

# Competition Between Big Sagebrush and Crested Wheatgrass<sup>1</sup>

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## Highlight

Mortality of big sagebrush appeared to be related to presence of seeded crested wheatgrass. Roots of both species were restricted by a shallow hardpan. An experiment was performed to compare relative drought resistance of the two species when rooted in the same volume of soil. Water was withheld until all leaves were airdry. Crested wheatgrass was the only survivor in all replications.

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<sup>1</sup> Contribution from the Nevada Agricultural Experiment Station, University of Nevada, Journal Series No. 200. Received September 15, 1971.

From the beginning of artificial range revegetation in and adjacent to the Great Basin, big sagebrush (*Artemisia tridentata*) has been an indicator of site suitability for crested wheatgrass (*Agropyron desertorum*).

However, many good stands of grass have been reoccupied by sagebrush, even under conservative use. At the other extreme are the few examples in which wheatgrass has apparently suppressed and killed intermingled sagebrush. Theoretically, the climax dominant should reoccupy the site on the basis of superior adaptation. This principle was applied in the Northern Great Plains by Allred (1940). He found that crested wheatgrass (*A. cristatum*) could not compete successfully in stands of climax grasses but did thrive in successional communities. Poulton (1950) concluded that sagebrush will come back on seeded range eventually if the range is grazed but not burned.

A seeding trial was observed in the 1950's in which crested wheatgrass was intermingled with dead and stunted sagebrush. The 20-acre field had been seeded in 1939 as a study of seedbed preparation methods. It had been closed to stock from 1939 and to rabbits during the 1940's.



FIG. 1. Shallow roots of big sagebrush restricted to upper stratum of soil above the impervious pan where wheatgrass roots are also confined.

The tract is 3 miles south of Wells, Nevada. Precipitation at Wells is 9 inches per year. The land had been cleared in 1915 and sown to alfalfa which failed. Sheet erosion and total loss of understory preceded reoccupancy by sagebrush. The soil is very light in color, clayey and free of rocks, but has a cover of pebbles. At 10–12 inches an indurated pan resisted penetration by the chisel used in one of the seedbed preparations. This pan also deflected sagebrush roots, forcing them to occupy the same shallow stratum as roots of the competing grasses (Fig. 1). It was suspected that the grass roots were the more efficient absorbers when in direct competition with the sagebrush roots, and wheatgrass was therefore better able to survive under stress of drought.

To test the relative drought endurance of crested wheatgrass and sagebrush, competition for moisture was studied. Four-year-old sagebrush plants were transplanted individually into five 5-gallon buckets each containing 75 lb. of loamy fine sand. One month later, when the shrubs were growing normally, five 2-inch crested wheatgrass crowns were halved and the 2 clones were planted on opposite sides of the shrub in each bucket. All were watered to original weight after 3 weeks and set in a trench in the field in October.

During late summer, one year after transplanting the sagebrush, competition was intensified by reduced watering until the leaves of each species were airdry. Upon watering, only the wheatgrass responded. The sagebrush was dead in every container. Complete intermingling of the roots throughout the soil volume was revealed by washing away the soil in the buckets (Fig. 2).

Superior drought survival by crested wheatgrass appeared to be due to a well-branched root system (Eckert et al., 1961), self-defoliation under stress, and the protected position of crown buds. Sagebrush has only the potentially deeper root system which was not effective in the buckets or under the field conditions described for the area near Wells, Nevada.

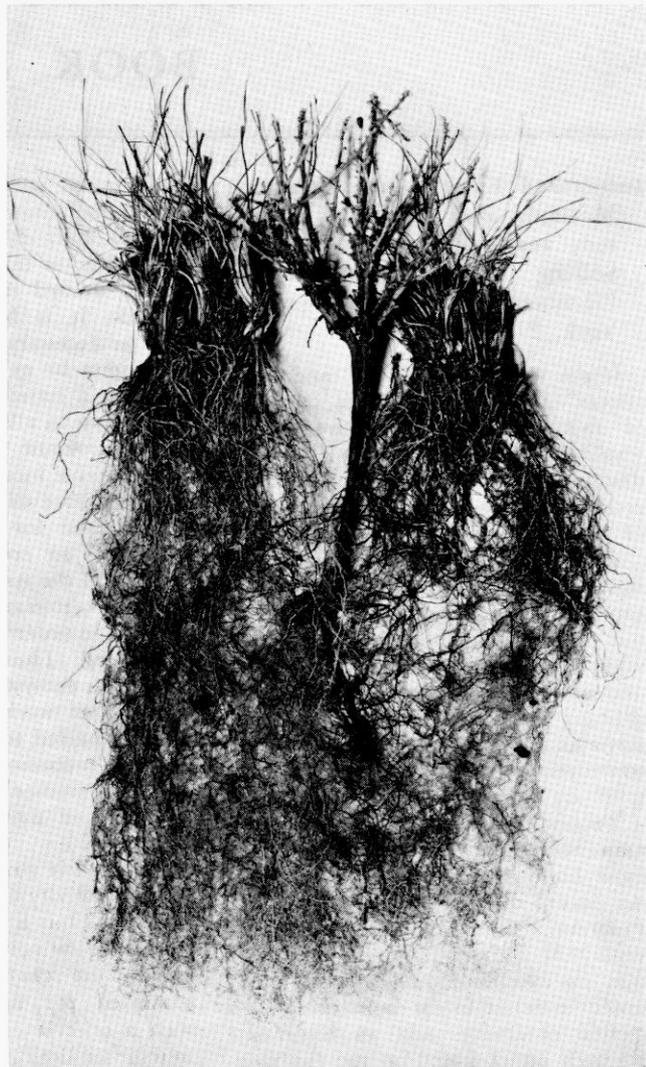


FIG. 2. Intermingled roots of big sagebrush and desert wheatgrass confined to 75 lbs. of soil for one year after transplanting.

This appears to be an example of one kind of severe site on which seeding and management of crested wheatgrass can hold sagebrush in check.

#### Literature Cited

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