Interagency Grizzly Bear Study Team Research and Monitoring Summary 2017

Study Team Members

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Overview

- Population estimates and trend

- Occupancy by females with offspring

- Mortalities and mortality rates
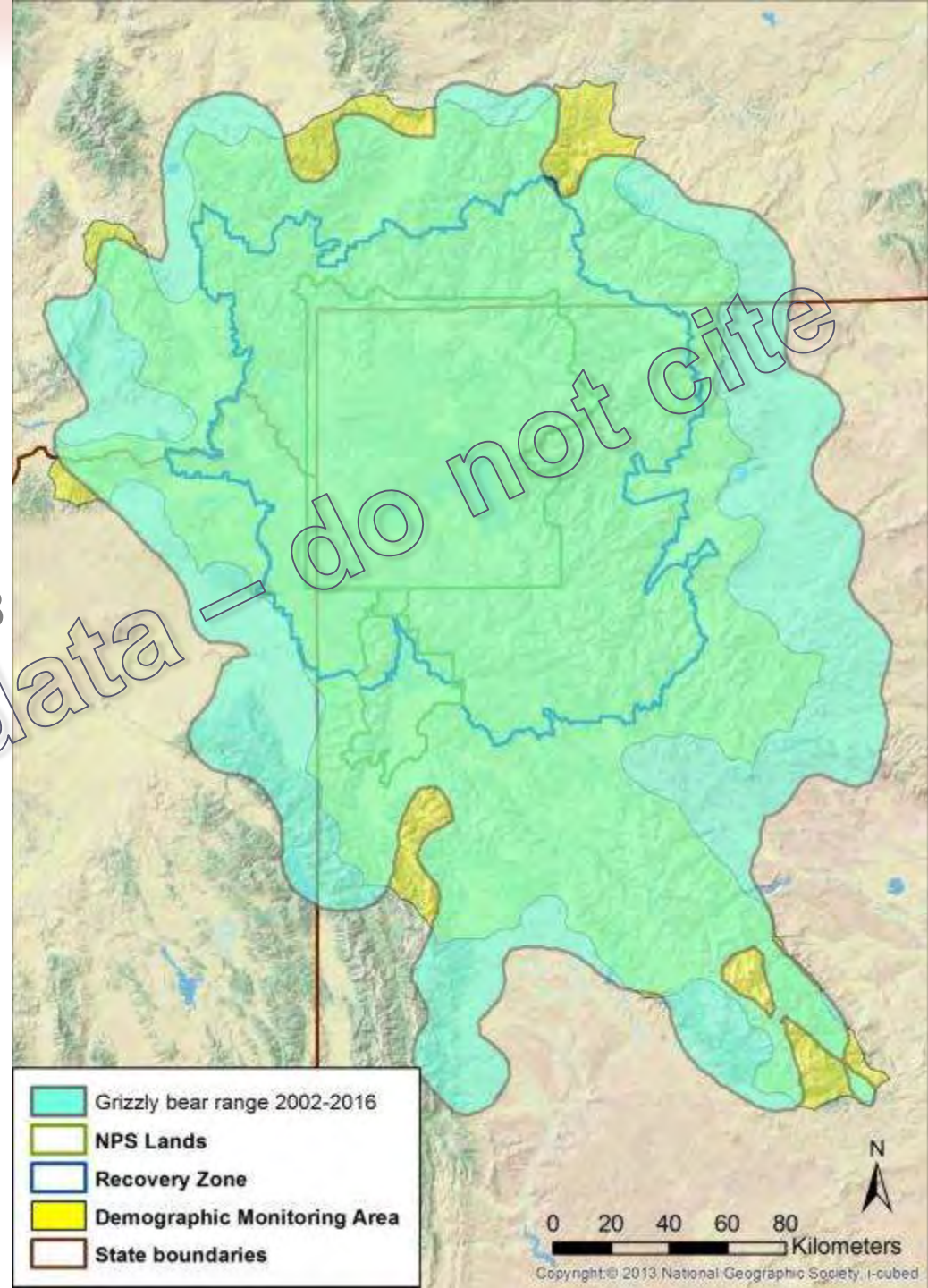
Some results are preliminary

Greater Yellowstone Ecosystem

- National Parks = 10,344 km^2

- Primary Conservation Area/Recovery Zone = 23,828 km^2

- Demographic Monitoring Area (DMA) = 49,931 km^2

NPS Lands
Recovery Zone
Demographic Monitoring Area
State boundaries

0 20 40 60 80 Kilometers

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Greater Yellowstone Ecosystem

- National Parks = 10,344 km^2

- Primary Conservation Area/Recovery Zone = 23,828 km^2

- Demographic Monitoring Area (DMA) = 49,931 km^2

- Occupied range (2002-2016) = 64,849 km^2

Grizzly bear range 2002-2016
NPS Lands
Recovery Zone
Demographic Monitoring Area
State boundaries

0 20 40 60 80 Kilometers

N

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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

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Observation flights 2017

Round 1, Area 17B, 07/19/2017   *Photo: WGFD*

Observation flights 2017
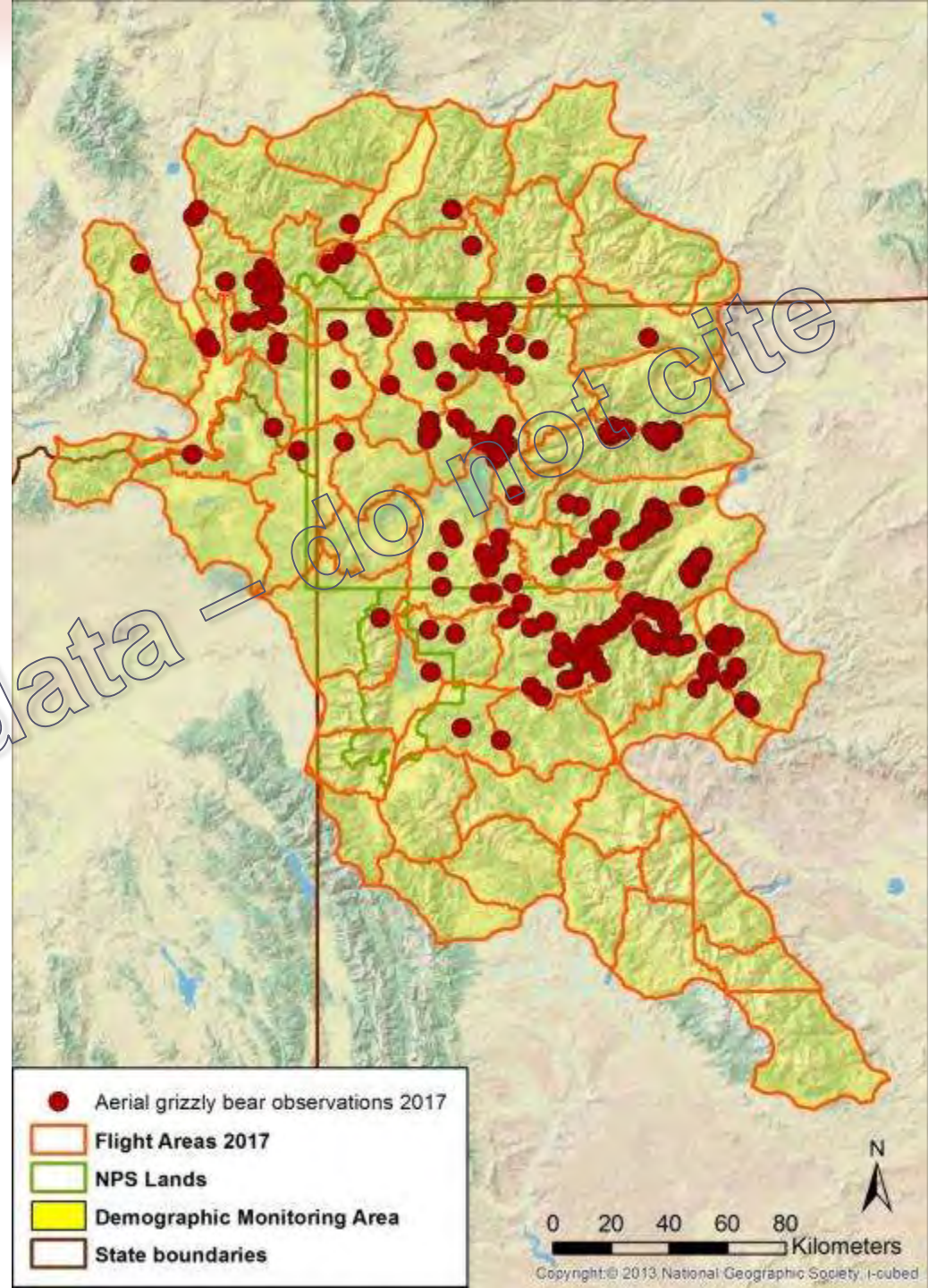
- **54 aerial observation areas**

  Round 1: 54 units
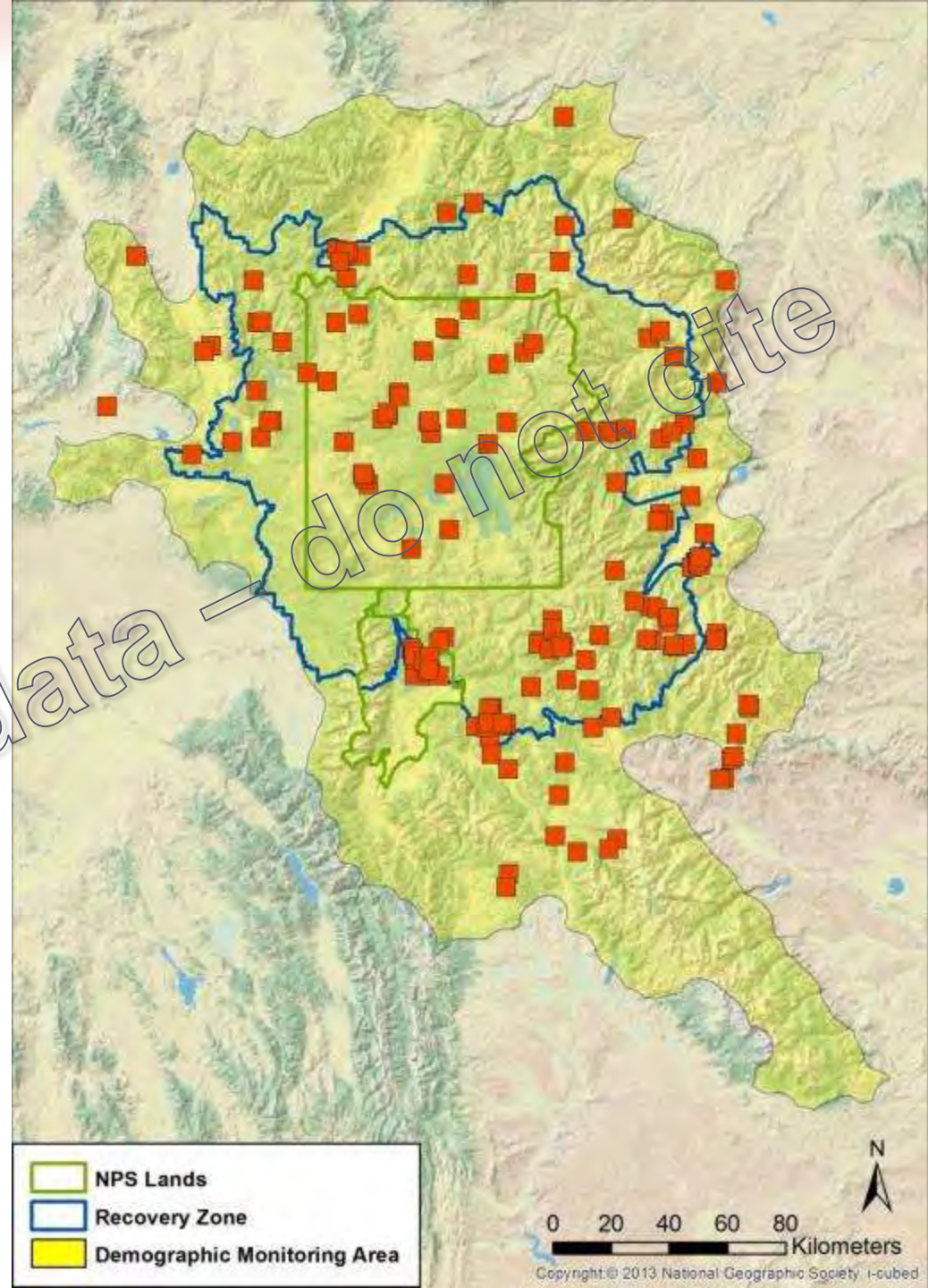
  Round 2: 40 units

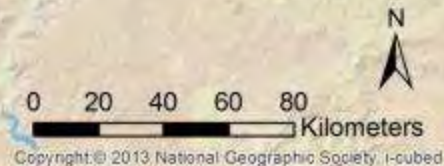- **184 survey hours**

- **369 groups**

  510 grizzly bears

Legend:
- Aerial grizzly bear observations 2017
- Flight Areas 2017
- NPS Lands
- Demographic Monitoring Area
- State boundaries

0 20 40 60 80 Kilometers

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Females with cubs 2017

- **180 observations**
  - 115 aerial (64%)
  - 65 ground (36%)

