

# **Test Document P04: Drought Monitoring and Impacts (scanned with OCR text)**

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## **Drought monitoring and impacts (USDA, NOAA)**

# Drought and Northwest Agriculture in a Changing Climate

Reading time: 9 minutes

Here at the Northwest Climate Hub, we recognize that the effects of climate change may have caused damage or distress to many of our readers. Reading about climate change may be triggering, so if you are suffering from mental health impacts because of climate change, please reach out to the Disaster Distress Helpline.

## Key Points

- Drought affects agriculture differently depending on location, severity, and length.
- While lack of precipitation can trigger droughts, in some places, rising temperatures have become a bigger factor in drought severity in recent decades.
- Reduced irrigation water availability and lower soil moisture associated with drought can affect agricultural production.
- Drought can cause severe economic losses, as it did in 2015, when a drought in Idaho, Oregon, and Washington led to \$1 billion in losses.
- Drought can heighten existing tensions over water use as agriculture, communities, fisheries, and hydropower compete for the same water resources.
- Despite the many challenges that accompany agricultural drought, there are adaptation actions that can help farmers build resilience to climate change.

Idaho, Oregon, and Washington host orchards that brim with apples, vineyards that stretch across rolling hillsides, golden dryland wheat fields, and millions of acres of irrigated row crops. With over 40 million acres of farmland, the Northwest is one of the most productive agricultural regions in the country and a top producer of many important crops. However, as climate change intensifies, agricultural droughts could become longer and more severe. Drought can have significant effects on agricultural productivity, and can threaten the agricultural economy, farmworker health, and food security in the Northwest.

## What is agricultural drought and how does climate change affect it?

Agricultural drought occurs when crops are affected by meteorological drought (drier-than-average conditions over a prolonged period) or hydrologic drought (low water levels). Because the Northwest is a diverse region with a range of precipitation and temperature patterns, the effects of drought vary by location. For instance, in the arid and semi-arid regions of the Northwest (e.g., southern Idaho, eastern Washington and Oregon), the impacts of drought on the agricultural community have been more severe than in the cooler, wetter parts of these states.

However, as the climate changes, the impact of drought is likely to intensify and spread to more agricultural regions throughout the Northwest.

Regional temperatures have already risen nearly 2°F since 1900. By the end of the 21st century, climate change is projected to raise regional temperatures by 4.7–10.0°F. Since 2000, high temperatures have actually played a larger role in drought severity than lack of precipitation.

For example, evaporation associated with higher temperatures accounted for 61% of the 2020 to 2022 drought's severity, whereas reduced precipitation only accounted for 39%. This is because hotter temperatures cause increased evapotranspiration, or the loss of water from the soil both by evaporation from the soil surface and by transpiration from the leaves of the plants growing on it.

With higher temperatures, plants have to acquire and transpire more water than they do in cool conditions (think of this like humans having to drink more water when it is hot). This is known as increased evaporative demand. A higher evaporative demand means less moisture can be stored in the soil and in plants themselves. This can stress plants, and even cause plant death.

Alongside high temperatures, drier-than-average conditions and reduced snowpack can also contribute to agricultural drought. Though climate change may lead to a slight increase in annual precipitation across the region, summer precipitation is expected to decrease. Furthermore, more precipitation will fall as rain, rather than snow, reducing snowpack. Beyond increased evaporative demand, rising temperatures could cause the snow that does fall to melt earlier in the year. These changes will affect soil moisture and irrigation water availability throughout the growing season.

### **How are crops affected by drought in the Northwest?**

Drought poses significant challenges to agricultural production. Limited water availability can cause plant stress, leading to reduced crop yields and quality. Annual crops (e.g., potatoes, hay, and onions) can experience reduced yields and quality associated with drought. But perennial crops (e.g., apples, cherries, pears, and apricots) can take years to recover from drought, and may not ever fully recover.

The threat of drought can also deter farmers from planting certain annual crops, resulting in lost potential harvests. The likelihood of simultaneous extreme heat and drought events is also increasing with climate change. Crops are more vulnerable to heat stress during drought, which can further reduce yields. In addition, drought can contribute to insect outbreaks, wildfires, and soil erosion, all of which can negatively affect agricultural productivity.

