

# Interagency Grizzly Bear Study Team Research and Monitoring Summary 2016

This presentation contains preliminary  
data

Do not cite these data



Photography by Jake Davis

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# Quote of the day

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*“When you are studying any matter, or considering any philosophy, ask yourself only what are the facts and what is the truth that the facts bear out. Never let yourself be diverted either by what you wish to believe, or by what you think would have beneficent social effects if it were believed. But look only, and solely, at what are the facts.”*

– Bertrand Russell

# Overview

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- Population estimates and trend
- Mortalities and mortality rates
- Occupancy by females with offspring
- Known-fate monitoring
- Food monitoring

**Some results are preliminary**

# Greater Yellowstone Ecosystem

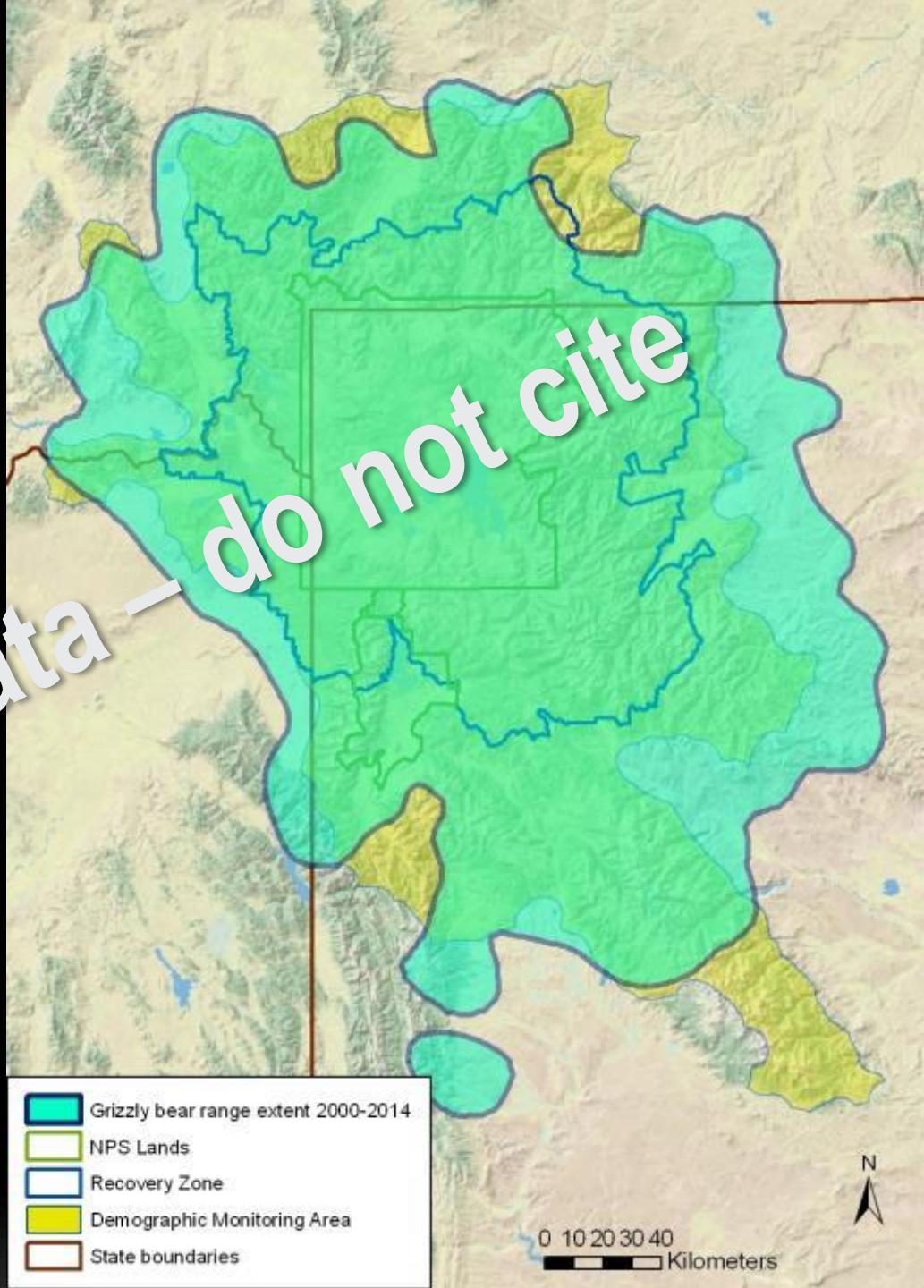
- National Parks = 10,344 km<sup>2</sup>
- Recovery Zone = 23,828 km<sup>2</sup>
- Demographic Monitoring Area (DMA) = 49,931 km<sup>2</sup>



# Greater Yellowstone Ecosystem

- National Parks = 10,344 km<sup>2</sup>
- Recovery Zone = 23,828 km<sup>2</sup>
- Demographic Monitoring Area (DMA) = 49,931 km<sup>2</sup>
- Grizzly bear distribution 2000-2014 = 38,314 km<sup>2</sup>

Preliminary data – do not cite



# Population and Trend Estimation

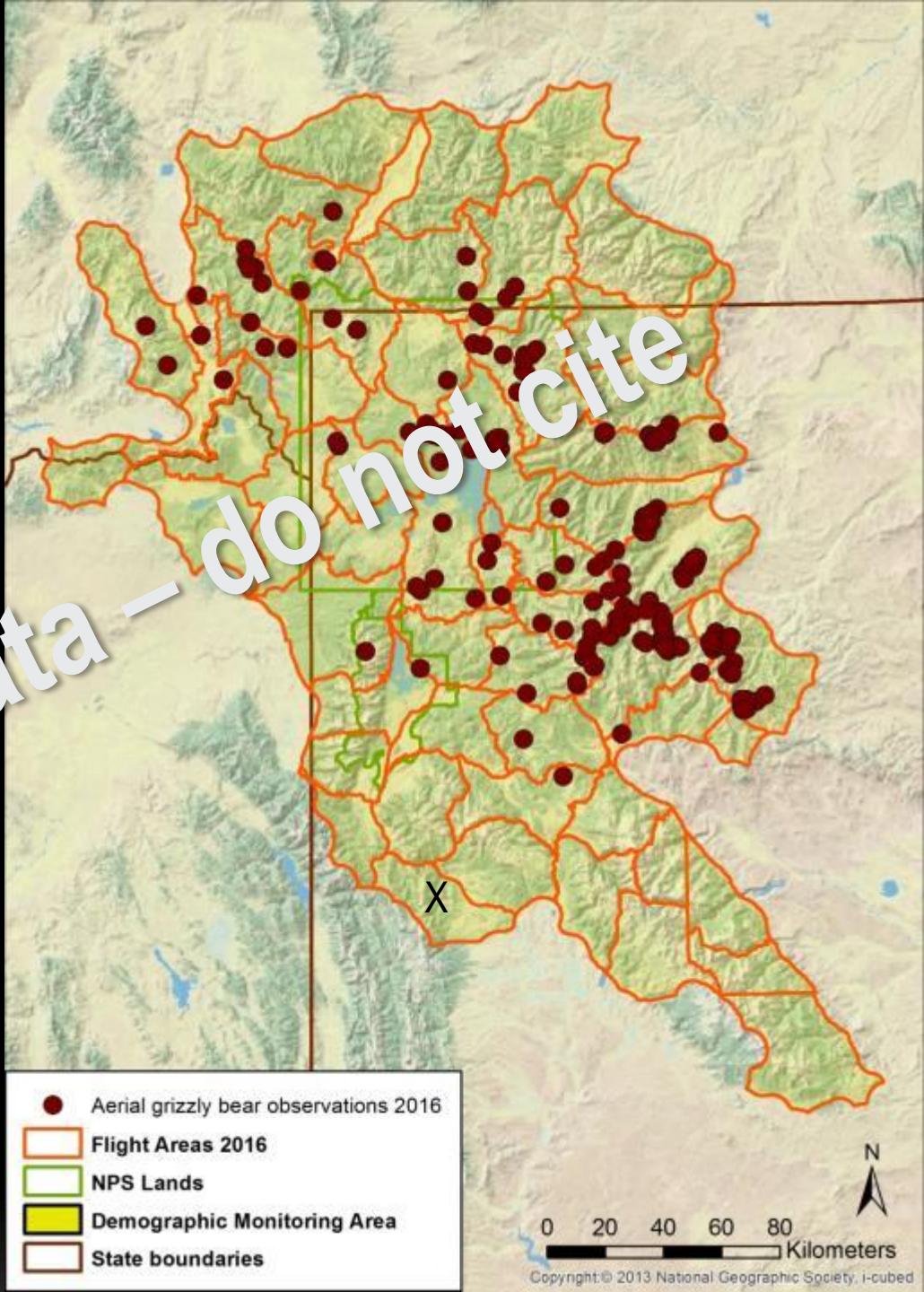
# Number of females with cubs: Chao2 estimator

- Annual counts based on Knight et al. (1995) “rule set”: sightings of unique females with cubs
- Cherry et al. (2007) applied estimator to correct for sighting heterogeneity (Chao2)
- Trend over time

# Observation flights 2016

- 54 aerial observation areas
  - Round 1: 53 units
  - Round 2: 42 units
  - 1 unit not flown (BMU 38)
- 193 survey hours
- 307 groups (441 grizzly bears)

Preliminary data – do not cite

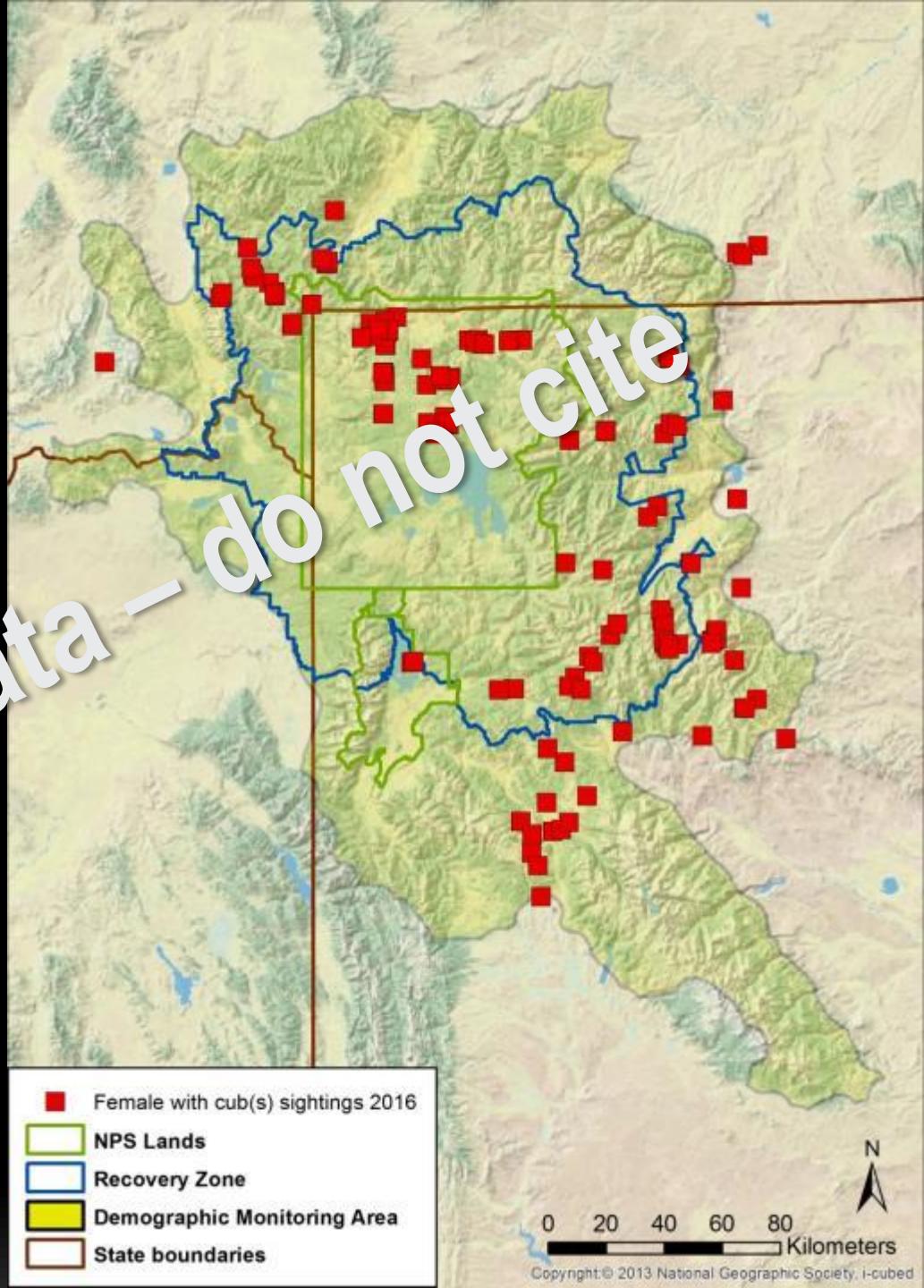


# Females with cubs

## 2016

- 144 observations
  - 68 aerial (47%)
  - 76 ground (53%)

Preliminary data – do not cite

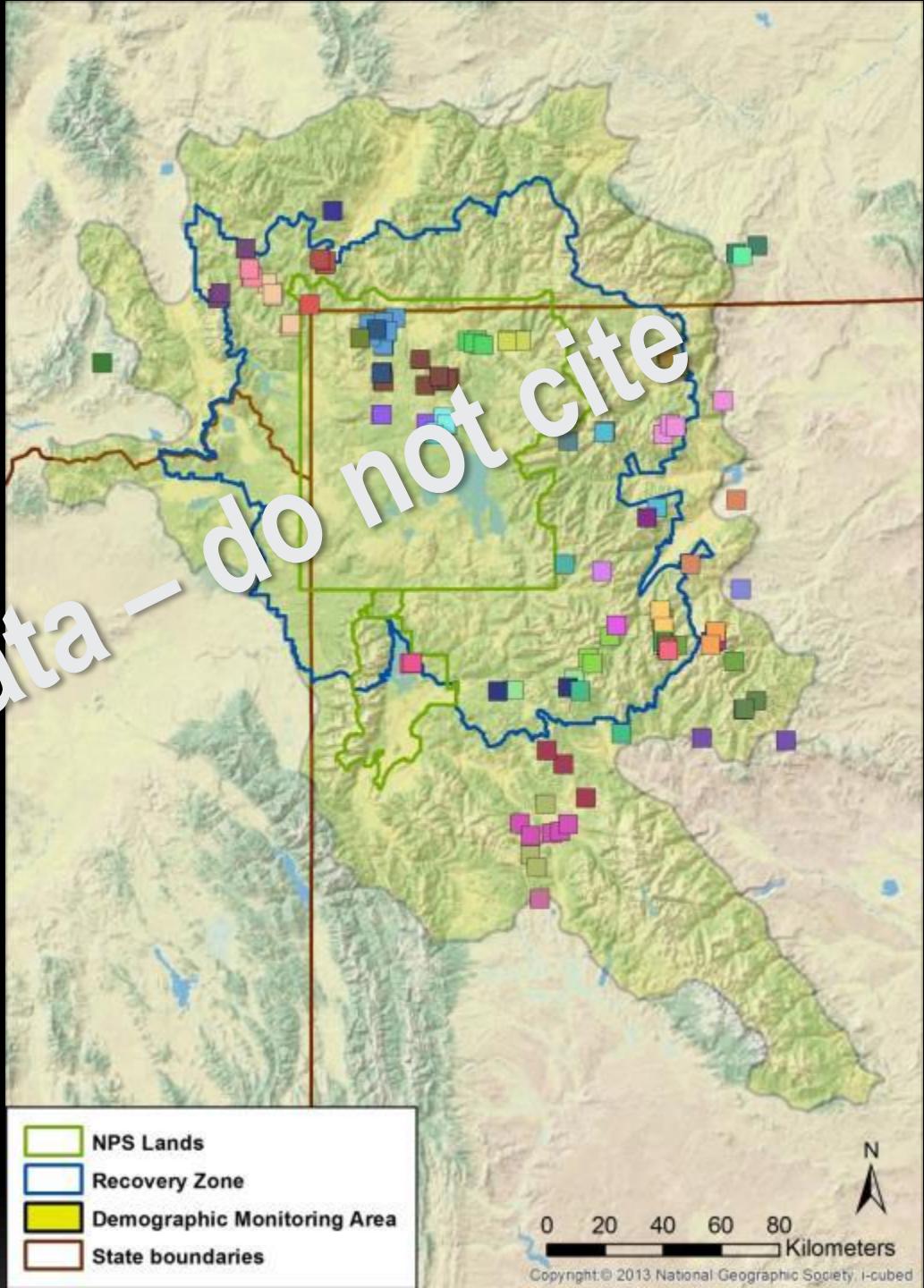


# Females with cubs

## 2016

- 144 observations
  - 68 aerial (47%)
  - 76 ground (53%)
- 50 unique  $F_{COY}$  in the GYE
  - Mean litter size = 1.96
  - Litter sizes
    - 15 single (30%)
    - 22 twins (44%)
    - 13 triplets (26%)

