Response to Joly et al. (2006), A Reevaluation of Caribou Distribution Near an Oilfield Road on Alaska’s North Slope

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Abstract
Joly et al. (2006) critically reviewed our paper (Noel et al. 2004) describing caribou (Rangifer tarandus) distribution data in relation to an oilfield road in Alaska, USA. Their review focused on 4 primary points: 1) we concluded there were no adverse impacts to caribou distribution, 2) we failed to discuss data that revealed caribou abandoned the study area following additional development of gravel roads and pads, 3) we failed to consider expanding infrastructure and some surveys, and 4) our conclusions contradict others’ findings. We did not draw conclusions, but rather presented our data and analyses and discussed possible explanations for our observations. We presented all of the original data showing a decline in caribou use of the area during calving and discussed potential influential factors. We discussed our method and rationale for the focus of our analysis on displacement from the Milne Point Road in order to replicate methods used in an earlier study. The fourth point reflects that we simply had different results from those of other studies. (WILDLIFE SOCIETY BULLETIN 34(3):870–873; 2006)

Key words
Alaska, caribou, North Slope, Rangifer tarandus.

We appreciate Joly et al.’s (2006) reading our paper (Noel et al. 2004) and reevaluating it. We value informed scientific discourse, recognition of the uncertainty of scientific research, and providing sound information to resource managers. In this response we first provide a brief background of the research related to the issue of caribou and Alaska, USA, oilfields to give the reader perspective. We then respond to specific comments by Joly et al. (2006).

Summary of Relevant Alaska Oilfield–Caribou Research
Dau and Cameron (1986) and Cameron et al. (1992) compared density of calving caribou before and after construction of an oilfield road near Prudhoe Bay, Alaska, USA. They showed statistically significant lower density of calving caribou within 0–1 km and significantly higher density of calving caribou 5–6 km from the Milne Point oilfield road after its construction in 1981–1982. These authors interpreted these densities as the result of displacement caused by the road.

As development progressed in the 1980s to 1990s, the number of caribou calving in the oilfield areas, including our study area at Milne Point, declined (Murphy and Lawhead 2000, Wolfe 2000, Cameron et al. 2002, 2005, National Research Council [NRC] 2003). Some authors interpreted this decline as a calving-range shift attributable to oilfield disturbance and loss of habitat (Wolfe 2000, Cameron et al. 2002, 2005, NRC 2003). Although oilfield effects cannot be ruled out in the Milne Point area, other authors have documented shifts in calving ranges where no disturbance or habitat loss was implicated (Gunn and Irvine 2003, Hinkes et al. 2005).

The research reported in our paper involved repeating the study of Cameron et al. (1992) in the same study area during 1991–2001 (Noel et al. 2004). We compared caribou densities and numbers in 6 1-km-distance intervals from the Milne Point Road over 3 time periods: the 2 time periods used by Cameron et al. (1992) that were designated “pre-road” and “early post-road” periods, and the 1991–2001 period designated as the “recent post-road period.” We evaluated these data using 3 analytical techniques: Student’s t-test of densities as completed by Cameron et al. (1992), Poisson regression of densities, and habitat use–availability of counts. Our results suggested that there was no consistent influence of the road on caribou distribution within the study area during the calving or post-calving periods. The data set illustrates the dynamic nature of caribou distributions during the calving and post-calving periods, as well as an overall decline over time in numbers of caribou during calving in the study area.

From the start of oilfield development and operation in the mid-1970s to 2002, the Central Arctic caribou herd (CAH), which uses ranges in and around the oil fields, grew from approximately 5,000 to 32,000 animals. This increase has been documented during photographic censuses and has been cited as evidence of successful achievement of the dual management objectives of oil production and maintenance of a wildlife population (Cronin et al. 1997, 1998a,b, 2000, 2001). Others have concluded that this increase cannot be interpreted as a lack of negative impacts of the oilfields on the caribou herd in light of fluctuations in herd numbers, body condition, and parturition data (e.g., Cameron et al. 2002, 2005, NRC 2003).

Response to Joly et al. (2006)
The review by Joly et al. (2006) focused on 4 primary points: Noel et al. (2004) 1) claimed there were no adverse impacts to caribou distribution, 2) failed to discuss data that revealed caribou abandoned the study area following additional development of
gravel roads and pads, 3) failed to consider expanding infrastructure and some surveys, and 4) had conclusions that contradict others’ findings.

