

MANAGING TEXAS JUNIPER WITH PRESCRIBED BURNING

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SUMMARY

The management of juniper, commonly referred to as cedar, throughout Texas spans multiple species and regions, each requiring differing methods of managing the encroachment of these woody plants. Fire is one management method that is effective at managing juniper under the right conditions. However, the timing and intensity requirements for an effective fire are dependent on the species of juniper. This paper classifies juniper species as either resprouting or non-resprouting and provides general fire management recommendations for landowners and land managers.

MANAGEMENT SUMMARY

- ▶ Non-resprouting juniper can generally be managed using less intense growing season fires.
- ▶ Resprouting juniper are difficult to manage with fire alone; however, fire may be able to suppress new seedlings and inhibit new trees from establishing
- ▶ Maintaining a 5- to 7-year fire return interval should prevent new juniper establishment in rangelands and pastures by killing young juniper seedlings while they are still vulnerable to fire mortality.

INTRODUCTION

The rangelands of Texas are increasingly threatened by the encroachment of woody plants. While considered noxious by some landowners, junipers are native to many ecosystems. Historically, natural and human-caused fires maintained grasslands and savannas, while keeping junipers restricted to fire-sheltered parts of the landscape. However, the combination of overgrazing and fire suppression has allowed junipers to invade many rangelands across Texas. After juniper stands become established, they become increasingly costly to manage and thus inhibit restoration efforts.

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This paper has three objectives:

- ▶ To identify the key species of native juniper that encroach upon Texas rangelands.
- ▶ Summarize the biology of these species and identify them as resprouting or nonresprouting.
- ▶ Broadly describe the effects of prescribed fire on each species.

THE PRIMARY SPECIES OF JUNIPER IN TEXAS

Five species of juniper (*Juniperus ashei*, *J. pinchotti*, *J. virginiana*, *J. monosperma*, and *J. deppeana*) are primarily found across Texas. Each of these species occurs in different regions of the state, with some overlap. As such, each juniper species has adapted physical characteristics that allow it to persist and establish within its range. As a part of these adaptations, they also respond differently to fire. An effective juniper management plan takes these physical characteristics and adaptations into account in order to maximize results.

Resprouting and Non-resprouting Juniper

From a management perspective, the juniper species of Texas can be broadly split into either resprouting or non-resprouting species. A critical part of managing juniper is correctly identifying the species present, as effective management of juniper depends on the biology of the plant. A juniper is considered to be resprouting if, once the main stem is cut, killed, or removed, new shoots will sprout from the belowground bud zone on the root collar of the plant (Fig. 1). This requires very different management techniques compared to nonresprouting junipers, which will die off after killed, or removed, new shoots will sprout from the belowground bud zone on the root collar of the plant (Fig. 1). This requires very different management techniques compared to nonresprouting junipers, which will die off after the main stem is burned or removed. Generally, non-resprouting junipers are more susceptible and sensitive to fire. Additionally, older and larger trees are able to withstand fire effects better than younger ones.

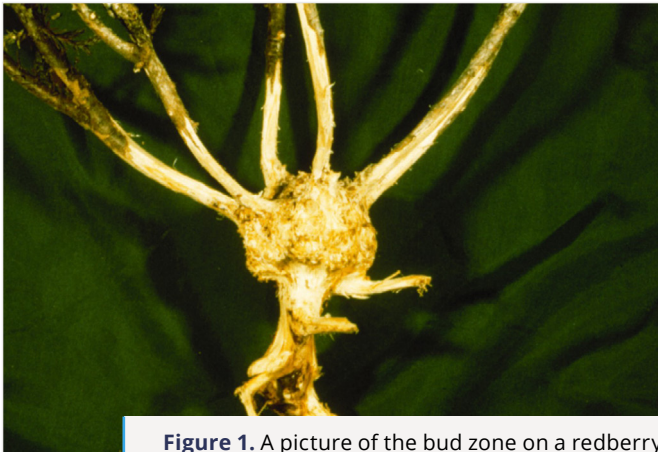


Figure 1. A picture of the bud zone on a redberry juniper (*J. pinchotti*). This zone is exposed above-ground for the first 7 years, which makes fire more effective at killing resprouting junipers in this time.

Photo by Dr. Darrell Ueckert.

Burning Juniper

Prescribed burning requires the correct application, timing, and weather conditions to successfully manage juniper. One key factor is the moisture content of juniper foliage; when the moisture content is greater than 80%, it may require over 3500lbs/ac of fine fuel to ignite that tree. As the fuel moisture level drops however, the tree can be ignited using less fuel. Most juniper species may develop very dense canopies that shade out and prevent grasses and other fuels from growing under them. One way to improve fire-effectiveness under high-fuel moisture conditions is to pile cut juniper limbs and trees under large individual trees or into cedar breaks. This cut-and-stuff method can provide cured ladder fuels to push the fire up into the canopy and increase the intensity of the fire thereby increasing the likelihood of the tree to burn (Fig. 2).

