**Comments on the Marathon Gold Valentine Lake Project's Environmental Impact Statement: Relating to Fish and Wildlife and Mitigating the Effects on Area Caribou**

December 30, 2020

Brian McLaren[1] and Richard Huang[2]

## Preamble

Marathon Gold has provided an Environmental Impact Statement (EIS) on its proposed Valentine Gold Project in west-central Newfoundland that became available for public review and comment in November 2020. This public review is taking place as part of the consultations mandated by the Canadian *Environmental Assessment Act* and the Newfoundland and Labrador *Environmental Protection Act*. Comments made during public review are intended to assist the Ministers of government in decision-making on how approval for the undertaking might take place. The Valentine Gold Project starts with a construction phase of 18-24 months, followed by an estimated mine operation life of over 12 years, then a two-year site rehabilitation and closure period forecast for 2035-36, followed by a five-year commitment to post-closure monitoring.

Comments related to the disturbance to caribou that will occur throughout the construction, operation and closure periods of the Valentine Gold Project, over at least 15 years should it move forward as described, are the justifiable focus of this brief report on the fish and wildlife impacts described in the EIS. The report draws on caribou data obtained from the Newfoundland and Labrador Wildlife Division. The report illustrates a high level of concern that the EIS is underplaying the serious potential effect of the project particularly on the Buchans Plateau caribou herd, and to a lesser extent on the Grey River and La Poile caribou herds. Caribou, as acknowledged by the EIS authors, are an indicator species, responsive to the range of potential project impacts (from loss of habitat, to air and water contamination, to noise). Moreover, and also underplayed in the EIS, all caribou populations in Canada and the U.S. are experiencing declines, and outside of Newfoundland, *cumulative effects* on the stability of their populations have put most of the woodland caribou subspecies in either a threatened or an endangered status.

This report illustrates—with more detail than does the EIS—that most Buchans Plateau caribou females, either in their last term of pregnancy or with calf at heel, pass through an area that is within 6 km of the planned project site. They do so twice per year, and most do not choose alternate routes in successive years. (The pattern is created by the relatively narrow upland area between Valentine and Victoria lakes and the numerous surrounding wetlands that otherwise interrupt a straight path from the Buchans Plateau to the south coast.) Their relatively predictable behaviour during these fall and spring migrations was already interrupted during the construction of the Star Lake hydroelectric dam in 1997-99, and made narrower by the flooding of Star Lake and Victoria

[1] Associate Professor, Faculty of Natural Resources, Lakehead University, 955 Oliver Road, Thunder Bay, ON, P7B 1T4.
[2] Graduate Student, Environmental and Life Sciences, Trent University, 1600 West Bank Drive Peterborough, ON Canada, K9L 0G2.

Lake in 1968-69. These are *cumulative effects* that must be considered given this report's projected Valentine Lake mine disturbance area, a 6 km buffer, that is more realistic than the 0.5 km buffer drawn in the EIS, especially when calving caribou are at their most sensitive. This larger disturbance distance was illustrated amply by monitoring effects on the La Poile caribou herd when the Hope Brook Gold Mine was in construction and operation phases.

Another very important consideration, acknowledged in the EIS, is that observations and monitoring to date on environmental impacts to caribou in Newfoundland have largely occurred before the establishment of substantial coyote predation. Precarious declines in the Grey River and La Poile caribou herds, very likely as a result of the arrival of coyotes since around 2000, suggest that developing a gold mine in areas where females from these herds calve is once again equivalent to treading the dangerous waters of *cumulative effects*. (The arrival of coyotes to Newfoundland is ultimately a human-caused phenomenon, because their migration eastward was only possible after wolves were eradicated from eastern North America.) A key issue when considering *cumulative effects* on a large mammal like caribou is that they may only show up over generations. A commitment to monitoring and to adaptive management will be essential to any industrial developments in a land of declining caribou.

