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Results of a 2021 Population Survey of Reintroduced Bison (*Bison bison*) in the Yukon

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Government of Yukon
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SR-23-03

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Executive Summary

- Population surveys for the Aishihik bison population are used to track their restoration, as well as to support an annual harvest that is well-subscribed by Yukoners.
- The last population survey was conducted in July 2016 and estimated 1,325 adults (95% confidence intervals = 1,157–1,552). A survey was scheduled for July 2019. However, for the third year in a row, we could not conduct the survey due to circumstances beyond our control (this particular year – forest fires).
- In lieu of a population survey, we sought to obtain a minimum count by counting as many bison as possible during the time allotted (one day), similar to July 2020. We focused our search effort on known locations of 22 GPS-collared bison and other areas known to be seasonally used. We had 29 collars active in 2020 and 22 in 2021, which decreased our ability to find bison.
- We flew approximately 1,094 km (excluding the ferry from Whitehorse), during which we observed 39 groups of bison, totalling 786 adults and 168 calves.
- For management purposes, the Minimum Number Known Alive (MNKA) is 786. For comparison, the MNKA in July 2020 was 1,054.
- In July 2021, calf production (21%) and the ratio of dominant bulls to adult females and yearlings (7%) were lower than that observed in July 2020 (26% and 14%, respectively), which is concerning.
- Reasons for the lower population values in 2021 versus 2020 are unknown but may be due to either a poorer survey or an actual decrease in the population. This uncertainty is a hazard of conducting MNKA surveys.
- The true population size remains unknown, and there is a need to get an accurate population estimate to inform a plan review and harvest management.
- Exclusive of staff time, project costs were about $18,000.

Contents

Introduction

Bison (*Bison bison*) were reintroduced into the Aishihik area from 1988 to 1992 as part of a national recovery effort to restore the species to its native range (Government of Yukon 2012, Environment and Climate Change Canada 2018). Since then, the population has grown substantially and was last estimated in July 2016 at 1,325 adults (95% confidence intervals = 1,157–1,552). Population surveys are a fundamental monitoring initiative for the Aishihik population, and are used to track the restoration effort as well as to support an annual harvest that is popular with many Yukoners. Since 2007, bison management in the Yukon has relied on mark-resight methodology, using paintballs to mark animals to estimate the size of the population (Hegel et al. 2012, Jung and Egli 2011, 2014). Bison harvest in the Yukon is managed under an adaptive management framework, and repeated population estimates allow bison managers (i.e., the Aishihik Bison Technical Team) to track population trends and evaluate the effectiveness of changes in the harvest regime.

Mark-resight population estimates for the Aishihik population were conducted using a consistent methodology in 2007, 2009, 2011, 2014, and 2016. A detailed account of the methodology used to conduct a mark-resight population estimate of bison can be found elsewhere (see: Hegel et al. 2012, Jung and Egli 2012, 2014). An updated population estimate was scheduled for July 2019. Unfortunately, 2019 was a year of extensive forest fires across the territory and contracting a helicopter to do the work was not possible, so the survey was postponed until 2020. Substantial effort was made in 2020 to obtain another mark-resight population estimate. However, again, it was not possible to conduct the survey. This time, a third of the GPS-collared bison did not move into the alpine, as they typically do in mid-June to late-July. Reasons for this change in behaviour are unknown, but it may be due to the cool, rainy weather that occurred during June and July. Our mark-resight methodology is predicated on bison being congregated in open alpine habitats (**Fig. 1**), where the number of marked (paintballed) animals can be precisely counted (Jung and Egli 2012, 2014). With many bison not migrating to the alpine and remaining in treed habitats at low elevations, it would have been exceedingly challenging to accurately count

them, especially the marked individuals. Because of the behaviour of the bison, a mark-resight survey under the July 2020 conditions was unlikely to produce a reliable population estimate, and the work was postponed again. The same issue of a large percentage of collared bison not moving into the alpine occurred in July 2021.

