

**Results of a 2023 Population
Survey of Reintroduced Bison
(*Bison bison*) in the Yukon**

November 2023



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Government of Yukon
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Executive Summary

- Surveys of the Aishihik bison population are used to track their abundance and annual demographic values such as productivity and sex-ratios, as well as to manage a well-subscribed annual harvest by Yukoners.
- The last population census was conducted in summer 2022 and estimated 1,951 adults (95% confidence intervals = 1,688–2,295), amounting to a 47% increase in population size since the last population census in 2016.
- In lieu of a population census in 2023, we sought to obtain a minimum count by counting as many bison as possible during the time allotted (2 days), like surveys conducted in 2020 and 2021. We focused our search effort on known locations of 58 GPS-collared bison and other areas known to be seasonally used.
- We flew approximately 3,322 km (excluding the ferry from Whitehorse), during which we observed 42 groups of bison, totalling 776 adults and 131 calves.
- For management purposes, the Minimum Number Known Alive (MNKA) is 776. For comparison, the MNKA in July 2020 and 2021 were 1,054 and 786, respectively.
- In June 2023, calf production (17%) was lower than observed in 2020 (26%) and 2021 (21%). The percent of dominant bulls to adult females was lower than 2020 (14%) but the same as in 2021 (7%).
- Reasons for the lower number of bison seen in 2023 compared to previous MNKA surveys in 2020 are unknown but likely to be due to random chance in encountering bison, which is a hazard of MNKA surveys.
- The reduction in bison seen in 2023 may reflect a real decrease in the population. However, given the limitations of the MNKA approach and the results of a mark-resight population survey conducted in 2022 using more reliable methods, this is unlikely. Given the 2022 mark-resight population census provided clear evidence that the population has been growing, it is most likely that the population remains well above a minimum threshold of 1000 animals (not including calves).
- A new mark-resight population survey in summer 2024 or 2025 will help clarify the current abundance of the Aishihik population.
- Exclusive of staff time, project costs were about \$24,000.

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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). The population has grown consistently and was last estimated in summer 2022 at 1,951 adults (95% confidence intervals = 1,688–2,295), representing a 47% increase in population size since it was last estimated in summer 2016 (Jung et al. 2023b). Population surveys are fundamental for the Aishihik population and are used to track the restoration effort, as well as to support an annual harvest, popular with many Yukoners. Since 2007, bison management has relied on the mark-resight methodology, using paintballs to mark animals, when estimating the size of the population (Hegel et al. 2012, Jung and Egli 2011, 2014, Jung et al. 2023b). 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 consistent methodology in 2007, 2009, 2011, 2014, 2016, and 2022. 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 et al. 2023b). However, mark-resight population estimates for the Aishihik population were not possible from 2019–2021 due to a lack of helicopter availability and a shift in seasonal bison movements in which they did not move into the alpine and therefore, were difficult to count. Reasons for this change in behaviour are unknown, but it may be due to changes in seasonal weather patterns or insect harassment. Our mark-resight methodology was predicated on bison being congregated in open alpine habitat where the number of marked (paintballed) animals can be precisely counted (Hegel et al. 2012, Jung et al. 2023b). With many bison not migrating to the alpine and remaining in treed habitats at low elevations, mark-resight methods are challenging and are unlikely to produce reliable population estimates.

Because mark-resight population estimates were not possible in 2020–2021, minimum counts of the herd (also known as the Minimum Number Known Alive [MNKA]) were conducted instead (Jung et al. 2020, Jung et al. 2023a). A minimum count survey aims to count all the animals we can find in a day or two in order to get a minimum number of animals in the population. In contrast, a population estimate, as was performed in 2022, involves repeated daily counts of marked and unmarked animals and then uses statistical modelling to estimate the population size (the number seen during the survey plus an estimate of those missed). As mark-resight population estimates are not needed (or in some cases possible) every year, minimum count surveys allow an additional, more cost-effective method for monitoring the status of the Aishihik bison population in-between years when a population census are conducted. These MNKA surveys allow bison managers to track the population size and demographic parameters and can serve as an early warning if changes in the harvest regime are required.

Methods

On 28 and 29 June 2023, we used a Bell 206L LongRanger 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. Like previous MNKA surveys, our strategy was to find bison associated with 58 GPS-collared animals based on their recent locations (within 24 hours), as well as by searching adjacent and other areas known to be seasonally used during the summer. We also prioritized flying the east side of Kluane Lake, at the request of Kluane First Nation and Dän Keyi Renewable Resource Council (Fig. 1). Our strategy sought to count as many bison as possible during the allotted time (2 days) while distributing our effort across the population's range.

