Periodic Burning Enhances Utilization of Grass Type Conversions

Mike Dennis

Effectively utilizing the long established perennial grass type conversions on the Stonyford District, Mendocino National Forest, in northern California, has evolved into a critical problem. The most significant problem is the increasing recovery of brush and the related poor utilization of grass by livestock. Faced with the critical controversy over the use of herbicides on public lands and the high cost of mechanical treatment, additional cost-effective techniques to control brush encroachment and renovate the pastures are needed.

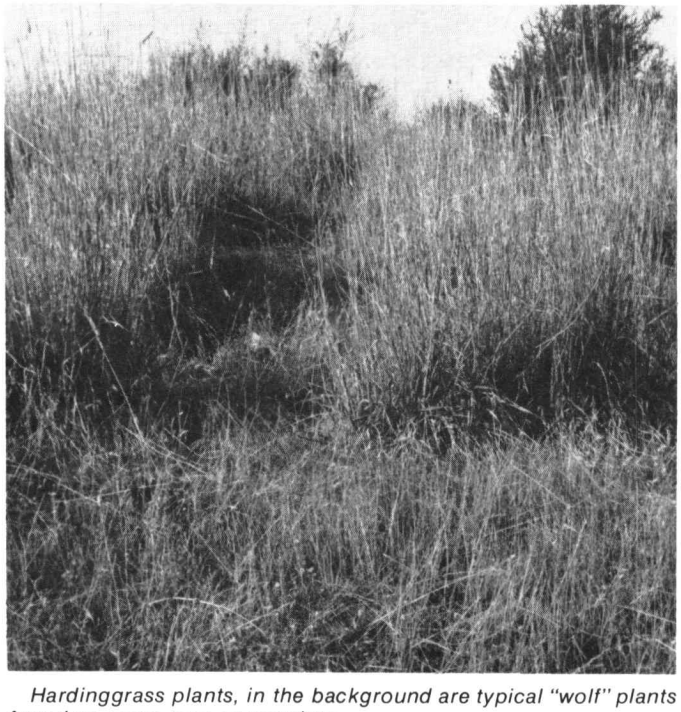
The Big Stony type conversion was initially selected for an experimental trial to control brush encroachment and re-establish the vigor and management of the pasture. The type conversion was established in 1962. Approximately 180 acres of chamise *(Adenostoma fasciculatum)* dominated chaparral was successively crushed, burned, disked and seeded between 1962 and 1963.

Soils underlying the area are predominately in the Stonyford series and texture ranges from clay/clay loam to gravelly clay. The effective rooting depth ranges from 25″ to 45″ and the depth to a fractured basaltic bedrock averages 50″. Inherent fertility is moderate to low and the pH is neutral. Slopes range from 2 to 20 percent. Average annual precipitation is 25″ - 30″, occurring mainly between November and May. The average elevation is 1,600 ft.

The area was drill seeded almost entirely in Hardinggrass *(Phalaris tuberosa var. stenoptera)* at a rate of 5 lb/acre. Approximately 80 acres was additionally seeded with rose clover *(Trifolium hirtiglumus)* at a rate of 8 lb/acre. Although dominated by Hardinggrass, annual grasses and forbs have become well established between the perennials. Soft chess *(Bromus mollis)*, annual fescue *(Festuca megaleura)*, slender oats *(Avena barbata)*, red-stem filaree *(Erodium cicutarium)* and bur clover *(Medicago hispida)* are predominant in the annual community. Yellow star thistle *(Centaurea solstitialis)* is evident as a late-maturing summer annual.

Since 1963, seedling and crown sprouting brush invading the pasture was sprayed with 2-4-D herbicide twice (1965, 1967). Spraying was done by helicopter and control was reported to have been complete and effective. The type conversion again needed maintenance by 1975, but with the controversy over herbicide use increasing, respraying the invading brush was neglected. Consequently, brush encroachment from resprout and seedlings is threatening the vegetative conversion. The majority of brush species are chamise, buck brush *(Ceonothus cuneatus)* manzanita *(Arctostaphlos manzanita)* and Yerba Santa *(Eriodictyon californicum)*. Of the four, chamise and Yerba Santa are crown sprouters, with chamise also being an avid reseeder.

