AERIAL WILDLIFE SURVEY OF THE EDÉHZHÍE CANDIDATE PROTECTED AREA AND VICINITY, FEBRUARY 2003

NICHOLAS C. LARTER[1], DEBORAH JOHNSON [2] & DANNY G. ALLAIRE [1]

DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES

GOVERNMENT OF THE NORTHWEST TERRITORIES

FORT SIMPSON [1], FORT SMITH [2], NWT

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ABSTRACT

We conducted an aerial wildlife survey of the Edéhzhíe candidate protected area and vicinity from 19-22 February, 2003. Survey legs of 4-5 hours duration were flown daily, with each leg being conducted in an area to the southeast of the previous one to maximize the area of total coverage and minimize overlapping coverage. All flights originated from Fort Simpson. Survey conditions were exceptional with cold, clear weather following immediately after a new snow fall of 10-30cm. We observed 44 boreal caribou (*Rangifer tarandus caribou*), 63 moose (*Alces alces*), 13 bison (*Bison bison athabascae*), and 1 wolverine (*Gulo gulo*) during the survey. Although caribou were observed in areas of higher elevation, both on the Horn Plateau and hills/mountains in the Wrigley area, we observed fresh feeding craters and tracks north of Fort Simpson toward the Ebbutt Hills and 25km east of Jean Marie River, north of the Mackenzie River. Caribou, and fresh cratering by caribou, were located in areas both with and without a recent (1991-2000) fire history. Although caribou and their fresh cratering tended to be found in areas predicted to be of low and medium late winter occupancy by Gunn et al. (2004), the majority of the survey was flown over areas predicted to be of low and medium caribou occupancy. Most moose were observed in lowlands surrounding the Horn Plateau to the south, north and west, and were most plentiful in burnt areas on the Laferte River. More moose were observed in the recently burned areas (1991-2000), and in areas predicted to have a medium or low level of occupancy of boreal caribou. Bison were observed on the east flank of the Horn Plateau and in the Mills Lake and Mink Lake areas. Fresh sign was seen as far north as the Horn River 35km NW of Fawn Lake (62^{o} 17'N x 117^{o} 55'W) and as far west along both the Laferte and Rabbitskin Rivers at Rabbitskin Lake (61^{o} 38'N x 119^{o} 20'W). This is the farthest west report for bison. Bison and fresh craters were found in areas that had burnt in the 1970's and in areas predicted to have a low level of boreal caribou occupancy. The wolverine was sighted on the Horn Plateau in an area that had not burnt since 1970.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Edéhzhíe candidate protected area covers some 25 000 km^2 north of the Mackenzie River, west of Great Slave Lake, and is dominated by the Horn Plateau. This area has long been recognized for its ecological, and cultural importance and as a central First Nations' spiritual gathering place. In March 2002, the Dehcho and Tlicho First Nations formally agreed to combine their efforts into legally protecting Edéhzhíe and in June 2002 a five year land withdrawal was secured through the Northwest Territories Protected Areas Strategy (PAS) (Fig. 1). The area supports a variety of large mammal populations including moose (*Alces alces*), boreal caribou (*Rangifer tarandus caribou*), wood bison (*Bison bison athabascae*), and a variety of furbearers including marten (*Martes americana*), lynx (*Lynx canadensis*) and wolverine (*Gulo gulo*). In 2002, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated boreal caribou and wood bison as threatened species and wolverine as a species of special concern. Under the PAS the ecological resources of this area were to be further assessed over the next 5 years starting in 2002.

To assist in land use planning in the Dehcho, a previous study conducted jointly by the DFN and the Department of Resources, Wildlife & Economic Development (DRWED), Yellowknife, had been conducted to predict late winter occupancy of boreal caribou and map the late winter distribution of boreal caribou habitat in the Dehcho (Gunn et al. 2004). The results of this study were encouraging, however poor weather had limited the area of the March 2002 survey creating a need to collect further empirical data to delineate the distribution of boreal caribou habitat and to better test the predictions of the boreal caribou occupancy model. Also, the northern boundary of proposed Edéhzhíe candidate protected area had changed and now included new areas which had not been part of the study area when the previous study (Gunn et al. 2004) was conducted.

This survey provided the opportunity to collect baseline information on mid-winter animal distribution of the Edéhzhíe candidate protected area and vicinity to assist in assessing the ecological resources of this newly proposed protected area. It also provided an opportunity to collect more empirical data that could be used to test the predictions of and/or improve the predictability of the Dehcho boreal caribou late winter occupancy