Because most Northwest crops are irrigated, reduced irrigation water availability can affect agricultural productivity. In most places in Idaho, Oregon, and Washington, a reliable supply of irrigation water depends on the gradual melting of mountain snowpack throughout summer. Yet, climate change is projected to reduce snowpack and cause earlier snowmelt. These changes could reduce groundwater recharge, streamflow, and reservoir levels, limiting irrigation water availability for crops during late stages of the growing season. Simultaneously, warmer, drier conditions will increase crop water demand, further straining water resources.

Water quality can also be affected by drought. When water levels in streams, rivers, or reservoirs decrease, the concentration of nutrients can increase, and water temperatures can rise. These changes can lead to higher salinity levels, increased algal blooms, and more pollutants in waterways. Poor irrigation water quality can negatively affect plant growth, reducing crop quality and yields.

The Northwest also produces a variety of non-irrigated crops, including dryland wheat. These crops rely on residual moisture stored in the soil throughout the growing season. Though many dryland farms employ adaptation practices that increase their resilience to drought, dryland crops can still be affected by reduced soil moisture retention and increased evaporative demand. Drought and high temperatures can deplete soil moisture, potentially leading to lower yields and reduced quality.

Drought has many implications for agriculture in the region. The table below includes a few specific examples of agricultural drought impacts experienced in Idaho, Oregon, and Washington since 2005.

| <b>Drought Category</b>  | <b>Examples of historically observed impacts of drought on agriculture</b>                                                                                                                                                                |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D0 - abnormally dry      | Dryland crops stressed; fields left fallow (unplanted); alternate crops planted in anticipation of drought; water allotments reduced                                                                                                      |
| D1 - moderate drought    | Some irrigators switch from surface to groundwater irrigation; junior water rights holders receive less water; cranberry harvest delayed                                                                                                  |
| D2 - severe drought      | Small grain crops fail; irrigators lose access to water; groundwater pumping stopped; farmers irrigate fewer acres; conflicts with other sectors that require water occur                                                                 |
| D3 - extreme drought     | Wheat yields significantly reduced; reservoirs extremely low or empty; soil erosion increases; domestic wells run dry; apples, cherries, pears, and raspberries smaller than average; lower yield of seed potatoes; pumpkin crop failures |
| D4 - exceptional drought | Pear production reduced by 25-100%; wheat yield reduced by 50%; blueberry yield, quality, and size reduced; severe grasshopper outbreaks; crop losses common; empty streams, canals, and reservoirs                                       |

## **How can farmers and consumers be affected by drought?**

Farmers in Idaho, Oregon, and Washington are no strangers to drought. They have successfully adapted to drought in the past, including events in the 1930s, 1970s, early 2000s, 2015, and from 2020 to 2022. However, for farmers already contending with more extreme heat, flooding, and economic challenges, drought can introduce one obstacle too many. Conflicts over access to water can further exacerbate stress associated with drought. For consumers, drought can affect food pricing, accessibility, and quality. Climate change is likely to intensify these challenges.

### ***Economics and human health***

The agriculture industry creates nearly 300,000 jobs and generated \$18.5 billion in sales in 2022, making up more than 13% of each state's economic activity. As such, drought can have a severe economic impact on farmers, farmworkers, and agricultural communities. When crop yield or quality are reduced, farmers have less to sell or receive lower prices, resulting in decreased revenue.

In 2015, for example, drought caused agricultural losses in Idaho, Oregon, and Washington to reach nearly \$1 billion, including extensive losses to raspberries, blueberries, and the dairy industry. The threat of drought can also cause farmers to delay plantings or leave fields fallow (unplanted), reducing the number of crops that can be harvested and sold.

Reduced yields and quality can strain farmers' finances and reduce the demand for farm labor, which can jeopardize farmworker income. Industries dependent on agriculture, such as food processors and fertilizer companies, can also suffer secondhand from the

effects of drought. In addition, food and water shortages can cause costs to rise for farmers and consumers alike.

