

# Restoration Techniques to Increase Survival and Vigor of Wyoming Big Sagebrush Seedlings<sup>1</sup>

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**Abstract:** Loss of shrub species in semi-arid systems reduces ecosystem function and causes abiotic resources to be re-distributed to, and monopolized by, competition from native and non-native plant species. Low water availability in dryland soils hinders shrub establishment and survival, and is the largest bottleneck of successful restoration in these disturbed environments. Our study focused on the efficacy of mechanically suppressing herbaceous species to reduce competitive pressures and increase the survival and reproductive value of transplanted shrub seedlings. We measured the effects of polypropylene fabric mulch and sod removal on 10,900 Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis* Beetle & A.W. Young) seedlings outplanted into two sites burned in different years (1986, 2012) in eastern Wyoming, USA. We transplanted seedlings in spring 2015 and monitored over two growing seasons (2015-2017). Two years post-planting, mean survivorship of sagebrush treated with 1m<sup>2</sup> sod removal (65% ±6) was up to one-fold higher than other treatments (p=0.0392). 1 m<sup>2</sup> polypropylene fabric dramatically increased the above-ground volume (cm<sup>3</sup>) of sagebrush canopy (up to 2400%; p<0.0001) and was the only treatment with a significant percentage of seedhead (60%; p<0.0001) produced by individual transplants. Sites outplanted with sagebrush 3-years post fire experienced higher rates of transplant survivorship, canopy volume, and seedhead production across all treatments (p=0.0299). Combining techniques of outplanting and mulching, in a timely manner following wildfire, can increase the survival, growth, and seedhead production of foundational shrubs in semi-arid environments. These findings can be useful for the successful restoration of ecosystem function in sagebrush steppe systems.

Additional Key Words: Competition, Disturbance, Ecosystem Function, Outplant, Sagebrush, Wildfire.

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