

2022-2026

Newfoundland and Labrador **Moose Management Plan**



Message from the Minister



It is a pleasure to present the 2022-2026 Newfoundland and Labrador Moose Management Plan. The annual moose hunt is a cherished cultural and recreational activity enjoyed by tens of thousands of hunters who benefit from the physical activity of hunting, the healthy food it provides, and the shared culture of the moose hunt.

This new plan recognizes that managing our big game resources requires a sustainable approach based on sound scientific data collected through moose management surveys and other research activities. Wildlife managers also value the input and knowledge from hunters and the public and have incorporated feedback collected during public consultations into the plan.

The plan illustrates the sustainable management of our wildlife resources and shares the details of monitoring and research programs that enable wildlife managers to better understand factors impacting wildlife behavior and habitat.

The plan also identifies the need to sustain interest in traditional hunting activities and seeks to enhance the number of citizens involved in hunting by increasing mentorship programs for youth; continuing to support the Becoming an Outdoors Woman program; Indigenous engagement; and other incentive programs that increase access for persons with disabilities and senior hunters.

I am confident this responsible management approach will maintain healthy moose populations while continuing to provide hunters throughout the province with regular harvesting opportunities.

Finally, I would like to acknowledge our dedicated team of wildlife management professionals from the Department of Fisheries, Forestry and Agriculture for their efforts preparing this plan and ongoing commitment to effectively manage our wildlife resources on behalf of the citizens of the province.

A handwritten signature in black ink, appearing to read 'Derrick Bragg', with a large, stylized flourish extending from the end.

Hon. Derrick Bragg
Minister of Fisheries, Forestry and Agriculture

Executive Summary

This is the second five-year moose management plan for Newfoundland and Labrador. The previous plan was heavily focused on research, data collection, and program review in support of sustainable moose populations, benefits to citizens, and reducing human-moose conflicts. The 2022-2026 plan builds upon data collected under the previous plan and focuses on showing the people of the province how the best available scientific and social data will be utilized for moose management. The goals of the plan are threefold:

- 1) ensure that moose are managed sustainably, and in balance with the environment and public safety,
- 2) present the science-based decision-making framework used for moose management, and
- 3) share knowledge and improve the transparency around management objectives and targets.

These goals were developed based on broad consultations with citizens. In November 2021, after adjusting consultation plans in response to COVID-19 delays, the Provincial Government held an online engagement process to assess hunter opinions on moose management and several related wildlife issues. The online survey received 2,658 responses, and an online town hall held by Minister Bragg had 65 participants. Individuals and organizations were also invited to submit written comments to the Wildlife Division.

In this plan, Government presents an overview of the biology and history of moose in Newfoundland and Labrador, describing past peaks in the moose population and the conditions leading to the moose population we have today. The plan goes on to lay out the key management principles and targets biologists use to manage moose and describes how scientific data is collected and used to make decisions. The presentation of these data and the framework for decisions brings a new level of transparency to moose management in the province.

Key opportunities for improvements to moose management are also identified. These include commitments to maintain an active aerial survey program and use digital tools and incentives to collect hunter data, development of initiatives to engage and consult hunters and grow the hunting community and exploring several areas for future research.

The management of moose is a complex activity that integrates many social, biological, and economic factors. Over the last 120 years the Province has been successfully managing moose for the benefit of citizens. Modern biologists have the benefit of learning from past management actions, having long-term data series, and a suite of tools to monitor moose populations. This plan outlines how these accrued benefits of past investments will be used to ensure our ecosystem remains balanced and moose populations will be managed sustainably into the future.

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Introduction

Moose are naturally occurring in Labrador and were introduced to the island of Newfoundland in 1878 and 1904. In Labrador moose are found primarily in southern regions and in low numbers in northern river valleys. On the island, moose were relatively widespread by 1945, although full habitat utilization in places like the Northern Peninsula would not occur until the 1970s. Moose have become the premier big game species harvested on the island. Each year up to 90,000 people apply for one of the 24,000 resident licences. The annual harvest of 16,000-22,000 moose has become a cultural event and a meaningful food source for citizens of the province. Just under 4,000 licences are allocated to non-residents through the commercial outfitting sector. The outfitting sector supports over 1,300 jobs in rural Newfoundland and Labrador and generates about \$50 million in direct revenue annually.

This is the second five-year moose management plan for Newfoundland and Labrador. The previous plan was heavily focused on research, data collection, and program review in support sustainable moose populations, benefits to citizens, and reducing human-moose conflicts. The 2022-2026 plan builds upon data collected under the previous plan and is focused on showing the people of the province how the best available scientific and social data will be utilized for moose management.

The 2022-2026 plan has three overarching goals:

- 1) Ensure that moose are managed sustainably, and in balance with the environment and public safety.
- 2) Present the science-based decision-making framework used for moose management.
- 3) Share knowledge and improve the transparency around management objectives and targets.

These goals were developed based on broad consultations with citizens. Feedback on specific management issues from those consultations are presented throughout the plan. An overarching theme in the consultations was an interest in understanding of moose management policy and the science that supports it. This plan will share the wealth of knowledge and tools provincial biologists use to sustainably manage moose for benefit of the citizens of Newfoundland and Labrador.

The Biology of Moose

Moose are the largest members of the cervid, or deer family, and are closely related to many other cervids found in North America such as Elk and White Tail Deer. Large bulls can reach over 600 kilograms. Moose are primarily plant eaters who rely on productive forest habitat for survival. An adult moose can consume 20-30 kilograms of food per day. For the insular Newfoundland population, that translates into about 2750 metric tonnes of food per day or about a million tonnes of plant biomass per year. The large amount of plant biomass consumed by moose has a major influence on the health of forest ecosystems. In fact, the availability of food is the main factor determining moose abundance in insular Newfoundland. Moose prefer younger forests with lots of new growth for food. Areas that have been disturbed by wind and insects, fire, or forestry harvest all produce good habitat for moose as the forest regrows. Mature forests with closed canopies (treetops tightly packed) generally make poor habitat. Little light gets through to the forest floor for understory plants, which are important food for moose.

Moose generally produce one calf per year, twins occasionally, and very rarely triplets. The number of calves in the population and the frequency of twins is a strong indicator of habitat condition. When food is in abundance twinning rates tend to increase. Mating occurs during the rut in late September and October. Bulls compete for access to cows during the rut with large dominant bulls mating with multiple cows. Calves are born

throughout May and into early June. In insular Newfoundland about half of the calves born will survive to reproduce. Maturity generally occurs at age two for males and age three for females, although both sexes can mature earlier, especially when food availability is high.

Natural mortality (deaths not caused by humans) of moose can occur through predation, disease, starvation, and injury. Adult natural mortality on the island is between 10 to 15 per cent annually. Predation is not a limiting factor for moose on the island and predators can generally only threaten calves. Black bear is the most common predator, other species, such as coyote play a minor role in predation. In Labrador, where wolves are present, predation is an important factor in moose abundance. Disease has not been a major factor in moose populations in Newfoundland and Labrador to date. Diseases such as Chronic Wasting Disease and Winter Tick that affect moose in Quebec for example are not present on the island of Newfoundland and rare in Labrador.

Moose are well adapted to winter conditions with long legs suitable to deep snow conditions and the ability to survive on a variety of winter forage. They can also travel at speeds up to 56 kilometres per hour, are strong swimmers, and often adapt nocturnal behaviour to avoid threats. These traits and the lack of predators and disease have allowed moose to flourish on the island of Newfoundland.

The History of Moose in Newfoundland and Labrador

The North American moose population spans from Alaska to Newfoundland and Labrador and ranges from the edge of the tundra in northern Canada to the northern regions of the United States. The North American population of moose is estimated at about one million. Despite being introduced to the island portion of Newfoundland and Labrador, the province is now home to about 10 per cent of the North American moose population, with the vast majority being found on the island.

Introduction and the First Population Peak: 1878/1904 - 1958

The introduction of moose to the island of Newfoundland has been exceedingly successful from the perspective of moose and hunters. When moose were introduced to the island there were no other herbivores present with similar diet requirements. This meant that forests contained tremendous reserves of moose habitat and food. As well, the primary predator of moose, wolves, were on the verge of extinction. The Newfoundland Wolf was extinct by around 1930. Abundant food and low predation allowed moose on the island to spread quickly and reach some of the highest densities in the world. The moose population reached its first peak, which may have been between 150,000 – 200,000, in the late 1950's.

Post Introduction Crash and Recovery: 1959 - 1997

Widespread over-browsing, especially in remote regions, in combinations with localized over-hunting caused declines throughout the 1960's. Data are sparse from this period, but the island population may have been less than 50,000 by the early 1970's. The 1960's declines triggered implementation of an area-based quota system in 1973 which is still in use today.

The redistribution of harvest in the new area-based quota system reduced moose numbers in over-browsed remote regions (allowing habitat to recover), and reduced harvest in over-hunted accessible regions. The new management system halted the decline and moose abundance grew rapidly for the next 25 years. During this period, commercial forest harvesting on the island, which produces good moose habitat, also expanded rapidly, and peaked in the 1990s.

By the 1990's, moose abundance had again surpassed 150,000 on the island. This second population peak occurred despite increased quotas which were meant to limit runaway population growth and protect habitat.

Second Population Peak and Decline: 1997 - 2012

In the late 1990's, a second decline in moose abundance began. From the peak in the mid 1990's until 2012 the island moose population declined by about 25 per cent. Licence numbers and harvest remained relatively constant during this period. This decline also occurred in areas with no hunting, and like the 1960's, decline appears to have been driven by the moose population again exceeding the carrying capacity of the island (i.e., forests cannot produce enough food to support more than 150,000 moose). It is important to note that habitat was better protected in this peak by proactive quota increases.

After a species exceeds the carrying capacity of a habitat, there are two likely responses: 1) if the abundance peak was extreme and prolonged, the habitat may be so badly damaged that the population crashes to very low levels, even to the point of extinction; or 2) a short moderate abundance peak may allow the population to stabilize at a new lower level. Fortunately, active management by biologists and consistent harvest by hunters has put Newfoundland and Labrador solidly in the second response category. In remote areas the reduction in habitat quality from the peaks in the 1950's and 1990's may be long-term and it is unlikely those areas will be able support similar numbers of moose in the future. The recent decline was much less severe than in the 1960's as biologists were able to use the Moose Management Area (MMA) system to protect habitat in areas with high moose abundance and reduce quotas where local overharvest was a concern.

Stabilization, Managing the Balance: 2012 - Present

Between 2012 and 2022, the overall moose population of the island has been relatively stable with a four per cent decline over 10 years (The 2022 estimate is about 110,000).

