Aerial Moose Survey

Summary 1998-2025

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Saskatchewan

Aerial Moose Surveys in Saskatchewan Conducted from 1998-2025

Introduction

Moose are a public resource managed for the enjoyment and use by all Saskatchewan residents. It is important to acknowledge moose play a key role in food security for many Indigenous and Métis communities (Popp et al., 2019). The Ministry of Environment released the Management Plan for Moose in Saskatchewan 2025-2034 (Government of Saskatchewan, 2025) in 2025 that offers detailed information on the ecology and management of moose in the province. The goal of moose management in Saskatchewan is to maintain sustainable populations within their current range. Saskatchewan uses multiple sources of information to monitor moose populations, relying on aerial surveys, hunter harvest data, hunter surveys, and field reports. An important part of achieving this goal is using aerial surveys to estimate moose population size, composition and trends.

From 1998-2025, ministry staff have conducted aerial moose surveys to support effective wildlife management and conservation planning. There are five areas in the province (WMZ 33, 56, 57, 59, 67) with high hunter interest that have repeat aerial moose surveys which provide long-term population trends and help guide regional and provincial management (see Figure 1). Five other areas of the province (WMZs 37, 50, 55, Fort à la Corne, and Duck Mountain Provincial Park) have been surveyed once and provide important local information (see Figure 7). The purpose of this report is to summarize information on moose population size, composition and trend over time gathered during 32 aerial moose surveys in Saskatchewan from 1998-2025.

Aerial Survey Methods

Aerial surveys are conducted in winter and used to estimate density, age, and sex composition of moose in select regions of the province (Stewart and Gauthier, 1988, Laforge et. al., 2016). There are three main aerial survey methods utilized for moose in Saskatchewan: the modified Gasaway (Gasaway et al,. 1986, Beveridge, 2006), total coverage (Alberta Sustainable Resource Development, 2010), and distance sampling (Peters et al., 2014). All surveys are conducted in winter, ideally when there is 45 cm or more of snow. If conditions allow, January is an optimal time to survey as most bulls still have antlers to aid in classification (Beveridge, 2006).

Total coverage surveys were conducted in relatively small geographic areas compared to full Wildlife Management Zones (WMZs); for example, Moose Mountain Provincial Park compared to the larger WMZ 33. They are typically used to monitor elk but include moose when present. These surveys are conducted using rotary-wing helicopters, flying

systematic transects to visually count and classify (i.e. bulls, cows, calves) all individuals within the survey area. Because the intent is to count all animals within the defined boundaries, complete coverage surveys do not require statistical confidence intervals. While they do not produce statistical confidence intervals, the results are used to track relative abundance and assess long-term population trends over time, particularly in areas of high management interest or with repeated survey history (Alberta Sustainable Resource Development, 2010).

From 1998 to 2019, the modified Gasaway method was used to estimate moose population density and composition in Saskatchewan. The survey begins with a fixed-wing pre-stratification flight, where the landscape is classified into density strata—high, medium, or low—based on observed moose abundance. A random sample of survey blocks is then selected from each stratum and intensively surveyed using rotary-wing helicopters to collect detailed data on moose density and species composition. Population estimates are generated by extrapolating these observed densities to the larger survey area (Beveridge, 2006). Survey effort is designed to produce population estimates with a confidence interval of approximately ±20 per cent, ensuring sufficient precision for management decisions.

Since 2020, Saskatchewan has used distance sampling as an alternative survey method. Like the modified Gasaway method, distance sampling is conducted using rotary-wing helicopters, but it does not require pre-stratification of habitat or moose abundance. Instead, observers record the perpendicular distance from transect lines to each moose sighted, allowing detection probability to be estimated. Survey design targets a confidence interval of approximately ±20 per cent to maintain consistency in data quality and reliability. This method improves efficiency by enabling broader survey coverage with fewer flights, while also accounting for animals that may be missed (Peters, 2014). Both survey methods classify moose as bulls:cows:calves which enables assessing proportions of bulls and calves in the population.

Repeat Aerial Surveys

Five areas of Saskatchewan have had repeated aerial moose surveys since 1998 providing a consistent dataset to track moose population trends over time (Figure 1).

