QUICK GUIDE SERIES FM 2011-1

Piñon-Juniper Management

By N. Marcus, S. Woods, S. Simmons, N. Jester, D. Wand, M. Wiedeman, and CK Morey

Piñon-Juniper Ecology

Figure 1: *Piñon-juniper woodlands are the dominant vegetation type in the Colorado National Monument. Photo: Bill Ciesla*

Piñon-juniper woodlands are widespread in Colorado's lower elevations, ranging from 4,900 to 8,000 feet on Colorado's Western Slope and in limited distribution in south-central Colorado and the Eastern Plains. In southeastern Colorado, piñon-juniper ecosystems are found in the canyonlands and adjacent shortgrass prairie ecosystems below the Gambel oak zone. These woodlands are comprised primarily of piñon pine (*Pinus edulis*) and regionalized juniper species. One-seed juniper (*Juniperus monosperma*) is found in the southeastern portion of the state, while Rocky Mountain juniper (*Juniperus scopulorum*) dominates the upper elevation ranges of the southwest, and Utah juniper (*Juniperus osteosperma*) is the primary species in the lower portion of the elevational range in the southwest. Juniper tends to grow in more arid areas; its scaled foliage allows it to conserve water more effectively than piñon pine. Piñon-juniper grows in conjunction with skunkbush sumac and various grasses and forbs.

Piñon-juniper typically grows on harsh sites. Annual precipitation ranges from 10 to 15 inches per year in these woodlands. Both piñon and juniper species have developed resistance to drought and cold. This promotes preferred open canopy structure and encourages regeneration so that new trees are ready to replace the more mature and dying trees. Piñon-juniper reproduction occurs through natural seed dissemination and germination. Good seed crops may only occur every two to five years. Both tree types are shade-tolerant below a height of 12 inches. When the height is greater than 12 inches, full sun is required to promote further growth.

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Figure 2: *Mule deer are commonly found in piñon-juniper forests. Photo: CSFS*

Juniper dominated woodlands tend to include open savannahs of scattered trees with significant shrub cover, except in areas where sagebrush has become dominant. Scattered openings and shelter from remaining trees help sustain healthy populations of understory grasses, shrubs and forbs. Due to the lack of natural disturbances and proactive forest management, tree densities have increased to a level that will support damaging crown fires.

Form and growth habit of piñon and juniper limit their use as post and pole material. Because of their resistance to decay, junipers are a preferred species for posts and poles. Other uses of juniper include landscape timbers, ornamental materials, firewood and wood-plastic composites for roofing. Piñon pine woody material uses include pellets, firewood, animal litter and miscellaneous materials such as laminated veneer. Piñon pine also is known for growing and yielding edible, highly-valued piñon nuts.

Figure 3: *Collared lizards can be found warming their bodies on rocks and boulders in piñon-juniper habitat. Photo: Bill Ciesla*

While few mammal, invertebrate, avian and reptile species rely solely on piñon-juniper habitat throughout the year, many do benefit from the food, shelter and breeding areas provided. This habitat also serves as a frequently used migratory corridor.

Pine nuts and juniper berries provide an important source of winter food for wildlife in Colorado's piñon-juniper woodlands. This habitat supports the largest number of nesting bird species found in any upland vegetation type in the West. Wildlife commonly found in the piñon-juniper habitat include western scrub-jay, juniper titmouse, gray flycatcher, blacktail jackrabbit, cliff chipmunk, mule deer and elk. Predators common in this habitat include gray foxes and raptors such as red-tailed hawks.

Treatment Methods for Thinning Piñon-Juniper Forests

Figure 4: *Prickly pear cactus is a common plant in piñon-juniper forests. Photo: Bill Ciesla*

A variety of techniques may be used to manage piñon-juniper forests. Silvicultural prescriptions based on thinning focus on "de-stagnating" dense stands. This helps achieve woodland stand improvement and a healthy balance among overstory trees, young trees and other vegetation. Thinning a forest to a target density and having proper diameter distribution also improves the health and vigor of individual trees and promotes regeneration of forest tree species. A healthy, vigorous tree is less susceptible to insect infestation and pathogen infection and is better able to withstand wildfire – a natural, ecological process in piñon-juniper ecosystems.

Figure 5: *Characteristics of Rocky Mountain juniper include:*
- *scale-like, wispy, grayish-green branches;*
- *reddish branches in winter;*
- *blue-gray, waxy, 0.2 inch diameter berries;*
- *20-40 feet tall with a short, stout trunk; and*
- *gray-brown to reddish-brown bark.*

Photo: CSFS

Figure 6: *Characteristics of piñon include:*
- *edible seeds;*
- *1-1.5 inch-long needles;*
- *round, resinous, 2-inch long cones;*
- *20-50 feet tall; and*
- *a rounded crown with a short trunk.*

Photo: CSFS

Mechanical Treatment

Thinning is done where regeneration is not a primary objective. Thinning is applied to reduce stand cover, which will improve understory development, enhance wildlife habitat and reduce fuels in wildland-urban interface areas.