Data from surveys, hunter returns, and the jawbone collection program all suggest that moose populations in most MMAs are limited by habitat. However, some areas within MMAs, usually related to hunter access, show signs of overharvest. The eastern portion of the province has also been intentionally managed to reduce moose abundance, as outlined in the previous five-year moose management plan (see Category I region, Figure 1). The ongoing challenge for provincial biologists is to ensure that harvest quotas are high enough to prevent habitat damage, while not so high as to overharvest the population. It is especially important to avoid triggering a moose-habitat collapse cycle. This may occur when a moose population declines because of poor habitat, and then quotas are reduced in the mistaken belief that hunting is driving the population decline. Reducing quotas leads to even more habitat damage and less moose, and further quota reductions. This negative feedback loop can lead to population collapse.

Moose in Labrador

Moose have always been present in Labrador, however little historical data exist. Moose abundance in Labrador is much lower than on the island, with densities typical of other northern regions in Canada where wolves are present. For context, the entire quota

for Labrador in 2021 was 384 licences versus 28,324 for the island. In areas north of Rigolet, moose are effectively limited to forested river valleys, and the total population of that region is relatively small (a few hundred). Recent transect surveys in southern Labrador and anecdotal evidence suggest moose abundance in southern regions may be increasing. Biologists with the Province and the Torngat Wildlife and Plants Co-management Board are planning surveys in Labrador in 2022-2025.

Climate Change and the Future of Moose

Moose in Labrador will likely be the first to see substantial effects from climate change. Labrador is projected to warm earlier and faster than the island, and moose in this region are on the edge of their northern range. As Labrador warms and forests expand northward, moose may be able to avail of the expanded habitat and potentially higher forest productivity. However, as with all climate change predictions in complex natural systems, the potential response of moose populations remains difficult to determine.

Climate change models for the island portion of the province project warmer wetter winters, with stable dry periods in the summer, higher storm frequency, and longer more productive growing seasons. On the surface, more productive forests with high wind, insect and fire disturbance rates should produce better habitat for moose. However, there are many unknowns, such as the introduction of new diseases or species, and unexpected ecosystem level responses.



The best mitigation for climate change risk is to maintain the province's ecosystems in good condition, including moose populations. Natural systems are resilient when well-managed. A well-managed moose population would be well-positioned to adapt to climate change. A carefully monitored moose population will allow biologists to detect possible moose responses to climate change and respond appropriately. Proactive mitigations should focus on protecting the integrity of ecosystems. For example, prohibiting introductions of exotic species to the island and monitoring for forest pests moving into Labrador. Government currently monitors moose populations, potential forest pests, and prohibits introductions of wildlife to the island. Government also recently released a Protected Areas Plan for Newfoundland in 2020 that identifies a number of areas of the island that have high conservation value for wildlife.

Moose Management Overview

Newfoundland and Labrador manage moose through area-based quotas and a limited season. Hunters can apply to hunt in one of 46 MMAs, two national parks, and four sub-MMAs on the island and 24 MMAs in Labrador (Figure 1 and 2). The island is also divided by region into moose management categories (Figure 1). The island has three categories, each with different moose density (moose per square kilometre) targets, and Labrador has standard MMAs in the south and the Labrador Inuit Settlement Area in the north which is co-managed by Newfoundland and Labrador and Nunatsiavut governments through the Torngat Wildlife and Plants Co-management Board (MMAs 88, 89, 91, and 92) (Figure 2). The management regions and MMAs allow biologists to tailor the harvest to local habitat conditions and moose abundance. The hunting season on the island runs from late August until the end of December to allow licence holders ample opportunity to harvest a moose. In Labrador, moose season extends into winter to afford access to remote areas by snowmobile or aircraft. Season length does not significantly limit total harvest.

Licences are partitioned into resident and non-resident. The non-resident licences are limited to a maximum of 15 per cent of the

overall quota and can be no more than 50 per cent of an individual MMA. Non-resident hunting has two primary purposes:

- 1) create economic value and provide jobs in rural regions, and
- 2) help manage moose populations in remote areas where resident harvest is relatively low.

The non-resident hunt is managed to minimize competition with residents so that resident access to the resource is not impacted.

The Department of Fisheries, Forestry, and Agriculture (the Department) also works with the Newfoundland and Labrador Outfitters Association to ensure non-resident hunting is conducted in a professional and ethical manner.

Access to the moose hunt is controlled through a lottery system known as the 'big game draw' for resident hunters and through professional outfitters for non-resident hunters. The lottery system is MMA specific and improves an applicant's chance of receiving a licence each year they are unsuccessful in the draw. When a hunter receives a licence, they are returned to the lowest priority pool. This system ensures fair access to the moose resource.



A selective harvest model is used to manage moose populations and set quotas for the entire province. Individual MMA quotas are partitioned into Either Sex, or Male Only / Calf. Female only licences may be issued when populations are extremely high, and biologists are seeking to reduce the population. This partition allows biologists to control the sex ratio of the harvest. Managing the sex ratio of the harvest is an important factor in the sustainability (see Management Principles section). Generally, harvest is maximized when harvest is focused on males, and females are left to reproduce.

Each fall biologists review all the biological survey and hunter harvest data for each MMA in the province from the previous year. This review, as well as targeted consultations, are incorporated into the annual Game Management Plan. The annual plan provides science-based recommendations to the Minister of Fisheries, Forestry, and Agriculture. Quotas for the upcoming season, and regulatory changes, are announced at the opening of the big game draw in late February or early March.

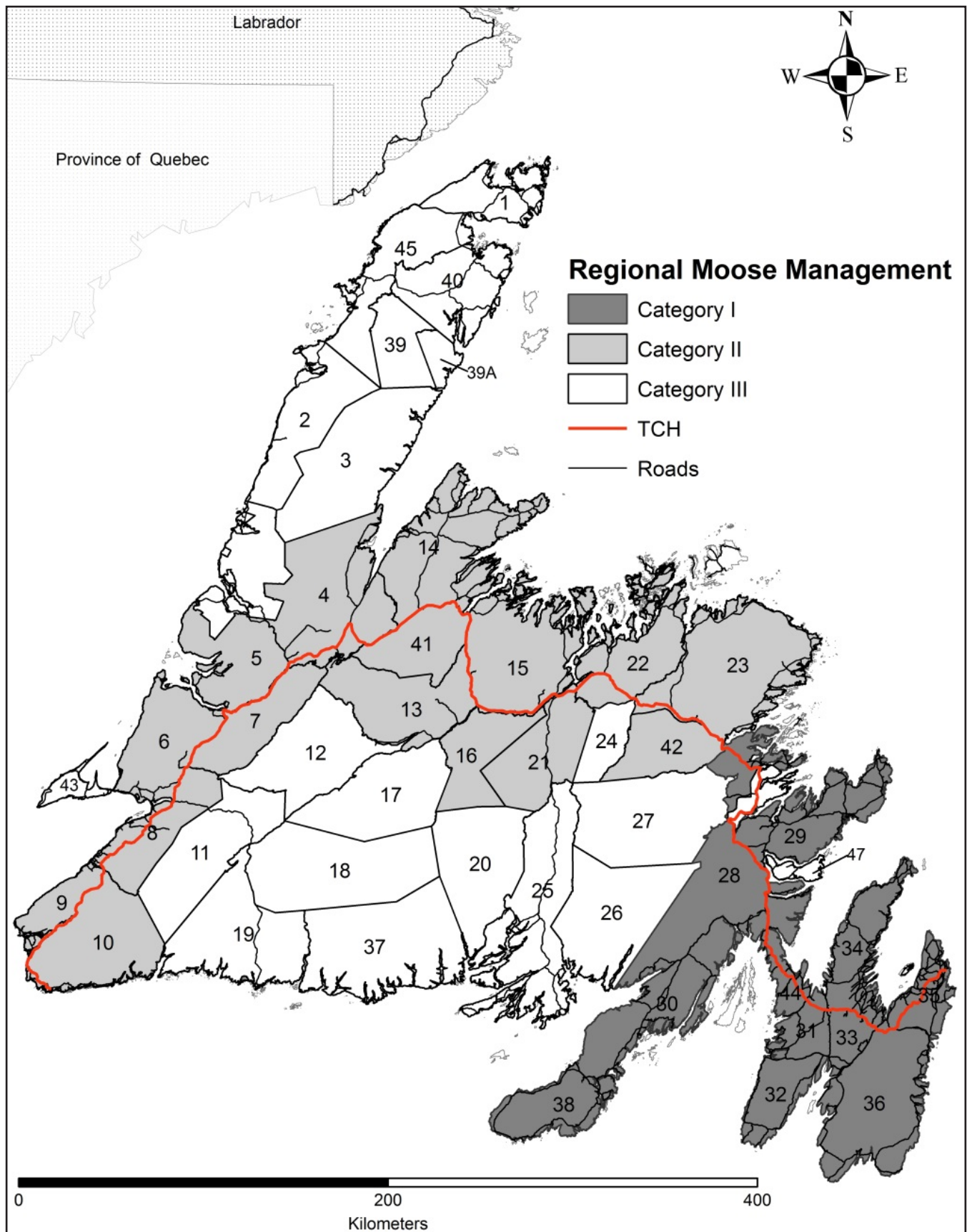


Figure 1. Moose management areas and density target categories for the island of Newfoundland. Category I – 1.0 moose per km², Category II – 1.5 moose per km², and Category III – 2.0 moose per km²