As climate change increases the duration and severity of agricultural drought in the Northwest, farmers, farmworkers, and communities could face increasing health risks. Northwest farmers are deeply concerned about the effects of drought on their operations. In Oregon, 60% of farmers surveyed identified drought as one of their top weather-related concerns. For farmers, people who already face high rates of depression, drought has been linked to mental distress, reduced life satisfaction, and increased suicidality.

Despite the economic challenges associated with drought in the Northwest, drought can be even more devastating in areas of the globe with less water. As drought affects more of the world, the demand for agricultural products from regions that are typically water rich, such as the western parts of Oregon and Washington, might lead to increased profitability for some Northwest farmers. In an example, drought in the Midwest is often associated with higher prices and more profit for farms in Idaho. However, to profit from increased drought worldwide, farmers in the Northwest will need to adapt to local changes in climate.

### ***Conflicts over water use***

Drought can heighten existing tensions over water use as agriculture, communities, fisheries, and hydropower compete for the same water resources. In the Klamath Basin of southern Oregon, for example, the increasing demands of agriculture, fisheries, and downstream communities have often exceeded the available water supply, creating a complex and contentious situation. However, there are examples of farmers in the region working with anglers and others to improve wildlife habitat, conserve water, and enhance crop yields.

Tensions between producers can also increase during drought. Idaho, Oregon, and Washington use prior appropriation doctrine, which grants rights to surface water and groundwater based on seniority. This means that the person who owns the oldest rights to water from a particular source is the last to be shut off during low water conditions. They can use their full allocation of water without regard for the needs of junior users. During periods of drought, this can leave irrigators with junior water rights particularly vulnerable, as they may receive little or no water.

Idaho, Oregon, and Washington allow for leasing of water rights and temporary exchange of water rights through water banks, which can reduce the vulnerability of junior rights holders if they have the resources to purchase additional water. However, as climate change alters water availability, tensions over water rights are likely to persist.

### **What can farmers do to prepare for more drought in the future?**

Despite the many challenges that accompany agricultural drought, there are adaptation actions that can help farmers build resilience to climate change. As drought becomes more frequent and severe, farmers in some areas may shift to drought-resistant crop or varieties. Researchers throughout the Northwest are already developing drought-resistant varieties of dominant crops, such as wheat. Investing in soil health can also help farmers reduce the impacts of drought.

Practices such as no-till farming, cover crops, and agroforestry can improve soil moisture retention and reduce water loss. Climate-informed irrigation systems, such as micro-irrigation and variable-rate irrigation technology, can enhance water application efficiency while reducing energy and water use. For junior water-rights holders, temporary water leasing during drought years can reduce impacts of drought, when available.

When drought affects farmland or farm revenue, crop insurance can lessen the financial impacts. USDA has many other programs that can help insured and uninsured farmers who have experienced farmland damage, crop losses, and more. With adaptation, there is hope that farmers can build resilience to drought and continue to support a thriving agricultural economy and regional food security in the Northwest.

Source: USDA Climate Hubs, "Drought and Northwest Agriculture in a Changing Climate", <https://www.climatehubs.usda.gov/hubs/northwest/topic/drought-and-northwest-agriculture-changing-climate>.

# Snow Drought in the Northwest

Reading time: 8 minutes

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## Key Points

- Snow droughts, characterized by below-average snowpack, are becoming longer and more severe in the Northwest.
- Rising temperatures are causing more precipitation to fall as rain rather than snow. This reduces snow accumulation, causes earlier snowmelt, and can lead to lower summer water availability.
- The 2015 snow drought serves as a stark reminder of the potential consequences of future snow droughts. Changes to snowpack can lead to reduced crop yields, increased wildfire risk, and decreased recreational opportunities.
- Various adaptation strategies can help farmers, ranchers, and natural resource managers adapt to future snow droughts.

