Monitoring Sage-Grouse Populations

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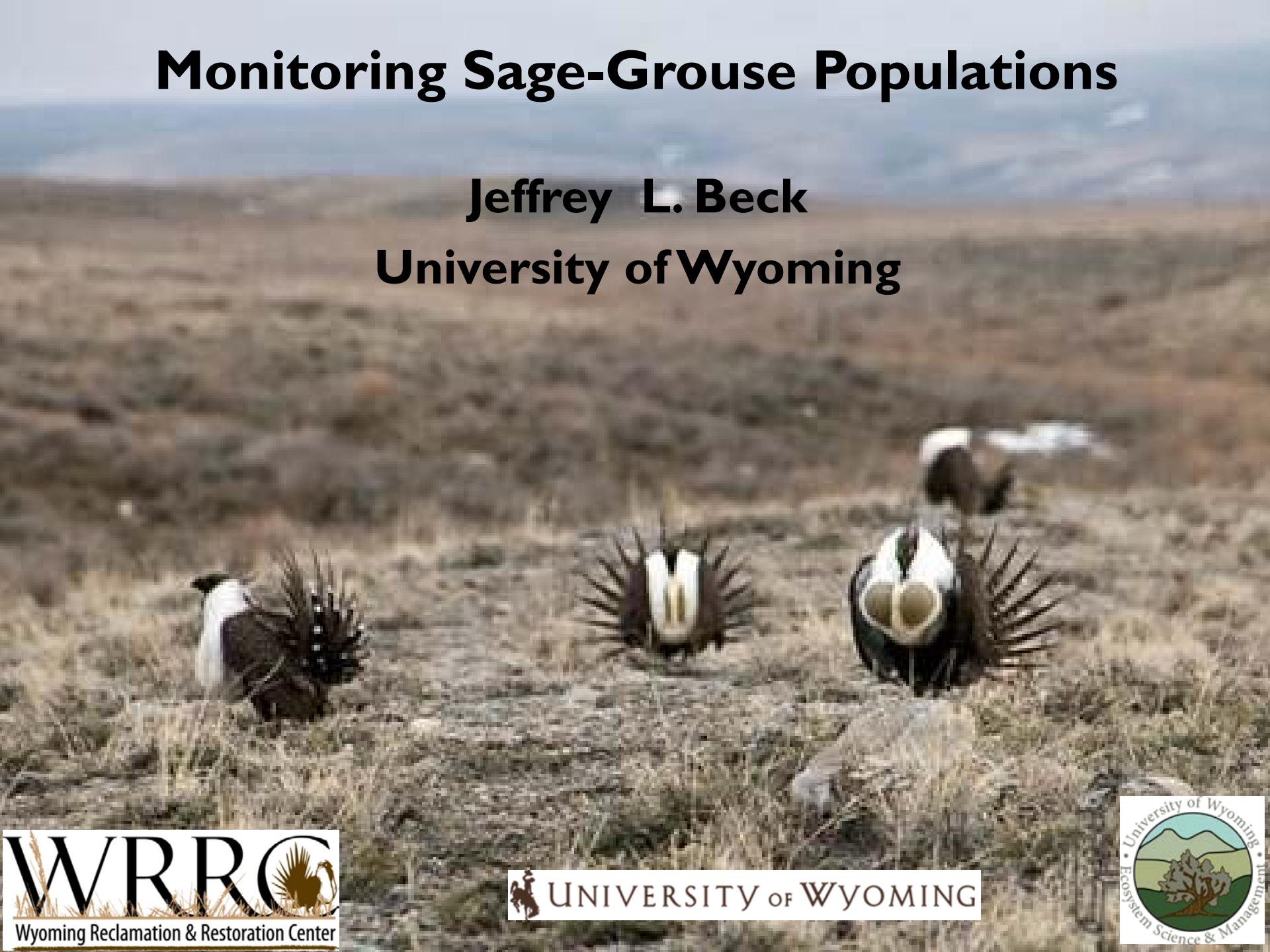

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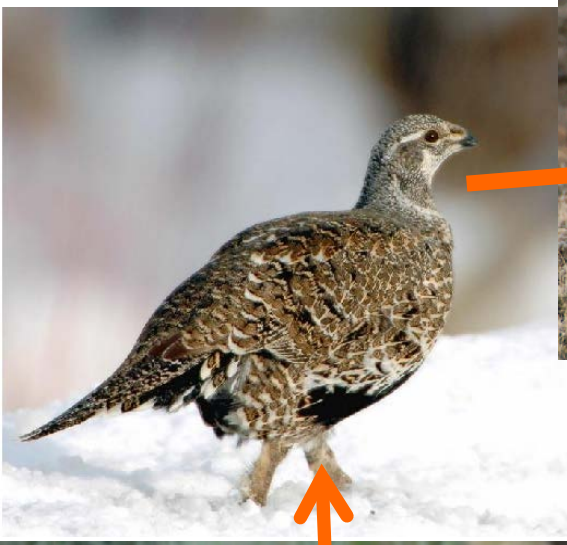
Life Cycle

Winter



Lek

Nesting

Early Brood-Rearing

Late Brood-Rearing

Biological Populations

- Populations are groups of individuals of the same species that live in the same region at the same time
  - Breeding populations
- Populations have unique attributes:
  - Growth rate **(lambda [λ])**
  - Age structure **(J, Y, A)**
  - Sex ratio **(F, M)**
  - Size **(N)**
  - Recruitment rate
  - Mortality and Survival **(S)** rates

Courtesy D. Scasta

Sage-Grouse Populations

- Long-lived species
- Low reproductive rates
  - Low clutch size
  - Low re-nesting rate
- Low chick survival
- High adult survival
- Aggregate at leks
- Lek attendance is cyclical

- **Female survival**, **chick survival, and nest success** most influential to population growth (Taylor et al. 2012)

Why Monitor Sage-Grouse Populations?

