

Bighorn Sheep Aerial Survey, Banff National Park. Winter 2020



Photo: K. Heuer/Parks Canada

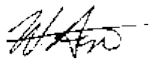
A Summary Report

Prepared by

Saundi Stevens, Resource Management Officer

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Reviewed by:



Bill Hunt
Resource Conservation Manager
Banff Field Unit

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Date

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Background

Bighorn sheep surveys in Banff National Park (BNP) have been conducted intermittently over the past 50 years using a combination of helicopter, ground studies, and warden observations (Jacobson 1977; Stelfox 1978; Jacobson 1982; Skjonsberg 1993; AEP 2015, 2018). The first aerial sheep surveys, conducted in BNP between 1974 and 1976, identified consistent winter ranges (Jacobson, 1977). Since then, these winter range have been surveyed intermittently to estimate population trends and distribution. Despite these repeated surveys, trends are difficult to identify as survey techniques change, survey areas and flight paths vary, and weather and snow cover differ between years. The use of different correction factors for sightability between years further complicates the issue.

More than 30 years have passed since the last comprehensive sheep study was done in BNP with radio-collared animals and repeated aerial winter range surveys (Skjonsberg 1993). Current knowledge of bighorn sheep numbers, distribution, movements, habitat use, health and demographics is limited. This lack of comparable data became apparent during the consultation phase of Parks Canada's 5-year pilot Bison Reintroduction Project when several stakeholders expressed concern about potential health risks and competition to resident bighorn sheep. Parks Canada committed to monitor for such impacts during the course of the 5-year pilot project and to report back to stakeholders prior to deciding whether or not to proceed with further bison restoration in 2022 (Heuer, 2017).

To partially fulfill this commitment, Parks Canada partnered with Alberta Environment and Parks (AEP) in February 2020 to complete the most expansive sheep survey conducted for the area in the last 32 years. We surveyed known bighorn sheep winter range as well as all ecologically similar habitats across the province's Red Deer and North Saskatchewan Sheep Management Areas, the Ghost Wilderness Area and the north-eastern ranges of Banff National Park (Figure 1). February is the best time for bighorn sheep surveys as all age and sex cohorts are grouped on smaller high-elevation winter ranges, the animals move minimally, and sightability is improved by snow cover (AEP, 2015). AEP typically conducts aerial winter range surveys across provincial sheep management areas every 2-3 years. Their previous 4 surveys (2011, 2013, 2015 and 2018) included some sheep ranges inside BNP.

When conducted at regular (annual or biennial) intervals, aerial surveys of winter ranges provide an indication of long term population trends. Classifying counts by sex and age class (ram: ewe: lamb ratios) also provides some indication of recruitment and survival rates (Hubbs, 2020). Classification of male horn size gives some indication of the sustainability of trophy ram hunting (Hubbs, 2020). This report summarizes results for each of these measures from the 2020 aerial winter sheep survey in BNP and compares them to past survey results for the park and surrounding areas. Detailed results for portions of the survey that occurred on Alberta provincial lands are in **Annex A**.

Survey Objectives

- 1) Establish a minimum bighorn sheep count and winter range distribution in and around the bison reintroduction zone of BNP;
- 2) Determine herd composition (population status) based on classified counts;

- 3) Where possible, compare results to previous surveys and to results outside of BNP for an indication of population trends;
- 4) Document and archive survey methods (flight lines, etc.) in such a way that repeatable surveys can be undertaken in future years.

Survey Area

The 1500 km² survey area is in the north-eastern region of BNP and includes most of the core bison reintroduction zone (Figure 1). It extends from the lower Bow Valley in the south to the Clearwater River in the north and includes the majority of historically known winter sheep ranges on the frontal range or eastern slope of BNP (as identified in Jacobson 1982). Many of these known winter sheep ranges are mid to high elevation alpine and open subalpine habitats, including some high elevation grasslands, dry shrub thickets, open mixed coniferous forests, windswept ridges, and slopes associated with escape terrain (Skjonsberg 1993).

Methods

We followed survey standards developed in other Western North American jurisdictions (Alberta, 2010; Montana, 2010; Colorado, 2009; British Columbia, 2002) with three survey crew members systematically flying survey lines in a Bell 206 helicopter, contouring major and tributary valleys and scouting known winter ranges and similar habitats to locate groups of sheep or their tracks in the snow.

When tracks were observed, we followed them until sheep were located. Once located, the sheep almost always ran towards escape terrain or tree cover, usually in a line or a fan along ridges and plateaus. The helicopter then approached from behind and flew past with the herd on the left hand side of the aircraft. Pursuit time was minimized, ranging from 10 to 60 seconds depending if the group bunched up, turned back, or broke into lines going different directions. Pursuit was terminated if sheep floundered in deep snow or continued at a run in steep cliff terrain. (NB: Subsequent location data for radio collared sheep indicated displacement was, on average, a few hundred metres). One observer completed a total count of sheep and a count of lambs. The second observer counted and classified rams. The third observer geo-referenced sheep locations and recorded counts and classifications. We recorded flight tracks on both a Garmin handheld GPS unit and on Avenza Maps using a GPS-enabled tablet. Photos were taken whenever possible to verify classifications either during or post-flight.

The difference between the total and the combined count of lambs and rams equalled the number of ewes. Juvenile males are difficult to reliably distinguish from adult females in aerial bighorn sheep surveys, and are commonly included in the adult female classification (ASRD, 2010). Sheep which could not be accurately classified were categorized as unclassified ram or unclassified ewe/lamb.

