

19C Sheep Working Group

Alaska Department of Fish & Game
Science Support Presentation

October 17th & 18th
Anchorage, Alaska



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McGrath Area Office
McGrath, AK

Presentation Overview:

1. Harvest Data
2. Survey Data
3. Carnivore Numbers
4. Carrying Capacity
5. Weather & Climate Data
6. Stressors

These subjects are in response to the “data needs/gaps” identified by this group during the august meeting.



Harvest Data



19C Sheep Hunter Effort and Harvest Data

Overview

The sheep harvest and hunter effort data presented here reflect a longer time frame, i.e., Historical Trends, and a more recent decade where both resident and nonresident opportunity was present (2013-2022). The 2023 harvest is not shown and totalled 5 sheep harvested during a season with no nonresident or youth opportunity. 2024 data are not yet available at the time of this meeting, and 10 legal farms have been reported thus far in the 2024 season. All data are preliminary and subject to change.

Historical Trends

Total Fall Sheep Hunters (19C): 1983-2023

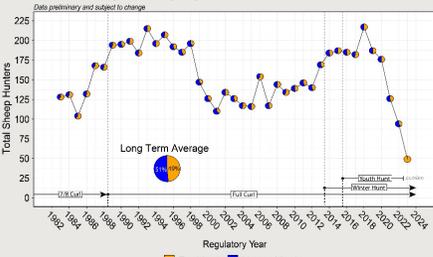


Figure 1. Total annual sheep hunters during the fall general season (GS000) from RY83 to RY23. Points and solid lines show the total number of hunters, with orange and blue regions of each point showing the proportion of resident (orange) and nonresident (blue) hunters each year. The vertical dashed lines show the regulation changes occurring during the period (e.g., Full-Cut (right), Youth Hunt, Winter Registration Hunt). Note that in RY23 hunting was closed to nonresident hunters. Unknown residency status are not shown but are generally a small number of individuals and typically earlier in the time series. RY24 hunter effort and harvest information was not available at the time of this meeting.

Total Fall Sheep Harvest (19C): 1983-2023

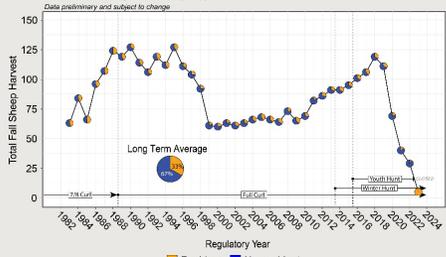


Figure 2. Total annual sheep harvested during the fall general season (GS000) from RY83 to RY23. Points and solid lines show the total harvest, with orange and blue regions of each point showing the proportion of resident (orange) and nonresident (blue) hunters each year. The vertical dashed lines show the regulation changes occurring during the period (e.g., Full-Cut (right), Youth Hunt, Winter Registration Hunt). Note that in RY23 hunting was closed to nonresident hunters. Unknown residency status are not shown but are generally a small number of individuals and typically earlier in the time series. RY24 harvest was not complete at the time of this meeting.

Contemporary Trends (2013-2022)

Total Fall Sheep Harvest (19C): 2013-2022

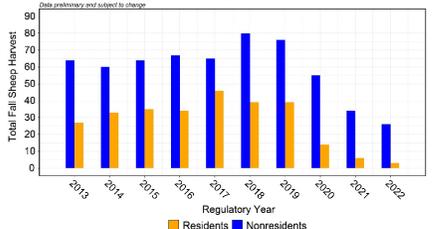


Figure 3. Total annual sheep harvested during the fall general season (GS000) from RY13 to RY22. Color indicates total fall resident (orange) and nonresident (blue) sheep harvested each year.

Sheep Hunter Success Rates (19C): 2013-2022

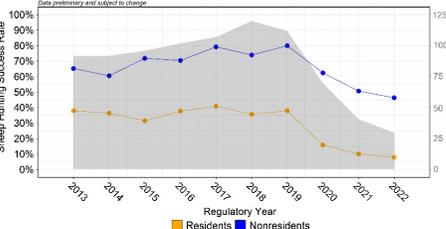


Figure 4. Success rates for the last decade where both resident and nonresident opportunity was present in GMIU 19C (RY13 to RY22). Points and solid lines show the success rates for nonresident (blue) and resident (orange) hunters during the fall general season (GS000). The shaded region and right axis show the total sheep harvest for both residents combined.

Sheep Harvest Chronology 19C: 2013-2022

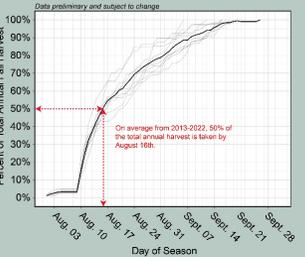


Figure 5. The percent of total harvest by day of season for the last decade where both resident and nonresident opportunity was present in GMIU 19C (RY13 to RY22). The solid black line shows the average proportion of total harvest by day of the season and light grey lines show individual years. Dashed red arrows indicate, on average, where 50% of the harvest has occurred (August 16th).

Age of Harvested Sheep 19C: 2013-2022

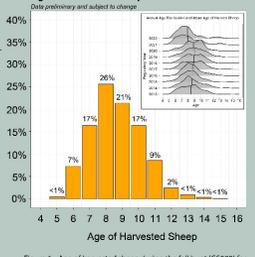
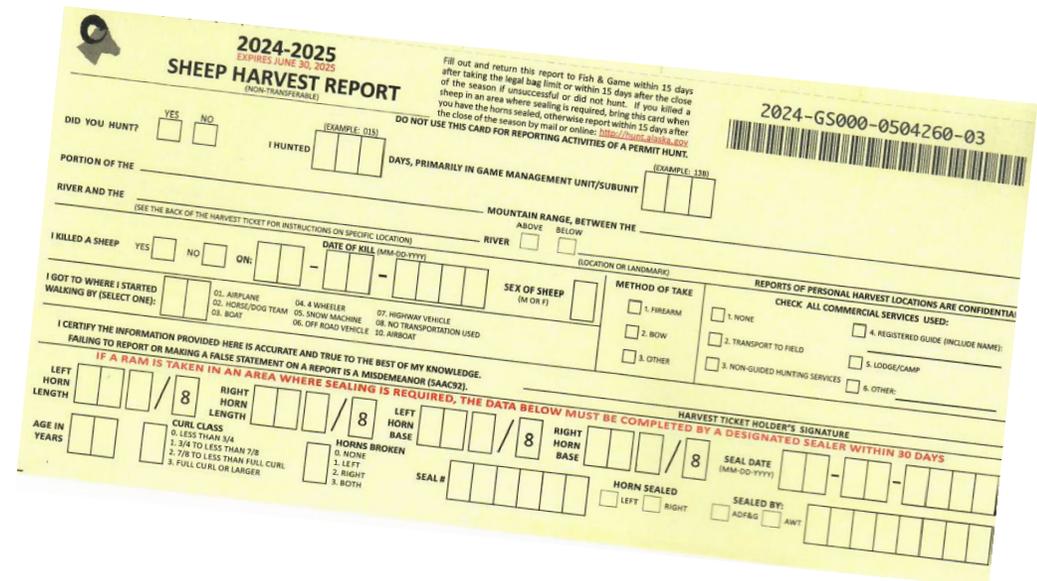


Figure 6. Age of harvested sheep during the fall hunt (GS000) for the last decade where both resident and nonresident opportunity was present in GMIU 19C (RY13 to RY22). Orange bars show the proportion of each age in the total harvest over the 10 year period. The inset shows the smoothed annual density of ages for each regulatory year and the mean age (solid vertical bars).

Table 1. Youth and Winter Registration Hunt (RS360) from 2013-2024 for GMIU 19C. Reported harvest and proportion of the total annual harvest.

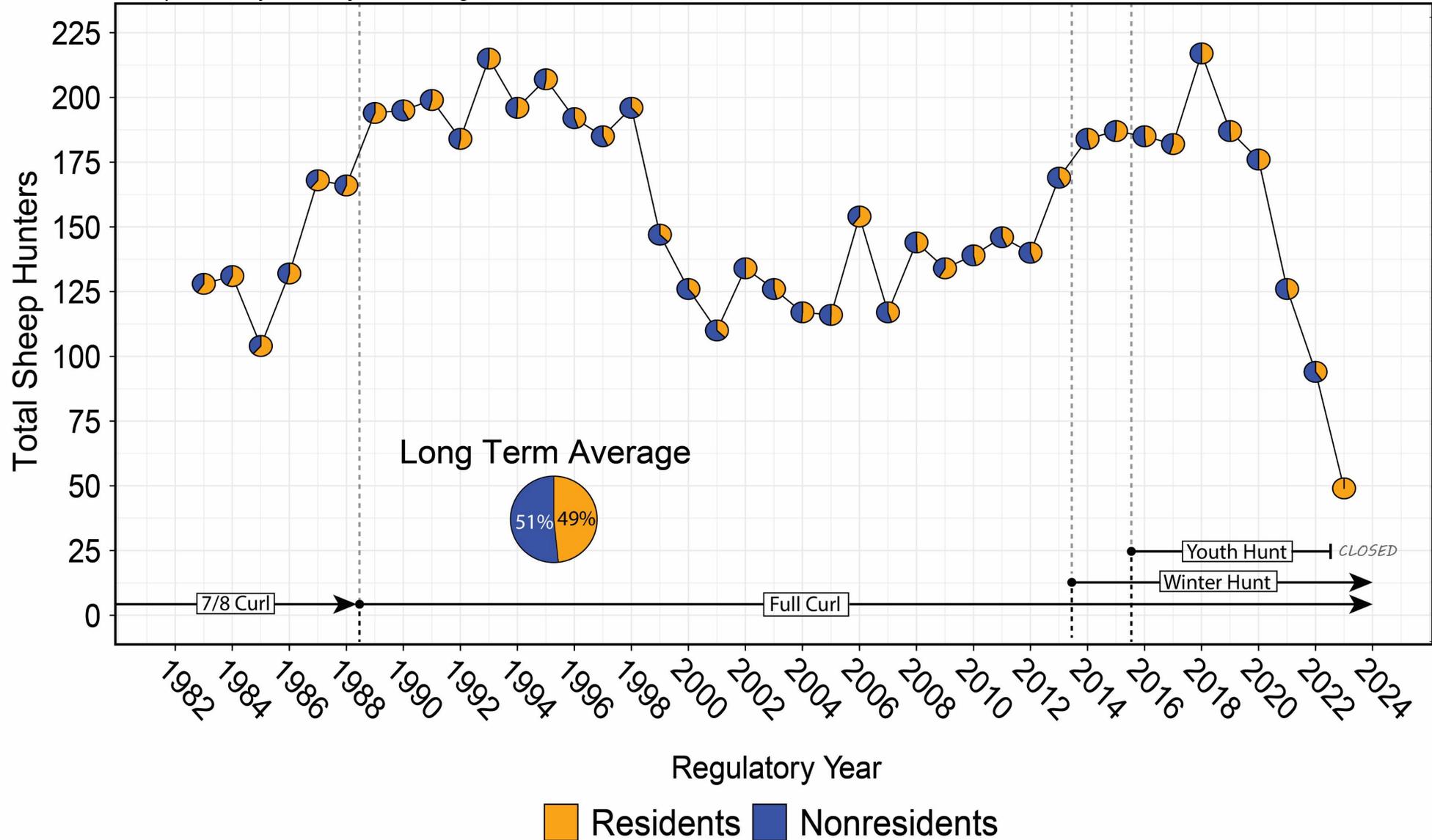
Regulatory Year	Youth Harvest		RS360 (Winter Registration Hunt)	
	Reported	% of Total Harvest	Reported	% of Total Harvest
2013	No Opportunity	-	No Opportunity	-
2014	No Opportunity	-	2	2.10%
2015	No Opportunity	-	4	4.04%
2016	3	2.97%	0	0.00%
2017	5	4.95%	5	4.95%
2018	6	5.68%	0	0.00%
2019	3	2.61%	4	3.46%
2020	2	2.90%	Closed	-
2021	1	2.60%	0	0%
2022	0	0.00%	0	0%
2023	Closed	-	0	0%
2024	Closed	-	-	-
Average	2.86	2.93%	1.87	1.57%

