

# Management of Juniper on Rangeland in Bosque County

## Cost comparison of shearing and grubbing.

By Allison Pyszen

In Bosque County, Texas, known as the “Top of the Hill Country,” a major concern about our rangeland is the Ashe juniper and redberry juniper coverage. Cedar is a common name for these junipers. Bosque County is a rural county with a population of an estimated 18,000 persons. One unique aspect of the county is that over 70% of the land in Bosque County is owned by absentee landowners from Dallas and Fort Worth. The Bosque Soil and Water Conservation District Board has estimated that 72% of Bosque County is rangeland, and that Ashe juniper and redberry juniper infest 324,000 acres out of 641,000 acres. Therefore, controlling the juniper species by an economical method is of great importance.

I live on the Old Sundown Ranch in Bosque County, Meridian, Texas. The ranch has about 5,000 acres, and we apply control methods to reduce the amount of juniper we have on the ranch. A major reason for the juniper control on the ranch is that the land is needed for beef cattle and other livestock grazing. The ranch has an ample amount of other brush species for cover for livestock and wildlife.

*Juniperus ashei*, better known as Ashe juniper, is a single-based tree that reaches 35–40 feet in height. The round-formed base canopy shape is usually less than 12 feet in diameter. The plants can be found secluded but are predominantly found in groups. Ashe juniper has a potent scent and is native in North America. The bark of the tree has a shredding texture that is gray to reddish brown. The fruits of the tree, which ripen in August and September, are blue, berry-like cones. When mature, the bark of the Ashe juniper peels off in long, thin strips, which provides nests for many birds. As you drive along the county roads and highways, you

will see that many fences consist of Ashe juniper and a few strands of old barbed wire. Once Ashe juniper is cut off at the base, it will not grow back again.

*Juniperus pinchotii*, or redberry juniper, is a multistemmed shrub or a small tree that is found throughout rangelands in Oklahoma, New Mexico, Arizona, and Texas. This tree does not usually exceed the height of 15 feet. The uneven canopy shape is normally less than 12 feet in diameter. Redberry is a major invader on lowland ranges. The bark is cracked lengthwise into scales and has an ashy-gray color. Redberry's fruit is a reddish- or copper-brown color. When the tree is less than 8 years of age, the bud zone will be at or above the ground; then as the tree develops, the bud zone moves below the ground toward the root system. To achieve control, redberry juniper has to be cut off below the bud zone.

Both Ashe juniper and redberry juniper are evergreen species with trees of both genders. These two aggressive junipers reduce the rangeland production of grass and forbs, which in turn provides less grazing for livestock and wildlife. One study near San Angelo, Texas (Table 1), indicated that forage production would be reduced from 1,900 pounds per acre to 283 pounds per acre. With a closed juniper canopy this would result in a 675% increase in acres required to graze one animal unit.

Junipers interfere with grass and forb production by intercepting rainfall before it reaches the ground and reduce the amount of water that can be infiltrated into underground aquifers. The canopy of a typical mature redberry juniper intercepts 26% of the annual precipitation. The canopy of the Ashe juniper intercepts 37% of the annual precipitation.



**Figure 1.** Royce Pyssen, Allison's dad, driving the skid-loader with the hydraulic shearing attachment.



**Figure 2.** Royce Pyssen driving the skid-loader with the grubbing attachment.

Ashe juniper litter intercepts about 43%, and red-berry juniper litter intercepts an estimated 40% of the annual rainfall. This makes the effective rainfall 6.4 inches out of 32 inches in areas covered with Ashe juniper.

Proper grazing management is important to overall juniper management as overgrazing of livestock will contribute to an increase in junipers. When seedlings fall to the ground and the grasses or forbs are overgrazed, the seedlings can receive more of the nutrients, water, and sunlight that they need to develop. The trees will grow quickly under these circumstances. Conversely, if the seedling falls into a protective grass cover, it will not be able to develop quickly, or at all.

Ashe and redberry juniper can be controlled by chemical, biological, and mechanical methods, as well as by fire. Chemical-control measures include a leaf spray or a soil spot spray. Generally, spray is

applied to juniper when the tree is 3 feet in height or smaller.

The grazing of goats can be another biological type of brush control. Adjustments to the stocking rate, grazing time, and stock density can be tailored to achieve the control desired. Because of the low palatability of juniper, most of the grass and forbs have been overgrazed by the time control is obtained on 3- to 5-foot junipers.

Burning can be a type of biological brush control, but it has been mostly used as a follow-up to mechanical or chemical brush control. When junipers 4 feet high or taller are burned, they require a more intense fire in conditions that increase landowners' liability exposure.