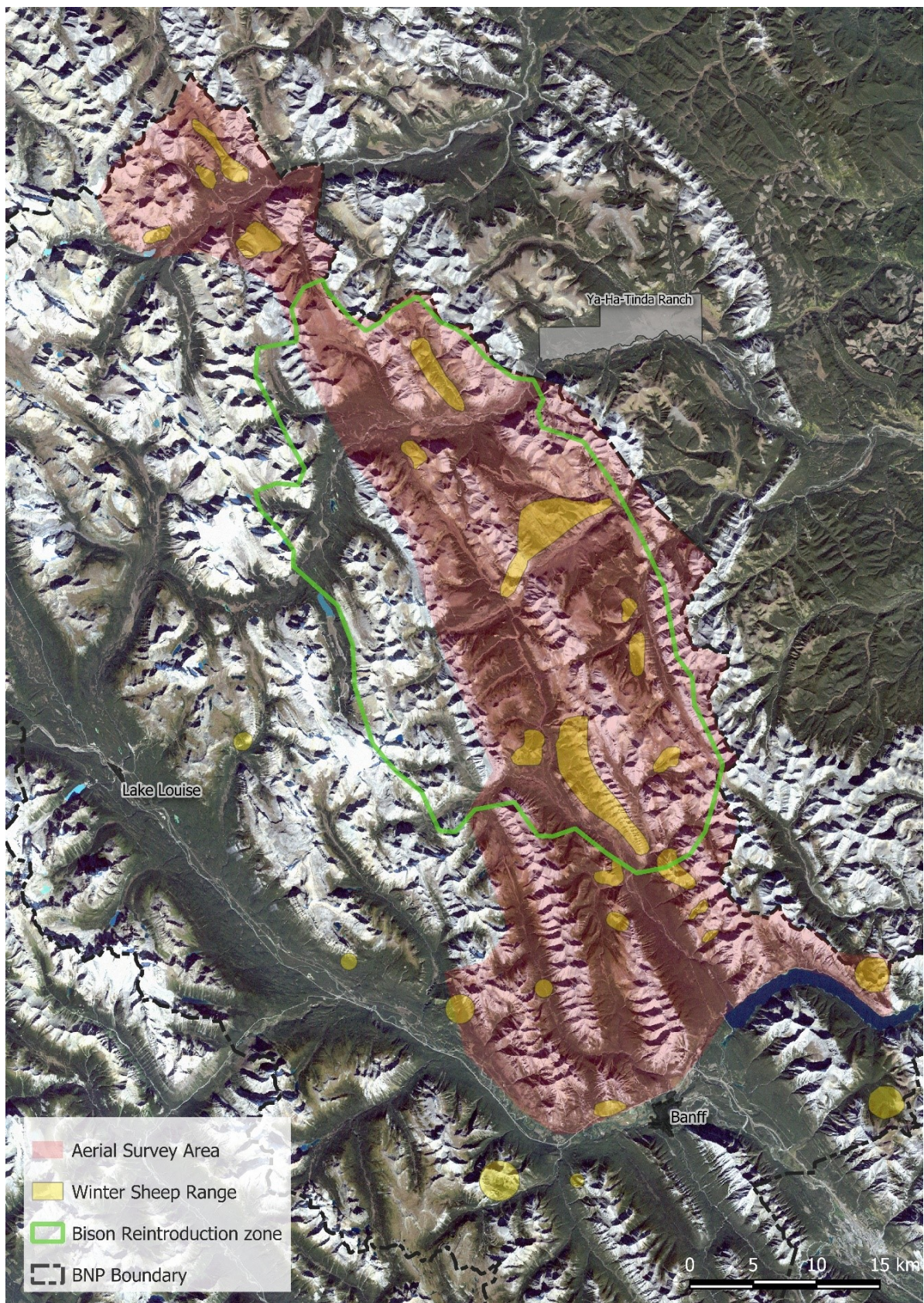


Figure 1. Bighorn sheep winter range survey area in BNP (2020) and historically known winter ranges.

We surveyed for sheep in BNP on February 9 and 10, 2020. Recent snowfall (<24 hours) made for good tracking conditions except on some wind exposed aspects. Visibility was good to excellent both days. Wind gusts up to 25 km/h on Day 1 limited thorough surveys of some small lower-level drainages adjacent to the Bow Valley near Mt Norquay. On Day 2, winds were calm and resulted in thorough searches of all survey areas. The average flight altitude was 100m above ground and airspeed was 80-120 km/hr during sheep observations. We used 11.2 hours of helicopter time of which 10.2 hours were spent surveying. We used fuel caches at Banff Compound Heli pad and the Ya Ha Tinda Ranch. The provincial lands portion of this shared survey was conducted Feb 5-7 and Feb 9-10, 2020.

Classified sheep counts for BNP were summarized by land management unit (LMU). The 2020 survey area overlapped with 9 LMU's, however only 2 LMU's (Cascade and Lower Red Deer) were surveyed in their entirety (Figure 2).

Sightability and Disturbance

Sightability is a correction factor used to account for sheep missed during aerial surveys. It requires a proportion of the surveyed population be marked with high visibility radio collars and the ratio of observed versus total marked individuals is then used along with habitat and animal activity variables to model sightability. Although they weren't wearing high visibility collars, we did have 16 GPS collared sheep (2-hour fix rate) scattered throughout the area during the 2020 survey. We were able to correlate our aerial observations (by location and time) with the satellite position data (2-hour fix rate) of these animals after-the-fact as a proxy sightability measure. Where GPS collar locations overlapped or clustered closely to aerial sheep observations, we assumed the collared animal was included ('sighted') in the classified count. We also closely monitored GPS positions of these radio collared sheep for 2 days following the survey to assess the extent to which they were displaced by the survey.

Comparisons to Past Surveys

Where appropriate, we compared this year's results to those from 2015 and 2018. Flight paths for these past surveys included known winter sheep ranges across 5 LMU's in BNP but were not identical each year. Known winter sheep ranges in three of 5 LMU's (Clearwater, Lower Red Deer and Panther) were surveyed in both 2015 and 2018; Cuthead and Upper Red Deer LMU's were each surveyed once (2015 and 2018 respectively).

We also summarized sheep counts from four BNP winter range surveys between 1982 and 1987 so broad comparisons could be made to this year's results. We caution against directly comparing these results as survey methods have evolved resulting in more efficient counts. For example, limited age/sex ratios were included in results from the early 1980s as surveyors lacked the experience and skill to confidently identify different cohorts from helicopter, a limitation that improved as time went on, resulting in more robust datasets (Skjonsberg 1993). The 2020 BNP aerial survey, by comparison, was conducted by a highly experienced survey crew who are skilled at classifying sheep from a helicopter.

Survey and Data files

To facilitate future repeatability and comparisons of bighorn sheep surveys, all digital mapping resources and metadata (flight tracks, waypoints, GIS layers, Avenza base maps), observation forms and template, 2020 survey data spreadsheets (BNP and AB province combined) can be found in the Banff field unit Groups drive: G:\Wildlife\Bighorn Sheep\Aerial Surveys\BNP\2020.

