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VEGETATION RESPONSES TO CONTROLLED
BURNING AT BIG MEADOWS

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The fire ecology project at Big Meadows in the central section of Shenandoah National Park is a cooperative effort involving local park service personnel, scientists from several educational institutions and Dr. Robert Stottlemeyer from the Mid-Atlantic Regional Office of the National Park Service. The experimental prescribed burns carried out in the Spring of 1975 for the purposes of our study were the result of efforts by Ray Schaffner, Robert Jacobsen, Clark Baker, and many others. This paper will describe some of the preliminary results of our participation in the project. The majority of the field work was carried out by Steve Lilly and Emily Baxter, graduate students in the Department of Biology at Madison College. We have been looking at the growth rates and community composition of the regenerating meadow vegetation and hope that the resultant data, combined with the soil and faunal observations of Dr. Norman Christensen and Dr. Peter Dalby, will give a complete picture of the ecosystem response to prescribed burning.

Big Meadows is at an intermediate stage of secondary succession and is therefore similar to the majority of the communities within Shenandoah National Park. The progress of succession at this site, however, has been periodically set back by fall mowing, the frequency of which has increased during the last decade until it is now virtually an annual occurrence. The purpose of this management practice has been to maintain open space adjacent to the Byrd Visitor Center and has resulted in a mosaic of herbaceous "grassland" and shrub "briar" communities. The increasing size of black locust stems over the last decade has made the mowing practice more difficult, and this project is designed

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to look at the feasibility of using fire to maintain the earlier stages of succession. Without some form of management, the meadowland will disappear and young successional forest will take its place.

The present mowing technique has two major disadvantages. First, it is an increasingly expensive and time consuming endeavor. Second, it appears to be stabilizing the community as a shrubland of Rubus spp. (blackberries and dewberries) and Robinia (black locust). Should this happen, the herbaceous species will disappear from the region due to their inability to compete successfully. Information from this study will be helpful in making management decisions concerning whether mowing, burning or a combination of both will be appropriate in the future.

Sixteen small plots (approximately 1/4 acre each) were selected within the dry, upland part of Big Meadows. One half were in the "grassland" community type and the rest in the "shrub-briar" community. Within each community type two plots were mowed as usual in the fall of 1974, two were burned on April 15, 1975, two received both treatments, and two received neither treatment and served as experimental controls.

Detailed discussion of the data from this study will be presented later, along with the results of a much more extensive spring burning carried out last week. However, it is possible to discuss some of our observations at this time. One of the primary investigations concerned the immediate effects of the burn on the physical environment. Temperatures during the burn were approximately 300 to 350 °C, a relatively warm fire, but not extremely hot in comparison with temperatures attained in some forest fires. We examined soil temperatures five days after the burn and found slight increases in the blackened areas as a result of the greater absorption of light by the dark soil surface. The impact of this warmth on spring growth remains to be established. Dr. Christiansen has analyzed soil samples taken two months following the burn and reports increases in potassium, calcium, magnesium, nitrogen and other ions. This greater nutrient mobility may promote better growth during the subsequent summer, however, this also remains to be determined. Another question which interested us was the rate of recovery from burn to green meadowland. Regrowth was extremely rapid in all burned plots, and very little evidence of the fire remained by mid-summer.

Quantitative assessment of the burn impact was carried out in two ways. We sampled the tissue by physically

collecting the above ground vegetation, drying it in an oven, and determining the dry weight of living and dead components of various species groups. We also used a sampling frame to determine the amount of soil surface area covered by the individual species. Recovery in "grassland" at the end of the growing season in August was more complete than that of the "shrubland." However, both community types were very repairable following the prescribed burns.

We are also interested in changes in species composition of the communities which might result from the use of burning as a management practice. Initial examination of the data indicates that some species, e.g., the Fragaria, Solidago, Achillea, Potentilla and Rubus, increase in relative cover while others, such as Dennstaedtia, Polytrichum, Lycopodium and Robinia, decrease following the burn treatment. The dynamics of these species composition changes will hopefully become more evident following the present study.

In conclusion, we feel assured from the initial project that burning and mowing are similar in their effect on the community and that the use of fire to set back succession will not result in prolonged damage to the ecosystem. We are not presently in a position to predict the effect on individual species. However, we do know that species present in the meadow are dependent on the open conditions of herbaceous and shrub communities and will certainly disappear if the community completes the successional process and returns to forest.