SAGE-GROUSE AND THE HUMAN FOOTPRINT

Implications for conservation of small and declining populations

Dave Naugle
Wildlife Biology Program

The University of Montana
MISSOULA

Outline for this evening

1. Natural history & scale
2. U.S. approach for comparison
3. Migration between U.S. & Canada

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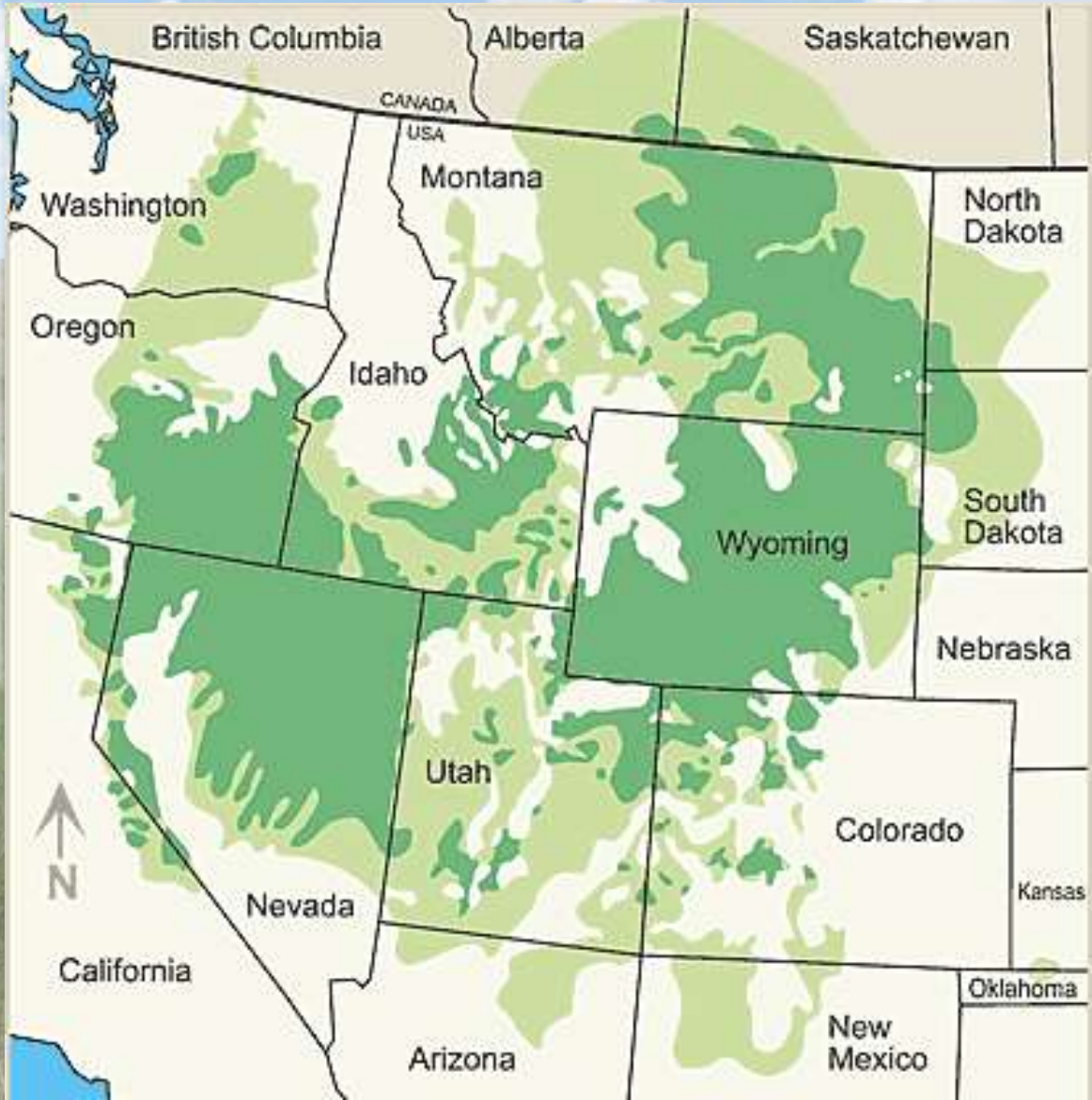
4. Small populations
5. Cumulative impacts
6. Possibilities for Canada?

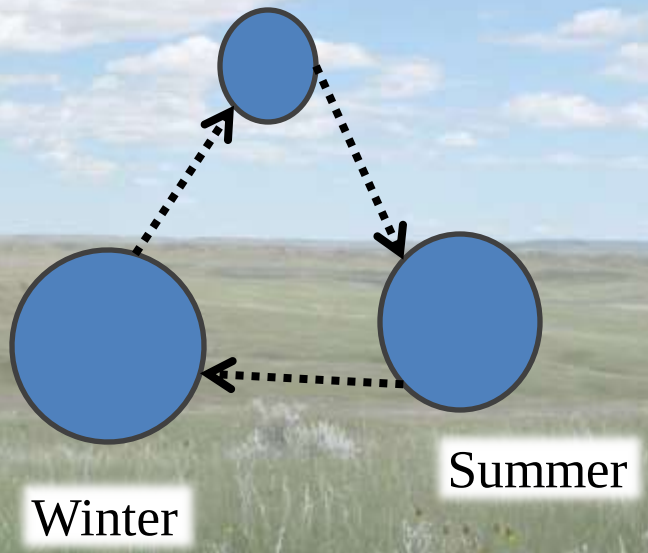
- Sagebrush obligate
- Found in 11 western states & two Canadian provinces
- ~50% range decrease
- ~98% population declines since 1800s
- Endangered in Canada
- Warranted but precluded from listing in US
  - Final listing decision scheduled in 2015

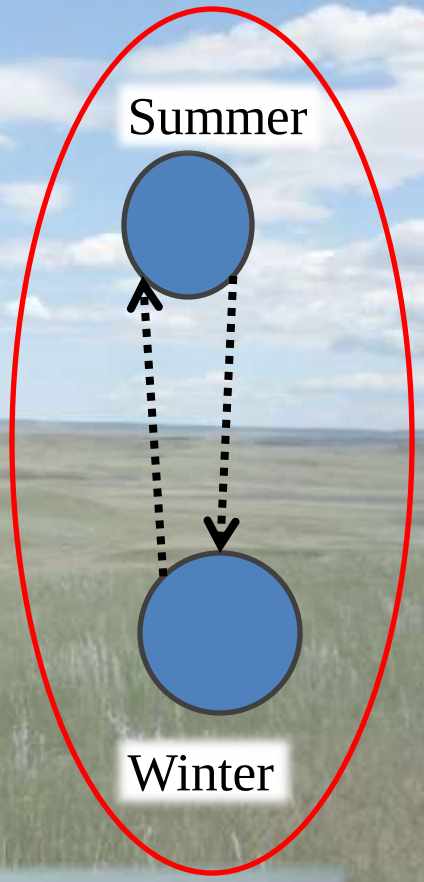
Historic (pale green) and current sage-grouse distribution

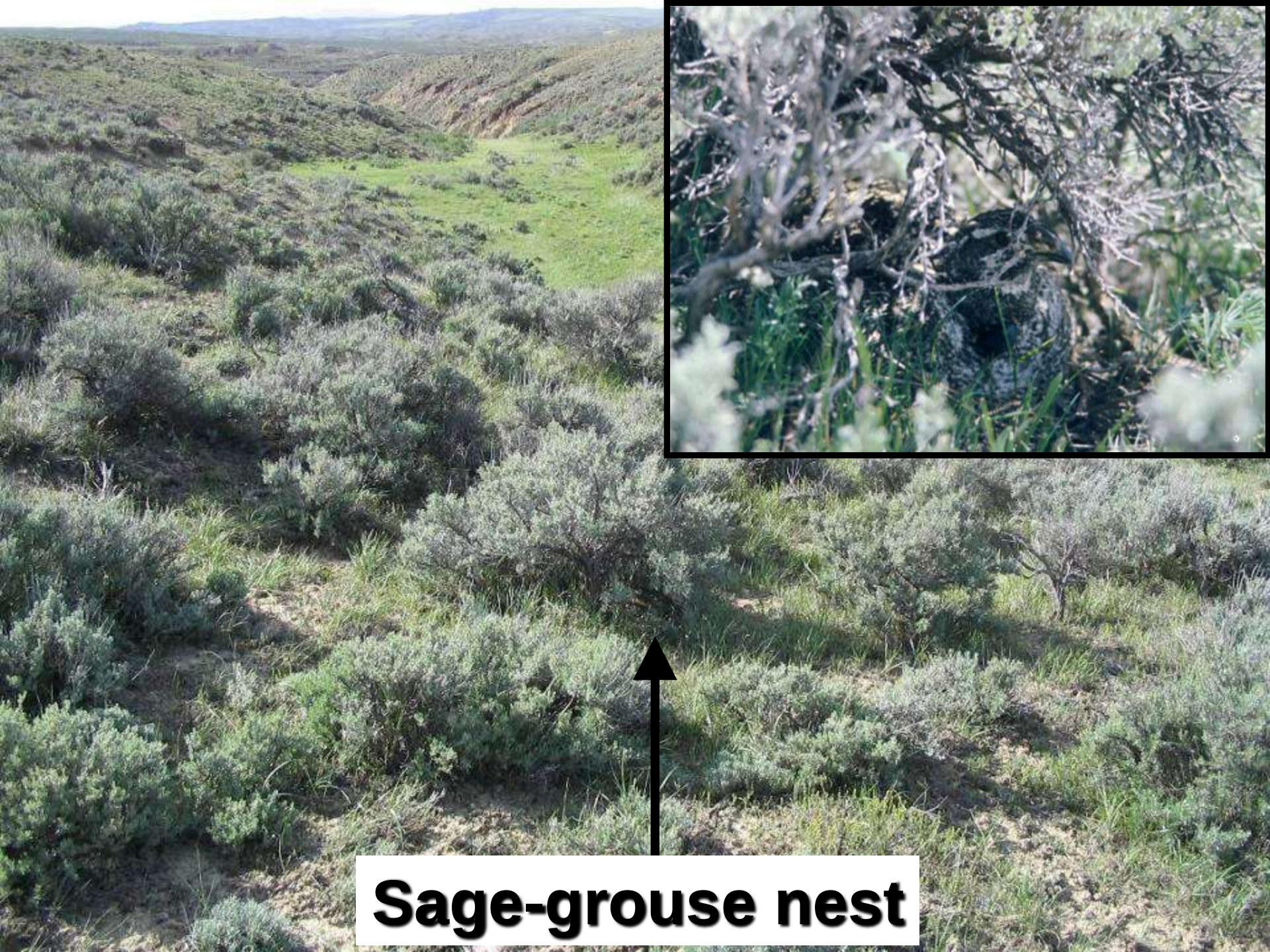


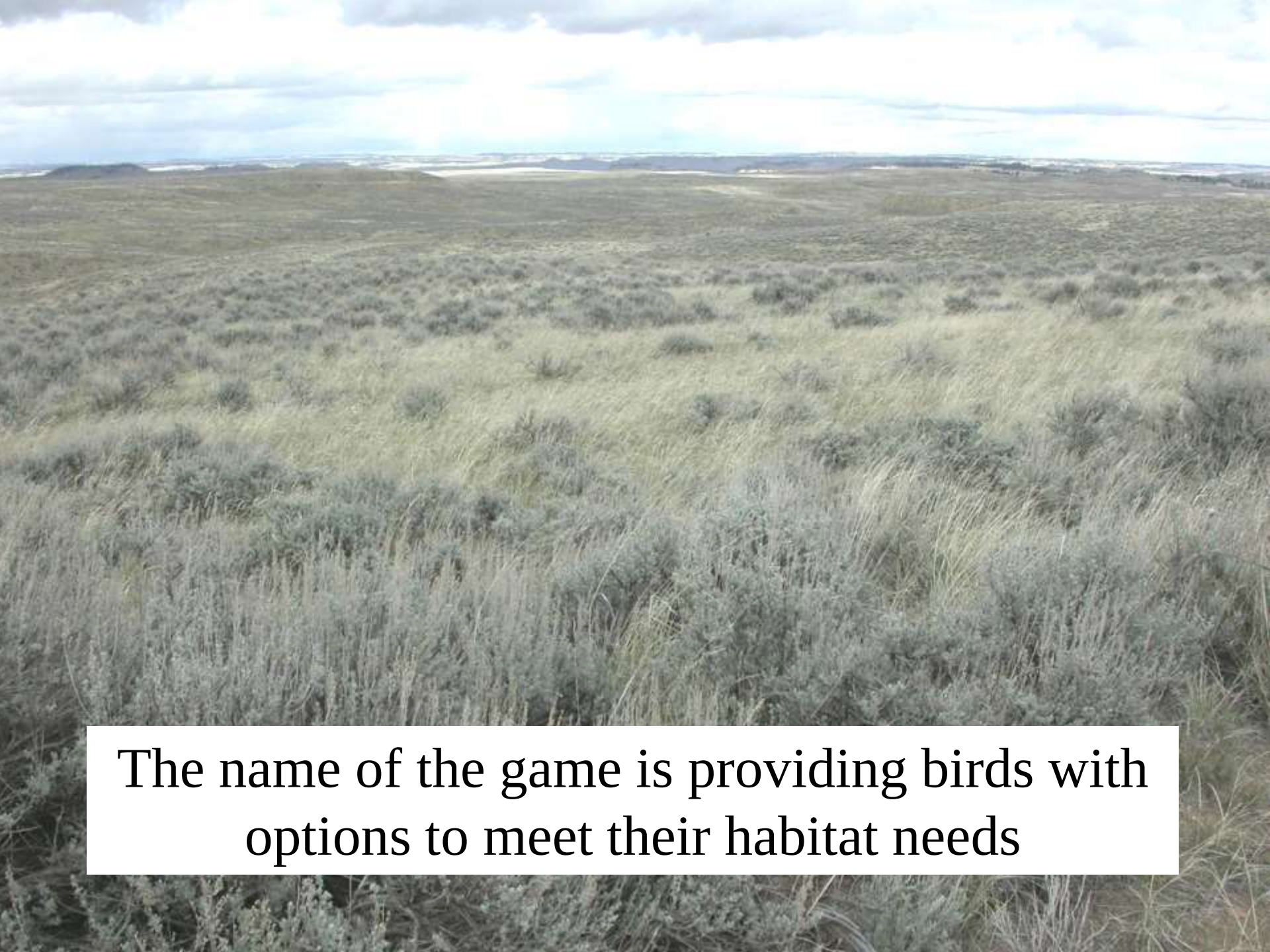
sage-grouse is a landscape 'focal' species