The proponent, Marathon Gold, lists in the EIS the importance of caribou to Indigenous people; from a Mi'kmaq point of view, the impact on caribou is especially serious, because of the cultural significance of caribou to Newfoundland Mi'kmaq and the already perilous state of the caribou. Three specific concerns were raised from consultations done for the EIS: (1, in consultation with Qalipu) on the project's decommissioning, rehabilitation and closure, (2, in consultation with Miawpukek) on the size of the project's footprint, and (3, in other consultations) on the potential long-term effects of the project on fish and wildlife.

**Cumulative effects and mitigation**

Before returning to caribou, three critical comments on the approach of the EIS relating generally to impact are warranted; they will be followed by a few comments on other wildlife (sections 8, 9, 10 and 12). First, mention is made of two other prior major impacts in the immediate region, but the reader is left to ponder their cumulative impacts in lieu of these being presented in a separate analytical section. Notably, (1) in 1968-69, the construction of the Victoria Dam reversed flows, drew down groundwater, raised the water level of Victoria Lake some 35 m, narrowed the Victoria River, and flooded over 12 $km^2$ of habitat; and (2) in 1997-99, the Star Lake hydroelectric project flooded an additional 15 $km^2$ of habitat in the same general project area. The region has sensitive wetlands and narrow routes for migration of caribou. The proposed loss of an additional 35 $km^2$ of habitat, plus the sensory disturbance and other impacts of the Valentine Lake project, should be put in the context of these *cumulative effects*.

A second criticism of the approach of the EIS: the post-shutdown vision beyond three years of monitoring during the closure phase lacks detail and often even mention. Again, context is key: the project proposal envisions 13 years of mine operation, but some long-term effects will be felt at least as long after closure. These latter effects suggest a plan is required over at least a decade to monitor, e.g., the leaching of any contaminants in slow-moving groundwater, revegetation of disturbed areas, and demographic effects on long-lived animals like caribou, for which behavioural

changes may imply modest short-term, but cumulative long-term effects on persistence. Third, and related to a call for long-term monitoring, the EIS misses an opportunity for adaptive management that, in fact, could document the success of some proposed novel mitigative measures.

**Concerns about effects on fish and fisheries**

The most serious potential effect on fish in the area appears to be groundwater contamination. It is impossible to understate the importance of continuous monitoring of mitigative measures to contain the effects of mine operations on groundwater, from sanding and plowing roads in winter, to in-stream work, to precipitation runoff from waste rock piles; monitoring these potential sources of harm must be taken seriously. It is appreciated that the proponent recognizes the potential harm from increased access to fisheries by anglers using the improved access road. Banning recreational fishing among workers at the worksite is appropriate near-term mitigation, but working with authorities and local stewards on limiting future access to avoid overfishing must be part of a longer-term mitigation. A third question related to fisheries: who will monitor the outcome of a goal for net gain of fish habitat as required by the *Fisheries Act*? For the EIS to lead to satisfactory outcomes on promised wetland restoration to this end, this goal of net habitat gain implies monitoring and rehabilitation beyond the three-year closure period.

Threats of invasive species, success in regenerating habitats, particularly wetland habitats, the loss of rare plants and waterfowl, and effects on other long-lived species, like bats, must be taken seriously. The sections of the EIS dealing with these ecosystem components are written comprehensively to show the extent of habitat loss, but are confused by the inclusion of many broad animal and plant surveys that are less pertinent than would be a detailed plan for on-site remediation of habitat, as well as a clear list of other mitigative measures related to negative impacts of road use and on-site and near-site activities. Mitigating the effects of machinery and noise in flagged sensitive areas should occur throughout the duration of mine operation and decommissioning, and not just during construction. (The list given of examples of flagged areas on page 9.54 includes wetlands, hibernacula, mineral licks, roosts, and caribou migration corridors.) Concerns about potential changes to flows in the Victoria Steadies Sensitive Wildlife Area seem to be downplayed on page 10.11, when these are real possibilities downstream of the proposed project area, where changes to groundwater flow are of course expected. Finally, it is a concern that up to six olive-sided flycatchers, a threatened species, were recorded in the project area in 2019 (page 10.21).

