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Fire and Invasive Plants in California Ecosystems

Within the Mediterranean-climate region of California and adjacent regions, alien invasive plants are largely concentrated in lower-elevation valleys and foothills. Fire has historically been an important part of the ecology of many of these ecosystems. However, as discussed in a recent Tall Timbers Research Station publication, USGS scientist Dr. Jon E. Keeley has shown that human-caused disruptions of natural fire regimes have contributed to the widespread invasion of certain communities.

Throughout the Coast Ranges and foothills of the Sierra Nevada and Cascades, high fire frequency has contributed to the type-conversion of shrublands and closed woodlands to annual grasslands dominated by alien grasses and forbs of Mediterranean Basin origin. Returning these landscapes to their former closed-canopy state is the only likely means of reducing the presence of nonnatives. Valleys and other sites with deeper clay soils, which formerly were perennial grasslands, also have been type-converted to nonnative annual grasslands by intensive grazing and plowing. There is evidence that spring burning may be an appropriate management tactic for shifting the balance away from the annual alien grasses toward increased native cover, but only on sites with an existing perennial bunchgrass presence. This tactic, however, may not be an appropriate community restoration technique since it is inhibitory to native annuals as well. Currently, the vast majority of grasslands in the state lack native bunchgrass, and on these sites different burning prescriptions may alter species composition, but fire alone will not eliminate aliens.

Prefire-fuel manipulations may contribute to alien plant invasion. For example, use of prescription burning on sites that currently have higher-than-natural fire frequencies potentially favors aliens. Also, fuel breaks may act as invasive highways, carrying alien species into uninfested wildlands. Following fire, the reduced fuels in fuel breaks contribute to enhanced survivorship of alien seed banks, resulting in source populations poised for invasion of adjacent burned sites. Post-fire site "rehabilitation" is responsible for widespread introduction of alien species that may increase fire frequency, further increasing expansion of aliens.

Management Implications:

- Many annual grasslands are derived from historical changes in fire regime that have degraded native shrublands, and on such sites, reducing the alien presence can only be obtained by allowing these sites to return to closed canopy shrublands.
- Prescription burning may be effective at controlling noxious weeds but unless accompanied by revegetation with native species, is unlikely to diminish the alien dominance.
- Fire management activities may increase the invasion of alien species, for example, if the frequency of prescription burning exceeds the natural fire frequency, natives are readily displaced by nonnative weeds.
- Prefire fuel manipulations such as fuel breaks produce conditions that favor many weedy aliens and thus act to increase the alien presence, increase the movement of aliens into wildlands, and increase seed sources capable of invading after fire.

Keeley, J. E. 2002. Fire and invasive species in Mediterranean-climate ecosystems of California. Pages 81–94 in K. E. M. Galley and T. P. Wilson (eds.), Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: The First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11. Tall Timbers Research Station, Tallahassee, FL.