WMU 51
Moose Aerial Inventory
Project Report
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1.0
Introduction:

Moose in Algonquin Park have been surveyed, monitored and studied for over half a century by numerous biologists and scientists. A total of 34 aerial surveys have been conducted, beginning in 1950.

2.0
Inventory Methodology:

Methodology for surveying moose has been standardised throughout Ontario by the Ontario Ministry of Natural Resources (OMNR). Moose Aerial Inventories (MAI) involve flying randomly selected plots that are 2.5 x 10 km in size (25 square kilometres each), and counting how many moose are observed in each plot. A number of plots are surveyed (usually via helicopter) and a density of moose is calculated for the land base.

2.1
Differences between 2006 Algonquin Moose Inventory and historic surveys:

Historically, MAI plots in Algonquin Park were not surveyed randomly (ie. the same plots were flown year after year). Thus while historic surveys illustrated population *trends*, they may not be an accurate population *estimate*. The limitation of this survey method is that while habitat changes due to forestry practices and succession of a forest over time, the change may not occur on the fixed plots at the same rate as change occurs on the ground.

This year plots were picked randomly to conform to provincial survey standards.

Provincial guidelines also involve 'stratifying' the plots into areas with predicted high, medium and low densities of moose. (eg. An area with recent forestry activity will usually have a higher density of moose due to removal of older age forest and release of new growth, while an area that is mostly water will have a lower density of moose). Moose habitat had not been stratified in recent times (stratification flights were flown in the 1960's).

A computer navigation program (VNP – visual navigation program) was used this year as well. This program helps prevent overestimating a moose population because it relies on GPS technology and allows the navigator to pinpoint whether a moose is on or off the plot being surveyed.

2.2
Stratification

Algonquin Park currently falls under two Wildlife Management Units, WMU 51 and 54. WMU 54 is managed by Bancroft District, and is not considered in this report. WMU 51 was once two units (51 & 52 respectively), but is currently managed as one, with the

eastern and northern half being harvested exclusively by First Nations for moose and deer annually, and the west being the un-hunted side.
In total, there are 281 Moose Aerial Inventory (MAI) plots within the current WMU 51 per the Moose Aerial Inventory Protocol. The majority of these plots are oriented North-South, with a few plots around the perimeter oriented East-West to fit inside the WMU
A number of sources of information were used for stratifying all 281 of the WMU plots (WMU 51) within Algonquin Provincial Park. This included the following considerations:

- 2005/06 forestry harvest allocations (excluding areas yet to be harvested)
- 2004/05 forestry harvest blocks
- 2000/05 Forest Management Plan.
- Previous survey results for each plot (total number of moose).
- Areas of dense road networks
- Hunted vs unhunted areas
- The amount of water within the plot
- FRI information (hardwood stands versus predominantly conifer stands)

*note – a computer program called OWHAM (Ontario Wildlife Habitat Assessment Model) is sometimes used by moose managers to help stratify moose habitat. This program was not used because it was not available at the time of survey planning.

Moose survey methodology includes a minimum of two density strata to accurately calculate the density of moose per stratum type. Based on the aforementioned sources of information, all 281 plots within the park were ranked. Table 1 shows the number of plots assigned to each of the stratum for both the hunted and unhunted portions of Algonquin Park (WMU 51).

Table 1. Plot Stratification for the entire park (WMU 51)

	High	Medium	Low	Total
WMU 51 – unhunted area				
Number of Plots	47	70	38	155
Total Area (km2)	1175	1750	950	3875
WMU 51 – hunt area				
Number of Plots	5	32	89	126
Total Area (km2)	125	800	2225	3150
Total WMU 51				
Number of Plots	52	102	127	281
Total Area (km2)	1300	2550	3175	7025

2.3
Plot Selection:

Plots to be flown during the 2006 survey were randomly selected. Even though the park was initially allocated only 20 plots under the provincial system, it seemed likely that based on the size of the WMU and past survey results that the park would qualify for the maximum number of plots (40). Consequently, 40 plots were selected.

The number of plots selected from each stratum was based on the provincial recommendation of 50% high density plots, and remaining 50% medium and low density plots. Thus, 20 high density, 10 medium and 10 low density plots were chosen.

As plots were completed, data was entered into MAI Desktop Version 2.1. This program, based on stratum variability, calculated where effort should be directed for the remaining plots to be flown. After 27 plots were completed, MAI Desktop showed that no more high density plots needed to be flown, and that our effort should concentrate the medium and low density plots which showed the greatest variability. Consequently, 3 more medium density and 2 more low density plots were randomly picked, and the remaining 5 high density plots were dropped.

