

IMPACTS OF PRESCRIBED BURNING ON ARCHEOLOGICAL
AND BIOLOGICAL RESOURCES OF THE
KNIFE RIVER INDIAN VILLAGES NHS

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Objectives

The Knife River Indian Villages National Historic Site (KNRI) was established in 1974 for the purpose of insuring the preservation, interpretation, and research of unique historical and archeological resources associated with the Plains Indian and various cultural-historic periods (Hellickson-Key 1984). Cultural resource studies have revealed a wealth of archeological artifacts and historical sites within the KNRI (Lovick and Ahler 1982). At the present time, all fires are suppressed, although it is known that both fire and flood management played major roles in maintenance of the park's ecosystem.

This study is designed to: (1) determine the effects of prairie fires on surface and subsurface archeological materials through an experimental burning program, (2) describe the potential impacts of various prescribed burning programs on plant communities and maintenance of the park ecosystem, and (3) based on the preceding results, develop a fire management plan for future implementation at the Knife River Indian Villages NHS.

Methods

Fieldwork for this project is being conducted partly on the KNRI site and partly on Oakville Prairie, a native prairie area managed by the University of North Dakota. Since it is generally not practical to attempt experimental studies directly on KNRI archeological sites or resources, we are conducting such investigations away from the park. On-site work at the park consists of evaluating fuel loads at representative locations and the gathering of other information pertinent to developing the fire management plan. Off-site research consists of an experimental program to determine the impacts of prairie fire on archeological materials.

Fuel loads were evaluated at KNRI by measuring plant biomass from small, replicate cutting plots. A thorough literature search was performed to compile information to assist in developing the fire management plan.

Test burns were completed on 12 October and 11 November, 1988, on four plots in mixed prairie grasslands near Grand Forks, North Dakota. A sample of representative archeological materials were deposited at marked surface and subsurface locations. Following burning, the artifacts were retrieved for laboratory analysis of fire impacts. Additional effects of temperature on archeological artifacts will be determined in controlled laboratory furnace experiments. Results of the test burning experiments and literature review will be used to develop a specific prescribed burning program for the KNRI.

Results

Analysis of the plant clip-plot samples indicates that the mixed grass community of Oakville Prairie test site falls in the mid-range of grassland biomass found at KNRI. The lowest plant biomass found at KNRI was for communities of crested wheatgrass, averaging about 174 g/plot, while the highest biomass occurred in areas dominated by smooth brome, which averaged about 346 g/plot. Biomass samples from Oakville Prairie averaged about 247 g/plot.

Test burns revealed that near-surface temperatures (2 - 10 cm) in mixed grass prairie reached or exceeded 750 F. However, thermal buffering occurred in a surface layer approximately 1-2 cm above the ground. Even highly flammable material, e.g. dry grass, was typically unburned in this near-surface location.

Most of the data on temperature impacts in grassland burning plots have been collected. Additional, experiments on artifacts using controlled temperature regimes in muffle furnaces will be conducted during the winter. A rough draft of the final project report should be available for review in May, 1989.

Conclusions

Preliminary study results indicate that while some temperature impacts on archeological artifacts are possible under prairie-fire conditions, the overall impacts might be relatively minor in most situations. It appears that a prescribed burning program can be developed and implemented at Knife River Indian Villages that will allow enhanced vegetation management, yet protect valuable archeological resources. Additional laboratory experiments and analyses are needed to complete qualitative and quantitative descriptions of fire impacts on archeological artifacts.

Literature Cited

- Hellickson-Key, S. 1984. Natural resource management plan and environmental assessment for Knife River Indian Villages National Historic Site. U.S. Nat. Park Serv., Stanton, ND. 142 pp.
- Lovick, S. K. and S. A. Ahler. 1982. Cultural resource reconnaissance in the Knife River Indian Villages National Historic Site. Contribution No. 159. Dept. of Anthropology and Archeology, Univ. of ND, Grand Forks. 286 pp.