RAILWAYS AND MOOSE IN THE CENTRAL INTERIOR OF BRITISH COLUMBIA: A RECURRENT MANAGEMENT PROBLEM

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Abstract: The Canadian National and British Columbia Railways traverse moose winter ranges in the Central Interior. Moose repeatedly intercept and travel along the rail grades. Many moose are injured, crippled or killed. The annual loss of moose to train collisions in the winters of 1969, 1974, 1978 and 1982 was estimated to range from hundreds to in excess of 1000 animals. Normal anti-predator behaviours seem to be of little survival value to moose when confronting trains. Remedial actions necessary to reduce rail mortalities are not apparent at this time. Moose mortality may increase significantly above reported levels when more grain and coal shipments move westward by rail through the Central Interior. Management programs for moose may never achieve their desired goals as continual losses to train traffic may hold population levels below potential.

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The Canadian National (CN) and British Columbia Railways (BCR) transect the ranges of some of British Columbia's most abundant moose populations in the Central Interior (Fig. 1). Large numbers of moose seasonally frequent railway rights-of-way. In some winters of above average snowfall, moose frequent the plowed railbed where they obstruct train traffic and are often killed or injured. The number killed each year varies considerably, but it has been reported by rail personnel

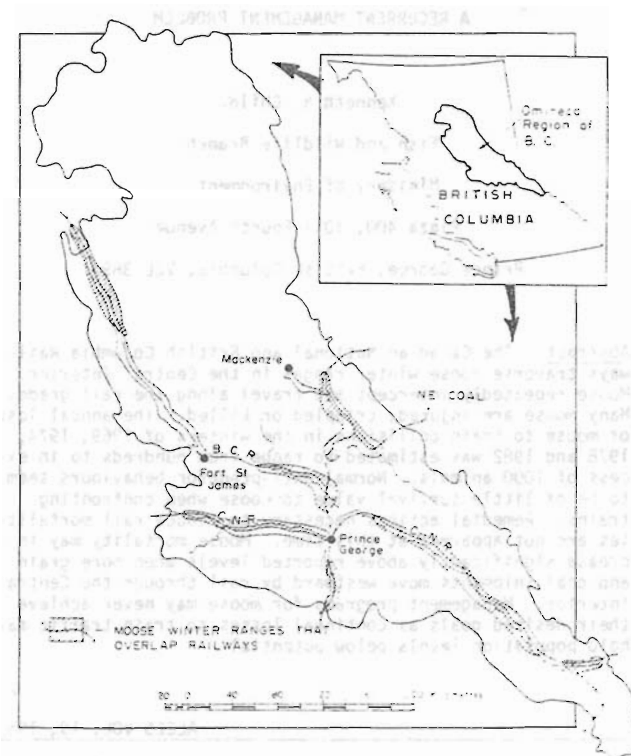

Figure 1. Railway corridors and overlapping moose winter ranges in the Omineca Region of British Columbia.

to be at least several hundred. In winters of above average snowfall however, kill estimates have exceeded 1000 animals in some years (Fig. 2). Moose in British Columbia and elsewhere (LeResche 1974) annually migrate from traditional summer ranges to lower elevational winter ranges with snowfall governing the onset and magnitude of these seasonal movements (Edwards and Ritcey 1956). These winter ranges are characterized by snow conditions that favour daily and seasonal movements and facilitate escape from predators. Man-made transportation corridors such as snow-free roadways and railbeds can substitute for natural routes. Wherever these corridors intercept and/or parallel traditional ranges of moose, large concentrations of animals may frequent the right-of-way. Both the CN and the BCR serve as substitute travel corridors for moose during the winter. The potential for railway-moose conflicts are maximized and loss of animals to trains continues unchecked.

METHODS

Rausch (1957) divided the problem of moose and railways into two major questions:

a) "How can moose be kept off the tracks and away from the right-of-way?

b) How can moose already on the tracks be removed without injury and without undue delay to rail operations?"

