EFFECTS OF AVIAN PREDATORS ON SITE SELECTION AND NEST SUCCESS OF GREATER SAGE-GROUSE

JONATHAN B. DINKINS[1,2], MICHAEL R. CONOVER[1], CHRISTOPHER P. KIROL[2], JEFFREY L. BECK[2], AND SHANDRA N. FREY[1]

[1]Department of Wildland Resources, Utah State University, Logan, UT

[2]Department of Ecosystem Science and Management, University of Wyoming, Laramie, WY

Overview

- Section I: Habitat Selection

- Section II: Nest Success

Section I: Habitat Selection

Predation

- Quantity and condition of breeding habitat
- Increasing levels of human development
- Consequence of habitat modification and fragmentation increased predation rates

Risk of Predation

- Non-lethal effects
- Predation risk trade-offs
  - Adult survival
  - Chick survival
  - Nest success

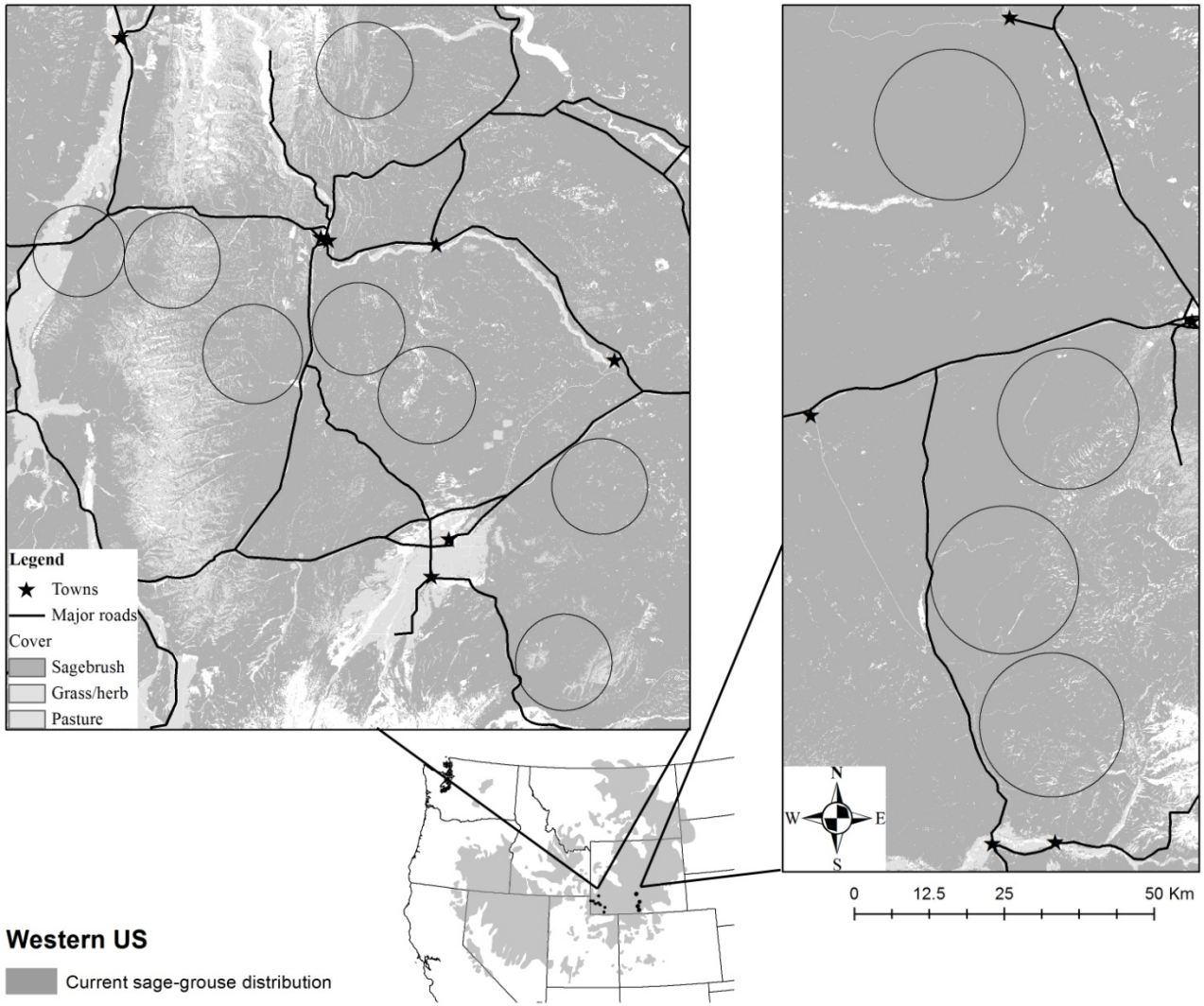
Predator Avoidance