3.0
Flights:

As predicted, a total of 40 plots were completed for the park. The MAI for WMU 51 covered 12 flying days starting on January 10 and finishing on February 27, 2006. And MNR Bell-Long Ranger, OFI, was used for the entire survey, with a total of 4 MNR pilots. Flights either originated at Clarke Lake or Smoke Lake depending on the plot locations. A fuel cache of 5 fuel drums was located at Lake Travers to reduced fuel shuttle time. Most fuelling occurred at Smoke Lake, with three fill ups at the Pembroke airport.

3.1
Participants

Sixteen participants attended the park training session on December 13. Two additional participants with previous MAI experience were added to the flight roster in January. Table 2 lists the fliers that were placed on the MAI schedule, including 7 First Nations participants (2 ANTC and 5 Pikwakaganan), 9 Parks Staff, 1 Friends of Algonquin staff member, and 1 individual from the Wildlife Research Station. Volunteer agreements were signed by all non-MNR participants. First Nations volunteers were given priority in scheduling and flew on two occasions.

Table 2. MAI Participants and Their Affiliation

Stakeholders	Melissa Pessendawatch	Pikwakaganan
	Lois Lavalley	Pikwakaganan
	Dale Benoit-Zohr	Pikwakaganan
	Valerie Smitt	Pikwakaganan
	John Paul Kohoko	Pikwakaganan
	Bob Craftchick	Whitney
	Randy Malcolm	ANTC
Ontario Parks Staff	Elizabeth Francis	MNR
	John Swick	MNR
	Richard Szczygiel	MNR
	Tim Eastman	MNR
	Richard Shalla	MNR
	Brad Steinberg	MNR
	Paul Smith	MNR
	Dave Smith	MNR
	Mike Dumouchel	MNR
Other	Paul Gelok	Wildlife Research Station
	Alison Lake	Friends of Algonquin Park

3.2
Navigation:

The MNR's Visual Navigation Program (VNP) program was used for the first time in an Algonquin Park MAI. The computer was plugged into the aircraft power inverter. A handheld Garmin 76S GPS unit was plugged into the computer's HyperTerminal which receives the NMEA string of output through the serial cable from the GPS unit to the laptop. The VNP program plots the aircraft location leaving a breadcrumb trail on the screen as it moves towards the plot. Once on plot, the program tracks the aircraft location as it moves through the 5 transects. Other NRVIS layers such as the park boundary and water layer were used as background data on the screen. As moose aggregates, moose tracks and other wildlife were seen on plot, waypoints were taken and marked on the screen. This facilitated the location of previously spotted moose, areas previously circled without a moose association, and determination of on/off plot status of all sightings.

3.3
Total Number of Plots by Strata:

Algonquin Park has a total of 281 plots based on the provincial protocol. Each plot is 25km^2 in area. The total area of plots with the park represents 7025 km^2. Forty plots were completed in the park, with one plot being resurveyed at the end. Of these 40 plots, 15 were high density plots, 13 were medium density plots, and 12 were low density plots. These plots were flown between January 10 and February 27, 2006.

Table 3. Total WMU area, stratified area and total # plots flown in each stratum.

	Total Area	Total # Plots	# Plots Flown
High Density	1300	52	15
Medium Density	2550	102	13
Low Density	3175	127	12
Total	7025	281	40

The greatest number of plots completed in one flying day was 6 low density plots. The average amount of time spent on plot was 55 minutes. Most plots were completed between 10:00 and 14:00 as per the protocol. The longest plot took 1:37 to complete (high density plot: 22 moose), with the shortest taking 0:32 (low density: 1 moose).

4.0
Survey Results:

A total of 320 moose were observed on 40 plots. This included 101 bulls, 167 cows and 38 calves. Raw Data and MAI Desktop summary is available in Appendix 1.

Data was analysed using MAI Desktop 2.1 and yielded the following:
* note – these tables include missed aggregates – where fresh moose tracks were seen but the actual moose was not.

Table 4 Total Population and Confidence Intervals

Population	Lower 90% CI (23%)	Upper 90% CI (23%)
2084	1605	2563

Table 5: Moose Population – Hunted Area

	# of Strata	Area within strata	Moose/km^2	Total Moose/ Strata
High Density	5	125 km^2	0.55	69
Medium Density	32	800 km^2	0.33	264
Low Density	89	2225 km^2	0.16	356
Total	126	3150 km^2		689

Table 6: Hunted Area Population and Confidence Intervals

Population	Lower 90% CI (23%)	Upper 90% CI (23%)
689	531	847

5.0
Population Dynamics for Algonquin Park

The MAI Desktop program analyses the moose population dynamics based on the number of bulls, cows and calves recorded. The total number of moose (including bulls,

cows and calves) was 320 animals. This included 101 bulls, 167 cows and 38 calves. Eleven unsexed adults were observed, and 3 unknown were observed (not confirmed as adults). The percent population of Bulls is 33%, percent population of cows is 54%, and percent population of calves is 12%. These values in 2003 were 35% Bulls, 52% Cows, and 13% Calves. (note: percentages may not = 100% because of rounding)

