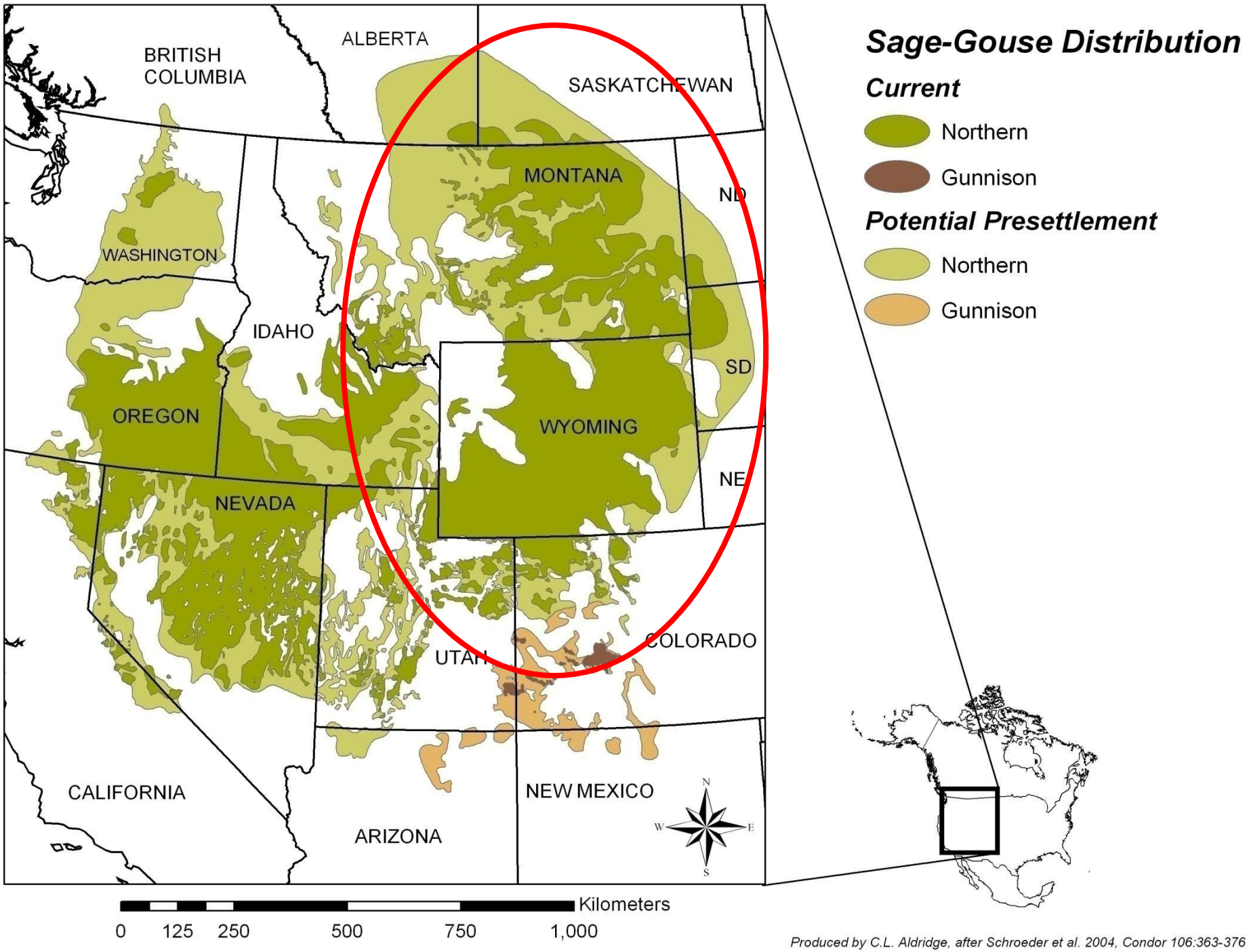
SAGE-GROUSE AND THE HUMAN FOOTPRINT:

Constraints to populations

Outline

- Lek counts as an index to population size
- Incorporating abundance with occurrence
- Regional lek analysis
- Impacts to populations
- Wrap-up



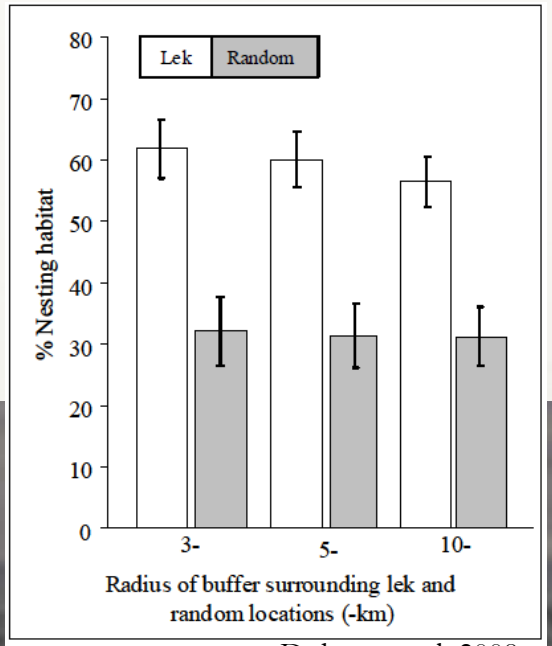
Produced by C.L. Aldridge, after Schroeder et al. 2004, Condor 106:363-376

- Overgrazing
- Tillage Agriculture
- Energy Development

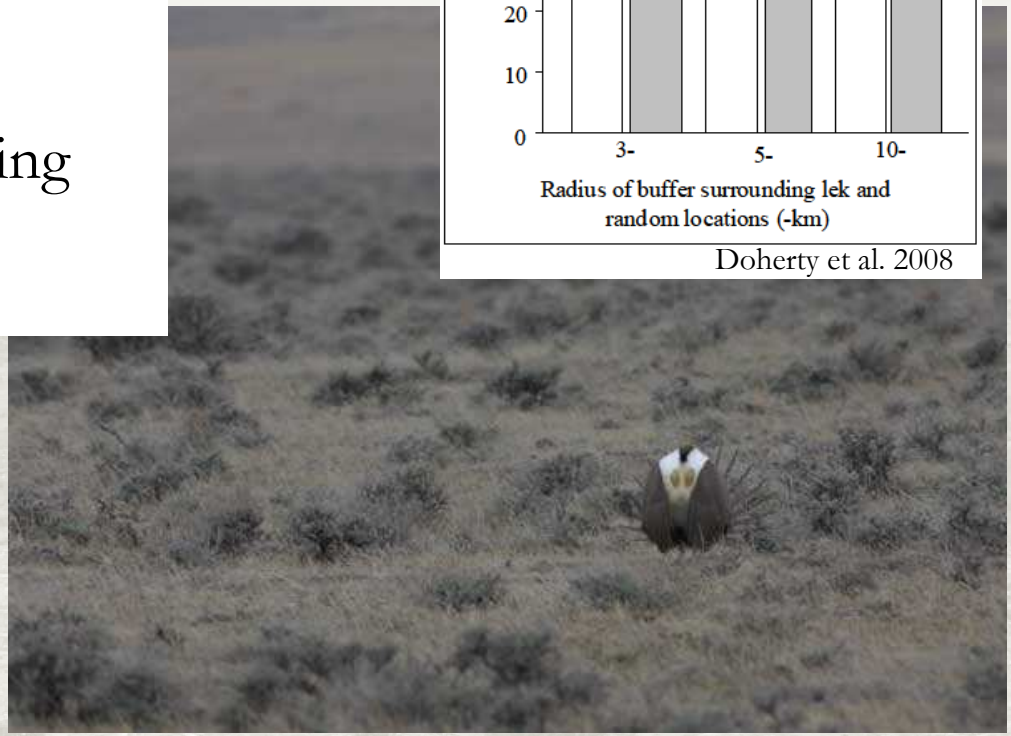
Lek Counts as Index for Population Status

How do we evaluate populations?

