

# Spring Burning to Manage Redberry Juniper Rangelands—Texas Rolling Plains

Allen A. Steuter and Henry A. Wright

Prescribed burning can be an effective, low-cost treatment for managing redberry juniper (*Juniperus pinchotii*)-mixed grass rangelands of north and west Texas. The treatment costs will range from \$4 to \$10/acre depending on the size of the area, topography, and juniper density (1982 costs). Because redberry juniper resprouts and resists all but high rates of picloram or dicamba herbicide, rootplowing and chaining have been recommended as control practices. These mechanical treatments are expensive and may leave up to 25% of the site covered with woody debris. This reduces the amount of pasture surface available to grow forage and makes travel in a vehicle or on horseback difficult. Prescribed burning provides a management alternative without these disadvantages. However, most ranchers are unwilling to invest time and money for prescribed burning without first knowing what to expect from their investments.

Local conditions and short-term environmental fluctuations appear to play a more important role in determining the overall outcome of a prescribed burn than is usually seen following herbicide or mechanical treatments. This is an important aspect of fire as a range management tool, and it suggests that increased experience in using fire may not result in single-outcome prescriptions. The need to describe and plan for several outcomes from a prescribed burn will be examined for redberry juniper rangelands.

## Management Considerations

Perennial grasses and shrubs are suppressed in dense, untreated redberry juniper stands. The initial conditions, on which improvements expected from burning are based, are usually characteristic of brush infested range. A chaining treatment reduces the redberry juniper canopy and allows for improved production and composition of grasses and shrubs. By burning 4 or 5 years after chaining, the effective treatment period can be extended. Plant response to the burn should be better on chained sites than on untreated sites because of the positive effects of chaining. Also, it is more difficult to attain fine fuel loads of at least 1,500 lb/acre to carry an effective fire in untreated redberry juniper stands.

Redberry juniper is a high-volatile fuel and standard fire plans have been developed. The main burn should be conducted in late winter or early spring, prior to green-up, with relative humidity 25 to 40%, temperature 70 to 80° F, and wind



Aspect of a previously untreated redberry juniper stand during the first season following a prescribed burn showing the partial skeletons of top growth remaining to obstruct pasture access.

8 to 15 mph. Under these conditions the fire will be continuous and relatively effective in controlling redberry juniper.

The objectives for burning redberry juniper rangelands are similar for untreated and chained stands except for reducing top-growth and woody debris. Burning of previously chained stands greatly reduces the screening effect of juniper. This is because the chaining treatment compacts the juniper canopies and results in dead, woody debris mixed in with the remaining living top-growth. The fire is then more effective in consuming all woody material. Woody debris was reduced to less than 2% by burning chained stands, and pasture access on horseback or in a vehicle was improved. Pasture access remains poor following burning of mature, untreated redberry juniper stands due to the standing dead wood of trees top-killed by the fire but not consumed. Visibility, however, is improved following burning. From our experience, redberry juniper regrowth does not seriously reduce visibility for approximately 10 years following a fire in a chained stand. It

The authors are research assistant and Horn Professor and chairperson, Department of Range and Wildlife Management, Texas Tech University, Lubbock 79409. Allen Steuter's present address is The Nature Conservancy, Samuel H. Ordway, Jr. Memorial Prairie, Star Route 1, Box 16, Leola, S. Dak. 57456.

The support and cooperation of Bill Masterson, Guthrie, Texas is acknowledged.



*Aspect of a mature redberry juniper stand.*

appears that the most effective use of fire on redberry juniper rangelands would be as a follow-up or maintenance treatment after chaining.

Fire may also be an effective tool for controlling young redberry juniper which are becoming established on sites previously not infested. Young plants less than 20 inches tall

are easily killed with fire. A mortality rate of 75% was obtained for young redberry juniper with the basal bud zone above the soil surface. This resprouting zone is located at the junction of the lowest primary branches, and is often swollen. The bud zone is easily recognized in the field and a quick survey of plants within a pasture provides an assess-



*Aspect of a previously chained redberry juniper stand during the first season following a prescribed burn.*

ment of the potential to control young redberry juniper with fire. Once the resprouting zone is partially or completely covered by soil, redberry juniper is resistant to fire except in dry years. High soil moisture after burning will reduce juniper mortality. The greatest mortality will occur during dry years.

