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IMPACT OF WILDFIRE ON MOOSE HOME RANGE

By

William C. Gasaway
and
Stephen D. DuBois

VOLUME II

Progress Report
Federal Aid in Wildlife Restoration
Project W-22-2, Job 1.32R

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(Printed December 1983)

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PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: None

Project No.: W-22-2 Project Title: Big Game Investigations

Job No.: 1.32R Job Title: Impact of Wildfire on Moose Home Range

Period Covered: 1 July 1982 through 30 June 1983

SUMMARY

No fieldwork was conducted during this period because of the alternate-year work schedule. A talk on the initial impact of wildfire on moose movement was given at the 18th North American Moose Conference and Workshop, and a manuscript on the same subject was submitted to the Canadian Journal of Zoology (Appendix A).

Key words: Alaska, *Alces*, moose, movements, wildfire.

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Appendix A. Initial response of moose to a wildfire in Interior Alaska by William C. Gasaway and Stephen D. DuBois.

SUMMARY

The initial response of 7 radio-collared moose (*Alces alces*) to wildfire was investigated to determine if moose were displaced from the burned portion of their home ranges. Home ranges of these moose overlapped a 500-km^2 fire that burned from 3 May-20 June 1980 in Interior Alaska. We concluded radio-collared moose were not displaced by comparing relocations and home ranges of animals from May-August of the 2 years preceding the fire to data in the year of the fire. Moose selected primarily unburned sites within the perimeter of the fire.

INTRODUCTION

The immediate effect wildfire has on wildlife is often perceived as panic stricken animals fleeing from flames. Although numerous examples support this concept (Komarek 1969), few data confirm or refute it for moose (*Alces alces*) (Kelleyhouse 1979). Hakala et al. (1971) observed no moose fleeing from approaching flames of a 348-km^2 fire on the Kenai National Moose Range, Alaska. Komarek (1969) indicated that large mammals usually escaped without panic along the sides and flanks upon determining the fire's direction. Conversely, Udvardy (1969, cited in Bendell 1974) reported a chaotic incident of moose and other animals escaping wildfire by swimming across large rivers. In Manitoba, a large, fast-moving fire (809-km^2 in 8 hours) killed and scorched some moose and other wildlife unable to escape (V. Crichton, pers. commun.)

Our objective was to determine if radio-collared moose were displaced from the burned portion of their traditional home ranges during and/or shortly after a large wildfire in Interior Alaska. This information would help moose managers predict effects of wildfire on moose, on postfire moose population density, and on potential population growth. If most moose are displaced from their home ranges either permanently or for many years, moose population regrowth would be slow or highly dependent upon immigration. Where moose density is low adjacent to the burn, immigration may not significantly contribute to population regrowth. Conversely, if moose that traditionally used the burned area remained in their established ranges, then they could contribute substantially to population growth in the burn, and there would be less need for concern by wildlife managers, fire suppression personnel, and the general public about the welfare of moose during and after wildfires.

STUDY AREA

The Interior Alaskan study area, located on the Tanana Flats lowlands (Fig. 1), supports a mosaic of habitat types including herbaceous bogs, shrub-dominated seres following numerous wildfires, deciduous forest, and black spruce (*Picea mariana*) and white spruce (*Picea glauca*) forests (LeResche et al. 1974).

A 500-km^2 wildfire burned on the Tanana Flats from 3 May-20 June 1980. The fire burned an area of predominantly mature black spruce and aspen forest (Populus tremuloides), which supported a low moose density.

METHODS

We tested the following hypotheses: (H_o) wildfire does not displace moose from burned portions of home ranges, (H_a) wildfire displaces moose from burned portions of their traditional home ranges. A wildfire in May and June 1980 burned portions of home ranges of 5 radio-collared cow moose and 2 radio-collared bulls. To determine if the fire displaced moose, locations and home ranges of radio-collared moose during 29 April-August 1980 were compared to similar data from the same moose during 29 April-August of 1978 and 1979. The 1978 and 1979 moose movements identify traditional home ranges and serve as controls for detecting effects of wildfire on home ranges. The frequency of radio-locating individual moose was 8-11 in 1978, 4-7 in 1979, and 4-6 in 1980 prior to and during the fire and 2-5 after the fire. Only 4 of the 7 moose were radio-collared in 1978. Home ranges were drawn using the minimum home range method (Mohr 1947). Subjective visual comparisons between the 1978-79 and 1980 home ranges of each moose help to determine if displacement occurred. We realize the limitations of home range polygons drawn from a small sample of locations.

