Long-Term Change in Plant Communities and Fuels among Management Interventions on Severe Disturbances in the Mojave Desert

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One of the challenges in managing severe disturbances in the Mojave Desert is that non-native, fuel-producing annual grasses can dominate the post-disturbance flora. Moreover, the same management actions to improve habitat for native plants on severe disturbances can inadvertently further enhance habitat for non-native plants and associated hazardous fuels.

This paper reports the results of long-term monitoring (spanning a 19-year period from 2006 to 2024) of plant community change on severely disturbed Mojave Desert sites on which the National Park Service conducted management activities designed to improve habitat conditions for native species (Figure 1). The managed sites, in Lake Mead National Recreation Area, had been bulldozed in 1998, destroying desert pavement surfaces and the native perennial community. In 1999, with the intention to improve habitat quality for native species, the National Park Service conducted a range of management activities including adding back salvaged topsoil, recontouring the soil surface, applying artificial desert varnish (intended for color restoration to simulate the color of desert pavement), and outplanting native perennials. The study compared locations receiving these management interventions with a nearby undisturbed reference (desert pavement containing a mature creosote bush [*Larrea tridentata*] shrubland) and an area similarly severely disturbed decades earlier in 1968 representing passive recovery without intervention.

MANAGEMENT IMPLICATIONS

- On severely disturbed Mojave Desert sites, a shrubland of creosote bush with native annuals, including forage favored by threatened desert tortoises, developed following a comprehensive management intervention by the National Park Service including salvaged topsoil, raking surface rocks, applying artificial desert varnish, and outplanting native shrubs. These benefits occurred with no apparent increase in fuel-producing, invasive annual grasses.
- Heavy aboveground mortality occurred in native shrubs across all sites following severe mid-2020-2022 drought. To sustain restoration gains through events such as severe droughts, planning for a possibility of augmentation treatments (e.g., supplemental plantings) may be useful following initial management interventions.
- Further monitoring of post-drought change in the plant community at this and similar study sites could provide valuable information on the long-term effectiveness of initial management interventions. Fuels in the future at these sites are likely to depend on persistence of dead woody fuels after shrub mortality associated with the 2020-2022 drought, potential for regrowth, and dynamics in the annual plant community.

Areas receiving the complete suite of management interventions recovered a creosote bush community and some native annual species typical of desert pavements. However, condition of the plant community among the interventions from no management to the undisturbed reference varied sharply across the decades with major climatic events (Figure 2). For example, in 2024 (26 years following management intervention) after mid-2020–2022 drought, density of creosote bush with live foliage declined by 55% in areas receiving the full management suite and by 70% on undisturbed desert pavement. Conditions on the managed area converged with that of the undisturbed reference both because of long-term improvement in the managed area and due to degradation (post-drought loss of native shrubs with live foliage) in the undisturbed reference. Although the density of creosote bush declined, other metrics, such as forage plants important to federally listed desert tortoises (*Gopherus agassizii*), fluctuated among years but overall improvements were maintained through time in the managed area. On the legacy disturbance area, even 56 years after disturbance, the area supported persistent assemblages of native early colonizers that differed from other areas and did not resemble the undisturbed reference. Future dynamics among the sites may depend on the degree of post-drought recovery (e.g., resprouting) by shrubs.

Regarding invasive annual grasses, Mediterranean grass (***Schismus*** spp.) predominated but did not necessarily show clear patterns in cover among sites across years. The grass had high cover in 2006 following record 2004-2005 rainfall, then generally declined aside from peaking at 6-8% cover in 2019 in the undisturbed reference and legacy disturbance area. Overall, the management interventions did not appear to increase cover of invasive grasses.

Figure 1. Repeat photos from the same locations among areas disturbed in 1968 and unmanaged (legacy disturbance), areas disturbed in 1998 and receiving partial or full management interventions to recover desert pavement functions and mature creosote bush shrublands, and an undisturbed reference on desert pavement with creosote bush. Note the sharp reduction in live shrub cover in 2024 following mid-2020-2022 drought.

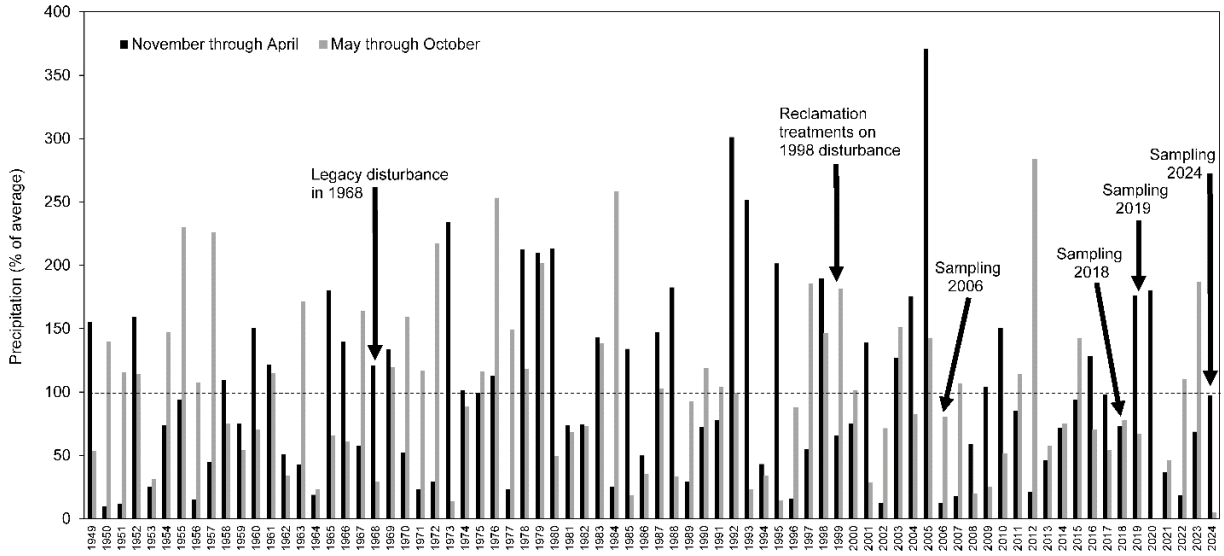

Figure 2. Palmer Drought Severity Index for southern Nevada corresponding with the cool season (November through April) and warm season (May through October). Notations indicate key events during the long-term study of vegetation change on severe disturbances with and without management interventions performed by the National Park Service in Lake Mead National Area, southern Nevada. Years in which study plots were sampled are also noted within the 2006-2024 monitoring period.

Additional Information

This brief is based on the following article:
Abella, S.R., L.P. Chiquoine, and S.M. Munson. 2026. Intermittent and reversible vegetation change during a 19-year period on severe disturbances receiving reclamation and on undisturbed desert pavement. Reclamation Sciences 3: 21-32. https://reclamationsciences.kglmeridian.com/view/journals/rcsc/3/1/article-p21.xml

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