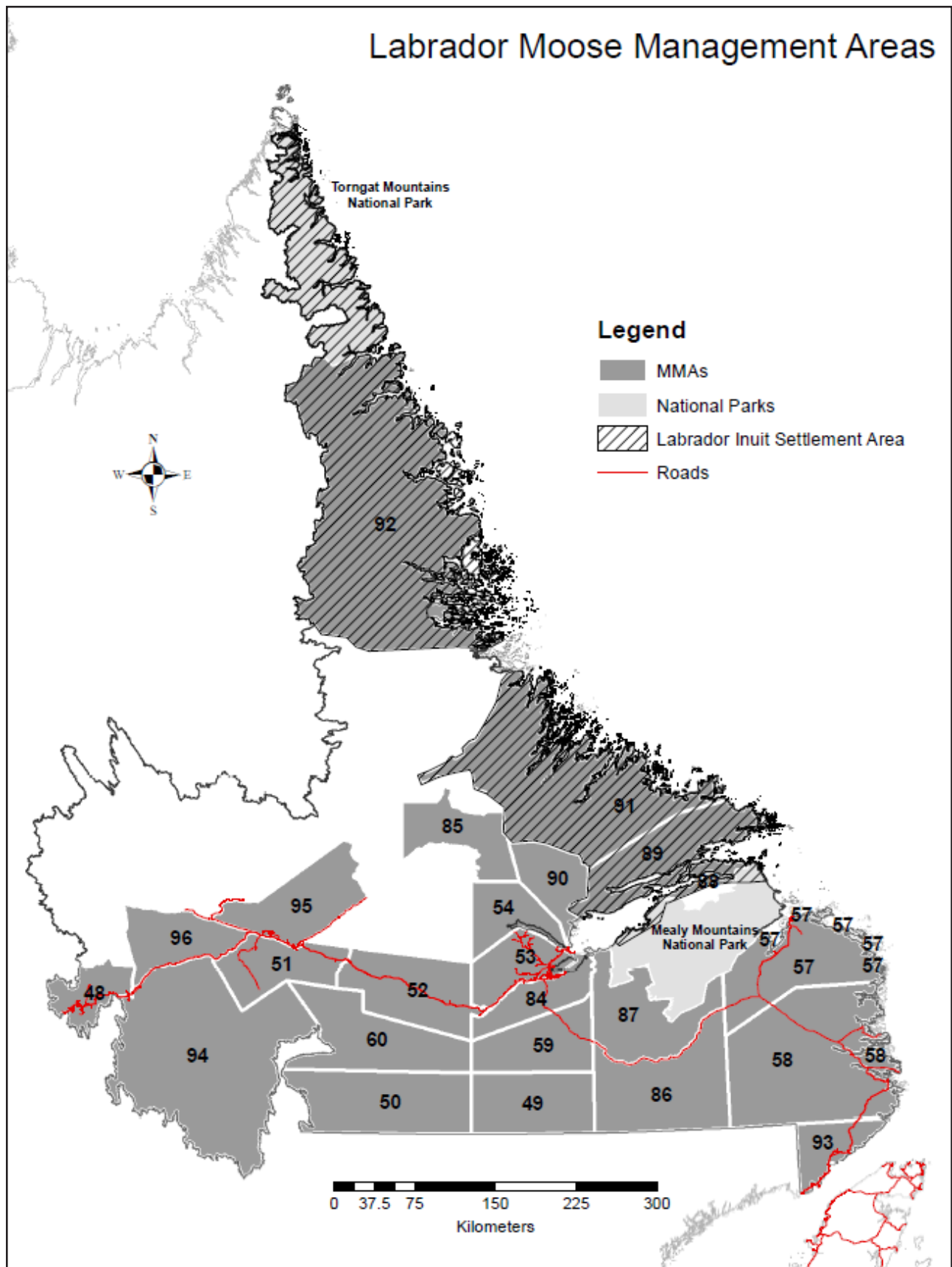


Figure 2. Moose management areas for Labrador. Note MMAs 88, 89, 91 and 92 are managed under the Labrador Inuit Land Claim Agreement.

Human-moose Conflict

While the introduction of moose to the island of Newfoundland has provided a wide array of social and economic benefits for the province there has also been conflict between humans and moose. These include animals wandering into communities, damage to agricultural crops, and moose-vehicle collisions on highways. Conservation Officers are generally able to quickly remove moose that wander into communities, and the Province has a crop protection program in place that provides non-lethal and lethal crop protection techniques. Moose that are removed by lethal means are donated to the Program for Hunters and Anglers with a Disability or made available to not-for-profit charities. Moose-vehicle collisions are the most significant human-moose conflict.

Moose vehicle collisions have occurred at a rate of 422 to 641 per year over the past decade. The rate of collisions is closely linked to traffic volumes (Table 1), but is also influenced by moose densities and vehicle speeds. As a proportion of total motor vehicle collisions, moose vehicle collisions have remained relatively constant over the past decade at about six per cent, excepting 2021

where they were almost eight per cent (note this is based on partial data). An objective of the previous Moose Management Plan was to investigate the relationship between moose abundance and moose vehicle collisions and to explore possible mitigations. The research on Moose Reduction Zones (MRZs) near highways established in the previous plan is still ongoing. Preliminary results suggest MRZs have the potential to reduce moose vehicle collisions, but their effectiveness may be limited to a narrow set of conditions (local collision hot spots geographically suitable for concentrated harvest).

The 2022-2026 plan maintains the lower target moose densities (number of moose per square kilometre in an area) along the Trans Canada Highway and in the eastern portion of the island (where traffic volumes are highest) that were established in the previous five-year plan.



Year	Total Reported Collisions	Total Fatalities	Total Injuries	Moose Vehicle Collisions (MVC)	MVC Fatalities	MVC Injuries
2012	9,808	33	2,987	608	0	142
2013	10,702	33	3,146	641	1	102
2014	9,752	39	2,986	566	2	125
2015	9,405	50	3,188	565	1	123
2016	8,691	49	2,951	529	2	122
2017	8,256	37	2,545	542	1	130
2018	8,024	40	2,442	490	0	84
2019	7,890	44	2,401	439	0	75
2020	6,239	56	1,925	474	2	84
2021*	5,468	35	1,865	438	1	69

Table 1. Total reported collisions, moose vehicle collisions (MVC), and related injuries and fatalities 2012-2021.

*Data for 2021 are incomplete as not all collision reports from law enforcement have been received.

Moose and Food Security

Wild game is an excellent source of healthy food and nutrition, and for centuries the people of Newfoundland and Labrador have relied on wild game for subsistence. In fact, the primary reason moose were introduced to the island of Newfoundland was to provide a reliable and accessible source of meat. In recent times, as access to other sources of protein such as beef have increased, the harvest of moose has shifted towards a recreational activity. However, these animals still play an important role in food security for many families. Each year 7,000,000 – 8,000,000 lbs. of moose is taken off the land in this province, equivalent to about 1/3 of the annual beef consumption. Even though an individual hunter may have to wait several years between licences in the big game draw, many families will work together to secure consistent access to moose meat each year. Hunters will share the harvest when successful, and receive gifts of meat while waiting for the next licence. For some families, this meat adds to their food security. Since 2020, the Province has run a pilot program allowing for the donation of moose meat to food banks by hunters. Under the 2022-2026 moose management plan the **Wildlife Act and Regulations** will be amended to make the food bank donation program permanent, and the process for butchering, transportation, and donation of meat will be streamlined.



Assessment of Moose Populations

Aerial Surveys

Aerial surveys of big game populations have been conducted in Newfoundland and Labrador since the 1960's. These surveys provide independent estimates of moose abundance to biologists. Aerial surveys are undertaken by MMA and consist of two phases. The entire MMA is first flown and stratified into grid squares of low, medium, high, or very high quality based on habitat, moose sightings, and moose sign (e.g., tracks). The MMA is then flown a second time and an appropriate number of randomly selected of low, medium, high, and very high grid

squares are thoroughly searched for moose (Figure 3). These grid square counts are then extrapolated to the entire MMA. This is a common method for big game surveys and produces an estimate with 95 per cent confidence intervals that are around 15 per cent of the estimate. For example, if the true number of moose in an MMA is 1,000, biologists will be very confident based on our survey that there are between 850 to 1150 moose in that MMA. The surveys also provide data on the numbers of bulls and cows in the herd and the number of calves in the population (See Tables 2 to 4 for summaries or survey data by MMA).

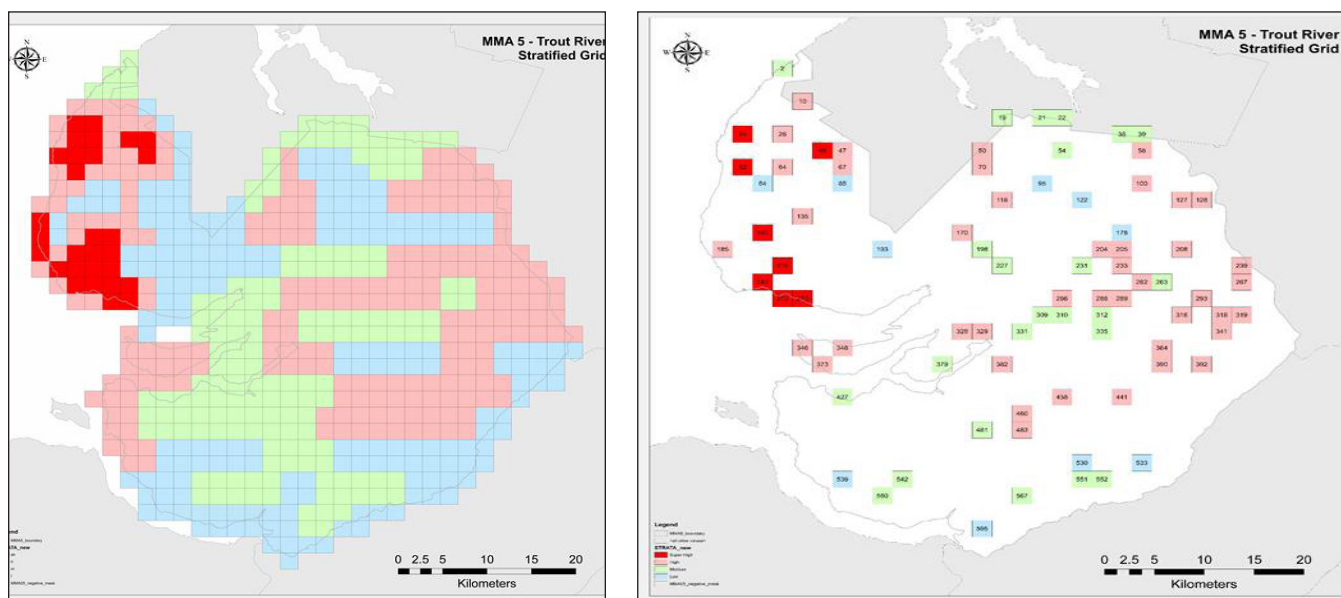


Figure 3. Grid system stratified by moose density/habitat quality and used to plan and execute aerial moose surveys. **Red = Very high** **Pink = High** **Green = Medium** **Blue = Low**

The left panel shows the stratification results for all grid blocks and the right panel shows the random subset of each 'quality' category surveyed.

While relatively accurate, aerial surveys are resource intensive and only a portion of MMAs can be surveyed each year. Historically between two and four MMAs were surveyed per year. However, since 2017 biologists have surveyed 5 to 10 per year. It is important to note that weather, snow conditions, and MMA size are important factors in survey work and can impact the number of surveys. Some regions of the province, such as the Avalon and South Coast, are difficult to resurvey due to lack of regular snow cover, which is a requirement for good tracking during the survey. Between 2017 and 2021, 30 MMAs were surveyed on the island, and four in Labrador (which were completed by the Torngat Wildlife and Plants Co-management Board) (Figure 4.)

