MANAGEMENT NOTES

Pinyon-Juniper Woodland Management for Multiple Use Benefits¹

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Highlight

A 4,000-acre pinyon-juniper management unit was established on the Tonopah Ranger District, Toiyabe National Forest, in central Nevada during 1968. Initially, an inventory was conducted to obtain basic data about this woodland type. By initiating silvicultural practices, the pinyon-juniper stand, forage production, wildlife habitat, soils and watershed values were improved. Eight times as many Christmas trees of an improved quality, and five times as many juniper fence posts can be produced. Forage production and shrub cover density were increased. Bitterbrush, the dominant shrub, increased in vigor and total growth. Managing selected pin-

yon-juniper areas can provide greater multiple use benefits and economic returns.

Direction for managing the pinyon-juniper woodland type has been provided for in the Forest Service, Intermountain Region, Multiple Use Management Guide (Forest Service, 1966). Where soils are of moderate or deep depth, and where the growth form characteristics of pinyon for Christmas tree production is exceptionally good, the management direction is for Christmas trees and other Forest products. Satisfactory watershed conditions, and proper wildlife and livestock use must be maintained, also.

On the shallow soil types the management direction is to: (1) restore to a satisfactory watershed condition, (2) remove the overstory to the extent necessary to permit soil stabilization by revegetation and/or mechanical measures.

The pinyon-juniper woodland

covers over 850,000 acres of the Toiyabe National Forest in central Nevada. It invades into other biotic communities (Cottom and Stewart, 1940). In east central Nevada it has invaded into Black Sagebrush communities and almost eliminated the understory. (Blackburn and Tueller, 1970). This woodland type is increasing in area and density. Eventually, it becomes overmature and degenerate.

The House Canyon Pinyon-Juniper Management Unit (Fig. 1) is located 70 miles northeast of Tonopah, Nevada. It is in the Willow Creek drainage on the eastern toe slope of the Monitor Range. The mean elevation is 7,200 feet. Annual precipitation for the 1969-70 water year was 13.3 inches.

The management unit is characterized by a pinyon-juniper-bitterbrush community. Utah juniper (*Juniperus osteosperma*) occurs co-dominant to singleleaf pinyon pine (*Pinus monophylla*). Antelope bit-

¹ Received July 21, 1971.

FIG. 1. General view of the House Canyon Management Unit.

terbrush (*Purshia tridentata*) is subordinate to the tree overstory. Grass cover consists of bottlebrush squirreltail (*Sitanion hystrix*) and needleandthread (*Stipa comata*). Sulphur eriogonum (*Eriogonum umbellatum*) is the predominant forb. Vegetation and litter cover is 34%.

Soils are derived from volcanic ash and flow tuffs. Soils are predominantly deep gravelly, stoney, sandy loams. There are some shallow clay loam soil types with a hardpan at 8 to 12 inches.

Infiltration rate is fast on the stoney, gravelly, sandy soils and is slower on the clay loams. The erosion hazard is moderate and pH is neutral. The stream channels show evidence of light erosion.

Management Treatments

An inventory was initiated and suitability classification developed.² Silvicultural and regeneration practices were initiated.

A field survey of twenty 1/10th and 1/20th acre plots were taken at

random to determine: (1) the total number of Christmas trees by grades, (2) the total number of juniper fence posts, (3) the number of trees to prune per acre, (4) the number of trees 2 to 4 feet class per acre, (5) the number of seedlings per acre, (6) the number of worthless trees to remove per acre, (7) the normal rotation cycle, (8) the number of Christmas trees in tops of trees to 14 feet high.

Plots were classified as suitable or unsuitable for pinyon-juniper management. A 12-inch high wooden stake was placed at the

FIG. 3. Juniper tree pruning shows adventitious sprouting, providing potential posts.

center of the plot and each plot delineated on aerial photographs.

Sites termed unsuitable were too steep, too rocky, poor soils, shallow soils or a hardpan, or a high erosion hazard index.

Silvicultural and regeneration practices initiated include stump culture, pruning, thinning, weeding, and tube stock planting.

Some Christmas trees of an improved grade were observed within the management unit that had been produced from stump culture. In stump culture, several limbs were left at the base of the trees when they were harvested (Fig. 2). One year later, after the limbs had begun to turn up, the limbs were pruned leaving one main stem.

Juniper trees were observed where the main stem had been cut at the base of the tree and adventitious sprouting occurred (Fig. 3).