**Concerns about effects on caribou**

The EIS is quite clear on the paramount significance of the potential development impacts on the Buchans Plateau caribou herd, and to a lesser extent on three other herds (La Poile, Grey River, and Gaff Topsails). However, two important points need to be made here that implicate failures in the EIS and its background data analysis. The first is that, in addition to acknowledging the new complexities of environmental impacts with the establishment of coyotes as a major predator of caribou calves, the proponent needs also to recognize that the long-term implications are part of the *cumulative effects of past developments, plus the arrival of the coyote*. They will play out *over the long term* and via generations of changes to calf recruitment (Mahoney *et al.* 2016, Lewis *et al.* 2017). Dynamics by herd will differ, as the literature indicates: variable effects of predation

depend on weather (Bastille-Rousseau *et al.* 2015) and on changes to caribou behaviour with food limitation (Schaefer *et al.* 2016). The second point deserving mention involves the distance over which sensory disturbance will occur to caribou, to be discussed ahead.

On the first point, the EIS fails to present data on calf survival and recruitment in a manner to provide the reader a sense of future consequences. Accordingly, we have done so here, showing differences pre-and post-coyote establishment (Figure 1). *Marked declines in calf recruitment that begin around 2000 will add up.* The EIS itself (Table 11.5) points to an 8% decline from 2007-19 in the size of the Buchans Plateau herd, and a steady decline since 1991 in the Grey River herd size. The same table shows that these two herds account for over 20% of Newfoundland's caribou population. The Buchans Plateau herd accounts for about 14% of the Newfoundland population, *and most of these caribou migrate through a corridor of about 10-km width that includes the proposed project development site*. What do we expect in a future that subjects caribou together with a new predator and a new gold mine development, added to the lingering effects of two previous flooding projects? Those hydroelectric developments did not occur with a significant number of coyotes in the area. The likely added effect of coyote predation after 2000 is to approximately halve the ratios of calves to adult females in the La Poile, Grey River and Gaff Topsail caribou herds, as shown below, making the precariousness of these three herds to another mine development not as easily dismissed as the EIS authors seem to have done.