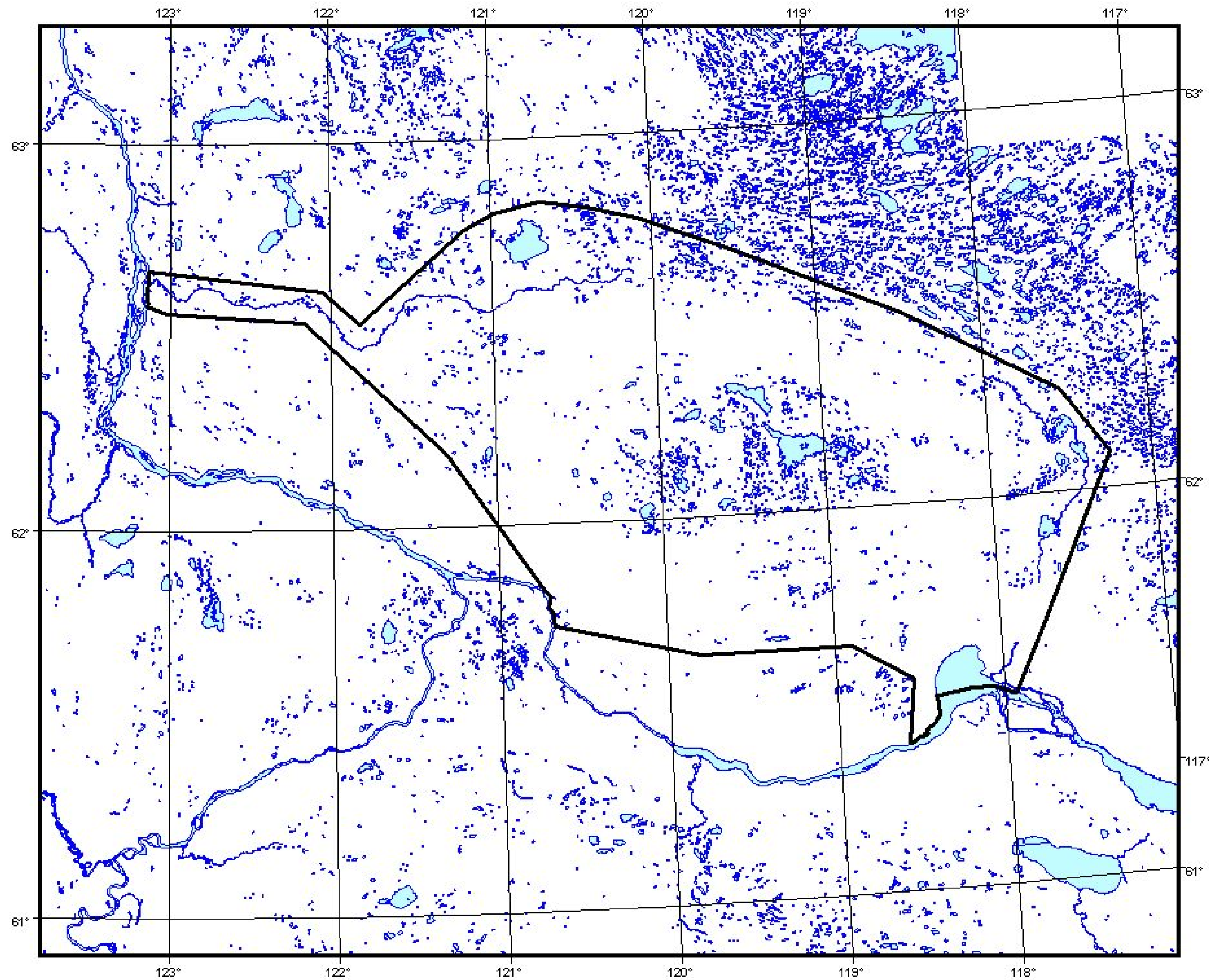

Figure 1. The study area with the boundaries of Edéhzhíe candidate protected area indicated.

model. Although the survey was designed to assess the distribution of ungulates and large furbearers (e.g. wolverine) in the Edéhzhíe, it was tailored to optimize information collected on boreal caribou in order to validate and build upon previous boreal caribou work in the Dehcho, The survey was not designed to estimate animal numbers or density, but it was flown in such a manner where estimates could be generated. The survey was designed with 3 major objectives:

1) To provide an opportunity for hunters/trappers from four Dehcho First Nations and biologists to participate together in an aerial reconnaissance survey of the Edéhzhíe and vicinity,
2) To collect information on the mid-winter distribution of wildlife, particularly boreal caribou, moose, and wood bison, of the Edéhzhíe and vicinity,
3) To collect empirical data that could be used to test and/or improve the predictability of the boreal caribou late winter occupancy model by:
    a) flying areas of the Edéhzhíe and vicinity that were flown in previous surveys as well as areas that had not been flown in previous surveys and,
    b) flying areas of the Edéhzhíe and vicinity that were flown in previous surveys, but at a greater search intensity.

METHODS

Survey Route Design

In a previous study (Gunn et al. 2004), the Dehcho was divided into 10 km X 10 km cells and aerial surveys were conducted over a representative samples of these cells in March 2001 and 2002. Coverage during these surveys had been standardized to approximately 10% as a single line, surveying a 1km wide swath of ground that was flown through the middle of the 10 km X 10 km survey cells. We used the same 10 km X 10 km cells to determine the survey routes for this study. We had been provided with the latitude and longitude of the centres of each of these cells, the flight routes of the March 2002 survey, the observational data from the March 2002 survey, and the predicted occupancy of caribou for each cell based upon the late winter caribou occupancy model (Gunn et al. 2004). We used OziExplorer software to assist in plotting flight routes (Fig. 2). These routes covered all representative areas of the study area, including areas not flown in the previous survey, and were designed to provide empirical data that could test the robustness of the boreal caribou late winter occupancy model (Gunn et al. 2004). Specifically, some of our flight routes covered the same routes through low, medium, and high caribou occupancy areas as in the March 2002 survey. Also, we flew some of the medium and high caribou occupancy areas at 20% coverage i.e. having 2 flight lines per 10 km X 10 km survey cell. In total the survey covered 250 different 10 km X 10 km survey cells, 233 different that had been delineated by Gunn et al. (2004). This broke down into 138 cells (55.2%) of predicted low caribou occupancy, 69 cells (27.6%) of predicted medium caribou occupancy, 26 (10.4%) of predicted high caribou occupancy, and 17cells (6.8%) which had not been included in the area used for the boreal caribou late winter occupancy model (Gunn et al. 2004).

Survey Flights and Data Collection

The survey was conducted using a Cessna 206 fixed-wing aircraft. The survey crew consisted of a pilot and local observer in the front seats, two observers (DJ and DGA) in the middle seats, and one recorder (NCL) in the rear seat. All occupants could communicate freely between each other using headsets with a live microphone.