NPS Lands
Recovery Zone
Demographic Monitoring Area

0 20 40 60 80
Kilometers

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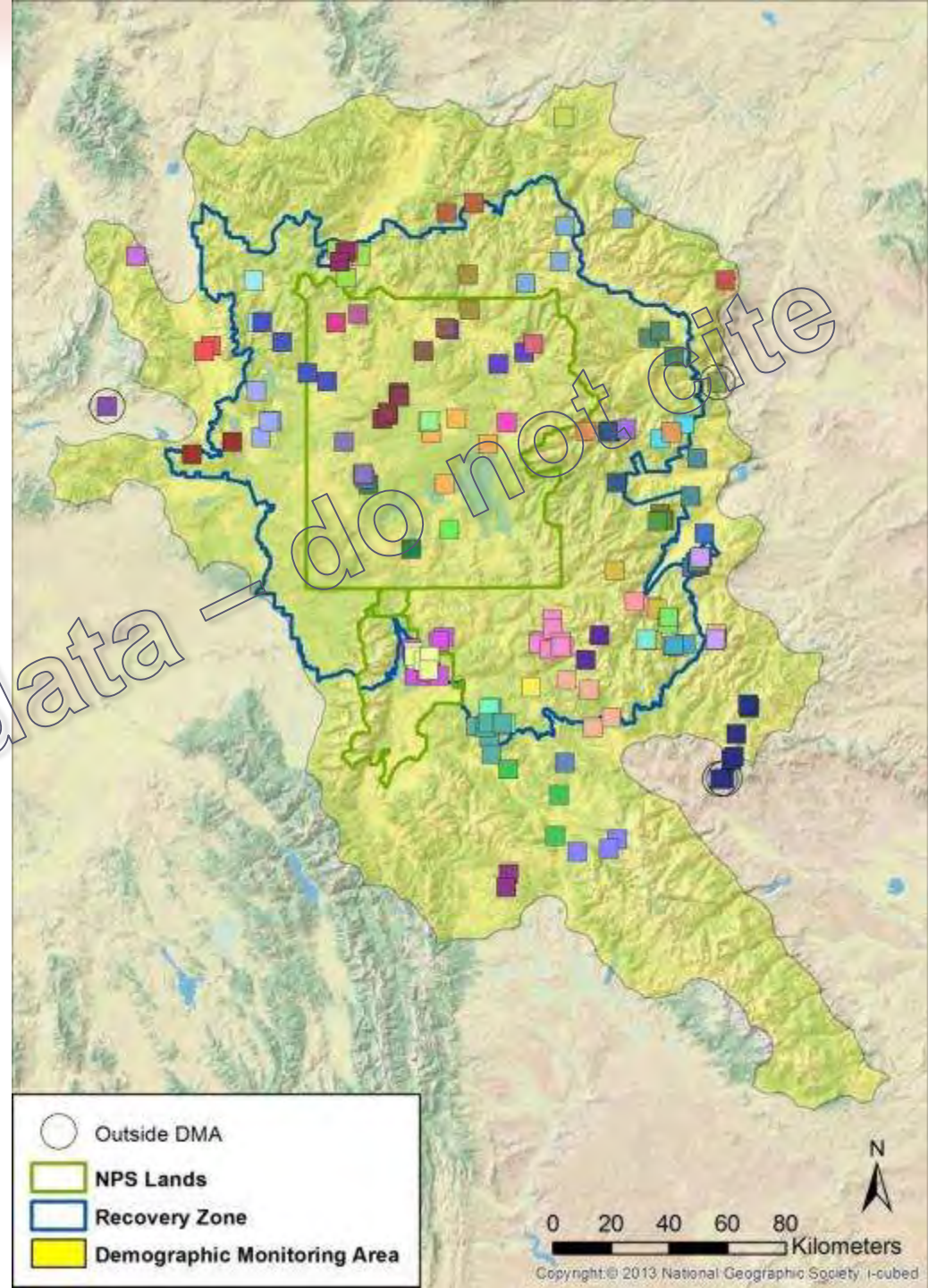IGBST

Preliminary data – do not cite

Females with cubs 2017

- **180 observations**
  115 aerial (64%)
  65 ground (36%)

- **58 unique females with cubs**
  Mean litter size = 1.98
    15 single (25.9%)
    30 twins (51.7%)
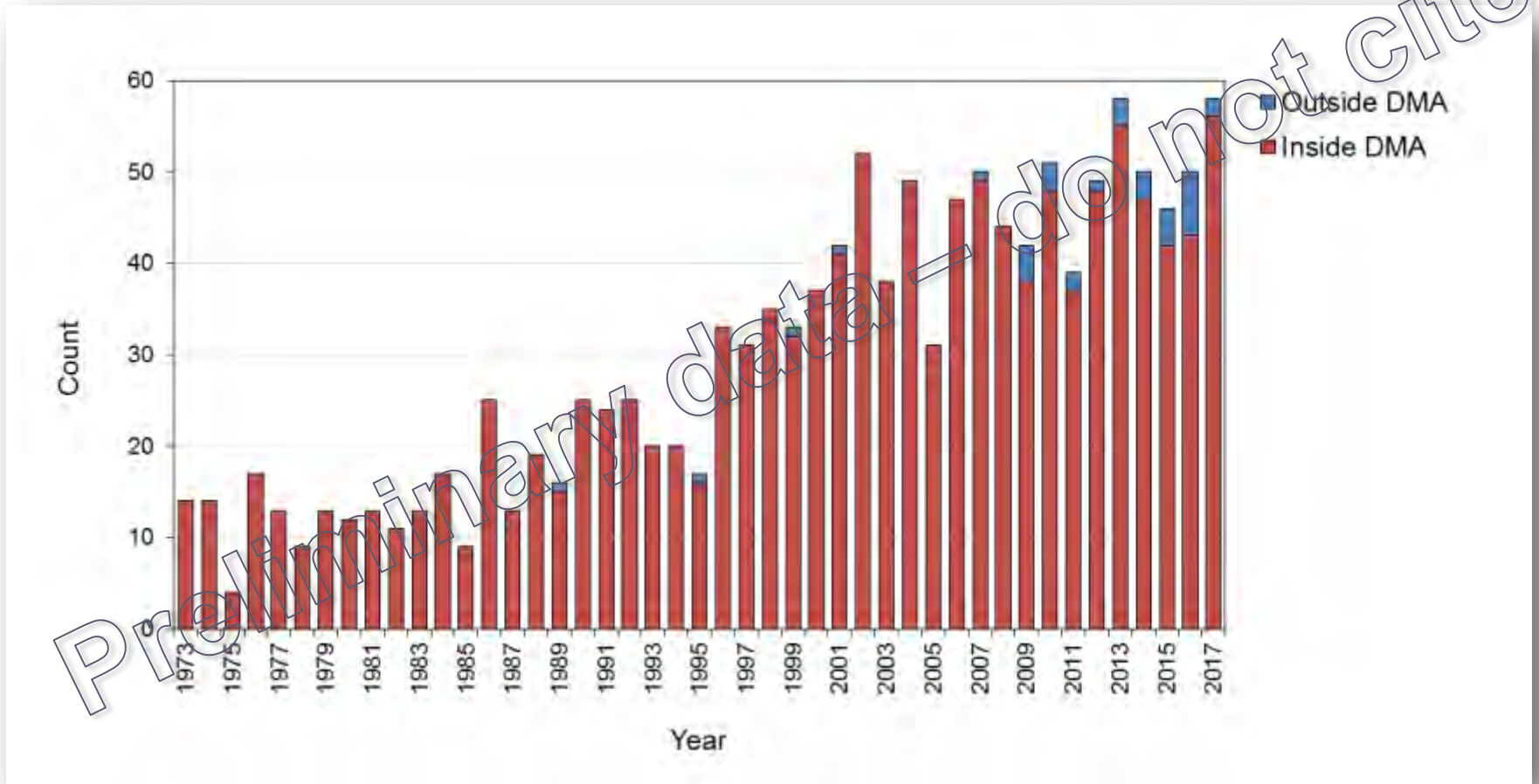   12 triplets (20.7%)
    1 quadruplet (1.7%)

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NPS Lands
Recovery Zone
Demographic Monitoring Area

N

0 20 40 60 80
Kilometers

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Females with cubs 2017

- **180 observations**
  - 115 aerial (64%)
  - 65 ground (36%)

- **58 unique females with cubs**
  - Mean litter size = 1.98
    - 15 single (25.9%)
    - 30 twins (51.7%)
    - 12 triplets (20.7%)
    - 1 quadruplet (1.7%)

- **57 in DMA**

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Outside DMA
NPS Lands
Recovery Zone
Demographic Monitoring Area

0 20 40 60 80 Kilometers

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Initial sightings of females with cubs inside and outside DMA 1973-2017
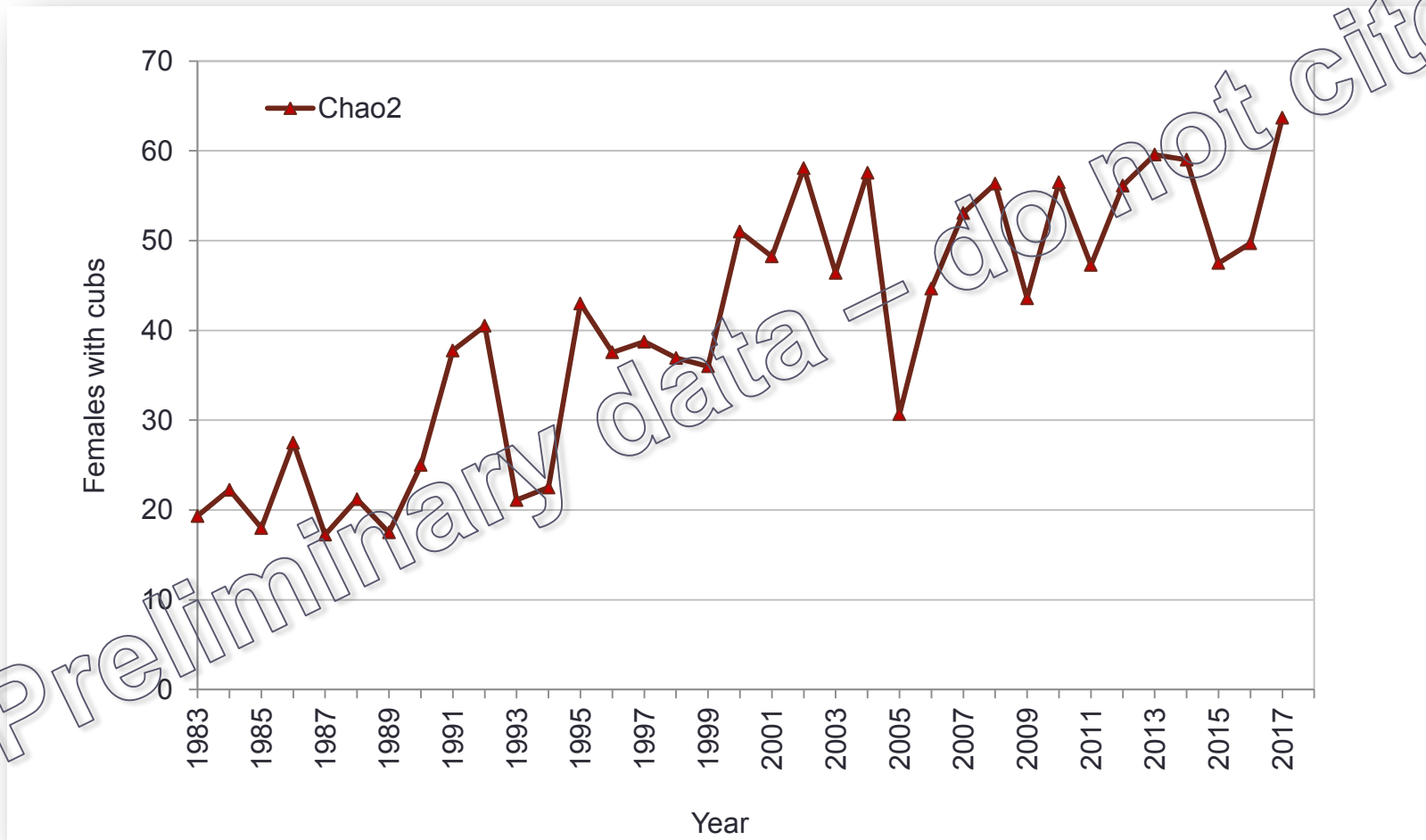

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Number of females with cubs 2017 (DMA only)

Parameter	Estimate
Unique females with cubs	57
Chao2	64
Model-averaged Chao2	57

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Bias in Chao2 estimator

Schwartz et al. (2008)
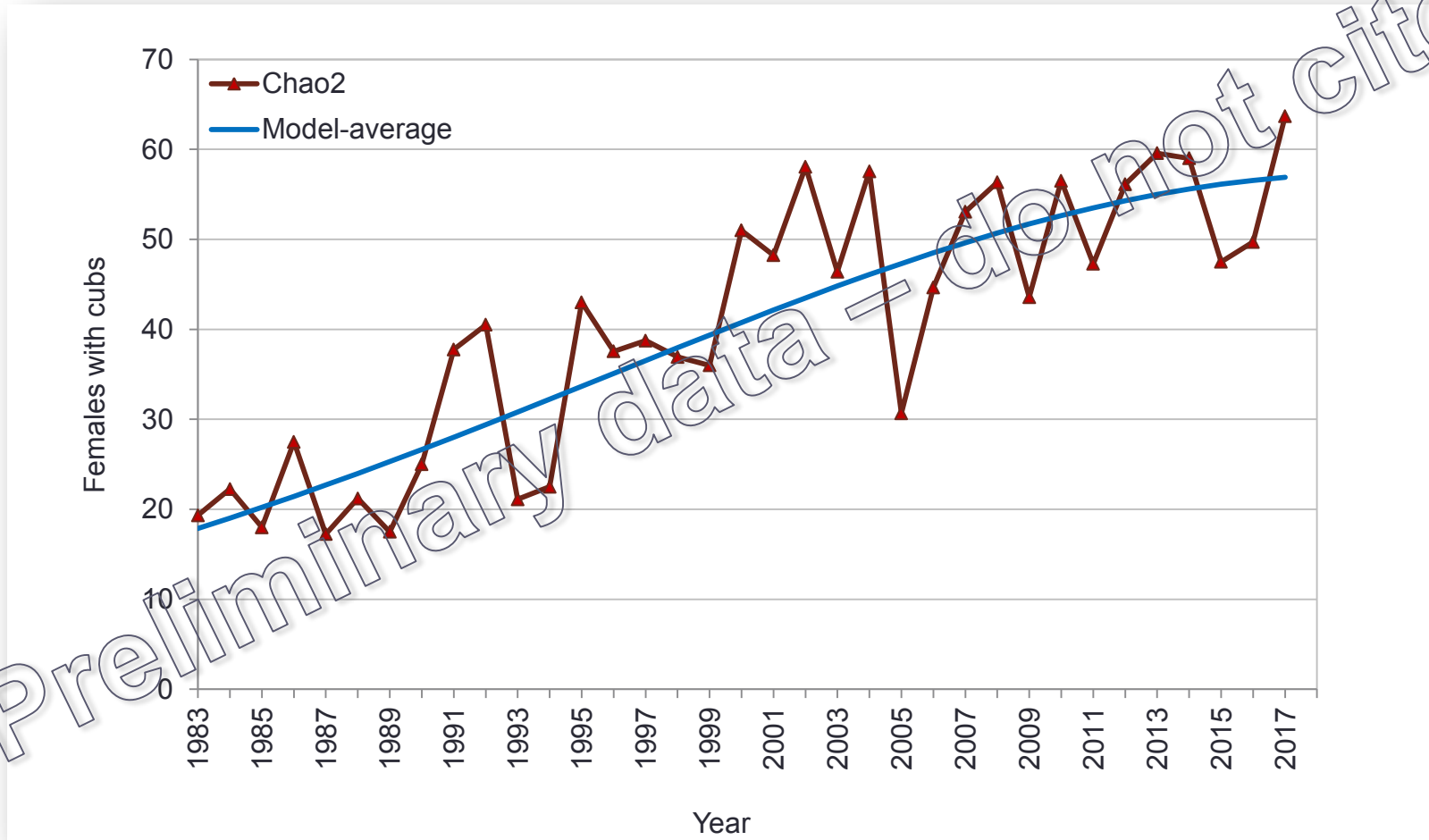
Annual estimates of females with cubs 1983-2017 (DMA only)

