Saltcedar Control

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Since its introduction into North America, saltcedar (*Tamarix ramosissima*), also called tamarisk, has spread throughout the southwest, up the Rio Grande and Colorado River drainages and throughout the Great Basin. Saltcedar, which is a facultative phreatophyte, vigorously consumes water, and invades lowlands and riparian areas where it competitively replaces native grasses, forbs, shrubs, and trees. It spreads and colonizes along stream banks, in areas with high water tables, and in seasonal moist spots in desert regions. It tolerates high amounts of salt, cold, drought, and flooding.

As saltcedar communities establish, native species are reduced in number and replaced. The resulting vegetative communities are much less valuable to livestock and wildlife than are the original native communities. Pheasant and songbird species density and total number of birds decrease as saltcedar invades and increases in density. Waterfowl habitat quality and quantity can be reduced by saltcedar due to reduced forage production and decreased nesting cover. Use of roads, access areas, and associated dikes are also adversely impacted by encroaching saltcedar. Riparian values are also reduced with the invasion of saltcedar.

Saltcedar stands build up large amounts of dry woody material that is susceptible to fire. In addition, saltcedar has exceptional fire tolerance and resprouts vigorously after burning. Saltcedar can increase the frequency of fire, and fire can increase the density of saltcedar, while reducing the density and composition of the native community.

There is no universal solution to managing saltcedar. Total control requires killing all plants and controlling reproduction. Mechanical treatment has ranged from chaining to root plowing and pulling plants up with unacceptable success (Kerpez and Smith 1987). Long-term inundation has been shown to be a somewhat effective means of kill and control (Kerpez and Smith 1987; Taylor and McDaniel 1997). The effectiveness of alternating livestock grazing (Hughes 1993), and employment of beavers and insects (Glausiusz 1996) in reducing the density of saltcedar has been reported. A number of herbicides have been evaluated with varying results (Duncan and McDaniel 1997). Herbicides have been applied to the foliage, stems, the base of the stump, and the root zone with varying success. Previous investigation by the authors demonstrated that saltcedar plants with ruptured bark were substantially more susceptible to a number of herbicides than were plants with nonruptured bark. These initial results lead to further investigation.

Saltcedar control studies employing a number of herbicides were established within saltcedar stands with and without various types of bark and stem injuries. The stands were located three miles southwest of Delta, Millard county, Utah, where the Sevier River terminates in a wide, gentle-sloping flood plain. Within the area there were three distinct age-size class stands of saltcedar; young, mature and old-decadent, classified according to Brotherson et al (1984). Separate studies were conducted within each of these three age classes. Soils were poorly drained, silty, clay loam. Herbicides and rate employed were Spike 20P (Tebuthiuron AI 20%), Roundup (Glyphosate AI 59%, 4 tablespoons per gallon), Weedmaster (2,4-D and Dicamba AI 51%, 1 tablespoon per gallon), 2,4-D (AI 65%, 8 tablespoons per gallon), and Tordon 22k (Picloram AI 24.4%, 2 teaspoons per gallon).

Approach

Older-aged plants

Spike 20P pellets were applied in mid November 1990 at four rates (0, 6, 18, and 30 pounds per acre) to four older saltcedar stands. Spike was applied to five 16 ft.^{2} randomly selected plots per rate per stand. Two stands were burned by wildfire eight months later (July). Individual saltcedar plants within each plot were evaluated prior to application, one year and two years (Table 1) following treatment. Understory vegetation of treated plots was evaluated three years following application (Table 1).

Mature plants

Randomly selected, mature saltcedar plants were individually exposed to one of six different mechanical treatments; 1. scraping less than 1 square inch of bark off two stems per plant; 2. prune all stems off at 8 inches above ground level; 3. prune 3/4 of all stems off at 8 inches above ground level; 4. prune 1/2 of all stems off at 8 inches above ground level; 5. prune 1/4 of all stems off at 8 inches above ground level; and 6. control—no stem pruning or bark disturbance. One of three herbicides; Roundup, Weedmaster, or 2,4-D

Table 1. Older-aged plant mortality and live understory. Percent of older-aged saltcedar plants dead two years following treatment with Spike 20P (*tebuthiuron*) and percent live ground cover of understory species three years following herbicide application.

	Pounds of Spike 20P per Acre			
	Control	6 lbs.	18 lbs.	30 lbs.
	(%)			
Saltcedar death two years post treatment	12	61	79	94
Live understory three years post treatment	76	35	8	6

Table 2. Mature plant mortality. Percent of mature pruned or debarked saltcedar plants that were dead two years following pruning or debarking and herbicide application.

