HUNTER AND TOURIST OUTFITTER PREFERENCES FOR REGULATING MOOSE HUNTING IN NORTHEASTERN ONTARIO

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ABSTRACT: It is important for managers to understand preferences of moose (*Alces alces*) hunters and other stakeholders regarding options for harvest management. We determined harvest preferences of resident moose hunters and tourist outfitters in 2013 in northeastern Ontario, Canada through surveys that provided 5 management options. We tested 2 hypotheses: 1) that moose hunters will support options that are least impactful to them, and 2) that tourist outfitters will support restrictive calf harvest regulations more than resident hunters. We found little support for the first hypothesis as resident hunters and tourist outfitters ranked the status quo as the second least and least preferable option, respectively. Resident hunters and tourist outfitters preferred shortened seasons for adult moose and less than a week long season for calves that would result in major departure from the status quo. We contend that this support arises because the hunters and outfitters are responding to the expectation of increased opportunities to hunt adult moose if they accept more restrictive regulations. Consistent with the second hypothesis, tourist outfitters preferred options focused on restricting calf hunting opportunities more than resident hunters because clientele of tourist outfitters generally have low demand for calf hunts. Resident hunters from areas where adult moose hunting opportunities were scarcer were surprisingly, less supportive than other hunters of change from an open to controlled hunt for calf moose. Individuals in both groups that responded by mail, versus online, had stronger support for the status quo.

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Of the many stressors that impact moose (*Alces alces*) populations, managers are often best capable of controlling mortality attributed to licensed hunting. This fact encourages managers to understand not only the biological consequences of management actions, but also the impact that such actions have on licensed hunters (Ericsson 2003, Hunt 2013). For example, while several different types of regulations can achieve the same level of harvest, some regulations are more preferable to hunters. Thus, information about moose hunter preferences for regulations can help managers select more desirable (or less undesirable) paths for management while achieving biological objectives.

Harvest strategy has a prominent role in moose population management, with hunters managed through either direct or indirect controls on harvest. The selective harvest system (SHS) that places hard limits on the maximum number of harvested bull and/or cow moose provides direct control. These limits often vary among management units and require hunters to obtain a special license or tag. Regulations that provide indirect control over moose harvest typically alter harvest efficiency and/or hunter effort. For example,

the timing and season length can limit hunting effort and regulations governing permitted firearms, equipment, and party hunting can limit hunter effectiveness and harvest.

Here we report results from a 2013 survey of moose hunters and tourist outfitters in northeastern Ontario, Canada to identify support for different suites of direct and indirect controls on harvest. We focus on 12 wildlife management units (WMUs) in this area that have been characterized by low calf recruitment since 2002 as documented through mid-winter aerial inventories, hunter post card surveys, and low calf hunter success rates (unpublished data, Ontario Ministry of Natural Resources [OMNR]). Nine WMUs had a population density near or below the desired ecological minimum of 20 moose/100 km^2 (OMNR 2009a), and calves represented 43% of the resident moose harvest from 2008 to 2012 (unpublished data, OMNR). It is suspected that the population decline was primarily caused by high calf harvest (*sensu* Patterson et al. 2013) and cumulative effects of stressors such as morbidity and mortality from parasites including the winter tick (*Dermacentor albipictus*) (Rempel 2011). For these reasons, there was interest in understanding moose hunter and tourist outfitter support for different harvest strategy options.

While many studies have evaluated trade-offs that moose hunters make when deciding where and how often to hunt (e.g., Boxall and MacNab 2000, Bottan et al. 2003), trade-offs have not been identified when evaluating support for different options for managing moose hunting. We expected that providing supplemental information that makes such trade-offs evident to hunters would better allow hunters and outfitters to evaluate their preferences regarding regulations, contingent upon achieving expected future improvements in terms of licenses available to hunt adult moose.

We developed 2 hypotheses to predict how moose hunters and tourist outfitters would prefer different sets of options. First, consistent with the view that individuals holding pro-hunting beliefs focus on wildlife for human use (Fulton et al. 1996, Teel and Manfredo 2009), moose hunters will prefer options that are least impactful to their behaviours. Thus, when evaluating more restrictive regulations than the status quo, moose hunters should be reluctant to support regulations other than the status quo (Decker et al. 1996). For example, Sigouin et al. (1999) noted that a greater share of Quebec resident moose hunters rated the status quo (non-selective harvest hunt) as making an enjoyable hunting experience when compared to 4 different scenarios limiting or prohibiting cow moose harvest. Status quo support, however, can be significantly lessened if hunters believe that a new management option will provide a positive future benefit to moose populations and, in turn, greater moose abundance for hunters (Courtois and Lamontange 1999). Besides the status quo, hunters should prefer options requiring only slight modification to their behaviours such as changes to the length of the season.

