2019 Winter Cougar Season Quota Updates

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Introduction

The success of a big game management strategy relies on a process that iteratively monitors, evaluates, and adjusts the strategy based on how it is performing to meet management goals and objectives (Fryxell et al. 2014). This process, commonly referred to as *Adaptive Management* (Walters 1986), is the framework of the current Management Plan for Cougars in Alberta (ESRD 2012; Plan) and has been guiding cougar management since 2011.

Based on a reassessment of cougar abundance in Alberta (Table 1), consultation with the Alberta Tree Hound Association (ATHA), early results from the Cougar Adaptive Management Project (CAMP), and recently published cougar research (Logan 2019, Beausoleil et al. 2013), Alberta Environment and Parks (AEP) has reduced quotas in some cougar management areas (CMAs) for the 2019 winter cougar season (Table 2). The objective of these changes is to stabilize the population at an older age structure (Beausoleil et al. 2013, Cooley et al. 2009). There is an emerging body of literature that suggests an older age structure in cougar populations leads to a more socially stable population resulting in fewer incidents of human cougar conflict (Teichman et al. 2016, Beausoleil et al. 2013, Cooley et al. 2009, Robinson et al. 2008). Using an adaptive management approach, AEP will continue to monitor human caused cougar mortality under the new quotas and assess if the response we see follows those proposed by the social stability hypothesis (Teichman et al. 2016, Beausoleil et al. 2013, Cooley et al. 2009, Robinson et al. 2008).

This report describes the process used to update the provincial cougar estimate and how the updated abundance estimate guided changes to the quota.

Management Framework

The Plan (ESRD 2012) identifies four primary goals;

1) Manage cougars to ensure no significant population decline,
2) Provide non-consumptive and consumptive recreational opportunities for resident Albertans and non-residents,
3) Minimize property damage and other hazards to humans, and

4) Learn about the cougar population in Alberta and communicate those learnings to Albertans.

Each goal includes a number of objectives that are intended to ensure the goal is met. The following objectives are of particular interest to harvest management:

a) Maintain a viable population of at least 1,500 cougars on provincial lands,

b) Allow a maximum human-caused mortality rate of not more than 20 per cent of the provincial cougar population estimate.

Abundance Estimate

Central to sustainable harvest of wildlife populations is an initial abundance estimate (Taylor et al. 2008). From this starting point models and calculations can be developed to inform the sustainability of harvest rates (Fryxell et al. 2014). Cougar abundance is difficult and costly to estimate (Beausoleil et al. 2013). As such, in Alberta we use averaged densities based on the best available information (i.e., research, literature, local knowledge) applied to know cougar habitat to produce an estimate (Beausoleil et al. 2013). The provincial cougar abundance estimate of approximately 2,051 individuals reported in the Plan (ESRD 2012) was generated this way.

2012 Abundance Estimate

To inform the Plan, AEP looked at research from radio telemetry studies in Alberta and local knowledge to generate a range of estimated cougar densities that were applied to each of the 32 cougar management areas (CMAs) or National and Provincial Parks (protected areas). Density estimates ranged from 0.2 cougars per 100 km^2 in northern Alberta to 4 cougars per 100 km^2 in the southwest. These densities were applied to the total area of each CMA or protected areas, regardless of the amount of cougar habitat in the target area. There was a conservative estimate of 100 cougars outside of the CMAs and protected areas added to the total (ESRD 2012). While

the estimate of 2,051 cougars is rough, it has been a guide for managers that is based in the best available scientific and expert information.

2019 Abundance Estimate

After the 2018 winter cougar season, concern of harvest rates resulting in a truncated (low) age structure in the cougar population were raised by the ATHA. At a meeting with the AHTA and the Minister of Environment and Parks, managers committed to evaluate recent harvest data and adjust cougar quotas where warranted.

An update to the provincial cougar population estimate was a logical starting point to consider updating harvest quotas. The first step in updating the abundance estimate was to limit the spatial extent to which density was applied to include actual cougar habitat (Beausoleil et al. 2013). Cougar habitat was estimated by extrapolating habitat use patterns of 79 individuals collared as part of the CAMP study. This process resulted in 143,164 km^2 of the 175,465 km^2 in CMAs and protected areas being designated cougar habitat (Table 1). The same density estimates for each CMA that was used to calculate the 2012 abundance were applied to the estimate of cougar habitat in each CMA and protected area. As was done in 2012, the conservative estimate of 100 animals living outside of CMAs was used. The sum for all areas is approximately 1,559 cougars in Alberta (Table 1); a reduction of 493 animals from the 2012 estimate (Table 1).

Adult Estimate 2019

An additional step taken for the 2019 abundance update was to estimate the number of adults in the population (Table 1). Beausoleil et al. (2013) calculated an adult density of 1.7 per 100 km^2 as part of their research in Washington. In CMAs and protected areas with densities similar to Washington, a density of 1.7 adult cougars per 100 km^2 was used to estimate adult abundance. Knopff (2010) estimated 1.1 adult cougars per 100 km^2 in west central Alberta, so in CMAs and protected areas with similar density to Knopff's study area, a density of 1.1 per 100 km^2 was used to estimate the number of adults. These two adult densities were applied to CMAs 1-17 & 21.

