# 2023 Big Game Surveys

The Government of Manitoba collects a variety of information to help manage wildlife populations in the province. One method used to collect information is by conducting aerial big game population surveys. Repeated surveys in an area allow biologists to determine changes in population trends over time. In recent years, Manitoba has been making efforts to modernize the aerial survey program by using new and innovative technology, new survey design, and new statistical models. Use of new technology includes fixed-wing aircraft (plane and solar drone) equipped with infrared (IR) and red-green-blue (RGB) cameras. IR cameras utilize the thermal signatures of wildlife to detect, quantify, and identify animals to species, sex, and age class (calf or adult).

In addition to the new technology, Manitoba is also using a new survey design and statistical model to produce population estimates. In the past, population estimates have been derived using stratified random block sampling as described in previous Manitoba Big Game Survey reports. The new method, distance sampling, is a cost-effective, efficient, and field-validated survey method that is supported by published studies. Distance sampling is the method used to conduct big game surveys by many other jurisdictions in North America. Utilizing IR technology and new survey methods allows Manitoba to survey larger areas more efficiently and with less demand on staff resources.

Manitoba

In 2023, aerial surveys were conducted in:

- **Game Hunting Area 13 & 13A (Porcupine Mountains)**
- **Game Hunting Area 18, 18A, 18B, & 18C (Duck Mountains)**
- **Game Hunting Area 29 & 29A (Turtle Mountains)**
- **Portion of Game Hunting Area 26**

GHA 29 & 29A
GHA 13 & 13A
GHA 18 & 18A-C
Portion of GHA 26
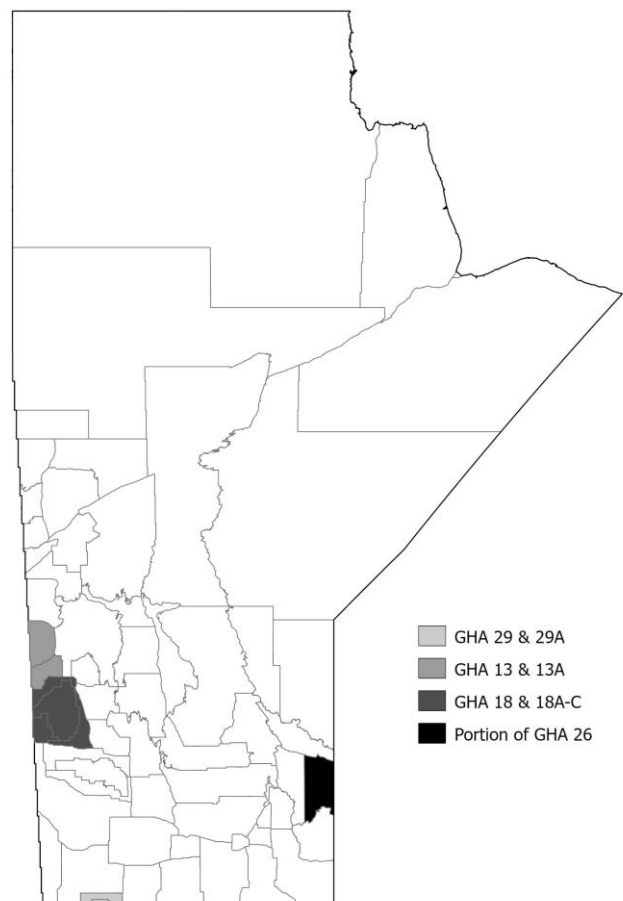
Game Hunting Areas 13 and 13A

Game Hunting Areas (GHAs) 13 and 13A (Figure 1) are situated in western Manitoba in the Mid-Boreal Uplands, Boreal Transition, and Interlake Plain Ecoregions and encompass approximately 3,527 km^2. This area contains many small lakes, streams, and undulating terrain. The best moose habitat exists primarily in GHA 13 along the south, east and north slopes. The area of good moose and elk habitat is predominately mixed wood forests, whereas the higher elevations are dominated by coniferous forest. Most of GHA 13A has been developed for agricultural use.