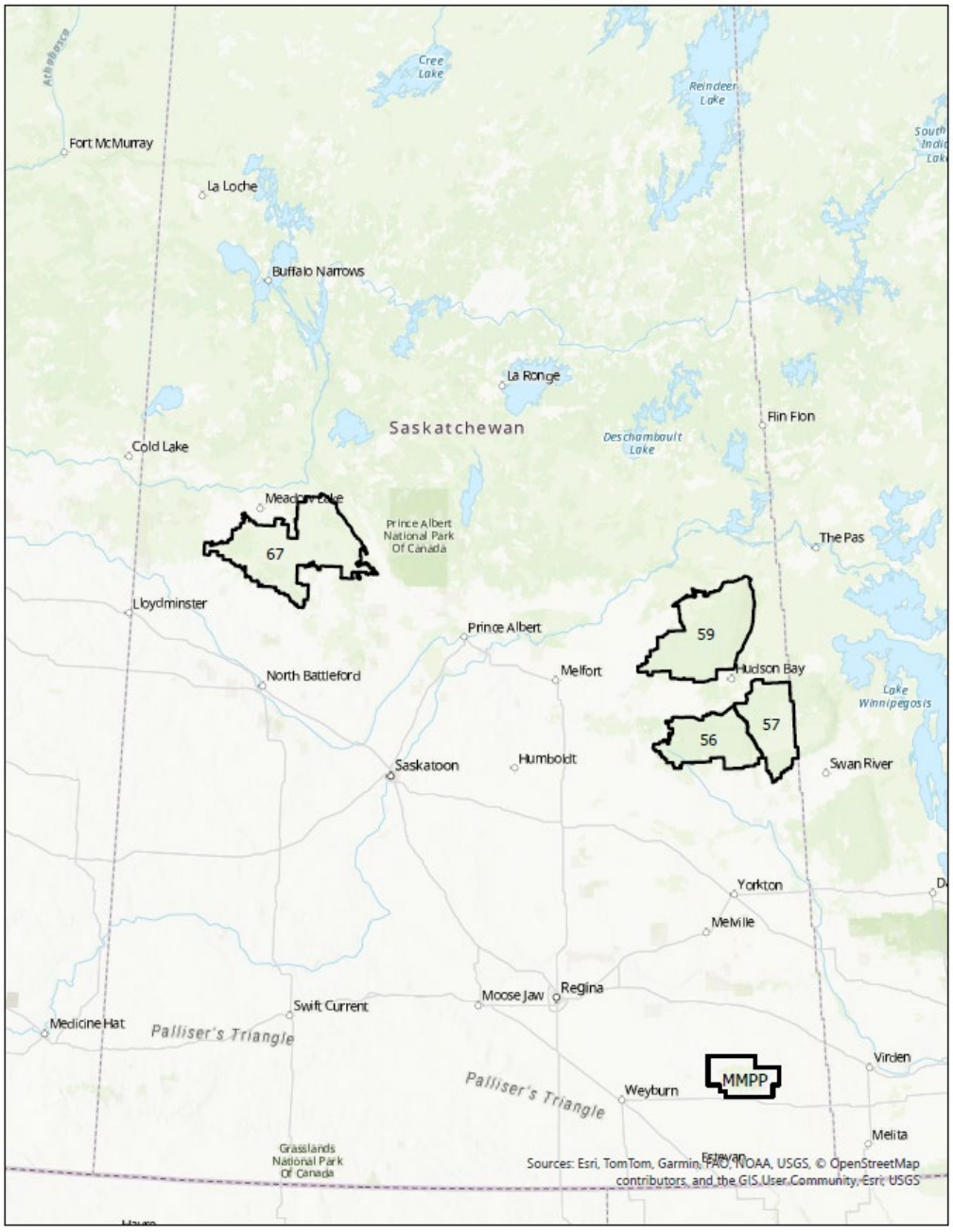

Figure 1. Map of Wildlife Management Zones 56, 57, 59, and 67, and the Moose Mountain Provincial Park, showing areas with repeat moose surveys.