Trend in annual estimates of females with cubs 1983-2017 (DMA only)

Total population estimate (DMA only)

Derived from:

- Model-averaged Chao2 estimate of number of females with cubs

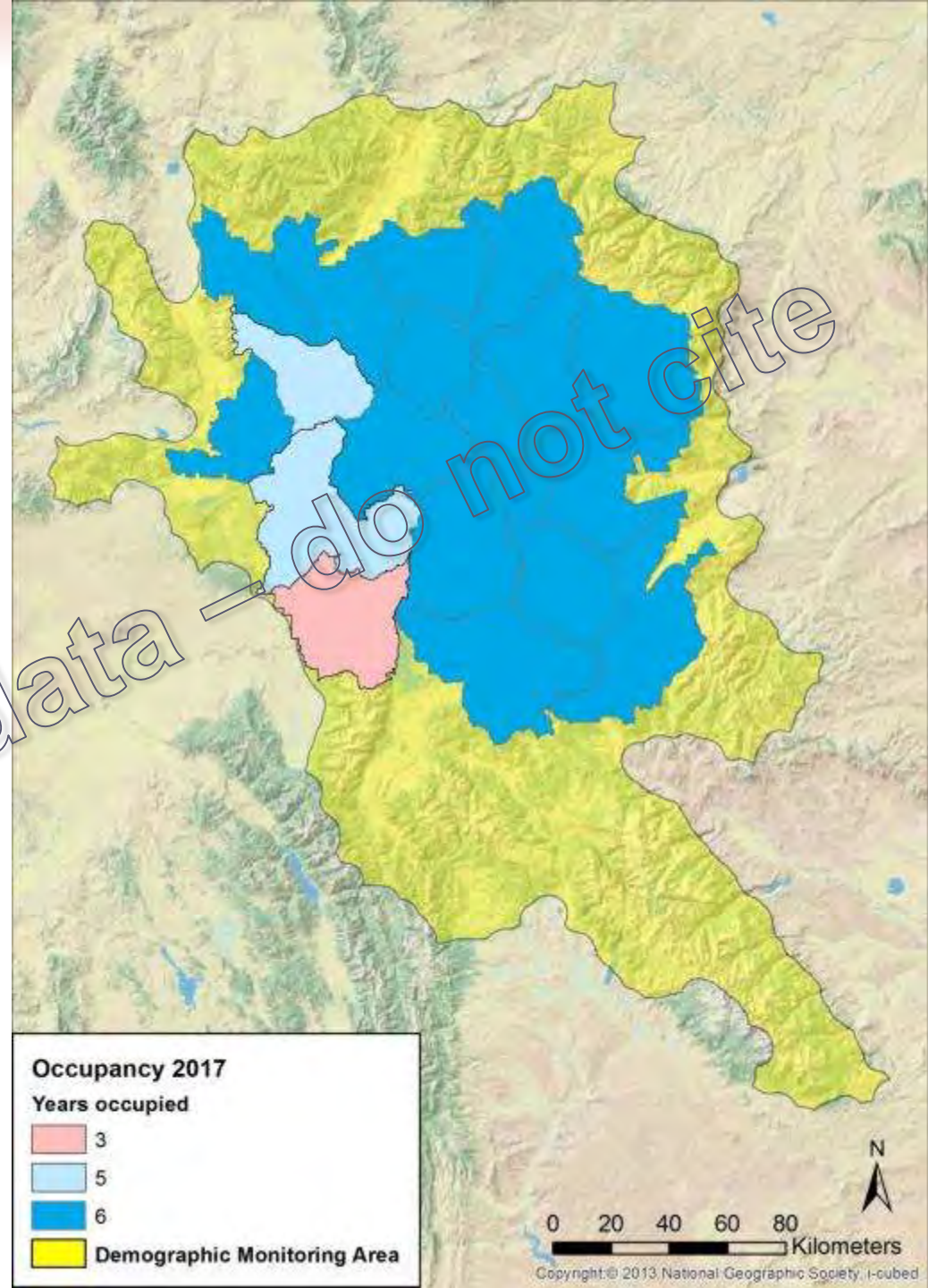- 2002-2011 vital rates and derived age structure to estimate population segments

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Total population estimate 2017 (Chao2 estimator; DMA only)

Population segment	Estimate
Independent females (≥2 yrs old)	250
Independent males (≥2 yrs old)	250
Dependent young (cubs and yearlings)	217
Total	718

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Occupancy by Females with Young

Occupancy by females with young (cubs, yearlings, or 2-year-olds) 2017

- 17 of 18 Bear Management Units (BMUs) occupied during 2017)

- 18 of 18 BMUs occupied at least 3 of last 6 years (2012-2017)

Occupancy 2017
Years occupied
- 3
- 5
- 6
- Demographic Monitoring Area

0 20 40 60 80 Kilometers

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Mortalities and Mortality Rates