Aerial surveys were conducted in GHAs 13 and 13A from November 13th to 16th, 2023. Surveys collected observations of both moose (*Alces alces*) and elk (*Cervus canadensis*), and identified individuals by sex and age class (calf or adult), where possible. The surveys were conducted using a fixed-wing plane outfitted with high resolution infrared imaging sensors. The survey crew consisted of one pilot and one on-board sensor operator/biologist. A distance sampling method was used, whereby linear transects of the entire area were flown and observations were recorded from the transect line. Transects were oriented North-South/South-North and were 1.6 km apart. When a heat source was detected, the distance of animal from the transect was measured using a laser distance finder. The aircraft then circled the thermal signature until the sensor operator identified the species and, where possible, sex of the individual. Once the exact location and number of individuals was recorded, the aircraft resumed surveying on transect. In total, 2,159 km of transect were flown within a total area of 3,527 km^2.

A population estimate for moose was calculated using the Rdistance package in Rstudio. The total population is estimated to be 817 (90% Confidence Interval (CI): 583 – 1,081) moose, making up a total density of approximately 0.23 moose/km^2 across GHAs 13 and 13A combined. This population estimate was not significantly different than the previous survey conducted in 2020, which was 997 (90% CI: 837-1,157), suggesting a relatively stable population. The long-term trend suggests that the population has remained stable since 2010 (Figure 2).

The calf:cow ratio was 17 calves to 100 cows. The observed low calf:cow ratio suggests that population recruitment is low. This calf:cow ratio was notably lower than the 2020 survey, which reported 38 calves to 100 cows. The bull:cow ratio was 54 bulls to 100 cows. The sex ratio for this population is similar to the results of the 2020 survey, which reported 54 bulls to 100 cows.
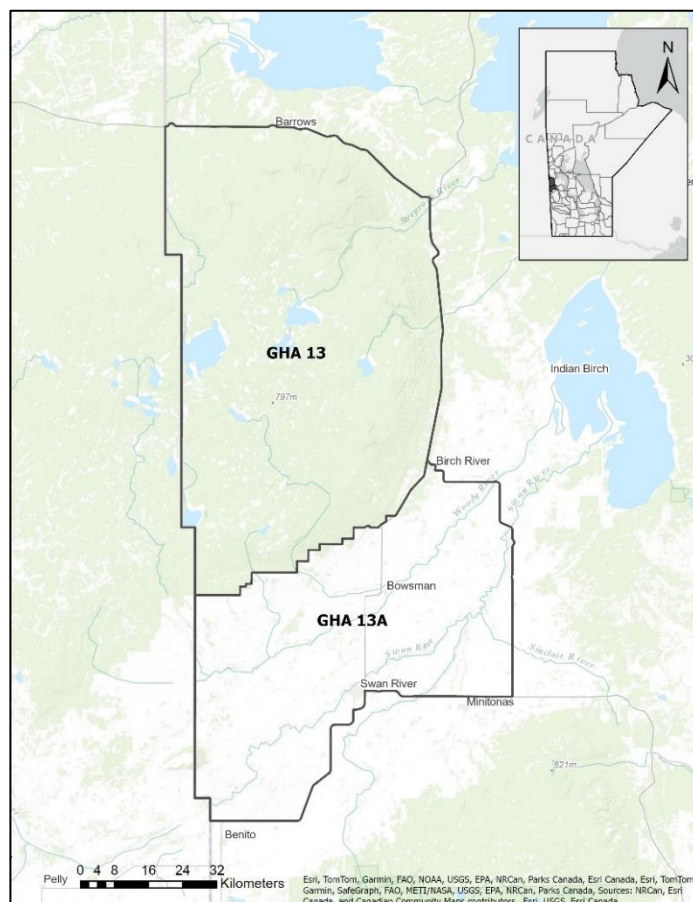