- Provides perspectives on population trends
- Environmental and anthropogenic factors can be used to predict what may influence **lek counts** and **vital rates** (nest success, brood survival, and adult survival)
- Vital rates and lek counts can be used to construct population growth models

Habitat Quality

- **Habitats** are those areas that provide resources and conditions necessary for occupancy, survival, and reproduction by wildlife species (Hall et al. 1997)

- **Habitat quality** is "the ability of the environment to provide conditions appropriate for individual and population persistence. It should be considered a continuous variable, ranging from low to medium to high, based on resources available for survival, reproduction, and population persistence, respectively (Hall et al. 1997:448)."

Population Monitoring

- Lek counts
- Nest success
- Brood success
- Population productivity
  - Harvest
  - Telemetry

Lek Counts

- Sample statistic is maximum count of males from 3 visits (Beck and Braun 1980)

- Counts can be converted into rate of growth (Nt+1/Nt)
-
- Trends in males counted per lek

- Trends in lek persistence (numbers of lek active leks)

WGFD Lek Monitoring Effort, 1948–2009 (T. Christiansen – 2013 JCR)

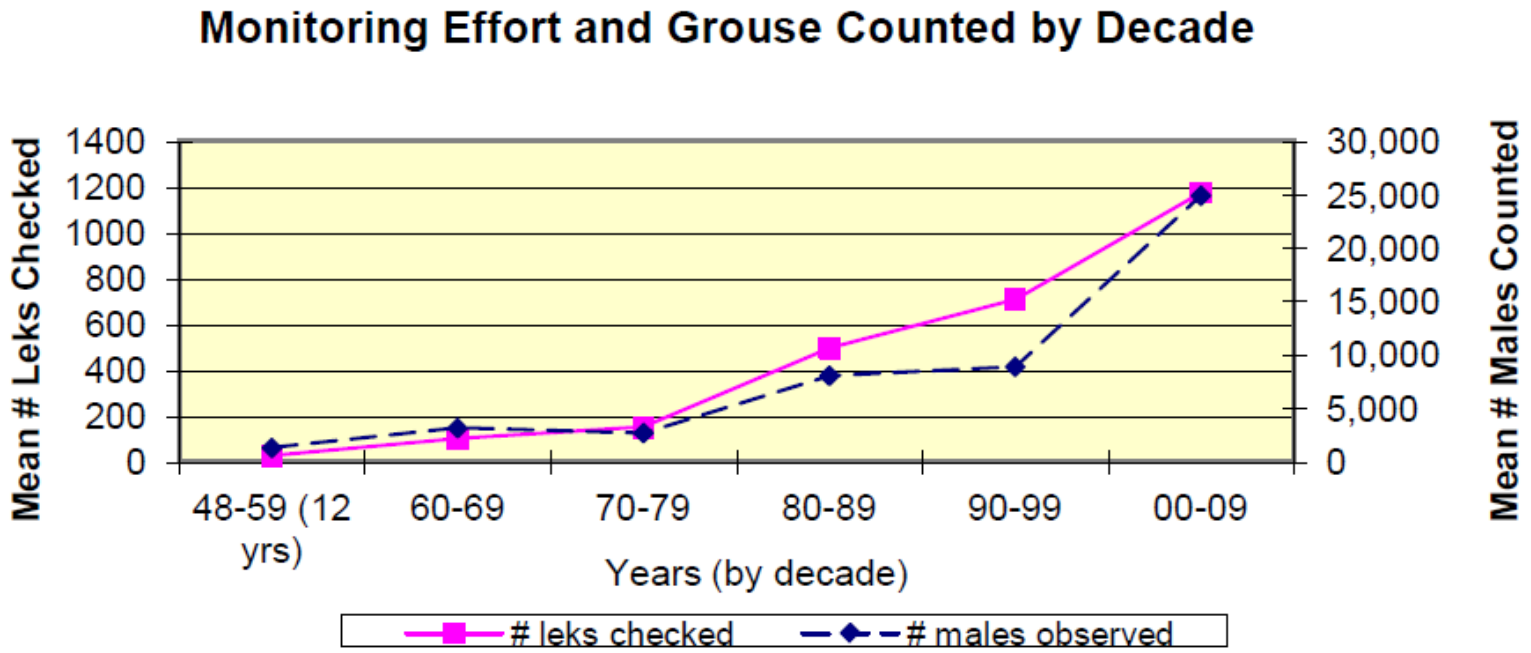
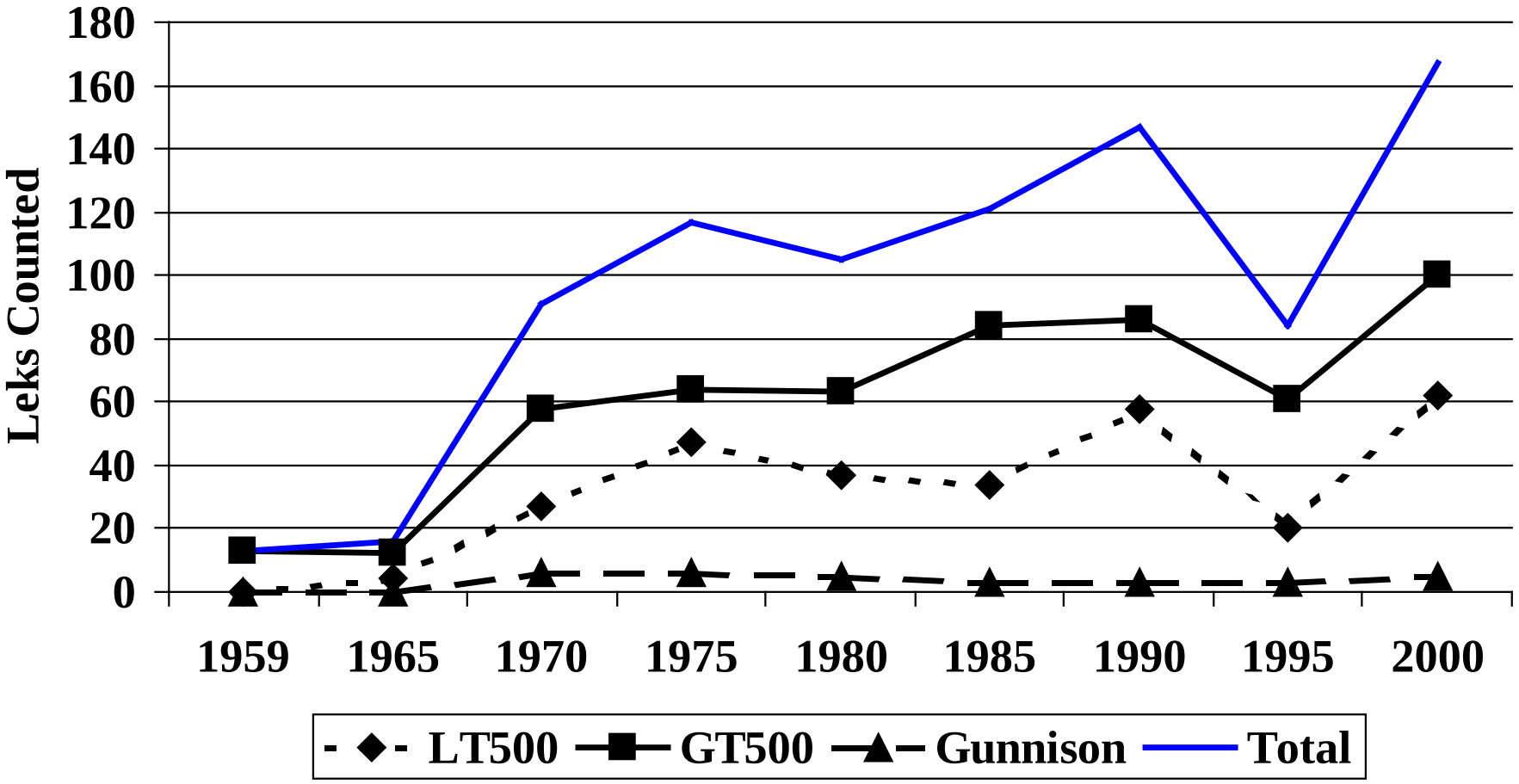
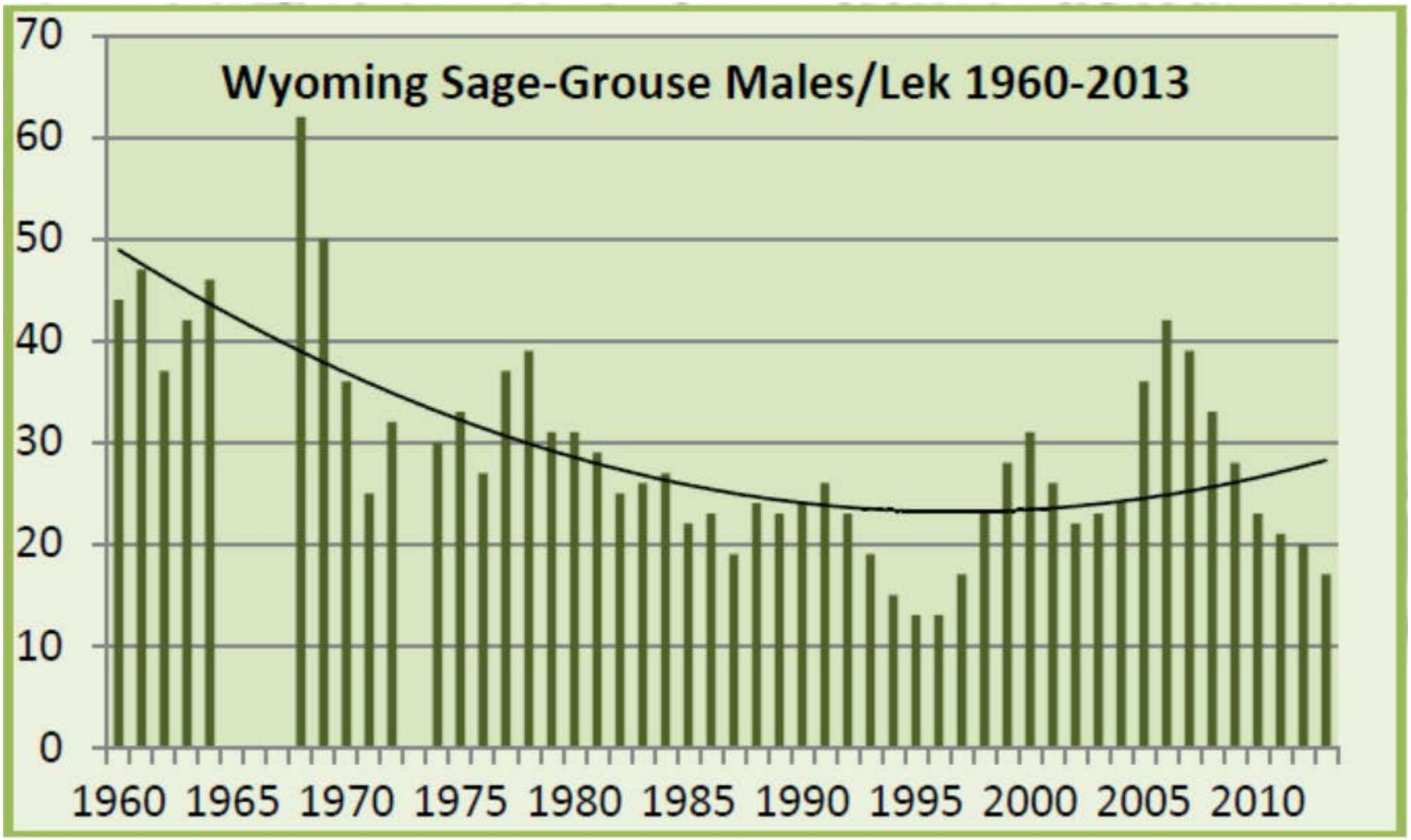