1) Overview of the Hunter Effort and Harvest Data Poster



Total Fall Sheep Hunters (19C): 1983–2023

Data preliminary and subject to change



19C Sheep Hunter Effort and Harvest Data

Historical Trends

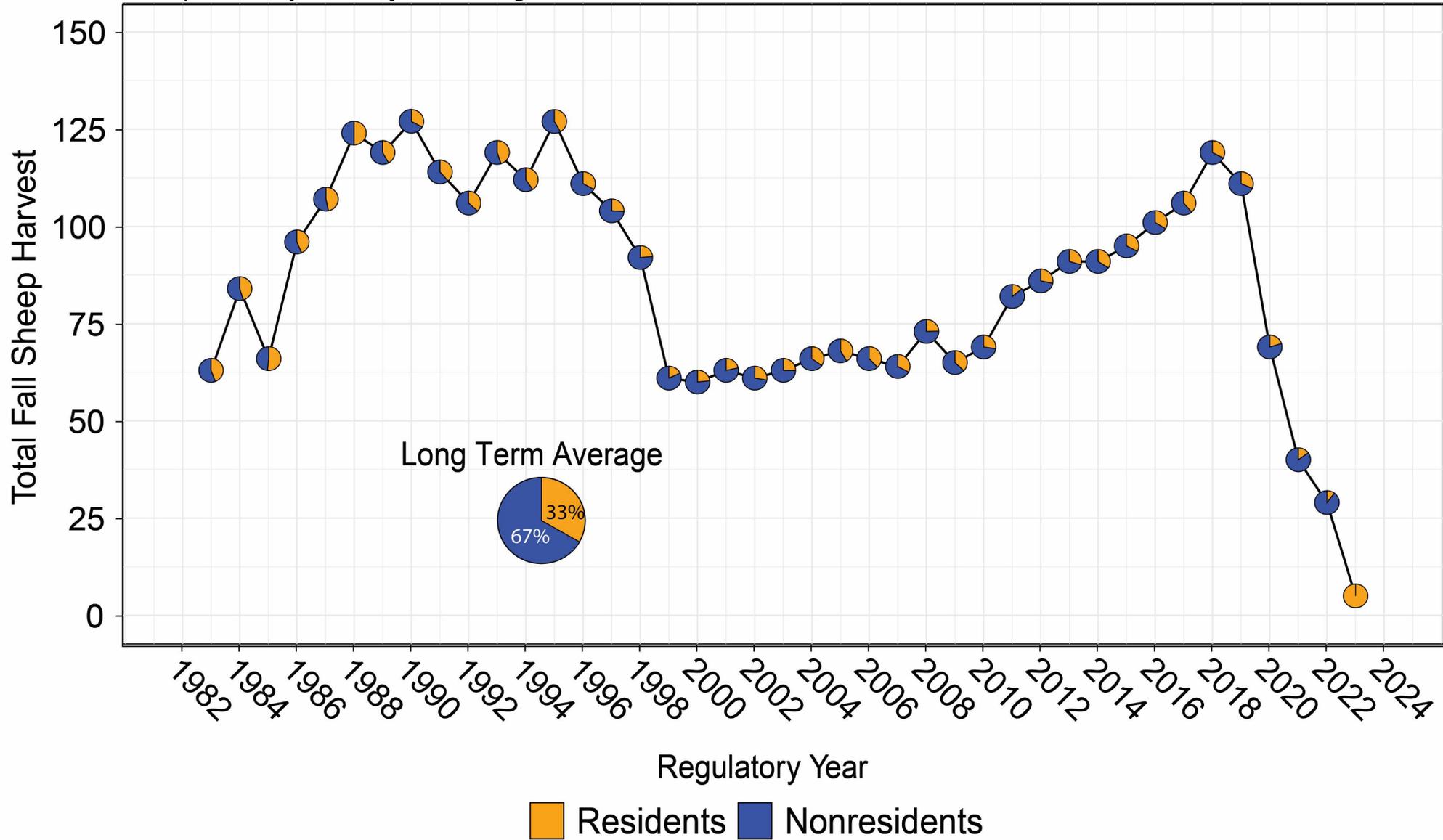
Contemporary Trends (2013-2022)

Sheep Harvest Overview 19C: 2013-2022

Age of Harvested Sheep 19C: 2013-2022

Total Fall Sheep Harvest (19C): 1983–2023

Data preliminary and subject to change



19C Sheep Hunter Effort and Harvest Data

Historical Trends

Total Fall Sheep Harvest (19C): 1983–2023

Long Term Average

67% Nonresidents

33% Residents

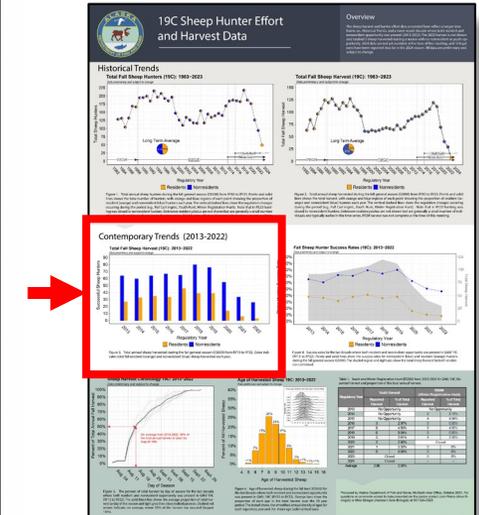
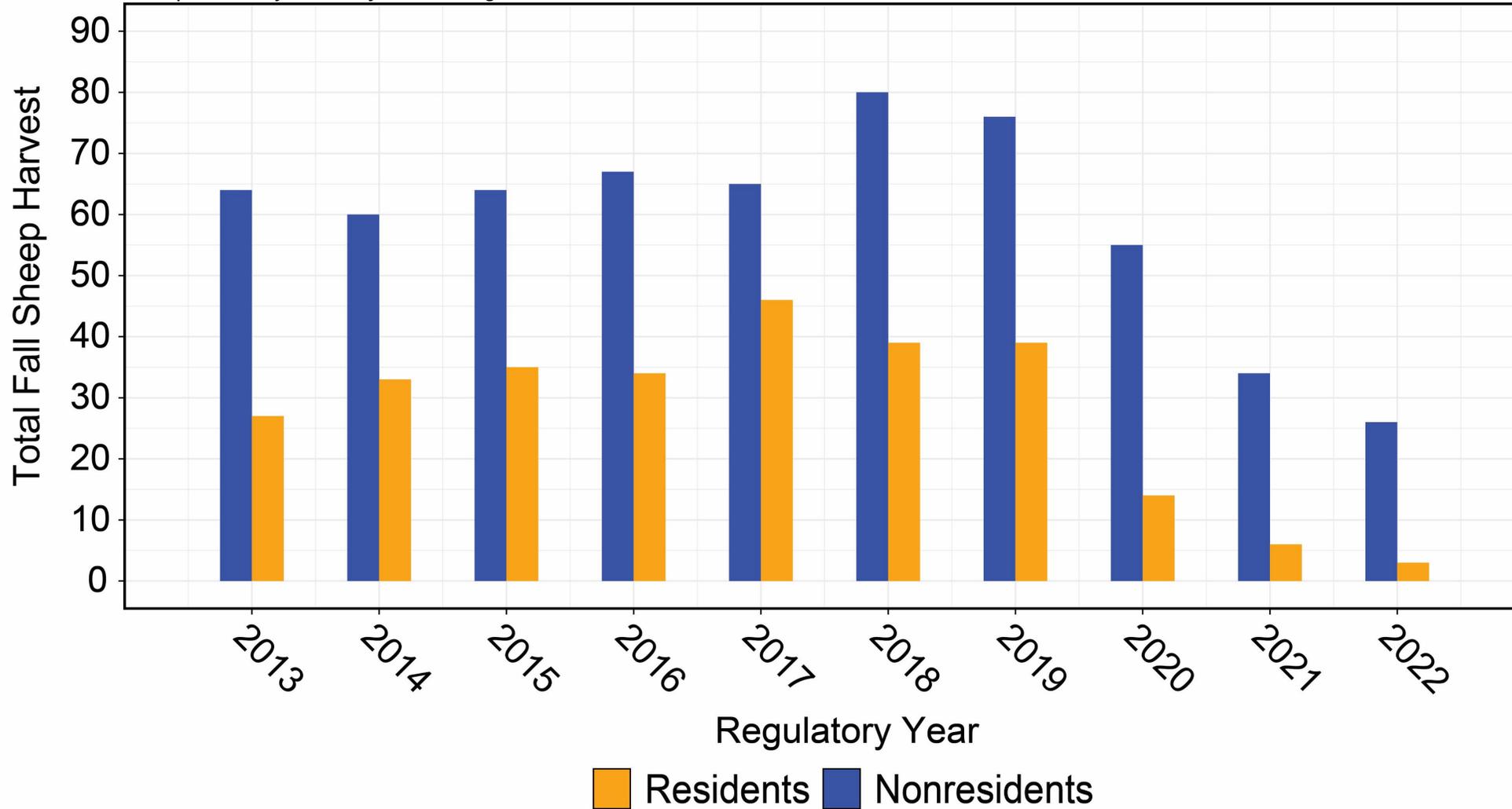
Contemporary Trends (2013–2022)

Sheep Harvest Change (19C): 2013–2022

Age of Harvested Sheep (19C): 2013–2022

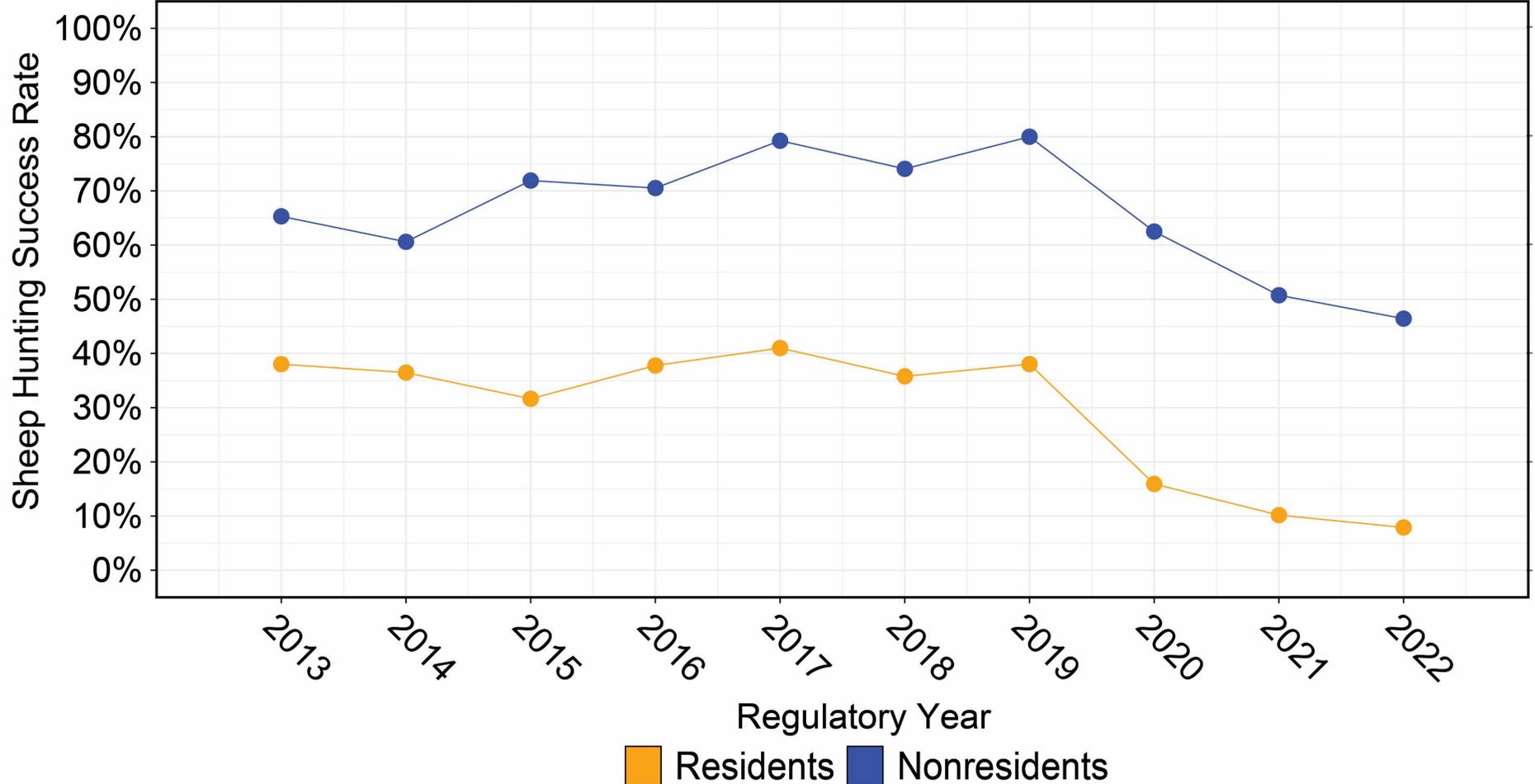
Total Fall Sheep Harvest (19C): 2013–2022