- Constant through time
- Reliable index to populations trends, persistence
- Center around suitable nesting habitat

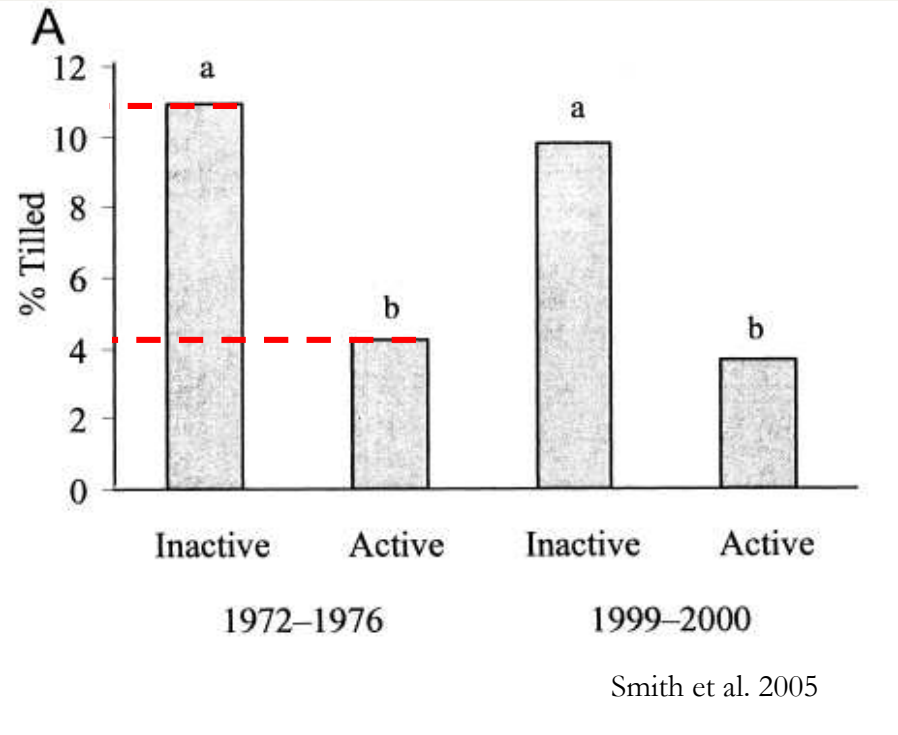


Doherty et al. 2008

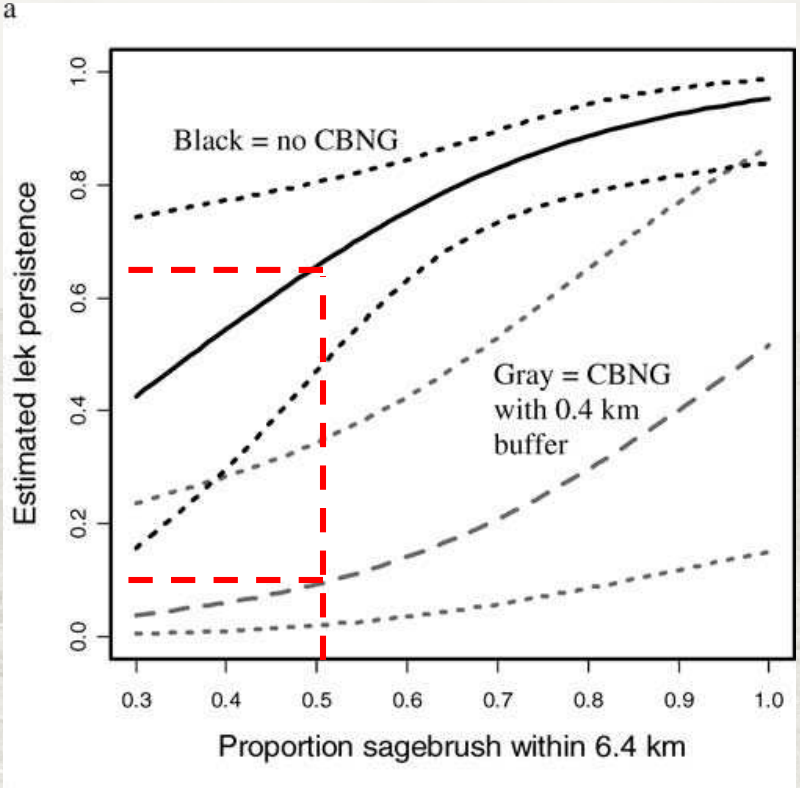


Using Lek Counts: Estimating Persistence

Studies have compared disturbance levels between active and inactive leks



Smith et al. 2005



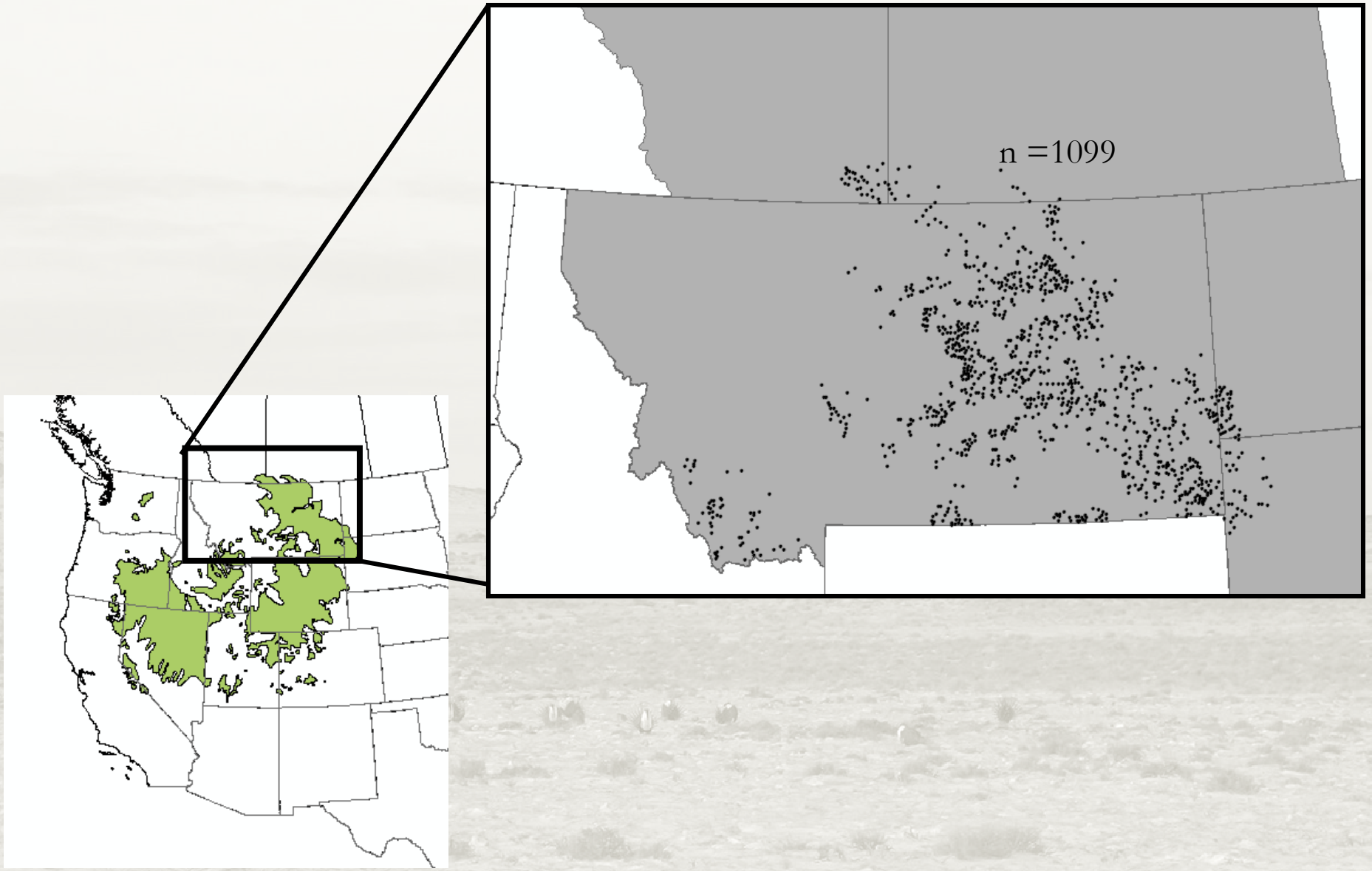
Are all Leks Created Equal?

