

# Greater Yellowstone area expected to become warmer, drier

June 23 2021

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This image shows a research raft on Spider Lake, Wind River Indian Reservation, Wind River Range, Wyoming. Credit: Bryan Schuman, University of Wyoming

Temperature has significantly increased and snowfall decreased in the iconic Greater Yellowstone Area since 1950 because of climate change, and these trends will likely continue through the rest of the century, according to a climate report published today.

Scientists with the U.S. Geological Survey, Montana State University and the University of Wyoming studied [climate change](#) in the Greater Yellowstone Area (GYA) from 1950-2018. They evaluated how these

changes could progress by 2100 based on various greenhouse gas emission scenarios and found that average GYA temperatures have increased by 2.3 degrees Fahrenheit and could increase an additional 5-10 degrees Fahrenheit by 2100.

"Greater Yellowstone is valued for its forests, rivers, fish and wildlife," said Steve Hostetler, a USGS scientist and co-lead author of the report. "The trend towards a warmer, [drier climate](#) described in this study will likely affect ecosystems in the region and the communities that depend on them."

The report also found that by the end of the century, the GYA could see:

- annual precipitation increase by 9-15%, but the combination of elevated temperatures and higher evaporation rates will likely make future conditions drier in summer;
- reduced soil moisture in the summer months, which will be an additional stress on plant communities that could make drought and wildfires more common;
- 40-60 more days per year exceeding 90 degrees Fahrenheit in Bozeman, Montana, and in Jackson, Pinedale and Cody, Wyoming, if there is little to no mitigation of future emissions.



Elk are one of many valued species in the Greater Yellowstone Ecosystem. Credit: Bryan Shuman, University of Wyoming

"The assessment is intended to provide the best available science on past, present and future conditions in the GYA so that stakeholders have needed information to plan ahead," said Cathy Whitlock, Regents Professor Emerita of Earth Sciences at Montana State University and report co-lead author.

The report also documents the effects of climate change on the GYA over recent decades, including:

- average [temperature](#) was as high or higher than any period in the last 20,000 years and likely the warmest of the last 800,000 years, according to geologic studies;
- the [growing season](#) has increased by nearly two weeks since 1950;
- average annual snowfall has decreased by 23 inches since 1950 and measurable snow has become rare in June and September.

"The decrease in snow is due to the increase in temperature over time, which caused more precipitation to fall as rain instead of snow," said report co-author Bryan Shuman, Wyoming Excellence Chair in Geology and Geophysics at the University of Wyoming.




Gallatin River in flood near Big Sky, Montana, taken mid-June 2011. The USGS and partners study the effects of climate change on the Greater Yellowstone Area. Credit: Scott Bischke, MountainWorks, Inc.

The report also found that earlier snowmelt has shifted the peak streamflow eight days earlier since 1925 and reduced [water supplies](#) in

summer, causing drier summer conditions that contributed to wildfires.

These ecosystem changes can impact people in the region in numerous ways, according to the scientists, including elevated temperatures and summer water shortages that affect agriculture and increased wildfires.

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What does climate change mean for the Greater Yellowstone Area?

**Greater Yellowstone Climate Assessment**

Past, present & future climate change in Greater Yellowstone's watersheds

A report on the region's changing climate & water resources

June 2021 <http://gyclimate.org>




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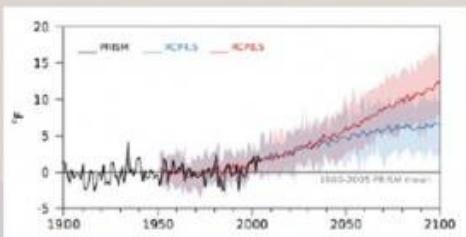
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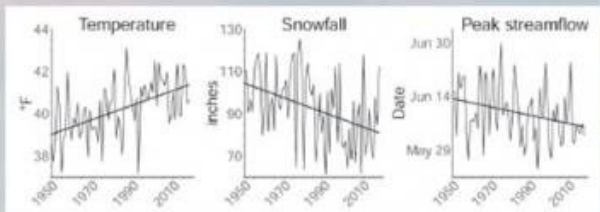
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### Greater Yellowstone Climate Assessment

The Assessment draws on the best-available science to provide a basis for understanding the consequences of climate change in our region. Compared to both distant and recent past, temperatures are increasing, snowfall is decreasing, and peak streamflow is occurring earlier. These climate trends are projected to continue and accelerate in the future in the Greater Yellowstone Area (GYA).



Changes in historical (black line) and future (red and blue lines) annual temperature in the GYA. Future trends differ depending on the projected rate of greenhouse gas emissions.



Trends in mean annual temperature, snowfall, and peak streamflow (derived mostly from snowmelt) in the GYA from 1950-2017.

#### Distant past

- Geologic studies indicate that the average temperature of recent decades is as high or higher than any period in the last 20,000 years, and likely the warmest of the last 800,000 years.

#### Since 1950



- GYA has warmed on average by 2.3°F.
- The growing season is 2 weeks longer.
- Snowfall has declined by 3.5 inches per decade below 8000 ft, and is now greater in December and February than January.
- Peak annual streamflow now occurs on average 8 days earlier than in 1950.

#### In the next 80 years



- GYA is projected to warm 5-6°F by 2040 and as much as 10-11°F by the end of the century.
- A greater portion of winter precipitation will fall as rain instead of snow and snowpack will continue to decline.
- Snowmelt and runoff will occur earlier in spring, adding to water shortages in summer.

This postcard summarizes the findings from a new Greater Yellowstone Area Climate Assessment released on June 23, 2021. Credit: USGS

"Based on nearly 50 interviews with [community leaders](#), city officials, agencies, businesses, citizens, ranchers and Tribal leaders, water and the need for more [climate](#) information are top concerns for folks in the GYA," said co-author Charles Wolf Drimal from the Greater Yellowstone Coalition.

**More information:** The report is available beginning June 23 at [www.gyclimate.org](http://www.gyclimate.org).

Provided by United States Geological Survey

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