Data preliminary and subject to change



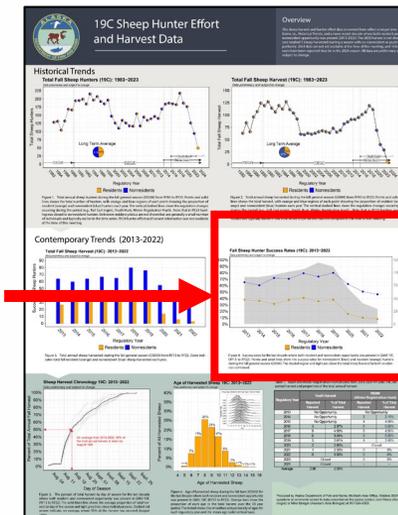
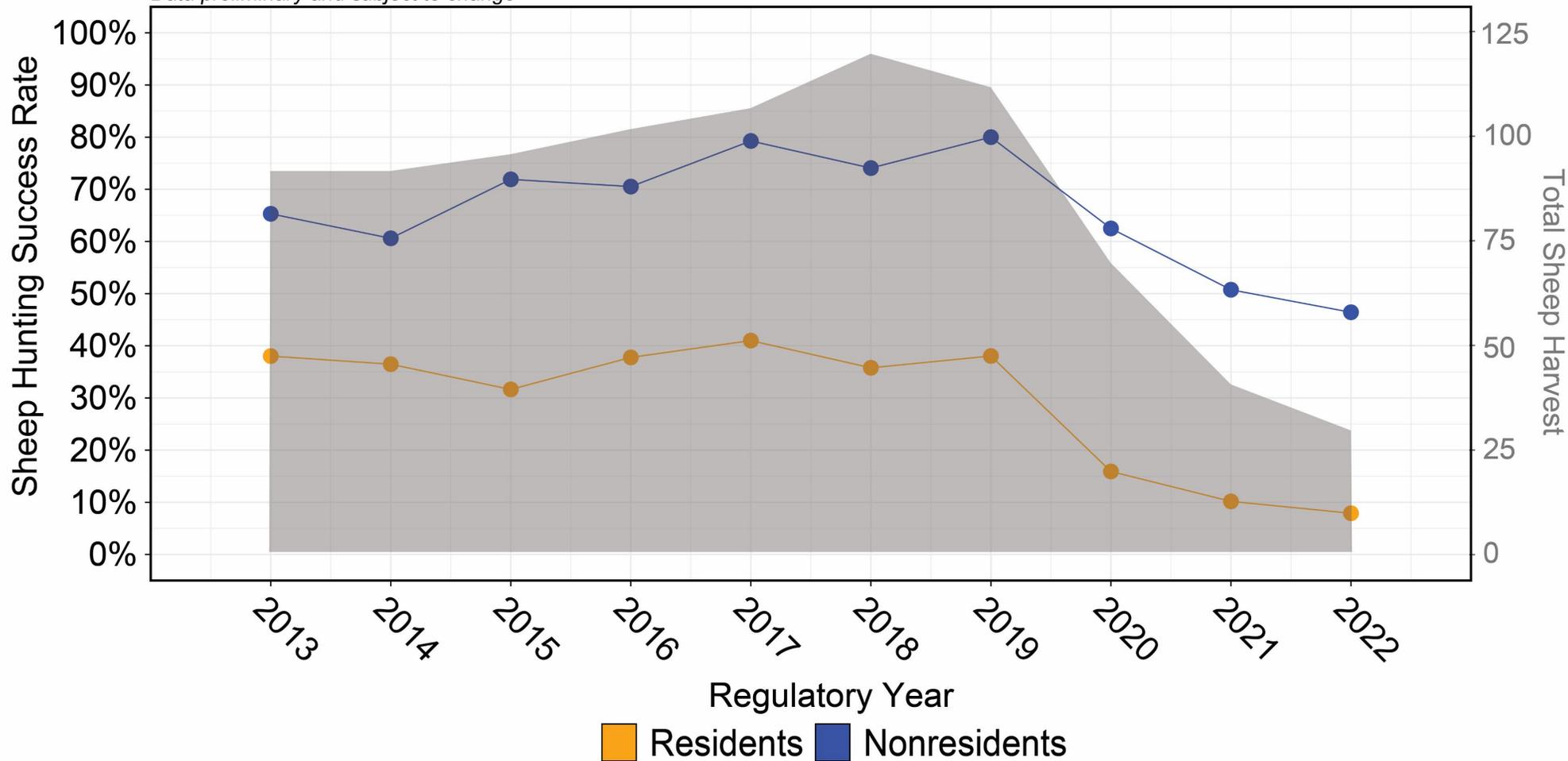
Fall Sheep Hunter Success Rates (19C): 2013–2022

Data preliminary and subject to change



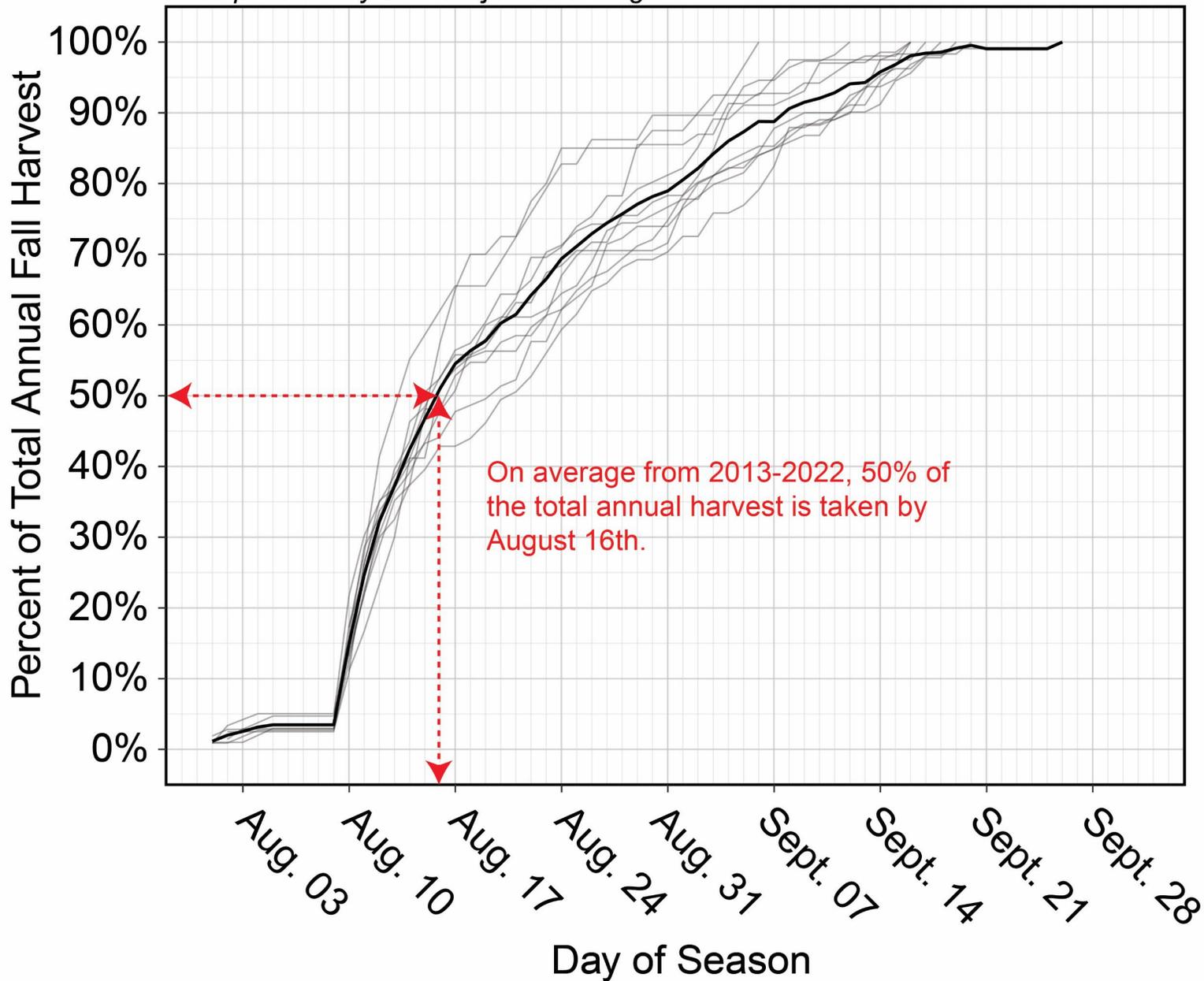
Fall Sheep Hunter Success Rates (19C): 2013–2022

Data preliminary and subject to change



Sheep Harvest Chronology 19C: 2013–2022

Data preliminary and subject to change



19C Sheep Hunter Effort and Harvest Data

Historical Trends: Total Fall Sheep Harvest (19C) 1983-2022

Contemporary Trends (2013-2022): Total Fall Sheep Harvest (19C) 2013-2022

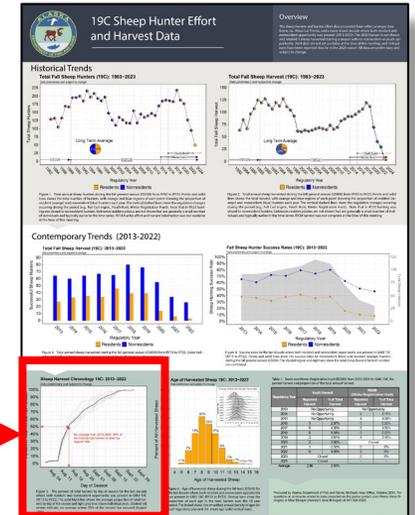
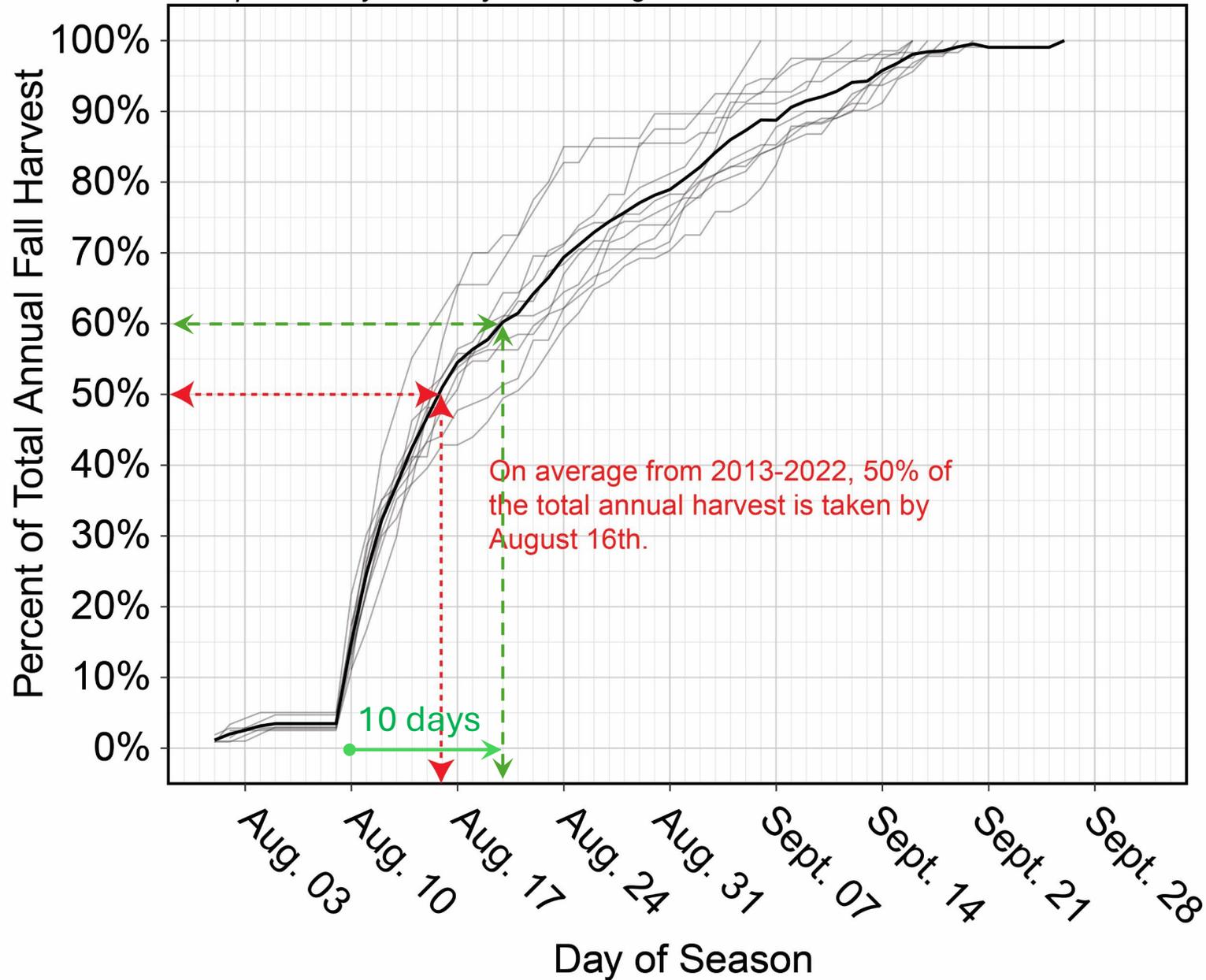
Age of Harvested Sheep (19C) 2013-2022

Table 1: Total Annual Sheep Harvest by Sex and Age Class (1983-2022)

Year	Sex	Age Class	Harvest
2013	Males	1	10
		2	15
	Females	1	12
		2	18
	Total	1	22
		2	33
2014	Males	1	11
		2	16
	Females	1	13
		2	19
	Total	1	24
		2	35
2015	Males	1	12
		2	17
	Females	1	14
		2	20
	Total	1	26
		2	37