Figure 1. *Map of GHA 13 and 13A.*

The aerial survey produced a minimum count of 107 elk. The most recent survey of elk in GHAs 13 and 13A was conducted in 2008/09; however, this was the only previous elk survey conducted in the area and used an opportunistic survey method and thus cannot be directly compared to make inferences about long-term trends. The 2023 survey will be used as a new baseline to compare future estimates and develop population trends.
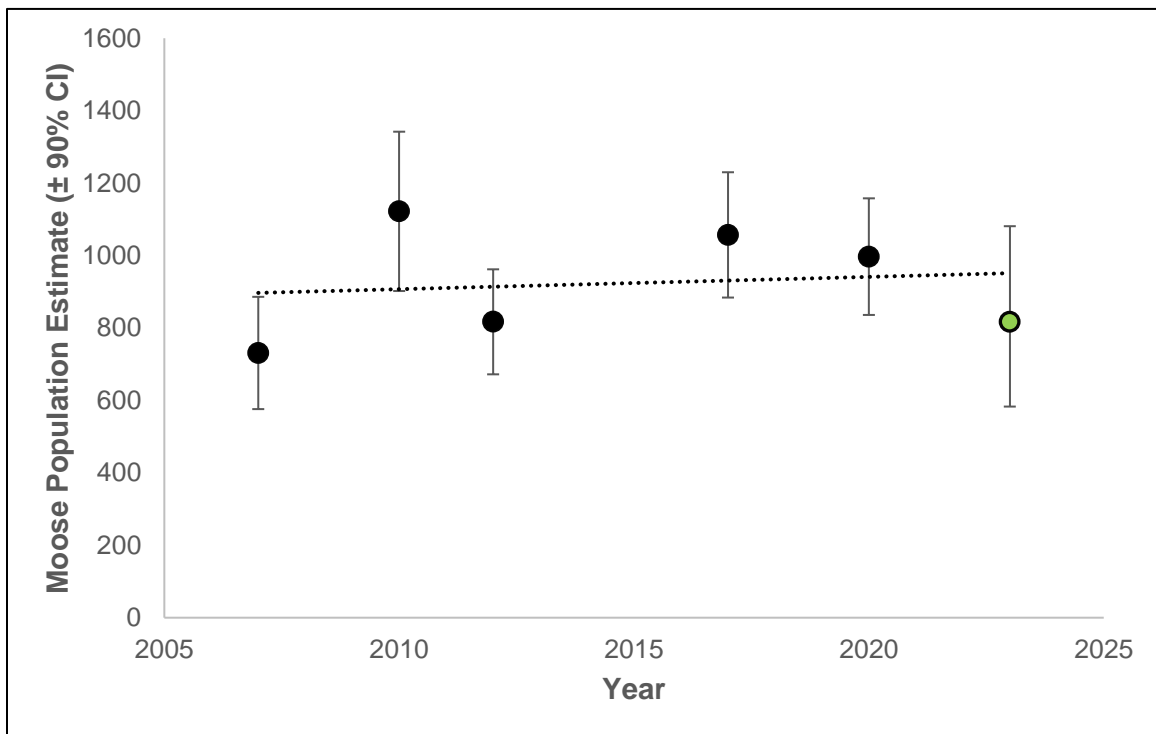
Figure 2. Population trend of moose in GHA 13 and 13A. The results from the 2023 survey (817 ± 583 – 1,081) indicate that the population has remained stable since the most recent survey in 2020 (997 ± 836 – 1,157) and similarly remains stable since the Conservation Closure was established in 2011 (2010 survey: 1,122 ± 902 – 1,342). Surveys between 2007 and 2020 were completed using stratified random block sampling methods. The survey conducted in 2023 (green) was completed using distance sampling methods. Error bars indicate ±90% confidence intervals.