WMZ 56

Seven aerial surveys were conducted in WMZ 56 in the years 1998, 2000, 2002, 2007, 2010, 2015, and 2022. During this period, moose densities ranged from 650 to 1,010 moose per 1,000 km^2. The moose population appears to have been generally stable from 1998 to 2022 (Figure 2). The composition of bulls in the population ranged from 21 to 52 bulls:100 cows though the composition of calves remained relatively stable (51 to 55 calves:100 cows over this timeframe.

Table 1: Moose Survey Summary WMZ 56

Survey Year	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
1998	Modified Gasaway	650	21:100:52
2000	Modified Gasaway	870	31:100:53
2002	Modified Gasaway	780	25:100:54
2007	Modified Gasaway	1090	52:100:51
2010	Modified Gasaway	820	21:100:53
2015	Modified Gasaway	680	34:100:52
2022	Distance	1010	52:100:55

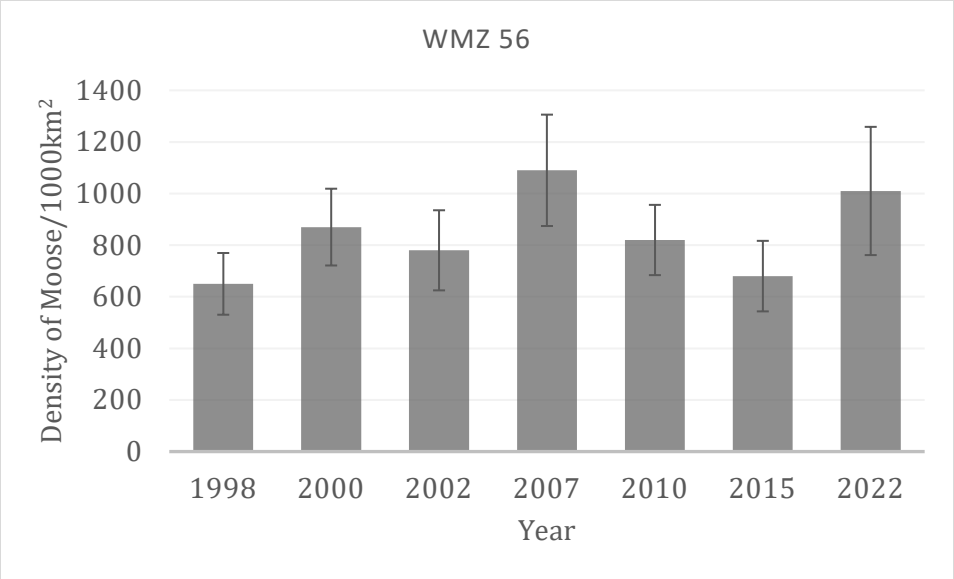

Figure 2. Estimated moose density (individuals per 1,000 km^2) in WMZ 56 for the years 1998, 2000, 2002, 2007, 2010. 2015, and 2022. Error bars represent 90% confidence intervals.

WMZ 57

Six aerial surveys were conducted in WMZ 57 in the years 2000, 2003, 2007, 2010, 2012, and 2022. Moose densities during this period ranged from 220 to 350 moose per 1,000 km^2. The moose population in WMZ 57 has slowly declined from 2000 to 2022 (Figure 3). There was variable bull:cow (30-56 bulls:100 cows) and calf:cow (35-57 calves:100 cows) ratios during these surveys.

Table 2: Moose Survey Summary WMZ 57

Survey Year	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
2000	Modified Gasaway	880	37:100:44
2003	Modified Gasaway	740	30:100:57
2007	Modified Gasaway	760	34:100:43
2010	Modified Gasaway	560	37:100:42
2012	Modified Gasaway	460	47:100:35
2022	Distance	350	56:100:38