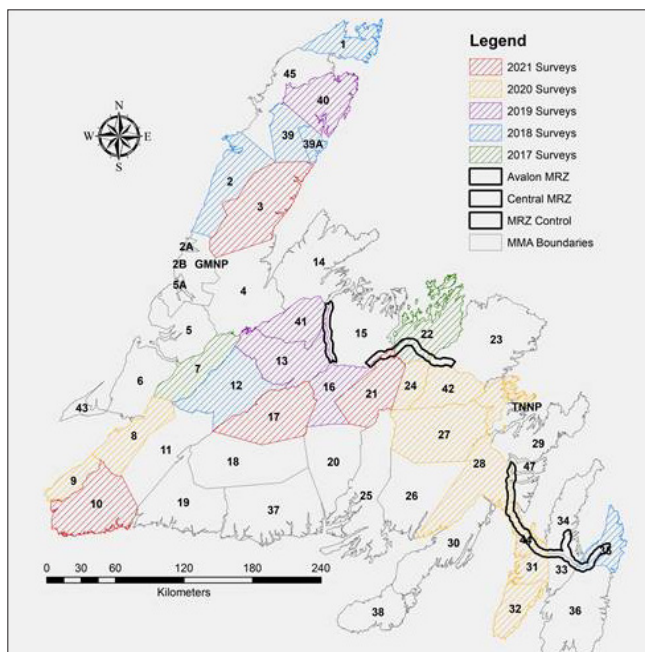


Figure 4. Moose management areas surveyed on the island of Newfoundland from 2017-2021, including Moose Reduction Zones.

Biologists will strive to survey all MMAs on the island and several in Labrador on a five to seven-year rotation.

Hunter Returns

Hunter returns provide critical data for the management of individual MMAs. These returns allow biologists to examine trends in the observations of moose by hunters and hunting effort. Hunter return data help monitor the status of moose populations, and it can indicate changes in hunter behaviour and moose populations in between aerial surveys. The returns tell biologists the harvest success rate of hunters, how long they hunted, the number and sex of moose seen, the sex of the harvested moose, and location of the harvest. Each of these pieces of information is provided directly by hunters in the field and they feed into management decisions and estimates of moose abundance. Specifically:

- Success rate multiplied by the number of licences issued provides an estimate of the total harvest in an MMA, so biologists know how many moose are being removed from the MMA each year.
- Time spent hunting and the number of moose seen is a good indicator of population status. A decline in moose seen is a good predictor of a declining population and will trigger biologists to plan a survey in that area.

- The sex of the harvested moose allows biologists to ensure hunters are not harvesting too many males or females, which can lead to a decline.
- Location data show where harvest effort and moose abundance may be mismatched and can often be used to identify where accessibility to remote areas may be impacting moose management.

In recent years, an average of 60 to 65 per cent of hunters submit returns (See Tables 2 to 4 for summaries of return data by MMA).

Hunter returns will be integrated with the online application system and completion of prior returns will be part of the application process.

Jawbone Collection Program

The Jawbone Collection Program gives biologists direct information on the health of individual animals and the age structure of the population. Jawbone length at age is related to the food availability for moose. Shrinking jawbone length and a declining population may mean that moose habitat from the area is in poor condition. Growing jawbone length and a declining population may mean that quotas are too high for the area. Knowing the age structure of a population of moose can also help determine status of the population. For example, if there are many young

and prime breeding animals present, the population is probably increasing. If there are many older animals and few young, it is likely that birth rates are low and the population is declining. If there are very few moose over the age of two or three, it may also indicate overharvest.

After an interruption from 2015-2019, the Jawbone Collection Program has returned with support from co-operating hunters, including the popular Co-operating Hunter Crests. In the two years since restarting the program, just over 6,000 jawbones have been submitted by hunters, with 3330 submitted in 2021 (Figure 5). The goal is to get at least 30 per cent of the jawbones submitted for each MMA. In the 2020-21 season the average jawbone submission rate was 21 per cent.



Incentives will be developed to further encourage moose jawbone submission, including providing hunters with information on the moose they harvested.

Canid Collection Program

Black bears are the primary predator of moose on the Island, and wolves are the primary predator in Labrador. Coyotes may rarely prey on moose calves, but do not appear to be a significant predator at the population level. However, since 2008 there have been a low number of wolves (from Labrador) and wolf-

coyote hybrids taken by trappers and hunters on the island. While it remains uncertain whether wolves have established a population on the island, biologists are concerned that wolves travelling over the ice from Labrador may establish a breeding population. The high density of moose and caribou on the island of Newfoundland are very favourable to wolf establishment. Wolves would have a dramatic effect on the abundance of both species.

The Canid Collection Program is designed to monitor for wolves and detect any wolf-coyote hybrids. In 2020-2021, 687 canids were submitted to the program. Of those

Monitoring will continue to evaluate the presence of wolves and hybrids on the island. Pending the outcome of this monitoring management action may be taken to limit or control wolf establishment.

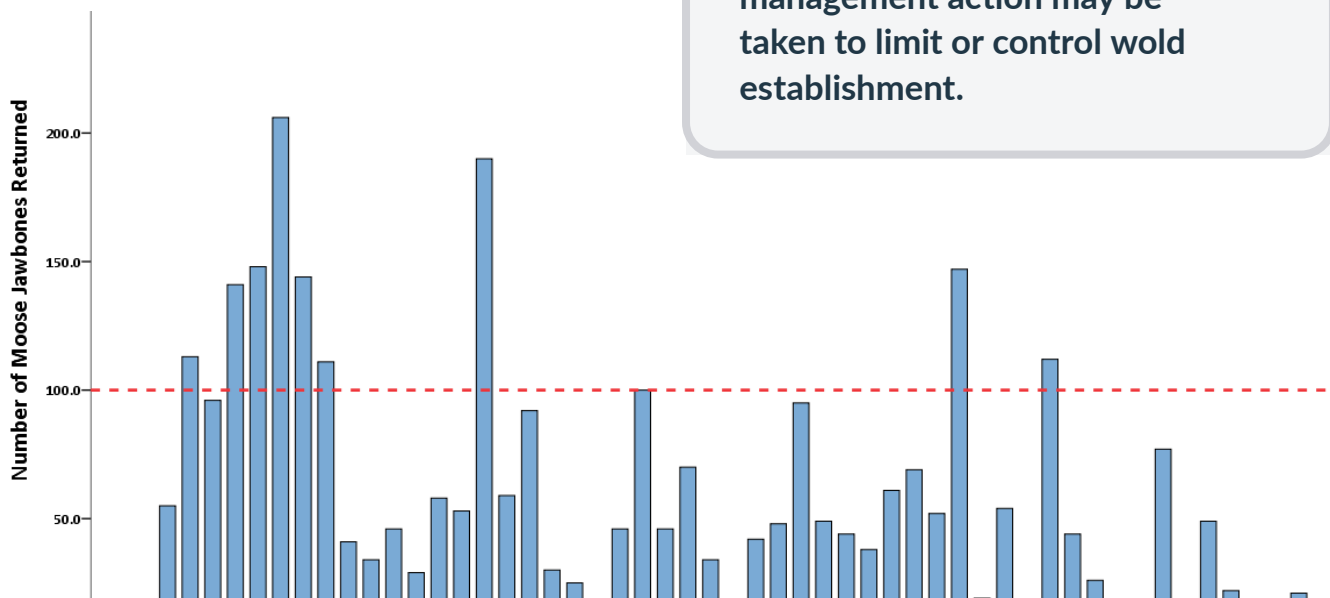


Figure 5. Moose jawbone submissions by moose management area. The solid bars are the number of jawbones returned. The horizontal dashed line is the goal return rate of 30 per cent, and the average return rate for 2020-2021 was 21 per cent.

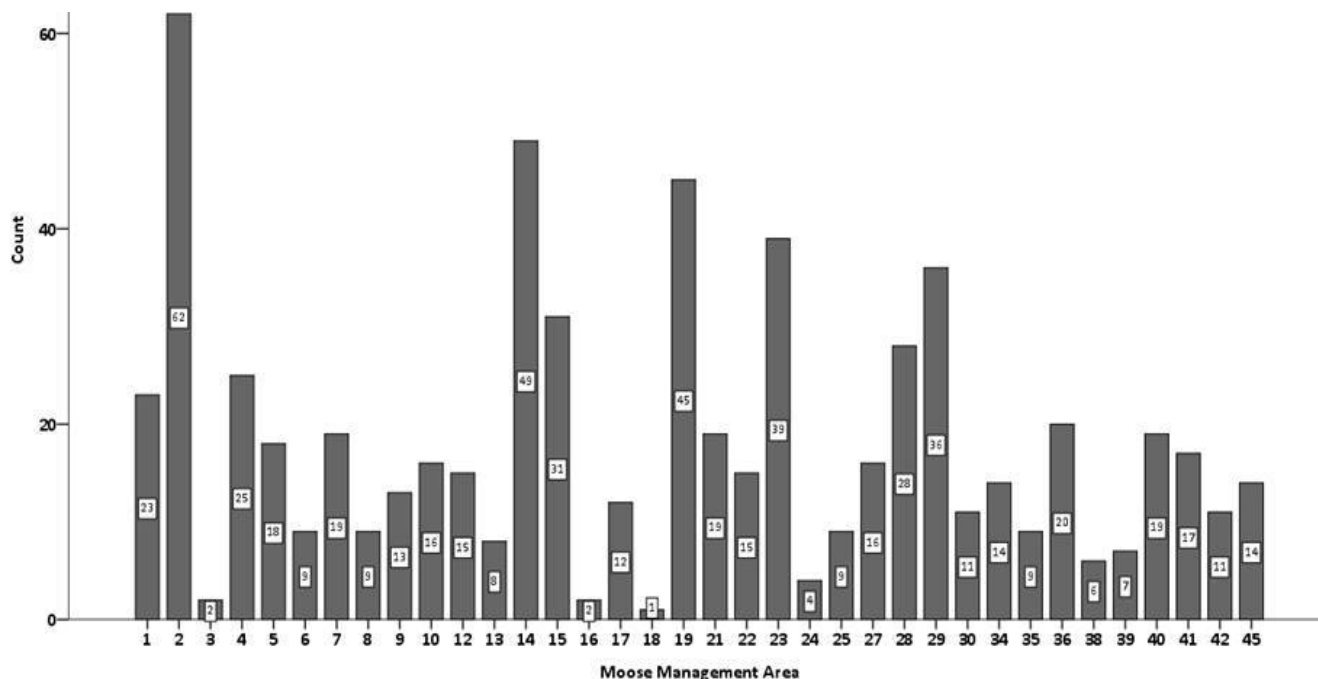


Figure 6. Submissions of canid carcasses in 2020-21 by moose management area.

58 were over the 15 kilogram criteria for full laboratory study. Canids were submitted from all around the island (Figure 6). Trapping was the primary method of coyote harvest, accounting for 87 per cent of the carcasses submitted (Figure 7). DNA results are pending. The Provincial Government is launching an initiative in partnership with the Newfoundland and Labrador Outfitters Association (NLOA) to increase incentives for the submission of canid carcasses. The goal of this program is to further improve data collection and incentivize increased harvest.