Game Hunting Areas 18, 18A, 18B, and 18C

GHAs 18, 18A, 18B, and 18C are situated in western Manitoba in the Mid-Boreal Uplands, Boreal Transition, and Aspen Parkland Ecoregions and encompass approximately 7,276 km^2. These GHAs are comprised of mixed wood and coniferous forest stands, swamps, and agricultural development. The best moose habitat exists primarily in GHA 18, which is predominately made up of mixed wood forest and forms part of the Manitoba escarpment. This area contains many small lakes, streams and undulating terrain. Both the north and east sides of the escarpment are characterized by significant elevation change. GHA 18 is surrounded by GHAs 18A, 18B, and 18C, much of which has been developed for agricultural use.
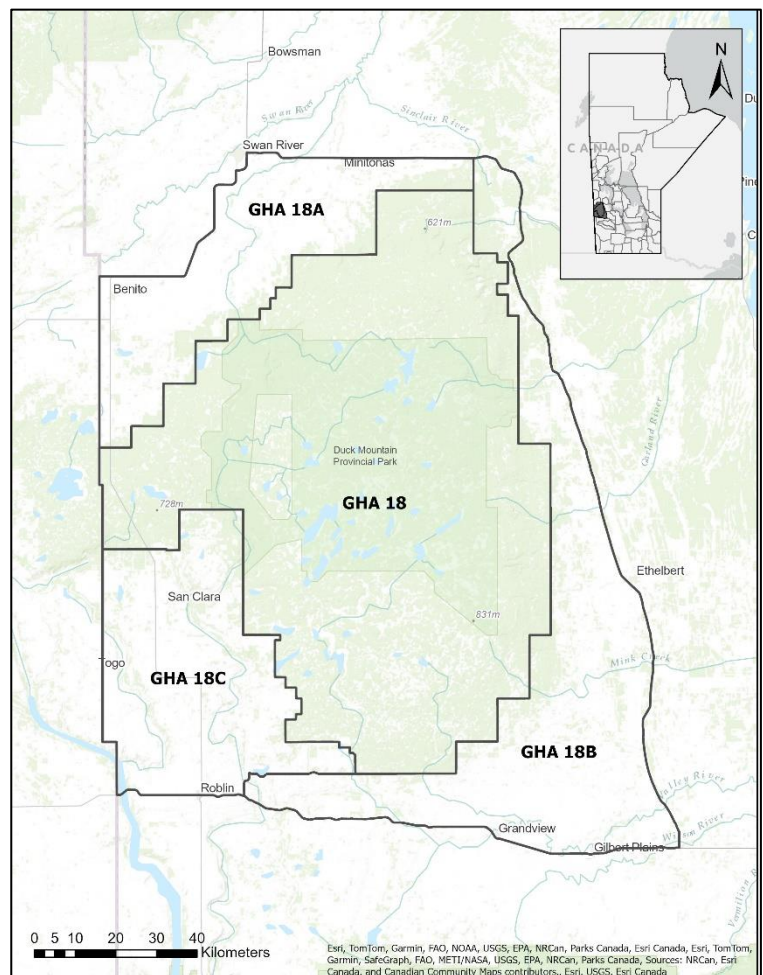

Figure 3. *Map of GHA 18, 18A, 18B, and 18C.*

Aerial surveys were conducted in GHAs 18 and 18A-C (Figure 3) from November 20th to December 6th, 2023. Surveys collected observations of both moose and elk, identifying individuals by sex and age class (calf or adult) where possible. The surveys were conducted in the same manner as GHAs 13 and 13A, with transects running North-South/South-North spaced 1.6 km apart. In total, 4,555 km of transect were flown within a total area of 7,276 km^2.

A population estimate for moose was calculated using the Rdistance package in Rstudio. The total population is estimated to be 2,337 (90% CI: 1,762 – 3,173) moose, making up a total density of approximately 0.32 moose/km^2 across GHAs 18 and 18A-C combined. This population estimate was not significantly different than the most recent previous survey conducted in 2020, which was 2,171 (90% CI: 1,841 – 2,519), suggesting a stable population over recent years. However, the long-term trend since 2010 suggests that the moose population in this area has slowly increased since a Conservation Closure went into effect in 2011 (Figure 4).

The calf:cow ratio was 32 calves to 100 cows. The proportion of calves to cows has decreased since the 2020 survey, which reported 41 calves per 100 cows. The bull:cow ratio was 68 bulls to 100 cows, indicating the proportion of bulls has decreased since the 2020 survey, which reported 83 bulls to 100 cows.