Second, tourist outfitters will generally be more supportive of restrictive regulations on calf harvest than would resident moose hunters. Given that most clients of tourist outfitters do not target calf moose when hunting[1], outfitters should view regulations that restrict calf moose hunting more positively than resident moose hunters.

We conducted a further set of analyses focused on the influence of context on the support for management options. In one instance, we compared support for management options among individuals hunting in

[1]From unpublished survey data collected between 2008 and 2012 by the OMNRF within the WMUs under study. Of all moose harvested by tourist outfitters only 5.5% were calves, whereas for resident hunters, 43% were calves.

areas with large variability in the odds of obtaining a special license or tag required to hunt for adult moose. This comparison provides information about how the scarcity of tags can influence hunter support for different harvest strategy options. For example, as tags become scarcer, hunters should exhibit less support for the status quo than for options that increase the availability of tags. We also evaluated whether the response mode (i.e., online versus mail) influenced support for the options to help managers better understand and interpret public input. Many wildlife management agencies are contemplating collecting survey data exclusively with online methods, yet collecting online data can be problematic (Duda and Nobile 2010).

STUDY AREA

The study area included 12 WMUs (28, 29, 31, 32, 35, 36, 37, 38, 39, 40, 41, and 42) in northeastern Ontario, Canada (Fig. 1) that are part of Cervid Ecological Zones (CEZ) C2 and D2 and represent a substantial portion of the core moose range in the province (see OMNR 2009b for details on CEZs). The 12 WMUs were governed by the same set of moose hunting regulations in 2013 that included 1) a gun hunt conducted from the Saturday nearest October 8 until November 15, and 2) a bow hunt conducted 3 weeks prior to the gun hunt. A 2013 resident license to hunt moose authorized the holder to hunt for calf moose in all WMUs in the study area. A 2013 resident license to hunt moose and an Adult Validation Tag (AVT)