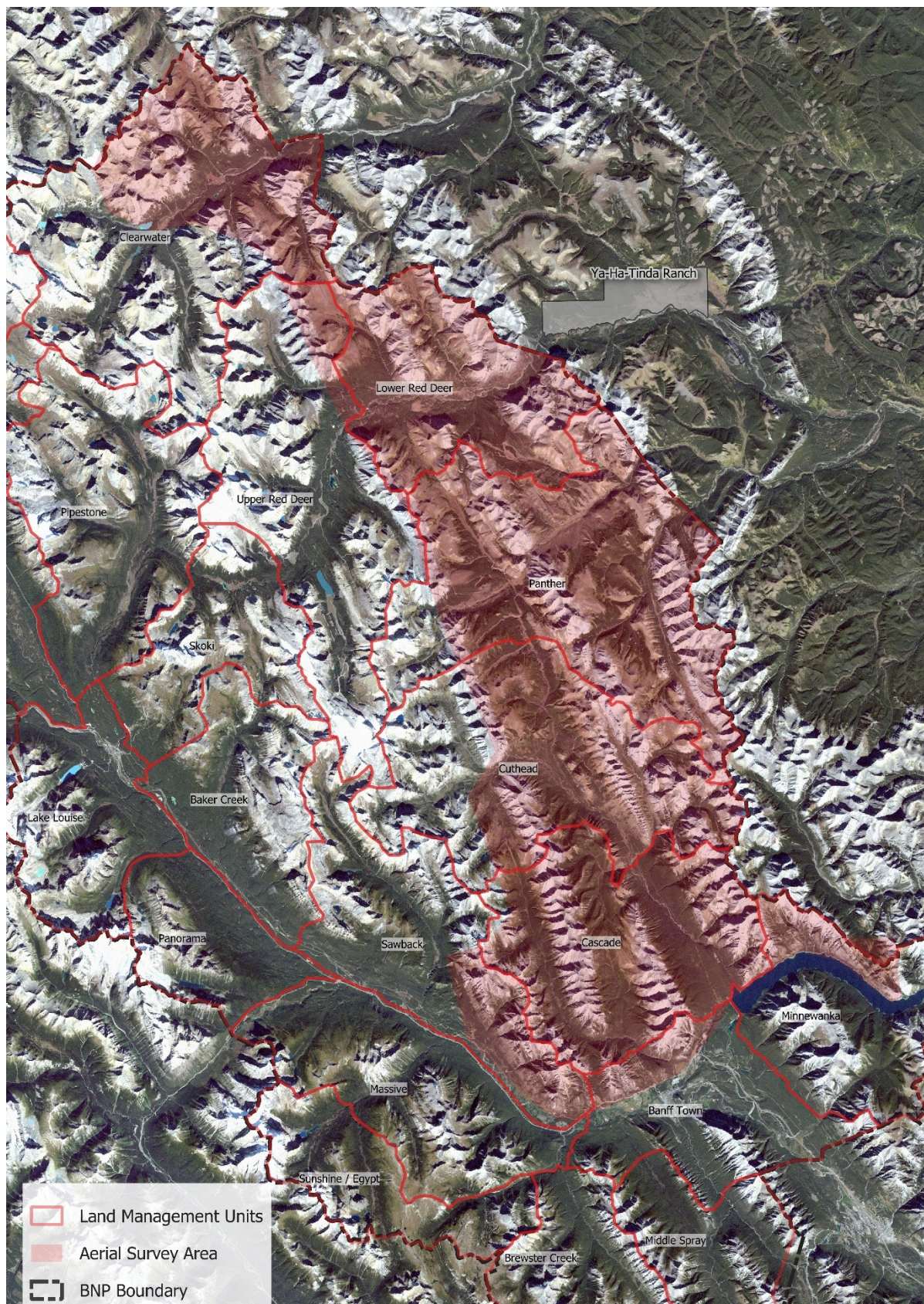


Figure 2. 2020 Bighorn sheep winter range survey area across Banff National Park Land Management Units.

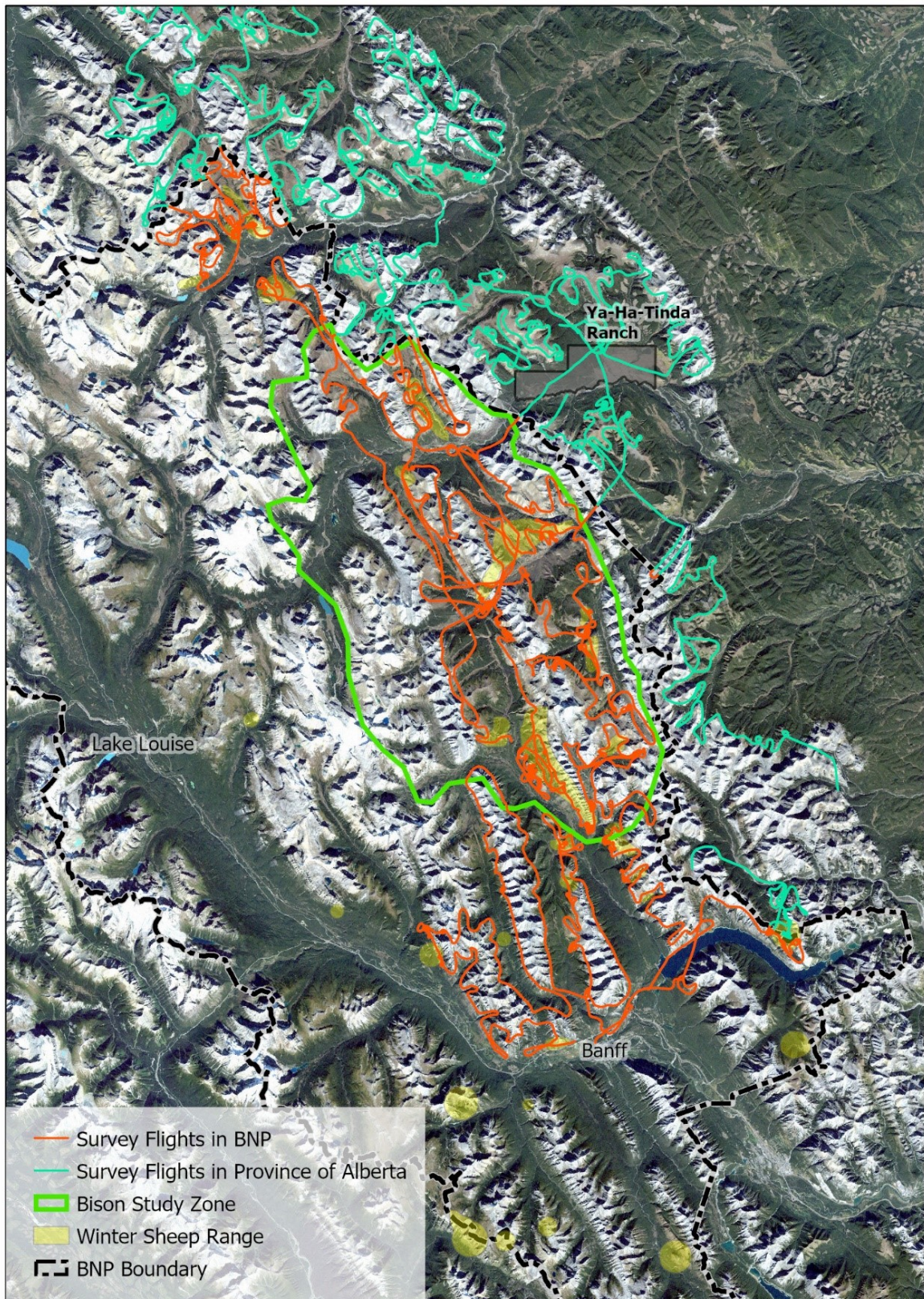


Figure 3. 2020 sheep winter range survey flight paths in Banff National Park and adjacent Alberta provincial lands.