In 1980, moose were recorded as being inside or outside the fire perimeter. If inside, the site selected by the moose was recorded as burned or unburned. All relocations were made from fixed-wing aircraft and plotted on 1:63,360 maps.

To determine the percentage of radio-locations from 1978 and 1979 that were in the 1980 burn, each location was compared to a map showing the chronological advance of the fire perimeter. The moose was determined to be in the area burned if the 1978 or 1979 location was within the burn perimeter for that day in 1980. Therefore, when the burned area was small, a 1979 point could have been recorded out of the burn, yet later when the burned area had enlarged, the same location could have been in the burn. The advance of the fire was monitored by the Bureau of Land Management and the Alaska Department of Natural Resources, Division of Forestry during fire suppression activities. Chronological advance of the fire's perimeter was drawn on 1:63,360 maps. The intensity of the burn, based on criteria of Viereck and Schandelmeier (1980), was assessed during aerial and ground level surveys.

In testing the hypotheses, H_o will be rejected if: (1) a X^2 test shows significantly fewer ($P < 0.05$) relocations of moose are found in the burn perimeter during 1980 than are expected, based on 1978 and 1979 relocations, and (2) a significantly ($P < 0.05$)

greater percentage of 1980 home range polygon area is outside the burn perimeter when compared to percentages for 1978 and 1979; the test is Wilcoxon's signed ranks procedure (Hollander and Wolfe 1973).

RESULTS

In that portion of the burn traditionally used by radio-collared moose, about 75% of the area was moderately to severely burned, about 10% lightly burned, and about 15% unburned. Basal sprouting of willows (*Salix* spp.) occurred during summer 1980. An average of 58% (SE 8, *N* 7, range 20-76) of the 1980 home ranges were inside the fire perimeter.

We accepted H_o because data show the fire did not displace moose from the general area used 1-2 years prior to the fire. The number of relocations points inside the fire perimeter in 1980 did not decline ($P > 0.05$) compared with 1978 and 1979 (Table 1). The mean percentage of home range area outside the burn perimeter was not greater in 1980 (42%, SE 7.7, *N* 7) than in 1978 and 1979 (57%, SE 8.6, *N* 11). In addition, home ranges in 1980 overlapped 1978 and 1979 home ranges by an average of 46% (SE 7, *N* 11). Visual inspection of these prefire and 1980 home ranges shows nonoverlapping portions of home ranges were spatially close and the long axes were generally parallel (Figs. 2, 3). These data indicate the fire had little effect on the shape and location of home ranges.

Moose showed no reluctance to use that portion of their home range within the fire perimeter while the fire was burning and producing dense smoke (Fig. 4). Fifty percent of all June 1980 relocation points were inside the fire perimeter (Table 1), and on 2 occasions, moose were seen standing within 2 and 15 m of small flames. These 2 moose appeared unconcerned about the flames.

When moose were within the perimeter of the burn, they showed strong selection for unburned vegetation (X^2, $P < 0.01$). Although only approximately 15% of the vegetation remained unburned, radio-collared moose were located in unburned sites 67% ($N = 30$) of the time.

DISCUSSION

Moose were not displaced from their traditional home ranges when a portion of their range was altered by fire. Unburned vegetation apparently met their immediate food and cover requirements and may have been the main factor initially enabling them to remain within their ranges. Unburned vegetation outside the fire perimeter and as "islands" inside the fire perimeter were used (Fig. 4). Additionally, moose had resprouting browse available in the burned area during summer 1980; therefore, their food base quickly increased.

Data in Table 1 appear to indicate that moose were attracted to the burn area during June and July 1980, but we hesitate to draw this conclusion. Movements of each moose viewed independently showed no clear shift of home range into the burn during 1980 as compared with other years.