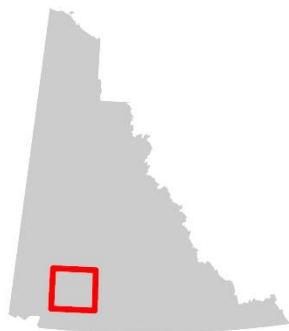
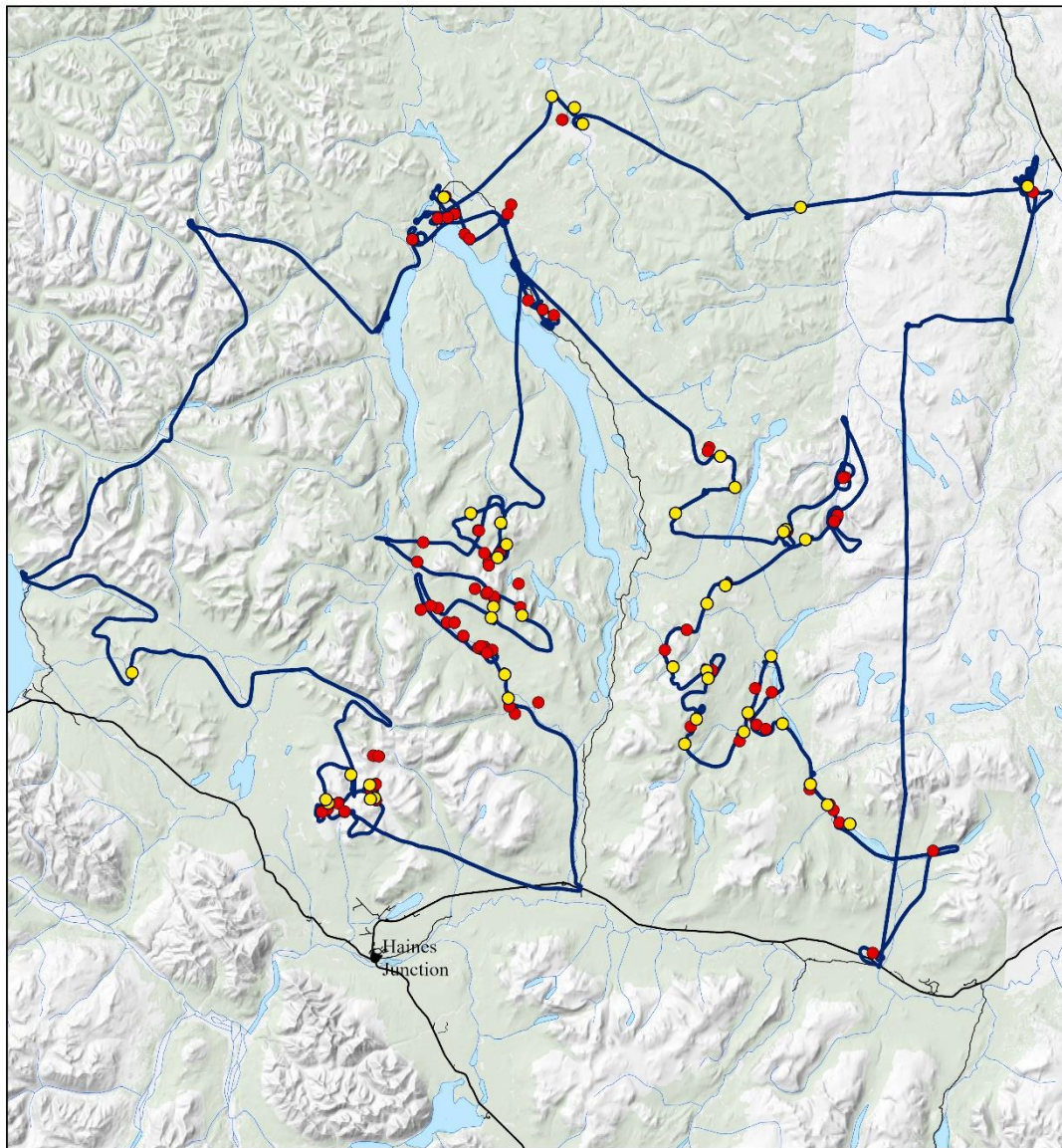
When we encountered a group of bison, the navigator counted and determined the group composition of all adult (≥ 1 -year-old) animals while the observer seated behind counted the calves. We obtained the coordinates of each encountered group using a GPS. From the field data, we determined the MNKA using adults only, like MNKA and mark-resight surveys in other years. 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 3,322 km during the survey (excluding the ferry from Whitehorse) and used 13.2 hours of helicopter time (Table 1). Our survey effort was increased from MNKA surveys in 2020 and 2021 to provide more complete coverage of the population's range, and because we also wanted to pick up GPS collars from bison and caribou (*Rangifer tarandus*) that died in the last few months. Survey conditions were favourable, with little cloud cover and we were not prohibited from flying anywhere due to weather.