By April 2015, water managers and agricultural producers in Idaho, Oregon, and Washington were facing a serious problem. Snowpack levels across all basins in the region were significantly below average, with some areas in western Washington and Oregon reporting as little as 7% of normal snow water equivalent (SWE) values (a measure of how much water is stored in snowpack).

By April 1st, SWE values are typically at their highest, representing peak snowpack. The critically low levels in April 2015 indicated a severe “snow drought” in Idaho, Oregon, and Washington. Since 1980, snow droughts have become longer and more severe in the Northwest. As climate change progresses, long-term changes to regional snowpack could affect the ecology, economy, and culture of the region.

## What are snow droughts?

Snow droughts are periods of abnormally low snowpack for a time of year in a particular location. Snow droughts can occur in two primary forms. **Dry snow droughts** occur when below-average precipitation leads to a below-average snowpack. Warm snow droughts occur when above-average temperatures cause precipitation to fall as rain instead of snow.

Both types typically result in lower-than-normal SWE values. Alaska, Idaho, Oregon, and Washington all experience snow drought from time to time. These events can be natural and influenced by several factors, including atmospheric events like El Niño. However, climate change could increase the frequency and severity of snow droughts as temperatures rise and affect precipitation patterns.

## **How does climate change affect snow in the Northwest?**

Snowpack serves as a natural reservoir, storing water for release during the drier summer months. This water is vital for river basins in Idaho, Oregon, Washington, and Alaska, supporting plants and wildlife, and sectors including agriculture, hydroelectric power, fisheries, and recreation. Most climate models project modest increases in precipitation by the mid-21st century, although summers are likely to be drier.

Despite increased precipitation, snowpack continues to decrease in parts of Idaho, Oregon, Washington, and parts of coastal and Southeast Alaska. The average level of snowpack in the region is projected to continue to decrease over the 21st century. However, high elevation or very cold areas, such as Alaska's Brooks Range, could see increases in snowpack.

Several factors contribute to decreasing snowpack. Rising temperatures are causing more precipitation to fall as rain rather than snow, particularly at low to mid elevations, which reduces snow accumulation. In addition, snow is melting earlier in the spring, shortening the snow season and affecting summer water availability. In parts of the Cascade Range, the snow season is projected to decrease by nearly half by the end of the 21st century.

In southern and western Alaska, snowpack is projected to decrease by 20 to 60% by the 2050s under a moderate greenhouse-gas emissions scenario, although high-elevation and cold parts of the state could see higher snowpack.

Under these conditions, snow droughts, particularly warm snow droughts, are likely to occur more frequently in the future. Recent research points to possible increases in frequency having already occurred. Since 1991, snow drought occurrences have increased 10 to 15% in Idaho, Oregon, and Washington, with variability in drought type trends (i.e., warm versus dry snow drought). From 1999 to 2018, snow droughts also became longer and more intense than they were from 1980 to 1998. However, it remains to be seen whether these short-term trends will continue with time.

## **What can past snow droughts teach us about the future in the Northwest?**

Snow drought can have cascading effects on the ecology, economy, and culture of the Northwest. The 2015 snow drought and other low-snowpack years show the potential effects of future snow droughts in Idaho, Oregon, Washington, and Alaska.

During the 2015 warm snow drought, precipitation levels were near normal. However, winter temperatures were 6.2 degrees F higher than average. These high temperatures caused precipitation that would normally fall as snow to fall as rain instead. When snow did fall, warmer temperatures caused snow to melt earlier than normal. This snowmelt, coupled with winter rain events, caused high peak streamflow and flooding during the winter. However, summer streamflow was far below normal, reducing the amount of water available for systems dependent on summer water availability.

As winter temperatures continue to rise, the region will likely experience earlier peak streamflow, contributing to lower water availability in summer. Extremely low summer flows in streams and rivers can lead to widespread fish mortality and drying wetlands

that affect aquatic species, which occurred in Oregon and Washington in 2015. In Southeast Alaska, low streamflow levels and high stream temperatures have contributed to hypoxia events, or a lack of oxygen, causing high salmon mortality. Changes to snowpack can also affect plants, as is the case with Alaska yellow-cedar, a species in significant decline in some parts of Southeast Alaska due to rising temperatures and reduced snowpack.

