

HERBICIDES FOR CONTROL OF WESTERN JUNIPER

W. C. Krueger, T. R. Bunch, and K. Killingsworth

Western juniper (*Juniperus occidentalis*) is a native tree present in much of central and eastern Oregon. Because of its large appetite for water, it is considered a problem species on certain rangelands when objectives are to produce satisfactory amounts of forage suitable for livestock and wildlife grazing. Invasion of juniper from its native rocky ridgetops into areas of deeper soil where it is not natural has greatly reduced forage production on these previously desirable rangelands. The general absence of wildfire through both man's intervention and ecological change will maintain extensive stands of invaded juniper, unless direct control programs are developed to arrest the spread of these trees and reclaim the land they have invaded.

This study was developed to evaluate two herbicides (picloram and karbutilate) previously known to be effective control agents for related but different junipers in the Southwest. The study was partially supported by Dow Chemical Company and FMC Corporation.

EXPERIMENTAL PROCEDURES ¹

Study areas representative of juniper stands on good soils were selected. In Wheeler County, the junipers were associated with: shrubs - basin big sagebrush (*Artemisia tridentata* subsp. *tridentata*), antelope bitterbrush (*Purshia tridentata*), gray and green rabbitbrush (*Chrysothamnus* sp.), and snakeweed (*Gutierrezia* sp.); forbs - western yarrow (*Achillea millefolium*), goatsbeard (*Tragopogon* sp.), silvery lupine (*Lupinus argenteus*), lomatium (*Lomatium* sp.), buckwheat (*Eriogonum* sp.), and a variety of annuals; grasses - Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), bluebunch wheatgrass (*Agropyron spicatum*), cheatgrass (*Bromus tectorum*) and other annuals. A total of 150 trees were selected for study representing small (less than six feet tall), medium (6 to 12 feet tall), and large (above 12 feet tall) size classes. Picloram was applied as Tordon beads at 0.2, 0.4, and 0.6 grams active ingredient per plant. Karbutilate was applied as Tandex granules at 4.7, 11.3, 17.0, and tablets at 1.25, 2.50, and 5.00 grams of active ingredient per plant. The herbicides were broadcast in late December 1971 in a uniform manner under the drip line of each tree. All treatments were evaluated in the fall of 1972, 1973, and 1974.

In Crook County, the junipers were associated with: shrubs - basin big sagebrush, mountain big sagebrush (*A. t.* subsp. *vaseyana*), low sagebrush (*A. arbuscula*), gray rabbitbrush; forbs - buckwheat, lupine, and yarrow; grasses - Sandberg bluegrass, bluebunch wheatgrass, Idaho fescue, junegrass (*Koeleria cristata*), squirreltail (*Sitanion hystrix*), and cheatgrass.

¹ For clarification, trade names have been used in this report. This is not to imply endorsement of products named or criticism of those not included.

A total of 50 trees were selected for study. All trees were in the small size class. Picloram was applied as Tordon 10K pellets at two, four, and six grams active ingredient per plant placed uniformly beneath the drip line of the tree. In addition, a second treatment of four grams active ingredient thrown at the base of the tree with no regard to the drip line was established. The herbicide was applied in the fall of 1972 and evaluated each fall in 1973 and 1974. Results were recorded as a visual estimate of level of activity and rates as follows: (1) no dead tissue, (2) up to one-quarter of the branches appeared dead, (3) one-quarter to three-quarters of the branches appeared dead, (4) more than three-quarters of the branches appeared dead and (5) no living tissue apparent.

RESULTS AND DISCUSSION

Picloram

In Wheeler County, no satisfactory kill was found for all sizes of trees (Table 1). Activity of the herbicide did not tend to increase over the three growing seasons studied. In Crook County, all the trees treated were dead at the end of the second growing season. The herbicide thrown at the base of the plant and not distributed around the drip line also resulted in a complete kill. These studies established that the correct rate of application is between 0.1 and 2 grams active ingredient for small trees. The label for Tordon 10K recommends that small trees should be treated with one tablespoonful of herbicide. This is approximately 2 grams active ingredient per plant.

Table 1. Level of activity of picloram applied to three size classes of junipers (1 = no dead tissue and 5 = all tissue dead) in 1974

Size	Wheeler County				Crook County			
	Control	0.2 g a.i.	0.4 g a.i.	0.6 g a.i.	Control	2 g a.i.	4 g a.i.	6 g a.i.
Small	1.6	2.6	3.4	3.6	1	5	5	5
Medium	1.6	1.8	2.0	2.6	-	-	-	-
Large	1.4	1.8	2.0	1.6	-	-	-	-

General observations of the study areas suggested that this herbicide was also toxic to gray rabbitbrush and cheatgrass but not to perennial grasses or sagebrush. Small junipers in the Crook County plots that were with 4 to 5 feet of treated trees usually died.

Karbutilate

Activity of this soil sterilant continued to increase each of the three years studied for all treatments on small and medium sized trees. No impact was noted for large trees. The proper rate of application to kill small trees was 5 grams active ingredient per tree and medium sized trees required 11.3 grams active ingredient (Table 2).

Table 2. Level of activity of karbutilate applied to three size classes of juniper (1 = no dead tissue and 5 = all tissue dead) in Wheeler County

Size	Granules (g a.i.)				Tablets (g a.i.)		
	Control	5.7	11.3	17.0	1.25	2.50	5.00
Small	1.6	4.6	5.0	5.0	2.6	3.4	5.0
Medium	1.6	3.2	4.6	4.5	1.4	2.4	2.4
Large	1.4	1.5	1.4	1.7	1.3	1.6	1.2

Records of effects of karbutilate on associated vegetation were not kept at this study site. However, in an allied study in Wasco County on an oak site, we broadcast the herbicide at four pounds active ingredient per acre. This eliminated annual plants, 70 to 80 percent of the perennial grasses and forbs, about half the sedges, and had no effect on woody plants. This effect occurred the first year after treatment. By the end of the third growing season, a few annuals began to show in the plots but no recovery of perennial vegetation had occurred.

POTENTIAL

We know picloram and karbutilate effectively will control western juniper. Studies by Britton and Sneva indicated tebuthiuron also is effective for controlling juniper. Of these, only picloram is registered for this use on rangeland in Oregon. Karbutilate and tebuthiuron both act as soil sterilants at rates high enough to kill juniper but on gentle slopes this effect is restricted to the site of application. Since the juniper tree competes with herbage some distance from the tree itself (perhaps 2 to 3 times its height), a local sterilization should still release considerable suppressed forage and these herbicides are worth consideration. However, picloram has little influence on grasses at the site of application and where sagebrush is not dense it should be superior to these other herbicides.

Costs are too high to consider herbicides as a general management tool to reduce overstories of dense juniper trees. However, they may be useful for maintenance of improved or good condition rangeland where the need for maximum forage production make a particular pasture especially important to a ranching operation or for foraging by wildlife.