Results and Discussion

2020 Survey

Minimum counts

2020 flight paths included all known and potential winter sheep ranges within the BNP study area (Figure 3). We observed 673 sheep in 65 groups within BNP, of which 39% were rams, 48% ewes, 11% lambs and 2% unclassified (Table 1). Of the unclassified sheep, 8 were of unknown sex or age class and 7 were rams of unknown horn classification (Table 1). Forty-five of the 65 groups (70%) were within (or very close to) historically known winter ranges (Figure 4), suggesting high fidelity to traditional winter ranges identified as far back as the mid 1970's (Jacobson 1977). Mean group size was 10.4 ($\pm$ 1.12 SE; range 1-54). Mean group size observed on provincial lands, during the shared 2020 survey, was 10.3 ($\pm$ 0.83 SE; range 1-52). These results represent a minimum count of bighorn sheep, not a population estimate as we did not model for sightability.

Sightability and Disturbance

Eleven of the 16 radio-collared sheep in the area were 'observed' during the 2020 survey (69%). This is in line with the average 70% sightability AEP assumes during its surveys (AEP 2015) and is slightly lower than the 77-82% sightability recorded for sheep surveys in the Elk Valley of B.C. (Poole 2013).

The brief disturbance by helicopter did not lead to abandonment of habitat.

None of the 11 counted radio-collared sheep moved more than 500m from their respective observed survey locations in the 48-hour post survey period.

Table 1. Bighorn sheep total classified counts across BNP Land Management Units during the 2020 aerial winter range survey.

LMU	Total	Lambs	Ewes	U/C ¹					Ram Full	U/C	Lambs:	Rams:
				Male	Ram ¼	Ram ½	Ram ¾	Ram 4/5			100 ewes	100 ewes
Cascade	92	12	34	7	14	6	6	9	4	0	35	135
Clearwater	173	20	79	0	25	15	11	16	7	0	25	94
Cuthead	120	15	61	0	10	4	7	9	8	6	25	62
Lower Red Deer	44	3	27	0	2	5	6	1	0	0	11	52
Minnewanka	10	2	3	0	0	1	3	0	1	0	67	167
Panther	208	25	106	0	13	15	23	23	1	2	24	71
Sawback	17	0	8	0	1	2	2	2	2	0	0	113
Upper Red Deer	9	1	6	0	1	0	1	0	0	0	17	33
Total	673	78	324	7	66	48	55	60	23	8	24	81

¹U/C = unclassified

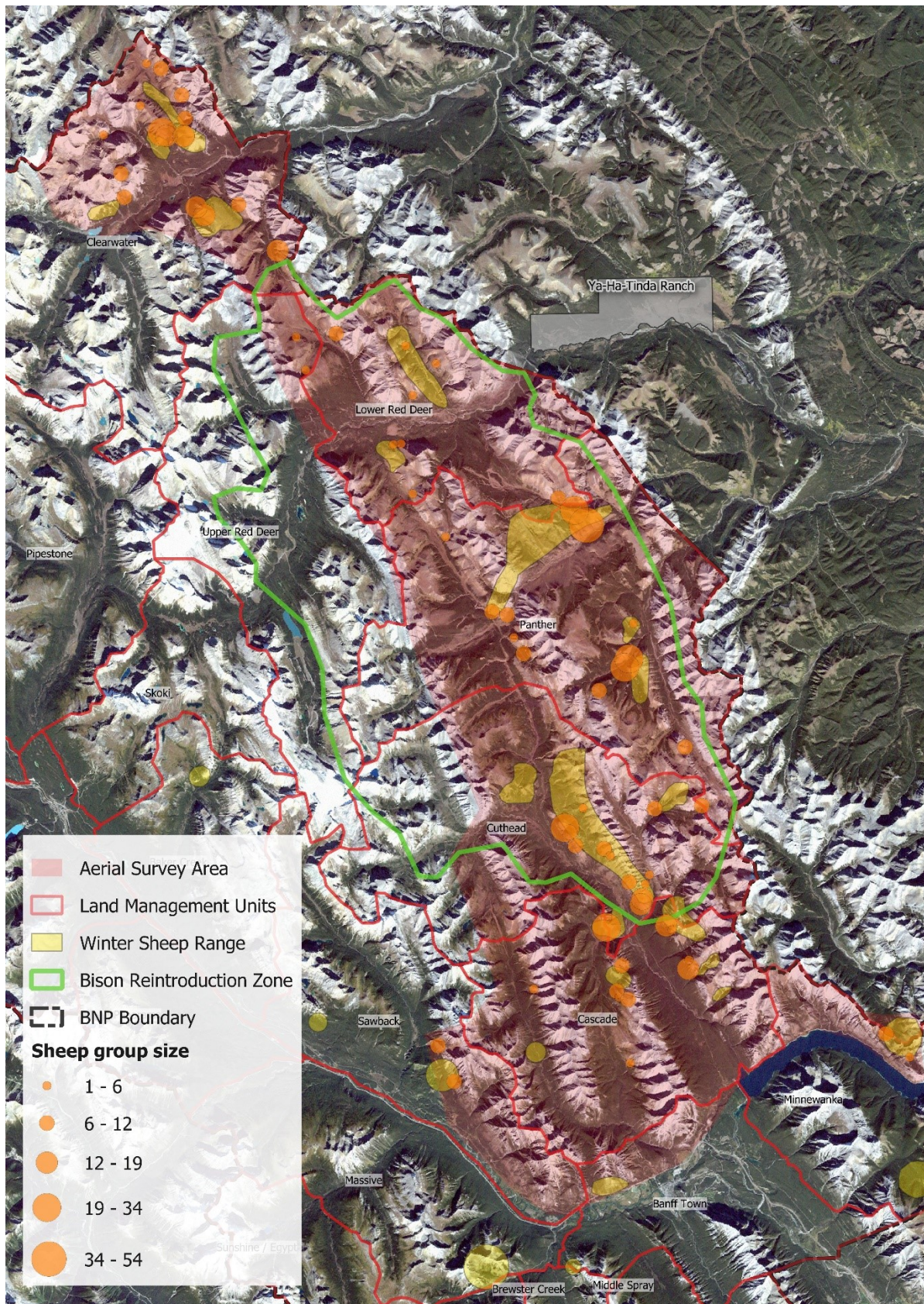


Figure 4. Bighorn sheep proportional group size observations during aerial winter range survey in Banff National Park, 2020.

