

# Joshua trees facing extinction

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*Summary:*

They outlived mammoths and saber-toothed tigers. But without dramatic action to reduce climate change, new research shows Joshua trees won't survive much past this century.

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Joshua Tree National Park, California (stock image).  
*Credit: © Doug / Adobe Stock*

They outlived mammoths and saber-toothed tigers. But without dramatic action to reduce climate change, new research shows Joshua trees won't survive much past

this century.

UC Riverside scientists wanted to verify earlier studies predicting global warming's deadly effect on the namesake trees that millions flock to see every year in Joshua Tree National Park. They also wanted to learn whether the trees are already in trouble.

Using multiple methods, the study arrived at several possible outcomes. In the best-case scenario, major efforts to reduce heat-trapping gasses in the atmosphere would save 19 percent of the tree habitat after the year 2070. In the worst case, with no reduction in carbon emissions, the park would retain a mere 0.02 percent of its Joshua tree habitat.

The team's findings were published recently in *Ecosphere*. Project lead Lynn Sweet, a UCR plant ecologist, said she hopes the study inspires people to take protective environmental action. "The fate of these unusual, amazing trees is in all of our hands," she said. "Their numbers will decline, but how much depends on us."

To answer their questions about whether climate change is already having an effect, a large group of volunteers helped the team gather data about more than 4,000 trees.

They found that Joshua trees have been migrating to higher elevation parts of the park with cooler weather and more moisture in the ground. In hotter, drier areas, the adult trees aren't producing as many younger plants, and the ones they do produce aren't surviving.

Joshua trees as a species have existed since the Pleistocene era, about 2.5 million years ago, and individual trees can live up to 300 years. One of the ways adult trees survive so long is by storing large reserves of water to weather droughts.

Younger trees and seedlings aren't capable of holding reserves in this way though, and the most recent, 376-week-long drought in California left the ground in some places without enough water to support new young plants. As the climate changes, long periods of drought are likely to occur with more frequency, leading to issues with the trees like those already observed.

An additional finding of this study is that in the cooler, wetter parts of the park the biggest threat other than climate change is fire. Fewer than 10 percent of Joshua trees survive wildfires, which have been exacerbated in recent years by smog from car and industrial exhaust. The smog deposits nitrogen on the ground, which in turn feeds non-

native grasses that act as kindling for wildfires.

As a partner on this project, the U.S. Park Service is using this information to mitigate fire risk by removing the invasive plants.

"Fires are just as much a threat to the trees as climate change, and removing grasses is a way park rangers are helping to protect the area today," Sweet said. "By protecting the trees, they're protecting a host of other native insects and animals that depend on them as well."

UCR animal ecologist and paper co-author Cameron Barrows conducted a similar research project in 2012, which also found Joshua tree populations would decline, based on models assuming a temperature rise of three degrees. However, this newer study considered a climate change scenario using twice as many variables, including soil-water estimates, rainfall, soil types, and more. In addition, Barrows said on-the-ground observations were essential to verifying the climate models this newer team had constructed.

Quoting the statistician George Box, Barrows said, "All models are wrong, but some are useful." Barrows went on to say, "Here, the data we collected outdoors showed us where our models gave us the most informative glimpse into the future of the park."

For this study, the UC Riverside Center for Conservation Biology partnered with Earthwatch Institute to recruit the volunteer scientists. Barrows and Sweet both recommend joining such organizations as a way to help find solutions to the park's problems.

"I hope members of the public read this and think, 'Someone like me could volunteer to help scientists get the kind of data that might lend itself to concrete, protective actions,'" Barrows said.

### **Story Source:**

**Materials** provided by [University of California - Riverside](#). Original written by Jules Bernstein. *Note: Content may be edited for style and length.*

### **Journal Reference:**

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# It makes me angry': is this the end for America's Joshua trees?