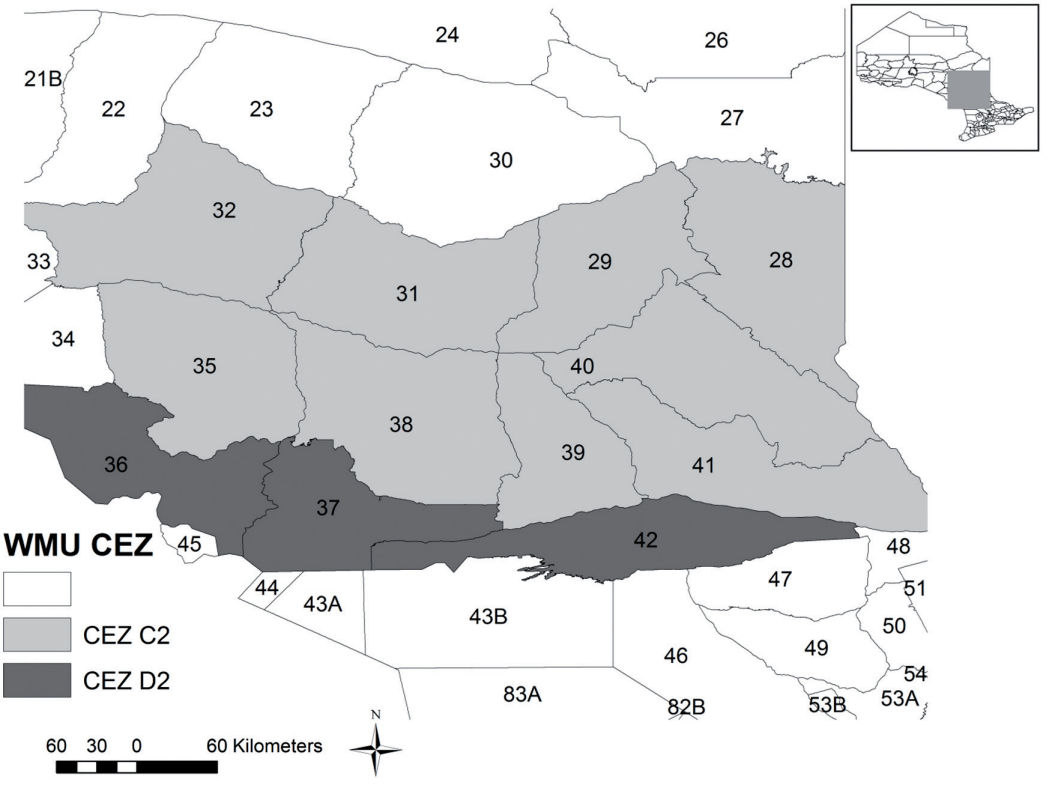

Fig. 1. Wildlife Management Units (WMUs) within the study area; study WMUs were associated with Cervid Ecological Zones (CEZ) C2 and D2 in the Northeast Region in northeastern Ontario.

authorized the holder to hunt for either a bull or cow moose, as specified on the AVT in the WMU and under the conditions specified on the tag. Party hunting for moose is legal as long as the applicable rules are adhered to under the Fish and Wildlife Conservation Act, 1997, Ontario Regulation 665/98, Part III, Hunting in a Party.

Applying to the Resident Moose Draw for an AVT requires a hunter to select a preferred (Choice 1) WMU and season (i.e., bow or gun hunt). About 32% of all Ontarians applying to this draw selected one of the 12 WMUs as their Choice 1 WMU. In 2012, 1,886 AVTs were available for the 31,449 individuals applying to the draw in these units (unpublished data, OMNR). The ratios of applicants to AVTs were 15:1 and 37:1 in 2012 for CEZs C2 and D2, respectively. From other research data about moose hunters in these WMUs, it was estimated that hunters were predominantly 40-69 year-old males who had hunted for 20 years, and ~9 days in 2012. Further, these hunters stated that the availability of an AVT was the most important factor influencing where they hunted, and most hunted between October 6 and November 2 (Hunt 2014). A total of 163 tourist outfitters catering to moose hunters were operating in 2012, and their allocation of AVTs was in addition to the 1,886 AVTs available for resident hunters.

METHODS

In 2013 surveys were developed to explore preferences of resident hunters and tourist outfitters for different harvest strategy options to hunt moose. Resident moose hunters were defined as those individuals who applied as a Choice 1 applicant in the 2012 resident draw for an AVT in one of the 12 WMUs in the study area (Fig. 1). A total of 5,229 individuals were selected to receive the resident hunter survey. To permit analyses at the CEZ and WMU scales, respondents were stratified by their Choice 1 WMU before the random selection (i.e., 1/6th of Choice 1 applicants were randomly selected for each WMU). We mailed a survey to all 163 tourist outfitters.

The survey process included up to 2 potential contacts for both groups. Sampled individuals were contacted by mail in late March 2013 and were requested to complete the survey either online or by mail; no return postage was provided to encourage online submissions. Unfortunately, some individuals experienced difficulty completing the survey online because they failed to use the correct web address and could not access the survey through a search engine. All mailed survey packages included a unique identification number for each potential respondent. Individuals not completing the survey before 17 May received a second mail contact encouraging their submission by 7 June. We accepted completed surveys on-line or by mail until 12 July 2013.

The survey contained a single question that asked individuals to rank 5 options by their preference for managing moose populations (Table 1). The options included the STATUS QUO and 4 choices that altered the total length of the hunting season, a calf validation tag system, and a shortened calf hunting season. All options were plausible based on directives from the moose harvest management guidelines (OMNR 2009c). The END EARLY option reduced the gun season by 15 days, and the 14D GUN option provided 14-day archery and gun seasons. The 6D CALF option combined a 6-day calf hunt with a 42-43 day adult moose season. The CALF TAG option required hunters to obtain a calf validation tag through a draw system in a given WMU, with no change in the length of any season.

Supplemental information was provided in the survey that described the challenges of managing moose populations over the past decade and the possible outcomes from adopting each season option. These outcomes

Table 1. Presented harvest strategy options for moose management in northeastern Ontario, Canada.

Label	Specific option
STATUS QUO	Keep moose harvest management the same (manage by altering adult validation tags)
CALF TAG	same current seasons; calf harvest restricted through resident moose draw for WMU-specific calf validation tags
END EARLY	reduce gun season by 15 days with last day October 31, same opening dates
6D CALF	21-day archery season and 21-22 day gun season, same opening dates for adult moose; calf hunting allowed only for 6 days corresponding with the moose gun season south of French-Mattawa Rivers
14D GUN	14-day archery season and 14-day gun season

Table 2. Supplemental information provided with the survey to identify potential increases in tag allocations for each harvest option.

