT

NIDIS coordinates and integrates federal, state, and tribal efforts to improve observation, monitoring, and forecasting in support of early warning systems, response, and longer-term planning such as observation data and health surveillance.

Prescribed fire in southern South Carolina, fire line



Controlled burn sign along road warning motorists of a prescribed burn area ahead

ALABAMA FORESTRY COMMISSION

The Alabama Forestry Commission called off a planned prescribed fire in *Alabama's Gulf State Park* in August 2023 after soil moisture data and fire models indicated conditions would be too risky to burn as planned. This marks the first time the Forestry Commission had access to real time soil moisture data at a prescribed burn site. A new type of low cost soil moisture monitoring station was deployed across the state as part of a *larger regional project to enhance soil moisture monitoring* in Alabama, Georgia, and Florida. The project, *part of the National Coordinated Soil Moisture Monitoring Network*, is a partnership between NIDIS, the University of Alabama in Huntsville, the University of Georgia, the University of Florida, and NOAA's Weather Program Office.

USING SOIL MOISTURE INFORMATION TO BETTER UNDERSTAND AND PREDICT WILDFIRE DANGER

Greater use of soil moisture information in fire danger rating systems can lead to earlier warning of wildfire danger, and better forecasts of wildfire occurrence and size. An *international review article* summarizes

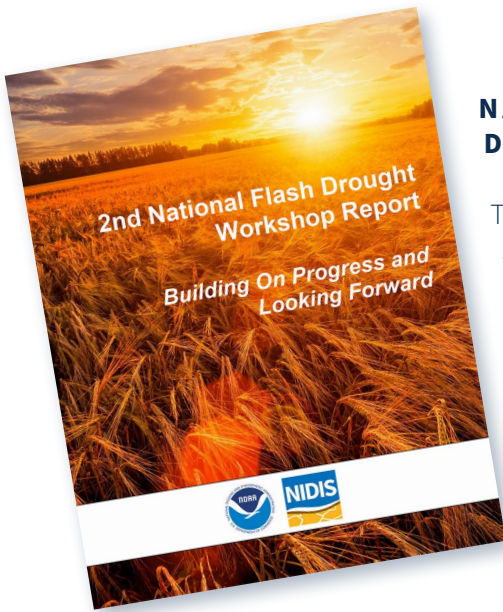
► "Using soil moisture information to better understand and predict wildfire danger" by Erik S. Krueger et al. was published in the *International Journal of Wildland Fire*.

the growing body of evidence indicating that greater use of soil moisture information in fire danger rating systems could lead to better estimates of dynamic live and dead herbaceous fuel loads, more accurate live and dead fuel moisture predictions, earlier warning of wildfire danger, and better forecasts of wildfire occurrence and size. This article arose in part as an outcome of a symposium sponsored by the U.S. Geological Survey's South Central Climate Adaptation Science Center, with support provided by NIDIS, the U.S. Forest Service, and the *National Coordinated Soil Moisture Monitoring Network*.





Drought impacts beets growing in an agricultural field



NATIONAL FLASH DROUGHT WORKSHOP

The NIDIS-sponsored *National Flash Drought Workshop*, held on May 2–4, 2023, brought together the flash drought research community and practitioners (i.e., those responding to/

planning for flash drought at the local, state, and regional levels). The overarching goals of this workshop were to build stronger connections and coordination among researchers and practitioners; discuss the state of the science, resources, and tools related to flash drought; and identify outstanding research and information needs since the *2020 virtual workshop*. NIDIS published a *workshop report* in March 2024.



NATIONAL SOIL MOISTURE WORKSHOP

Progress towards the *National Coordinated Soil Moisture Monitoring Network's* aim of sharing soil moisture research and applications was a key goal of the 2023 National Soil Moisture Workshop, held on August 14–17, 2023 at the National Agricultural Library in Beltsville, Maryland. The 2023 National Soil Moisture Workshop was co-hosted by the U.S. Department of Agriculture

▲ NIDIS's Marina Skumanich presents Tyson Ochsner, Professor of Plant & Soil Sciences at Oklahoma State University, with the Soil Moisture Community Award at the 2023 National Soil Moisture Workshop. Photo credit: Michael Cosh, USDA ARS



(USDA) and NIDIS. This was the 14th consecutive year for the workshop, which was started by the researchers who created the [Marena, Oklahoma, In Situ Sensor Testbed \(MOISST\)](#).