Because a mark-resight population estimate was not possible in 2021, we decided to truncate the field effort and instead aim to get a minimum count of the herd (also known as the Minimum Number Known Alive [MNKA]), similar to that done in July 2020 (Jung et al. 2020). Briefly, a minimum count is just that: We count all the animals we can find and get a minimum number of animals available in the population. By contrast, a population estimate, as was performed in July 2016, uses statistical modelling to estimate the true population size—the number seen during the survey plus an estimate of those missed. To do a population estimate, you need to mark several animals before counting them and meet a number of statistical assumptions. This was not tenable in July 2021 because many bison were in the trees, and it was unlikely that marked animals would be distinguishable.

Methods

On 13 July 2021, we used an AStar B2 helicopter to locate and count bison to obtain a Minimum Number Known Alive (MNKA). The crew consisted of a navigator, two observers, and the pilot. Our strategy was to find bison associated with 22 GPS-collared animals, based on their locations from the previous day, as well as by searching other areas known to be seasonally used by bison during the summer. We also prioritized flying the east side of Kluane Lake at the request of Kluane First Nation and the Dan Keyi Renewable Resource Council (**Fig. 1**). To be clear, we sought to count as many bison as possible during the time allotted (one day) while distributing our effort across the population's current range.

When we encountered a group of bison, the navigator counted and determined the group composition of all adult (≥1-year-old) animals while the observer seated behind them counted the calves. Using a GPS device, we obtained the coordinates of each group encountered. From the field data, we determined the MNKA, using adults only. We also

calculated the percent of calves and dominant bulls in the population, as well as the mean (average) group size.

Results and Discussion

We flew approximately 1,094 km during the survey (excluding the ferry from Whitehorse) and used 8.1 hours of helicopter time (**Table 1**). Survey conditions were perfect, with little cloud cover, although winds were sometimes strong. We were not prohibited from flying anywhere due to weather.

We observed 39 groups of bison, totalling 786 adults and 168 calves (**Tables 1 and 2**). Thus, for management purposes, the total MNKA is 786. This is a lower number of Aishihik bison counted than in 2020 when, using similar methods and survey effort, we observed 55 groups, and counted 1,054 adults and 271 calves (**Table 1**; Jung et al. 2020).

Group size ranged from 1 to 88 bison (including calves), with particularly large aggregations occurring in the Kloo Lake area and north of Big Mountain. Mean group size for mixed groups was 32.8 ± 21.3 SD (n = 29; range = 2–88), and for bull-only groups was 1.6 ± 1.0 SD (n = 8; range = 1–4). Group size is greatest at this time of year because mixed groups coalesce, and dominant bulls join them in large post-calving aggregations before the commencement of the rut. Regardless, the average size of mixed groups was greater than typically seen, which from July 1999 to 2014 was 21.7 bison per group (Jung 2020).