Option	Total # of days (resident moose seasons)	Potential % increase to Resident Gun AVTs	Potential % increase to Tourist Outfitter Moose Tags
STATUS QUO	57 to 63 d	0	0
CALF TAG	57 to 63 d	36	33
END EARLY	42 to 47 d	21	17
6D CALF	42 to 43 d; 6 d calf hunt	41	37
14D GUN	28 d	21	17

were based on a moose population maintenance perspective for the WMUs, and trade-offs were communicated in terms of increased availability of AVTs for resident hunters and tourist outfitters given the anticipated reduction in calf and adult moose harvest for each option (Table 2). The trade-offs were assessed by analyzing the temporal distribution of reported harvest by WMU and sector over the period 2000-2009. The temporal distribution of the calf harvest was 0.8% in September, 79.7% in October with the majority in the first 2 weeks of the gun season, and 19.5% in November. Resident hunters accounted for 99.2% of calf harvest over this period.

The supplemental information for the 5 options was aggregated for the 12 WMUs and provided with the survey (Table 2). To develop this information, several assumptions were invoked. First, the WMU-specific calf validation tag option had a planned cap of 25% of the total harvest. Second, for the shortened season ending 31 October, we assumed that the past proportion of November-harvested calves would not be harvested in this shortened season. Third, for the shortened season ending 31 October with the 6-day gun calf hunt (which would overlap the Southern Region gun moose hunt), we assumed that the proportion of November-harvested calves would be saved from harvest and that 2/3 of the current October calf harvest would be met in this 6-day gun calf hunt. Fourth, for the 14-day archery and gun hunts, we assumed that the proportion of November-harvested calves would be saved from harvest and that 100% of the current October calf harvest would still occur. Fifth, for the 3 options with shortened seasons, we assumed that the AVT tag fill rates for adult moose would decline equal to the corresponding adult harvest that occurs in November, with the exception of WMU 28 where AVT

tag fill rates would not change. Finally, all other harvest planning parameters remained constant (e.g., harvest rates, bull:cow ratios, proportional sector allocations).

Individuals ranked all 5 options from 1 to 5 where 1 was the most preferred and 5 was the least preferred option. When an individual ranked all options but did not follow the instruction of using each rank only once, we allowed ties among options and recoded the original ranks such that ranks were compatible with surveys completed correctly. For example, if an individual gave 2 options a rank of 5, these 2 options were recoded with a rank of 4.5; this approach ensured that the sum of ranks equaled 15 in each survey. Another tendency was that some supporters of the STATUS QUO option failed to rank any other option. To avoid underestimating support for STATUS QUO, we accepted these responses and ranked all other options of equal preference (i.e., 3.5).

The rank data were analyzed with 2 approaches. First, the non-parametric Friedman and Wilcoxon-sign tests were conducted to assess whether differences in ranks (preference) existed among the options, and then to identify differences between options. A Bonferroni correction for the number of pairwise corrections was made to the probabilities estimated from the Wilcoxon-sign tests (i.e., a significant difference was based on $P < 0.005$ rather than $P < 0.05$ because of the 10 pairwise-combinations among the 5 options). Second, for any single option and different groups of respondents, mean ranks between the groups were assessed with an independent samples *t*-test; where necessary, correction was made to the *t*-values for unequal variances between samples. While the rank data for the groups were discrete, it is common practice to analyze this type of survey data with parametric tests for assessing statistical inferences (Vaske 2008).

The hypotheses were tested by examining support among options and between respondents from resident hunters and tourist outfitters. Hypothesis 1 focused on whether support for the STATUS QUO was greatest, and for the other options, whether support for END EARLY was next most preferred. Hypothesis 2 focused on the role of the CALF TAG and if it was less preferred by tourist outfitters than resident hunters owing to the lower harvest of calf moose by tourists. The effect of context was examined by 1) comparing responses of individuals completing the survey online versus by mail, and 2) for resident hunters, CEZ C2 and D2 as defined by the Choice 1 WMU. All analyses were conducted with R (R Core Team 2015) with null hypothesis testing and significance at $P < 0.05$ except when adjusted for multiple comparisons.

