

Recent droughts could be new normal, may lead to massive tree death, study suggests

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Evidence uncovered by a University of Tennessee, Knoxville, geography professor suggests recent droughts could be the new normal. This is especially bad news for our nation's forests.

For most, to find evidence that recent years' droughts have been record-breaking, they need not look past the withering garden or lawn. For Henri Grissino-Mayer he looks at the rings of trees over the past one thousand years. He can tell you that this [drought](#) is one of the worst in the last 600 years in America's Southwest and predicts worst are still to come.

Grissino-Mayer collaborated with a team of scientists led by Park Williams of Los Alamos National Laboratory and others from the U.S. Geological Survey, University of Arizona and Columbia University to evaluate how drought affects productivity and survival in conifer trees in the Southwestern U.S. Their findings are published this month in *Nature [Climate Change](#)*.

[Tree rings](#) act as time capsules for analyzing [climate conditions](#) because they grow more slowly in periods of drought and the size of rings they produce vary accordingly. Widely spaced rings indicate wetter seasons and narrow rings indicate drier seasons.

"Using a comprehensive tree-ring data set from A.D. 1000 to 2007, we found that the U.S. has suffered several 'mega-droughts' in the last 1,000 years in the Southwest," said Grissino-Mayer. "But the most recent

drought that began in the late 1990s lasted through the following decade and could become one of the worst, if not the worst, in history."

The researchers created a tree-ring-based index that catalogs the [drought stress](#) on forests which resolves the contributions of vapor-pressure deficit—the difference between the moisture in the air and how much the air can hold—and precipitation. They linked this information to disturbances that cause changes in forests, such as bark-beetle outbreaks, mortality and [wildfires](#) and compared these data with their model projections.

"Looking forward to 2050, our climate-forest stress model suggests we will see worse drought and increased tree mortality than we've seen in the past 1,000 years," Grissino-Mayer said. "This drought will be exacerbated by increasing temperatures globally, foreshadowing major changes in the structure and species composition of forests worldwide."

Increasing temperatures impact the water balance because they exponentially influence how much water evaporates into the atmosphere. More water in the air means less water in the ground. Trees need that water to survive, especially in water-limited areas like the American Southwest.

"We have nothing comparable in the past to today's environment and certainly tomorrow's environment," Grissino-Mayer said. "With increasing drought stress, our forests of tomorrow will hardly resemble our forests of yesterday."

Grissino-Mayer suggests [forest](#) management practices will need to adjust to the changes, noting the increased danger for wildfires even in East Tennessee's Great Smoky Mountains.

Provided by University of Tennessee at Knoxville

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