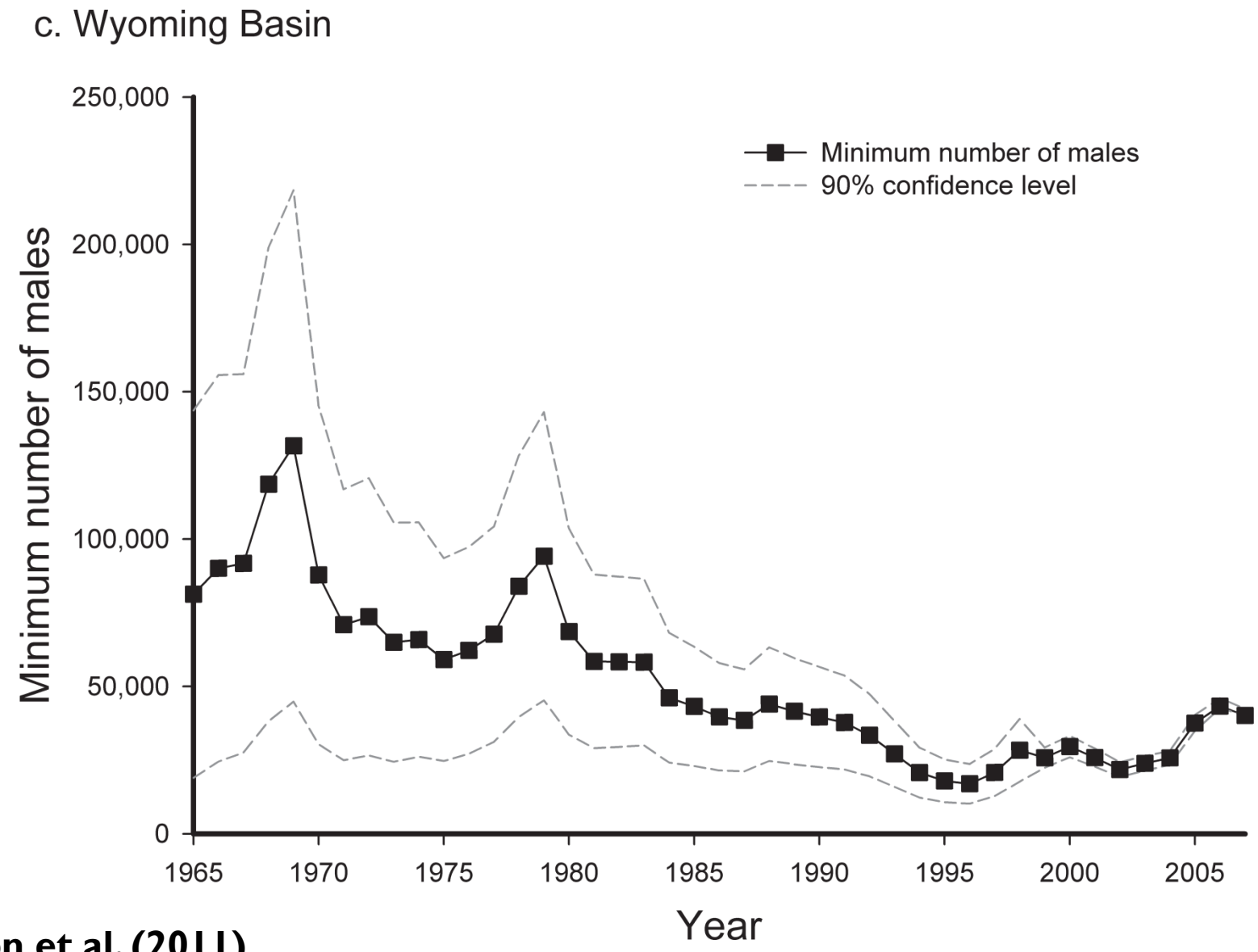
Figure 5. Mean annual numbers of leks checked (monitoring effort) and male grouse counted in Wyoming 1948-2009 by decade.