- Avoid areas with higher densities
- Avoid riskier habitats

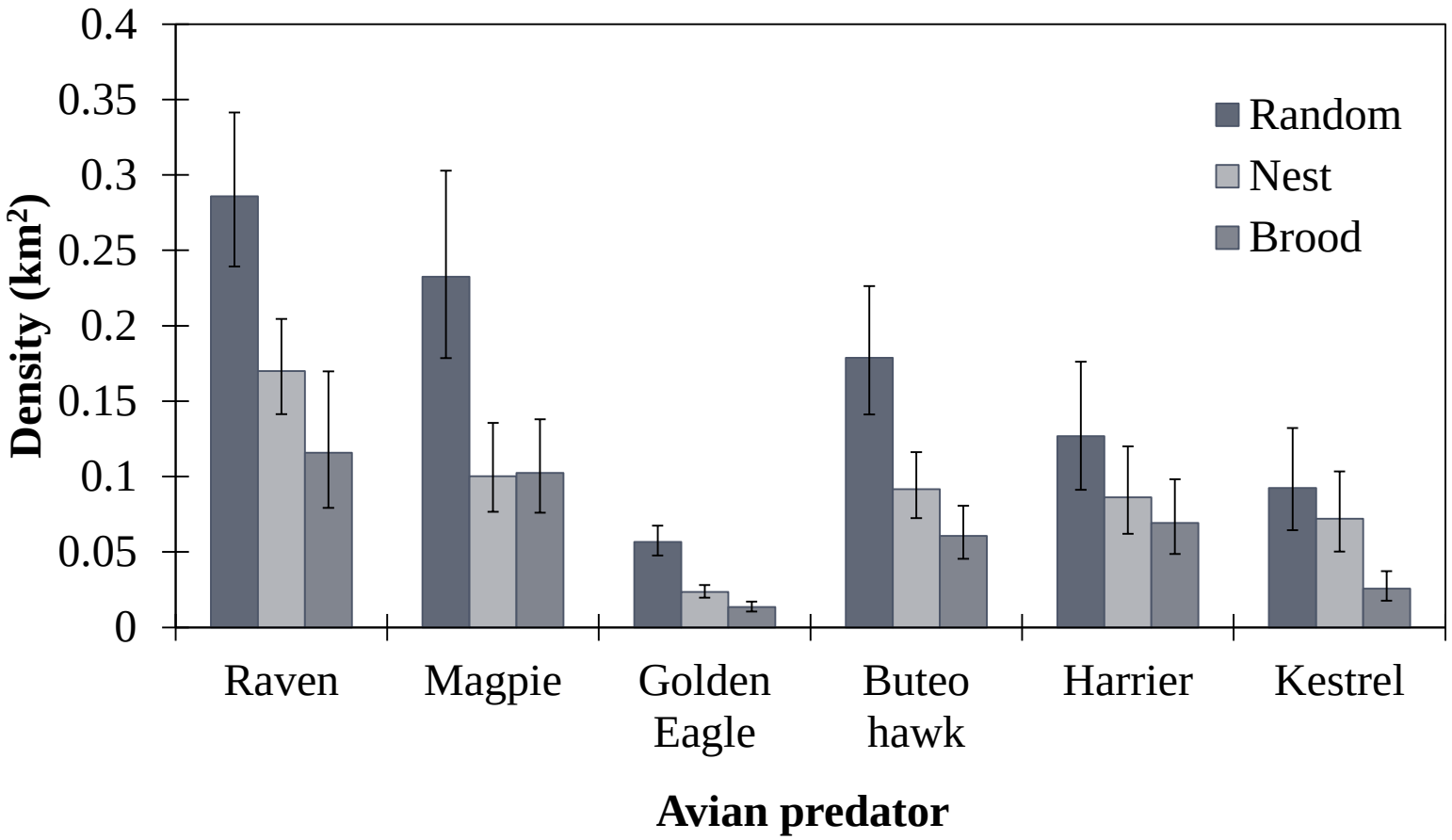
Questions

- Do sage-grouse avoid avian predators?
- Which avian predators are sage-grouse avoiding?
- Why are sage-grouse avoiding avian predators?

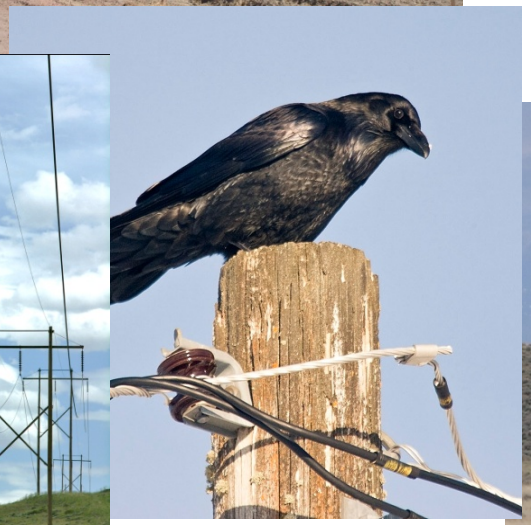
Study Sites


Legend
Towns
Major roads
Cover
Sagebrush
Grass/herb
Pasture
N
W
E
S
0
12.5
25
50 Km
Western US
Current sage-grouse distribution

Do? and Which?


0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Density (km²)
Random
Nest
Brood
Raven
Magpie
Golden Eagle
Buteo hawk
Harrier
Kestrel
Avian predator

Alternatives?



Questions

- What is the relative importance of direct versus indirect predator avoidance?
- Are there differences in habitat use among nesting, early-brood, and late-brood hens?