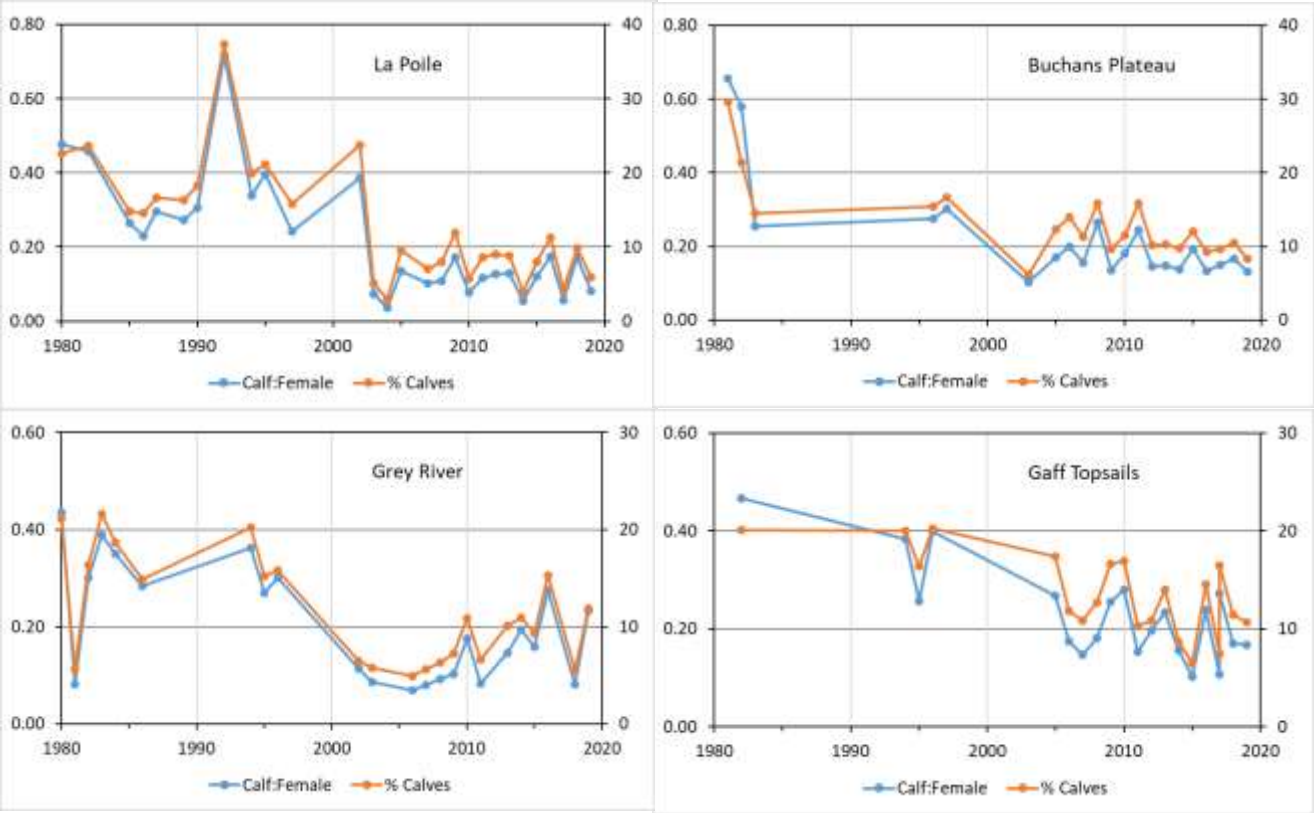


Figure 1. Caribou classification results between 1980 and 2019 for the La Poile, Grey River, Buchans Plateau and Gaff Topsail caribou herds from aerial caribou classification surveys conducted between September and December each year. Left axes are calf:female ratios and right axes are percent calves in the sample count. A minimum sample size of 200 animals for each herd is attempted. Source: Newfoundland and Labrador Wildlife Division.

To fill another gap related to understanding calf recruitment that has missed the EIS, and to supplement our point made in the illustration above, we present the same GPS collared data provided to the proponent from 2006-13 (see Table 11.2) on the four potentially affected caribou herds (Figure 1). Such collar data are sufficiently accurate to use to interpret the distance between successive GPS locations as a way (1) to distinguish non-parturient females (without calves) from parturient females (with calves), and (2) to determine which parturient females later lose their calf (DeMars *et al.* 2013). Doing this analysis for the period chosen by the proponent to encompass the sensitive pre-calving, calving and post-calving periods over the seven years, April 1 to August 31, we show the vulnerability of the La Poile and Grey River caribou herds in particular (Table 1).

Table 1. Birth rate and calf survival from tracking distances between successive GPS locations, as outlined in DeMars *et al.* (2013). Sample size is the total of the number of tracked caribou, at least 30 females in 2007 for each herd, each year from 2006-2012 (with the same female usually tracked more than one year). Calf survival is estimated to August 31 following DeMars *et al.* (2013), and further estimated to fall classification using the average calf:female estimates from the data shown in Figure 1 and comparing them to estimates from the GPS-collared data.

| **Caribou herd** | **Sample size** | **Birth rate** | **Calf survival** | | |
|---|---|---|---|---|---|
| | | | **Birth to August 31** | **Aug. 31 to fall classification** | **Birth to fall classification** |
| **La Poile** | 132 | 0.43 | 0.55 | 0.51 | 0.28 |
| **Grey River** | 145 | 0.44 | 0.56 | 0.41 | 0.23 |
| **Buchans Plateau** | 125 | 0.46 | 0.73 | 0.57 | 0.42 |
| **Gaff Topsails** | 129 | 0.58 | 0.64 | 0.54 | 0.36 |

Interpreting Table 1, we project that most of the La Poile and Grey River calves surviving to fall classification will also have to survive to the end of winter just to achieve sustainable populations; such winter survival is not a likely scenario given the vulnerability of caribou calves. The Buchans Plateau caribou herd has 'more to lose,' but how much more?

