WOLVERINE ABUNDANCE AND HABITAT USE IN THE ROCKY MOUNTAIN PARKS OF CENTRAL ALBERTA, CANADA: Year-end Report 2006-2007.

Prepared by:

Dr. Steve Bradbury and Jason Fisher (Ph.D. candidate, University of Victoria)
Ecological Research & Restoration Program
Alberta Research Council
Vegreville, Alberta, T9C 1T4.

April 30, 2007

DISCLAIMER

The views, statements, and conclusions expressed in this report are those of the authors alone, and any errors or omissions are theirs.

ACKNOWLEDGEMENTS

This project has five committed partners including the Alberta Research Council, the Alberta Conservation Association (ACA), Alberta Tourism, Parks, Recreation & Culture (Alberta Parks), Alberta Sustainable Resource Development (ASRD), and the Foundation for North American Wild Sheep – Alberta Chapter (FNAWS).

This project would not be a reality without the individual support and enthusiasm of Ksenija Vujnovic, Drajs Vujnovic, Laura Graham and Kyle Clifford (Alberta Parks), Gordon Glover, Chad Morrison and Chris Stockdale (Forest Protection, ASRD), and (Grande Cache Tanker Base, ASRD).

Field assistance was provided by Randy Kadatz and Drajs Vujnovic (Alberta Parks), Lisa Wilkinson and Jan Ficht (ASRD), and Len Peleshok, Colin Twitchell, Karen Brown, Sharon Newman, Sandi Melenka, Larry Roy and Shawn Gervais (all from the Alberta Research Council). Luke Nolan (ARC) coordinated and participated in all field-related aspects of the study. Luke Nolan, Len Peleshok, and Colin Twitchell participated in lengthy discussions about sampling design, camera setup, barbed wire arrangement, and helicopter logistics.

Thanks also to the helicopter pilots who ensured our efficiency and safety in all sorts of conditions.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

WOLVERINE ABUNDANCE AND HABITAT USE IN THE ROCKY MOUNTAIN PARKS OF CENTRAL ALBERTA, CANADA.

INTRODUCTION

Project background

The wolverine (*Gulo gulo*) is a reclusive and wide-ranging scavenging carnivore that has experienced considerable range reduction over the last two centuries. Federally, the wolverine is listed as a species of *Special Concern* (COSEWIC 2005), and provincially, the wolverine is listed as *May be at Risk* (ASRD 2006). Wolverines inhabit the mountains, foothills and boreal plain of Alberta, areas of increasingly rapid development *via* forest harvesting, mining, and oil and gas activities. Preliminary information from the Alberta Wolverine Experimental Monitoring Project (Fisher 2003, 2004, 2005; Fisher and Bradbury unpublished data) suggests that wolverines occur in very low densities in Alberta - lower than in other jurisdictions to the south, west, and north. The Monitoring Project also revealed that wolverine habitat is being heavily impacted by human development. For example, areas with detected wolverine activity in 2005 were subsequently bisected with new gas pipeline developments in 2006, rendering that habitat unusable to wolverines (Fisher and Bradbury, unpublished data). Historical harvest data from Alberta (Poole and Mowat 2001) suggests that wolverine populations are declining, and data from British Columbia (J. Krebs, pers. comm.) indicate that wolverines are highly susceptible to human development.

Habitat loss is likely the largest parameter affecting wolverine survivorship in Alberta. In an era of unprecedented economic growth, and concomitant habitat loss to fuel this growth, few areas in Alberta remain sufficiently remote and undisturbed to support and protect wolverines. The notable exception is Alberta's network of Parks and Protected Areas.

This project, while a separate endeavor with entirely different goals, builds on wolverine research in Alberta currently being finalized (Fisher 2003, 2004, 2005; Fisher and Bradbury unpublished data).

Project study area

Willmore Wilderness Park (WWP) occupies nearly 460 000 Ha of the Rocky Mountain front ranges in the Province of Alberta's protected area system (Figure 1). It is a mountainous park adjacent to Jasper National Park (to the south), and is a component of the Yellowstone to Yukon "connectivity corridor" (Figure 2). The WWP represents some of the most enduringly pristine mountainous habitat in Alberta, and given the immense industrial pressure *(i.e.*, oil and gas development, forestry, mining) occurring on Alberta's public lands immediately to the east and north, and forestry activity occurring in British Columbia provincial lands immediately to the west, the park's role in conservation is paramount. Despite this, no data exist on the presence, abundance or habitat use of wolverine, and furbearers in general, within the park.

