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Drought caused huge loss of piñons

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An unusually long hot drought earlier this decade led directly to a massive die-off of piñon trees across the Southwest, a new study has found.

Between 40 percent and 90 percent of all piñon trees died at study sites in each of the Four Corners states between 2002 and 2003, when the most recent drought was at its peak, according to the study, which will be published in the Proceedings of the National Academy of Sciences - a scientific journal. The study included researchers from the University of Arizona and nine other universities and government agencies.

Because of slightly but still significantly higher temperatures in this decade, the piñon die-off in this period was worse than it was during the region's last prolonged major drought during the 1950s, the researchers said. Worse, the piñon stands that died may not come back for 60 to 70 years - if ever, the researchers said.

The findings are consistent with what could happen during a period of long-term global warming and serve as a prediction of what could happen during such an event, said David D. Breshears, one of the study's authors. But the study did not indicate whether this die-off is directly traced to global warming, whether caused by humans or nature, Breshears said.

Still, "we documented a massive forest die-off, and it's a concern because it's the type of thing we can expect more of with global warming," said Breshears, a professor of natural resources at UA's School of Natural Resources in Tucson and a member of UA's Institute for the Study of Planet Earth.

The researchers found high concentrations of dead trees, up to 200 years old, in nearly 5,800 acres out of 57,915 acres studied, including a site at the base of the San Francisco Peaks north of Flagstaff. Aerial satellite photos taken as far south as Globe and Safford backed up the researchers' findings. They didn't look as far south as the Tucson area because this area has a different kind of piñon tree.

While the bark beetle provided the final death blow to most of the piñons, hot weather during the drought is the underlying cause, the researchers said.

"The beetles can only attack trees if they are stressed," said Neil S. Cobb, director of the Merriam-Powell Center for Environmental Research at Northern Arizona University in Flagstaff. "When the study started in 2002 you could cut a stem off a tree and find no resin on it. Well, that resin is there to protect the tree from the bark beetle."

Piñon tree information

- Typically are found at least 6,000 feet high in piñon-juniper woodlands.
- Provide habitat and food for many birds and mammals, including piñon, scrub and Steller's jays, Clark's nutcrackers, black bears, pack rats, squirrels, mule deer and wild turkeys.
- Piñons have served Indian tribes for thousands of years. Many people in the Southwest today still pick, eat and in some cases sell piñon nuts as a cash crop.
- The decline of piñons may hurt native grasses surrounding the trees, and researchers have noticed an invasion of undesirable cheat grasses in areas where the trees disappeared.

From 2000 through 2003, the Southwest annually got an inch less of precipitation each year than it did from 1953 to 1956. But the annual average temperature from 2000 through 2003 was 1.6 degrees higher than in the 1950s, Cobb said.

This time around, dead and dying piñons were found at higher, wetter elevations than in the 1950s, Breshears said. Most dead trees in the 1950s were more than a century old, but this time around dead trees were of many different size and age classes.

Hotter temperatures in this decade would have increased the trees' water demands and may account for the apparently greater mortality, the study said. These effects could have been aggravated by unusually high precipitation from 1978 to 1995 that allowed rapid, dense tree growth that could have increased competition for water, the study said.

The researchers also said there's no guarantee that the piñons will come back even when and if more normal rainfall resumes. Ponderosa pine stands that died off during the 1950s still haven't regenerated, Breshears said.

"Part of this depends on whether this is a global change and drought taking place," said Cobb. "If temperatures increase and droughts become more frequent, we could be talking about losing piñon-juniper woodlands."

Even if no more deaths occur, it could be 60 to 70 years before the piñon stands that just died off return, he said.