Regardless of the way fire is ignited, careful planning is required to conduct a safe and successful burn that meets management objectives. Proper construction of firelines, checking the weather conditions before, during, and after the fire, along with staying in control of fire operations are all key parts of ensuring a successful burn.

NON-RESPROUTING JUNIPERS

Ashe Juniper (*J. ashei*)

Common names:

- ▶ Ashe cedar
- ▶ Ash juniper
- ▶ Blueberry cedar

Prevalent across central Texas, parts of Oklahoma and Arkansas (Fig. 3), Ashe juniper is a non-resprouting



Figure 2. A juniper burning during a prescribed fire. Note how the flames are consuming a large portion of the juniper canopy, thereby improving the likelihood of tree mortality. However, a resprouting juniper may persist even if the aboveground stem is destroyed.

evergreen tree with a relatively short and bushy form which often forms thick stands along with oaks, pecans, and other trees. The tree can grow up to 30 feet tall, though typical heights in open fields tend to be closer to 9 to 12 feet. Ashe juniper is characterized by yellow-green foliage, with blue fleshy cones that resemble berries, long shredding bark, and dense foliage with scaly leaves. Ashe juniper seeds sprout in the late winter and early spring and take approximately 10 to 20 years for female trees to mature and begin producing seed.

RESPONSE TO FIRE

Ashe junipers are readily managed with fire, herbicide, or mechanical removal. Fire is most effective at suppressing Ashe juniper within the first 10 years after seedling establishment. Seedlings and trees less than 10 feet tall are the most vulnerable, though mature trees can still be managed with intense fires. As a nonresprouting juniper,

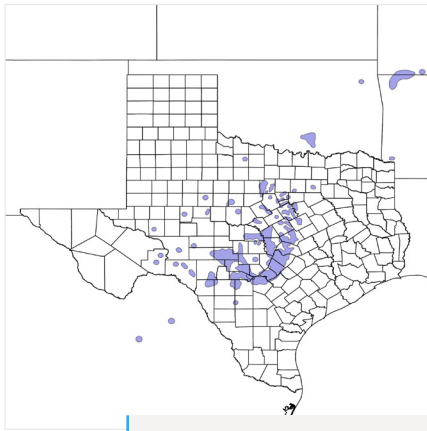


Figure 3. The approximate distribution of Ashe juniper (*J. ashei*) across Texas.

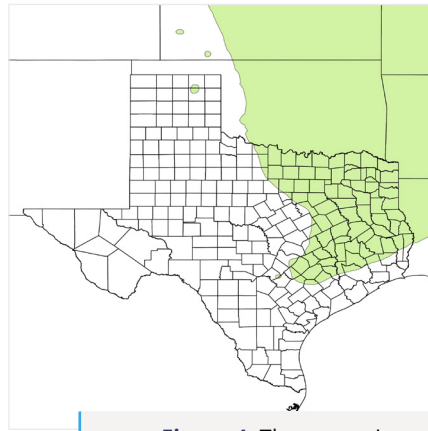


Figure 4. The approximate distribution of eastern red cedar (*J. virginiana*) in Texas.

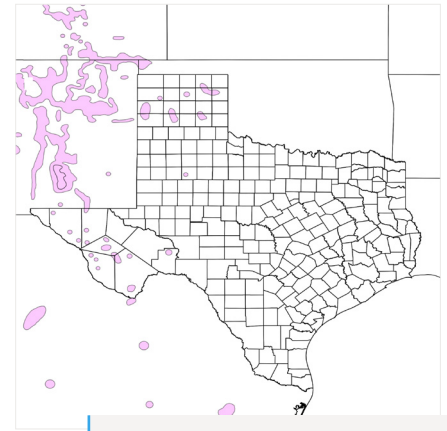


Figure 5. The approximate distribution of One-seed juniper (*J. monosperma*) in Texas.

if sufficient topkill of the plant is achieved, then there is little chance of individual recovery. Burning during the winter and late spring inhibits Ashe juniper establishment by killing the fire-sensitive sprouts and seedlings along with removing larger trees. As such, fire is a very effective method of managing Ashe juniper. The fire conditions required to manage Ashe juniper are easily attained in winter/spring burns. Winter fires may be preferable to reduce the negative impact of fire on more desirable woody species such as oak or pecan trees. Implementing a fire return interval of 5 to 15 years is likely to actively remove and suppress Ashe juniper.