To have an answer returns us to the issue of sensory disturbance to all phases of activity at the proposed mine site and the distance over which its effects are felt by caribou (major issue 2 above). Reading Mahoney and Schaefer (2002) on VHF-collared Buchans Plateau caribou to show the effect of construction of the Star Lake Dam, and Weir *et al.* (2007) on aerial surveys of La Poile caribou during operation of the Hope Brook gold mine, we conclude that *3-4 km avoidance by caribou of sources of sensory disturbance the size of a gold mine is a year-round average*. Thus, a temporary loss of functional habitat will go considerably beyond the 0.5-km buffered area used in the EIS calculation of habitat loss (equivalent to 46 $km^2$ on and around the proposed Valentine Lake project area, or 163 $km^2$ including the access road). *We choose to work with the Weir et al. (2007) estimate of a 6-km buffered area during sensitive pre-calving, calving and post-calving periods*; the result is a loss of functional habitat of 416 $km^2$ for developing and operating the mine (299 $km^2$ around the mine site alone), over 2.5 times what is reported in the EIS using the smaller buffer (and *6.5 times the proposed disturbed area around the mine site alone, comparing the EIS*).

On the question of the effect of the disturbance itself, review of literature shows the matter is worse than a temporary loss of functional habitat. The start of fall and spring migrations was altered for the duration of construction for every collared caribou passing by the Star Lake Dam even once, and avoidance of the construction area continued for two years afterward: *sensory disturbance effects on caribou behaviour persist even if they are no longer near the disturbance.* Reading the outcomes in the much longer list of impact studies cited in Table 11.14 of the EIS, it is difficult for us to understand why the proponents are satisfied with an analysis and recommendations for mitigation based on a 500-m buffer around the proposed project site. To illustrate this point, we show the same collared caribou data used to calculate parturition and calf survival in Table 1 as a series of maps (Figure 2). Here, the number of cases (per year) of females passing through a 6-km buffered area *around the proposed project site just before calving or with calves at heel*: one collared from La Poile, six from the Grey River set (10% of the total calving) and *33 or 57% of the Buchans Plateau cases*, plus three more from the Gaff Topsails set.

