

# Environmental Concerns of The Joshua Tree



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**Joshua Trees:** (*Yucca brevifolia*) are woody monocots found exclusively in the Mojave desert at Joshua Tree National Park.

Joshua trees are threatened by **Climate Change** and other environmental factors.

Based on climate models using a 3-degree Celsius increase, the range of Joshua Trees could be reduced up to **90%** by the end of this century, stated by Cameron Barrows of University of Southern California.

**Other Threats:** In addition to the warming climate, invasive grasses, covering thousands of acres at JTNP, pose a threat to native species- i.e., as competition and potential fuel for severe wildfires. Air pollution also affects the ecosystem by fertilizing the soil with excess nitrogen; consequently stimulating the growth of invasive grasses.

## Challenges for the Tree:

### Internal Challenges:

- **Low Reproductive Rate-** Reproductive success is low for Joshua Trees due to its exploitative obligate pollination mutualism relationship.
- **Exclusive Pollinator-** The Yucca Moth is solely responsible for the pollination of the Joshua Tree, and therefore its reproductive success and survival as a species.
- **Low Growth Rate-** Mature Joshua Trees only grow at approximately at 3 cm per year.
- **Fewer Young Trees-** There are not enough Joshua Tree seedlings to replace the population of mature trees. Younger trees do not have the extensive root systems to help sustain them through prolonged periods of drought.

### External Challenges:

#### •Climate Change-

Species:	Current modeled suitable habitat area regionally: (ha)	Current modeled suitable habitat area in JTNP: (ha)	Projected suitable habitat: +3 degrees Celsius regionally: (ha)	Proportion change regionally:	Projected suitable habitat: +3 degrees Celsius in JTNP: (ha)	Proportion Change in JTNP:
<i>Yucca brevifolia</i>	26,811	16,041	3,664	-86%	1,863	-88%

•**Drought-** Joshua Trees are adapted to desert dry conditions; however increasing evaporation rates due to climate change are reducing available water for plants.

•**Invasive Species\*-** Spread of Red Brome, an invasive grass species, fuels intensely hot wildfires that can burn even the largest Joshua trees.

•**Wildfire-** Wildfires are becoming larger, more frequent, and more destructive due to an excess of invasive grasses (fire fuel).

•**Air Pollution-** Nitrogen from urban air pollution acts as a fertilizer for the desert soil, turning the barren desert into a grassland. These grasses compete against native species, and increase the likelihood of wildfires.

## What Can We Do?

Talking with Neil Frakes, Biologist and Chief Vegetation Branch Steward of JTNP, I learned what *we can do* to protect and conserve the Joshua Tree. The vegetation branch of JTNP is actively managing *twenty* of the *eighty* invasive species in the park. **HABITAT RESTORATION** measures help eradicate the invasive grasses (fire fuel). Dr. Cameron Barrows, an ecologist at the University of Southern California, suggests **RELOCATION** of the Joshua Tree may be the only solution against rising climate temperatures. Pockets of land that remain suitable in the warming climate, called *refugia*, are being further researched. The best prevention of introducing more invasive plants is to come to JTNP with clean clothing and in a clean vehicle. **WASH YOUR CAR** before entering the park, especially if you have driven long distances. Finally, we can all **LOWER OUR CARBON FOOTPRINT** to reduce the negative impact on the environment and encourage the survival of the Joshua tree.

#### Sources:

- Barrows, Cameron, et al. "Designing a sustainable monitoring framework for assessing impacts of climate change at Joshua Tree National Park, USA." *Biodiversity and Conservation*, 2014. [https://www.researchgate.net/profile/Cameron\\_Barrows/contributions](https://www.researchgate.net/profile/Cameron_Barrows/contributions). Accessed 4 Apr. 2018.
- Clarke, Chris. "No More Joshua Trees?" *Earth Island Journal*, 2007.
- Davidson, G. Osha. "Climate Change Threatens an Iconic Desert Tree." *National Geographic*, 28 Oct. 2015.
- Frakes, Neil. Personal Interview. 28 February 2018.
- Joshua Tree National Park. 2014. photograph. [http://photoeverywhere.co.uk/west/usa/california/slides/joshua\\_tree\\_national\\_park4374.htm](http://photoeverywhere.co.uk/west/usa/california/slides/joshua_tree_national_park4374.htm).
- Schafer, Kevin. *Joshua Tree*. 2015. photograph. National Geographic.
- Steinberg, Jim. "Can Joshua Trees Survive Global Warming? Scientists Have Differing Thoughts." *The Sun*, 30 Nov. 2016.