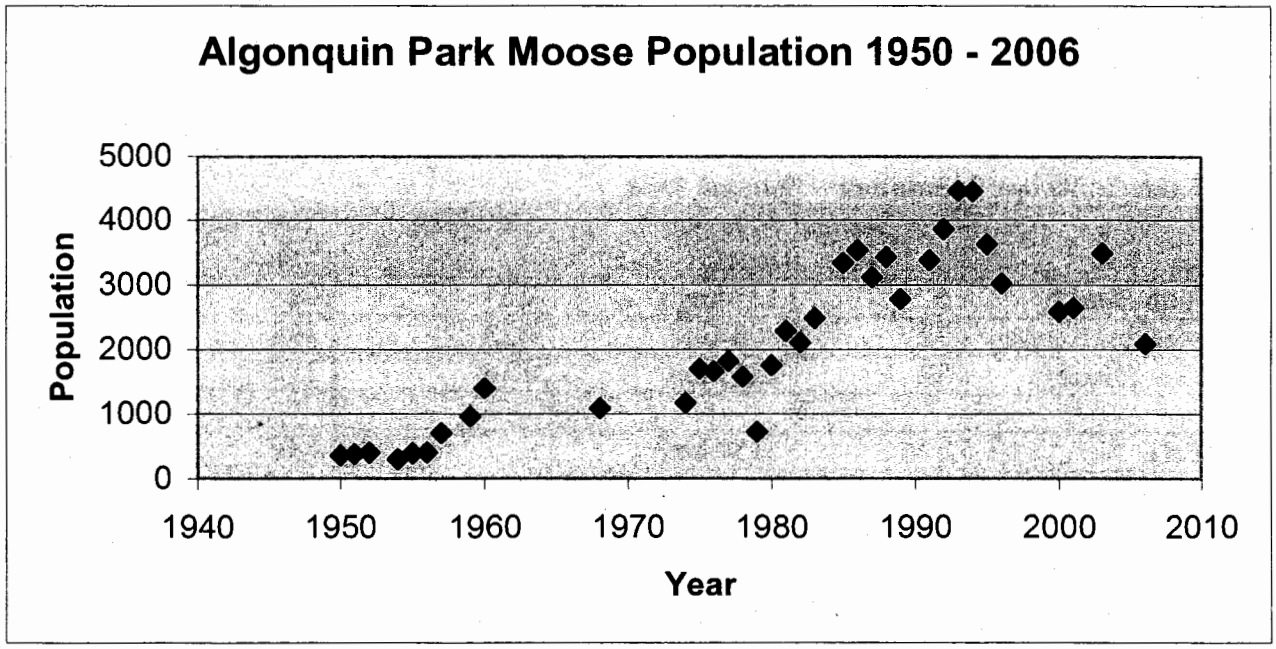
The cows per bull ratio is 1.7: 1. The calves per 100 cows ratio is 20.*

Note – a cow/calf ratio of 20/100 is considered low. This is lower than the cow/calf ratio in 2003 which was 25/100. This can be interpreted as low recruitment into the population. With potential of spring mortality due to ticks this number may go even lower.

6.0
Population Trends

Results from the 2006 Moose Aerial Inventory show that the moose population in Algonquin Park is lower than previous years. Table 8 shows the moose population from 1950 to present, based on historical data.

Table 7: Algonquin Park Moose Population 1950 - 2006



7.0
Harvesting Objectives

The mid-winter population is used when calculating harvest targets for a moose population. For the Hunted side of Algonquin Park, the mid winter population was calculated at 689 moose (can be rounded to 700 moose).

Moose managers across North America set harvest rates based on a percentage of the mid winter population. These percentages generally range from 3% to 16% based on the objective.

If the objective is to grow the moose herd, a percent harvest of 8% or lower is applied.

If the objective is to keep the population at the same level, a percent harvest of 10% is usually applied.

If a population is growing and is at or above its target, a higher percentage harvest can be applied.

8.0
Immigration

The hunted side of Algonquin lies adjacent to an unhunted moose population (the un-hunted west side of Algonquin Park). This population acts as a source, with moose migrating from the unhunted area into the hunted area. In general, hunted areas adjacent to unhunted areas can harvest a higher percentage of the mid-winter population because of immigration. This is true for the hunted area of Algonquin Park.