Photo: J. Smith, D. Scott, MTFWP

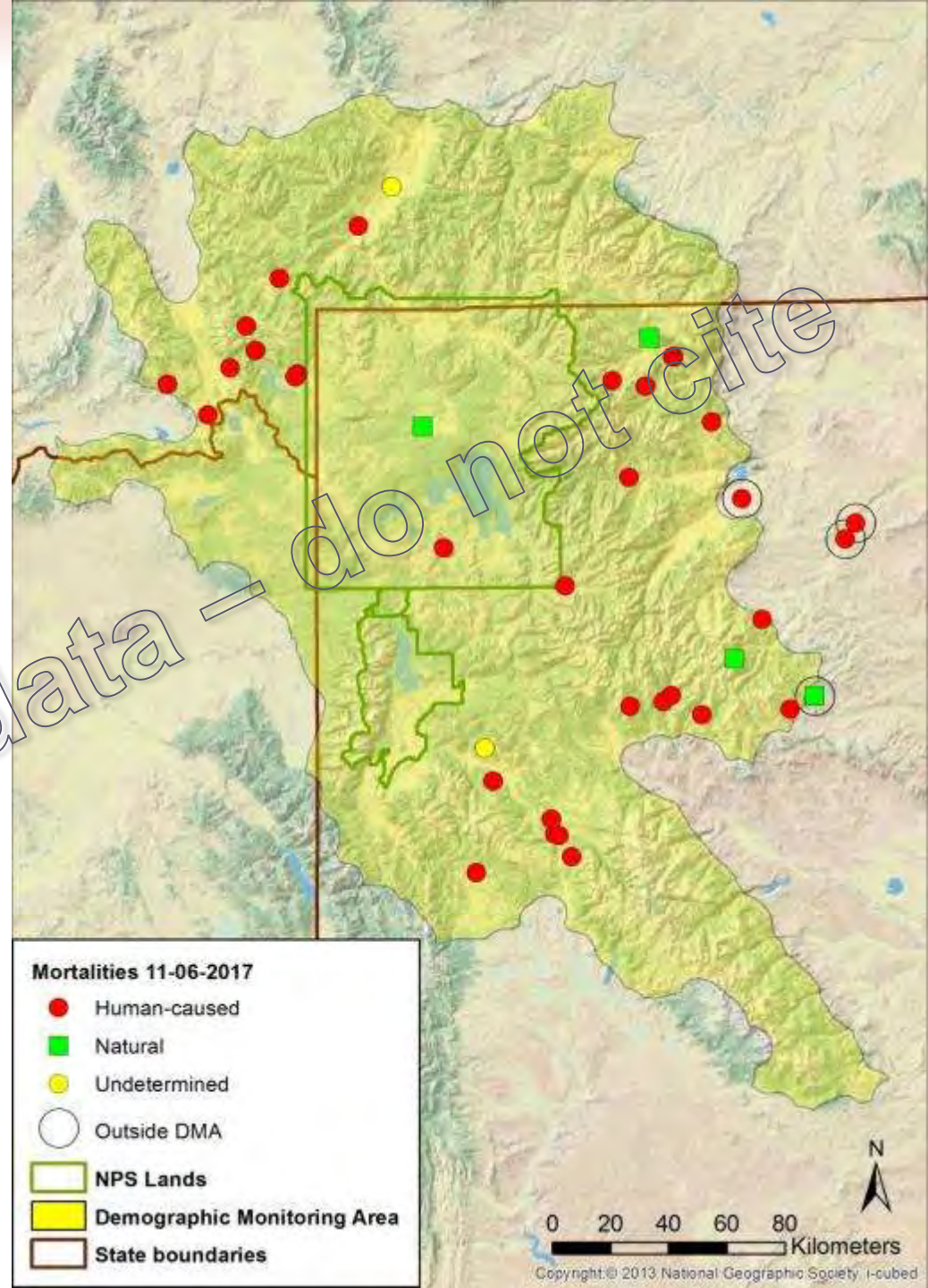# Known and probable mortalities 2017

- **46 in DMA**

  39 human-caused

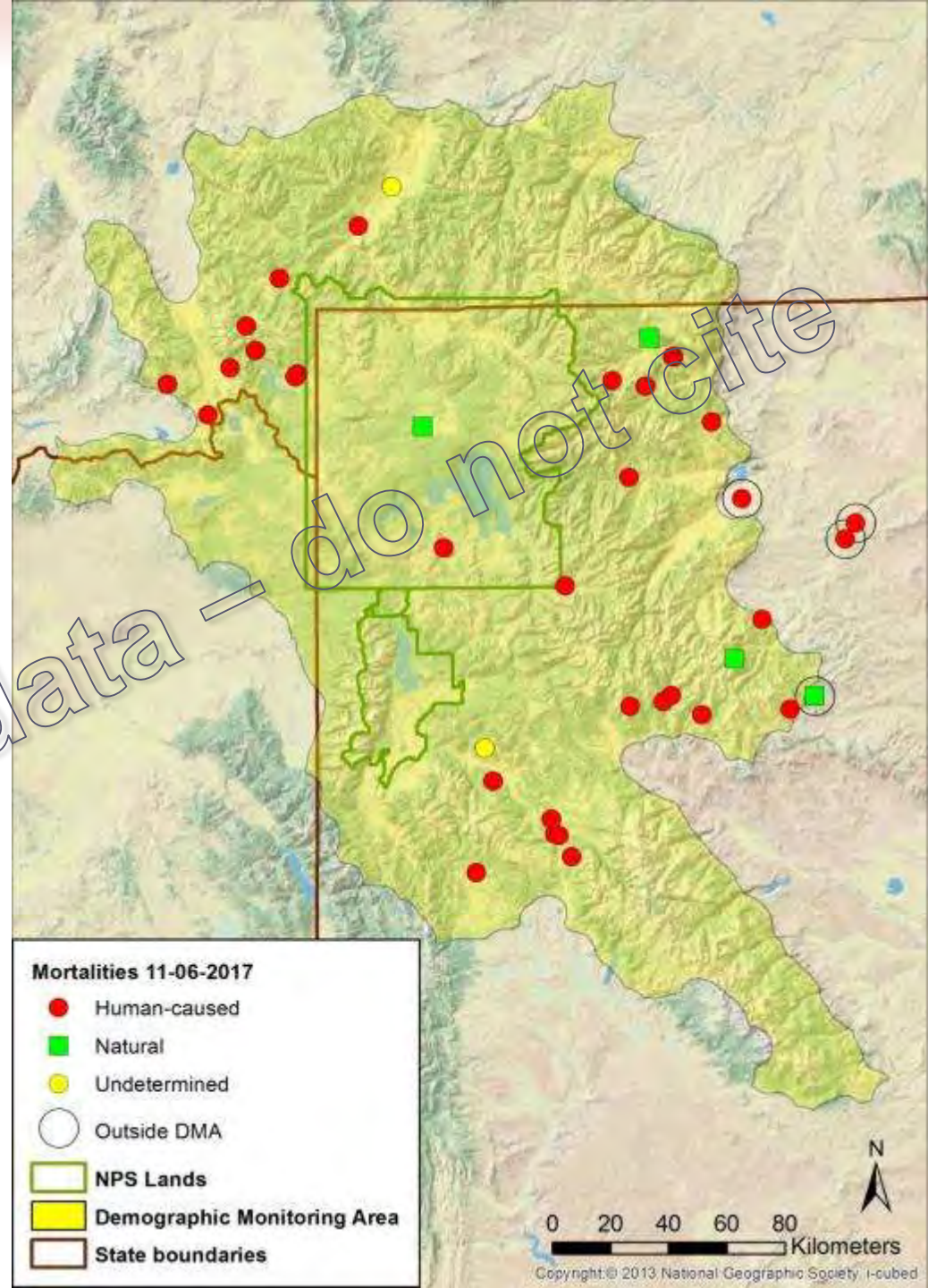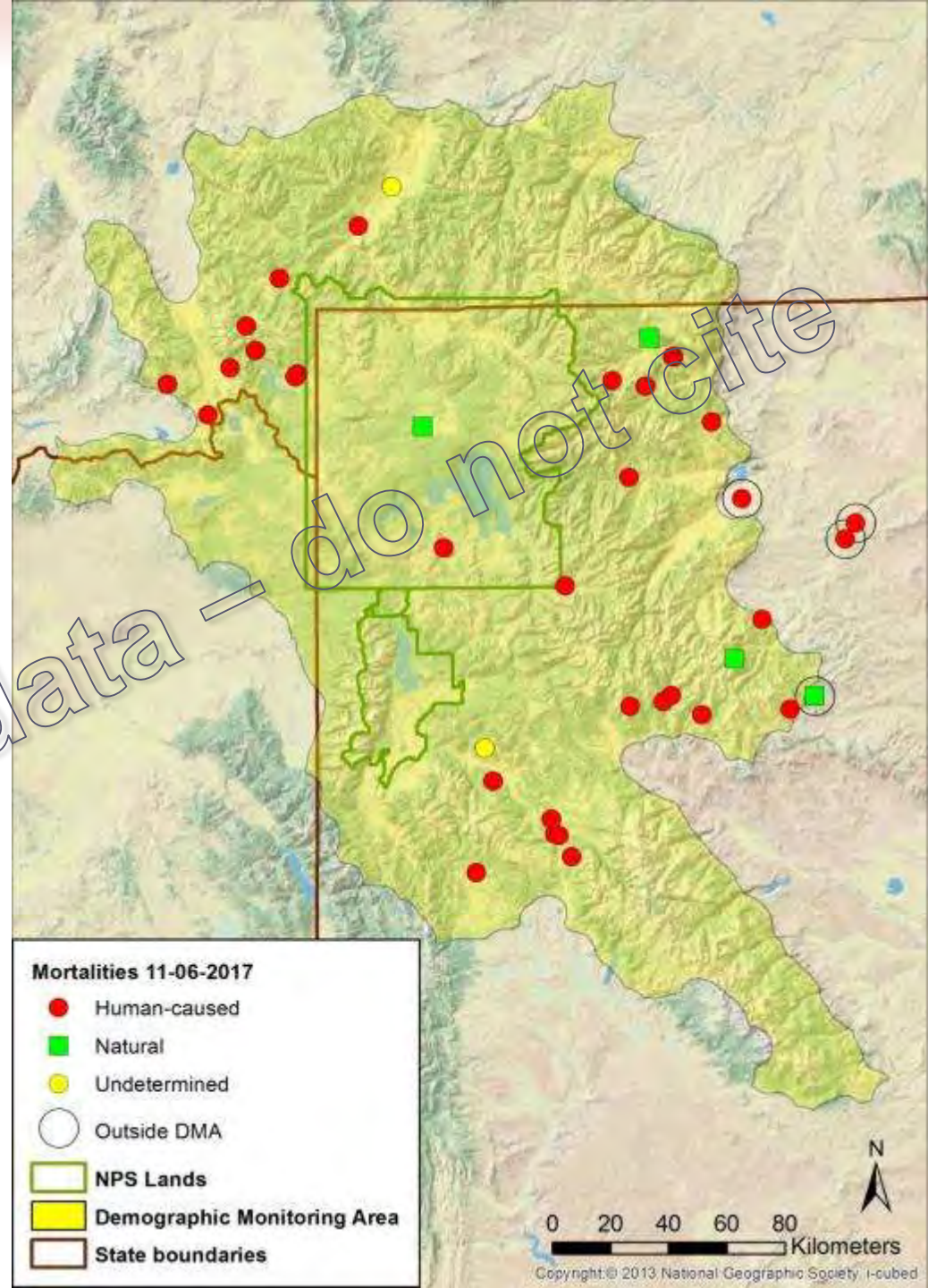 3 natural

  4 undetermined cause

Mortalities 11-06-2017
- ● Human-caused
- ■ Natural
- ● Undetermined
- ○ Outside DMA
- ☐ NPS Lands
- ☐ Demographic Monitoring Area
- ☐ State boundaries

Preliminary data – do not cite

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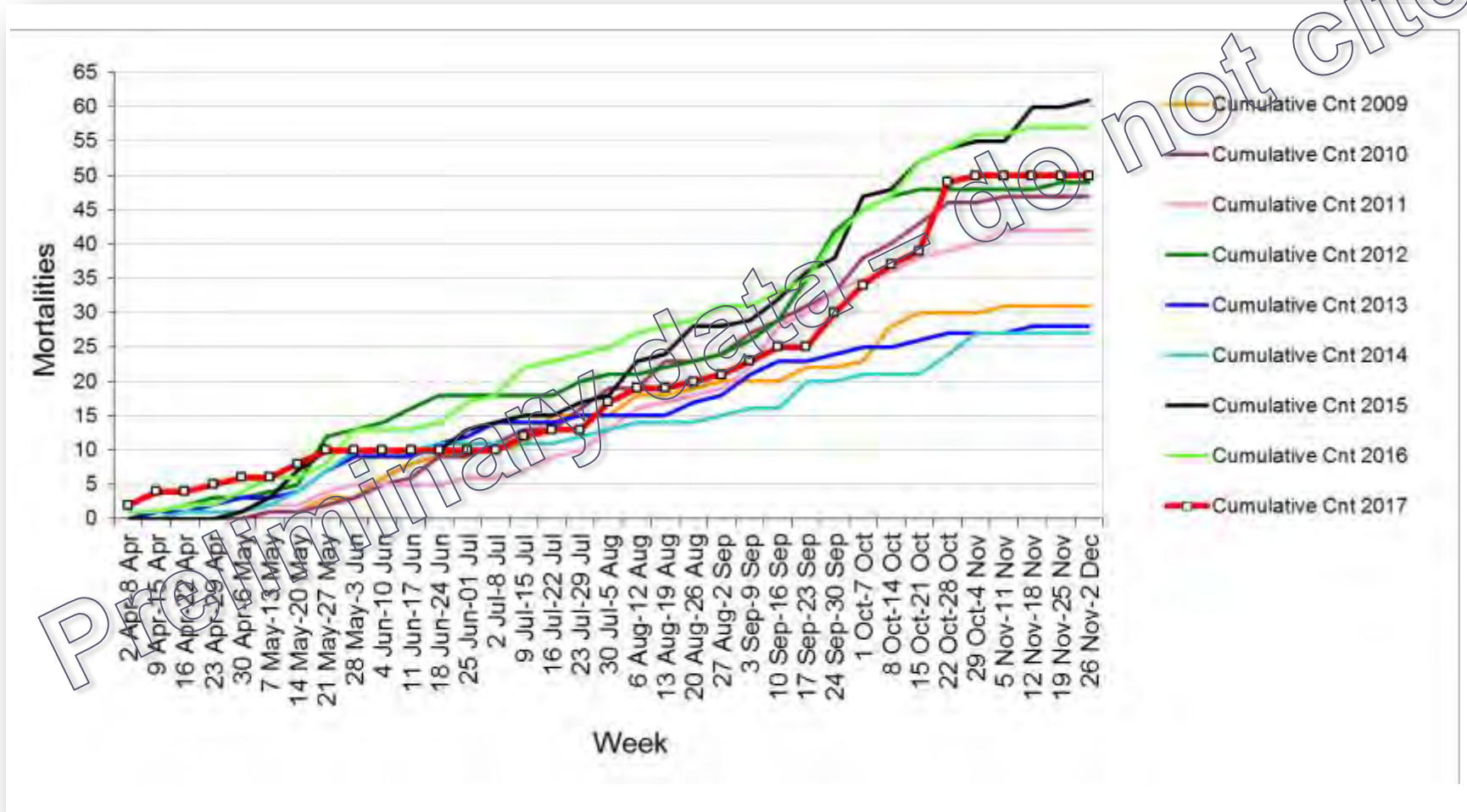# Known and probable mortalities 2017

- **46 in DMA**

  39 human-caused

  3 natural

  4 undetermined cause

- **4 outside DMA**

  3 human-caused

  1 natural

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Mortalities 11-06-2017

- ● Human-caused
- ■ Natural
- ● Undetermined
- ○ Outside DMA
- ☐ NPS Lands
- ☐ Demographic Monitoring Area
- ☐ State boundaries

0 20 40 60 80 Kilometers

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Known and probable mortalities 2017

- **46 in DMA**

  39 human-caused

  3 natural

  4 undetermined cause

- **4 outside DMA**

  3 human-caused

  1 natural

- **1 additional mortality**

  (skull found) likely died prior to 2015, sex unknown

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Preliminary data – do not cite

Mortalities 11-06-2017

- 🔴 Human-caused
- 🟩 Natural
- 🟡 Undetermined
- ⭕ Outside DMA
- ☐ NPS Lands
- ☐ Demographic Monitoring Area
- ☐ State boundaries

0 20 40 60 80 Kilometers

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Cumulative counts of known and probable mortalities by week 2009-2017

Known and probable mortalities by area, sex, and age class 2017

| Area | Sex | Age class | | |
		Dependent (<2 years old)	Independent (≥2 years old)	Total
Inside DMA	Female	0	11	11
	Male	3	20	23
	Unknown	12	0	12
	Total	15	31	46
Outside DMA	Female	0	2	2
	Male	0	2	2
	Unknown	0	0	0
	Total	0	4	4

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Mortality thresholds (2016 Conservation Strategy, Table 2)

	Total Grizzly Bear Population Estimate*		
	≤674	675–747	>747
Total mortality rate for independent **FEMALES**.	<7.6%	9%	10%
Total mortality rate for independent **MALES**.	15%	20%	22%
Total mortality rate for dependent young.	<7.6%	9%	10%

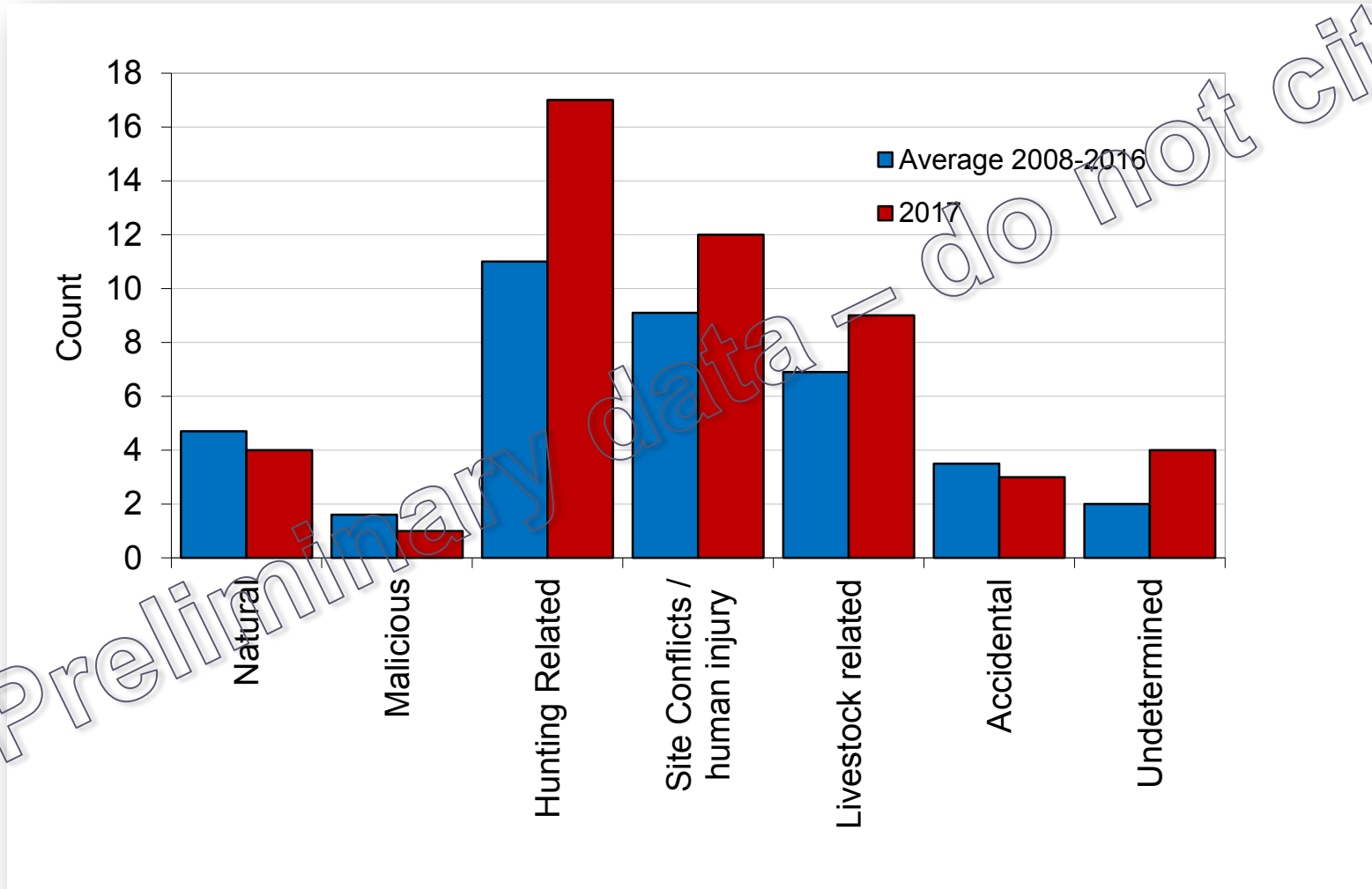# Estimated percent mortality for population segments (DMA only)