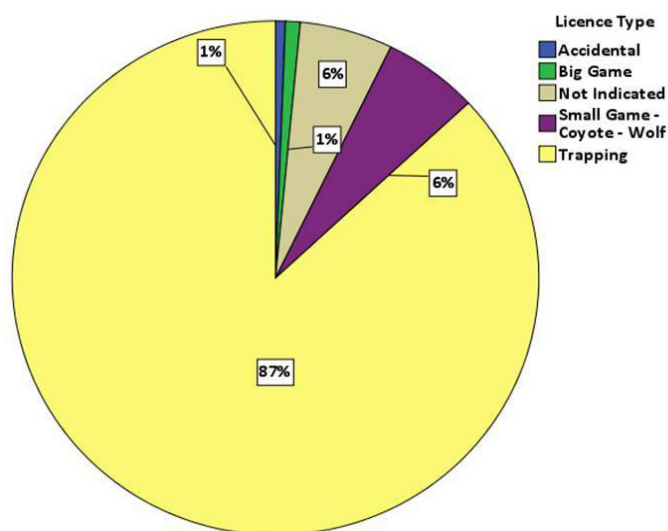


Figure 7. Harvest technique for canids submitted to the canid collection program for the 2020-21 season by licence type.

Monitoring and Managing Hunting

Hunter Demographics

Newfoundland and Labrador has the highest hunting participation rates in Canada. About 20 per cent the province's population participates in big game hunting. Moose management is as much about understanding hunters and harvest patterns as it is about the ecology and monitoring of moose. Hunting not only provides many of the benefits citizens derive from moose, but it is also the primary and most practical tool that biologists use to keep moose populations stable and ecosystems in balance. The licensing system and hunter licence returns provide important data for managing the hunt.

Hunters in Newfoundland and Labrador tend to be older than the general population. The province has the oldest median age in Canada at 47.8. The median age of big game hunters is 53.5. The largest age group for hunters is 61 to 70, followed closely by 51 to 60. The hunting population is also heavily skewed towards a greater number of males. Male applicants in the big game draw outnumber female applicants in the draw at a ratio of 3.3 : 1.

In recent years there also appears to have been a shift in hunter behaviour to favour hunting in more accessible areas. There

has been an increasing concentration of hunting effort along resource road networks. This can create strong competition among hunters, reducing success rates and leading to overharvest in accessible areas. In recent years, biologists have noticed a weakening relationship between success rates and moose abundance in some MMAs. This may be partially related to the changes in hunter behaviour. The second and perhaps more significant concern is hunters giving up hunting completely. Hunters retiring from hunting combined with lower participation rates by youth may impact biologists' ability to maintain stable moose populations in some regions by the end of this decade and certainly by the early 2030's. It will be critical in the future to increase hunting participation rates across all ages and genders.

Compliance

Compliance with wildlife regulations is dependant on hunters having a clear understanding of management methods and goals. There must also be ample opportunity to provide input on wildlife management decisions. Compliance with a regulation within the hunting community is closely tied to the perception of the conservation impact of not complying. If hunters believe a regulation is in



place to ensure moose remain abundant and protect fair hunter access to the resource, voluntary compliance is likely. However, if rules appear arbitrary and the intent of the regulation is unclear, compliance is less likely and enforcement action is the only incentive for compliance. One of the key goals of the 2022-2026 Moose Management Plan is to bring transparency to moose management by sharing management targets and assessment methods. Through this transparency and accountability, Government hopes to improve overall compliance rates. When violations of the **Wildlife Act and Regulations** do occur, the Resource Enforcement Division has approximately 91 officers stationed around the province to protect wildlife.

The enforcement and penalties provisions of the Wildlife Act and Regulations will be reviewed to ensure officers have the tools needed to prevent poaching and other activities that impact the sustainability of moose populations.

Moose Management Principles and Targets

While trends in moose abundance are frequently reported to the public at the island scale, moose management is applied at the scale of regions or MMAs. Biologists do not use province or island wide data to set quotas. A moose population in MMA 1 on the tip of the Northern Peninsula may be experiencing very different conditions than a moose population in MMA 35 surrounding St. John's. There is also a consistent divergence between accessible (road access) and inaccessible MMAs. Biologists examine the local conditions in each MMA in relation to the density targets (i.e., management category; Figure 1.) and science-based management principles. Then, using all of the available data, biologists set each MMA quota accordingly.

Management Principles

These overarching management principles are based on well-established and accepted principles of natural resource management and moose biology. However, special action may be taken if local conditions warrant (e.g., hot spots for human-moose conflict). The guiding principles for moose management are:

- **Moose in Newfoundland and Labrador will be managed to sustainably optimize recreational and economic benefits to citizens while protecting ecological integrity and human safety.** In practice, this will likely mean fewer licences, higher success rates by hunters, more either sex licences, lower moose densities in some areas, and higher calf production. This approach will lower habitat degradation risk in remote areas and human safety risk near population centres, while ensuring long-term stability of moose populations. Ninety-seven per cent of respondents to online consultations agreed that habitat is essential for moose management and 62 per cent agreed with managing for a balance between hunter success and public safety.
- **Management actions will seek to distribute harvest evenly over the landscape.** Uneven harvest pressure between accessible and remote areas has been the most significant management challenge since moose were introduced to the island, and it remains a challenge to effective moose management in 2022. Tools that may be utilized to address this issue may include sub-management areas, altering season lengths at the MMA or regional scale, incentivising hunting in remote areas, antler-based harvest restrictions, and utilizing non-resident hunters to target rapidly increasing populations (in remote areas with limited resident interest).
- **MMAs with poor quality data will be managed conservatively.** For example, MMAs with poor hunter return and jawbone submission rates or long periods between aerial surveys will require a cautious approach. In practice, this means remote areas will be managed with quotas

at the higher end of target ranges to protect habitat and accessible areas will be managed with quotas at the lower end of targets to prevent over harvest.

- **Biological management targets have been established for each MMA.** The following population targets are management objectives for MMAs at target densities (i.e., where the goal is stability and optimum harvest). These targets may be altered for an MMA if the management objective is to reduce or increase moose abundance (e.g., if moose abundance is above habitat carrying capacity, the percentage of cows harvested may be set above the target).
 - Bull to cow ratio should exceed 30 bulls/100 cows.
 - Calf to cow ratio should exceed 35 to 45 calves/100 cows
 - Harvest rate should be maintained below 5 per cent for cows and below 15 per cent in total.
- **Regional density targets established in the 2015-2020 moose management plan will be continued.** The regional/ category density targets of moose per square kilometre of productive forest (productive forest is defined as $>60 \text{ m}^3$ per hectare) established in the previous five-year moose management plan will be retained. If all MMAs achieve targets, the estimated island-wide population range, including 0.7 moose per square kilometre in low productivity forest ($>35 \text{ m}^3$ per ha), will fall between 96,000 – 118,000

moose. Specifically for the island of Newfoundland (Figure 1):

- Category I – Eastern MMAs (east of Terra Nova National Park and the Burin Peninsula) will be managed for one moose per square kilometre of productive forest habitat.
- Category II – MMAs in central and adjacent to the Trans Canada Highway will be managed for 1.5 moose per square kilometre of productive forest habitat.
- Category III – MMAs in the remainder of the island will be managed for two moose per square kilometre of productive forest habitat.
- Category IV (Not shown in Figure 1) – Portions of MMAs across categories I to III with low productivity forest will be managed for 0.7 moose per square kilometre.
- Category V – Labrador will be maintained at current densities, but adjustments may be made if surveys show changes in abundance trends.
- **The Province is committed to the collection of high quality biological and harvest data through a comprehensive survey program and expanded hunter data collection.** These data are critical to sustainable management of moose. Without regular surveys and high rates of hunter returns and jawbone submissions, there is a risk of missing management targets and forfeiting much of the value that this resource provides to citizens.

Establishing a Moose Harvest Quota

Establishing or modifying a quota for an MMA combines all of the principles and data outlined in this Moose Management Plan. The following decision tree (Figure 8) outlines the general process followed by provincial biologists when developing their quota recommendations. In unusual circumstances, alternative management actions may be required to adapt to rapidly changing conditions (e.g., a forest fire burning a large area of an MMA or a pandemic prohibiting non-resident hunting). Quotas may also be altered on short notice if a survey detects a rapid unexpected change in moose numbers in an MMA.

Moose Management Area Status, Assessment Confidence, and Management Targets

Tables 2 to 4 present the status of the moose populations for each MMA in the province by management category, as well as an assessment of the data quality, recent management actions, and near-term management objectives. These are the core data used by biologists to make management recommendations. These data are constantly updated for each MMA. Because there is uncertainty in all scientific estimates, biologists also take a precautionary approach

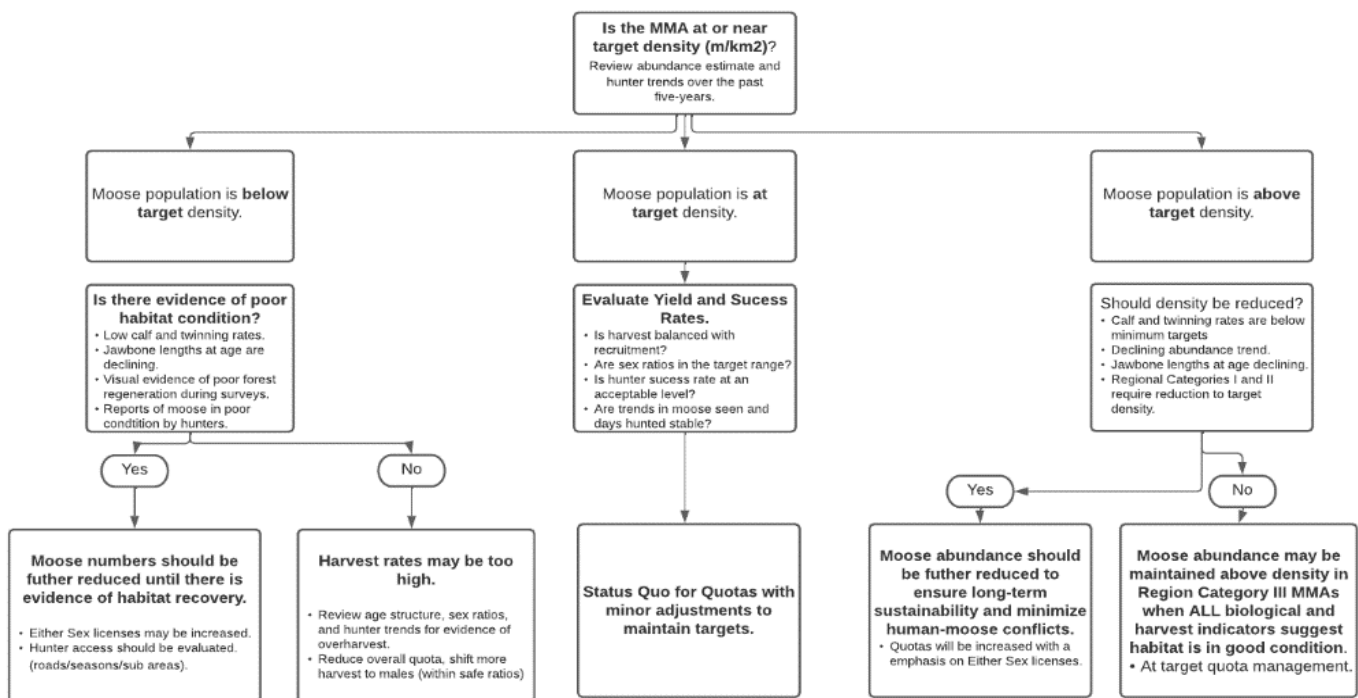


Figure 8. A decision tree outlining the general criteria for developing moose quota recommendations based on the principles outlined in the Moose Management Plan.

to management actions. For example, if recent hunter returns indicate a rapidly increasing moose population for a MMA, instead of increasing quotas by 15 per cent in one year, biologists will recommend five per cent a year over three years. This cautious approach gives biologists time to collect more data (e.g., complete an aerial survey or gather more hunter information) and confirm that the increase in population is real and sustained. Rapid changes in quotas, up or down, based on short-term or sparse data have a high risk of a poor outcome.

