

Terms in **bold** are defined on the final page of the case study.

Moose (*Alces alces*), native to mainland North America including Labrador, were first introduced to the island portion of the province in 1878 with the release of one male and one female from Nova Scotia at Gander Bay. In 1904, there was another release of two males and two females from New Brunswick at Howley. Moose were reported on most of the island of Newfoundland by 1935.



In North America, moose are the largest members of the deer family. An adult moose stands between 1.5 and 2.8 metres high, and can achieve weights ranging from 385 to 534 kg for a male (bull) and 270 to 362 kg for a female (cow). Moose are dark brown to reddish brown in colour with grayish white legs, have short, stubby tails, long necks and nose, and have ears similar to a mule. The “bell”, hanging under a moose’s throat, is a pendant of fur about 30 cm long. The front legs of a moose are longer than the back, giving it a humped appearance. Males have flat antlers with small prongs projecting, while females do not have antlers. A moose can live up to 20 years, and newborn moose are known as calves.



Moose are **herbivores** and during winter their diet consists of the tender shoots of hardwood species including birch, red maple, trembling aspen, pin cherry and mountain ash. Balsam fir, a coniferous species, is also consumed but generally when the more preferred hardwood species are depleted. They do not eat spruce and larch so these species are able to grow normally in the presence of moose. In summer they like to eat aquatic vegetation found in ponds and streams.

The **density** of moose varies by the availability of food, the presence of natural **predators** and the level of hunting. In some areas of Newfoundland an overabundance of moose has occurred and resource managers are facing new challenges for maintaining ecosystem health. A stable equilibrium has not occurred between the moose population and food resources; one reason

Did you know? Amazingly, moose consume up to 19-28 kilograms of foliage per day. And while they may look clumsy, moose can run up to 56 kilometres per hour and swim as fast as two people paddling a canoe.

for this may be the extinction of the Newfoundland wolf in 1911¹. As an **apex predator**, wolves are the main predator of moose across North America. In Newfoundland, bears are known to prey on moose calves and, less frequently, on adult moose.

Moose densities in some forested areas of insular Newfoundland have been found to exceed four moose per square kilometer. Studies from the 1950's and 1980's indicated that moose habitat on the island can support on average about two moose per square kilometer². However, there are extreme cases where moose numbers have reached up to 15 moose per square kilometer! In these instances moose are above **ecological carrying capacity**³, that is, there numbers have reached a level where their food supply is exhausted and ultimately the moose population is expected to 'crash'. Today the population of moose on the island is estimated at 120, 000.

Moose are known to have a significant impact on how forests regenerate and in turn the wildlife species that inhabit an area. A joint research project between Terra Nova National Park, Memorial University and the Department of Natural Resources is investigating the impact of moose on forest succession in eastern Newfoundland. This began with the construction of 20 fenced exclosures that are designed to keep moose out. By measuring vegetation growth patterns inside and out of the fenced area, scientists are able to determine the impact that



moose are having on forest regeneration. The photo (left) illustrates the difference in the vegetation inside and outside the exclosures 10 years after they were constructed.

Moose browsing is causing some concern for forest managers, the forestry industry and the National Parks on the island portion of the province. The moose population in Gros Morne National Park rose from 271 in 1971 to around 5,000 in 2007, with an estimated 5-6 moose per square kilometre. This high

This Balsam Fir tree is around 40 years of age. Moose browsing has stunted the growth of the tree so that, instead of standing at around 5 metres in height, it is only half a metre tall!