The aerial survey produced a minimum elk count of 1,158 individuals. The most recent survey estimate, conducted in 2018, was 1,162 (90% CI: 1,093 – 1,231); however, this elk survey is not directly comparable to previous estimates that used a stratified block method, which is not an ideal approach for elk population surveys. As with the elk surveys conducted in

GHA 13 and 13A, the 2023 count will be used as a new baseline to compare estimates and develop population trends in the future.
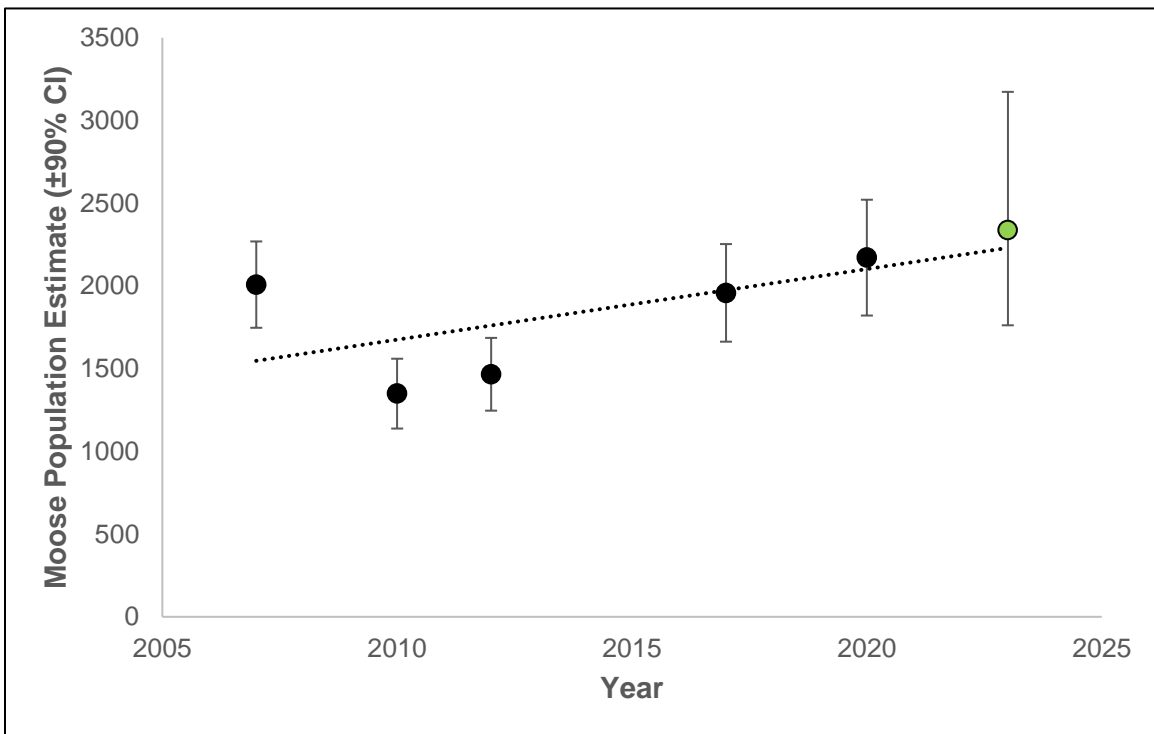

Figure 4. Population trend of moose in GHA 18, 18A, 18B, and 18C. The results from the 2023 survey (2,337 ± 1,762 – 3,173) indicate that the population has remained stable since the most recent survey in 2020 (2,171 ± 1,821 – 2,516) and has significantly increased since the Conservation Closure was established in 2011 (2010 survey: 1,349 ± 1,138 – 1,560). Surveys between 2007 and 2020 were completed using stratified random block sampling methods. The survey conducted in 2023 (green) was completed using distance sampling methods. Error bars indicate ±90% confidence intervals.

Game Hunting Areas 29 and 29A

GHAs 29 and 29A (Figure 5) are located in southwestern Manitoba and encompass 1,295 km^2. GHA 29A encompasses Turtle Mountain Provincial Park and the Turtle Mountain Community Pasture. Habitat in the area includes mixed-wood forest, grassland, wetland, and land developed for agricultural use. GHAs 29 and 29A have been under a Conservation Closure for moose since 2015 and the moose population has been declining over the past decade.