UDWR Lek Monitoring Effort, 1959–2000



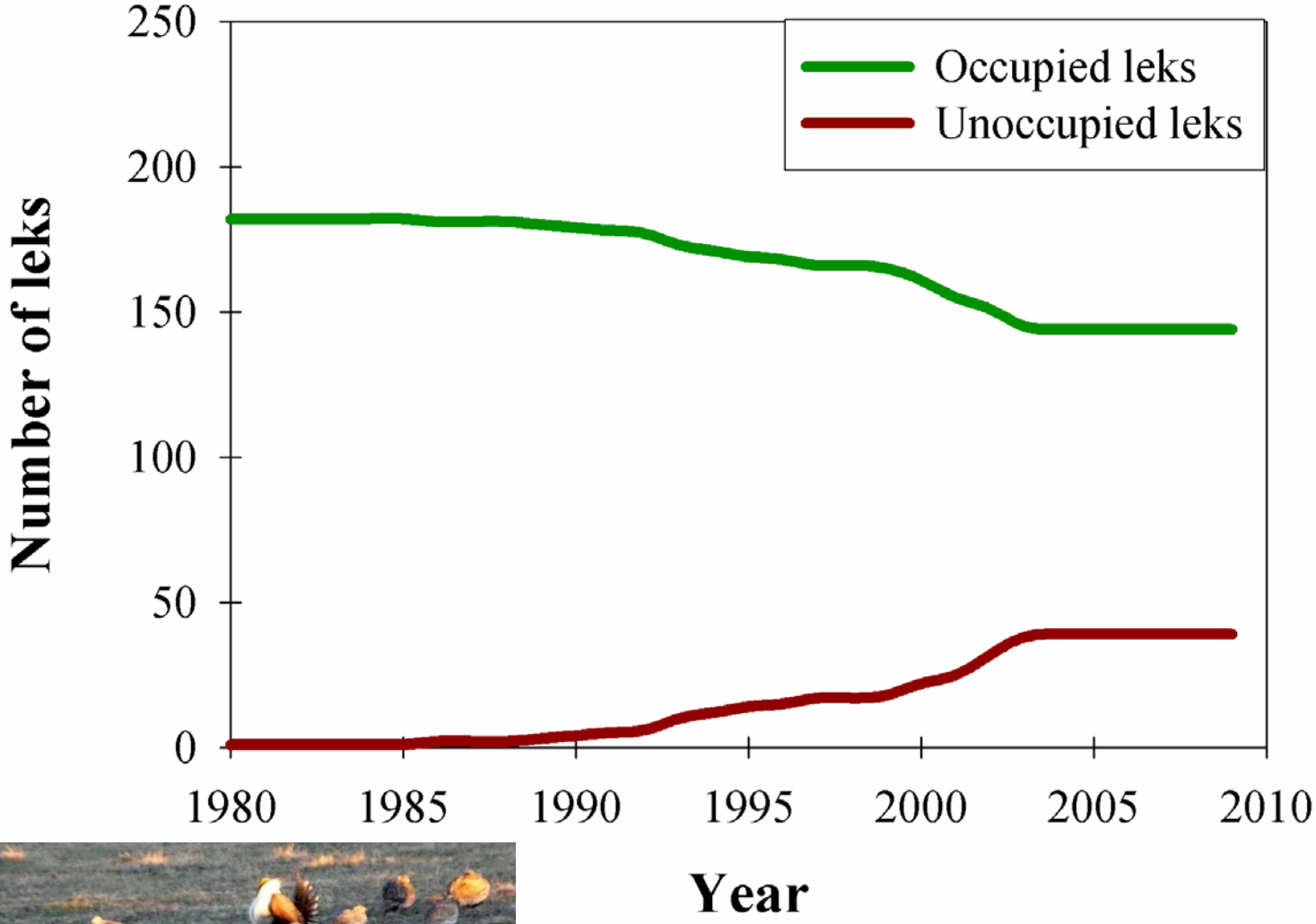


From 2014 WGFD Sage-Grouse Fact Sheet



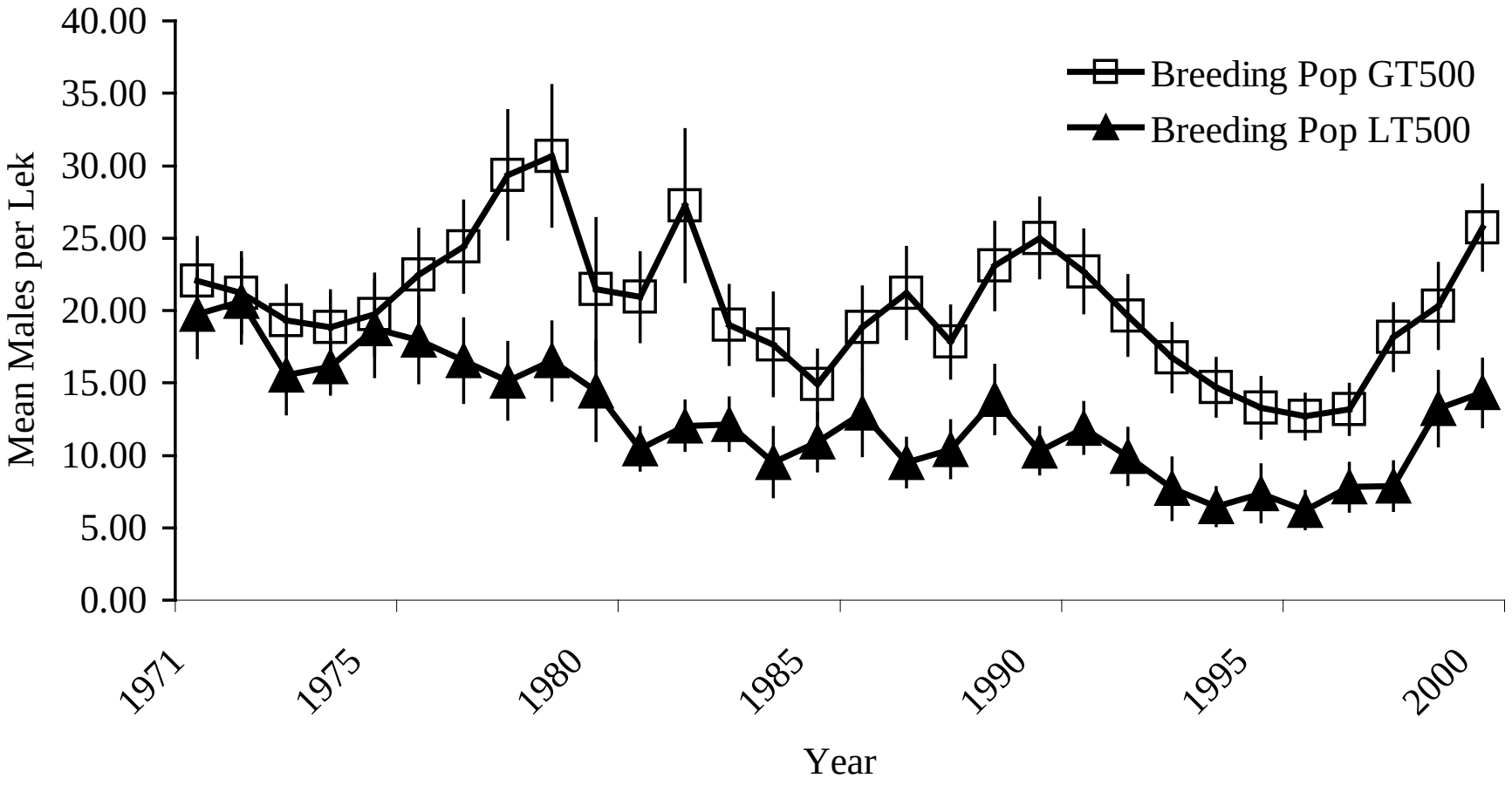
Garton et al. (2011)

Bighorn Basin Lek Persistence



Hess and Beck (2012) - JWM