Several lines of investigation were pursued in an attempt to answer these two questions and to lay the groundwork for further invest-

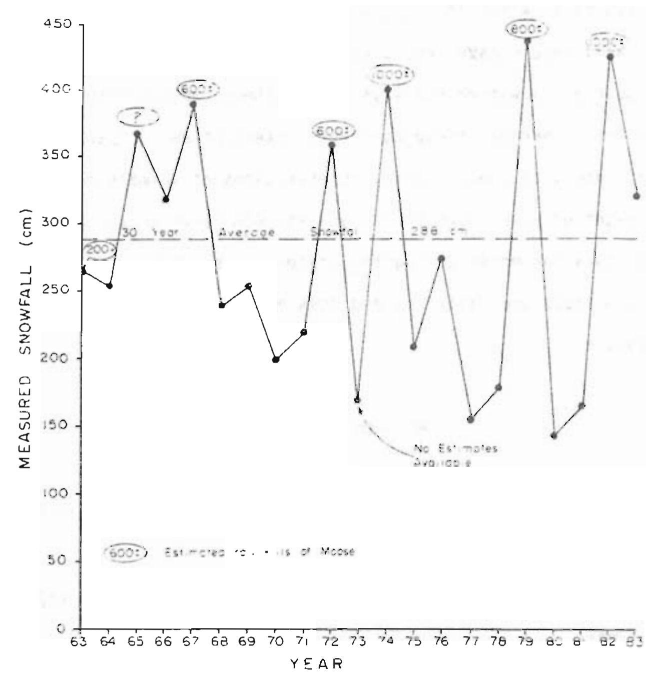

Figure 2. Relationship of estimated rail kills of moose and recorded snowfall in the Omineca, 1963 - 1983.

igation. Provincial agencies were telephoned in order to learn whether or not other jurisdictions reported moose-railway conflicts. Also, each agency was asked to indicate whether or not the magnitude of the problem reported was of management concern and what corrective measures, if any, were prescribed. A variety of literature references were consulted but it was soon discovered that few studies have been conducted specific to moose on railways. Our opportunity to study the local problem was limited to two helicopter flights along the CN line east of Prince George during which time we observed a moose-train encounter.

RESULTS

Provincial Reports

The provincial agencies reported that winter railway mortalities of moose do occur, but in such inaccessible areas to be treated in some instances as "write-offs" because recreational demand does not warrant management attention. In the prairies deer-railroad interactions are of a higher priority concern. Manitoba and Saskatchewan for example, are currently pursuing studies of scaring devices to reduce deer mortalities on rail lines. The Maritime provinces report that moose-railroad conflicts are infrequent and as a consequence, do not present a significant winter mortality problem. Ontario has reported that rail line mortalities of moose, like British Columbia, can be high in some winters but springtime collisions are more significant (Timmerman 1983; pers. comm.). The Algoma Central Railroad in Ontario reported that a decline in rail collisions of moose had been experienced but attributed

this change to a depopulation of animals frequenting the line rather than to any corrective or mitigative measures adopted by the company. Parks Canada, Ottawa, has voiced similar concern about rail losses of big game in National Parks, especially Banff and Jasper (Surrendi 1983). Currently, Parks Canada maintains mortality statistics of animals lost within the environs of the Parks to both train and vehicular collisions. No preventative measures, however have been employed to reduce rail collision losses, even though Parks Canada has contracted a thorough review of the problem (Damas and Smith 1982) with respect to National Parks. British Columbia annually reported the heaviest rail losses of moose along the CN, Canadian Pacific and the B.C. Railways according to Stuart (1983).

Literature Sources

Few references are available that specifically discuss moose-train conflicts (Child 1982; Damas and Smith 1982; Hartman 1962; Hatler 1983; Rausch 1956; Viol 1980). There is an obvious paucity of literature available that discusses either the nature of the problem, the magnitude of the losses, the remedial actions taken to reduce the potential of collisions, or for that matter the implications this mortality may have on management programs. All authors do agree that rail mortalities can be at significant proportions, that mitigation/compensation should be considered and that investigation for remedial actions are warranted.

