HISTORY OF MOOSE IN NEW BRUNSWICK

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ABSTRACT: Archeological evidence suggests the presence of moose in New Brunswick as early as 2500BP (before present). With the arrival of European settlers in 1604, intense exploitation for the meat and hides of moose began. For the next 270 years, moose populations waxed and waned due to the combined effects of unregulated exploitation by hunters and a changing habitat mosaic. Habitat reflected the dynamic interaction of localized catastrophic events such as wildfire and epidemics of spruce budworm (*Choristoneura fumiferana*). Aggressive land clearing for settlement and logging began in the mid-1800s. Anecdotal evidence indicates that moose numbers peaked between 1910-1920. A subsequent chronic decline in harvest numbers was addressed by introducing increasingly restrictive regulations. In 1937, moose hunting was prohibited. Moose hunting was reestablished in 1960 in the form of a tightly controlled, limited-entry hunting season. The number of hunters and, hence hunting pressure, was gradually increased until 1974. Since then, 6000 hunting permits have been made available annually. Present moose harvests exceed those reported in the recent history of New Brunswick. Positive rates of increase in both harvest and hunter success rates suggests moose numbers are still increasing in New Brunswick.

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Moose (*Alces alces*) have a long history in New Brunswick. Archeological evidence from historic Indian campsites in New Brunswick suggests moose were present for at least the last 2500 years (Allen 1981). The fossil record is meager because bones and animal remains decompose quickly in the acidic soils of New Brunswick. However, bones in large middens and fire pits are relatively well-preserved and these provide tangible proof of the presence of moose and their use by indigenous peoples (Stewart 1989).

Historically, native hunting in New Brunswick was likely localized and relatively inefficent. Studying the Cree in the James Bay region of Quebec, Feit (1987) concluded native hunters "managed" moose populations by noting relative changes in moose sign and shifting their hunting activities accordingly. Consequently, historic hunting by natives was likely not a major factor in moose population dynamics. How moose populations fluctuated temporally and spatially before European settlement is unknown.

With the coming of European explorers and settlers, a written record of moose in New Brunswick became available. Early records were largely anecdotal: changes in population and annual harvests were crudely estimated. A mandatory registration system instituted in 1960 provided an accurate count of moose killed by legal hunters. Unregulated exploitation by European settlers influenced all wildlife, including moose, in New Brunswick. Perhaps more dramatic than exploitation pressure, and of greater importance to wildlife, was the profound changes that settlement brought to the forest.

THE NEW BRUNSWICK FOREST

Forest harvesting intensified and broadened progressively as more products allowed more types and sizes of trees to be used (Morison 1938, Regier and Baskerville 1986). In the early 1800s forests provided large white pine (*Pinus strobus*) for shipmasts. From the mid 1800s, and peaking in 1900, sawmilling of dimensional timber for construction was the major activity of the logging industry. Shortly after the turn of the century the pulp and paper industry emerged. The large wood volumes required for the chemical pulp industry intensified the exploitation of New Brunswick's forests and, each year, extended the areas cut. At first, pulpwood was cut

selectively mainly in autumn and winter. Yarding was done using horses and transport to the mill was by stream and river. Clearcutting began in the 1920s and, by 1960, became the dominant form of forest harvesting. In present day New Brunswick, approximately 1.5% of the forested area is clearcut annually (O'Neill 1979).

Budworm (*Choristoneura fumiferana*) and the fir (*Abies balsamea*) and spruce (*Picea* sp.) forests it inhabits have persisted for thousands of years (Greenbank 1956). Evidence exists for at least 7 major outbreaks in eastern Canada in the past 200 years, each extending over thousands of km^2. Several authors suggest that the frequency, intensity, and scale of infection has increased as the proportion of fir in New Brunswick forests increased in response to changes in forestry practises (Swaine and Craighead 1924, Blais 1965).

Wildfire has also been a determining force in shaping the forests of New Brunswick. Presettlement fires were thought to have been generally low intensity, local and relatively small. The frequency of fire in a particular site was approximately 340 years in the Maritime lowland region of New Brunswick and 625 years in the hardwood and coniferous forests found at higher elevations (Wein and Moore 1977).. Active logging during the 1800s produced a great deal of flammable slash in the forest which led to more frequent, larger, and more intense fires than occurred historically (Ganong 1906). Fire suppression efforts and improved road access since the 1920s has reduced both the size of areas burned and the intensity of the fires.