We observed 42 groups of bison, totalling 776 adults and 131 calves (Tables 1, Appendix 1). Thus, for management purposes, the total MNKA is 776. This is comparable to the number of Aishihik bison counted in 2021 (39 groups; 786 adults, 168 calves), but a lower than the number counted in 2020 (55 groups; 1,054 adults, 271 calves), using similar methods (Jung et al. 2020, Jung et al. 2023a).

Group size ranged from 1–78 bison (including calves). As in previous years, we observed particularly large aggregations occurring in the Kloo Lake area and north of Big Mountain. Mean group size for mixed groups was 30.2 ± 17.4 ($n = 29$; range = 8–78), and for bull only groups was 2.3 ± 2.0 ($n = 13$; range = 1–7). 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 remained greater than typically seen, which from July 1999 to 2014 was 21.7 bison per group (32.8 bison per group in 2021; Jung 2020, Jung et al. 2023a).



- Flight Track
- GPS Collar Locations
- Bison Observations
- Watercourse
- Waterbody
- Forested area
- Roads

YUKON TERRITORY



Scale: 1:730,480
Yukon Albers Projection, NAD83

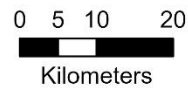


Fig. 1. Flight track and bison observations during an MNKA survey conducted on 28-29 June 2023.

Table 1. Summary of results from three MNKA surveys for bison in southwestern Yukon, summer 2020, 2021, and 2023.

Survey Results	2020 Results	2021 Results	2023 Results
Survey Date	17 July 2020	13 July 2021	28–29 June 2023
Survey Effort	8.2 hrs 1,046 km	8.1 hrs 1,094 km	13.2 hrs 3,322 km
Number of GPS-Collared Bison	29	22	60
Total Number of Bison Observed	1,325	954	907
Number of Adult Bison Observed	1054	786	776
Number of Calves Observed	271	168	131
Percent Calves in the Population	26%	21%	17%
Percent of Dominant Bulls Observed	14%	7%	~7%
Number of Groups Observed	55	39	42
Group Size Range	1–108	1–88	1–78

Calf composition, a measure of productivity, was 16.9 calves per 100 adults. This value was lower than previous surveys in 2014, 2016, 2021 and 2021, which were all above 20 calves per 100 adults. Reasons for the decline are unknown but may be a result of deep winter snows that occurred during the previous three winters, impacting the physical condition of newborn calves or their mothers, and therefore calf survival. However, there are many factors that can influence calf survival, and 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. The number of calves recruited into the population is likely to vary from year to year in response to predation, snow depth, winter severity, or other factors.

The percentage of mature, dominant bulls (≥ 8 years old) to adult females was ~7%, which is like 2021 but half that seen in 2020 (14%; Table 1; Jung et al. 2020, Jung et al. 2023a). This percent is an underestimate of all bulls to females because it was not possible to sex the yearlings or young bulls still with their maternal group, so both sexes are included in the cow-calf groups. Additionally, there were some observations where groups moved into forested or covered habitat in which composition could not be determined. Another ~22% of the animals observed were younger bulls (estimated at 2-7 years old), and many of those will likely survive to become dominant bulls. This value was greater compared to the survey conducted in 2021 (6% young bulls; Jung et al. 2023a). However, the number of dominant bulls required to maintain a bison population is low, as only a few dominant bulls

are successful in breeding. However, the decrease in the number of dominant bulls observed since 2020 is cause for concern and should continue to be closely monitored.

Bison were distributed widely across their range, with many observed in the alpine around Kloo Lake, Ittlemit Lake, and Long Lake, as well as at low elevations near Hutshi and Taye lakes and Aishihik Village (Fig. 1). Like the survey conducted in 2021, we observed bison in the Aishihik Village and Hutshi Lakes areas remaining in lower elevations rather than moving into the alpine. The reasons for these anomalies in distributions are unknown, however the implication is that an unknown percent of the population was in the trees at low elevations, which made it challenging to find and count individuals.