The effects of brush re-invasion were (1) about 20% of the available grazing area was lost, (2) livestock tended to graze the more open areas and avoid the forage adjacent to and under the brush and (3) ungrazed or poorly grazed Hardinggrass plants become "wolf" plants which showed no signs of tillering. Green forage, produced in the mass of dry material, could not be grazed. The situation gradually evolved into a scenario of underutilized "wolf" plants and proliferating less desirable annuals; aggravated by the re-invasion of undesirable brush species.



Hardinggrass plants, in the background are typical "wolf" plants found on some type conversions.

Burning to Control Wolf Plants and Brush Invasion

The entire 180 acres of the brush-grass type conversion was burned by hand crews in late October 1979. By that time, .66″ of precipitation had been received, which was adequate to stimulate germination of annual grasses and forbs beneath the litter. Typical of a grass burn, the fire spread and burned quickly, consuming the majority of dry perennial growth and annual grass litter. It was interesting to note, however, that germinating annual plants under the litter were

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not visibly affected by the fire. Clumped perennial grass "wolf" plants provided enough fuel to ignite some brush. This was particularly obvious where the brush limited utilization of the grasses by livestock and more dry fuel was available.

In the trial area sampled, some form of control was obvious on about 41% of the brush. Underburning the grass had four effects on brush:

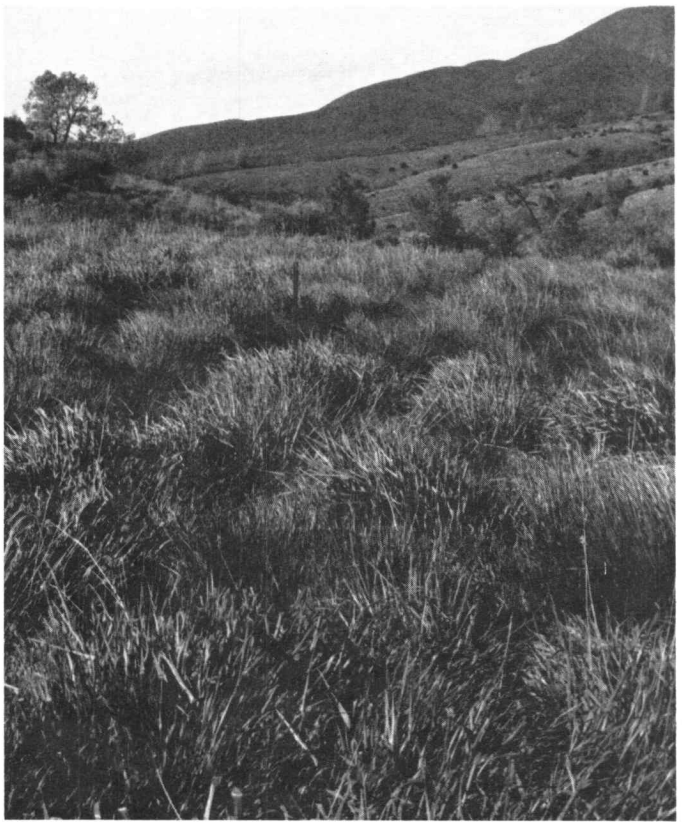
1. Some mature plants ignited and were totally consumed.
2. Only dead branches and litter burned on some.
3. Brush seedlings were totally consumed.
4. Low intensity underburning did retard the growth on some plants (principally manzanita).

At least 80% of all dry leaves and stems were burned off the Hardinggrass plants. More than 80% of the annual litter was also consumed. Growth of foliage on perennial plants was evident as little as three days after the burning.