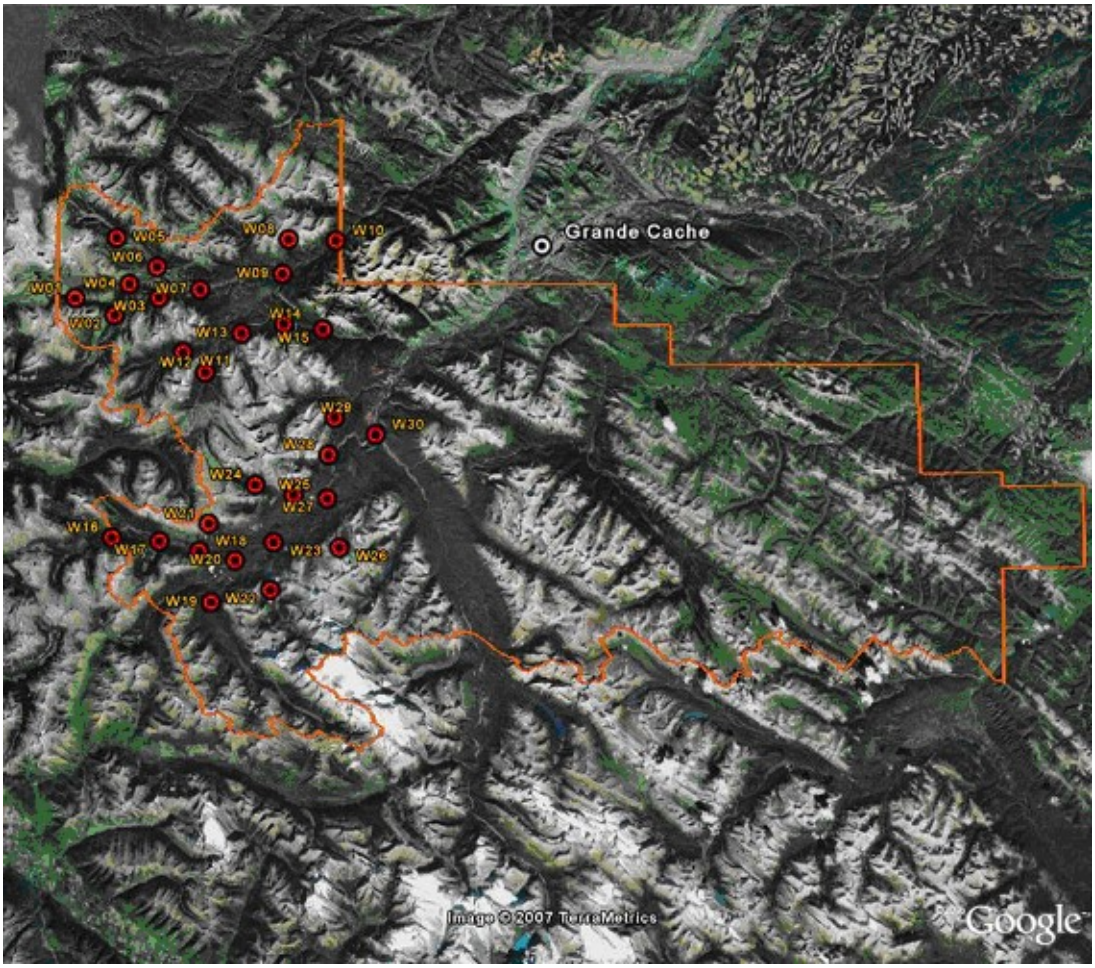

Figure 1. Willmore Wilderness Park and the 30 sampling locations for the December 2006 – March 2007 season.

Project objectives

Using previously developed non-invasive monitoring techniques specific to wolverine, as well as population viability analysis (PVA) and GIS-based habitat analysis, we will estimate the number of wolverines in WWP, and assess whether this constitutes a viable population. This information will illustrate the role played by the park in the protecting wolverines, and greatly contribute to the currently accumulating body of knowledge on wolverines in Alberta. Under the Species-at-Risk Act, species must be assessed for vulnerability, and a legal status assigned. Wolverine abundance and distribution data are required for population assessment of this potential species-at-risk, and data from this project will provide some of this vital information.