Migration and sage-grouse

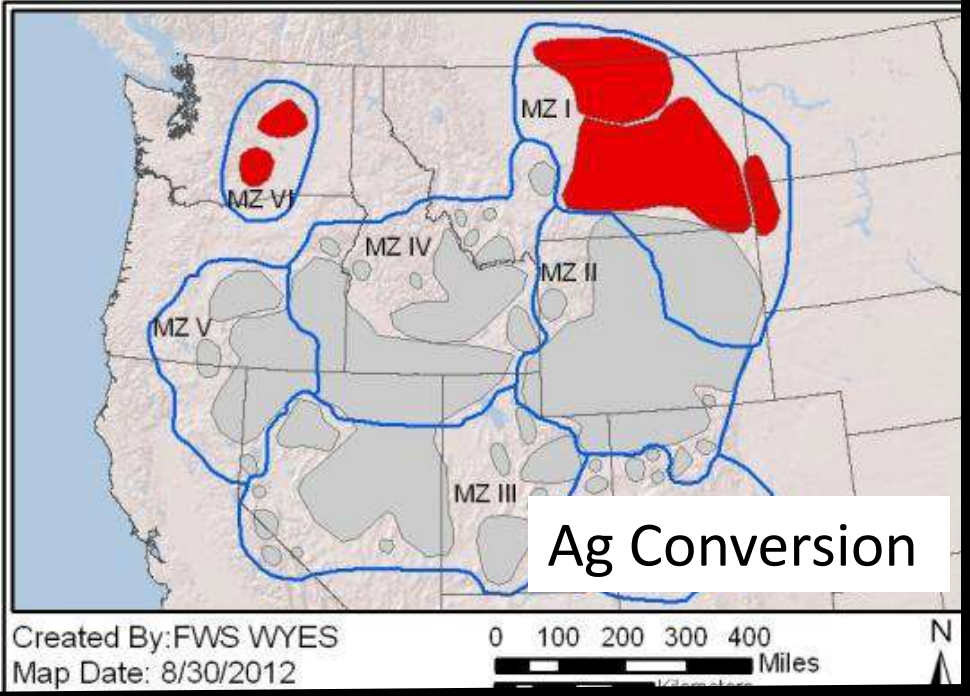


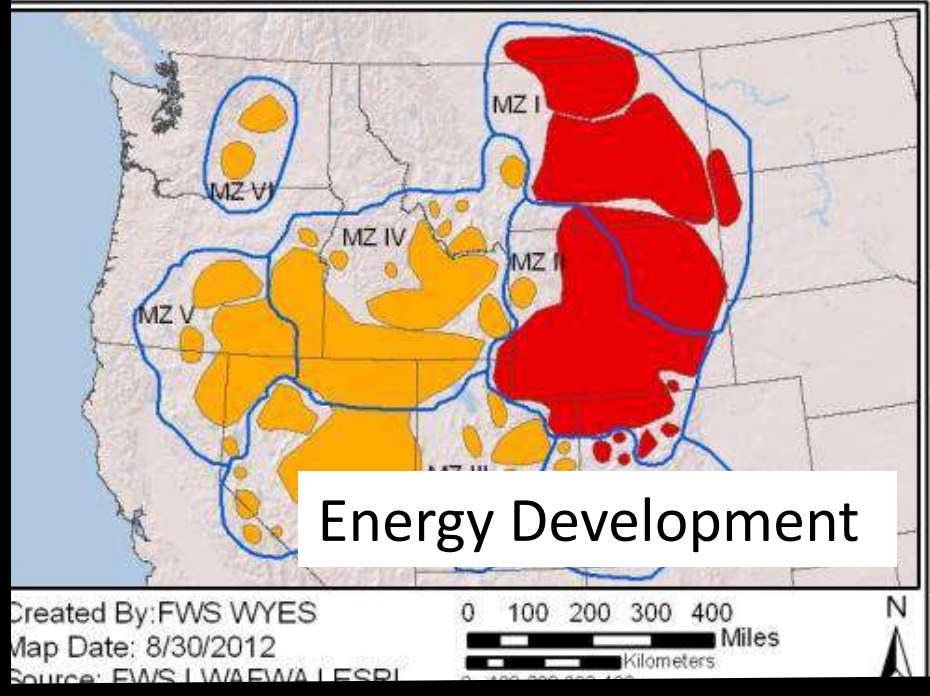


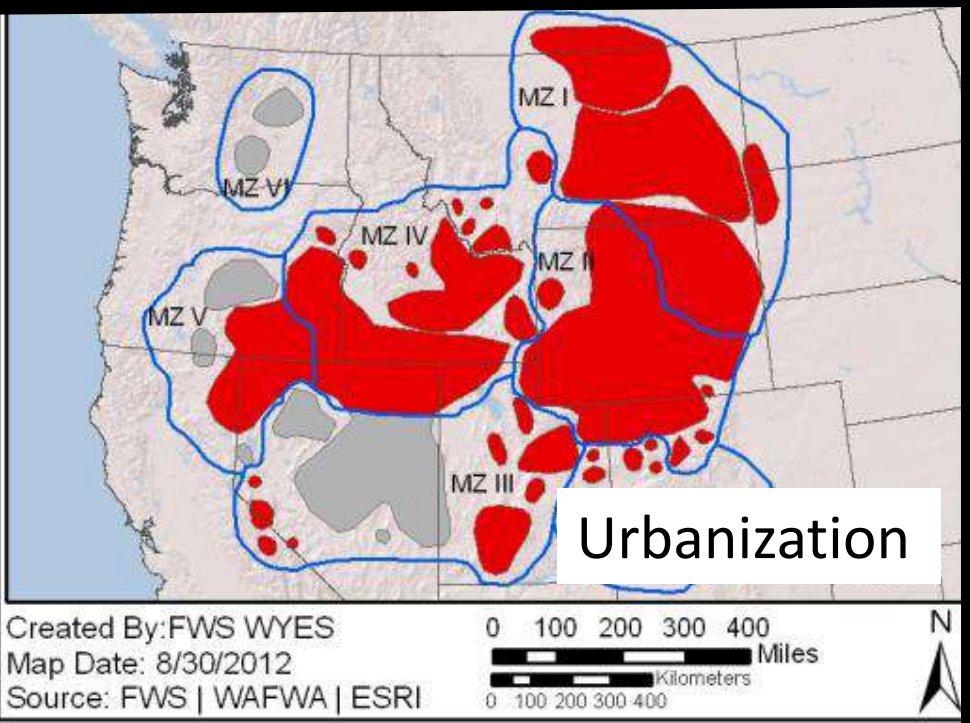

Sage-grouse nest

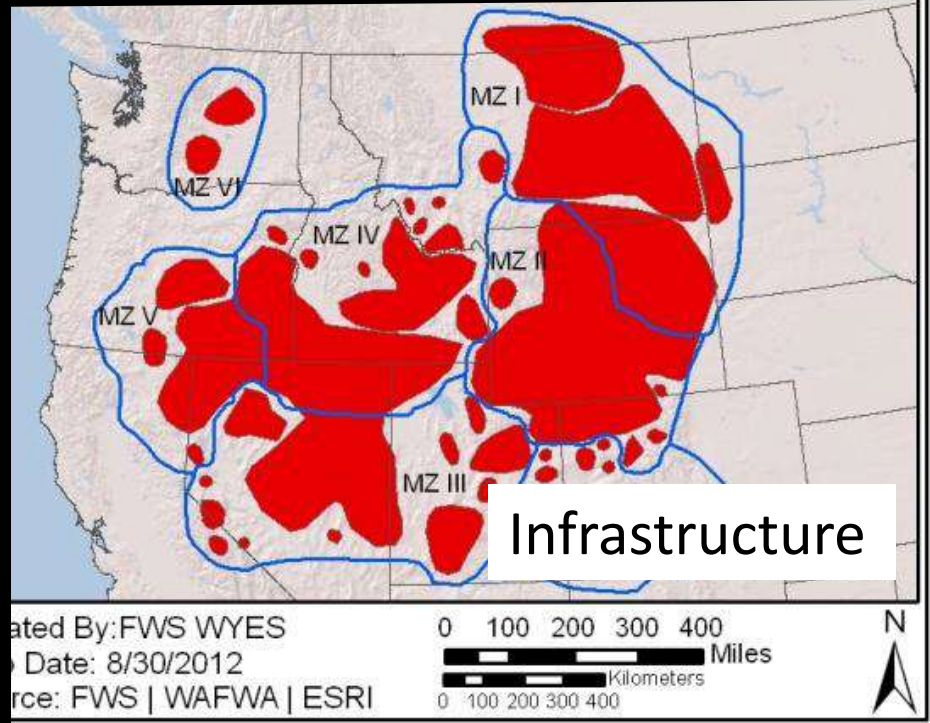


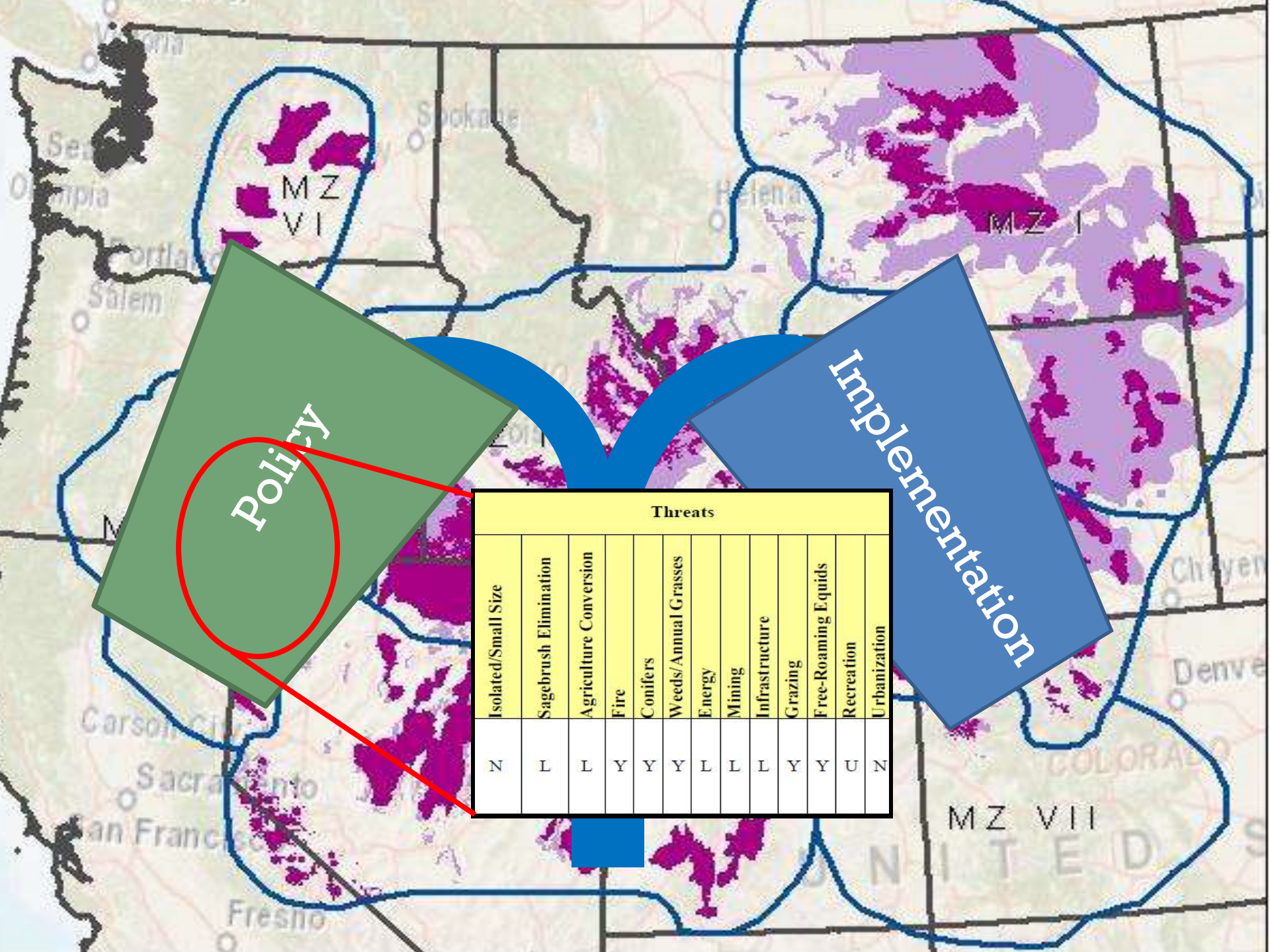
The name of the game is providing birds with options to meet their habitat needs


MZ I
MZ VI
MZ IV
MZ II
MZ V
MZ III
Ag Conversion
Created By:FWS WYES
Map Date: 8/30/2012
0 100 200 300 400
Miles
N


MZ I
MZ VI
MZ IV
MZ II
MZ V
Energy Development
Created By:FWS WYES
Map Date: 8/30/2012
0 100 200 300 400
Miles
Kilometers
N


MZ I
MZ VI
MZ IV
MZ II
MZ V
MZ III
Urbanization
Created By:FWS WYES
Map Date: 8/30/2012
Source: FWS | WAFWA | ESRI
0 100 200 300 400
Miles
Kilometers
0 100 200 300 400
N


MZ I
MZ VI
MZ IV
MZ II
MZ V
MZ III
Infrastructure
0 100 200 300 400
Miles
Kilometers
0 100 200 300 400
N

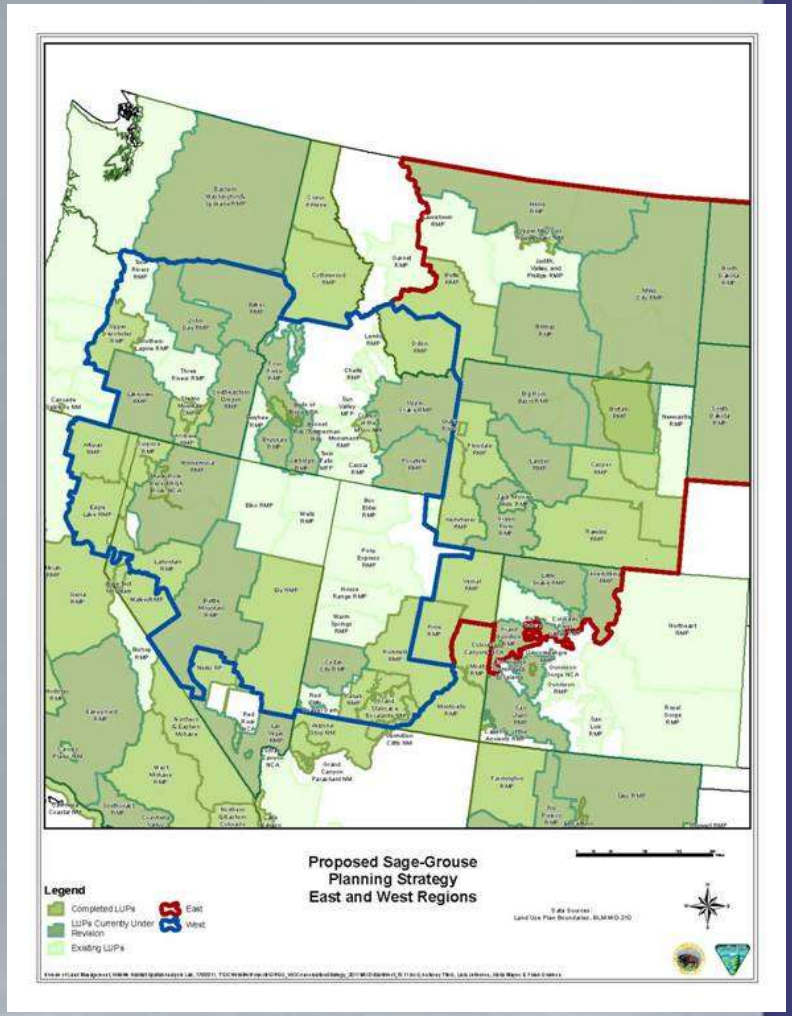


Threats												
Isolated/Small Size	Sagebrush Elimination	Agriculture Conversion	Fire	Conifers	Weeds/Annual Grasses	Energy	Mining	Infrastructure	Grazing	Free-Roaming Equids	Recreation	Urbanization
N	L	L	Y	Y	Y	L	L	L	Y	Y	U	N

Policy

BLM and USFS revising RMP's to address regulatory mechanisms

State-based solutions to further limit fragmenting effects



MATTHEW H. MEAD
GOVERNOR

THE STATE OF WYOMING

STATE CAPITOL
CHEYENNE, WY 82002

Office of the Governor

STATE OF WYOMING
EXECUTIVE DEPARTMENT
EXECUTIVE ORDER

NATIONAL SYSTEM OF PUBLIC LANDS




Saving Sage-Grouse

The Wyoming Example

Implementation
Conservation Easements

Policy
Core Area Strategy

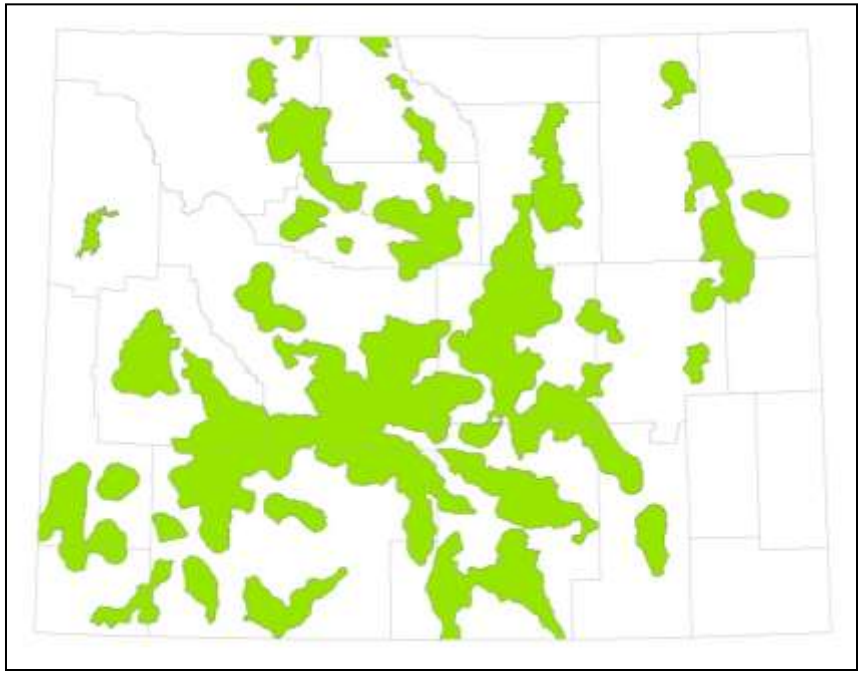
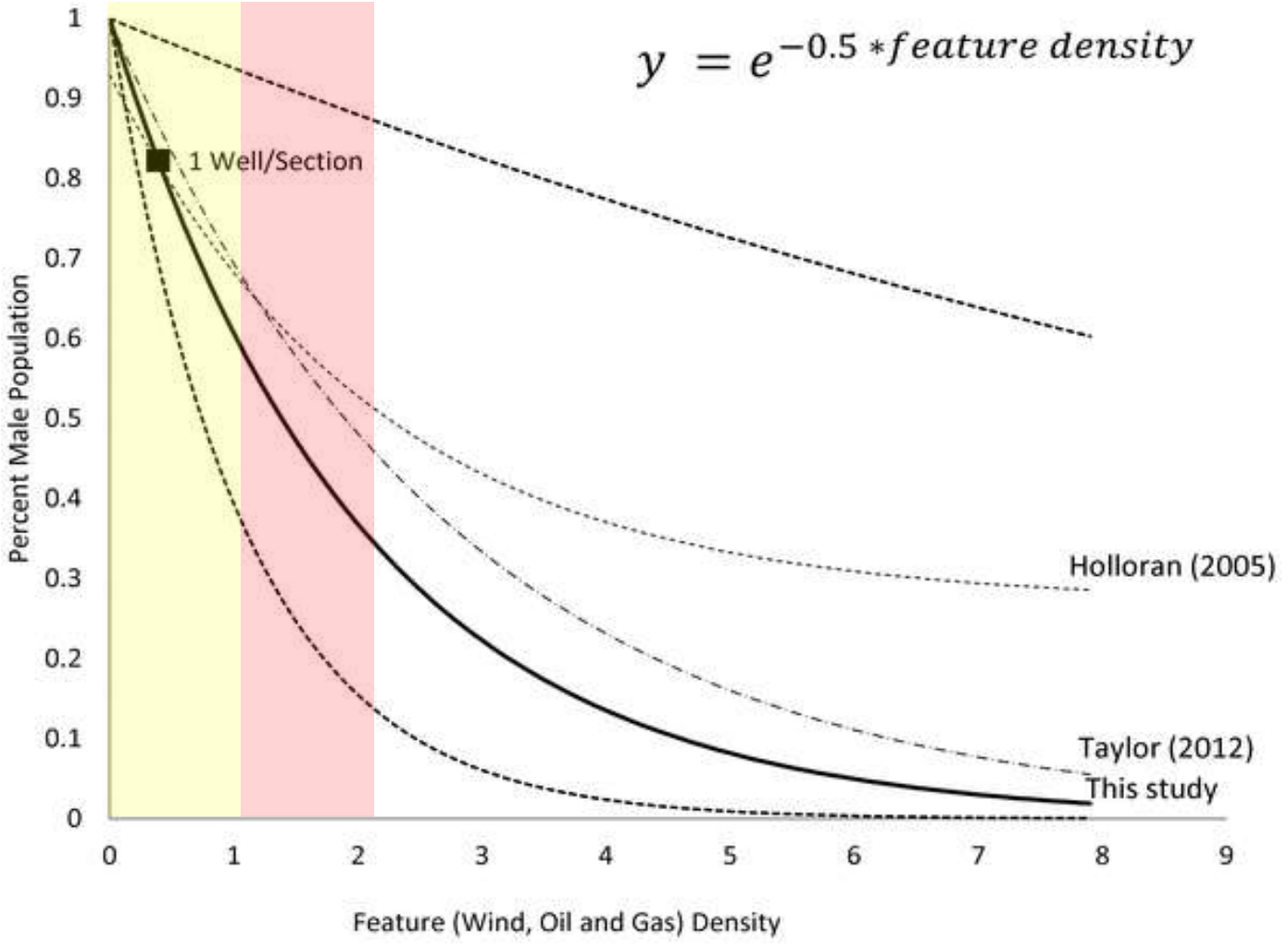
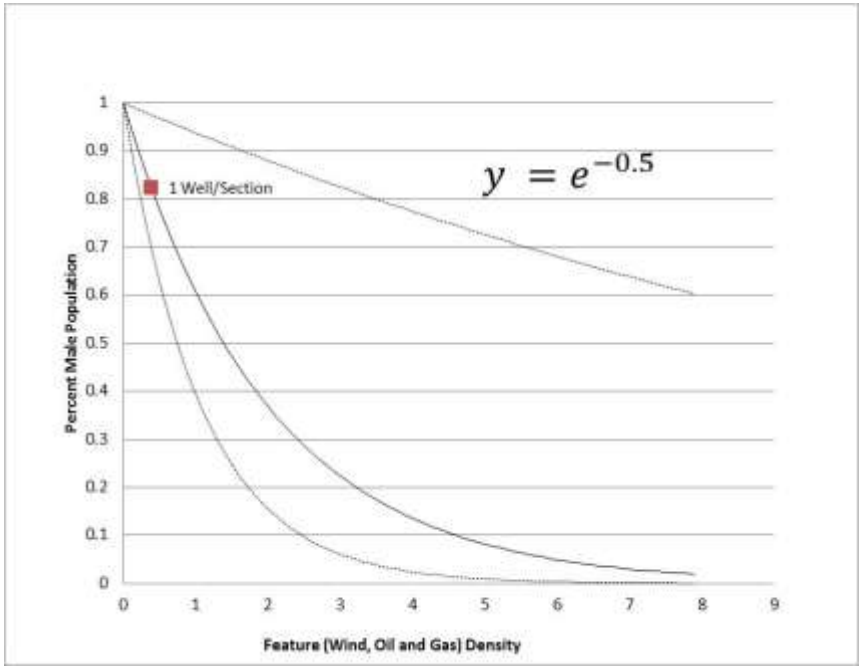
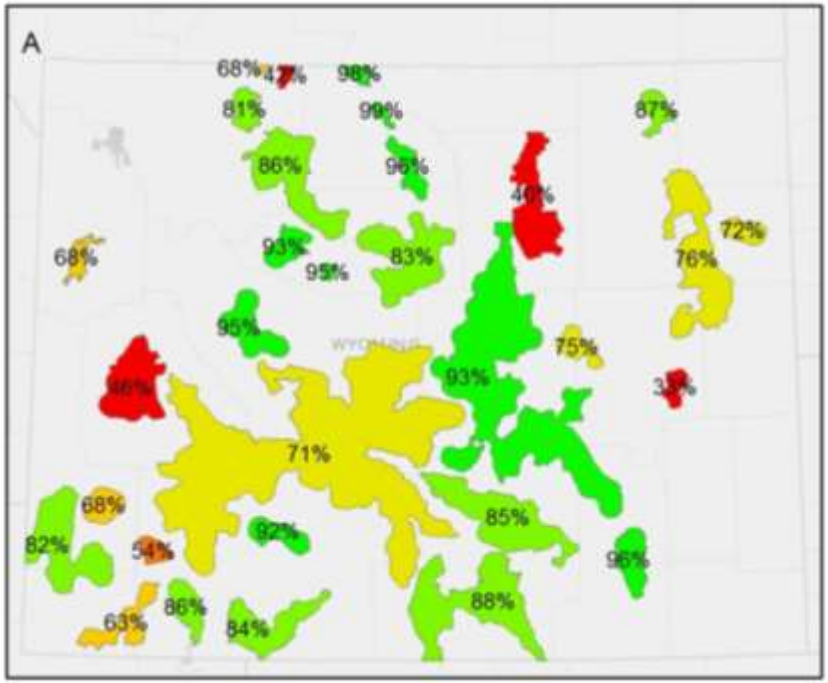


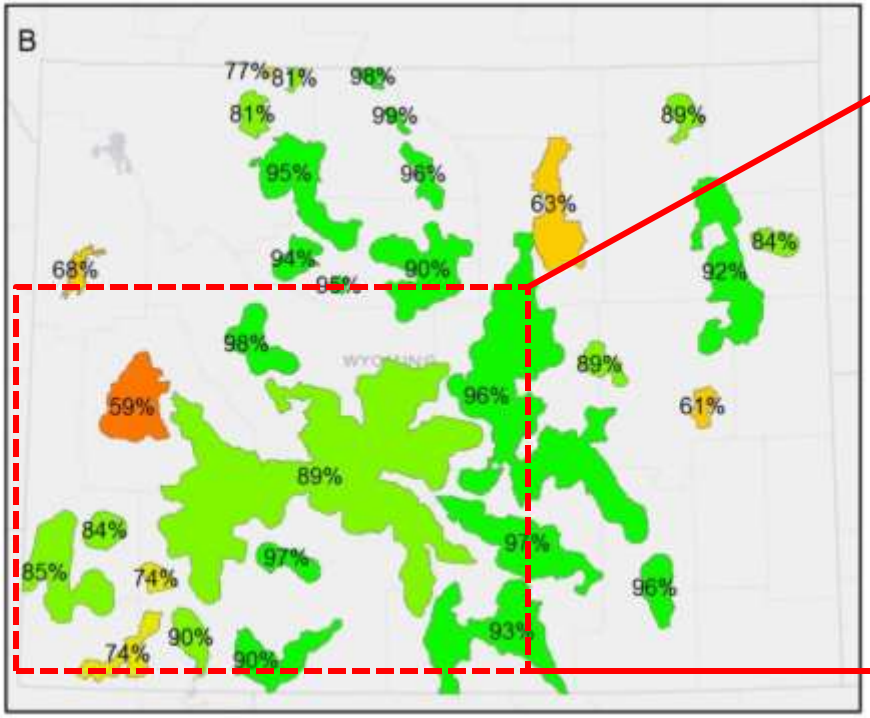
Figure 4. Sage-grouse population response to feature density regression relationship (solid line) with 95% CI (dotted lines).