Behavioral Observation

The only opportunity that I have had to date to study the nature of the problem was from one observation of a moose-train encounter on the CN line east of Prince George in February, 1982. I include the observational details of this event as recorded in my field notes:

" On February 3 at 0942 hrs., two (2) moose are observed at mile 84.5 on the CN rail line. One moose was standing between the rails investigating the carcass of another animal lying immediately adjacent to the rails in the snowbank. Three (3) helicopter passes were conducted over the animal. But, the moose was reluctant to leave, even when pressed by the disturbance (noise) and position (visual) of the helicopter. The animal remained on the railbed positioning itself between the rails, and stood it's ground. At 0948 hrs. a freight train approached from the east. We increased our elevation and circled the position of the moose in order to observe the encounter of animal and train. As the train approached, the moose left the tracks initially and with it's front hooves seemed to test the condition of the snow adjacent to the tracks. The animal after touching it's chest to the snowbank, extracted itself from the softer snows next to the skirt of the blade wash and returned to the top of the railgrade where it continued to trot westwards along the tracks and between the rails ahead of the approaching train (Photo 1). The train continued to gain on the position of the running moose. Within a distance of 3 to 4 body lengths to the train,

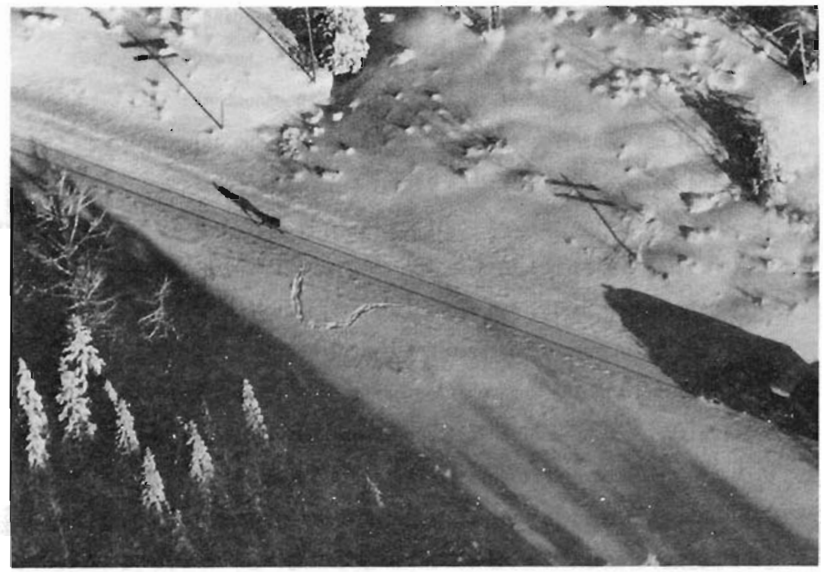

Photo 1. The moose attempts to escape the approaching train but due to snow conditions returns to the tracks and runs along the grade, between the rails, ahead of the train. (Photo by K. Child)

the moose stopped, turned and directed it's attention towards the train - ears back, hackles erect, neck low and outstretched. The moose moved suddenly towards the approaching locomotive, striking it head on. The animal was deflected to the left of the train falling on the snowbank where for a few moments, it lay kicking and writhing in the snow. The moose after regaining it's footing, commenced to strike at the train cars passing by. The train finally came to a stop. Once the motion of the train stopped, the moose also stopped it's aggressive assault on the passing train, investigated it for several seconds, then reversed it's position and moved away from the train a distance of about 8 body lengths amongst some willows. At this time, the train departed. The moose watched the train leave but no reaction was elicited. At 1058 hrs., returning to the site of the encounter, the moose was located on the tracks once again less than .5 km from it's last position. The animal was standing on the railbed between the tracks again. After four (4) attempts by the helicopter to push the moose from the tracks we left, as the animal was reluctant to leave the "security" of the rail line (Photo 2)."