Population segment	Estimated N	Documented mortality	Estimated total mortality [a]	Estimate % mortality
Independent aged females (≥2yrs old)	250	11	20	8.0
Independent aged males (≥2yrs old)	250	20	33	13.2
Dependent young (<2yrs old)	217	12		5.5[b]

[a] Unknown/Unreported estimate is not applied to loss of dependent young

[b] Estimated from documented human-caused mortalities only

Preliminary data – do not cite

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Number of mortalities by cause for 2008-2016 (average) and 2017
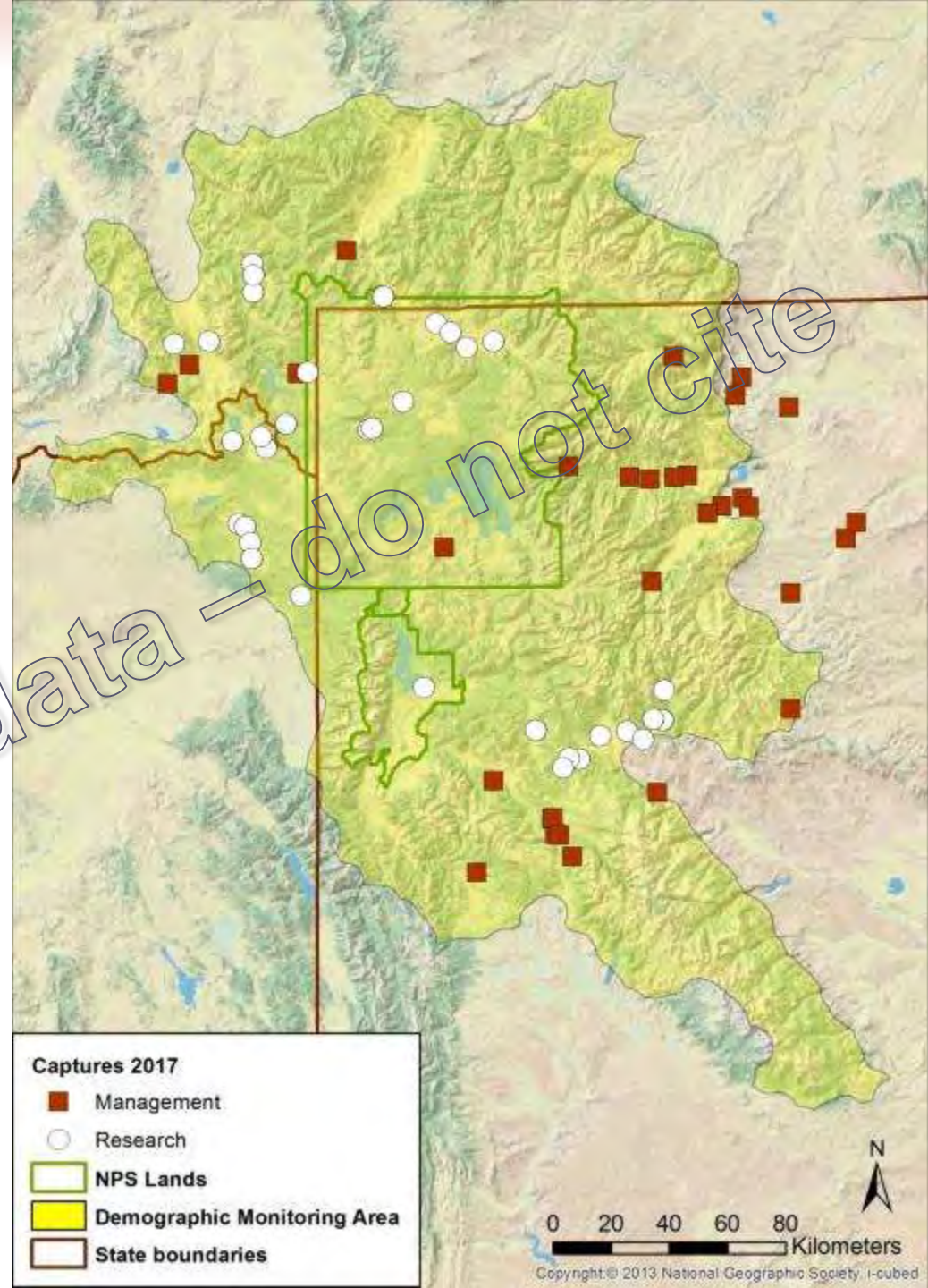
Known and probable mortality from vehicle strikes 2001–2017
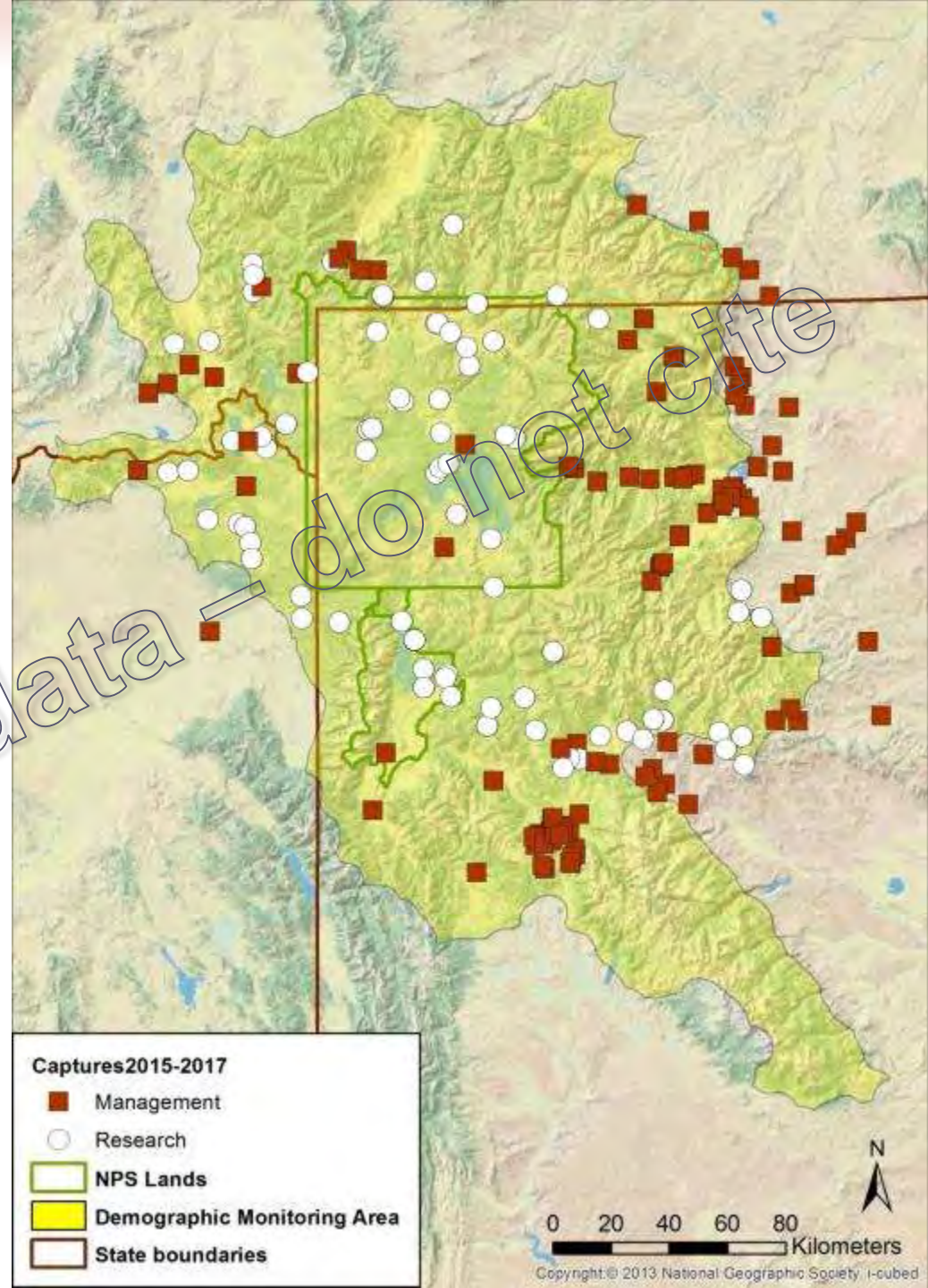
Captures and Known-Fate Monitoring

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Photo: IGBST Remote

Grizzly bear captures 2017

- **Total captures = 98**

  Research = 61

  Management = 37

- **Individuals bears = 86**

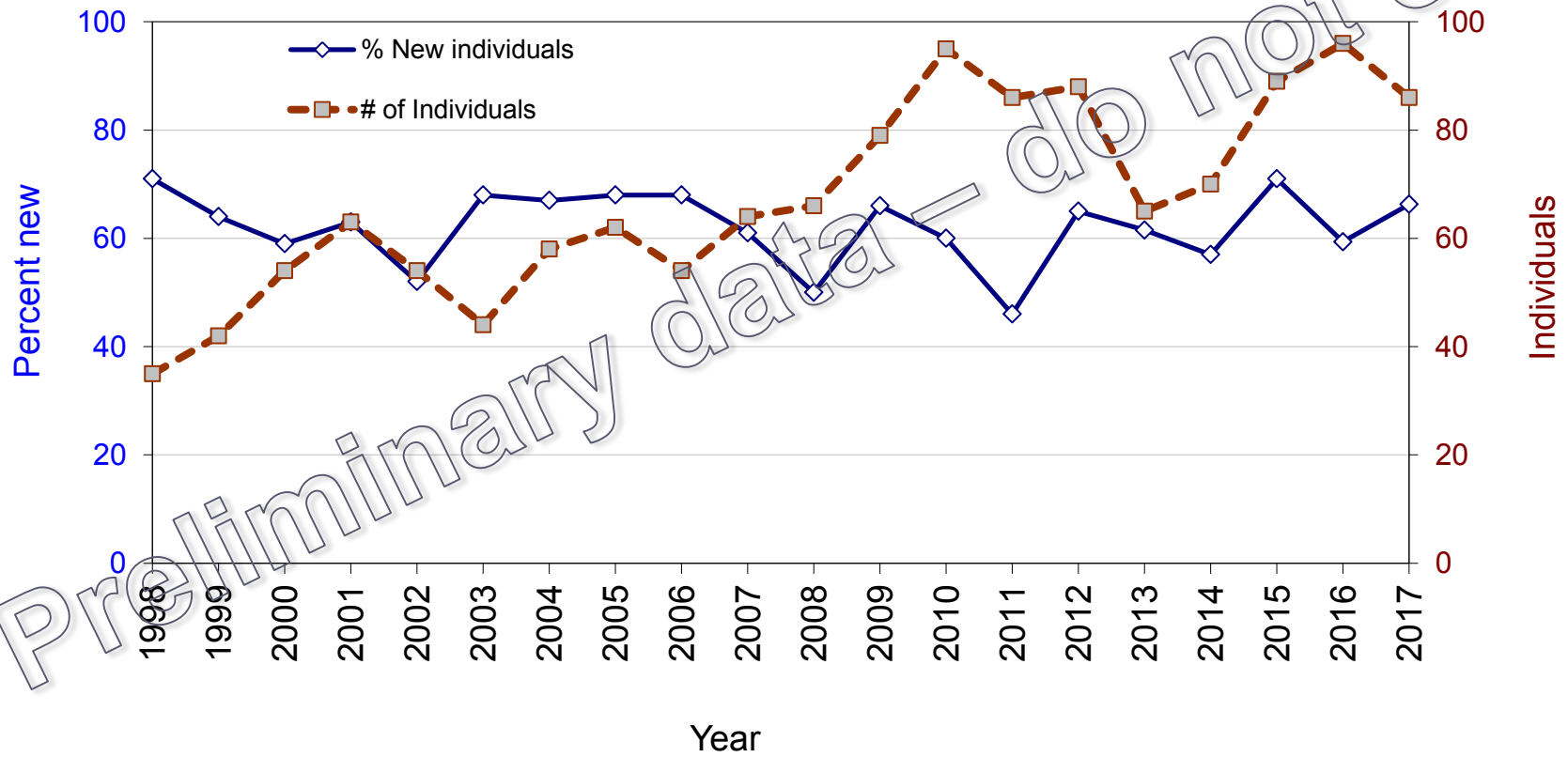 Females = 26

  Males = 54

  Unknown = 6

- **New bears = 57**

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Captures 2017

- Management
- Research
- NPS Lands
- Demographic Monitoring Area
- State boundaries

0 20 40 60 80
Kilometers

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Grizzly bear captures 2015-2017

- **Total captures = 312**

  Research = 154

  Management = 158

- **Individuals bears = 235**

  Females = 79

  Males = 156

Captures2015-2017
- Management
- Research
- NPS Lands
- Demographic Monitoring Area
- State boundaries

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Number of individuals and percent new captures 1998–2017

