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NATIONAL DROUGHT
MITIGATION CENTER

HOW DO PEOPLE STUDY DROUGHT?

UNIVERSITY OF NEBRASKA

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Climatologists

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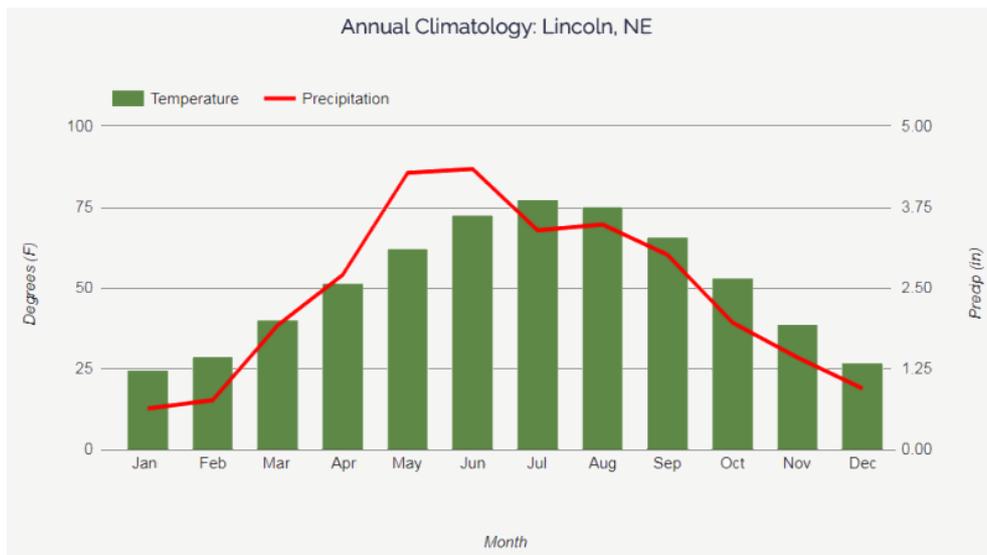
Social Scientists

Drought is a very complex part of our climate. It's different from floods, hurricanes, and tornadoes because it is harder to observe and predict. Drought can also affect people and the environment differently from place to place. Let's learn how scientists study past and present drought.

CLIMATOLOGISTS

People who study climate are called *climatologists*. Climatologists use temperature and precipitation records to define a place's "normal" climate. They do this by averaging 30 years of temperature and precipitation records. They also keep track of this information by making climographs for cities and regions.





A *climograph* is a graph that shows average monthly temperature and precipitation for a place. The graph above is an example of a climograph for Chicago, Illinois. The green bars show the amount of precipitation each month. The red line shows the average temperature each month. (See more **climographs** .)

Climatologists can look back through years of records to determine how often droughts happen in a specific city or region. Remember, drought can happen anywhere, but it may happen more often in some areas than in others!

A rain gauge helps us keep track of how much rain we get, but keeping track of drought isn't that simple. Climatologists use many different **indicators** to *monitor* (watch) when drought begins and ends, and also how severe a drought is. Temperature and amount of rainfall are the most noticeable drought indicators, but water levels in streams, rivers, and lakes; the amount of moisture in the soil, and the amount of snowpack in the mountains are also important drought indicators.

The process a climatologist uses to understand if there is a drought is similar to the way a doctor or nurse takes your temperature and makes other observations to understand if you are sick. Doctors have calculated that a person's normal body temperature is 98.6 degrees Fahrenheit. How much above or below normal (98.6°F) it is can indicate how sick you might be.

Climatologists do the same thing to let people know if there is a drought and how severe the drought is. Climatologists compare the information they collect on drought indicators to what is "normal" for an area to determine whether a drought is beginning or ending or even how bad the drought might be.



PALEOCLIMATOLOGISTS

In the United States, people began keeping weather records regularly in 1895. That seems like a long time ago, but compared to the age of the earth, it is a very, very short period of time.

Paleoclimatologists are scientists who figure out what the earth's climate was like before written records existed. They find clues in pollen from trees and plants at archeological sites and in ice, soil, and lake beds. Fossils of plants and animals also can hold clues about what the climate was like hundreds, thousands, millions, or even billions of years ago.

Tales of Trees

One way scientists study the paleoclimate is through looking at tree rings. If you have ever seen a tree that has been cut down, you might have noticed that inside the trunk of the tree, circles or rings expand out from the middle of the trunk. Each ring signals a year that the tree was alive. The distance between each ring shows how much the tree grew in a single year. The farther apart the rings are, the more the tree grew. If the rings are closer to each other, we know that the tree didn't grow very much in those years.

During droughts, trees don't grow as much as they do during years of normal precipitation. So if a number of rings are close together, that indicates several years of drought when the tree did not get enough moisture to grow.

Let's think about it this way: Imagine that you measure how tall you are each year on your birthday by marking it on a wall or door in your house. The distance between those measurements shows how much you grew during that year. You grow more in some years than in other years. If you were a tree, those marks would be the rings in your trunk.



HYDROLOGISTS

People who study water and how it moves through the environment are called *hydrologists*. Hydrologists watch streamflow (the amount of water in rivers and streams), lake and reservoir levels, groundwater levels, and even snowpack. They monitor each one of these water sources a little differently, using many different tools. Let's look at a few of the tools and ways they study water.