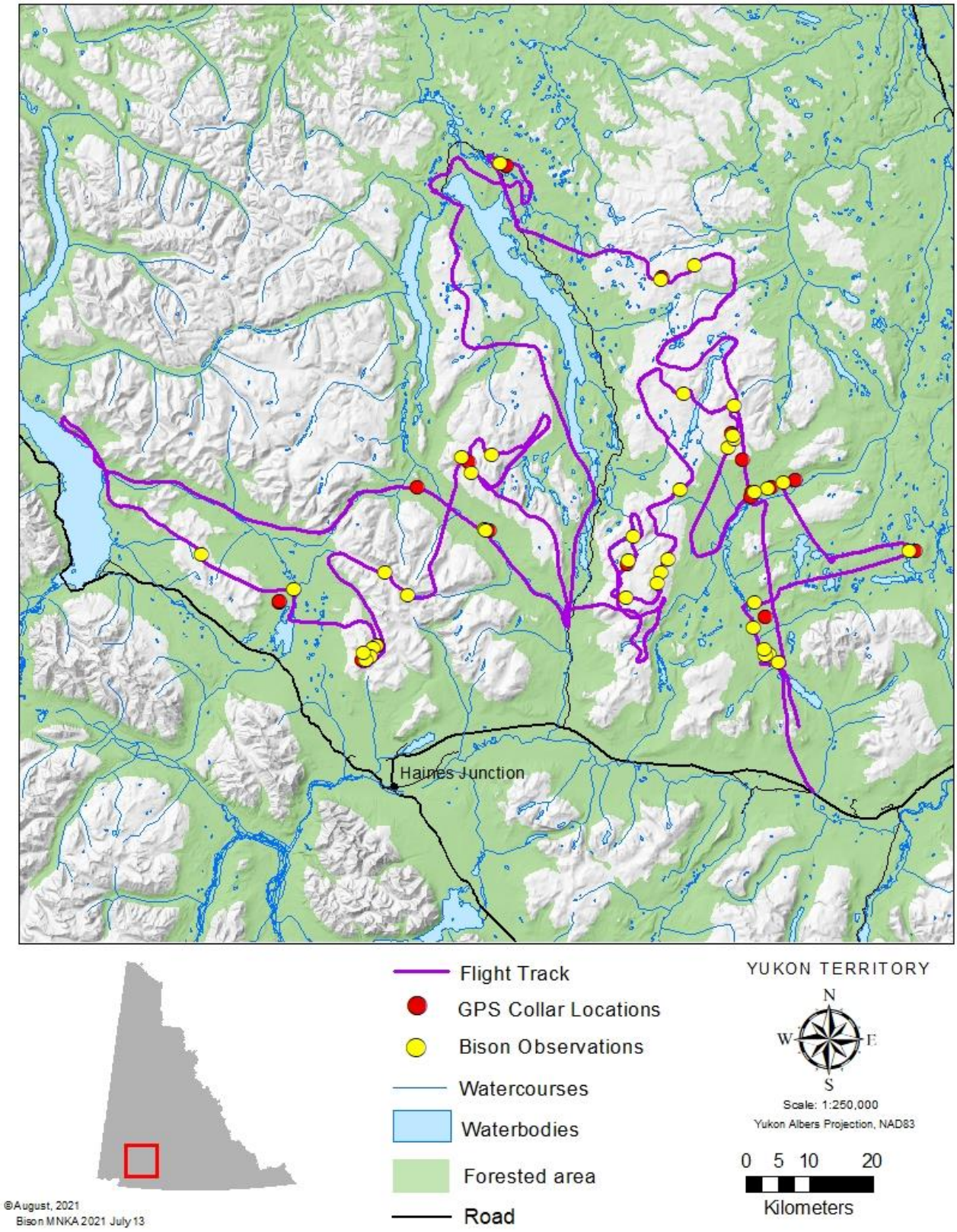

Fig. 1. Flight track and bison observations during the survey conducted on 13 July 2021.

Table 1. Summary of results from three "minimum number known alive" surveys for bison in the southwestern Yukon, summer 2020 and 2021.

Survey Results	2020 Results	2021 Results
Survey Date	17 July 2020	13 July 2021
Survey Effort	8.2 hrs 1,046 km	8.1 hrs 1,094 km
Number of GPS-Collared Bison	29	22
Total Number of Bison Observed	1,325	954
Number of Adult Bison Observed	1054	786
Number of Calves Observed	271	168
Percent Calves in the Population	26.0%	21.4%
Percent of Dominant Bulls Observed	14%	7%
Number of Groups Observed	55	39
Group Size Range	1-108	1-88

Calf composition, a measure of productivity, was 21.4 calves per 100 adults. This value was lower compared to previous surveys in 2020, 2016, and 2014, which were all 26 calves per 100 adults. Reasons for the decline are unknown but may be a result of deep snow during winter, resulting in increased numbers of calves born in poor physical condition and not surviving the neonatal period. However, this measure of productivity does not translate directly to the number of calves that will be recruited into the population at the end of the next winter, as an unknown number will die before then. Moreover, the number that do recruit into the population is likely to vary from year to year, in response to factors such as predation, snow depth, or winter severity.

The percentage of mature, dominant bulls (≥8 years old) to adult females was 7%, which is half that seen in 2020 (14%; **Table 1**; Jung et al. 2020). This percent is an underestimate of dominant bulls to females because it was not possible to sex the yearlings, so both sexes are included. Moreover, another 6% of the animals observed were younger bulls (estimated at 2–7 years old), and many of these will likely survive to become

dominant bulls in the near term. While the minimum percent of dominant bulls required to maintain a bison population is unknown, it is likely a low percent because only a few dominant bulls are successful in breeding. That said, the decrease in the number of dominant bulls observed is a cause for concern and could be due to high hunting mortality. The number of dominant bulls should be closely monitored.