Coupled with low spring precipitation and higher-than-average summer temperatures, the 2015 snow drought contributed to unusually dry dead fuels (wood and other dead vegetation on the ground), and very low moisture content in live fuels (e.g., conifer needles) in Northwest forests. These conditions contributed to high fire intensity and rates of spread during the 2015 fire season in Idaho, Oregon, and Washington.

In fact, the 2015 wildfire season was one of the most severe seasons in recorded history, with more than 2.3 million acres burning across Idaho, Oregon, and Washington. As drought increases in severity in the Northwest, the frequency and extent of wildfires could also increase.

Snow drought can also impact agriculture in the region. Agricultural losses in Idaho, Oregon, and Washington reached nearly \$1 billion in 2015, including extensive losses to raspberries, blueberries, and the dairy industry. Water-rights holders experienced water delivery cuts and short irrigation seasons. Some producers relied on groundwater pumping to supplement their water needs. If snow drought occurs more often, farmers may need to adapt their practices to suit drier conditions.

Snow- and water-based recreational activities can also be affected by snow drought. In 2015, several ski areas closed earlier in the season than ever before, and many struggled to stay open with low snow. For example, the 2015 ski season at Stevens Pass Mountain Resort in Washington was two months shorter than average, reducing visitation by over 50%.

In the summer, low water levels in Detroit Lake, Oregon reduced visitation by 26% and rendered most boat ramps unusable. Yet, high temperatures extended the summer recreation season in some areas. In Oregon, 171 state parks reported a nearly 10% increase in visitation from 2014 to 2015. However, as the climate continues to warm, these gains could be offset by deteriorating summer conditions, such as increased wildfire smoke, more intense heat waves, and dusty trails associated with drought.

The 2015 snow drought in the Cascade Range was the most severe in 300 years. Researchers have compared this event to projected climate conditions for the 2050s under a moderate greenhouse-gas emissions scenario (RCP 4.5). Although climate models suggest similar winter temperatures in the 2050s, winter precipitation is expected to increase slightly by that time, which could reduce the severity of future snow droughts in comparison to the 2015 event.

However, many of the effects of prior events are expected to recur as snow droughts become more common. This will pose significant challenges for farmers, ranchers, foresters, and natural resource managers.

## **How can we adapt to less snow in the Northwest?**

Despite the challenges associated with snow drought, many options are available for adapting to more drought in the future. Farmers can diversify crops and crop varieties, shifting to drought- and heat-tolerant crops that can cope with less water. Irrigation efficiency can be improved with practices like drip irrigation, and practices like no-till and cover-cropping can help retain soil moisture.

Ranchers can use adaptive grazing management to accommodate changing conditions. Livestock can be bred or selected for drought tolerance. Foresters and natural resource managers can thin and/or use prescribed fire in dense forest stands to reduce competition for water and improve resilience to drought, insects, and diseases. Alternative tree species or assisted migration (using drought-tolerant tree species and genotypes) can be considered for reforestation projects.

Natural resource managers can also restore and maintain natural water storage systems like wetlands and reservoirs, protect watersheds from erosion and sedimentation, and monitor water quality to ensure it meets the needs of ecosystems and human communities. Land management agencies, ski resorts, and other recreation-based industries can consider expanding summer recreation opportunities. For example, Stevens Pass Ski Resort diversified summer operations to include mountain biking, disc-golfing, and hiking. Implementing these and other strategies can increase regional resilience to snow droughts, helping resource managers strengthen the long-term sustainability of their operations and the ecosystems they manage.

Source: USDA Climate Hubs, "Snow Drought in the Northwest",  
<https://www.climatehubs.usda.gov/hubs/northwest/topic/snow-drought-northwest>.

## **Agriculture**

Drought can reduce both water availability and water quality necessary for productive farms, ranches, and grazing lands, resulting in significant negative direct and indirect economic impacts to the agricultural sector. Drought can also contribute to insect outbreaks, increases in wildfire and altered rates of carbon, nutrient, and water cycling—all of which can impact agricultural production, critical ecosystem functions that underpin agricultural systems, and the livelihoods and health of farming communities.