We assessed non-response bias by testing whether early and late responders to the survey differed in their support for options by assuming that late responders would be more like non-responders than would early responders (Miller and Smith 1983). Late responders were defined as individuals responding 5 weeks after the initial distribution of the survey.

RESULTS

A total of 2,507 resident moose hunters and 108 tourist outfitters completed at least part of the survey. After accounting for undeliverable mail addresses, the response rate was 48.9% for resident hunters and 68.8% for tourist outfitters; late responders represented 27% and 29% of these groups, respectively. Proportionally, online surveys represented 43% of resident hunter and 34% of tourist outfitter responses. Differences (Friedman test, $P < 0.05$) in the ranks of the 5 options were found in all WMUs except #37 (Table 3).

Rank preferences of the 5 options by resident moose hunters were different ($\chi^2 = 375.3$,

Table 3. Mean ranks for 5 harvest strategy options by resident moose hunters' Choice 1 Wildlife Management Unit (WMU), 2013. Ranks range from 1 (most preferred) to 5 (least preferred). * signifies difference (Friedman test, $P < 0.05$) among the ranks of options for a WMU.

WMU	STATUS QUO	CALF TAG	END EARLY	6D CALF	14D GUN
28*	3.12	2.99	2.65	2.76	3.48
29*	3.48	3.00	2.67	2.69	3.17
31*	3.02	3.13	2.46	2.90	3.49
32*	3.50	2.57	2.89	2.48	3.56
35*	2.93	3.04	2.78	2.73	3.52
36*	2.98	3.26	2.08	3.17	3.52
37	3.17	3.24	2.77	2.67	3.15
38*	3.08	2.95	2.67	2.74	3.56
39*	2.84	3.20	2.71	2.73	3.53
40*	3.43	2.87	2.67	2.64	3.39
41*	3.20	3.31	2.58	2.78	3.14
42*	3.29	3.19	2.59	2.79	3.14

df = 4, $P < 0.001$). The 6D CALF and END EARLY options were ranked higher than the other options. The CALF TAG and STATUS QUO options were third and fourth ranked, and the 14D GUN option was lowest ranked (Table 4, Fig. 2). The top 3 options (6D CALF, END EARLY, CALF TAG) garnered similar support when combining the top 2 ranks (most or second most preferred), although the CALF TAG option had a higher percentage indicating it was the least preferred option. Similarly, despite ~20% ranking the STATUS QUO option as most preferred, a large percentage rated it least preferred.

While the ranks also differed among the options for the tourist outfitters ($\chi^2 = 78.9$, df = 4, $P < 0.001$), fewer pairwise differences were identified (Fig. 3). No significant differences were found among the comparisons of the 6D CALF, END EARLY, and CALF TAG options. The same negative response pattern by resident hunters for the CALF TAG option was also found for tourist outfitters. As with resident hunters, the STATUS QUO option was ranked the least preferred option by the majority (~60%) of tourist outfitters.

Certain significant differences existed between resident hunters and tourist outfitters in their mean ranks of the 5 options (Table 5). Tourist outfitters preferred the CALF TAG and 6D CALF options more than resident

Table 4. Unadjusted significance probabilities from Wilcoxon pairwise statistical tests of ranks for harvest strategy options by northeastern Ontario resident licensed hunters and tourist outfitters in 2013 (C2, D2 – hunters with choice 1 WMU in Cervid Ecological Zones C2 and D2, respectively).

Option 1	Option 2	Resident	Tourist	Resident C2	Resident D2
END EARLY	6D CALF	0.021	0.115	0.097	0.033
END EARLY	CALF TAG	<0.001**[1]	0.527	<0.001**[1]	<0.001**[1]
END EARLY	STATUS QUO	<0.001**[1]	<0.001**[1]	<0.001**[1]	<0.001**[1]
END EARLY	14D GUN	<0.001**[1]	<0.001**[1]	<0.001**[1]	<0.001**[1]
6D CALF	CALF TAG	<0.001**[1]	0.019	<0.001**[1]	<0.001**[1]
6D CALF	STATUS QUO	<0.001**[1]	<0.001**[1]	<0.001**[1]	<0.001**[1]
6D CALF	14D GUN	<0.001**[1]	<0.001**[1]	<0.001**[1]	<0.001**[1]
CALF TAG	STATUS QUO	0.006*[1]	<0.001**[1]	0.003**[1]	0.943
CALF TAG	14D GUN	<0.001**[1]	0.009*[1]	<0.001**[1]	0.924
STATUS QUO	14D GUN	<0.001**[1]	<0.001**[2]	0.004**[1]	0.896