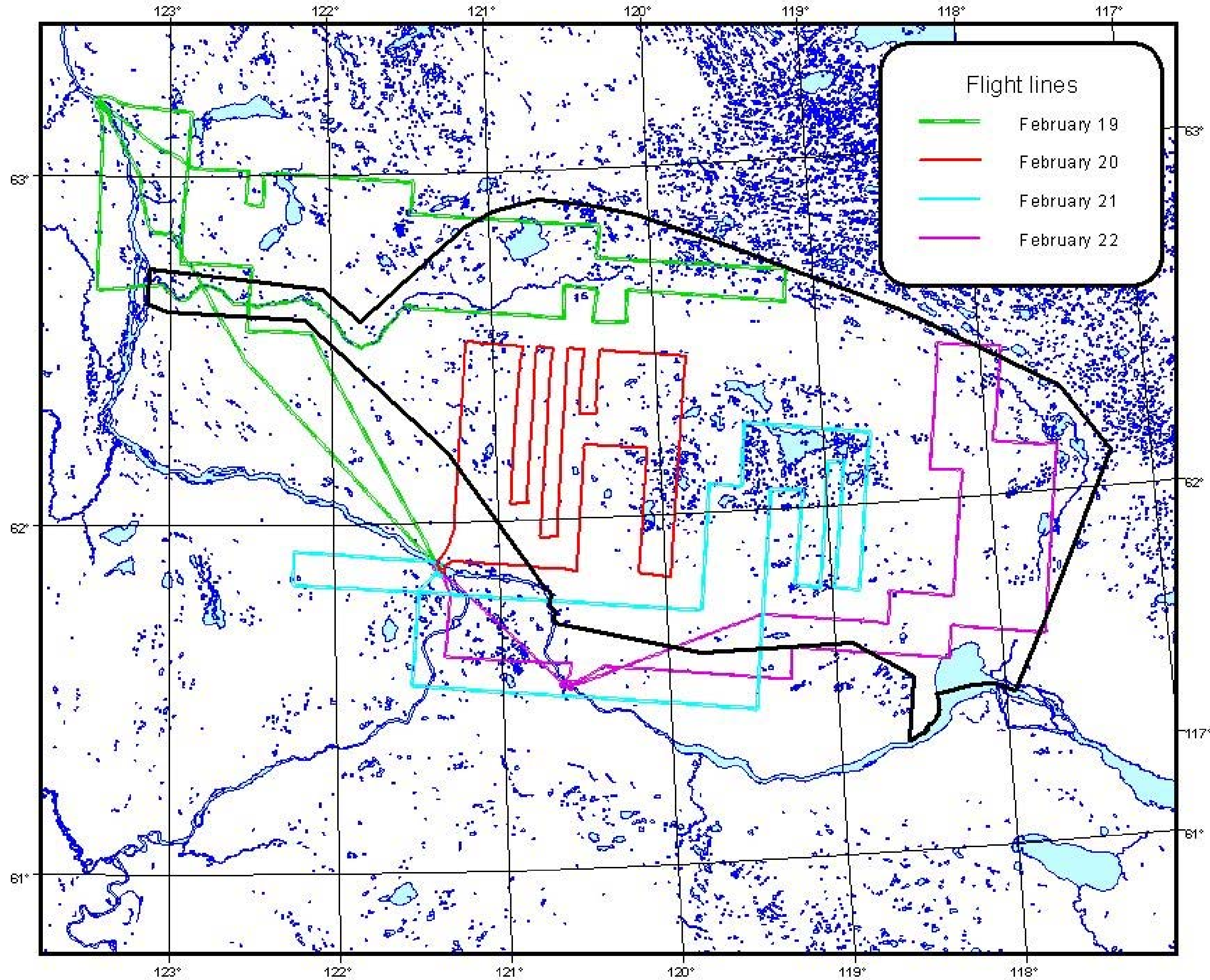

Figure 2. The flight routes for each of the 4 survey legs.

For survey legs flown on 19 and 22 February the local observer was picked up and dropped off en route from Wrigley and Jean Marie River, respectively. Transects were flown at 400 feet (122 m) above ground level (agl) at an approximate speed of 160 km/h. Although a previous wildlife survey of the Dehcho had been conducted at 75m (Gunn et al. 2004), we increased the altitude agl to be more consistent with other surveys for boreal caribou elsewhere (Nagy, J. pers. comm.; Cross, D. pers. comm.; Hillis T. pers. comm.). Observations were made in a 500 m wide strip on each side of the aircraft. Tape marks were placed on the inside of the windows so the observers in the second row of the aircraft could delineate the transect boundaries (following Norton-Griffiths 1978). On 18 February the aircraft made passes over the airstrip at 400 feet agl to ensure that the 500 m transect widths had been calibrated correctly for both sides of the aircraft. Markers had previously been placed on the airstrip to indicate 500 m distances. Flights were generally conducted from mid-morning to mid-afternoon and were 4-5 h in length (Table 1). On 20 February we were delayed in leaving until almost noon because the temperature had not risen to the required -37 ^{o}C until then.

The recorder used a handheld Garmin 12XL global positioning system (GPS) to record the locations of observed animals and assign a waypoint (WGS84 datum). The GPS was equipped with an external antenna which was positioned underneath the front window of the aircraft. Waypoints were also taken at the start and end of each flight leg; these waypoints were used to determine flight time and flight distance. The GPS was also programmed to record locations for a flight track log every 20 s. Observation data were written directly onto datasheets during the flight, and included caribou feeding craters (either fresh or old), caribou tracks (either fresh or old), moose tracks (either fresh or old), bison feeding craters (either fresh or old), bison tracks (either fresh or old), and observed animals. Observed animals were subdivided into calf and non-calf age classes with sex being recorded if possible. We also recorded whether observations were on the left or right side of the aircraft and whether on or off transect. If craters and tracks were observed bisecting the flight line they were recorded as being on both sides. At the completion of each flight we downloaded both the waypoint and track files from the GPS into a laptop computer using OziExplorer software.

Table 1. Detailed descriptions of the 4 flight legs of the survey indicating the date, travel route, departure time, flight time (hours), weather at departure time (MST), and flight distance (km).