Preliminary data – do not cite

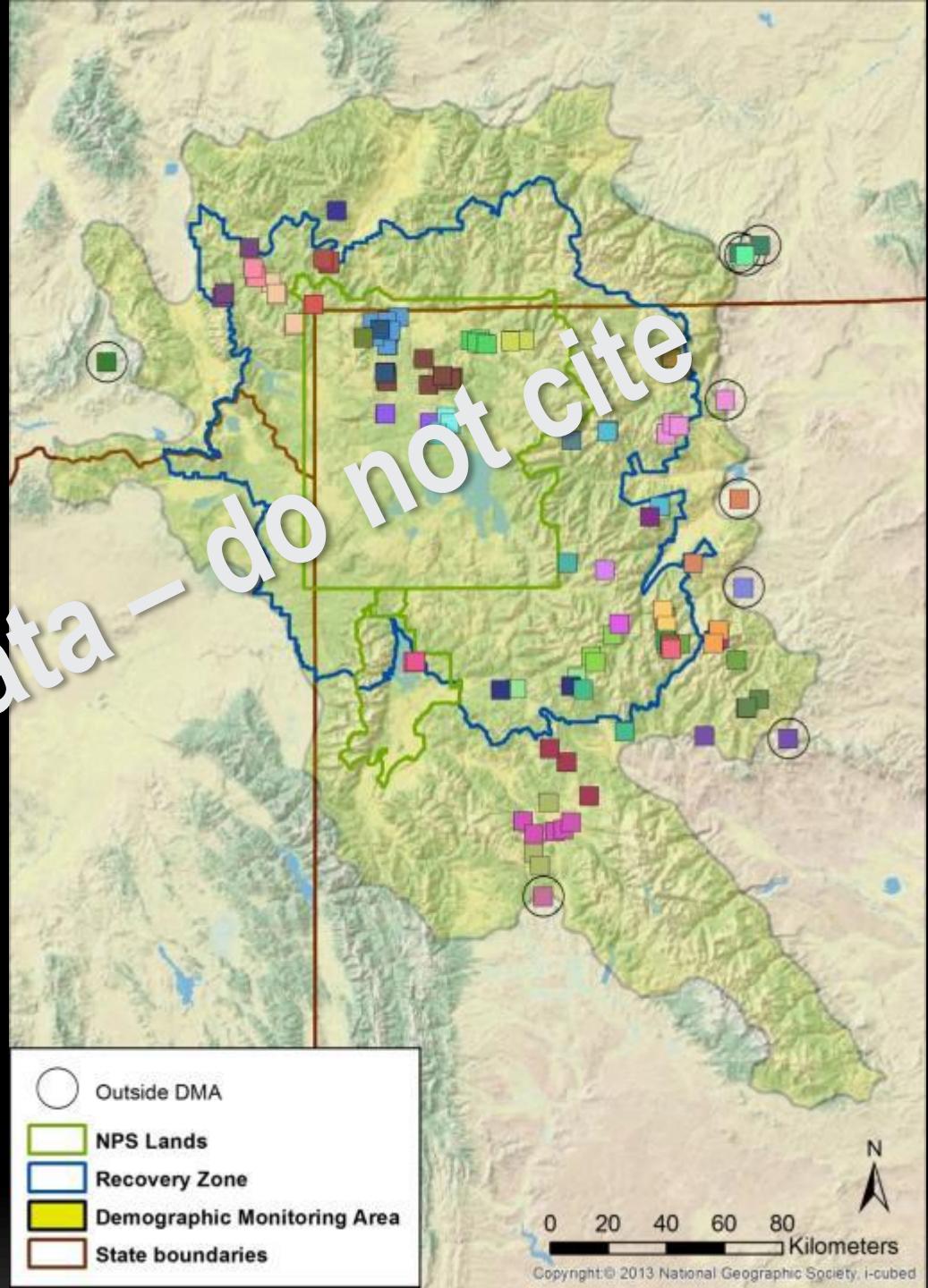


# Females with cubs

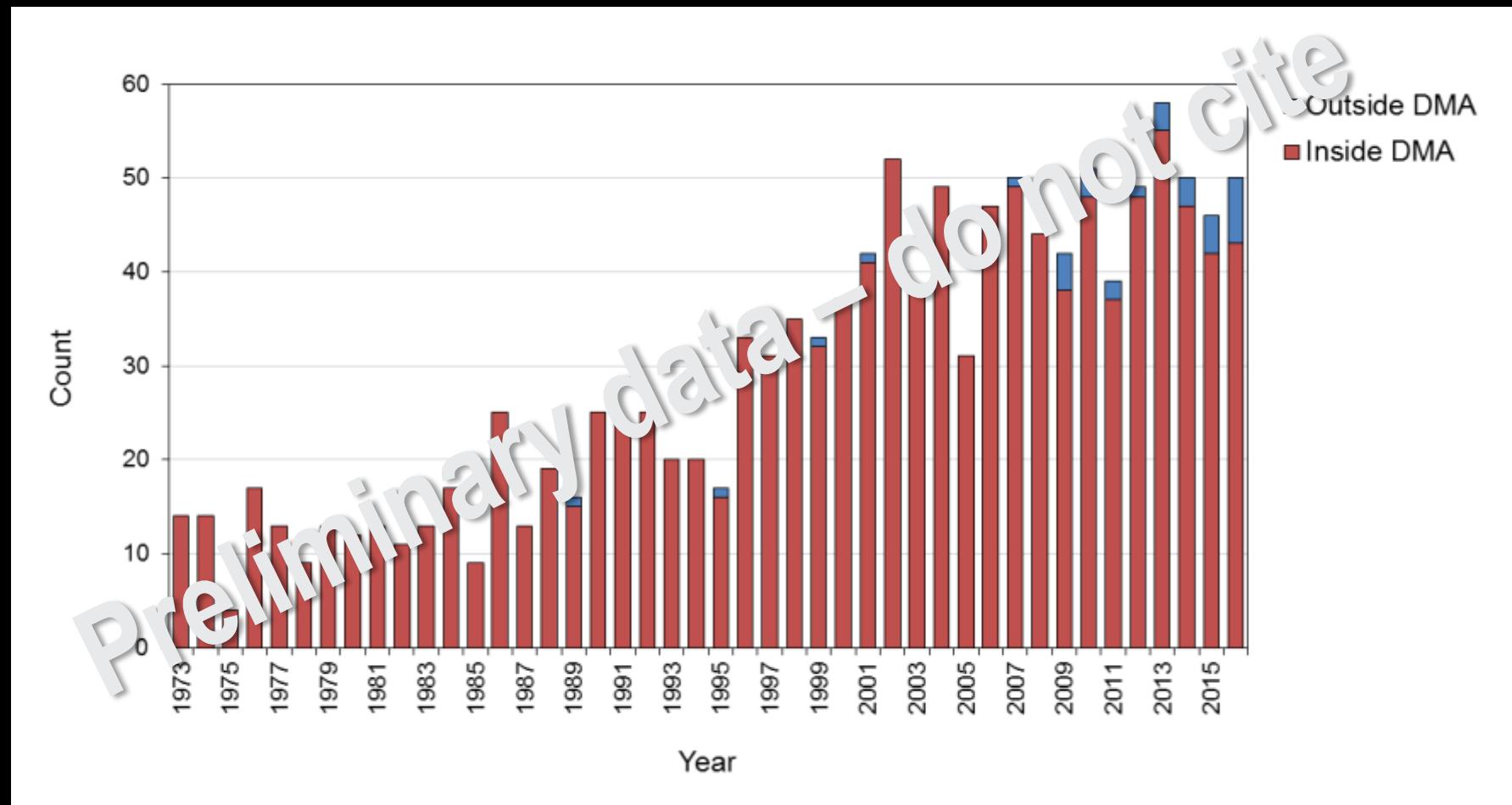
## 2016

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  - Mean litter size = 1.96
  - Litter sizes
    - 15 single (30%)
    - 22 twins (44%)
    - 13 triplets (26%)
- 40 unique females with cubs in DMA
- 9 individuals partially, 5 individuals fully outside the DMA