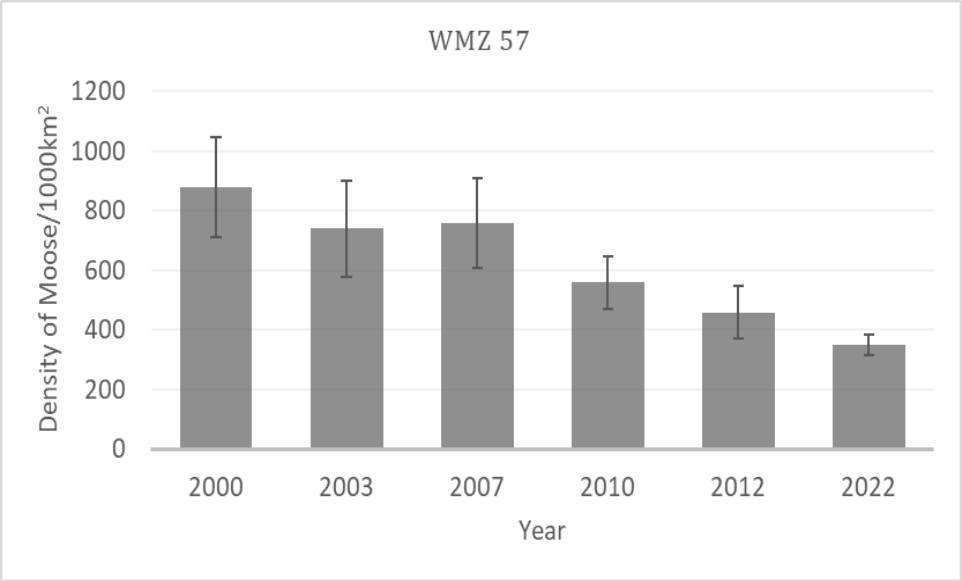

Figure 3. Estimated moose density (individuals per 1,000 km^2) in WMZ 57 for the years 2000, 2003, 2007, 2010, 2012, 2022. Error bars represent 90% confidence intervals.

WMZ 59

Four aerial surveys were conducted in WMZ 59 in 2000, 2007, 2010, and 2022. Moose densities during this period ranged from 340 to 600 moose per 1,000 km^2. The population appears to have slowly declined from 2000 to 2022 (Figure 4). The bull:cow (38-48 bulls:100 cows) and calf:cow (28-39 calves:100 cows) varied among surveys.

Table 3: Moose Survey Summary WMZ 59

Survey Year	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
2000	Modified Gasaway	600	38:100:39
2007	Modified Gasaway	450	41:100:28
2010	Modified Gasaway	420	42:100:35
2022	Distance	340	48:100:33

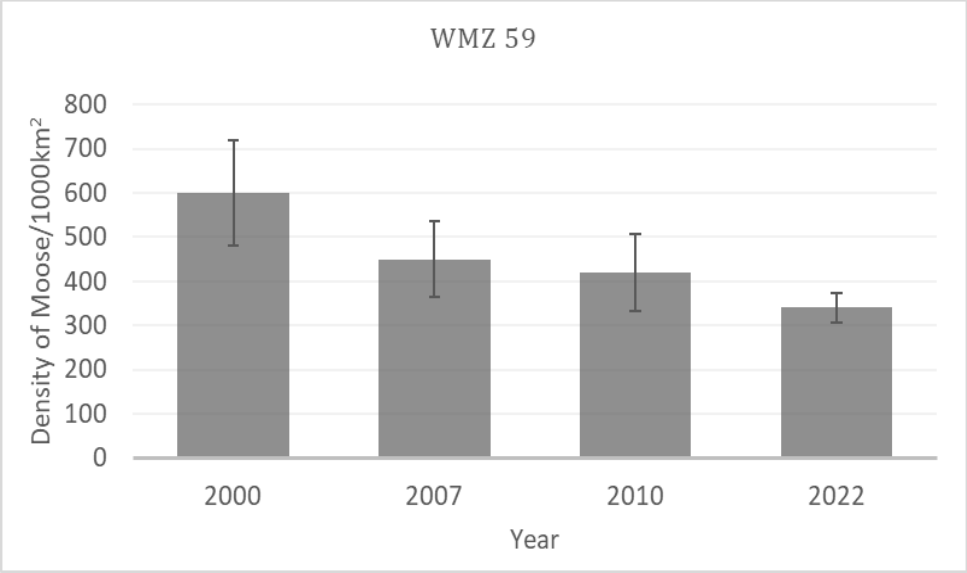

Figure 4. Estimated moose density (individuals per 1,000 km^2) in WMZ 59 for the years 2000, 2007, 2010, 2022. Error bars represent 90% confidence intervals.