EUROPEAN SETTLEMENT

Moose were plentiful when Champlain discovered New Brunswick in 1604 (Denys 1672). With the arrival of the first European settlers, an age of intense exploitation for meat and hides of moose began. Moose meat was a staple for the settlers as well as for indigenous people. Moose hides were an important trade item in the New World: in 1650, 3000 moose hides were traded from Indians along the St. John River (Denys 1672).

The unregulated exploitation of moose by Indians, settlers, and hide hunters apparently reduced moose numbers dramatically. By 1786, moose were considered scarse and an Act for the preservation of moose was passed by the legislature. Gradual changes in moose habitat resulted from the dynamic interaction of localized catastrophic events such as wildfire, spruce budworm epidemics, land clearing for settlement, and logging. The change to a younger forest presumably improved the quality of moose habitat. However, continuous exploitation of moose caused a fluctuating chronic decline in numbers until, in 1888, the hunting of moose was prohibited altogether (Wright 1956).

1900-1936

The proportion of early successional forest increased during this period concomitant with the expanding pulpwood industry. The younger forest favoured white-tailed deer (*Odocoileus virginanus*) and deer spread rapidly across the province from the southwestern coast. Moose populations grew rapidly along with deer but then declined, beginning in 1917. I speculate that moose responded positively to the overall improvement in their range as more of the forest was cut. Anecdotal evidence suggests that moose numbers peaked between 1910 and 1920. Legal hunting continued, and although the actual harvest figures may not be accurate, the trend in harvest (λ = 0.91) and hunter numbers (λ = 0.93) is apparent (Fig.1). Since the number of hunters declined at approximately the same rate as the harvest, the success rate remained relatively constant. The chronic decline in harvest numbers was addressed by introducing increasingly restrictive regulations. By 1937, moose were so scarce that the hunting season

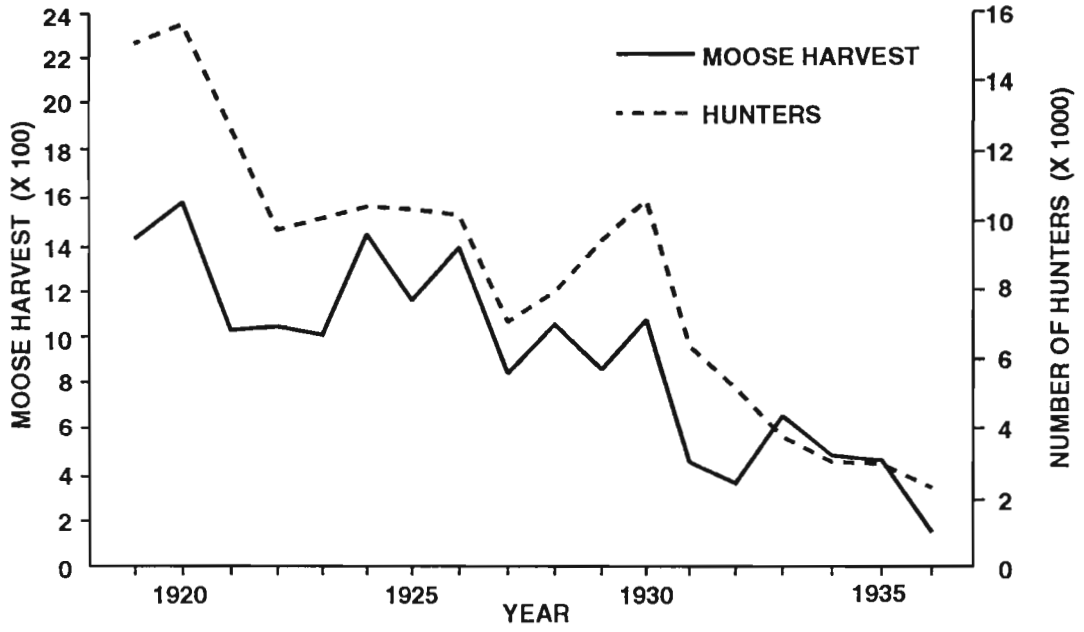

Fig. 1. Estimated moose harvest and number of hunters in New Brunswick 1919-1936.

was closed. Caribou (*Rangifer tarandus*) were plentiful at the beginning of this period, but by 1927, were extirpated perhaps as a reflection of the changing forest.