Sex-Age classes

Recruitment, as measured by winter lamb: ewe ratios of approximately 24:100, was very similar inside and outside of the park (Table 2) but could be cause for concern. Demarchi et. al. (2000) indicate an over-winter ratio of 30 lambs: 100 ewes results in a stable population of bighorn sheep. The Alberta Bighorn Sheep Management Plan (2015) identifies a mean target ratio of 35 lambs: 100 ewes, over multiple winter survey counts to maintain population resiliency.

Of all classified rams in BNP, 26% were $\frac{1}{4}$ curl, 19% were $\frac{1}{2}$ curl, 23% were $\frac{3}{4}$ curl and 32% were legal rams ($\frac{4}{5}$ curl or larger) and the overall observed ram ratio was 81 rams: 100 ewes (Table 1). The number of legal rams observed in BNP equates to 12.6% of the total classified sheep (Table 2). By comparison, the ram ratio observed across the provincial Red Deer North Saskatchewan region, in 2020, was 29 rams: 100 ewes, and 2.8% of total classified sheep were legal rams (Table 2).

Table 2. Bighorn sheep population ratios observed during 2020 aerial winter range surveys in BNP and on Alberta provincial lands.

Survey Area	Total sheep ¹	Lambs: 100 ewes	Rams: 100 ewes	% Legal Rams
Banff National Park	658	24	81	12.6
AB Province - Red Deer/N. Saskatchewan	1224	25	29	2.8

¹classified count

To manage for sustainable harvest, Alberta's Bighorn Sheep Management Plan (2015) sets a target that 7-10% of total sheep observed during the last 2-3 winter surveys should be legal rams ($\frac{4}{5}$ th curl or larger). 2020 survey results on provincial lands closest to the national park are well below this target (2.8%), but this survey covered only a small proportion of the total Alberta Sheep Management Areas for which the target is established. A substantially higher proportion of legal rams inside BNP (12.6%) suggests the park is an important refuge for trophy animals that are legally harvested on adjacent lands.

Health

Wild bighorn sheep populations across North America are susceptible to a variety of viruses, diseases and parasites that cause significant long-term health effects and large-scale die-offs (AEP 2015, Garde et al. 2005). In some cases, viruses can spread between ungulate populations that share habitat with sheep (Garde et al 2005). Sheep herd health monitoring and surveillance in Alberta is a coordinated effort between provincial government agencies and the Canadian Wildlife Health Cooperative (CWHC). Parks Canada recently collected blood from over 25 sheep captured during radio collaring efforts in BNP and is in the process of having them analyzed for indices of health.

During the 2020 winter aerial sheep survey, we did not detect any outward signs of ill-health in the sheep observed across national park and provincial lands. We observed no outward signs of any sheep in poor body condition, no visible signs of poor coat condition or skin lesions, and all animals appeared to move well in response to the helicopter.

Comparisons to Past Surveys

As expressed earlier in this report, caution is advised when comparing survey results between years as survey routes, effort, personnel and weather and snow conditions vary. That said, a rough comparison of 2020 results to past surveys inside and outside of BNP is presented below and suggests the sheep population is stable.

Within Banff National Park 2015-2020

Where BNP LMU's were repeatedly surveyed across years, the Panther and Clearwater LMU's had the highest total sheep counts (Figure 5 and **Appendix 1**). Winter sheep ranges in the Cuthead LMU also consistently supported high numbers of sheep since 2015. Numbers are lower and have declined in the lower Red Deer (Figure 5). The 2020 BNP survey observed the highest ram to ewe ratio (81:100) since 2015, but also recorded the lowest lamb to ewe ratio (25:100) in the same time period (Table 3). Legal rams inside BNP represented an average of 9.4% of the total classified sheep count between 2015 and 2020. The average group size has been consistent across all 3 surveys at 11.5 sheep.