Large wildfires in Interior Alaska commonly burn mature or climax forests, which generally have low moose densities (0.1-0.2 moose/km^2; W. Gasaway and S. DuBois, unpubl. data); therefore, few moose will be associated directly with wildfires. Moose that are in contact with wildfires similar to the one we observed may not be adversely affected and probably will remain in their home range. In contrast, extremely hot, large, and fast-moving wildfires that leave few unburned inclusions may occasionally kill or temporarily force moose to abandon their home ranges. These factors should be considered when planning prescribed burns or managing wildfire to benefit low density moose populations. When moose density is high adjacent to burns, type of burn is of lesser long-term importance because of the potentially high rates of immigration, as observed in Minnesota (Peek 1974). Additionally, burning in spring or early summer allows some forage regrowth in the same year, thus providing a widespread food source. Burning in late summer or fall in northern latitudes will delay vegetative regrowth until the following spring, which could be a factor in forcing moose to abandon portions of their home range.

The consequences of home range abandonment and the resultant slowed population regrowth are significant to people dependent of moose for food and recreation in Interior Alaska and northern Canada. Moose density is currently low over much of the area, and this can have a bearing on the long-term response of moose to burned areas. When moose density is low and well below carrying capacity, there is neither a reservoir of moose nor the competitive incentive for moose to immigrate into burns. Therefore, growth of low density moose populations may be primarily dependent on production by moose that traditionally occupied the area (Gasaway et al. 1980). Under favorable conditions, moose populations can double in 3-4 years (finite rate of growth = 1.2-1.25), hence the starting moose density is an important determinant of future moose densities and availability of moose for use by humans.

ACKNOWLEDGMENTS

We thank Diane Preston for assistance with data collection, Dan Reed for statistical advice, and Joann Barnett and Wayne Regelin for reviewing a previous draft. This work was funded by Federal Aid in Wildlife Restoration Project W-21-2.