To what extent the complex interaction between changing habitat and the rapid expansion of deer influenced moose and caribou numbers is not clear. Deer in New Brunswick carry the brainworm nematode (*Parelaphostrongylus tenuis*) commonly known as brainworm. This parasite is fatal to moose and caribou (Anderson 1964). Parelaphostrongylosis may have been a cause for the decline of caribou and moose, although the presence of brainworm at that time has not been documented. Caribou numbers declined rapidly while moose persisted. Sympatric deer with *P. tenuis* likely increased the natural mortality rate of moose due to parelaphostongylosis.

1937-1959

Moose hunting was prohibited during this period. Without harvest information and standardized population surveys, little is known about the changes in moose numbers during these years. Deer numbers fluctuated but generally continued to grow. Pulpwood cutting expanded throughout the province and clearcutting large tracts of land became the common practise. By the end of this period, moose numbers in southern New Brunswick were estimated to be large enough to support a hunt (Carter 1961). In Fundy National Park located in southeastern New Brunswick the moose population was estimated to exceed 0.6 moose/km^2 (Kelsall 1963).

1960-1973

Moose hunting was reinstated in the area surrounding Fundy National Park in 1960. The hunt was limited to 400 hunters, chosen on the basis of a draw, and restricted to antlered animals. Moose hunting was permitted in the entire province in 1961 and moose of any age and sex could be hunted beginning in 1966. Gradually the hunt was expanded so that by 1973, 2500 licenses were issued and all areas of the province were open to hunting. Hunter numbers, kill, and success rates all increased dramatically (Fig 2). Averaged over the entire period, hunter numbers increased at a finite rate (λ) of 1.13, the harvest at λ = 10.8 and hunter success at λ = 1.37.

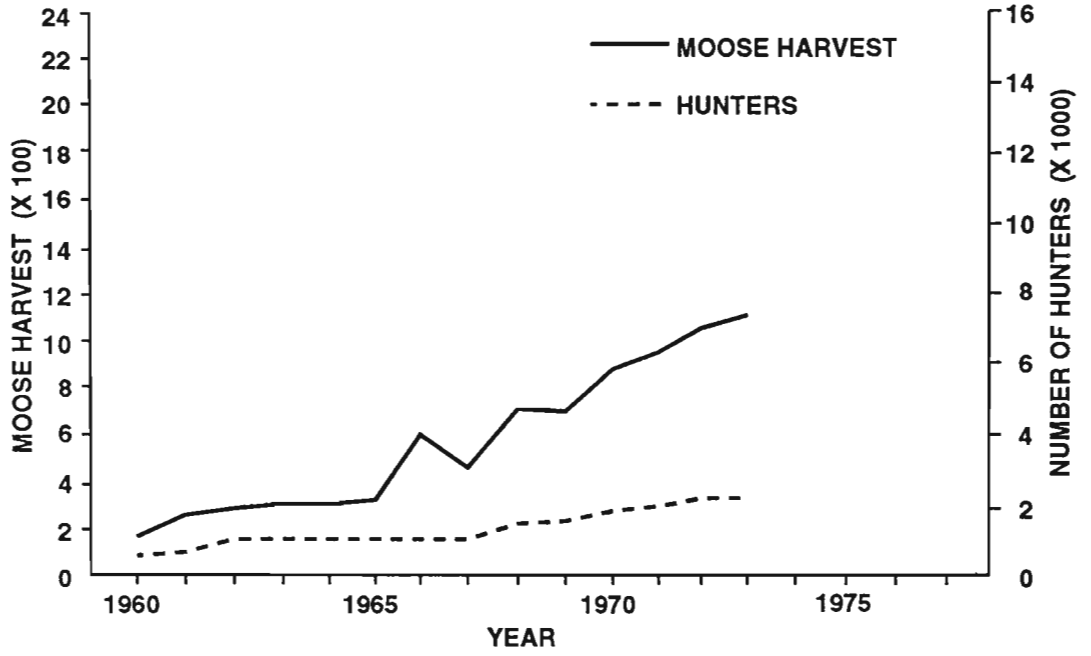

Fig. 2. Registered moose harvest and number of hunters in New Brunswick 1960-1973.