Incidental observations of other wildlife were also made, including caribou, thinhorn sheep (*Ovis dalli*), and grizzly bears (*Ursus arctos*), including one guarding a bison calf. This is the first known occurrence of grizzly bear predation on bison.

The project cost about \$24,000, not including staff time.

Conclusions

Our MNKA survey indicates that the size of the Aishihik bison population in June 2023 was minimum of 776 animals, not including calves. This is a similar MNKA value to 2021, but substantially lower than in 2020 (Table 1). Moreover, calf production we observed was less than similar surveys in previous years. The ratio of dominant bulls to adult females and yearlings was consistent with surveys in 2021, but also less than previous years.

We observed a similar MNKA value in 2023 as 2021, however we used more helicopter time to search for bison in 2023 than previous MNKA surveys. Moreover, the MNKA in both 2021 and 2023 was substantially lower than in 2020. Reasons for the reduced numbers in our MNKA count in 2021 and 2023 are unknown, but likely result from simply seeing more animals in 2020 than in 2021 and 2023. 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.

The use of GPS collars aided us in identifying group locations, and without these known locations of collared animals our MNKA would almost certainly be lower. We had significantly more active GPS collars than in past years (2023 = 58, 2021 = 22, 2020 = 29). Despite this, we observed fewer groups than in 2020 (Table 1), even given the increased survey effort.

The reduction in bison seen in 2023 may reflect a real decrease in the population. However, given the limitations of the MNKA approach and the population estimate conducted in 2022 using more reliable methods, this is unlikely. The reduction in observed bison is more likely due to behavioural changes in which bison are remaining in low elevation forest habitat rather than moving into alpine habitat in June and July. This shift in seasonal movement creates a challenge for monitoring the population through mark-recapture

methods as well as MNKA approaches and may result in inaccurate or underestimated population sizes.

While the MNKA surveys conducted in 2021 and 2023 indicate lower numbers than in 2020, a more accurate mark-resight survey conducted in 2022 indicated that the bison population has increased since 2016 (Jung et al. 2023b). Given the 2022 mark-resight population census provided clear evidence that the population has been growing, it is most likely that the population remains well above a minimum threshold of 1000 animals (not including calves). A new mark-resight population survey in summer 2024 or 2025 will help clarify the current status of the Aishihik population.

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Appendix

Appendix 1. Raw count data from an aerial survey of bison on 28-29 June 2023.

Obs.	No. Calves	No. Adults & Yearlings	No. Females & Yearling Males	No. Young Males	No. Dominant Males	Group Type	Group Size
1	0	2	-	-	-	-	2
2	0	1	0	0	1	Bull	1
3	7	38	20	17	1	Mixed	45
4	0	3	0	0	3	Bull	3
5	0	1	0	0	1	Bull	1
6	4	17	13	1	3	Mixed	21
7	0	2	0	0	2	Bull	2
8	0	1	0	0	1	Bull	1
9	0	1	0	0	1	Bull	1
10	9	55	40	11	4	Mixed	64
11	0	7	0	0	7	Bull	7
12	7	25	24	1	0	Mixed	32
13	7	36	25	11	0	Mixed	38
14	2	13	9	3	1	Mixed	15
15	0	12	1	8	3	Mixed	12
16	0	6	0	1	5	Bull	6
17	0	1	0	0	1	Bull	1
18	0	8	3	4	1	Mixed	8
19	4	25	20	5	0	Mixed	29
20	0	12	9	2	1	Mixed	12
21	4	19	12	4	3	Mixed	23
22	3	14	7	6	1	Mixed	17
23	2	8	-	-	-	Mixed	10
24	2	9	-	-	-	Mixed	11
25	4	39	-	-	-	Mixed	43
26	9	45	-	-	-	Mixed	54
27	9	25	16	9	0	Mixed	34
28	1	25	9	16	0	Mixed	26

29	12	22	12	10	0	Mixed	34
30	4	46	23	19	4	Mixed	50
31	11	67	-	-	-	Mixed	78
32	4	28	20	7	1	Mixed	32
33	0	3	0	2	1	Bull	3
34	0	1	0	0	1	Bull	1
35	0	1	0	0	1	Bull	1
36	3	16	8	7	1	Mixed	19
37	1	26	17	8	1	Mixed	27
38	11	46	31	13	2	Mixed	56
39	1	26	17	9	0	Mixed	27
40	3	18	13	4	1	Mixed	21
41	3	18	-	-	-	Mixed	21
42	4	14	-	-	-	Mixed	18
TOTALS	131	776	349+	178+	53+		907