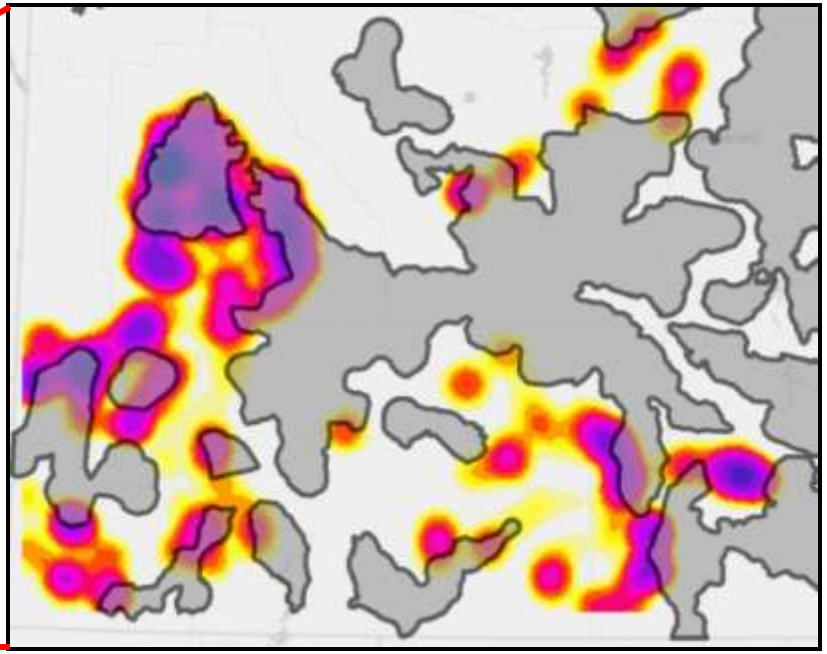


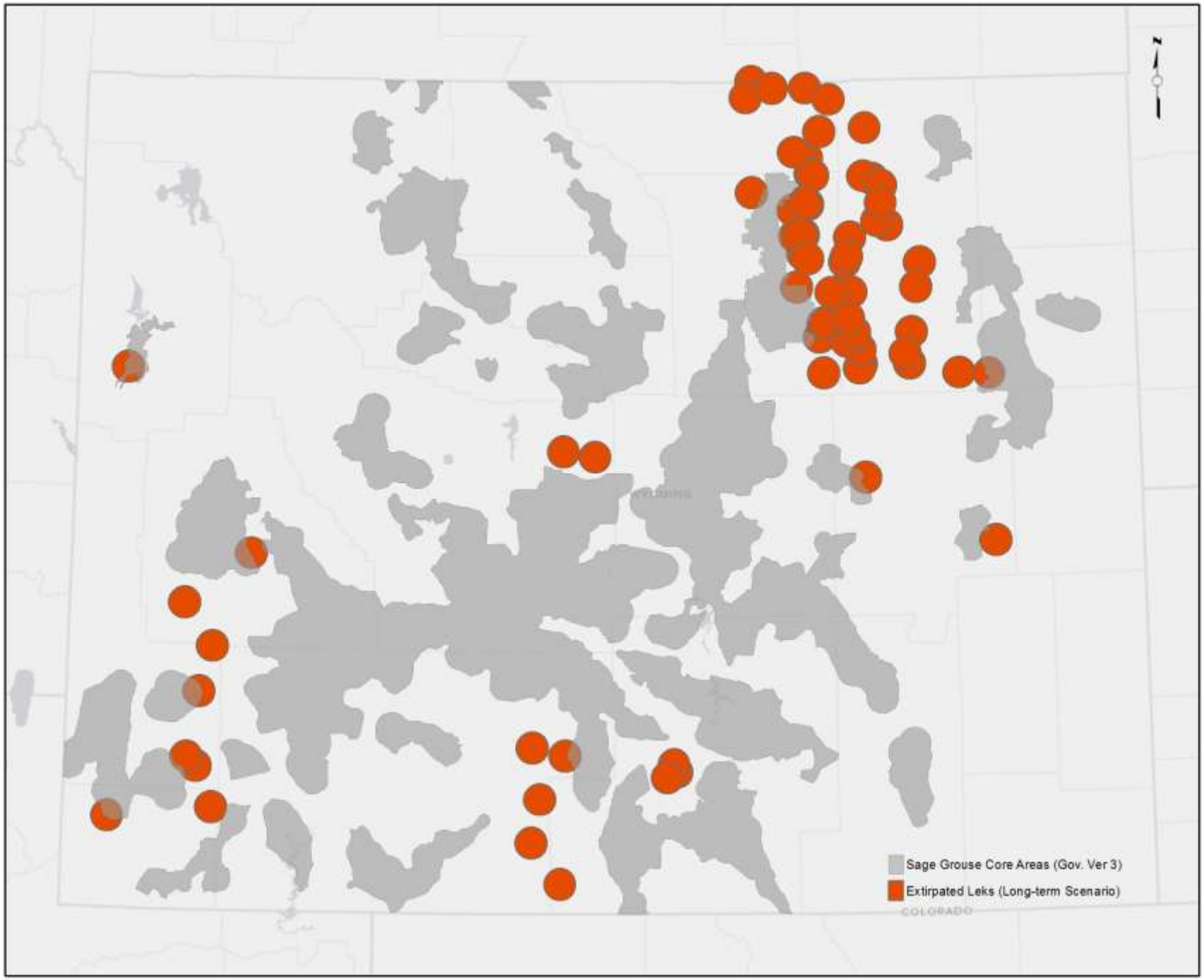
Copeland HE, Pocewicz A, Naugle DE, Griffiths T, et al. (2013) Measuring the Effectiveness of Conservation: A Novel Framework to Quantify the Benefits of Sage-Grouse Conservation Policy and Easements in Wyoming. PLoS ONE 8(6): e67261. doi:10.1371/journal.pone.0067261
http://www.plosone.org/article/info:doi/10.1371/journal.pone.0067261

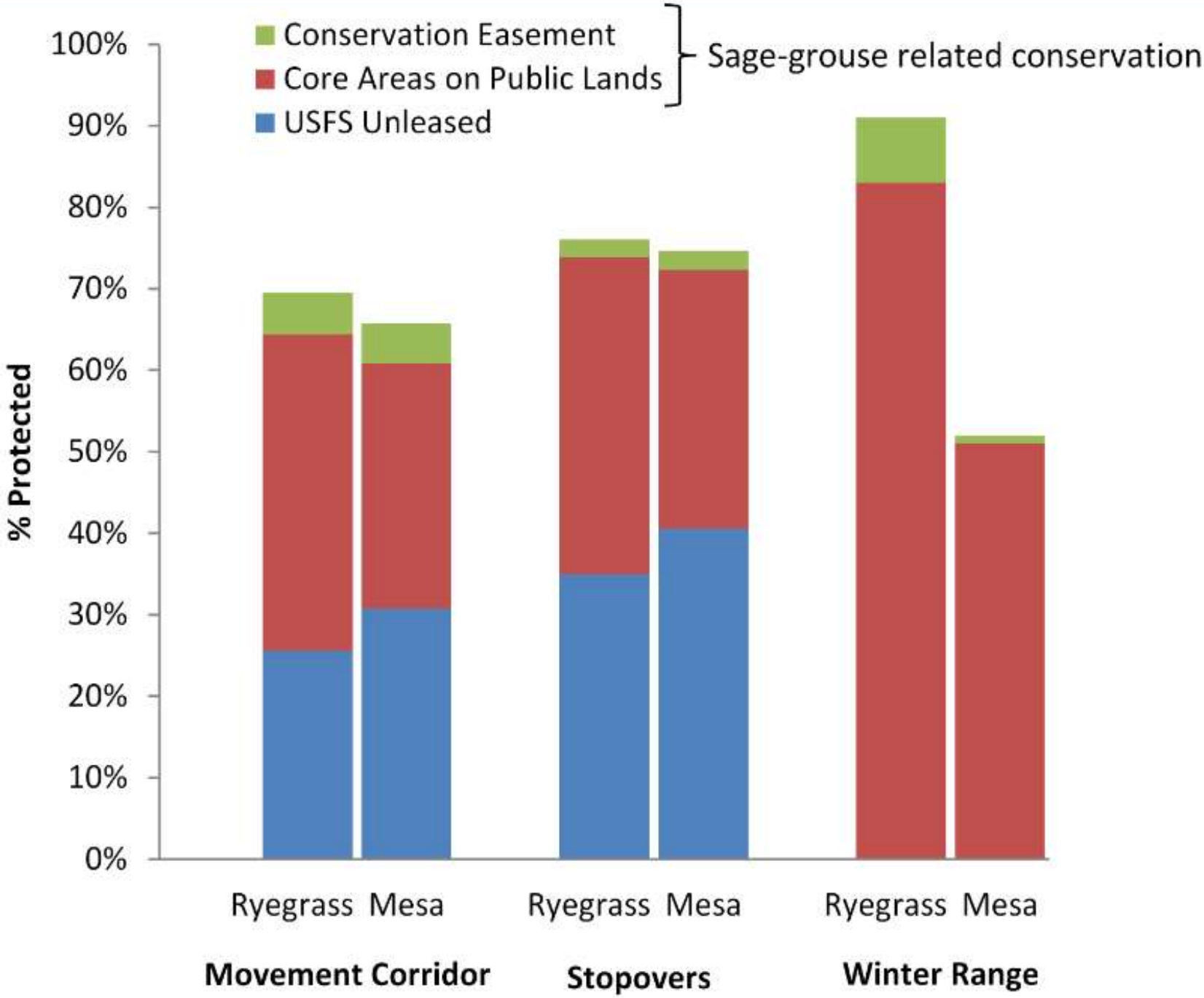

$y = e^{-0.5}$
1 Well/Section
Percent Male Population
Feature (Wind, Oil and Gas) Density
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
1
2
3
4
5
6
7
8
9


A
68%
47%
98%
81%
99%
87%
86%
96%
40%
72%
68%
93%
95%
83%
76%
95%
75%
46%
93%
34%
71%
68%
85%
82%
54%
92%
96%
63%
86%
84%
88%

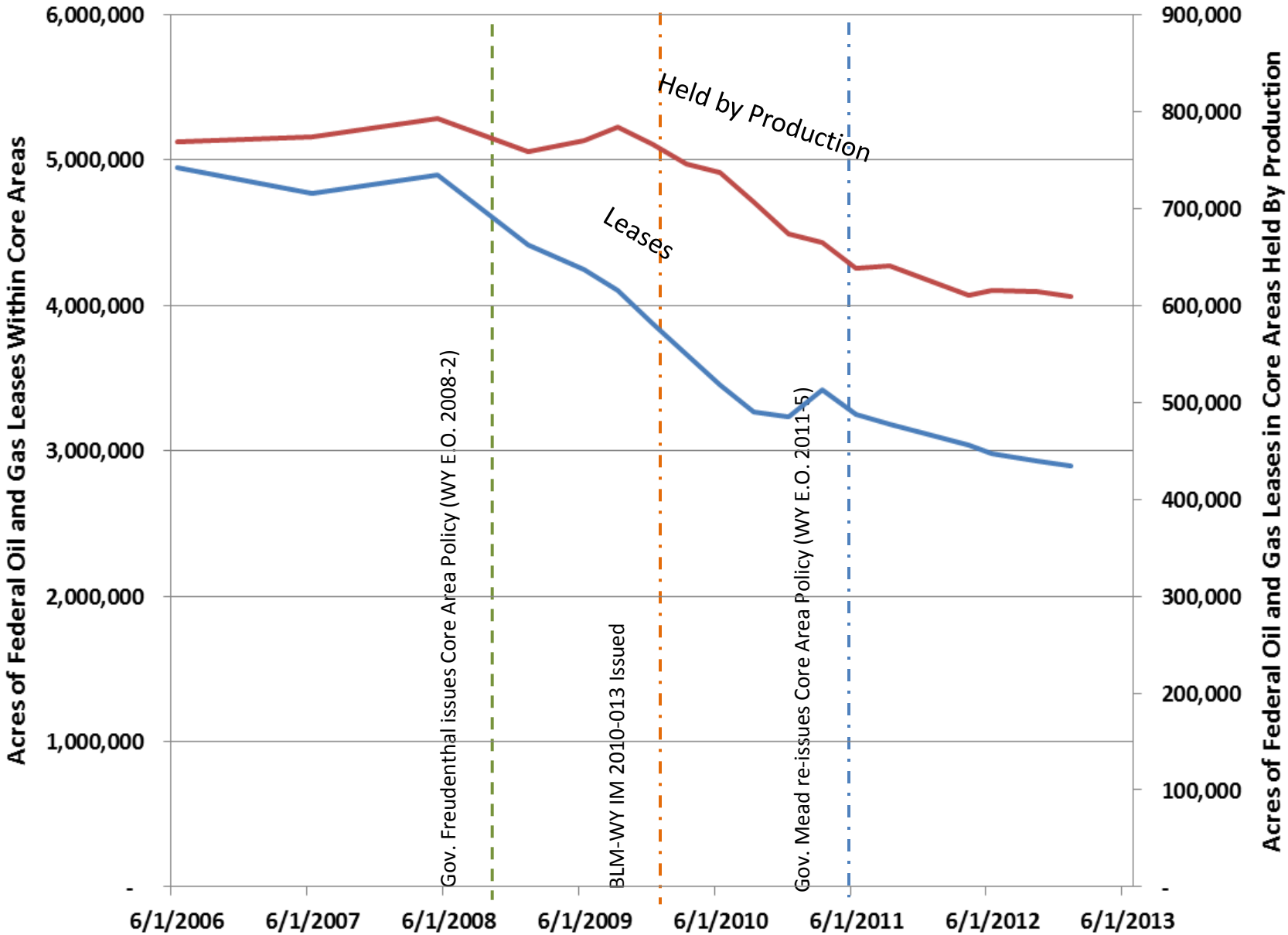

B
77%
81%
98%
81%
99%
89%
95%
96%
63%
84%
68%
94%
90%
92%
98%
89%
59%
96%
61%
89%
84%
97%
97%
85%
74%
96%
93%
74%
90%
90%

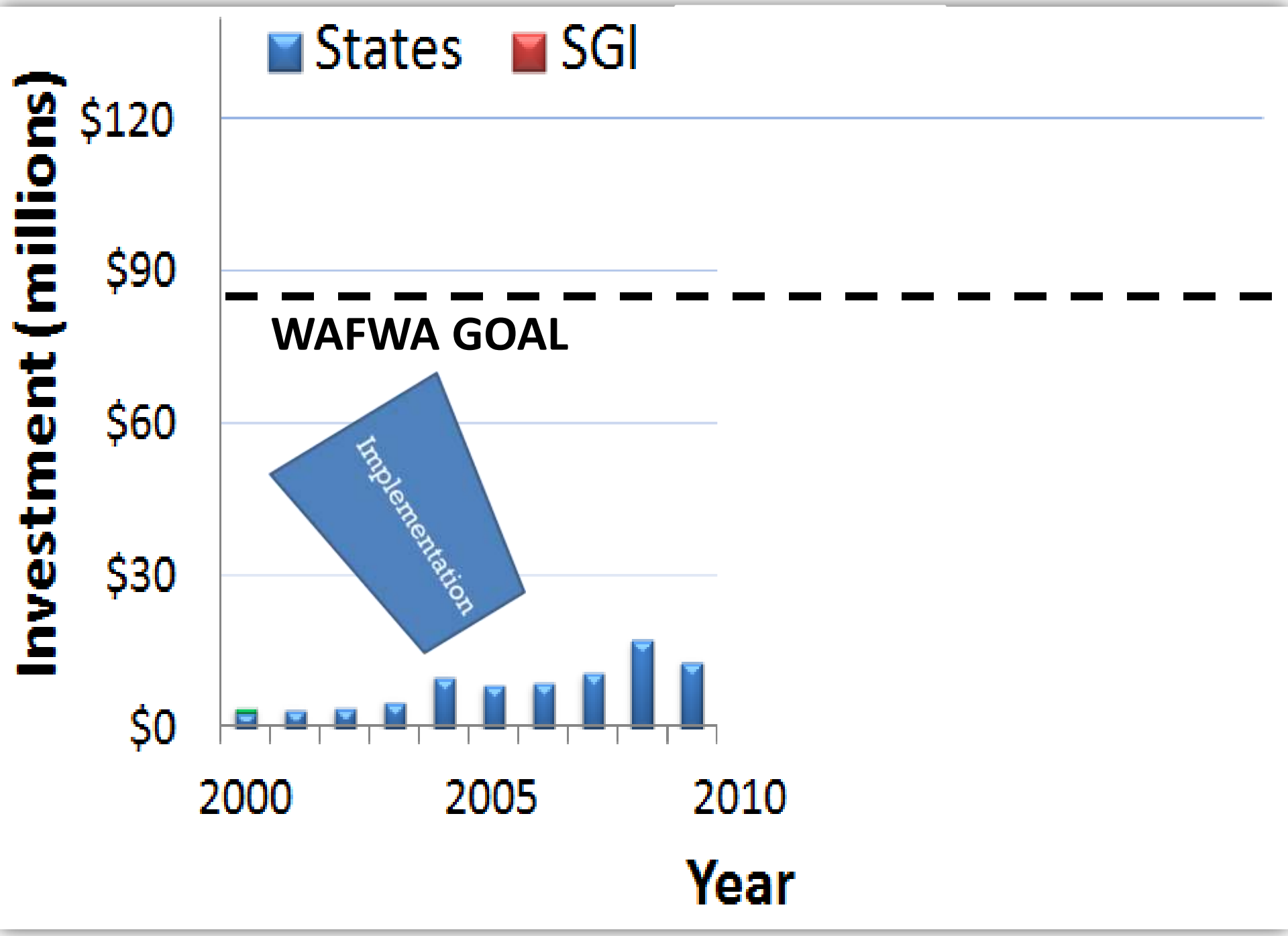



Sage Grouse Core Areas (Gov. Ver 3)
Extirpated Leks (Long-term Scenario)
COLORADO


Conservation Easement
Core Areas on Public Lands
USFS Unleased
Sage-grouse related conservation
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Protected
Ryegrass
Mesa
Ryegrass
Mesa
Ryegrass
Mesa
Movement Corridor
Stopovers
Winter Range

Federal Oil and Gas Lease Acreages Within State of Wyoming Greater Sage-Grouse Core Areas




States
SGI
Investment (millions)
$120
$90
$60
$30
$0
WAFWA GOAL
Implementation
2000
2005
2010
Year

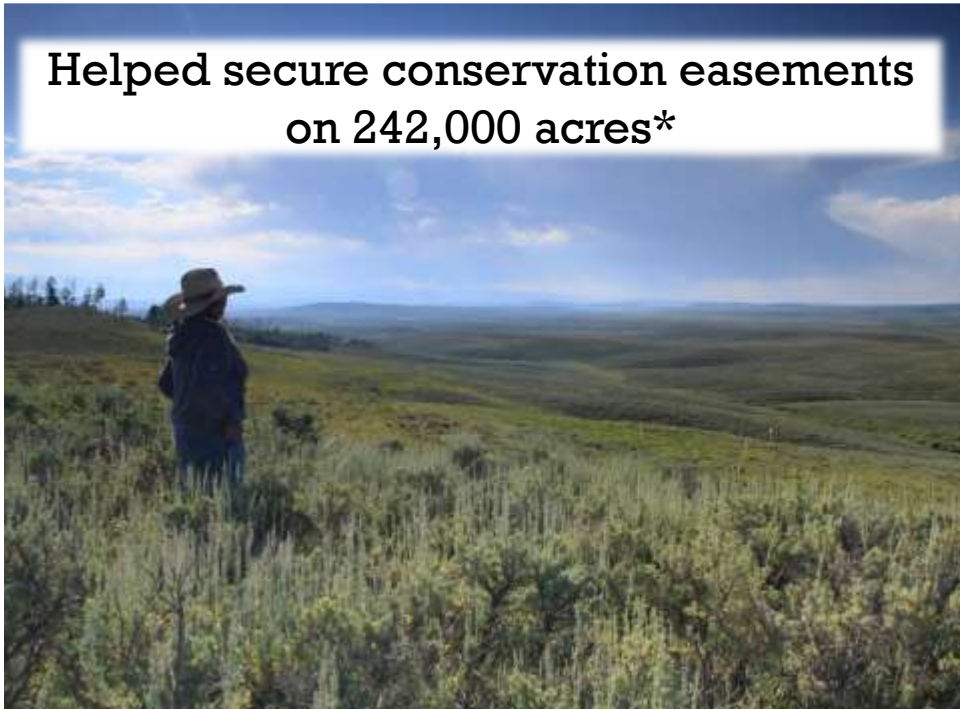
Sage Grouse Initiative

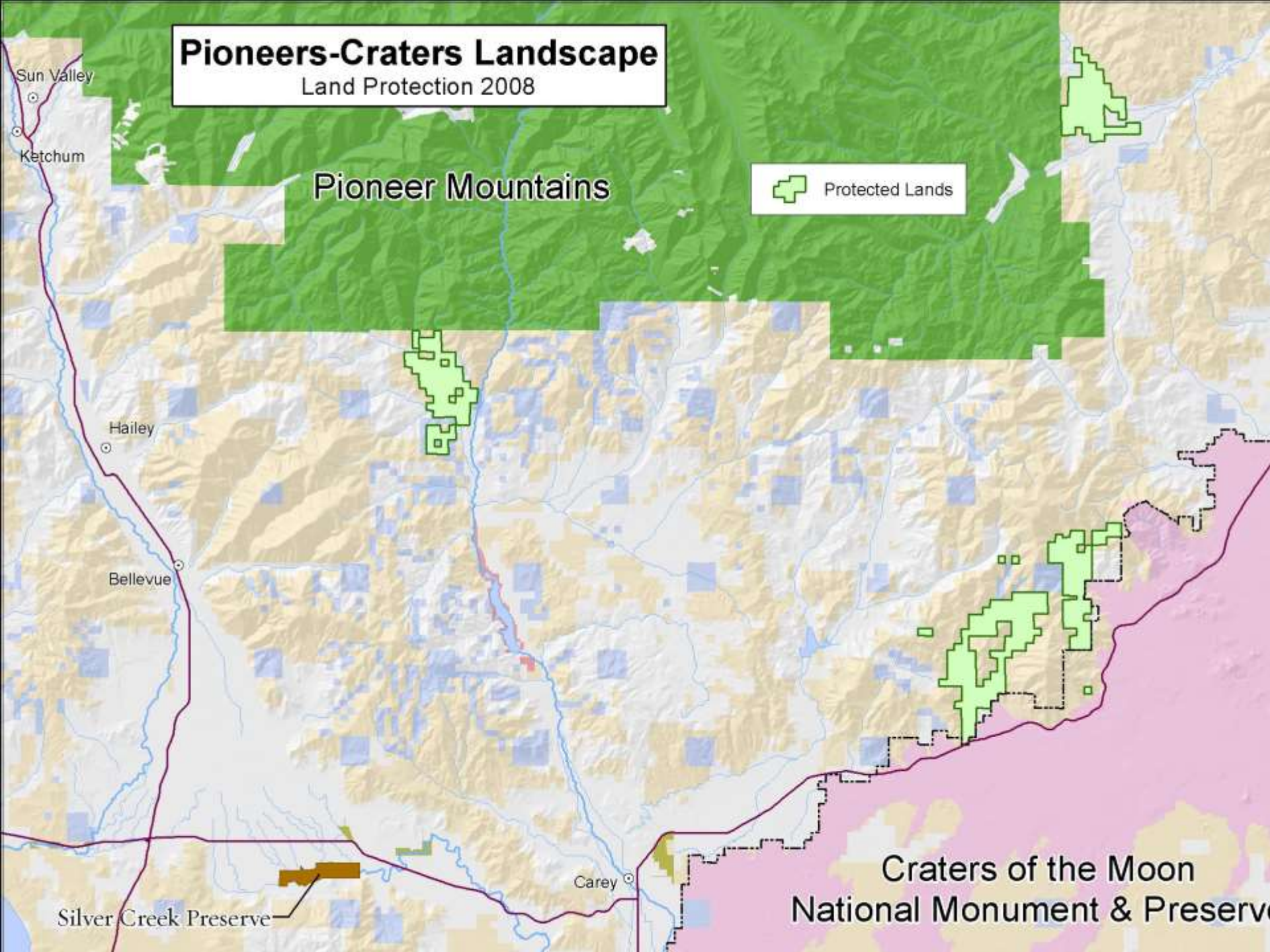
- Remove threats to sage-grouse and improve sustainability of working ranches
- Implement enough of the right practices in the right places to benefit populations
- Assess effectiveness, quantify benefits and adapt program delivery

