

THE ELY CHAIN

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Abstract. The Ely chain is a vegetative manipulation technique used to reduce competition from pinyon-juniper (Pinus monophylla - Juniperus osteosperma) and big sagebrush (Artemisia tridentata) for the release of desirable understory plants or the establishment of a mixture of introduced plant species. The conversion of undesirable plant communities into desirable communities of mixed browse, grasses and forbs makes it a desirable technique to improve habitat conditions for wildlife. Proper consideration must be given to planting methods, seed mixtures, cover, edge effect and wildlife benefits.

INTRODUCTION

During the past several decades, numerous methods of manipulating vegetation have been used to restore depleted rangelands. Among these is the use of anchor chains to reduce competitive vegetation. Chaining is favored because of its low cost and adaptability to areas with steep terrain and soils too rocky to permit use of other mechanical tools. The common practice has involved the combination of the initial anchor chaining with a smooth chain, followed by the aerial application of seed of desirable species, then a second chaining in the opposite direction, which covers the seed and increases the removal of undesirable plants. Results of this practice have been varied. In some cases problems with poor elimination of competition, inadequate seedbed preparation and poor seed coverage have produced undesirable results on Nevada ranges.

The most common control methods for big sagebrush are plowing or aerial application of a herbicide. These are highly successful since in many instances eradication is achieved. These practices, however, have detrimental effects upon most wildlife habitat because of the elimination of big sagebrush and forbs as important vegetative components.

Most seeding practices accompanying vegetative manipulation have involved the application of a single exotic grass species. The consequence is a change from a dominant shrub community to a grass type. Monotypes, or plant communities consisting of a single species, are regarded as poor wildlife habitat because they do not supply an assortment of plant species which are needed to provide a variety of nourishment for wildlife.

In 1966, the Bureau of Land Management in eastern Nevada initiated a four year study with an objective to improve the usefulness of the anchor chain in restoring deteriorated rangelands covered by pinyon-juniper and big sagebrush. As a result of the effort, the Ely chain was developed, tested and evaluated under field conditions. In addition, special attention was given to the role of manipulating vegetation for the improvement of wildlife habitat.

MATERIALS AND METHODS

The Ely chain is a large anchor chain with short lengths of railroad iron welded across each link. The unique characteristic of the Ely chain is the rooting and scarifying action of the rail as the chain rolls in the direction of pull. This rolling action is facilitated by the use of large anchor chain swivels attached to each end of the chain. The chain is pulled by two large crawler tractors (Cain 1971).

Competition from closed communities of pinyon-juniper and big sagebrush on selected sites was removed by the Ely chain within important big game and upland game habitat areas. A minimum of twelve pounds of seed per acre was planted in the pinyon-juniper community, while seven pounds was planted in big sagebrush. The mixture was comprised of a variety of browse, grasses and forbs in pinyon-juniper and grasses and forbs in big sagebrush (Table 1). Only seed adapted to particular soils and precipitation zones was planted. Seeding was not done when understory grasses and forbs were present in big sagebrush communities.

Table 1. List of plant species included in mixtures planted in the pinyon-juniper type. The same grasses and forbs were planted in the big sagebrush type.

GRASSES	FORBS	SHRUBS
Fairway crested wheatgrass Standard wheatgrass Intermediate wheatgrass Smooth brome (southern strain) Russian wildrye Pubescent wheatgrass Siberian wheatgrass	Alfalfa Yellow sweetclover Small burnet	Antelope bitterbrush Four-wing saltbush Curl-leaf mountain mahogany True mountain mahogany Golden current

In the pinyon-juniper chainings, edge effect and escape cover were provided by creating irregular boundaries and leaving patches or islands of unchained trees within chained areas. Depending upon tree density, the escape cover was wide enough to provide escape areas where big game using the cover could not be observed from the openings.

The relative success of the chainings was determined by making seedling counts of planted and native understory plants. The success of the chainings in improving wildlife habitat was determined by the response of plant species needed to fulfill food and cover requirements of wildlife species.

RESULTS

The manipulation of pinyon-juniper and big sagebrush by the Ely chain accomplished the basic effect of setting back plant succession by controlling the climax of invading species and introducing other desirable vegetative species or perpetuating native plants. The result was a conversion of undesirable plant communities into mixed communities of desirable browse, grass and forbs.

Removal of Competition

In dense stands of pinyon-juniper, the Ely chain effectively removed about 90 percent pinyon-juniper trees, while 70 to 85 percent big sagebrush plants in closed communities were removed. In both types, adequate competition was removed for: (1) the release of

native understory browse, grasses and forbs, and (2) the establishment of introduced browse, grasses and forbs.

Response of Understory and Planted Species

The response of understory species resulting from the removal of competition was most significant in the big sagebrush communities. Reasons for this are attributed to: (1) understory plants generally were absent in closed communities of pinyon-juniper, and (2) the chaining treatment uprooted most existing understory plants in the pinyon-juniper. In the big sagebrush community, five native species of grasses and numerous annual and perennial forbs responded.