Preliminary data – do not cite

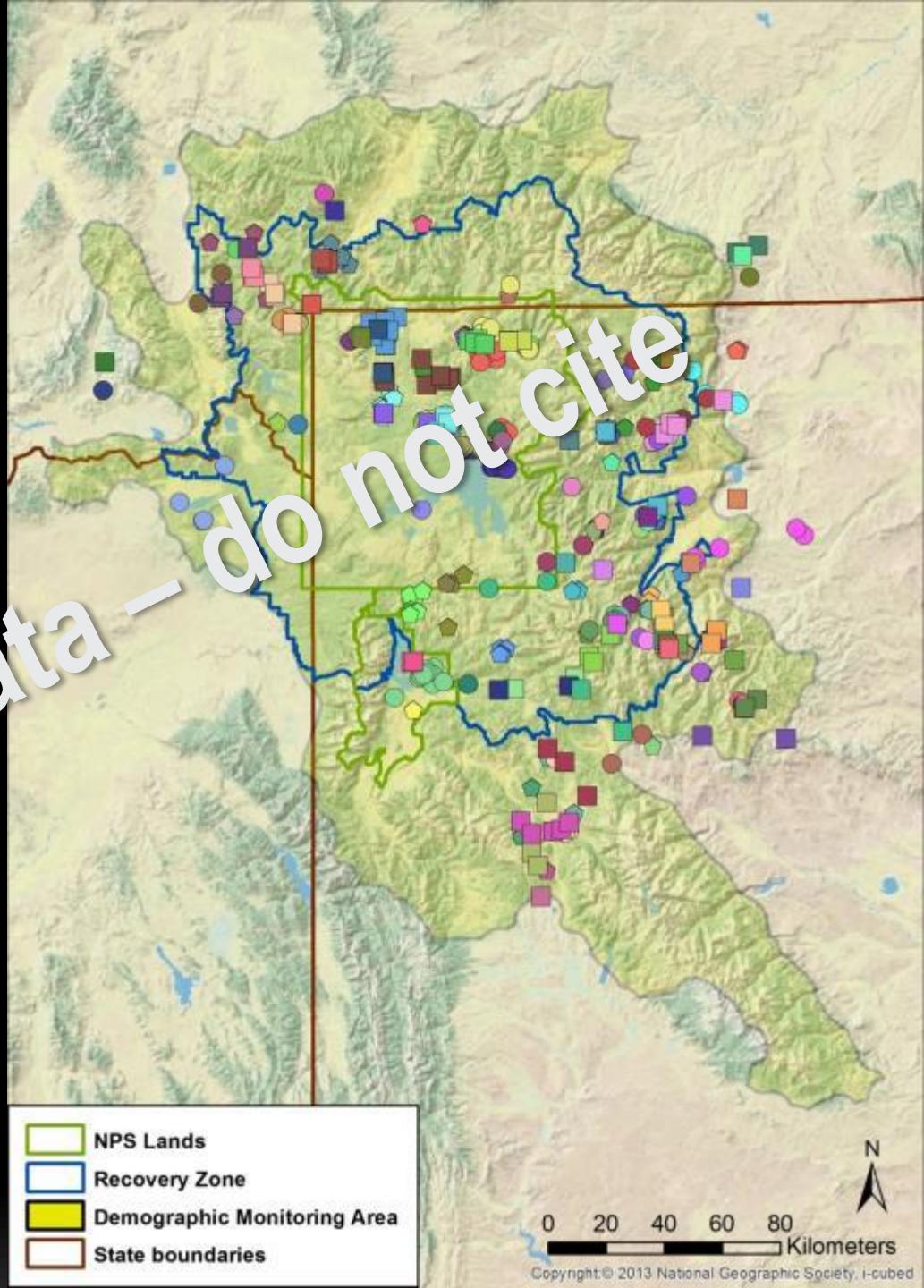


# Initial sightings of females with cubs inside and outside the DMA 1973–2016



# Initial sightings of females with cubs 2014–2016

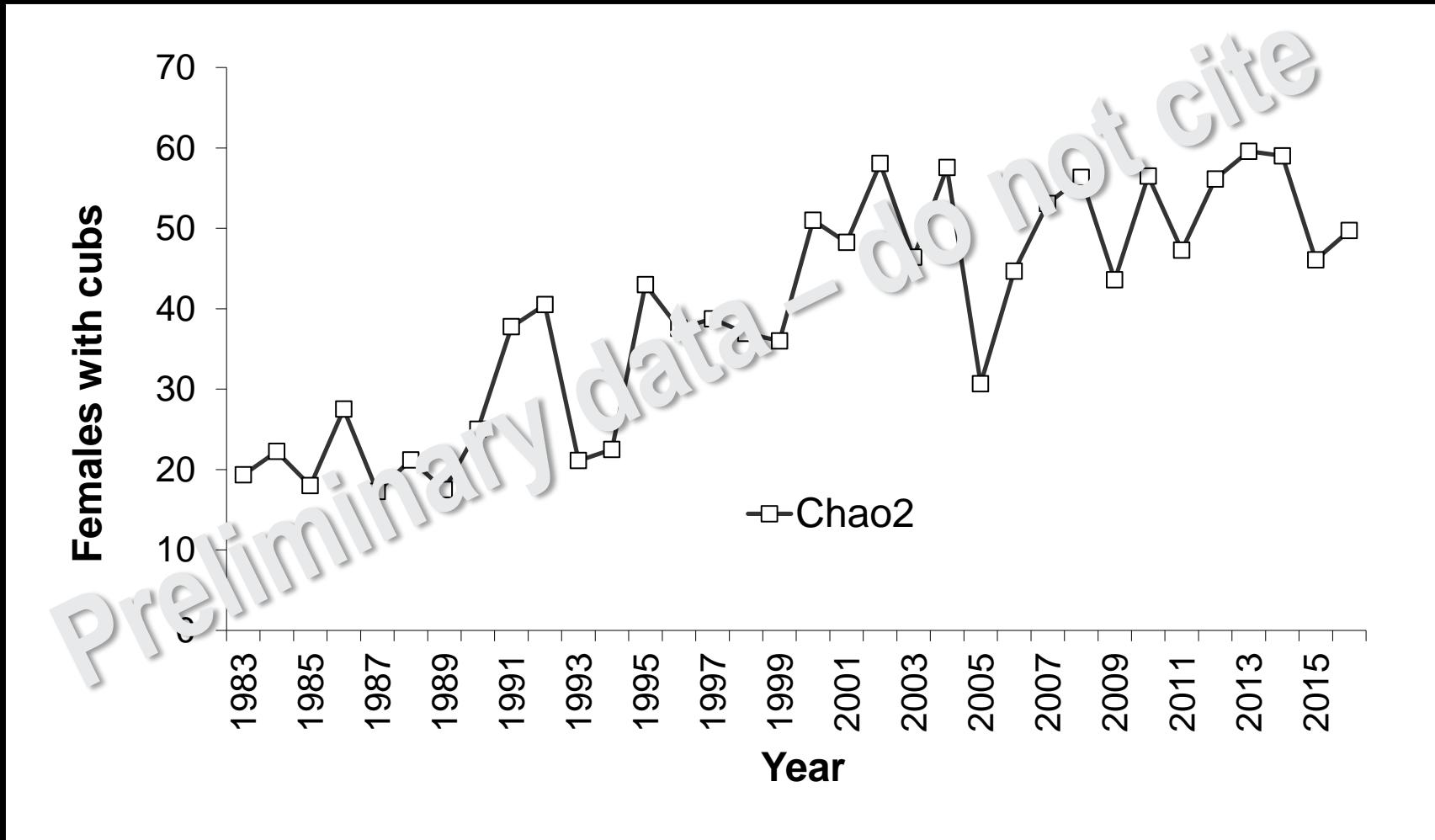
Preliminary data – do not cite



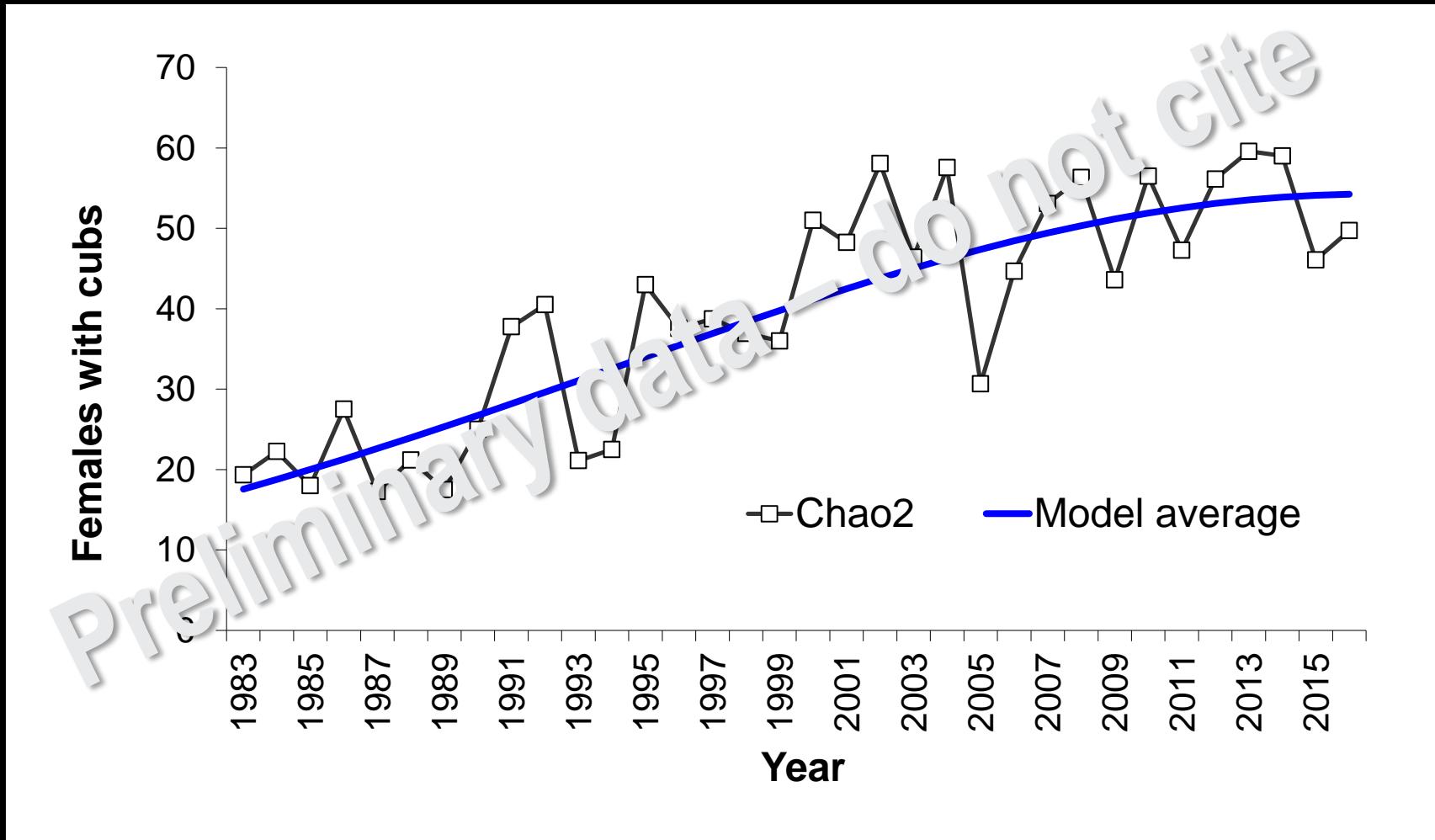
# Number of females with cubs 2016 (DMA only)

Parameter	Estimate
Unique females with cubs	45
Chao2	50
Model-averaged Chao2	54

# Trend in annual estimates of females with cubs 1983–2016 (DMA only)



# Trend in annual estimates of females with cubs 1983–2016 (DMA only)



# Total population estimate (DMA only)

Derived from:

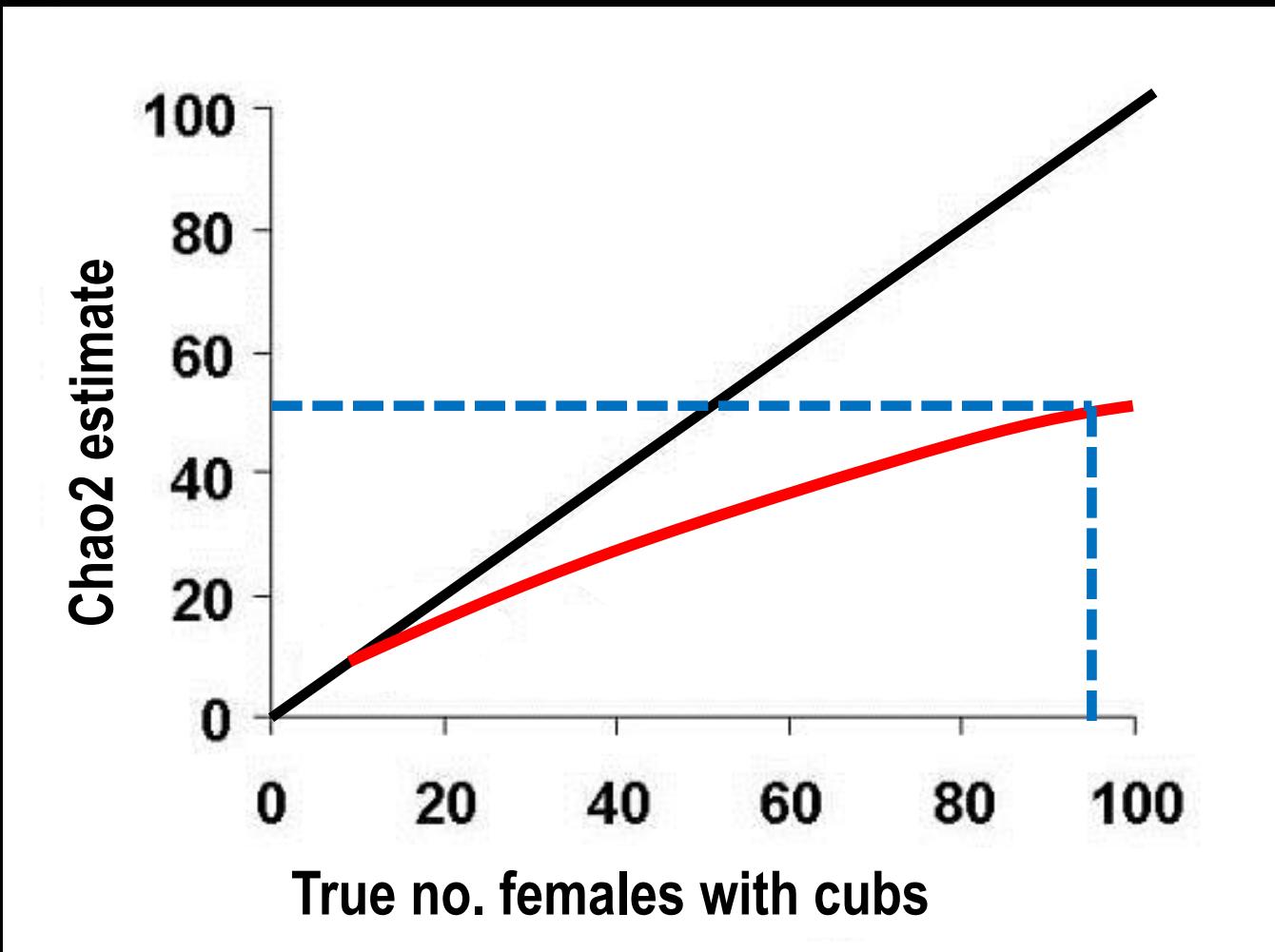
- Model-averaged Chao2 estimate of number of females with cubs
- 2002-2011 vital rates and derived age structure to estimate population segments

# 2016 total population estimate

## Chao2 estimator (DMA only)

Population segment	Estimate	95% CI	
		Lower	Upper
Independent females ( $\geq 2$ yrs old)	238	190	287
Independent males ( $\geq 2$ yrs old)	238	186	291
Dependent young (cubs and yearlings)	213	192	234
Total	690	615	764

# Bias in Chao2 estimator

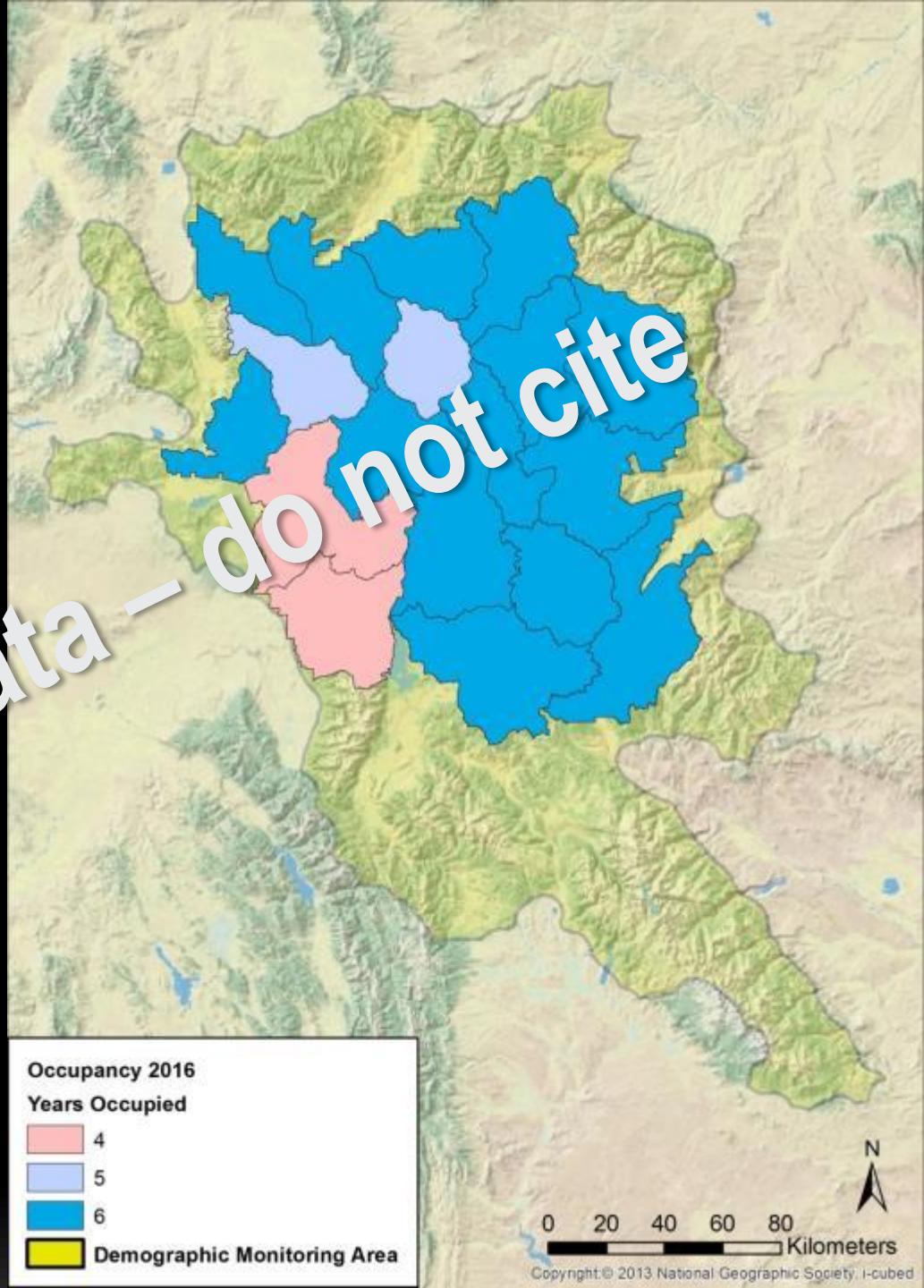


Schwartz et al. (2008)

# Occupancy by females with young (cubs, yearlings, or 2-year-olds) 2016

- 18 of 18 Bear Management Units (BMUs) occupied during 2016
- 18 of 18 BMUs occupied at least 4 of last 6 years (2010-2015)

