



Current Report

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EASTERN REDCEDAR UPDATE - 1991

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History of Eastern Redcedar

Historically, fire prevented eastern redcedar encroachment into rangelands and forests of Oklahoma. With the reduced incidence of fire since European settlement, redcedar has become a prominent component of Oklahoma rangelands, including the Cross Timbers (post oak - blackjack oak savannah). Redcedar was a problem on almost 1.5 million acres of Oklahoma rangeland in 1950, and by 1985 this area had increased to over 3.5 million acres. We have identified three main areas of redcedar invasion. Two of these areas are located along the slopes adjacent to major river drainages in the northwestern and central-north central part of the state. The third area is in the Arbuckle Mountains where redcedars are often found growing in association with ashe juniper. Some scattered pockets of redcedar are located in southeastern Oklahoma. The visible increase of redcedar in pastures that were recently free of brush has many land managers concerned with declining forage production, livestock carrying capacity and degraded wildlife habitat. This concern has generated a concerted effort in research and extension in Oklahoma State University's Grazing Lands Ecology and Management Group. One of the Group's major objectives is to learn more about control and management of redcedar and ashe juniper.

Growth Rate of Trees

We aged redcedar trees from study areas in eastern, central and western Oklahoma (McIntosh, Payne, and Major counties, respectively) by tree ring analysis to determine the relationship of tree age to crown height and crown area. The study areas were Shallow Prairie in McIntosh County, Shallow Prairie and Loamy Prairie in Payne County, and

Sandy Prairie in Major County. Trees varied from five to thirty years old. Trees increased in height about one foot per year in McIntosh County and about nine to ten inches per year in Payne County and Major County.

In McIntosh County and Major County, crown area of redcedar expanded at a greater rate and trees grew to be considerably larger than in Payne County. The rates of increase in area of crowns of trees 25 years old in Major and McIntosh Counties were 18 square feet per year and 31 square feet per year, respectively. However, in Payne County, crown area of trees older than 20 years increased at a slower rate than either McIntosh or Major County. In McIntosh and Major Counties, redcedar trees up to 30 years of age continued to grow rapidly. Results suggest that burning intervals on rangelands should be no longer than once every 10 years in eastern Oklahoma and once every 15 years in western Oklahoma.

Effects of Standing and Fallen Redcedar on Forage Production

We measured forage production around individual redcedar trees in Payne County. Some reduction of forage production occurred beyond the dripline of redcedar trees, but the major reduction of forage was beneath the tree crown. This reduction under the tree was similar for trees of all sizes. A tree with a six foot crown diameter (area of 28 square feet) reduced forage production on shallow prairie range sites approximately six pounds per acre. Shallow prairie range sites in central Oklahoma produce about 3,000 pounds of forage per acre in a favorable year, so 250 trees per acre (one tree about every 13 feet) reduced forage production by 50 percent.

From the data on crown growth as it related to age, we calculated that mechanical cutting reduced the crown area of redcedar only 30%. Although mechanical cutting effectively kills redcedar, the tree crowns lying on the ground continue to occupy about 70% as much area as when they were standing. For example, during the first and second growing seasons after cutting, forage decreased by 50% (50% of 3,000 pounds) or 1,500 pounds per acre because of standing redcedar trees, and an additional 1,050 pounds per acre (70% of 1,500 pounds) because of fallen redcedar trees. Thus, of 3,000 pounds per acre of potential forage production, only 450 pounds per acre would be available for livestock and wildlife for two years. By the third year after cutting, the area that was shaded by the redcedar crown is usually re-vegetated.

Because cut trees retain the dense foliage and limb structure in the crown, forage production and utilization by livestock and wildlife will continue to be reduced. Trees should not be allowed to lay after mechanical cutting, except in brush piles for specific wildlife management uses.

Burning Prescriptions for Control

Prescribed fire is the most economical way to control small redcedar. With trees less than five feet tall, more than 85% of the trees can be controlled with fire if 4,000 pounds per acre of fine fuel (herbaceous plant material) is available from February through April. Fine fuel loading is the main factor influencing cedar kill. For example, when fine fuel loading is only 2,000 pounds per acre, less than 60% of trees five feet tall will be killed. Even distribution and uniformity of fine fuels throughout the pasture will enhance redcedar kill. Water content of the redcedar leaves also plays an important role in the effectiveness of control by prescribed fire. Burns in late winter and early spring before cedar begin rapid growth will usually be timed at the low-point in leaf water content.

The general fire prescription for spring burning is as follows:

Season:	late winter - late spring
Air Temperature:	(60-80°F)
Relative Humidity:	(30-50%)
Wind Speed:	(5-10 miles per hour)
Fine Fuel Loading:	(minimum 2,000 lbs./ac.)
Soil Moisture:	(top 6 inches is moist)

Post-Burning - A Way to Kill Large Trees

A portion of the lower part of large redcedar trees is often scorched from prescribed fire. We have found that these large trees can be completely burned if the lower scorched branches are re-ignited after they turn brown. Based on our observations of trees with different amounts of browned-out leaves

and under different environmental conditions, tree kill will average between 60 and 70% when trees are re-ignited in late spring and summer. We optimized kill of large redcedar trees by igniting the crown in several positions with winds less than 10 miles per hour.

