A Progress Report on Techniques to Broadcast Burn Dozed Juniper

HENRY A. WRIGHT

Department of Range and Wildlife Management
Texas Tech University, Lubbock, TX 79409

CARLTON M. BRITTON

Texas Tech University

ROBERT L. WINK

Texas Tech University

BOB BECKHAM

Rancher, Abilene, TX 79601

JUNIPER (*Juniperus* spp.) is a volatile fuel and can be very dangerous to burn, especially after it has been dozed or chained and is dry. Nevertheless, fire is a natural part of juniper communities, and since broadcast burning is the only economical way that we can control the population of young Ashe juniper (*Juniperus Ashei*) and to remove piles of decay-resistant juniper, we have pursued the development of prescription burning techniques in the Ashe juniper community in central Texas (Fig. 1).

This study is being carried out on the Bob Beckham ranch, about 40 miles east of Abilene. Average annual precipitation is 24 to 28 inches, topography is level to undulating with some slopes greater

FIG. 1. Techniques to broadcast burn dozed Ashe juniper communities are currently under development. Because of volatile oils in the wood, juniper is a dangerous fuel to burn.

than 20 percent, and elevation is 1,200 to 1,400 feet above sea level. Sandy loam and low stony hill range sites dominate the study area.

Vegetation consists of mixed prairie grasses interspersed with Ashe juniper and several species of oak (*Quercus* spp.). Little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*) are the dominant decreasers while buffalograss (*Buchloe dactyloides*), vine-mesquite (*Panicum obtusum*), Texas wintergrass (*Stipa leucotricha*), tall grama (*Bouteloua pectinata*), and meadow dropseed (*Sporobolus asper* var. *hookeri*) are important increasers.

The juniper trees were dozed in all pastures, starting in 1965. Pastures were tree dozed about 5 years previous to our prescribed burning. Following the dozing treatment, many juniper trees that were too small to doze and numerous seedlings of juniper became prominent. Juniper seedlings usually proliferate following any initial treatment on the large trees (Wright 1971).

We started our prescription burning during a very wet winter

and spring of 1970. During this year we burned 1,000 acres on six separate burns. In 1971, a very dry winter and spring, we burned 1,600 acres on 10 separate burns. This year, a "normal" spring, we burned 22 acres on four separate areas. Three of the burns in 1972 were on watersheds which had to be burned without any fire lines.

During the past 3 years of testing under a wide variety of weather and fuel conditions, we have observed about 40 spot fires, none of which escaped control. While burning, we have had a D-7 Caterpillar tractor present at our fires at all times. This Caterpillar tractor has been the best insurance that we could buy. The Caterpillar operator has put out most of our spot fires, although our slip-on pumper and students with good common sense have also saved their share of fires.

With this much experience behind us, we think that we have established the limits pertaining to when juniper fuel is safe to burn and when it is dangerous to burn. In addition, we know what fine fuel (grass) and weather conditions are needed to do an effective job of burning. Finally, we think we can make good approximations on how wide our fire lines need to be for the weather conditions under which we want to burn. Further testing will be done in 1973 and 1974 before we will feel confident to give recommendations to ranchers and public agencies.

FIREBRANDS

Firebrands from burning piles of juniper trees are the greatest threat when burning an Ashe juniper community. The distance that a firebrand will travel is dependent primarily on volume of the juniper pile. For small piles (up to 3,000 ft^3) firebrands above 220° F travel from 0 to 180 feet, depending on their looseness and the wind. For piles with more than 3,000 ft^3 of volume, the following equation predicts the maximum distance that firebrands will travel.

$$D = 126 + 0.01X,$$

$$R^2 = 0.998$$

$$s_{y \cdot x} = 1.99 \text{ ft}$$

where D is the distance that a firebrand will travel in feet and X is the pile volume in ft^3.

During a wet spring we saw several spot fires start from 60 to 90 feet from piles and only once at a distance of 100 feet. However, during the spring drouth of 1971, we had many spot fires start at a distance of 300 to 400 feet and two were ignited 800 to 1,000 feet from the leading edge of the fire. These spot fires during the drouth started under extremely dry conditions, wind velocities were 10–15 mph, relative humidity was 14 percent, air temperature was 81°F, and fuel moisture was 1 percent. Thus, the distances of spot fires in 1971 should be the maximum that one might expect.

The areas where we had the most difficulty with firebrands contained high concentrations of juniper piles within 50 to 60 feet of each other. When piles are this close together, they seem to behave as one large pile. The total estimated volume of the two high concentration areas indicated that they would send firebrands 930 feet.

An interesting feature about the spot fires in 1971 was that most of them started in cow chips, which ignited the surrounding short grass (est. 400 lbs/acre) and later the piles of juniper. One spot fire started in oak leaves and a couple started in juniper piles.

PRELIMINARY TECHNIQUES TO BURN DOZED JUNIPER

We have established that under prescribed burning conditions we need a minimum of 1,000 lb/acre of fine fuel to carry a fire (Wink 1972). Where the fire will carry, juniper piles are ignited easily and small juniper trees (less than 4 ft high) are killed. If the juniper piles ignite, comsumption will be at least 98 percent (Wink 1972).

The current tentative procedure that we are using to burn dozed juniper is as follows:

Step 1: Graze the pasture heavily before 1 May.