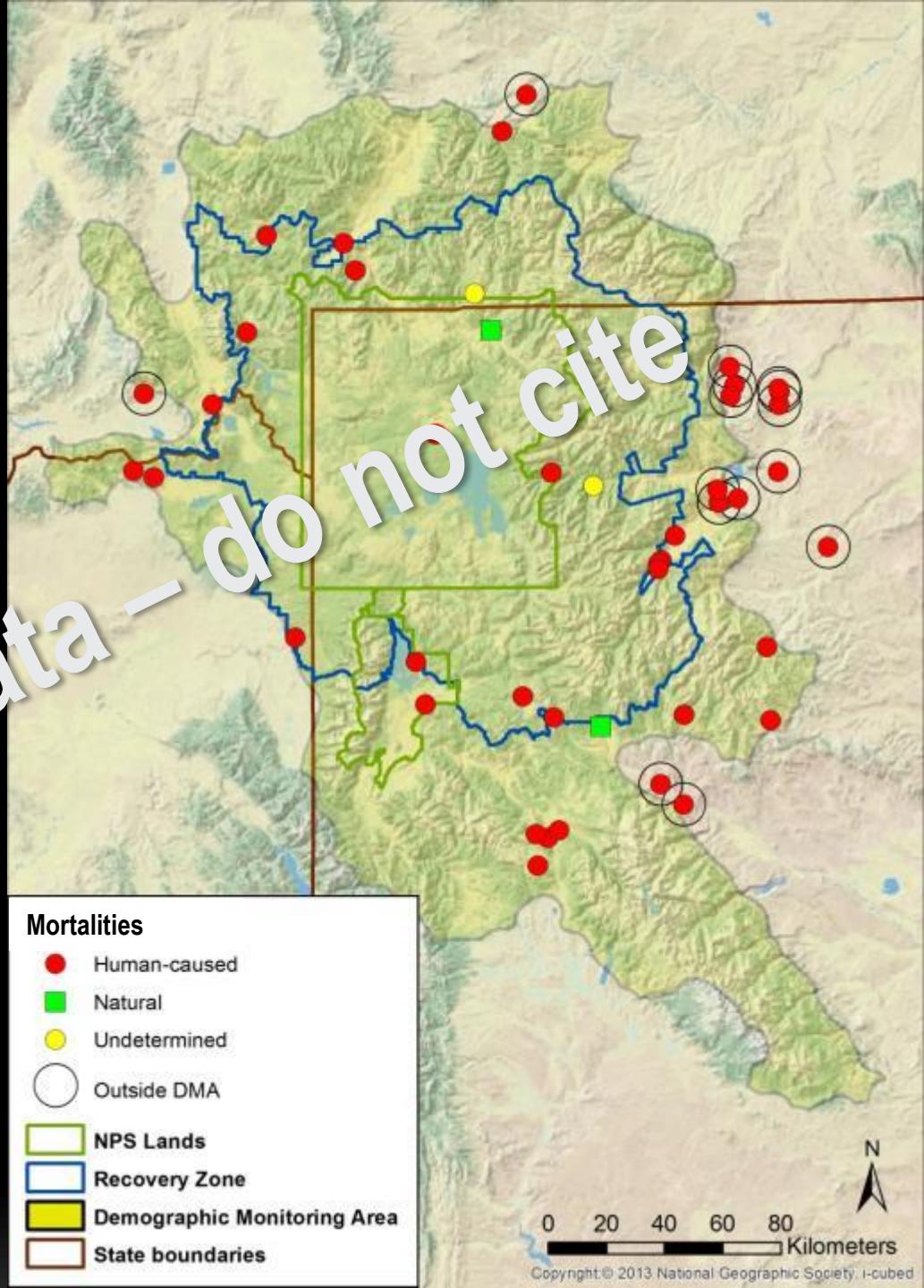
Preliminary data - do not cite



# Grizzly Bear Mortalities and Evaluating Annual Mortality Rates in the DMA

# Known and probable mortalities 2016

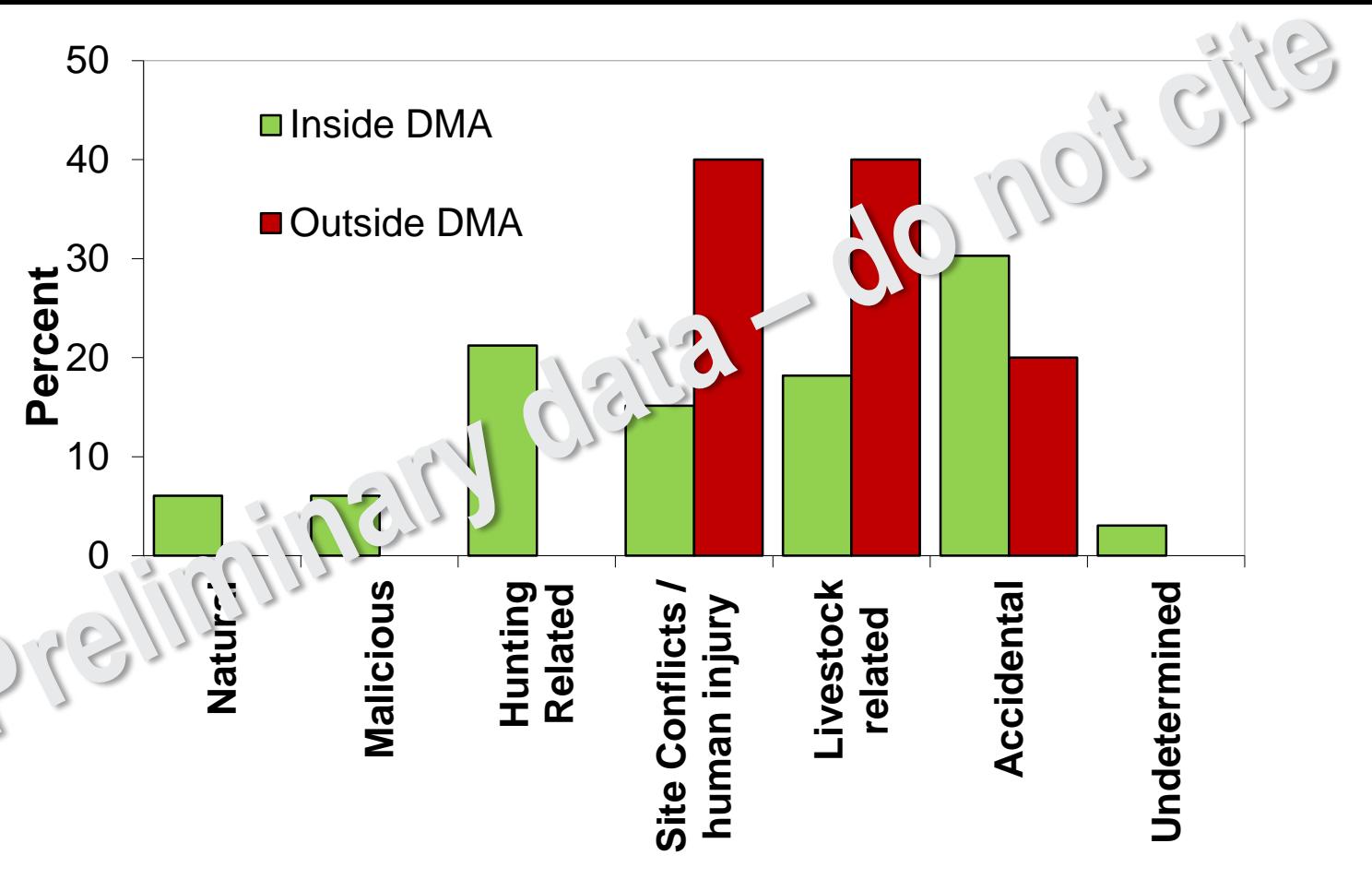
- 33 known and probable mortalities in DMA
  - 30 human-caused
  - 2 natural
  - 1 undetermined cause
- 20 outside the DMA
  - All 20 human-caused
- 1 additional mortality from 2015 documented, sex unknown



# Known and probable mortalities by area, sex, and age class 2016

Area	Sex	Age class		Total
		Dependent (<2 years old)	Independent (>2 years old)	
Inside DMA	Female	6	6	12
	Male	2	18	20
	Unknown	1	0	1
	Total	9	24	33
Outside DMA	Female	1	3	4
	Male	2	14	16
	Unknown	0	0	0
	Total	3	17	20

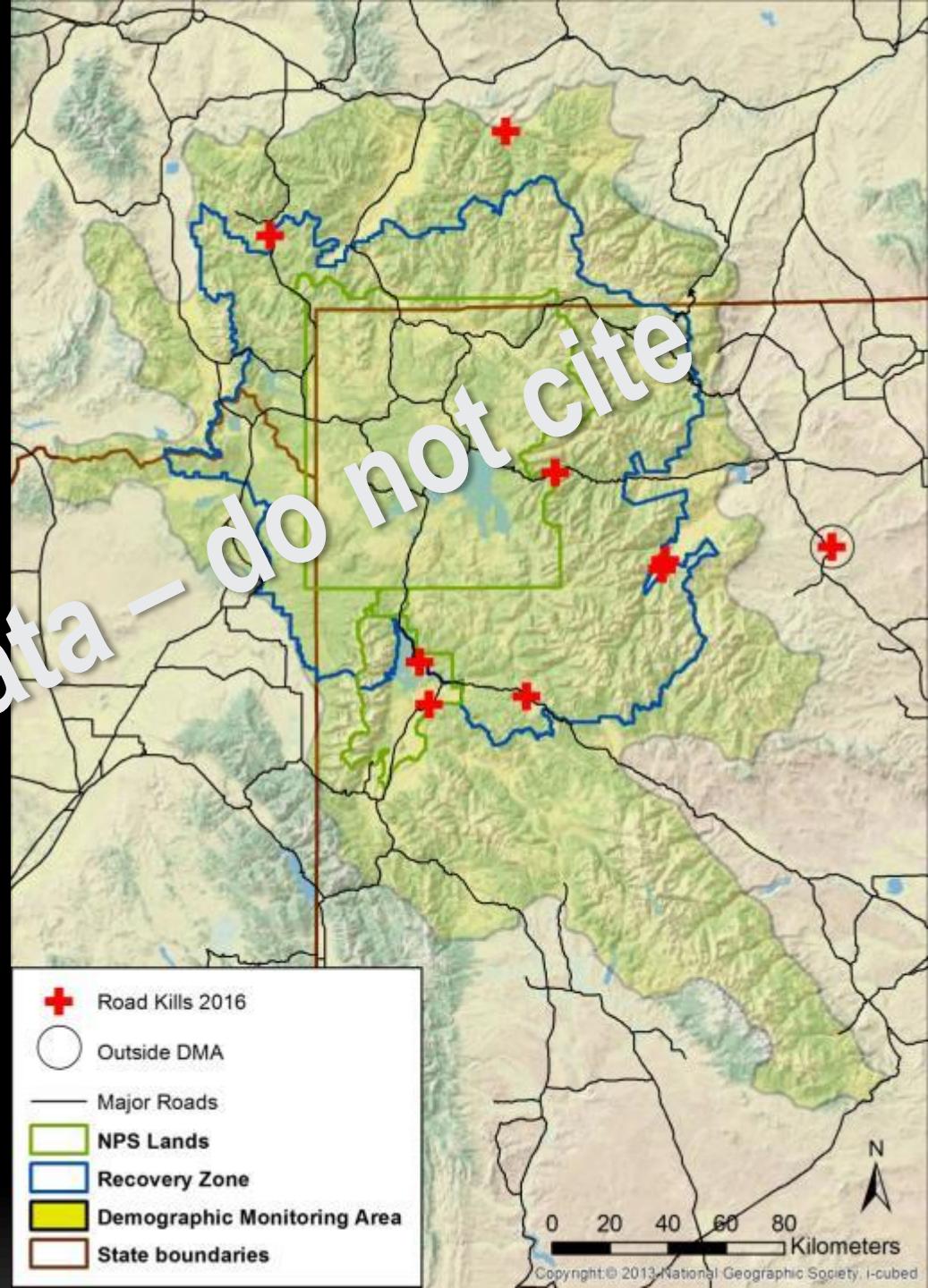
# Mortality causes inside and outside of DMA 2016



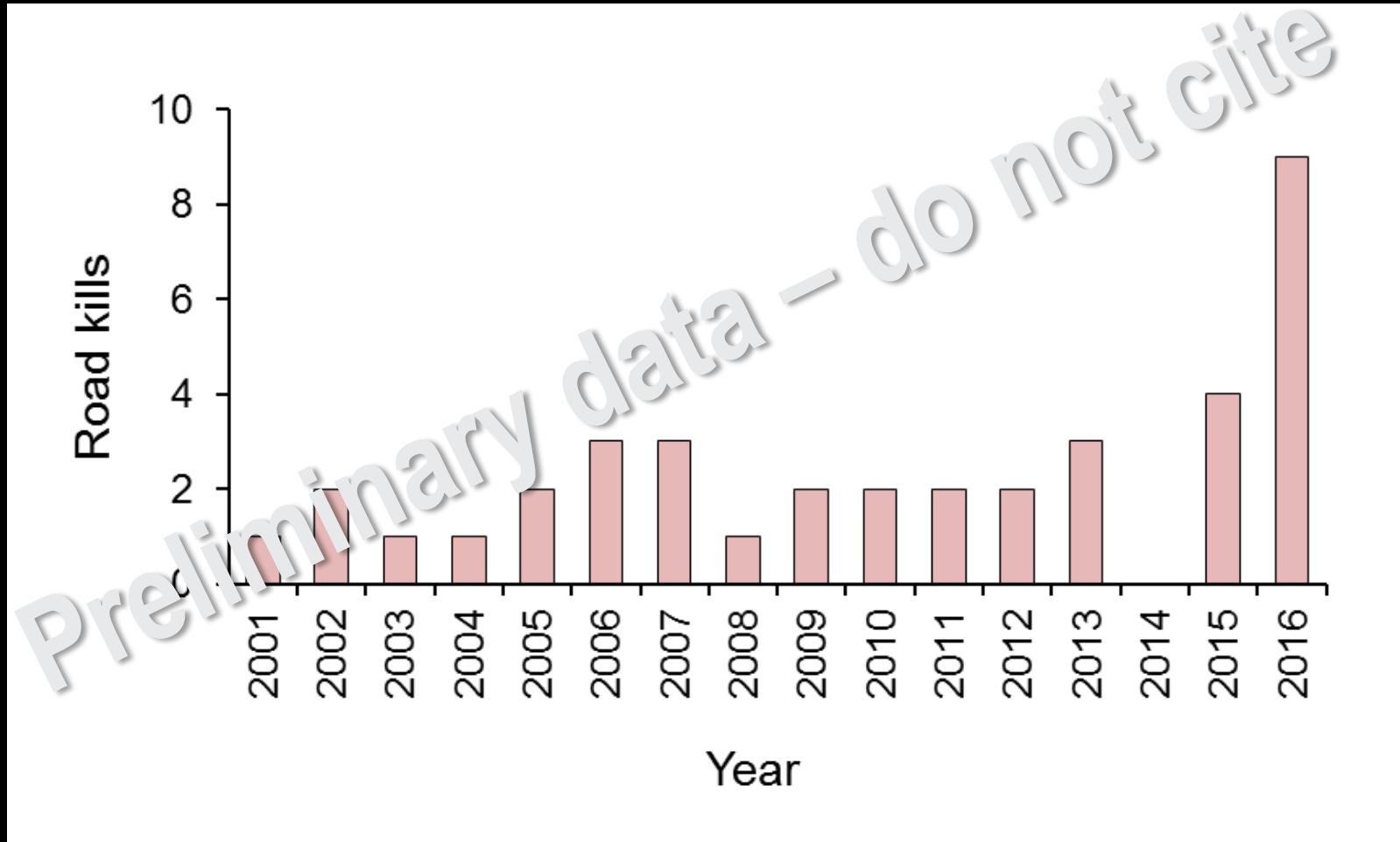
# 9 mortalities from vehicle strikes in 2016

- 7 males (5 subadults)
- 2 females (both subadults)
- Average 2001–2015 = 1.9/year

Preliminary data - do not cite



# Known and probable mortality from vehicle strikes 2001–2016



# 3 grizzly bears drowned in 2016

- All adult males

Preliminary data – do not cite



# **Estimated percent mortality for population segments (DMA only)**

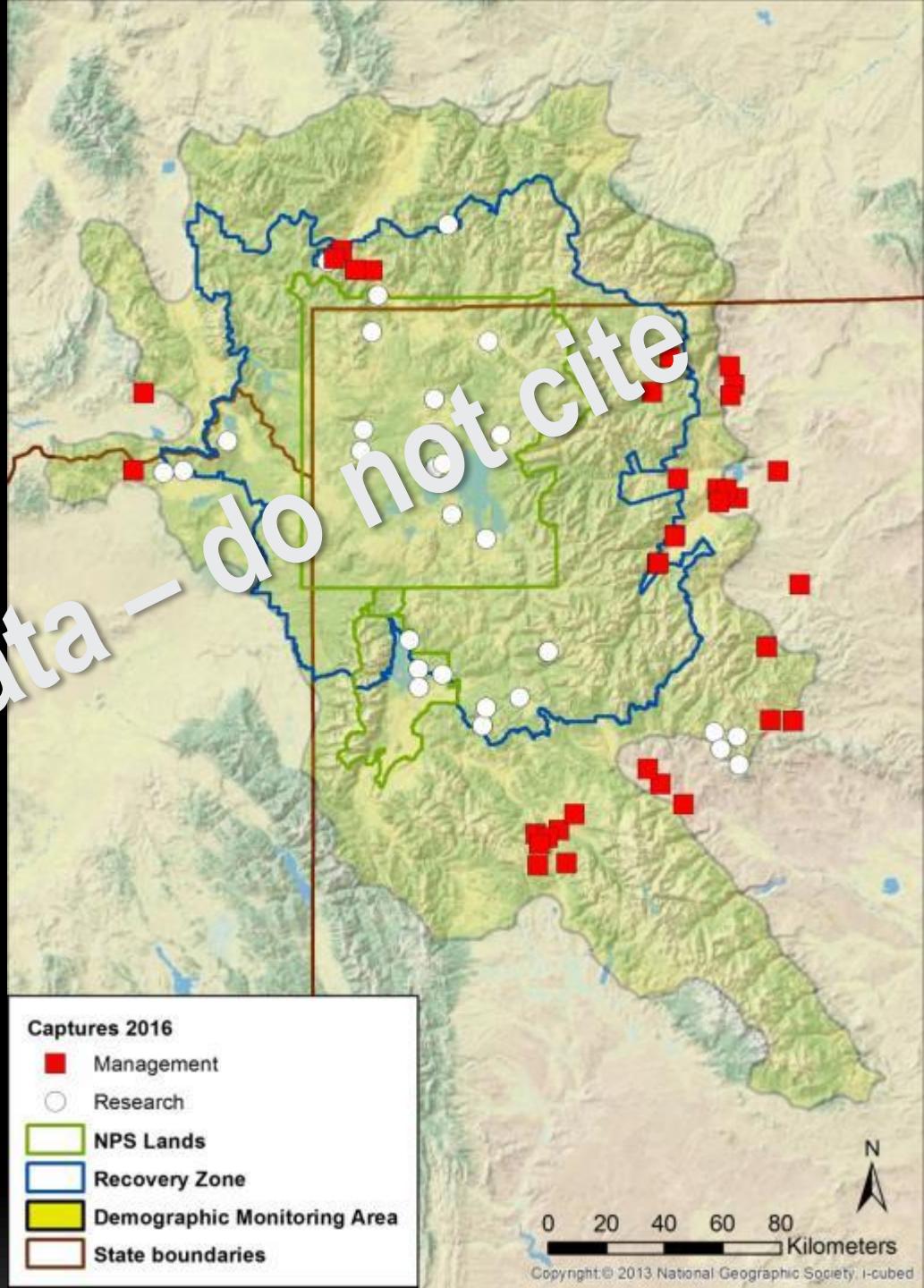
Population segment	Estimated N	Estimated Documented mortality	Estimated total mortality	Estimate % mortality
Independent females ( $\geq 2$ yrs old)	238	6	12	5.0
Independent males ( $\geq 2$ yrs old)	238	18	34	14.3
Dependent young ( $< 2$ yrs old)	213	9		4.2