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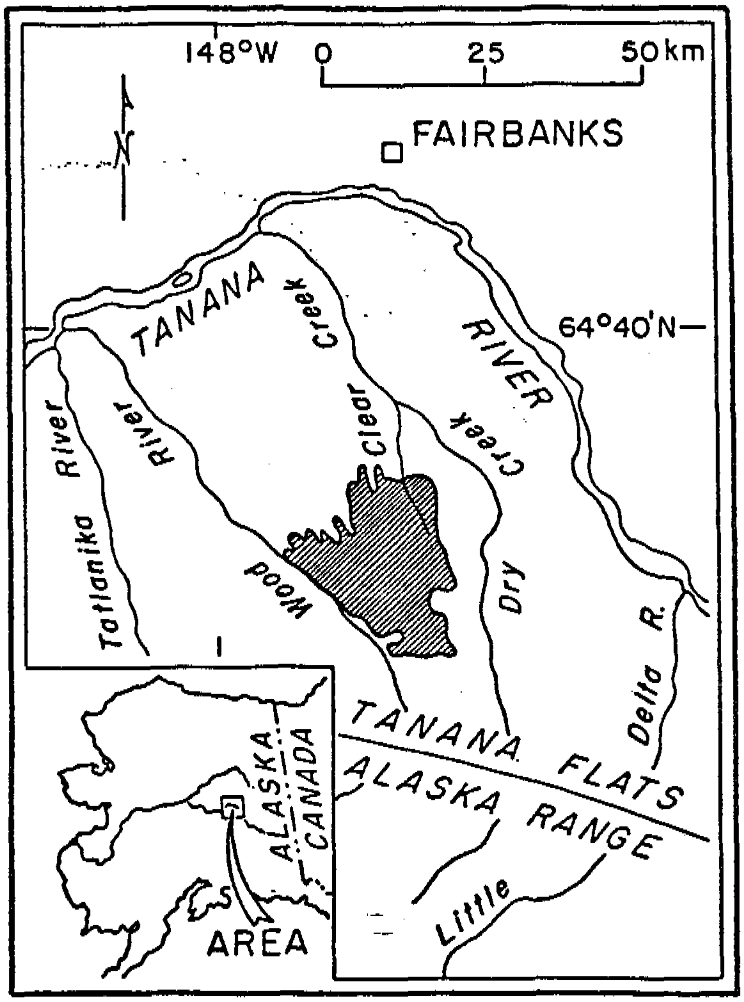
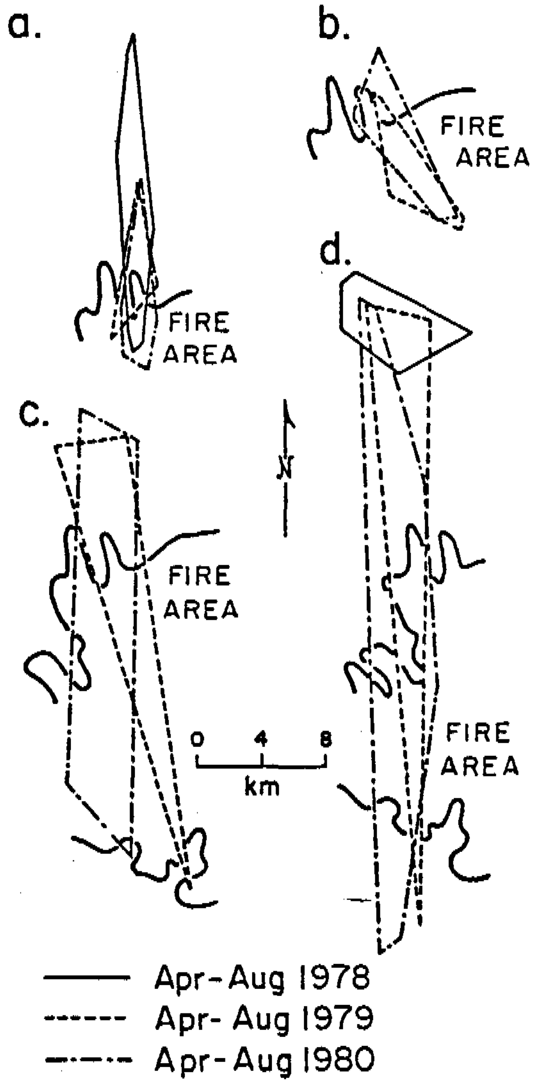
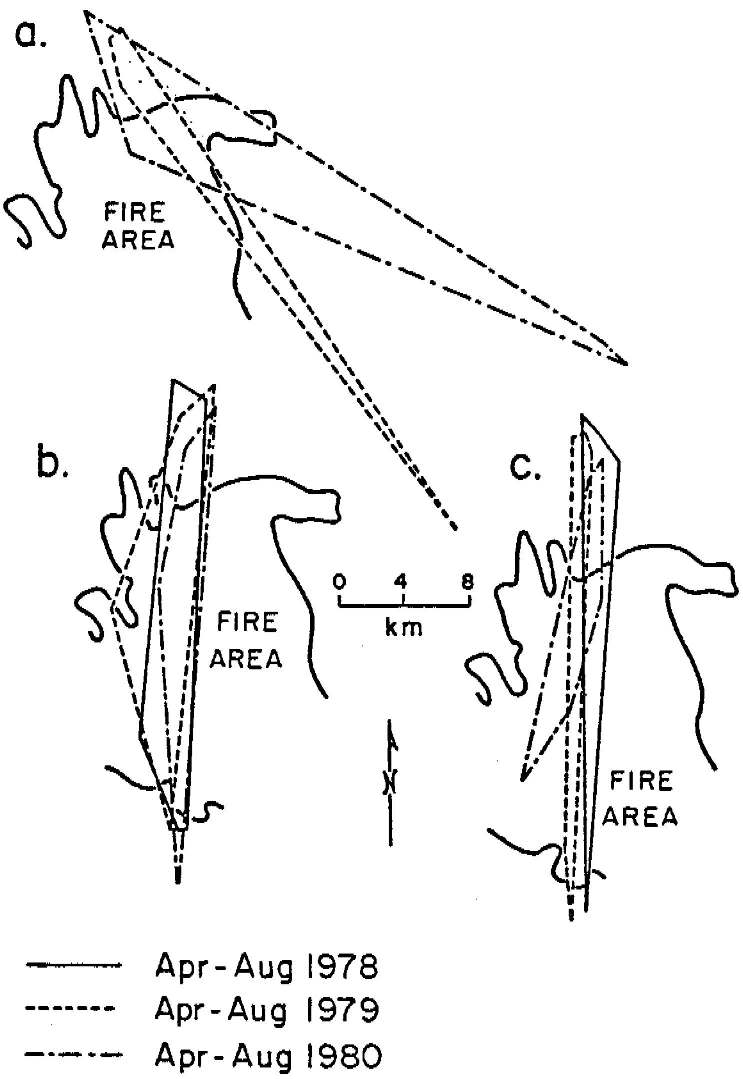


