Dall's sheep research in the Chugach Range, GMUs 13D and 14C

Tom Lohuis, Alaska Department of Fish and Game, Anchorage, AK

Caution:

Today's talk covers five years of research in 13D, but only 2 years in 14C. GMU 14C data collection is ongoing.

Not appropriate to compare study areas.

Some analyses are not complete and values should be considered approximate at this time

Study area background and goals

13D – Declining sheep population

Study area estimates

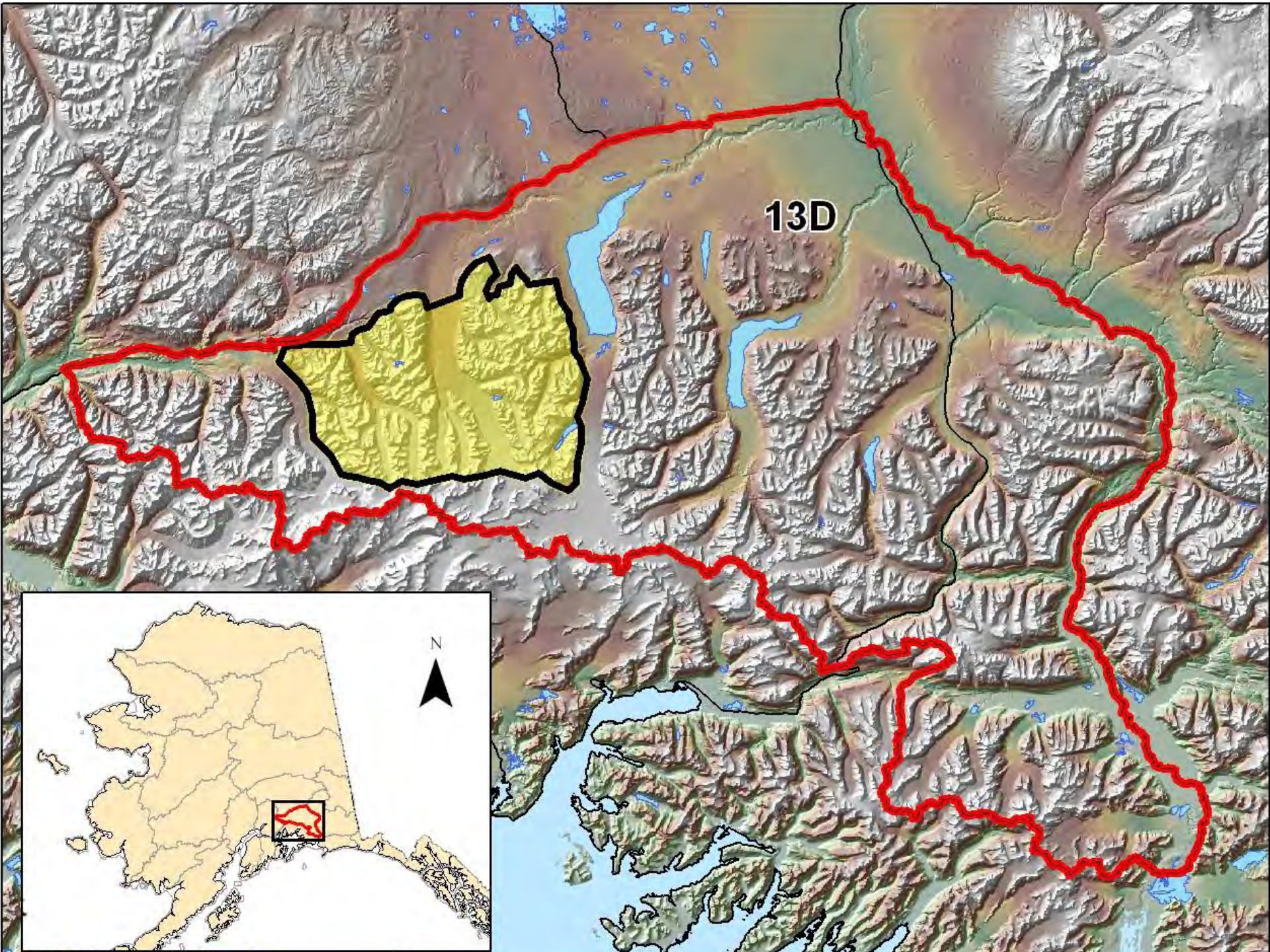
≈650-750 1960s through 1980s

≈350-430 2007 and 2009

- Until 2005, declines approximately equal in ram and ewe component

Project goals: Establish a baseline demographic picture…"What is driving sheep population trends in southcentral Alaska?"

Pregnancy, recruitment, rates and causes of mortality, disease


13D
N

Study area background and goals

14C – Cyclic sheep population

GMU-wide estimates

≈900-1100 1970s through early 1980s

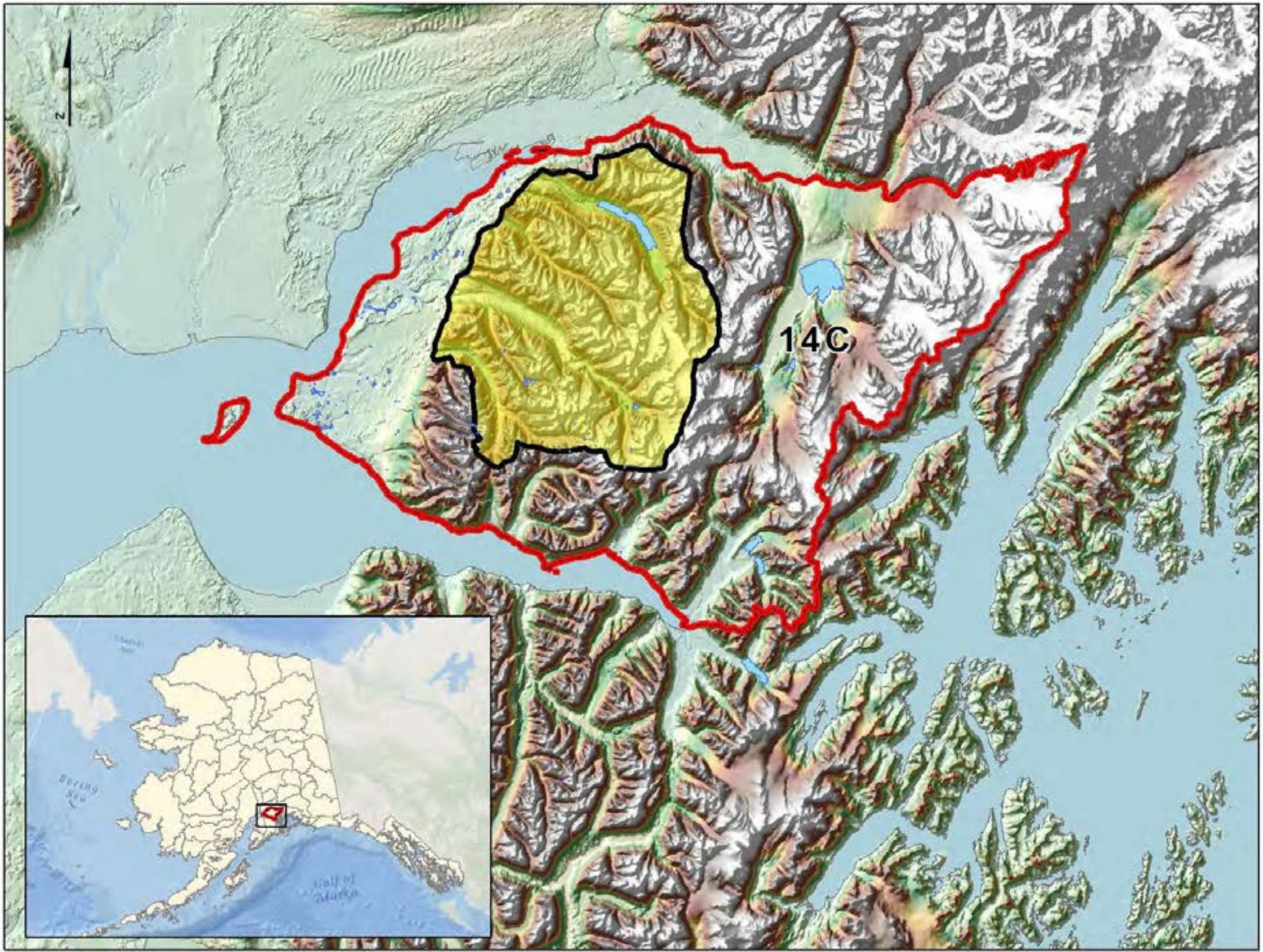
≈2000-2100 late 1980s through 2000

≈900-1100 2007 through 2011

- Trajectory similar in ram and ewe component

Primary project goals: 1) Are the driving factors similar between the northern and southern Chugach? 2) Can we generalize between study areas?

Secondary project goals: What are the rates and causes of mortality in 3-8 year old rams?


N
14C
Bering Sea
Gulf of Alaska

Lines of inquiry

Weather

- Late, heavy spring snows
- Ice formation

Predation

- AK range studies (Arthur 2003 and Scotton 1998)
- ≈ 90% of lamb mortality due to predation
- coyotes 47%, eagles 30%
- 100% adult mortality caused by predation
- wolves 57%, bears 7%, wolverines 7%

Lamb survival to 1 yr = 22%

Annual adult survival = 85%

Lines of inquiry

- Habitat and nutrition
  - Mineral deficiencies
  - Malnutrition
- Disease
  - Pneumonia or other disease
    - Reports of dead sheep in both study areas from hunters and during annual surveys

Adult Captures – March and April

Captures and handling – Animal care

Extremely stressful event for animal

3 minute maximum helicopter chase time

20 minute total handling time, including chase

Continuous temperature monitoring during handling, 106°F = release immediately

≥200 sheep captures to date, 3 capture mortalities

R44
Raven II


Pollux
R44
N7528Z

GMU 13D
Captures and handling

March 2009-2012 ≈40 adult ewes captured/recaptured annually

VHF radiocollar, blood, fecal samples, nasal and pharyngeal swabs, qualitative body condition assessment, pregnancy test

GMU 14C
Captures and handling

March 2012 - 35 adult ewes and 19 three to six year old rams captured and radiocollared to start project

VHF or GPS radiocollar, blood, fecal samples, nasal and pharyngeal swabs, qualitative body condition assessment, pregnancy test in ewes

Nutritional condition – GMU 13D

Body condition appeared extremely poor, even for late winter (1-2 on a 0-5 scale)

No subcutaneous (SQ) fat present

All bony structures of neck, spine, withers, pelvis evident (0.5-1.0 cm between spine and muscle)

S. Arthur (ADF&G, Fairbanks) reports all ewes captured in Brooks and AK ranges all carry SQ fat and are well-muscled

Reproductive status – 13D

2009 -Pregnancy rate lower than expected at 62% (≥ 3 y.o. ewes)

Typically 85-100% (AK Range, Arthur 2003; BC Stone's Sheep - Wood et al 2012)

2010 -88%

2011 -69%

2012 -21%*

2013 -91%

Disease – 13D

Nasal and pharyngeal swabs from 37 adult ewes cultured for bacteria, blood samples tested for exposure to viral disease

28/37 positive for one of two “families” of bacteria associated with respiratory disease in BHS in lower 48. Note: both required for large scale die-off

0/37 positive for viral diseases

Preliminary observations Nutritional condition – GMU 14C

Body condition appeared poor, though slightly better than GMU 13D ewes (2-2+ on a 0-5 scale)

No subcutaneous (SQ) fat present

All bony structures of neck, spine, withers, pelvis evident (0.0-0.50 cm between spine and muscle)

S. Arthur (ADF&G, Fairbanks) reports ewes captured in Brooks and AK ranges all carry SQ fat and are well-muscled

Preliminary observations Disease - 14C

Nasal and pharyngeal swabs from 35 adult ewes and 13 rams cultured for bacteria, blood samples tested for exposure to viral disease

27/48 positive for one of two “families” of bacteria associated with respiratory disease in BHS in lower 48. Note: both required for large scale die off

2/48 positive for viral diseases

Preliminary observations Nutritional condition – GMU 14C

Body condition appeared poor, though slightly better than GMU 13D ewes (2-2+ on a 0-5 scale)

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Preliminary observations: Reproductive status -14C

2012 – Low pregnancy rate at 43%

2013 – 94%

Preliminary observations Disease - 14C

Nasal and pharyngeal swabs from 35 adult ewes and 13 rams cultured for bacteria, blood samples tested for exposure to viral disease

27/48 positive for one of two “families” of bacteria associated with respiratory disease in BHS in lower 48. Note: both required for large scale die off

2/48 positive for viral diseases

Monitoring

Monitoring – Adult sheep

Flights 2x/mo. Check animal, record location

Radio telemetry – Collar emits 60 bpm as long as animal is alive

Mortality mode (4 hrs adults, 1 hr lambs) 90 bpm

When a mortality signal is detected, we investigate as quickly as possible.

Adult Mortality

Adult Mortality

Adult Mortality

Adult Mortality

Adult Mortality

Ewe mortality – 13D

22 mortalities 3/2009-2/2014

183 sheep – years of data

≈12.0 % adult mortality/year

11 avalanche

4 pneumonia

2 wolverine predation

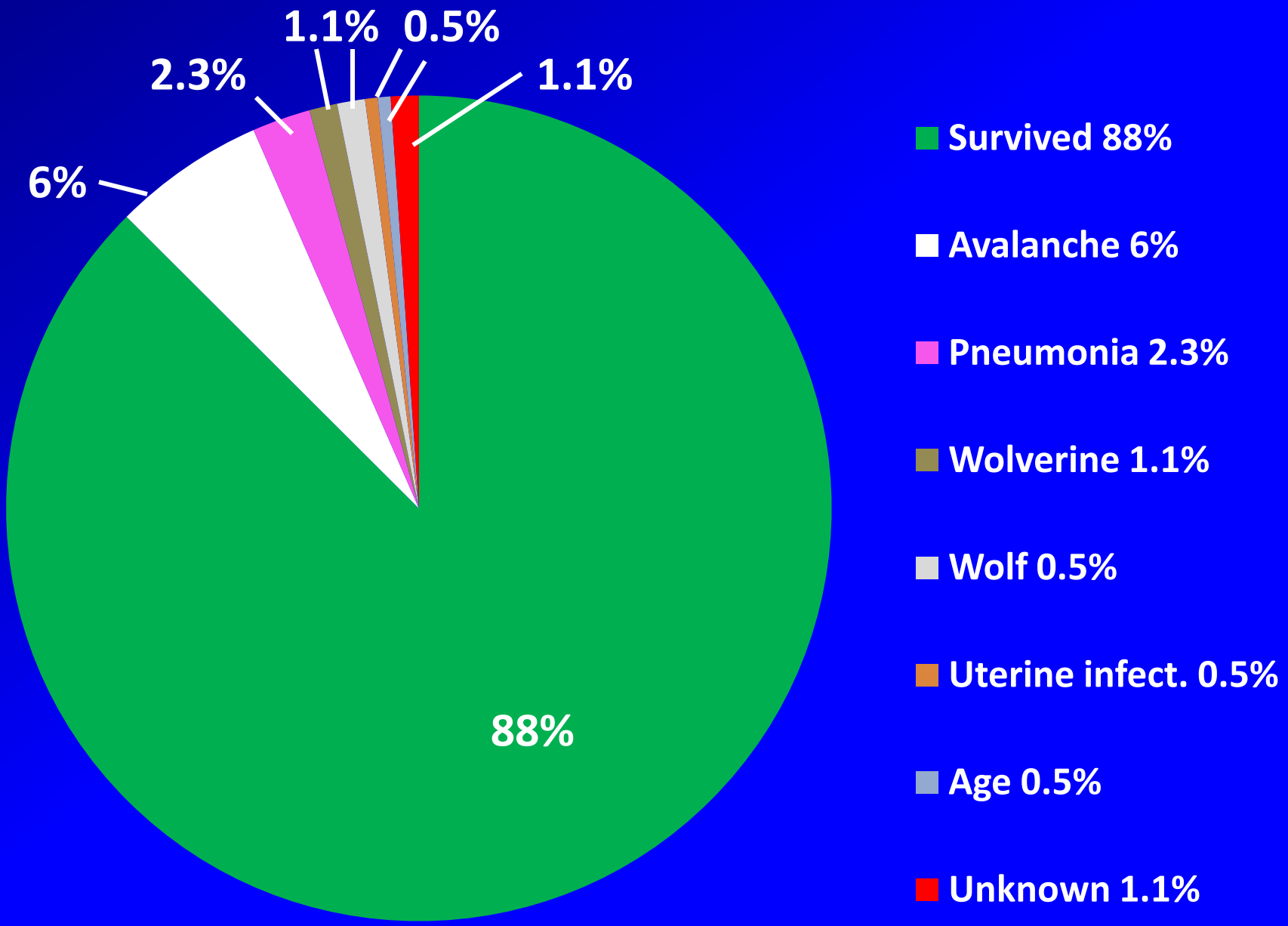
2 unknown, not recovered

1 uterine infection/septicemia

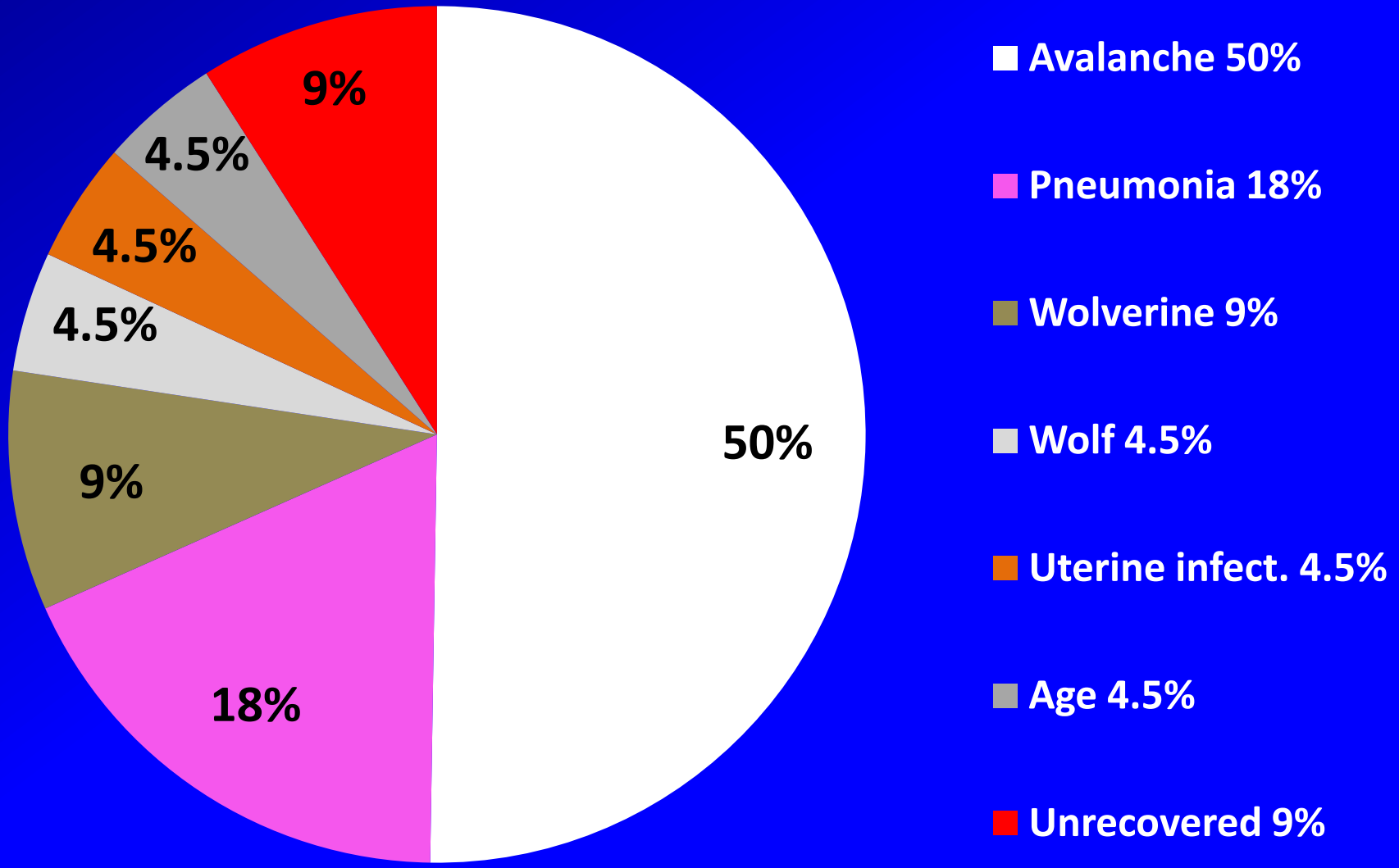
1 wolf predation

1 age (17 y.o., pneumonia, malnutrition)

Fate of GMU 13D adult ewes



GMU 13D ewe mortality (22 deaths)



Adult mortality – 14C

2 / 35 collared ewes died 4/2012-3/2013

≈5.7 % mortality/year

1 avalanche

1 unknown predator (likely wolverine)

1/ 19 collared rams died 4/2012 – 3/2013

≈5.2 % mortality/year

Unknown nonpredation

Adult mortality – 14C

9/33 collared ewes died 4/1/2013 - 2/26/2014

≈27 % mortality to date*

- 4 avalanche
- 1 wolverine
- 1 brown bear
- 1 unknown predator
- 1 unknown nonpredation (at least 14 y.o)
- 1 birth (lamb did not clear birth canal)

4/18 collared rams died 4/1/2013 - 2/26/2014

≈22 % mortality to date*

- 1 avalanche
- 1 brown bear
- 2 unknown nonpredation

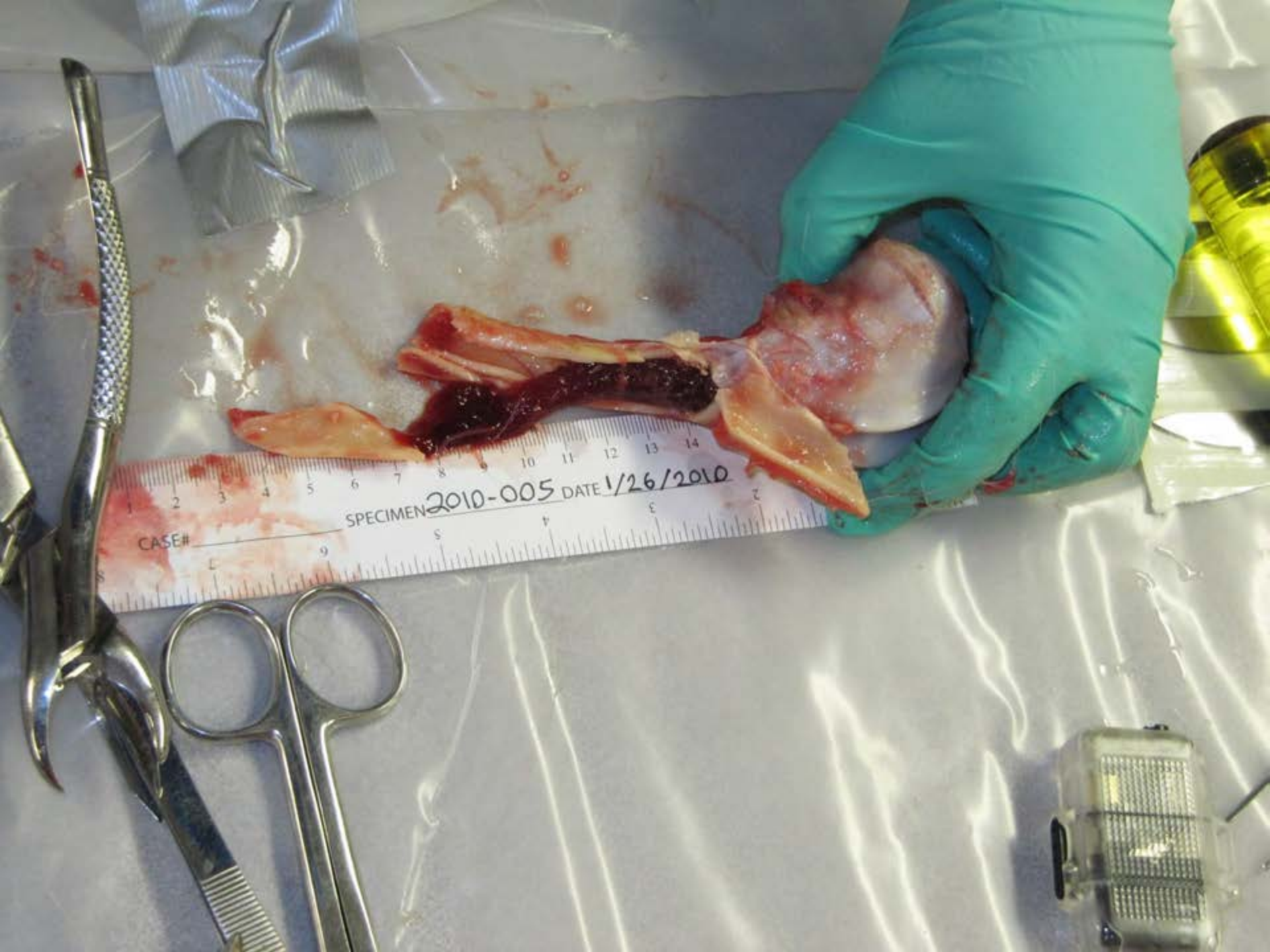

Lamb Captures - May 15-June 15

Monitoring Schedule

Daily flights May 15 - June 15 to determine parturition, locate lambs for capture, and check for mortality of collared lambs

June 15 – July 1	flights 2x/week.
July 1 – Aug 10	flights 1x/week.
After Oct. 1	flights 2x/mo.

When a mortality is detected via radio signal, we investigate as soon as possible


SPECIMEN 2010-005 DATE 1/26/2010
CASE#

Lamb survival rates – 13D

8/19 (42%) 2009 lambs survived to one year

2/21 (9%) 2010 lambs survived

4/26 (15%) 2011 lambs survived

7/11 (63%) 2012 lambs survived

Timing of lamb mortality – 13D (2009 cohort)

Predation (5/19, 26%)

2 Eagles at 9d and 17d
Brown bear at 2d

Unknown pred at 15d

Wolf at ± 9 mo

Nonpredation (6/19, 32%)

Starvation at 2d
Drowning at 4d

Pneumonia/lungworm at 35 d

Malnutrition/CE at ± 7 mos.

Malnutrition at ± 8 mos.

Avalanche at ± 9 mos.

Timing of lamb mortality – 13D (2010 cohort)

Predation (10/21, 47%)

2 Eagles at 15d. and 16d.

Unknown pred at 1 mo.

4 Brown Bear at 4.5 -5 and 11 mo.

Wolf/coyote/lynx at ± 7 mo.

2 Wolverine at ± 9 mo.

Nonpredation (9/21, 43%)

Fall at 2d.

2 Drownings at 2d. and 6 d.

Starvation at 2d.

Pneumonia at 45 d.

Unknown nonpred at 1-2 mo.

3 Avalanches at ± 9, 10, 11 mo.

Timing of lamb mortality-13D (2011 cohort)

Predation (10/26, 38%)	Nonpredation (9/26, 35%)
3 Eagles at 5, 8, and 14 d.	2 Rockslide at 2 and 14 d.
Black bear at 2 d.	Fall at 1 mo.
Unknown pred at 1 mo.	Pneumonia at 45 d.
	2 Avalanches at ± 6 and 7 mo.
Coyote at 6 mo.	Unknown nonpred at 6 mo.
3 Wolverine at ± 7-9 mo.	2 Malnutrition at 7 and 8 mo.
Wolf/wolverine at 10 mo.	

3/26 (12%) Not recovered at 10 mo.

Timing of lamb mortality-13D (2012 cohort)

Predation (2/11, 18%)

Eagle at 2 d.

Brown bear at 11 mo.

Nonpredation (1/11, 9%)

Avalanche at 10 mo.

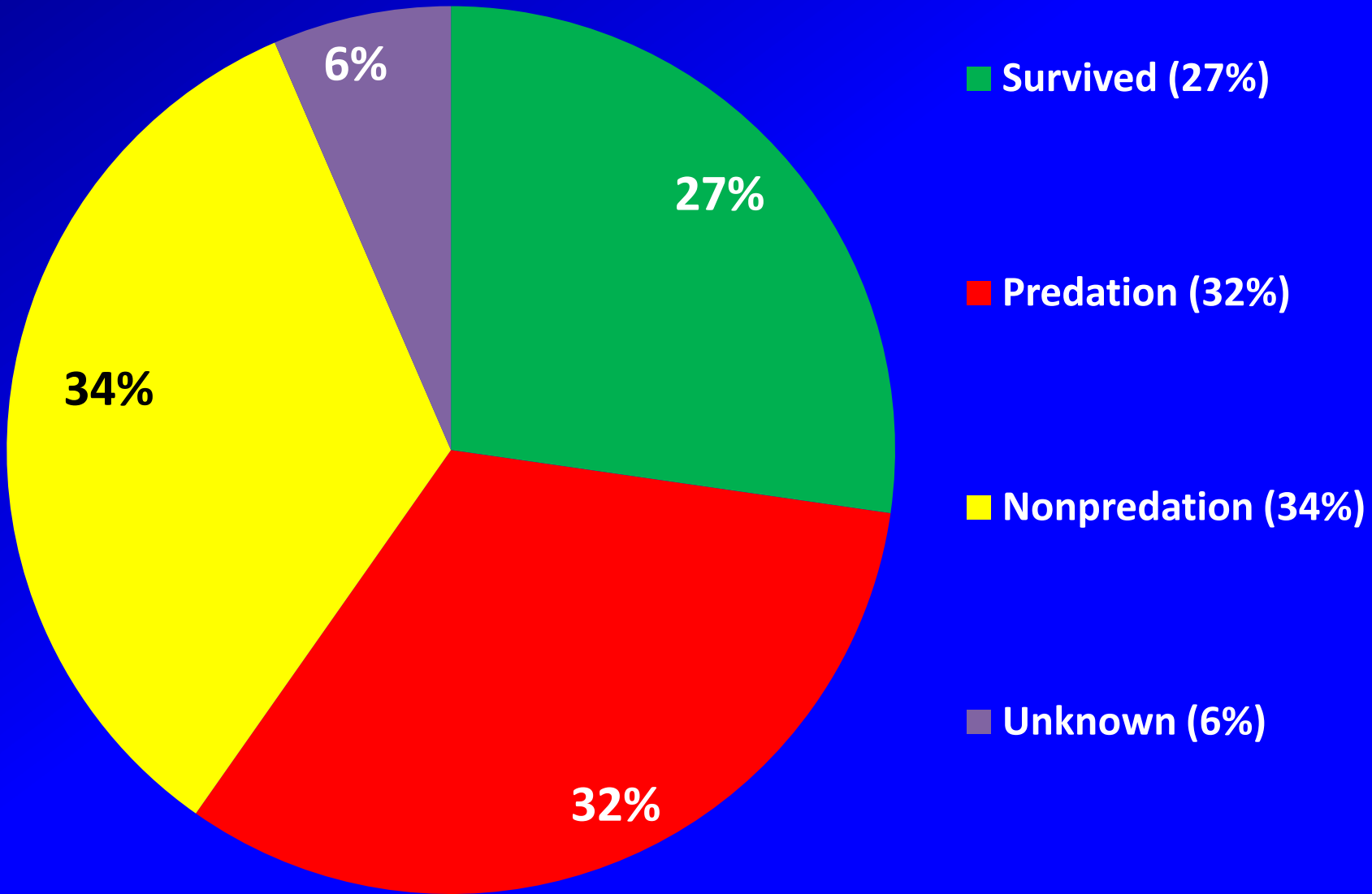
Unknown, not recovered at 10 mo.