# Grizzly Bear Captures and Monitoring for Known-Fate Estimation of Population Trend

# Grizzly bear captures 2016

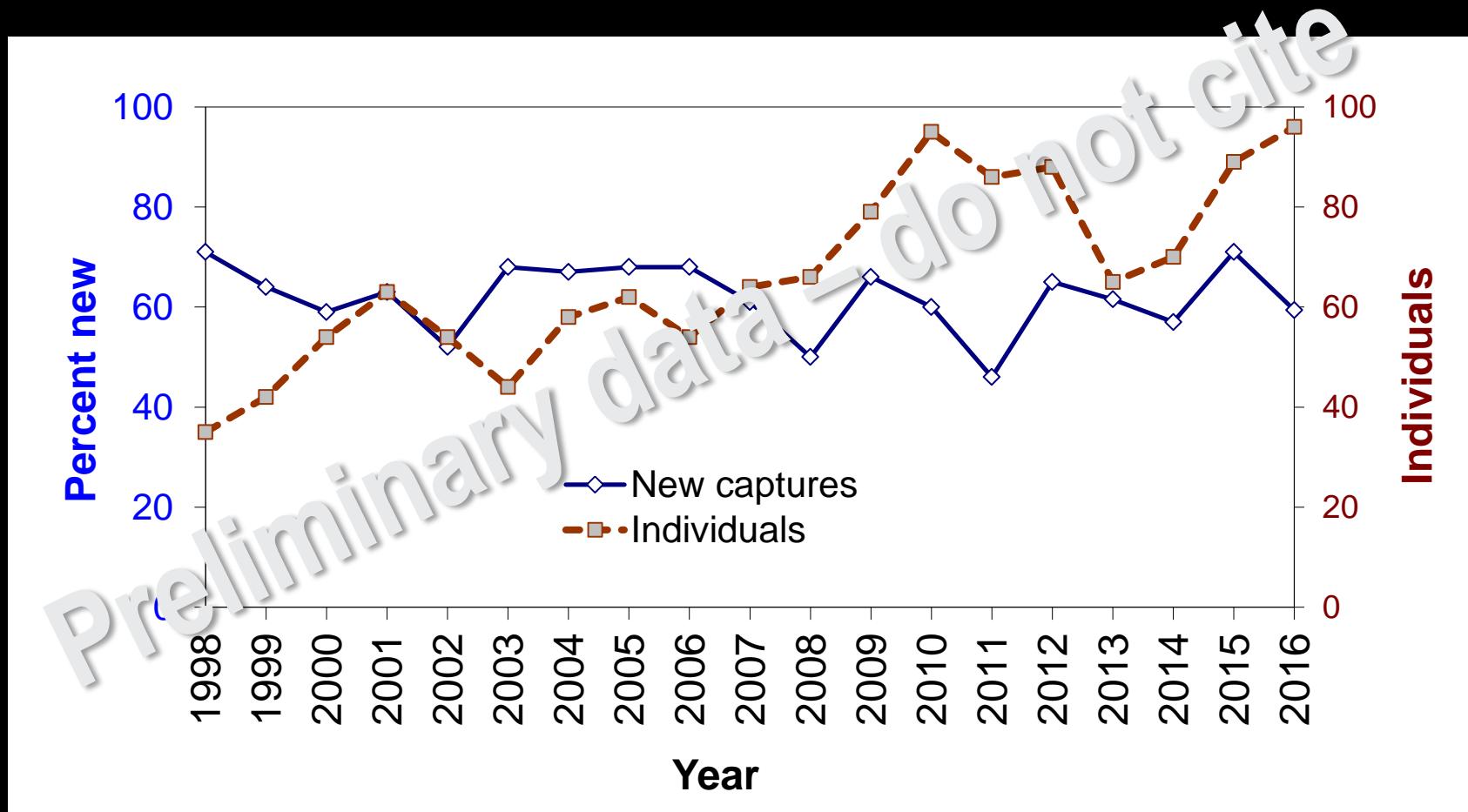
- Total captures = 108
  - Research = 59
  - Management = 49
- Individuals bears = 96
  - Females = 33
  - Males = 63
  - New bears = 57



# Number of individuals and percent new captures 1998–2016



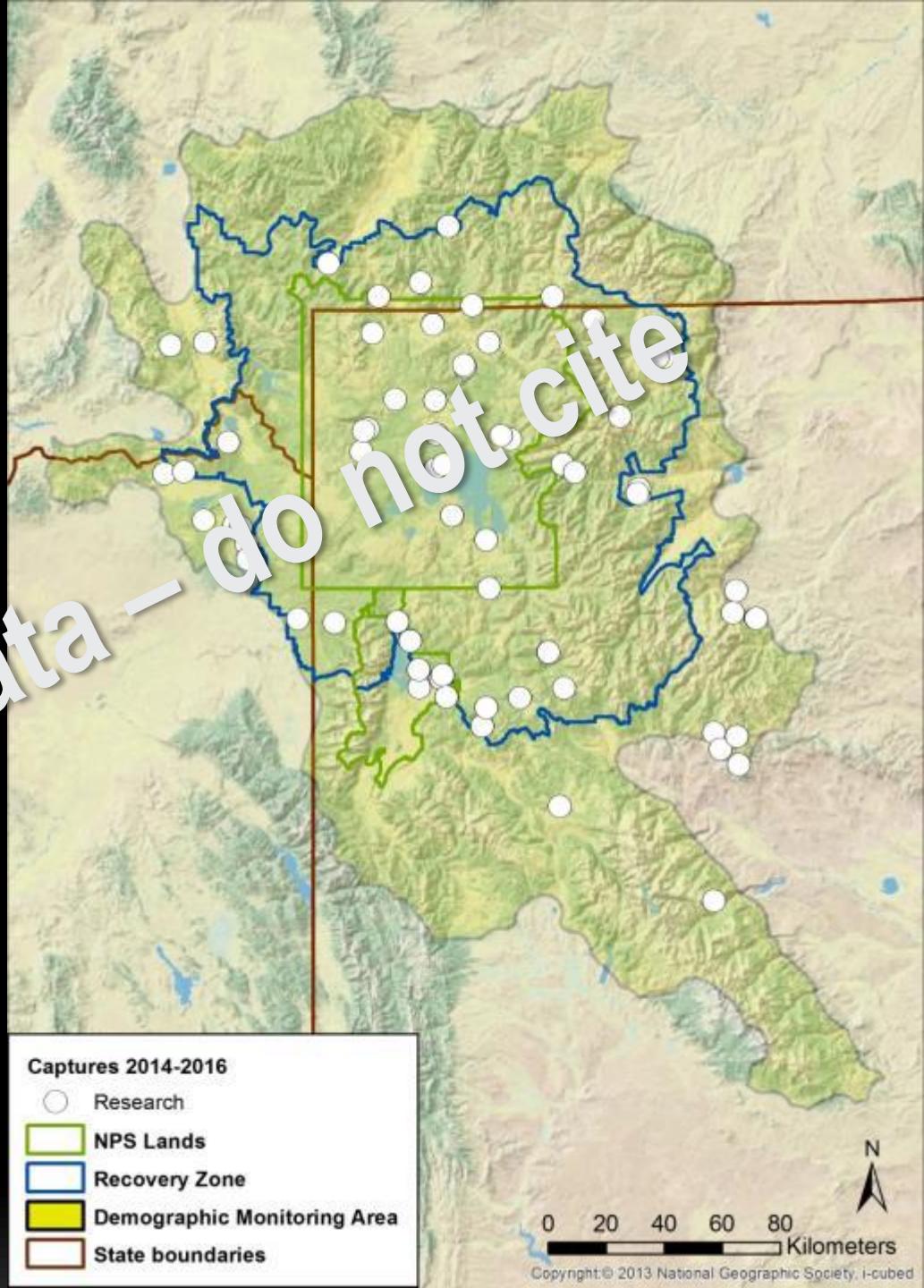
# Number of individuals and percent new captures 1998–2016