Date	Travel Route	Departure Time	Flight Time	Departure Weather	Flight Distance
19 February	Fort Simpson - Wrigley	0858	1.3H	-35 ^oC, light cloud, calm	202
19 February	Wrigley - Wrigley	1053	3.8H	-24 ^oC, clearing, NW 20km/h	613
19 February	Wrigley - Fort Simpson	1521	1.4H	-24 ^oC, clear, W 10km/h	236
20 February	Fort Simpson - Fort Simpson	1154	3.9H	-37 ^oC, clear, calm	631
21 February	Fort Simpson - Fort Simpson	1026	4.4H	-35 ^oC, clear, calm	713
22 February	Fort Simpson - Jean Marie River	0955	0.5H	-36 ^oC, clear, calm	61
22 February	Jean Marie River - Jean Marie River	1026	3.3H	-36 ^oC, clear, calm	545
22 February	Jean Marie River - Fort Simpson	1347	0.6H	n/a, clear, calm	83

Post-survey Data Manipulation and Analysis

For each survey leg we plotted the track files and waypoints. For the 6 instances where we had lost satellite coverage, we manually corrected the flight line by connecting the two points of the broken line using OziExplorer. All instances where the coverage was lost was minor and happened on straight sections of the transect; in one instance the lost line amounted to *ca*. 5 km in length all the others were <2 km. For all waypoints of animal sign we used OziExplorer software to move the recorded waypoint to either the left or right of the flight line (by *ca*. 250 m on the scaled map) based upon the recorded data forms. This was to provide the most accurate location information. For observations recorded on both sides of the aircraft the waypoint remained on the flight line.

The corrected waypoint data were transformed into a spreadsheet. All observational data were transcribed into the spreadsheet with its accompanying location data. These data files were verified by a third party and saved as files which could be imported into ArcView GIS 3.3. We used ArcView to overlay fire history data from 1970-2000 and the area with the observed animal and feeding crater distributions. Fire history data were subdivided into approximately 10-year intervals, 1970-1980, 1981-1990, and 1991-2000. Fire history data were provided by Forest Management, DRWED. We also overlaid the predicted late winter occupancy of boreal caribou based upon the Gunn et al. (2004) model with the observed animal and feeding crater distributions.

RESULTS

Weather conditions, immediately prior to, and throughout the survey were ideal. A heavy snowstorm occurred throughout the region from 14-16 February, tapering off on 15 February and leaving 10-30cm of fresh snow. Hence fresh animal tracks observed on the survey were from 2-5 days old. Following the snowstorm, a high pressure system moved into the region bringing with it low (-32 to -42^{o} C) temperatures and clear, cloudless skies. Conditions were ideal for making observations throughout the entire survey except for some minor turbulence and ice crystals around the Ebbutt Hills and crossing the Mt. Connell Range of the Franklin Mountains on the first day of the survey. Although these were not ideal conditions, they did not preclude observations of 1 km from the aircraft in any direction.

We flew approximately 3100 km of survey lines over the 4 days. A total of 44 boreal caribou (on and off transect), 63 moose (on and off transect), 13 bison (on and off transect), and 1 wolverine (on transect) were observed during the survey (Figs. 3 and 4).

We observed a total of 132 fresh (2-5 day old) boreal caribou cratering sites, 82 (62%) were located in areas that had not burnt since 1970, the remaining 50 (38%) were located in areas that had burnt since 1970 with 30 crater sites being located in areas that had burnt recently (1991-2000) (Fig. 5). Sixty-six of 132 fresh caribou cratering sites were located in areas predicted by the Gunn et al. (2004) model to have medium late winter caribou occupancy. The remaining 63 were located in areas predicted to have high (n=23) and low (n=40) late winter caribou occupancy (Fig. 6). Three crater sites were located out of the area where caribou occupancy had been modelled. We observed 44 adult caribou, 29 (66%) located in areas unburnt since 1970, and 15 (34%) in areas that had burnt since 1970; 5 were in recently (1991-2000) burnt areas (Fig. 3). Six of the 44 caribou (14%) were located in areas predicted to have high late winter caribou occupancy by the Gunn et al. (2004) model while 30 caribou (68%) were observed in areas predicted to have medium late winter caribou occupancy (Fig. 4). The remaining 8 caribou (18%) were observed in areas predicted to have low late winter caribou occupancy. We surveyed 233 blocks for which late winter caribou occupancy had been predicted; 138 blocks (59%) were predicted low caribou occupancy, 69 blocks (30%) were predicted medium caribou occupancy and

26 blocks (11%) were predicted high caribou occupancy.

Fresh (2-5 day old) bison cratering sites (n=3) and the 13 observed bison were located adjacent to or within areas that had burnt during the 1970's (Figs. 3 and 5). All 3 crater sites and 11 of the 13 observed bison were located in areas predicted by the Gunn et al. (2004) model to have low late winter caribou occupancy (Fig. 6). The other 2 bison were observed in an area of predicted medium late winter caribou occupancy (Fig. 4).

We observed 63 moose, 43 (68%) were located within areas that had burnt recently (1991-2000) with only 12 animals (32%) located in areas that had not burnt since 1970 (Fig. 3). Only 2 of 58 moose were observed in areas predicted by Gunn et al. 2004 to have high late winter caribou occupancy. The majority (n=39) were located in areas predicted to have low late winter caribou occupancy (Fig. 4). We surveyed *ca*. 5 times more survey blocks predicted to have low late winter caribou occupancy than blocks predicted to have high caribou occupancy.