DISCUSSION

Snowbanks heights are apparently not a hindrance to moose crossing rail lines but density of snow adjacent to the rails might be. Moose, following a collision experience, may not be that reluctant to re-enter the zone of the tracks again (Hatler 1983). Is there some visual re-

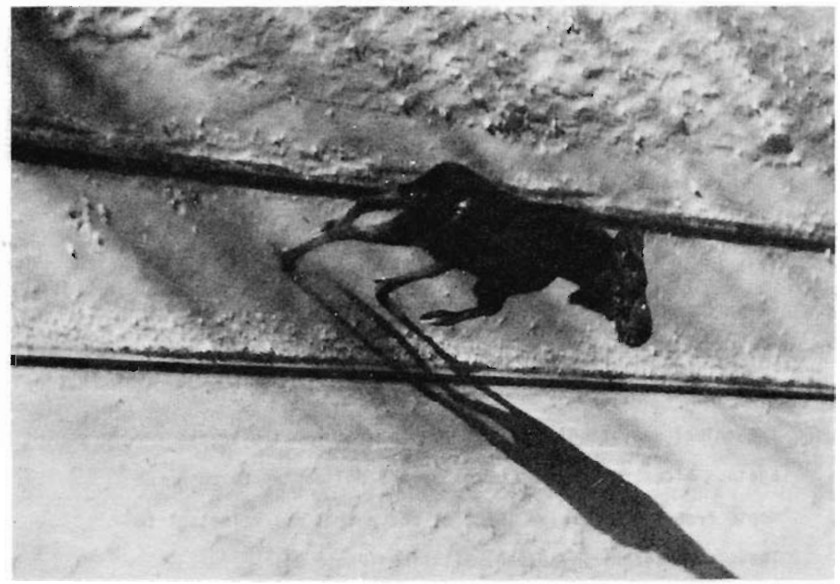

Photo 2. The moose eventually returned to the tracks after its collision experience, positioned itself between the rails, and would not leave when pushed by a helicopter chase. (Photo by K. Child)

inforcement of the non-cryptic nature of the parallel rails to the favourable conditions of the tracks that make moose reluctant to leave the railbed? Animals seem to be responding naturally to a threat stimulus as would be expected under natural conditions to a predator. They initially take to flight but, if unsuccessful, then fight to survive. But the innate defensive behaviors (Geist 1962) are to the animals' disadvantage against the trains. These observations are similar to what has been described for moose on tracks in Alaska (Rausch 1956), on the CN line near Prince George by Hartman (1962), and on the CP line in South Central British Columbia by Hatler (1983). Moose obviously attempt to leave the tracks, but because of snow conditions, return to the solid ground afforded by the railbed and then, by running, attempt to out-distance the approaching train. Failing to escape, moose may resort to more aggressive behaviors, stand their ground, and attack the source of threat, in this case the front of the locomotive or the passing train.

Moose generally escape from a predator by either seeking concealment, outrunning the pursuer or, upon close encounter, standing their ground and kicking aggressively with their hooves (Stringham 1973). These defensive behaviors have been described by several authors (Peterson 1977; Mech 1970; Geist 1962) who have observed moose defending themselves against wolves. Anti-predator behaviors of moose are apparently triggered by the sight, sound and approach of trains. The anti-predator strategies of running and fighting now however are of little survival advantage against a locomotive. Daylight observations of moose on the tracks and some nighttime observations by trainmen

suggest that moose also display diurnal response differences to passing and/or oncoming trains. CN and BCR employees have reported that generally moose tend to run ahead of trains during the day; whereas at night, they move across the tracks. It is not known how a moose reacts when approached by a train at night when standing on the railbed. Rausch (1956) reported that in Alaska moose remained "hypnotized" by the headlights of a locomotive, and failing to move are usually killed. The diurnal nature of the behavioral responses of moose to the railbed environment or to the approach of a locomotive are certainly not fully understood and require more intensive study. Is there a temporal aspect to the moose-train conflict that may be correlated to the daily activity cycle of moose? Unfortunately, collision data is not that plentiful to establish a relationship between time of collision, train scheduling and the daily activity cycle of moose. Obviously more study is needed to fully describe this relationship.