¹ McLaren *et al.* 2004

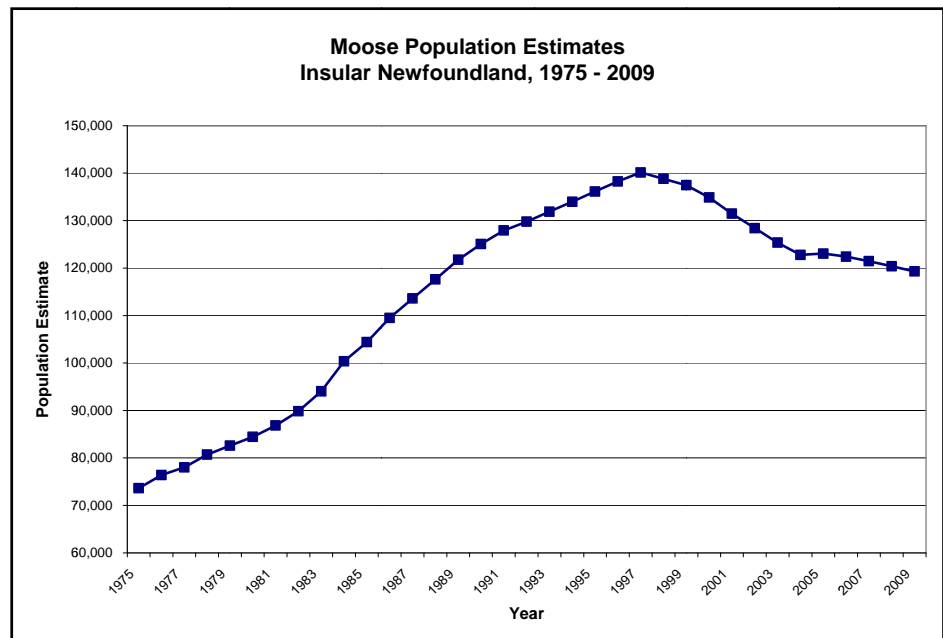
² Mercer and McLaren 2002

³ Mercer and McLaren 2002

moose population has greatly impacted the forests in the park by removing much of the forest understory that is used by other animals for cover. Heavy browsing by moose often removes younger trees that under normal conditions replace older trees affected by forest insects, fire, or logging. This pattern of natural regeneration is not occurring in many parts of Gros Morne and Terra Nova National Parks, and some disturbed forest areas are converting to non-forest areas such as grasslands.

Moose are an important big game animal for the residents of Newfoundland with approximately 22,000 harvested yearly. While management of moose hunting began in 1945 the current management scheme was first instituted in 1973. The number of moose licenses made available each year is determined by inventory and monitoring conducted by the Department of Environment and Conservation, and usually ranges from 25,000 to 27,000 annually. Sport hunting is a source of tourist revenue and a large part of an **outfitter's** income.

The average cost of a week-long stay at an all inclusive Newfoundland hunting lodge is \$ 4,000. In 2006 the total value for moose/caribou/bear hunting in the outfitting industry was around \$40 million. The abundance of moose on the island has also become a source of tourism revenue. The moose has become somewhat of a cultural icon of Newfoundland and Labrador and is frequently depicted in souvenirs and artwork.



Large moose numbers have also impacted transportation on the island. Around 700 moose vehicle collisions occur on the province's highways each year. The presence of moose on roads is often attributed to the vegetation on the sides of the roads in the warmer months. Motor vehicle accidents are most common immediately prior to calving when females drive away their yearling calves. Drivers in Newfoundland and Labrador must be aware that the road systems are part of the home range of many of the province's moose.

Glossary of terms

Herbivore: an animal that feeds chiefly on plants

Density: the number of animals living per unit of an area, such as a square kilometer

Predator: an animal that hunts and feeds on other animals

Apex Predator: a predator at the top of its food chain that is not normally preyed upon by other animals as an adult

Ecological carrying capacity: the population size of the species that the environment can sustain in the long term, given the food, habitat, water and other necessities available in the environment

Browsing: eating, or grazing

Understorey: underlying layer of vegetation, especially the plants that grow beneath a forest's canopy

Outfitter: person who provides guided hunting expeditions

Questions:

1. Describe the diet of moose.
2. List the animals that prey on moose. How has this list changed over the past one hundred years?
3. What might you expect to happen if the moose population exceeds ecological carrying capacity? Where is this already happening, and what is the result in this area?
4. Who has benefitted from the introduction of moose to Newfoundland? How?
5. List the problems that have resulted from the introduction of moose to the island of Newfoundland.
6. Copy the chart below onto a piece of paper, *filling in the blanks* with your own ideas and/or information found in the case study.

Options for dealing with rising moose population in Newfoundland.	How might this option be viewed by the public? Why?	How might this option be viewed by the outfitting industry? Why?	How might this option be viewed by the forestry industry? Why?	What other groups may have a strong opinion on this option? Why?
No intervention				
Increased harvesting of moose				
Predator reintroduction				
Large scale fencing				
Fertility control				