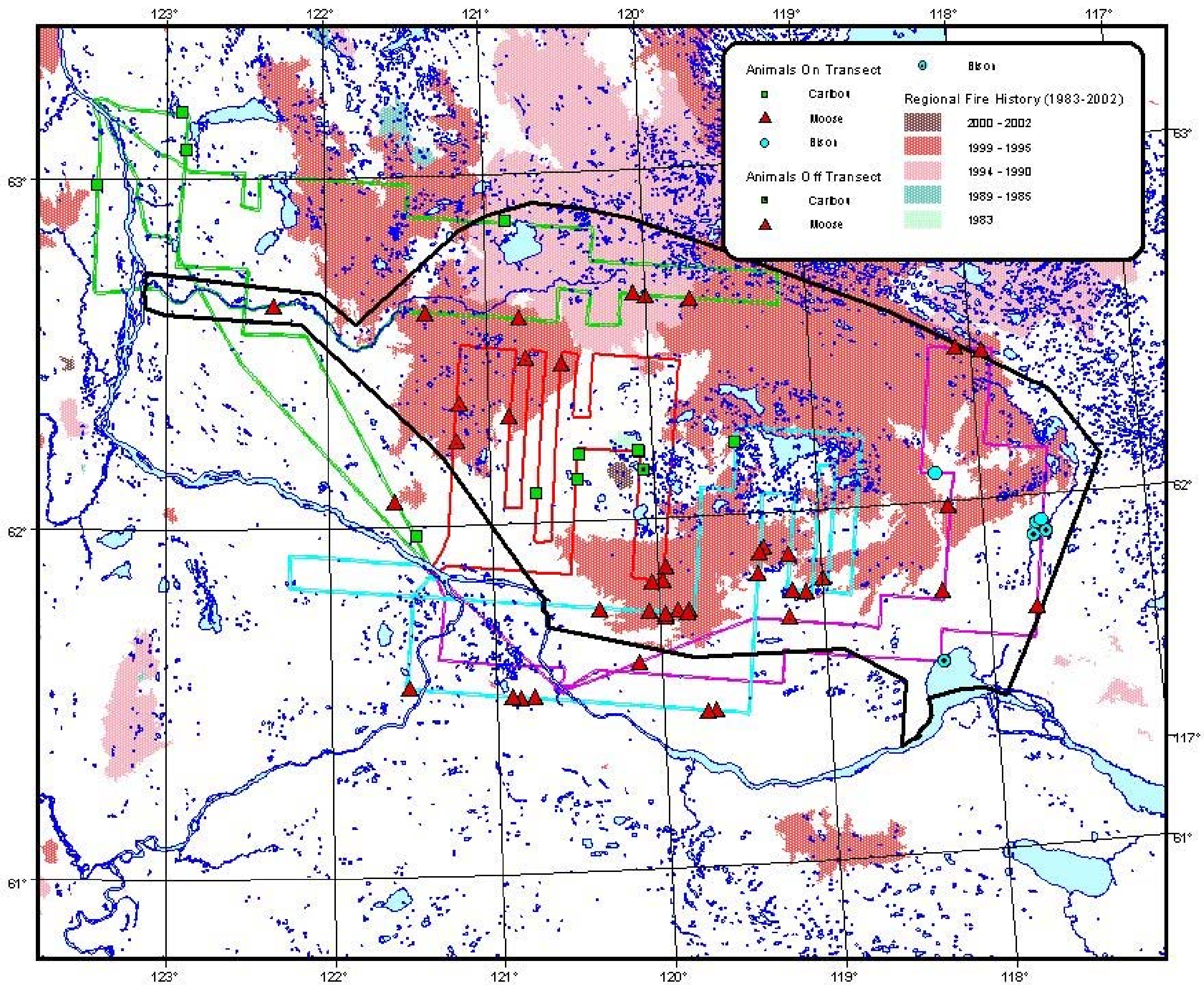

Figure 3. The observed distribution of wildlife species in relation to fire history.