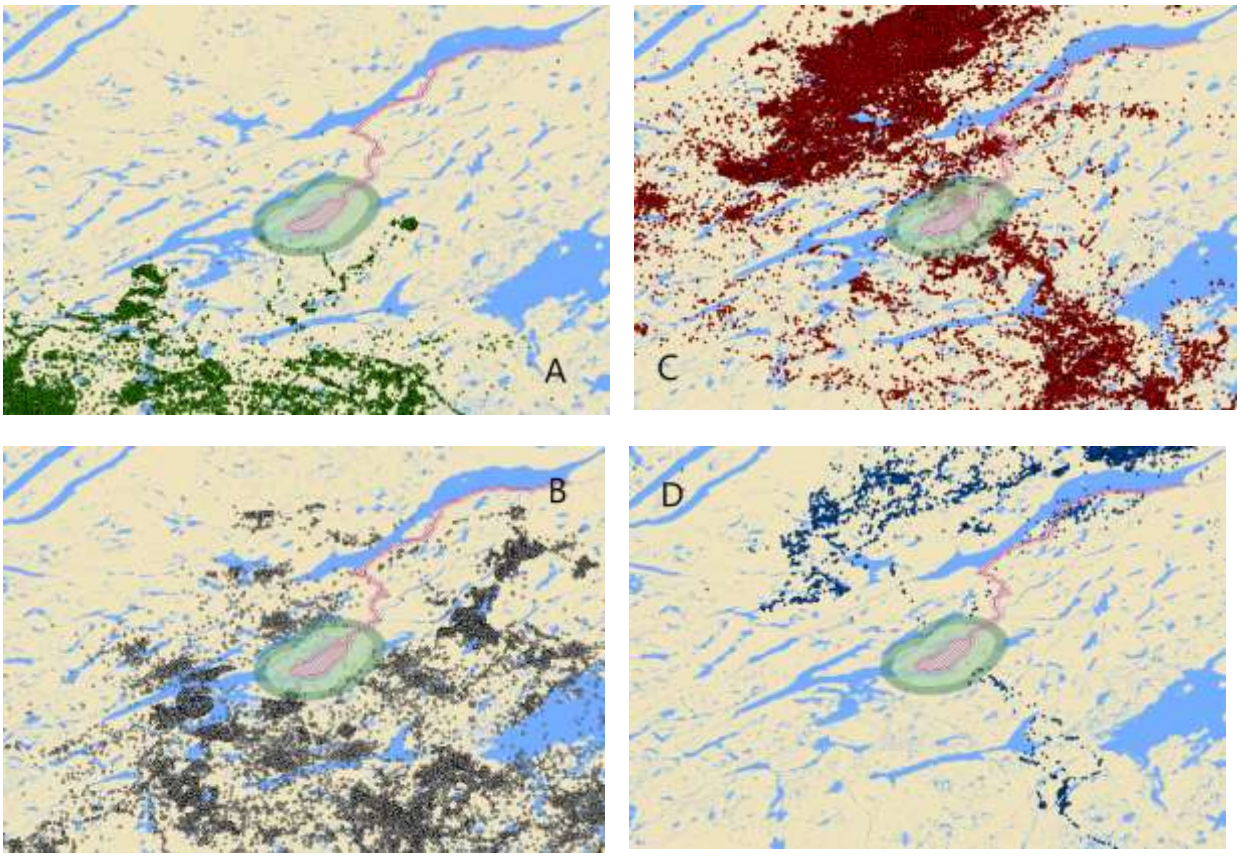


Figure 2. GPS locations of collared caribou in four herds during April 1 to August 31 between 2006 and 2013: (A) La Poile, (B) Grey River, (C) Buchans Plateau, and (D) Gaff Topsail. Sample sizes in Table 1. The pink hatched area in the centre of each figure is the 500-m buffered area around the proposed Valentine Lake project site and access road. The light and dark green areas extend the project site buffer to 4 and 6 km. A substantial number of passes through the larger buffer site occurs for calving caribou from the Buchans Plateau herd. Both parturient and non-parturient caribou are shown in the maps, as years are combined.

To disrupt the migration of an estimated 57% of female caribou with calves is unacceptable.[3] Even if the 0.5-km buffer is used around the access road and the project site, as in the EIS, the proponent's calculations also mislead, because they do not consider this sensitive part of the caribou life cycle. Parturient females of the Buchans Plateau herd appear occasionally to choose a route north and east of the proposed project site that takes them directly past the proposed access road (Figures 11-12 and 11-13 in the EIS, Figure 2C above). Analyzing the GPS data once again, but this time with the estimates of parturition for the Buchans Plateau herd, we calculate that 40 of 58 collared parturient females over the period 2009-13, or *69% of females with calves* could be affected by disturbance within 500 m of the proposed project site or access road. This number would only become smaller if pregnant females (in spring) or females with calves (in fall) choose a route south and west of the proposed project area. *This is unacceptable disruption*: of collared females in the Buchans Plateau herd over the period 2009-13, those that were parturient crossed the *actual area* of proposed mine site development in 21 cases, or 20% of this cohort.