WMZ 67

Five aerial surveys were conducted in WMZ 67 in 2004, 2007, 2010, 2022, and 2025. Moose densities during this period ranged from 220 to 500 moose per 1,000 km^2. The moose population remained at a low abundance from 2007 to 2025. The bull:cow (42-91 bulls:100 cows) and calf:cow (36-59 calves:100 cows) had a lot of variation among surveys.

Table 4: Moose Survey Summary WMZ 67

Survey Year	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
2004	Modified Gasaway	500	46:100:43
2007	Modified Gasaway	320	42:100:55
2010	Modified Gasaway	310	43:100:36
2018	Modified Gasaway	220	59:100:59
2025	Distance	220	91:100:38

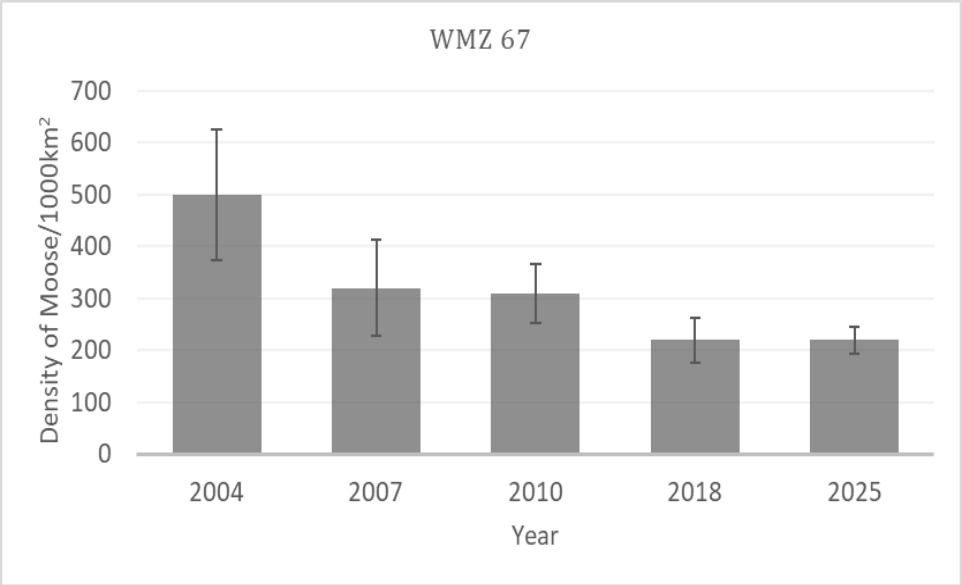

Figure 5. Estimated moose density (individuals per 1,000 km^2) in WMZ 67 for the years 2004, 2007, 2010, 2018, and 2025. Error bars represent 90% confidence intervals.

WMZ 33/ Moose Mountain Provincial Park (MMPP)

Five aerial surveys were conducted across Moose Mountain Provincial Park and the surrounding areas within WMZ 33 in 1998, 2009, 2013, 2017 and 2024. Moose densities during this period ranged from 400 to 700 moose per 1,000 km^2 and indicated a stable population trend over time. The bull:cow (49-56 bulls:100 cows) and calf:cow (42-57 calves:100 cows) had limited variation among surveys.

Table 5: Moose Survey Summary MMPP

Survey Year	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
1998	Total Coverage	400	49:100:42
2009	Total Coverage	500	70:100:55
2013	Total Coverage	700	56:100:57
2017	Total Coverage	410	N/A
2024	Total Coverage	460	49:100:55

