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Shearing and Growth of Five Intermountain Native Shrub Species[1]

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Abstract

We investigated growth of native Intermountain West shrub species sheared yearly. Five shrub species with potential for use in naturalized landscapes and roadside reclamation, silver sage (*Artemesia cana*), rabbitbrush (*Chrysothamnus nauseosus*), red-stem dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*), and curlleaf mountain mahogany (*Cercocarpus ledifolius*), were planted as seedlings in summer 1989. From 1991–1993, half of the plants were sheared to within 0.15 m (0.5 ft) of the ground every spring prior to or at budbreak. Crown height and crown cross-sectional area were measured every year prior to pruning. Significant shearing effects were detected in some shrubs the first year after shearing, with crown area affected more than height. Height of three species with a multi-stemmed habit, *C. nauseosus*, *A. cana*, and *C. sericea*, was unaffected by shearing both years. Crown area of all species except *C. sericea* was reduced by shearing. All species were able to regrow to at least 50% of the crown area and 70% of the height of the unsheared plants, suggesting they would be able to tolerate shearing as a management tool with little to no loss of vigor.

Index words: pruning, landscape, *Artemisia*, *Chrysothamnus*, *Cornus*, *Prunus*, *Cercocarpus*.

Species used in this study: silver sage (*Artemesia cana* Pursh); rabbitbrush (*Chrysothamnus nauseosus* (Pall.) Britt); red-stem dogwood (*Cornus sericea* L.); chokecherry (*Prunus virginiana* L.); curlleaf mountain mahogany (*Cercocarpus ledifolius* Nutt.).

Significance to the Nursery Industry

The results of this study show that five shrub species native to the Intermountain West tolerate yearly shearing with partial to complete regrowth to unsheared height and crown area. This information allows managers of road right-of-ways to select species that can improve aesthetics and soil stability while tolerating annual mowing. The results of this study show that these species can be maintained in commercial/residential low-maintenance landscapes by moderate to severe periodic dormant pruning and achieve acceptable appearance the same year.

Introduction

Native vegetation of the Intermountain region of the United States ranges from dominant steppe-scrub, adapted to high summer evaporation rate, low rainfall, and cold winter temperatures (2), to riparian species along rivers. Use of shrubs native to this region can play an important role in a variety of landscapes because the drought tolerance of these species can reduce or eliminate the need for costly supplemental irrigation.

Establishment of native shrub species is particularly important in disturbed areas along roads that are highly visible to the public. Native grasses are typically used, but interest in using native shrubs is increasing. Native shrubs add visual diversity and deeper and woodier root systems that impart greater soil shear strength (5), stabilizing slopes more effectively (3). Roadsides are often maintained by yearly shearing, but little is known about shrub response to such shearing. If highway departments knew how to manage shrubs along right-of-ways, consumer demand for these plants from the nursery industry would likely increase.

In addition, studies of pruning native shrubs in commercial/residential low-water-use landscapes to maintain an attractive appearance are needed. Interest in using native shrubs in low-water-use landscapes is increasing as water becomes more scarce and expensive in the Intermountain West. However, there is little to no information on the type and extent of maintenance required by Intermountain native shrubs in the landscape. A common complaint about these shrubs is their tendency towards rank and excessive growth, particularly under favorable landscape growing conditions. The objectives of this study were to determine how five shrub species native to the Intermountain West respond to annual shearing.

Materials and Methods

This research was conducted at the Utah State University research farm in Farmington, UT, approximately 20 miles north of Salt Lake City on a silt loam soil. In the summer of 1989, one-year-old seedling plants grown in 160 ml (10 in^3) tubes were planted in a split plot design where shearing was the main plot effect. Five species, silver sage (*Artemesia cana*), rabbitbrush (*Chrysothamnus nauseosus*), red-stem dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*), and mountain mahogany (*Cercocarpus ledifolius*), were assigned as subplots within each main plot, and each species subplot consisted of six-plant sub-samples. Each individual plant sub-sample was assigned to random locations within a main plot. Each block consisting of paired sheared and unsheared main plots was replicated four times.