- Higher counts could mean more and better habitat
- Large leks make up majority of populations
- Facing policy of 'no net loss' of birds
- Required to maintain more birds in fewer landscapes

Questions

- How does human disturbance impact lek persistence?
- How do estimates change with lek size ?
- What do findings tell us about how to manage populations?

Study Area



Predictor Variables

- Disturbance
  - Proportion Cropland
    - Producing Wells per Section
      - Total Road Lengths
- Range

Predictor Variables

Disturbance

- Proportion Cropland
- Producing Wells per Section
- Total Road Lengths

Range

- Distance to Edge of Range
- Lek Density
- Dominant Sagebrush Spp.

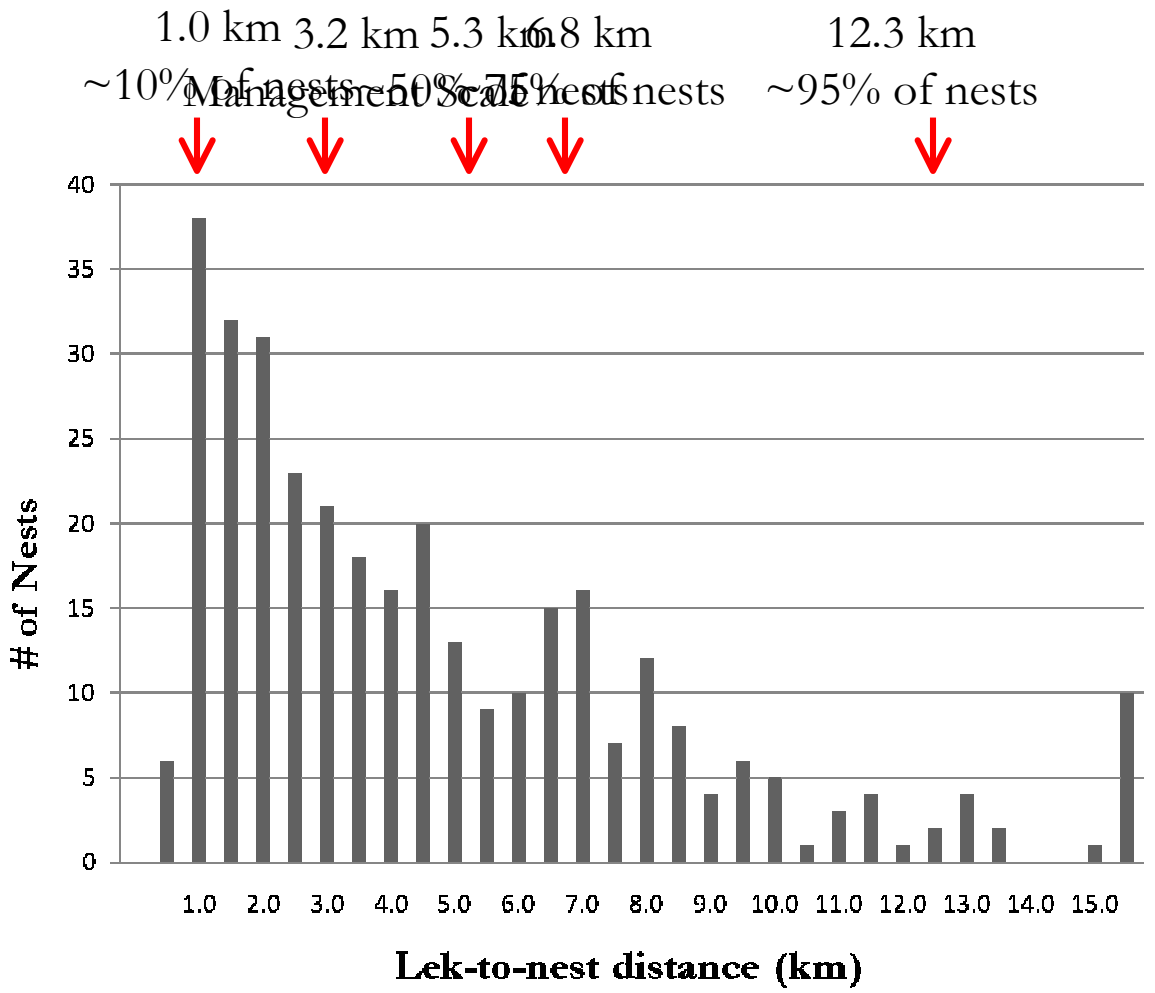
Choosing Biologically Relevant Scales

1.0 km: 1.2 mi^2

5.3 km: 34.1 mi^2

6.8 km: 56.1 mi^2

12.3 km: 183.5 mi^2



Modified from Holloran and Anderson 2005

Estimating Lek Occurrence with Abundance

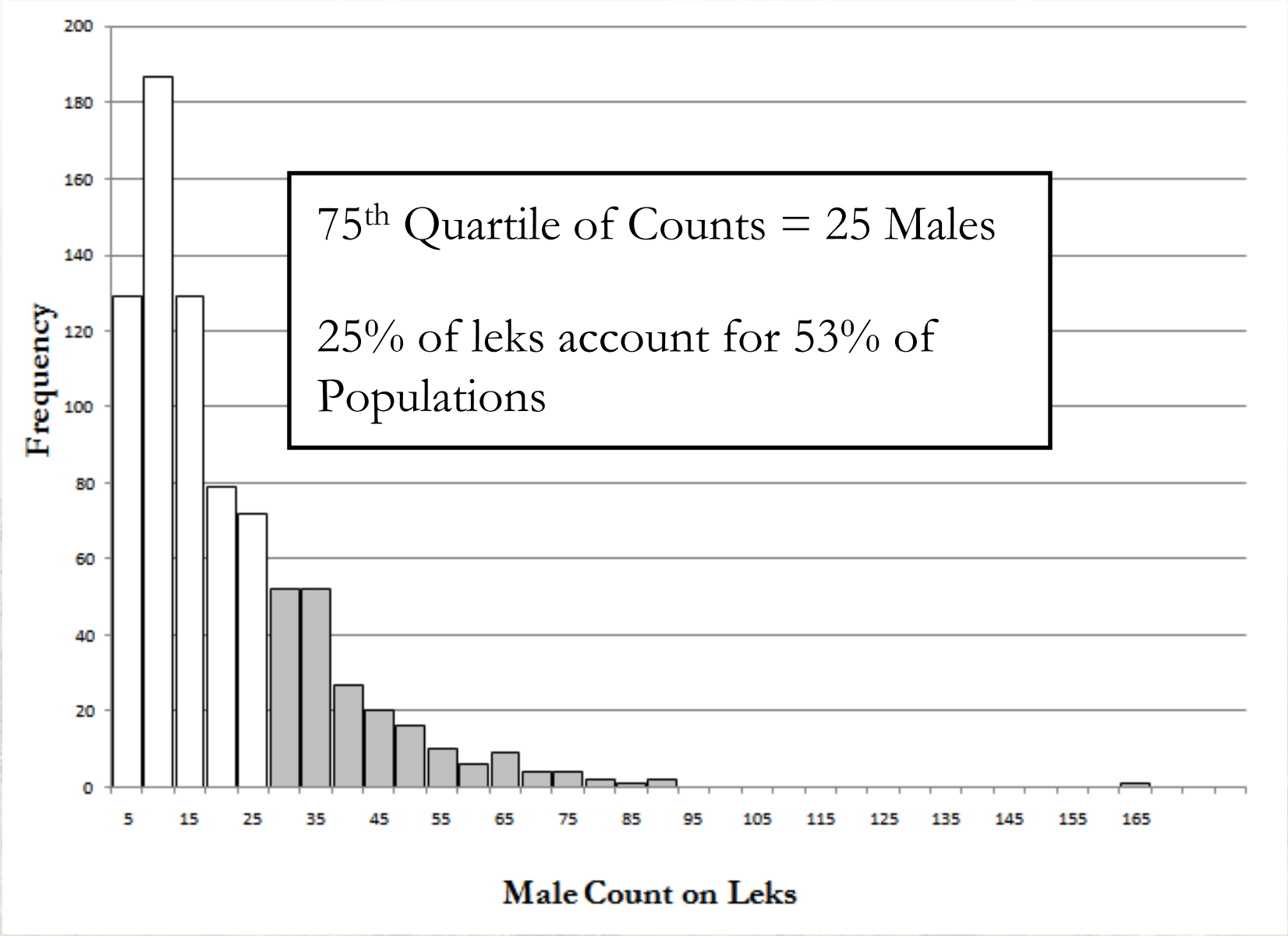
Is this the right question?

Active Leks 1

Inactive Leks 0

$$= \beta_0 + \beta_1 x_1 + \ldots + \beta_i x_i$$

Defining the Dependent Variable



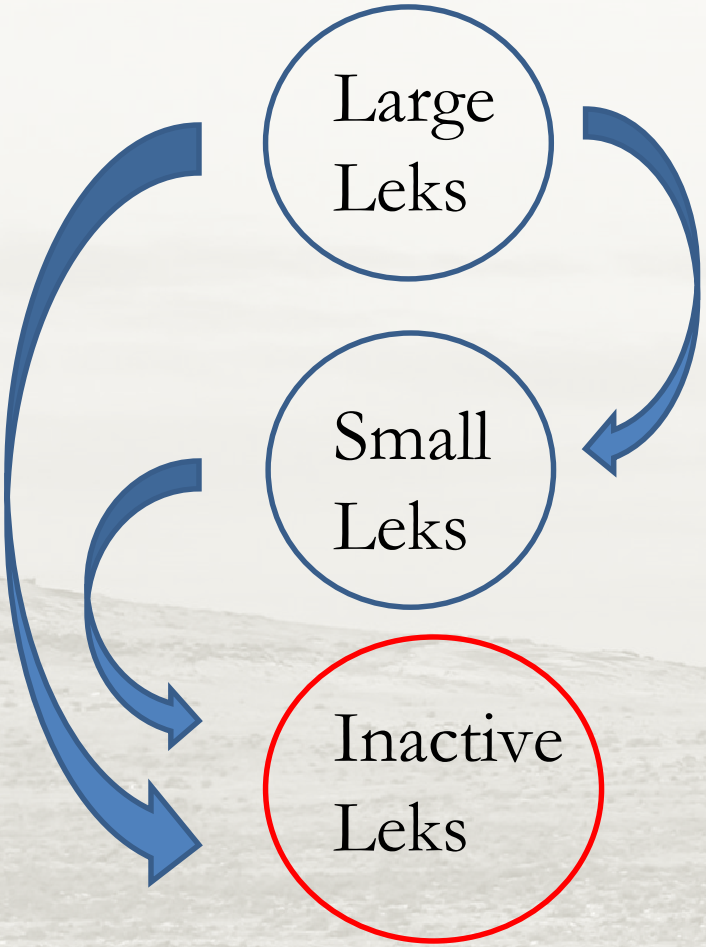
Estimating Lek Occurrence with Abundance

Large Leks	2
Active Leks	1
Small Leks	1
Inactive Leks	0
Inactive Leks	0

Is this the right question?