9.0
Summary

Overall the 2006 Algonquin Moose Aerial Inventory was a success. Change was initiated in a number of areas, namely the stratification of moose habitat and use of random plot selection. This makes the MAI for WMU 51 consistent with the survey methodology used in the rest of Ontario. The population of moose is lower, both in the unhunted and hunted portions of Algonquin Park. The reasons for this population decline are unclear, but possible culprits include predation, winter tick, a series of hot summers, and climate change. A major study of moose, that is currently underway, will give greater understanding of survival and immigration of moose in and around Algonquin Park.

First Nations participation in the Moose Aerial Inventory was greater this year than in years past, with a total of 5 attending the training session, and an additional two being added to the roster later on. Due to scheduling difficulties, only two First Nations individuals actually flew, (16% of flights), however, we hope that this will increase in future inventories.

10.0
Acknowledgements:

The following people lent their time, expertise and advice to the 2006 Algonquin Moose Aerial Inventory, and deserve thanks:

Cathy Pordonick, Marie Shalla, and Teri Frey for Flightwatch.

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WMU 51

2006 Moose Aerial Inventory

WMU characteristics

Stratum Description	Stratum Code	Area (km2)	Number of Plots in Stratum	Plots Flown
High Density	1	1300	52	15
Medium Density	2	2550	102	13
Low Density	3	3175	127	12
WMU Total		7025	281	

Survey data

Date	Plot ID	Stratum Code	Bulls	Cows	Calves	Unsexed	Unknown	Total	Groups	Track Aggregates	Plot Order
10-Jan-06	QA2902	3	0	1	0	0	0	1	1	0	1
10-Jan-06	PA7403	1	9	12	5	0	0	26	13	0	2
15-Jan-06	QA1903	3	0	0	0	0	0	0	0	0	1
15-Jan-06	QA1702	1	0	3	0	1	0	4	2	0	2
15-Jan-06	QA0501	2	2	3	1	0	0	6	5	0	3
15-Jan-06	PA9501	1	2	5	3	1	0	11	8	2	4
16-Jan-06	QA1603	1	2	6	2	0	0	10	5	0	1
16-Jan-06	QA0603	3	0	0	0	0	0	0	0	2	2
16-Jan-06	QA1701	3	0	5	1	0	0	6	3	0	3
16-Jan-06	QA0701	3	2	9	3	0	2	16	7	0	4
23-Jan-06	TF6804	2	0	0	0	0	1	1	1	1	1
23-Jan-06	TF6604	2	0	0	0	0	0	0	0	1	2
23-Jan-06	TF7603	2	7	6	0	1	0	14	5	1	3
26-Jan-06	TF8802	2	0	0	0	0	0	0	0	0	1
26-Jan-06	QA2701	3	1	0	0	0	0	1	1	1	2
26-Jan-06	QA1803	3	1	0	0	0	0	1	1	0	3
26-Jan-06	QA0904	1	6	3	0	0	0	9	3	0	4
27-Jan-06	QA0304	1	6	8	3	0	0	17	8	0	1
27-Jan-06	QA0302	1	8	4	0	0	0	12	5	2	2
27-Jan-06	QA0301	1	8	7	0	0	0	15	4	1	3
7-Feb-06	PA9302	1	4	13	3	1	0	21	12	2	1
7-Feb-06	PA6603	1	2	7	2	0	0	11	7	3	2
8-Feb-06	PA6702	1	4	5	1	0	0	10	9	1	1
8-Feb-06	PA6703	1	5	6	3	0	0	14	10	2	2
8-Feb-06	PA6803	1	4	16	1	1	0	22	13	1	3
9-Feb-06	PA7904	2	10	12	0	1	0	23	7	0	1
9-Feb-06	PA8802	2	2	7	2	0	0	11	6	2	2
18-Feb-06	PA9904	3	1	0	0	0	0	1	1	0	1
18-Feb-06	QB1001	3	0	1	0	0	0	1	1	1	2
18-Feb-06	TF9704	3	2	3	1	0	0	6	4	0	3
18-Feb-06	TF9701	3	0	1	1	1	0	3	2	0	4
18-Feb-06	TF7804	2	2	8	2	0	0	12	7	0	5
18-Feb-06	TF7604	3	4	1	0	1	0	6	3	0	6
24-Feb-06	QA0704	2	1	2	0	0	0	3	2	0	1
24-Feb-06	QA0804	3	0	1	0	2	0	3	3	0	2
24-Feb-06	QA1801	3	0	0	0	0	0	0	0	0	3
24-Feb-06	PA8804	2	4	1	0	1	0	6	3	0	4
27-Feb-06	PA9901	2	1	4	1	0	0	6	2	1	1
27-Feb-06	PB8004	2	0	2	1	0	0	3	3	0	2
27-Feb-06	PA6901	2	1	5	1	0	0	7	4	2	3