### **Soil Moisture and Vegetation Conditions**

An accurate depiction of soil moisture conditions can provide valuable insights for agricultural monitoring, weather prediction, and drought and flood early warning.

This map shows the moisture content of the top 1 meter of soil compared to historical conditions from 1981–2013, based on NASA's Short-term Prediction and Transition Center – Land Information System (SPoRT-LIS).

Red and orange hues indicate drier soils, while greens and blues indicate greater soil moisture.

Source(s): NASA

The Vegetation Health Index is a proxy characterizing vegetation health or a combined estimation of moisture and thermal conditions. Vegetation health is often used to estimate crop condition and anticipated yield. Values below 40 (pink/orange shades) indicate different levels of vegetation stress, and losses of crop and pasture production might be expected. Values above 60 (green/blue shades) indicate favorable conditions.

Source(s): NOAA STAR

### **Updates**

This map updates daily with data from NASA's Short-term Prediction and Transition Center – Land Information System (SPoRT-LIS).

The Vegetation Health Index map updates weekly.

## **Key Issues**

### **Agricultural Production Losses**

The primary direct economic impact of drought in the agricultural sector is crop failure and pasture losses. These costs are often passed on to consumers through increased prices and/or they may be offset through government disaster assistance programs. Indirect impacts of drought in the sector can include reduced supplies to downstream industries, such as food processors, and reduced demand for inputs, such as fertilizer and farm labor. The non-market impacts of production losses include mental health strain on farmers.

### ***Decreased Water Availability for Agriculture***

The depletion of water availability in soils causes significant declines in crops and livestock productivity. In addition, surface and groundwater supplies may decline during drought, affecting water availability and increasing costs to access water for crop or forage irrigation and watering livestock. With a return to normal precipitation, soil moisture typically recovers long before surface and groundwater supplies are replenished.

### ***Pests and Diseases***

Drought, coupled with high temperatures, may expand the distribution and incidence of pests and diseases that affect crops, forage, and livestock.

### ***Specialty Crops***

Most specialty crops (such as fruits, vegetables, tree nuts, and medicinal herbs) are more vulnerable to drought than field crops and have a higher value per unit of land/water. They may therefore represent a higher risk for experiencing economic loss in drought if the crop water demand exceeds water supply.

### ***Drought Impacts on Agriculture***

The agricultural sector is an important contributor to the economy of the United States in many ways, from promoting food and energy security to providing jobs in rural communities. In 2015, farms contributed \$136.7 billion to the U.S. economy and accounted for 2.6 million jobs, with about half of farm revenue coming from livestock production. Other agriculture- and food-related sectors contributed an additional \$85.5 billion and accounted for 21 million full- and part-time jobs.

Drought ranks third among environmental phenomena associated with billion-dollar weather disasters since 1980, behind tropical cyclones and severe storms. The cost of drought events averages over \$9 billion per year, with an annual cost of over \$6 billion, making it a serious hazard with substantial socioeconomic consequences.

Sustained drought has considerable negative effects on crops and livestock, including the reduced production, destruction of property, and livestock sell-offs.

For example, in 2012, severe drought impacted 80 percent of agricultural land in the United States, causing more than two-thirds of its counties to be declared disaster areas. The drought affected the production of livestock and field crops such as wheat, corn, and soybean production in the Great Plains and Midwest and accounted for \$14.5 billion in loss payments by the federal crop insurance program. In 2015, drought impacts to California's agricultural sector resulted in \$1.84 billion in direct costs, a loss of 10,100 seasonal jobs, and surface water shortages of 8.7 million acre-feet.

NIDIS partners with the USDA Climate Hubs across the nation to support agricultural producers and ranchers with early information of drought onset and intensification; assessing the impacts of drought on the sector and the economy; and training and raising awareness among farmers and ranchers of how drought is depicted in the U.S. Drought Monitor, which determines federal assistance for producers.