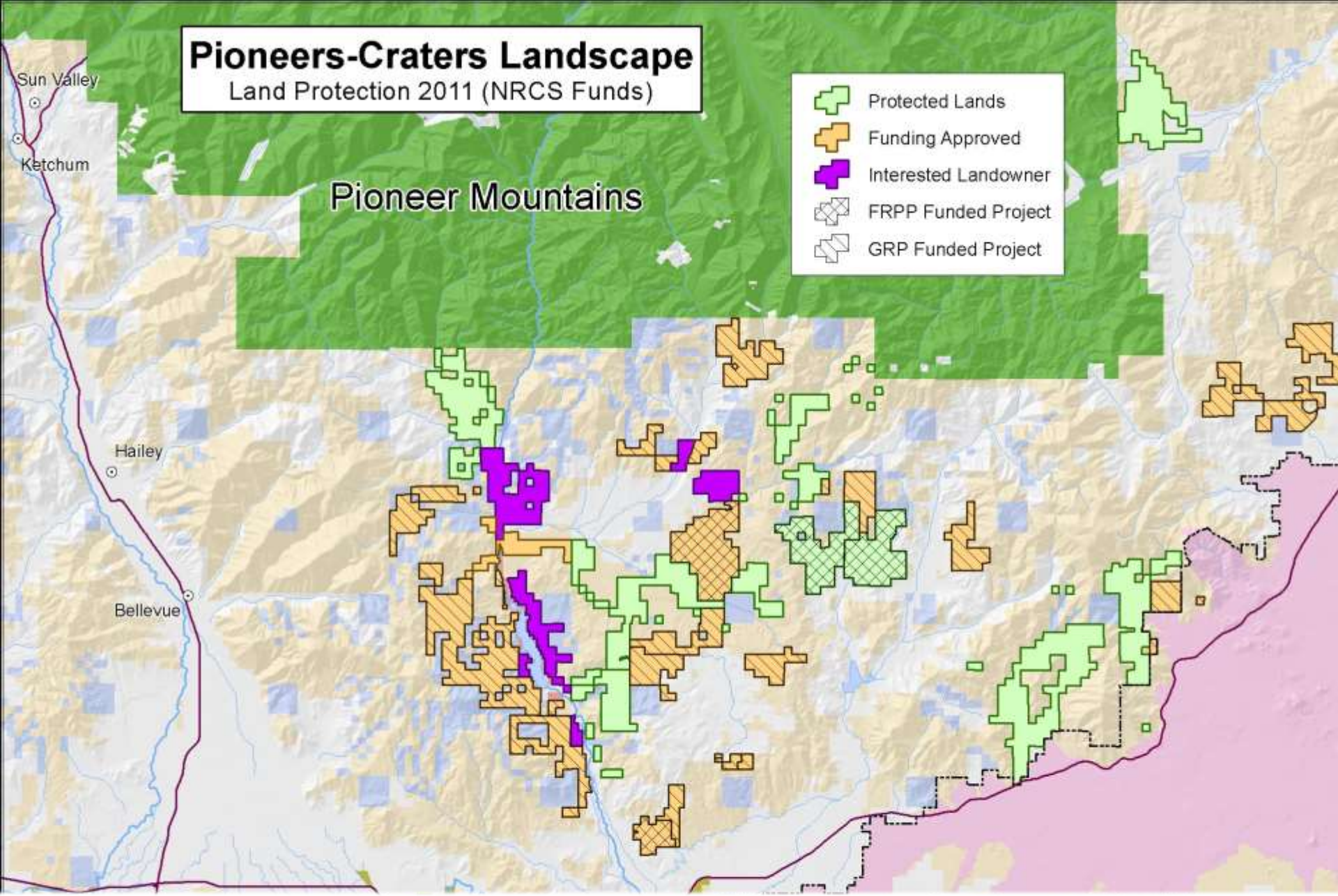

Grazing systems on
2.1 million acres


Marked or moved 495 miles of
'high risk' fence


Removed encroached conifers on
195,000 acres

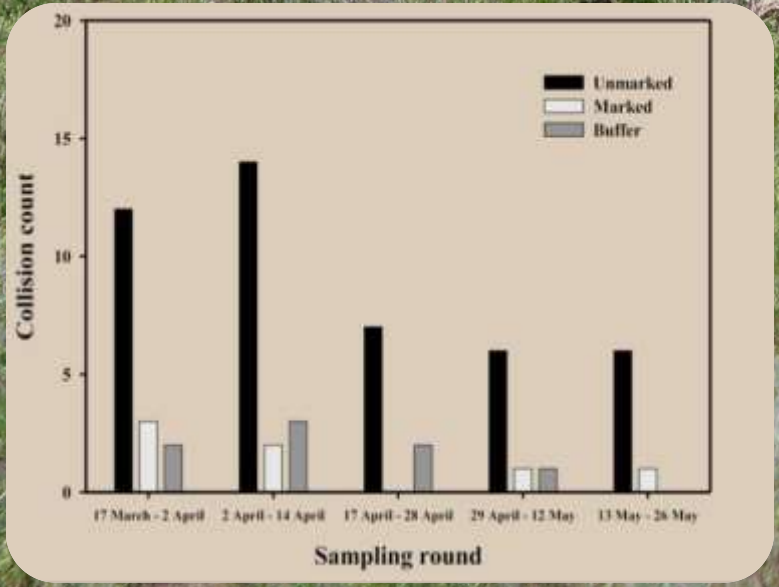

Helped secure conservation easements
on 242,000 acres*


Pioneers-Craters Landscape
Land Protection 2008
Sun Valley
Ketchum
Pioneer Mountains
Protected Lands
Hailey
Bellevue
Carey
Silver Creek Preserve
Craters of the Moon
National Monument & Preserve



Total of 16 easements on 30,189 acres

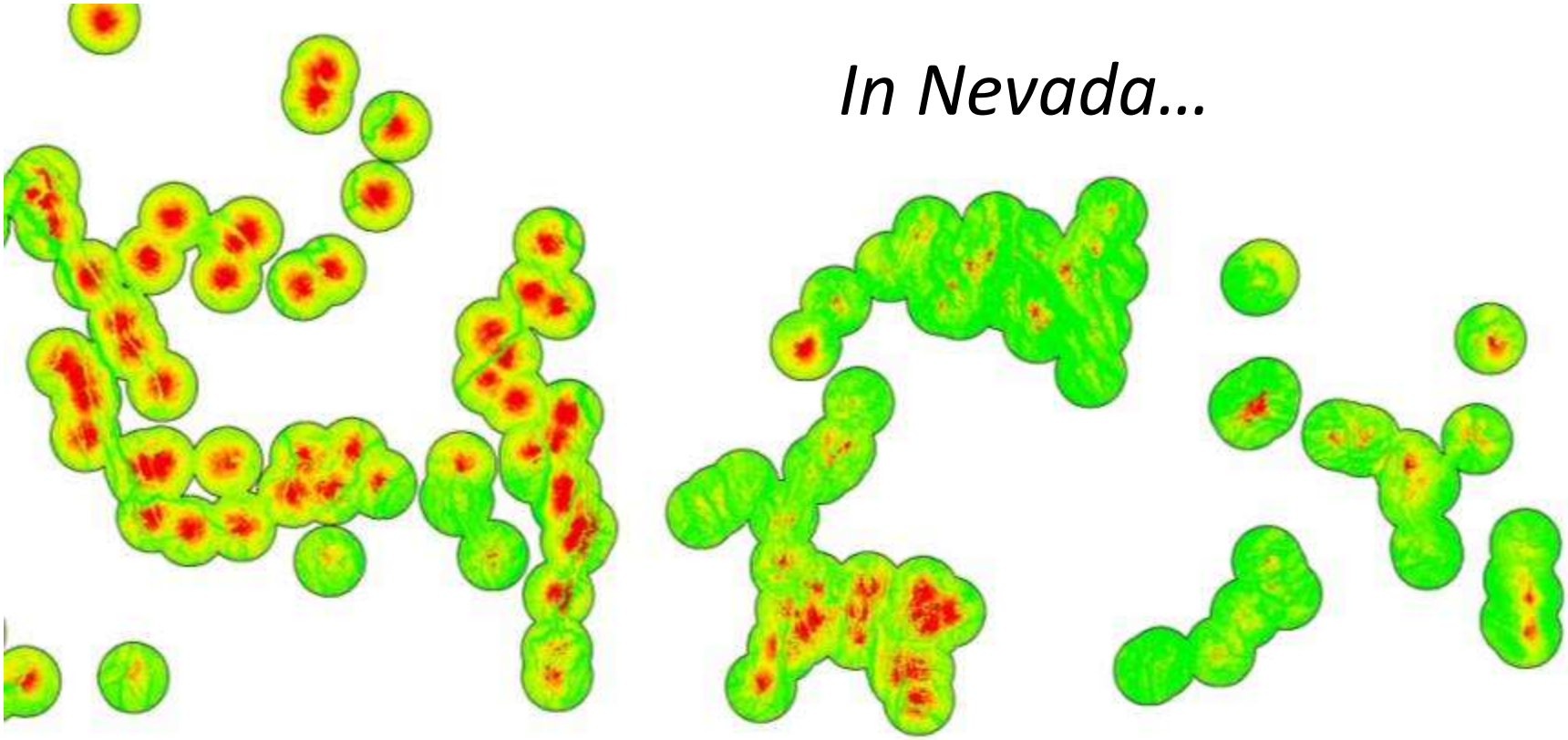
Treatment	Collisions
Marked	7
Unmarked	42



B.S. Stevens, K.P. Reese, J.W. Connelly, and D.D. Musil
Univ. Idaho and ID Fish and Game

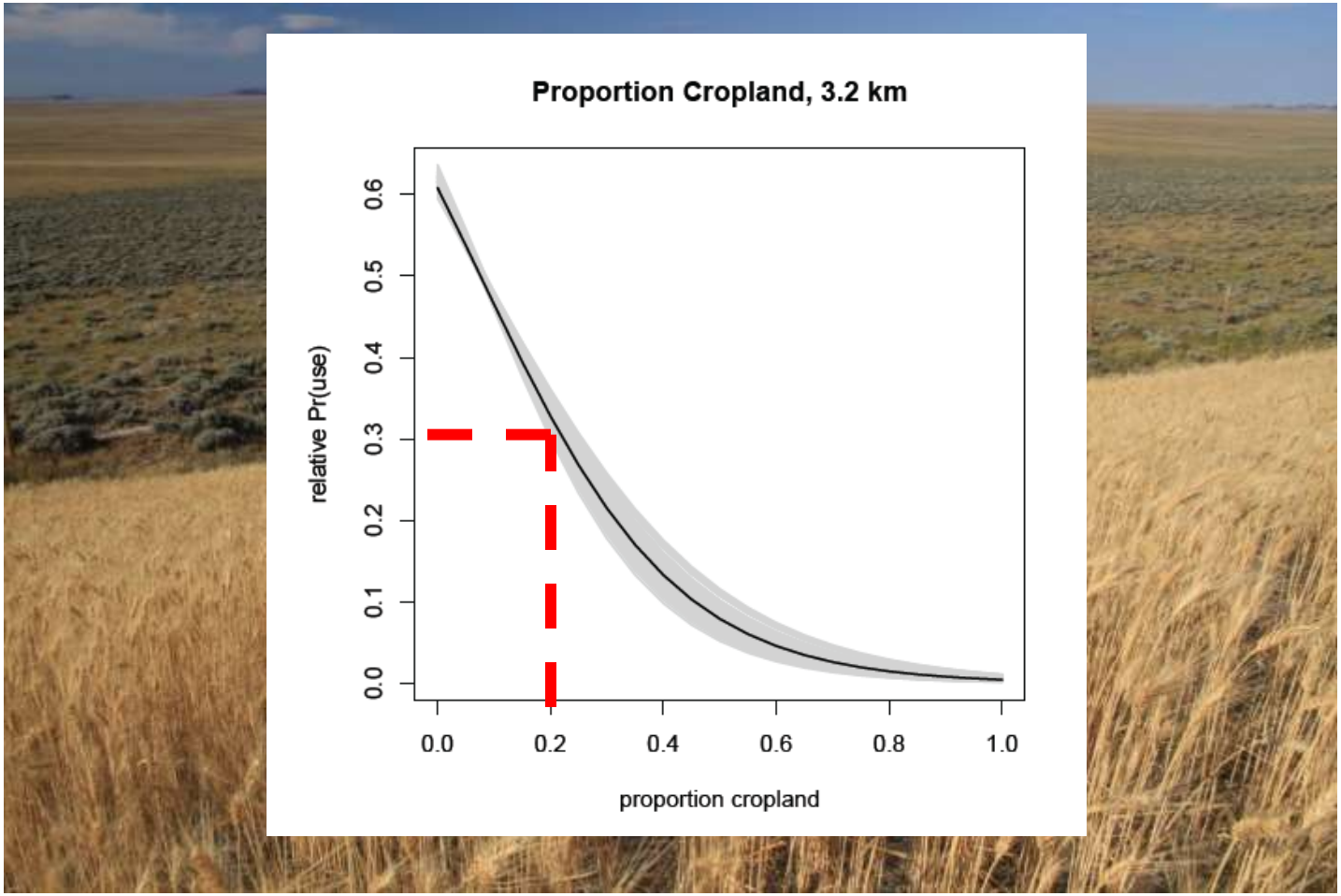
New range wide fence marking tool

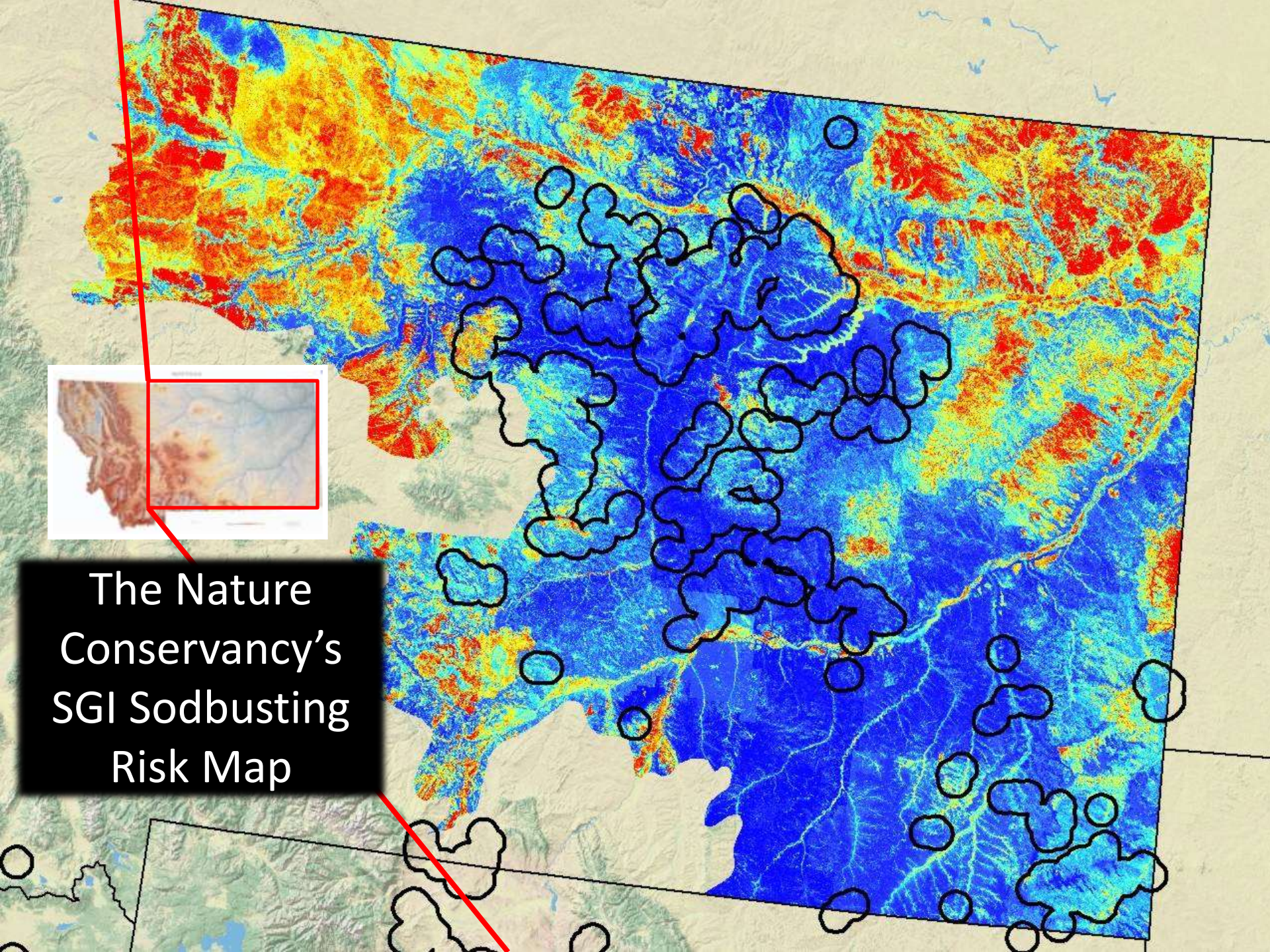
In Nevada…

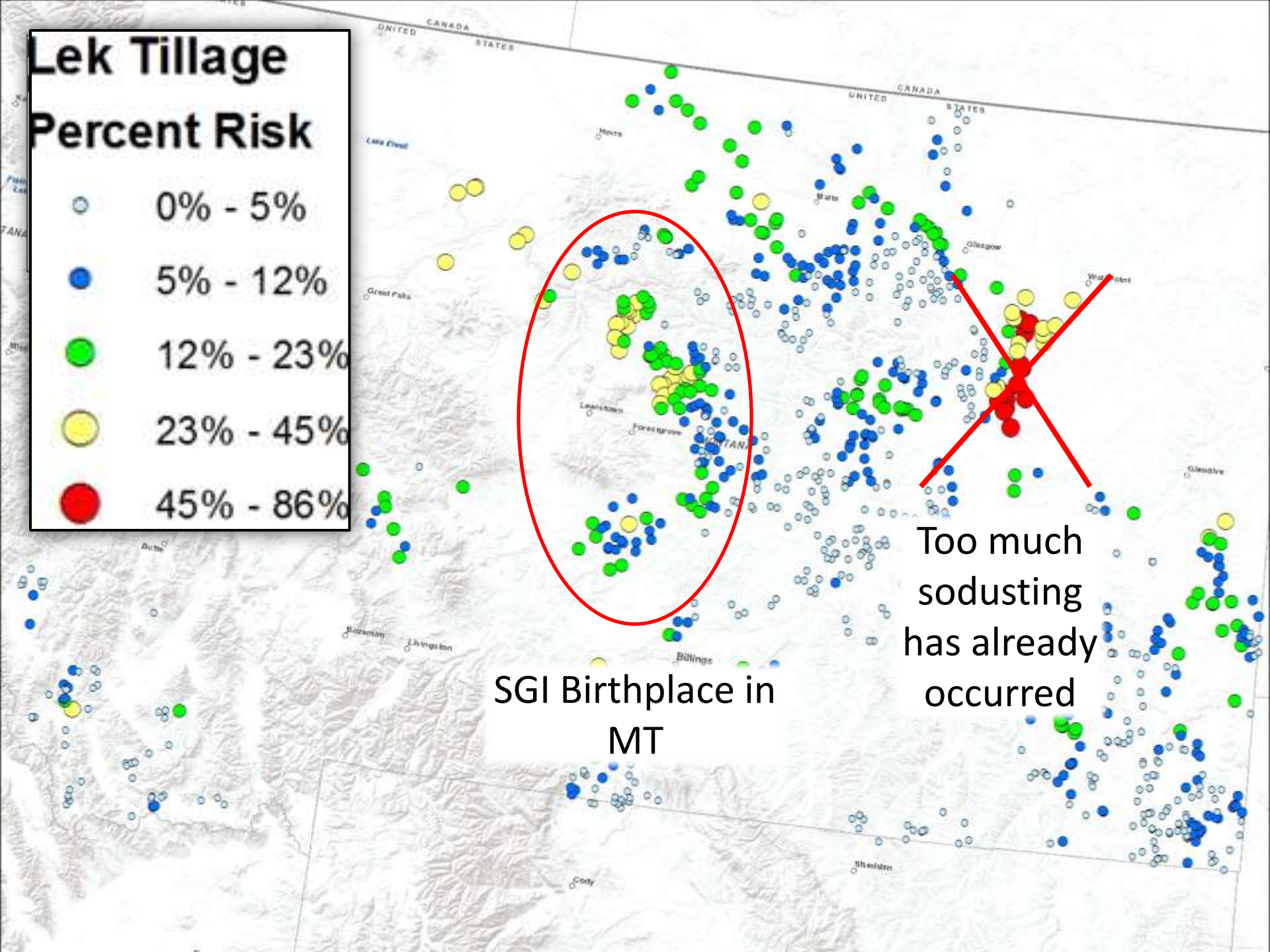


Marking fence >1 collision is 9%
of area (260,000 ac) within 2 mi of leks

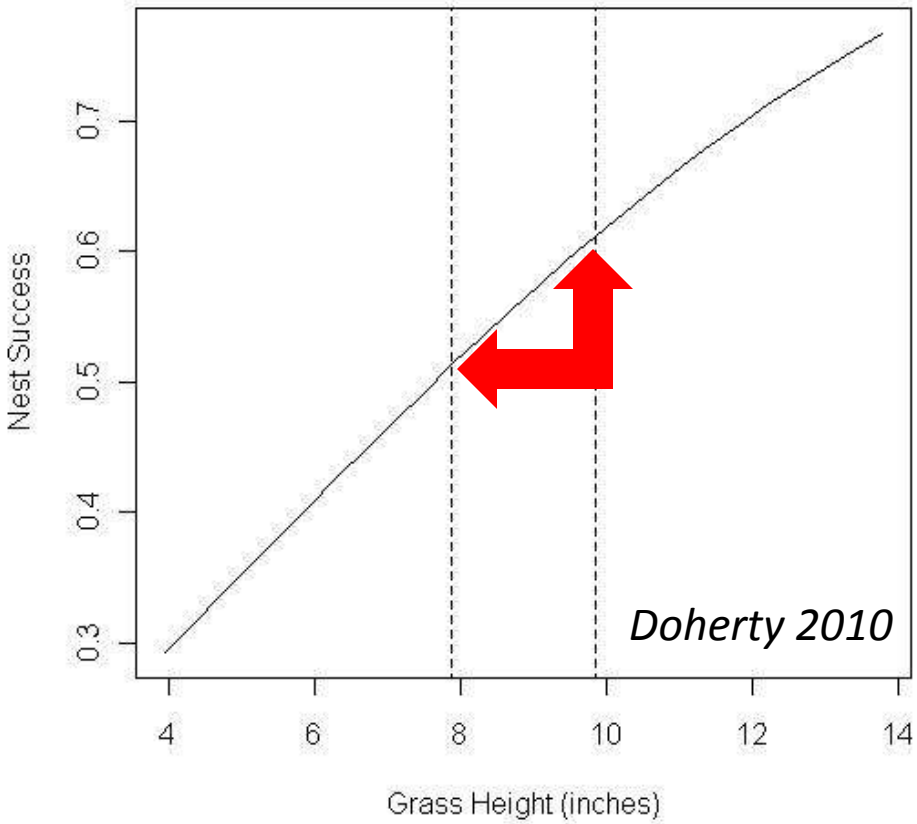
Job # 1
Stop the bleeding by keeping ranchers in business