While MMAs are managed individually, adjacent MMAs will most likely share similar conditions. This creates some **generalized** regional trends outlined below.

In the eastern portions of the province (i.e., Terra Nova National Park east), which accounts for about 10 per cent of the island population of moose, there has been about a 27 per cent decline in moose abundance over the past decade. This decline has primarily been driven by quotas designed to reduce the moose population in this region in accordance with the 2015-2020 Moose Management Plan. These MMAs, which make up the Category I (Figure 1; Table 2) management area will continue to be managed for one moose per square kilometre. This will maintain the balance between moose abundance and human-moose conflict, with the added benefit of allowing habitat recovery in the region.

The central Newfoundland region (i.e., roughly Terra Nova National Park west to the edge of the Buchan's Plateau and from the south

to northeast coasts) has consistently had the lowest densities of moose in the province for the last two decades. While this region still produces about one quarter of the island's moose, the habitat remains in generally poor condition and has not recovered since the regional population peak of the late 1980s. Data suggest that in several of the MMAs, mainly in the eastern portion of this region, calf production is on the lower end of targets, and habitat quality is a possible cause. Moose abundance in this area is also likely influenced heavily by commercial forest harvesting, which creates moose habitat. Commercial forest harvesting has been significantly reduced in this region as the sector has transitioned from primarily a pulp and paper industry to being more focused on lumber production. Some of the MMAs in this region may require short-to-medium term quota increases to allow habitat to recover and calf productivity to increase.

Though much smaller in area than central Newfoundland, the western Newfoundland forest and the southwestern Long Range Mountains regions (west of the Buchan's Plateau, not including the Northern Peninsula) account for another quarter of the island moose population. Moose populations in this region have been relatively stable for the last several decades; good quality habitat combined with commercial forest harvesting activities and good hunter access to distribute moose harvest has allowed for relatively steady management approach. This Moose Management Plan strives to maintain that regional stability.

The Great Northern Peninsula moose population peaked in the late 1990's and early 2000's at some of the highest moose densities in the world. This region was on the same trajectory as central Newfoundland, which had similar densities in both the 1950's and 1980's. However, aggressive quotas in the 2000's helped to protect habitat in the accessible MMAs of this region. Unfortunately, some remote areas, such as portions of MMA 3 and 39, appear to have severely degraded habitat and consequently have some of the lowest calf production on the island. With careful management of moose numbers and habitat quality, the Northern Peninsula can be maintained at densities similar to the western Newfoundland forest (i.e., Category III). A return to the numbers of moose seen in the 2000's is not possible without major habitat damage and a long-term decline to low densities such as occurred in central Newfoundland in the past. Quotas are likely to be variable in this region, as biologists work to stabilize good moose production for the long-term.

Quotas in Labrador are conservative relative to the island. This reflects the fact that southern Labrador is a wolf-mediated moose population (abundance is limited by wolf predation), data are sparse, and much of northern Labrador is not suitable moose habitat. Recent surveys by the Torngat Wildlife and Plants Co-management Board suggest moose numbers in northern Labrador are lower than previously believed. The Board has taken action to reduce the quota

allocation in collaboration with Nunatsiavut Government. In southern Labrador, the Wildlife Division is planning wolf and moose monitoring under the Boreal Caribou Conservation Agreement. This research will provide new data and will be followed up with appropriate moose or wolf management actions in the region.

Biologists have good confidence that over the past decade the moose population on the island of Newfoundland has been about 100,000 – 120,000 animals post-hunt. This is about 30 per cent lower than the most recent population peak in the 1990's, and hunters have seen success rates decline by about 20 per cent over the same period. Hunter success is highly variable across MMAs (Table 2) depending on the status of local moose populations, accessibility (which affects competition among hunters), and management objectives (e.g., managing for hunting opportunities versus reduced human-moose conflict, or for population decline versus increase). Generally, resident hunters in Newfoundland and Labrador express satisfaction with the hunting experience when success rates are between 60 and 70 per cent or better. When success rates fall below 50 per cent, hunters will often advocate for changes to quotas.

Specific data for each MMA is presented below in Tables 2 to 4; note that despite the regional trends discussed above, individual MMAs, even within regions, can vary substantially.

Table 2. Metrics of population status, hunter trends, data quality, and short-term management goals for Category I Moose Management Areas (1.0 moose per km²).

MMA	Pop Est ¹	Survey (year) ²	Bulls ³	Calves ⁴	Density (m/km ²) ⁵	Returns (%) ⁶	Success (MO) ⁷	Success (ES) ⁸	Jawbones (%) ⁹	Data Quality ¹⁰	Quota (2022)	Quota Change ¹¹	Mgmt. Goal ¹²
28	1727	1742 (2020)	42.7	32.9	1.2	64.8	57.4	66.4	28	Excellent	300	-450	Increase Density
29	4530	RS	47.8	30.9	2.3	69.7	49.4	62.0	18	Fair	850	-350	Stabilize
30	2528	RS	TBD	TBD	3.6	64.9	81.3	75.0	16	Fair	450	0	Reduce Density
31	637	⁶⁴⁷ (2020)	30.8	43.6	1.4	62.0	46.2	43.8	32	Excellent	300	-300	Improve Success
32	981	⁹⁶³ (2020)	52.6	47.4	2.1	60.0	65.5	73.3	29	Excellent	275	-25	Reduce Density
33	1107	RS	25.0	38.2	2.9	64.7	43.3	40.1	33	Fair	375	-325	Increase Success/ Reduce Density
34	1248	RS	31.6	50.9	1.2	73.8	66.4	61.6	25	Fair	550	-150	Status Quo
35	659	⁷⁷³ (2018)	39.3	57.1	1.3	56.8	34.6	39.6	34	Good	425	-250	Increase Success
36	3505	RS	TBD	TBD	2.3	60.2	47.7	52.0	24	Fair	1200	-400	Increase Success
38	344	RS	TBD	TBD	0.5	67.8	81.1	82.6	27	Fair	270	0	Status Quo
44	580	480 (2020)	21.7	43.5	1.9	61.3	N/A	43.2	24	Excellent	100	-475	Increase Bulls/ Success

¹Current population estimate based on the most recent aerial survey projected to 2021 using a statistical population model incorporating recruitment, harvest data, and hunter return information.

²Aerial survey estimate for surveys completed within the past five years. Confidence intervals omitted for brevity, but they generally range from 10 to 15 per cent of the estimate. (RS – Resurvey required).

³The number of bulls per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and hunter returns, when the aerial surveys are out of date. In some cases adjacent MMAs also had old data and estimates are TBD.

⁴The number of calves per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and hunter returns, when the aerial surveys are out of date.

⁵The number of moose per km² of productive forest based on the current population estimate. In some cases adjacent MMAs also had old data and estimates are TBD.

⁶The per centage of hunters who submitted licence returns per MMA.

⁷The harvest success rate of hunters with a Male Only licence per MMA. Note that some areas do not have Male Only licences.

⁸ The harvest success rate of hunters with an Either Sex licence per MMA.

⁹ The per centage of hunters who submitted jawbones returns per MMA.

¹⁰Overall data quality, reliability, and confidence in the data as the basis of management decisions (Excellent, Good, fair, Poor).

¹¹Net quota change over the past five years (2017-2021).

¹²Management objective for the next one to three years.

Table 3. Metrics of population status, hunter trends, data quality, and short-term management goals for category II Moose Management Areas (1.5 moose per km²).

MMA	Pop Est ¹	Survey (year) ²	Bulls ³	Calves ⁴	Density (m/ km ²) ⁵	Returns (%) ⁶	Success (MO) ⁷	Success (ES) ⁸	Jawbones (%) ⁹	Data Quality ¹⁰	Quota (2022)	Quota Change ¹¹	Mgmt. Goal ¹²
4	2375	RS	50.0	23.2	0.9	56.4	61.3	73.0	24	Poor	625	-175	Increase Density
5	5156	4956 (2016)	32.9	71.4	4.0	52.2	65.8	67.0	21	Fair	1130	-80	Reduce Density
6	6819	RS	43.9	49.3	5.4	59.0	57.2	66.5	21	Poor	1500	+50	Reduce Density
7	2247	2503 (2017)	34.1	51.6	2.3	56.0	55.4	66.5	33	Fair	800	+100	Reduce Density
8	3019	3139 (2018)	19.9	37.0	2.7	70.4	52.0	54.3	20	Good	920	-330	Increase Bulls
9	1684	1644 (2020)	40.7	34.6	2.8	69.2	49.6	47.8	10	Excellent	530	-20	Reduce Density
10	2604	2604 (2021)	44.3	35.9	2.1	59.4	36.6	47.2	4	Good	900	0	Increase Success
13	1062	1162 (2019)	34.6	29.5	0.9	59.4	58.0	76.7	29	Good	350	0	Increase Density
14	4802	RS	32.4	43.6	1.7	57.8	67.1	75.6	8	Poor	1100	0	Status Quo
15	4692	RS	37.5	46.3	1.8	59.2	41.8	58.2	17	Poor	1150	-200	Improve Success
16	1016	1092 (2019)	35.4	34.1	1.1	66.3	58.9	66.7	39	Good	200	-50	Increase Density
21	1812	1812 (2021)	23.1	34.6	1.2	65.4	59.5	64.4	36	Excellent	300	0	Increase Bulls
22	1803	2175 (2017)	40.9	57.0	1.1	64.2	56.2	72.3	19	Good	800	0	Status Quo
23	2695	RS	52.4	30.2	1.0	59.7	51.4	69.6	19	Fair	600	-100	Increase Density
41	1029	1019 (2019)	21.5	35.4	1.0	61.3	50.3	68.1	19	Good	350	+100	Increase Density/ Bulls
42	463	463 (2020)	109.1	45.5	0.4	68.2	59.1	73.6	30	Excellent	150	-50	Increase Density

¹Current population estimate based on the most recent aerial survey projected to 2021 using a statistical population model incorporating recruitment, harvest data, and hunter return information.