How many caribou are willing to take an alternate route if the project goes ahead? The only clue is in fidelity to the route taken through or within 6 km past the project area in the background data. From the GPS data, 12 of 19 (63%) of collared females took their calves or traveled pregnant over the 6-km buffered proposed project site over at least two successive years (two were recorded over three successive years). This calculation is likely an underestimate, because not all collars (or parturient females) survive over two successive years. Of course, these females faithful in their migration to what might become a gold mine will likely take an alternate route—one that may take them right past the road—but the point here is that their life pattern will be disrupted, and the choice route will be no more, should the project goes ahead as described. We conclude that during a sensitive period from pre- to post-calving, all construction and mining operations must cease. To assist the proponent and the assessment agencies with resolving a closure period, we present the information in Table 2 and move to recommendations.

Table 2. Estimates of the earliest and latest parturition dates for collared female from GPS locations, as outlined in DeMars *et al.* (2013). Note that additional data exist (to 2019) for the Buchans Plateau herd but are not analyzed here.

| **Caribou herd** | **La Poile** | | **Grey River** | | **Buchans Plateau** | | **Gaff Topsails** | |
|---|---|---|---|---|---|---|---|---|
| **First and last dates of parturition by year and caribou herd** | | | | | | | | |
| **2006** | — | | — | | 3 June | 6 July | 3 June | 9 July |
| **2007** | 27 May | 6 July | 28 May | 11 July | 24 May | 8 July | 23 May | 10 July |
| **2008** | 27 May | 27 June | 23 May | 6 July | 24 May | 16 June | 29 May | 12 July |
| **2009** | 26 May | 3 July | 23 May | 4 July | 23 May | 9 July | 26 May | 11 July |
| **2010** | 28 May | 23 June | 23 May | 12 June | 26 May | 30 June | 23 May | 11 July |
| **2011** | 28 May | 17 June | 25 May | 29 June | 28 May | 27 June | 27 May | 29 June |
| **2012** | 24 May | 20 June | 3 June | 9 July | 28 May | 22 June | 27 May | 14 June |

[3] This estimate is extrapolated from the measure of the fraction of cases (caribou per year) passing through the buffered project area; note that most caribou are monitored over more than one year.

**Conclusions and recommendations**

Among the points below, recommendations are made in the sense that they imply minimum changes to the analyses and mitigative measures outlined in the EIS before the Valentine Gold Project can be released from environmental assessment. They are listed in order of importance:

- The mitigating measures for caribou cannot rely on the actions of monitors; during a sensitive period before and after calving, all construction and mining operations must cease.[4]

- The EIS should include long-term modeling of caribou demographics given a range of potential effects of loss of functional habitat due to on-site activities, road travel, and sensory disturbance. The modeling should include the parturition and calf survival analysis on the most recent data from the Buchans Plateau collared caribou, and a rationale—like the one in the footnote below—for a period of restricted activity. The model outcomes, which should be in the form of a sensitivity analysis, must then be compared to past effects of other developments to put the project proposal in context. This is one example of a cumulative effects documentation that should be a separate section of the EIS.

- At less sensitive times of the year (e.g., following the logic of the footnote, from 25 July to 15 May, with an option to shorten the period, either 15 September to 15 May or with a second restricted period timed to the fall migration of the Buchans Plateau caribou), any loud noises like blasting must not occur within a 3-km buffer (not a 0.5-km buffer) of any caribou spotted by monitors or crew.

- Noise should be modelled on the terrain and then monitored throughout the construction and operation phases, and any changes to mitigation measures should be put in place as needed with maximum sound recommendations agreed upon by the assessment agencies and the proponent, in consultation with the Newfoundland and Labrador Wildlife Division. This is the first of the adaptive management approaches that should be detailed throughout the EIS, and applies to sensory disturbance to a number of other wildlife species, e.g., hibernating bats.

