

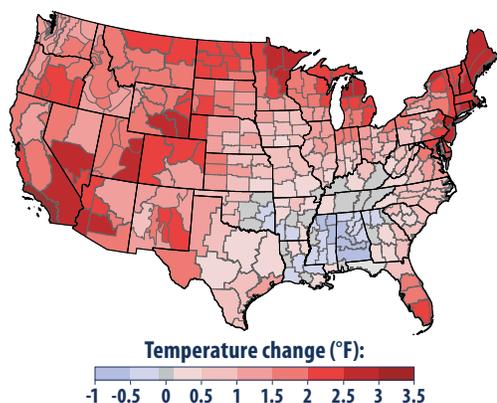
US EPA ARCHIVE DOCUMENT

# What Climate Change Means for Utah

Utah's climate is changing. The state has warmed about two degrees (F) in the last century. Throughout the western United States, heat waves are becoming more common, and snow is melting earlier in spring. In the coming decades, the changing climate is likely to decrease the flow of water in Utah's rivers, increase the frequency and intensity of wildfires, and decrease the productivity of ranches and farms.

Our climate is changing because Earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has warmed about one degree during the last 80 years. Warming is causing snow to melt earlier in spring.



Rising temperatures in the last century. The last decade was the warmest on record throughout the West. Source: EPA, Climate Change Indicators in the United States.

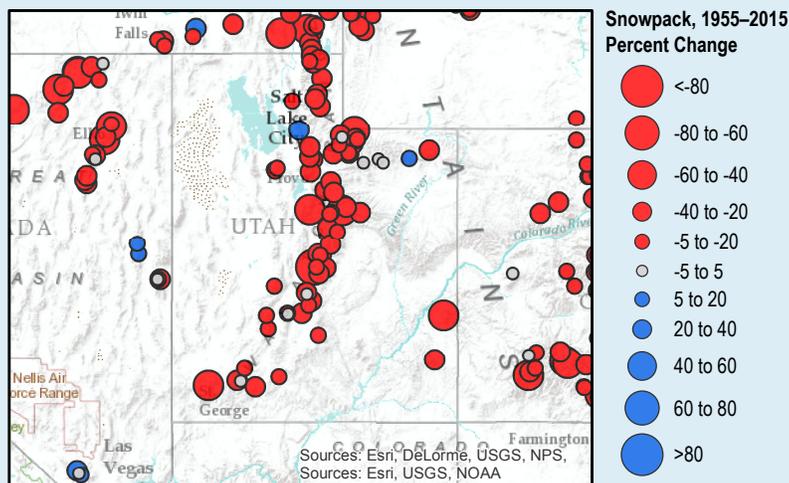
## Snowpack

As the climate warms, less precipitation falls as snow, and more snow melts during the winter. That decreases snowpack—the amount of snow that accumulates over the winter. Since the 1950s, the snowpack has been decreasing in Utah, as well as Wyoming and Colorado, which contribute snowmelt to the Green and Colorado rivers.

Diminishing snowpack can shorten the season for skiing and other forms of winter tourism and recreation. The tree line may shift, as subalpine fir and other high-altitude trees become able to grow at higher elevations. A higher tree line would decrease the extent of alpine tundra ecosystems, which could threaten some species.



A surveyor measures the depth of the snowpack at Mt. Baldy on the Wasatch Plateau in April 2015. The map below shows the results of many years of this type of measurement. Credit: Jordan Clayton, USDA Natural Resources Conservation Service.



Trends in April snowpack, 1955–2013. Snowpack has declined at most monitoring sites in Utah and the Upper Colorado River Basin. Source: EPA.

## Water Availability

The changing climate is likely to increase the need for water but reduce the supply. Rising temperatures increase the rate at which water evaporates (or transpires) into the air from soils, plants, and surface waters. Soils are likely to be drier in most of the state, so irrigated farmland would need more water. But less water is likely to be available, because precipitation is unlikely to increase as much as evaporation.

The decline in snowpack could further limit the supply of water for some purposes. Mountain snowpacks are natural reservoirs. They collect the snow that falls during winter and release water when the snow melts during spring and summer. Over the past 50 years, snowpack has been melting earlier in the year. Dams capture most meltwater and retain it for use later in the year. But upstream of these reservoirs, less water is available during droughts for ecosystems, fish, water-based recreation, and landowners who draw water directly from a flowing river.

## Agriculture

Increasing droughts and higher temperatures are likely to interfere with Utah's farms and cattle ranches. Hot temperatures threaten cows' health and cause them to eat less, grow more slowly, and produce less milk. Fire may also impair livestock operations. Reduced water availability would create challenges for ranches and irrigated farms, which account for 80 percent of the water used in the state.

## Wildfires and Changing Landscapes

Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires, which could harm property, livelihoods, and human health. The Milford Flat Fire in 2007 was the largest wildfire ever recorded in Utah. Wildfire smoke can reduce air quality and increase medical visits for chest pains, respiratory problems, and heart problems.

The combination of more fires and drier conditions may expand deserts and otherwise change parts of Utah's landscape. Many plants and animals living in arid lands are already near the limits of what they can tolerate. Higher temperatures and a drier climate would generally extend the Great Basin desert to higher elevations and expand its geographic range. In some cases, native vegetation may persist and delay or prevent expansion of the desert. In other cases, fires or livestock grazing may accelerate the conversion of

grassland to desert in response to the changing climate. For similar reasons, some forests may change to desert or grassland.

## Pests

Warmer and drier conditions make forests more susceptible to pests. Drought reduces the ability of trees to mount a defense against attacks from pests such as bark beetles, which infested 50,000 acres of Utah's forests in 2012. Temperature controls the life cycle and winter mortality rates of many pests. With higher winter temperatures, some pests can persist year-round, and new pests and diseases may become established.



*In Utah's Uinta-Wasatch-Cache National Forest, bark beetles have killed more than 90 percent of the trees in some areas. Credit: Brendan Waterman, USDA Forest Service.*

## Human Health

Hot days can be unhealthy—even dangerous. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular, respiratory, and nervous systems. Higher temperatures are amplified in urban settings where paved and other surfaces tend to store heat. Construction crews may have to alter their work schedules to avoid the heat of the day.

Rising temperatures can also increase the formation of ground-level ozone, a key component of smog. Ozone has a variety of health effects, aggravates lung diseases such as asthma, and increases the risk of premature death from heart or lung disease. EPA and the Utah Department of Environmental Quality have been working to reduce ozone concentrations. As the climate changes, continued progress toward clean air will be more difficult.