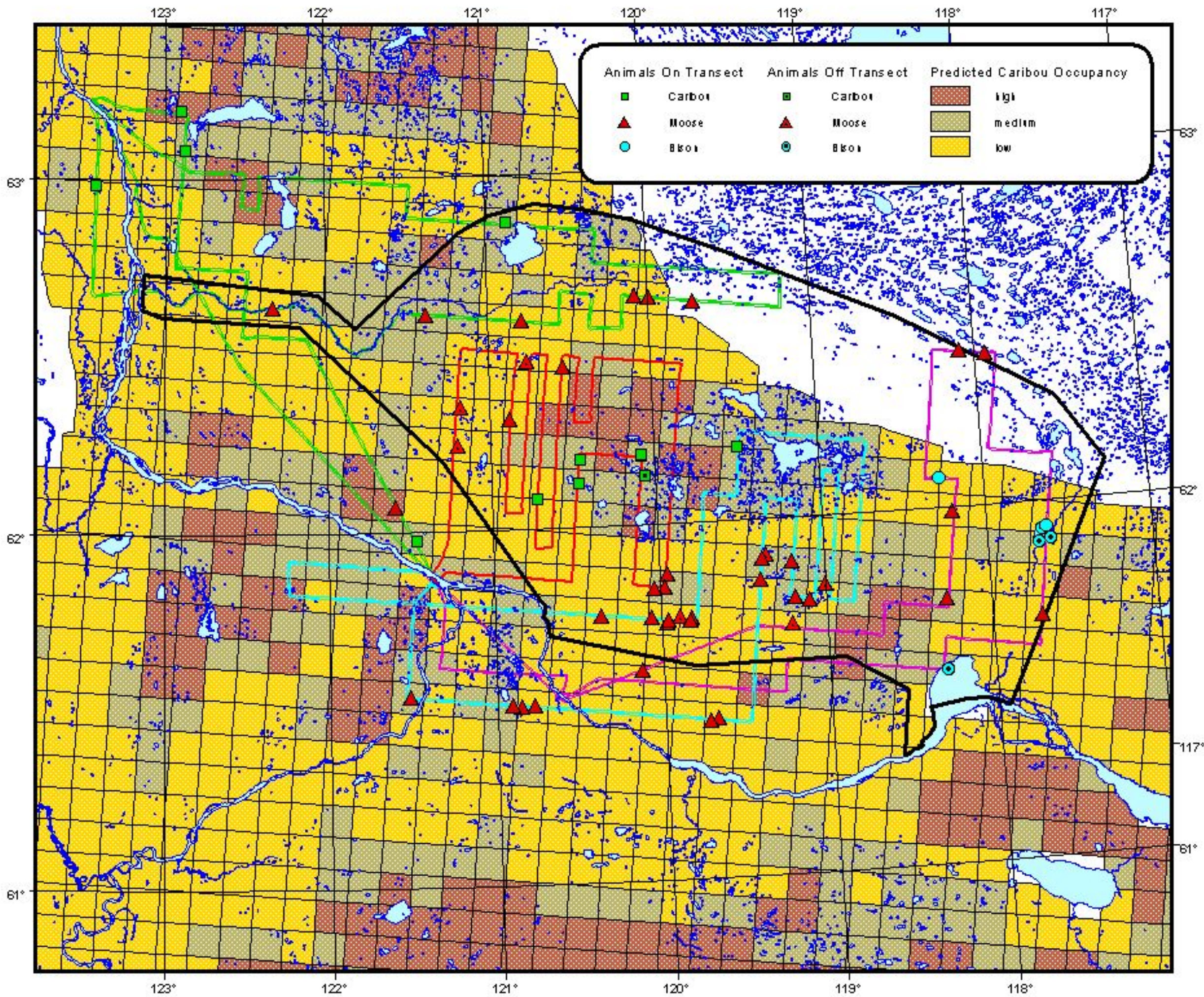

Figure 4. The observed distribution of wildlife species in relation to the predicted occupancy of boreal caribou based upon Gunn et al. (2004).

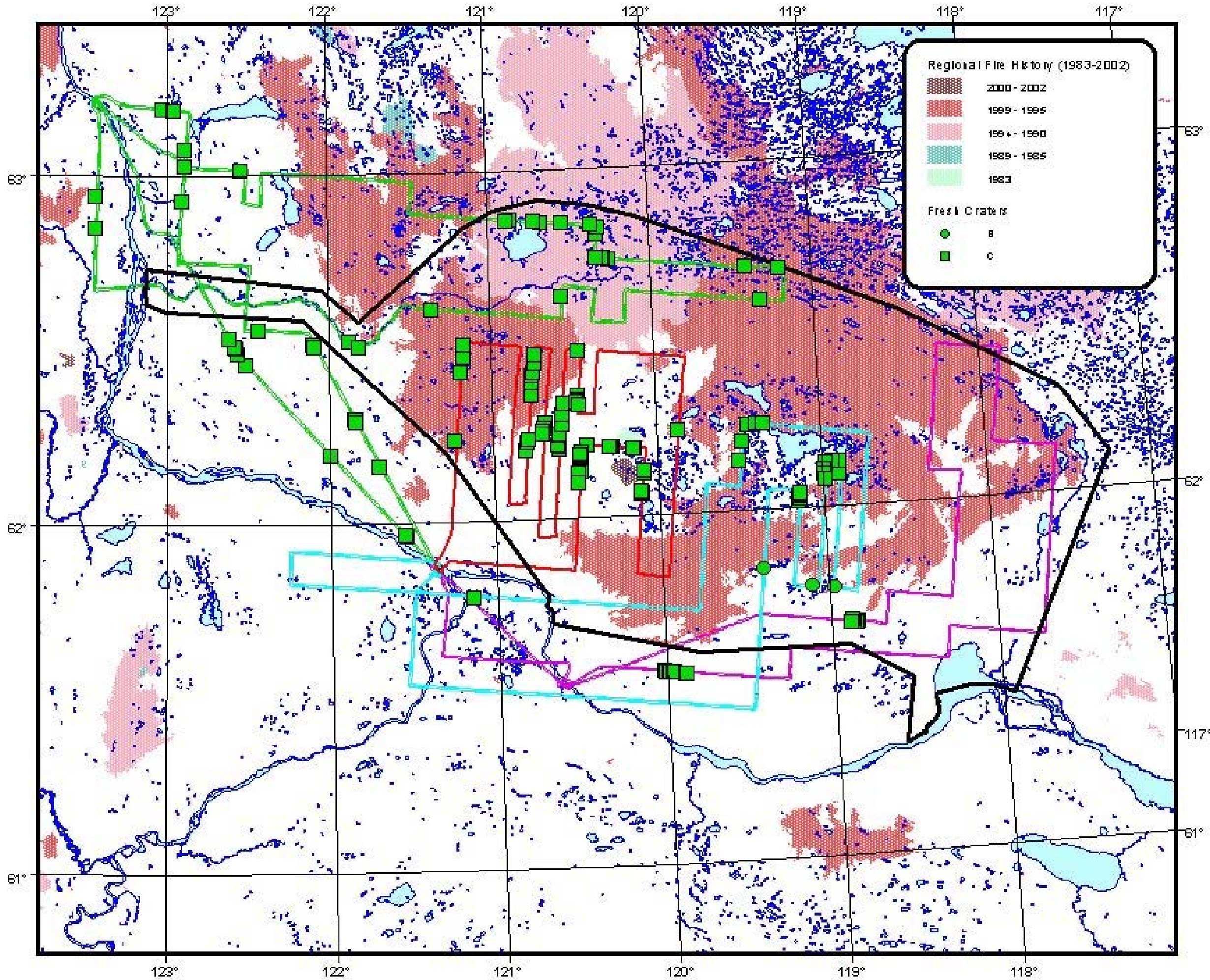

Figure 5. The observed distribution of fresh (2-5 days old) caribou and bison feeding craters in relation to fire history.