The Nature Conservancy's SGI Sodbusting Risk Map


Lek Tillage
Percent Risk
0% - 5%
5% - 12%
12% - 23%
23% - 45%
45% - 86%
SGI Birthplace in MT
Too much sodusting has already occurred

Stop the bleeding, ***make more birds***



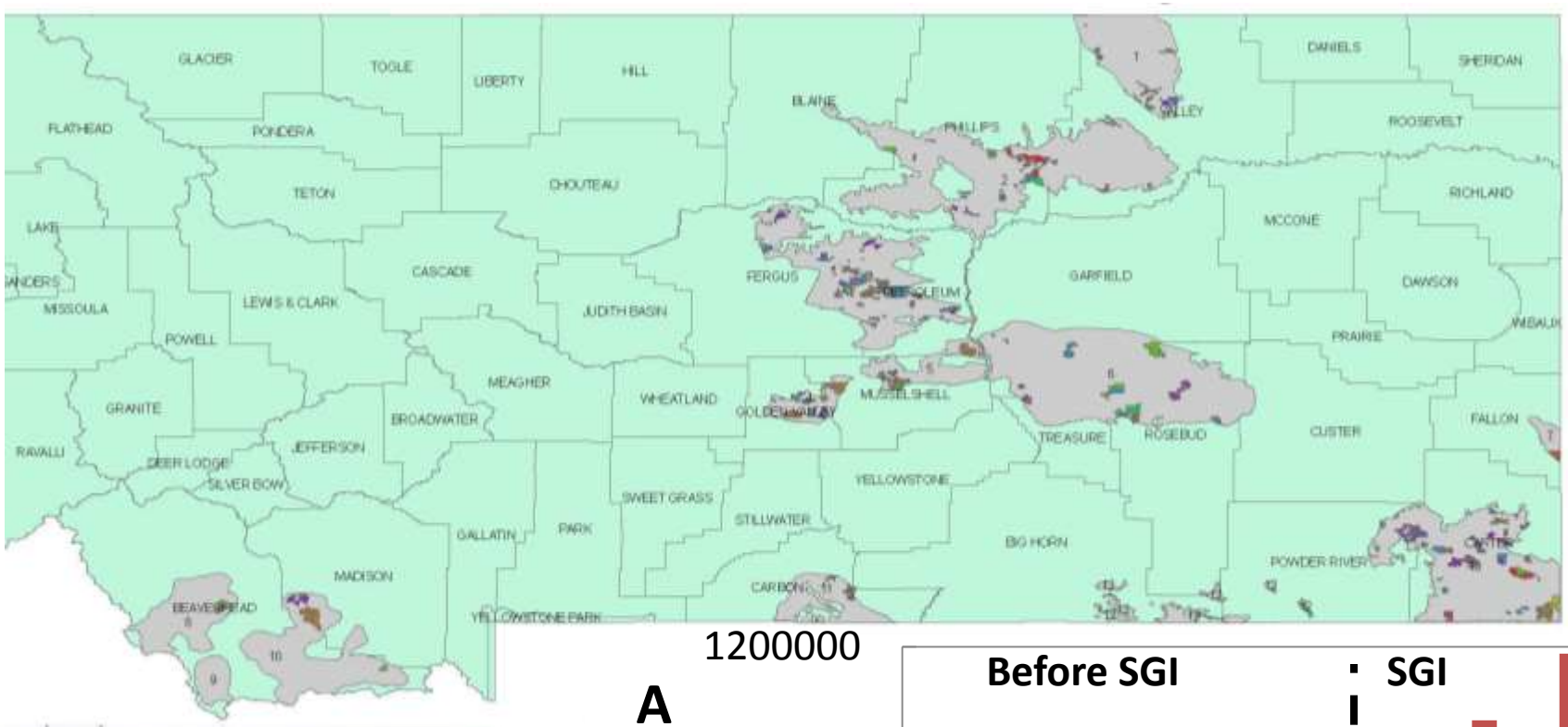
8% increase in nest success

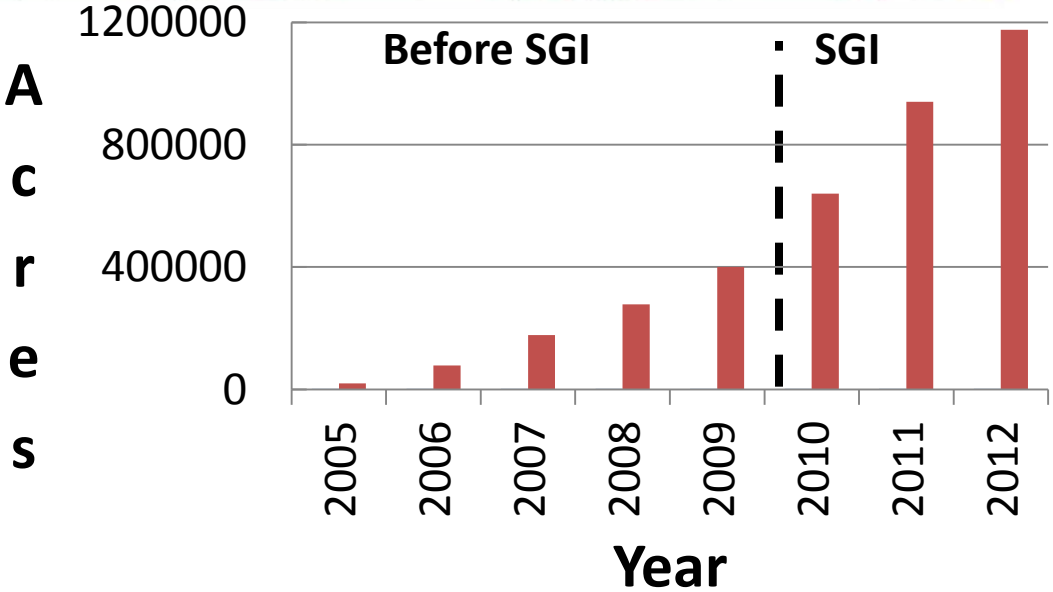
equates to 10% increase in population growth

Taylor, Naugle and Mills BLM Report 2011

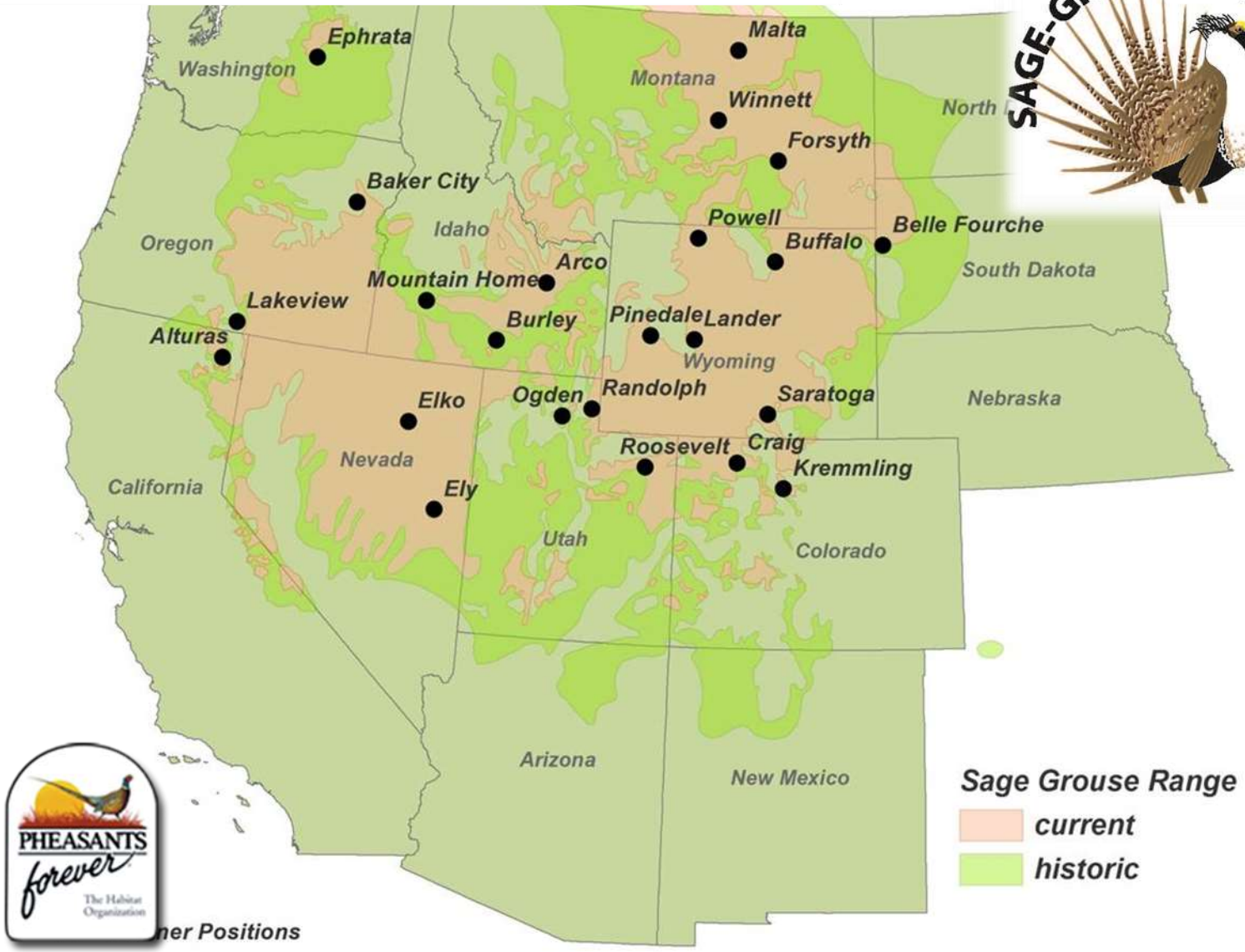
4 years of applied grazing system

Montana Grazing Systems 4x higher with SGI





6. Partnerships and capacity

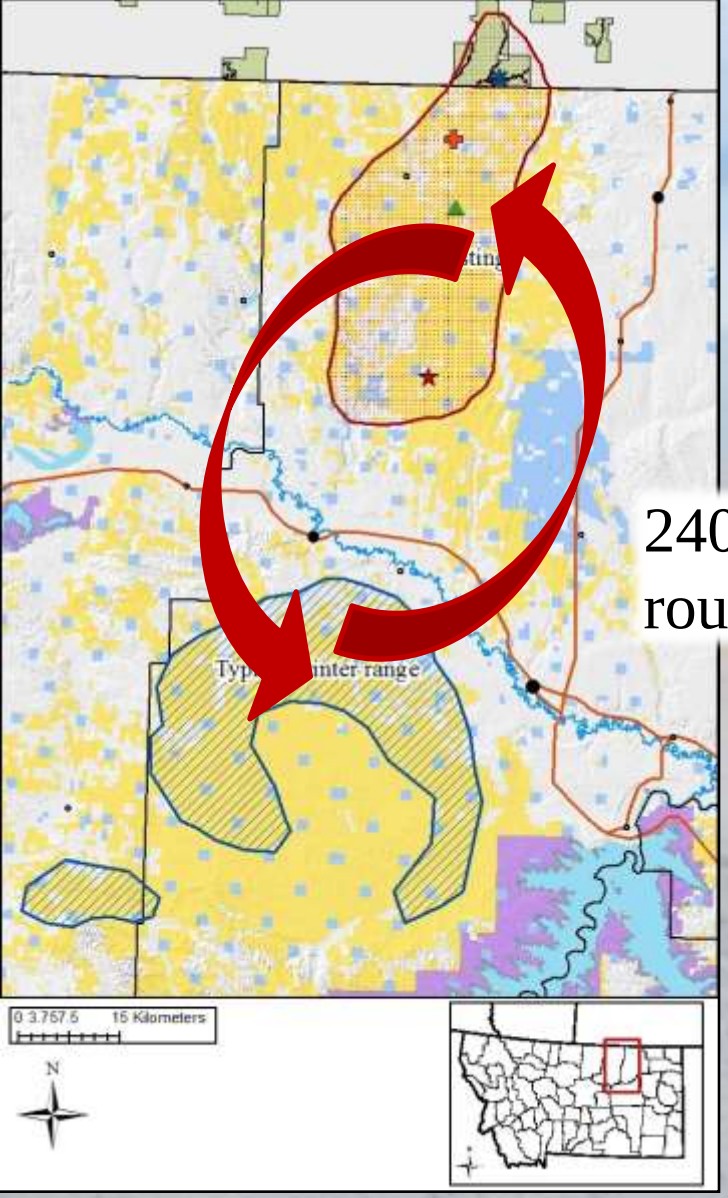


SAGE-GROUSE INITIATIVE

PHEASANTS forever
The Habitat Organization

ner Positions

Let’s talk briefly about migration between countries before break

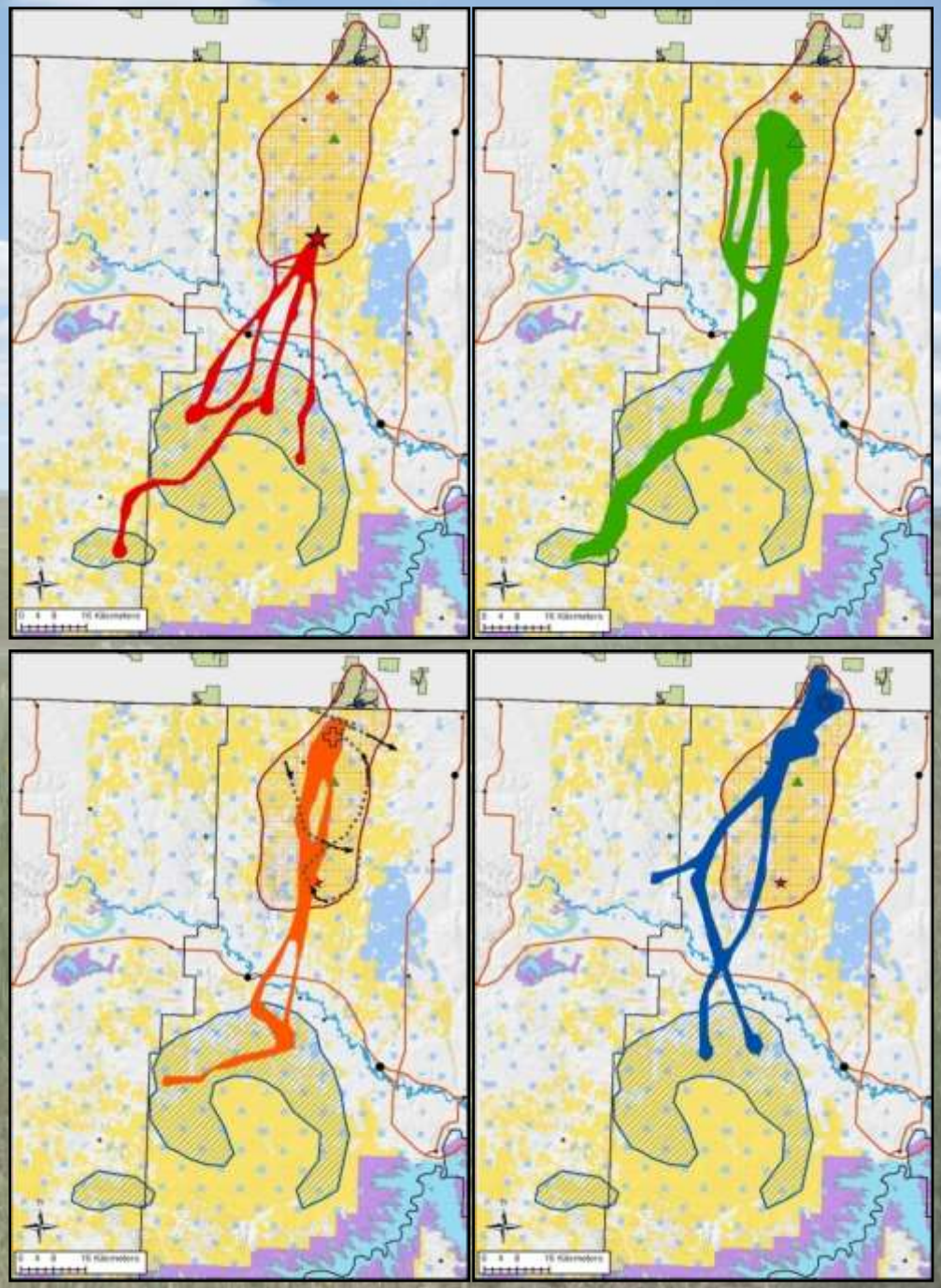


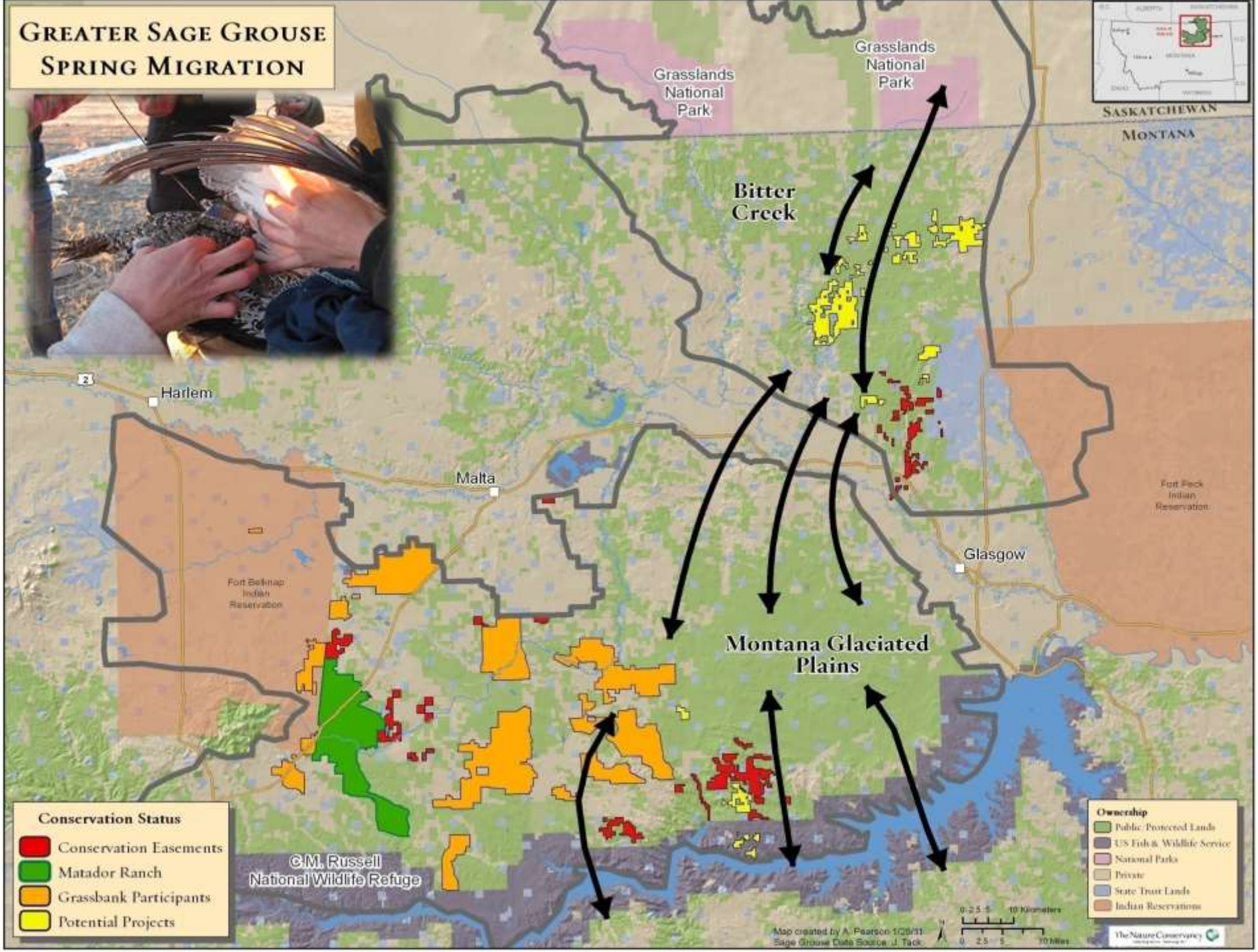
Greater sage-grouse *Centrocercus urophasianus* migration links the USA and Canada: a biological basis for international prairie conservation