FIG. 2. Stump culture. (Left) Before pruning. Limbs turn up within one year. (Right) After pruning. One main stem is left.

²Contribution of Stanley L. Towne, retired, formerly Timber and Fire Project Staff Officer, Toiyabe National Forest, Reno, Nevada.

FIG. 4. Fred Fisher planting tube stock at base of big sagebrush shrub.

These new stems growing vertically along the lateral branches have the potential of producing more posts.

Many pinyon trees had a double stem or a prominent secondary stem which was pruned to leave one main stem.

Thinning can be accomplished according to site potential which will improve the grade of the future Christmas tree crop.

In weeding, shrubs were removed from around seedling trees to eliminate competition and to produce Christmas trees with a much better form class.

It was observed and confirmed (Forest Service, 1965) that natural seedling establishment occurs at the base of shrubs and mature trees. Fall and spring plantings were made on the north side of shrubs. Pinyon seedlings (one month old stock) were obtained from the Nevada State Nursery which had been planted in individual heavy paper containers (Fig. 4).

Removal of the pinyon-juniper overstory on a 10-acre plot was accomplished. Four 100-foot line intercept transects were established (two in the control, and two in the treated area). The shrub composition and density before and after treatment was determined.

One antelope bitterbrush tagged twig transect was established in the control and one in the treated area. Readings were made each fall during 1968, 1969, and 1970 and summarized.

FIG. 5. Stanley Towne and author observe Christmas tree in top of 12-foot pinyon tree.

Forage production was determined before and after treatment by the site analysis method (Forest Service, 1969).

Results and Discussion

A summary of the inventory data shows this management unit has an average of 23 Christmas trees and 19 Juniper fence posts per acre. There are 106 seedlings per acre and 40 trees per acre in the 2 to 4 foot height class. Also, there are 77 trees per acre (old growth) to be removed under intensive management. About 17% of the Christmas trees can be "topped" from trees up to a height of 14 feet (Fig. 5).

Annual ring counts made of pinyon trees indicate the normal rotation cycle in this management unit for a 7 to 8 foot Christmas tree is 23 years. By practicing thinning and pruning the double stemmed

trees and/or the secondary stems, it is estimated the first rotation cycle for Christmas trees can be shortened to 7 years.

Seedling counts made for both the fall and spring plantings show that 20% of the fall plantings survived, compared with 40% of the spring-planted seedlings. Spring plantings are generally more successful in the Intermountain Region.

After the pinyon-juniper overstory was removed, allowing bitterbrush release, there were 42% more twigs and 100% greater leader growth produced in the treated plots than were produced in the control area. Cover of all shrubs also greatly increased (Table 1).

Forage production before treatment was only 80 pounds decrease (D) and increase (I) plants per acre. After treatment, forage production was 650 pounds of D and I plants per acre, with bitterbrush producing 48% of the total forage.

In central Nevada the demand is increasing for pinyon pine Christmas trees, juniper posts, pine nuts, and cordwood. Until this management unit was started in 1968, the Tonopah Ranger District had only a small volume of business in these categories. During 1970, sales of forest products from the district totaled \$3,323. There were 4,635 Christmas trees, 3,030 juniper posts, 180 cords of cordwood, and 3,800 pounds of pine nuts sold for harvest.

Conclusion

Pinyon-juniper management units can be selected according to

Table 1. Summarization of shrub transect data, using line intercept method. Increase or decrease (inches + or -) in cover during three-year period.¹

Plant species	Control area	Treated area
Antelope bitterbrush	+ 3	+ 334
Sagebrush (<i>Artemisia tridentata</i>)	- 2	+ 226
Rabbitbrush (<i>Chrysothamnus viscidiflorus</i>)	- 4	+ 41
Green ephedra (<i>Ephedra viridis</i>)	0	+ 51
Pinyon pine, singleleaf	+ 106	0

¹ Data collection made by Thomas S. Stinson, Range Conservationist, Toiyabe National Forest. Now, Range Conservationist, Challis National Forest, Mackay, Idaho.

soil types and growth-form characteristics of the trees. A basic inventory will determine the adaptability of a site for management. Vigor and production of forage plants can be increased to benefit livestock and big game. Openings created on the pinyon-juniper type would be beneficial to wildlife in providing an edge effect. Increase in vegetation and litter cover would improve watershed conditions.

More forest products of better quality would be a result. Greater economical returns could be realized.

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