Deer numbers had apparently peaked in the early 1960s with an estimated legal kill of 31000. Following several severe winters from 1968 to 1972, the number of white-tailed deer registered by hunters was 4273. The lowest harvest level in 30 years. In contrast, the number of moose killed was apparently unaffected by the severe winters.

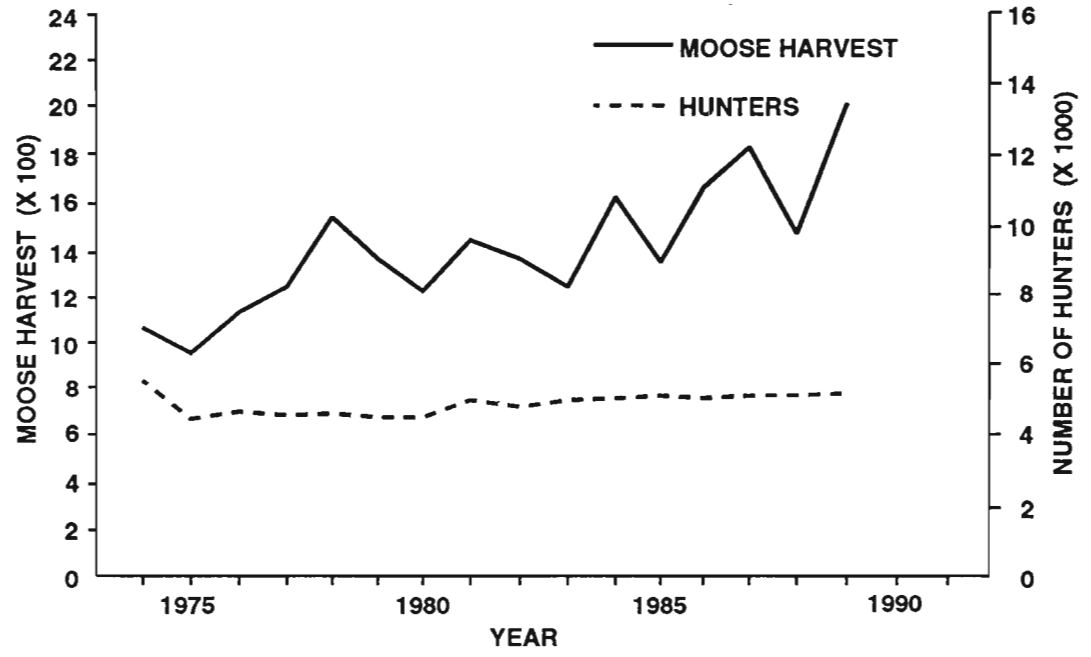

Fig. 3. Registered moose harvest and number of hunters in New Brunswick 1974-1989.

1974-present

Increases in number of moose harvested and in hunter success rates prompted an increase in the number of hunting permits made available in 1974 from 2500 to 6000. However, the lenght of the moose season was reduced from 6 days to 3 so that the total number of potential hunter days remained constant although the total number of hunters was increased. Since 1974, the number of hunters has remained relatively constant (Fig. 3).

White-tailed deer numbers increased dramatically during this period. In 1985 31,205 deer were brought to compulsory registration stations. Yet the moose harvest and hunter success increased steadily (Fig. 3) at a finite rate of growth of 1.03. If *P. tenuis* is an ultimate factor which determines the potential density of moose below K carrying capacity (Kearney and Gilbert 1976), then the relationship does not appear to be strictly a function of deer density.

Locally, moose populations remain dynamic throughout New Brunswick. Some areas, particularly in the northern portions have increasing numbers of moose, other areas are relatively stable, while in the more densely settled areas in southeastern New Brunswick moose densities are apparently declining (A. Boer, Dept. Nat. Res., unpubl. data). Ironically, Albert county, the area first reopened to moose hunting in 1960 was closed to hunting in 1989 because of a chronic decline in moose numbers. Legal harvests in this county gradually declined from 105 moose in 1974 to 18 in 1988.

The total moose harvest in New Brunswick of 2022, registered in 1989 is higher than has been recorded since reliable records became available. Winter moose densities in one study in southeastern New Brunswick, were 0.17 ± 0.6 moose/km^2 and harvest rates were estimated at 11% of the autumn population (Boer 1987). Positive rates of increase in both harvest and hunter success rates suggests moose numbers are still increasing in New Brunswick.

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