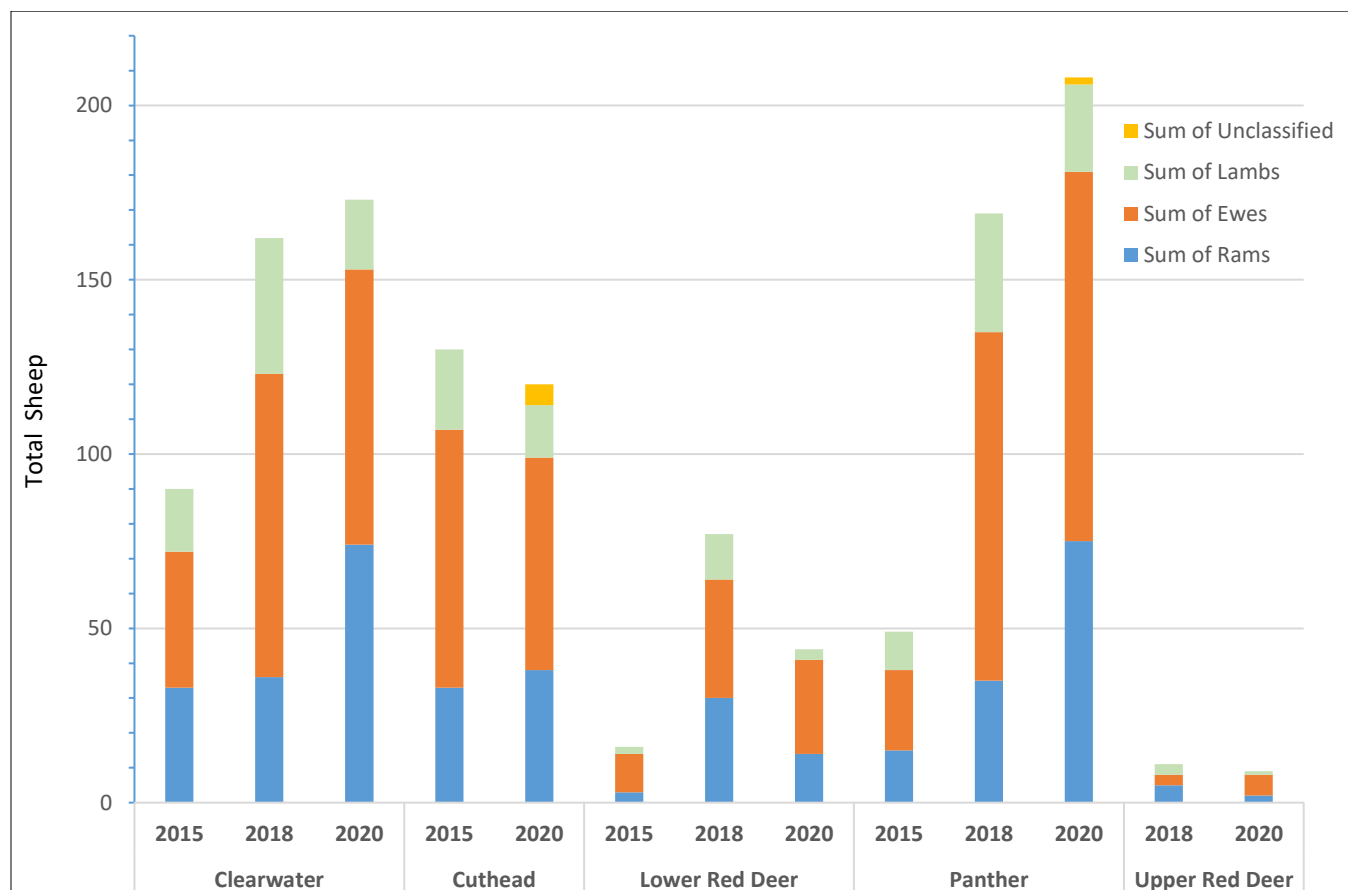


Figure 5. Comparison of bighorn sheep classified counts across five different BNP Land Management Units during aerial winter range surveys conducted in 2015, 2018 and 2020.

Table 3. Comparison of bighorn sheep counts and population ratios between BNP and Alberta Provincial lands during annual aerial winter range surveys in 2015, 2018 and 2020.

Survey Year	Total sheep ¹		Lambs: 100 ewes		Rams: 100 ewes		% Legal Rams	
	BNP	AB Prov	BNP	AB Prov	BNP	AB Prov	BNP	AB Prov
2015	288	1527	37	37	59	29	10	3.2
2018	419	1706	39	42	47	33	5.7	3.1
2020	658	1224	24	25	81	29	12.6	2.8

¹classified count

Banff National Park versus Provincial lands 2015-2020

A low recruitment (lamb to ewe ratio) was observed both inside and outside BNP in 2020 (Table 3). The provincial survey data also recorded a decline in lamb numbers per 100 ewes since their previous survey (25 lambs in 2020, down from 42 lambs in 2018 (Table 3)). Sheep numbers, including lamb recruitment and survival, can be affected by many factors, including predation, hunting, disease, habitat quality, climate and human disturbance. Whether or not the observed low ratios are real, and what might be causing them, would require additional research. Provincial wildlife managers commented that lamb to ewe ratios can be highly variable across years and they will continue to monitor sheep populations to look for any long-term trends of concern (Hubbs, 2020).

Legal size rams on provincial lands averaged 3% of the total classified counts between 2015 and 2020, compared to an average of 9.4% in BNP during the same years (Table 3). In 2018, the average group size of sheep observed was identical (11) on both provincial lands and national park lands.

Within Banff National Park 1982-1987

Aerial surveys on winter sheep ranges north of the Trans Canada Highway between 1982 and 1987 saw a gradual rise in counts each year (Table 4; Skjonsberg, 1993). Herd composition for 3 years (1985-87) along the eastern slopes averaged 44% rams: 47% ewes: 9% lambs with a ratio of 94 rams: 100 ewes and 20 lambs: 100 ewes (Skjonsberg, 1993). There was a gradual rise in lamb: ewe ratio each year since 1985 (Table 4). The average group size from 1982-87 was 12.6 sheep, identical to the 2020 BNP survey. Overall, the population ratios observed in 2020 (39% rams: 48% ewes: 11% lambs) were not substantially different from observations reported many decades earlier.

Table 4. Bighorn sheep classified count data from winter range aerial surveys in Banff National Park (north of the Trans Canada Highway) between 1982 and 1987.

Survey Year	Total count	Rams	Ewes	Lambs	Unclassified	lambs: 100 ewes	Avg. group size
1982	551	162	7	2	388	29	10
1985	812	361	368	33	50	9	15
1986	1100	437	568	95	0	16	12.5
1987	1319	571	514	162	72	32	13

Conclusions

Stakeholder concerns about the potential effects of bison reintroduction on bighorn sheep led to the most extensive aerial survey of sheep winter ranges in and around BNP in over 30 years. A minimum of 673 sheep was recorded within BNP while 1,224 were counted on surrounding provincial lands.

It is difficult to draw direct comparisons between 2020 survey numbers and results from previous surveys due to varying survey routes, survey efforts, skill level of surveyors, and weather and snow conditions. That said, 2020 survey results point to the trans-jurisdictional sheep population being stable (pooled counts for BNP and surrounding areas in 2020 were within +/- 10% of those for 2015 and 2018). Average group size in 2020 (10.3 animals) was also similar to sheep surveys over the past several decades.

Sex and age ratios recorded during the 2020 survey point to two potentially concerning trends. The first is a 25% lamb to ewe ratio, the lowest recorded ratio this decade both inside and outside BNP and well below the 35% threshold for population resiliency over time. Lamb to ewe ratios can be highly variable between years, as evidenced by frequent sheep surveys in BNP in the 1980s (Skjonsberg, 1993). Provincial wildlife managers have noted the 2020 result and will continue to monitor the population and look for any long-term trends of concern (Hubbs, 2020).

The second concerning trend is the much lower ratio of rams, especially older trophy rams, on provincial lands outside BNP. The ratio of all rams to ewes outside BNP is also substantially lower (29:100 outside vs 81:100 inside). Without further investigation and research, it is difficult to say whether hunting pressure outside of the park or other contributing factors are having a substantial effect on population demographics.

Establishing a pre-bison baseline for sheep numbers, demographics and distribution was one of the primary objectives of this 2020 sheep survey. Doing so creates the foundation for comparisons to future surveys when bison potentially become more numerous and widespread. Questions about the potential effect of bison on wild sheep are also being addressed more immediately through health and habitat studies that were launched over the last 2 years.

Recommendations

Aerial surveys are the primary method of assessing population size, trends, distribution, and herd composition (AEP, 2010). A baseline understanding of these key metrics for sheep, particularly where there is potential for interspecific competition, is vital for future wildlife management planning. Sheep herds in this trans-jurisdictional area are vulnerable to harvest pressure outside the park and should continue to be monitored frequently. This monitoring must be done in as consistent manner as possible for results to be comparable and to identify important trends.

The following recommendations will maximize the consistency and comparability of future sheep surveys:

1. Aerial surveys of winter range should be conducted on a minimum 3-year rotation (preferably every 2 years) to ensure data is collected frequently enough to provide abundance measures. Provincial sheep management guidelines (AEP, 2015) emphasize that population sizes can

change rapidly (in one season) when die-offs occur. Low recruitment and lamb survival can follow for many years. Infrequent surveys are insufficient to detect these population changes. We recommend a subsequent survey in March 2022. This would coincide with the AB provincial sheep monitoring cycle and provide multi-year trend data to better inform Parks Canada's 5-year review of the bison reintroduction program in 2022.

