RESPONSE OF A WINTERING MOOSE POPULATION TO ACCESS MANAGEMENT AND NO HUNTING – A MANITOBA EXPERIMENT

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ABSTRACT: We report on an experiment undertaken in eastern Manitoba beginning in 1996, in which a moose population wintering in 62 km^2 (24.2 mi^2) was protected from hunting until September 2003. At the time of closure, it is speculated that about 37 (0.6/km^2 (1.5/mi^2)) moose wintered in the area based on aerial surveys and considering visibility bias. The closure was supported by the Eastern Region Committee for Moose Management, which is comprised of Manitoba Conservation staff, First Nation representatives from local communities, local hunting organizations, and other interest groups such as Tembec Manitoba Incorporated and the Manitoba Model Forest. Road access to the area was curtailed by using locked gates, millstones, and V-plowing a portion of the road in 2002. The area was surveyed from a helicopter on March 4, 2003, and 107 moose were counted in the closed area and again, based on visibility bias, it is speculated that about 142 moose (2.3/km^2 (5.8/mi^2)) were present. This experiment clearly demonstrates that moose will respond positively to access management and no hunting, and that V-plowing roadbeds is a useful technique for controlling access. The cost associated with such plowing varies from about $500-$1,500/km depending on material contained in the roadbed.

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Both positive and negative impacts of roads on wildlife values in forested areas have been documented. From a positive perspective, access provides opportunities for public use of many resources and offers other recreational opportunities. On the other hand, roads and associated public access are a component of increased land use which can be a threat to the sustainability of wildlife populations. These threats are manifested as: (1) direct loss of habitat along cleared rights-of-way; (2) a potential for increased hunting, subsequent harvest, and associated disturbance; (3) decreased habitat utilization adjacent to roads due to motorized traffic and other human activities (Bjorge 1984, Singer and Beattie 1985, Thiel 1985, Ellison et al. 1986, Shideler et al. 1986, Cameron et al. 1992, Nellemann and Cameron 1996, Jalkotzy et al. 1997); (4) habitat fragmentation; and, (5) displacement by exotic species (e.g., cowbirds displacing warblers). To minimize the negatives (e.g., destruction of important habitats, unsustainable harvests, displacement of species into less preferable habitat, etc.), the location and public use of roads must be addressed early in the forest management planning process.

Human activities on roads can impact wildlife in variable ways ranging from subtle energetic costs to animals constantly exposed to such disturbances, to being killed. Wildlife, on the other hand, have the option of moving to avoid the disturbance or with some territorial species, existing within the

zone of influence. With the former, animals may be forced into less preferred habitats and become exposed to factors such as increased predation, nest parasitism, disease, etc. Reducing foraging efficiency and altering energetic costs can further affect activity budgets. These incremental energetic costs are less pronounced in undisturbed habitats. The cumulative impact of roads and associated activities must be understood and acceptance given that roads significantly alter landscape dynamics. Road density is an excellent indicator of the location and the potential pressure placed on wilderness areas. With this in mind, road development proposals must be closely scrutinized with the view to maintaining the lowest road density possible and approving locations, which will minimize impacts on important habitats, wildlife sustainability, and reduce fragmentation. Each proposal must also include a proactive access management and road retirement program recognizing that once a tradition of access has been established on such roads the chances of closing it are greatly reduced.

Manitoba Conservation (MC) in 1996 initiated the Eastern Region Committee for Moose Management, which functioned in an advisory capacity to MC on issues applicable to moose (*Alces alces andersoni)* and moose habitat. This committee is comprised of MC staff, representatives from local First Nation communities, local game and fish clubs, Tembec Manitoba Inc., the Manitoba Model Forest, and various other stakeholders. In 1996, the committee recommended to MC that the study area be closed to moose hunting from 1996 until 2000 inclusive, at which time moose hunting would again be permitted. MC accepted this recommendation and although the agreement was for a 5-year closure, this was extended to September 2003, 7 years after the initial closure. This paper presents the results of the closure on the number of moose wintering in the Happy Lake area and what was done to close roads. Although there is much written in the literature on the impacts of roads, there is a paucity of information on how to effectively deal with access and access management. It is hoped that this paper will, in a small way, begin to address these issues.