Predator Avoidance Mechanisms

- Direct avoidance
  - Avian predators

- Indirect avoidance
  - Landscape composition
  - Anthropogenic features

Methods

- Avian predators
  - Small, medium, large
- Landscape features
  - Forested habitat (TREE)
  - Riparian habitat (RIP)
  - NDVI
  - Topographic ruggedness (TRI)
    - 0.27, 0.54, 1, and 3 km
- Anthropogenic features
  - Oil and gas structures (OGS)
  - Communication towers
  - Power lines (POW)
    - Transmission
    - Distribution
  - Rural houses (HOM)
  - Roads
    - Paved and rail (MRD)
    - + improved gravel
    - All roads

Avian, Anthropogenic, and Landscape Covariate Sets

Models	K	ΔAIC_c	w_i	Deviance
Avian, anthropogenic, landscape [a]	30	0.00	1.00	3171.92
Avian, anthropogenic	24	36.56	0.00	3220.94
Avian, landscape	18	50.67	0.00	3247.42
Avian	12	88.57	0.00	3297.58
Anthropogenic, landscape	18	313.52	0.00	3510.26
Anthropogenic	12	351.18	0.00	3560.18
Landscape	9	354.13	0.00	3569.22
Intercept only	3	391.92	0.00	3619.12

[a] AIC_c = 3125.62






Habitat Selection

	Avian predators			Anthropogenic				Landscape			
	Small	Med	Large	OGS	POW	HOM	MRD	RIP	SAGE	TRI	NDVI
Nest	–	–	–	–			–	–	+	–	+
Early brood	–	–	–	–	–	+			+	–	+
Late brood	–	–	–	–	–	+		+	+	–	+

Conclusions

- Sage-grouse use both direct and indirect predator avoidance mechanisms
- Sage-grouse responded to potential perch structures similarly.




Section II: Nest Success

Ravens in Southern Wyoming

- Raven densities have increased in southern Wyoming (Sauer et al. 2011)

Depredation Impacts

- Most failed sage-grouse nests lost to predation
- Ravens negatively correlated with nest success
- Can depredation be reduced?

Predator Control

- Raven removal with DRC-1339
  - Specific and high efficacy
  - Egg, meat, and dog food baits

Objectives

1) Quantify raven densities
2) Evaluate raven removal by Wildlife Services
3) Assess effect of ravens on nest success