Aerial surveys were conducted in GHAs 29 and 29A from January 28th to February 1st, 2023. Due to the relatively small size of the area, a full coverage survey was feasible, and a minimum count method was used for moose and elk. Surveys were flown using a helicopter with three on-board observers and one pilot. Transects were 500 m apart and ran North-South/South-North.
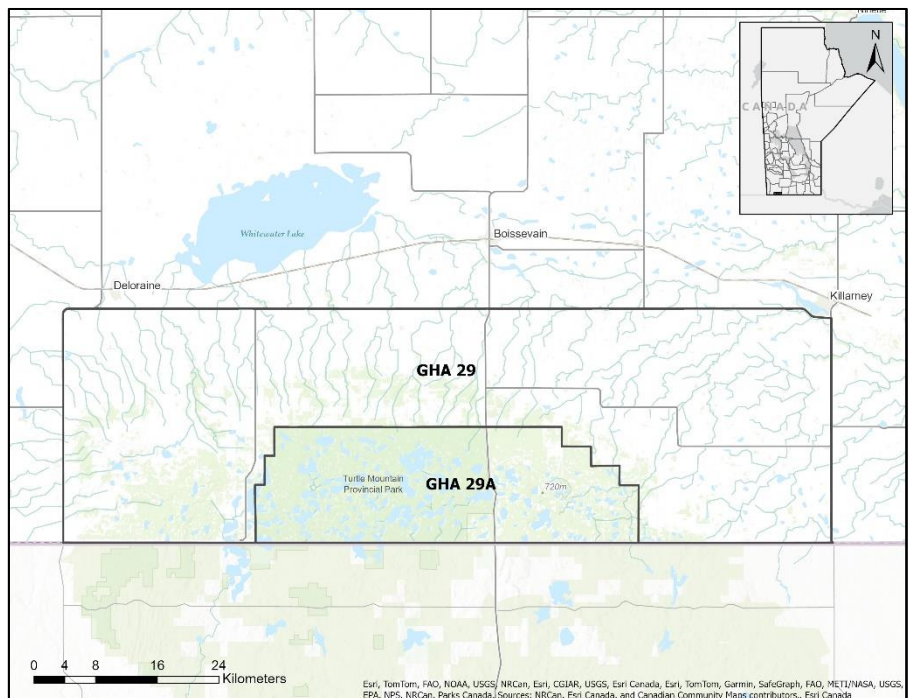

Figure 5. *Map of GHA 29 and 29A.*

Although surveys are full-coverage, it cannot be guaranteed that all moose are observed by biologists due to vegetation, moose behaviour, landscape variability, and other environmental factors. Minimum counts are likely an underestimate of the actual population on the landscape and are best suited for establishing long-term trends such as stable, increasing, or decreasing populations. As a cross-jurisdictional collaborative study with the state of North Dakota, a secondary survey was conducted several weeks after the helicopter survey, using a fixed-wing plane equipped with an infrared sensor. The sampling design of the helicopter and fixed-wing surveys were notably different, including the spacing and orientation of transects, speed and altitude of the aircraft, size of the area surveyed, and timing between surveys; thus, the results are not directly comparable. The two survey methods resulted in the same conclusions regarding population trends despite observing differing minimum counts. We considered the estimates produced by the helicopter survey when comparing to previous estimates (Figure 6), as this method produced higher counts for both species and is more comparable to the historical surveys.

A total of 60 moose were observed during the survey, consisting of 25 bulls, 23 cows, 10 calves, and 2 of unknown sex. This corresponds to a calf:cow ratio of 43 calves to 100 cows, and a bull:cow ratio of 109 bulls to 100 cows. The observed bull:cow ratio is very high, suggesting there may not be enough cows available for mating opportunities; however, these inferences are limited by the very small sample size.

The population density across the entire survey area was 0.046 moose/km^2. This survey suggests that the moose population in GHAs 29 and 29A has declined significantly since 2019, when the population estimate was 112 individuals (Figure 6). This represents a 46.4% decline in the 29/29A moose population since 2019.