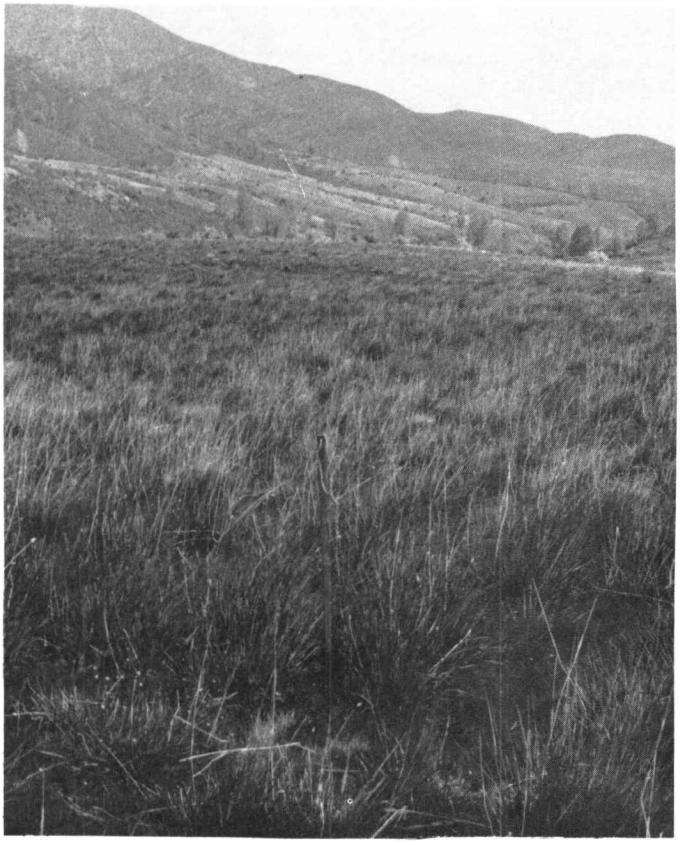
Forty acres of the burned area was fertilized with approximately 300 lb per acre of ammonium phosphate (16-20-0) between late October and early November.

The immediate effect of burning, besides eliminating some competitive brush plants, was the removal of a large amount of essentially ungrazable overgrowth. Observation of livestock grazing habits and post-season evaluations show that clumped Hardinggrass is not grazed. The majority of green foliage was intermixed in the clumps of dry material and coarse stems and was therefore not available as forage.

The amount of available forage almost doubled. Significant growth was measured on the burned plants as the season progressed. This may be due in part to a released flush of nutrients for plant use from the ash and the removal of the constricting influence of the matted stems and dry foliage. By late spring, evidence of lateral plant expansion (not seen in the "wolf" plants) was common in all burned pastures. When grazed, the pasture was evaluated as receiving moderate but even use, particularly where some degree of brush control was achieved.



After burning, 300 lb/acre of ammonium phosphate (16-20-0) was applied to this Hardinggrass pasture. Production was estimated at 6,776 lb/acre of usable forage or 7.53 cow months per acre.



This burned and unfertilized Hardinggrass pasture has an estimated production of 3,331 lb/acre usuable forage (or 3.7 cow months/acre).

Fertilization of the 40-acre trial showed a marked increase in forage production and condition. Late season evaluations documented significant lateral plant expansion, greater seed cast and concentrated but even livestock use. Fertilization as a spot-burn treatment afforded the following results:

- Production of usable forage doubled in burned but unfertilized pastures and tripled in burned and fertilized pastures.
- Increased tillering was stimulated.
- Seed production was heavier than non-treated plants.
- Fertilized annuals growing between the perennial plants received more grazing use, reducing the selective pressure on perennials.
- Deferment of livestock was not required to assure perennial pasture recovery in this instance.
- Carry over of nutrients is evident for the second season and predicted for the third season.

Cost Data and Conclusions

The hand burning of perennial grass/brush type conversions cost $5.50/acre. Compared to the $18.50/acre cost for herbicide applications, and $29/acre for mechanical treatment with a gyrocutter, burning of some perennial stands is a viable, cost-effective tool for brush reduction in established

type conversions. When coupled with a program of deferment and fertilization, the increased fuel developed by perennial and annual grasses, will assure a higher level of control on brush when burned.

Fertilization of rangeland has prompted some debate over the cost effectiveness of the practice. Based on current prices, the application of 300 lb/acre of ammonium phosphate would cost approximately $12.00/acre. With the predicted 3-year effectiveness of the practice, it would amount to a $4.00 acre per year investment. The range manager's decision to fertilize must be tempered with the multiplicity of benefits expected.

