HOW LONG SHOULD RANGELANDS BE RESTED FROM LIVESTOCK GRAZING FOLLOWING A FIRE?

A Viewpoint

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Some land management agencies have a general policy that rangelands are to be rested from grazing for at least two growing seasons following fire. Many range scientists and range managers, including myself, question this policy. There are three reasons commonly cited for a post-burn rest from grazing: recovery of residual plants, regeneration of desirable plant species and accumulation of litter for soil stability. The effect of fire on plant survival and regeneration depends on several variables, including plant species, season of the fire, intensity of the fire, vigor of the plants prior to the fire, associated species and climatic conditions during and following the fire. Soil stability varies by soil type, topography and climatic conditions. Therefore, a more reasonable approach would be to decide on a pasture by pasture basis whether to graze the year following the fire or to rest the pasture for two or more growing seasons. This paper is not intended as an exhaustive literature review, but rather, as a starting point for on-the-ground discussions between land managers and livestock permittees in the coming year.

I will limit my discussion to the effect on major perennial grass species of the sagebrush-grasslands in the Intermountain Region. The late Henry Wright, widely regarded as the preeminent rangeland fire ecologist of the western U.S., discussed fire effects on this vegetation type (Wright 1985). He reported that fire effect on grasses is largely dependent on growth form and season of burning. Bunchgrasses with densely clustered culms and lots of leaf tissue (Idaho fescue and needle-and-thread) are more susceptible to damage by fire and are slower to recover because the they will burn longer and hotter than those without dense culms and less leaf tissue (wheatgrasses). The latter burn quickly with little heat transfer below the soil surface. Rhizomatous grasses (thickspike and western wheatgrasses) tolerate fire well, as does Indian ricegrass. June and July is the most detrimental season to burn bunchgrasses, with spring burns less detrimental than fall burns.

In reviewing research on how long it takes for bunchgrass production to return to preburn levels, Wright (1985) reported that bluebunch wheatgrass will recover in 1 to 3 years; Idaho fescue 2 or more years; and needlegrasses 3 or more years, all depending on soil moisture, season and intensity of the fire. But what is the effect of grazing on perennial grasses the first season after they burn? Jirik and Bunting (1994) examined the response of bluebunch wheatgrass and bottlebrush squireltail grass to post-fire defoliation at two locations in southern Idaho. They found that late season defoliation (after seedset) the first year after burning did not significantly reduce the vigor of either grass species. Production, basal area and tiller numbers of bluebunch wheatgrass were not affected by late season defoliation, despite two years of below normal precipitation following the fire. Squireltail grass was slightly more sensitive to late season defoliation than bluebunch wheatgrass. Early season defoliation (during the boot phenological stage) the first year after burning did reduce vigor of the two grasses. Bunting et al. (1998) found that early-season defoliation the first year after fire resulted in plant mortality as high as 50% for Idaho fescue and 70% for bluebunch wheatgrass in a study in northern Idaho. However, the effects were lessened when defoliation was delayed one growing season after the fire.

Uresk et al. (1980) reported an increase in vegetative growth and superior reproductive performance in bluebunch wheatgrass during the first post-burn season. Patton et al. (1988) also found greater seed production of bluebunch wheatgrass on 2 out of 4 one-year old burns, compared to unburned control plots. Idaho fescue had less seed production on the burned areas than the unburned controls on one-year old burns, but recovered by the third year. Bunting (1985) pointed out that most studies indicate two to several years may be required for this to occur. He attributes the increase in production primarily to an increase in production per plant and not an increase in density of plants (new plants established from seed). Thus it appears that the increased seed production does not necessarily result in new plants becoming established. What causes a low establishment rate has not been addressed by research, except when there is competition from invading annual grasses, such as cheatgrass.