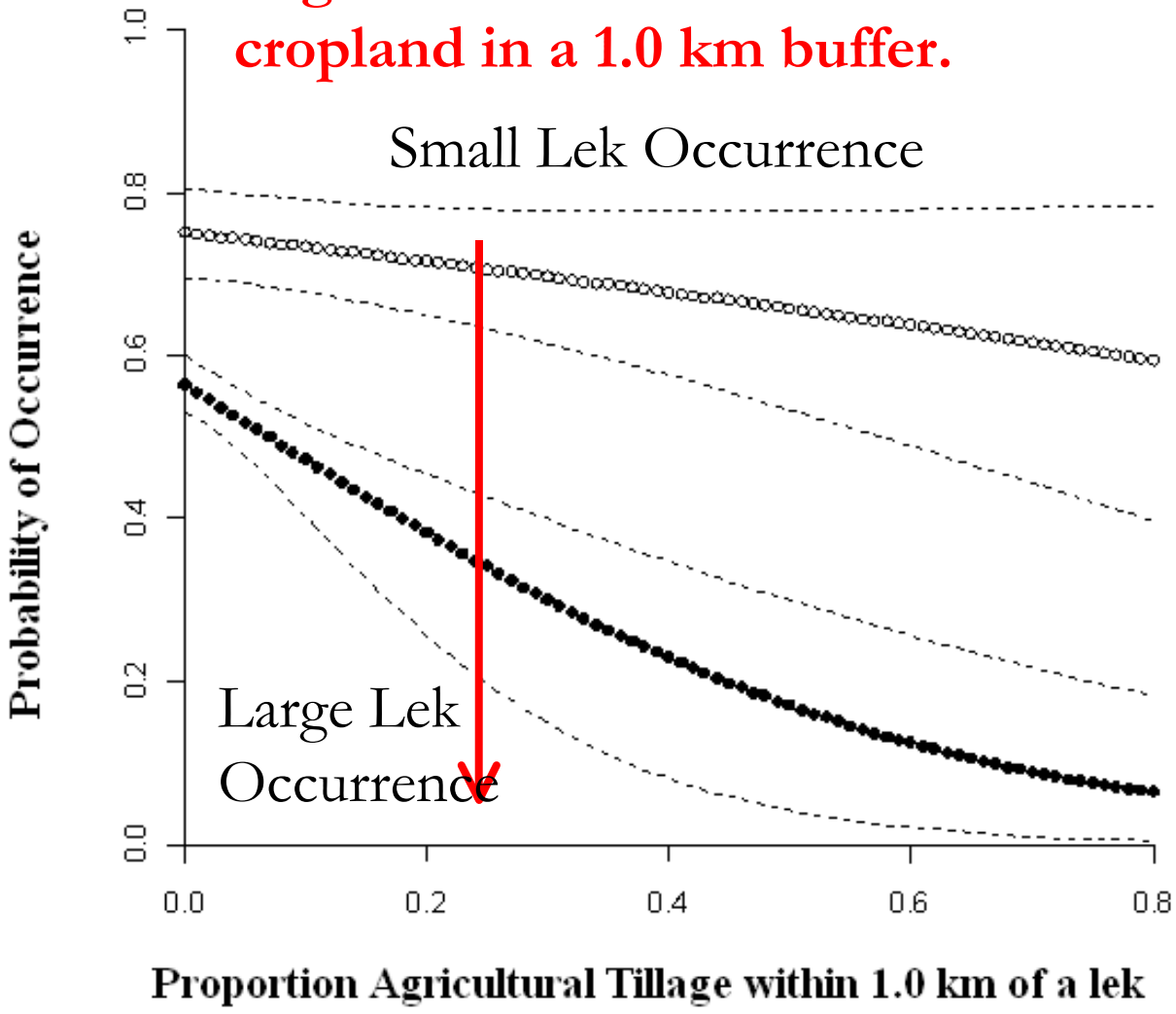
$$= \beta_0 + \beta_1 x_1 + \ldots + \beta_i x_i$$

Multinomial Logistic Regression



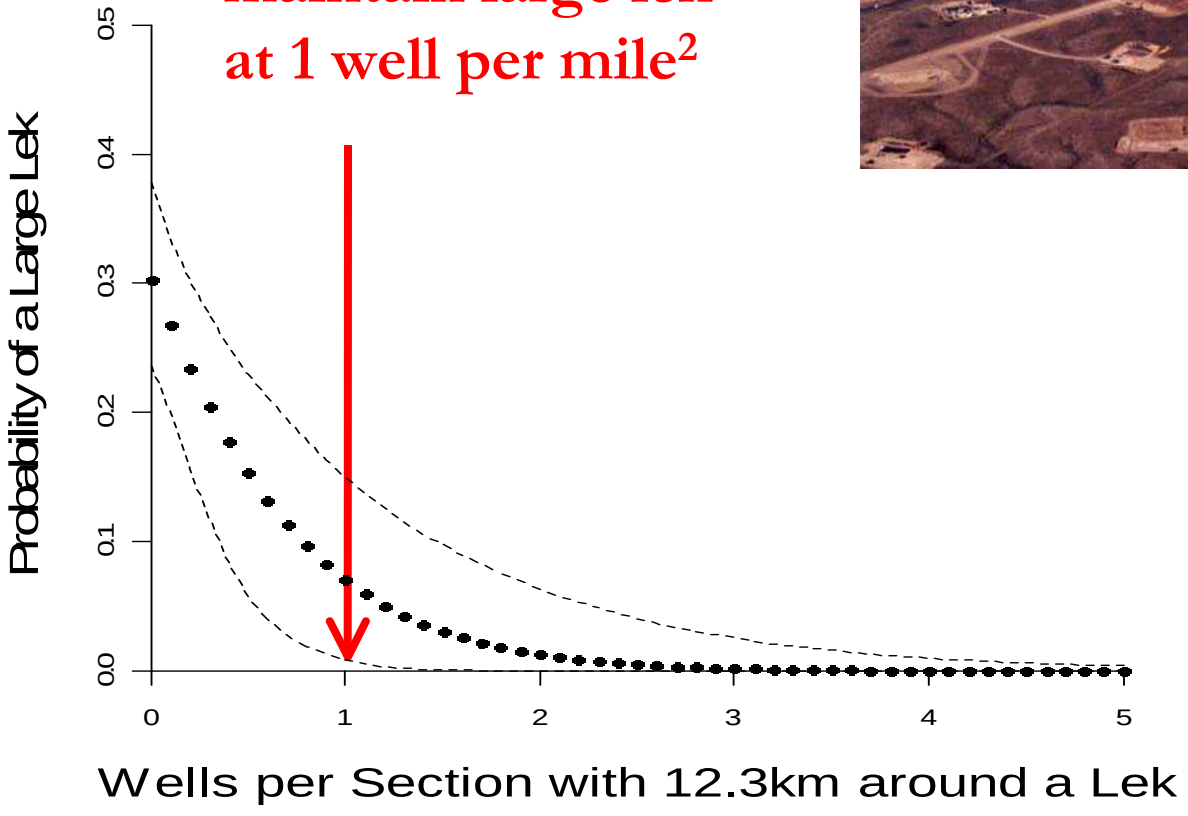
$$= \beta_0 + \beta_1 x_1 + \ldots + \beta_i x_i$$

3 x less likely to maintain a large lek with ¼ mile of cropland in a 1.0 km buffer.



