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# *Research Brief for Resource Managers*


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# Treatments and Planting Location Affect Post-Burn Restoration


*Devitt, D.A., F. Landau, S.R. Abella, M.D. Petrie, A.M. McLuckie, and J.O. Kellam. 2020. Post burn restoration response of Encelia virginensis within a small wash system in the Mojave Desert. Ecological Restoration 38:169-179. doi: 10.3368/er.38.3.169*


## Management Implications

- The native perennial brittlebush was successfully outplanted to increase plant cover on a burned site in the Mojave Desert. Survival up to 45% was achieved.
- Providing outplants with cages to deter herbivory and hydrogels as a slow-release irrigation enhanced survival.
- Planting location within a desert wash system influenced plant survival and flowering and seed production.

In southwestern USA deserts, invasion by non-native annual grasses, such as red brome (*Bromus rubens*), is thought to have increased the amount and continuity of fine fuels, in turn enhancing the spread and severity of wildfire in ecosystems not thought to have much evolutionary history of fire. In the record 2005 fire season, for example, almost 3% of the entire land area of the Mojave Desert surrounding Las Vegas burned that year alone (Brooks and Matchett 2006). Other major fire years have since occurred, where any year with winter rainfall sufficient to stimulate growth of non-native plants, followed by a dry summer with lightning or human ignitions of the dried fuels, can experience a severe fire season given the current situation of altered fuels provided by non-native plants. Wildfires in low-elevation deserts were historically limited by low perennial cover and sparse and discontinuous fine fuels, and are disturbances to which native desert biota are not considered adapted. Consequently, fire devastates mature desert communities, such as those with creosote bush (*Larrea tridentata*), Joshua tree (*Yucca brevifolia*), and other long-lived perennials that structure desert ecosystems and their wildlife habitat values.

When wildfires occur, ecological restoration is difficult as it is subject to the same challenges that limit natural plant recruitment in deserts. One way that perhaps restoration success can be enhanced is by carefully matching restoration treatments and their locations to microsites where restoration has the greatest chance for success within sites.

*Burned site in Beaver Dam Wash National Conservation Area, near St. George, Utah, and managed by the Bureau of Land Management. Photo by S.R. Abella.*

On a burned site in the northeastern Mojave Desert that is conservation-priority habitat for federally listed desert tortoises, a field experiment was conducted to test different treatments for outplanting greenhouse-propagated seedlings of the native perennial brittlebush (*Encelia virginensis*). The set of treatments was repeated at different locations within the site along a desert wash gradient that might provide different amounts and timings of soil moisture. The idea was that planting success could vary within and across the wash system and that certain treatments (such as adding supplemental moisture sources) could be less or more important depending on planting location. The treatments included providing a wire cage around outlants to deter herbivory and providing a slow-release hydrogel irrigation, and both cage + hydrogel. There was also an untreated control where seedlings were planted with no further treatment. Plant survival and growth was monitored for three growing seasons.

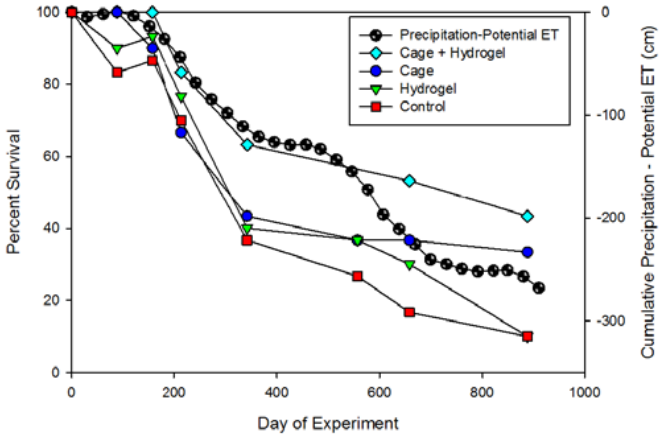
After three growing seasons, outplants provided with cages enhanced survival as did adding hydrogel as a slow-release irrigation to caged plants. Survival was about 40% for all caged plants, compared to only about 10% for plants without cages. Adding hydrogel to caged plants increased survival by 10%.

Survival overall was higher in upper elevation parts of the desert wash system, near the headwaters, as compared to the lower elevation portions where the wash was wider. Spatial variability through time in soil moisture availability across the wash system was complex. It appeared that plant survival within wash systems might be affected by combinations of soil texture, landscape configurations affecting water inputs and proximity to them, and the speed at which water may move through a system.

Providing cages + hydrogel enhanced flowering and seed production of surviving plants. Flowering and seed production were also more prevalent in the upper elevation headwater locations of the wash system as compared to the lower elevation, topographically broad area of the lower wash system.

Results supported previous research in the Mojave Desert in finding that cages, or some form of protection from herbivory, was a key to outplant survival for this species as it has been for several previously tested species. However, increases in plant survival would need to be balanced with the added costs and logistical challenges of providing cage and hydrogel treatments. Results also suggest that further research to match treatments to spatial variability in edaphic factors might enhance restoration success.

Brittlebush, when provided with suitable treatments aiding survival, seems like a good candidate species for post-burn restoration to increase native perennial cover on denuded burned sites. Flowering and seed production by some of the outplanted individuals could also assist soil seed bank formation and potentially enable the outplanting treatment to promote revegetation in broader areas beyond just the planting area.




*Survival of brittlebush outplanted at a burned Mojave Desert site. Providing cages to deter herbivory enhanced outplant survival, as did adding hydrogel.*

**Suggestions for further reading:**

Abella, S.R., and K.H. Berry. 2016. Enhancing and restoring habitat for the desert tortoise. Journal of Fish and Wildlife Management 7:255-279.

Brooks, M.L., and J.R. Matchett. 2006. Spatial and temporal patterns of wildfires in the Mojave Desert, 1980-2004. Journal of Arid Environments 67:148-164.