A total of 625 elk were observed. Of these, 74 were antlered and 551 were antlerless. Elk density over the entire survey area was 0.51 elk/km^2. This survey covered the entirety of GHAs 29 and 29A, whereas previous surveys only covered portions of the GHAs. The most recent survey, in 2019, produced an elk population estimate of 605 individuals within 79% of the survey area covered in this survey. Although the two surveys are not directly comparable, the results suggest that the elk population has remained relatively stable since 2019.
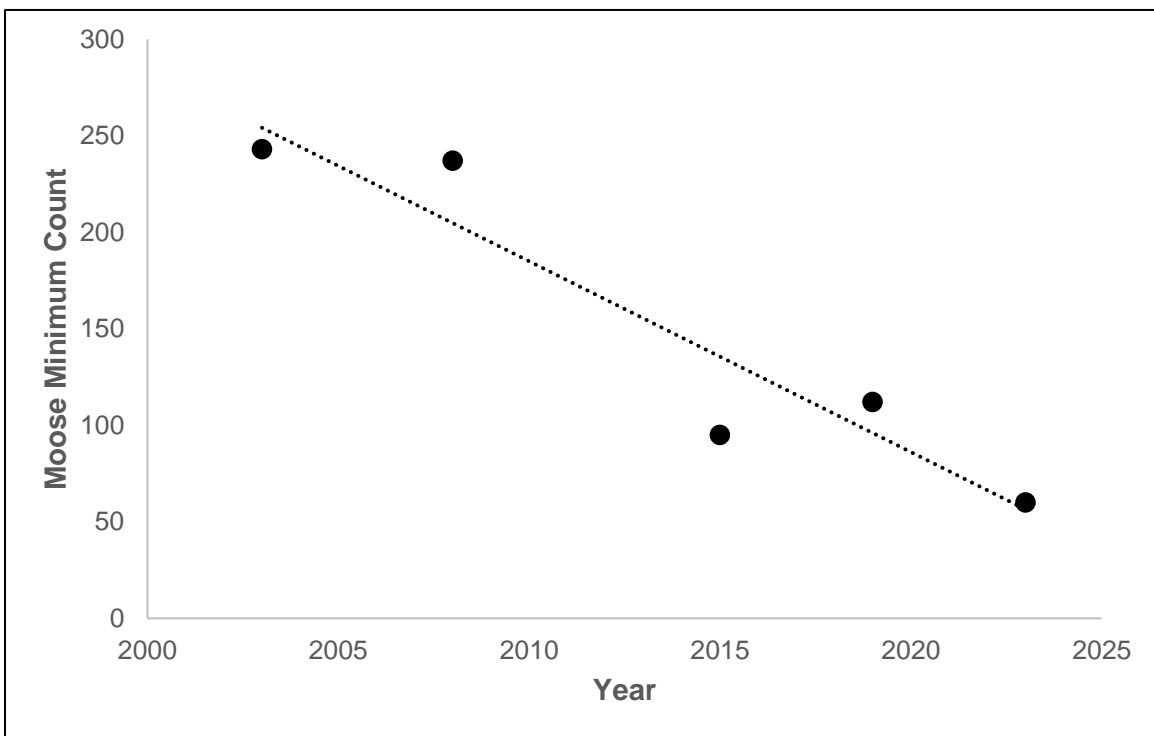
Figure 6. *Population trend of moose in GHA 29 and 29A. The results from the 2023 survey indicate that the population has significantly declined since 2003. Population estimates are derived from full-coverage aerial surveys and reported as minimum counts.*

Game Hunting Area 26

GHA 26 (Figure 7) is located in eastern Manitoba, sharing its eastern border with Ontario and its western border with Lake Winnipeg. GHA 26 contains Nopiming Provincial Park to the east, and Manigotagen Provincial Park to the North. Dominant topography includes numerous lakes and wetlands, as well as slight undulating hills and rocky outcrops. Forest stands in the area contain a mosaic of softwood species and broad leaf hardwoods.