The Ely chain prepared an excellent seedbed for aerial applied seed and sufficient seed coverage was achieved. The relative response of certain seeded plants has been reported by Cain and Hammersmark (1969). These authors list three browse, seven grass, and four forb species which responded favorably to planting in pinyon-juniper and big sagebrush communities in eastern Nevada. The adaptability of additional plant species to the pinyon-juniper and big sagebrush communities are described by Plummer, Christensen and Monsen (1968).

Wildlife Benefits

On selected sites in eastern Nevada, the conversion of dense stands of pinyon-juniper by chaining to mixed communities of browse, grass, and forbs resulted in favorable habitat conditions for mule deer (Odocoileus hemionus). The mixture of plant species is providing a variety of nourishment on a seasonal or yearlong basis. Investigators are unanimous that deer need a variety of food plants to maintain their health and vigor. Dasmann (1971) reports on the importance of providing a variety of forage when manipulating vegetation for the benefit of deer. The importance of pinyon-juniper conversions to mixed communities of browse, grass and forbs for the benefit of mule deer has been well documented by Plummer, Christensen and Monsen (1966). These authors describe the improvement of deer winter ranges through the conversion of 120,000 acres of dense stands of pinyon-juniper in Utah to mixed communities of desirable plant species.

The role of pinyon-juniper conversions is not confined to improving habitat for mule deer. According to Yoakum (1971), a dense stand of pinyon-juniper in central Nevada was converted to a mixed browse, grass and forb community for the benefit of bighorn sheep (Ovis canadensis). In eastern Nevada, I observed pronghorn antelope (Antilocapra americana) utilizing the edges of a pinyon-juniper conversion during a dry summer season.

Chaining irregular boundaries and leaving untreated pinyon-juniper on at least three sides of pinyon-juniper chainings resulted in adequate edge effect. Unchained fingers or islands of trees within approximately one-fourth mile of any part of a chained area provided escape cover. Studies of big game--escape cover relationships by Reynolds (1962) indicates a strong correlation between the proximity of cover to openings and use by big game. In his studies of natural openings in Arizona, Reynolds found that deer use into clearings stopped at about 1,200 feet and elk (Cervus canadensis) use 1,400 feet from the forest edge.

The successful conversion of dense stands of big sagebrush, by the Ely chain, into mixed communities of browse, grass and forbs, created favorable habitat conditions by: (1) establishing an assortment of plant species needed to provide a variety of nourishment on a seasonal or yearlong basis; and (2) maintaining adequate shrub cover. The 15 to 30 percent big sagebrush plants after the conversion are considered a necessary component in the mixed plant community. The importance of big sagebrush to big game and upland game is described by Smith (1950); Martin, Zim and Nelson (1951); and Girard (1937). Wildlife species benefiting from this type of conversion include, but are not limited to: mule deer, pronghorn antelope, sage grouse (Centrocercus urophasianus) and small mammals and birds.

The release of native grasses and forbs proved to be a particularly worthwhile means of improving native habitat. Cain and Hammersmark (1969) recorded the movement of pronghorn antelope onto a big sagebrush community converted to a native browse, grass and forb

community. Barngrover and McColm (1970) reported a situation in central Nevada where sage grouse were attracted to a big sagebrush community that was converted, by raiiling, to a native browse and forb community. Klebenow and Gray (1968) documented the importance of forbs in the diet of juvenile sage grouse in Idaho and stated that the importance of forb components in the habitat must be recognized if native ranges are to be properly managed for sage grouse.

DISCUSSION

The Ely chain effectively removed about 90 percent pinyon-juniper and 70 to 85 percent big sagebrush by double chaining in opposite directions. Where desirable understory plants were not present, seed mixtures of desirable browse, grasses and forbs were aerial applied between chainings. Adequate seedbed preparation and seed coverage were achieved. In big sagebrush communities with desirable understory plants, a reduction of competitive vegetation by chaining resulted in a significant response of desirable understory plants. Big sagebrush plants remaining after the chaining are considered to be an important component in the mixed plant community because they provide necessary food and cover. Four browse, six grass and three forb species responded favorably to planting in pinyon-juniper and big sagebrush communities.

Adequate edge effect was provided by chaining irregular boundaries and leaving untreated pinyon-juniper on at least three sides of pinyon-juniper chainings. Sufficient cover was furnished by leaving unchained fingers or islands of trees within approximately one-fourth mile of any part of a chained area.

The successful conversion of undesirable plant communities into desirable communities of mixed browse, grasses and forbs by chaining provides favorable habitat conditions by supplying an assortment of plant species needed to furnish a variety of nourishment for wildlife on a seasonal or yearlong basis. Wildlife species benefiting include: mule deer, pronghorn antelope, bighorn sheep, sage grouse, and small mammals and birds.

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