STUDY AREA

The study area comprising 62 km^2 (24.2 mi^2) is located in MC's Game Hunting Area (GHA) 26 with the centre being at approximately latitude 50^0 50' 26" and longitude 95^0 30' 30". It is located in eastern Manitoba in the southern portion of the Lac Seul Upland (Boreal Plain Ecoregion) which encompasses the southern part of Canada's Precambrian shield and is 25.6 km (16 mi) west of the provincial boundary between Manitoba and Ontario. The GHA has been extensively logged over the last 80 years with softwoods being the primary species taken and wildfires have occurred periodically. The result of the aforementioned is moose habitat, which is considered high quality. Previously the area was a mature mixedwood forest. This GHA is a designated route area for big game hunting and all vehicles used for moose hunting by licensed hunters are restricted to designated trails and/or roads but can leave the trails/roads for retrieval purposes. The study area has one logging road accessing it and on the north side it is accessible by water or over the ice in winter. The response of the moose population to access control and no hunting was studied. Although movement studies have not been undertaken, the presumption is, based on familiarity of the area by the senior author, that all of the moose seen are not resident in the area year round but rather an unknown number reside in adjacent areas during the summer and fall and are subjected to hunting in these habitats. It is speculated that movement to this

relatively remote area occurs in early winter. Concomitant with wood harvesting has been the need to develop a network of roads to access the timber resource. All-weather access to the area was developed for timber harvesting and renewal.

Moose hunting by licensed hunters for the last 40 years has been restricted to a 2-week period in early December and since the early 1980s, the bag limit has been bulls only. Previously it was any moose. MC in the late 1960s recognized the need to restrict vehicles if the moose population was to be sustainable, and at that time embarked on a system of designated routes, which is still in effect. Hunting by First Nation peoples is without restrictions in GHA 26 and they are able to travel anywhere using vehicles except on closed roads, can harvest any moose, and there are no restrictions on numbers that can be taken.

METHODS

The study area, which was delineated based on roads, a hydro electric transmission line, lakes, creeks, and rivers, was initially surveyed for moose using a 206B helicopter in 1996 and each subsequent year (excluding 1998/99) up to and including 2002/03. It had been logged prior to the closure. The protocol for each survey was to have 2 experienced observers, a navigator who directed the pilot to follow specified flight lines which were spaced 0.4 km (0.25 mi) apart, record all sightings on a computer using a global positioning system (GPS), classify all animals as either adults or calves, and sex each adult using the presence of antlers or, in the case of animals without antlers, the presence or absence of a vulva patch. It was estimated that about one third of the moose were missed. Crête et al. (1986) in mixedwood forest of Quebec found that 27% of the moose were missed during early winter counts using helicopters.

The access road to this study area was open at periodic intervals from 1996 to 2003 to allow logging trucks to remove wood. Outside of these occasions, the road was closed using millstones and a locked gate (Fig. 1) and, in 2002, bridges and culverts were pulled to further restrict access. The access road split at the southwest corner of the study area into a north and south section. A portion of the south road was V-plowed in 2002. The equipment necessary to do this was attached to the back of a Fiat HD 21 tractor and the roadbed ripped (Figs. 2, 3, and 4).

RESULTS

The results of the aerial surveys are presented in Table 1. The initial survey conducted in 1996 yielded a total of 28 moose. Based on one-third being missed, approximately 37 moose were present in the closed area at the time of the 1996 survey (Table 2). The estimated moose density was 0.6/km^2 (1.5/mi^2). During the 2003 survey, 107 moose were observed and again assuming one-third were missed, it is estimated that approximately 142 moose were present in March, 2003, which is an estimated density of 2.3/km^2 (5.8/mi^2).

Fig. 1. Millstones and gate used to control access on Happy Lake Road.

Table 1. Results of Happy Lake study area moose surveys – 1996/97 to 2002/03.

Year	Bulls (%)	Cows (%)	Calves (%)	Unknown (%)	Total	Bulls/ 100 Cows	Calves/ 100 Cows
1996/97	4 (14.3)	7 (25)	8 (28.6)	9 (32.1)	28	57.1	114.3
1997/98	9 (24.3)	18 (48.6)	10 (27.0)		37	50	55.6
1999/00	18 (31.6)	19 (33.3)	15 (26.3)	5 (8.8)	57	94.7	78.9
2000/01	23 (26.7)	41 (47.7)	17 (19.8)	5 (5.8)	86	56.1	41.5
2001/02	40 (42.1)	41 (43.2)	14 (14.7)		95	97.6	34
2002/03	40 (38.0)	49 (46.7)	16 (15.2)	2 (1.9)	107	81.6	32.7

Note: survey not done in 1998/99.