Uneven-aged forest management prescriptions use two types of treatments to achieve the objectives of maintaining continuous forest cover, regenerating desirable species and allowing for multiple size classes:

1. Single-tree selection involves selected removal of trees in varying size classes. This method promotes natural regeneration of tree and other herbaceous cover species. Regeneration protects the managed area from wind and water erosion and maximizes vertical diversity for wildlife. This method requires proper planning so that prescribed burning may be added as an additional maintenance treatment.

2. Group-tree selection involves removing trees in groups throughout the stand. The openings should be smaller than twice the average height of the mature trees. This method re-establishes conditions where diverse grasses and shrubs colonize spaces created by the removal of tree groups. Group-tree removal is the optimal alternative for controlling dwarf-mistletoe infestations. Group-tree selection also mimics naturally occurring competition, fire and insect and disease outbreaks.

A combination of group and single-tree selection methods can be combined as one adaptive treatment. This combined method can be used over time to disperse costs and minimize impacts on the forest.

An easy method for determining which trees to thin is to identify the healthiest looking trees based on live tree crowns, signs or symptoms of insects or disease and overall tree vigor. Once the healthiest trees are identified, the unhealthy trees are removed to create more room for the remaining trees to grow.

To achieve the desired spacing, thin the trees so that, on average, tips of individual tree limbs do not touch their neighbors, or allow for a minimum five feet of space between tree crowns. Spacing reduces competition and allows remaining trees space to grow. Random clumps of trees may be left and occasional larger openings created for greater forest diversity.

Figure 7: *Chipping slash from a piñon-juniper management project. Photo: CSFS*

In drought years, it is best to thin and prune during the

late fall and winter months (the dormant season) to avoid attracting Ips beetles. If thinning and pruning occurs in the spring and/or summer, it is important to properly dispose of slash within three weeks. This is to prevent a generation of Ips from infesting slash piles and producing offspring that may infest healthy trees. Slash that is chipped in spring or summer should not be placed or piled near the base of standing trees because it may attract Ips. Slash piles created in winter or fall may be retained for small mammal habitat.

Figure 8: *Slash piles from Rocky Mountain juniper trees. Photo: CSFS*

Active forest management results in uneven-aged tree stands that are more resistant to fire, insect infestation and pathogen infection. Treated stands also will provide cover, forage and wildlife habitat.

Prescribed Burning

Survivability of piñon and juniper as a result of prescribed burning depends on spatial arrangement across the landscape, overstory density where forest types intertwine, fuel loads of herbaceous understory and individual crown density. Broadcast prescribed burning is best conducted when combined with uneven-aged thinning treatments. The combination of burning and thinning provides better long-term benefits than burning alone. This is due to the reduction of crown-bulk density, which influences potential crowning fire behavior. Fire helps stimulate new growth of the herbaceous understory, including grasses and low shrubs, which increases browsing opportunities for wildlife. A low-intensity fire may increase the size and age class diversity of the piñon and juniper. Fire also may be used to address slash piles in fall, winter and early spring when favorable conditions are present.

Figure 9: *A completed management project in a piñon-juniper forest. Photo: CSFS*

Treating for Wildfire Safety

Fuel Hazards

Fuel-hazard measures relate to fuel continuity, both horizontally (across the ground) and vertically (from the ground up into the crown). Fuels with a high degree of vertical and horizontal continuity are the most hazardous, particularly when they occur on slopes. Heavier fuels (brush and trees) are more hazardous and produce more intense fires than light fuels (grasses). Mitigation of fuel hazards focuses on breaking up the continuity of fuels, with greater distance between vegetation on slopes.

Fuel Definitions and Standards for Mitigation

Trees are woody perennials that usually have one dominant vertical trunk and a height greater than 15 feet at maturity. The spacing requirement between trees is a minimum of 10 feet between the edges of the crowns.

Brush and shrubs are woody plants that are smaller than trees and often are formed by a number of vertical or semi-upright branches remaining close to the ground. Brush is smaller than shrubbery and can be either woody or herbaceous vegetation. Thinning of brush and shrubs often can be accomplished by separating clumps rather than individual stems. The spacing requirement between clumps of brush and/or shrubs is 2½ times the height of the vegetation. The maximum diameter of clumps is twice the height of the vegetation measured from the edges of vegetation crowns. Example: If the shrub clumps are 6 feet in height, the spacing distance between clumps should be at least 15 feet. The diameter of shrub clumps should be less than 12 feet measured from the edges of the crowns.