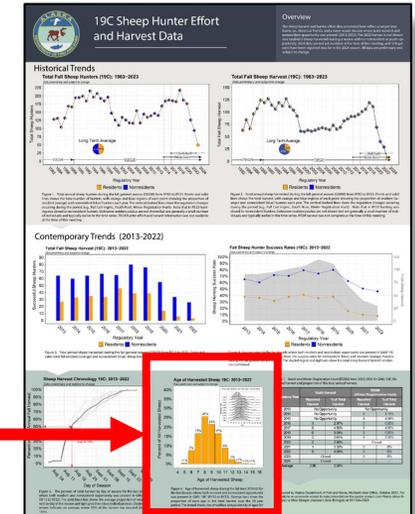
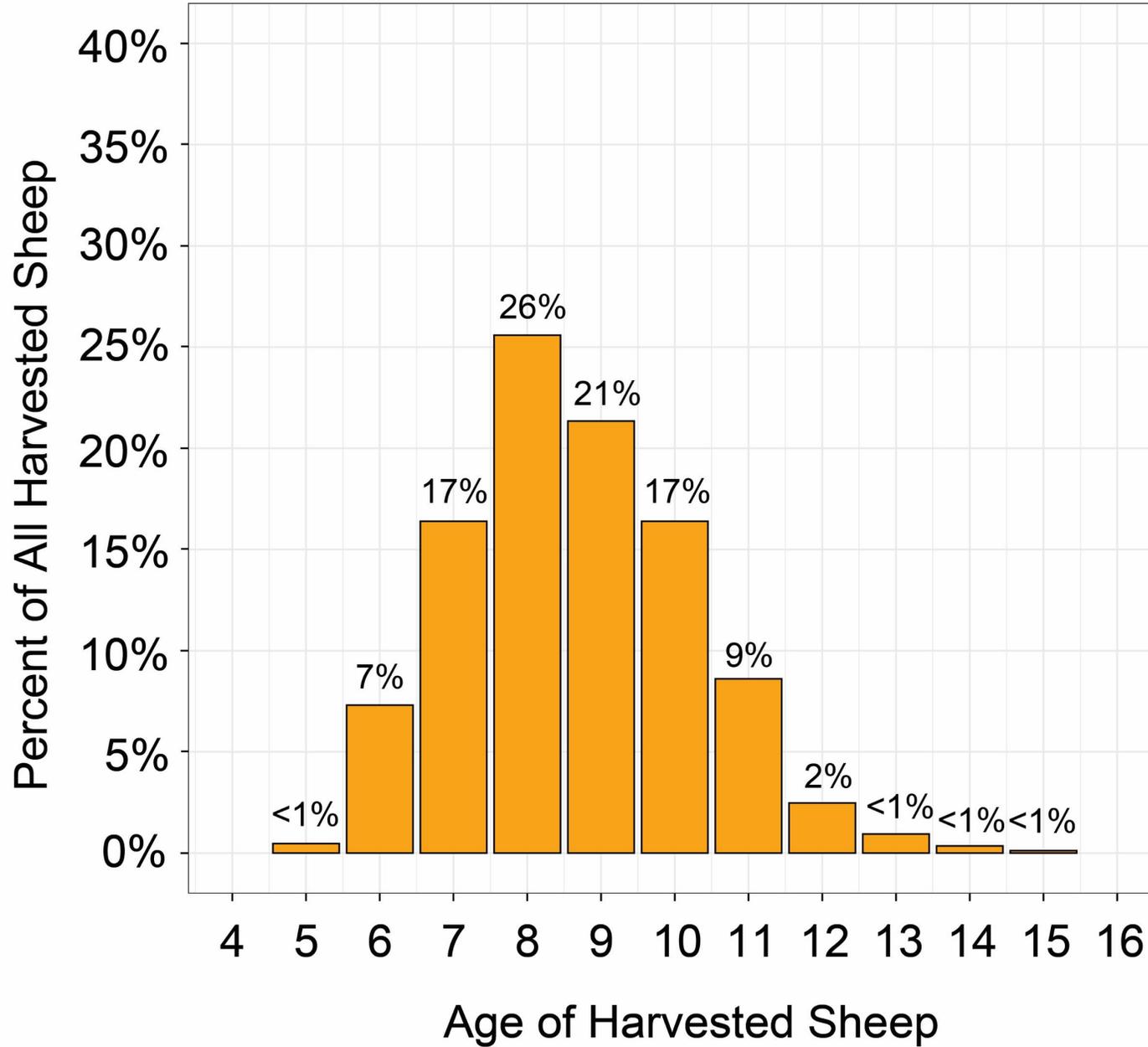
Sheep Harvest Chronology 19C: 2013-2022

Data preliminary and subject to change



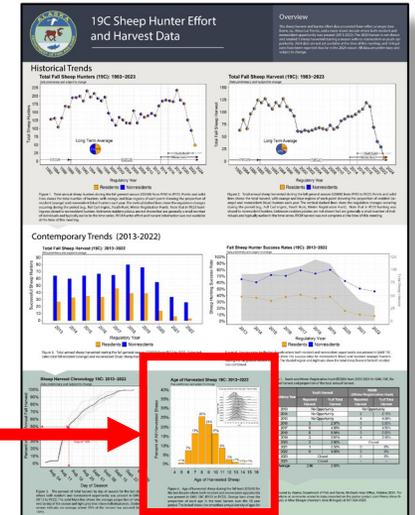
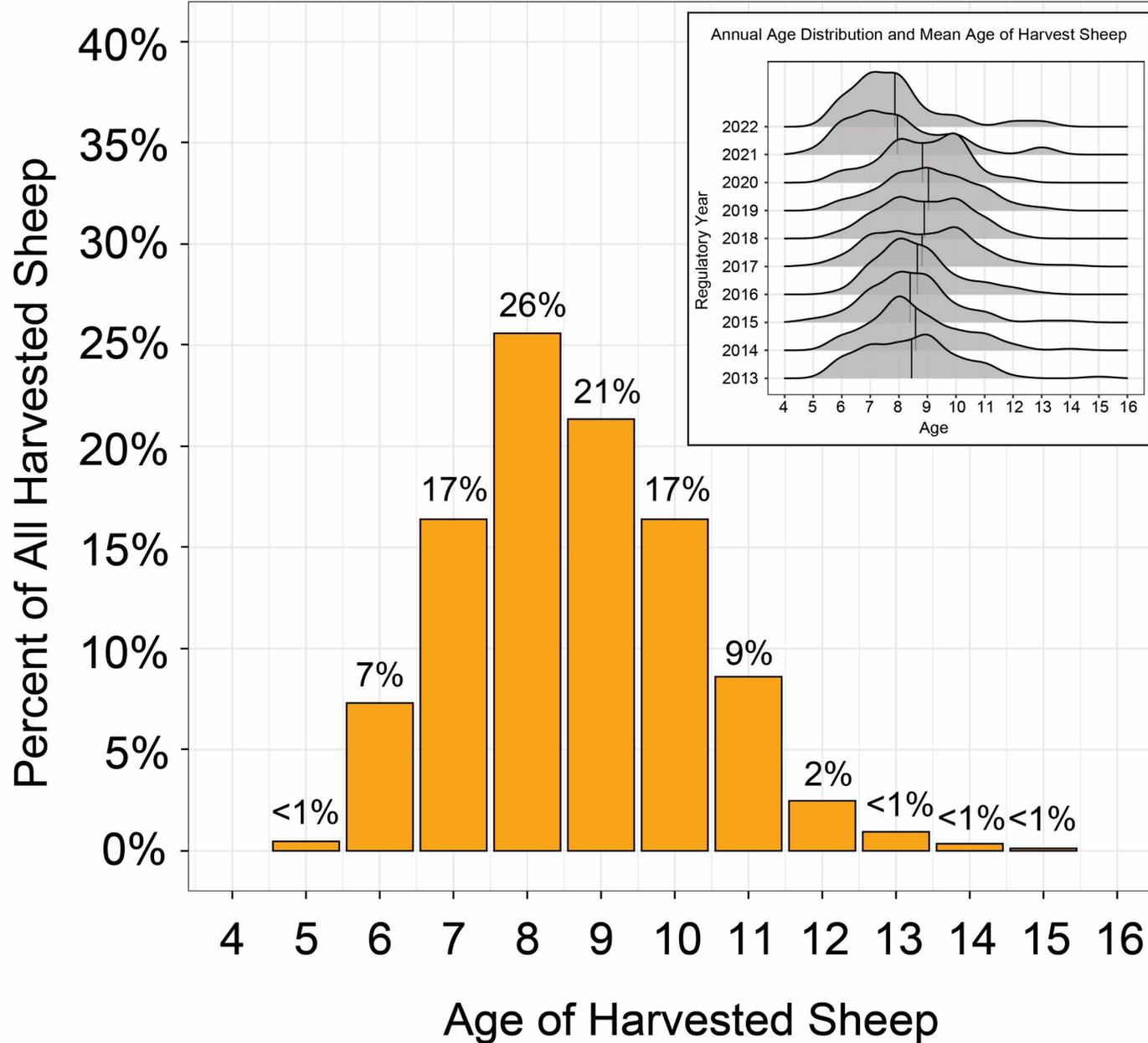
Age of Harvested Sheep 19C: 2013–2022

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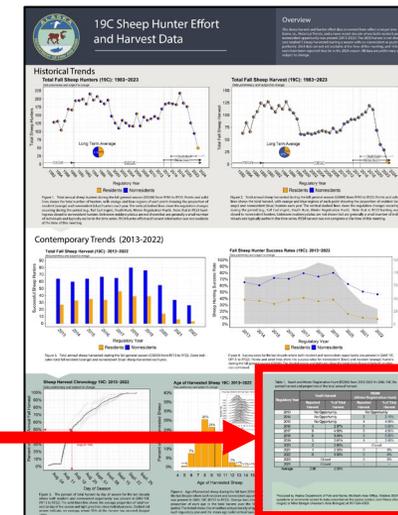


Age of Harvested Sheep 19C: 2013–2022

Data preliminary and subject to change



Regulatory Year	Youth Harvest		RS380 (Winter Registration Hunt)	
	Reported Harvest	% of Total Harvest	Reported Harvest	% of Total Harvest
2013	No Opportunity		No Opportunity	
2014	No Opportunity		2	2.15%
2015	No Opportunity		4	4.04%
2016	3	2.97%	0	0.00%
2017	5	4.50%	5	4.50%
2018	6	5.04%	0	0.00%
2019	3	2.61%	4	3.48%
2020	2	2.90%	Closed	
2021	1	2.50%	0	0%
2022	0	0.00%	0	0%
2023	Closed		0	0%
2024	Closed		-	-
Average	2.86	2.93%	1.67	1.57%



Sublegal Harvest (Harvest Data)

Sublegal Harvest (19C): 2013-2022

Data preliminary and subject to change

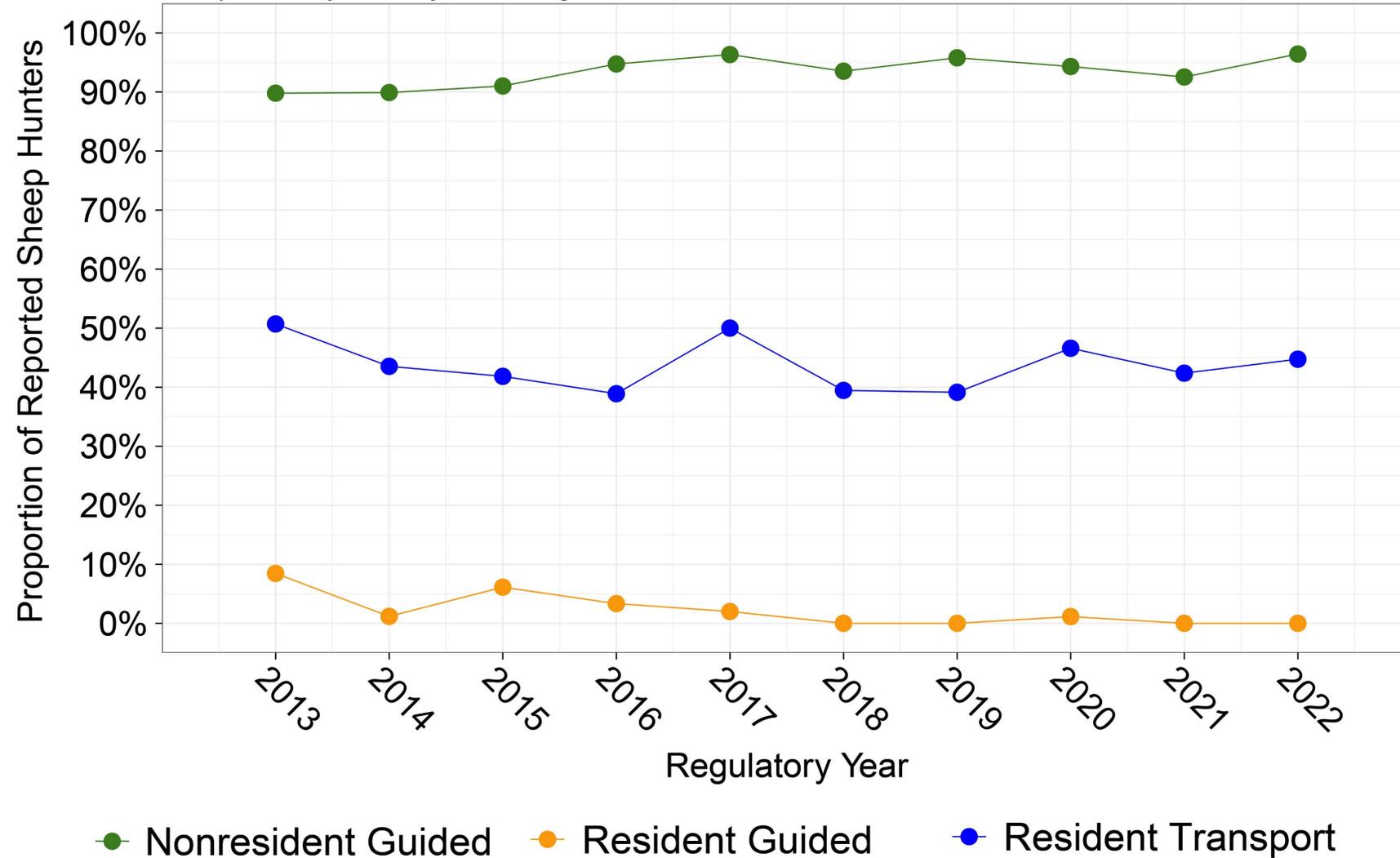


Reg Year	Residency	Total Harvest	Sublegal Harvest	% of Total Harvest
2013	N	64	4	6%
2013	R	27	0	0%
2014	N	60	2	3%
2014	R	31	1	3%
2015	N	64	3	5%
2015	R	31	0	0
2016	N	67	2	3%
2016	R	34	1	3%
2017	N	65	0	0%
2017	R	41	0	0%
2018	N	80	1	1%
2018	R	39	1	3%
2019	N	76	0	0%
2019	R	35	2	6%
2020	N	55	0	0%
2020	R	14	0	0%
2021	N	34	2	6%
2021	R	6	1	17%
2022	N	26	1	4%
2022	R	3	0	0%