Fertilization merely for the sake of increasing production is a valuable but limited goal. However, the investment in fertilizer is often justified when coupled with the ulterior benefits of reestablishing or supplementing soil nutrients, providing an increase in the quantity/quality of forage in key wildlife areas, and stimulating a concentrated build-up of fuel for underburning.

The burning and fertilizer trials on the Big Stony type conversion were evaluated as an alternative to spraying for brush encroachment along with post-burning responses and accelerated recovery techniques for perennial grasses. Several notable conclusions were drawn:

1. Seasonal burning of annual or perennial grasses is a viable tool for controlling brush reinvasion in key range areas.
2. Perennial plants respond to burning with accelerated growth, lateral plant development, increased forage production and improving the availability of forage to livestock or wildlife.
3. The early removal of annual plant litter eliminates some competition to the proliferation of perennials.
4. When used in conjunction with burning, fertilization can speed-up recovery, improve forage conditions and provide fuel for late season burning.
5. Scattered buck brush plants *(Ceanothus cuneatus)* fertilized along with the pasture showed definite signs of heavy deer browsing and hedging.
6. The burning/fertilizing/brush control management of Big Stony redeveloped the type conversion as a key grazing area. Grazing use tripled, not only increasing the number of livestock, but extending the season of use (30 days beyond usual use). This is *significant* in so much as it reduced the early grazing pressure on native meadows and glades. Total deferment of pasture was *not* needed to assure recovery to the type conversion.

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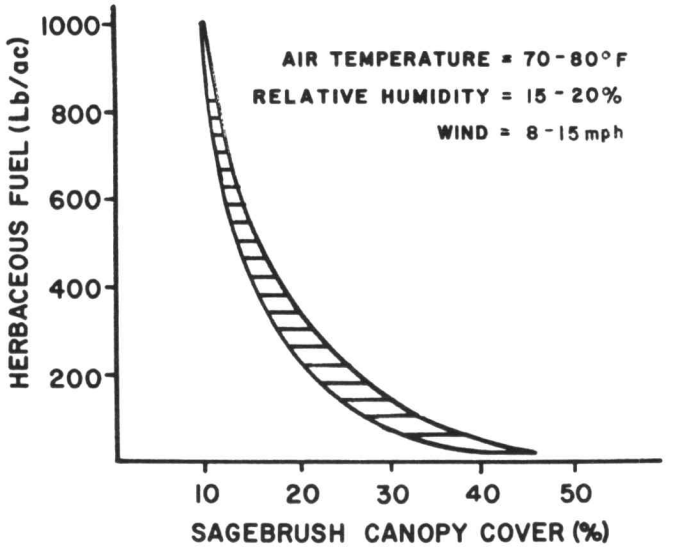
Will Your Sagebrush Range Burn?

Carlton M. Britton, Robert G. Clark, and Forrest A. Sneva

Currently, many sagebrush-bunchgrass communities of the Great Basin are virtual monocultures of big sagebrush *(Artemisia tridentata)*. This condition results in reduced herbaceous production and minimal habitat diversity. When management objectives include reduction of sagebrush density, prescribed fire provides an ecologically sound vegetation manipulation tool. Unfortunately, prescribed fire cannot be used to treat all sagebrush-bunchgrass communities. This paper presents a simple technique which will allow range managers to determine if a particular area can be burned under prescribed conditions. This technique is based on the relative amounts of herbaceous fuel (grasses and forbs) and the canopy cover of big sagebrush necessary to ensure fire spread.

The Relationship

The curve presented represents the relationship between sagebrush canopy cover and herbaceous fuel at which safe and successful prescribed burns can be expected. This relationship will hold when wind is 8 to 15 mph, relative humidity is 15 to 20%, and air temperature is 70 to 80° F. If burns are



Relationship of sagebrush canopy cover and herbaceous fuel load. Curve represents proportions of the two parameters where successful burns can be expected for the given conditions.

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