Prescribed Burning of Bog Birch

Edward Bork, Darrell Smith, and Michael Willoughby

Brush encroachment of rangelands is a major concern in Alberta's Rocky Mountain Forest Reserve. Ranges flanking the numerous water courses in the reserve were generally open with low brush cover as little as 85 years ago (Johnston and Smoliak, 1968). The existing grasslands are an important source of feed for both cattle in the summer and elk during the winter. The combined demand for sufficient high quality forage for both uses has made it increasingly necessary to maintain these areas.

On many northern rangelands, naturally occurring wildfires kept the spread of brush in check. These fires often resulted from lightning and natives. Indians used fire in Northern Alberta to provide lines of protection from wildfire, maintain open meadows for horse grazing and village establishment, and as a method of habitat im-provement to attract native ungulates and fur bearers (Lewis, 1978).

In the past, public agencies responsible for resource management have placed considerable emphasis on the suppression of fire in attempts to protect timber supplies, recreational pursuits, watersheds, and rural communities. Ironically, the result of decades of fire suppression, now has resource managers searching for a means through which they can maintain important native grasslands.

Fig. 1. *Overview of Seven Mile Flats grazing unit containing the burn. This picture is typical of the valley bottoms throughout the Upper Foothills subregion of Alberta.*

Authors are Range Ecologists, Forest Management Division, 9920-108St, Edmonton, Alta. T5K 2M4 and Range Forester, Land and Forest Service, Box 1720, Rocky Mountain House, Alta. T0M 1T0.

Prescribed Burning for Range Improvement

A trial project to evaluate burning as a range improvement tool was set up in 1984. A portion of the Clearwater Range Allotment, locally known as the Seven Mile Flats (Figure 1), was prescription burned by the Alberta Forest Service. The valley floor consisted of a floodplain which had been extensively colonized by shrubby species, mostly bog birch (*Betula glandulosa*). Bog birch occurs in the northern and central eastern slopes of the Rocky Mountains, ranging from the lower foothills into the subalpine, often forming thicket communities together with willow. On this site, shrubby cinquefoil was also present. The dominant forage species were foothills rough fescue, slender wheatgrass and dryland sedges. These sites are typical of the Foothills Natural region and the Upper Foothills subregion of Alberta (Alberta Environmental Protection 1994).

The objectives were to: 1) determine any changes in the species composition and vigor, of both the forage understory and shrub overstory as a result of prescribed burning, 2) evaluate burning as a tool for improving non-woody forage production on bog birch encroached areas, thereby increasing the potential for livestock grazing, 3) formulate recommendations as to which prescribed burning practices lead to a greater degree of shrub control and grassy regrowth in the valley bottoms of west central Alberta's Rocky Mountain Forest Reserve.

The project area was initially burned in 1984 under a limited burning window. Followup, more effective burns, took place in 1987 and 1993 under warmer, drier, less humid conditions (Table 1).

Table 1. Burn conditions.

	1984	1987	1993
Date	Apr 30	May 7	May 3
Temperature	8°C	30°C	16°C
Relative humidity	54%	8%	17%
Wind speed (Mph)	NE,18	W,15	SE,7
Fine Fuel Moisture Content (FFMC)	87	92	93
Initial Spread Index (ISI)	4	15	11
Area (acres)	70	70	70

Stem density and canopy cover of bog birch were recorded every year except in 1987 when the site was reburned. The canopy cover of forbs, grasses, and shrubs were also recorded on four permanent transects.

Impact on the Shrub Community.

The annual growth of the shrubs at the burn site declined moderately the year after the initial burn. Two years following the initial burn in 1984, both the annual growth and stem densities had increased sharply to above pre-burn levels (Figure 2).

During the first burn, the moderate humidity and low air temperatures at ignition resulted in a cooler, less intense surface burn. Consequently, heat was not sustained long enough to penetrate and kill the shrub basal crowns with abundant resprouting, resulting in higher stem densities, canopy cover, and annual growth.

For the second and third burn in 1987 and 1993, air temperatures were higher and humidities lower. This resulted in a very intense fire which penetrated deeper into the duff layer and shrub crowns. High fire temperatures were a result of increased accumulation of grass and forb material underneath individual shrub colonies due to the inability of cattle to access forage supplies located underneath the shrub cover. Figures 3 and 4 illustrate the affect of three burns in reducing the overall shrub canopy on the site over a ten year period.