Step 2: Doze 10 foot fire lines on each side of a 300 to 400 foot wide strip on the north and east sides of the pasture to be burned (Fig. 2).

Step 3: Between 1 May and 1 June, burn the juniper piles in the 300 to 400 foot strips on the north and east sides when grass is green, wind is less than 10 mph, and relative humidity is above 45 percent (Fig. 2). Care should be taken not to burn into areas that contain oak leaves. Thick mats of leaves will ignite easily from

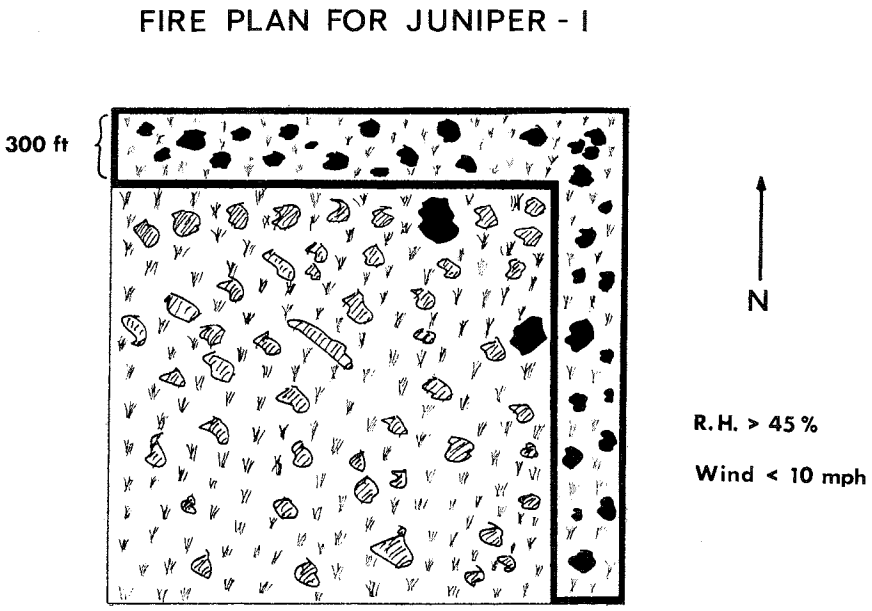

FIG. 2. Between 1 May and 1 June when the grass is green, juniper piles in the 300 to 400 foot strips on the north and east sides are burned when wind velocities are less than 10 mph and relative humidity is above 45 percent.

cinders. Also wait at least one day to burn piles after receiving 0.25 inch or more of rain. Small piles must be dry to ignite easily and to burn completely. After 1 June, defer the pasture so that adequate grass fuel will be available to burn the pasture the following spring.

Step 4: Eight months later in February, burn the grass in the strips. If the grass fuel is more than 2,000 lbs/acre (e.g. little bluestem), burn when wind is less than 8 mph and relative humidity is 50 to 60 percent (Fig. 3). If the grass fuel is less than 2,000 lbs/acre (e.g. buffalograss), burn when wind is less than 8 mph and relative humidity is 25 to 40 percent. This prepares the fire lines for the major burn that follows.

Step 5: Burn into the prepared fire lines when wind is 8 to 15 mph and relative humidity is 25 to 40 percent (Fig. 3). If there are large concentrations of piles within 50 to 60 feet of each other, on the north and east sides, backfire them before headfiring the general area.

These are only preliminary techniques based on the information

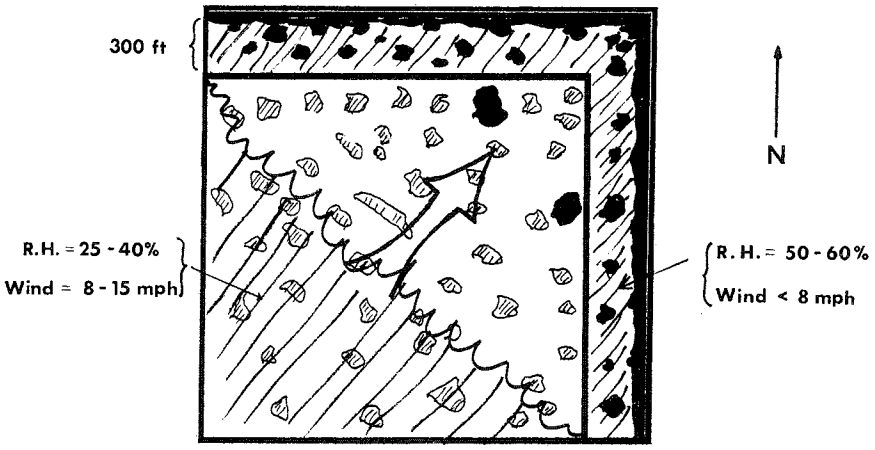

FIG. 3. Burn grass on north and east sides (strips) in late winter when wind velocities are less than 8 mph and relative humidity is between 50 and 60 percent. Lower relative humidities may be used if the grass fuel is less than 2,000 lbs/acre. Backfire all large concentrations of piles on north and east sides of main area to be burned, and then burn into the prepared fire lines with a wind of 8 to 15 mph and a relative humidity of 25 to 40 percent.

that we have to date. Currently we are doing a firebrand study, which will help us to improve our techniques. This firebrand study along with additional field-testing planned on 3,000 acres in 1973 and 1974 will complete our development of procedures to broadcast burn dozed Ashe juniper.

LITERATURE CITED

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