Snowpack

Snowpack is very important for hydrologists. The snowpack in the mountains melts in the spring and flows into streams and rivers. During a drought, the snowpack is less than normal. Less snow in the mountains can mean less water in the streams and rivers.

Hydrologists need to know the *snow water equivalent*, which is how much water you would get if you were to melt the snow very quickly. They can find this out by measuring the snowpack in several different ways. First, snowpack can be measured by pushing a very long metal tube through the snow until it reaches the ground. The tube is marked like a ruler so you can see the depth of the snow. The snow that gets packed in the middle of the tube is weighed and that weight is the amount of water in the snow. Scientists can also use snow sensors called snow pillows. A snow pillow is basically a scale that is placed on the ground. When snow falls on the snow pillow, the pillow weighs the amount of snow on top of it. This weight tells hydrologists how much water is in the snow.

Streamflow

Hydrologists use stream gauges that they place at different points in rivers and streams to find out how much water is flowing in a river or stream from place to place. During droughts, less water flows, and the water that is in the river or stream will be moving much more slowly than normal. You can find more information about this and even view stream gauges near you on the United States Geologic Survey's **WaterWatch** website.

Groundwater



Hydrologists monitor **groundwater** levels by measuring the distance between the surface of the earth and the surface of water in a well. There are a variety of ways to do this. Sometimes, hydrologists use a simple tape measure. Other times they use high-tech sensors.

Hydrologists check the groundwater level at different times throughout the year. Taking groundwater measurements helps us know if groundwater levels are changing over a year or over many years. They also help us understand how quickly the groundwater supply is being “recharged.” Surface water (rivers, lakes, streams) and precipitation “recharge” or “refill” groundwater levels. During droughts, groundwater levels may drop because people may be pumping more water out of the ground to water lawns and crops. They may also drop because there is less precipitation and less surface water to refill the groundwater.

Hydrologists also use the information gained from measuring snowpack, streamflow, and groundwater levels to make computer models. The computer models and information from the measurements we just learned about help us know how much water we have to use during normal years and during drought years.

ECONOMISTS

Economists study the impact of drought on the economy. The economy is like a city’s, region’s, or country’s bank account. The more money you make, the more you can put in your bank account, either to save or to buy things you may need or want.

Drought can affect the economy in many ways:

Farmers may not be able to grow as many crops, raise as many cattle, or produce enough milk. When this happens, it may cost you and your parents more money to buy things like bread, milk, or meat.

Your parents might have to pay more for the electricity you use in your house because much of the energy we use comes from “**hydroelectric**” power sources.

If the water level in a lake is low, you might not be able to swim, fish, or boat on the lake. The people who make money by providing goods and services (like selling gas, running hotels and restaurants, or selling bait) will lose money because people aren’t visiting the

lake.

Not all of the economic impacts of drought are negative. People who drill wells may be hired to drill more wells as people search for more water, so they may make more money.

Economists keep track of the money lost and gained during drought. It is very difficult to identify all the economic effects of drought. We do know that droughts can be very costly natural hazards. In 1995, the federal government estimated that droughts cost the United States \$6-8 billion dollars a year.

SOCIAL SCIENTISTS

Social scientists study people . When social scientists study drought, they look at how it affects people, communities, and society, and the ways that people can work together to make drought less harmful to society.

Social scientists help us understand:

- how drought affects rich countries or people in comparison to poor countries or people.
- how drought affects men, women, and children.
- how drought affects different racial or cultural groups.
- how drought affects families.
- how drought affects the movement of people from one area to another.
- how drought affects food systems and food supplies.

Social scientists also help us understand the choices we need to make before, during, and after drought. People can affect the impacts of drought in many ways:

- People can plan ahead for drought and decide what they, as individuals or as a community, will do if a drought occurs.
- People can think of new ways to conserve water, or depend less on rainfall, during drought.
- People can carry out policies that help the community before, during, and after drought.



Social scientists help us understand how individuals and groups within a society make these choices. You or your parents may make choices before, during, and after drought (for instance, buying water from someone else, not watering the lawn, moving somewhere that is not as dry). But the choices we make are shaped by laws and customs that are part of the community we live in (for instance, laws about who can purchase water, or customs that say you should not move away from other family members or that your lawn should look green all summer long). And the laws and customs of our communities are shaped by the actions of people like you. For example, if you live in an area that often runs short of water during the hottest part of summer, you might start a social movement in your community that makes it “normal” to have a brown lawn during the summer. Once everyone starts to look at brown lawns as “normal” in summer, the “custom” of your community will also be changed, and new people will be more likely to allow their lawns to go brown in the hottest part of summer. As a community, you would save a lot of water that could be used for drinking, washing, and growing food.

Contact

National Drought Mitigation Center

University of Nebraska-Lincoln

 3310 Holdrege Street, Lincoln, 68583-0988

 P.O. Box 830988, Lincoln, 68583-0988

 (402) 472-6707

 (402) 472-2946

 ndmc@unl.edu

[More Contact Info](#) | [Web Policy](#)

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National Drought Mitigation Center enters into 3-year USDA agreement

January 7, 2021



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December 23, 2020

NDMC's Haigh discusses drought and rancher decision-making on Center for Grassland Studies Podcast

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