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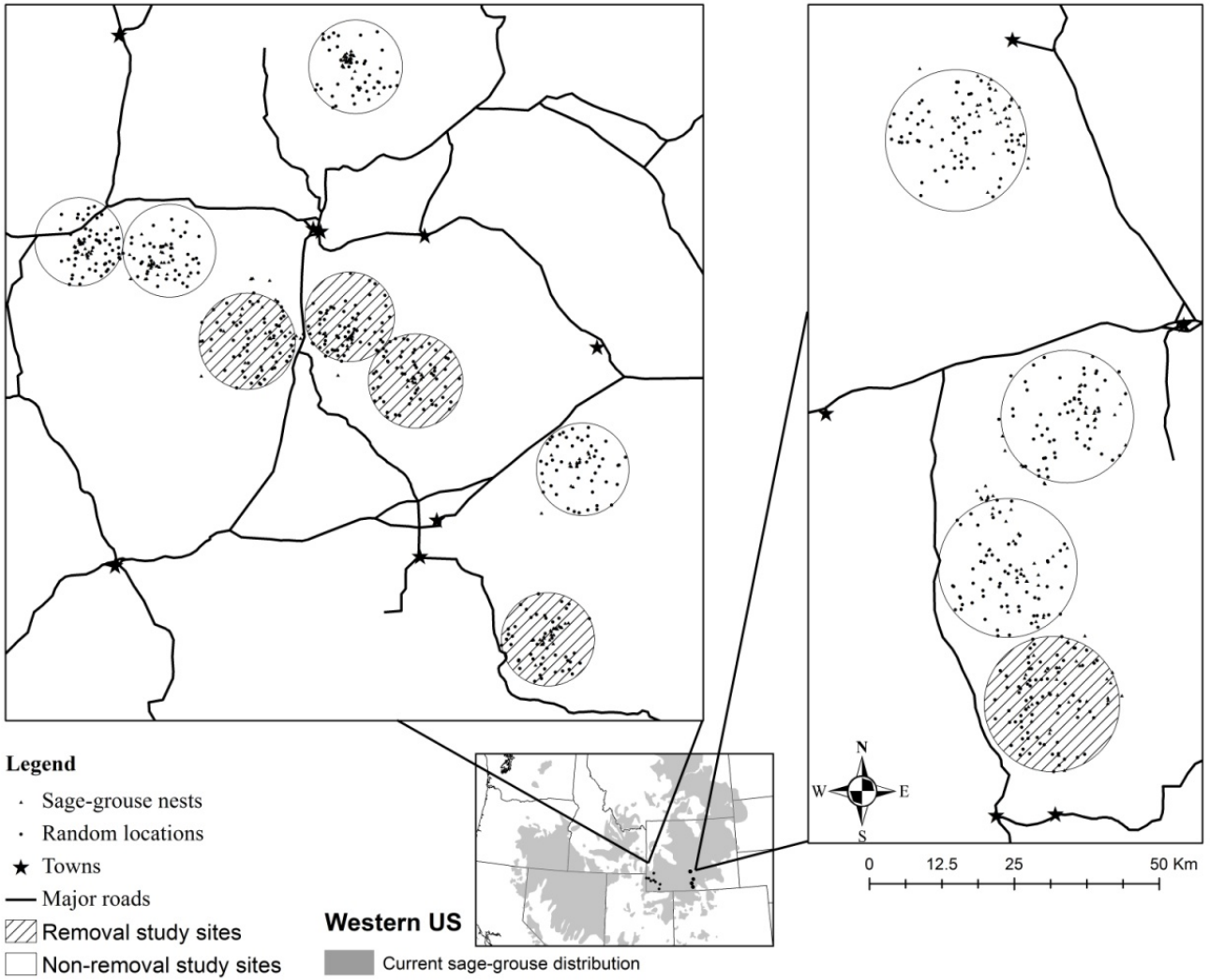
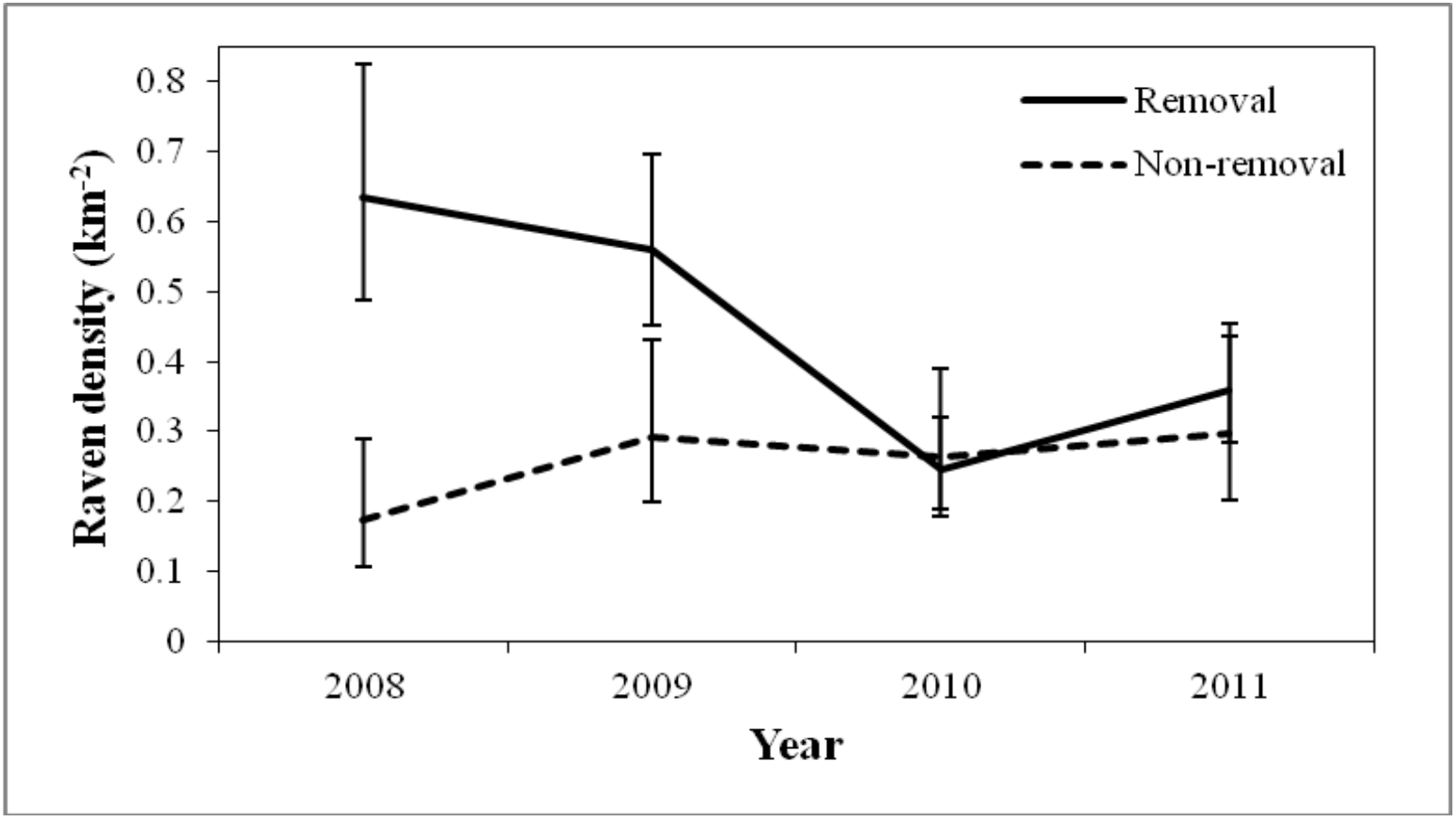
Study Sites 2008–2011



