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Evaluating Efficacy of Restoration Techniques, Keys View Road Reconstruction, Joshua Tree National Park, California, U.S.A.

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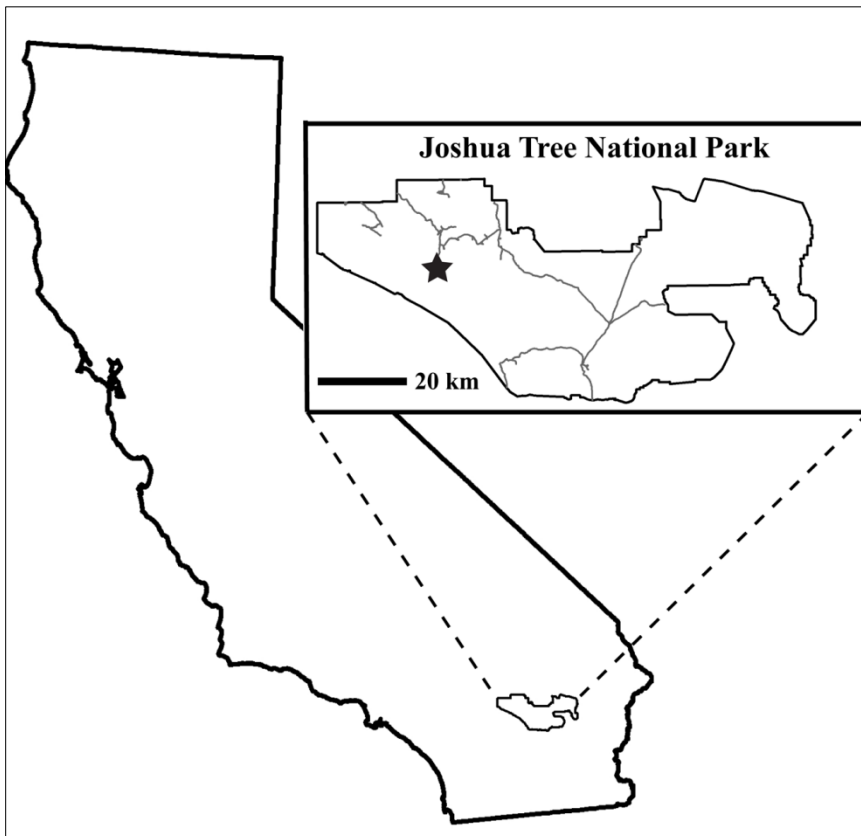


Figure 1. Location of Joshua Tree National Park within California, USA. Light grey lines denote major roads through the park. The star marks the location of Keys View Road.

Keys View Road in Joshua Tree National Park (JOTR) was recently repaved, resulting in a buffer of vegetation and soil disturbance along the road corridor. In order to mitigate the effects of the repaving, JOTR designed an experimental framework to test various revegetation strategies. They outplanted salvaged and nursery grown native plant species in conjunction with vertical mulch in a fully crossed design (outplanting only, vertical mulch only, outplanting + vertical mulch, bare ground) to examine if any of the treatments most efficiently establish native plant communities.

Outplanting was completed in February, 2008, and we began monitoring in April, 2009. We surveyed six replicates of each of the four treatment combinations along the 5-mile stretch of road. Because the disturbance was a linear feature along the roadside, we established 2 m × 20 m plots where we sampled plant composition by taking sub-samples around outplanted and vertical mulch individuals, and samples from open interspaces (open space between plantings) to examine the impact each microsite had on the composition at the whole plot level.

Our study goals were to address the following questions:

- What is the success rate of outplanting salvaged native perennial vegetation?
- Do any of the four treatments increase vegetation recruitment on the disturbed roadside?
- What is the effect of outplanting and vertical mulch addition on establishment of exotic invasive species?

Survival rates were high, with 13 out of 15 species monitored exhibiting a 50% or greater survival rate, and six out of the 15 species had a survival rate 86% or greater. However, plant community composition of species that recruited naturally into the disturbed roadside systems, along with richness and diversity, did not differ among treat-

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Evaluating efficacy of restoration techniques *(continued from page 3).*

ments. Richness, as expected, was lower in disturbed communities than in intact, undisturbed communities. Additionally, invasive grasses (brome species) had greater establishment rates in outplanted and vertical mulch microhabitats. Brome abundance at the plot level, however, was only greater in outplanting + vertical mulch plots than in bare plots, otherwise treatments did not differ. It appears that the combination of the treatments provide more microsites within which brome can establish, and therefore increases the plot level abundance. However, the same pattern was not followed by native species.

Overall, the techniques that JOTR have developed for establishing native perennial species through outplanting have been effective two years after outplanting. However, with the success of the outplantings, outplanted and vertical mulch individuals appeared to foster establishment of non-native brome grasses directly around individuals, and native plant community composition does not appear to benefit from these treatments. These results reflect just two years after disturbance and subsequent sampling. Succession in Mojave Desert communities is slow. The combination of planting success, which can contribute to propagation from the direct seed course, plus the increased rate of exotic invasion, may steer the treated communities on different trajectories from non-treated communities. Future plant community monitoring is necessary to track the establishment of native perennial and exotic annual species in these disturbed sites.

Figure 2. Pictures from Keys View Road restoration sites. **(top left)** Undisturbed site, **(top right)** vertical mulch plot, **(bottom left)** outplant and vertical mulch plot, **(bottom right)** example of an outplanted individual with abundant brome within the cage.