Despite the favorable decline in shrub growth immediately after the second and third burns, shrub regrowth continued to increase in 1992, after the second burn, and in 1994 after the third burn. Although the increase in shrub growth was not to the same degree as after the initial burn in 1984. Regrowth was marked by large increases in stem density, indicating that while the low lying remnant shrubs were no longer tall enough to inhibit livestock movement, they maintained the potential to regain problematic status with continued regrowth. Shrubby regrowth from the birch will likely continue to accelerate unless periodic burning is undertaken to ensure that the shrub community remains in check.

Non-Woody Species Response.

The key impacts of the burns in 1987 and 1993, was a significant decline in rough fescue cover. Fires that penetrate the duff layer sear fescue and wheatgrass crowns and

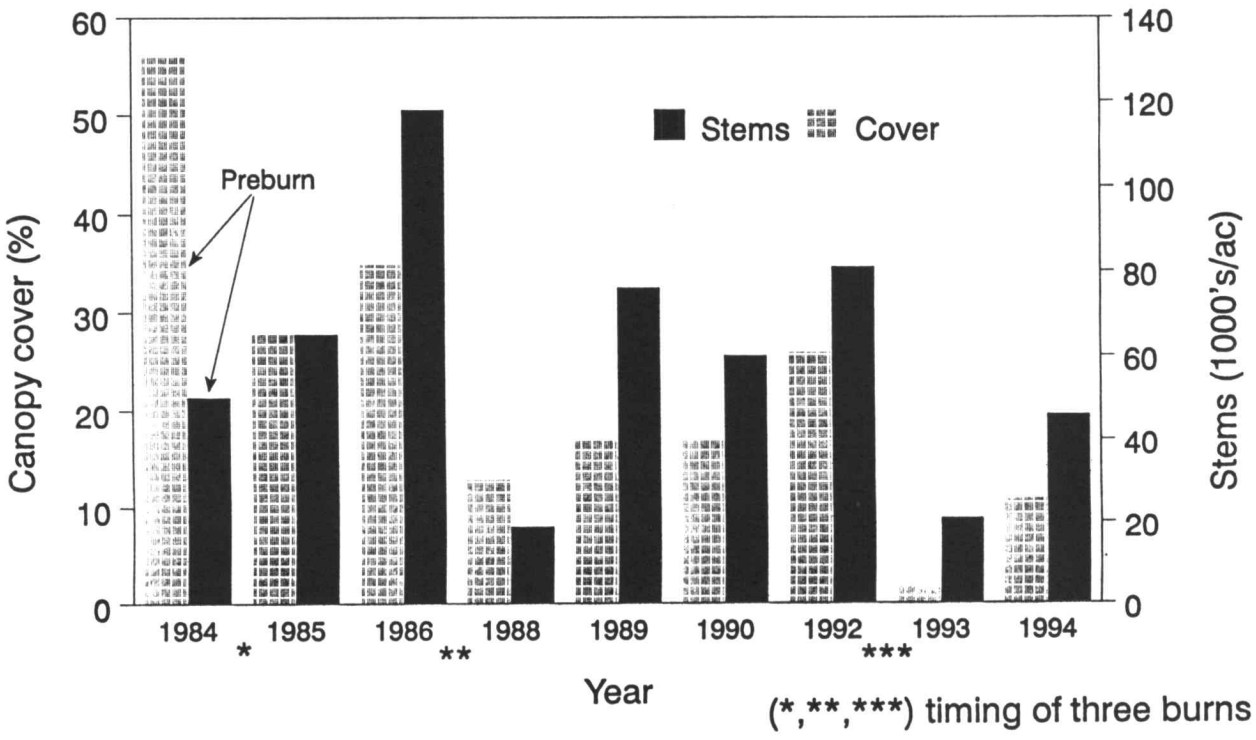

Fig. 2. *Canopy cover (%) and stem density of bog birch (*Betula glandulosa*) for ten years, with burns occurring in 1984, 1987, and 1993.*

Fig. 3. *Prior to burning in 1984 the stem density of bog birch was low and canopy cover was high.*

Fig. 4. *Burning initially lowered stem density and canopy cover, but two to four years after burning stem density and canopy cover had increased to near preburn levels.*

growing points. Bunchgrasses are a cause for concern when burning because their growing points are elevated above the soil surface with recovery taking several years. Thus, while the type of burn in 1987 and 1993 was damaging to the bog birch, it was also detrimental to the desirable forage grasses. This trade-off means that the interval time between burns must be a compromise between minimizing bunchgrass damage and facilitating their recovery, while still controlling the birch in the long term.