In order for perennial grasses to establish from seed, certain requirements have to be met. These are a source of viable seed, adequate seed coverage, suitable germination temperatures, minimal competition from other plants and last, but probably most important, adequate soil moisture for the seedling to develop sufficiently that it can survive the dry summers. Patton et al. (1988) reported the number of filled florets (i.e. viable seed) was greater on burned plots than on unburned control plots on bluebunch wheatgrass, Idaho fescue and Columbia needlegrass. Thus it is likely there is an adequate source of viable seed the first year following a burn. Suitable temperatures for seed germination will occur every spring, although the date may vary from year to year

Soil moisture is not only required for a plant to germinate, but there must be sufficient moisture in the seedling root zone over a long enough period for the plant to develop sufficiently to survive an extended dormant period. For most bunchgrasses, this requires the seedling to reach the 3-leaf or greater stage of growth. At higher elevations (6000 ft plus), there is generally adequate soil moisture for seedling establishment. At lower elevations in the Intermountain Region, adequate soil moisture is dependent on the frequency of spring precipitation. Some years it is adequate, some it is not. It is common at the lower elevations to see seedlings of plants every year of both grasses and sagebrush. However, in years with below average spring precipitation, most of those seedlings do not survive.

Competition from other plants, especially annual grasses, is generally not a problem on higher elevation rangelands. However, where cheatgrass or medusahead was present prior to the fire or a seed source is at hand, competition for moisture on the lower elevation rangelands can be a problem for perennial grass seedling establishment. Considerable research has been conducted on reducing or controlling the competition from these annual grasses, but such control is not assured with mechanical or chemical means. The most successful biological control method has been to seed crested wheatgrass. Crested wheatgrass and squireltail grass are the only perennial grass species that have been shown to successfully compete with the annual grasses in the Intermountain Region.

Since cheatgrass generally initiates growth earlier in the spring than crested wheatgrass (or other perennial bunchgrasses), competition from the cheatgrass might be reduced with livestock grazing in the spring, before the perennial seedlings have made sufficient growth to be grazed.

The final criteria for successful seed germination and establishment is adequate seed coverage. All perennial grasses require some seed coverage by mineral soil before the seed can germinate. However, cheatgrass can germinate and become established lying on top of the soil, again giving it a competitive advantage. It is widely accepted by those with experience in seeding rangelands that aerial broadcasting of seed on burned areas at lower elevations is seldom successful and it is only slightly more successful at the higher elevations. The greater success at higher elevations is probably related to a deeper ash layer to cover the seed and more available moisture. Why is aerial broadcasting seldom successful at lower elevations? The most likely cause is inadequate seed coverage, especially when the area is placed off limits to livestock grazing for two or more growing seasons. The principles of rest-rotation grazing, developed by Gus Hormay (1961) and widely applied throughout the Intermountain Region and the Pacific Northwest, especially the treatment of grazing after seed ripe to get seed coverage applies to burned areas as well as low condition rangelands.

The argument can be made that in some cases it might be better to graze the first year following fire. When there is an adequate stand of perennial bunchgrasses surviving a fire, grazing after seed ripe may enhance the establishment of new plants through seed coverage. However, if the perennial plants were in low vigor prior to the fire, then the area should probably be rested for the entire first year. Those species more susceptible to fire (i.e. Idaho fescue, needle-and-thread) should also be rested the first year. Following the principles of rest-rotation grazing, if there are abundant seedlings the second spring and average or above spring precipitation, the area should probably be rested that entire grazing season to give the seedlings a chance to become established. Second, on lower elevation rangelands faced with heavy competition from annual grasses, consideration should be given to grazing the burned area early the first spring or two to reduce competition from the annuals with perennial grass seedlings.

A blanket policy of withholding livestock grazing on a burned area for two or more growing seasons is open to question. The decision to graze or not to graze the first year following the fire may vary from one pasture to another within an allotment, depending on the many variables affecting plant survival, growth and reproduction. Because of the many variables involved, such decisions should be made on a case by case basis.

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