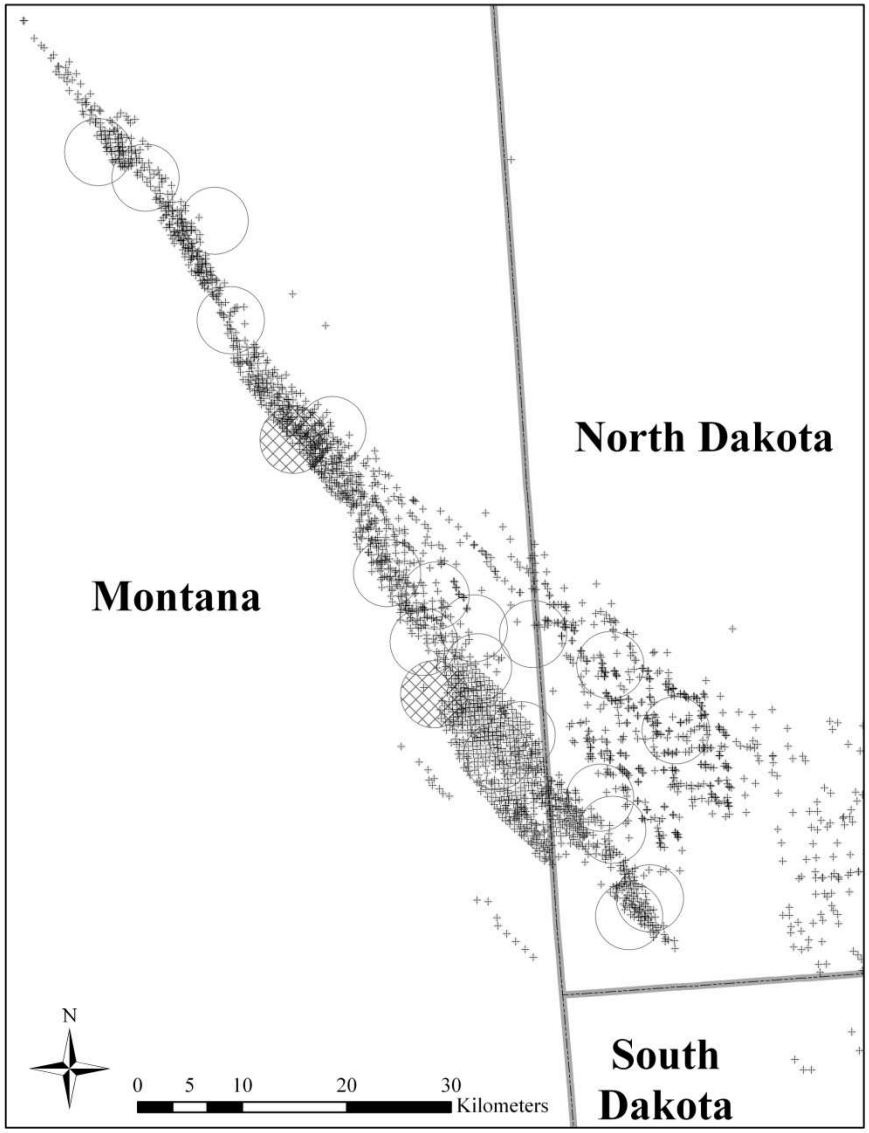
Energy and Abundance

3X less likely to maintain large lek at 1 well per mile^2



Energy Impacts

40% within past 4 years

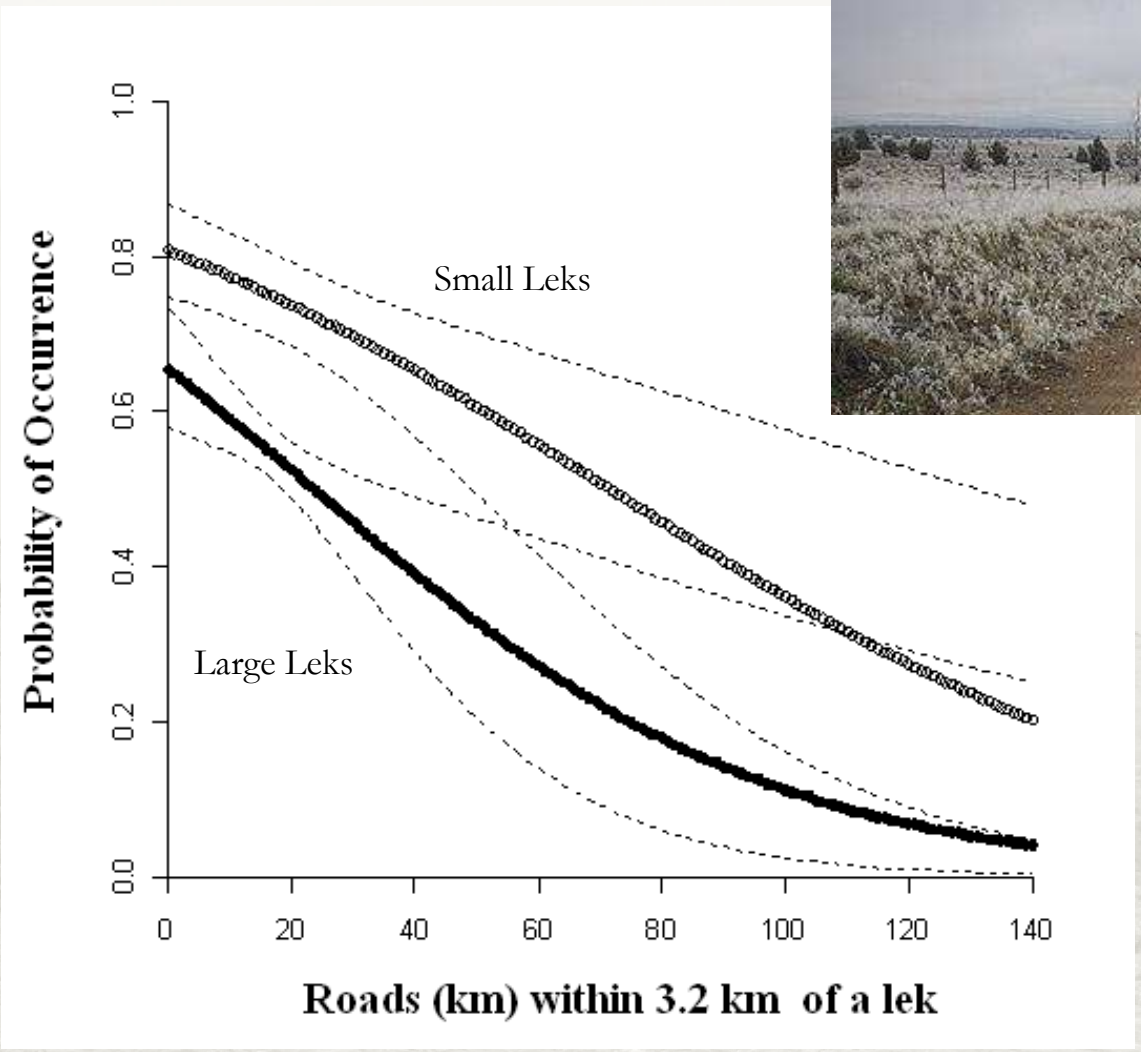


Time lags catching up?