Eastern Redcedar (*J. virginiana*)

Common names:

- ▶ Eastern red cedar
- ▶ Red cedar

The eastern red cedar (*Juniperus virginiana*) is a non-resprouting juniper primarily found along the southeast US, though it extends into Central Texas and Central Oklahoma in its westernmost extent (Fig. 4). A common colonizer of open ranges, eastern red cedar is fire intolerant and has expanded readily with the widespread fire suppression across the Great Plains. The tree can grow over 60 feet tall, with trunk diameters reaching over 3 feet. Individuals reach maturity at 10 years of age and produce small amounts of fruit annually with a large production of fruit every 2 to 3 years.

Response to Fire

In many ways, managing eastern red cedar with fire is similar to managing Ashe juniper. In mixed oak-juniper forests, small trees (<3 feet tall) are readily controlled using winter burns with recommended fuel loads of 2000 lbs/ac of fine fuels, while larger trees are more

likely to be killed in late-spring burns. Given the ability of eastern red cedar to grow rapidly under higher rainfall in the eastern portions of the state, a maximum fire return interval of 10 years is necessary.

One-seed Juniper (*J. monosperma*)

Common names:

- ▶ One-seed cedar
- ▶ Sabina

One-seed juniper is a non-resprouting juniper that grows across the American southwest and into the panhandle and western portions of Texas (Fig. 5). Individual junipers may grow up to 10 to 40 feet tall depending on the location, age, and water availability. Trees are also very drought resistant and are able to slow growth during dry years, only to continue growing after rainfall. One-seed juniper is thus, generally slow-growing, averaging between 1 to 4 inches of vertical growth per year depending on site conditions. Female trees will begin seed production between 10 to 50 years of age, and berries may persist on the tree for 1 to 2 years.

Response to Fire

One-seed juniper is very susceptible to fire due to their slow growth and inherent biology. Like other non-resprouting junipers, winter and spring fires are able to remove existing trees and suppress their reestablishment. Fire is effective at removing shorter one-seed junipers regardless of age, though tall individuals may require alternative treatments. Regular reapplication of fire every 10 to 20 years will suffice to prevent the reestablishment of one-seed juniper, as its slow growth provides a larger window of treatment compared to other faster growing species.

RESPROUTING JUNIPERS

Alligator Juniper (*J. deppeana*)

Common names:

- ▶ Alligator cedar
- ▶ Mountain cedar
- ▶ Tascate

Alligator juniper is more commonly found in the savannas and slopes of western Texas (Fig. 6). Commonly called alligator juniper due to the scaly appearance of its bark, it is difficult to remove once established and often survives treatment by resprouting from the bud zone or large surface roots of the tree. The tree generally grows as a single-trunked scrubby shrub but can reach 20 to 40 feet tall in the right conditions. Like other arid-adapted junipers, alligator juniper grows very slowly, with approximately 0.5 inch in diameter per year given good growing conditions. Trees are strong resprouters, as individuals even as young as 1 year old are able to resprout after being cut. As the trees grow larger, their ability to resprout declines over time until they reach approximately 32 inches in diameter; a point after which they are very unlikely to resprout.

Response to Fire

Alligator juniper is noted to be very fire-resistant, with even small seedlings being more resistant to fire relative to other juniper species. Low-severity fires have little effect on removing mature junipers over 4 inches in diameter, and severe fires are only marginally able to kill

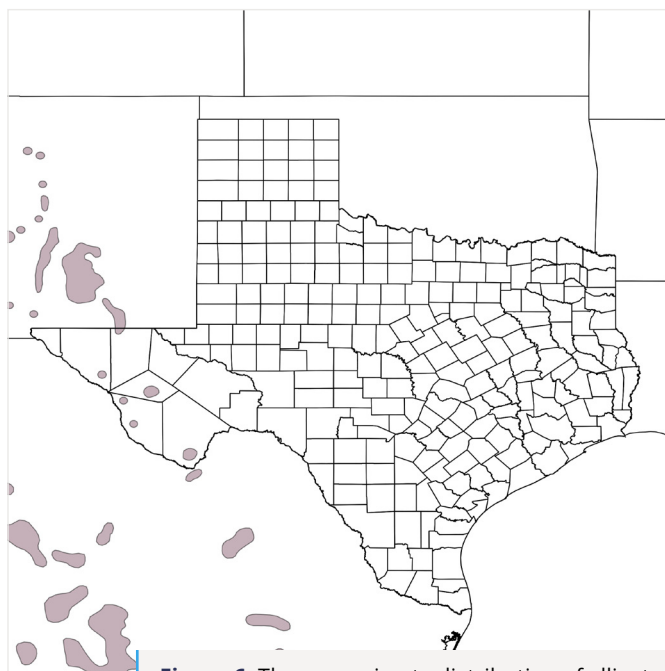


Figure 6. The approximate distribution of alligator juniper (*J. deppeana*) in Texas.