Bison were distributed widely across their known range, with many observed in the alpine around Kloo Lake, Ittlemit Lake, and Long Lake, as well as at low elevations near Husthi and Taye lakes, and Aishihik Village (Fig. 1). The number of animals observed near Aishihik Village was unusual for this time of year, as was the failure of those in the Hutshi Lakes area to move into the alpine south of Long Lake toward Big Mountain. When compared to previous years, the reasons for these anomalies in the distributions are unknown. The implication, however, is that a large percent of the population was in the trees at low elevations and were challenging to find and count, confirming that mark-resight methods would not have led to a reliable population estimate this summer.

Incidental observations of other wildlife were also made, including grizzly bears (*Ursus arctos*), caribou (*Rangifer tarandus*), moose (*Alces americanus*), thinhorn sheep (*Ovis dalli*) and golden eagles (*Aquila chrysaetos*).

The project cost about $18,000, not including staff time.

Table 2. Raw count data from an aerial survey of bison on 13 July 2021.

Group Waypoint	No. Calves	No. Females & Yearling Males	No. Young Males	No. Dominant Males	Group Type	Group Size
057	2	2	0	0	Mixed	4
055	4	12	0	0	Mixed	16
056	0	4	0	0	Mixed	16
057	2	2	0	0	Mixed	4
058	2	7	0	0	Mixed	9
059	1	19	0	1	Mixed	21
060	2	6	0	0	Mixed	8
063	7	31	0	2	Mixed	40
064	5	22	0	1	Mixed	27
065	2	18	0	2	Mixed	22

066	0	0	0	1	Bull	1
067	17	34	2	3	Mixed	58
068	7	23	4	4	Mixed	38
069	0	0	0	2	Bull	2
070	0	0	0	2	Bull	2
071	0	0	4	0	Bull	4
072	0	0	0	1	Bull	1
073	5	23	2	0	Mixed	31
074	9	57	3	3	Mixed	72
075	2	31	3	1	Mixed	37
077	0	0	0	1	Bull	1
078	11	40	3	2	Mixed	56
082	6	18	0	0	Mixed	24
083	5	17	3	0	Mixed	25
084	0	0	0	1	Bull	1
085	6	17	1	0	Mixed	24
086	0	6	0	0	Mixed	6
087	7	37	2	0	Mixed	46
088	22	57	3	6	Mixed	88
089	10	40	4	4	Mixed	58
090	11	36	5	1	Mixed	53
091	0	0	0	1	Bull	1
092	2	2	0	2	Mixed	6
093	4	21	3	1	Mixed	29
094	0	1	0	1	Bull	2
095	9	33	1	2	Mixed	45
097	3	46	0	2	Mixed	51
098	5	25	2	3	Mixed	35
099	0	0	0	1	Bull	1
101	2	5	0	0	Mixed	7
TOTALS	**168**	**690**	**45**	**51**		**968**

Conclusions

Our aerial survey indicates that the size of the Aishihik bison population in July 2021 was a minimum of 786 animals, not including calves. This is a substantially lower MNKA than in 2020 (**Table 1**). Moreover, calf production and the ratio of dominant bulls to adult females and yearlings was reduced compared to last year.

Reasons for the reduced numbers in 2021 are unknown but could result from simply missing more animals in 2021 than in 2020. The fundamental problem with a minimum count, as performed in this work, is that it does not indicate the true population size, unlike a mark-resight survey or other similar types of surveys. This is because we have no reliable estimate of the number of animals missed in the survey. For example, we may have missed 100 or 500 animals, and there is no way to know which may be the case.

The GPS collars aided us in identifying group locations. Without knowing the locations of the collared animals, our MNKA would almost certainly have been lower, thus pointing to the value of having a reasonable number of bison radio-collared. We had fewer active GPS collars (22 in 2021 versus 29 in 2020), which likely led to missing groups. Indeed, we saw 55 groups in 2020 and 39 in 2021 (**Table 1**).

Alternatively, the reduction in bison seen in 2021 may reflect a real decrease in the population. As such, there remains a need to get a reliable population estimate (bounded by confidence intervals) of the Aishihik herd to inform current harvest management. Given the limitations of the MNKA approach, it is recommended we conduct a statistically robust population estimate using mark-resight methods as soon as feasible.

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