Mean (±1.0 SE) Males Per Lek, GT500 and LT500 Greater Sage-Grouse Populations, Utah, 1971–2000

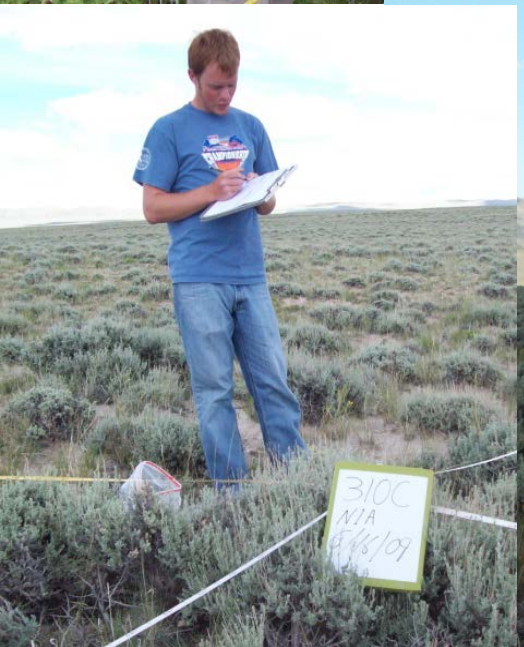


Long-term mean (± 1.0 SE) counts (GT500 = 20.4 ± 0.8; LT500 = 12.5 ± 0.7)
Beck et al. (2003) - *WNAN*