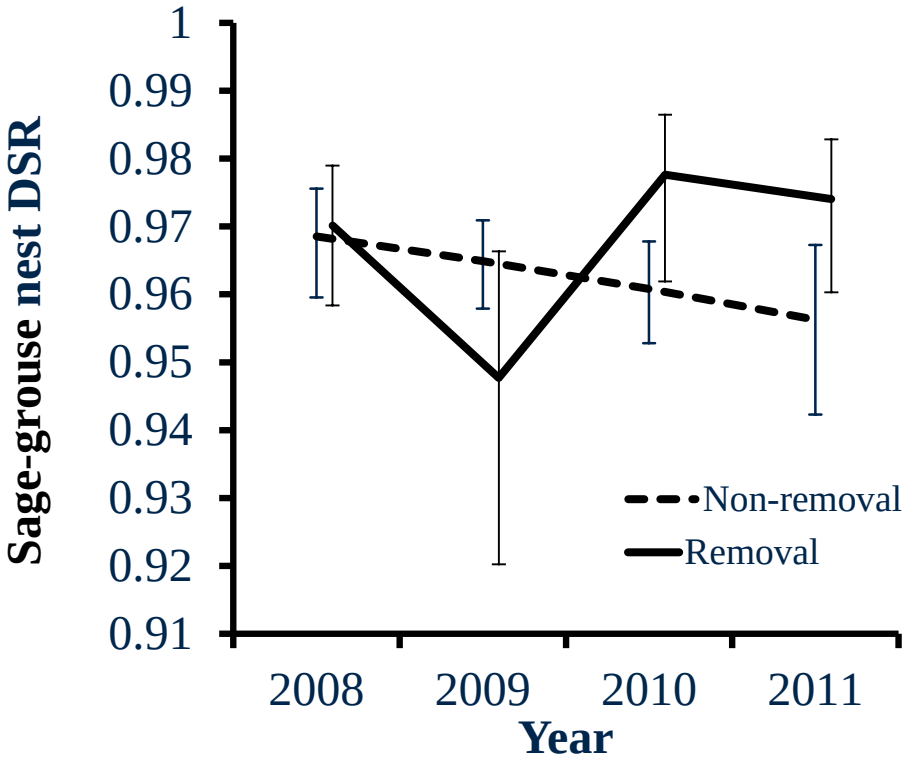
Raven Results

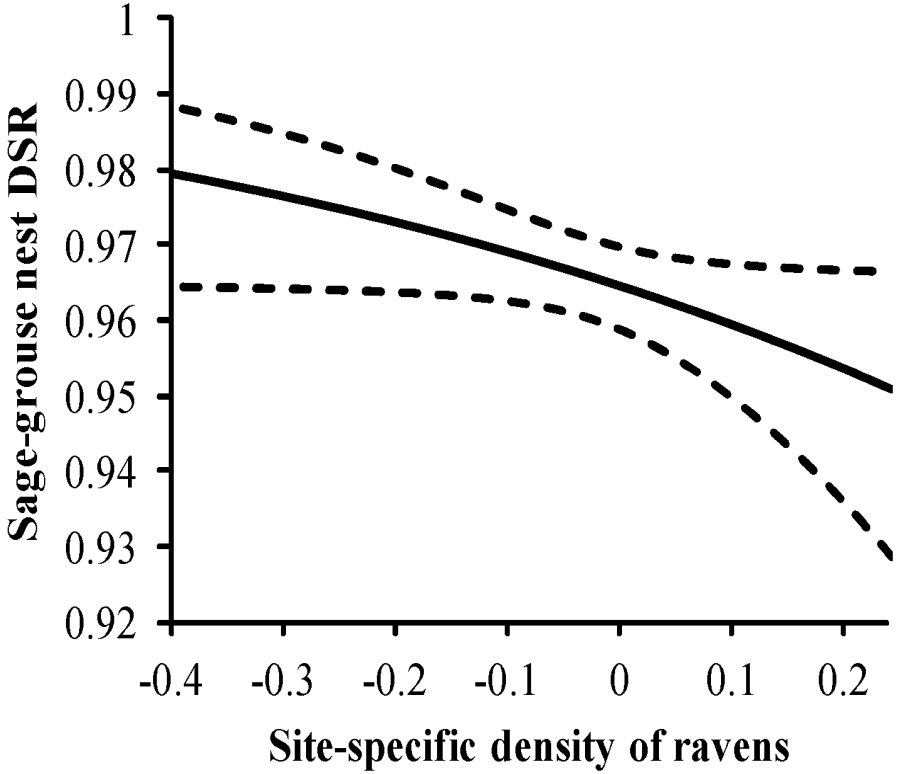
Raven Densities



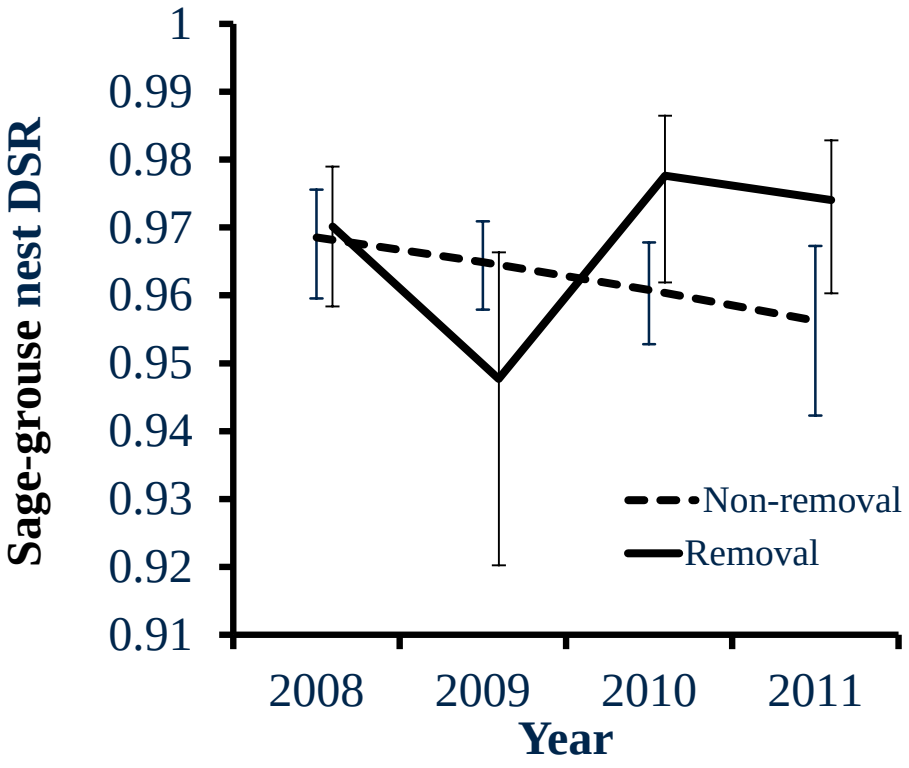
Nest Success Results

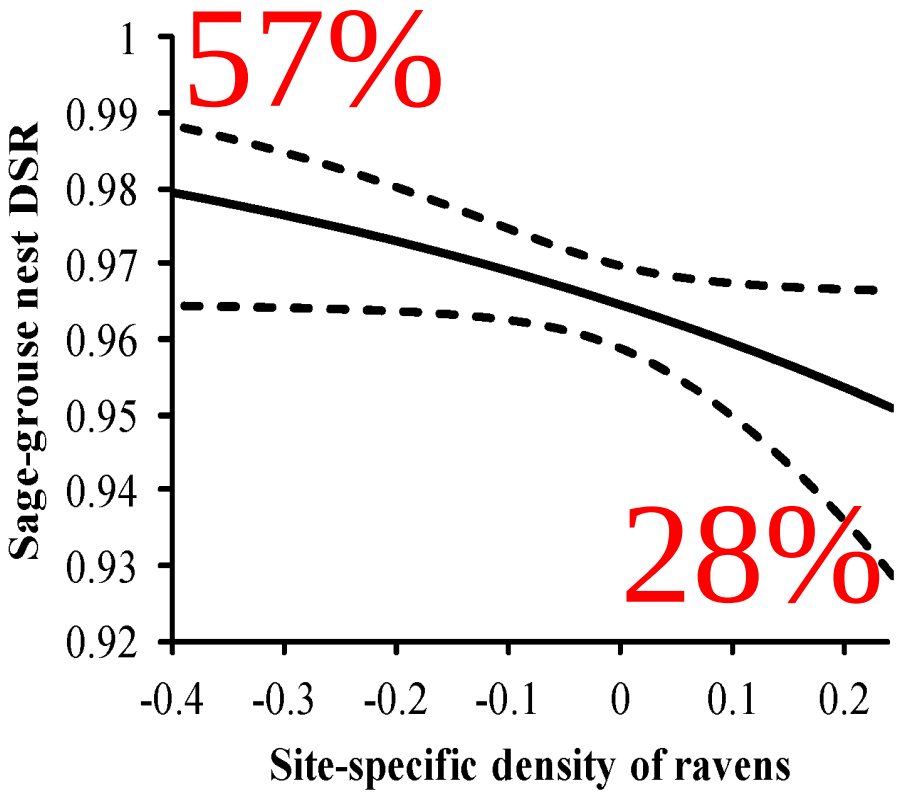
Sage-grouse Nest Success



