

EFFECTS OF FIRE ON BIRD AND SMALL MAMMAL COMMUNITIES
IN THE GRASSLANDS OF WIND CAVE NATIONAL PARK

J. D. Forde
N. F. Sloan
Department of Forestry
Michigan Technological University
Houghton

Objectives

Wind Cave National Park initiated a prescribed burning program in 1972 and yearly burns have been conducted since to evaluate the effects of fire on the Park biota. This research project is designed to determine what effects burning is having on bird and small mammal populations within the grassland community.

The objectives of this investigation include:

1. Comparisons of bird and small mammal population levels between pre- and post-burn transects and between burned and control areas; and
2. Vegetation sampling to demonstrate the importance of certain plant species densities and stand composition for the various species of birds and small mammals.

Methods

Details of the research methodology included in the proposal will not be repeated here. Only the main points of the methodology as they relate to the objectives stated above will be summarized.

The first objective required a breeding bird census and a small mammal census. Species composition and breeding density of birds were estimated using the transect method developed by Emlen (1971, 1977), foregoing the determination of a cue frequency as suggested by Mikol et al. (1979). The program TRANSECT was used to aid in analysis.

Prior to the census period, transect lines were re-established on each of the study areas. Stakes with plastic flagging attached were placed 201.2 m apart along an 804.7 m line.

All transects within the burn and control areas were traversed each day for two 5-day periods during the last weeks of May and June. The census was initiated at sunrise (Jarvinen et al., 1977) with random starting points selected to eliminate possible bias.

The census of small mammal populations was conducted using two different

methods: the snap trap removal method and the capture-recapture method. Paired Victor snap traps were placed in a 10 row x 7 column grid, with 20 m between rows and 15 m between columns. Traps were checked daily and all catches were aged, sexed, and weighed. Trapping took place in late June.

A capture-recapture technique was also used on the study transects. This technique used Sherman rat-sized live traps placed in a 7 row x 5 column grid, with 28.7 m between rows and 20 m between columns. Traps were prebaited with peanut butter for three nights. Traps were then activated for five days in late-July and captured animals were toe-clipped, aged, sexed, and weighed before being released.

The second objective was addressed through a vegetative analysis. The ground-cover method (Daubenmire, 1968) and the quadrant method of clipping was used.

A 2 row x 7 station grid was centered on the transect lines, making a total of 63 stations per plot. At each station a 1 m x 0.5 m Daubenmire frame was used to make two coverage estimates. The first reading in late-June was made approximately 2 m to the left of center and the second reading in late-July was made approximately 2 m to the right of center, parallel to the direction of the row.

The percentage of ground cover by species was then determined as the observer stood directly over the frame. In addition, an estimate was made of the amount of bare ground present and the amount of dead material present.

After the coverage estimates were made, the vegetation was clipped to within 1.27 cm of the ground and placed in a paper bag. Later, each sample was separated by species and the number of stems counted. The samples were then dried and weighed.

This will allow four parameters (ground-coverage, density, biomass, and frequency of occurrence) to be used to compare vegetational differences.

Results

Preliminary analyses indicate that prescribed burning is altering the bird and small mammal communities within the Park. Numbers of singing males of the grasshopper sparrow (Ammodramus savannarum) were greatly reduced on areas burned in 1981, with an increase seen on the same areas in 1982 (Table 1). Corresponding control areas increased in number of singing males for the same period. The singing male population of western meadowlark (Sturnella neglecta) was only slightly affected.

The snap trap results indicate an increase in the number of prairie deer mice (Peromyscus maniculatus bairdii) on the areas burned in 1981 (Table 2), with a decrease the following year. Live trapping results provide the basis for the same conclusions.

Table 1. Breeding bird estimates for the transects located at Wind Cave National Park.

Transect	Singing males/ha					
	Grasshopper Sparrow			Western Meadowlark		
	1980	1981	1982	1980	1981	1982
	Bison Flats					
1	.71	.78	.58	.80	.95	.55
2 ^a	.63	.15	.16	.84	.13	.70
3	.81	.64	.65	.67	.87	.65
	Upper Red Valley					
7	.48	.64	.77	.50	.53	.14
8 ^a	.63	.72	.80	.83	1.04	.75
	Lower Red Valley					
9 ^a	.68	.10	.71	.67	.54	.68
10 ^a	.59	.59	.75	.66	.82	.90
11	.94	.99	.64	.94	1.01	.60

^aTransects burned in spring of 1981

Table 2. Densities of small mammals on each of the study transects using the snaptrap removal method of sampling in the summer.

Transect	Individuals/ha					
	Thirteen-lined 1980	Ground 1981	Squirrel 1982	Prairie Deer 1980	Mouse 1981	1982
Bison Flats						
1	2.44	1.82	0.25	0.62	0	0.49
2 ^a	3.06	1.23	0.12	0.62	1.82	0.37
Lower Red Valley						
9 ^a	1.23	0.62	0.12	0	6.74	0.12
11	0.62	1.24	0.12	1.23	0.62	0.25

Table 3. Densities of small mammals on each of the study transects using the capture-recapture method of sampling in the summer.

Transect	Individuals/ha					
	Thirteen-lined 1980	Ground 1981	Squirrel 1982	Prairie Deer 1980	Mouse 1981	1982
Bison Flats						
1	1.70	4.10	0.31	1.23	0	5.93
2 ^a	0	0	0	0.62	3.26	1.54
Lower Red Valley						
9 ^a	0.62	0	0.62	0.83	3.99	0.62
11	1.03	0.62	0.62	0	0	0.62

^a Transects burned in spring of 1981.

There appears to be a reduction in the ground-coverage of the vegetation. Bare ground estimates on the burned areas are twice as large as on the unburned areas. The amount of dead material present is also much higher on the unburned transects.

Conclusion

Fire is causing changes in the bird and small mammal populations in Wind Cave National Park. At this point it appears that the changes are temporary, but the vegetation seems to take longer to recover than the animals.

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