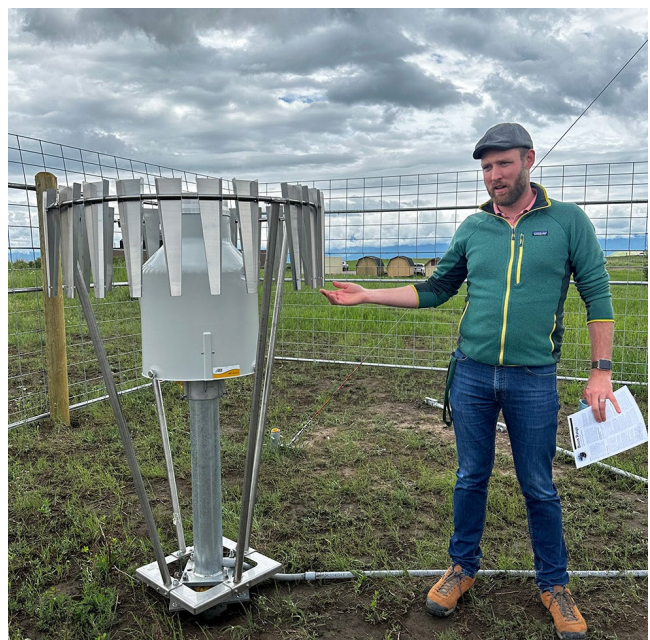
▲ **Confederated Salish and Kootenai Tribes Mesonet Station.** Photo credit: **Britt Parker, NOAA/NIDIS**

University of Montana, and The Wilderness Society. The Montana Climate Office worked closely with the Bison Range to ensure cultural resources were protected and that minimal disruption to the environment occurred before, during, and after station installation. The project was funded by NIDIS through an [FY22 Coping with Drought – Building Tribal Drought Resilience grant](#).

NEW MESONET STATION RECORDS & DELIVERS CLIMATE DATA AT CSKT BISON RANGE

A new mesonet station at the Confederated Salish and Kootenai Tribes (CSKT) Bison Range went live on May 4, 2023 with a goal to improve the monitoring of weather, soil, and snowpack across the Flathead Reservation, as well as contribute to the larger Montana Mesonet network. [The state-of-the-art mesonet station](#) provides a high-quality "total water" record of temperature, precipitation, relative humidity, solar radiation, snow depth, and soil moisture at depths down to a meter. This will provide a comprehensive picture of changing moisture conditions in the air and soil to support drought and other assessments. This new mesonet station is part of the [Native Drought Resilience project](#), a partnership between the CSKT, Salish Kootenai College, the Montana Climate Office at the

► **Kyle Bocinsky with the Montana Climate Office stands next to the new mesonet station.** Photo credit: **Britt Parker, NOAA/NIDIS**



PLANNING FOR FUTURE DROUGHTS

Some drought decision-makers are primarily focused on a particular timescale (e.g., emergency managers on response, urban planners on resilience), but NIDIS aims to bring these stakeholders together so they can learn from one another and conduct integrated planning across timescales.



View of the Colorado
River flowing through
Glenwood Canyon

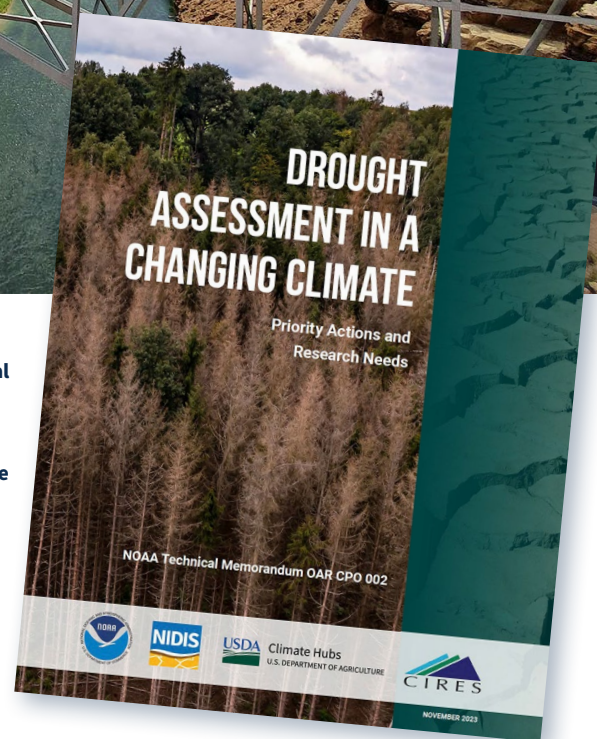


▲ Navajo Bridge Across the Colorado River in the Grand Canyon National Park. Photo credit: José Oliveira, Creative Commons