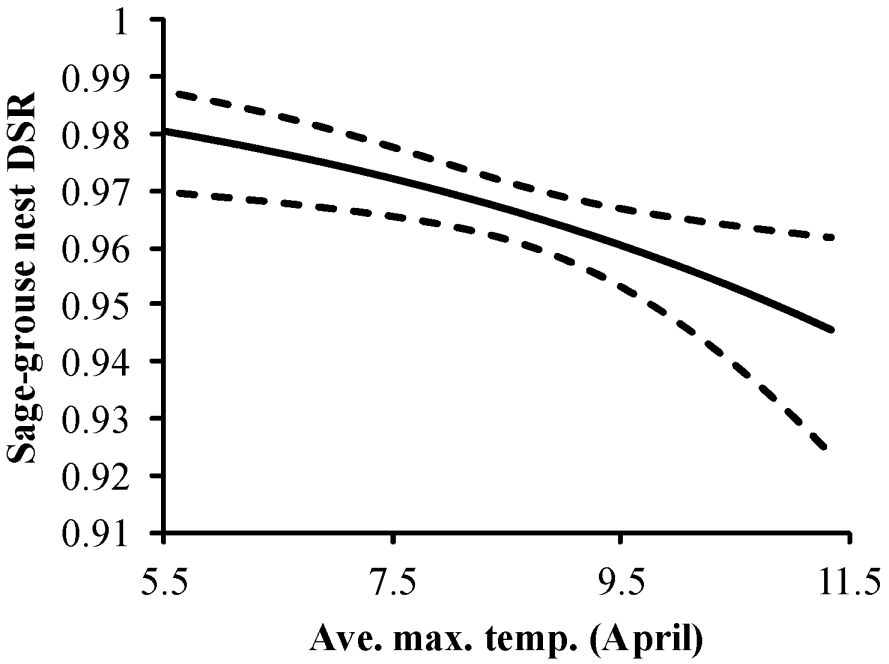


Sage-grouse Nest Success





April Temperature



Conclusions

- Sage-grouse nest away from ravens
- Raven removal by WS decreases raven densities
- Sage-grouse nest success was higher where raven densities were lower