---

[4] Referencing Bonar *et al.* (2018), survival of calves is compromised in the presence of coyotes and black bears until at least 15 days after birth; referencing Lewis et al. (2017), most predation occurs on calves on the calving grounds and up to 70 days after birth. Allowing one week of precaution before the earliest parturition date for the Buchans Plateau caribou herd, which passes through the mine site in large numbers, and 15 days after the latest parturition date for the Grey River, which calves in the area (from Table 2), we suggest *a period of restricted activities on the mine site occur from 16 May to 24 July*. Referencing Bastille-Rousseau *et al.* (2016), this suggestion has an end date for the restriction that co-occurs with a reduction to about half the risk of coyote and black bear predation relative to the period immediately post parturition. We note that a precautionary approach—which should be part of the adaptive management plan adopted by the proponent—would suggest, according to Lewis et al. (2017), a much later end date for restricted activities, roughly in mid September. *We recommend that the proponent list this plan and be ready to opt for* a second period of restricted activities during the onset of the fall migration or a longer single period of restricted activities.

- Mitigating the effects of machinery and noise in flagged sensitive areas should occur throughout mine site and road construction, operation and closure periods.

- A long-term plan should be presented to monitor recovery where it is expected to take longer than three years. Examples are monitoring effectiveness of revegetation of disturbed sites, including tracking invasive species, monitoring quantity and quality of ground and surface waters, and ensuring a net increase in fish habitat.

- A plan should be outlined for working with authorities and local stewards on limiting future access to avoid overfishing that may be introduced by improvement and extension of road access to the area.

- A separate section of the document should describe cumulative effects of the proposed Valentine Gold Project given the two other environmental impacts in the area, i.e., the Star Lake hydroelectric project and the Victoria Lake diversion.

## References

Bastille-Rousseau, G., N.D. Rayl, E.H. Ellington, J.A. Schaefer, M.J.L. Peers, M.A. Mumma, S.P. Mahoney, and D.L. Murray. 2016. Temporal variation in habitat use, co-occurrence, and risk among generalist predators and a shared prey. Canadian Journal of Zoology 94: 191-198.

Bastille-Rousseau, G., J.A. Schaefer, K.P. Lewis, M.A. Mumma, E.H. Ellington, N.D. Rayl, S.P. Mahoney, D. Pouliot, and D.L. Murray. 2015. Phase-dependent climate–predator interactions explain three decades of variation in neonatal caribou survival. Journal of Animal Ecology 85: 445-456.

Bonar, M., Ellington, E.H., Lewis, K.P., and Vander Wal, E. 2018. Implementing a novel movement-based approach to inferring parturition and neonate calf survival. PLoS One 13: e0192204.

DeMars, C.A., M. Auger-Méthé, U.E. Schlaegel, and S. Boutin. 2013. Inferring parturition and neonate survival from movement patterns of female ungulates: a case study using woodland caribou. Ecology and Evolution 3: 4149-4160.

Lewis, K.P., S.E. Gullage, D.A. Fifield, D.H. Jennings, and S.P. Mahoney. 2017. Manipulations of black bear and coyote affect caribou calf survival. Journal of Wildlife Management 81: 122-132.

Mahoney, S.P., K.P. Lewis, J.N. Weir, S.F. Morrison, J.G. Luther, J.A. Schaefer, D. Pouliot, and R. Latifovic. 2016. Woodland caribou calf mortality in Newfoundland: insights into the role of climate, predation and population density over three decades of study. Population Ecology 58: 91-103.

Mahoney, S.P., and J.A. Schaefer. 2002. Hydroelectric development and the disruption of migration in caribou. Biological Conservation 107: 147-153.

Schaefer, J.A., S.P. Mahoney, J.N. Weir, J.G. Luther, and C.E. Soulliere. 2016. Decades of habitat use reveal food limitation of Newfoundland caribou. Journal of Mammalogy 97: 386-393.

Weir, J.N., S.P. Mahoney, B. McLaren, and S.H. Ferguson. 2007. Effects of mine development on Woodland Caribou *Rangifer tarandus* distribution. Wildlife Biology 13: 66-74.