Commercial Services (Harvest Data)

Commercial Services 19C Sheep Hunters: 2013–2022

Data preliminary and subject to change



Survey Data



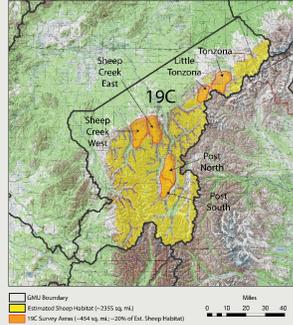
19C Sheep Survey Data

Overview

The sheep survey data presented here reflect surveys across multiple ADF&G offices within Region 3 from 2010-2024. The focus is on CMA 19C and other sheep populations are included to provide a regional comparison of sheep populations in the Alaska Range. Timeseries of lambs:100 ewe-like sheep provide a proxy for lamb production, but do not incorporate annual lamb survival and recruitment into the adult age class. Accordingly, changes of the ewe-like cohort over time serve as the best proxy for recruitment of lambs into the adult population. All data are preliminary and subject to change.

Table 1. Cumulative 19C Aerial Survey Data

	2010	2013	2014	2015	2016	2017	2019	2023	2024
Approx. Area (mi ²)	453	453	453	453	453	453	453	453	453
Total Rams	348	268	374	301	255	343	202	98	101
Legal Rams	56	60	55	46	53	60	33	13	16
Sublegal Rams	292	208	319	255	202	283	169	85	89
"Ewes"	864	490	639	499	593	697	390	242	247
Lambs	287	94	168	167	195	266	178	73	120
Lambs:100 "Ewes"	33	19	26	33	33	38	46	30	49
Rams:100 "Ewes"	40	55	59	60	43	49	52	40	41
Legal Rams:100 "Ewes"	6	12	9	9	9	9	8	5	7
Sublegal Rams:100 "Ewes"	34	42	50	51	34	41	43	35	36
% Lambs	19	11	14	17	19	20	23	18	25
% Rams	23	31	32	31	24	26	26	24	21
% Legal Rams	4	7	5	5	5	5	4	3	3
% Sublegal Rams	19	24	27	26	19	22	22	21	19
Total Sheep	1499	852	1181	967	1043	1306	770	413	473



Regional Comparisons and Cohort Specific Trends

Total Sheep Counted : 2010-2024
Data preliminary and subject to change.

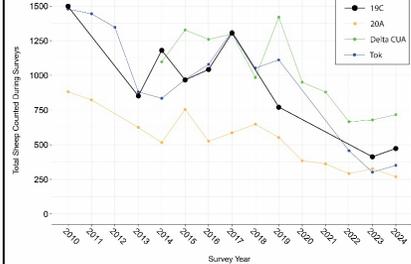


Figure 1. Total sheep counted on sheep trend-composition surveys in Unit 19C, Unit 20A, the Delta Controlled Use Area (CUA), and Tok (2010-2024). Unit 19C sheep are shown in large black points and bold lines and other Alaska Range herds are shown as small points for regional comparison. Line connect consecutive years where surveys were conducted. Some survey years may include incomplete survey coverage due to weather or pilot availability.

Percent of Observed Sheep That Were Rams : 2010-2024
Data preliminary and subject to change.

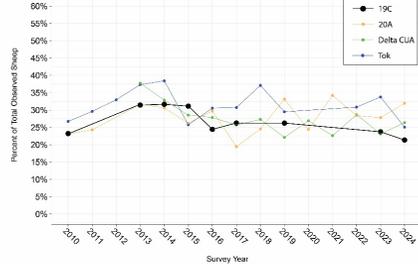


Figure 2. Percent of total sheep counted on sheep trend-composition surveys in Unit 19C, Unit 20A, the Delta Controlled Use Area (CUA), and Tok (2010-2024) that were rams. Unit 19C sheep are shown in large black points and bold lines and other Alaska Range herds are shown as small points for regional comparison. Line connect consecutive years where surveys were conducted. Some survey years may include incomplete survey coverage due to weather or pilot availability.

Total 'Ewe like' Sheep : 2010-2024
Data preliminary and subject to change.

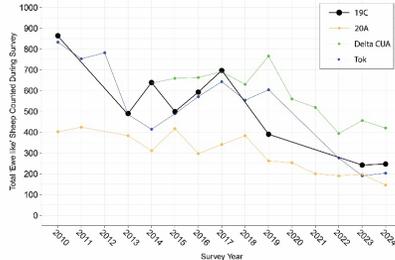


Figure 3. Total "ewe-like" sheep counted on sheep trend-composition surveys in Unit 19C, Unit 20A, the Delta Controlled Use Area (CUA), and Tok (2010-2024). Unit 19C sheep are shown in large black points and bold lines and other Alaska Range herds are shown as small points for regional comparison. Line connect consecutive years where surveys were conducted. Some survey years may include incomplete survey coverage due to weather or pilot availability.

Lambs per 100 'Ewe like' : 2010-2024
Data preliminary and subject to change.

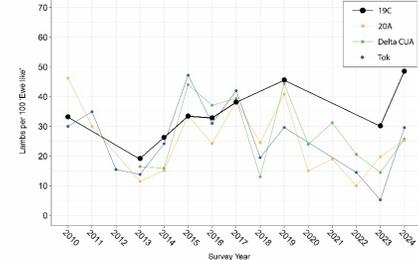


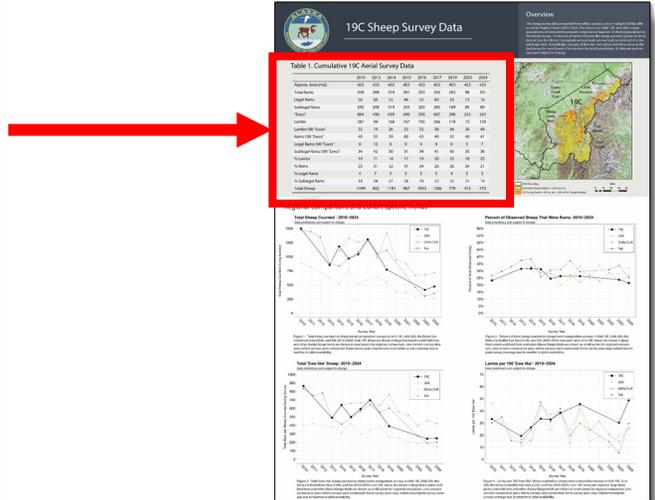
Figure 4. Lambs per 100 "ewe-like" sheep counted on sheep trend-composition surveys in Unit 19C, Unit 20A, the Delta Controlled Use Area (CUA), and Tok (2010-2024). Unit 19C sheep are shown in large black points and bold lines and other Alaska Range herds are shown as small points for regional comparison. Line connect consecutive years where surveys were conducted. Some survey years may include incomplete survey coverage due to weather or pilot availability.

2) Overview of the Survey Data Poster



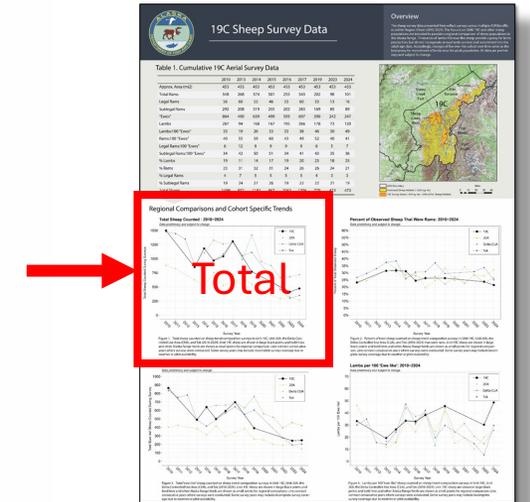
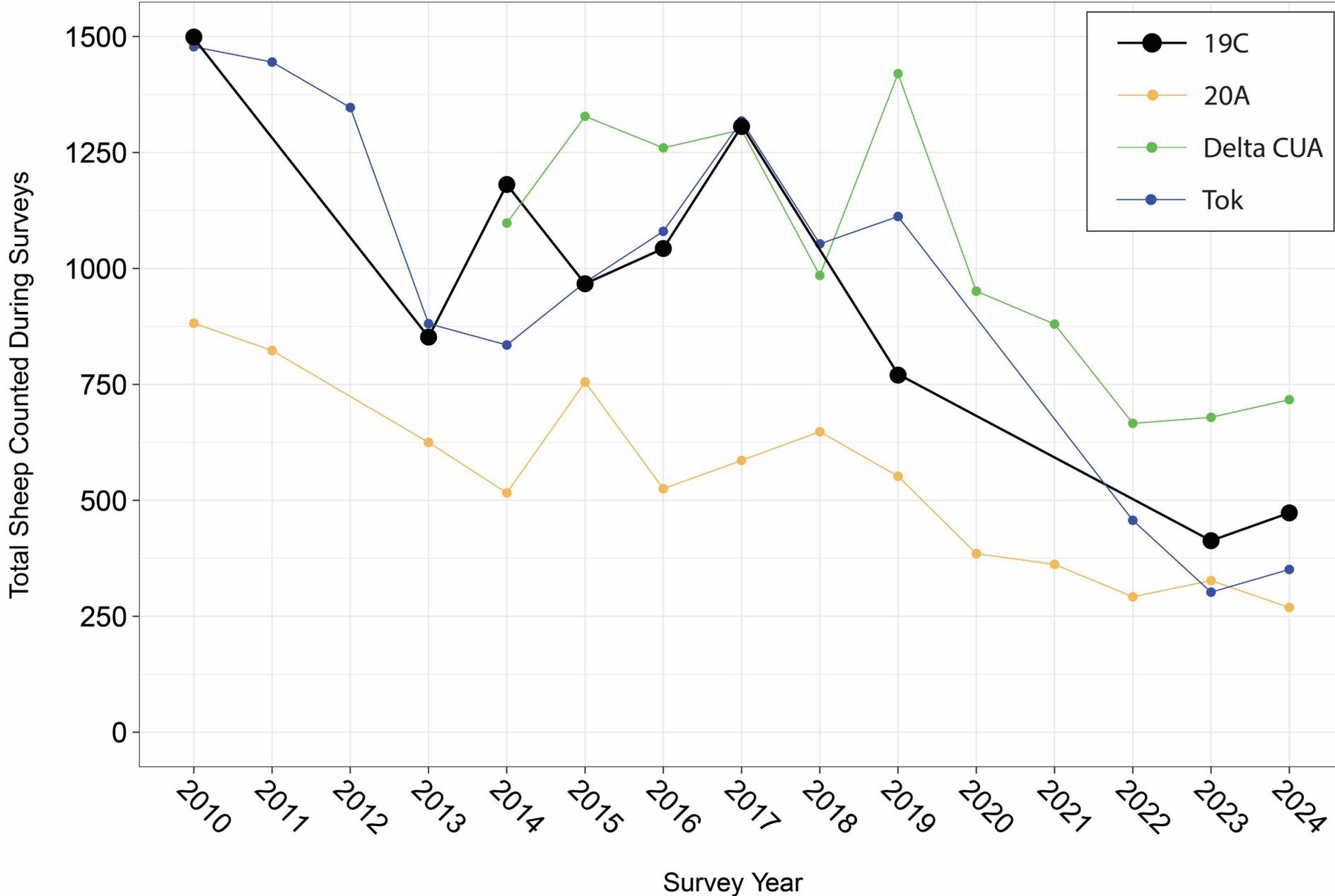
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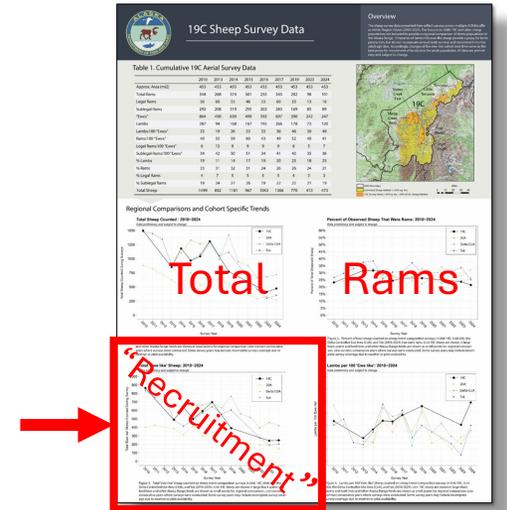
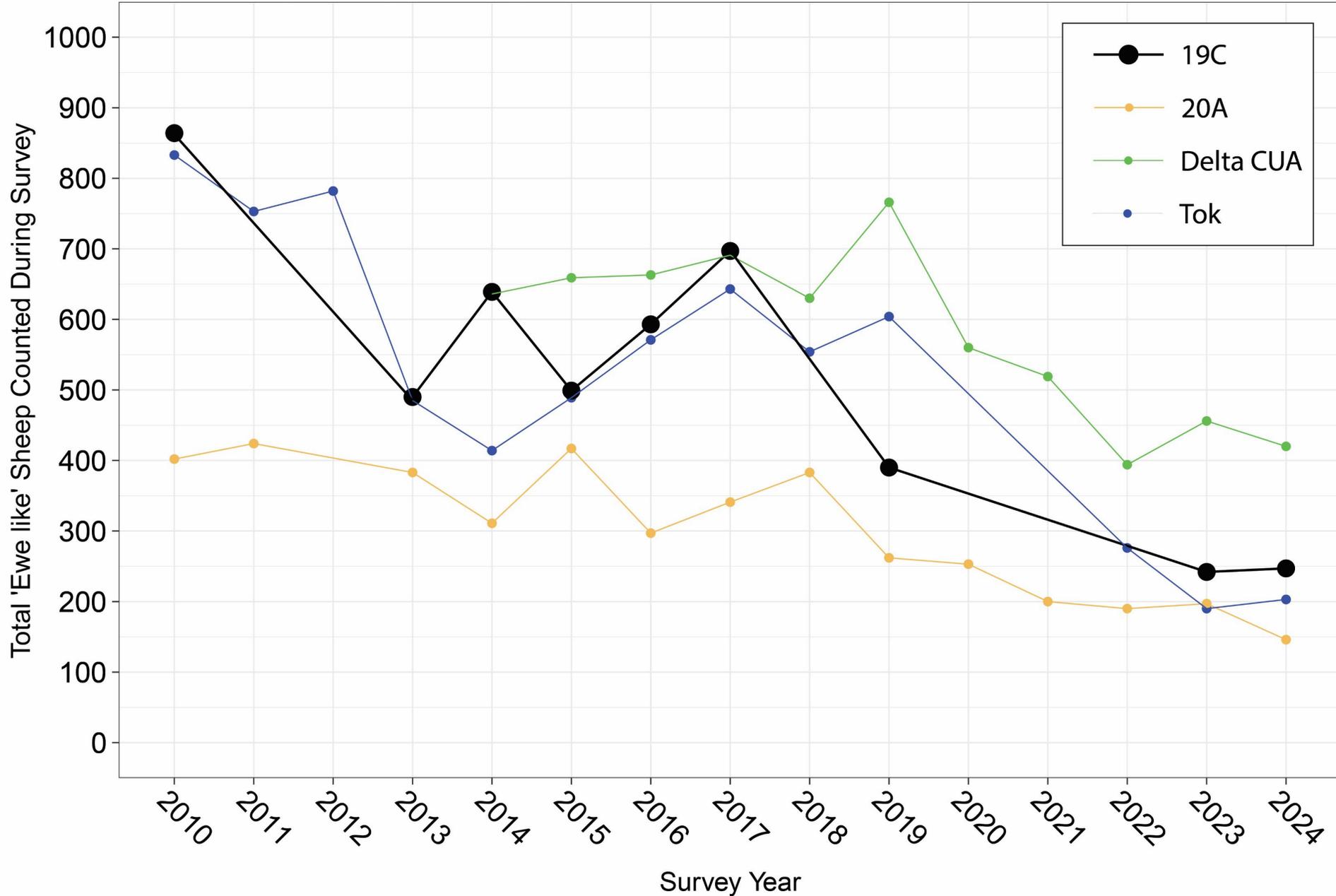
Total Sheep Counted : 2010–2024