Jason D. Tack, David E. Naugle, John C. Carlson and Pat J. Fargey

Migratory pathway

- Individual routes varied
- Routes formed diffuse migratory pathway
- Birds frequented stopovers along routes

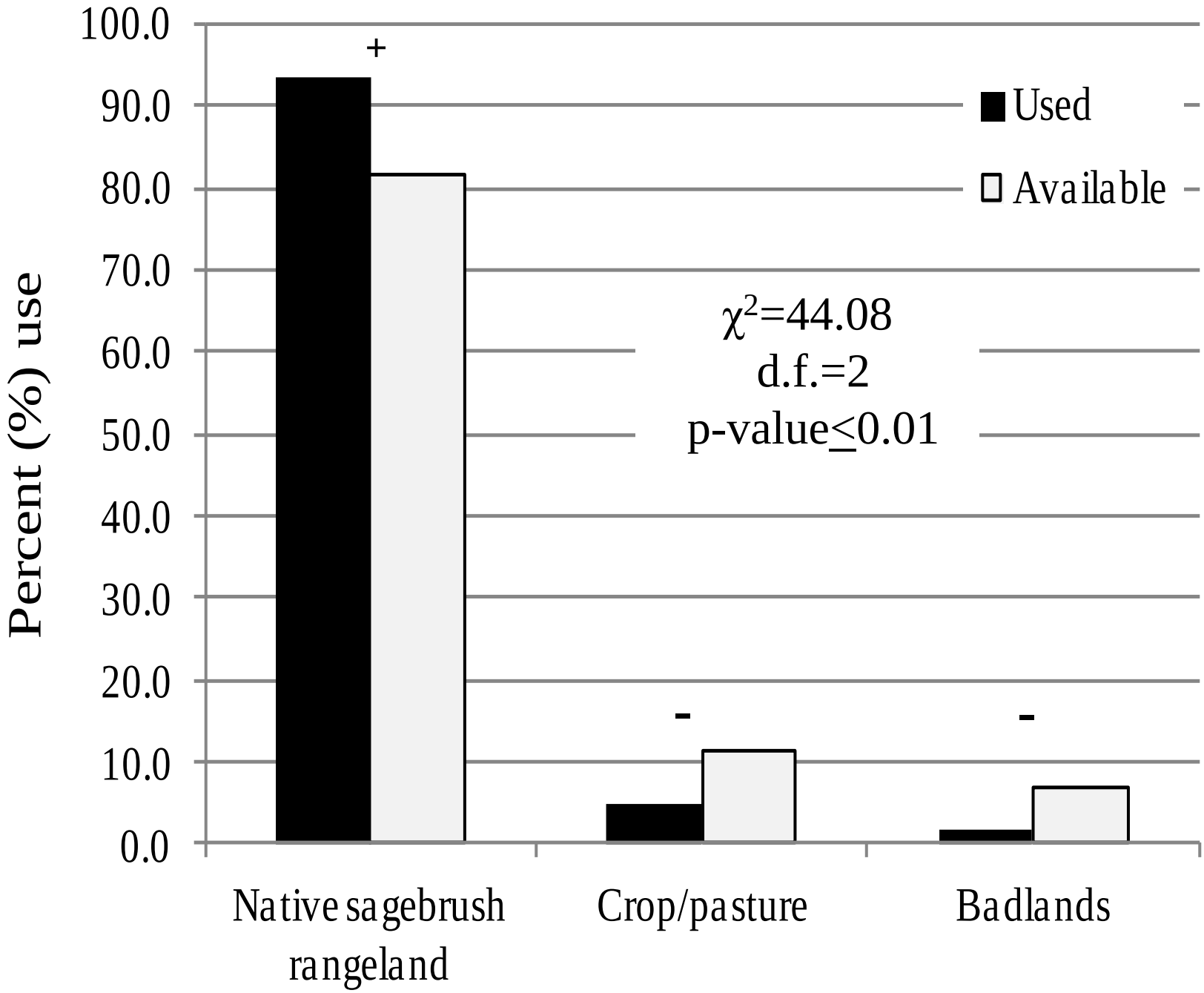



Greater Sage Grouse
Spring Migration
Grasslands National Park
Grasslands National Park
Saskatchewan
Montana
Bitter Creek
Harlem
Malta
Glasgow
Fort Peck Indian Reservation
Fort Belknap Indian Reservation
Montana Glaciated Plains
C.M. Russell National Wildlife Refuge
Conservation Status
Conservation Easements
Matador Ranch
Grassbank Participants
Potential Projects
Ownership
Public Protected Lands
US Fish & Wildlife Service
National Parks
Private
State Trust Lands
Indian Reservations
Map created by A. Pearson 1/28/11
Sage Grouse Data Source: J. Tack
0 2.5 5 10 Kilometers
0 2.5 5 10 Miles
The Nature Conservancy

Number & Duration of Stopovers

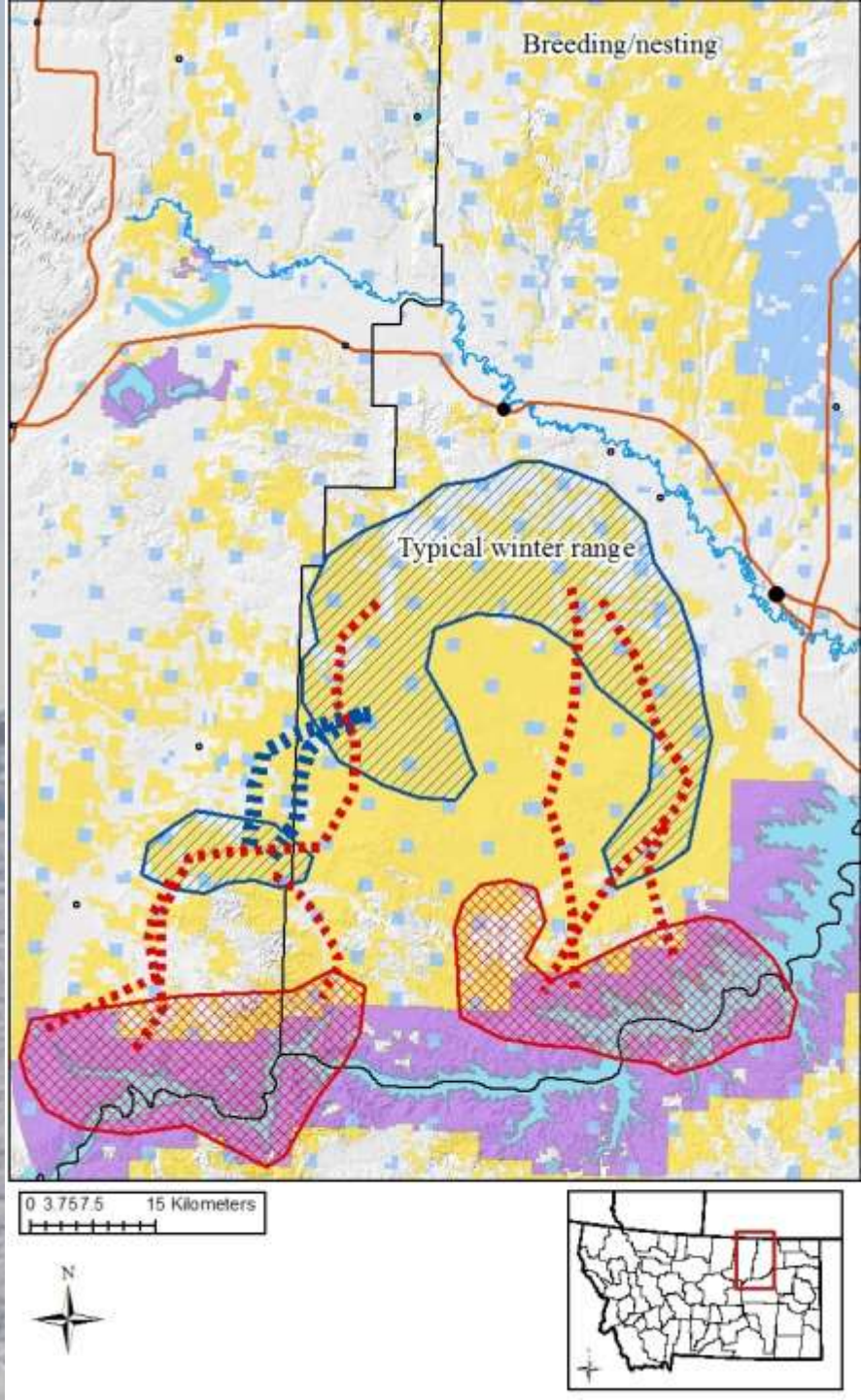
- Migrating birds averaged 8 stopovers apiece
- Stopovers average ½ day in fall and 1 day in spring

		No. stopovers		Hours/stopover	
Season	Year	Mean	Range	Mean	Range
Fall (1 Oct -30 Nov)	2010	8	3 - 15	15	9 - 22
	2011	9	2 - 15	16	11 - 29
Spring (1 Mar -30 Apr)	2011	12	10 - 16	20	15 - 30
	2012	7	5 - 10	21	8 - 39


100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Percent (%) use
+
-
-
Used
Available
χ2=44.08
d.f.=2
p-value≤0.01
Native sagebrush rangeland
Crop/pasture
Badlands

Emergency migration

- Highly adaptable = 100% overwinter survival
- ~50 km farther south = 300 km roundtrip
- Additional wintering areas identified on CMR

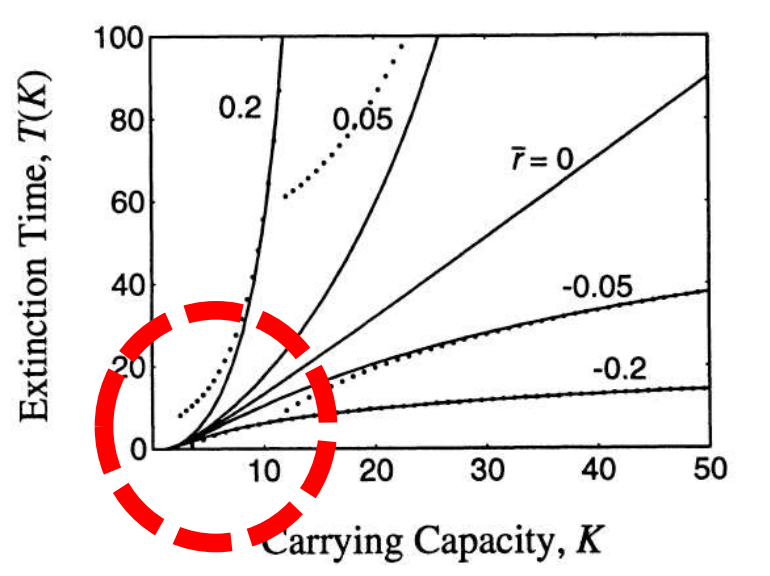


Conserving Small Populations

Canada's story is one of cumulative impacts and small populations

Chance of losing populations is greater when they are small, isolated and already impacted

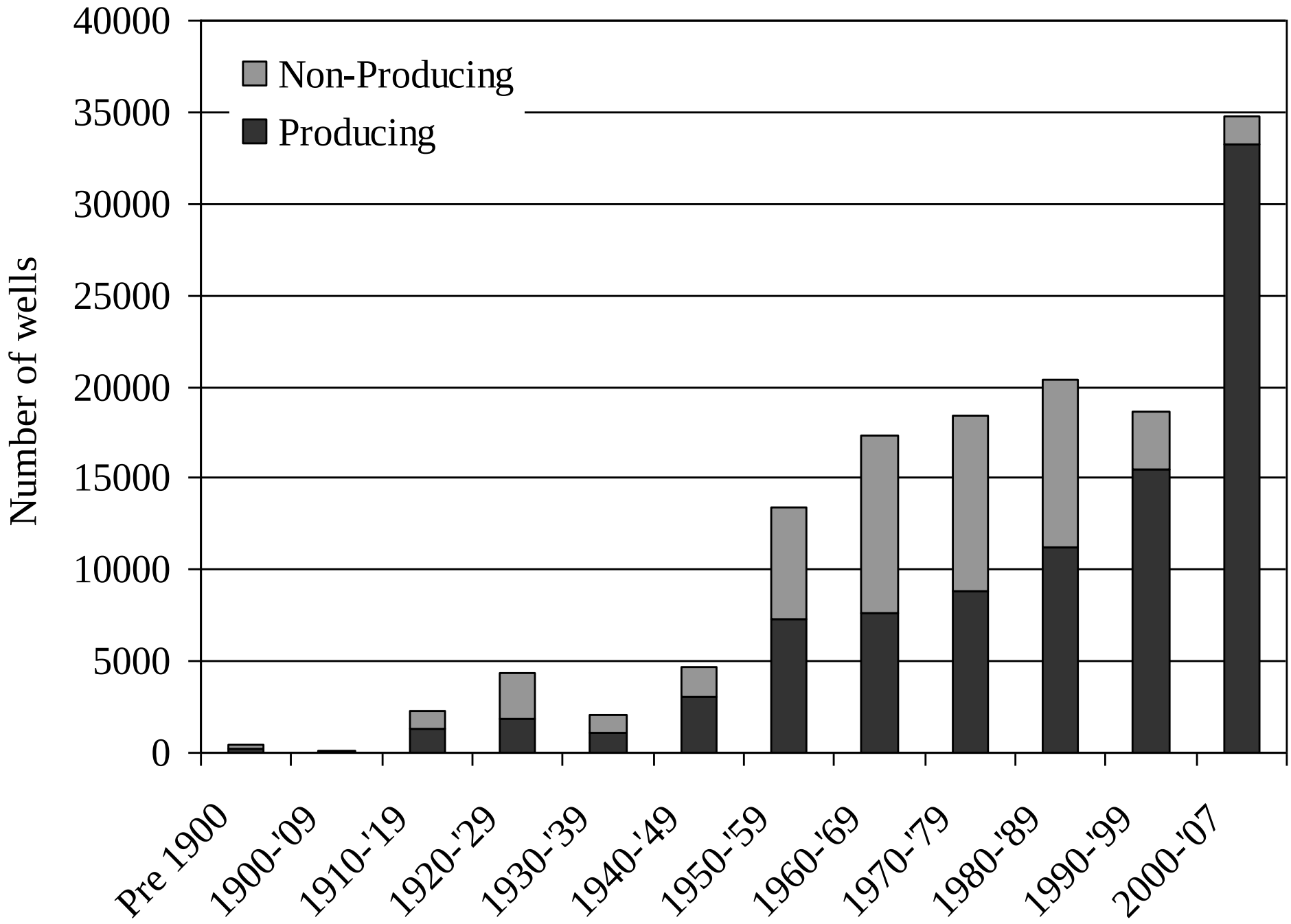
West Nile as a stochastic event



Lande 1983

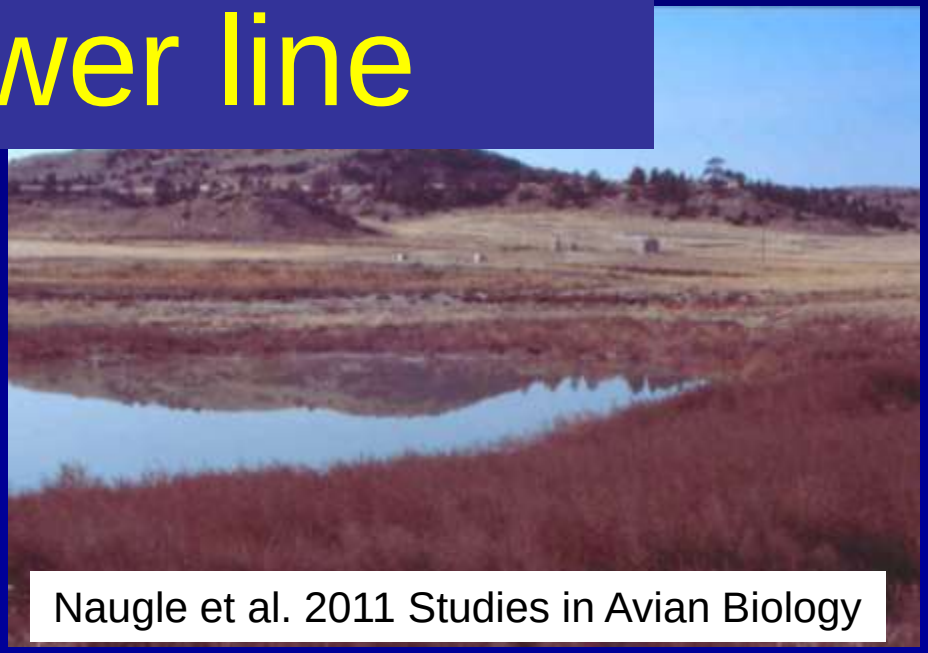
of leks, average male count, and % abundance in U.S. and Canada in 2010

	# leks	Males	% abundance
Wyoming	1,244	27.9	37.4%
Montana	992	16.9	18.0%
Alberta	10	6.6	0.07%
Saskatchewan	6	8.3	0.05%


Non-Producing
Producing
Number of wells
40000
35000
30000
25000
20000
15000
10000
5000
0
Pre 1900
1900-'09
1910-'19
1920-'29
1930-'39
1940-'49
1950-'59
1960-'69
1970-'79
1980-'89
1990-'99
2000-'07

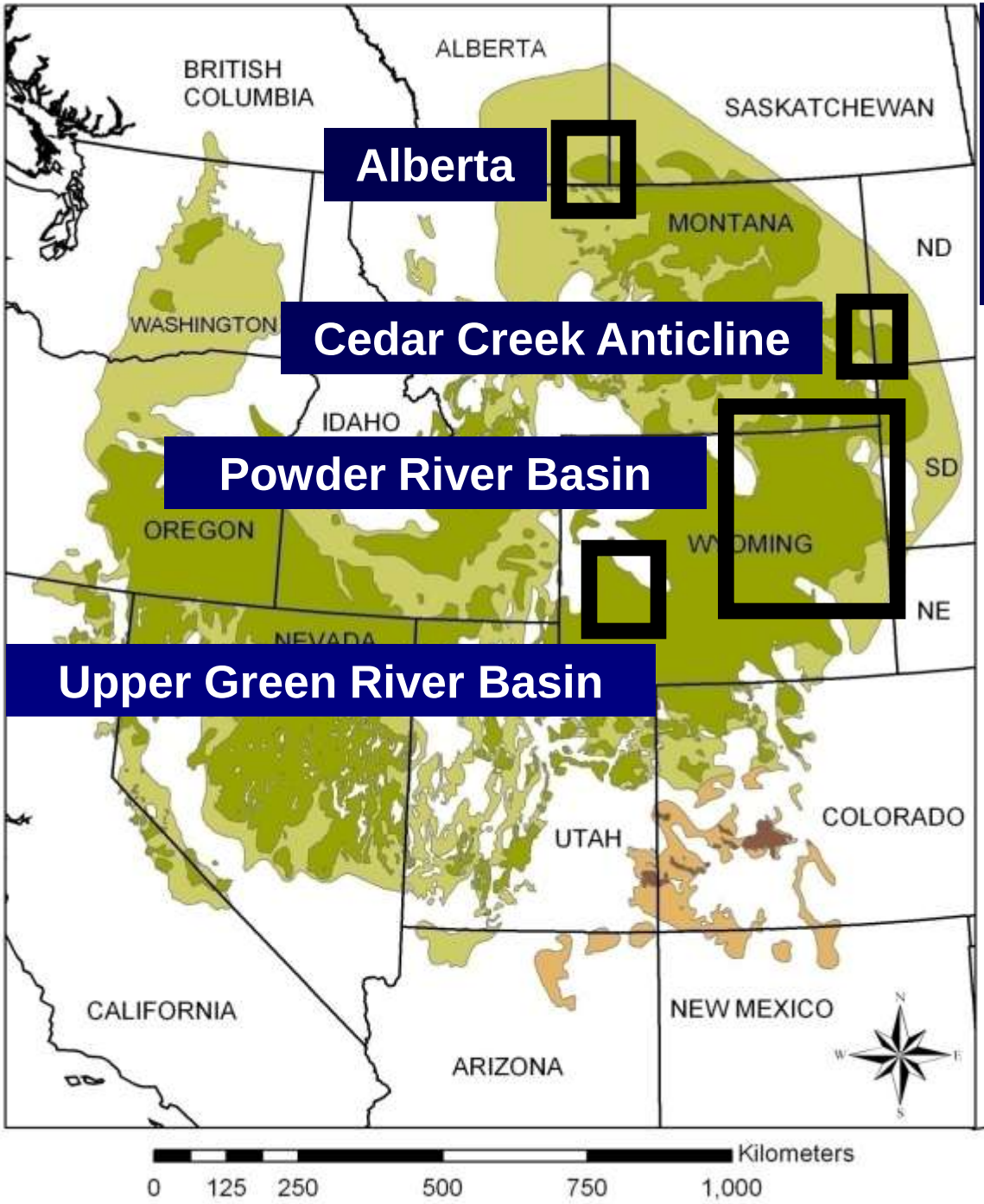

Energy development and wildlife
is a story of cumulative impacts

Every km^2 bounded by a road and bisected by a power line



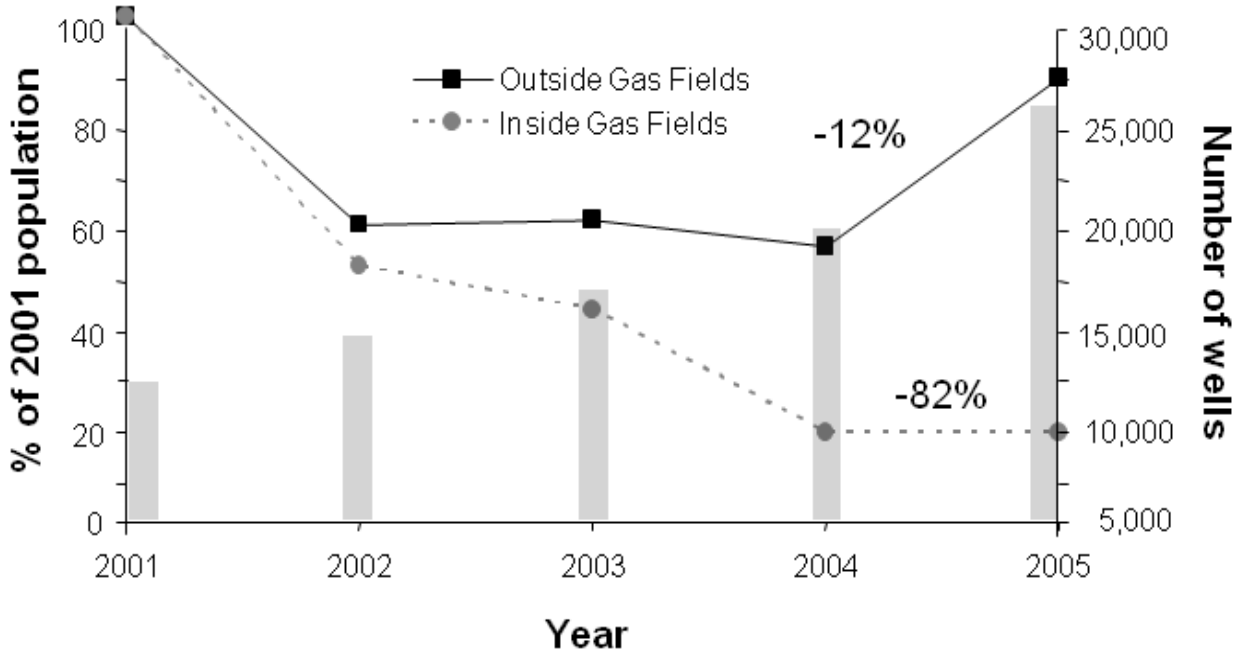
Naugle et al. 2011 Studies in Avian Biology