Herbicide	Treatment[1]		
	Stem pruned[2]	Debarked[3]	Control[4]
	---------- (%) ----------		
Roundup	76	59	1
Weedmaster	90	91	2
2,4-D	95	95	2

[1]Average percent kill on three treatment application dates. No significant differences in percent kill between treatment dates (June—84%, July—84%, November—85%) with pruned and debarked stem.
[2]Average percent kill of 4 pruning treatments. No significant difference between the four pruning treatments.
[3]Less than 1 square inch of bark removed from each of two stems per plant.
[4]Herbicides but no pruned or debarked stems.

was applied in association with each of the mechanical treatments. On each of three different dates (the first week of June, July and November 1991) four plants were exposed to each mechanical treatment-herbicide combination. Herbicides were applied to saturation to bark injury areas or pruned stem ends within one hour of bark removal or pruning. Two years following treatment (Table 2), individually treated plants were rated as dead or alive.

Young plants

Within a young, even aged saltcedar stand 45- 16 ft.^{2} plots were identified. On each of three dates (June 20, July 12, and November 6, 1991) one third of the plots were randomly selected and all plants within each plot were cut off 8 inches above the ground level with a chain saw. Four herbicides; Weedmaster, 2,4-D, Tordon 22k , Roundup, and control - no herbicides were each applied to three randomly selected 16 ft.^{2} plots that had all plants cut off within the last hour. Plants were evaluated as to their status; dead or alive, one and two years following treatment (Table 3).

Discussion

On poorly drained, silty clay soil, percent of saltcedar plants killed varied with herbicide, pruning and bark injury, date of application, and age of saltcedar plants. Twelve percent of older, untreated saltcedar plants died of natural causes in two years, whereas, only 1 to 2 percent of young and mature saltcedar untreated plants died during the same period.

Table 3. Young plant mortality. Percent of young saltcedar plants dead two years following 100% stem pruning and spraying with one of four herbicides on three dates.

Herbicide	Date of Pruning and Herbicide Application			
	June	July	Nov.	Ave.
	---------- (%) ----------			
Weedmaster	57	23	54	45
2,4-D	48	29	59	45
Tordon	91	86	51	76
Roundup	7	7	7	7
Control—prune, no herbicide	2	1	1	1

Fig. 1. *Saltcedar stand two years following treatment using six pounds per acre of Spike 20P (tebuthiuron).*

Older-aged plants

Older-aged saltcedar plants did not show any visible effect from the herbicide Spike, for the first seven to eight months following application. By 12 months, death was ap-

Fig. 2. *Saltcedar plant two years following less than 1 square inch of bark removed from two stems and injured area sprayed with 2,4-D.*

Fig. 3. *Saltcedar plants two years following one fourth of stems removed and stem ends sprayed with 2,4-D.*

Mature plants

Treated mature plants showed no significant difference in the percentage of plants killed with regard to number of stems removed or bark removed. What appears to be important is whether the bark is injured or not. For any of the herbicides to be effective, stem bark had to be injured. The amount of bark injuries to a plant did not need to be great. Scraping less than 1 square inch of bark off two stems per plant (Fig. 2), and applying the herbicide to the scraped areas resulted in death. Herbicides applied to various number of cut off stem stumps (Fig. 3) and to scrapped openings in the bark resulted in similar kill rates. Roundup was the least effective (67% kill) (Table 2) of the herbicides evaluated. Weedmaster, Tordon, and 2,4-D all resulted in over 91% kill of barked or stem cut plants with June, July, or November application dates.

Young plants

Young saltcedar plants (Table 3) were less susceptible to stem pruning and herbicide treatments than were mature plants treated in the same manner (Table 2). Roundup had little effect (7% kill) on young plants, cut off and treated in June, July or November. Kill of young plants was somewhat variable with Weedmaster (45%), 2,4-D (45%) and Tordon (76%). More kill resulted from June application (Fig. 4.) than from November or July application dates. July was the least effective time of application.

Higher percent kill of saltcedar can occur when stem bark is disturbed prior to herbicide applications. Individual plants could receive bark injuries with a shovel, ax, pulaski, chain saw, etc. Complete stands and individual plants can receive bark and stem injuries and breakage when treated

parent. Up to 30 percent of plants that appeared dead resprouted 16 months following application. All resprouted plants were, however, dead by the end of the second growing season (Table 1). The manufacturers recommended rate of 6 pounds per acre for woody plants resulted in 61 percent kill two growing seasons following application (Fig. 1). By increasing the rate three and five times, percent kill was increased to 79 and 94 percent respectively. Understory vegetation, primarily inland saltgrass (*Disticlis spicata*) and annual kochia (*Kochia scoparia*), density was reduced by more than 50% with the light (6 lbs./A) treatment, and by over 90% with the two heavier treatments. There was no difference in percent kill of saltcedar plants between spike treated burned and non-burned stands. Spike adversely affected understory species for up to three years following treatment.

Fig. 4. *Young-aged saltcedar stand two years following pruning with a chain saw and sprayed with 2,4-D in June.*

Fig. 5. *Disk chain being pulled through a saltcedar stand prior to green-up to inflict bark injury and stem pruning. Stand was then aerially sprayed with 2,4-D.*

with an anchor chain, disk chain (Fig. 5), disk or rotobeater and then sprayed with the appropriate herbicide.

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