Nest Success

- Obtained from telemetry studies
- Apparent nest success is the proportion of nests in a sample where at least 1 egg hatches
- Nest success (Y) used as a response in regression models that predict nest success


207C
Hatched
7/11/08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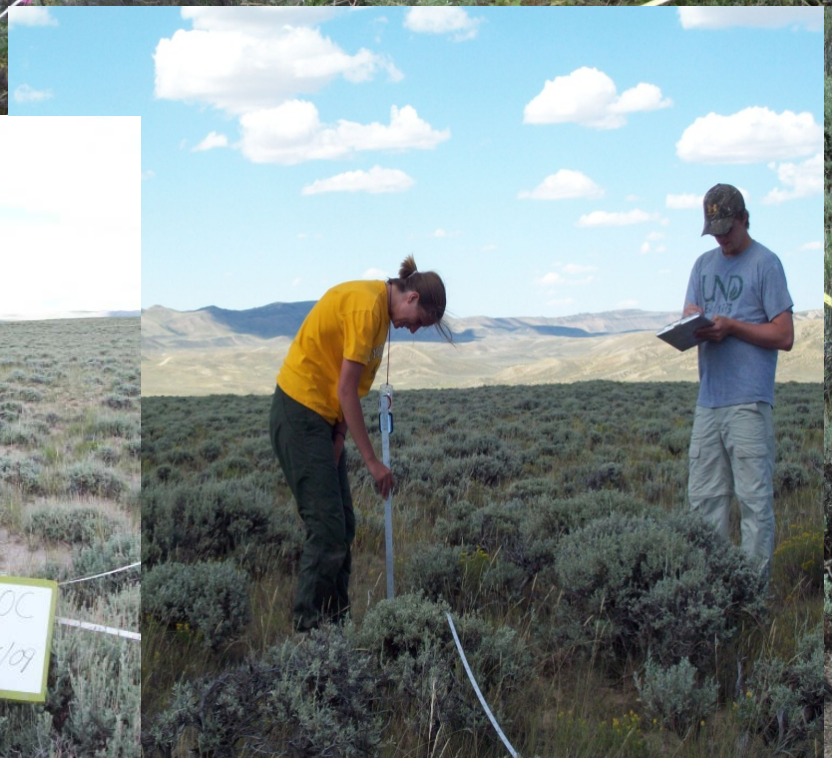
NIA




313NIA
6/11/09

Brood Success

- Proportion of successful nesting hens with ≥1 chick

- Different time periods (e.g., 5, 7, and 10 weeks)

- Techniques
  - Night-time brood counts
  - Pointing dog surveys
  - Brood surveys (morning)

Connelly et al. (2003)

Gregg et al. (2006) - JWM

Population Productivity

- Ratio of juveniles to adult females

Courtesy C. Kirol

Sex

MALE primaries 20-30 mm longer than FEMALE primaries for each age class, region, and sage-grouse species (sample midpoint cutoffs shown to right – measurements with an asterisk have overlap).

State	P10	P9	P7	P6	P5	P1
Oregon	155*	194	212	218	207	
Washington	158*	207*	222	226	216	
Idaho	158	193		210	206	
Montana	160	205*	228	232	229	
Colorado-GUSG	157	190				140
Colorado-GRSG	160	200				140

Age

Rounded S1

Non-juvenal tertial

Non-juvenal covert

No juvenal feathers (except possibly P10 and P9).

Pointed S1

HY

Juvenal P8 (shorter than P9)

At least one juvenal feather is present.

Juvenal tertial

Juvenal covert

P10, or P10 and P9 have not been replaced; if molt is complete, P10 and P9 are pointed relative to P7 and P6.

P10, or P10 and P9 are pointed relative to P7 and P6.

AHY

Molt progressed through P10; P10 and P9 are rounded and similar in appearance to P7 and P6.

ASY

P10, or P10 and P9 retained; rounded and similar in shape to P7 and P6 but relatively worn and/or faded.