²Aerial survey estimate for surveys completed within the past five years. Confidence intervals omitted for brevity, but they generally range from 10 to 15 per cent of the estimate. (RS - Resurvey required).

³The number of bulls per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and

hunter returns, when the aerial surveys are out of date. In some cases adjacent MMAs also had old data and estimates are TBD.

⁴The number of calves per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and hunter returns, when the aerial surveys are out of date.

⁵The number of moose per km² of productive forest based on the current population estimate. In some cases adjacent MMAs also had old data and estimates are TBD.

⁶The per centage of hunters who submitted licence returns per MMA.

⁷The harvest success rate of hunters with a Male Only licence per MMA. Note that some areas do not have Male Only licences.

⁸The harvest success rate of hunters with an Either Sex licence per MMA.

⁹The per centage of hunters who submitted jawbones returns per MMA.

¹⁰Overall data quality, reliability, and confidence in the data as the basis of management decisions (Excellent, Good, fair, Poor).

¹¹Net quota change over the past five years (2017-2021).

¹²Management objective for the next one to three years.

Table 4. Metrics of population status, hunter trends, data quality, and short-term management goals for Category III Moose Management Areas (2.0 moose per km²).

MMA	Pop Est ¹	Survey (year) ²	Bulls ³	Calves ⁴	Density (m/km ²) ⁵	Returns (%) ⁶	Success (MO) ⁷	Success (ES) ⁸	Jawbones (%) ⁹	Data Quality ¹⁰	Quota (2022)	Quota Change ¹¹	Mgmt. Goal ¹²
1	2631	2487 (2018)	46.4	37.5	5.3	58.6	54.5	69.2	23	Good	550	+100	Reduce Density
2	4264	4618 (2018)	35.2	38.8	3.3	57.1	54.5	68.4	21	Good	950	+50	Reduce Density
3	3332	3332 (2021)	56.4	26.1	1.6	46.2	N/A	37.9	10	Good	1150	+100	Status Quo
11	3298	3298 (2022)	51.1	34.3	2.8	65.0	35.0	52.5	11	Excellent	655	-45	Increase Success
12	1824	1824 (2022)	30.5	22.9	1.6	64.5	46.0	49.4	16	Excellent	375	0	Status Quo
17	3346	3346 (2021)	32.5	32.5	1.8	65.3	46.6	78.3	25	Excellent	650	+50	Status Quo
18	2909	RS	TBD	TBD	3.1	61.1	43.4	54.4	23	Fair	450	-100	Improve success/ Resurvey
19	1235	RS	64.9	31.8	1.8	67.5	70.0	67.4	13	Fair	450	+150	Increase Yield
20	1004	RS	TBD	TBD	0.7	76.7	68.7	64.6	18	Fair	80	-20	Increase Density
24	898	877 (2020)	57.6	42.4	1.4	65.8	45.8	69.0	25	Excellent	200	0	Status Quo
25	4204	RS	TBD	TBD	2.3	67.8	79.5	97.4	15	Fair	350	0	Increase Yield
26	2193	RS	41.2	27.8	2.2	51.9	N/A	56.6	13	Poor	375	-25	Reduce Density
27	1394	1434 (2020)	36.4	25.0	0.8	69.2	32.8	62.2	31	Excellent	250	-100	Increase Density
37	1967	RS	70.3	23.1	2.4	52.1	N/A	35.1	5	Poor	350	0	Increase Yield
39	2188	1720 (2018)	56.8	18.9	3.2	41.7	N/A	38.3	15	Fair	550	-50	Reduce Density
40	5572	5665 (2019)	39.3	39.0	4.2	53.2	66.6	71.4	22	Fair	1050	+250	Reduce Density
43	506	RS	TBD	TBD	2.1	79.0	N/A	65.8	17	Fair	100	-25	Status Quo
45	3856	3856 (2022)	47.3	50.5	3.8	50.0	68.6	73.2	14	Excellent	800	0	Reduce Density
47	188	RS	23.1	23.2	1.1	72.5	65.0	53.3	29	Fair	40	0	Status Quo Resurvey
92	210	76-343 (2019)	23.0	31.0	0.044 (Total MMA Area)	100	N/A	59.0	100	Good	25	-14	TBD - Consult

¹Current population estimate based on the most recent aerial survey projected to 2021 using a statistical population model incorporating recruitment, harvest data, and hunter return information.

²Aerial survey estimate for surveys completed within the past five years. Confidence intervals omitted for brevity, but they generally range from 10 to 15 per cent of the estimate. (RS – Resurvey required).

³The number of bulls per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and hunter returns, when the aerial surveys are out of date. In some cases adjacent MMAs

also had old data and estimates are TBD.

⁴ The number of calves per 100 cows from the most recent aerial survey, or estimated from adjacent recently surveyed MMAs and hunter returns, when the aerial surveys are out of date.

⁵The number of moose per km² of productive forest based on the current population estimate. In some cases adjacent MMAs also had old data and estimates are TBD.

⁶The per centage of hunters who submitted licence returns per MMA.

⁷The harvest success rate of hunters with a Male Only licence per MMA. Note that

some areas do not have Male Only licences.

⁸ The harvest success rate of hunters with an Either Sex licence per MMA.

⁹ The per centage of hunters who submitted jawbones returns per MMA.

¹⁰Overall data quality, reliability, and confidence in the data as the basis of management decisions (Excellent, Good, fair, Poor).

¹¹Net quota change over the past five years (2017-2021).

¹²Management objective for the next one to three years.

Opportunities in Moose Management

Indigenous Engagement

Indigenous governments and organizations are important partners in the conservation and management of wildlife in Newfoundland and Labrador. This plan outlines the data collection, analysis, and western scientific principles that form the basis of moose management in the Province. However, it is essential that traditional Indigenous knowledge and perspectives are incorporated into the implementation of the plan and specific management actions. Government will engage with Indigenous partners on moose management actions.

The Provincial Government will expand engagement with Indigenous Governments and Organizations on moose management.

Habitat Research

Understanding habitat limitations is crucial for the successful management of moose populations. This is especially true on the island of Newfoundland, where predation does not appear to be a limiting factor to

population growth. Currently biologists do not have a direct method for evaluating habitat condition. Rather, the assessment of habitat occurs indirectly by measuring changes in habitat related characteristics of moose populations (e.g., recruitment, jawbones). A direct measure of habitat condition would allow biologists to be proactive in managing moose habitat and likely lead to more efficient quotas. Currently, the department works with several researchers at Memorial University under the Terrestrial Ecology Research Group. The department is also establishing a new Habitat Policy and Research Section within the Wildlife Division which will focus on integrating the latest habitat research with habitat management.

The Provincial Government will develop academic partnerships to explore the development of habitat indices for moose management.

Improved Harvest Data and Opportunities for Hunter Input

Modern digital and online tools are an opportunity to collect high quality data on

moose harvest and can allow hunters to provide direct and regular input for biologists. Many other jurisdictions have implemented online licensing systems including mobile applications that allow hunter to buy licences, document georeferenced hunting and harvest experiences, and provide feedback to biologists. These data have the potential to improve the understanding of moose harvest and allow biologists adjust moose management accordingly.

Under the 2022-2026 Moose Management Plan the Province will explore options to improve the hunter licensing and reporting experience and develop digital data tools to collect hunter information for moose management.

Research on Moose Life Histories, Predation, Disease, and Climate Change Risk

The 2022-2026 Moose Management Plan focuses on the dominant effects of habitat and harvest, and the interaction between them, on the abundance of moose in Newfoundland and Labrador. The Provincial Government has been focused on improving monitoring and assessment programs to address these important factors. However, many other factors also influence moose populations. A future focus will include research on the ecology of moose in Newfoundland and Labrador. In particular,

reproductive biology, behavioural responses to habitat changes, and the effects of harvest on life history evolution.

The Provincial Government will develop academic partnerships to update and improve knowledge of the basic biology and ecology of moose in Newfoundland and Labrador.

Continue Research on Human-moose Conflicts

The previous moose management plan identified several research objectives around human-moose conflict. The complex nature of vehicle traffic, moose abundance and behaviour, and moose vehicle collisions required extending the research program to collect enough data to develop recommendations for management of moose near roadways. The results of this research are anticipated to be made available in 2023.

The Province will continue this research, report on the results to date, and adapt the research based on those results. The research will also be used to develop recommendations around mitigations for moose vehicle collisions.



Hunter Demographics

Wildlife management principles recognize the value of having active and proportionate involvement in hunting to effectively manage moose resources. As demographic shifts continue to occur in our province, engaging youth, focusing on non-traditional hunters, and new Canadians, improving access for persons with disabilities as well as creating opportunities to keep senior hunters involved in hunting will be important in addressing the challenge of future decreases in hunter participation rates. Other important factors involved in encouraging participation in hunting include supporting outreach and education programs to help train and mentor youth and adults.

The Provincial Government will seek to increase the number of citizens involved in hunting and that access to moose hunting opportunities are created by enhancing online hunter education options, increasing mentorship programs for youth, and continuing to support the Becoming an Outdoors Woman program and other programs that increase access for persons with disabilities and senior hunters.

Conclusion

The management of moose is a complex activity that integrates many social, biological, and economic factors. Over the last 120 years, the Provincial Government has been successful in managing moose for the benefits of citizens. Modern biologists have the benefit of learning from past management actions, having long-term data series, and a suite of tools to monitor moose populations. This plan outlines how all of the information will be used to ensure our province's ecosystem remains balanced and how moose populations will be managed sustainably into the future. Newfoundland and Labrador's moose population is no longer in the introduction

and expansion phase of establishment. The population now appears to be approaching an equilibrium with the island ecosystem. However, the province must remain alert to long-term challenges such as climate change, particularly in Labrador, or the establishment of wolves, or introduction of other non-native species. It is likely impossible, and certainly undesirable, for the population to ever reach the peaks of then 1950s and 1980s again, but with good management moose populations can be sustained at a level to ensure continuation of the many benefits this natural resource provides to the province.

Annex A

Engage NL Consultations

In November 2021, the Provincial Government held an online engagement process to assess hunter opinion on moose management and several related wildlife issues. The online survey received 2,658 responses, and an online town hall session was held by the Minister of Fisheries, Forestry, and Agriculture, the Honorable Derrick Bragg which was attended by 65 participants. Individuals and organizations were also invited to submit written comments to the Wildlife

Division. This survey will continue to inform management decisions over the next five years.

