Rooting Ability of Redberry Juniper Sprouts

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ABSTRACT

Redberry juniper (*Juniperus pinchotii* Sudw.; Cupressaceae) sprout rooting ability was evaluated following their mechanical dislodgement from the shrub bases of a random sample of a Rolling Plains population. The objectives of the evaluation were to determine if dislodged sprouts are capable of producing adventitious roots and establishing as individual plants. Twenty-five sprouting shrubs were slashed then top removed with chain saw cuts; random samples of dislodged sprouts from each shrub were placed on gravel and soil and watered monthly on a single bench of the greenhouse. All of the sprouts placed on gravel died within six months after dislodgement. Ninety-eight of the sprouts placed on soil survived and 22 of them produced adventitious roots and established as independent plants. Mechanical manipulation of shrubs can result in their dislodgement. If dislodged sprouts are dispersed to a site with access to soil and water they can establish as independent plants. Best management practices would suggest that mechanical manipulation of redberry juniper be deferred or followed by pyric treatment within one year of slashing or top removal to kill dislodged sprouts.

KEYWORDS: Juniper, *Juniperus*, sprouting

Populations of redberry juniper or cedar (*J. pinchotti* Sudw.) are found within Texas in the Trans-Pecos, Edwards Pleateau, High Plains, and Rolling Plains (Adams 1993). Juniper distribution was reported to have increased in a 65 county area of Texas from 6.3 million acres to 10.1 million acres between 1948 and 1982 (Ansley et al. 1995) with concurrent decreases in herbaceous productivity (Graves 1971) and alterations of precipitation regimes (Hester 1996). The reported increases in juniper distribution within these areas are hypothesized to be the result of seedling establishments in gaps of climax vegetation from either seed banks or dispersed seed (FEIS 1996). Though sprouting may also be a recruitment mechanism for redberry juniper, there are no published accounts of its potential role in the reported increased juniper distribution.

Redberry juniper sprouting (Sudworth 1905, Correl and Johnston 1979) occurs from meristematic tissue in the first leaf area of seedlings and plant canopy base of saplings, juveniles, and adults. Sprouting from this tissue is believed to be related to shrub age (Smith et al. 1975), size (Schuster and George 1976), or position in relationship to soil coverage (Smith et al. 1975). Redberry juniper sprouting has been assumed to be an adaptation to remedy loss of photosynthetic material, i.e., from being browsed or grazed (Adams 1994). Hypothetically, redberry juniper sprouting may also be a

reproductive strategy to produce clones that can be dispersed from the shrub by water, wind, or animal transport.

Management techniques employed in an attempt to decrease redberry juniper distribution and density between the 1940's and 1980's decades included dozing (Rechenthin et al. 1964), chaining (Vallentine 1989), mechanical removal (Ueckert and Whisenant 1982), and pyric treatment (Steuter and Britton 1983) with variable success rates related to post-treatment sprouting. Though there are many data reporting the growth rates and numbers of sprouts that are produced after treatment (Ahlstrand 1982, Kittams 1973, McPherson and Wright 1989), no data have been published that describe the behavior of sprouts dislodged from shrubs by mechanical manipulation. If dislodged sprouts are capable of surviving and producing roots, i.e., establishing as independent plants, mechanical manipulation may have contributed to the changes in redberry juniper distribution reported between the 1940's and 1980's decades.

Knowledge of redberry juniper sprout rooting ability would assist in understanding the recent historical changes in distribution and deciding if mechanical treatment alone should be deferred and/or augmented with post-treatment prescription fire or herbicide application. To determine if redberry juniper sprouts are capable of establishing as independent plants, we assessed their rooting ability after they were dislodged from shrub basal areas by mechanical manipulation. The null hypothesis for the study was that no redberry juniper sprout rooting would occur.

METHODS AND MATERIALS

Study material was collected 1 and 3 January, 1999 at the Roy Ranch located 22 miles southeast of Post, Texas in the Rolling Plains. Twenty-five shrubs growing in a Lincoln-Yahola complex, sandy clay loam on the flood plain of Gobbler Creek (33°4'N, 101°8'E) were randomly chosen. The shrubs varied in height from 3 to 6.5 ft but all had sprouts growing from their bases. The shrubs first had their lower limbs removed with a chain saw then were top removed with a cut made as close as possible to ground level. Sprouts that were dislodged from each shrub during the chain saw top removal were gathered, placed in plastic bags, and transported to the Texas Tech University Department of Biology greenhouse facility.

Ten randomly chosen sprouts from each cutting of each shrub were placed on the soil surface of 8 inch diameter plastic pots of either sandy clay loam soil collected at the site of shrub manipulation or gravel. Pots were inspected, rotated on a single greenhouse bench, and watered weekly with a pint dose of tap water for one month, then monthly for 11 months. The total number of sprouts that survived and developed roots was determined at the end of the 11-month period.

RESULTS AND DISCUSSION

All of the sprouts placed on gravel after collection died within six months. One hundred-two of the 250 (40.8%) sprouts placed on soil after collection also died within six months, but roots had developed on 22 (14.9%) of the survivors. A G-test of heterogeneity for sprout root development indicated greater numbers of rooting sprouts than expected by chance along ($G = 15.698$, 1 df; $p<0.05$). The null hypothesis that no rooting of redberry juniper sprouts occurs was rejected.

It appears that redberry juniper sprouting has two functions – maintaining plant occupancy after canopy loss and producing independent plants when sprouts are dispersed from the parent shrub. For the later, the number of sprouts that produce independent plants will be related to their dislodgement, dispersal, and deposition into a suitable habitat for rooting.

Under natural conditions animals may selectively dislodge sprouts and disperse them to areas of suitable habitat: we have documented redberry juniper sprouts incorporated in the entrances of white throated (*Neotoma albigula warreni* Merriam) trade-rat nests. Sprouts may also be naturally dislodged when a shrub falls or basilar branches die back and/or break off. In these scenarios water and wind may also disperse sprouts to suitable microsites. The mechanical manipulation of chain saw top removal in this study also caused sprout dislodgement with dispersal and deposition into microsites that contained shade from slash, soil contact, and increased water access from interception by slash.

The finding that redberry juniper sprouts are capable of establishing as independent plants provides a supplemental explanation for the changes in distribution and density documented during the 1970's to 1990's decades that has been attributed to maximized seed germination and seedling establishment. Mechanical manipulation was used in an attempt to control shrubs prior to and during this time period and doubtlessly dislodged sprouts. If dislodged sprouts were deposited into microsites that included soil contact and water availability, a percentage probably established as independent plants. The total number of plants that established from this pathway would be related to the total number of sprouts dislodged. The observation of seedling densities greater than 800 per acre on sites where mature redberry juniper had been dozed (FEIS 1996) has been attributed to soil seed bank response, but may have been compounded with 'sproutling' establishment.

Until field data for sprout establishment can be collected and analyzed it seems prudent to suggest that dozing, chaining, and top removal manipulations of redberry juniper should either be deterred or a treatment application after manipulation should be used to kill sprouts. Because there are presently no published herbicide trials or recommendations for redberry juniper sprouts, pyric application to slash is the only treatment that could be applied to kill sprouts before they root. This would require that fire treatment be applied to top-removed shrubs and slash within one year of treatment.

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