Solutions to railway-moose conflicts have focused on scaring or baiting methods and habitat manipulations adjacent to the tracks to either alarm or lure animals from the railbed. Rausch (1956) reported on the effectiveness of scaring and preventative strategies and made the following recommendations:

1. Operate trains through less critical time periods such as daylight hours (temporal factor implied), whenever it is economically feasible to do so.
2. Manipulate headlights and horn to frighten the moose from the tracks.
3. Reduce speed of trains through critical areas.

4. Spread snow berm as soon as possible after the initial plowing operation.

Most of these measures have been attempted by both CN and BCR in the Omineca. Train speed has been adjusted, frequency of snowclearing increased when possible, horn and light combinations manipulated and runways created adjacent to the tracks. Rail collisions of moose unfortunately continued to occur as before (R. Mason, Conductor, B.C. Railway, pers. comm.).

It would appear that in most moose-train interactions described, the alarm distance is sufficient to permit animals to escape. The depth and texture of snow beyond the blade wash of the spreader however may discourage animals from leaving the railbed. Escape is often directed along the railbed between the tracks where the snow conditions tend to encourage moose to run and out distance the approaching train (Photo 1).

"Why don't you just fence the track?" is an often-heard question. The fencing solution would be possible only if economically feasible and many factors must be considered. Is it easy to construct, maintain and repair? Would it facilitate movements of moose across the tracks and minimize the potential of entrapment within the corridor? Would it act as a diversional obstacle that would funnel moose in greater concentration across the tracks at some other location? And, would it hinder traditional and seasonal migration patterns of moose?

Sensory stimuli have also been used to scare animals from transportation rights-of-way. Flashing lights, noise, odors, visual signals and a combination of several of these have been tested in an attempt to

keep moose from entering vehicular and rail corridors (Viol 1980; Damas and Smith 1982). Initial results were favourable. Once the animals had habituated to the stimuli however, they began to frequent the transportation corridors once again.

Perhaps studies of animal behavior should be conducted prior to field tests in order to determine the response thresholds of animals to certain sensory stimuli and their innate abilities to adapt to changing stimuli strengths. Too often we have argued that moose can adapt to human invention. However, in light of the recurrent nature of railway-moose mortalities, this may not be the case.

Biological & Management Implications

Due to a lack of carcass collections, no assessment of the effects of rail mortality on the welfare of moose populations can be presented. We don't know what sex and age classes are involved. We do know that mortality in some local areas is excessive to the point where the continuation of recreational hunting oportunities may be in jeopardy. One can presume that several hundred animals are involved annually with considerable costs resulting from derailments, damage to goods and downtime (Anon. 1978). Losses of moose to trains may exceed 1000 animals especially in those years with winters having above average snowfall.

CONCLUSIONS AND RECOMMENDATIONS

Even though they share common summer and winter ranges, the moose and the "iron horse" do not co-exist in sympatric harmony. Railway corridors are currently being extended, some by twin-tracking, to serve coal developments, to facilitate grain shipments and to haul smelter and mining goods to market. Moose will continue to cross, travel, or stand on these railways. Collisions can be expected to continue and may in fact double as rail traffic accelerates to meet development demands.

Moose management programs are becoming more intensive and managers are increasingly challenged to manage for sustainable yields (Ritcey 1974). It is therefore becoming more difficult to excuse rail mortality as a "write-off". Too often, and because of the supposed remoteness of a population, these man-induced losses have been argued to be of little consequence since such have been reasoned to be compensatory in nature. Unfortunately, a reduction in train-moose fatalities may be the result of a loss of animal traditions rather than a description of the adaptation of the animals to the presence of a railway or other conveyance.