Consistency in patterns across studies of energy development



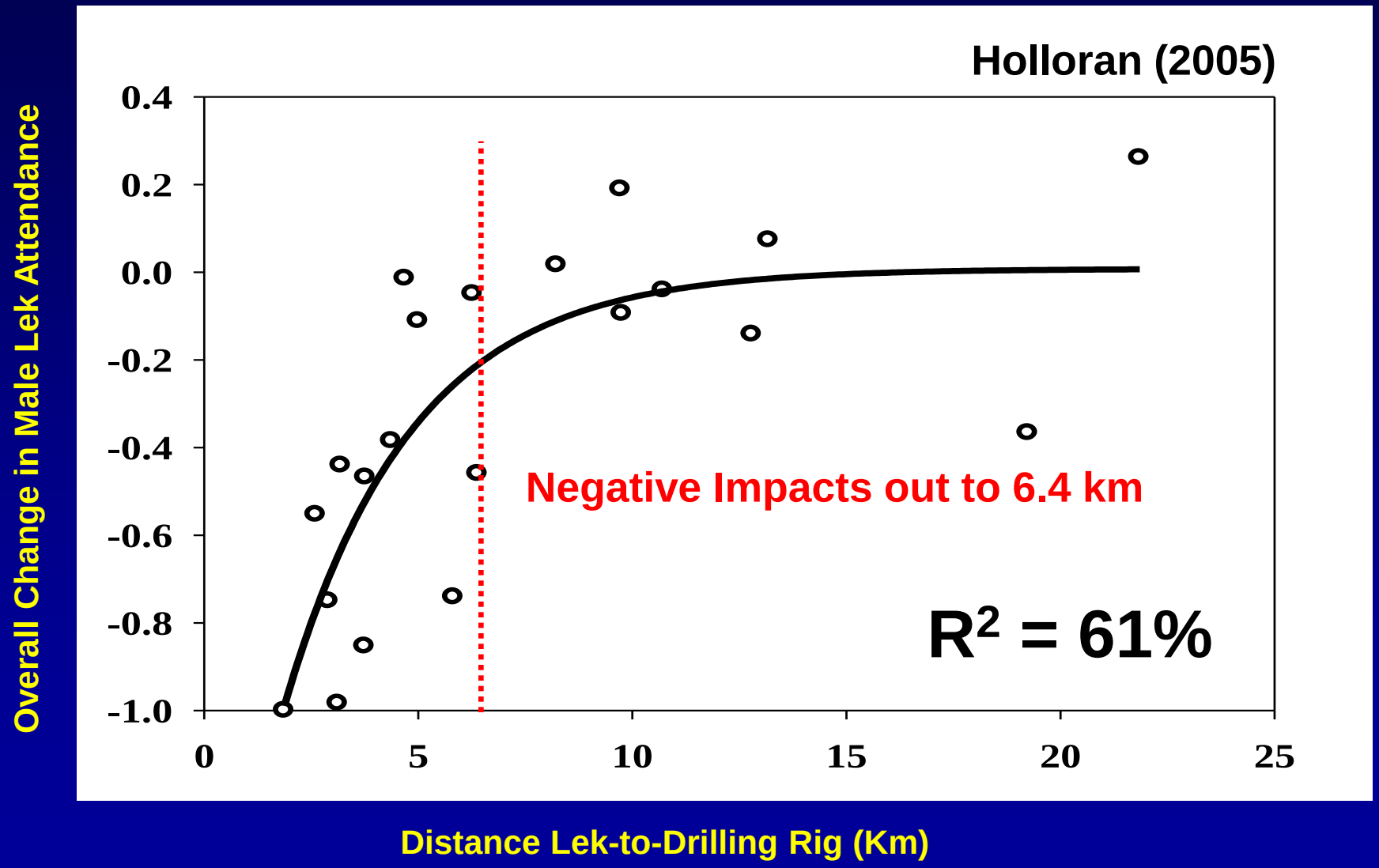
Produced by C.L. Aldridge, after Schroeder et al. 2004, Condor 106:363-376

Population trends lower inside than outside gas fields



Walker and Naugle, et al. (2007) Journal of Wildlife Management

Distance to Closest Drilling Rig by Lek



Sage Grouse in Alberta

Manyberries Oil Field – Chicks go to development where succulent forbs abundant, but mortality 1.5x higher for each additional well within 1 km

Chick Survival = 13.3% ~13 males left Alberta

Alberta is augmenting their population with birds from MT

Wintering sage-grouse avoid otherwise suitable habitat that has been developed for energy

Doherty and Naugle et al. (2008) Journal of Wildlife Management
Carpenter and Boyce (2010) Journal of Wildlife Management

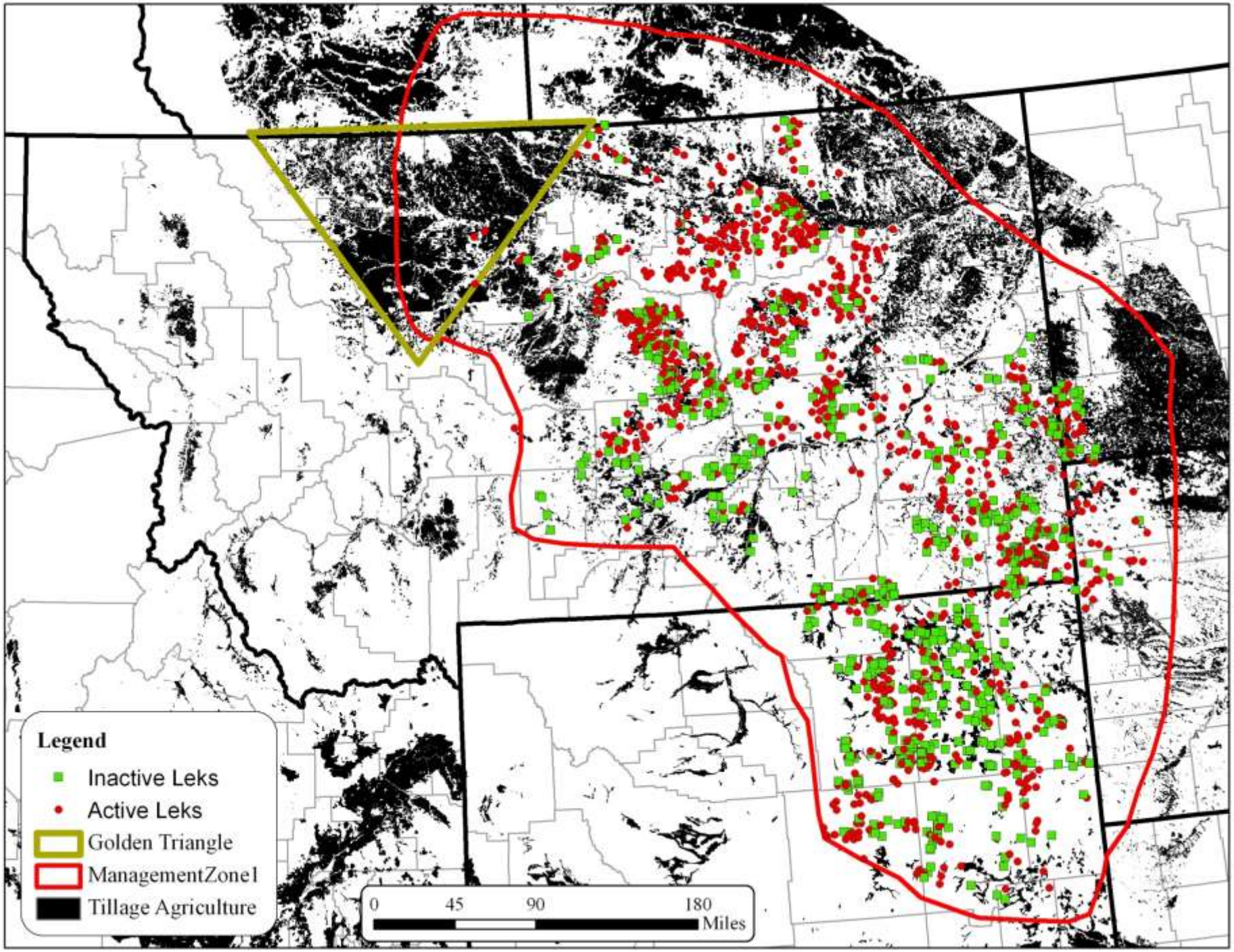
Cumulative impacts of multiple threats

Associated each lek count with threats

Producing Wells

West Nile Virus

Sod busting


Legend
Inactive Leks
Active Leks
Golden Triangle
ManagementZone1
Tillage Agriculture
0
45
90
180
Miles

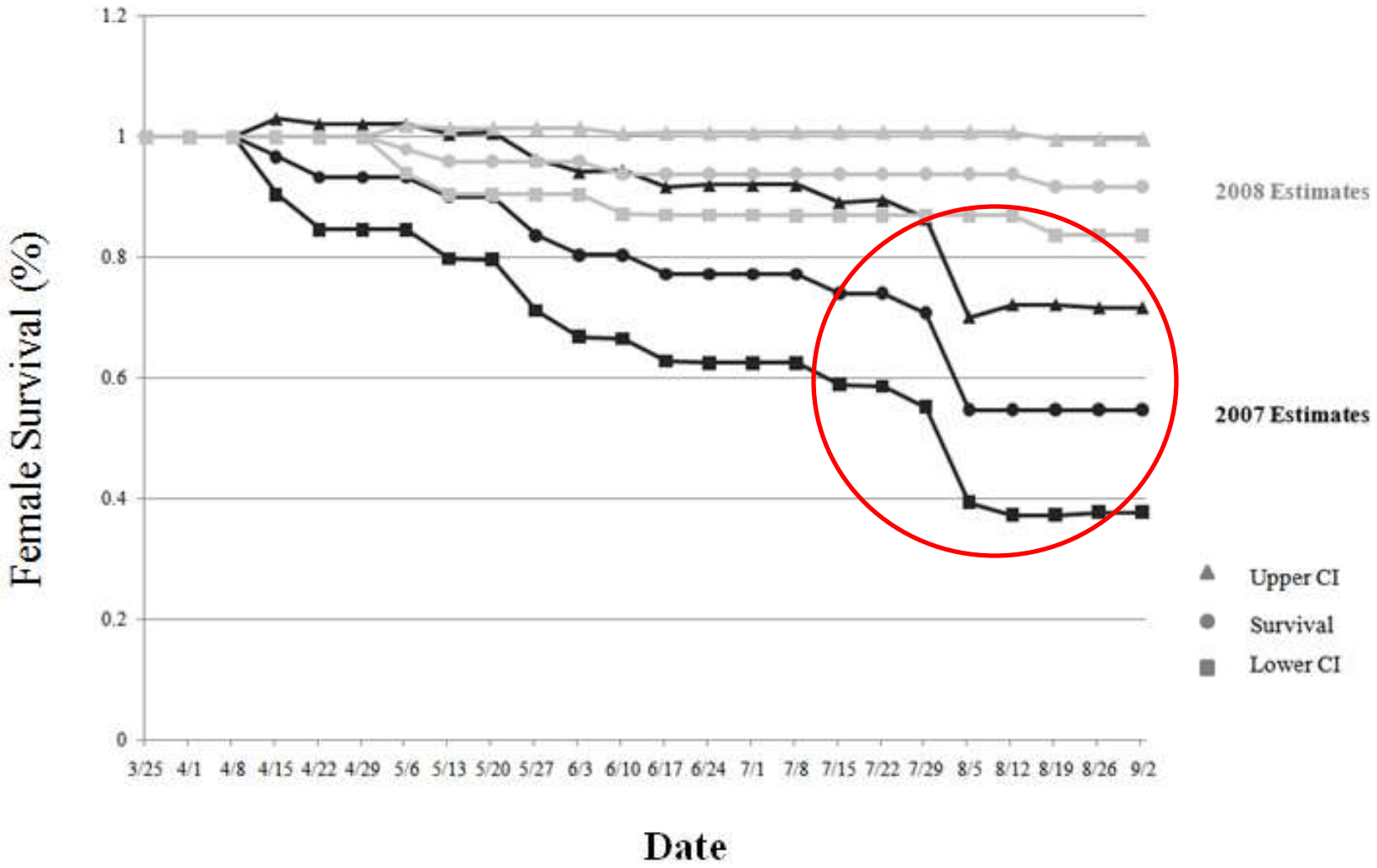
Managing Multiple Stressors in Carter

Without WNv Outbreak								With WNv Outbreak					
%	Well	Male	%	# leks of size				Male	%	# leks of size			
Tilled	Spacing	Count	Remaining	0	1-10	11-25	> 25	Count	Remaining	0	1-10	11-25	> 25
1	33294	1363	99	40	43	36	14	992	72	64	33	27	10
1	640	1213	88	33	55	36	10	543	39	87	26	16	4
1	160	767	55	22	90	21	1	46	3	127	6	1	0
1	80	365	26	29	102	3	0	1	0	133	1	0	0
1	40	73	5	84	50	0	0	0	0	134	0	0	0
10	33294	1215	88	46	43	34	12	670	48	71	38	21	4
10	640	1096	79	38	55	34	8	353	26	94	27	11	1
10	160	712	51	25	89	19	1	28	2	128	5	1	0
10	80	344	25	31	100	2	0	0	0	134	0	0	0
10	40	69	5	85	49	0	0	0	0	134	0	0	0
20	33294	1058	77	53	41	30	10	428	31	80	40	13	1
20	640	969	70	44	54	30	6	217	16	101	27	6	0
20	160	652	47	28	88	16	1	16	1	130	4	0	0
20	80	321	23	34	98	2	0	0	0	134	0	0	0
20	40	65	5	87	47	0	0	0	0	134	0	0	0

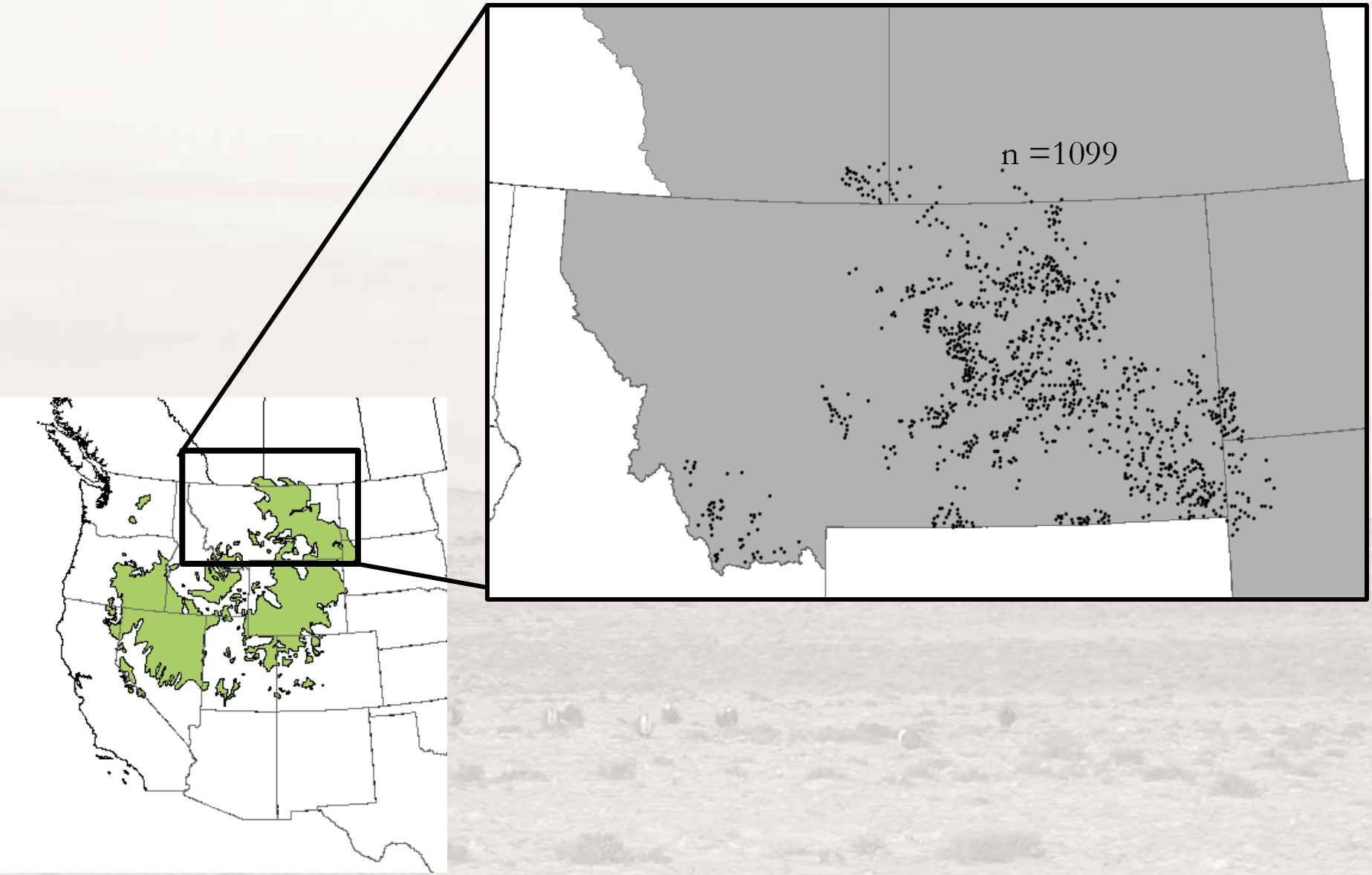
Vital Rate Comparisons

	Range-wide	MRB
Nest Initiation:	20 - 95%	94%
Nest Success:	35 - 70%	53 - 61%
Chick Survival:	13 - 45%	33 - 38%
Winter Survival:	40 - 95%	84 - 92%

