The Good with the Bad: when Ecological Restoration Facilitates Non-Native Plants

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Fertile Islands Underpin Desert Restoration

- Microsites below many perennials (often shrubs)
- Enriched nutrients, shaded, seed deposition
- Restore for structure and function
Are these patterns similar during restoration?
Joshua Tree National Park

Red brome

Cheatgrass

Schismus spp.
Keys View Road Study Area

- 6-mile disturbance corridor, Federal Highways
- Outplanting, vertical mulch in March 2008
- Outplants caged, hand watered
- 5 whole-plot treatments
- Nested outplant, vertical mulch, interspace

2008
Ambient “undisturbed”
Microsite Scale – annual-biennial species

Non-native                      Native

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-native</th>
<th>Native</th>
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<tbody>
<tr>
<td>2009</td>
<td></td>
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<td>2010</td>
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<td>2011</td>
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<td>2017</td>
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Vertical mulch whole-plot treatment

Vertical mulch
Microsite Scale – annual-biennial species

Non-native

Native

Vertical mulch + outplant whole-plot treatment

Outplant + vertical mulch
Whole-Plot Treatment Scale – native perennials

Cover (%)

- Disturbed/unrestored
- Disturbed/vertical mulch
- Disturbed/outplant
- Disturbed/OPVM
- Undisturbed/unrestored

Highly variable; globemallow, Atriplex
Whole-Plot Treatment Scale – non-native annuals-biennials

- Native annuals no significant patterns, not shown
Discussion and Conclusions

- Lower-elevation Twentynine Palms, CA weather station reported 1936-2016 avg of 4.3 inches/yr rain
- All 9 study years (incl 2017 trends) below average
- Lacking winter rains or if have, shut off in late winter as in 2017

- Difficult restoration setting – chronic disturbance, non-native plants coupled with the usual challenges of weather, herbivory, etc.
- Outplanting treatment includes cage, watering, greenhouse soil
- Native annuals were mercurial – run correlation analysis, species
- Are fertile islands less important in wet years?
- Weed control paired with native plant restoration?
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