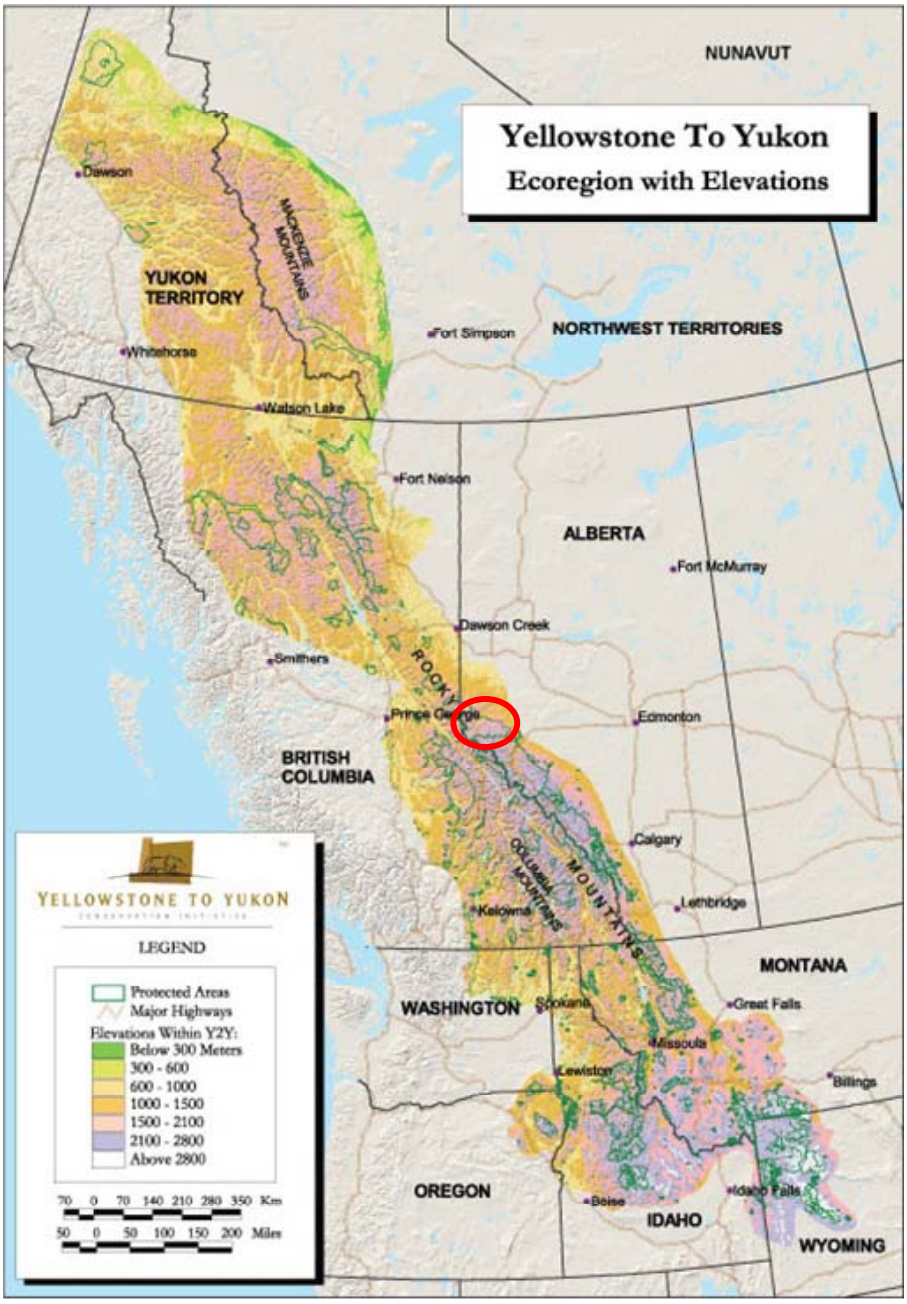

Figure 2. The Yellowstone to Yukon connectivity corridor. The Willmore Wilderness Park is identified by the red ellipse. Modified from http://www.y2y.net.

This project is designed to run from September 2006 to December 2008, encompassing two field sampling seasons. Over the course of the two years, the project's objective is to answer two main questions:

(1) What is the current population estimate of wolverines in Willmore Wilderness Park; and,
(2) Will the area and habitat represented in this pristine Protected Area be sufficient to support a viable population of wolverines?