We used an LPG vapor torch with a 20 pound fuel cylinder mounted on an aluminum back pack frame for ignition. We post-burned scorched redcedar on 640 acres of cross timbers rangeland at an average rate of 190 trees per hour. Burning costs for labor, propane fuel, and equipment depreciation amounted to \$0.03 per tree. Post-burning is an excellent way to kill large redcedar trees that were not controlled by the initial prescribed fire.

Chaining for Control

Part of the state's rangeland has redcedar trees that are too large to control with ground ignited prescribed fire. In addition, there are inadequate fine fuels to support a crown fire. Chaining is an alternative to dozing, grubbing, sawing, or cutting large redcedar trees. Chaining is accomplished by dragging a heavy anchor chain in a U-shaped, half circle, or J-shape behind two dozers traveling in a parallel direction. Chains with links weighing more than 70 pounds stay on the ground better and are more effective on young flexible trees. The chain must be pulled at a speed to maintain maximum ground contact. The narrow U-shape provides better pull-up of small trees and gives more wind-rowing effect. The half-circle shape increases swath-width, but decreases effectiveness in the center section. We recommend a chain-length to swath-width ratio of 2:1 to 3:1. For example, when a 300-foot chain is used, a swath width of 100 to 175 feet is common and generally gives good control. Higher traveling speed also gives more whip action and better kill. We recommend a follow-up prescribed fire to reduce the debris on the area after chaining. Burning dead redcedar requires extreme caution because dead trees are volatile and can create spot fires several hundred yards down wind.

Contractors chained 530 acres in Pittsburg County during the fall of 1987 using two D6 dozers and a borrowed chain at an estimated cost of \$16 per acre. Following the chaining, the ranch burned in the spring of 1988 to control small redcedar at an estimated cost of \$2.50 per acre. Native grasses regained dominance on the site, but another prescribed fire the following April was needed to burn debris, to kill remaining redcedar trees, and to improve forage quality.

If a commercial chaining contractor is hired to do a similar job, costs will vary. Depending on the terrain and density of redcedars, most jobs would range from \$20 to \$30 per acre. There are some

acre limitations used by chaining contractors. For example, some contractors require a minimum of 1,000 acres of brush before they can justify moving their equipment to do the job.

Cut Plus Burning

When fine fuels are insufficient for conducting a prescribed burn, such as a closed canopy of redcedar, additional fuel can be provided by cutting selected trees and branches of redcedar. The redcedar must then be allowed to dry before initiating a fire. ¹Cutting redcedar trees in winter before spring burning has resulted in excellent tree kill in closed canopy stands. Although this method does require intensive labor, its fast and inexpensive. For example, it took from 0.5 to 3.0 hours per acre to chainsaw the branches, depending on terrain and density of trees. Chainsaw maintenance was about \$0.80 per hour. Although chain-sawing is the most common method of cutting redcedars, using a redcedar clipper or rotary saw will also work.

Dozing for Control

Contractors, using a D5 and D6 bulldozer, pushed individual redcedar trees on 48 acres in Pittsburg County in 1987-88. After dozing, the trees were piled and burned. Estimated cost of clearing was \$97 per acre. In addition, the land was prepared for planting for an introduced grass at a cost of \$26 per acre. The cost to remove redcedar by individual dozing and conversion to an introduced grass totaled \$123 per acre.

Paraquat Plus Aerial Ignition in Closed Stands of Cedar

A contractor aerially applied paraquat to a mixed stand of ashe juniper and redcedar in summer of 1989 and 1990. Ground ignitions were not effective in 1989, so in 1990, a helicopter equipped with helitorch ignited the redcedar crowns one month after application of paraquat. This ignition resulted in a very intense crown fire. Burning was continuous in solid stands of treated redcedar trees, but when tree spacing exceeded crown diameter, burning was spotty. This treatment may have application in dense stands of redcedar where canopy closure has occurred and there is little or no fine fuel.

Controlling Redcedar in Oakbrush Treated with Herbicide

Tebuthiuron (trade name SPIKE) and most other herbicides used to control weeds and brush do not control redcedar. Research results suggest that burning the oak leaf-litter in the fall following spring application of brush herbicides will provide excellent control of small redcedar trees. The increased leaf-

litter associated with the herbicide treatments results in enough fuel by late September to early October for an intense prescribed fire. Oak-leaf fires burn more intensely and redcedar kill is greater when the leaf litter is dry. Having dry leaf litter may take up to one month of dry weather after a significant rainfall event. Oak leaves rapidly decompose in moist, warm weather, so controlling redcedar with this method is limited to the first fall after the herbicide application.

Fall burning after herbicide treatment also is an opportune time to re-seed if needed. The fire exposes enough mineral soil that good success with both cool-season and warm-season grass and forb species can result. Applying seed should be done immediately after the burn so that the first rain will incorporate the seed with the ash. In solid stands of hardwood that essentially have no grass to release, it is very important to control redcedar with a fall burn following the spring herbicide treatment. Herbaceous plant species that colonize closed tree canopy sites are warm season forbs such as polk weed and horse weed that do not provide adequate fuel for a fire. It takes 4-5 years before enough fine fuels accumulate. During this time, redcedars that were previously suppressed by the hardwood overstory, will grow rapidly and preclude the use of ground ignited prescribed fires.