[1, 2] indicates the option with the higher mean rank
* P < 0.10 (Bonferonni-adjusted probability)
** P < 0.05 (Bonferonni-adjusted probability)

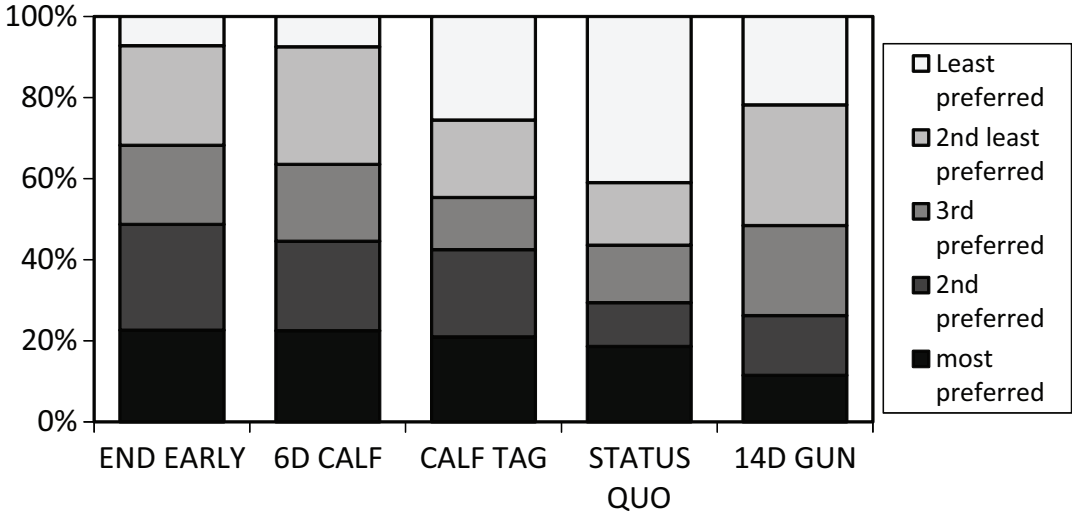

Fig. 2. Rank preferences of resident hunters to 5 harvest management options in a moose harvest survey in northeastern Ontario, 2013.

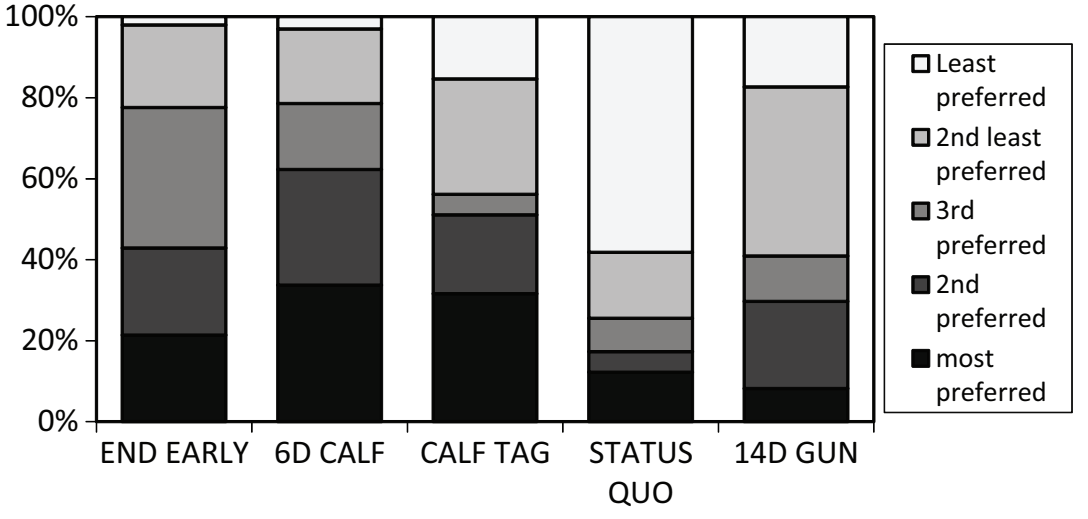

Fig. 3. Rank preferences of tourist outfitters to 5 harvest management options in a moose harvest survey in northeastern Ontario, 2013.

hunters, whereas resident hunters preferred the STATUS QUO option more than tourist outfitters, although it was the least preferred option of both groups.