MATERIALS AND METHODS

Estimation of population size requires: 1) a reliable method of detecting presence of individuals within that population; and, 2) a rigorous experimental design that provides accurate estimates with narrow confidence limits. The Alberta Research Council has previously developed reliable non-invasive techniques for detecting wolverines in Alberta (Fisher 2003, 2004, 2005; Fisher and Bradbury unpublished data). A combination of remote camera detection (Reconyx LLP 2006) and DNA analysis (via hair capture) has proven successful in detecting wolverine in Alberta forest ecosystems. Individual wolverines have been identified using both remote camera imaging and DNA microsatellite analysis. Following this protocol, we employed a detection system that counts individuals via hair capture at baited stations. Remote cameras also provide:

- estimates of detectability, and thus, a correction factor,
- insight into wolverine behaviour around the hair-capture station, and
- possibly, another mechanism for the identification of individual wolverines.

We deployed 30 wolverine detection stations in close proximity (approximately 5000m apart, dependent on topography) and over a smaller contiguous area to obtain accurate wolverine population estimators for that area (Figure 1). Our systematic design sampled different habitats within the WWP in proportions that are representative of their frequency in the landscape (Table 1). Stations were active December 2006 - March 2007. Three sampling periods were established to allow for re-baiting and to periodically retrieve memory cards from cameras. Depending on the day each site was visited, sampling periods were:

- Period 1 - December 12-14, 2006 to January 15-17, 2007
- Period 2 - January 15-17, 2007 to February 13-16, 2007
- Period 3 - February 13-16, 2007 to March 26-28, 2007.

Table 1. Location and elevation of the 30 sampling sites for the December 2006 – March 2007 season.

Site	Latitude	Longitude	Elevation (m)	Site	Latitude	Longitude	Elevation (m)
W01	53.82963	-119.963	1587	**W16**	53.57566	-119.892	1529
W02	53.81199	-119.892	1627	**W17**	53.57225	-119.807	1497
W03	53.83108	-119.812	1544	**W18**	53.56226	-119.735	1484
W04	53.84517	-119.866	1506	**W19**	53.508	-119.713	1547
W05	53.89428	-119.889	1570	**W20**	53.5526	-119.67	1530
W06	53.8636	-119.816	1503	**W21**	53.5914	-119.718	1803
W07	53.83992	-119.737	1424	**W22**	53.52152	-119.607	1454
W08	53.894	-119.578	1854	**W23**	53.5723	-119.602	1366
W09	53.85707	-119.589	1389	**W24**	53.63313	-119.635	1647
W10	53.89277	-119.493	1320	**W25**	53.62252	-119.566	1565
W11	53.77316	-119.767	1475	**W26**	53.56706	-119.484	1959
W12	53.75207	-119.727	1509	**W27**	53.61901	-119.506	1306
W13	53.79377	-119.662	1523	**W28**	53.66536	-119.504	1341
W14	53.80392	-119.586	1316	**W29**	53.70477	-119.493	1375
W15	53.79853	-119.515	1271	**W30**	53.68717	-119.42	1071

At each site two trees approximately 4m apart were selected. One tree was ringed with barbed wire (Figure 3) and baited with a whole beaver carcass; trees were rebaited at the beginning of

each sampling period if required. The second tree was used to support a Reconyx remote camera (Reconyx LLP 2006). Cameras (Figure 4) were initially programmed to capture two images, five seconds apart, at each sensor trigger; the camera would then go into sleep mode for ten minutes after which time the sensor could again be triggered. After the second sampling period (*i.e.*, for the February – March sampling period), programming was changed to take three images, each three seconds apart, at each sensor trigger; additionally, the sleep mode was reduced to five minutes. This did not change wolverine detectability, but did improve our understanding of wolverine behaviour around the baited and barbed wire tree. Hair samples were collected and stored in envelopes until the end of the field season and then sent for DNA analysis (Wildlife Genetics International, Nelson, BC).

RESULTS SUMMARY

In the first sampling period (December 2006 – January 2007), 7785 triggered events yielded 11570 images of various wildlife species. Wolverines were detected at 14 of 30 sampling sites, by a combination of camera imaging and snow-tracking (Table 2).

In the second sampling period (January 2007 – February 2007), 8935 triggered events yielded 17870 images of various wildlife species. Wolverines were detected at 23 of 30 sampling sites, again by a combination of camera imaging and snow-tracking.