Chemical Control

Grazon PC and Velpar are labeled for eastern redcedar control. Kill of redcedar by hexazinone (Velpar) and picloram (Grazon 10K and Grazon PC) are inconsistent. Control with both herbicides has varied from fair to excellent depending on rainfall after application. Grazon 10K is no longer available, so Grazon PC, applied as a spot treatment, is the current formulation of picloram to use. At comparable rates, Grazon PC usually was more effective than Grazon 10K.

The rate of for these herbicides is dependent on the size of the redcedar tree measured as either diameter or tree height. For practical purposes, redcedar trees three feet tall have a one inch stem diameter. Current recommendations are to use two cubic centimeters (cc) of either herbicide per three feet of tree height.

Past results suggest that both herbicides can produce good results with adequate rainfall. However, too little or too much rainfall will significantly decrease effectiveness. We currently favor May and early June applications on dry soil preceding a one or two inches of rain.

The cost of treating a redcedar tree (three feet tall tree and with a one inch stem diameter) with two cubic centimeters of Velpar or Grazon PC is approximately three cents. Kill on redcedar trees

less than six feet tall with both herbicides has been consistent. The cost is low enough to use these herbicides on small redcedar trees on small acreages.

Grazing Management After Treatment

Proper grazing management must be used after a fire, herbicide, or mechanical practice to insure the success of the grass stand. If only part of a pasture is burned, livestock will concentrate there and overgraze the area. Therefore, the entire pasture should be burned to maintain even grazing distribution or fenced separately. Also, stocking rate should be adjusted to reflect how much forage is available for livestock to graze. Stocking rate guidelines are available from the USDA-Soil Conservation Service Office. The best guide to proper stocking rate is ranch records that show animal performance, trend in range condition and utilization.

Decision Support System

The Grazing Lands Ecology and Management Group at OSU has developed a prototype computer software system to be used for supporting decisions for controlling redcedar. The prototype is restricted to redcedar control in tallgrass prairie in central Oklahoma, but it will be expanded to other sites. The program selects feasible control methods based on range site characteristics, redcedar height and canopy cover, and the level of control desired by the manager. The program also computes the net return from each control method over a ten year period.

Wildlife Use of Eastern Redcedar

Eradication of redcedar is not only unrealistic but also undesirable. Redcedar is valuable as a windbreak when only male trees are present. However, there is only a short time (5-10 years) that redcedar will be valuable for wildlife or domestic livestock before tree crown closure occurs. Current research on the Cross Timbers Experimental Range (CTER) west of Stillwater demonstrates that several species of wildlife eat the foliage and fruit of eastern redcedar. During the winter, redcedar made up 10% of the diet of white-tailed deer, 20% of the diet of cottontail rabbits, and 100% of the diet of wood rats. We plan to do further research on wildlife uses of redcedar.

Utilization of Eastern Redcedar

As landowners consider ways to control redcedar, it is important to remember that utilization may be possible. Also, because redcedar is very hardy, male trees can be used for windbreaks and shade. Leaving the male trees and cutting out the female trees that produce seed will reduce the constant problem of new trees arising from seed. Landowners may be able to sell redcedar trees for profit or at least to offset the cost of control. The landowner may want to let the redcedar trees grow into a larger size class that may provide additional income in the future.

The present markets for redcedar in Oklahoma are not well developed, especially for small trees. The supply of redcedar greatly exceeds current demand. However, there have been several recent developments in Oklahoma which landowners should consider. Currently, businesses are exporting large redcedar logs to Korea and other countries. Minimum log size required for export is usually a log that is eight feet long with a small end diameter of at least nine inches. Several mills are producing redcedar shavings in Oklahoma. Also, some companies are producing lumber, furniture and novelty products from redcedar.

Harvesting redcedar trees after an intense crown fire has shown promise both in terms of harvesting logistics and wood quality. A mill chipped redcedar logs from the burned area and found them to have similar wood properties to unburned trees. This could result in an additional source of income for landowners.

Based on the estimated resource of about 4.5 million acres of redcedar trees, there exists a potential to develop other markets. As a result, landowners and business persons came together in January of 1991 to organize the Oklahoma Redcedar Association². Their general goals will be to (1) provide information regarding redcedar control and management, (2) increase awareness of marketing opportunities for redcedar, (3) improve utilization of redcedar, and (4) promote Oklahoma redcedar as a unique product. In addition, the Association will serve as a forum where landowners and businesses can discuss opportunities.

1. Information from Mr. Jim Altom, RC&D Coordinator, USDA-Soil Conservation Service, Pauls Valley, OK.
2. Oklahoma Redcedar Association, Western Farmers Electric Cooperative, c/o Dennis Constein, Economic Data Specialist, P.O. Box 429, Anadarko, OK 73005.