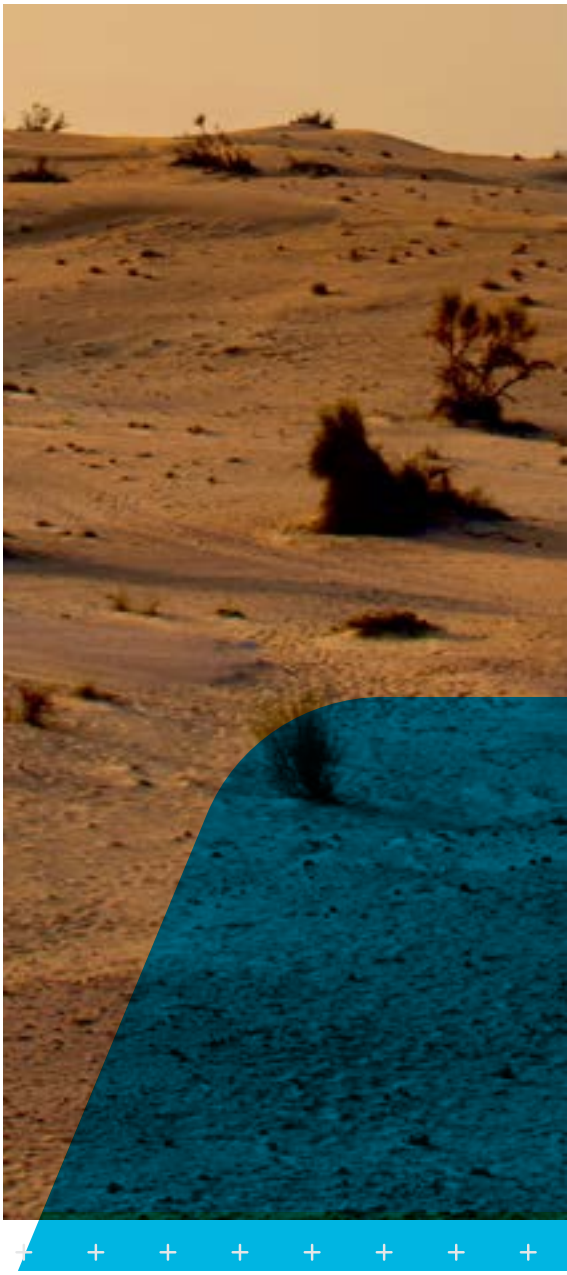
Drought Basics

Drought Timescales: Short- vs. Long-Term Drought

Defining Short- and Long-Term Drought

If a weather pattern that results in a precipitation deficit lasts for a few weeks or months, it is considered short-term drought. If the pattern and precipitation deficits last for more than six months, it is typically considered long-term drought.

It is possible to have short-term changes that result in wet spells during a drought and for wet conditions to be interrupted by weather patterns that result in short-term drought.



Short-Term Drought Impacts and Monitoring

Hydrological Impacts

During short-term drought, declines in surface water flows can impact water supplies for agriculture, drinking water, hydropower production, navigation, recreation, and ecosystem habitats.

Agricultural and Ecological Impacts

During short-term drought, topsoil moisture becomes depleted, which impacts shallow-rooted plants such as grasses—including corn and wheat crops—first because their roots cannot reach deep enough into the soil to access other water sources. Combined with heat and wind, low soil moisture can harm agricultural crops in a relatively short period of time if they are not able to access other water supplies. Short-term drought also causes woody plants such as trees and shrubs to wilt, their leaves to turn brown, and some leaves to drop away from plants (UMass Amherst).

Harm to plants caused by drought has cascading effects throughout ecosystems. However, some animals, including birds, obtain water from the food they eat and may not be initially impacted in short-term drought by reductions in available water.

Flash Drought

In its simplest form, flash drought is the rapid onset of drought. In contrast with conventional drought, which is mainly driven by lack of precipitation, flash drought usually includes abnormally high temperatures, winds, and/or incoming radiation that leads to abnormally high evapotranspiration (ET) rates. Flash droughts occur more often than perceived and can cause major agricultural losses if they are not predicted and detected in a timely manner. Closely monitoring rapid changes in ET, along with soil moisture and precipitation conditions, can provide early warnings of flash drought development. The prediction of flash droughts on subseasonal timescales is of critical importance for impact assessment, disaster mitigation, and loss prevention.