Management Applications

- Short-term release of predation rates
- Identification and implementation
- Long-term solutions needed

Advisors
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Dr. Shandra Nicole Frey

Committee
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Private Landowners

Funders/Collaborators
Anadarko
Bureau of Land Management
Lincoln County Predator Management Board
Predatory Animal District of Sweetwater County
South-central Sage-grouse Local Working Group
Southwest Sage-grouse Local Working Group
Uinta County Predator Management Board
Wyoming Animal Damage Management Board
Wyoming Game and Fish Department
Wyoming Land Conservation Initiative

Technicians & Volunteers

Questions

Raven Data

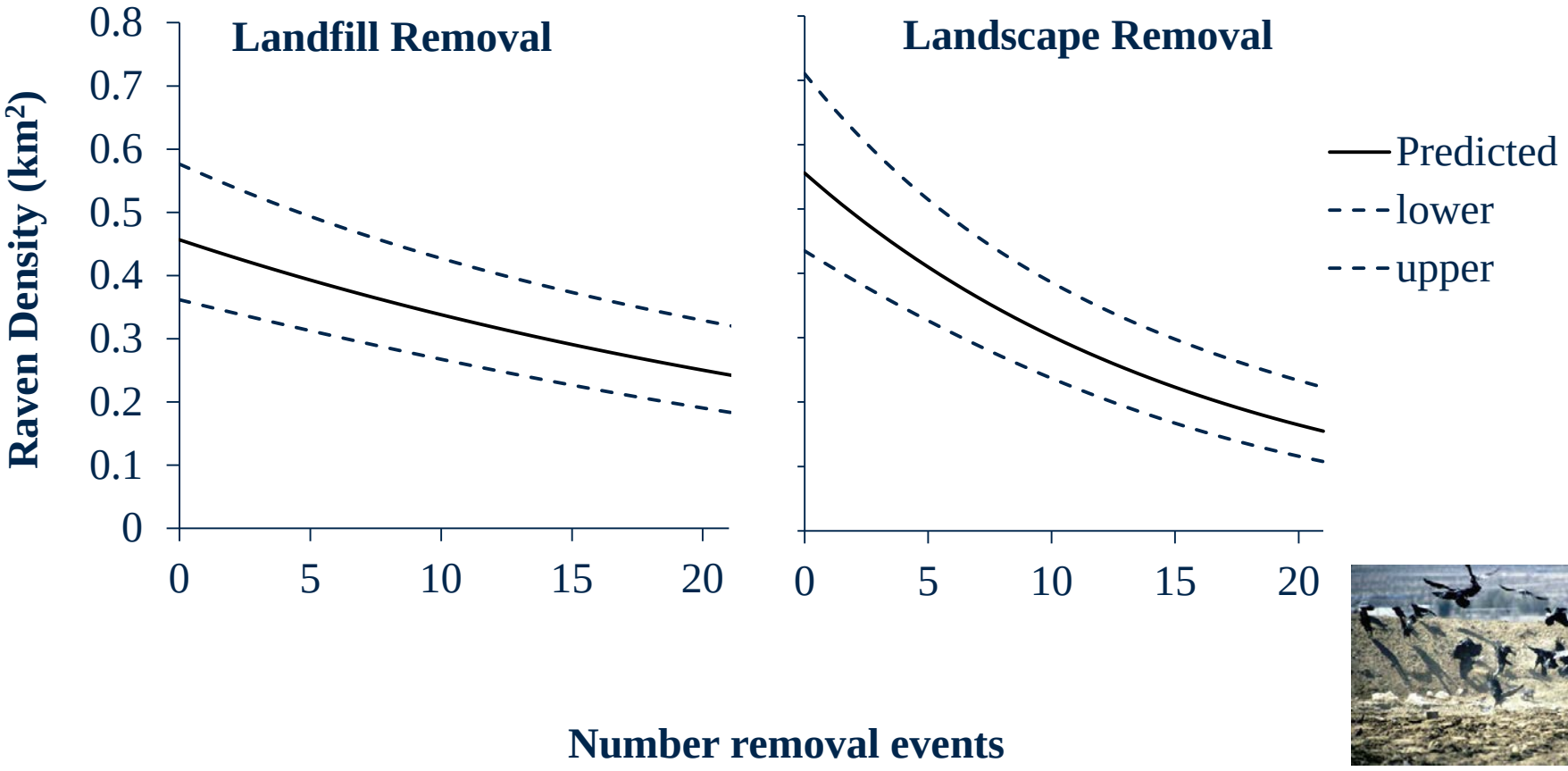
- Point count surveys
  - Nest and random
- Wildlife Services
  - Raven removal
    - Proportional application