Even with major efforts to reduce greenhouse gases, 80% of the trees' habitat will be whittled away by the end of the century

**Maanvi Singh** in *San Francisco*

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Joshua trees along the Wall Street Mill trail, Joshua Tree national park, California, 31 January 2019. Photograph: John Francis Peters/The Guardian

Joshua trees have dotted the Mojave desert for 2.5m years, but even if humans take urgent action to combat the climate crisis, their decimation is all but ensured by the end of this century, a study has found.

Only .02% of the tree's current habitat in Joshua Tree national park would remain viable amid unmitigated climate change, according to [research](#) published in the journal *Ecosphere*. Even in a best-case scenario, with major efforts to reduce greenhouse gases, 80% of the trees' habitat will be whittled away.

"Over the past couple of millions of years, we've had multiple ice ages with warming periods in between, and the Joshua trees have survived that," said the ecologist Cameron Barrows, who co-authored the study. "But right now the warming is happening so quickly – and it's getting hotter than any of those previous periods."



Even if the trees manage to ride out warming temperatures, they face additional threats from smog and wildfires. Photograph: roman\_slavik/Getty Images/Stockphoto

Trees in cooler, higher elevation areas of the park

are still thriving and multiplying, but those in hotter areas are producing fewer saplings. Although these desert dwellers require much less water than most plants, the **most recent** year-long drought in California left the ground too desiccated to support many young trees, the researchers said.

Eventually, most of the park will become too hot and dry for the Joshua trees. The predictions, based on climate change data from the UN's Intergovernmental Panel on Climate Change and other global-scale models, forecast that summers in the national park would be an average of three degrees celsius hotter, in the best case, and five degrees hotter in the worst case.

"It makes me angry, and I do get tired and burned out," said Rand Abbot, a Joshua Tree resident and park volunteer. "I don't want this beautiful area to end up looking like something out of Mad Max."

Right now, "the landscape looks like it came out of a Dr Seuss book", said Barrows. "Joshua trees look like a fantasy." They're also a keystone species that provide food and shelter for other plants and animals – once they're gone, much of the desert ecosystem would disappear as well, he noted.



The trees' decimation is all but ensured by the end of this century, a study has found. Photograph: James O'Neil/Getty Images

Even if the trees manage to ride out warming temperatures, they face additional threats from smog and wildfires. "The national park is right on a path for the smog from LA to go east into the desert," Barrows said. Nitrogen dioxide from polluted air has acted as a fertilizer, encouraging the growth of non-native grasses across the desert, which have fueled unprecedented wildfires.

In recent years, crews have been working to cut down the invasive grasses, but in the dry, desert environment, "just one lightning strike can wipe out acres," Barrows noted. "And very few Joshua trees tend to survive wildfires."

The study didn't evaluate how Joshua trees outside the national park, including ones that grow in parts of Nevada and Arizona, will fare. "It's possible they'll have a better future there," Barrows said.

A 2011 study predicted that while global heating would wipe out most of the Joshua trees in California, some could survive in the northern-most areas of their natural range. It is unclear if that forecast will change in light of more recent climate data indicating a hotter future than scientists previously expected.

Overall, the latest report "is extremely discouraging", said Kenji Haroutunian of the volunteer group Friends Of Joshua Tree. "But at the same time – I don't see it as a case where we might as well give up."



The Cholla cactus garden at sunrise, Joshua Tree national park, California. Photograph: Matteo Colombo/Getty Images

Record **numbers** of people have been visiting Joshua Tree national park – more than the park's staff have been able to handle in recent months,

especially during the most **recent government shutdown** when wayward visitors caused irreparable damage.

“Yes, the park is underfunded, and threatened by overuse – but at the end of the day getting more visitors to come and see what an amazing place it is maybe the key to saving it,” said Haroutunian, who’s been frequenting the national park since the mid-1980 and leads groups of visitors on rock climbing trips.

He wants to encourage more people to come and experience the landscape – perhaps before it’s too late.

“It’s just a fascinating place. You know, a few years ago, literally every Joshua tree in the park bloomed at the same time,” he said. “In my mind, it was like the trees were fighting back. Like, ‘Alright everyone, let’s go.’”