Mechanical control practices may include hydraulic shearing or grubbing, during which a skid-loader or a tractor may be used. Mechanical practice also includes bulldozing. Bulldozing is probably the

**Table 1. Effect of juniper on production near San Angelo, Texas**

Productivity	No juniper	Partially closed canopy	Closed canopy
Forage production, pound/acre	1,900	1,156	283
Carrying capacity acres/animals unit year	20	33	135
Increase acres required per animal unit year, %	0	165	675

**Table 2. Comparison of control methods**

	Plot 1 (shearing)	Plot 2 (grubbing)
Height of 100 trees (inches)	5,953	6,310
Average height per tree	59.53	63.1
Plot size (square feet)	3,510	3,969
Plant density per acre	1,241	1,098
Cost per plot	\$23.60	\$8.53
Cost per acre with 1,000 trees	\$238.30	\$87.09
Cost per acre	\$294.94	\$106.60
Cost per inch	\$0.004	\$0.0014

most beneficial type of mechanical control when juniper is over 10 feet tall and the cover is heavy.

Hydraulic shearing is a mechanical technique that cuts the base of the tree like a pair of scissors. Tree shearers come in several different brands and sizes. They all basically work the same, but the larger models will cut trees up to 20 inches in diameter. When shearing a tree, the blades of the shearer will slowly move together and cut the base of the tree. Because the shearing attachment is on the front end of a tractor or skid-loader, the cutting height from ground level can vary, but most people use it as close to ground level as possible. Hydraulic shearing can present a few limitations such as being slower than grubbing. It takes 15 seconds to successfully shear a tree with a 6-inch-diameter base. Hydraulic shearing offers a way to work under the canopy of desirable trees such as live oak and blackjack oak because little or no soil disturbance occurs. Hydraulic shearing could be useful when trying to rid an area of Ashe juniper, but redberry juniper would have to be younger for shearing to work successfully. For instance, the bud zone would have to be above ground; otherwise, the tree will grow back after being cut off.

The other mechanical method is grubbing. A grubber is a 2-pronged device that forks the tree at

the base and then raises the tree and most of the root system out of the ground. Grubbing, just like hydraulic shearing, can exhibit a few limitations. The grubber works best on smaller trees with a base of 6 inches in diameter or less. It causes soil and root disturbance under desirable trees. Grubbing is more effective on a wider variety of tree species, such as Ashe juniper, redberry juniper, mesquite, elbow brush, oaks, and elms. An added benefit is that if reseeding is needed, the grubbing technique pulls the whole root system out of the ground, and stirs up all the nutrients, thus making an excellent seedbed with its own irrigation system.



**Figure 3.** This is the test plot before the hydraulic shearing method was used.



**Figure 4.** Allison's family marking and measuring the height of the Ashe juniper in the plot.

In research planned by the local county extension service and conducted by my dad and me on the Old Sundown Ranch, we have been able to explore the cost of shearing versus grubbing of Ashe juniper. This experiment was conducted on January 1, 2004. We marked and measured Ashe juniper trees in 2 plots of 100 Ashe junipers on a site located on the ranch. The area where the data were collected was regrowth of Ashe juniper cleared 4 to 5 years earlier. First, we determined the site by selecting 2 plots where the juniper height and land area were relatively equal. Second, we flagged and measured the individual size of each tree in inches using a stick that we had premeasured and marked. We then measured the plot size. The soil type was an eckrant and the moisture of the soil was moderate to dry. All economic data is based on \$45 an hour. This was the average cost based on quotes from 3 custom operators in Bosque County. Finally, we sheared one plot and grubbed the other, and we used a stopwatch to time the length of each method.

In plot 1, the hydraulic shearing method was used. In this plot the land area was 3,510 square feet or

0.08 acres, and the total height of all the junipers was 5,953 inches. The hydraulic shearing took 31 minutes and 46 seconds to complete the controlling of 100 Ashe junipers. This makes the effective cost per plot \$23.60, the cost per acre \$294.94, and the cost per inch or foot was \$0.004 and \$0.048, respectively.

In plot 2, the grubbing method was used. In this plot the land area was 3,969 square feet or 0.09 acres, and the total height of junipers was 6,310 inches. This method took 11 minutes and 37 seconds to successfully clear the area. Grubbing-cost figures were \$8.53 per plot, and \$106.60 per acre. The cost was \$0.0014 per inch, and \$0.0168 per foot, respectively. Table 2 shows easier evaluation of cost figures between shearing and grubbing.

Once finished with clearing Ashe or redberry juniper, the question is whether or not to stack and pile or to leave the tree there to decompose. Most people stack and pile for the aesthetics. This process concentrates the nutrients that the juniper accumulates to the pile. When burning the pile, all the nutrients lie there and that spot remains sterile for 3 to 5 years following the fire. Leaving the tree to lie in place causes the nutrients to be sustained in the area of origin. Even though it is not very appealing to the human eye, the rangeland and wildlife benefit from the nutrients lying in place following a prescribed burn in 2 to 3 years.

In conclusion, controlling Ashe juniper and redberry juniper is vital on rangelands in Bosque County. Without any control, the invasion of juniper will render the land useless for livestock and wildlife. Junipers capture 75% of the rainfall that can be put into streams, rivers, and aquifers or that could be utilized for grass production. Hydraulic shearing and grubbing are excellent ways of mechanical control. The research indicated that grubbing was cheaper by 277%.

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