These five species have diverse native habitats. *C. nauseosus* is a multi-stemmed shrub that grows to 1.5 m (4.5 ft) found in extremely dry and well-drained, often disturbed, soils throughout the Intermountain West from 600–3,000 m (2,000–10,000 ft) elevation (1, 5). *A. cana* is also a multi-stemmed, suckering shrub of more limited distribution that grows to 1 m (3 ft) (1). *P. virginiana* is a larger, 3–5 m (9–15 ft), suckering shrub found in multiple-stem groves throughout the west (1, 5). Both *P. virginiana* and *A. cana* are found at higher elevations from 1,400–3,000 m (4,500–10,000 ft) on well-drained slopes as well as bottomlands. *C. sericea* is another widely distributed, 1.5 m (4.5 ft) high, multi-stemmed

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Table 1. Final height each year in cm over a four-year period for five sheared and unsheared shrub species native to the Intermountain West.

	1990[z]	1991	1992		1993	
	Pre-shearing		Sheared	Unsheared	Sheared	Unsheared
	cm					
Artemisia cana[y]	15c	64b	87c	89cd	90cd	90c
Cercocarpus ledifolius	34a	67b	82c*	103bc*	81d**	141b**
Chrysothamnus nauseosus	33a	84a	104b	111b	110b	123b
Cornus sericea	35a	43c	77c	77d	95c	98c
Prunus virginiana	26a	76a	126a*	148a*	148a*	205a*

[z]Differences among species within a column separated by least significant difference (LSD) at 5% level of probability.
[y]Differences between shearing treatments within a row separated by t-tests at 5% (*) and 1% (**) level of probability.

shrub found in riparian habitats from 900–2,700 m (3,000–9,000 ft) (1, 5). While *C. sericea* is not found in dry habitats, it was included because it is a native species commonly used in landscapes; and because it is known to take pruning well, it can serve as a reference species. *C. ledifolius* is a drought-tolerant evergreen, single-stemmed but round headed, large shrub or small tree that grows on exposed, gravelly outcrops from 1,500–3,000 m (5,000–10,000 ft) and is widely distributed throughout the mountain west (1, 4).

The plants were allowed to establish during the first year with irrigation. The experiment was not irrigated in subsequent years and the plants received no fertilizer during the course of the experiment. Weeds were controlled with cultivation and directed sprays of foliar-applied post-emergent herbicide (Round-up™) as per manufacturer's recommendations. The plants were allowed to grow without shearing the first two seasons. Height was determined by measuring the single highest growing point. Crown cross-sectional area was estimated by measuring the width of the shrub at its widest point (with the exception of dead flower stalks on *A. Cana*) and the width perpendicular to the original measurement. Crown cross-sectional area was calculated using the average crown radius taken from the two perpendicular measurements to calculate the area of a circle. Starting in 1991 after measurements were taken, *C. ledifolius*, *C. nauseousus* and *C. sericea* in the shearing plots were pruned such that all branches were cut back to 0.15 m (6 in) in length, resulting in a hemispherical shape. Cutting all stems to within 0.15 m (6 in) of the crown was done to better assess plant response to severe pruning. Suckering shrubs (*P. virginiana* and *A. cana*) were cut flat at 0.15 m (6 in) above the ground.

Analysis of variance for a two-way split-plot design was used to initially determine differences among main effects on height and crown area. Analysis was conducted on the sub-sample mean for each species × treatment combination. Where the species by shearing interaction term was significant, differences between shearing treatments within a species were determined by t-tests at 5% and 1% level of probability. Differences among species within a shearing treatment were determined by Duncan's multiple range test at the 5% level of probability.

Results and Discussion

Shearing reduced size in some species more than others, but all species were able to vigorously re-grow following shearing (Tables 1 and 2). All species grew rapidly during the first two years of establishment when plants were unsheared. Survival during the establishment period was high: 100% for *A. cana*, 94% for P. virginiana, 90% for *C. ledifolius*, 75% for *C. nauseosus*, and 67% for *C. sericea*. At least three sub-sample plants survived in each main plot except for one shearing plot where only two *C. nauseosus* survived. During this establishment period survival was identical, 85%, between the to-be sheared and unsheared blocks prior to implementation of shearing. Implementation of shearing treatments following establishment resulted in the death of only three plants in the entire experiment after the first shearing, and none after the second. The three dead plants were *Chrysothamnus*, 14% of the total plant number for that species. Height of all species doubled between the 1990–1991 growing seasons, with few differences among species. Area

Table 2. Total crown area in cm² over a four-year period for five sheared and unsheared shrub species native to the Intermountain West.