# Research captures 2014–2016

- Total captures = 144

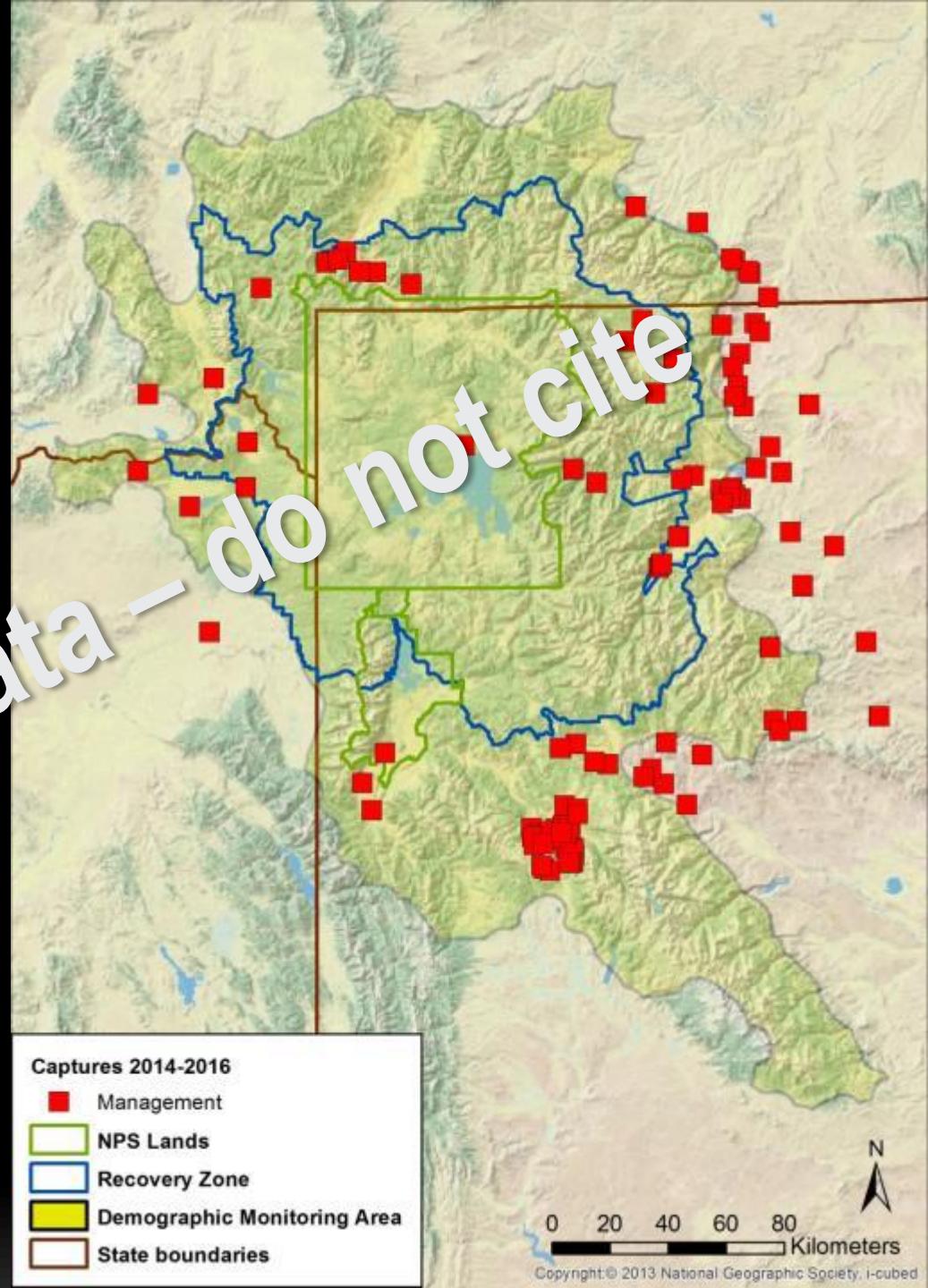
Preliminary data – do not cite



# Management captures 2014–2016

- Total captures = 151

Preliminary data – do not cite



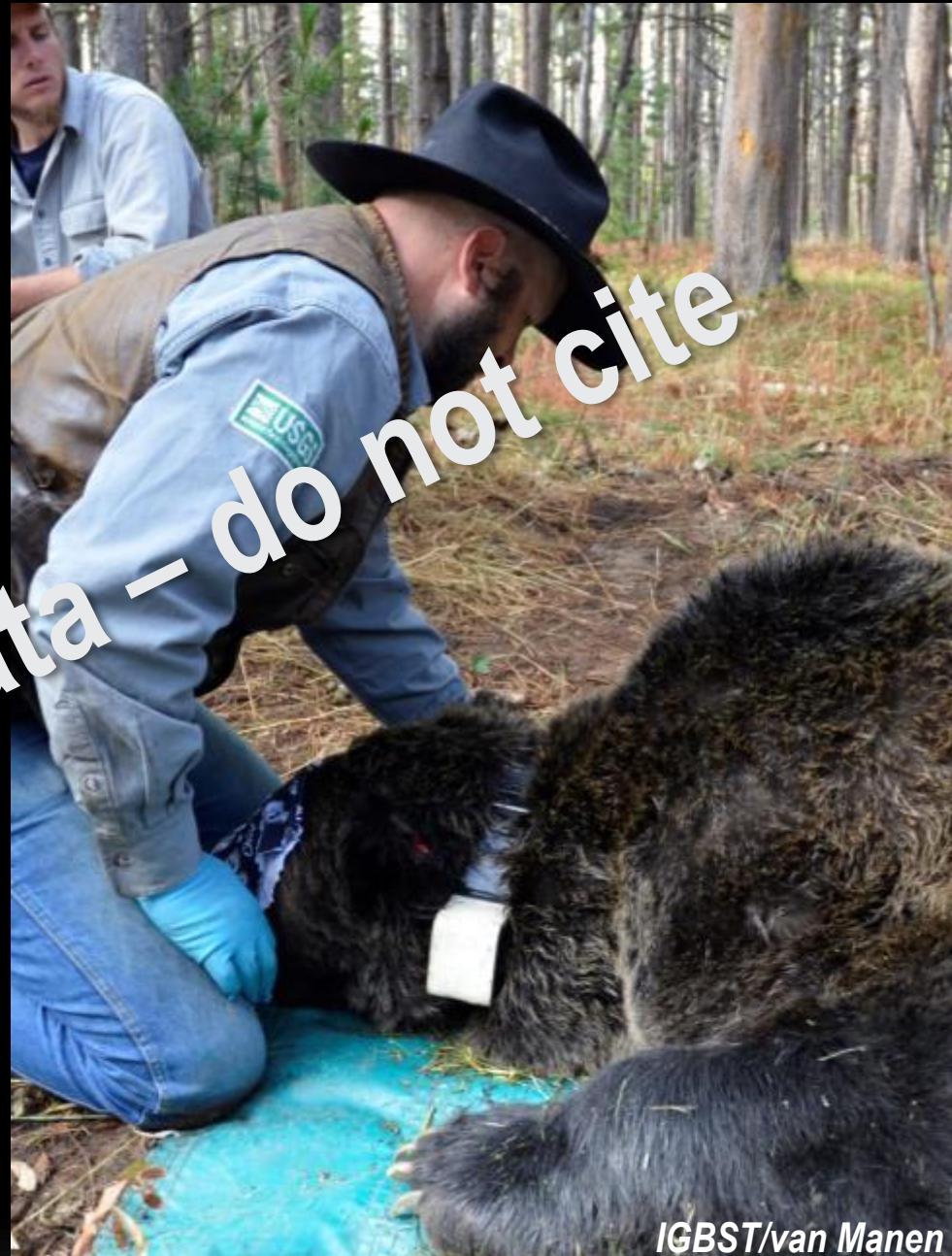
# Grizzly bears radio-monitored 2016

Total monitored = 106

- Adult females = 28

Currently radio-marked = 64

- Females = 30
- Males = 34
- Bears missing = 0

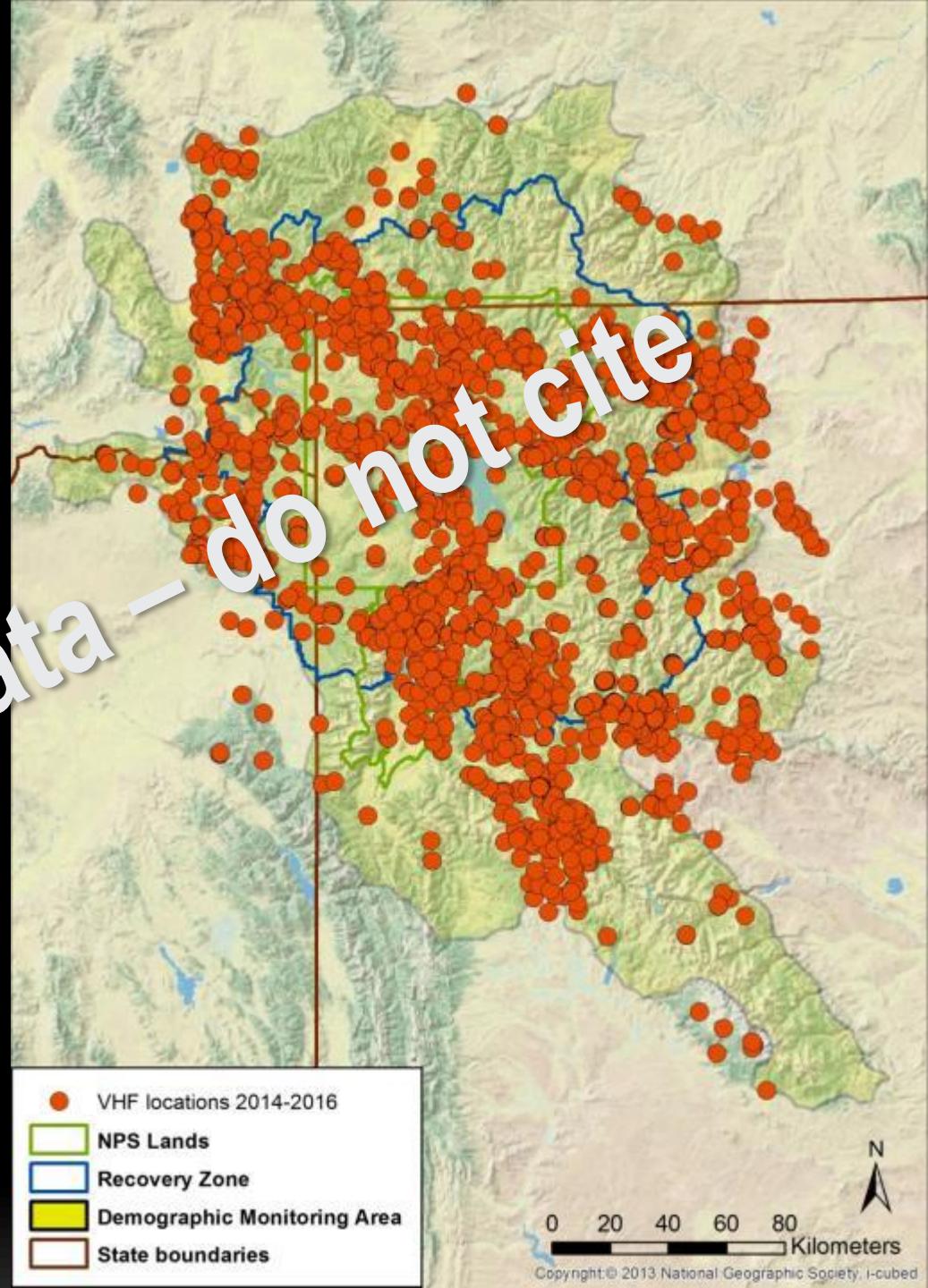


# VHF telemetry 2014-2016

## VHF

- Flight hours = 790
- Observations of radio-marked bears = 548

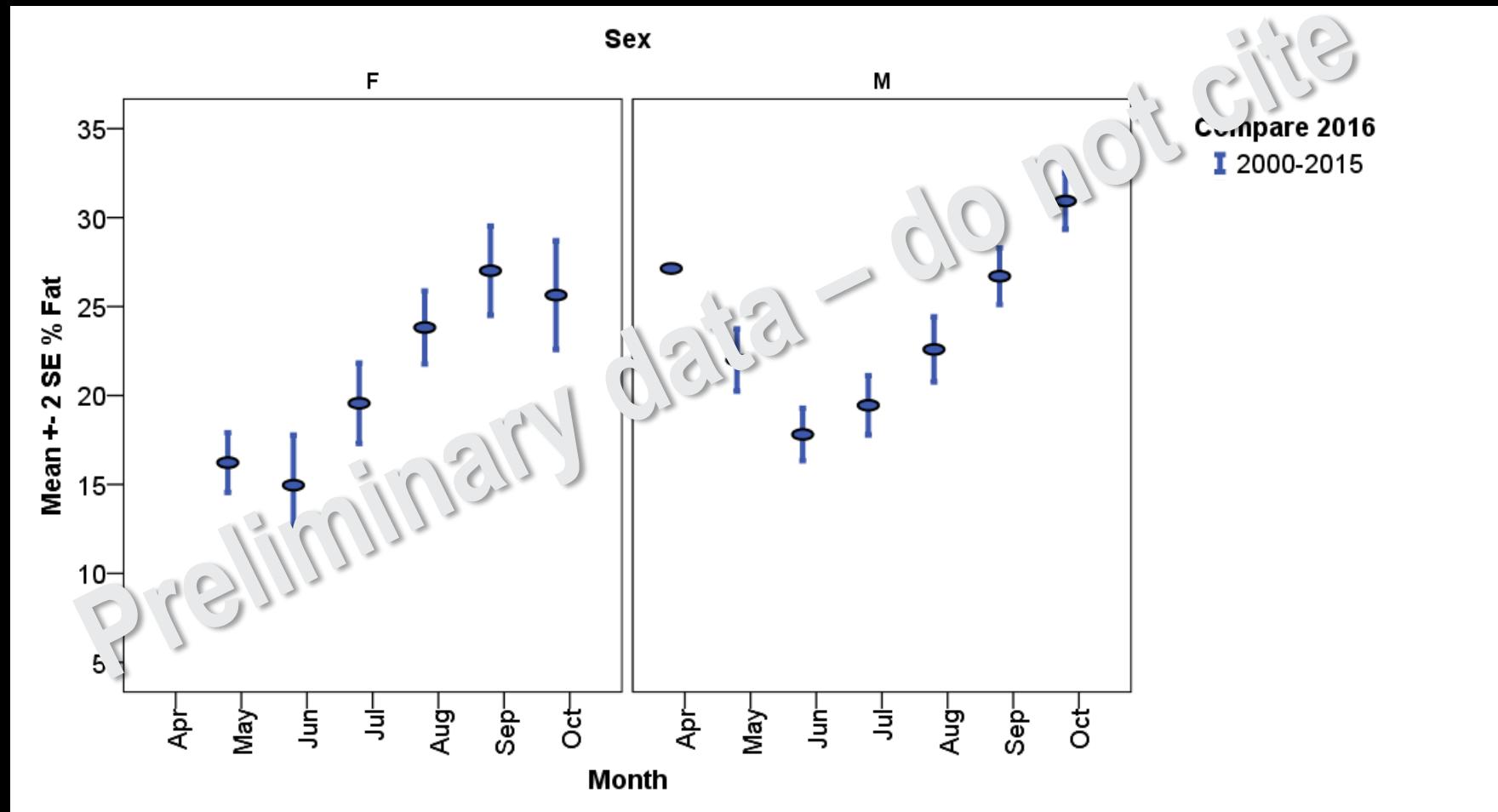
Preliminary data – do not cite



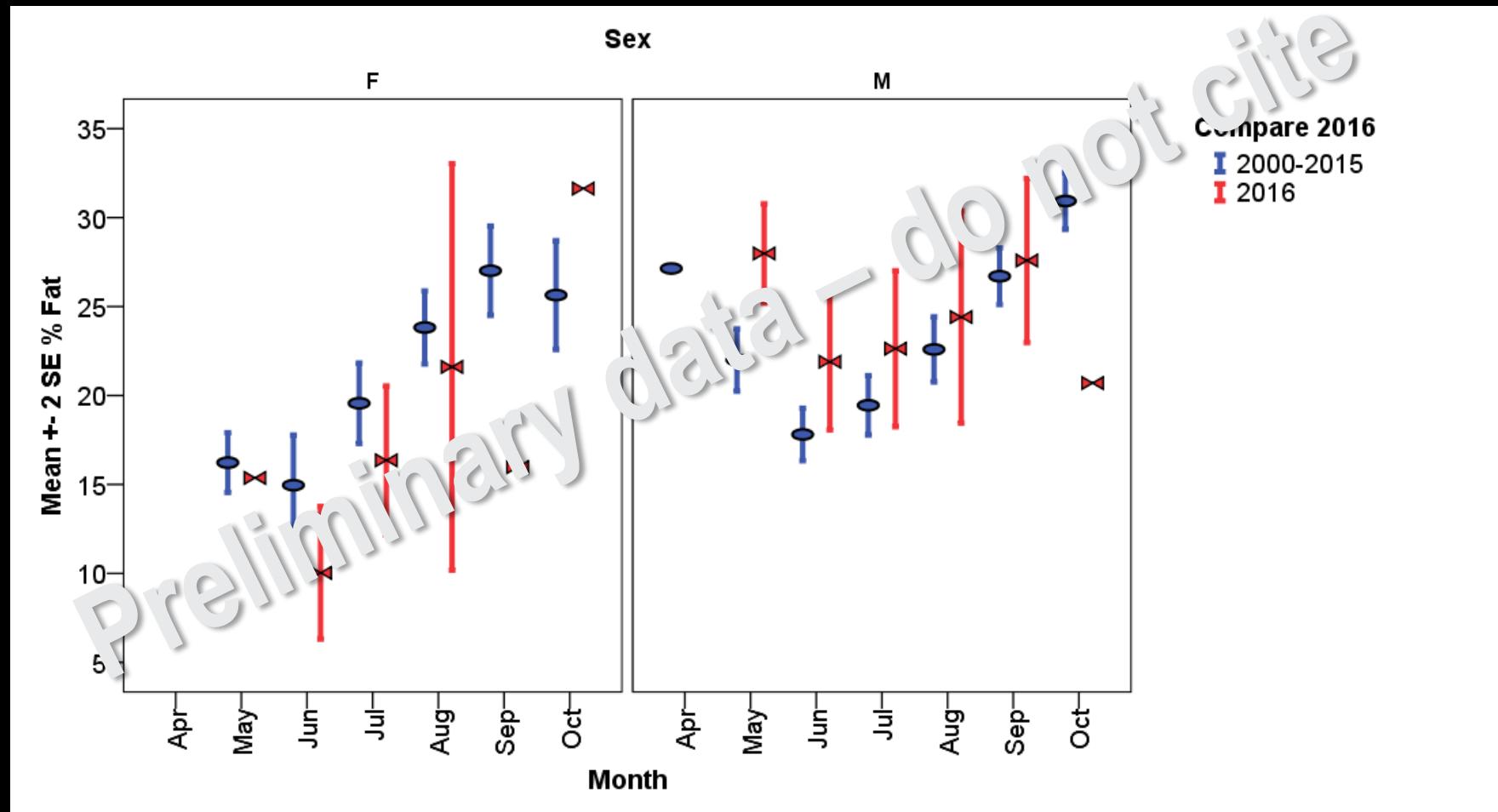
# Estimating body condition (% body fat)



# % body fat by month 2000–2015 and 2016



# % body fat by month 2000–2015 and 2016



# Genetic monitoring

- Results through 2014
- Over 900 individuals genotyped (20 microsatellite markers)
- No evidence of non-GYE ancestry in any of the individuals genotyped to date



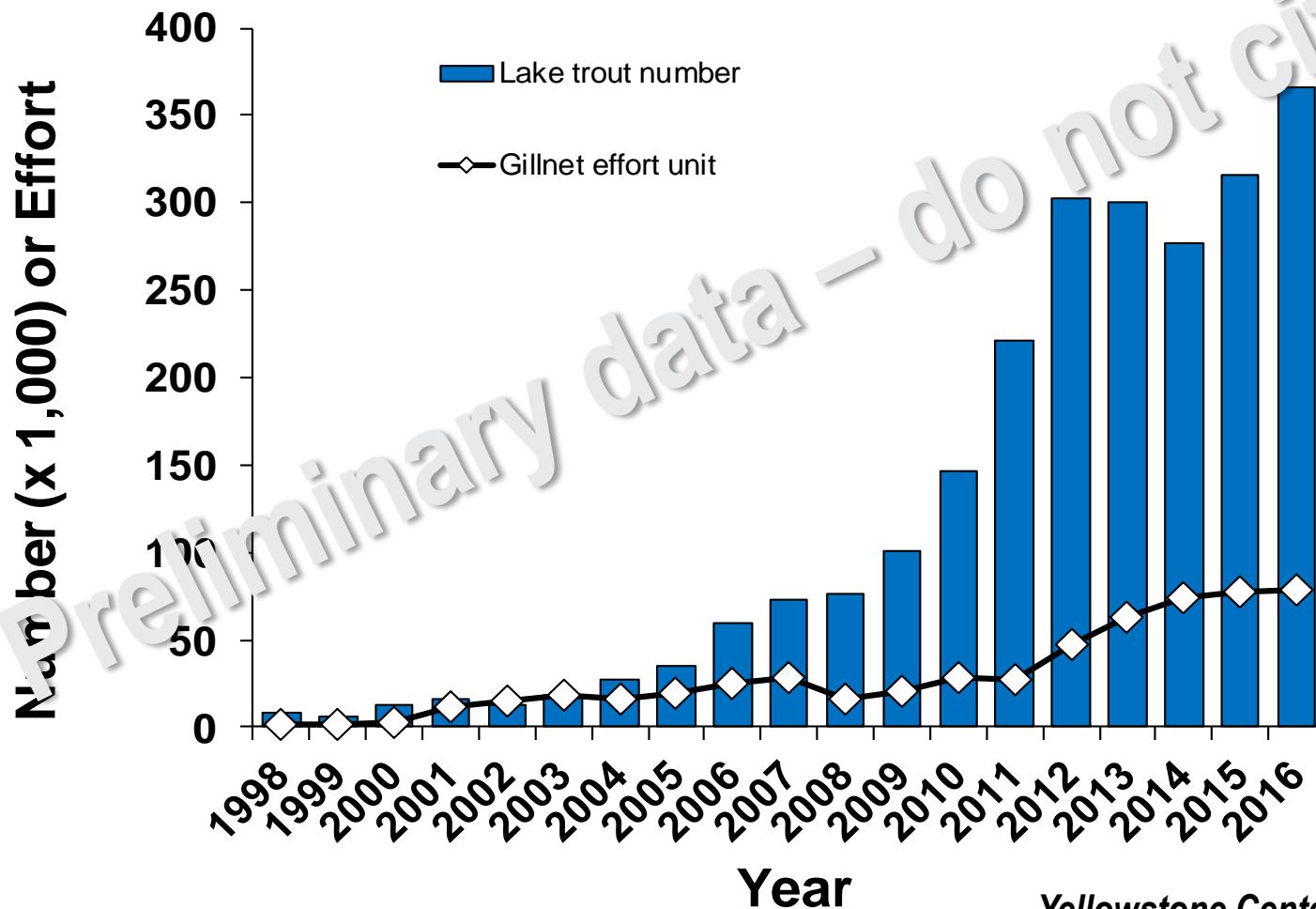
# Foods Monitoring

# Spring carcass surveys on ungulate winter ranges, Yellowstone NP, 2016

Survey Area	Total carcasses	Elk	Bison	Mule deer, moose, bighorn	Carcasses /km
Firehole	1	0	1	0	0.01
Norris	0	0	0	0	0
Heart Lake	0	0	0	0	0
Mud Volcano	0	0	0	1	0.15
Northern Range	35	14	4	17	0.22
Total	36	14	5	18	0.13

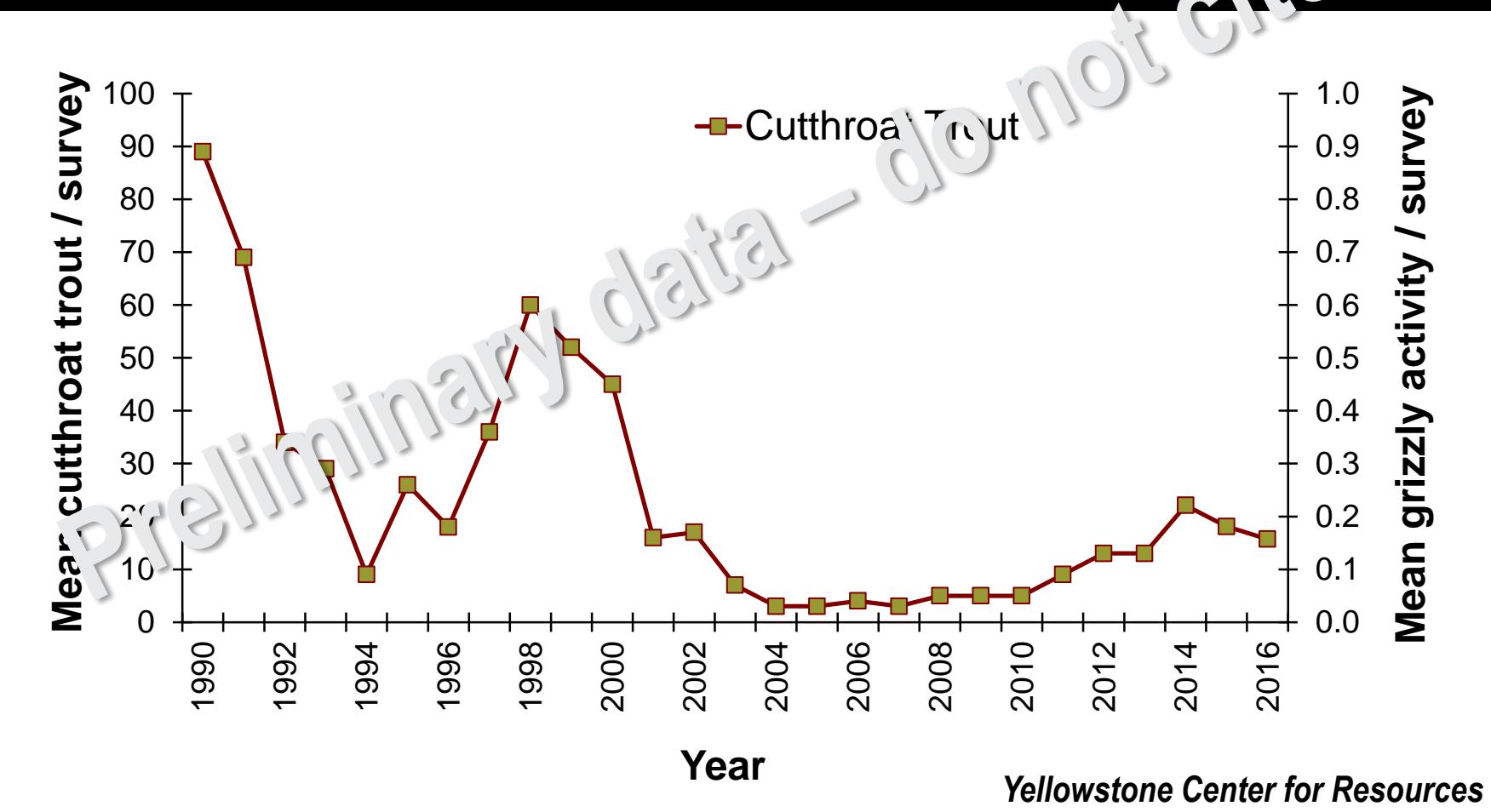
# Lake trout removal on Yellowstone Lake