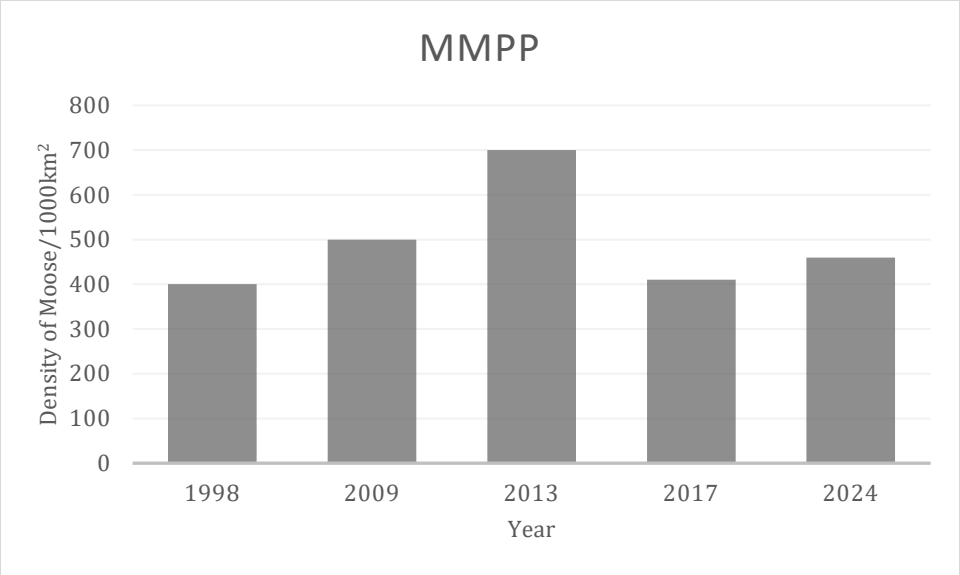

Figure 6. Estimated moose density (individuals per 1,000 km^2) in MMPP for the years 1998, 2009, 2013, 2017, and 2024 (No CI's because total coverage)

There were five zones with single surveys (Figure 7). In 1998 a modified Gassaway was conducted in Duck Mountain Provincial Park (DMPP). In 2020 a distance survey was conducted in WMZ 37, and in 2022 distances surveys were conducted in WMZ 55, 50, and Fort à la Corne (FALC). Other species such as deer and elk were recorded on some of these surveys though the survey protocol was followed to enable an accurate estimation of moose density and composition. Calf:cow ratios are generally higher in these 3 WMZs as they are in the non-forest and have less predators than the repeat surveys in forested WMZs.

Table 6: Moose survey results for single survey areas.

Survey Year	WMZ	Survey Method	Density (/1000 km^2)	Bull:Cow:Calf
1998	DMPP	Modified Gassaway	450	43:100:30
2020	37	Distance	180	41:100:78
2022	FALC	Distance	240	55:100:32
2022	50	Distance	90	35:100:60
2022	55	Distance	610	35:100:53