## **Drought Early Warning for the Agriculture Sector**

Agricultural production is affected by climate and weather variability. Drought early warning systems are vital for the agricultural sector to prepare for this variability, strengthening its resilience to drought.

The resources below are organized by the key components of a drought early warning system: (1) drought observation and monitoring; (2) drought planning and preparedness; (3) prediction and forecasting of drought; (4) communication and outreach to the public and affected sectors; and (5) interdisciplinary and applied research on topics of concern to drought-affected sectors.

### **Related Content**

#### ***Data & Maps | Agriculture***

This collection ranges from easy-to-understand maps depicting drought severity to experimental, satellite-based composite maps primarily used by climate monitoring professionals.

#### ***Drought Relief, Recovery, and Support***

A number of federal and state agencies provide relief and recovery support for drought impacts. Find more resources here.

#### ***Research & Learn | Flash Drought***

Flash droughts can cause extensive damage to agriculture and economies if they are not predicted and discovered early. Learn more about flash drought here.

#### ***Research & Learn | Monitoring Drought***

Drought monitoring involves measuring changes in precipitation, temperature, and surface and groundwater supplies, among other factors. Learn more about the importance of monitoring drought.

Source: National Oceanic and Atmospheric Administration, National Integrated Drought Information System, "Drought and Agricultural Impacts", <https://www.drought.gov/sectors/agriculture>.

## **U.S. Drought Monitor (USDM)**

The U.S. Drought Monitor (USDM) is a map that is updated each Thursday to show the location and intensity of drought across the country. The USDM uses a five-category system, ranging from Abnormally Dry (D0, a precursor to drought, not actually drought), to Moderate (D1), Severe (D2), Extreme (D3) and Exceptional (D4) Drought.

Drought categories show experts' assessments of conditions related to dryness and drought including observations of how much water is available in streams, lakes, and soils compared to usual for the same time of year. The U.S. Drought Monitor began in 2000 and is a collaboration between the National Drought Mitigation Center, U.S. Department of Agriculture, National Oceanic and Atmospheric Administration, and National Aeronautics and Space Administration, who share the weekly author role for the product. The National Drought Mitigation Center, based at University of Nebraska, Lincoln, leads the coordination of weekly U.S. Drought Monitor process and provides the maps, data, and statistics to the public.

### **Where does this come from?**

Each week, the U.S. Drought Monitor authors consider how recent precipitation totals across the country compare to their long-term averages. They check variables including temperatures, soil moisture, water levels in streams and lakes, snow cover, and meltwater runoff. The authors also check whether areas are showing drought impacts, such as water shortages and business interruptions.

Based on dozens of indicators, experts make their best judgments of regional-scale drought conditions, and then check their assessments with experts in the field before publishing weekly drought maps. Associated statistics show what proportion of various geographic areas are in each category of dryness or drought and estimate how many people are affected. Learn more about how the map is made.

### **Access**

Compare Two Weeks: Compare two U.S. Drought Monitor weeks side by side.

USDM Map Comparison Slider: Displays the USDM maps from two selected dates with a slider bar to compare how dry and drought areas changed.

Time Series: View a graph of the U.S. Drought Monitor statistics for a chosen area.

Map Archive: View any map format for a selected week.

Drought Summary: View the weekly narrative for a selected week.

USDM Change Maps: View a series of change maps for a selected week.

USDM Animations: View an animation of maps for a selected period or download animated GIF files.

Drought.gov Historical Time Series Tool: View the time series and maps in a unified page.

Tabular Data Tables: View the U.S. Drought Monitor data in tabular format for a selected area.

Web Services / GIS data: Download data in GIS formats and access Web Map Service endpoints.

### **Get Emails When Conditions Change**

Want to receive emails when U.S. Drought Monitor conditions change for your location? Sign up for Drought.gov's local drought alert emails.

Source: National Oceanic and Atmospheric Administration, National Integrated Drought Information System, "U.S. Drought Monitor (USDM)",  
<https://www.drought.gov/data-maps-tools/us-drought-monitor>.