## 1998–2016

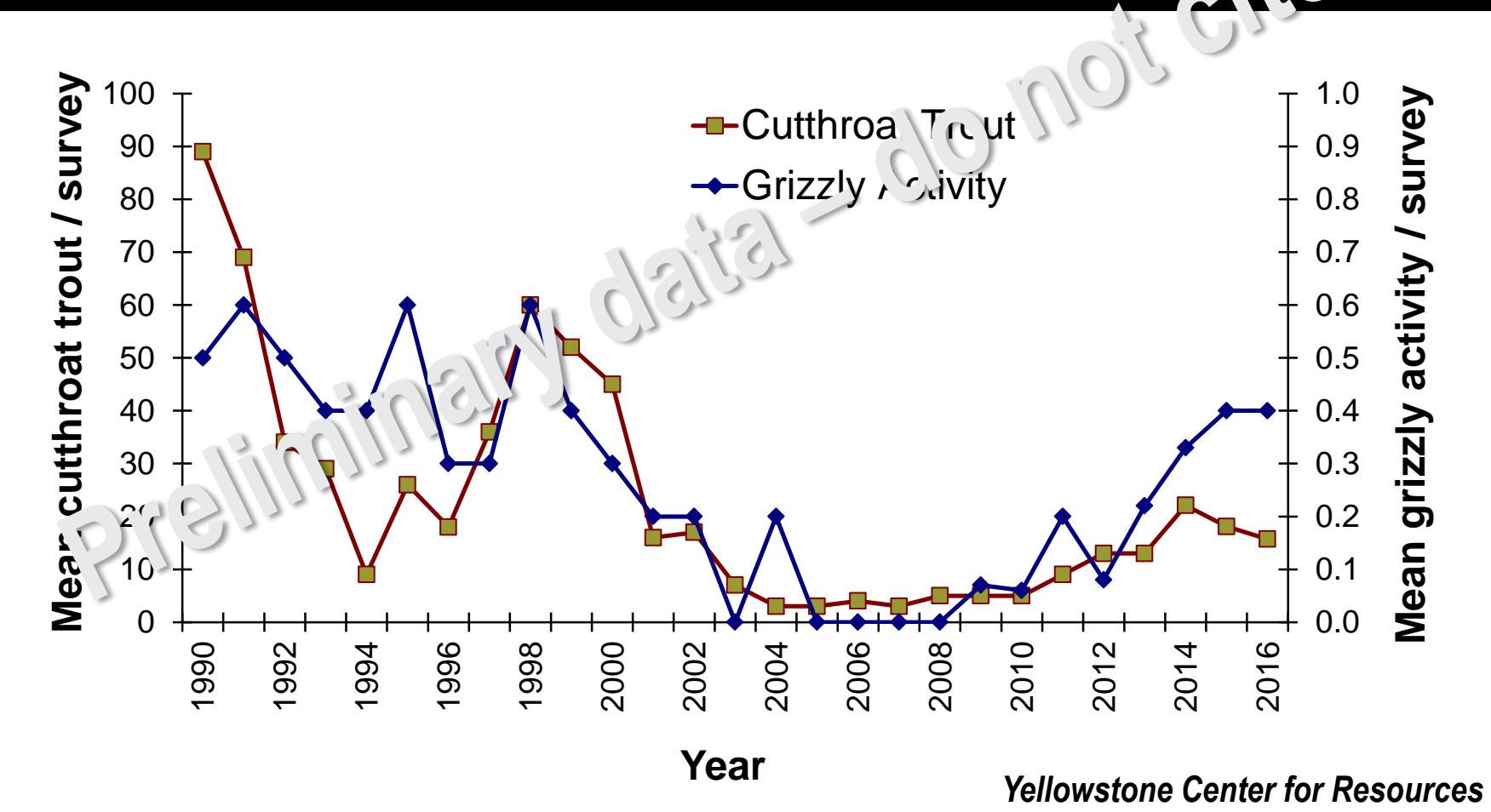


Yellowstone Center for Resources

# Spawning cutthroat trout and grizzly bear activity on front-country tributary streams 1989–2016



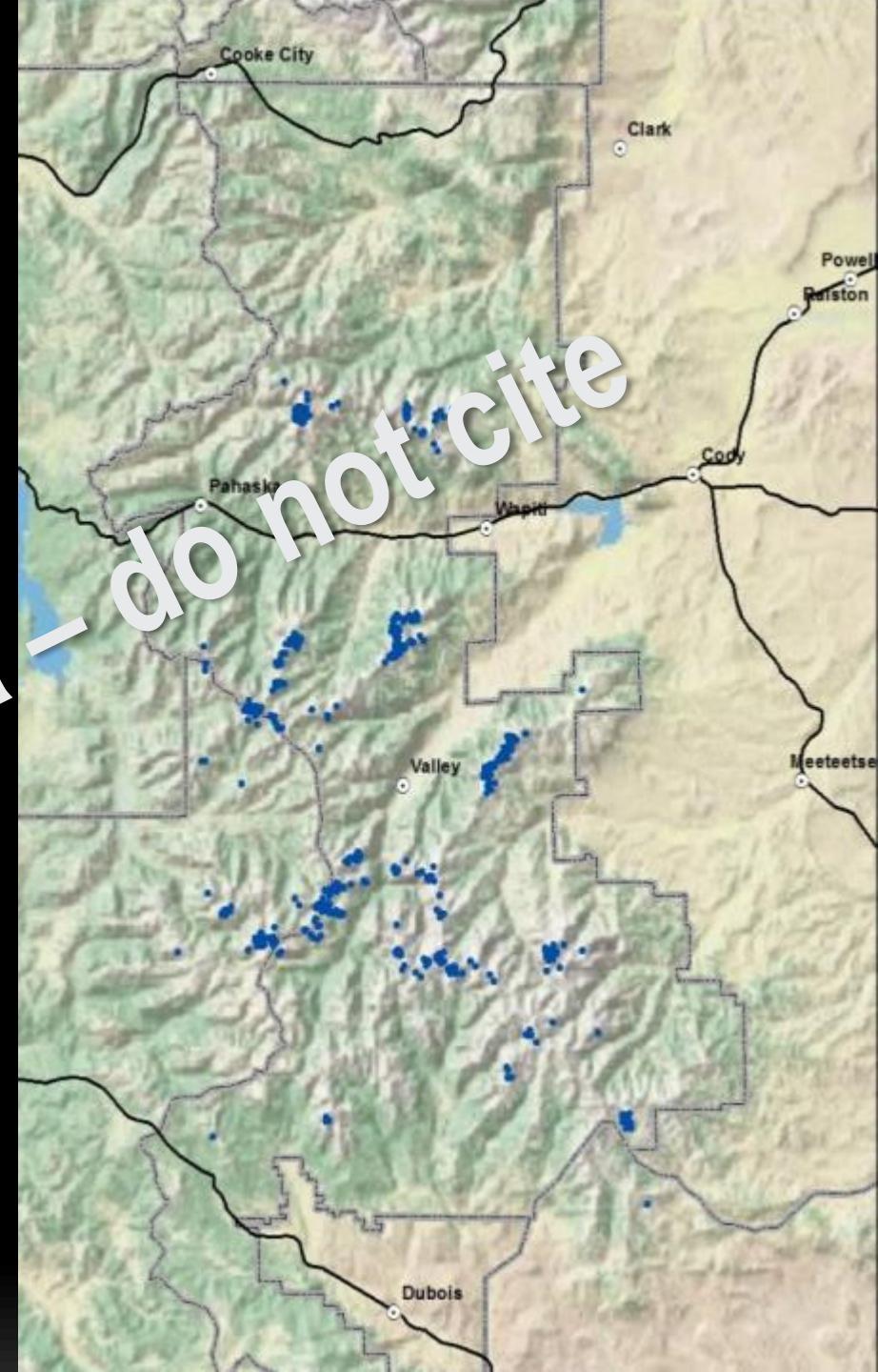
# Spawning cutthroat trout and grizzly bear activity on front-country tributary streams 1989–2016



# Army cutworm moths

- 30 confirmed sites – multiple observations of bears feeding during more than 1 year
- 14 possible sites – single observation of bear(s) feeding

Preliminary data - do not cite



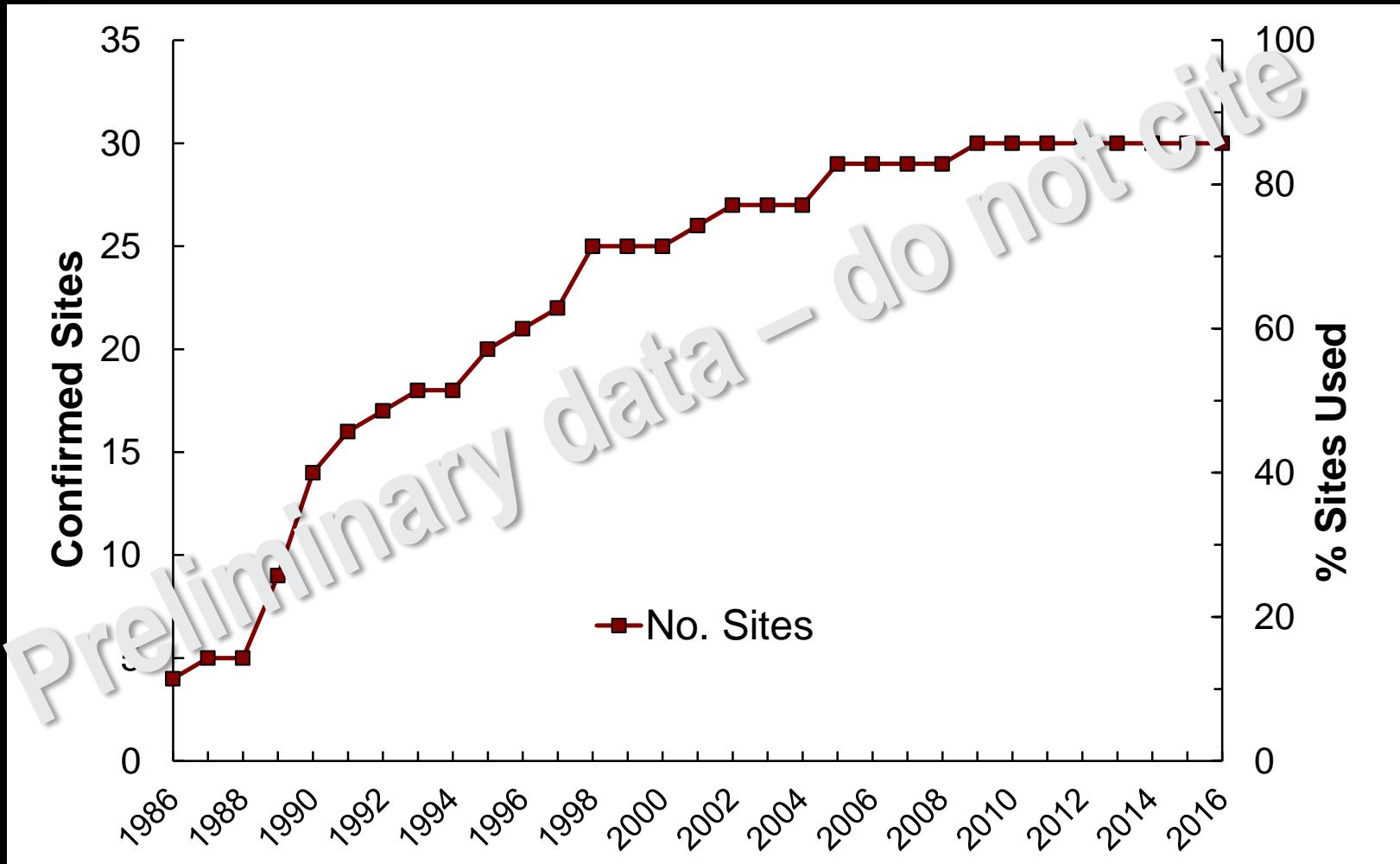
# Army cutworm moths

- Observations of 301 grizzly bears on 19 (43%) of the 44 sites
- 26% ( $n = 13$ ) of 50 initial observations of unique females with cubs