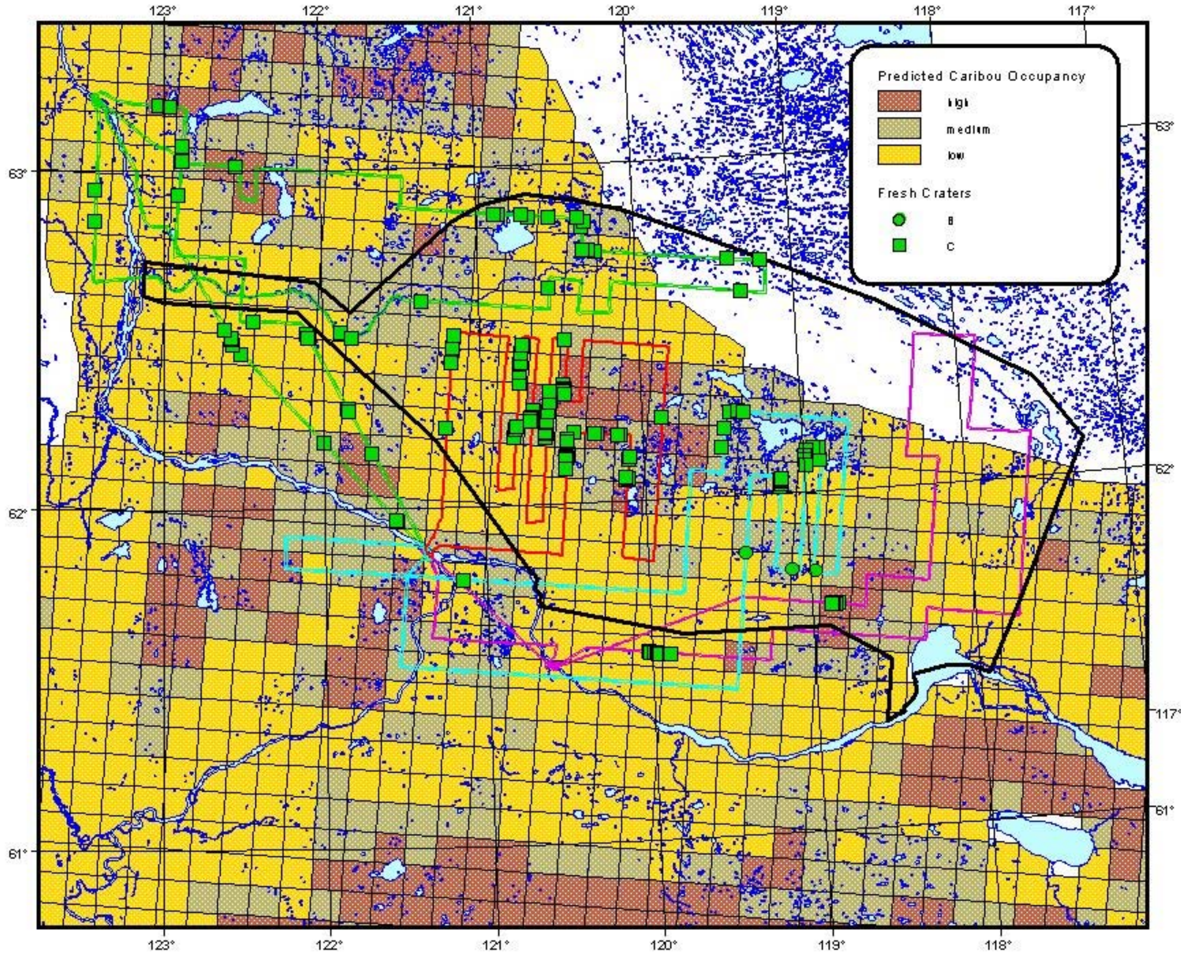

Figure 6. The observed distribution of fresh (2-5 days old) caribou and bison feeding craters in relation to the predicted occupancy of boreal caribou based upon Gunn et al. (2004).

DISCUSSION

The relatively low snow depth and the ideal survey conditions make this an important baseline survey. It is likely that animal distribution was minimally affected by the snow depth and animals were wherever they chose to be. Snow depth in winter 2002-03 was low and lower than in the previous winter (Environment Canada 2005), when the survey was conducted that fed into the boreal caribou occupancy model (Gunn et al. 2004). Snow depths most likely affected animal distribution by restricting the movements and distributions of those ungulates less capable of moving through deep snow in comparison to those ungulates more capable of moving through deeper snow.

We observed an abundance of areas which were frequented by caribou during this survey in comparison to previous surveys. Ideal snow and survey conditions were undoubtably a factor; sightability was excellent, and low snow depth likely did not curtail animal movements and distribution. This survey included areas to the north which had not been flown in previous surveys and where boreal caribou were believed to frequent (K. Davidge pers. comm.). We observed fresh caribou signs in these areas. We did not observe the majority of fresh caribou signs or animals in areas predicted by the caribou occupancy model to have high caribou occupancy, however the majority of the survey was flown over areas where late winter caribou occupancy was predicted to be medium (28% of the survey) or low (55% of the survey). Relative to the amount of survey coverage, the number of caribou and fresh craters observed in areas predicted to be of low late winter caribou occupancy was generally consistent with model predictions.

The caribou late winter occupancy model is based on 100 km^2 blocks of land and thus a fairly coarse scale, especially in relation to the habitat patchiness of the boreal forest in the Dehcho, which has been subjected to an active fire history (eg. Fig. 3). It is also based upon limited empirical data from flights that covered the entire area and only reflects data collected from one year. Consequently, it would not be unexpected for our observations of caribou and caribou activity to differ from those predicted by the model regardless of the proportions of late winter high, medium, and low predicted caribou occupancy blocks flown. Additional empirical data from aerial surveys and/or the locations of collared caribou are required to test the robustness of and to potentially refine this model. We plan on incorporating the observational data from this survey into the current caribou late winter occupancy model in hopes of improving its predictive capability.

We anticipated finding more moose signs in areas with a more frequent burn history (burns < 20 years old), and caribou signs to be found in areas which hadn't burned recently (in the last 30 years). Our observations are consistent with this (Figs. 3 and 5). The majority of moose were observed in areas that had burned since 1999, with only 12/63 (19%) animals being observed in areas which had not burned since 1970. The majority (82/132) of fresh caribou cratering sites were located in areas which had not burned recently, but 30 sites were found in areas that had burned more recently, 1991-2000. Because approximately 40% of the survey was flown over areas that had burned from 1991-2000 the number of fresh caribou cratering sites found in recently burned areas relative to less burned areas may be somewhat inflated.