During the survey, the remains of one moose were observed which appeared to be a poacher's kill and 3 animals were seen that were not fully mobile and may have been wounded. Natural Resource Officers have documented poaching in this area over the period of closure but it has not been extensive. Access by poachers was done by breaching the gate (breaking locks) and millstones or by cutting trails through the bush adjacent to the gates. A few offenders (those shooting moose in the closed area) have been charged with hunting illegally within this area and these cases are currently before the courts. There have been transgressions of the gates during holiday seasons particularly at Christmas when officers are on annual leave. In one case, hunting along the road to the Happy Lake area by a group of unidentified persons resulted in 21 moose being taken in 1 week.

V-plowing is effective in prohibiting access by trucks, snow machines and all terrain vehicles (ATVs) (Fig. 4). The cost of operating the tractor along with the attached V-plow was CAN $125/hour and a km of road can be done in anywhere from 4 to 12 hours depending on what is contained in the roadbed. The presence of large rocks will slow progress. Therefore, the cost of doing a km will vary from CAN $500-$1,500. This activity includes criss-crossing

Table 2. Estimated wintering moose population and density in the Happy Lake study area.

Year	Estimated Population	Estimated Density
1996/97	37	0.6/km^2 (1.5/mi^2)
1997/98	49	0.8/km^2 (2.0/mi^2)
1999/00	76	1.2/km^2 (3.1/mi^2)
2000/01	114	1.8/km^2 (4.7/mi^2)
2001/02	126	2.0/km^2 (5.2/mi^2)
2002/03	142	2.3/km^2 (5.8/mi^2)

Note: survey not done in 1998/99.

Fig. 2. V-plow attached to back of Fiat HD-21 tractor.

Fig. 3. Fiat HD-21 tractor 'ripping' road with use of a V-plow.

back and forth. The purchase price of such V-plows is about CAN $15,000 and adaptations had to be made so that it dug properly and did not skip. The operator advised that once perfected, there has been no breaking of bolts which he anticipated, and the equipment has functioned smoothly in all cases.

DISCUSSION

Access to forested areas can be controlled to varying degrees by existing Manitoba legislation namely, *The Crown Lands Act* (Chapter C340, regulation 145/91, section 3), *The Wildlife Act* (Chapter W130, section 3 and section 2.1 of 351.87), *The Provincial Parks Act* (Chapter P20, section 27), as well as *The Workplace Health and Safety Act* (102/88 R). The effectiveness of this legislation can vary and the application is subject to various criteria. It is not a catch-all for access management and legal challenges may affect government's ability to apply access controls in the future.

Wildlife Values of Access Control

Access management on roads, i.e., controlling use of cars and trucks, must be given one of the highest priorities in order to minimize the impacts of forest harvesting and associated roads on wildlife, particularly big game such as moose, elk (*Cervus elaphus*), and other species which may be impacted. This will enable Manitoba (and other jurisdictions) to adhere to the conservation of biodiversity, to secure renewable resources for future generations, i.e., sustainability, and to meet the province's fiduciary obligations to First Nation peoples. The aforementioned necessitate the preparation of road management plans early in the overall planning process and must address issues such as location, type, longevity, mitigative measures, road retirement and rehabilitation, and resource values at risk. It is also important to evaluate access in adjacent operating areas. This information will permit an evaluation of the cumulative impact of road development and provide opportunity for mitigation of these impacts (i.e., road retirement in adjacent

Fig. 4. Results of ripping road bed to control access.

areas).