The first 2 points are inaccurate. We intentionally did not draw conclusions or claim there were no adverse impacts. Caribou were documented within the study area during calving and postcalving, and we presented the original data and discussed changes in the numbers of animals in the study area over time. The third point relates to our replication of the methods used in an earlier study, and the fourth point reflects that we simply had different results from those of other studies. We discuss these points below.

Point 1: Noel et al. (2004) Claims No Adverse Impacts to Caribou Distribution

Joly et al. (2006:866) state that “Noel et al. (2004) claimed that oil development on Alaska’s North Slope has not adversely affected caribou (Rangifer tarandus) distribution.” They go on to say, “The primary conclusion reached by Noel et al. (2004:757) was that ‘distributions of calves and adult caribou were not strongly influenced by presence of the road’” (Joly et al. 2006:866). Our paper did not claim that oil development has not adversely affected caribou distribution, nor did we draw any conclusions. We were careful to state our empirical result with a reasonable interpretation and not as a conclusion: “Analyses of relationships between calving and postcalving caribou densities and distance intervals from Milne Point Road suggested that distributions of calves and adult caribou were not strongly influenced by the presence of the road” (Noel et al. 2004:757; emphasis added).

With regard to the statistical analysis in our paper, Joly et al. (2006:866) “…argue that, in this case, a lack of statistical significance is not the same as lack of impact. Noel et al. (2004) used their finding of no statistically significant difference in density of caribou within 1 km of the road between pre-road (1978–1981) and recent post-road surveys (1991–2001) to support a conclusion that oilfield roads do not strongly influence the distribution of calves and adult caribou.” Furthermore, “although the central tenet of Noel et al. (2004) was that there are no statistically significant differences between caribou distribution in relation to the Milne Point Road prior to its construction and recent post-road surveys, we contend they failed to accurately discuss what their data actually did portray” (Joly et al. 2006:866). On the contrary, our paper does not make a general claim about whether or not oilfields displace caribou. Our purpose was to present the data and compare it with the original study. As a result, we presented data and analyses with reasonable interpretations after replicating a previous study (Cameron et al. 1992) of caribou distribution relative to this road.

Joly et al. (2006:866) claim that we “further imply that this new analysis refutes the Cameron et al. (1992) claim that oilfield development displaces caribou.” In our paper, we discussed the fact that our results may have differed from those of Cameron et al. (1992) because of habituation or other factors, and illustrated, with habitat use–availability analyses, that caribou distributions within this area were variable prior to and after construction of the Milne Point Road. Rather than refute the findings of Cameron et al. (1992), we added new data to complement the original study.

Point 2: Noel et al. (2004) Failed to Discuss Data that Revealed Caribou Largely Abandoned the Study Area Following this Development

In several places, Joly et al. (2006) misrepresent our paper: “our primary criticisms of that article are that the authors failed to . . . discuss data that revealed caribou largely abandoned their study area following this development” (Joly et al. 2006:866); and “we believe that the Noel et al. (2004) conclusion represents a potentially serious misinterpretation because they failed to . . . discuss the bulk of their results revealing an abandonment of the study area” (Joly et al. 2006:866). However, we presented, acknowledged, cited, and discussed the fact that our data were consistent with other studies showing the decrease in caribou numbers during calving in the Milne Point area over time. The Abstract states “the total number of calving caribou observed in the study area has declined since pre-road construction and early post-road periods…” (Noel et al. 2004:757). The Discussion points out that “another observation from our data is that numbers observed in surveys of the study area declined from a mean of 216 to 61 calves and from 521 to 192 total caribou between the pre-road and recent post-road periods. This is consistent with other observations of decreased use of the area during the calving period (Murphy and Lawhead 2000, Cameron et al. 2002, NRC 2003)” (Noel et al. 2004:766).

Joly et al. (2006) point out that our primary focus should have been on the changes in overall numbers of caribou in the study area during the calving period. “We believe it is possible that progressive development, which left areas more than 4 km from development in small, isolated fragments, may have contributed to caribou abandoning the study area” (Joly et al. 2006:866). “Our analysis of the Noel et al. data shows an overall gradual abandonment of the oilfield during calving and a drop in abundance of calving caribou” (Joly et al. 2006:866). However, our research objective, as well as that of Cameron et al. (1992), was to measure displacement of calving caribou and postcalving caribou away from the Milne Point Road.