Using this calculation, the proportion of adults in the total abundance estimate for those 18 CMAs ranged from 42.5 to 56.7 with an average of 48 per cent.

For those CMAs (18-20 & 22-32) and protected areas with an estimated total density below that of Knopff (2010) or Beausoleil et al. (2013), the average of 48 per cent of the total population was used to estimate the number of adult cougars in the unit. Based on dispersal ecology, all 100 cats estimated to be living outside of CMAs and protected areas were placed in the adult age class. These calculations resulted in an estimated 795 adult cougars in Alberta (Table 1).

Harvest Evaluation

The Plan describes general harvest objectives in a source, stable, and sink zone management system with prescriptions for each zone based on the proportion of females and average age of males in the harvest. While soundly based in theory, AEP attempted to apply this strategy to harvest data from 2011 to 2014 seasons and found several shortcomings that prevented application. The main issues were that Alberta implements a sex selective harvest which predetermines the proportion of females in the harvest (one metric of successful management). Additionally, the sample sizes for age of male cougars was too low to provide meaningful input to our analysis of mean age. This realization lead to the initiation of the CAMP in spring of 2016 with an objective of providing additional Alberta specific data to guide cougar management. Early results have been incorporated here and the project and analysis are ongoing.

While a complete evaluation of cougar harvest under the 2012 Plan is in process as part of the CAMP study, Table 2 in this report presents relevant data that were used to guide quota updates in some CMAs for the 2019 winter cougar season. The 2019 quotas incorporate the idea presented in recent publications suggesting that high harvest can lead to high rates of human-cougar conflict (Teichman et al. 2016, Beausoleil et al. 2013, Cooley et al. 2009, Robinson et al. 2008) and that managing for adult harvest less than or equal to the population growth rate will produce an older and more stable age structure in the population (Beausoleil et al. 2013). The 2018 quotas were assessed against the estimated adult population in each CMA and adjusted toward 14 per cent for 2019, as discussed in the harvest allocation section below. CMAs 11, 12,

and 21 are the ongoing CAMP study area and for consistency for the study, quotas there were not changed for the 2019 season.

When considering the updated provincial cougar population estimate relative to the management objective of maintaining a viable population of at least 1,500 cougars on provincial lands, we are doing well. Likewise, the 3-year average total HCM is 14.6 per cent of the total population of approximately 1,559 (Table 2). In some CMAs the HCM is above 20 per cent of the estimated population in the unit, while in others it is less than that. Variability in proportion of the population harvested is the nature of the source, stability, and sink zone management strategy. The important point is that the total HCM is less than 20 per cent of the provincial population estimate as an objective presented in the Plan.

Harvest Allocation

Beausoleil et al. (2013) suggest that harvesting adult cougars at or near the population growth rate, in their case 14 per cent, should balance immigration and emigration between CMAs and help to stabilize the cougar age structure and densities. The density estimate analysis portion of the CAMP has yet to be completed, so for this harvest assessment the intrinsic growth rate of 14 per cent that was measured in Washington by Beausoleil et al. (2013) was used as our target harvest rate with the objective of stabilizing densities and age structure. In those CMAs that are being managed as sinks, the quota may exceed 14 per cent (Table 2).

Adaptive Management

As part of the CAMP, a more robust analysis of Alberta's cause specific cougar mortality will be conducted after the 2019 winter cougar season which is the final year of the high harvest manipulation in CMA 21. Results from that analysis may be used to adjust quotas again in the future. Additionally, AEP will continue monitoring HCM and analyze the relationship between sources of mortality and harvest rates, which may also be used to guide future quota adjustments and to test the social stability hypothesis.

Table 1. Cougar abundance estimate for Alberta based on extrapolations of reported and estimated densities in cougar management areas and protected areas. The 2012 estimate is based on the total area while the 2019 estimate is based on habitat area. The 2019 adult estimate was based on 1.7 and 1.1 adult cougars/100 km^2 reported in areas of similar density. Where density was less than that reported, an average proportion of 48 per cent adults was used.

CMA	Area km^2	Habitat km^2	Cougars/100 km^2	Abundance Estimates		
				2012	2019	2019 AD
1	1,129	626	4.0	45	25	11
2	1,911	1,559	3.5	67	55	26
3	2,562	2,315	3.5	90	81	39
4	3,663	1,558	4.0	147	62	26
5	2,915	2,394	3.5	102	84	41
6	1,098	748	3.5	38	26	13
7	2,823	1,194	4.0	113	48	20
8	2,780	1,778	3.0	83	53	30
9	2,030	1,480	3.0	61	44	25
10	4,338	2,195	3.0	65	33	15
11	3,162	2,731	2.5	79	68	30
12	4,861	4,834	2.5	122	121	53
13	2,000	1,655	2.0	40	33	18
14	1,693	1,237	1.5	25	19	9
15	1,989	1,663	2.0	40	33	16
16	3,994	3,515	1.5	60	53	25
17	2,236	2,163	1.5	34	32	15
18	6,768	5,625	0.5	34	28	14