Another set of factors that contribute to the low Fescue cover include the timing and pattern of grazing. The 70 acre burn area is situated within an extensive valley bottomland which is managed as a single grazing cell (Figure 1). The area is grazed in rotation on a yearly basis beginning with a two week period in the latter half of June. The area cannot be feasibly subdivided without incurring significant additional costs. Despite riding by ranchers to disperse the livestock, cattle tend to congregate on the burned area, particularly in the spring.

This process accelerates the reduction in vigor and composition among fescue and other sensitive plant species and is an important consideration in any burning program. While bunchgrasses did not fare well after the burns, sedges, particularly graceful sedge (*Carex praegracilis*), increased. These sedges have creeping rhizomes with growing points well protected below the soil surface. This allows them to recover quickly following a fire. In addition, the low growth form of these upland sedges make these plants more resistant to grazing. These species increase from the competitive advantage they gain during both prescribed burning and spring grazing.

Forb species found to increase prominently after the burn included yarrow (*Achillea millefolium*) Lindley's aster (*Aster ciliolatus*) and three flowered avens (*Geum triflorum*) probably due to their ability to

withstand fire and/or effectively utilize the ash seedbed. Bearberry (*Arctostaphylos uva-ursi*) appears to be very susceptible to burning declining to almost zero after the third burn.

Burn Evaluation

The burn project on the Clearwater Grazing Allotment had both positive and negative impacts on the area.

A. Advantages:

1. Effective Decrease in Competition from Shrubs. Shrub cover, stem densities, and annual growth were all reduced in the shrub community as a result of burning.

2. Improved Access To Forage.The removal of shrub cover improved cattle access to all sources of available forage. In addition, livestock were more free to move about the area rather than remain along the trails.

B. Disadvantages:

1. Abundant Shrub Regrowth.

Regrowth of the bog birch continues to occur several years after burning. A burning program aimed at completely eliminating the shrubs is likely uneconomical and unrealistic. Periodic reburning (eg. 3–5 year interval) will minimize the bog birch regrowth.

2. Livestock Distribution Problems.

Localized over use was a problem while livestock were in the grazing cell containing the burn. Cattle preferred to graze the 70 acre improvement area over all other areas. To prevent localized overuse of any particular improvement area, burns should be laid out to maximize coverage within a grazing unit. Large scale burns not only limit livestock congregation by reducing the potential for selectivity, but also reduce the overall cost of burning per acre. This process does involve intensive planning and is accompanied by an increase in risk (eg. wildfire potential).

3. Reduction in Rough Fescue.

A significant problem was the reduction in rough fescue on the site. This may have occurred as a result of the burns themselves, or from the intensive localized grazing taking place.

Burns should be timed far enough apart to facilitate proper shrub control while minimizing the damage to bunchgrasses and allowing for their sufficient recovery in the community.

Continuing work is needed to determine this optimum burning interval to minimize the economic and ecological costs.

To help ensure that the burning interval and effectiveness of shrub control are both maximized, burns should be deferred in the spring until environmental conditions near optimum are reached. Very low humidities (eg. < 15%) and moderate to high ambient air temperatures (eg. 20 to 30 degrees C) are two important factors that contribute towards producing a fire more effective at killing the shrub crowns.

Grazing should be deferred and/or rotated among other grazing units, particularly early in the growing season and immediately following a burn. This will encourage bunchgrass recovery and protect key forage species.

Burning As An Acceptable Tool In Range Management.

The factor that will likely play the most important role in the future use of prescribed burns, is the willingness of resource managers to understand and appreciate the importance of fire in maintaining desired ecosystems. The philosophy of using fire on a regular basis to manage rangelands must become more widely accepted in the management of our native grasslands in the Alberta foothills and Rocky Mountains.

The native grasslands and forage supplies available to livestock producers, backcountry horse riders, and wildlife, are significant. These same resources however, are rapidly becoming less accessible and productive as our ecosystems continue to undergo slow and steady change throughout Alberta's Forest Reserve. The implementation of a long term, large scale burning policy and strategy is critical if this resource is to be maintained for generations to come.

Literature Cited

Alberta Environmental Protection. 1994. Natural regions and subregions of Alberta. Dept. Environmental Protection, Edmonton, Alta. Publ. no: I/531. 18 pp.

Johnston, A.and S. Smoliak. 1968. Reclaiming brushland in southwestern Alberta. *J. Range Manage.* 21:404-406.

Lewis, H.T. 1978. Traditional Indian Uses of Fire in Northern Alberta, Proceeding from the Fire Ecology in Resource Management Workshop. 61-62 pp.