FIRE MANAGEMENT

Assisting Adaptation of Joshua Trees to a Changing Climate and Fire Regime

Joshua Tree Habitat After Fine Fuels Treatment Around Upper Covington

INTRODUCTION

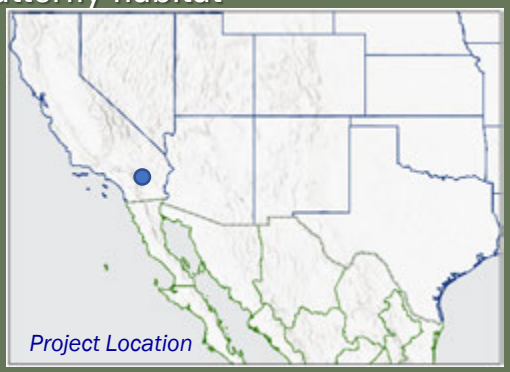
Joshua Tree National Park (JOTR) was established, in part, to protect the Joshua tree (*Yucca brevifolia*). Joshua trees are threatened by habitat loss from climate change, more frequent and severe droughts, and more frequent fires fueled by invasive grasses. Fire effects can be particularly long lasting and severe for Joshua trees, a slow growing and long-lived species. JOTR staff and partners use data about climate and fire to understand which areas of the park are likely to remain viable habitat in the future. This data help JOTR staff decide when and where to use the Resist, Accept, Direct framework (RAD; Schuurman et al, 2020) to ensure management decisions are climate informed. For instance, by *Resisting* declines in suitable Joshua tree habitat by installing fire breaks, *Accepting* these declines in areas that will be unsuitable under future climate conditions, or *Directing* the trajectory of change by replanting burned areas with Joshua trees that are more drought adapted.

KEY ISSUES ADDRESSED

JOTR's deserts are naturally fuel-limited landscapes that minimize the spread of fire. However, the growth of invasive grasses has increased the quantity and continuity of fuels. This increases the risk of large fires that can kill Joshua trees. Wildfire typically causes approximately 80% mortality in Joshua trees. Climate change contributes to higher temperatures, longer droughts, and lower rainfall. Joshua trees are not adapted to a hotter and drier climate, increasing the risk of large-scale die-offs, and shrinking the size of future viable habitat as climate change progresses. Maintaining habitat for Joshua trees also benefits other wildlife, such as the desert tortoise (*Gopherus agassizii*) and the pallid dotted-blue butterfly (*Euphilotes pallescens elvirae*).

PROJECT GOALS

- Establish fuel breaks by reducing fuels to limit spread of fire
- Use climate data to predict future Joshua tree habitat viability
- Determine which sub-populations of Joshua Trees will be most suited to long-term survival
- Prevent unintended consequences to desert tortoise and pallid blue butterfly habitat



PROJECT HIGHLIGHTS

Fuel Breaks to Resist Fire and Climate Change: In 2021, JOTR staff installed fuel breaks by removing 60-70% of woody plants and 70-80% of invasive grasses along 9.2 miles of Covington Flats Road. This helps prevent fires from spreading and improve safe access for firefighters. Joshua trees, yucca, cacti, and pine plants were left in place for wildlife habitat.

Replanting Guided by Future Climate Models: Models predict an 80-99.8% reduction in future Joshua tree habitat in JOTR and increasing drought stress for trees in the remaining 0.2-20% of habitat. Trees from drier parts of the park may do better in a hotter, drier climate. To find Joshua tree populations with the best genetics for future climate, JOTR staff plated trees from 14 areas of the park with different temperature and rainfall conditions to see which ones will survive and grow best.

Replanting in Burned Areas: JOTR replants Joshua trees and associated species along edges of washes and roads, maximizing the likelihood of capturing rain and increasing survival.

Preserving and Maintaining Endangered Wildlife Populations: Before restoring and replanting, JOTR staff surveys for desert tortoises and undergo mandatory desert tortoise training. When implementing fuel breaks, Pallid dotted-blue butterfly habitat is left as undisturbed as possible.

Unburned Joshua Tree Habitat At Joshua Tree National Park

LESSONS LEARNED

To **maintain the effectiveness of fuel breaks, JOTR staff uses both post- and pre-emergent herbicides** (indaziflam) to reduce growth of invasive grasses with minimal impact on native perennial vegetation. JOTR also pays attention to the life cycle and germination period of invasive grasses to determine the best time to apply herbicides. **JOTR staff use climate data alongside fire risk models to bring a climate informed lens to planning fuel management projects**. To understand fire risk, fuel management professionals use models to predict fire behavior. JOTR staff learned **that fire risk models often struggle to accurately assess fuel loads from dead invasive grasses without in-field validation**. This can lead to inaccurate fuel load analysis and improper assessment of risk after significant rainfall events that increase growth of invasive grasses and fine fuel content.

There is a need for large-scale fuels reduction projects to limit wildfire occurrence, however, the funding for large-scale projects is not always available. **JOTR acts on opportunities to reduce heavy fuel loads when funding is readily available and continues to monitor high-risk areas** to plan and prioritize projects that will most effectively benefit the ecosystem.

NEXT STEPS

- Expand monitoring and continue to study climate effects on Joshua tree populations.
- Study fire effects on Joshua trees and JOTR ecosystems to better understand the fire effects and needs of the landscape to create new fire management plans.

PARTNERS

- See online for full list of partners
- For more information, contact Jane Rodgers: jane_rodgers@nps.gov

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For more information on CART, visit https://www.fws.gov/CART
Photos Courtesy of Jane Rodgers, National Park Service

Read the full Case Study: