



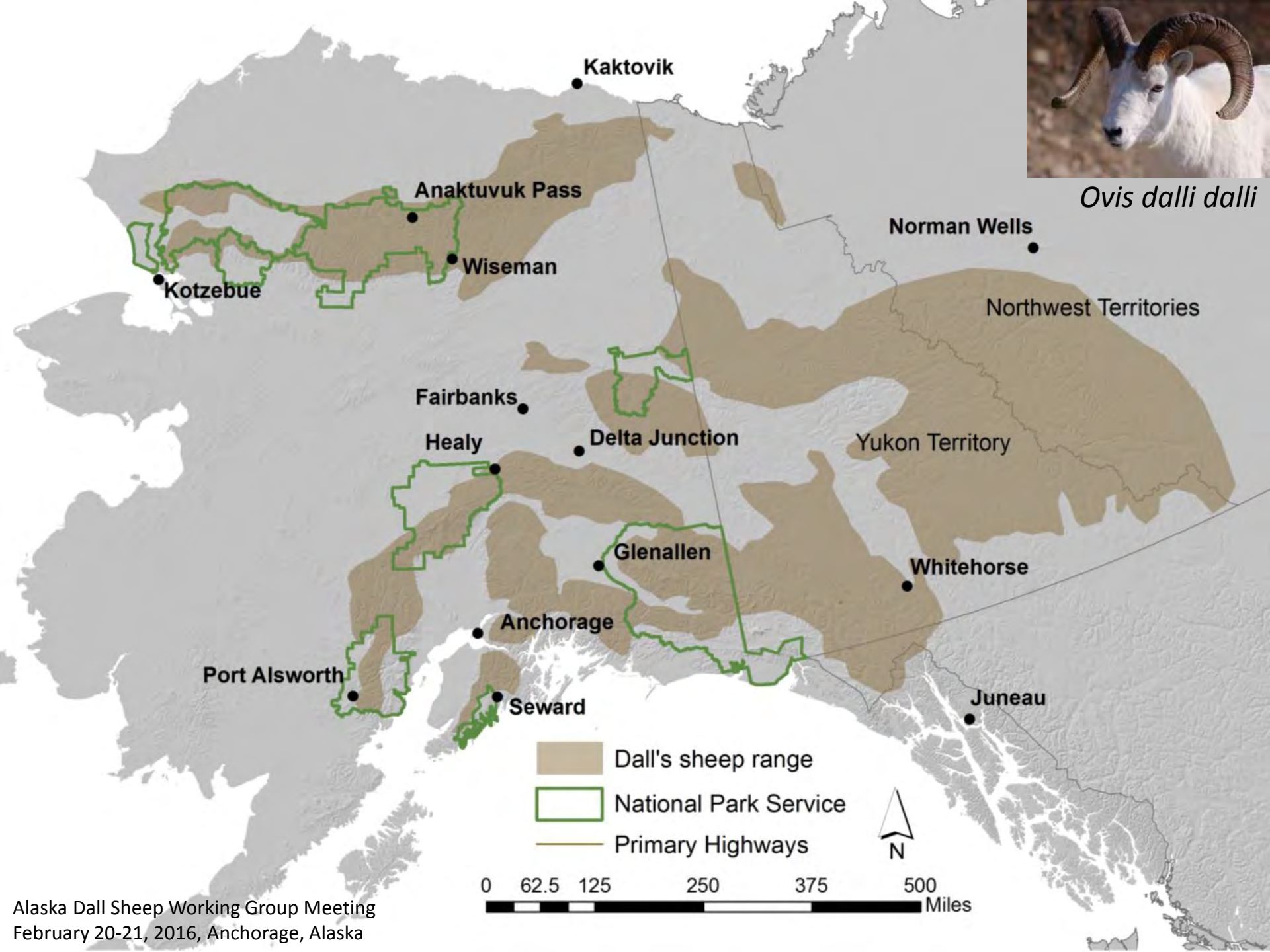
Recent trends in Dall's sheep populations in Alaska's National Parks and Preserves



Kumi Rattenbury, Joshua Schmidt,
Laura Phillips, Steve Arthur, Bridget
Borg, John Burch, Kyle Joly, Jim Lawler,
Buck Mangipane, Judy Putera

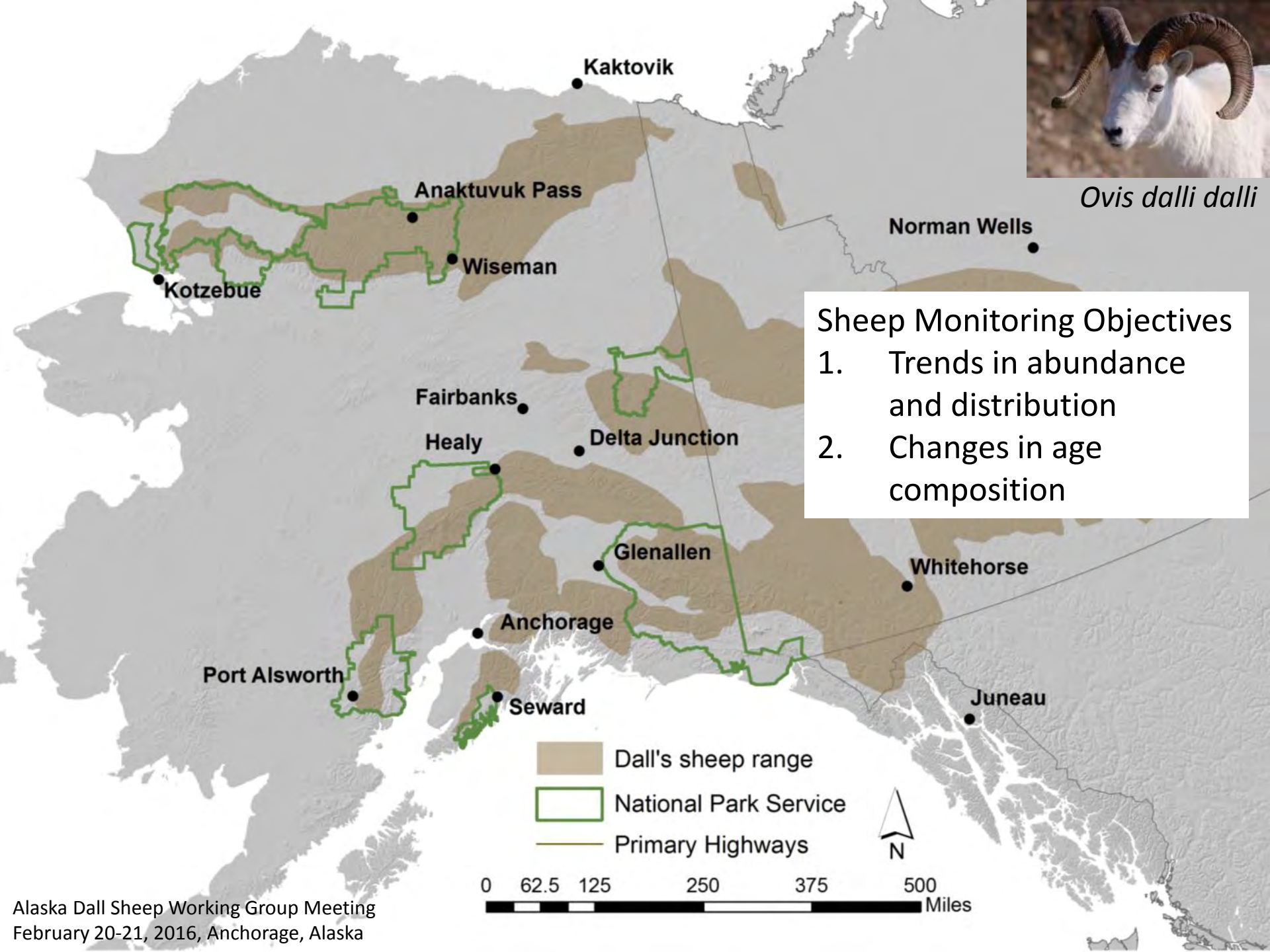


Ovis dalli dalli





Ovis dalli dalli



Sheep Monitoring Objectives

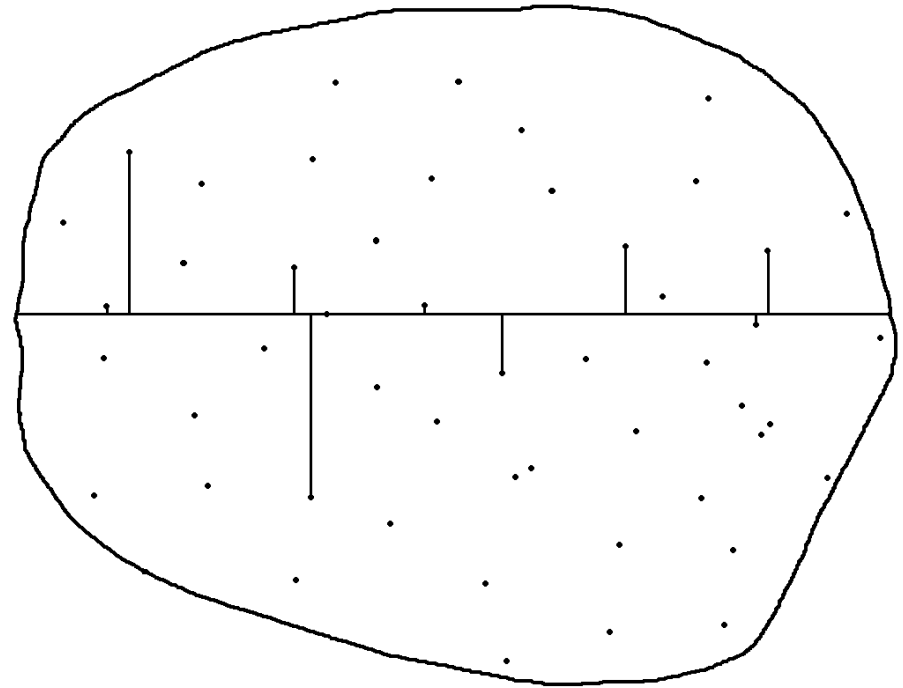
1. Trends in abundance and distribution
2. Changes in age composition



Distance Sampling

Basic form

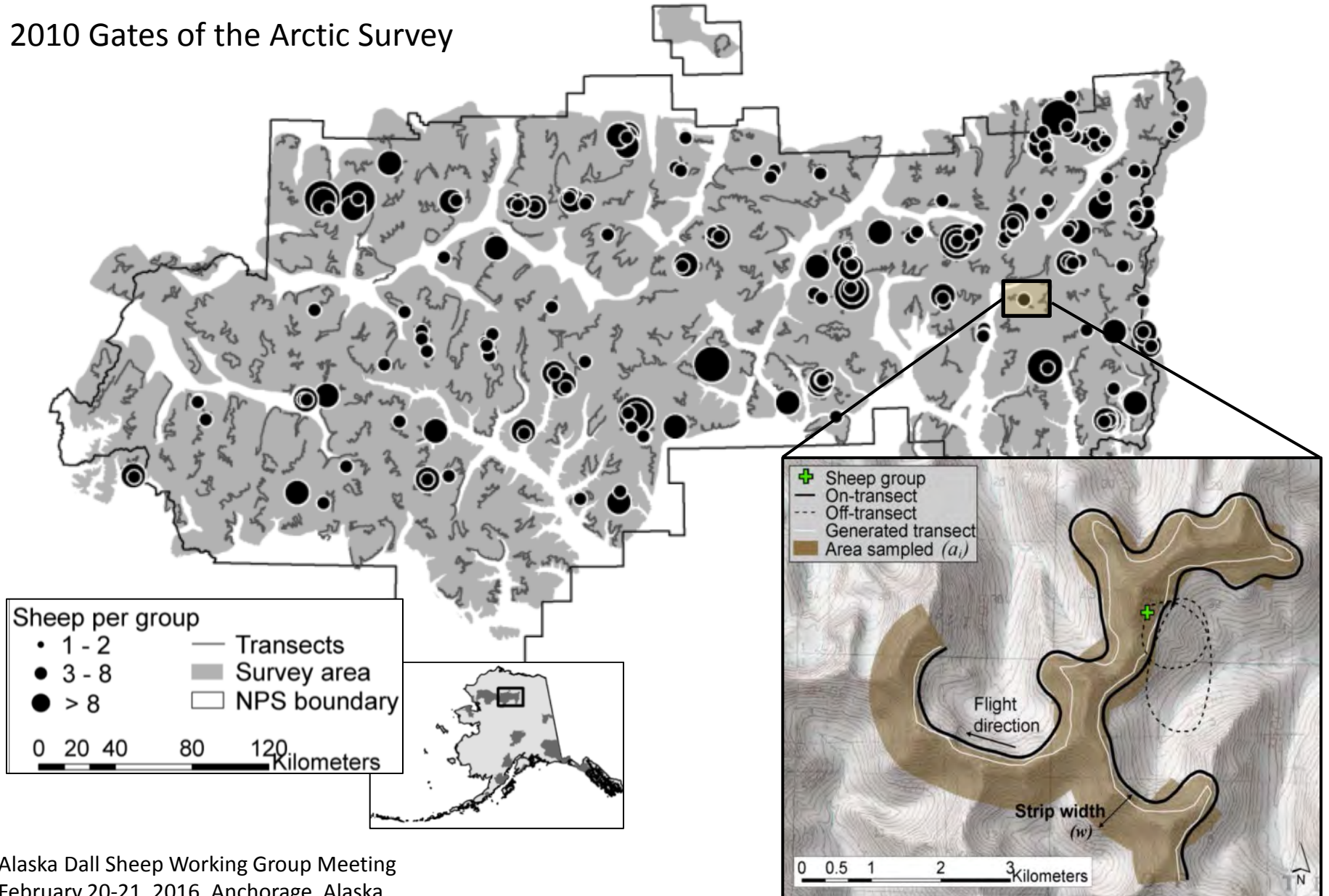
- Traverse a transect line
- Identify individuals or groups of interest
- Record perpendicular distance from line
- Detection probability decreases with distance





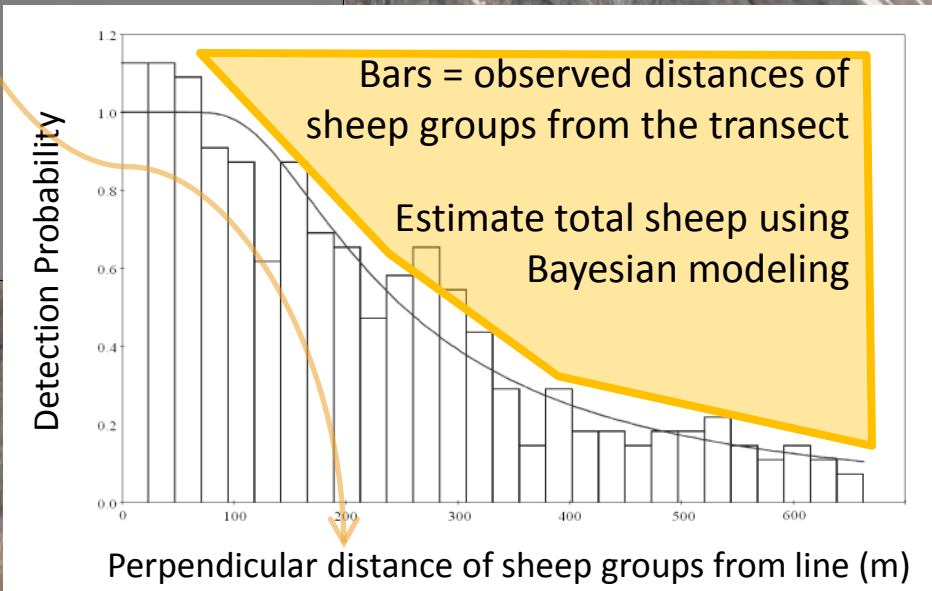
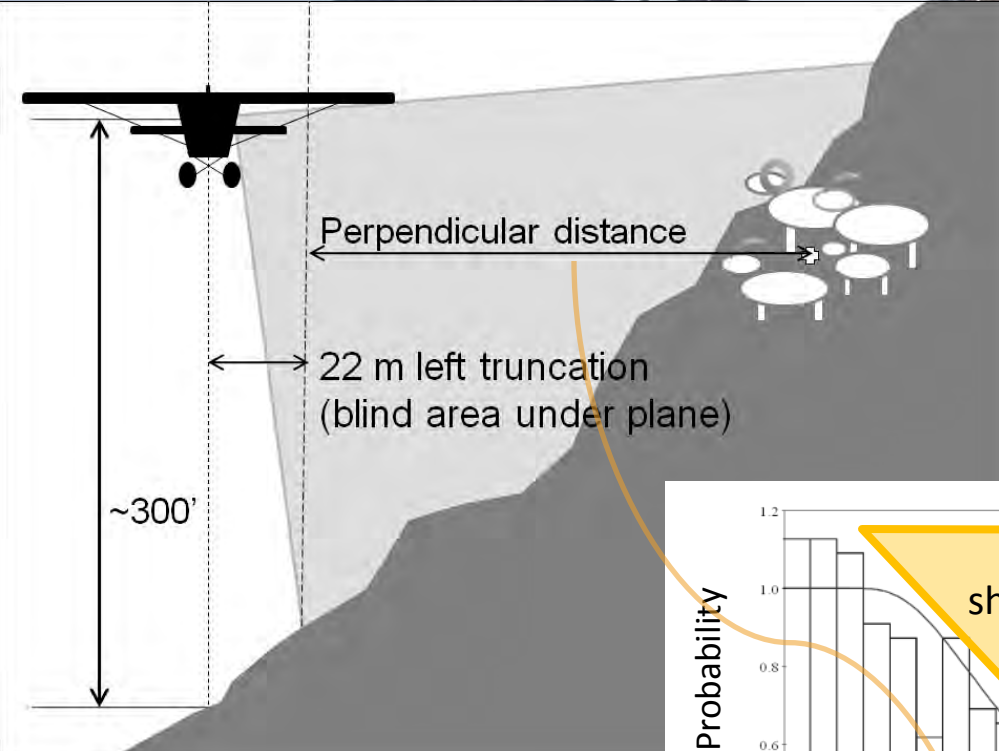
In mountains – transects follow contours

2010 Gates of the Arctic Survey





Distance Sampling Surveys





Distance Sampling Surveys

Advantages

- Direct estimates of detection
- Time per transect low
- Weather less influential
- Movement ok
- Park-wide estimates
- Directly comparable estimates
- Estimates of sightability

Disadvantages

- More restrictive
- More gear in the plane
- Additional prep/training
- Analysis more complex
- Difficult to estimate full-curl rams



2009-2012 Survey Results

**~29,000 total sheep
estimated on NPS
lands in Alaska**

Noatak (2011)
~2,800 sheep




Gates of the Arctic (2010)
~10,000 sheep

Yukon-Charley (2009)
333 sheep - minimum count

Denali (2011)
~2,200 sheep

Wrangell-St. Elias (2010-2011)
~12,400 sheep

Lake Clark (2012)
~1,000 sheep

-  Dall's sheep range
-  National Park Service
-  Primary Highways



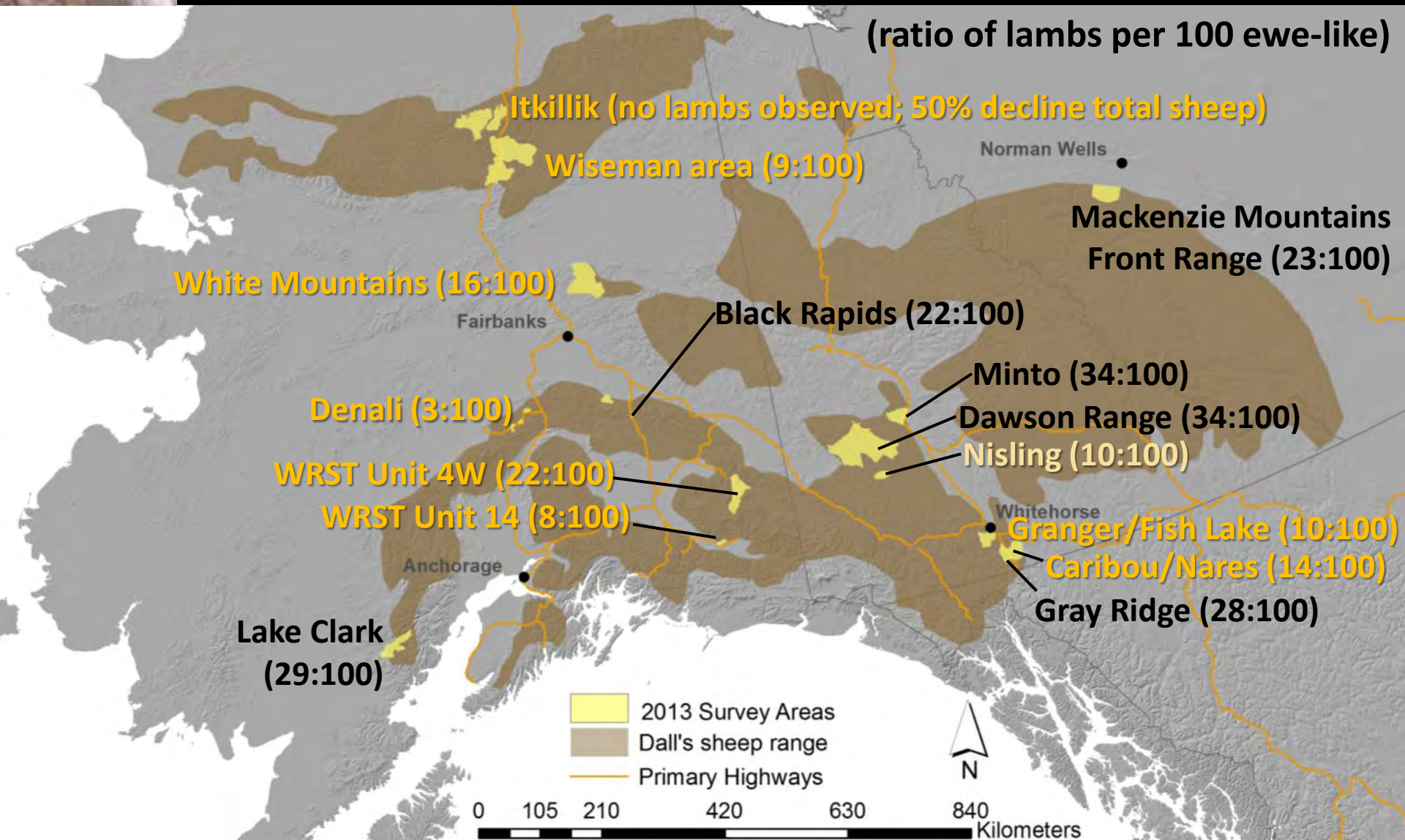
0 62.5 125 250 375 500 Miles

Schmidt et al. 2012
Schmidt and Rattenbury 2013
July 2015



2013 – Low lamb numbers across range

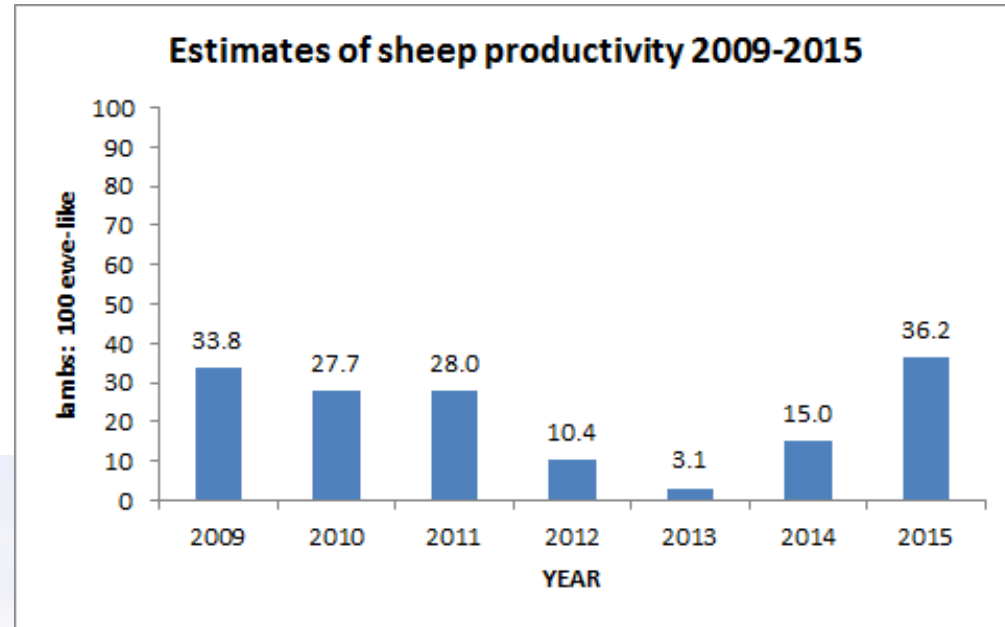
(ratio of lambs per 100 ewe-like)





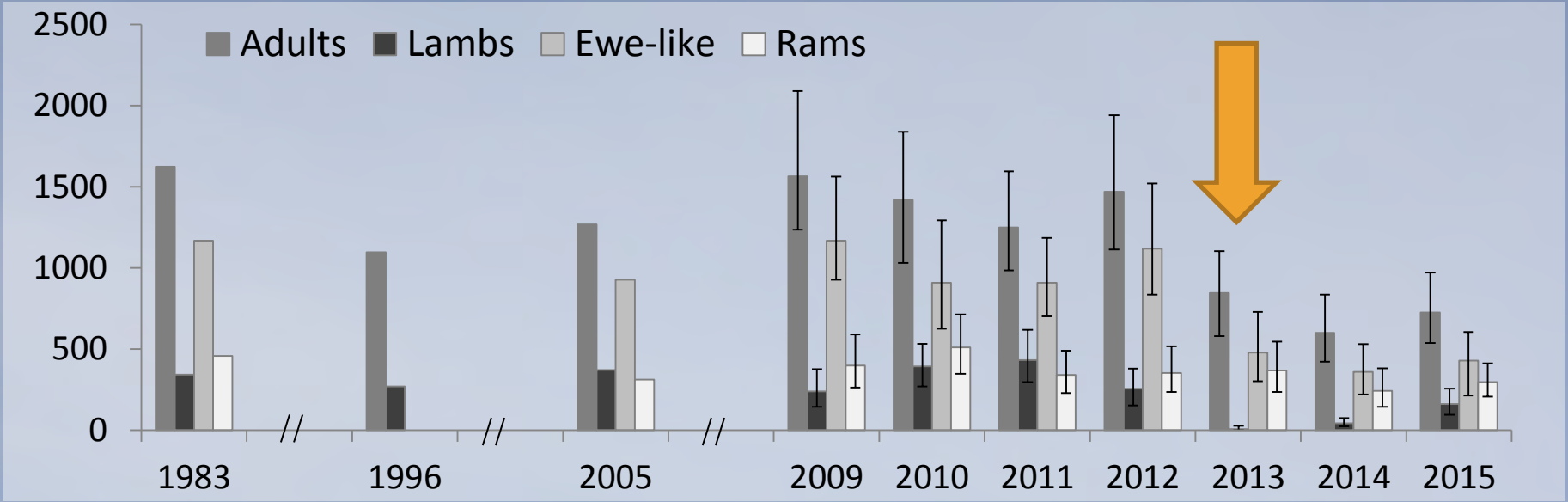
Denali Road Surveys

- 1974-1996 and 2008-2015
- Average lamb:ewe ratio 43:100
- Lamb productivity low in 1993 (6:100), 2012-2014





Itkillik Sheep Surveys 1983-2015



Minimum count → Distance sampling →

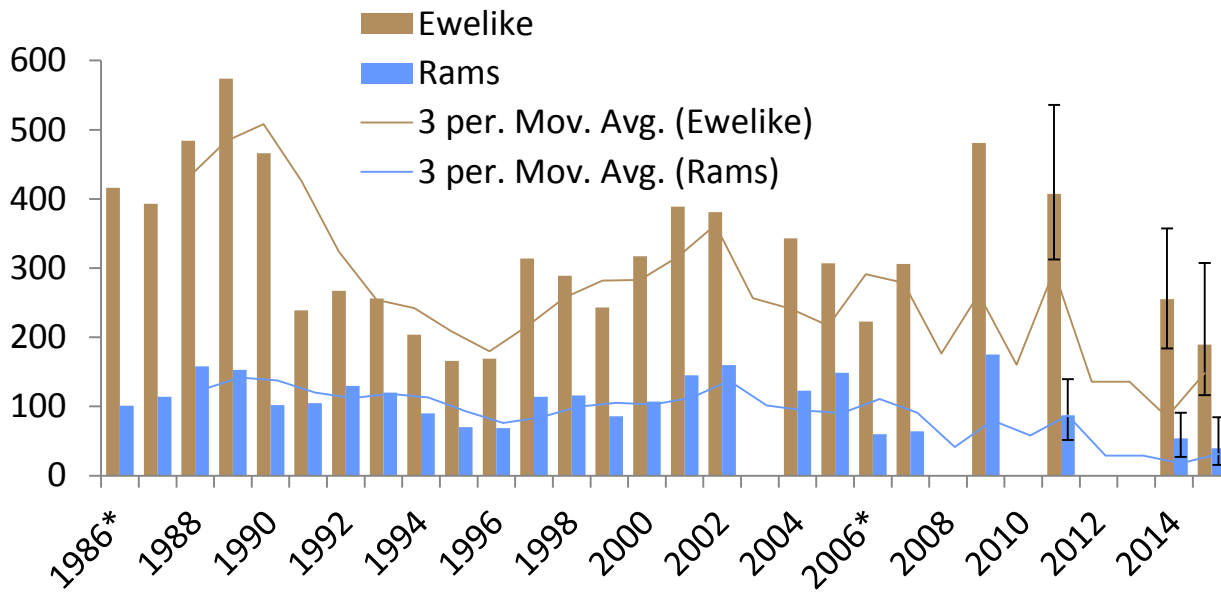
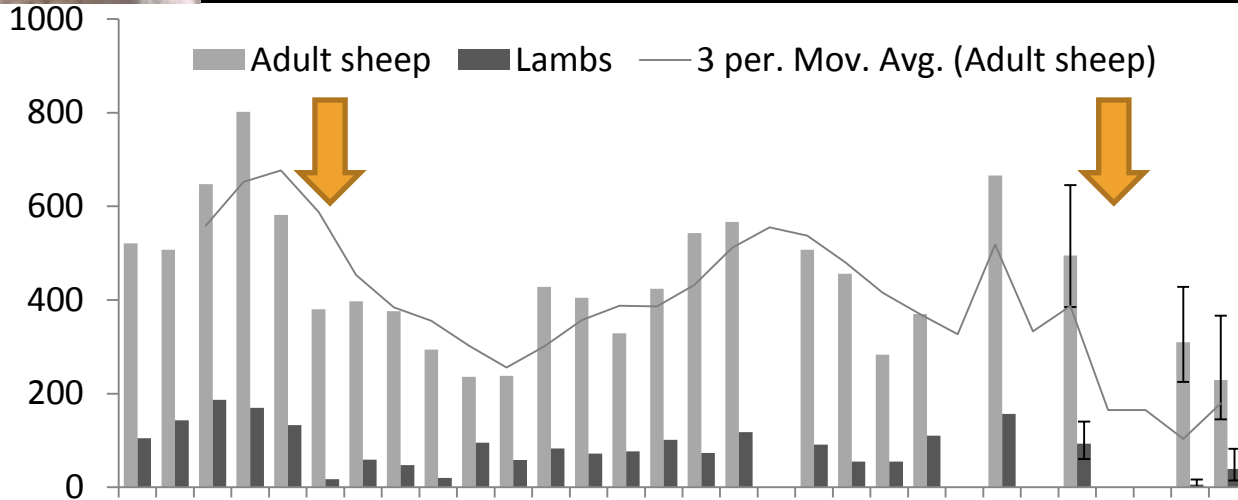


Error bars are 95% Credible Intervals



Western Baird Mountains Sheep Surveys

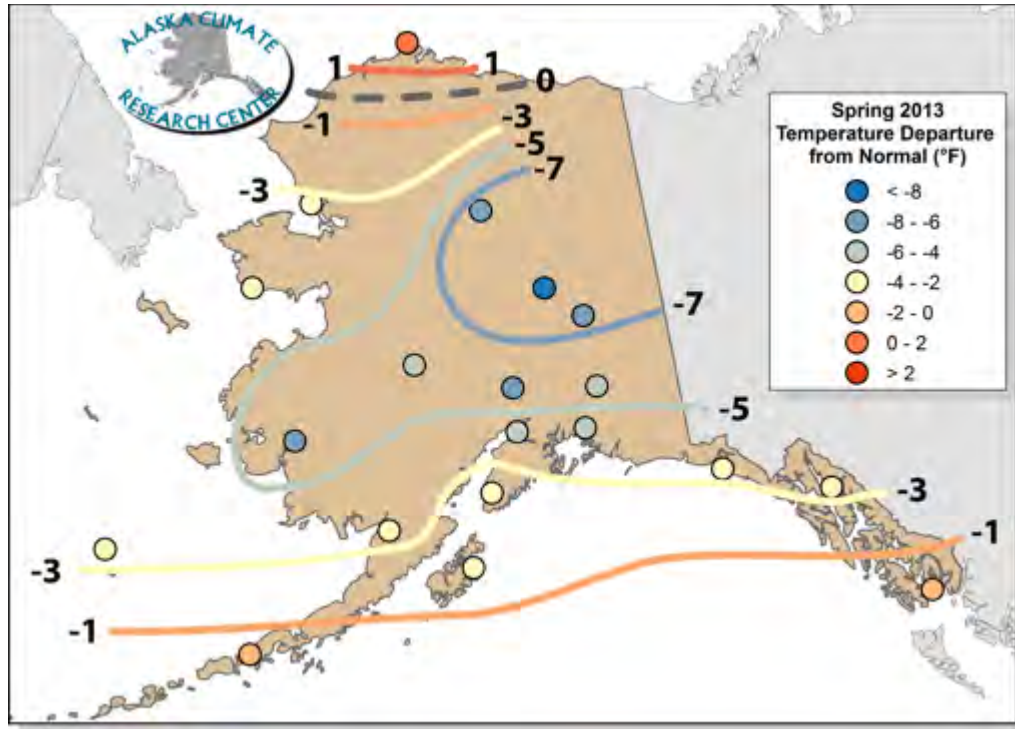
1986-2015



1986-2009 Minimum count
 2011-2015 Distance sampling
 Partial surveys in 1986, 1987, 2005-2007
 Error bars are 95% Credible Intervals
 Shults 2004, Schmidt and Rattenbury 2013

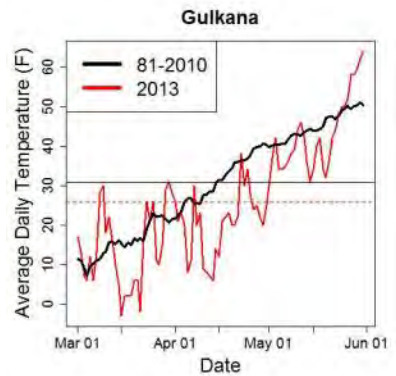
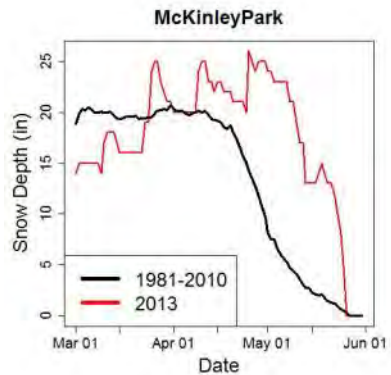
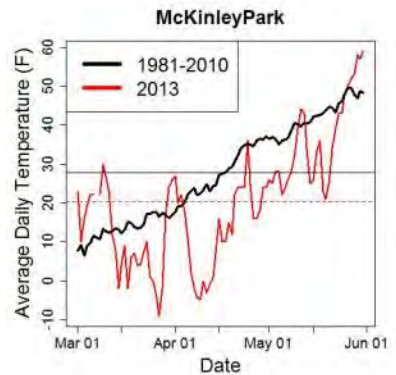
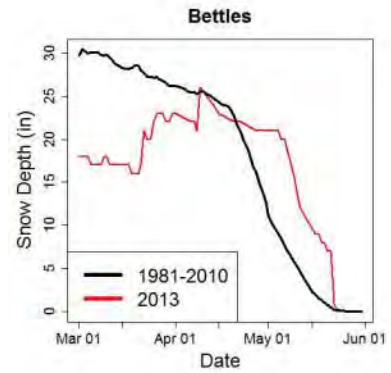
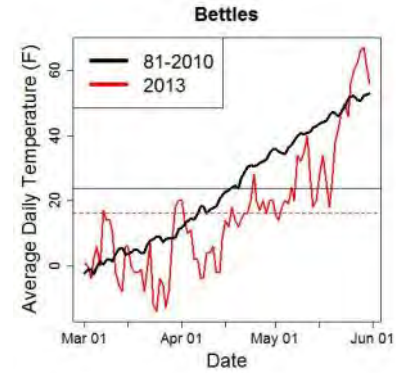


2013 Delayed spring



Alaska Climate Dispatch, June 2013.

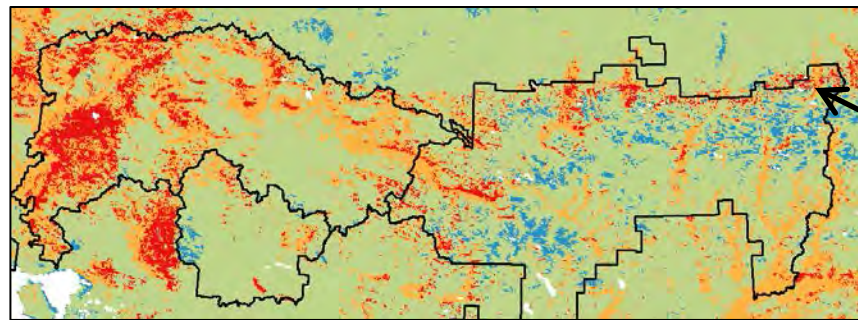
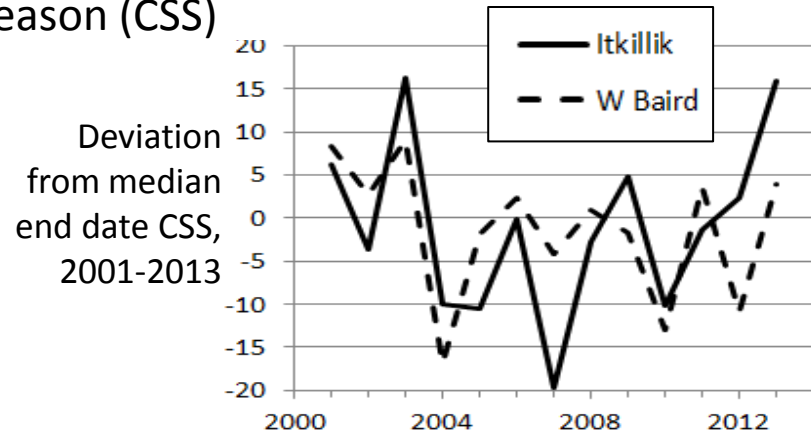
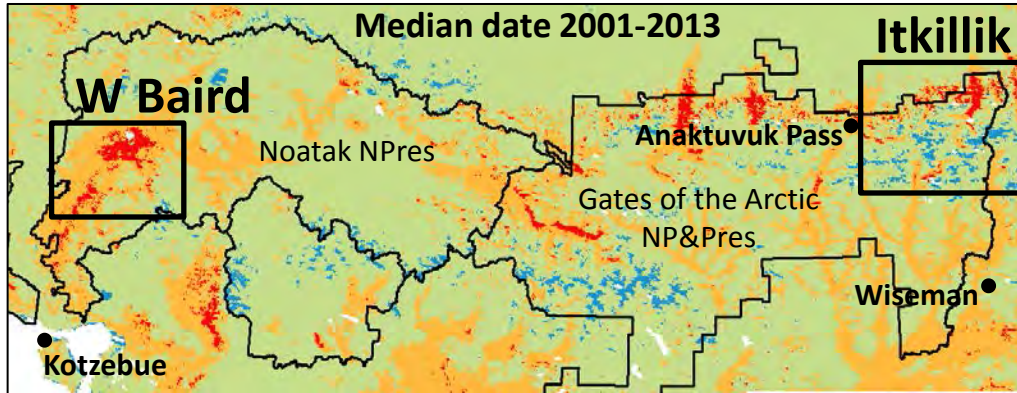
https://accap.uaf.edu/sites/default/files/Alaska_Climate_Dispatch_june%202013.pdf



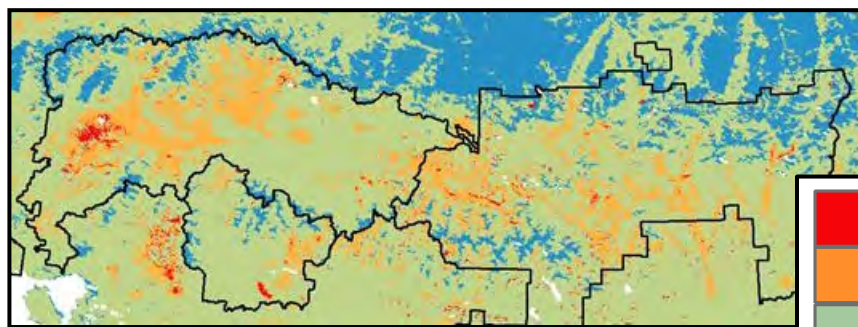
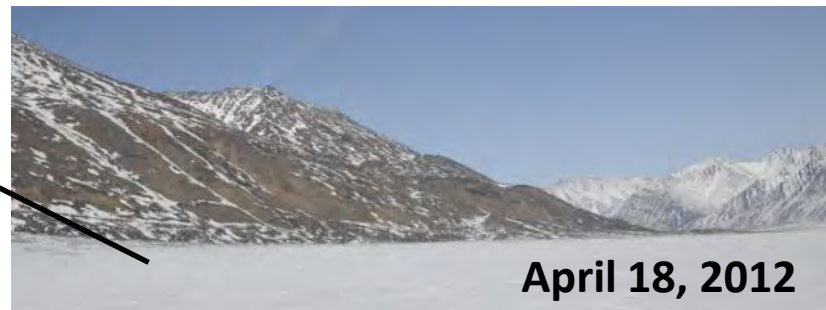


2013 - Delayed spring, snow melt

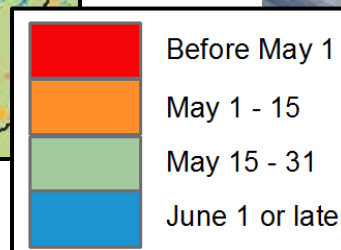
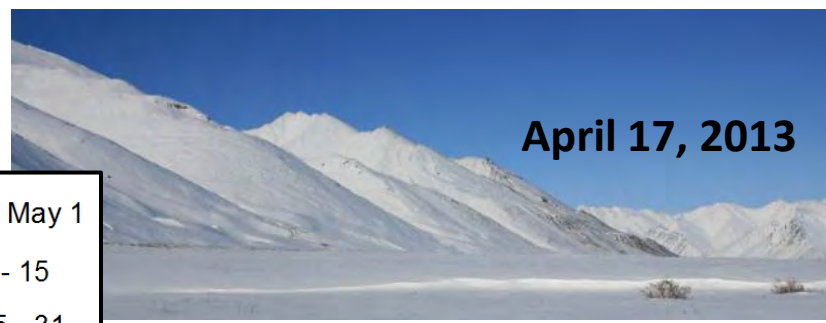
Satellite data showing end date of continuous snow season (CSS)



2012

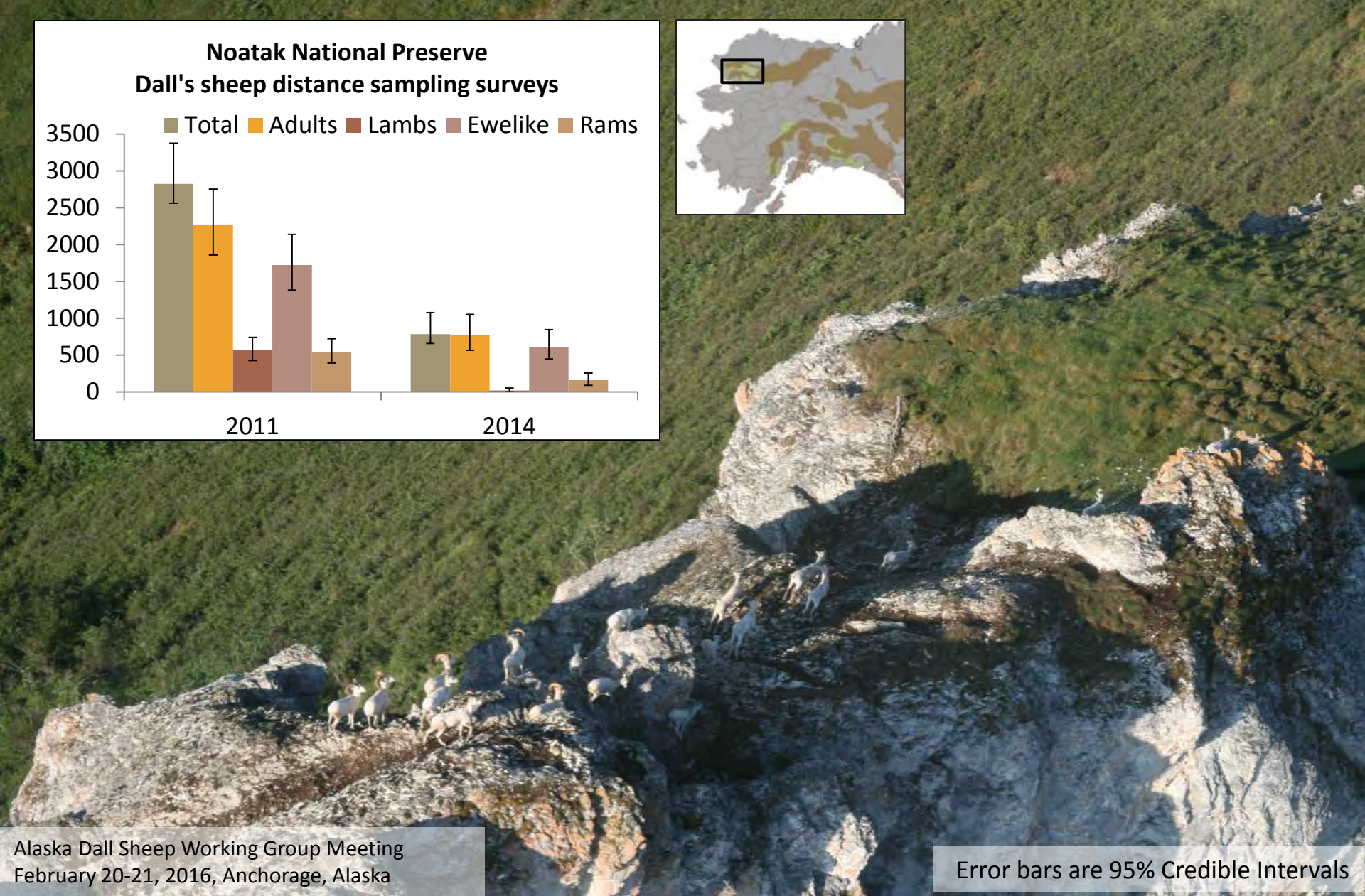
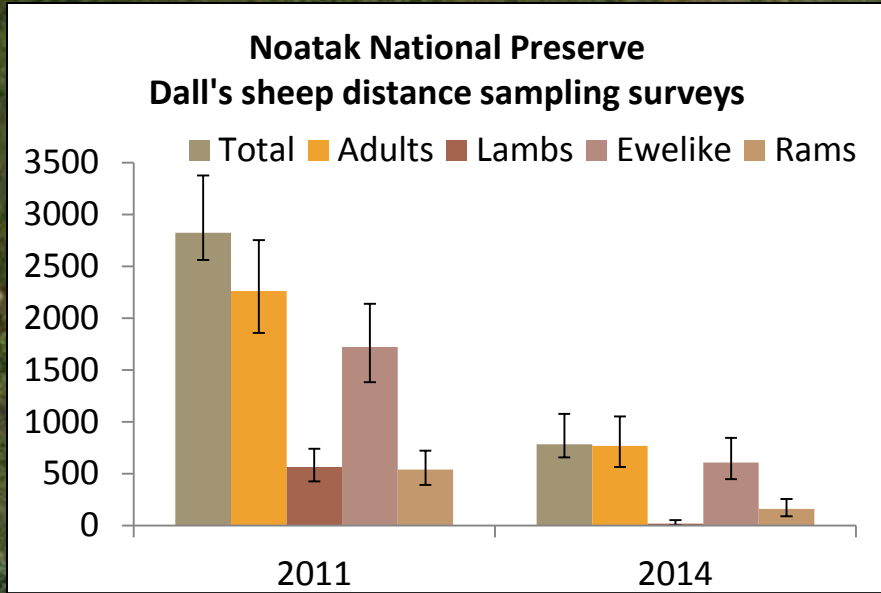


2013



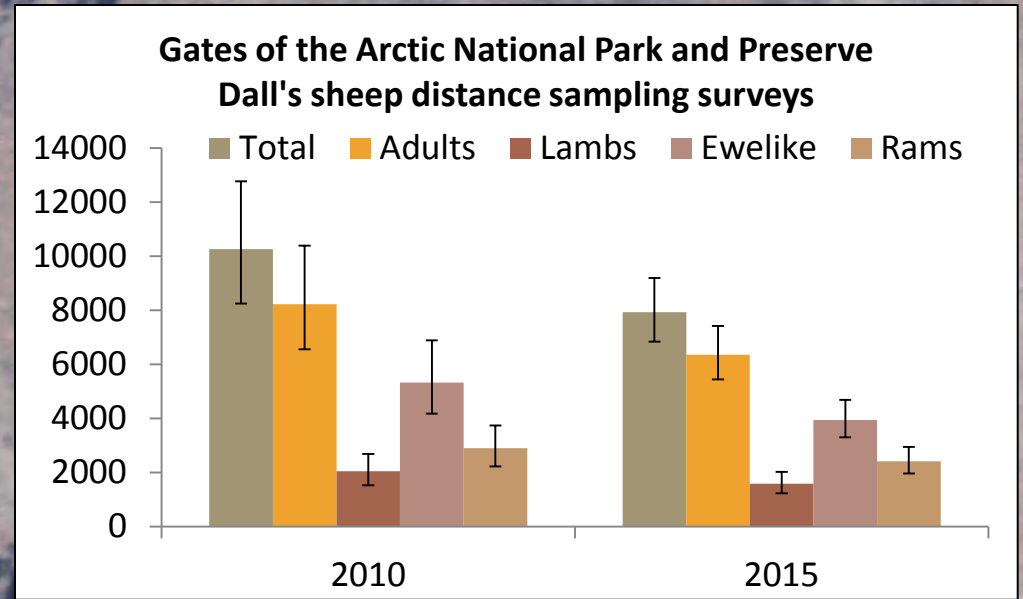


Noatak 2011 to 2014





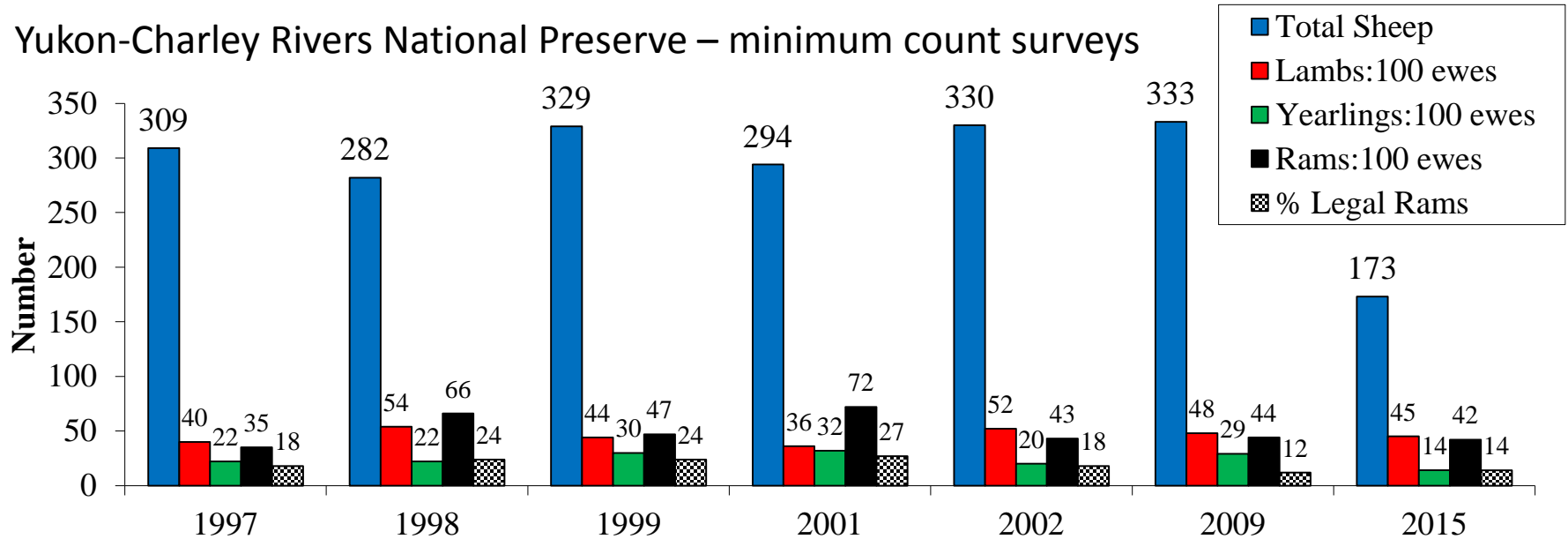
Gates of the Arctic 2010 to 2015



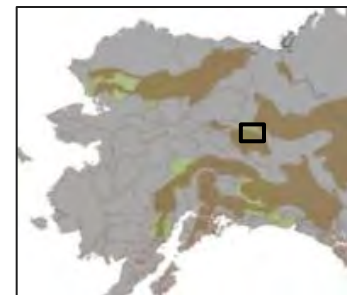


Yukon-Charley Rivers 1997-2015

Yukon-Charley Rivers National Preserve – minimum count surveys

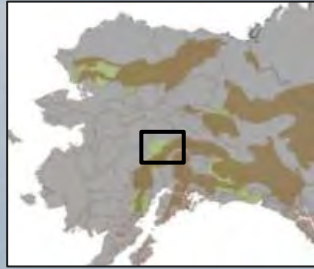


July 2015

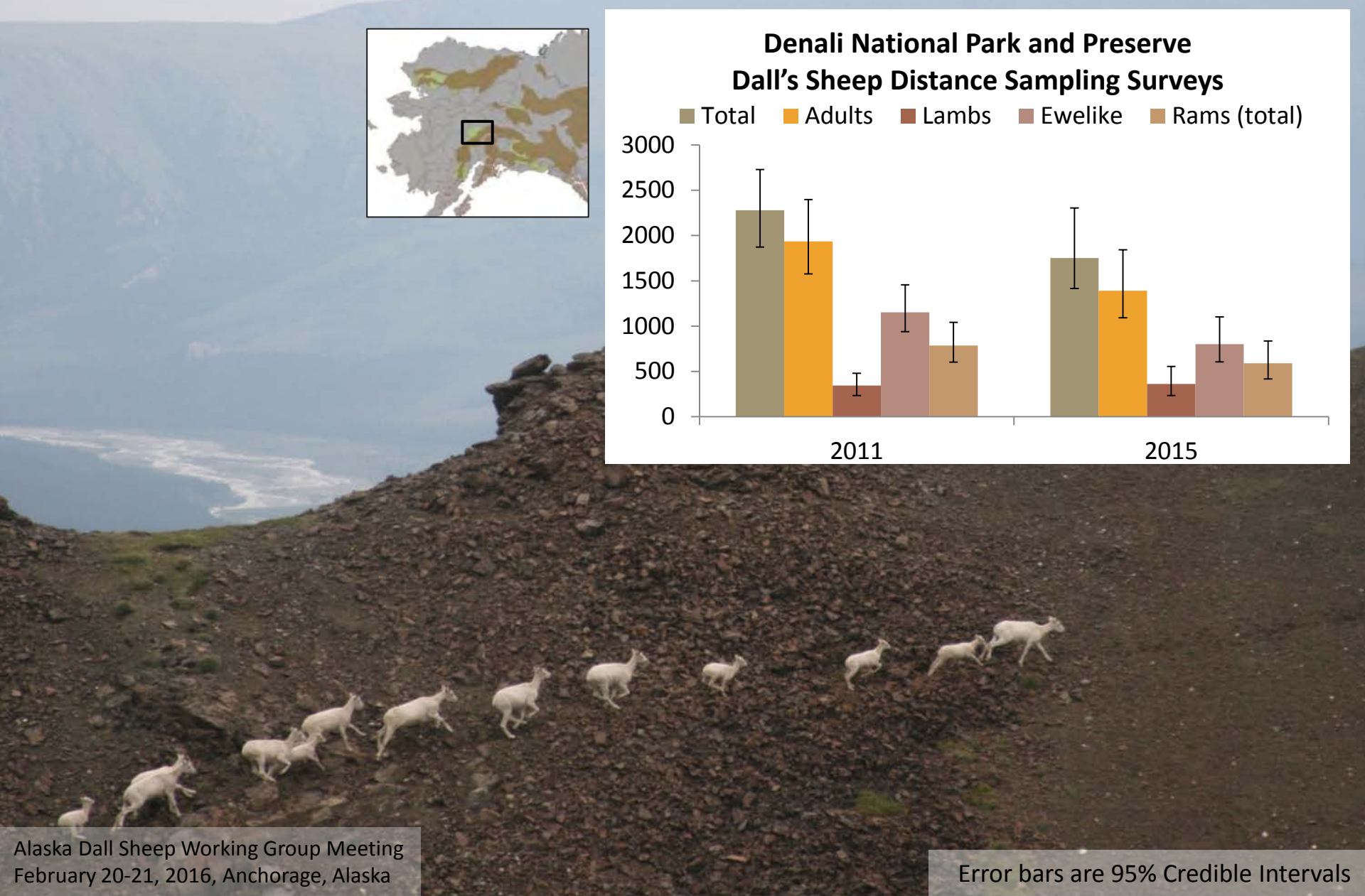
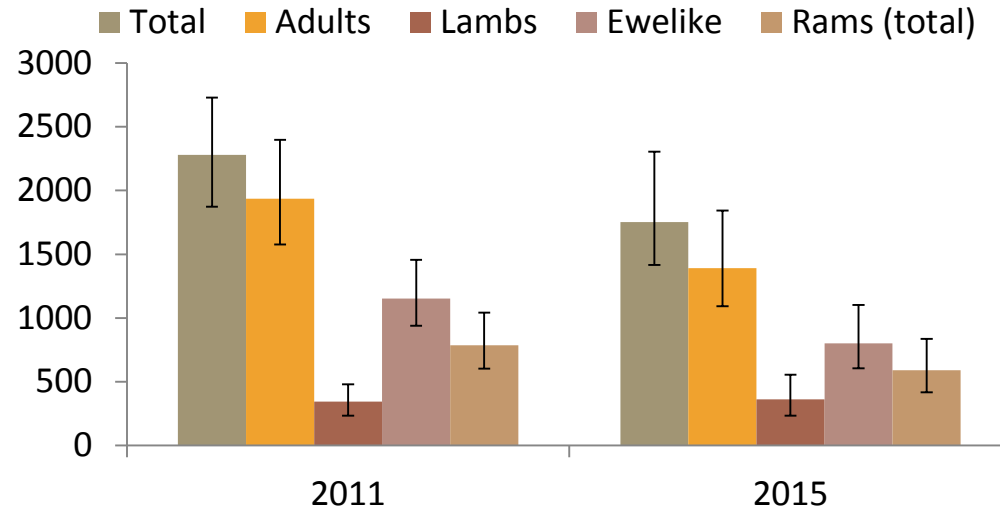




Denali 2011 to 2015



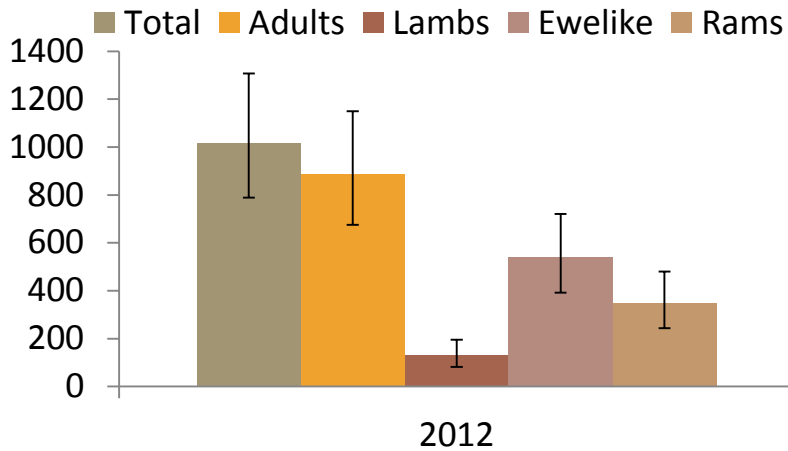
Denali National Park and Preserve Dall's Sheep Distance Sampling Surveys



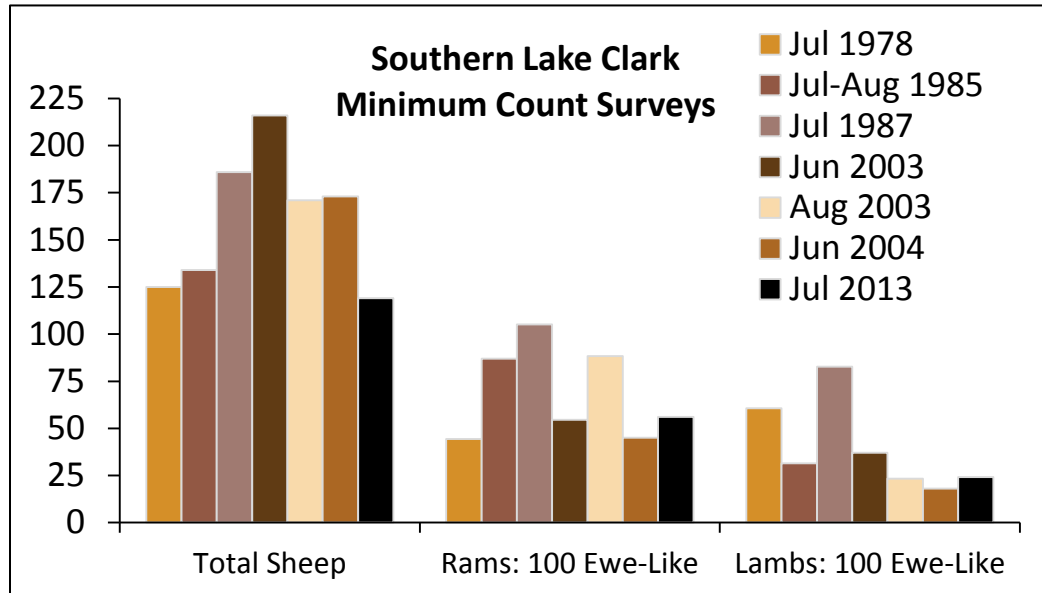
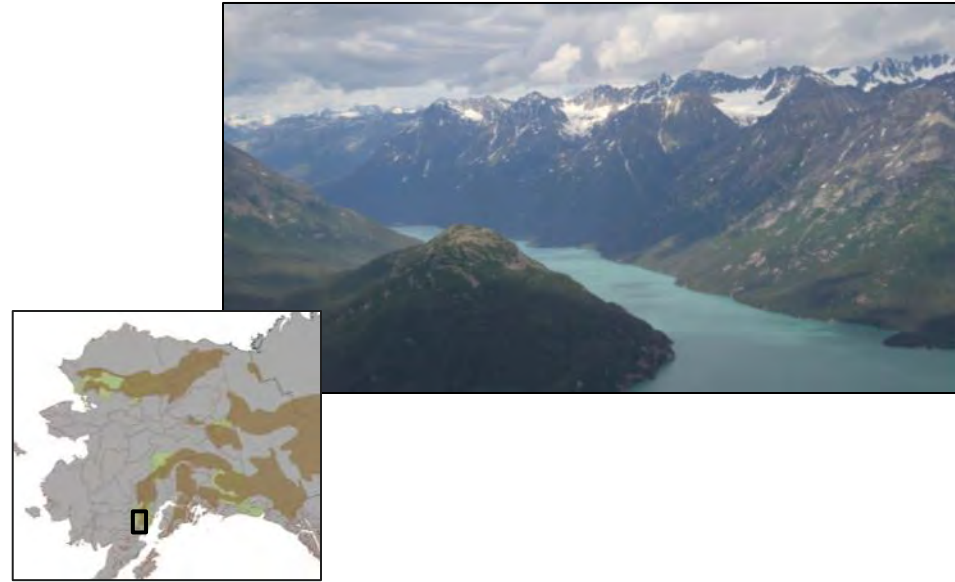


Lake Clark 2012

Lake Clark National Park and Preserve
2012 Dall's sheep distance sampling surveys

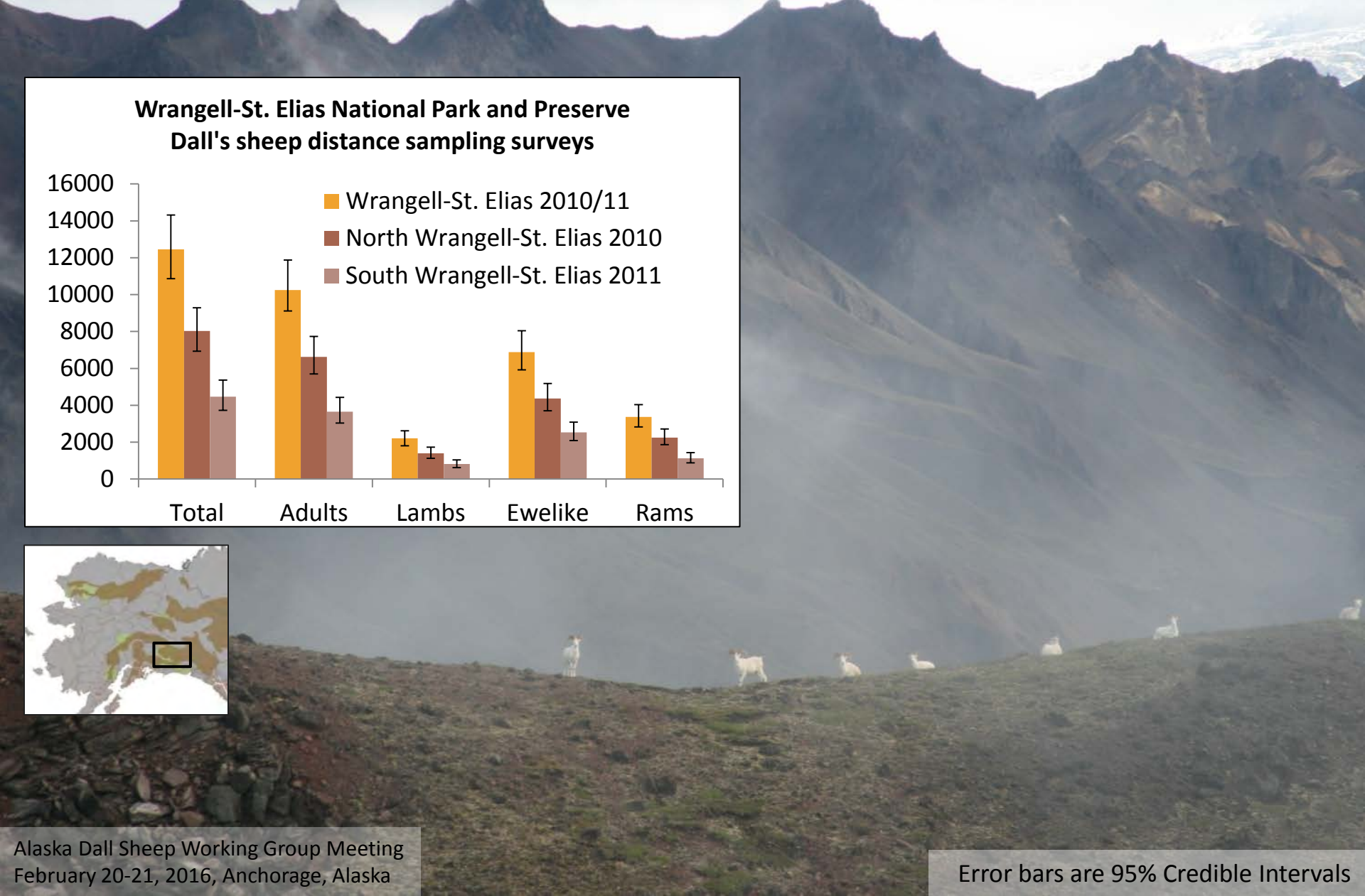
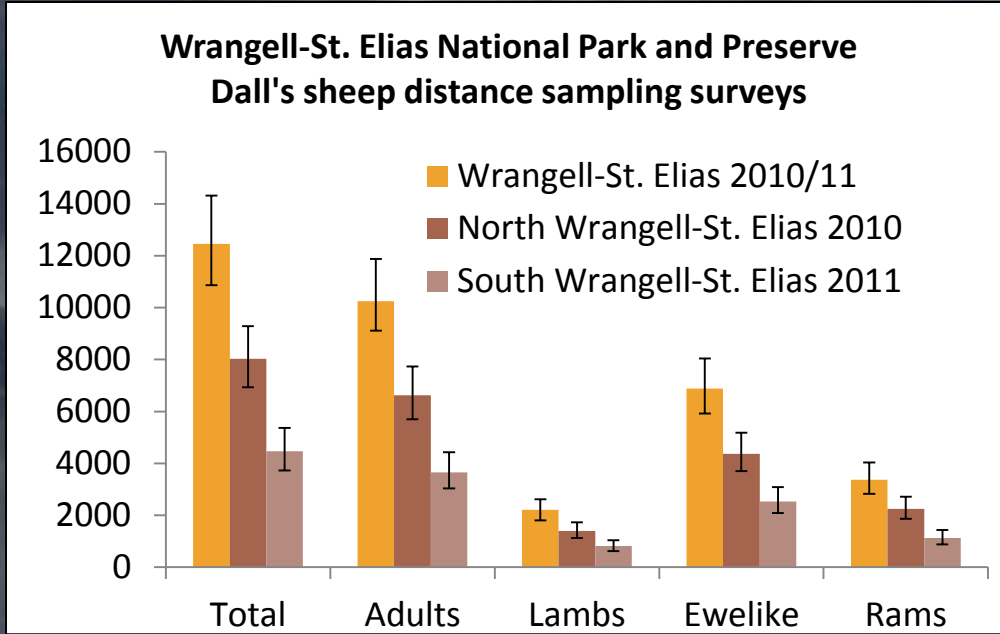


Error bars are 95% Credible Intervals





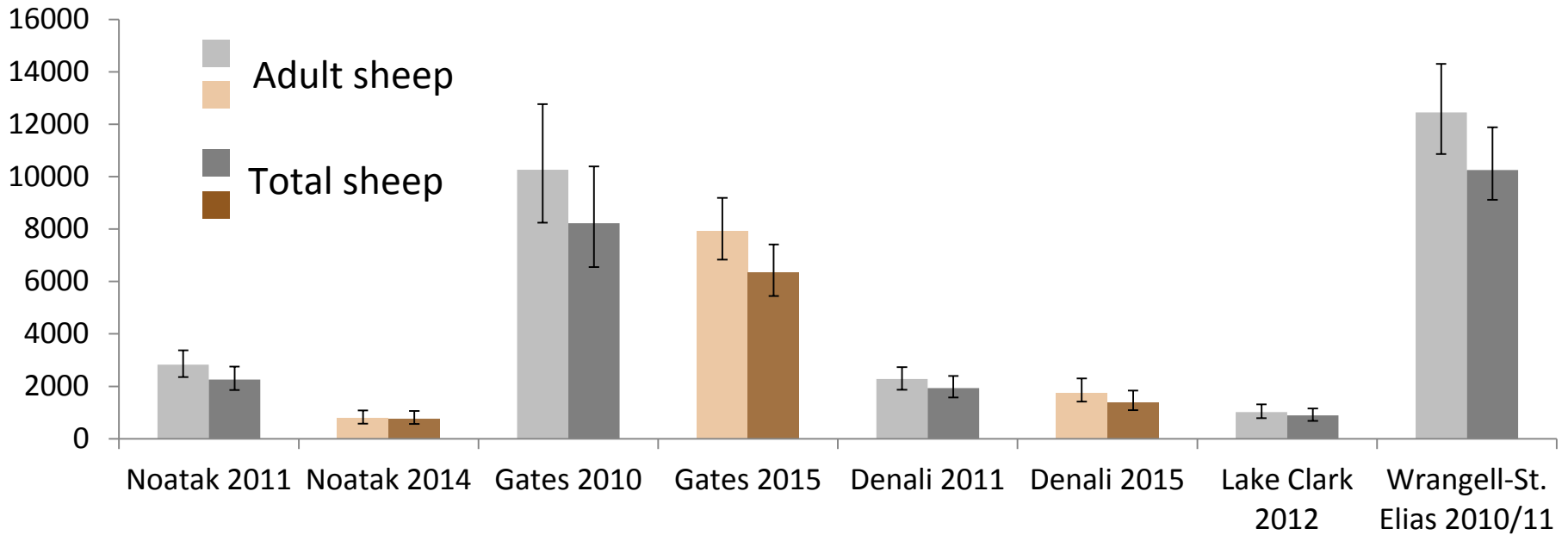
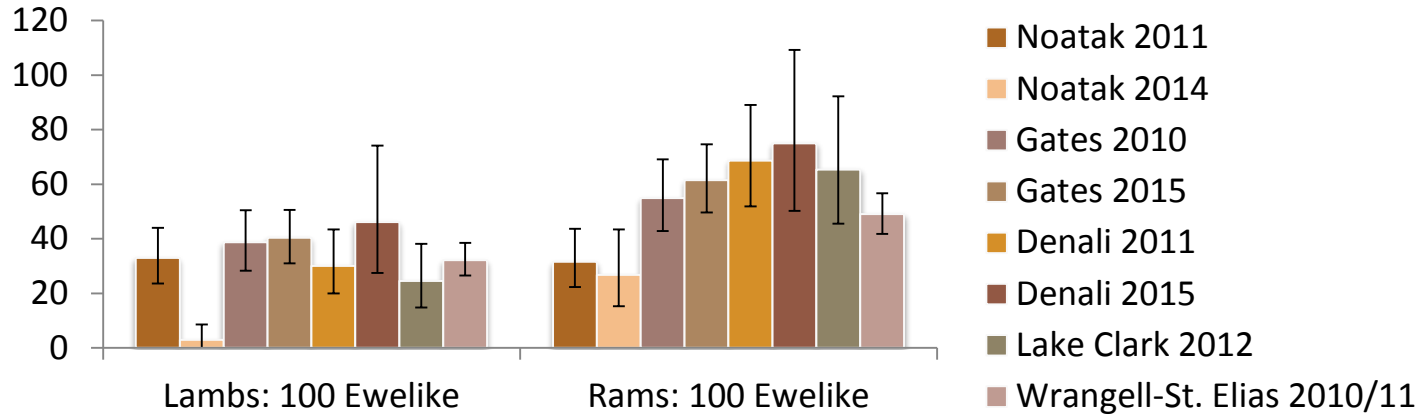
Wrangell-St. Elias 2010/2011



Error bars are 95% Credible Intervals



Lamb and ram ratios





NPS Long-term Dall's Sheep Monitoring

- Annual distance sampling surveys – *Western Baird Mountains (Noatak), Itkillik (Gates of the Arctic)*
- Park-wide distance sampling surveys – *every 4-5 years - Noatak, Gates of the Arctic, Denali, Lake Clark*
- Annual ground-based surveys - *Denali*
- Diet composition and quality – *Itkillik (Gates of the Arctic)*



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February 20-21, 2016, Anchorage, Alaska



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