SYNOPSIS: THE ROLE OF PRESCRIBED BURNING IN REGENERATING. *QURCUS MACROCARPA* AND ASSOCIATED WOODY PLANTS IN STRINGER WOODLANDS IN THE BLACK HILLS, SOUTH DAKOTA[1]

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Poor tree reproduction, sparse shrub cover, and increasing amounts of exotic species such as Kentucky bluegrass *(Poa pratensis)* are common problems in woody draws in the Northern Great Plains. Although the historic role of fire in maintaining woody draws is unclear, it is likely that these woodlands burned periodically, especially in dry years on hot and windy days. This paper summarizes the first of two studies designed to assess the role of fire in maintaining woody draws in this region.

Our first prescribed burning project in woody draws explored the role of fire in regenerating bur oak *(Quercus macrocarpa* Michx.) woodlands in the foothills of the Black Hills. We established four study sites in the Fort Meade Recreation Area near Sturgis. All four sites were dominated by bur *oak.* Northern hawthorn *(Crataegus rotundifolia* Moench), green ash *(Fraxinus pennsylvanica* Marsh.), and ironwood *(Ostrya virginiana* (P. Mill)) were less common overstory species. Western snowberry *(Symphoricarpos occidentalis* Hook.) strongly dominated the understory, followed by chokecherry *(Prunus virginiana* L.), poison ivy *(Toxicodendron rydbergii* (Small)), and Missouri gooseberry *(Ribes missouriense* Nutt.).

The first sampling season, we collected pretreatment data on overstory and understory woody plant densities, as well as on soil and fuel characteristics. We burned half of the plots on each site in the spring (17 April) of the second growing season. Although fuel moisture and weather parameters during the burns were within the prescription, fire spread was hampered by grasses matted by previous snow pack, lower wind speeds in the interior of the woodlands compared to uplands, and poorly distributed fuels.

In spite of the less than optimum conditions for regenerating woody plants, the number of basal sprouts for bur oak, box elder, and green ash increased the first two growing seasons following spring burns; and the number of northern hawthorn sprouts increased the second year following burning. Oak basal sprouting increased with increasing scorch height, indicating the need to damage the tree sufficiently to induce sprouting. Topographic position, scorch height, and soil moisture influenced the response of the other overstory species.

Our hypothesis that prescribed burning would increase densities of woody understory plants was supported for some species. However, for other species, a combination of low fire intensity and relatively dry conditions following the burns resulted in no significant changes. Fire apparently provided microsites for northern hawthorn germination, as evidenced by the large number of

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seedlings following burning; but, densities of bur oak seedlings did not change consistently in response to burning. The density of poison ivy also increased on bumed'sites the first growing season following burning. The initial density, along with aspect and soil compaction, influenced the response of poison ivy. Chokecherry density increased on some sites following burning.

These initial results suggest that prescribed burning shows some promise for rejuvenating woody plants in oak stands; but modification of the prescription is necessary. From a fire control point of view, spring and fall burning have appeal. However, prescriptions should be set to achieve high intensities if the goal is to regenerate trees and shrubs and/or to approximate historical fire effects. Some combination of cutting and burning may be helpful in reducing the overstory and stimulating oak and woody plant reproduction, and multiple burns may be needed to greatly enhance regeneration.

If woody plant regeneration is the goal and dormant season burns are used, the following guidelines are suggested: 1) burn in the fall so grasses are not matted down from snow; 2) wait until after a killing frost when the percentage of green grass canopy cover is <25%; 3) defer livestock grazing to ensure that fine fuel loads are consistently > 700 kg/ha; 4) wait for wind speeds in excess of 13 km/hr; and 5) enhance woody fuels by either not allowing fuel wood cutting and scavenging, or by scattering and leaving slash following cutting to increase fire residence times.

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