Data preliminary and subject to change



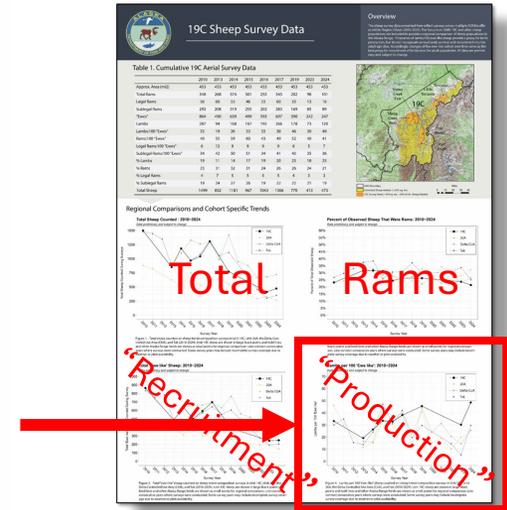
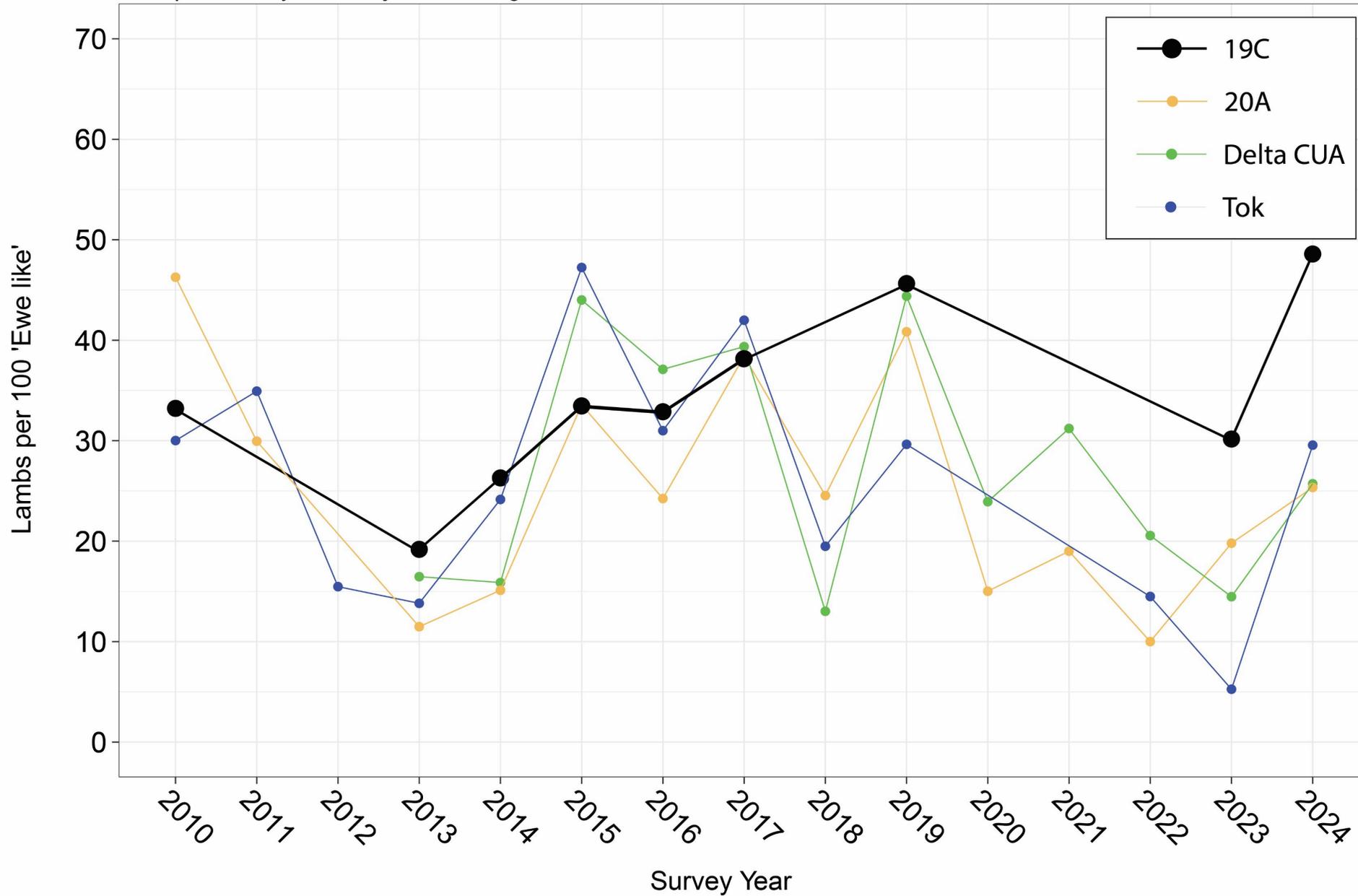
Total 'Ewe like' Sheep: 2010–2024

Data preliminary and subject to change



Lambs per 100 'Ewe like': 2010–2024

Data preliminary and subject to change



Carnivore Data



No Population Estimates exist for bears and wolves in 19C.

Our best information comes from harvest data and literature.

1st Biennial Symposium Northern Wild Sheep and Goat Council

Snowshoe Hare Abundance Affects Survival of Dall's Sheep Lambs in Alaska

STEPHEN M. ARTHUR, Alaska Department of Fish and Game, 1300 C
Fairbanks, AK 99701, USA

LAURA R. PRUGH, Department of Environmental Science, Po
Mulford Hall, University of California, Berkeley, CA 94720,

Mamm Res (2015) 60:21–28
DOI 10.1007/s13364-014-0199-4

ORIGINAL PAPER

Population density of Dall's sheep in Alaska: effects of predator harvest?

Carl D. Mitchell · Roy Chaney · Ken Aho · John G. Kie ·
R. Terry Bowyer

PLOS ONE

RESEARCH ARTICLE

Predation risk and space use of a declining Dall sheep (*Ovis dalli dalli*) population

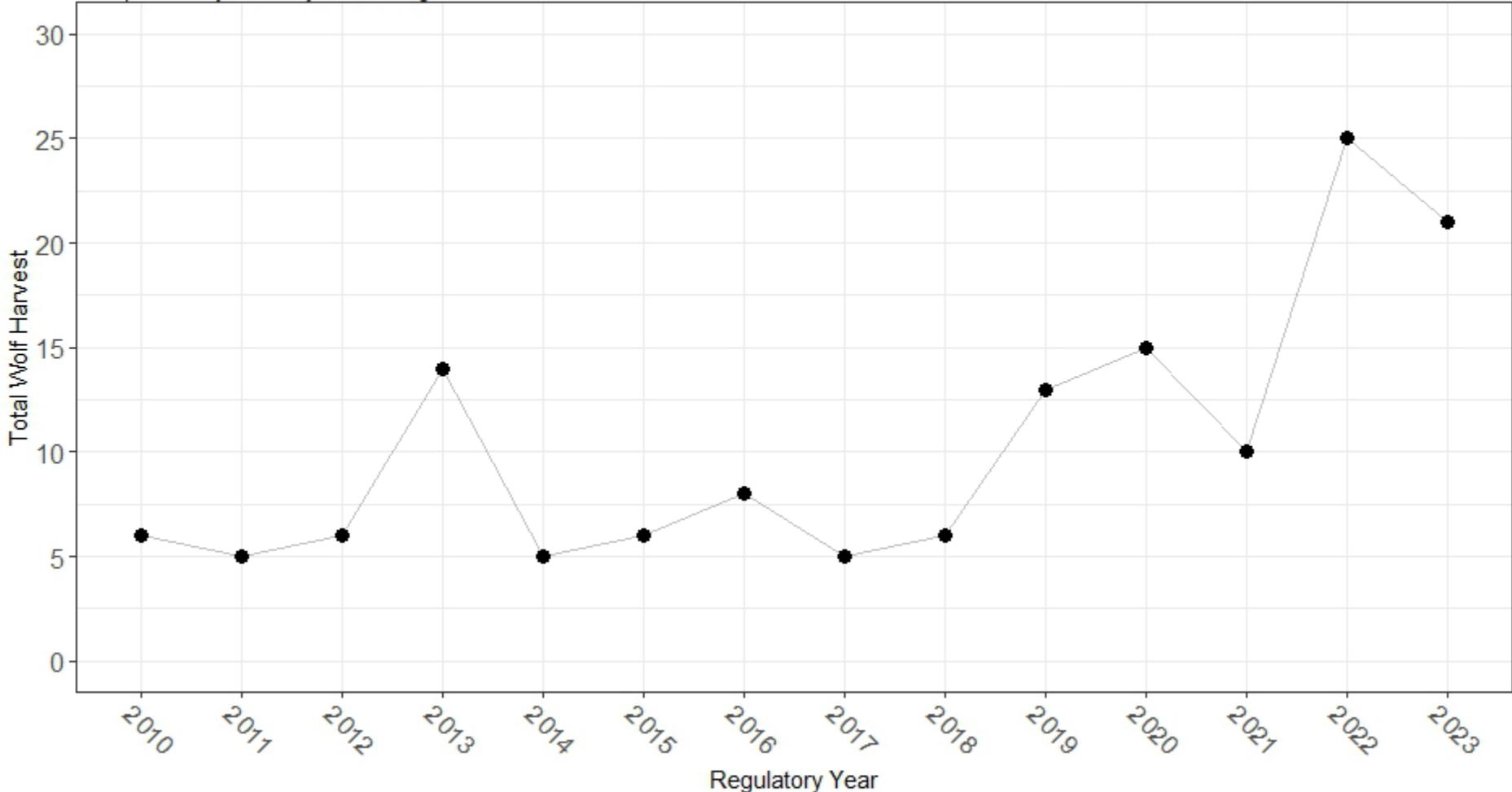
Catherine Lambert Koizumi^{1,2}, Andrew E. Derocher^{1*}