Grizzly bears radio-monitored 2017

Total monitored = 112

Adult females = 38

Current = 59

Females = 37

Males = 22

Bears missing = 2

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Telemetry 2015-2017
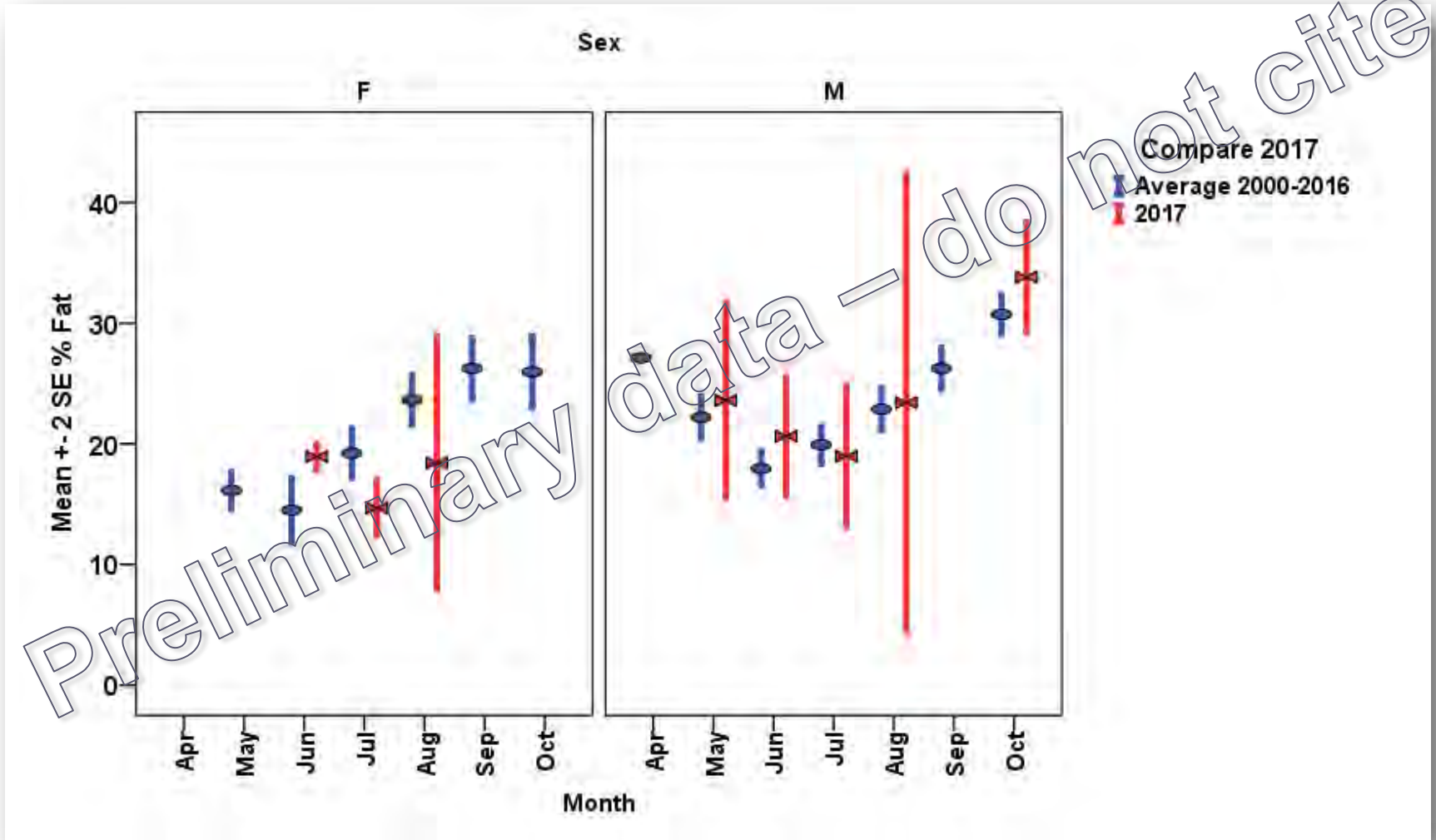
VHF

Individuals bears = 161

VHF locations ≈ 2,600

GPS

Individual bears = 60

Iridium GPS locations more than 172,000

Legend:
- VHF Locations 2015-2017
- Iridium GPS locations 2015-2017
- NPS Lands
- Demographic Monitoring Area
- State boundaries

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Body Condition and Genetic Monitoring

Average % body fat by month, 2000–2016 vs. 2017

Genetic monitoring

- Results through 2016

- **1053** individuals genotyped (20 microsatellite markers)

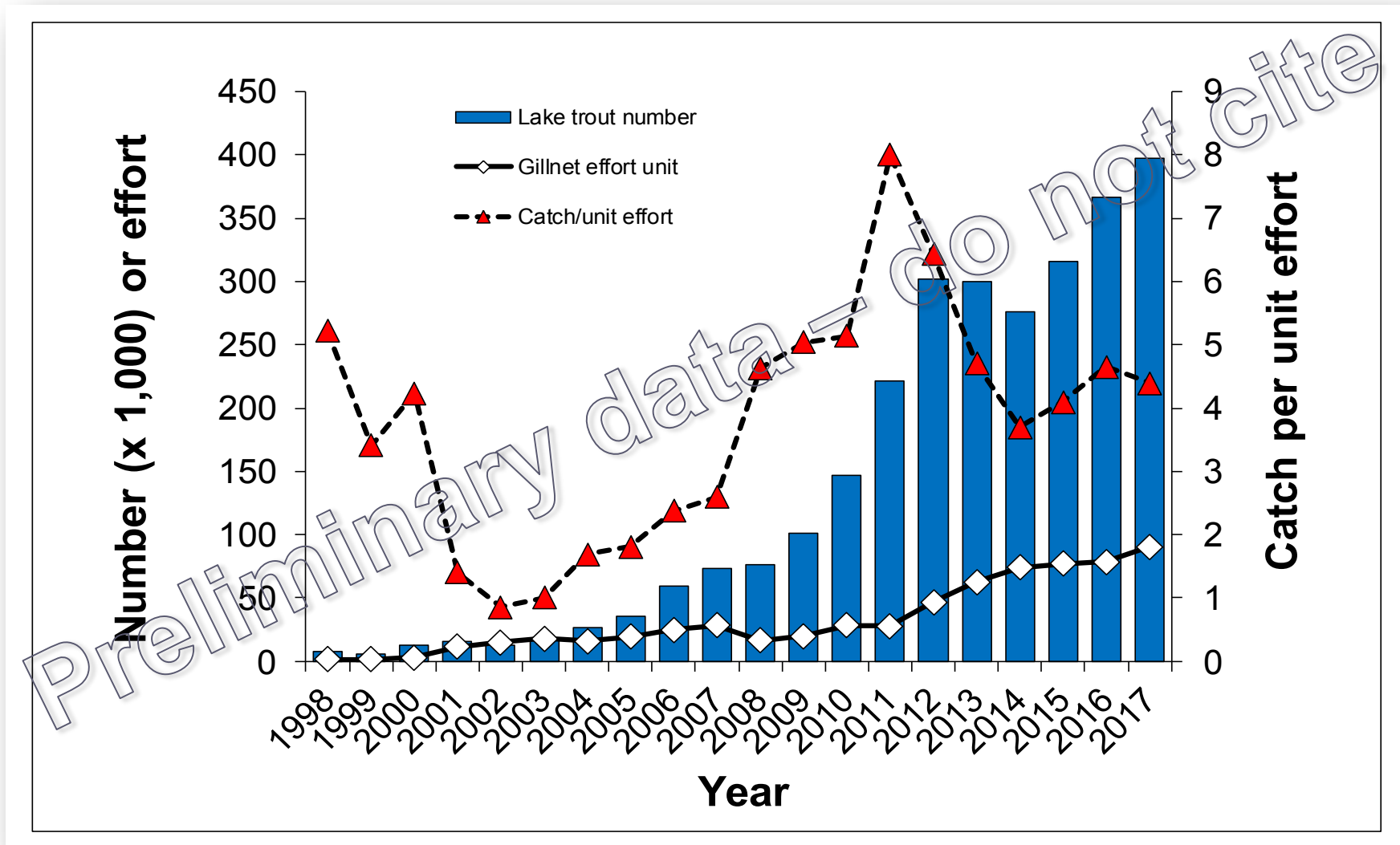- No evidence of non-GYE ancestry in any of the individuals genotyped to date

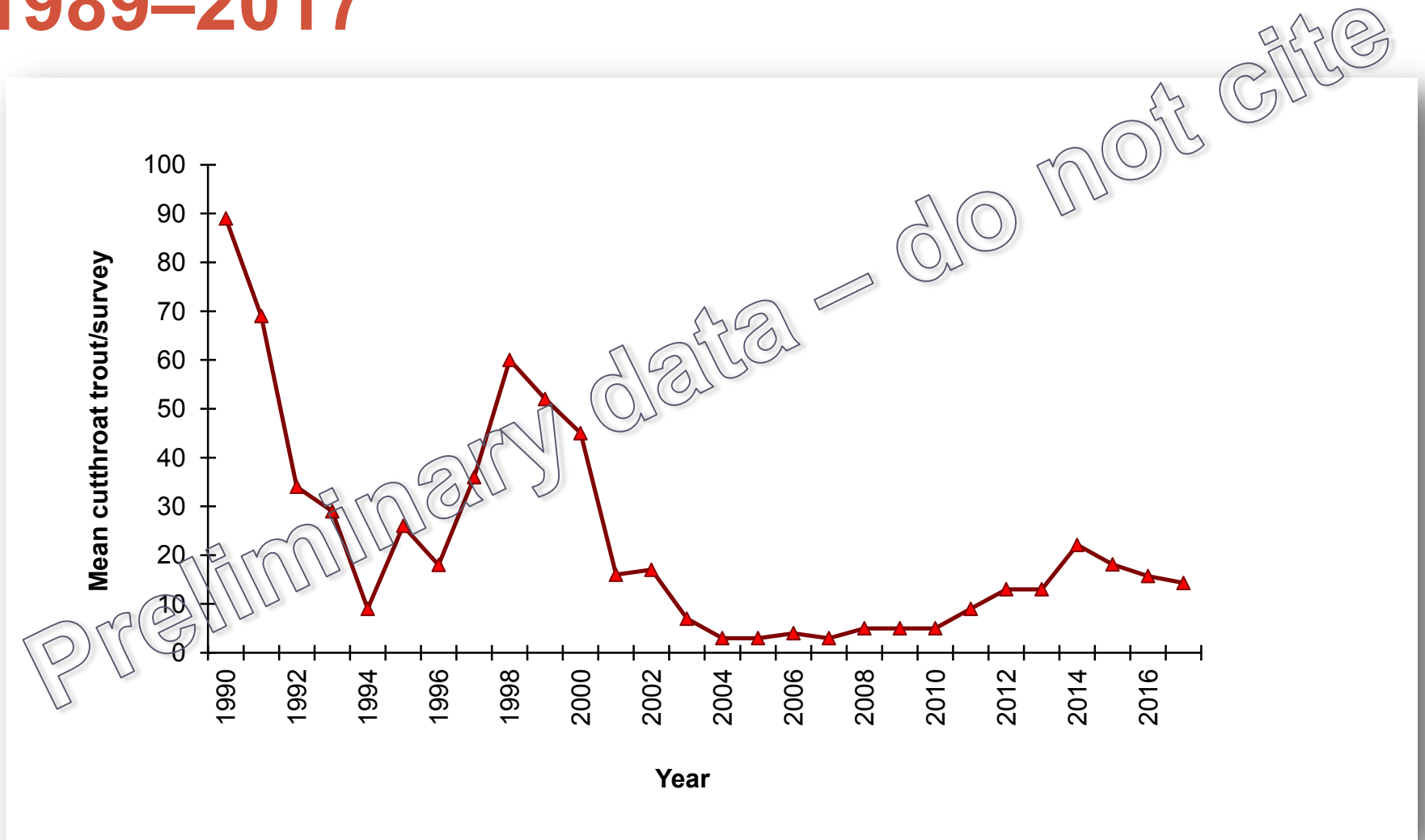

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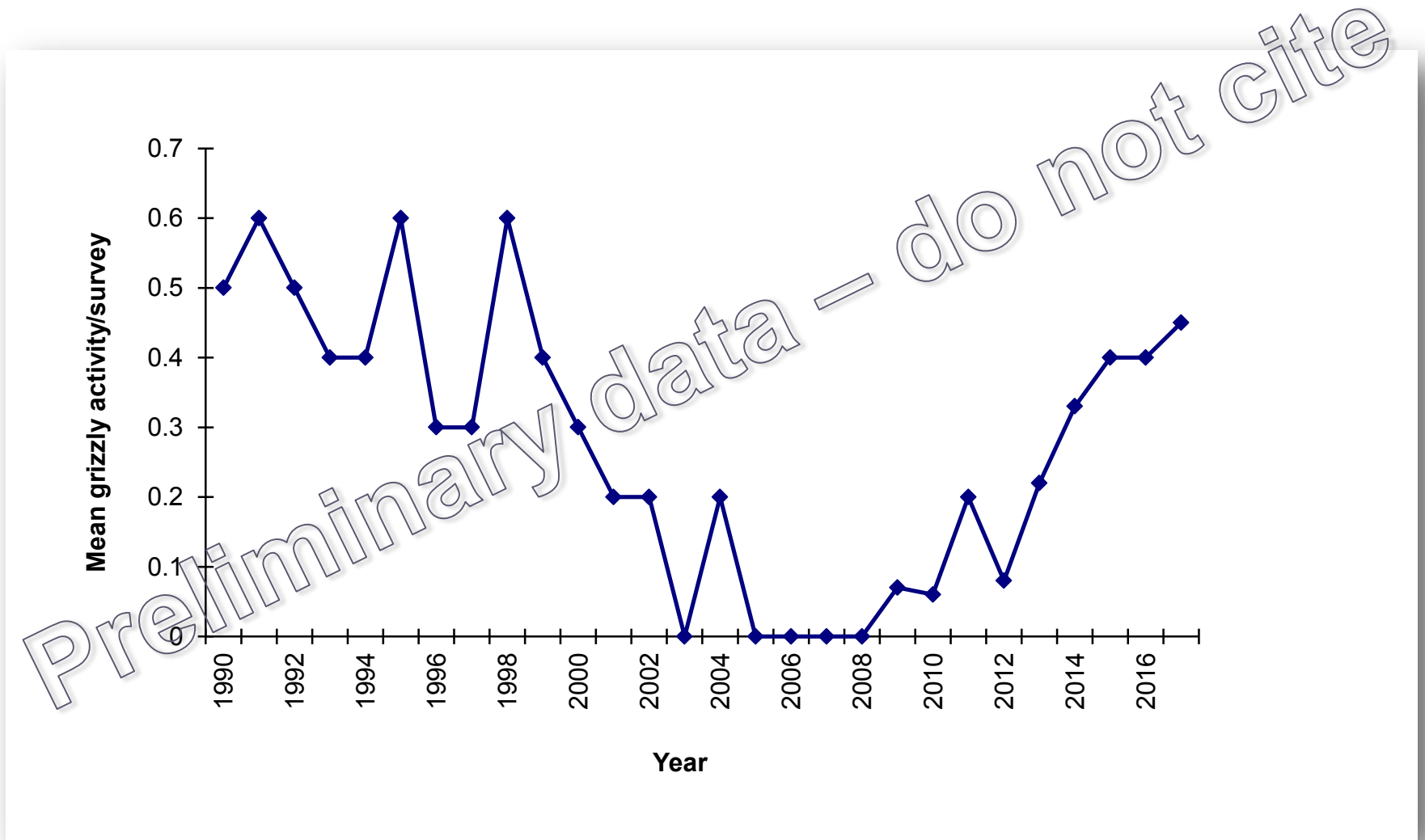# Genetic clustering based on 20 microsatellite markers