2. Joint/shared aerial surveys (with AEP) along boundary areas are desirable for assessing population numbers where animal movement in and out of BNP is likely occurring. Collaborating on these flights is also valuable in that it facilitates a consistent team of skilled observers. The shared expertise vastly improves quality of data while minimizing animal stress.
3. Accurate age and sex ratios are essential to understanding herd composition and population status; a highly experienced observer in this role is essential. Also, we recommend a video camera with image stabilization and high quality optics to improve accuracy for classifying rams, especially when herds are moving quickly into cover. Having the ability to obtain and review video footage post survey would allow for count verification and would also serve as a learning tool when training new observers.
4. There appears to be strong fidelity to known winter ranges in the north-east region of BNP; we recommend that future sheep surveys follow a standardized flight path (Figure 6) for inter-year consistency in survey effort.
5. In the absence of incorporating a sightability correction to sheep population measures (which requires additional flights and high visibility radio collars, and consequently higher associated costs and increased herd disturbance on winter ranges), surveys must be conducted during consistent weather conditions across years to allow for good visibility and reasonable comparisons between population estimates (AEP 2010).

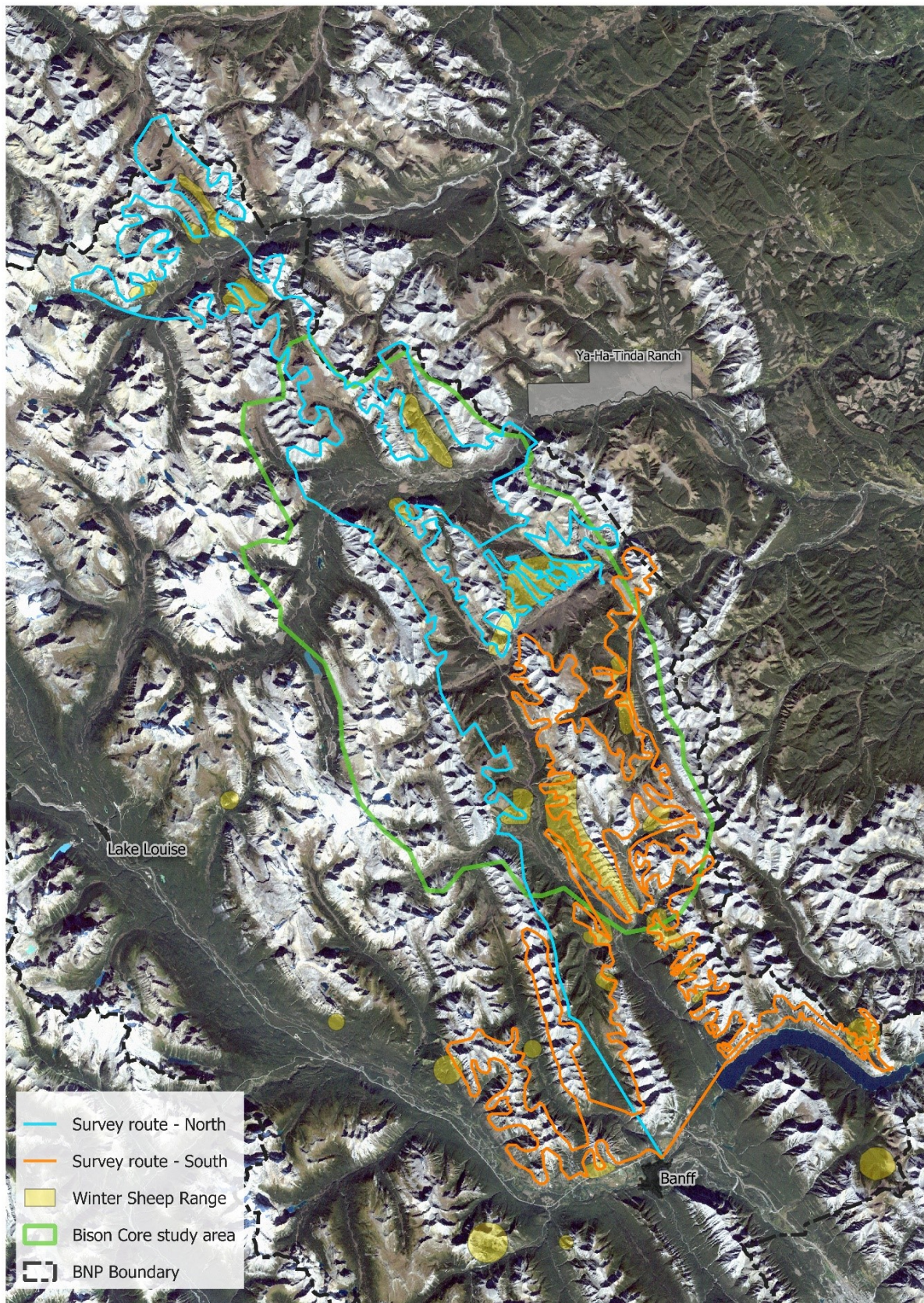


Figure 6. Recommended survey routes for subsequent sheep winter range surveys in Banff National Park.

ANNEX A

Bighorn Sheep Aerial Ungulate Survey. Red Deer North Saskatchewan Region - Winter 2020 (Hubbs, A. 2020. Alberta Environment and Parks).

Background

Bighorn sheep surveys of winter ranges give a minimum population count and contribute to establishing and monitoring long term population trends. Classification of sheep populations (ram: ewe: lamb ratios) are used to assess population composition and recruitment. Classification of rams by horn size is completed to allow for an estimate of trophy sheep sustainability. Alberta's Bighorn Sheep Management Plan's objective for legal rams found during winter surveys is 5% of the total population being comprised of legal rams following the completion of the preceding hunting season. Legal rams are defined as having achieved a 4/5 curl or larger. Ideally, bighorn sheep surveys are completed every second year and the last two surveys in the Red Deer North Saskatchewan (RDNS) Region were completed during the winters of 2018 and 2015.

All known bighorn sheep winter ranges in Wildlife Management Units (WMUs) 328, 414, 418, 420, 422, 426, 428, 429, 430, 432, 434, 734 (Ghost Wilderness Area (WA)) and 738 (White Goat WA) were flown during the 2020 survey. In addition, all sheep winter ranges in Banff National Park north of the Banff town site were surveyed. This was the most complete survey of Banff Park in the past 15-20 years. A portion of the Brazeau/Issac complex in the south-east corner of Jasper Park (just north of WMU 432) was also flown.