Causes of lamb mortality - 13D (2009-2012)

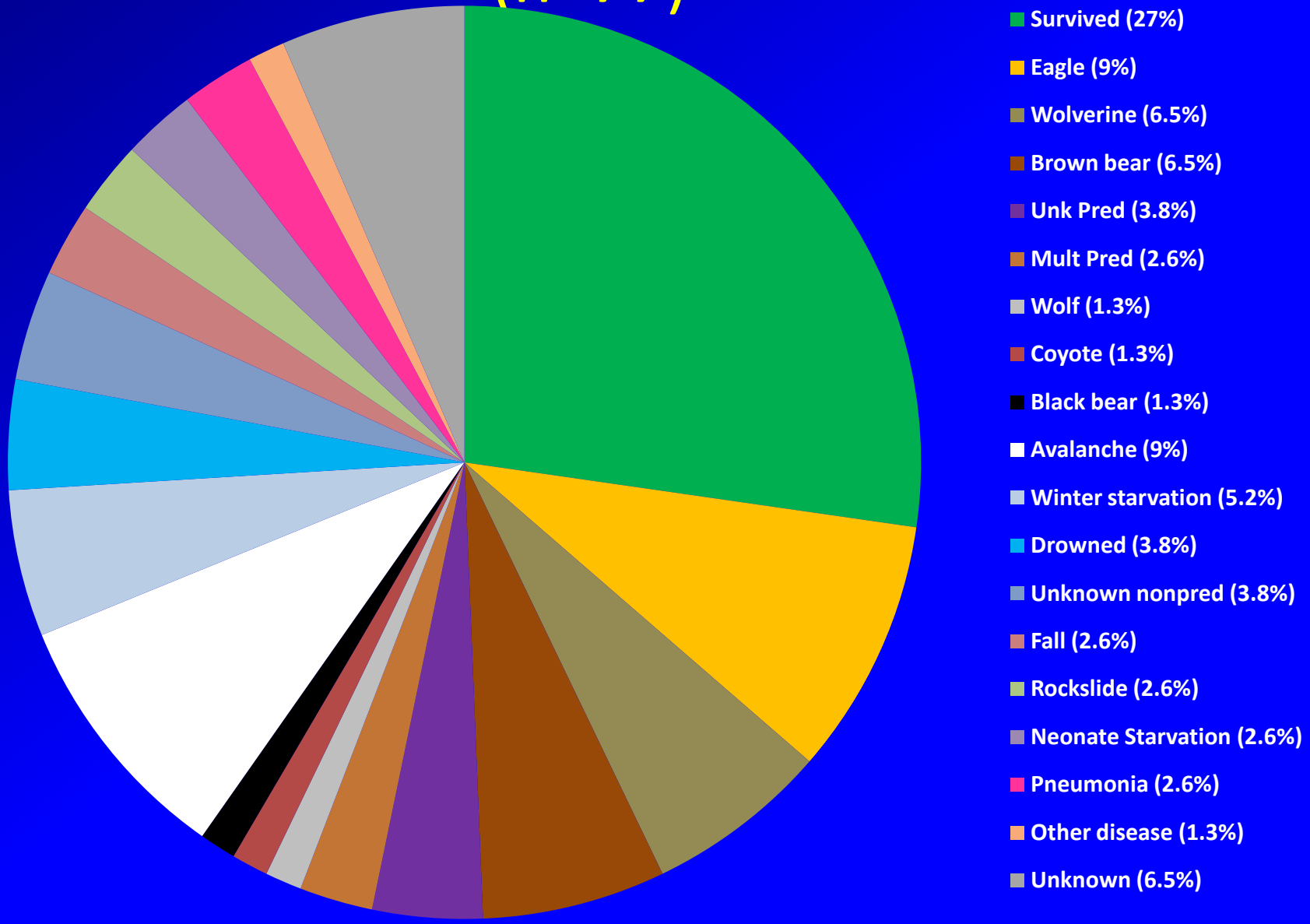
77 lambs included in analysis

- 21/77 (27%) survived
- 25/77 (32%) killed by predators
- 26/77 (34%) lost to nonpredation causes
- 5/77 (6%) unknown fate

GMU 13D - Fate of 2009-2012 lambs (n=77)



GMU 13D - Fate of 2009-2012 lambs (n=77)



Causes of lamb mortality - 14C (2012 only)

26 lambs included in analysis

- 16/26 (61.5%) survived
- 8/26 (31%) killed by predators
- 2/26 (8%) lost to nonpredation causes

Lamb mortality - 14C (2012 only)

Predation (8/26, 31%)		Nonpredation (2/26, 8%)	
Eagles	6*	Avalanche	1
Unknown pred.	1	Drowning	1
Coyote	1		

7/11 2013 lambs survived to date (2 eagle kills, 1 wolverine, 1 fall. Not included in analysis, year not complete)

Summary - GMU 13D

Annual adult survival rate ≈ 87.5%

AK range 1999-2003 = 76-91% (Arthur 2003)

Brooks 2009-2011 = 77-88% (Arthur 2012)