Resident hunters in C2 and D2 ranked the options differently (χ^2 = 340.2, df = 4, $P < 0.001$; χ^2 = 45.0, df = 4, $P < 0.001$, respectively; Table 5). Those associated with C2 preferred the CALF TAG and were less supportive of the 14D GUN option than those associated with D2 (Table 5). No other differences between the groups were found in rankings of the STATUS QUO, END EARLY, and 6D CALF options.

Resident hunters responding by mail were more supportive than online respondents for the STATUS QUO, and less supportive of the END EARLY and 6D CALF options (Table 6). Similarly, the STATUS QUO option received higher support from tourist outfitters

Table 5. Results from pairwise comparisons of mean ranks between resident hunters and tourist outfitters and resident hunters applying to Cervid Ecological Zones (CEZ) C2 and D2 in 2013 (Note: ranks range from 1 to 5 with 1 being most preferred).

Option	Resident hunter	Tourist outfitter	*t*-test (*t*, df, P)	CEZ C2	CEZ D2	*t*-test (*t*, df, P)
END EARLY	2.65	2.61	(0.34, 108, 0.735)	2.66	2.58	(1.12, 369, 0.263)
6D CALF	2.73	2.29	(2.73, 106, <0.001)	2.72	2.80	(−1.06, 371, 0.290)
CALF TAG	3.05	2.73	(2.15, 105, 0.034)	3.03	3.21	(−2.08, 375, 0.039)
STATUS QUO	3.20	4.01	(−5.90, 109, <0.001)	3.19	3.23	(−0.32, 374, 0.749)
14D GUN	3.37	3.36	(0.04, 106, 0.971)	3.39	3.18	(2.80, 373, 0.005)

responding by mail. No other significant differences were found for the other options.

For all respondents, ~60% completed the questionnaire correctly (i.e., assigned each rank once and ranked all options). The remaining respondents either ranked each option but used the same rank value more than once (~27%), provided an incomplete set of ranks (~10%), or ranked the STATUS QUO option as most preferred without ranking the other options (~3%). By including these additional responses in the analysis, support increased for the STATUS QUO option for both resident hunters and tourist outfitters ($t = -12.32$, df = ~1771, $P < 0.001$ and $t = -3.35$, df = ~109, $P = 0.002$ for resident hunters and tourist outfitters, respectively). Conversely, it led to reduced support for the 6D CALF hunt option in both groups ($t = 8.31$, df = ~1951, $P < 0.001$ and $t = 1.95$, df = ~58, $P = 0.056$ for resident hunters and tourist outfitters, respectively), and less support for the END EARLY option by resident hunters ($t = 8.31$, df = ~1951.4, $P < 0.001$). We report results from the full data set as we believe it best describes the relative support of the 5 options by both groups.

The results were potentially compromised by non-response bias owing to the fact that many hunters and tourist outfitters did not complete the survey. The STATUS QUO

Table 6. Results from pairwise comparisons of mean ranks between resident hunters and tourist outfitters in 2013 by mode of survey completion (Note: ranks range from 1 to 5 with 1 being most preferred).

Option	Online	Mail	*t*-value	Df	P
Resident hunters					
END EARLY	2.74	2.51	4.86	2005	<0.001
6D CALF	2.81	2.63	3.54	1912	<0.001
CALF TAG	3.04	3.08	−0.63	1820	0.529
STATUS QUO	3.06	3.40	−5.17	1973	<0.001
14D GUN	3.35	3.39	−0.69	1862	0.492
Tourist outfitters					
END EARLY	2.56	2.72	−0.74	66	0.459
6D CALF	2.35	2.16	0.78	62	0.438
CALF TAG	2.89	2.41	1.52	60	0.134
STATUS QUO	3.77	4.50	−2.89	79	0.005
14D GUN	3.43	3.22	0.87	63	0.389

option was more preferred by the late (mean rank = 3.71) than early (mean rank = 4.13) responding resident hunters (t = 3.85, df = ~1102, $P < 0.001$). No other pairwise difference among the options was found in either group.