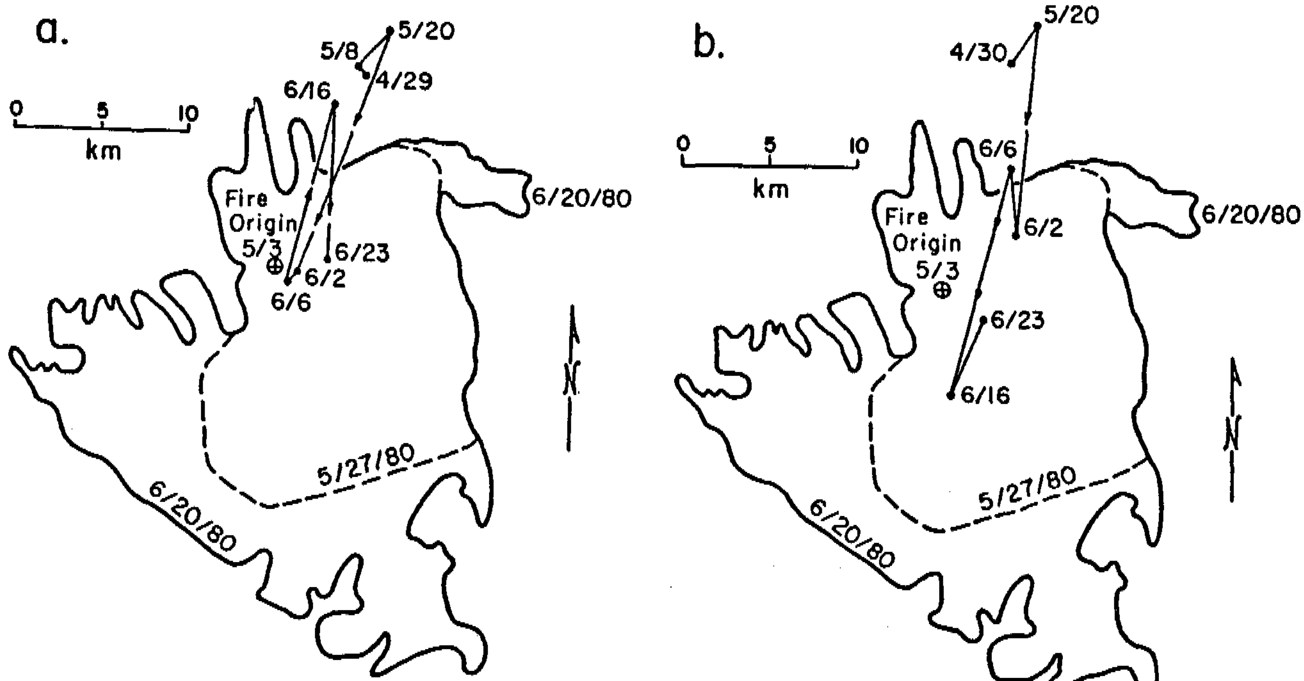
Appendix A. Fig. 1. Location of the 500-km^2 wildfire (shaded area) that burned on the Tanana Flats, Alaska from 3 May-20 June 1980.



Appendix A. Fig. 2. Home ranges of 4 radio-collared moose for 29 April-August 1978, 1979, and 1980 in relation to a wildlfire that burned from 3 May-20 June 1980 on the Tanana Flats, Alaska.



Appendix A. Fig. 3. Home ranges of 3 radio-collared moose for 29 April-August 1978, 1979, and 1980 in relation to a wildfire that burned from 3 May-20 June 1980 on the Tanana Flats, Alaska.



Appendix A. Fig. 4. Movements of 2 radio-collared moose from 29 April-23 June 1980 in relation to a wildfire that burned from 3 May-20 June 1980 on Tanana Flats, Alaska. Intermediate (dashed line) and final fire perimeter (solid line) are shown.

Appendix A. Table 1. Percentage of relocation points within the fire perimeter for 7 radio-collared moose during May-August 1980 (year of fire) on the Tanana Flats, Alaska, and for the same moose, the percentage of relocations in 1978 and 1979 that fell within the 1980 fire perimeter.

Month	Status of fire	1978-79		1980	
		N	%	N	%
May	Burning	37	11	11	9
June	Burning	17	12	20	50
July	Out	6	17	8	75
August	Out	8	63	9	78
Total or Mean of Means		68	26	48	53