Alternatives such as the use of existing roads or portions thereof must be examined along with the need for all weather versus seasonal roads. There are 4 issues requiring attention namely: (1) access to cutting blocks which deals with location and road density; (2) public access to the roads constructed; (3) road closure, retirement, and roadbed/rights-of-way reclamation; and (4) access to logged areas for silvicultural purposes. These issues are not unique to Manitoba. MC acknowledges that directives are required to control vehicular access to wildlife, to protect wildlife values, to ensure that unsustainable use patterns are not established, and that traffic prohibits regeneration on roadbeds. Such directives will promote the department's commitment to the goals of biodiversity and ecosystem management while at the same time sustain a viable timber industry. A first priority in managing access on forest roads must be to identify wildlife values at risk, mitigative measures to be employed, and to implement a timely road retirement program. Such strategies must balance resource conservation against the need for legitimate use. Travel may have to be restricted and/or prohibited on roads, which traverse the habitats of endangered species, species rich (including plants, neotropical migrants, etc.) areas, and/or which may result in over-exploitation of resident wildlife populations. The latter will enable some species (e.g., moose) to maximize their response to rejuvenated habitats as witnessed in the Happy Lake study area. Wintering moose densities of 2.3/km^2 (5.8/mi^2), although only a portion of the entire GHA, are the highest in any of Manitoba's GHAs that are hunted and demonstrates what can be achieved with the co-operation of interested stakeholders and First Nation peoples.

Methods to Control Access

When evaluating options to deal with road-wildlife issues, each is a compromise addressing only a subset of the multiple ecological impacts of roads, and is less satisfactory than outright closure and complete rehabilitation. Options for consideration include minimizing road densities, locating roads away from important habitats, and controlling vehicular access as it relates to management of all recreational activities including hunting and trapping. Further, the legal penalties are not severe enough and it does create tension between MC and First Nation users. Closures, which look good on paper, may not function as such on the ground – in some situations, the only effective technique may be to "rip" and wait for natural re-vegetation. This approach has the added advantage of returning the roadbed to productive forest at minimal cost. It is suggested that by exposing soil and reducing compaction this will facilitate re-vegetation. To enhance the success of road closures, an effective public education and communication program (developed by government and industry) relating to the rationale for closures along with effective enforcement must be part of any program.

At the very least, a minimum of 1.6 km (1 mi) should be ripped as well as removing culverts and bridges. It is not a deterrent to rip only a few hundred metres of road as, although inconvenient, users of ATVs will navigate over such obstacles for short distances. It also is not a deterrent to rip a few hundred metres of road and then leave the road intact and again rip another short section at some further distance. Also, such V-plowing should not be done on inclines where the potential for erosion is greater. It is speculated that the use of gates and millstones curtails approximately 95% of the traffic, however they are not always successful in restricting access to those 'die hard' individuals who view areas behind such obstacles as places where moose can be easily killed and/or their own private

hunting grounds. The V-plowing curtails access by trucks and makes it extremely difficult for those on all terrain vehicles and snow machines to navigate such disturbed areas. Making the disturbed corridor at least a kilometer long will function as a deterrent to those 'die hards'. Attempts to control vehicular access through legislation and gates do not always work and there will be those who have little or no intention of working co-operatively with government and other concerned stakeholders.

Costs and Benefits

Some will suggest that the financial costs of ripping roads for long distances may be prohibitive, however, this must be balanced against the resource values that require protection over the long term and their contribution to ecosystem health and to the cultural and economic well being of each jurisdiction. We suggest that a cost of $500-$1,500/km is manageable when compared with the resource values which will be lost.

The effectiveness of no hunting and road closures such as V-plowing, as well as the co-operation of all interest groups and communities, clearly illustrates what can be achieved in terms of moose density. However, it is acknowledged that certain elements of society do not appreciate the need for such proactive measures if these resources are to remain sustainable for future generations. An appreciation of this by all would not require management agencies to undertake these control measures, which can be expensive in terms of direct costs and staff time. Although there has been pressure to open the Happy Lake area to hunting and, this will occur in 2003 as per the original agreement, efforts are being made to ensure that access to the area is rigidly controlled. Some argue that the area should remain closed and being such a small area, it will have little impact on hunting and opportunity in the entire GHA. It is our belief that those who support an opening of hunting clearly see it as an enhanced opportunity to harvest a moose with little effort and lack a long-term vision for moose management in this GHA. In contrast, those seeking to maintain the area closed see it as an investment over the long term with the wintering moose population in the closed area functioning as the principle and those moose taken outside representing the interest to be used. What is not known at this time is how widely the wintering moose disperse during the snow free period; thus the consequences of protecting moose here may have wider implications. The Committee for Moose Management clearly illustrates what can happen when First Nations and stakeholders from different walks of life put aside real and perceived philosophical differences and work in a co-operative spirit for the wildlife resource and for future use of these resources.

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