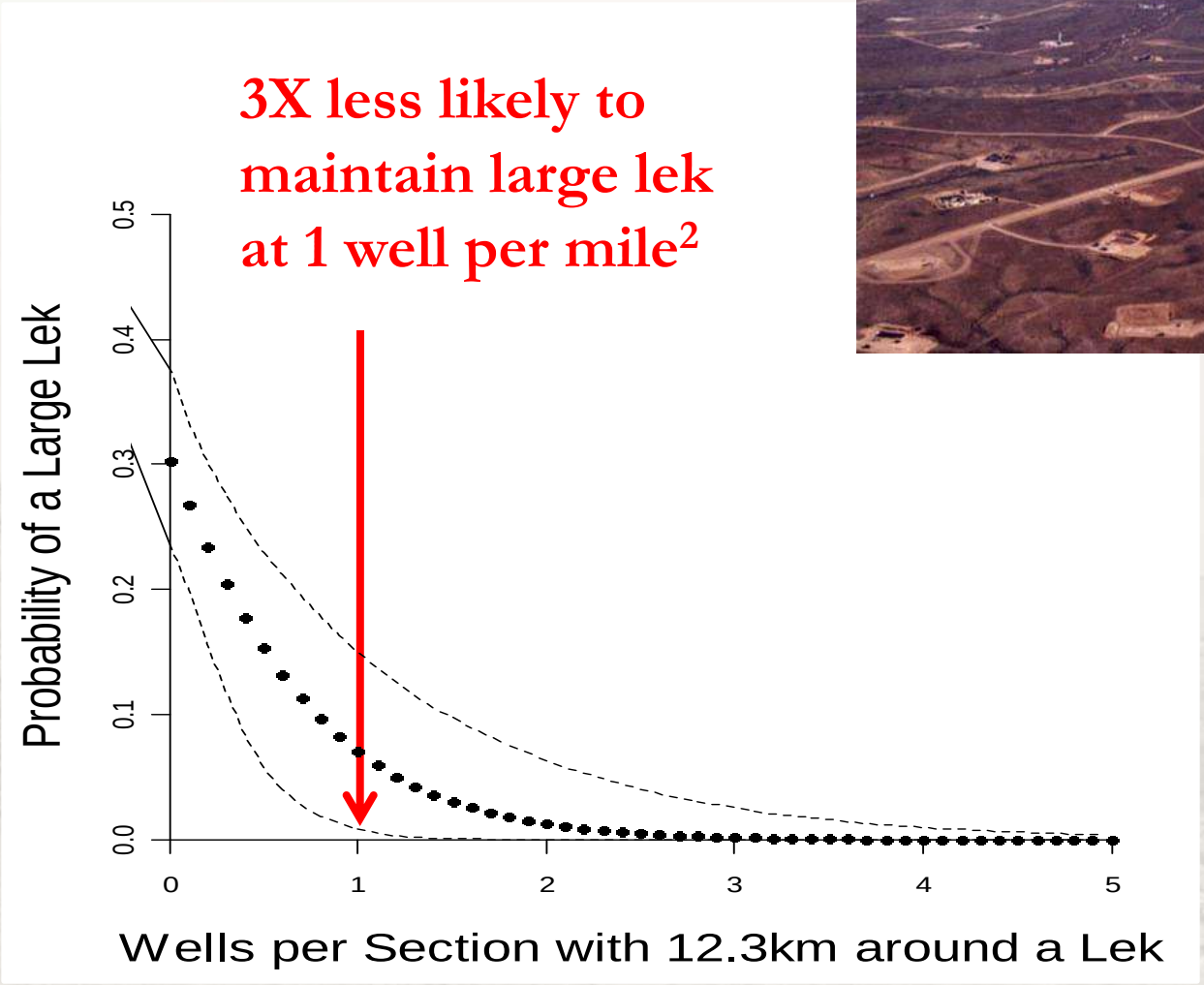
West Nile virus in the MRB



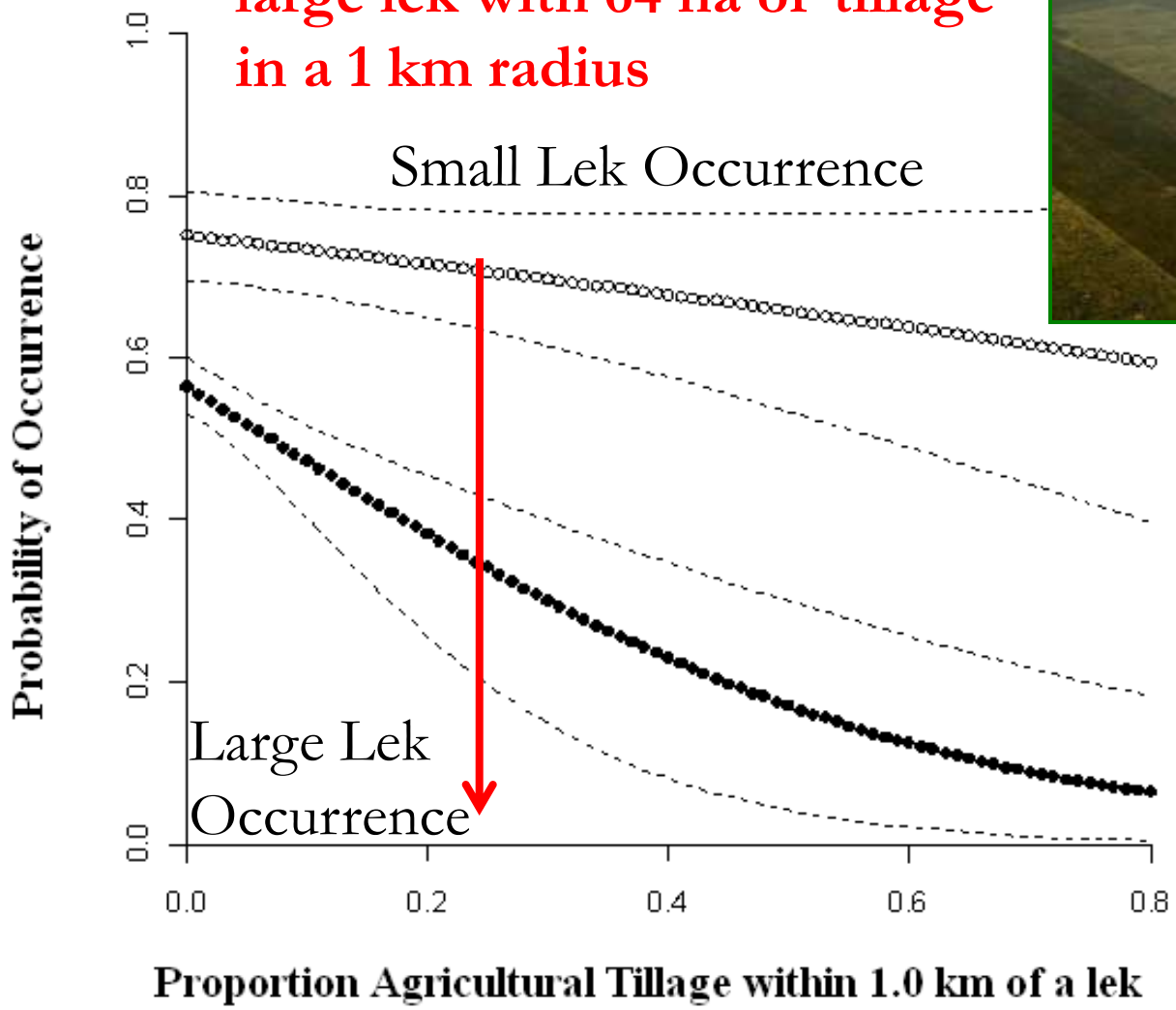
Study Area



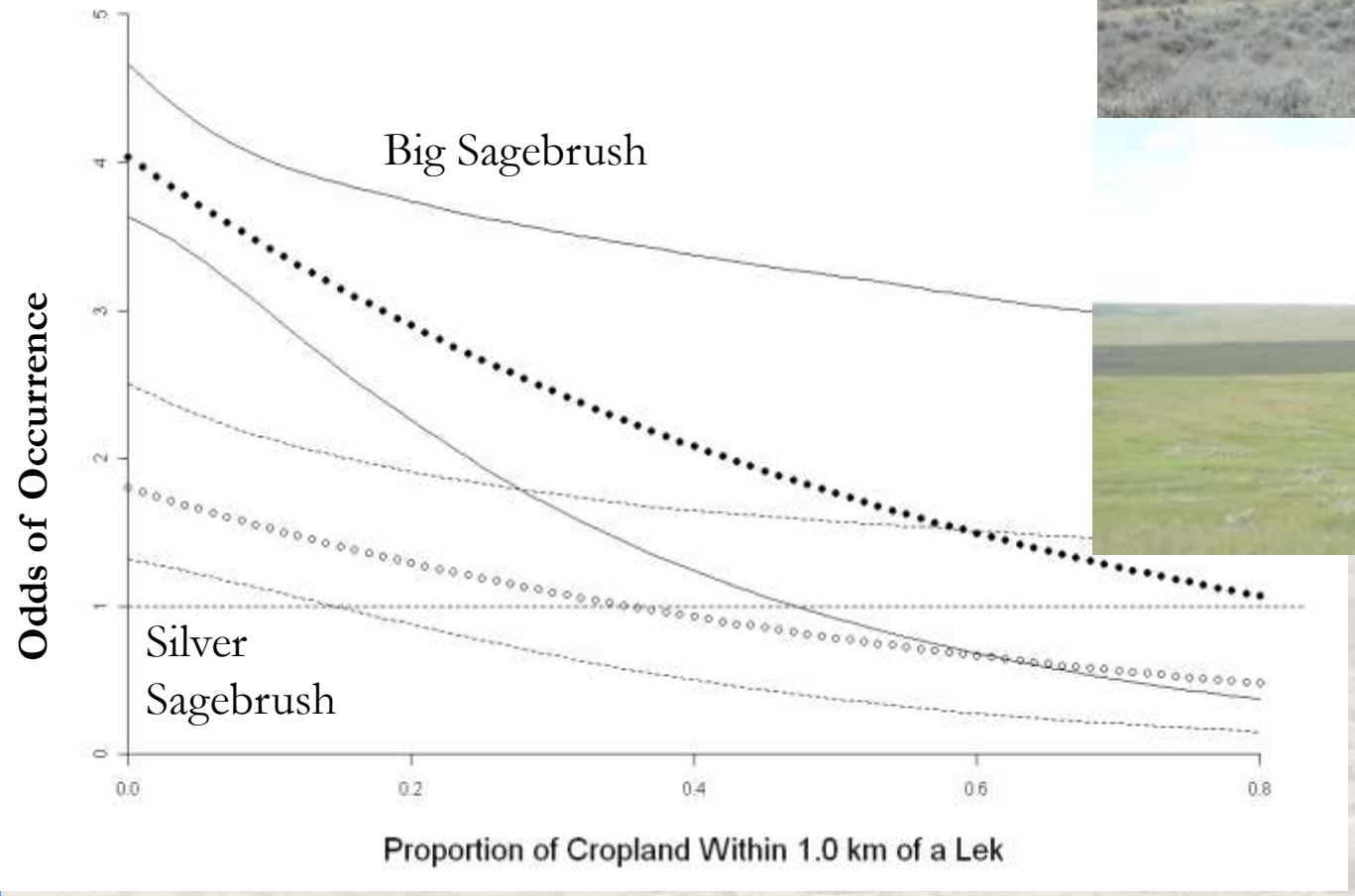
Energy and Abundance



3x less likely to maintain a large lek with 64 ha of tillage in a 1 km radius



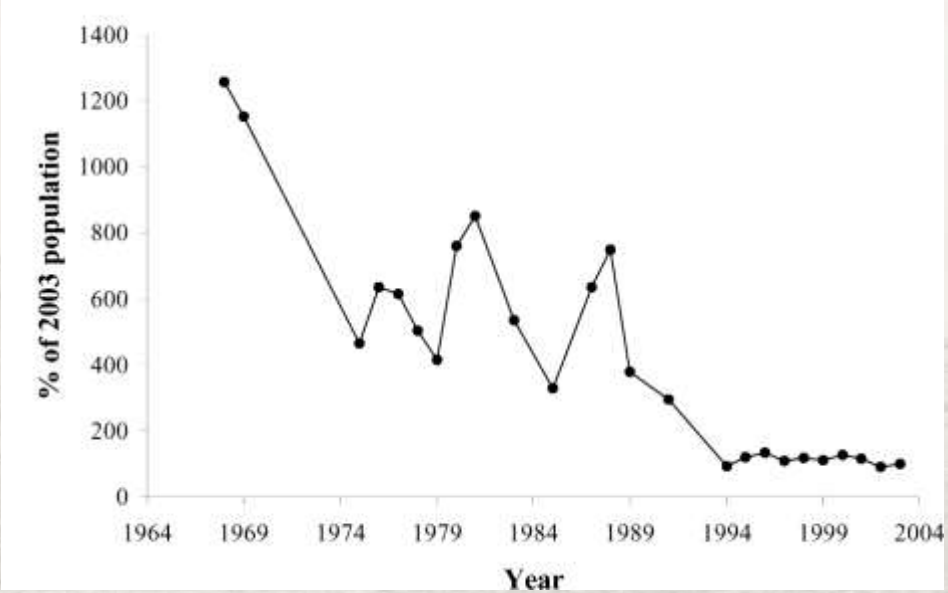
Managing in Silver and Big Sagebrush Habitats:

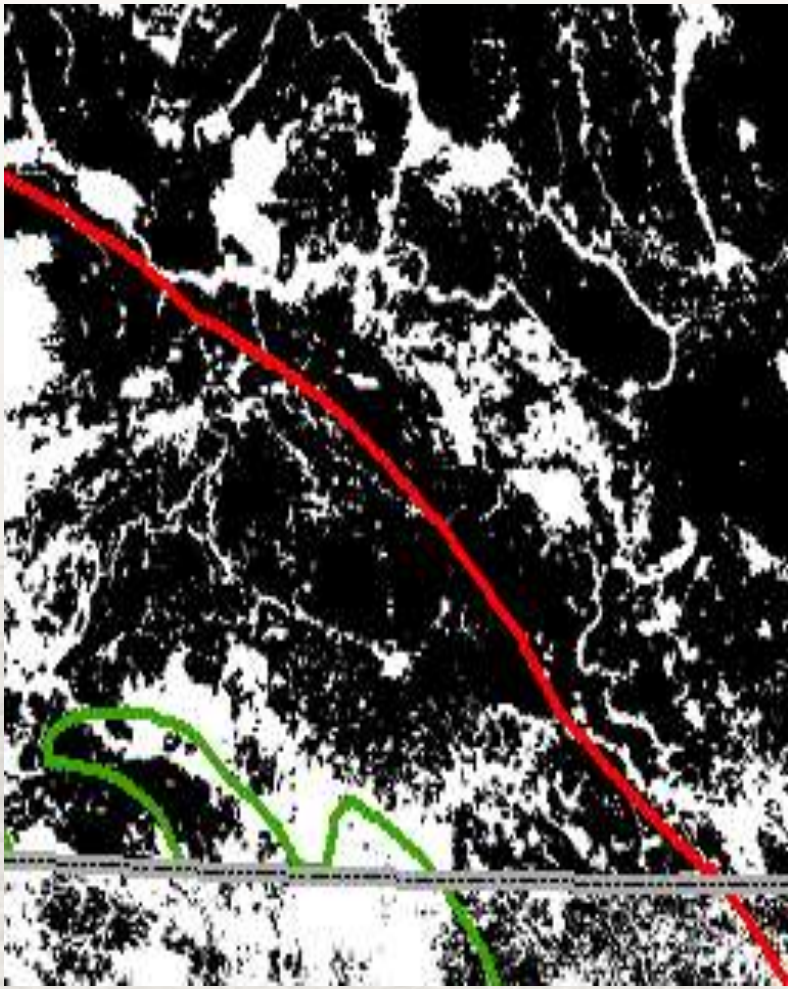


Conserving Small Populations

Could not find bottleneck

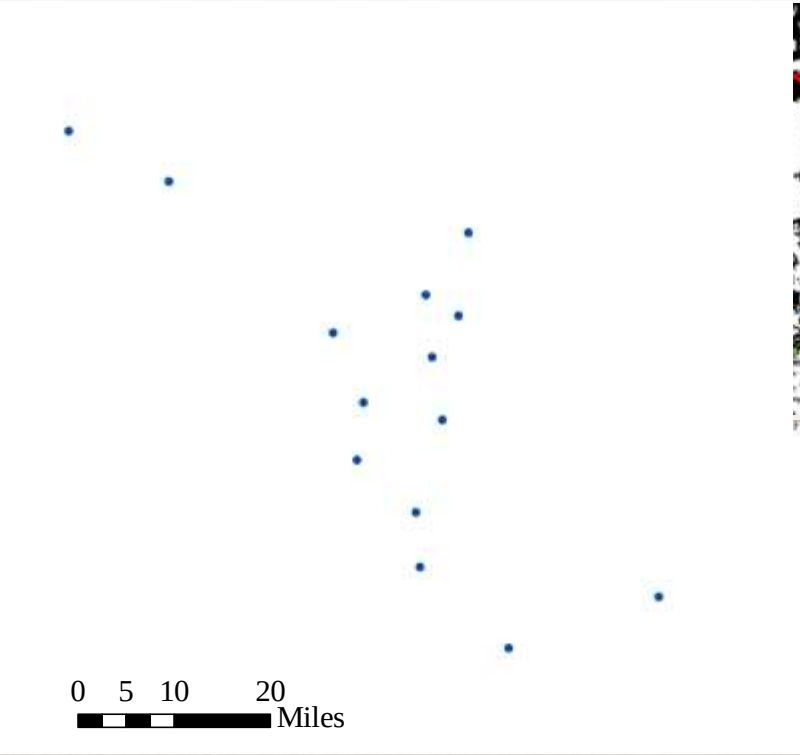
Fig. A5.7. Change in the population index for AB/SK/MT subpopulation, 1968-2003.

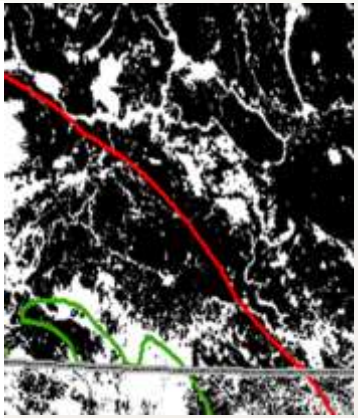




Conserving Small Populations

Milk River Basin





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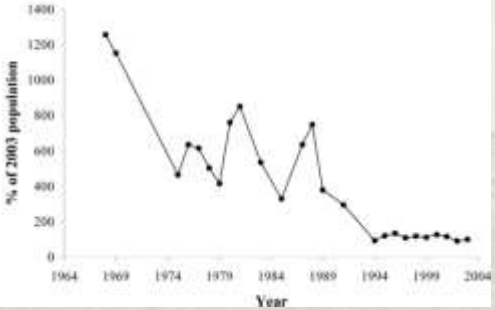
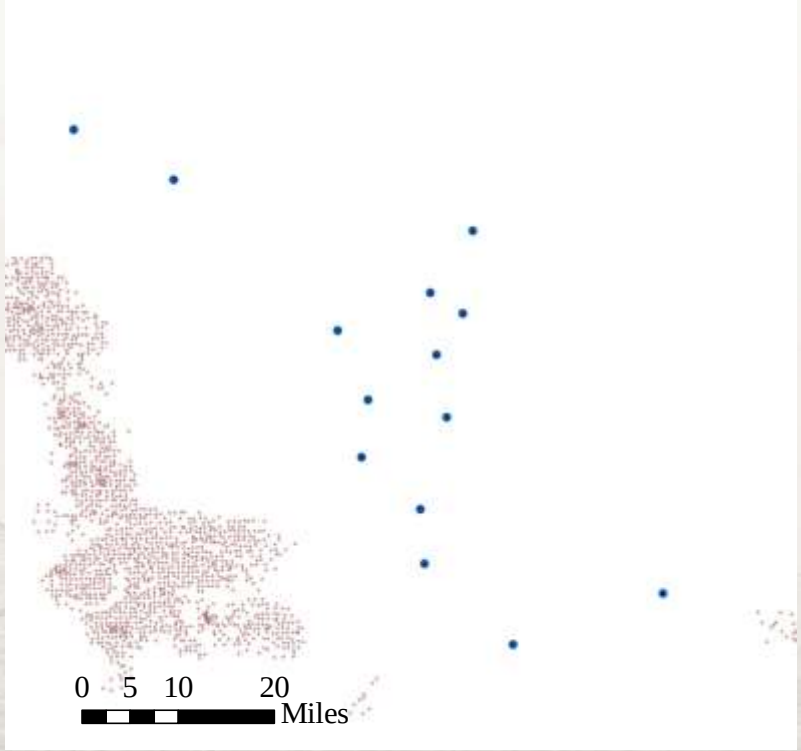


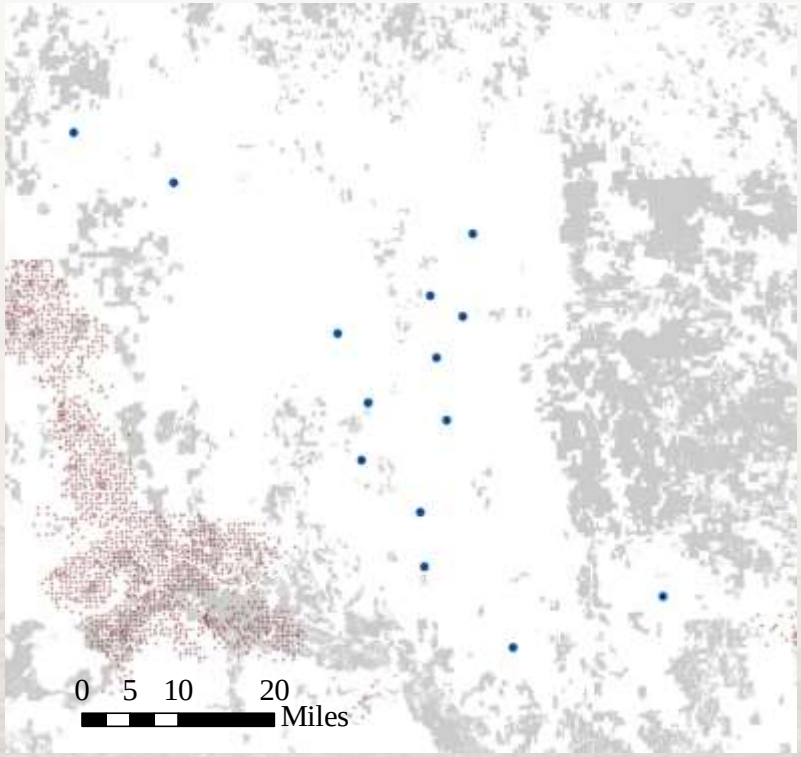
Conserving Small Populations

Milk River Basin



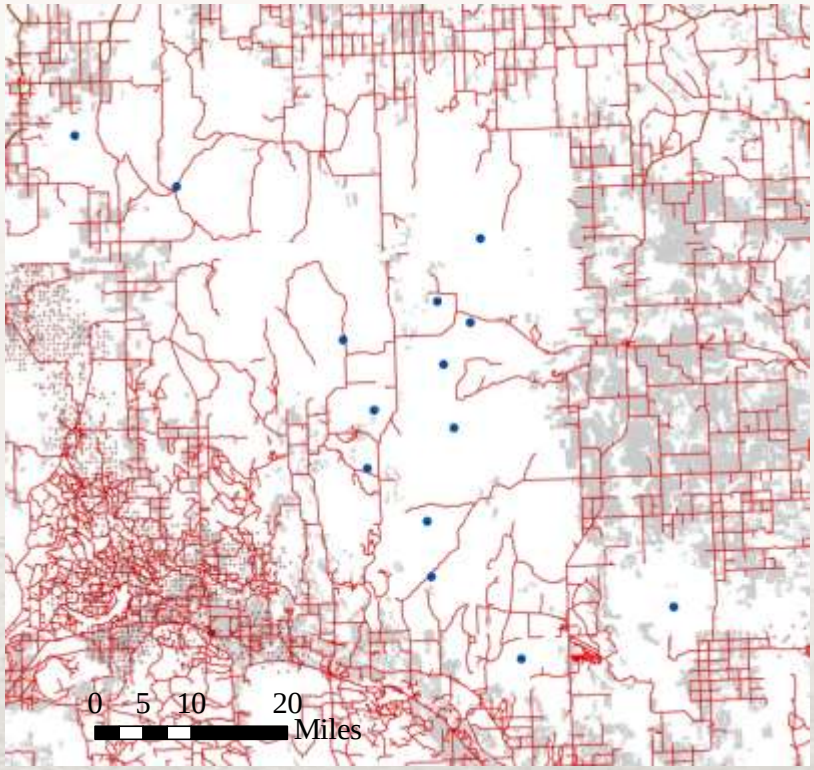
Conserving Small Populations

Milk River Basin



Conserving Small Populations

Milk River Basin



Discussion Topics

1. More bird translocations
2. Predator control
3. Oil & gas and timing restrictions
4. Critical habitat
5. Grazing
6. Disease
7. Implications of Canada to the U.S.

Thanks for having me back to Canada!