DISCUSSION

The results provided little support for the first hypothesis that respondents should generally prefer the STATUS QUO and options that result in least impact to hunter behaviours. The weak support for the STATUS QUO option and strong support for the 6D CALF hunt option suggested that hunters, and to a greater extent tourist outfitters, were generally willing to move to a system away from the STATUS QUO. The strong support for the 15-day reduction to the moose hunting season (END EARLY) was consistent with this hypothesis as <20% of resident hunters in these WMUs hunted after 1 November (Hunt 2014).

Explaining why support for the STATUS QUO was less than expected is difficult. Perhaps it was the expectation of future benefits in terms of increased AVTs by accepting other options (Table 2). This would be consistent with choice model studies that illustrate how trade-offs influence hunter selection of hunting sites (e.g., Boxall and MacNab 2000, Bottan et al. 2003). Unexpectedly, however, the value of increased AVTs was not influenced by the scarcity of AVTs because applicants to CEZ C2, where tags were relatively more plentiful than in D2, were not more supportive of the STATUS QUO option than applicants to D2. This choice contrasts with previous information that indicated hunters placed greater value on tags in WMUs where tag availability was scarce (Hunt 2013).

Another possible explanation for the lack of support for the STATUS QUO option is that hunters were responding more in the interest of moose rather than themselves. Individuals are characterized by value orientations ranging from mutualism to domination. Mutualism value would focus more on respect for moose regardless of their value to people, whereas domination value would focus on the human benefit derived from moose (Teel and Manfredo 2009). Pro-hunting beliefs are closely aligned with a domination orientation (Fulton et al. 1996, Teel and Manfredo 2009). Furthermore, satisfaction with wildlife management depends on hunting success (Miller and Graefe 2010) suggesting that management views of hunters are domination-oriented. Finally, in a survey conducted simultaneously, strong support was found for the STATUS QUO option among moose hunters (Hunt 2013). The primary difference in ranking options between these surveys was the provision of information (this study) relating to future AVT benefits to hunters by adopting other options. It follows that the lack of support for the STATUS QUO option was related to future, expected benefits for hunting moose.

Many hunters, however, are concerned about moose regardless of hunting opportunities. For example, Fulton and Hundertmark (2004) found strong support for a selective harvest system among Alaskan hunters; ~2/3 recognized benefits of the system for moose and <1/2 recognized benefits for hunters. Our different conclusion is probably related to our maintaining, not increasing moose populations, suggesting that hunters might only respond to benefits to moose in terms of increased recruitment of calves. Given this perspective, the hunter support and preference for harvest options were largely self-serving.

The results generally supported the second hypothesis that tourist outfitters would prefer more restrictive options than resident hunters, especially with regard to hunting calves. Tourist outfitters preferred the CALF TAG and 6D CALF options more than resident hunters, whereas resident hunters were more supportive of the STATUS QUO option. Given that most tourist outfitters cater to clients hunting adult moose, the benefits

of reduced calf harvest through shortened seasons and a tag draw system may have been more appealing to outfitters. This is consistent with the idea that hunters and tourist outfitters exhibit a domination value orientation that encourages support for options that increase hunting opportunity.

Context also affected support for the options as notable differences in ranks were found between online and mail respondents. Mail respondents in both groups had higher support than online respondents for the STATUS QUO option, and online resident hunters ranked the END EARLY and 6D CALF options higher than mail respondents. That responses may differ between online and conventional mail surveys is certainly not novel (e.g., Duda and Nobile 2010), but our data indicate the potential for bias by using a single survey response mode.

Our non-response test revealed an important difference between early and late responding hunters in that late responding hunters were more supportive of the STATUS QUO option. Consequently, our sample might underestimate support for this option, although this underestimation was qualitatively unimportant in affecting our conclusions. Even if we adjusted for non-response bias in resident hunters, the STATUS QUO option remained the second least supported option. The potential underestimation of support for the STATUS QUO option strongly influenced our decision to use information from all surveys with ranked options, rather than only those surveys completed correctly. Had we excluded the responses from the "incorrect surveys", the STATUS QUO option would have been ranked last and, we believe not reflective of the moose hunter population.

Our study illustrates an effective approach to measure support and preferences of hunters and other stakeholders with respect to options for managing moose. Importantly, the data were not supportive of one of our original hypotheses and point to the complexity of survey construction, interpretation, and potential bias. We hope that other researchers will build upon our survey methodology and embrace the importance of enabling respondents to consider trade-offs when assessing preference or support for management options (Cornicelli et al. 2011). Otherwise, support will probably be biased upwardly for status quo management programs despite options that provide positive future outcomes for moose and moose hunters.

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