In general caribou and fresh caribou signs dominated the hills and higher elevations of the survey area, with moose and fresh moose signs dominating the lower elevations along water courses and the southern face of the Horn Plateau which has had an active recent fire history and the high amount of blow down is only favourable to moose. Bison and fresh bison signs was limited to the eastern portions of the survey area and although most observations were found in the lower elevations they were also found on the slopes of the eastern part of the Horn Plateau that were open and not heavily treed. In the lower elevations south of the Horn Plateau, east of the Rabbitskin River and north of the Mackenzie River there was an overlapping distribution of the three species.

Our observation of wood bison signs on the Rabbitskin River in the vicinity of Rabbitskin Lake (61^{o} 38'N x 119^{o} 20'W) is the most western report of wood bison. In recent years the core of the Mackenzie wood bison herd distribution has been shifting northward and westward (John Nishi pers. comm.; NCL, DJ pers. obs.). The extensive high water table throughout the Mackenzie Bison Sanctuary has reduced forage availability in the meadows that were historically used by a large proportion of the bison population and has likely contributed to the changing bison distribution. Although a majority of the bison tracks we observed west of Mills Lake were likely made by individual or small groups of adult males at least one set of tracks was likely made by a group of mixed sex and age animals. Given the history of range expansion of the Mackenzie bison herd, once adult males begin to occupy areas, groups of mixed sex and age animals are likely to follow (Gates and Larter

1990; Larter et al. 2000).

RECOMMENDATIONS

1) The observational data collected from this survey should be incorporated with the previous data that were used to create the boreal caribou late winter occupancy model to test and enhance its predictions.
2) Areas determined by this survey to be of high boreal caribou late winter occupancy should be visited during the summer if possible to investigate the habitat characteristics at a finer scale.
3) Areas determined by this survey to be of high boreal caribou occupancy should be included in a list of potential sites for measuring winter snow severity throughout the Northwest Territories.
4) Data about moose presence from this survey should be incorporated into assisting with the stratification of various areas of the Dehcho into high and low moose density for future studies and surveys of moose in the Region.
5) Data about bison presence should be incorporated into future work with the Mackenzie Bison population pertaining to evaluating areas of known occupancy, winter distribution and range expansion to the west.

ACKNOWLEDGMENTS

We thank Anne Gunn for providing unpublished data from the Dehcho boreal caribou occupancy predictive model, which were key components used to determine our survey routes and design. Bruno Croft provided copies of both the digital and hard copy maps of the Dehcho and Edéhzhíe. We would like to thank all of the staff of Wolverine Air for providing a well maintained aircraft for this work and especially thank Aaron Close for his excellent piloting which made this survey a success. We thank all of the observers who assisted with the survey: Raymond Pellissey (Pehdzeh Ki First Nation), Ronnie Antoine (Fort Simpson Métis Local), Peter Corneille (Liidlii Kue First Nation), and Douglas Norwegian Sr. (Jean Marie First Nation). Funding for this project came from RWED Protected Area Secretariat, RWED Dehcho and South Slave Regions.

PERSONAL COMMUNICATIONS

D. Cross, Resource Technician, Government of Manitoba, The Pas.

K. Davidge, Renewable Resources Officer, Department of Environment & Natural Resources, Government of the Northwest Territories, Fort Simpson.

T. Hillis, Climate Change Biologist, Department of Environment & Natural Resources, Government of the Northwest Territories, Yellowknife.

J. Nagy, Senior Wildlife Researcher, Department of Environment & Natural Resources, Government of the Northwest Territories, Inuvik.

J. Nishi, Bison Ecologist, Department of Environment & Natural Resources, Government of the Northwest Territories, Fort Smith.

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APPENDIX 1

A breakdown of the various observations recorded by survey leg.

	Leg 1	Leg 2	Leg 3	Leg 4
Fresh Moose Tracks On Transect	35	21	96	50
Fresh Moose Tracks Off Transect	0	0	0	0
Old Moose Tracks On Transect	2	14	86	41
Old Moose Tracks Off Transect	0	0	0	0
Moose, non-calf, On Transect	8	11	21	9
Moose, non-calf, Off Transect	0	3	5	1
Moose calf On Transect	1	0	3	1
Moose calf Off Transect	0	0	0	0
Fresh Caribou Feeding Crater On Transect	43	51	18	13
Fresh Caribou Feeding Crater Off Transect	0	5	2	0
Old Caribou Feeding Crater On Transect	65	155	45	23
Old Caribou Feeding Crater Off Transect	0	0	3	0
Fresh Caribou Tracks On Transect	178	103	31	14
Fresh Caribou Tracks Off Transect	0	0	0	0
Old Caribou Tracks On Transect	8	0	0	0
Old Caribou Tracks Off Transect	0	0	0	0
Caribou, non-calf, On Transect	18	16	5	0
Caribou, non-calf, Off Transect	0	5	0	0
Caribou calf On Transect	0	0	0	0
Caribou calf Off Transect	0	0	0	0
Fresh Bison Feeding Crater On Transect	0	0	3	0
Fresh Bison Feeding Crater Off Transect	0	0	0	0
Old Bison Feeding Crater On Transect	0	0	0	0
Old Bison Feeding Crater Off Transect	0	0	0	0

Appendix 1. cont.

Fresh Bison Tracks On Transect	0	0	0	0
Fresh Bison Tracks Off Transect	0	0	0	0
Old Bison Tracks On Transect	0	0	5	107
Old Bison Tracks Off Transect	0	0	0	1
Bison, non-calf, On Transect	0	0	0	3
Bison, non-calf, Off Transect	0	0	0	10
Bison calf On Transect	0	0	0	0
Bison calf Off Transect	0	0	0	0