An infrared aerial survey was conducted for boreal woodland caribou and moose throughout GHA 26 from March 23rd to March 29th, 2023. The survey was conducted in the same manner as GHAs 13, 13A, 18, and 18A-C, with transects also running North-South/South-North and 1.6 km apart. Approximately half of the total area of GHA 26 was surveyed; the remainder of the
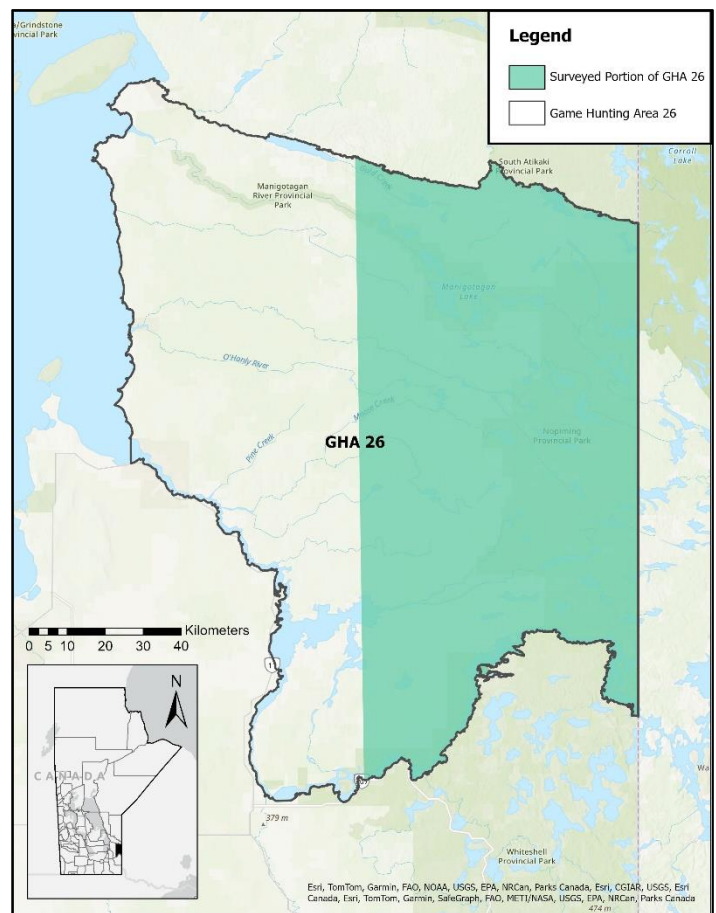

Figure 7. *Map of surveyed portion of GHA 26 (in green).*

survey was not completed due to a mechanical failure. In total, 2,617 km of transect were flown within a total area of 7,244 km^2.

A population estimate for moose was derived using the Rdistance package in Rstudio. The total population is estimated to be 2,029 (90% CI: 1,588 – 2,537) moose, making up a total density of approximately 0.28 moose/km^2. The calf:cow ratio was 24 calves to 100 cows. The bull:cow ratio was 45 bulls to 100 cows. No inference will be made regarding the long-term trend of the population because the survey only covered a portion of the GHA. Notably, the surveyed portion of the GHA is known to contain areas of higher moose density than the portion of the GHA that was not surveyed, which likely has inflated the reported estimate, resulting in a higher than expected population estimate. An updated moose population estimate will be produced in 2024 once a re-survey of the entire GHA has been completed.

There were no boreal woodland caribou detected during the survey period. GHA 26 contains a small herd of boreal woodland caribou whose range is expected to be within the northwest quadrant of the GHA. Due to the fact that the survey only covered the eastern half of the area, it is not surprising that no caribou were detected. The Wildlife Branch will re-survey the entire area in 2024 to collect more information on caribou in this region.

CONCLUSIONS

Manitoba recognizes that big game species are valued by Manitobans. The Wildlife Branch is committed to using the best available science and traditional knowledge to guide management efforts. Improvements to the aerial survey program over recent years includes incorporating new technology to increase the quality and efficiency of wildlife surveys.

The 2023 survey results indicate a stable moose population in GHAs 13 and 13A, a recently stable but gradually increasing population in GHAs 18, 18A, 18B, and 18C, and a declining moose population in GHA 29 and 29A.

In order make informed management decisions regarding hunting opportunities and conservation of big game species, it is important to have reliable survey data. Incorporating new technology, such as infrared imaging, can increase the efficiency and reliability of data collection for big game aerial surveys. In addition to aerial surveys, the Wildlife Branch continues to study big game species through various research collaborations with Indigenous communities, other government agencies, and academic partners. Manitoba's Wildlife Branch remains dedicated to obtaining accurate population data to support sustainable wildlife management.