them. Therefore, alligator juniper is most susceptible to fire application during its sapling phase and under 1 to 3 feet tall. However, fire intervals of 3 to 7 years may reduce juniper seedling establishment in cleared pastures. If fire is not feasible, grubbing is a more effective alternative mechanical treatment than cutting, due to the destruction of the sprouting collar that would be left if cut. As a final consideration, given the arid regions alligator juniper thrives in; managing the species with fire may be a challenge if grazing or limited precipitation limits grass fuel loads to less than the general 2000 lbs/ac recommendation.

Redberry Juniper (*J. pinchottii*)

Common names:

- ▶ Redberry cedar
- ▶ Pinchot's juniper

Redberry juniper is a multi-stemmed shrubby tree commonly found in the shallow and rocky soils in the northern and western parts of the state (Fig. 7). Individuals grow 3 to 15 feet tall, and reach maturity at 12 years, though competition from other vegetation may increase time to maturity and slow tree growth. Trees typically flower in the spring, with fruit ripened by November.

Response to Fire

Commonly considered a pest, redberry juniper is very difficult to remove after it has established itself in a field or pasture. As a resprouting juniper, removing and controlling the species is much easier during the

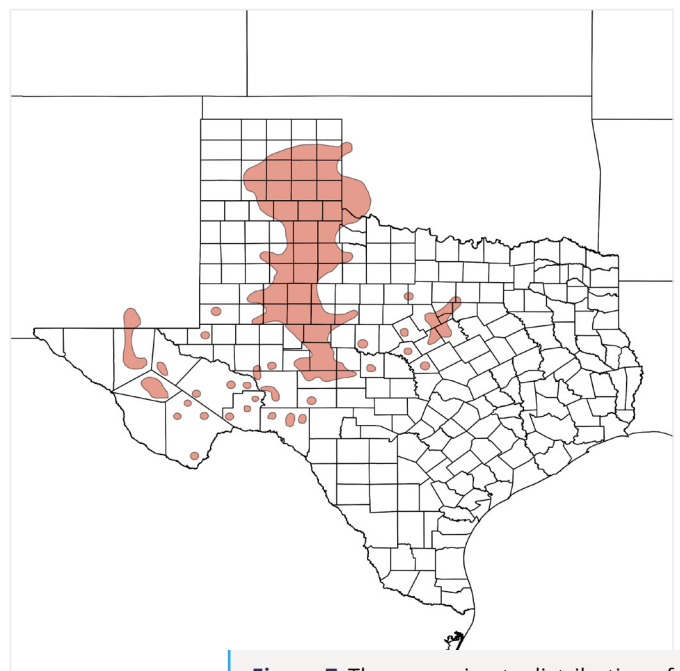


Figure 7. The approximate distribution of Redberry Juniper (*J. pinchottii*) in Texas.

seedling phase (under 40 inches tall) than as a mature tree. Additionally, fire effectiveness is greater when the bud zone of the tree is above the soil level, and sufficient (~2000 lb/ac) fine fuels are present. This allows the heat to penetrate the resprouting meristematic tissues and, thereby, inhibiting new sprouts from growing, with approximately 70–75% mortality.

Fire also reduces the canopy size of post-fire redberry junipers, freeing up space for grass and forb growth. Alternative treatments include grubbing and excavating trees, which are made more effective with a follow-up burn within 5 years. Overall, a frequent 5- to 10-year fire rotation in pastures with redberry juniper will increase forage production, prevent the establishment of new trees, and potentially kill mature trees.

FOR MORE INFORMATION

More information about prescribed fire may be found at <https://agrilife.org/rxburn/>

Most of these species may be found and identified using:

Stalh, C. & McElvaney, R., 2003, An easy guide to tree identification, The Trees of Texas. Texas A&M University Press.

Additional information on Juniper and Fire can be found from the US Forest Service's Fire Effects Information System (<https://www.feis-crs.org/feis/>), and through the Texas A&M Agrilife Extension Service publication, [Juniper Biology and Management in Texas](#).

Maps displaying the approximate distribution of Juniper species were made with data from:

Little, E.L., Jr., 1971, Atlas of United States trees, volume 1, Conifers and important hardwoods: Washington, D.C., U.S. Department of Agriculture, Forest Service Miscellaneous Publication 1146, 200 maps.

Please note that the distribution maps only show where each species were confirmed to occur at the time of the original publication, and it is likely that they can be found outside the displayed areas as well.