Monitoring Indices

Indices used to monitor short-term drought-related impacts (timescales ranging from a few days to a few months) include wildfire danger, non-irrigated agriculture, topsoil moisture, range and pasture conditions, and unregulated streamflows. The Palmer indices—water balance indices that consider water supply (precipitation), demand (evapotranspiration), and loss (runoff)—for short-term drought include the following:

+ **The Palmer Crop Moisture Index** measures short-term drought on a weekly scale and is used to quantify drought's impacts on agriculture during the growing season
+ **The Palmer Z-Index** measures short-term drought on a monthly scale
+ **The Standardized Precipitation Index**, a probability index that considers only precipitation, is computed for several timescales ranging from 1 to 72 months to capture the various scales of both short-term and long-term drought.

Key Takeaways

+ Declines in surface water flows can impact water supplies.
+ Groundwater levels in wells may not immediately reflect a shortage of rainfall.
+ Groundwater use often increases due to pumping to meet increased water demands.
+ Soil moisture decreases, impacting shallow-rooted plants such as grasses—including corn and wheat crops.
+ Indices used to monitor short-term drought include topsoil moisture and streamflows.

Long-Term Drought Impacts and Monitoring

Hydrological Impacts

Increased groundwater pumping to meet water demand during drought can lead to aquifer depletion. This can lead to subsidence (sinking of the ground), permanent loss of storage for groundwater, and infrastructure damage.

In coastal communities, groundwater pumping can reverse natural flows to the ocean, allowing seawater to enter the aquifer system (known as saltwater intrusion). This compromises water quality and increases management costs.

Water allocations for ecosystems and various restoration projects could be reduced or stopped altogether during severe drought.

Agricultural and Ecological Impacts

Long-term drought escalates the damage caused to plants, ecosystems, and wildlife. In the agricultural sector, sustained drought can result in complete crop and forage failure and livestock sell-offs. If drought becomes prolonged, the branches of woody plants will begin to die back, and plants can die entirely if their ability to absorb water from the environment is damaged (UMass Amherst).

In long-term drought, native plants may die back, allowing for the intrusion of invasive plant species. Invasive plants may further disrupt the balance of an ecosystem, which can cause further conversion of vegetation, increase wildfire risk, and lead to desertification. Changes in plant land cover during long-term drought reduce habitat for wildlife and affect water resources. Dry vegetation due to drought conditions combined with high temperatures, windy weather, and a spark can start a wildfire.

Monitoring Indices

Indices used to monitor long-term drought-related impacts (timescales ranging from several months to a few years) include reservoir stores, irrigated agriculture, groundwater levels, and well water depth. The Palmer Drought Severity Index (known as the Palmer Drought Index, or PDI) measures the duration and intensity of long-term drought-inducing weather patterns and can respond fairly rapidly to their rapid changes. The Standardized Precipitation Index, a probability index that considers only precipitation, is computed for several timescales ranging from 1 to 72 months to capture the various scales of both short-term and long-term drought.

Key Takeaways

- Excessive groundwater pumping can lead to aquifer depletion and, in coastal communities, saltwater intrusion.
- Long-term drought escalates the damage caused to plants, ecosystems, and wildlife.
- In the agricultural sector, sustained drought can result in complete crop and forage failure and livestock sell-offs.
- Drought conditions can increase wildfire intensity and severity.
- Indices used to monitor long-term drought impacts include reservoir stores and groundwater levels.

Sources

Content on this page excerpted and adapted from:

https://www.drought.gov/what-is-drought/drought-timescales-short-vs-long-term-drought

NOAA National Centers for Environmental Information - https://www.ncdc.noaa.gov/monitoring-references/dyk/measuring-drought

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U.S. Drought Monitor - https://www.drought.gov/external-links?prev=https%3A%2F%2Fwww.drought.gov%2Fwhat-is-drought%2Fdrought-timescales-short-vs-long-term-drought&url=https%3A%2F%2Fdroughtmonitor.unl.edu%2FConditionsOutlooks%2FCurrentConditions.aspx

U.S. Department of Agriculture - https://www.usda.gov/media/radio/daily-newsline/2017-06-13/actuality-short-term-vs-long-term-drought

University of Massachusetts Amherst | The Center for Agriculture, Food, and the Environment - https://ag.umass.edu/landscape/fact-sheets/long-term-drought-effects-on-trees-shrubs

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