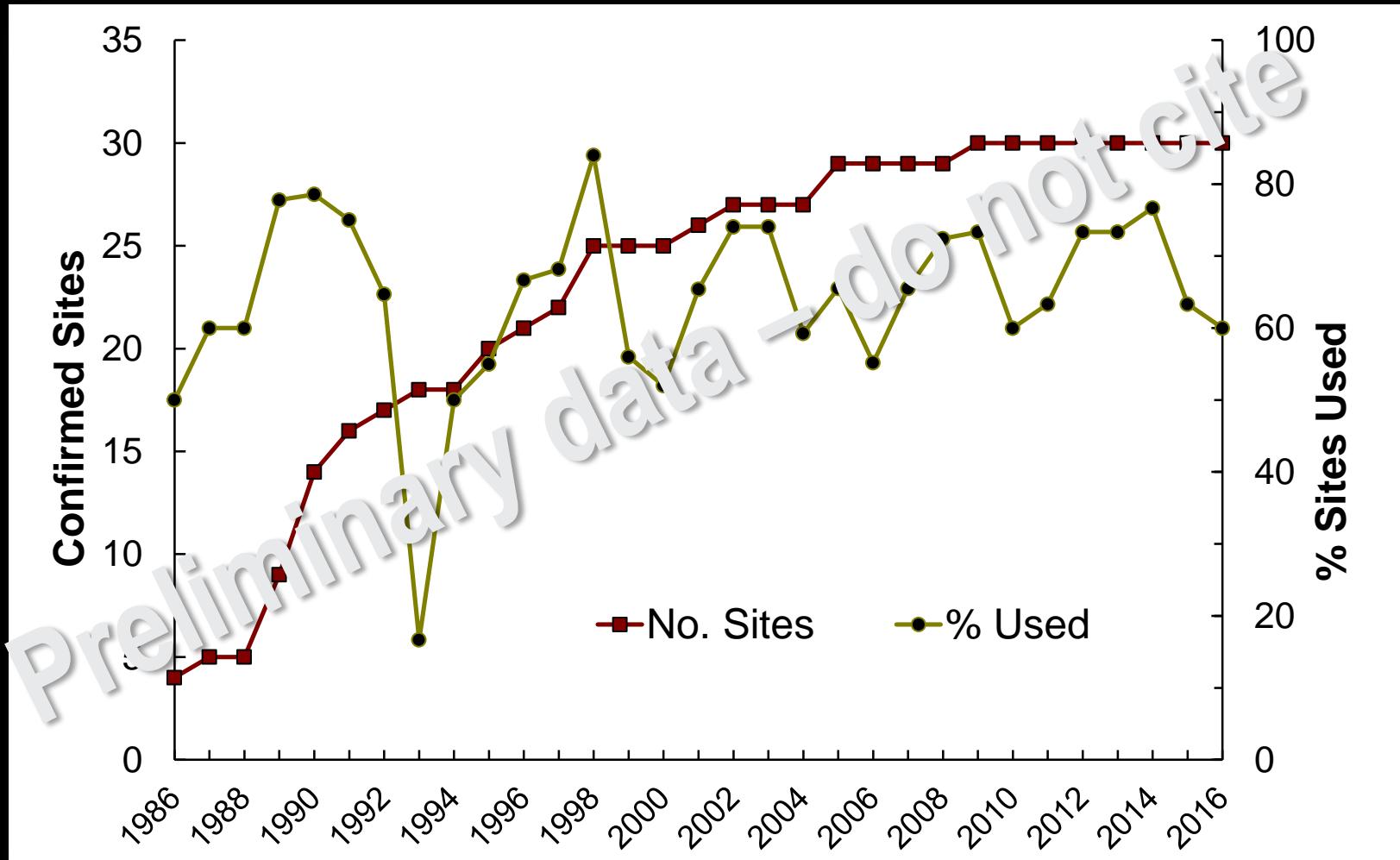
Preliminary data – do not cite



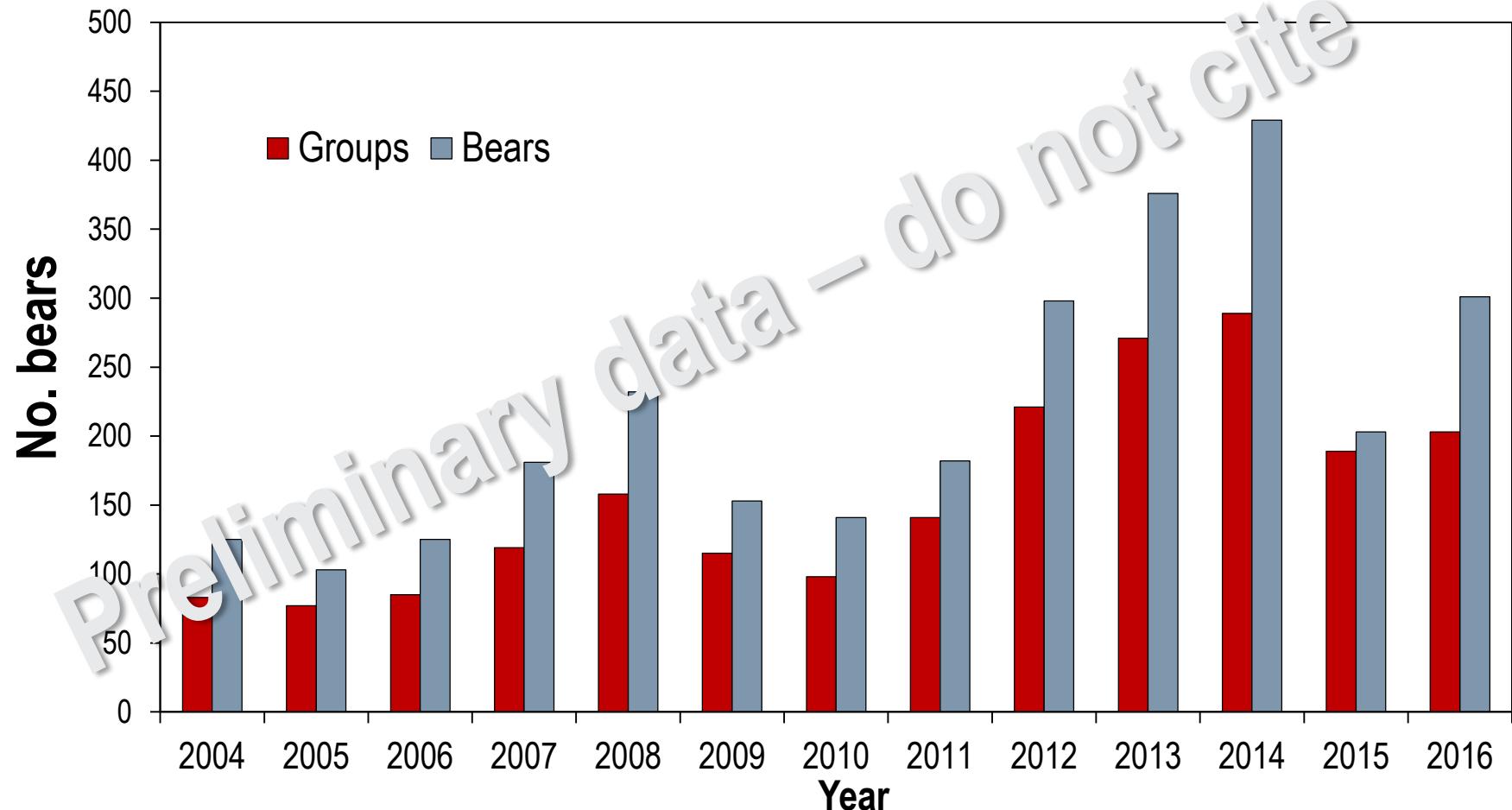
# Confirmed moth sites and percent used 1986–2016



# Confirmed moth sites and percent used 1986–2016



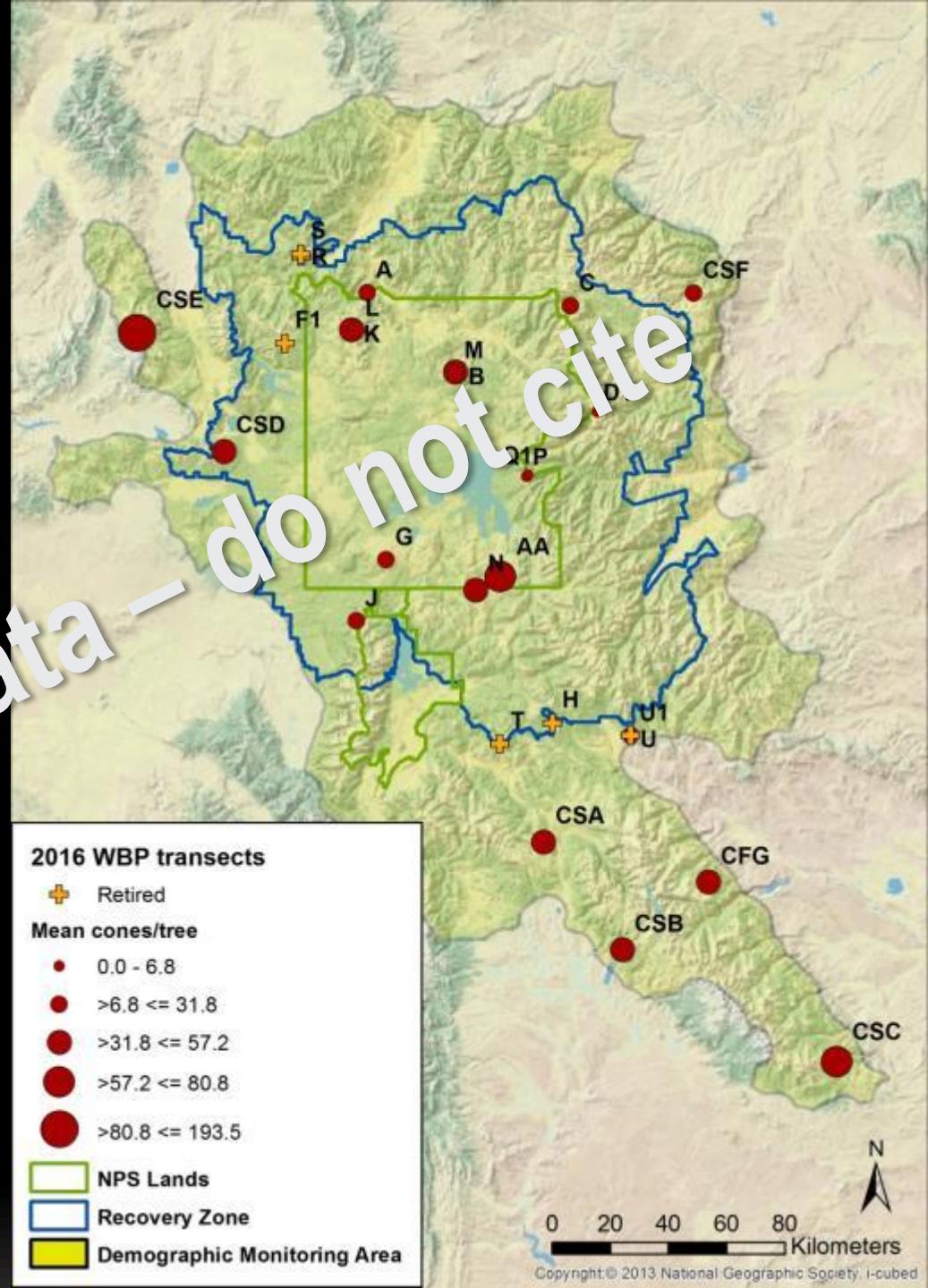
# Grizzly bear sightings on moth sites observation flights 2004–2016



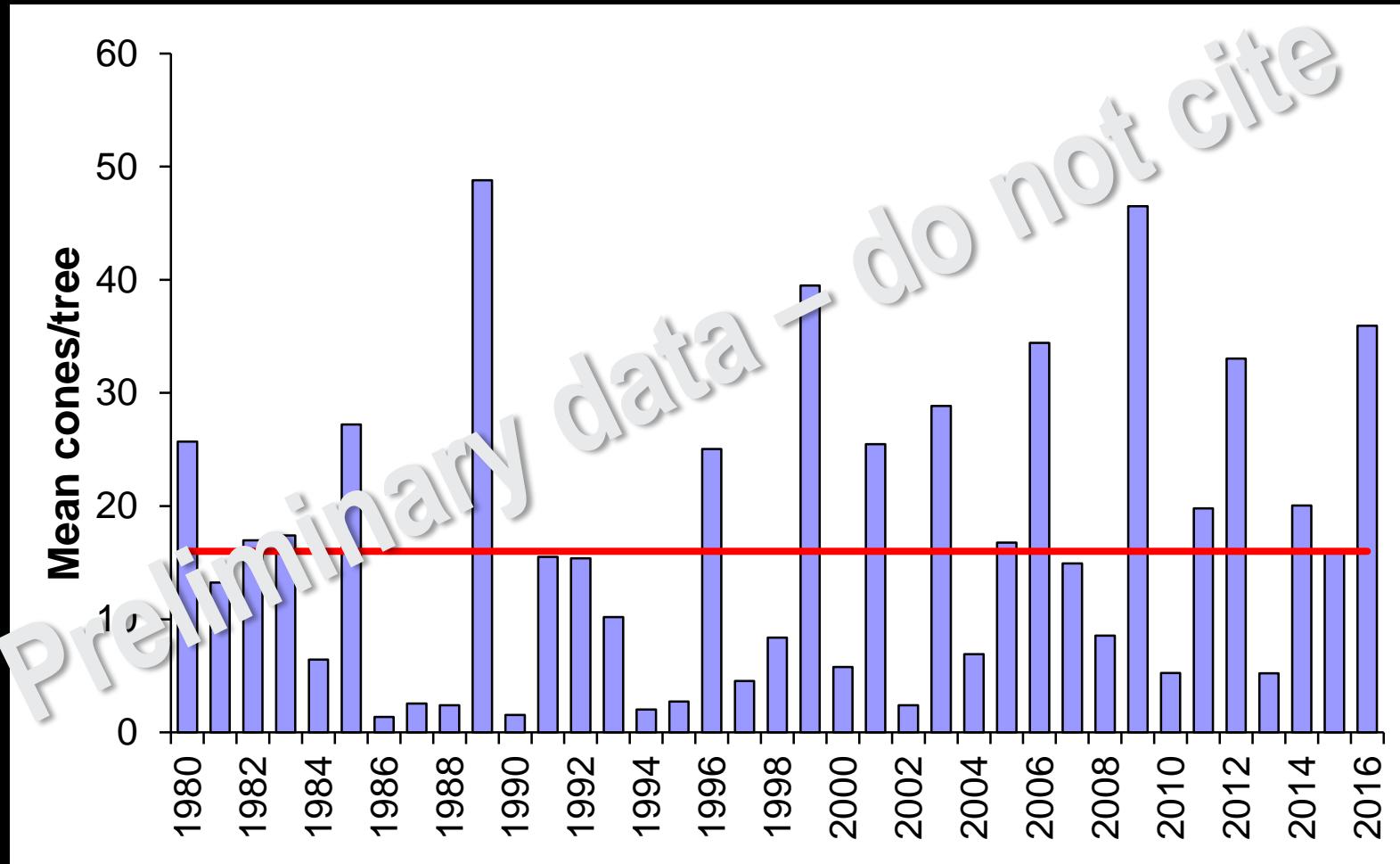
# Whitebark pine transects 2016

- 21 transects
- 185 trees surveyed
- Average no. of cones/tree = 35.9

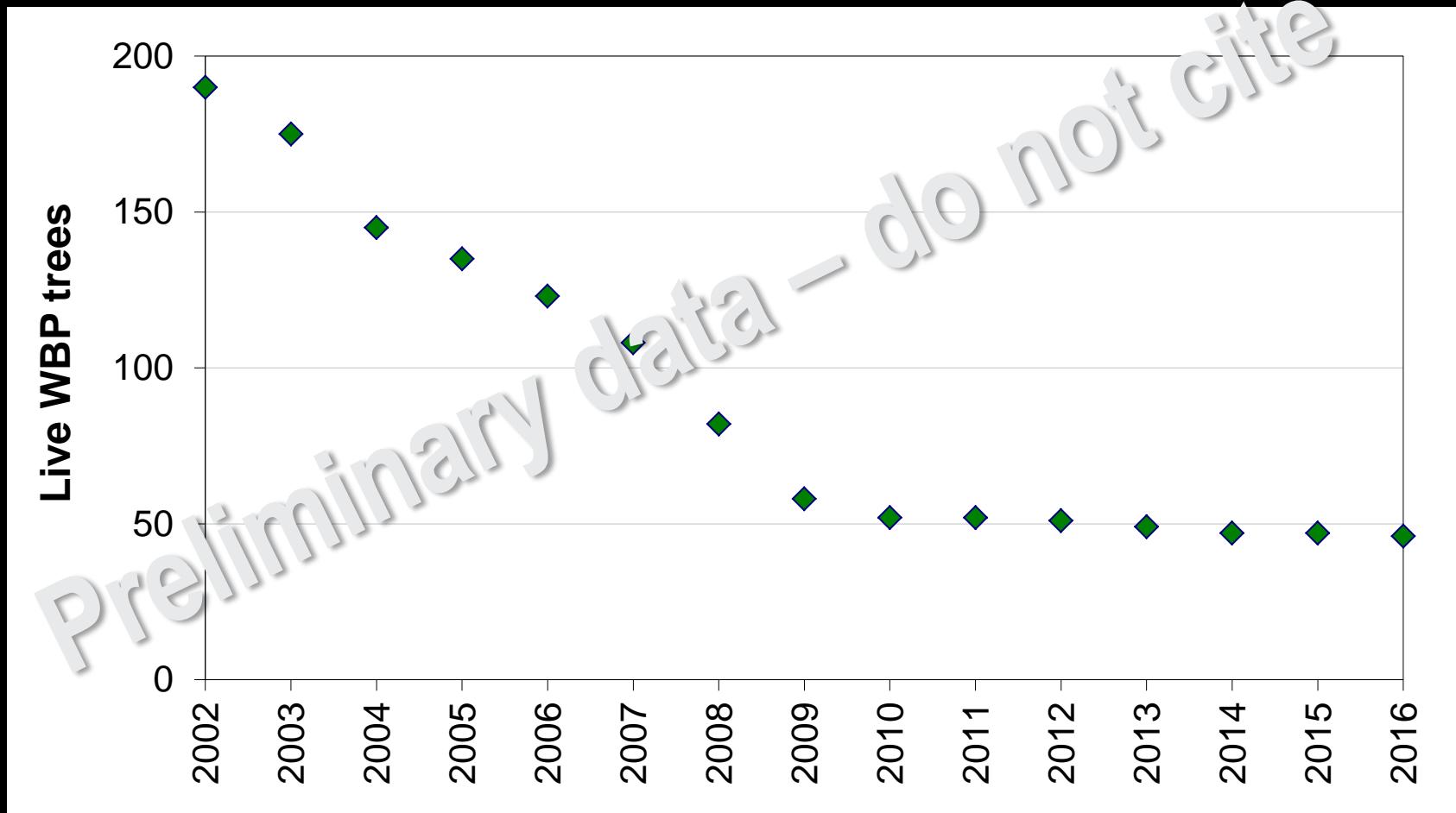
Preliminary data – do not cite



# Whitebark pine cone production 1980–2016



# Whitebark pine tree mortality on cone production transects 2002–2016



# Summary

- **Population**

- Population estimate = 690
- No major change in trend since early 2000s
- No evidence of bears leaving core of ecosystem

- **Mortality**

- 38% of all mortalities occurred outside the DMA
- Primary causes: livestock, accidental (road kills and drownings), and site conflicts
- 2016 DMA mortality limits not exceeded to date

- **Year of relatively good food supply**

- Low availability of winter-killed carcasses
- Good berry production
- Above average whitebark pine cone production

**Annual Report, data, maps,  
and other products available at  
IGBST website:**

**Google “IGBST”**

# Acknowledgments 2016

- IDFG: P. Atwood, R. Cavallaro, C. de Caussin, J. Farr, K. Guy, C. Hendricks, C. Johnson, D. Kelsey, L. Lane, J. Nicholson , D. Petersen, J. Rydalch;
- MSU: S. Cherry, C. Peck;
- MTFWP: J. Cunningham, D. Fagone, K. Frey, C. Kerin, J. Knarr, B. Lloyd, A. Nelson, J. Ramsey, J. Smith, D. Scott, J. Smolczynski, S. Stewart;
- NPS: K. Atkins, C. Ausprung, D. Bergum, N. Bowersock, E. Boyd, S. Consolo-Murphy, R. Coscarelli, S. Dewey, Erwin, C. Flaherty, K. Gunther, D. Gustine, K. Harrigan, D. Harris, Q. Harrison, J. Jakicic, E. Johnston, E. Laubach, S. Mayberry, J. Mohr, E. Reinertson, T. Ritter, J. Roper, W. Scherer, D. Schneider, J. Schwabedissen, K. Simpson, J. Stephenson, K. Szcodronski, B. Tatu, T. Tatu, J. Warren, K. Wilmot, T. Wyman;
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