NEW REPORT ON DROUGHT ASSESSMENT IN A CHANGING CLIMATE

The changing climate is causing the probability of extreme events, like drought, to change, a phenomenon known as non-stationarity. Non-stationarity poses new challenges that include identifying the differences between permanent change (e.g., trends towards wetter or drier conditions) and temporary anomalies from normal conditions (e.g., drought). For example, the Southwest U.S. is not seeing a strong trend change in annual precipitation, but rising temperatures and evaporation have led to more rapidly depleted soil moisture, runoff, and streamflow in an already arid region. As a result, droughts feature higher temperatures than past droughts and are more impactful on the hydrology of the region, which is already stressed by human use. On the other hand, the Midwest and Northeast U.S. are trending wetter, with more precipitation falling as rain and less as snow. Changes in how we assess drought could impact disaster relief and adaptation programs and inform future policy. To address these challenges, NIDIS and U.S. Department

► NOAA Technical Memorandum, *Drought Assessment in a Changing Climate* by B. Parker, J. Lisonbee, E. Ossowski, H. Prendeville, and D. Today



of Agriculture (USDA) Climate Hubs held a workshop and released the NOAA Technical Memorandum, *Drought Assessment in a Changing Climate: Priority Actions and Research Needs*. This memorandum captures the ideas and feedback of more than 100 subject matter experts from over 44 institutions across the drought research and practitioner communities. It includes a state of the science overview on drought in a changing climate and identifies some of the most pressing and strategic areas of research and action to advance the knowledge and understanding of drought assessment.

NIDIS INVESTS APPROXIMATELY \$2 MILLION TO BUILD TRIBAL DROUGHT RESILIENCE

NIDIS invested approximately *\$2 million for projects to build tribal drought resilience*. This investment is part of NIDIS's Coping With Drought funding competition. It will help Tribal Nations address current and future drought risk on tribal lands across the Western U.S. while informing decision-making and strengthening tribal drought resilience in a changing climate. Competition activities may include conducting drought vulnerability assessments; developing drought plans and communication plans; and identifying primary drought impacts, optimal drought indicators, and/or triggers. Projects and research teams will be announced in 2024.

DROUGHT RISK AND RESILIENCE PLANNING PLATFORM

A new drought planning platform, launching in partnership between NIDIS and the U.S. Bureau of Reclamation (Reclamation), will improve methods and tools needed for risk and vulnerability assessments that incorporate climate change and support building long term drought resilience. At full development, the platform will be a multi-sector and multi-scale resource that meets the planning needs of multiple federal, tribal, local and state agencies and organizations. The platform can help advance drought planning to meet 21st century climate risks, and meet the requirements for a variety of planning efforts including the Reclamation WaterSmart and Drought Resilience Project grant applications and reports, Federal Emergency Management Agency (FEMA) Hazard Mitigation Plans, and state and local water efficiency and drought plans. The platform will provide stakeholders a streamlined toolkit of climate-adaptive best practices in drought planning and trusted scientific data and monitoring, mapping and decision support products that include climate change impacts, all of which tie actionable goals to measurable outcomes. Importantly, the platform will empower communities to prepare for future drought risk and climate variability, improving cross-cutting and cross-sector needs while sustaining livelihoods and resilience.

CLIMATE ADAPTIVE DROUGHT PLANNING (CADP) VISION

Prepare and plan for future droughts and water challenges in the context of a changing climate extremes and impacts – using contemporary, climate adaptive planning tools for drought risk and vulnerability assessments, to equitably build drought resilience across sectors and geographic scales.

The Little Missouri River cuts through Theodore Roosevelt National Park, North Dakota

APPLYING RESEARCH TO MITIGATE THE IMPACTS OF CASCADING HAZARDS

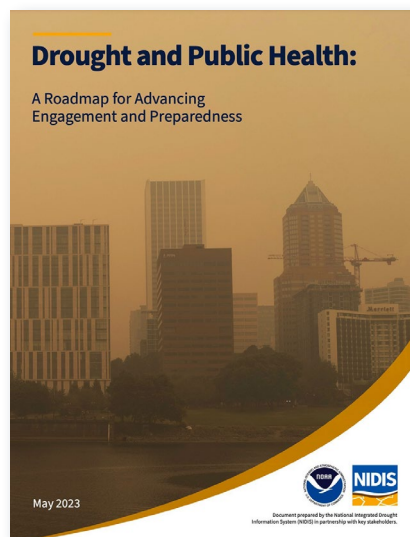
Drought can have far-reaching effects on a community and intersect with other natural hazards, such as wildfires and illness. Hazard mitigation planning is conducted to reduce the impact of natural disasters, including drought, by reducing loss of life and property. NIDIS facilitates the connection and coordination between research and assessment efforts around drought and cascading hazards and jointly develops and implements coherent strategies and priorities.