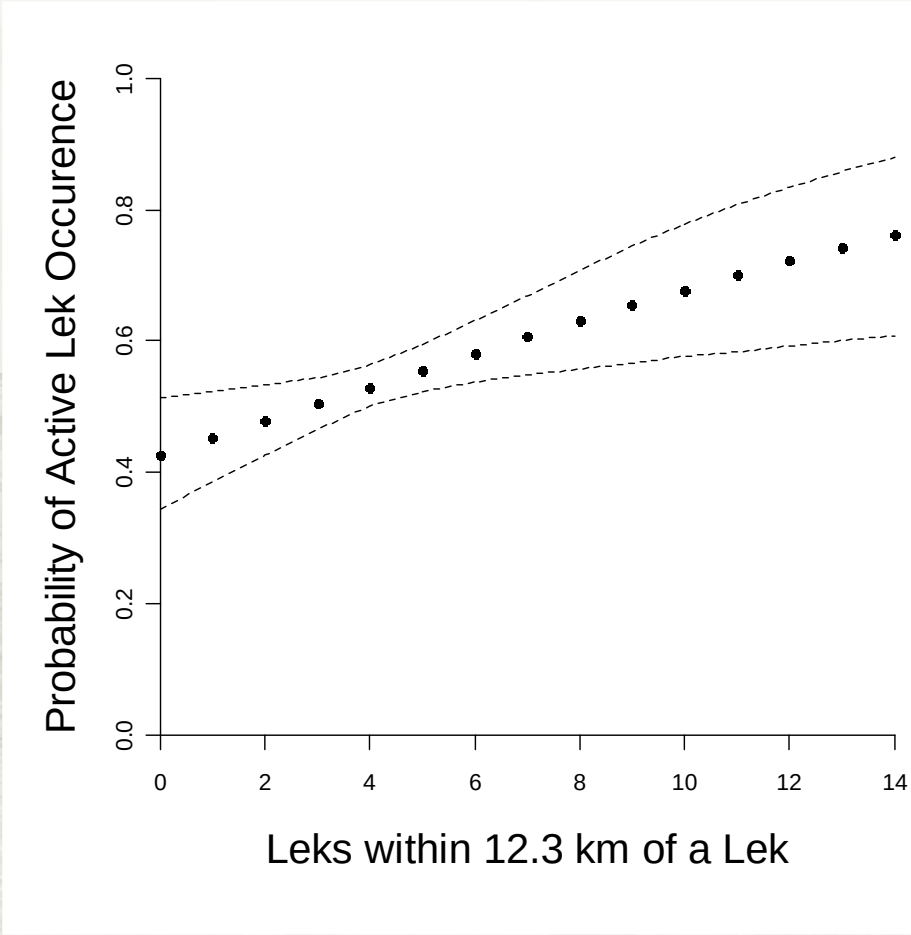
•Four leks became inactive in 2009

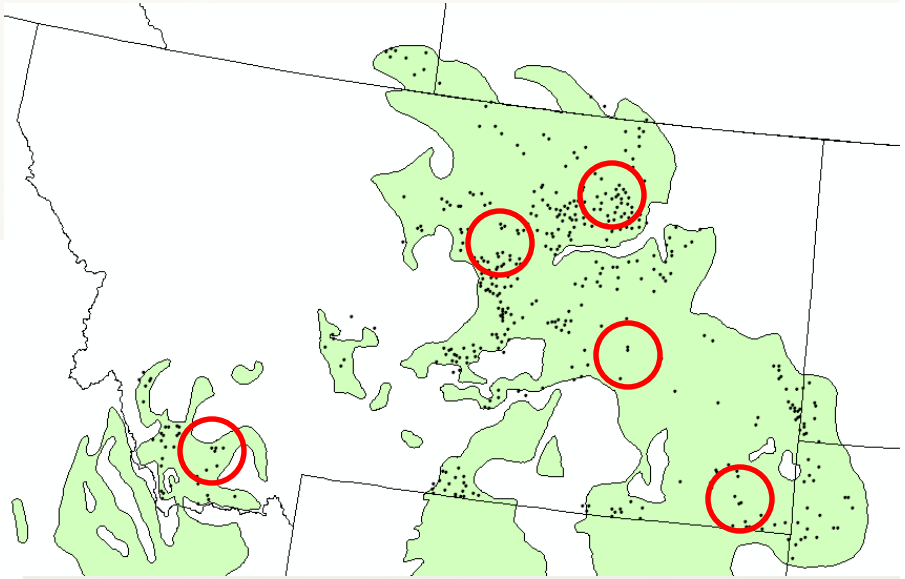
• Population cut in half in one year

Probability of Occurrence: Road Lengths

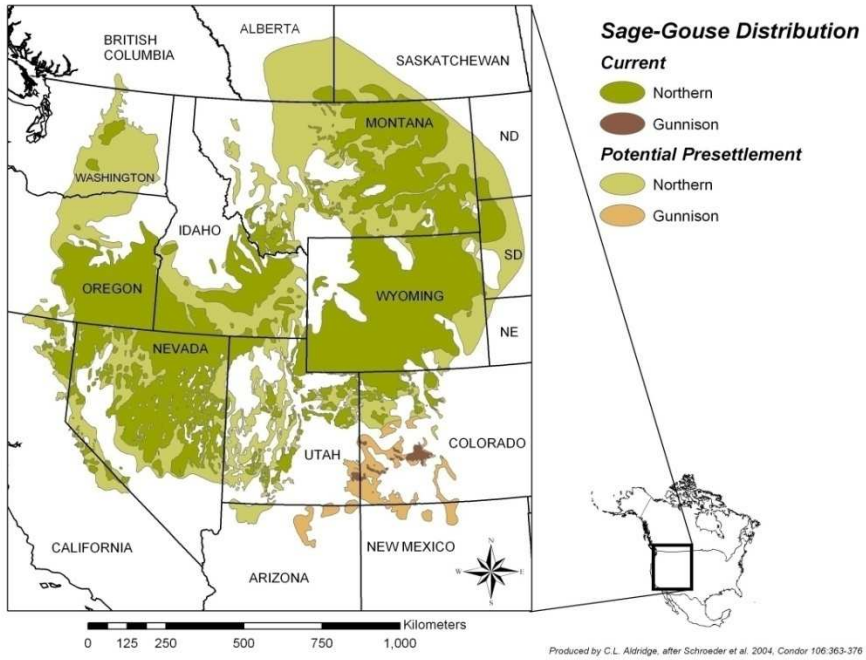


Lek Density

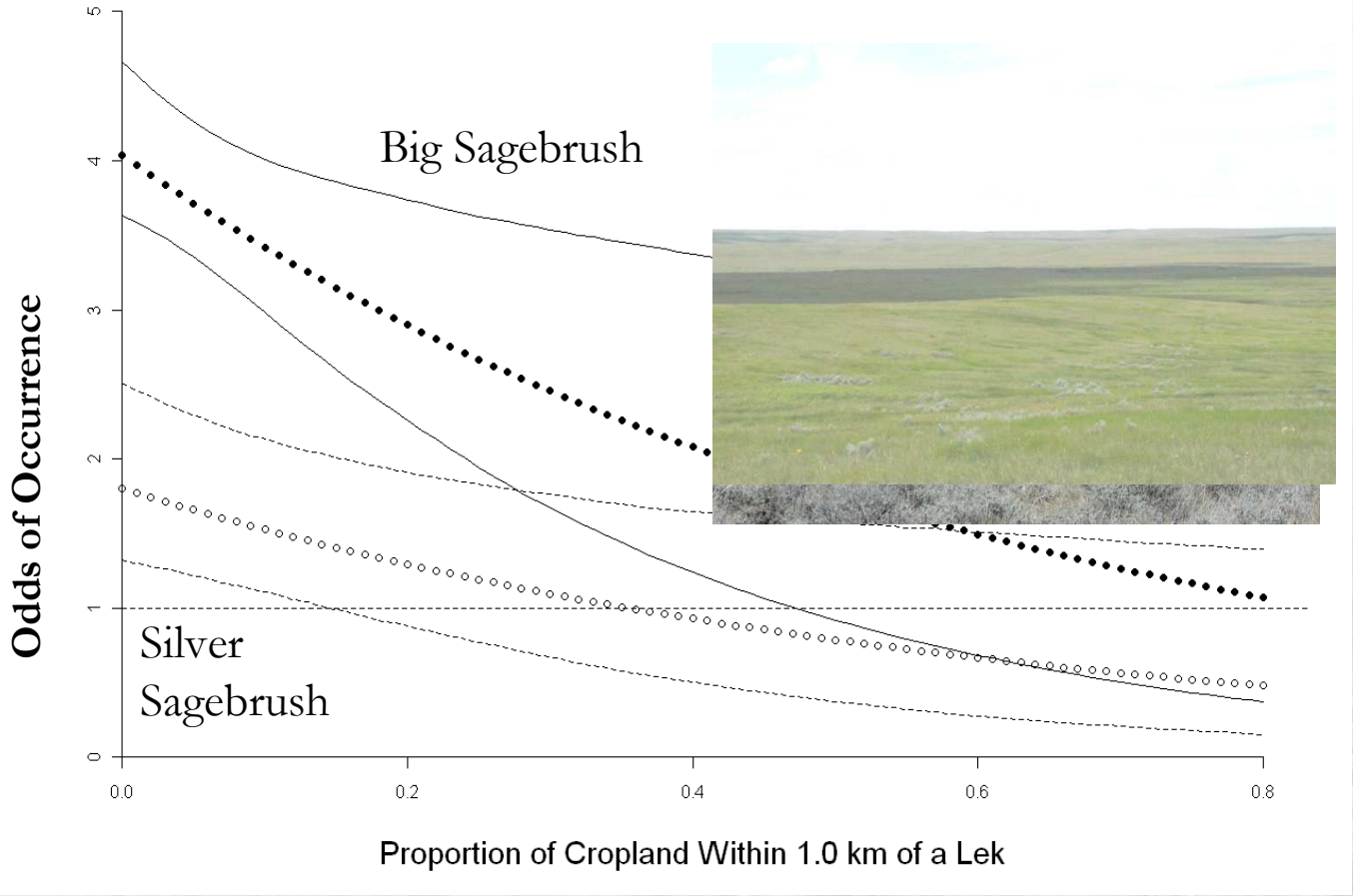

Probability of Active Lek Occurence
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
12
14
Leks within 12.3 km of a Lek



Location in Range



Managing in Silver and Big Sagebrush Habitats:



CORRIDOR LINKING BREEDING AND WINTERING HOMERANGES FOR GREATER SAGE GROUSE

SASKATCHEWAN

Havre

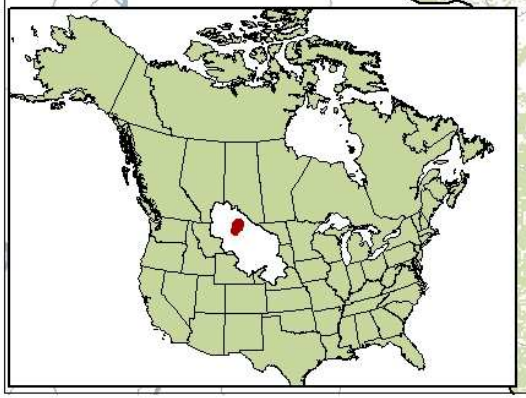
Malta

Glasgow

191

