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Effects of Erosion Control Treatments on Native Plant and Ryegrass Establishment

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Abstract:

Disturbed sites characteristically exhibit an encroachment of nonnative plant species and an alteration of native populations due to competition for water, light, and nutrients. The California Department of Transportation (Caltrans) hydroseeds as a standard technique for revegetation of highway construction sites in California. Hydroseeding involves mixing seeds, mulches, and fertilizers and hydraulically spraying the mixtures to disturbed soil banks creating a bed for plant species to germinate and establish. Hydroseeding is less labor intensive and cheaper than alternative methods, though is subject to high failure rates. Seeds have characteristic germination and growth requirements controlled by their unique microclimates; therefore, site-specific preliminary research is important. Over-application of erosion control materials can bury seeds at improper depths decreasing germination potentials. California Polytechnic State University, in conjunction with Caltrans, investigated soil stabilization treatments and burial depth influences on the germination capabilities of seven native District 5 California plant species and annual ryegrass.

Forty-eight 1M by 1M by 0.3 M deep boxes were set up in a 6 X 8 full factorial experiment and filled with 0.16 M (6 inches) of a medium sandy loam (USDA) soil and compacted to 90%. 0.1 meters (4 inches) of steam-sterilized soil of the same soil were added to the surface of the nonsterilized soil. Six treatments: gypsum, gypsum and wood fiber, guar tackifier, bonified fiber matrix (BFM), wood fiber, and bare were hydraulically applied to the soil surface. One hundred seeds of 8 plant species (*Lotus scoparius*, *Lupinus succulentus*, *Artemesia californica*, *Eriogonum fasciculatum*, *Escholzia californica*, *Bromus carinatus*, *Achillea millefolium*, and *Lolium multiflorum*) were hand planted into each treatment. Seeds were placed at 0.0064 meter (¼-inch) depths for the gypsum, tackifier and bare treatments, while gypsum and wood fiber, wood fiber and BFM were placed at 0.0064 and 0.013 meter (¼ and ½-inch) depths. Climate and watering conditions were kept consistent for all treatments and monitored for 100 days.

Germination percentages were measured. *Eriogonum fasciculatum*, *Artemesia californica*, and *Lotus scoparius* experienced less than 18 % germination for all treatments. *Lupinus succulentus* experienced less than 13% germination for all treatments. *Lolium multiflorum* (Ryegrass), with the highest germination rate for all species, had higher than 86% germination rates for all treatments. The BFM treatment resulted in the lowest germination percentages. Other methods, such as plugging, may be more suitable for rehabilitating sites depending on plant species and site conditions.

Key Words: Native Vegetation, Erosion Control, Vegetation Establishment, Hydroseeding, and Plant Germination