In our study 90% of the plants which were less than 20 inches tall were killed when precipitation was 32% below normal during the growing season. The benefits of juniper control are offset to some extent by the loss of forage, which may be reduced 50% by burning in a dry year. Rainfall is not within the manager's control and so at least 2 general outcomes can occur following a fire in a given spring. In a dry year, juniper control will be high but grasses and shrubs will also be reduced—increased interval until the next fire is needed. In a wet year, grasses and shrubs will respond well but juniper control will not be as good—shorter interval until the next fire is needed. A third alternative is to burn only during springs when soils are moist and minimize the adverse effects associated with drought and herbage production.

Redberry juniper rangelands typically occur on rolling to broken topography with soils changing rapidly in texture and depth in short distances. Range sites with shallow, loamy soils over limestone will respond differently than sites with deep and, or clay soils. Tobosagrass (*Hilaria mutica*) may occupy most of the deep, heavy soil sites. Following burning, deep sites tend to be more stable with regard to production and species composition. Redberry juniper becomes fire tolerant at a younger age on deep sites, and honey mesquite (*Prosopis glandulosa* var. *glandulosa*) may be the more serious brush problem. As a result, a burning interval (7 to 10 years) similar to that recommended for mesquite-tobosagrass rangelands should be effective on deep soil sites. Other shrubs are usually not abundant on deep sites of redberry juniper rangelands and will not benefit from burning.

On chained redberry juniper rangelands, forage production in the year of the burn will be maintained or increased on

shallow, rocky sites if good soil moisture conditions exist. Long-term forage production will be higher than for untreated stands regardless of moisture the year of the burn. Perennial three-awn (*Aristida* spp.), a generally unpalatable grass, was reduced 50% or more, while mid to tall grasses appeared to increase on shallow, rocky sites. The bud zone of young redberry juniper on shallow sites remained exposed above the soil for plants estimated to be 5 or more years older than plants with exposed bud zones on deep sites. This should allow a longer fire-free interval (15 to 20 years) to be effective on shallow sites. Several shrubs important to wildlife may occur on the shallow sites of redberry juniper rangelands. Most of these shrubs resprout and respond well to a spring burn. In areas where skunkbush sumac (*Rhus aromatica*) is a major shrub, it may become the dominant shrub in the years immediately following a spring fire.

### Implications

The burning intervals of 7 to 20 years are intended to be as long as possible, while preventing new redberry juniper from becoming established to the point that it is not easily controlled by fire. These burning intervals should top-kill established plants and maintain juniper regrowth below the height at which livestock handling becomes difficult. Total forage for livestock and wildlife will be maintained at a higher level than if redberry juniper stands remain untreated and increase in density.

It appears that several different outcomes, requiring varied post fire management, can occur from spring fires conducted with similar fire plans and prescriptions. For the redberry juniper rangelands we studied, the varied outcomes resulted from differences in initial stand conditions, growing conditions following the fire, and site potentials. These and other factors will play a role in determining the outcomes of prescribed fires on redberry juniper, as well as on other rangeland types. The range manager will not be able to control all of the factors involved, and therefore will need to plan for the various outcomes possible from a specific fire.

## Freeman's Remarks

The day on or about February 13, 1984, will be a sad day and a glad day for me. That's when I shall step out as editor and turn the job over to the new editor, Gary Frasier.

After nine years I think it's time to step aside for a younger person with vim, vigor, and new ideas. Gary and I have already visited several times on the subject and I'm confident the transition will go smoothly. I am also confident he will be a good editor—he has the necessary interest and dedication. Just to be sure to keep him on his toes I promised to write a letter to the editor occasionally.

I have enjoyed being editor—it has kept me in touch with my range friends and also kept me up to date on what was happening in the field of range management. The job provided challenge, intrigue, frustration at times, but most important, it provided a high degree of satisfaction and fulfillment.

My love for the Society and time devoted to *Rangelands* can now be turned to the writing of a 100-year history of Prescott Frontier Days Rodeo that started in 1888.—**Danny Freeman**, Editor

## Readers Write

Yesterday, [September 12] I received my first copy of the August issue of *Rangelands*. Hopefully, I am the first to extend my congratulations for this outstanding issue. Without question, it is the best issue of this extremely excellent magazine. You and your entire crew are to be congratulated. You are really going to have to work to retain this quality for the remaining portion of your term as editor. However, I know you will do it.

Danny, I would like to take this opportunity to show my appreciation for taking on the job as editor of *Rangelands*. I really appreciate your efforts during my tenure as President. The best of luck in your retirement.—**Robert M. Williamson**

### Need Help

I have 5 beautifully hand-drawn sketches of awns on paper, 8×11. I have forgotten who sent them to me. Let me know and I shall gladly return them. Thank you—**Danny Freeman**, Editor.