

Effects of soil preparation treatments on restoration of native perennial grasslands

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~ Abstract ~

Selecting the best soil preparation technique is an important aspect of successful grassland restoration projects. Disking, scraping, herbicide application and a control treatment were compared for their effect on the establishment of native perennial grasses and for their ability to reduce and/or control the abundance of non-native annual grasses. Scraping and disking were most successful in establishment of the native perennial grass *Nassella pulchra*. Scraped plots had significantly fewer non-native annual grasses than the control. Removal of live and dead plants and seeding were found to be crucial components for successfully reestablishing *Nassella pulchra* in this coastal Los Angeles grassland.

~ Introduction ~

The rarity of native grasses such as *Nassella pulchra* in most annual grasslands causes seed limitations (Hamilton et al. 1999) and seedling survival is often poor due to competition with non-native annual grass species. Because limited seed quantities and poor dispersal rather than competitive inferiority may be factors in the lack of re-establishment of native perennial grasses in exotic annual dominated grasslands (Seabloom et al. 2003), there is hope that restoration efforts may provide positive results in reclaiming portions of California grasslands. Such is the case at White Point Nature Preserve where multiple soil treatments were employed to assess perennial bunchgrass establishment in a highly degraded coastal grassland dominated by exotic annuals.

~ Materials and Methods ~

Three 30 m transects were established with 40 1m² plots running along each transect. Each plot was randomly assigned a treatment.

Herbicide- 2% Glyphosate solution was applied with a backpack sprayer and the dead vegetation was allowed to remain in each plot.

Disking- A D-4 tractor with a Rome-disc attachment was operated in each plot. The upper 7cm of soil were churned and any vegetation was uprooted, buried, and sliced.

Scraping- A blade from a Bobcat was dragged over each plot to remove the uppermost thin layer of soil and existing vegetation.

Control- No treatments were applied to these plots.

All plots were hydroseeded with the mix shown in Table 1. Irrigation was

provided by a rotor sprinkler system for germination and growth.

Table 1. Species seeded with application rates

| Species | kg/ha |
|------------------------------|-------|
| <i>Vulpia microstachys</i> | 8.97 |
| <i>Nassella cernua</i> | 11.21 |
| <i>Nassella pulchra</i> | 16.82 |
| <i>Lasthenia californica</i> | 0.45 |
| <i>Nemophila menziesii</i> | 0.11 |
| <i>Grindelia camporum</i> | 0.11 |
| <i>Layia platyglossa</i> | 0.34 |
| <i>Calandrinia ciliata</i> | 0.22 |

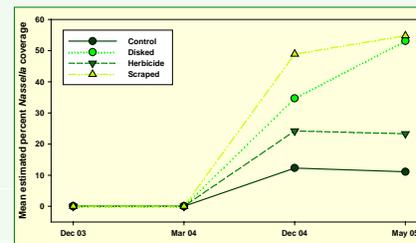


D-4 Tractor used for disking and scraping treatments.

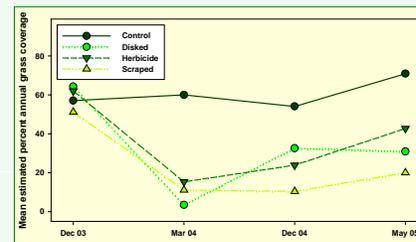


Location of treatment types.

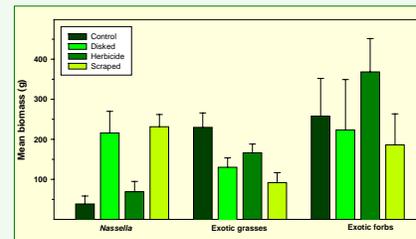
~ Results ~



Nassella pulchra cover through time.



Annual grass cover through time.



Mean aboveground biomass (+SE) of *Nassella*, exotic annual grass, and exotic forbs. Significant differences ($P < 0.05$) are computed between treatments, not species.

~ Conclusions ~

Soil preparation prior to seeding improved seed germination of *Nassella pulchra* and/or reduced cover and competition from annual non-native grass. Scraping resulted in a significant reduction of annual grass biomass and may be considered a viable option for annual grass reduction. The greater success of scraping in reducing annual grass biomass, compared to disking, may be attributed to lack of soil disturbance. Disking and scraping appear to be equally successful treatments, while herbicide application does not appear to favor the establishment of *Nassella pulchra*.



After treatment:
2 months above,
6 months right.

~ Acknowledgement ~

Many thanks to Dr. H. Jochen Schenk, Department of Biological Science; California State University Fullerton.

~ References ~

- Hamilton, J.G., Holzapfel C., & Mahall, B.E. 1999 Coexistence and interference between a native perennial grass and non native annual grasses in California. *Oecologia*, 121, 518-526.
- Seabloom, E.W., Stanley Harpole, O.J. Reichman, and D. Tilman 2003. Invasion, competitive dominance, and resource use by exotic and native California grassland species. *Proceeding of the Natural Academy of Sciences* 100 (Nov): 13384-13389.