16% adult mortality due to predation

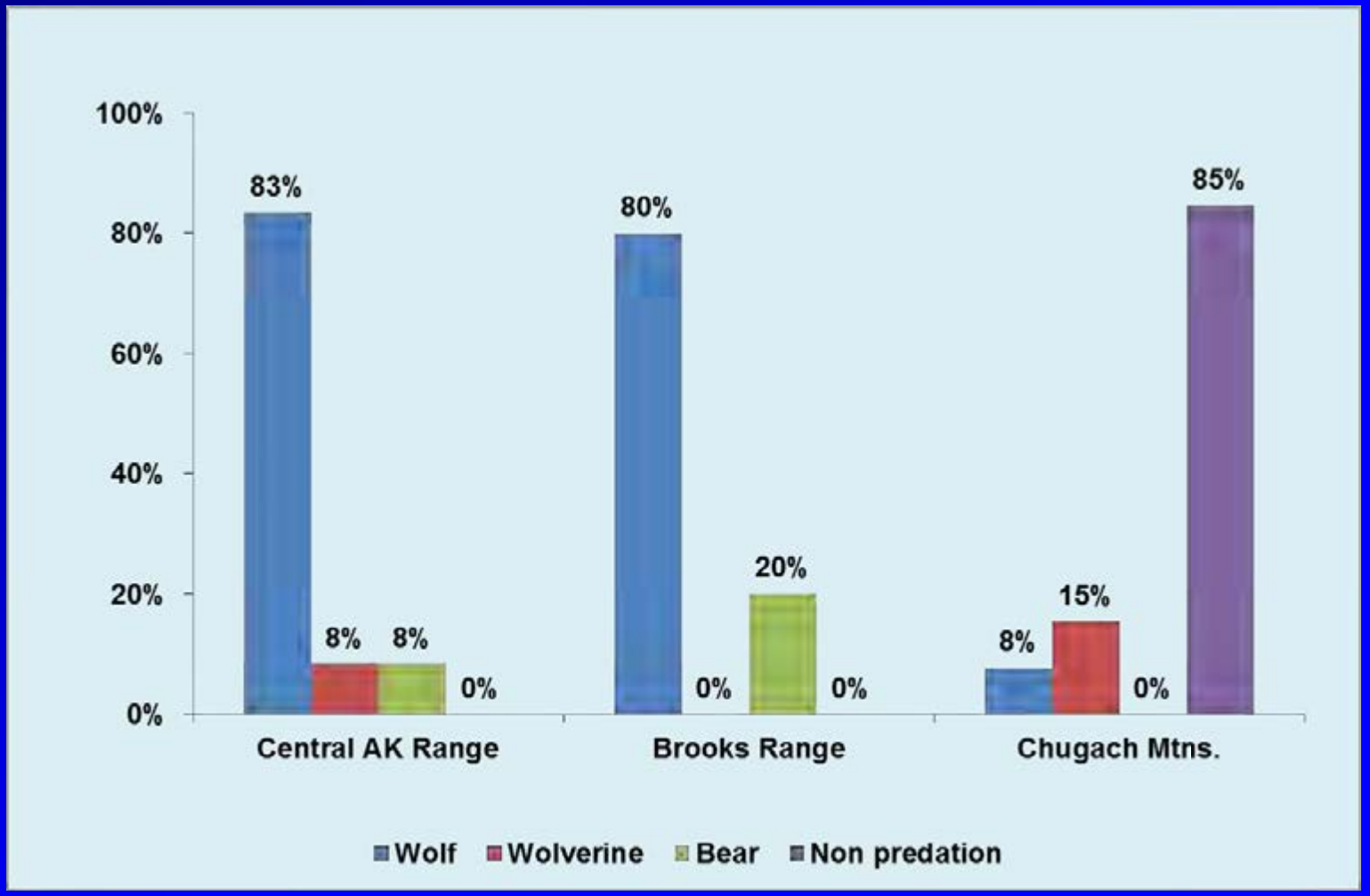
84% adult mortality to nonpredation

AK range 1999-2003 = 100% adult mortality to predation

Brooks 2009-2011 = 100% adult mortality to predation

(Arthur 2003; Arthur 2012)

Percent of Deaths of Adult Ewes by Cause



Annual survival averaged 83% – 91%

Slide courtesy of S. Arthur, NPS – Denali, note Chugach data 2009-2011 only

Summary - GMU 13D

Lamb survival to 1 year 2009-2012 ≈ 42%, 9%, 15%, 63% respectively (27% average)

AK range 1999-2003 = 12%, 23%, 16%, 36% (Arthur 2003)

Brooks 2009-2011 = 68%, 48%, 28% (Arthur 2012)

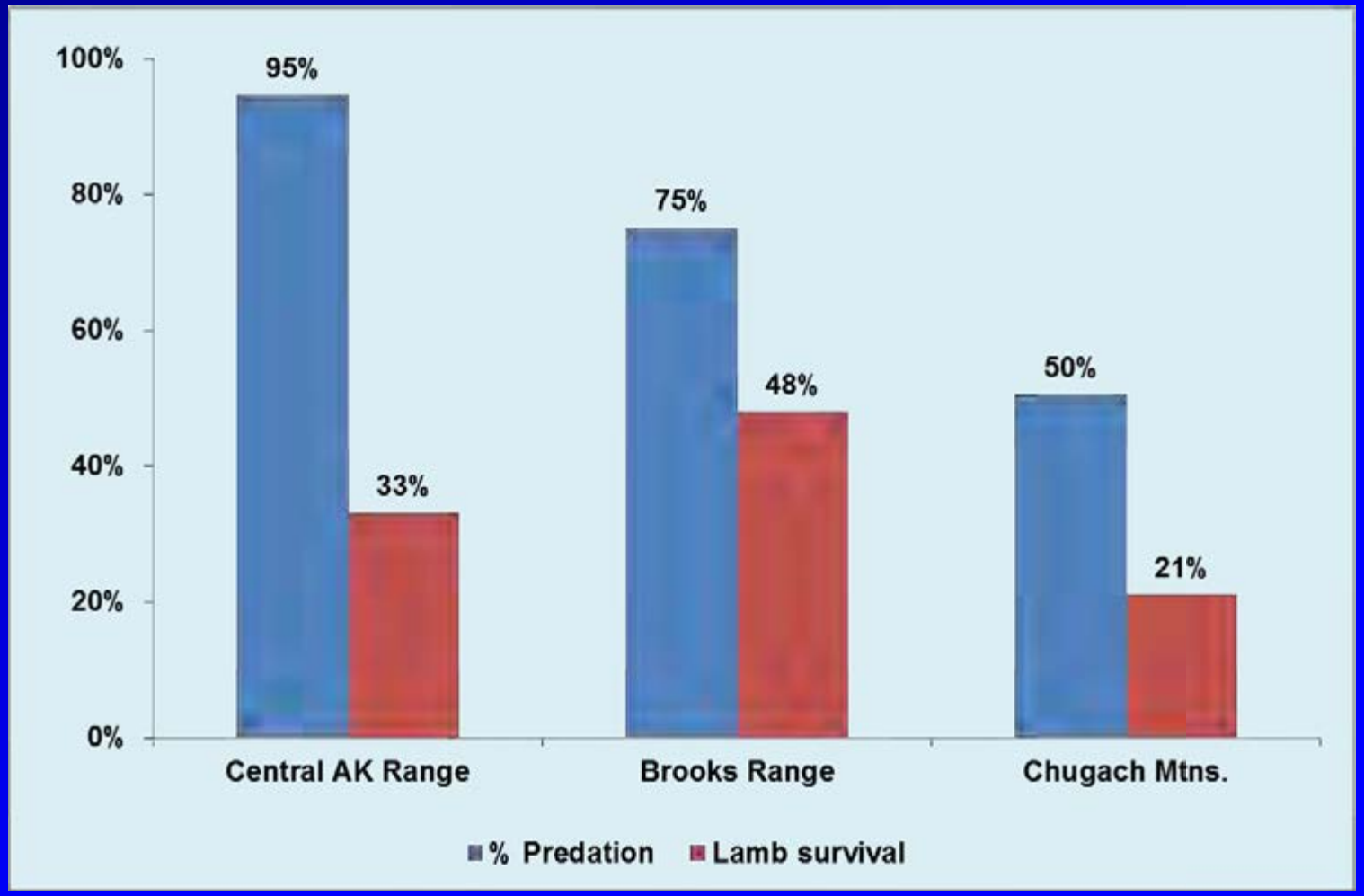
44% of lamb mortality due to predation (25/56 lamb deaths caused by predators)