Aerial view of
Lake Powell near
Navajo Mountain

Dust storm over
a farm field
in Arizona

NEW ROADMAP PROVIDES A COMPREHENSIVE ASSESSMENT OF DROUGHT & PUBLIC HEALTH

In order to better mitigate the public health impact of drought events, NIDIS and the University of Nebraska Medical Center (UNMC) co-led the development of *Drought and Public Health: A Roadmap for Advancing Engagement and Preparedness*. This report represents the culmination of knowledge gathering from a *Drought and Public Health Summit* and five regional workshops, which were held between 2019–2022. The report provides insights into the connection between drought events and human health impacts. In addition, this report provides a roadmap of key opportunities and recommended actions to advance drought and public health engagement and preparedness based upon extensive dialogue and feedback from academic and practitioner communities across drought and public health disciplines.



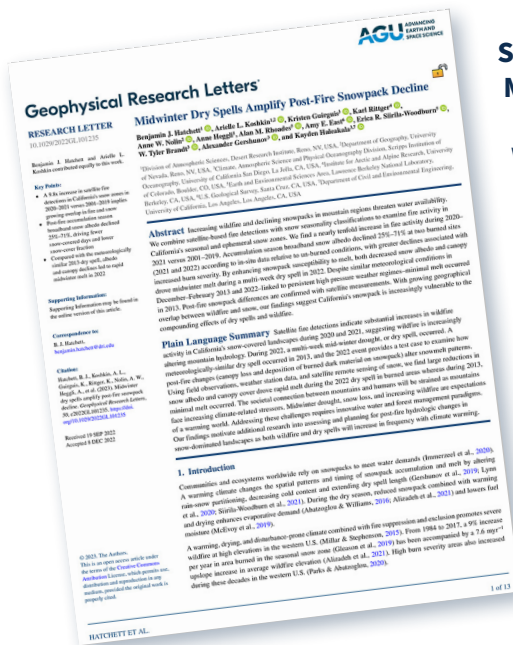
STUDY FINDS REGIONAL & DEMOGRAPHIC INCREASES OF RESPIRATORY MORTALITY DURING DROUGHT

To better understand the negative impacts of drought on respiratory mortality, a *NIDIS-funded study* led by the University of Nebraska Medical Center examined the effects of monthly drought exposure on respiratory-related deaths in different NOAA climate regions from 2000–2018. As opposed to regions that are frequently in drought, the study found that geographical regions with fewer drought events had a higher respiratory mortality risk ratio. During moderate and severe drought exposure, the respiratory mortality risk ratio in the general population increased up to 6.0% in the Northeast, 9.0% in the Northern

Rockies and Plains, 5.2% in the Ohio Valley, 3.5% in the Southeast, and 15.9% in the Upper Midwest. Public health practitioners and officers can use results of this study to provide early warnings to the public, develop targeted mitigation strategies, and design messaging to populations of higher concern.



Charred trees damaged by a wildfire in a snowy valley in Montana



SEVERE SUMMER WILDFIRES ARE IMPACTING WESTERN U.S. MOUNTAIN SNOWPACK DURING WINTER AND SPRING

When wildfires burn in areas that receive winter snow, the impact of the charred forest can cause snow to disappear earlier and melt out faster, [according to a NIDIS-funded study](#) led by scientists with the Desert Research Institute. The changes occur for two reasons. First, the loss of forest canopy allows more direct sunlight to reach the snowpack. Second, the charred remains of trees and other vegetation shed black carbon onto the snow, reducing the snow's ability to reflect the incoming sunlight. The combination of darker snow and more sunlight causes snow to melt earlier and faster in the spring, and as the new research shows, snowmelt can even occur during the middle of winter.

www.drought.gov



Have questions about the report?

Please contact:

Adam Lang | adam.lang@noaa.gov

Veva Deheza | veva.deheza@noaa.gov

AUTHOR

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EDITORIAL COORDINATION

Adam Lang

Communications Coordinator
CIRES/NOAA/NIDIS

Elizabeth Ossowski

Program Manager
NOAA/NIDIS

Veva Deheza

Executive Director
NOAA/NIDIS

DESIGN AND LAYOUT

Ami Nacu-Schmidt

CIRES Center for Education,
Engagement and Evaluation