Food Monitoring

Lake trout removal on Yellowstone Lake, 1998–2017

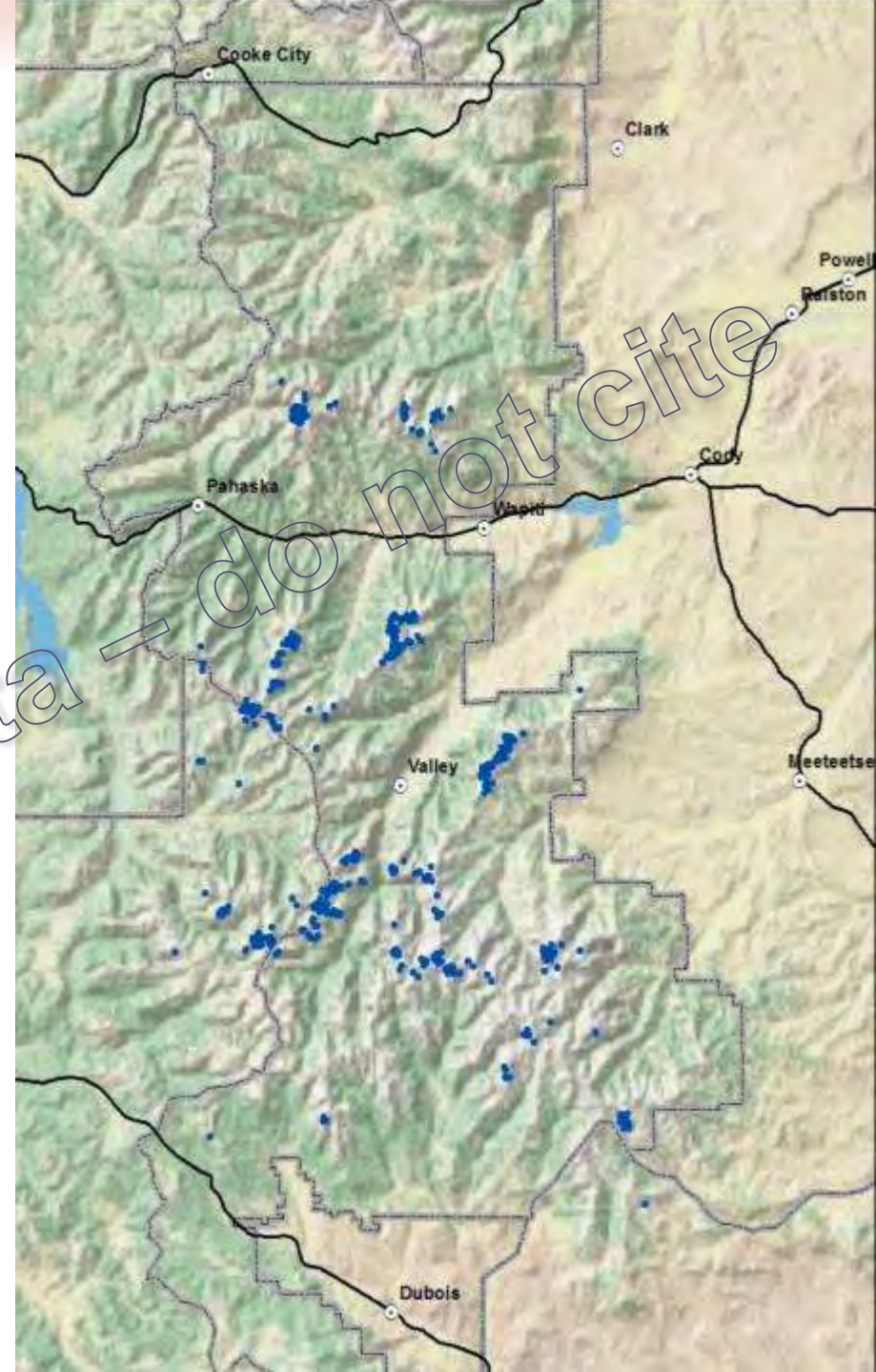# Spawning cutthroat trout activity on front-country tributary streams 1989–2017

Grizzly bear activity on front-country tributary streams 1989–2017

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Army cutworm moths

- **31 confirmed sites**
  Multiple observations of bears feeding during more than 1 year

- **14 possible sites**
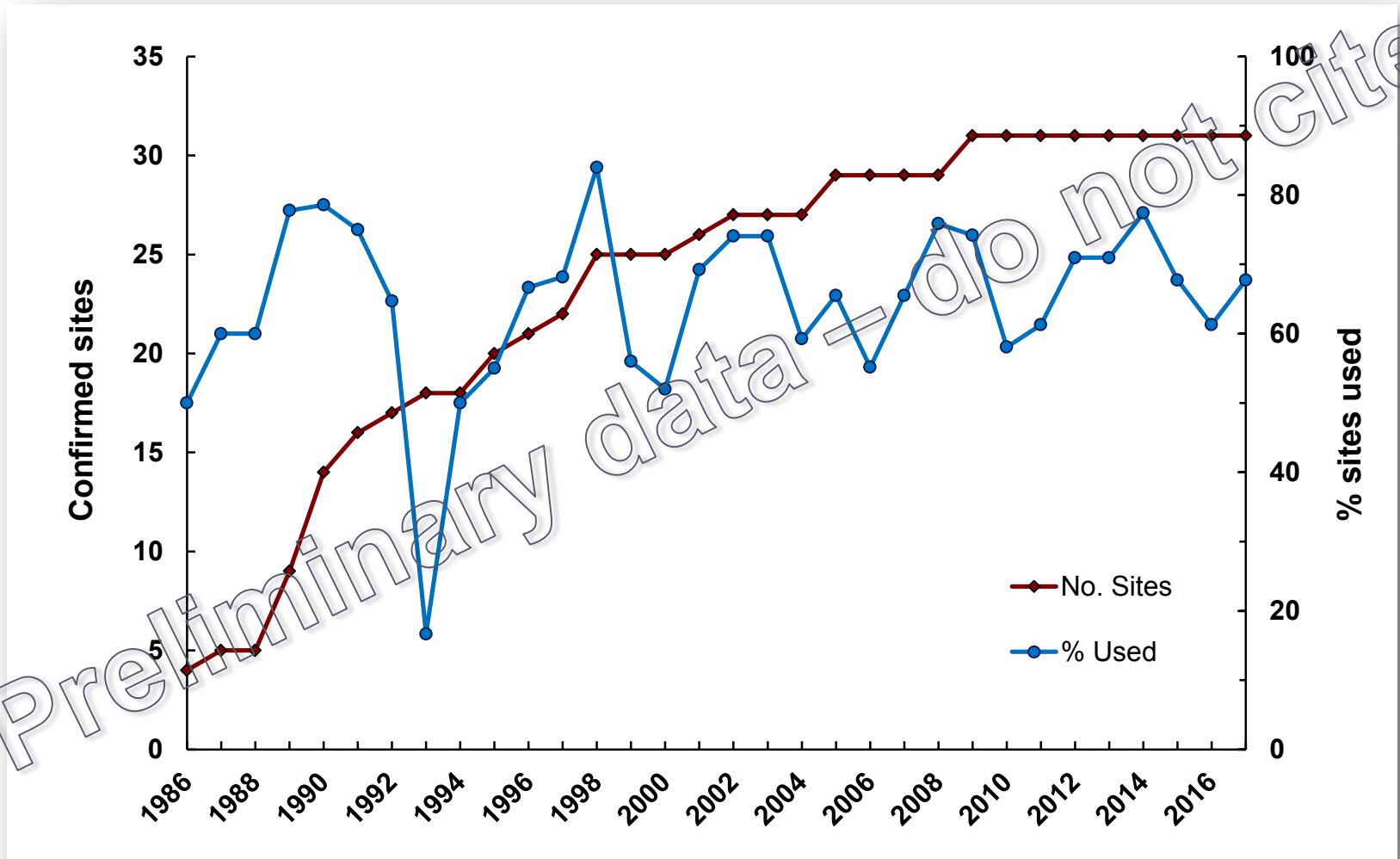 Single observation of bear(s) feeding

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Army cutworm moths 2017

- 438 grizzly bears

- 21 of the 45 sites

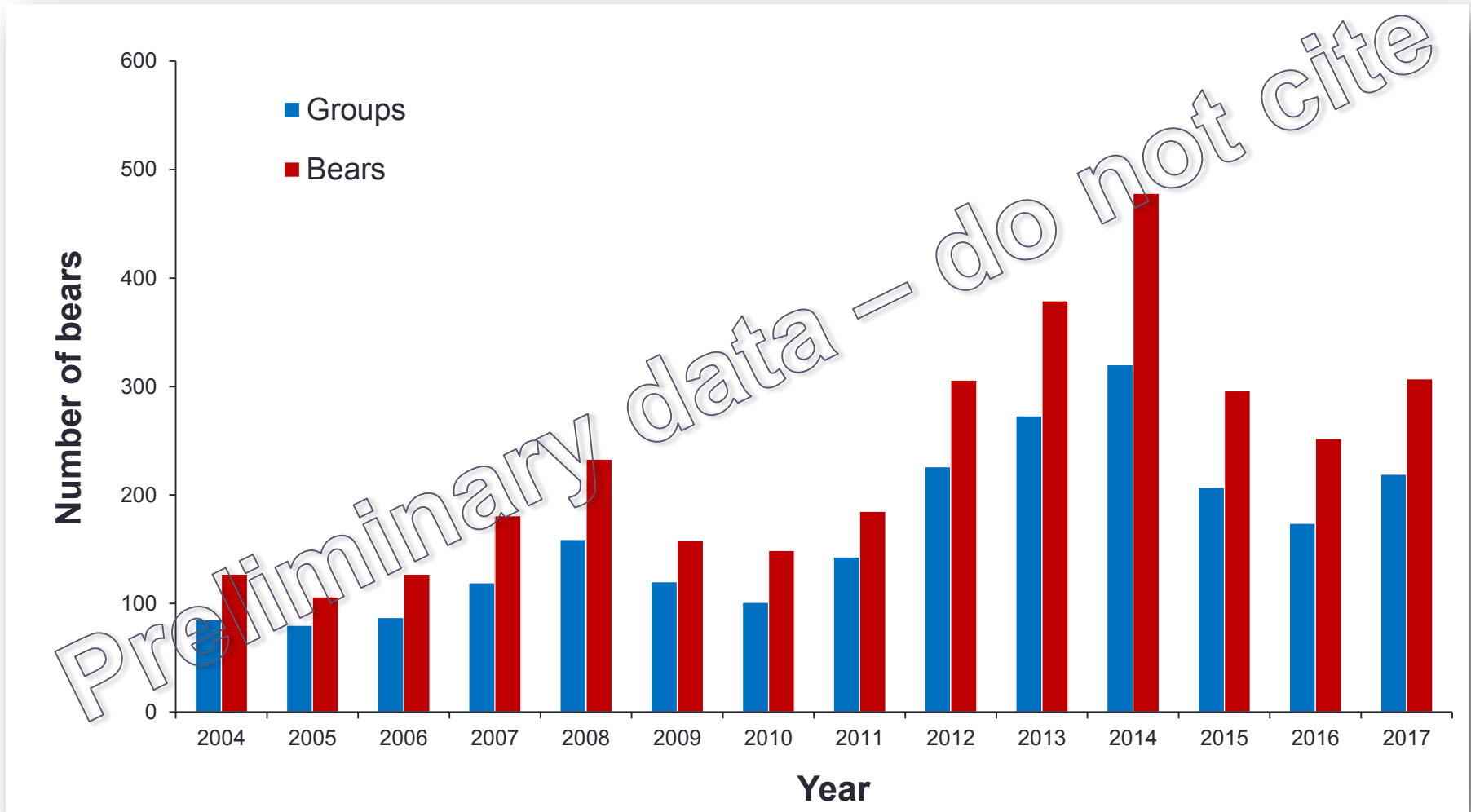- 12 of 58 initial observations of unique females with cubs (21%)