Year	Number removal events 3 months	Number removal events 6 months
2007	16 (0 landfill)	16 (0 landfill)
2008	6 (0 landfill)	7 (0 landfill)
2009	30 (6 landfill)	44 (6 landfill)
2010	33 (13 landfill)	40 (15 landfill)
2011	16 (1 landfill)	27 (8 landfill)

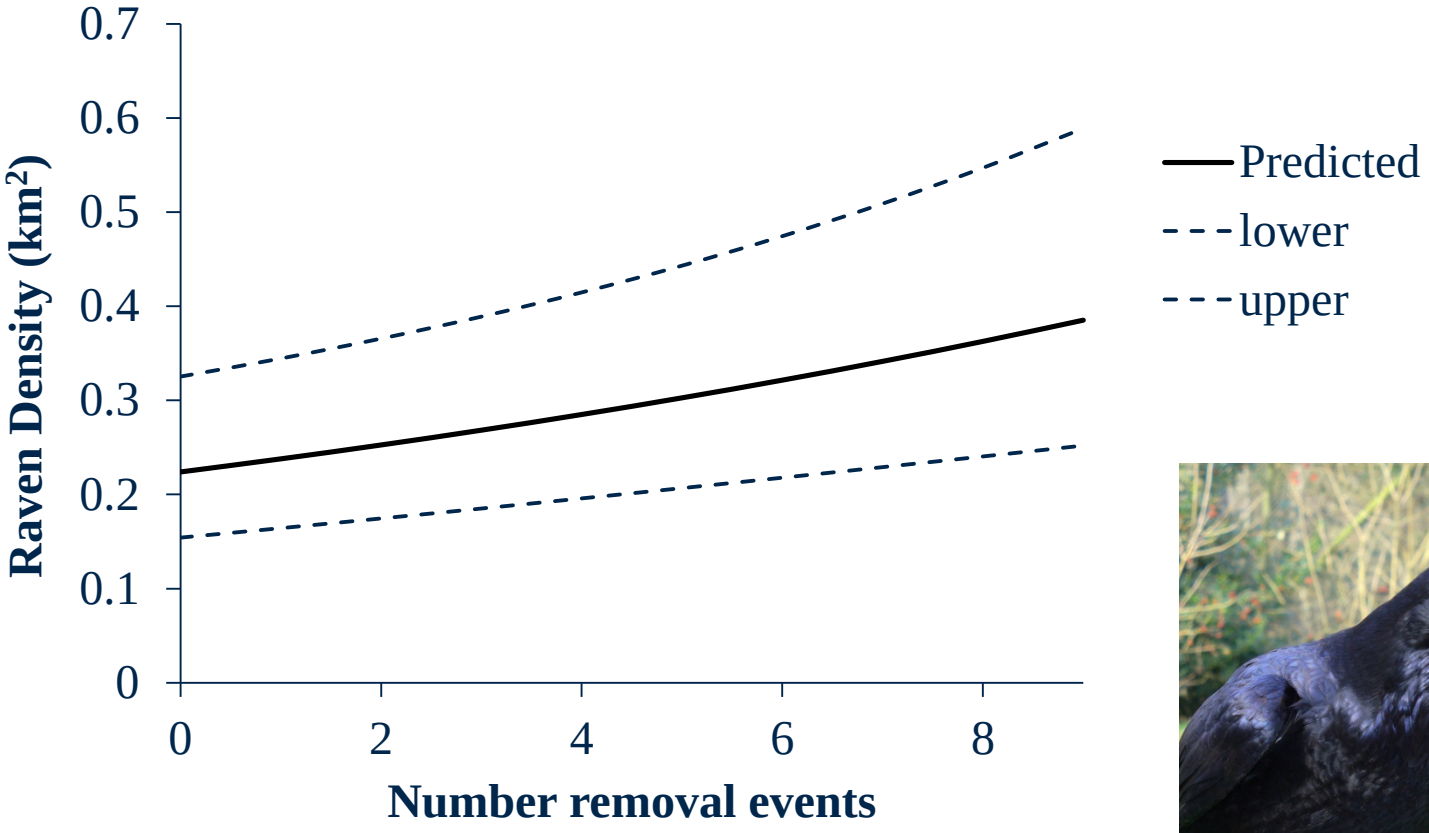





Wildlife Services Efficacy



Non-Removal Study Sites



Avian Predator Detections

Avian predator species	Truncated distance	Number of detections	Avian predators counted	EDR	SE
Common Raven	1800	546	853	606.8	22.3
Black-billed Magpie	850	138	157	294.2	19.1
Golden Eagle	2500	376	434	1006.3	42.7
Buteo hawk	1650	242	298	439.1	26.0
Northern Harrier	1100	100	107	318.4	26.3
American Kestrel	1500	118	129	397.1	36.1

Methods

Detected Avian Predators

- Common Ravens
- Black-billed Magpies
- Golden Eagles
- *Buteo* hawks
  - Ferruginous Hawk
  - Red-tailed Hawk
  - Swainson's Hawk
- Northern Harriers
- American Kestrels