AK range 1999-2003 = 90% (Arthur 2012)

Brooks 2009-2011 = 72% (Arthur 2012)

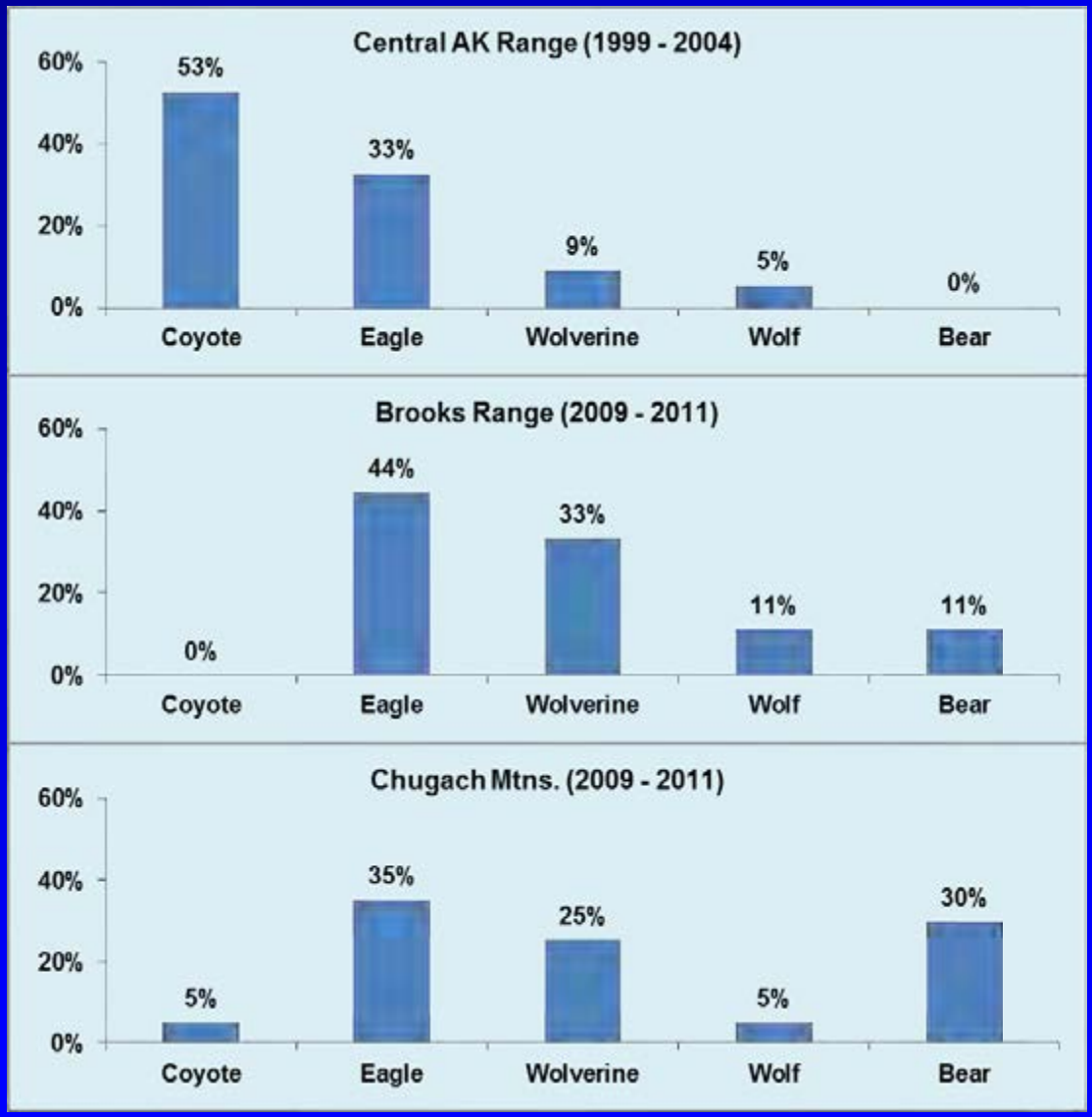
56% of lamb deaths were not caused by predators

Average Lamb Survival and Percent of Deaths Due to Predation



Slide courtesy of S. Arthur, NPS – Denali, note Chugach data 2009-2011 only

Percent of Lamb Predation by Predator Species



Slide courtesy of S. Arthur, NPS – Denali, note Chugach data 2009-2011 only

Conclusions - GMU 13D

Predation -Accounts for only 1/7.5 adult, 1/2 lamb deaths

- Low percentage, and broad distribution across predator species suggests population is not predation limited

Disease - Low presence/prevalence major wildlife diseases

- Disease does not have population-level effects
- Some animals succumb to pneumonia (additional stressors?) but overall, disease not a major factor

Conclusions - GMU 13D

Annual pregnancy rates in 3 of 5 years (62%, 88%, 66%, 21%, and 91%) lower than observed in other populations

Chronically low pregnancy rates along with poor body condition strongly suggests nutrition/ habitat/weather issue

Future direction – GMU 13D

Project slated to end after current year -- it's time to ask new questions

Finish analyses:

- Long term reproductive history
- Weather/limited winter range due to snow/ice?
  - Satellite imagery
  - Temperature records
- Trace mineral levels and blood chemistry

Preliminary observations - GMU 14C

Predation accounts for 4/10 ewe deaths, 1/4 rams.

- Caveat: One year of data
- Interesting observation: Ram death rates = ewe death rates

Low pregnancy rates in 2012 mirror that in 13D, note record snowfall.

94% pregnancy in 2013 may be rebound effect - additional year of study

Future Direction - GMU 14C

Initially intended as 2 year study, March 2012 - June 2014

30-35 ewes – captured once each year

rams – captured once, radiocollared, monitored for movement and survival

20-30 lambs/year

Low # lambs captured in 2013 necessitate additional year of study 2014-2015

Research Goals – GMU 14C

Are demographics similar to other areas of the Chugach?

- Weather
- Predation
- Habitat

Can we generalize demographic data across southcentral Alaska?

Gather information on ram movement, dispersal, distribution, survival rates – Evaluate “full curl” harvest

Future Direction - GMU 14C

Known age rams

- Rates and causes of mortality, 2-8 years old
- Movement and dispersal
- Horn growth, annuli formation

Use lambs born in 2012 and 2013, collar at 18 months, follow through lifetime

Thanks !

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