In their comments, Joly et al. (2006) discuss a shift of calving to the south: “The major concentration of calving shifted to south of the oilfield, whereas such shifts in calving did not occur in the eastern portion of the Central Arctic Herd that was less affected by development” (Joly et al. 2006:866); and “…after 1987, there was a southward shift of the calving ground away from the oilfield study area” (Joly et al. 2006:868). However, we were not able to address the potential southward shift of the calving ground because we did not collect data outside of the Milne Point study area. We noted in our discussion that the decrease in numbers of caribou in the study area over time could be due to oilfield impacts. We also stated that there may be other influential factors and illustrated that timing of snowmelt may influence numbers of caribou during calving within this study area (Noel et al. 2004:760, fig. 2). Range shifts by caribou during calving without oilfields in their ranges have been documented (Hinkes et al. 2005 and references therein), as has timing of snowmelt (Whitten and Cameron 1985, Haskell 2003).

Point 3: Noel et al. (2004) Failed to Consider Expanding Infrastructure and Some Surveys

This point is made several times: “these new developments within the study area, though ignored by Noel et al. (2004), have changed
traffic patterns in the area and substantially increased the area affected by roads and pipelines” (Joly et al. 2006:866); and “we believe the Noel et al. (2004) failure to incorporate growing oil infrastructure in their analyses compromised the utility of their conclusions” (Joly et al. 2006:868). Although not described in Noel et al. (2004), we had previously evaluated caribou distributions in relation to new infrastructure in the Milne Point area during calving and postcalving. We chose not to include new infrastructure in the data analyses presented in Noel et al. (2004) because our intent was to replicate a previous study that included analysis of caribou distribution relative to the Milne Point Road. This road is the primary access road for the Milne Point oilfield and has more vehicle traffic than the access roads to the oil production pads. We cover this point in the text and in a figure (Noel et al. 2004:758, fig. 1). Our previous analyses, including new roads and pads, included areas beyond the boundaries presented in fig. 1 of Noel et al. (2004:758). These analyses indicated that caribou calving and postcalving distributions were highly variable within and among years and showed no consistent trend in decreased use of areas near new and old infrastructure nor increased use of areas away from infrastructure. With regard to the 6 of 13 surveys not used in our analysis, “we believe that the Noel et al. omission of 46% (6 of 13) of their survey results conceals more substantial declines in caribou numbers in the area” (Joly et al. 2006:868), these data were presented in appendices (Noel et al. 2004:768–771). Although not explicitly stated, fig. 3 of Noel et al. (2004:763) shows the mean value by interval for all recent post-road construction surveys (n = 13). We used one survey per year in our analyses because the previous study (Cameron et al. 1992) that we replicated did so. Our objective was to assess the distribution of caribou, and for each year we chose the survey with the largest number of animals (i.e., the largest sample size). Four of the 6 surveys not used in analyses but presented in appendices were completed prior to the 10–14 June period used in Cameron et al. (1992; Noel et al. 2004:768–769). Rather than considering that the data for more than one survey per year provided the valuable insight that caribou distribution changes daily and annually within this study area, Joly et al. (2006) consider that the additional survey data further supported their analysis that caribou use of the area during calving has declined beyond that reported by Noel et al. (2004). Additional surveys with fewer animals do not negate the presence of caribou in the surveys that were used in the analyses. Joly et al (2006:867 and fig. 2) consistently dismiss variability and statistical significance in distributions even as presented in Cameron et al. (1992) and Noel et al. (2004): “… but caribou abundance within 1–4 km of the road declined significantly and increased 4–6 km from the road (Fig. 2).” However, there were significant differences in caribou densities from pre-road to early post-road periods only for the 0–1-km and 5–6-km intervals (Cameron et al. 1992, Noel et al. 2004).


Joly et al. (2006) argue “that the Noel et al. (2004) conclusion contradicts a large series of investigations, most recently summarized in the reports from the National Research Council (NRC 2003), Cameron et al. (2005), and more importantly, their own data” (Joly et al. 2006:866). It is important to realize that our data differed from those of other studies and we gave possible explanations why. We believe scientists and land managers should consider and evaluate all data, even those that may be inconsistent with other studies.

**Discussion**

Joly et al. (2006) place primary importance on the decline over time in overall numbers in the study area during calving. However, this does not invalidate our objective to replicate the previous study focused on displacement away from the Milne Point Road. Joly et al. (2006) focused on the issue of changes in the numbers of animals in the area, but given the variability inherent in this relationship, attributing this decline in numbers of caribou solely to the single variable, gravel oilfield roads and pads, should be interpreted with caution. As noted above, we presented the decline in numbers in this area during the calving period and discussed potential causes. “Potential causes for lower numbers in the area during the calving period include a range shift away from the oil fields . . . or natural factors such as snowmelt timing . . . and rotational grazing to reduce parasite transmission” (Noel et al. 2004:766).

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**Literature Cited**


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