	1990[z]	1991	1992		1993	
	Pre-shearing		Sheared	Unsheared	Sheared	Unsheared
	cm²					
Artemisia cana[y]	115b	2574b	4746b*	7083b*	28077b*	39353b*
Cercocarpus ledifolius	48c	637c	1454c	1876c	7662d*	13438c*
Chrysothamnus nauseaosus	542a	5120a	5897a**	10643a**	33730a*	62030a*
Cornus sericea	17c	750c	2140c	2354a	14400c	17596a
Prunus virginiana	11c	506c	1523a	2604a	13941c*	18844a*
LSD (0.05)	34	600	520	1157	5173	6820

[z]Differences among species within a column separated by least significant difference (LSD) at 5% level of probability.
[y]Differences between shearing treatments within a row separated by t-tests at 5% (*) and 1% (**) level of probability.

increased an order of magnitude between 1990 to 1991 for all species, with *C. nauseosus* and *A. cana* growth 3- to10-fold greater than the other species.

Shearing affected height of only two species (Table 1). Because of its more tree-like habit, *P. virginiana*, sheared and unsheared, was the tallest of the five species. Probably because of its greater potential size, shearing significantly slowed height regrowth of *P. virginiana* by about 15–28%. *C. ledifolius* is a slower growing species with a more single-stemmed, upright growth habit, and shearing resulted in significantly lower height and a thick, dense, multi-stemmed crown. Both years' regrowth of sheared *C. ledifolius* was the same, 80% and 57% of the unsheared plants for 1992 and 1993, respectively. Three species, *C. nauseosus*, *A. cana*, and *C. sericea* were able to regrow to the height of unsheared plants in every year of the study. *C. nauseosus*, *A. cana*, and *C. sericea* have a broader, multi-stemmed growth habit where new shoots grow rapidly from buds in the root crown through older interior stems that die after several years. Shearing of these species vigorously stimulated new shoots from the root crown.

Crown area was affected more than height growth by shearing (Table 2). In 1992, the first year following shearing, sheared *C. nauseosus* and *A. cana* achieved 55–65% the area of the unsheared plants. In 1993, all species but *C. sericea* had significantly smaller sheared crown size. Interestingly, while crown height did not vary more than 100% among species, crown area varied more than 4-fold. This variation was due to the rapid lateral growth of unsheared *C. nauseosus* and *A. cana*, as their area increased by an order of magnitude every year. *C. ledifolius* had the least crown area, due to slower growth rate and more tree-like growth habit.

All species were able to re-grow to at least 50% of the crown size and 70% of the height of the non-sheared plants following two years of shearing with negligible mortality. This ability to re-grow suggests that roadside mowing would not be detrimental to growth, and not limit the ability of these shrubs to compete with surrounding herbaceous vegetation. The multi-stemmed shrubs, *C. nauseosus*, *A. cana*, and *C. sericea*, behaved differently than *P. virginiana* and *C. ledifolius*, achieving most of their height growth within three years after transplanting. Sheared plants grew rapidly enough to approach the height of unsheared plants by the end of each growing season. Unsheared *P. virginiana* and *C. ledifolius* showed steady height growth each year, while the sheared plants remained shorter. The rapid height and crown area regrowth of *C. nauseosus* and *A. cana* following shearing suggest that they would be very successful competing with other vegetation while tolerating annual mowing. Timing may be important, as plants were sheared in early spring, but along a roadside shearing would likely occur during the summer with unknown effects on growth.

Landscape professionals may be somewhat reluctant to recommend many of the shrubs native to the Intermountain area for landscapes because they are opportunistic in their growth habits. These shrubs can proliferate if given favorable growing conditions such as deep soils and a wet growing season or even incidental irrigation. Such prolific growth may become rank and unattractive with time. This study has shown that shearing these shrubs can be recommended as an effective management tool for improving their appearance, and reducing their vigor if needed. In addition, sheared *C. ledifolius* produced a thick, dense crown in a manner typical of other shrub species used for hedges. The density of the crown, combined with its small, evergreen foliage, makes *C. ledifolius* a potentially effective evergreen hedge in landscapes requiring cold-hardy plants with minimal water use.

Native shrubs have not been accepted in Utah as an effective alternative to perennial grasses as non-irrigated roadside vegetation, even though they can utilize water harvesting by the adjacent road surface and offer increased plant diversity, wildlife habitat, and season-long green foliage as compared to dormant grasses. The concern that shrubs cannot survive the common practice of periodic roadside mowing is discounted by this study. However, the effect of competition by herbaceous plants on the growth of sheared shrubs was not addressed.

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