Preliminary data – do not cite

Photo: Josh Westerhold

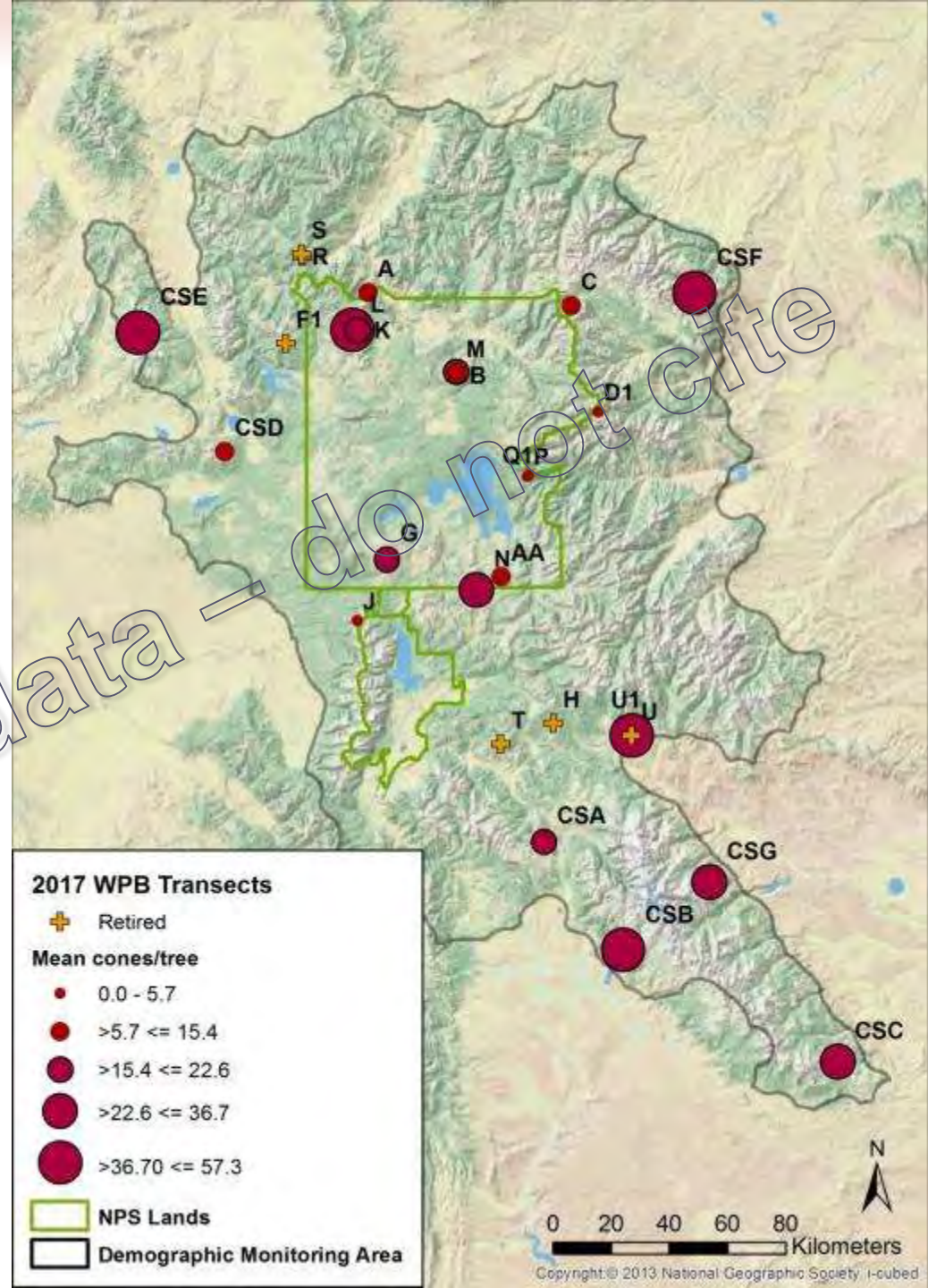# Confirmed moth sites and percent used 1986–2017

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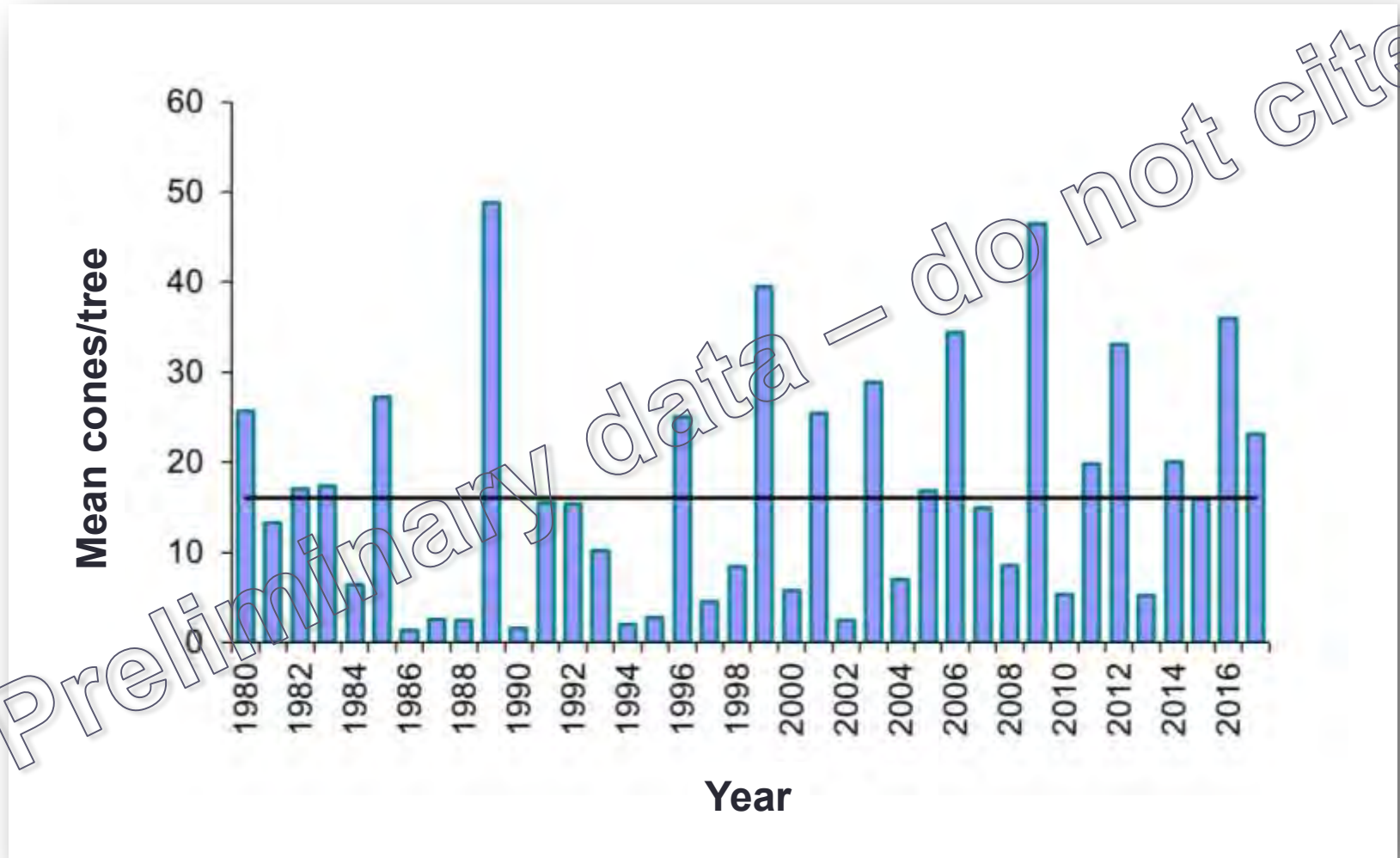# Grizzly bear sightings on moth sites observation flights 2004–2017

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Whitebark pine transects 2017

- 21 transects

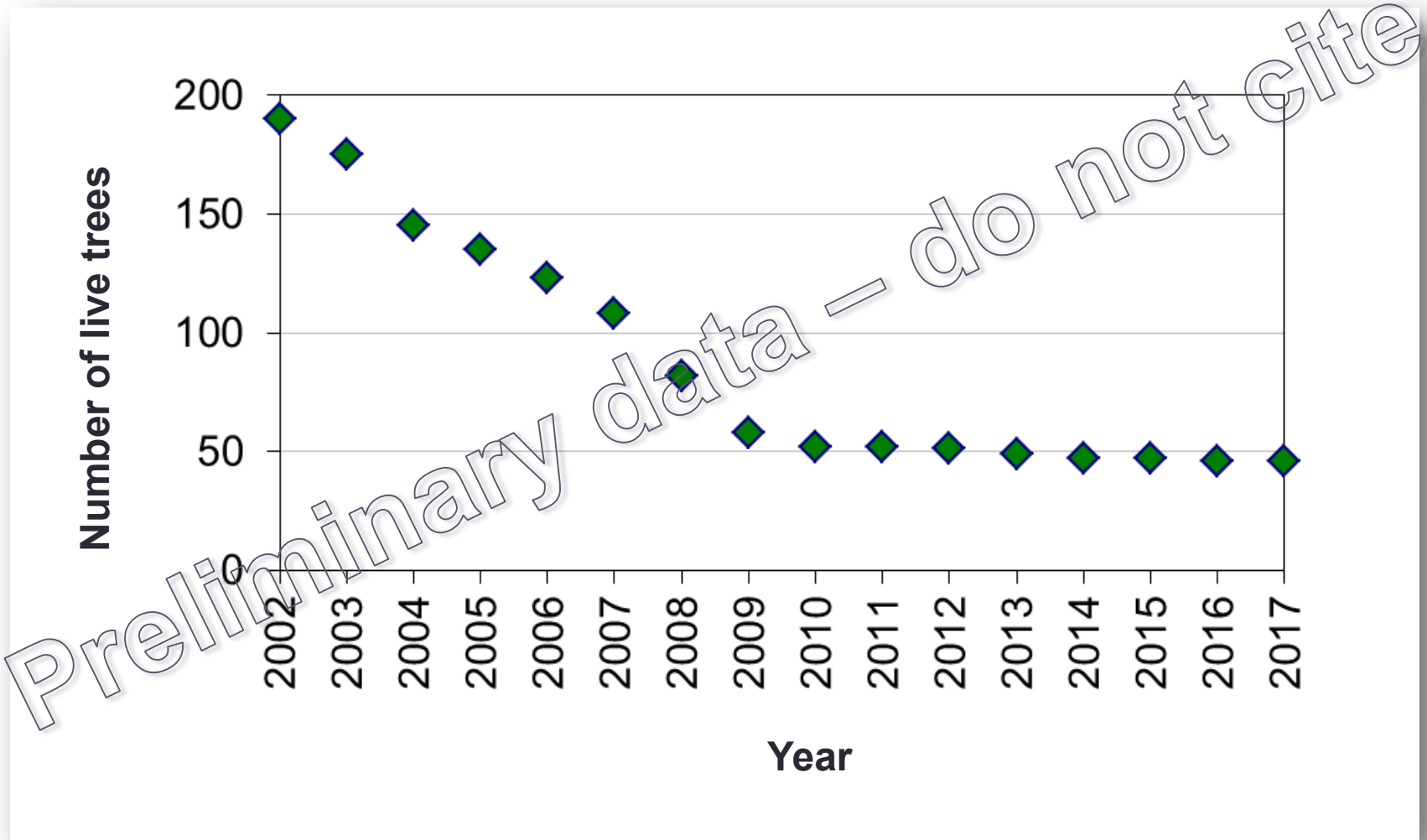- 185 trees surveyed

- Average no. of cones/tree = 23.1

Preliminary data – do not cite

2017 WPB Transects

✛ Retired

Mean cones/tree
- • 0.0 - 5.7
- ● >5.7 <= 15.4
- ⬤ >15.4 <= 22.6
- ⬤ >22.6 <= 36.7
- ⬤ >36.70 <= 57.3

▭ NPS Lands
▭ Demographic Monitoring Area

0 20 40 60 80 Kilometers

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Whitebark pine cone production 1980–2017

Whitebark pine tree mortality on cone production transects 2002–2017

Summary

- **Population**
  - High count for females with cubs (n = 58)
  - Population estimate = 718
  - Relatively constant since early 2000s
  - No evidence of bears leaving core of ecosystem
- **Mortality**
  - Only 8% of mortalities occurred outside the DMA
  - Primary causes inside DMA: hunting related, livestock, and site conflicts
  - 2017 mortality rates in DMA
    - Within thresholds for independent females (8%)
    - Within thresholds for independent males (13%)
- **Year of relatively good food supply**
  - Good berry production
  - Average whitebark pine cone production

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Annual Reports, data, maps, and other products available at IGBST website

Google "IGBST"

Photo: Craig Whitman

Acknowledgments 2017

- IDFG: C. Anderson, P. Atwood, J. Beer, C. Bleke, J. Brower, L. Cepenzski, D. Cureton, J. Farr, K. Garrett, K. Guy, C. Hendricks, R. Howe, C. Johnson, L. Lane, G. Losinski, A. McKarley, J. Nicholson, T. Nicholson, M. Pieron, R. Poole, M. Proett, J. Rydalch, J. White

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- NPS: N. Adams, K. Atkins, B. Bennett, J. Bennett, D. Bergum, N. Bowersock, E. Boyd, S. Consolo-Murphy, R. Coscarelli, S. Dewey, C. Flaherty, G. Grieco, K. Gunther, D. Gustine, A. Hanna, K. Harrigan, D. Harris, S. Hegg, B. Helms, D. Houck, J. Jakicic, E. Johnston, P. Kirchner, M. Landry, C. Liesen, S. Mayberry, J. Mills, J. Mohr, E. Reinertson, M. Renteria, T. Ritter, A. Rodriguez, J. Roper, W. Scherer, D. Schneider, J. Schwabedissen, D. Stahler, P. Stalker, J. Stephenson, S. Stewart, K. Szcodronski, L. Templin, J. Warren, G. White, K. Wilmot, G. Wilson, M. Wrigley, T. Wyman

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- USFWS: S. Becker, L. Connell, S. Conrad, H. Cooley, J. Fortin-Noreus, P. Hnilicka, M. Mazur, S. Stoinski

- USGS: C. Dickinson, M. Ebinger, M. Haroldson, B. Karabensh, M. Kurzen, F. van Manen, V. Villalobos, C. Whitman

- WS: C. Hoover, G. McDougal, M. Foster, K. Meidtke, R. Merrell

- WGFD: G. Anderson, C. Atkinson, K. Bales, B. Baker, D. Bjornlie, M. Boyce, J. Clapp, A. Courtemanch, Crane, B. Debolt, L. Ellsbury, Gerharter, P. Gerrity, M. Gocke, Z. Gregory, H. Haley, Hunter, R. Kindermann, J. Kraft, B. Kroger, K. Lash, D. Lasseter, D. Lemon, S. Lockwood, D. McWhirter, K. Mills, T. Mong, P. Quick, Richins, Ryder, Sculloch, J. Stephens, S. Stephens, S. Stewart, D. Thompson, Z. Turnbull, J. Winter, Wood

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