C.M. Russell National Wildlife Refuge

MONTANA



Legend

- Summer and Winter Sage Grouse Homeranges
- Sage Grouse Movement Corridor
- Northern Great Plains Ecoregion Boundary
- Federal Lands
- Untilled Grasslands

N

0 10 20 40 60 80

Miles

Putting it Together

- Human footprints set the 'biological sideboards' that limit populations

- Redefine the scale of multiple-use mandates

- Research to focus on how to bolster populations in priority landscapes

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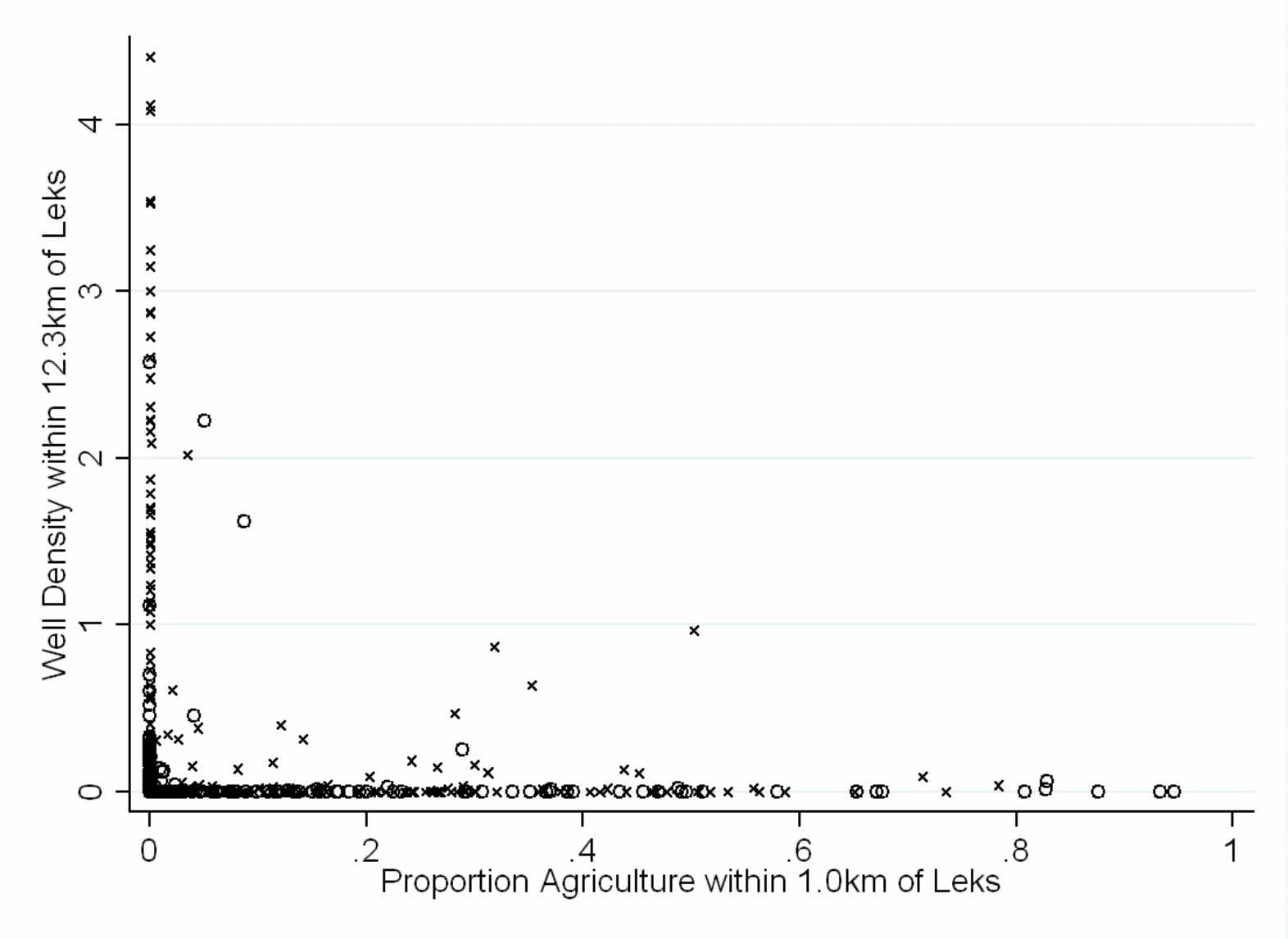
Well Density within 12.3km of Leks
0
1
2
3
4
0
.2
.4
.6
.8
1
Proportion Agriculture within 1.0km of Leks