The online survey had good representation from most of the province (Figure 9), excepting Labrador which made up only about 3 per cent of the responses. Ninety-six per cent of the respondents were hunters and 91 per cent were moose hunters. Hunters indicated that securing moose meat was the primary motivation for hunting (78 per cent), 92 per cent felt that they were at least somewhat

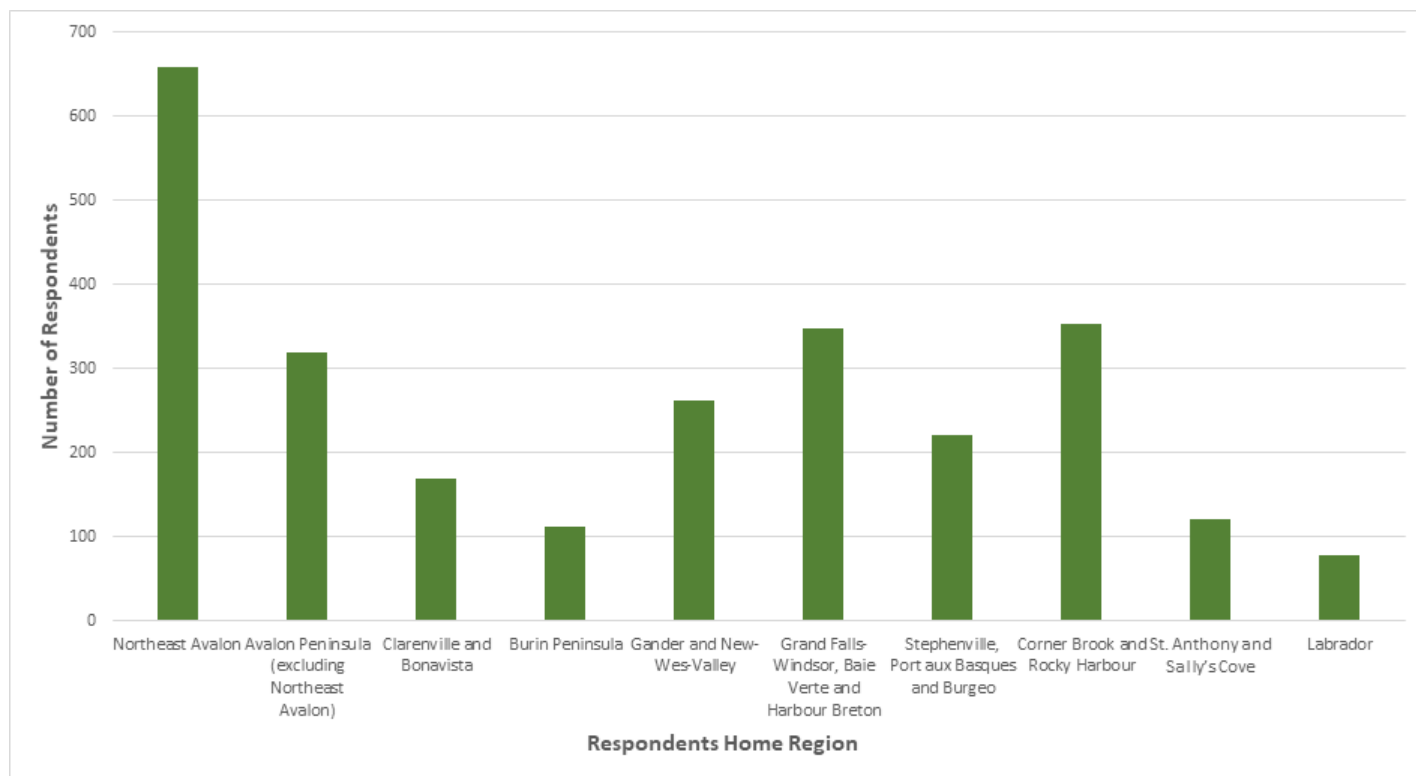


Figure 9. Representation of regions of the province in the Engage NL online survey completed in 2021.

knowledgeable concerning moose. Sixty-four per cent indicated they would like to see more moose in their area, 71 per cent participate in the Jawbone Collection Program, and 80 per cent supported the not-for-profit licences. There were also a number of comments suggesting not-for-profit licences should be integrated in the draw system and more oversight put in place.

Hunter opinion was split on satisfaction with moose management, with 44 per cent at least somewhat satisfied and 47 per cent not satisfied. This was heavily influenced by region, with hunters from eastern areas of the province expressing higher levels of dissatisfaction. This aligns with declining

success rates in eastern island Newfoundland MMAs, which is a consequence of managing for lower moose abundance in this area.

Support for Sunday hunting was strong (80 per cent), and there was substantial majority support expanding Sunday hunting to the entire season (66 per cent). Opinions on season dates were among the most diverse in the survey (Figure 10). Those who commented on season dates expressed a number of reasons for changing either the dates or length of seasons. There was a slight majority in support of maintaining current closing dates.

There was very little support for increasing the number of moose licences (14 per cent

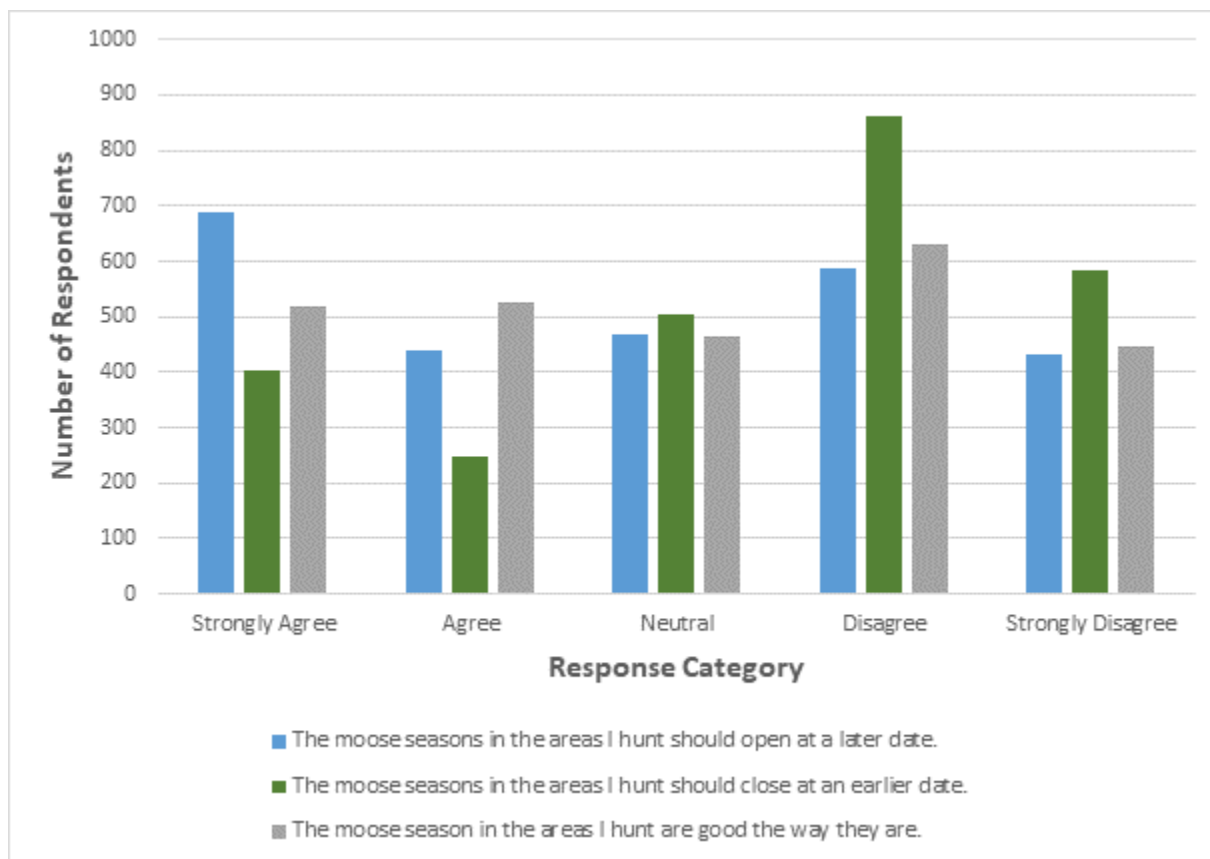


Figure 10. Responses to the Engage NL online survey for three questions about moose hunting season lengths.

in general and 27 per cent along roadways) and 50 per cent of respondents believe the Province currently issues too many moose licences, the remaining 50 per cent were split between no opinion (20 per cent) and support for current licence numbers (30 per cent). Hunters also expressed a clear preference for high success rates versus having more opportunities to hunt. Only 22 per cent place more emphasis on getting a licence than having a successful hunt.

Forty-nine per cent of respondents had a close family member or were themselves involved in a moose-vehicle collision. Reducing speeds, especially at night was identified as the best action to reduce moose vehicle collisions (89 per cent); 69 per cent of respondents believed that reducing moose abundance near roadways was not important. The majority of respondents (62 per cent) believe that the Provincial Government should manage moose for a balance between public safety and hunting opportunities.

The number of respondents identifying as members of the Program for Hunters and Anglers with a Disability (PHAD) was low (1.25 per cent). The department will conduct direct consultations with PHAD members and persons with disabilities before completing a review of the program.

Future Consultations

The Province will engage in regular consultation with hunters to inform annual game management plans. These consultations may include further online surveys, target consultations with relevant stakeholders (e.g., Newfoundland Trappers Association), and direct public engagement such as the open house hosted during the development of this plan.

Annex B

Table of Commitments for the 2022-2026 Moose Management Plan

The 2022-2026 plan maintains the lower target moose densities (number of moose per square kilometre in an area) along the Trans-Canada Highway and in the eastern portion of the island (where traffic volumes are highest) that were established in the previous five-year plan.

The **Wildlife Act and Regulations** will be amended to make the food bank donation program permanent, and the process for butchering, transportation, and donation of meat will be streamlined.

Biologists will strive to survey all MMAs on the island and several in Labrador on a five to seven-year rotation.

Hunter returns will be integrated with the online application system and completion of prior returns will be part of the application process.

Incentives will be developed to further encourage moose jawbone submission.

Monitoring will continue to evaluate the presence of wolves/hybrids on the island. Pending the outcome of this monitoring management, action will be taken.

Under the 2022-2026 Moose Management Plan, the enforcement and penalties provisions of the **Wildlife Act and Regulations** will be reviewed.

The Provincial Government will expand engagement with Indigenous Governments and Organizations on moose management.

The Provincial Government will develop academic partnerships to explore the development of habitat indices for moose management.

The Provincial Government will explore options to improve the hunter licensing and reporting experience and develop digital data tools to collect hunter information for moose management.

The Provincial Government will develop academic partnerships to update and improve knowledge of the basic biology and ecology of moose in Newfoundland and Labrador.

The Provincial Government will continue this research, report on the results to date, and adapt the research based on those results. The research will also be used to develop recommendations around mitigations for moose vehicle collisions.

The Provincial Government will seek to increase the number of citizens involved in hunting and that access to moose hunting opportunities are created by enhancing online hunter education options, increasing mentorship programs for youth, continuing to support the Becoming an Outdoors Woman program and other incentive programs that increase access for persons with disabilities and senior hunters.