This report summarizes the results of the 2020 winter survey on provincial lands. Details on the Banff Park survey are reported separately.

Survey Method

The locations of the bighorn winter ranges are GIS referenced and mapped allowing the survey crew to survey all known winter ranges within the defined survey area. Ideally, bighorn sheep surveys are completed as soon as possible following a snowfall so that the winter ranges have complete coverage of snow to optimize sight-ability. As the winter range is approached all crew members look for sheep and tracks. When tracks are observed they are followed until sheep are located. When a herd of sheep is observed the aircraft approaches from behind and flies by with the herd on the left hand side of the aircraft. One of the two observers on the left hand of the aircraft completes a total count of observed sheep and counts lambs. The other observer on the left counts and classifies observed rams. The difference between the total count and combination of lambs and rams observed will equal the number of ewes. The observer on the right side of the aircraft is responsible for geo-referencing sheep locations recording

counts and classifications. Photos are taken whenever possible to verify classifications.

Results

Bighorn sheep winter ranges were surveyed from February 5-7 and 9-10, 2020. The first three days of the survey focused on provincial lands north of the Red Deer River, while the last two days were concentrated in Banff National Park and southern WMUs (414 and 734). Weather conditions and visibility were poor to good during the survey, with variable winds and snow conditions. Some slopes were wind swept and lacked good snow coverage, despite recent snowfalls.

Totals

A total of 1235 bighorn sheep were observed on provincial lands, of which 1,199 sheep were classified. Of the 36 unclassified sheep, 11 were of unknown sex or age class, and 25 were “rams” of unknown horn classification.

The total number of rams which were classified were: 42 at $\frac{1}{4}$ curl, 59 at $\frac{1}{2}$ curl, 73 at $\frac{3}{4}$ curl, 33 legal rams ($\frac{4}{5}$ curl or larger). The number of legal rams that were observed equated to 2.8% of the total classified sheep. This includes 1 legal ram in the Ghost Wilderness Area (WMU 734) where hunting is prohibited. No legal rams were seen in other no-hunting areas (i.e. White Goat Wilderness Area (WMU 738) and WMU 429).

Population ratios were: 29 rams: 100 ewes: 25 lambs.

Comparison amongst survey results on provincial lands

Tables 1, 2 and 3 provide a summary by WMU for the 2020, 2018 and 2015 sheep surveys, respectively.

The most striking difference in 2020 was the low number of lambs per 100 ewes (25) compared with previous surveys (42 – 2018, 37 – 2015). Lamb: ewe ratios can be highly variable across years. Wildlife management will continue to monitor these ratios to look for any long-term trends of concern.

The numbers of ram: 100 ewes were the same in 2020 and 2015 (29), and down slightly from 2018 (33). The percentage of legal rams on provincial lands declined slightly in 2020 (2.8%) from 2018 (3.1%) and 2015 (3.2%).

Table 1. Number of Bighorn Sheep observed by WMU during the 2020 Red Deer - North Saskatchewan Region Aerial Survey.

WMU	Total Sheep	Rams	Ewes	Lambs	Unclassified
328	0	0	0	0	0
414	4	0	4	0	0
416	0	0	0	0	0
418	322	59	224	39	0
420	253	47	156	39	11
422	239	28	164	47	0
426	3	0	3	0	0
428	26	6	14	6	0
429	6	0	4	2	0
430	61	30	21	10	0
432	26	7	19	0	0
434	181	40	103	38	0
734	85	13	58	14	0
738	29	2	23	4	0
Total	1235	232	793	199	0
Rams/Ewes / Lambs	29:100: 25	% Legal Rams in Population		2.8%	

Banff *	673	263	324	78	8
Jasper	41	15	21	5	0

* Refer to Banff National Park survey report for more details.

Table 2. Number of Bighorn Sheep observed by WMU during the 2018 Survey

WMU	Total Sheep	Rams	Ewes	Lambs	Unclassified
328	51	8	29	14	0
414	18	0	11	6	1 yearling
416	4	4	0	0	0
418	366	71	204	91	0
420	523	105	299	119	0
422	211	34	119	47	11
426	46	4	23	9	10
428	0	0	0	0	0
429	17	2	8	7	0
430	104	28	63	13	0
432	75	16	39	20	0
434	207	29	123	55	0
734	69	19	29	16	5
738	42	5	26	11	0
Banff	419	106	224	89	0
Provincial Land Total	1733	325	973	408	27
Banff Park Total	419	106	224	89	0
Combined Total	2152	431	1197	497	27
	Province	Banff			
Herd Composition (Rams/Ewes/Lambs)	33:100:42	47:100: 39			
% Legal Rams in Population	3.1 % ¹	5.7%			

¹ Fifty-two rams 4/5 curl or larger out of 1698 classified sheep. This includes four legal rams observed in SMA 5, where there are currently no hunting seasons for sheep.

Table 3. Number of Bighorn Sheep observed by WMU during the 2015 Survey

WMU	Total Bighorn Sheep	Rams	Ewes	Lam bs	Unclassified
328	0	0	0	0	0
414	19	6	8	5	0
416	8	8	0	0	0
418	317	40	203	74	0
420	381	72	224	85	0
422	148	34	76	37	1
426	27	4	18	5	0
428	29	8	16	5	0
429	35	4	19	12	0
430	132	26	68	38	0
432	96	13	62	21	0
434	313	47	176	51	39
738	62	3	48	11	0
Banff	288	87	147	54	0
Provincial Land Total	1567	265	918	344	40
Banff Park Total	288	87	147	54	0
Combined Total	1855	352	1065	398	40
	Province	BNP	Combined		
Herd composition (Rams/Ewes/Lambs)	29:100:37	59:100:37	33:100:37		
% Legal Rams in population	3.2%	10.0%	4.2%		

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APPENDIX 1

Comparison of total and classified counts of Bighorn sheep observed across 5 land management units in Banff National Park during 3 winter range surveys, between 2015 and 2020.

Survey Year	Total Sheep	Rams	Ewes	Lambs	Unclassified
Clearwater					
2015	93	33	39	18	0
2018	162	36	87	39	0
2020	173	74	79	20	0
Cuthead					
2015	130	33	74	23	0
2018	–	–	–	–	–
2020	120	38	61	15	6
Lower Red Deer					
2015	16	3	11	2	0
2018	77	30	34	13	0
2020	44	14	27	3	0
Upper Red Deer					
2015	–	–	–	–	–
2018	11	5	3	3	0
2020	9	2	6	1	0
Panther					
2015	49	15	23	11	0
2018	169	35	100	34	0
2020	208	75	106	25	2

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