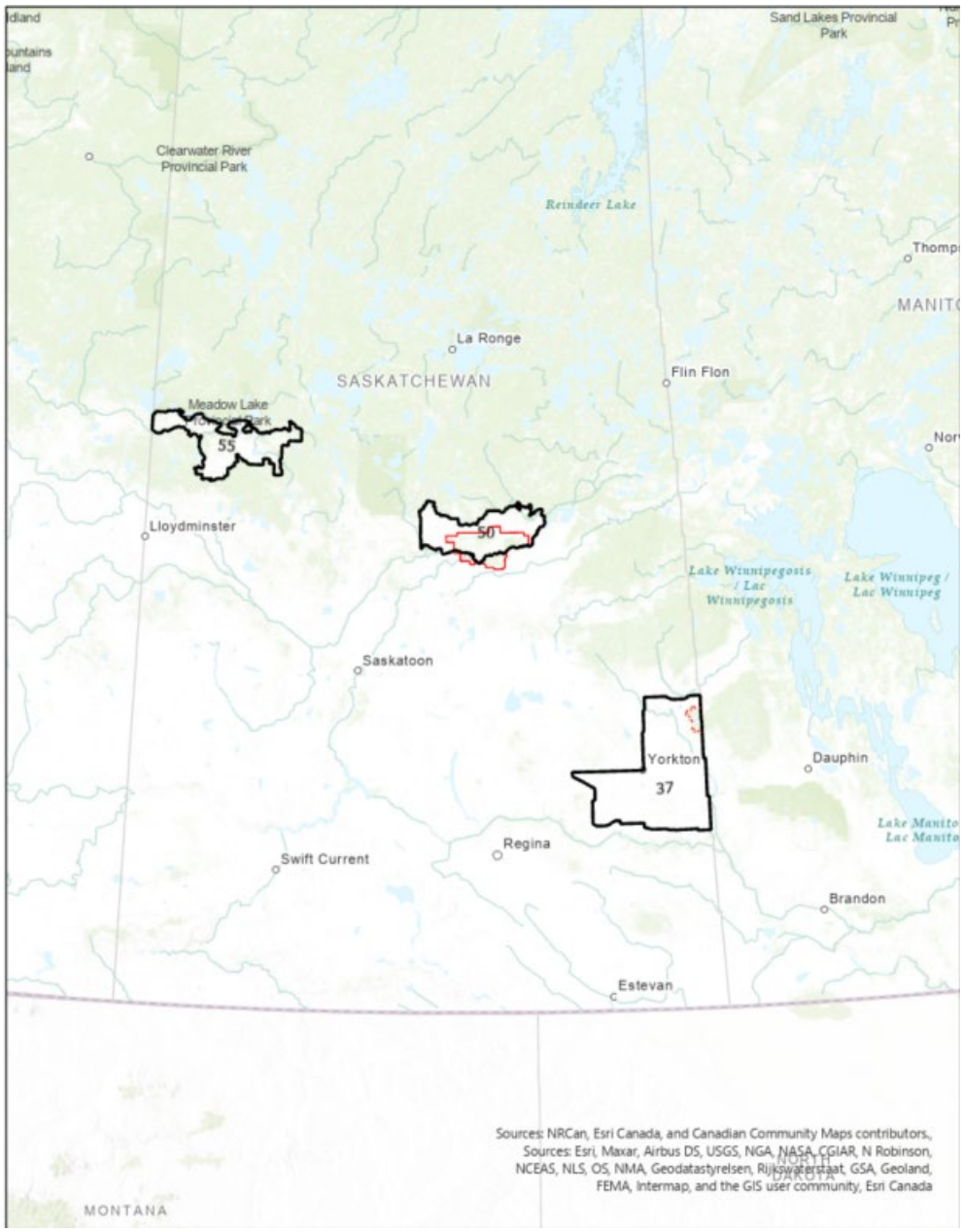

Figure 7. Map showing WMZ with non-regular moose surveys, FALC is outlined by a solid red line, and DMPP is outlined by a dashed red line.

Discussion and Conclusion

From 1998 to 2025, aerial moose surveys conducted across Saskatchewan have provided critical data on moose abundance, composition, and trends. Of the five Wildlife Management Zones (WMZs) with repeated surveys, three zones (WMZs 57, 59, and 67) have shown declining or persistently low moose densities over time, while WMZs 56 and MMPP have exhibited generally stable populations. All surveys, except for three in WMZ 56, had bull:cow ratios greater than 30:100 which is considered to be the minimum for a post-hunt population (Laurian et al., 2000). All surveys had 30-40 calves/100 cows which are required to support a sustainable hunter harvest except one in WMZ 59 (Saskatchewan Ministry of Environment, Fish and Wildlife Branch, 2025). There was consistent high cow:calf ratios in WMZ 56 which may have helped maintain population stability.

The transition to distance sampling in recent years has allowed for increased survey efficiency while maintaining reliable population estimates. This method, which accounts for detection probability and requires fewer flight hours, is particularly advantageous for surveying moose. While some surveys used total coverage in small zones (e.g. MMPP), distance sampling is now the primary survey method for moose in Saskatchewan.

Single surveys conducted in WMZs 37, 50 55, FALC, and DMPP provide important baseline information in areas with high hunter interest. These surveys are especially valuable for evaluating local conditions, guiding harvest regulations, and identifying potential zones for future repeat monitoring. Given the observed declines in forested regions and the ongoing range expansion of moose into farmland and parkland, future surveys should consider building on the long-term data sets for the five repeat survey areas. There may be future benefit in surveying WMZs where there is high hunter interest in moose and no aerial survey data exists. For example, a moose survey south of the Churchill River would provide valuable information on moose density and composition, given it has the only remaining regular moose season (Sept 1-Nov 30) and there may be increased hunter interest in the area since WMZ 55-69 became draw only in 2025. Also, an estimate of moose density and composition in other non-forest WMZs (e.g. either WMZ 21,22,23 and/or WMZ 46) would help refine quota calculations in the non-forest regions of the province.

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