Branches should be pruned to a height of 3 feet. Applying herbicide to stumps immediately following cutting may be necessary to effectively reduce long-term fire hazards. Mowing sprouts annually is an alternative to herbicide treatment.

Ladder fuels are vegetative materials with vertical continuity that allows fire to burn from ground level up into the branches and crowns of trees. While potentially hazardous, ladder fuels are relatively easy to mitigate by following these guidelines: 1) Remove all ladder fuels beneath tree canopies. 2) In the remaining areas, prune all shrub and tree branches up to a height of 10 feet above ground or one-half the height of the plant, whichever is less. 3) Chip and/or remove pruned material from the site.

Dead and dry grasses should be mowed to a height of less than 6 inches.

Slope Adjustment Factors

The minimum distance from a structure to the outer edge of brush, shrub and tree fuels treatment is 75 feet on level ground. Where only grasses exist and no additional vegetative landscaping is planned, the minimum distance is 30 feet.

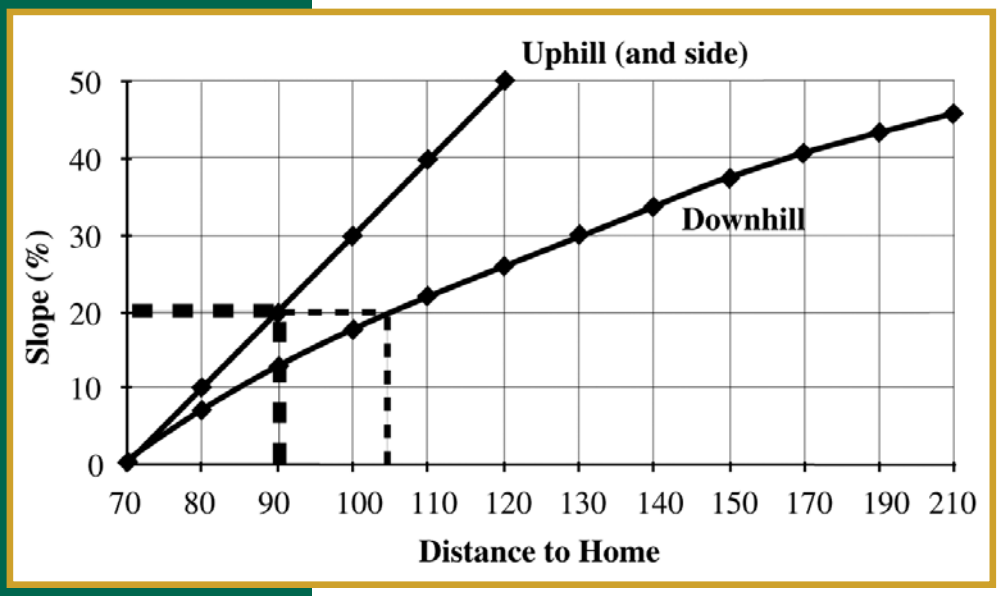

Figure 10: *Defensible space thinning guidelines.*

On slopes downhill and uphill from structures, fuels treatments should be extended further from structures. Complete defensible space thinning according to the increasing distances in Table 1.

Quick Review:

Piñon-juniper forests are found in elevations ranging from 4,900 to 8,000 feet.

Piñon-juniper grow in harsh environments.

Piñon and juniper trees are used for a variety of wood products. Piñon nuts are edible and highly valued.

A variety of wildlife utilize piñon-juniper habitat for food and shelter.

Treatments for piñon-juniper forests include thinning and prescribed burning.

Table 1. Defensible space thinning guidelines

1-percent to 20-percent slopes =	
Brush/shrubs	75' from structure; 3X height separation distance between vegetation.
Trees	75' from structure; 10-foot crown separation distance between trees.
Grass	30' from structure; mow dead, dry grass to 6 inches or less in height.
21-percent to 40-percent slopes =	
Brush/shrubs	150' from structure; 4X height separation distance between vegetation.
Trees	150' from structure; 20-foot crown separation distance between trees.
Grass	50' from structure; mow dead, dry grass to 6 inches or less in height.
Greater than 40-percent slopes =	
Brush/shrubs	200' from structure; 6X height separation distance between vegetation.
Trees	200' from structure; 30-foot crown separation distance between trees.
Grass	75' from structure; mow dead, dry grass to 6 inches or less in height.

Figure 11: *A juniper tree in the Colorado National Monument. Photo: Bill Ciesla*

For more information or professional assistance in managing your forest, contact your local Colorado State Forest Service district office.

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