¹ Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada, ² Gwich'in Renewable Resources Board, Inuvik, Northwest Territories, Canada

Carnivore Data

Total Wolf Harvest (Sealing; GMU 19C): 2010-2023

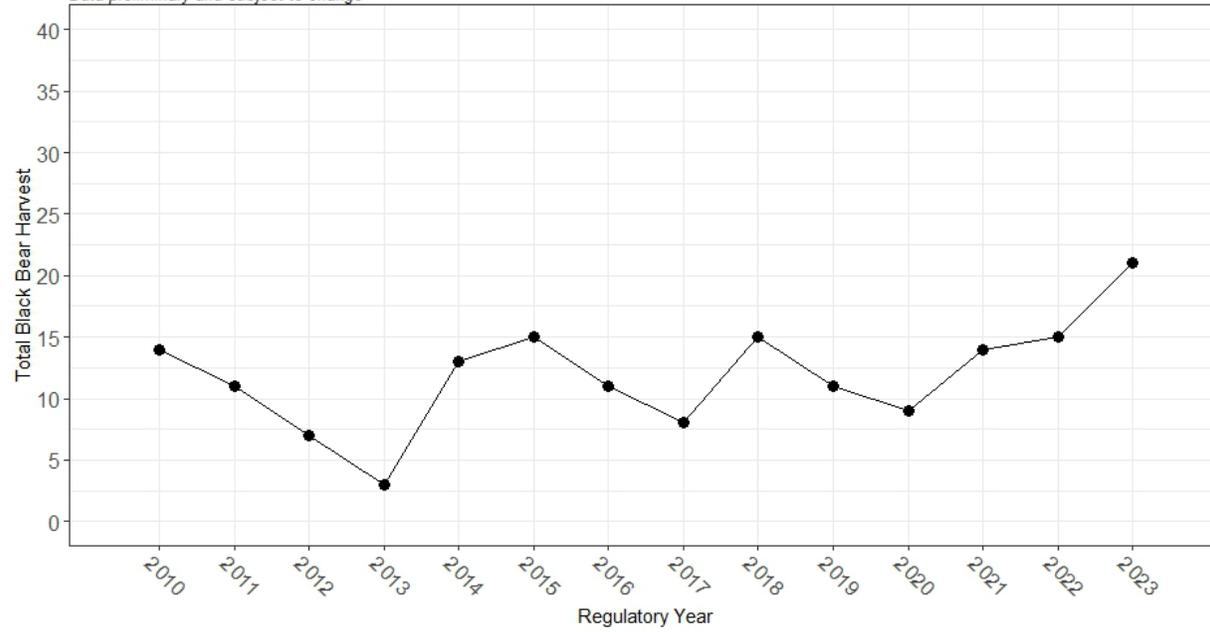
Data preliminary and subject to change



Carnivore Data

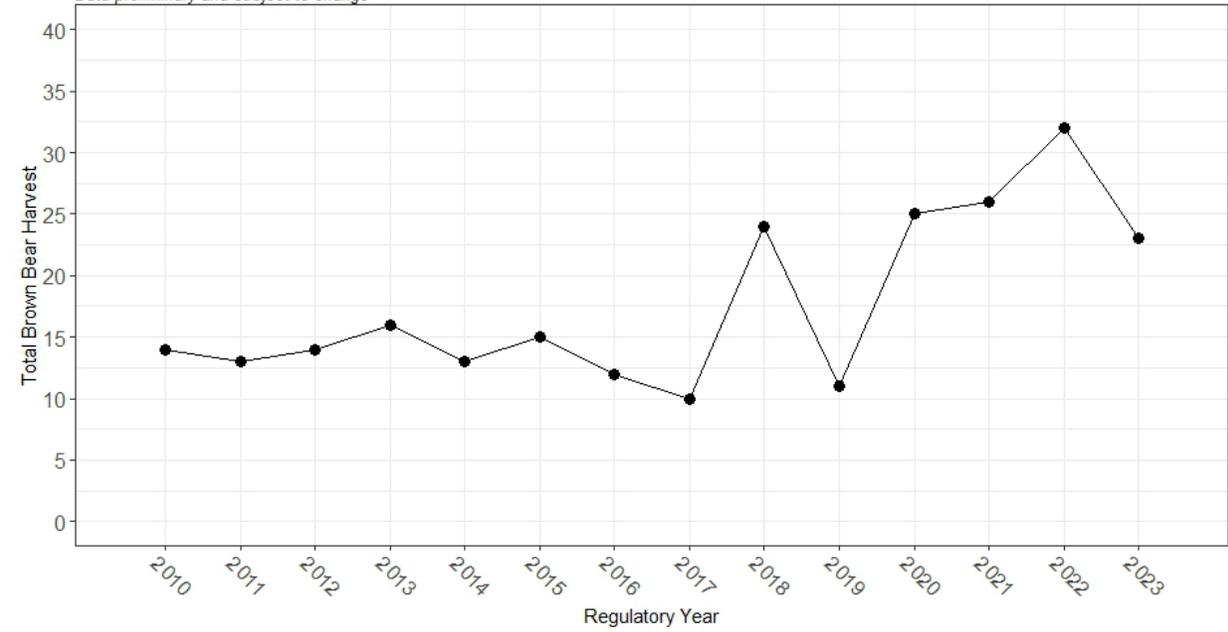
Total Black Bear Harvest (Sealing; GMU 19C): 2010-2023

Data preliminary and subject to change



Total Brown Bear Harvest (Sealing; GMU 19C): 2010-2023

Data preliminary and subject to change



Predation Rates From Previous Studies

Alaska Range GMU 20A 1995-1996 (Brad Scotton) and 1999-2002 (Steve Arthur)

SURVIVAL:

Annual Adult Ewe: 85%
Annual Lamb: 22% (12-36%)

MORTALITY:

Lamb Mortality from Predation: 90%
Coyotes: 40%
Eagles: 30%
wolverines/grizzly bears: <10%
unknown/multiple: 20%

Adult Mortality from predation: 100%
Wolves: 57%
Bears: 7%
Wolverines: 7%
unknown/multiple: 29%

Carrying Capacity

- We do not have estimates for the “carrying capacity” (K) for sheep in 19C.
 - K is constantly in flux (However, we can safely say we are well below the number of sheep that 19C can support, based on previous survey numbers).
 - K is influenced by numerous factors, both density dependent (e.g., nutritional resources) and density independent (e.g., winter severity). Measuring, and disentangling their relative contributions to population dynamics is extremely difficult, time consuming, and expensive.
 - A large body of literature suggests that in northern ecosystems with abundant predators, weather related factors (i.e., non-nutritional causes) are highly variable and more influential than (density-dependent) nutritional constraints.

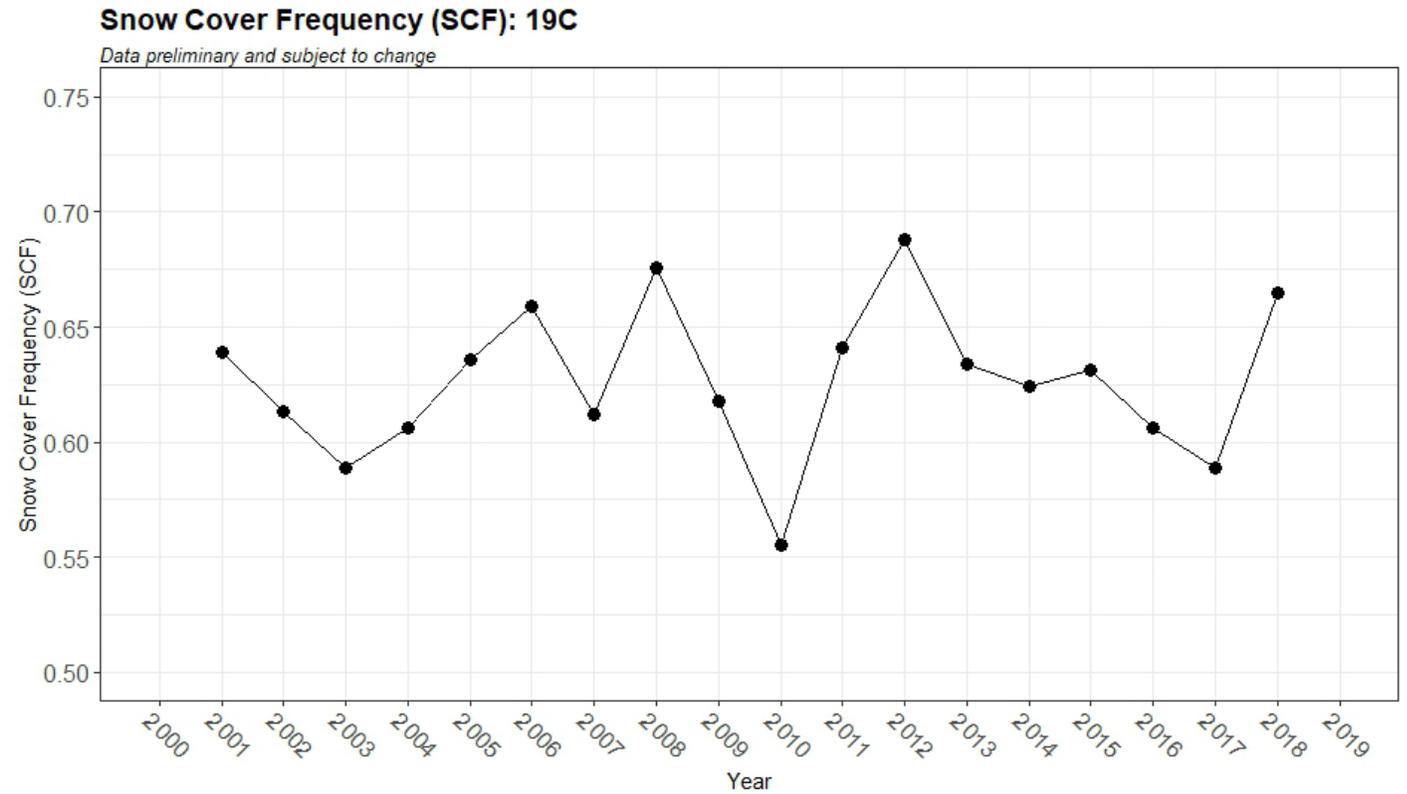
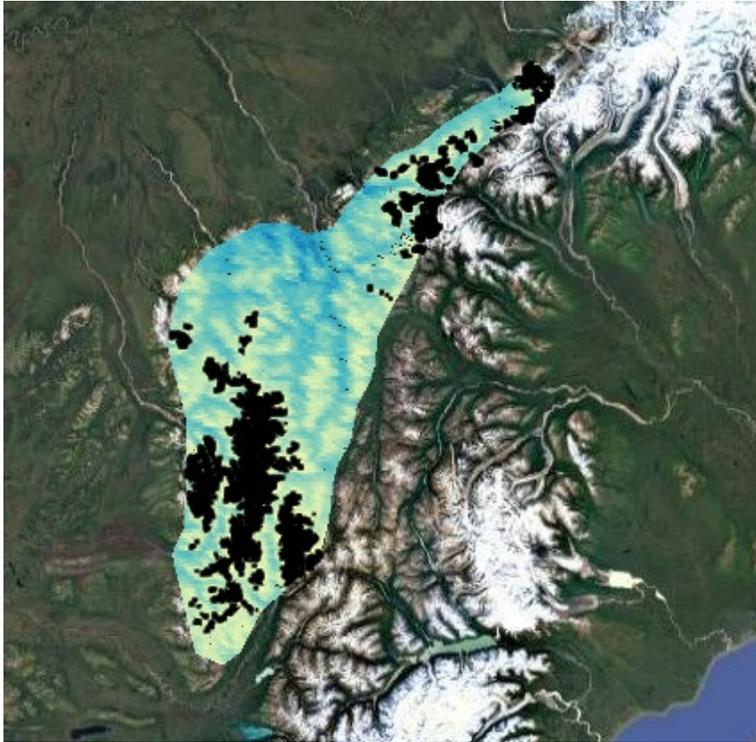
Weather/Climate Issues

Best Available Information is in published research:

- Vandekerck et al. 2018;2020: Meta analysis of 11 studies spanning 1997-2012 (Alaska, USA, and northwestern Canada)
- Findings: **Changes in winter temperatures and frequencies of freeze-thaw events** as the strongest weather/climate effects on Dall's sheep demographic rates.