19	7,268	7,268	0.5	36	36	17
20	4,551	1,779	0.5	23	9	4
21	7,557	5,525	1.5	113	83	39
22	6,192	5,956	1.0	62	60	29
23	8,816	8,084	1.0	88	81	39
24	8,062	7,981	0.5	40	40	19
25	10,585	10,025	0.2	21	20	10
26	2,514	2,514	0.5	13	13	6
27	3,831	3,621	0.5	19	18	9
28	6,526	6,526	0.5	33	33	16
29	4,837	1,890	0.5	24	9	5
30	6,945	5,525	0.2	14	11	5
31	9,777	9,458	0.2	20	19	90
32	15,743	15,574	0.2	31	31	15
P&P[1]	20,330	12,168	~1.0	170	98	49
Outside[2]	-	-	-	-	-	100
Totals	**172485**	**142,164**	**-**	**2,051**	**1,559**	**795**

1. Parks and protected areas
2. Outside of CMAs

Table 2. Cougar quotas in Alberta cougar management areas (CMAs) for the 2018 and 2019 seasons, management zone, and the 3-year average for both quota take and all sources of human caused mortality (HCM). The percent of estimated adult population for quotas and quota take and the percent of total population estimate for all HCM are in parentheses (% Ad, % Total).

CMA	Quota (% Ad) 2018	2019	Zone	3-Year Annual Average Quota Take (%Ad)	All HCM (%Total)
1	6 (56.4)	3 (28.3)	Sink	3.3 (31.3)	5.3 (21.3)
2	7 (26.4)	4 (15.1)	Stable	5.7 (21.4)	10.3 (20.0)
3	7 (17.8)	5 (12.7)	Stable	7.0 (17.8)	13.7 (16.9)
4	6 (22.7)	4 (15.1)	Stable	5.7 (21.4)	11.7 (18.8)
5	7 (17.2)	6 (14.7)	Stable	3.7 (9.0)	7.3 (8.7)
6	2 (15.7)	2 (15.7)	Stable	0.3 (2.6)	1.0 (3.8)
7	8 (39.4)	6 (29.6)	Stable	6.7 (32.8)	15.0 (31.3)
8	6 (19.9)	4 (13.2)	Stable	7.3 (24.3)	11.3 (21.4)
9	7 (27.8)	3 (11.9)	Stable	9.3 (57.3)	11.3 (25.8)
10	10 (41.4)	3 (12.4)	Sink	8.7 (35.9)	13.3 (40.4)
11	7 (23.3)	7 (23.3)	Stable	7.7 (25.5)	12.3 (18.1)
12	6 (11.3)	6 (11.3)	Stable	5.7 (10.7)	8.0 (6.6)
13	5 (2.7)	3 (16.5)	Source	4.3 (23.8)	6.0 (18.2)
14	2 (14.7)	2 (14.7)	Source	1.0 (7.3)	1.3 (7.0)
15	2 (12.5)	2 (12.5)	Source	1.3 (8.4)	2.7 (8.1)
16	3 (12.2)	3 (12.2)	Source	0.7 (2.7)	0.7 (1.3)

17	4 (26.4)	3 (19.8)	Stable	1.3 (8.8)	5.3 (16.7)
18	2 (14.8)	2 (14.8)	Source	0.3 (2.5)	1.3 (7.1)
19	3 (17.2)	2 (11.5)	Stable	1.7 (9.6)	3.7 (10.2)
20	6 (140.5)	2 (46.8)	Sink	4.0 (93.7)	4.7 (51.9)
21	18 (46.5)	18 (46.5)	Stable	10.3 (26.7)	23.3 (28.1)
22	4 (14.0)	4 (14.0)	Stable	4.0 (14.0)	8.3 (13.9)
23	6 (15.5)	5 (12.9)	Stable	6.0 (15.5)	12.7 (15.6)
24	3 (15.7)	3 (15.7)	Stable	2.7 (13.9)	5.3 (13.3)
25	3 (29.5)	3 (29.5)	Stable	2.0 (20.8)	4.3 (21.7)
26	4 (66.3)	4 (66.3)	Sink	0.7 (11.0)	1.0 (7.7)
27	2 (23.0)	2 (23.0)	Stable	1.0 (11.5)	1.7 (9.3)
28	6 (38.3)	4 (25.5)	Sink	1.0 (6.4)	1.7 (5.1)
29	6 (132.3)	2 (44.1)	Sink	3.7 (80.8)	5.7 (63.0)
30	3 (57.8)	2 (38.5)	Stable	1.3 (25.7)	2.3 (21.2)
31	3 (33.7)	2 (22.5)	Stable	0.0 (0.0)	1.0 (5.3)
32	3 (20.5)	2 (13.7)	Stable	0.0 (0.0)	0.7 (2.2)
Outside	0 (0.0)	0 (0.0)	NA	0.0 (0.0)	17.7 (17.7)
Total	**167**	**123**		**118.4**	**227.2**

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