In the third sampling period (February 2007 - March 2007), 15355 triggered events yielded 46066 images of various wildlife species. Images of wolverines were observed at 26 of 30 sampling sites.

Overall, wolverines were detected at 29 of 30 sampling sites.

Hair samples have been sent for DNA analysis, but results are not anticipated until the end of the summer 2007.

FUTURE ANALYSIS

The distance between sites (approximately 5000m) will allow for estimates of wolverine space-use to inform wolverine density estimates. Sampling over a two-year period should provide estimates of vagility that will allow us to assess the degree of closure within the Protected Area's population. In addition, in the final phase of this project, detection frequency data will be used to build site occupancy models (MacKenzie *et al*., 2006; Lukacs and Burnham 2005) that provide probabilities of wolverine occurrence across the WWP. These models will provide the basis for wolverine abundance and density estimates for the area; abundance estimates will then be used in population viability analyses to assess the ability of the Protected Area to sustain these populations.

Table 2. Wolverine detection history at the 30 sampling sites for the December 2006 – March 2007 season (Period 1: December 2006 – January 2007; Period 2: January 2007 - February 2007; Period 3: February 2007 – March 2007). The number of events refers to the number of sensor triggers. Detections indicated by 1; non-detections indicated by 0.

Site	Period 1 Events	Period 1 Detection	Period 2 Events	Period 2 Detection	Period 3 Events	Period 3 Detection
W01	810	0	638	1	557	1
W02	215	0	--[3]	1[2]	339	1
W03	435	1	300	1	745	1
W04	535	1	316	1	551	1
W05	415	0	517	0	773	1
W06	140	0	436	0	744	1
W07	10	0	357	0	571	1
W08	165	0	138	1	506	1
W09	208	0	295	1	373	0
W10	38	1	49	1	92	1
W11	330	1	508	1	630	1
W12	587	0	287	1	72	1
W13	353	1	342	1	920	1
W14	263	0	93	1	381	1
W15	20	0	104	1	662	1
W16	361	1	456	1	456	1
W17	168	1	203	1	696	1
W18	210	1	128	1	389	1
W19	267	1	240	1	809	1
W20	198	0	488	0	515	1
W21	--[1]	1[2]	159	0	739	1
W22	195	0	184	1	20	0
W23	372	1	253	1	970	1
W24	256	0	796	1	530	0
W25	206	0	387	1	483	1
W26	378	0	307	0	881	1
W27	364	1	149	1	350	1
W28	93	1	581	1	304	1
W29	3	1	15	1	41	1
W30	150	0	209	0	260	0

[1] Camera not turned on.
[2] Detection by tracks.
[3] Camera knocked off tree and lost in snow; it will be retrieved during summer 2007.

LITERATURE CITED

Alberta Sustainable Resource Development. 2006. The General Status of Alberta Wild Species 2006. Alberta Fish and Wildlife Division, Government of Alberta, Edmonton, Alberta.

COSEWIC. 2005. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada. 64 pp.

Fisher, J.T. 2003. Assessment of Wolverine Monitoring Methodologies in Alberta. Alberta Research Council, Vegreville, Alberta.

Fisher, J.T. 2004. Alberta Wolverine Experimental Monitoring Project: 2003-2004 Annual Report. Alberta Research Council, Vegreville, Alberta.

Fisher, J.T. 2005. Alberta Wolverine Experimental Monitoring Project: 2004-2005 Annual Report. Alberta Research Council, Vegreville, Alberta.

Lukacs, P.M., and K.P. Burnham. 2005. Review of capture-recapture methods applicable to noninvasive genetic sampling. Molecular Ecology. 14: 3909-3919.

MacKenzie, D.I., J.D. Nichols, J.A. Royle, K.H. Pollock, L.L. Bailey, and J.E. Hines. 2006. Occupancy estimation and modeling. Academic Press: New York. 324 pp.

Poole, K. and G. Mowat. 2001. Alberta Furbearer Harvest Data Analysis. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 31, Edmonton, Alberta. 51 pp.

Reconyx LLP. 2006. Silent Image. User Guide – Professional Edition. La Crosse, WI. 69 pp.

APPENDIX 1 – SAMPLING SITE SETUP

Figure 3. Beaver carcass as bait and barbed wire arrangement on hair-capture tree.

Figure 4. Reconyx remote camera with infra-red detector and flash.