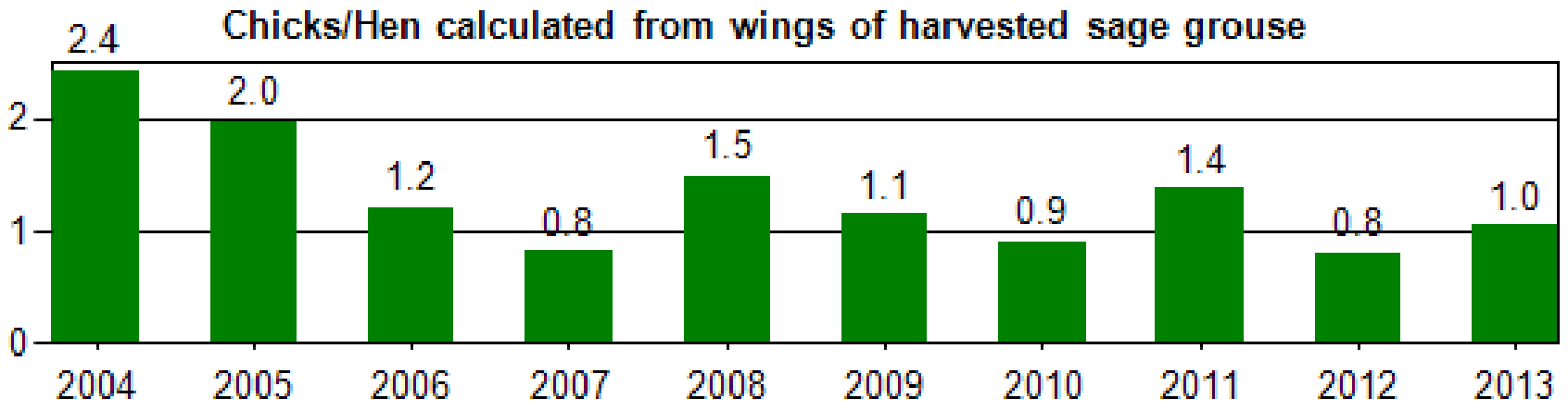
SY

P10, or P10 and P9 are pointed and relatively worn and faded when compared with the newest primaries.

HY

P10 and P9 are pointed and have comparable wear to P7 and P6.

Wyoming Chicks/Hen, 2002–2011 from Harvested Grouse (T. Christiansen – 2013 JCR)



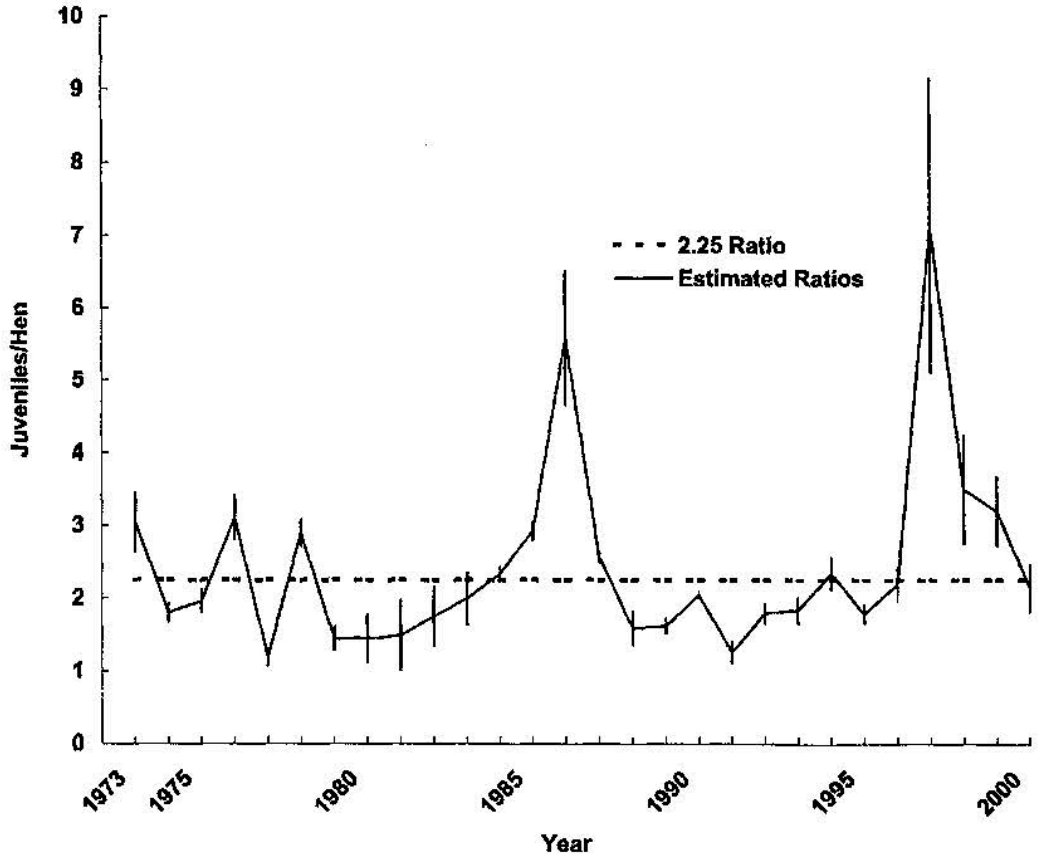


Fig. 3. Estimated ratios ($\bar{x} \pm s_{\bar{x}}$) of juveniles per adult hen (including yearling hens) Greater Sage-Grouse in the fall harvest from Box Elder, Rich, and Wayne Counties, Utah, 1973–2000. Estimated ratios compared to a ratio of 2.25 juveniles per hen, a level suggesting stable to increasing populations (Connelly et al. 2000a).

Long-term mean = 2.4 for Box Elder, Rich, and Wayne Counties. Not statistically different (P = 0.474) from 2.25 from 1973-2000
Beck et al. (2003) - *WNAN*

Conclusions

- Monitoring sage-grouse populations includes:
  - Lek counts
  - Lek surveys
- Vital rates
  - Nest success
  - Brood success
  - Survival
- Population productivity
- Monitoring data is useful for
  - Evaluating trends
  - Making predictions

Questions?