Several recommendations have been presented in order to better define the problem and seek some solution(s) (Child 1982):

1. Implement a reporting system to document rail kills.
2. Carcasses should be collected for biological examinations and salvaged for subsistence use.
3. A co-operative research commitment should be developed between Provincial and Federal agencies and Crown Rail Corporations to ensure that the conflict is adequately researched and solutions properly field tested and applied.
4. Opportunities for mitigation/compensation should be discussed between government and industry in order to offset resource losses.

Unfortunately, there are no known or researched solutions to the recurrent moose-train conflict. Mitigative measures that have been proposed to date are largely academic since associated costs and logistics appear too prohibitive to encourage field testing or adoption. Engineering prescriptions are largely cosmetic promising little long term relief. Moreover, there is no planned commitment within the private or public sectors to research this resource conflict even though much public debate has been generated. The annual loss of moose represents a significant mortality factor, that being largely additive in nature, will certainly necessitate major adjustments in both the recreational and management objectives for moose in the Omineca.

REFERENCES

ANONYMOUS. 1978. Wildlife Related Motor Vehicle Accidents in British Columbia. A Preliminary Assessment of the Problem Based on a Review of Motor Vehicle Accident Report Forms. B.C. Fish and Wildlife Branch report. 9 pp.

CHILD, K.N. 1982. Railway Corridors and Moose Mortality in the Central Interior of British Columbia. B.C. Fish and Wildlife Branch Report. 23 pp.

DAMAS and SMITH. 1982. Wildlife Mortality in Transportation Corridors in Canada's National Parks. Vol. 1 Main Report. 397 pp.

EDWARDS, R.Y. and R.W. RITCEY. 1956. The Migrations of a Moose Herd. Jour. Mamm. 27(4): 486-494.

GEIST, V. 1962. On the Behaviour of the North American Moose (Alces alces andersoni Peterson 1950) in British Columbia. Behaviour 20: 377-416.

HARTMAN, F.H. 1962. Report: Moose Mortality - CNR Locomotives, Prince Rupert to Red Pass. Fish and Wildlife Branch File Report. 1 pp.

HATLER, D.F. 1983. Concerns for Ungulate Collision Mortality Along New Surface Route. MacLaren Plansearch Corporation, Vancouver. 47 pp.

LERESCHE, R.E. 1974. Moose Migrations in North America. Naturaliste Can. 101: 393:415.

MECH, D.L. 1970. The Wolf: The Ecology and Behaviour of an Endangered Species. The National History Press. 384 pp.

PETERSON, R.O. 1977. Wolf Ecology and Prey Relationships on Isle Royale. National Park Service Scientific Monograph, No. 11. 210 pp.

RAUSCH, R.A. 1956. The Problem of Railroad-Moose Conflicts in the Susitna Valley, 1955-56. A Preliminary Report. U.S. Fish and Wildlife Service Report. 19 pp.

RITCEY, R.W. 1974. Moose Harvesting Programs in Canada. Naturaliste Can. 101: 631-642.

STRINGHAM, S.F. 1973. Mother-infant Relations in Moose. Naturaliste Can. 101: 325-369.

STUART, K.M. 1983. An Inventory of Wildlife-Vehicle Accidents in British Columbia. Ministry of Environment Report. 50 pp.

SURRENDI, C. 1983. Preliminary Report on Wildlife Mortality along C.N. Rights of Way, and Observation on Habitat Quality in Jasper National Park. Report to Canadian National Railways. Carsal Enterprises Ltd. Edmonton, Alberta. 46 pp.

VIOL. 1980. Game accidents on roads (VIOL). Department of Tranport, Development Division. Stockholm, Sweden. Final Report 1980.