Weather/Climate Issues

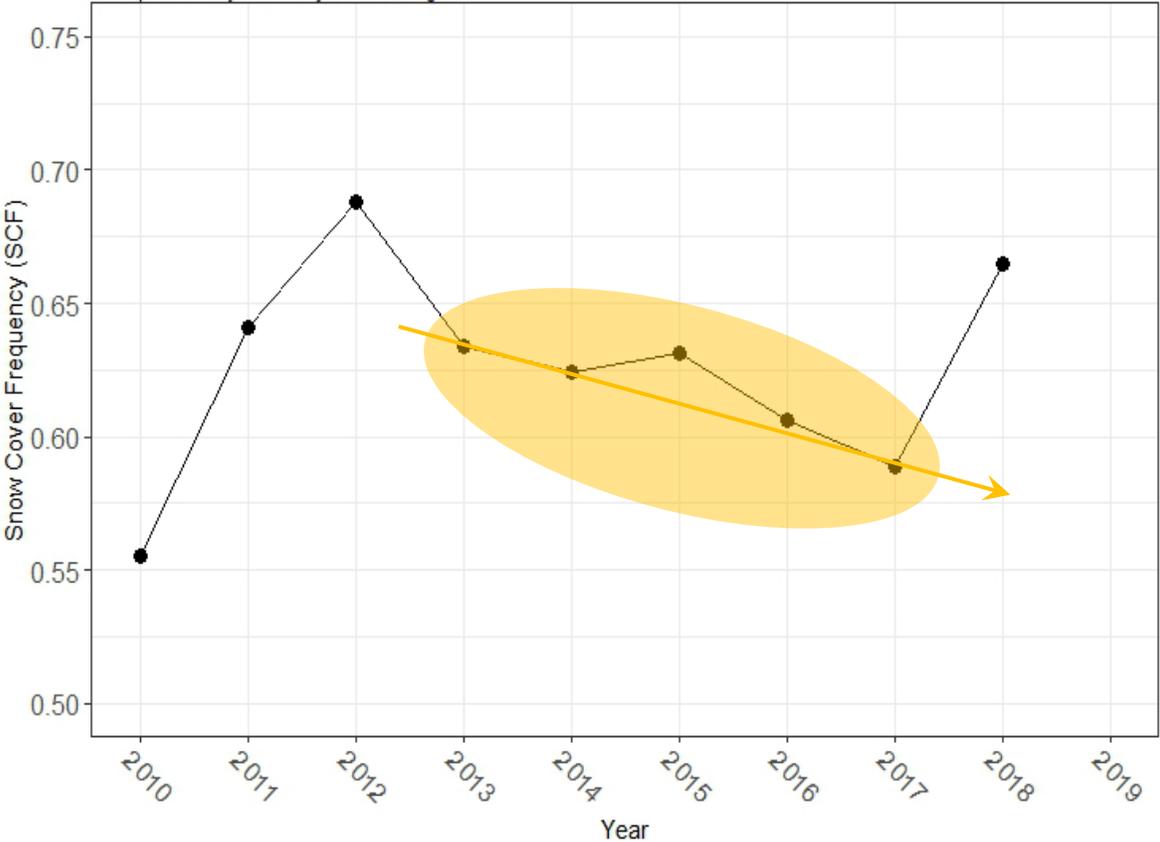
Analysis of Snow Data for 19C Region of the Alaska Range



Weather/Climate Issues

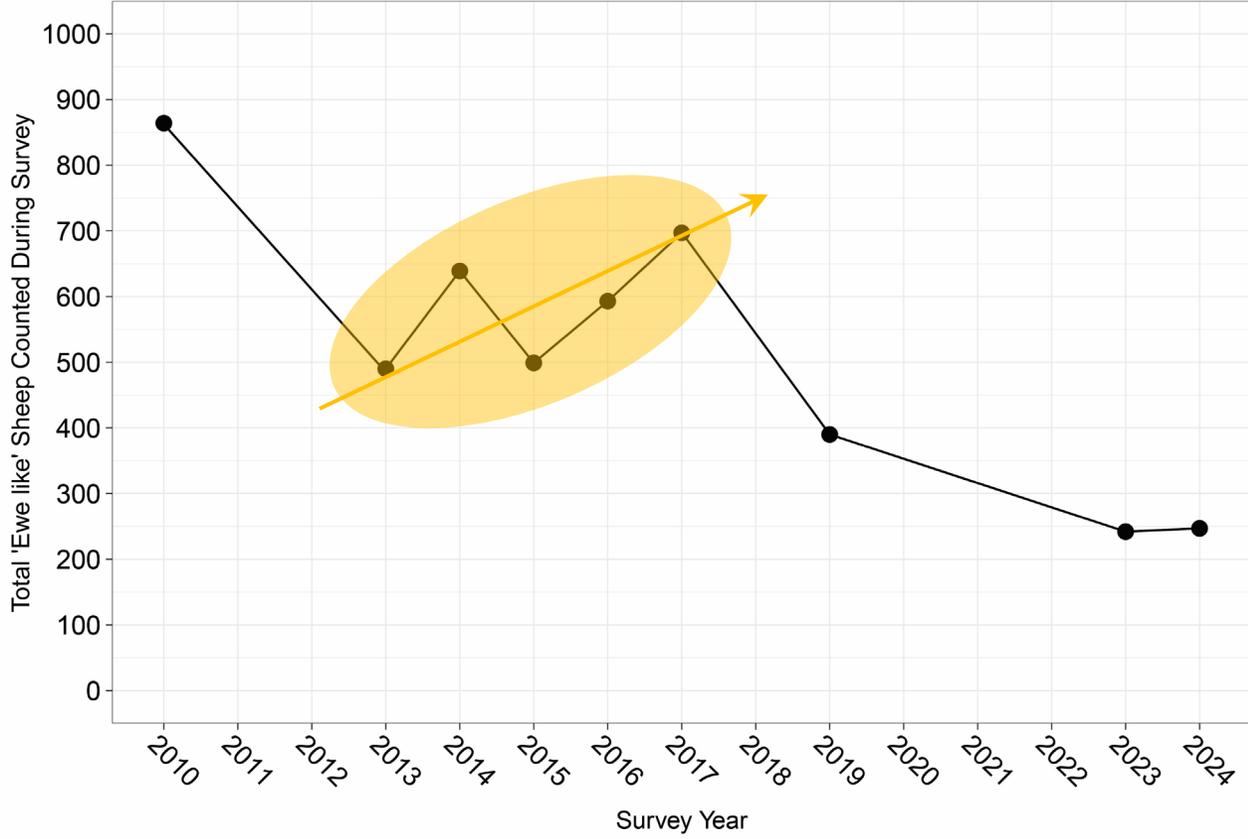
Snow Cover Frequency (SCF): 19C

Data preliminary and subject to change



Total 'Ewe like' Sheep 19C: 2010-2024

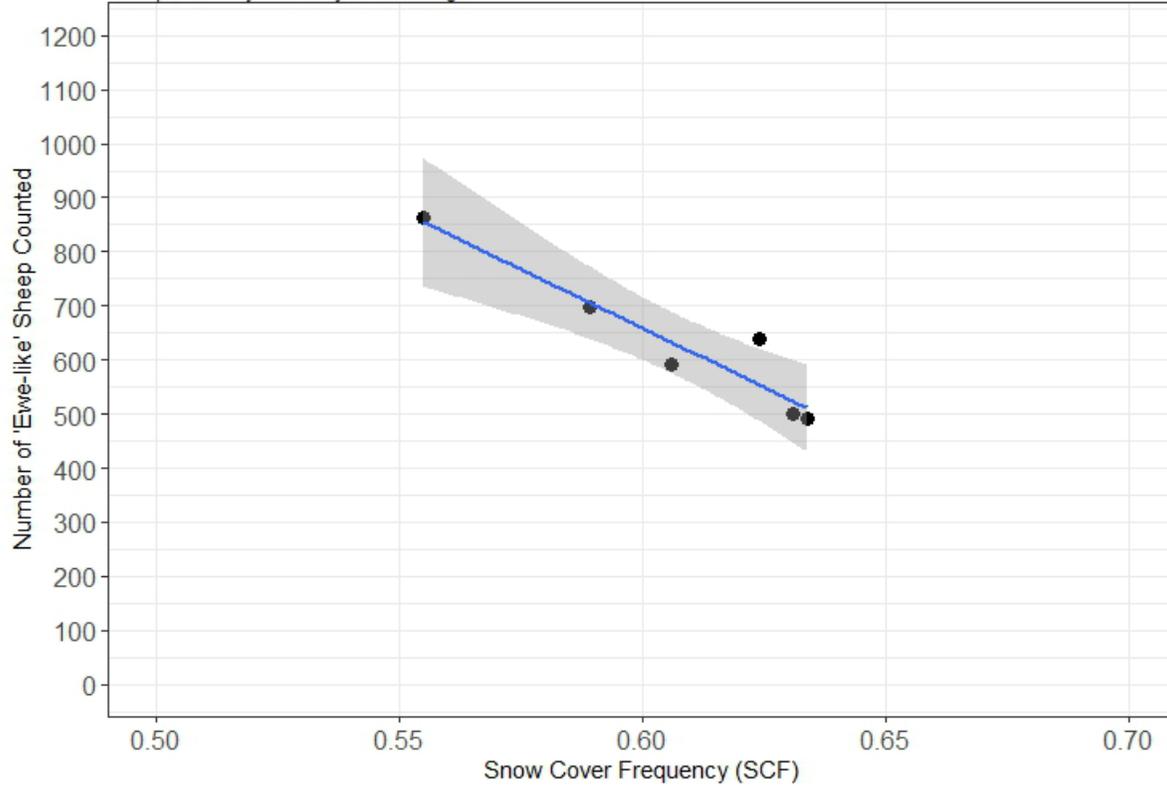
Data preliminary and subject to change



Weather/Climate Issues

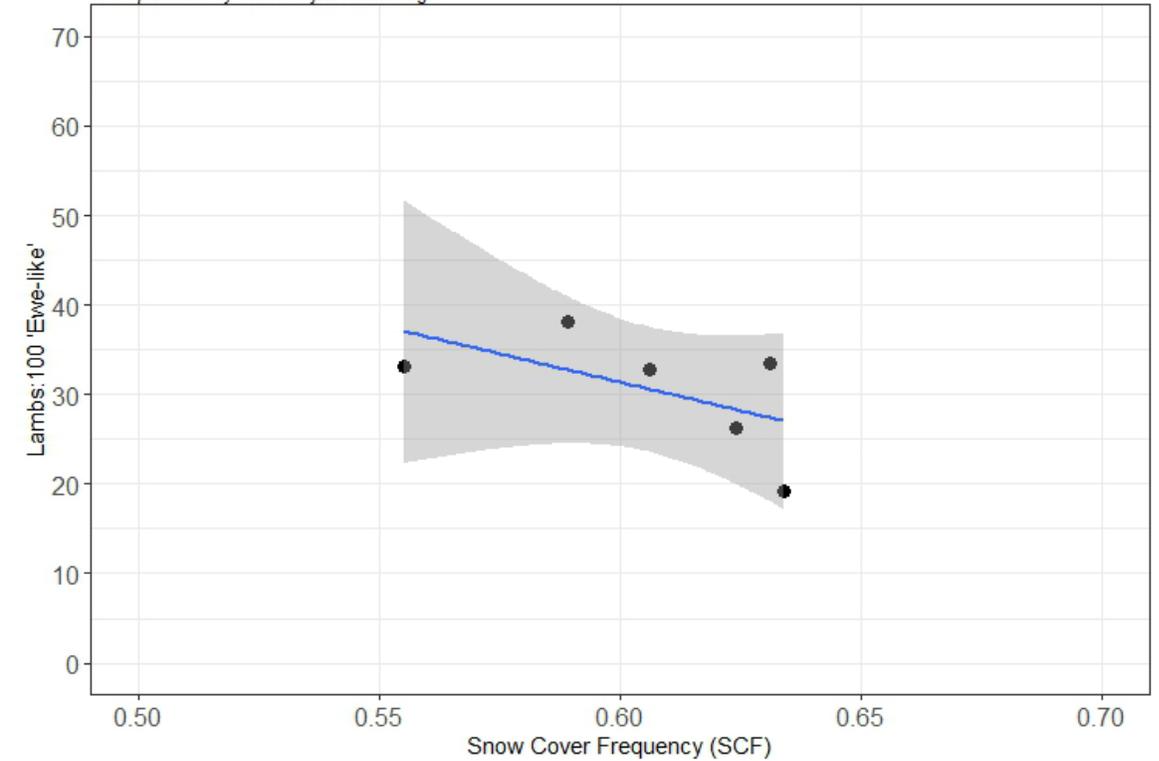
Snow -'Ewe-like' Relationships 19C

Data preliminary and subject to change



Snow - 'Lamb Production' Relationship 19C

Data preliminary and subject to change



Stressors (air traffic and other human activities)

EFFECTS OF MILITARY OVERFLIGHTS ON HABITAT USE AND SELECTION
 BY FEMALE DALL'S SHEEP, YUKON-TANANA UPLANDS, ALASKA

By

Bradley R. Wendling

The Journal of Wildlife Management 81(8):1457-1467; 2017; DOI: 10.1002/jwmg.21308



Research Article

Evaluating Dall's Sheep Habitat Use via Camera Traps

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Dall's sheep responses to overflights by helicopter and fixed-wing aircraft

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