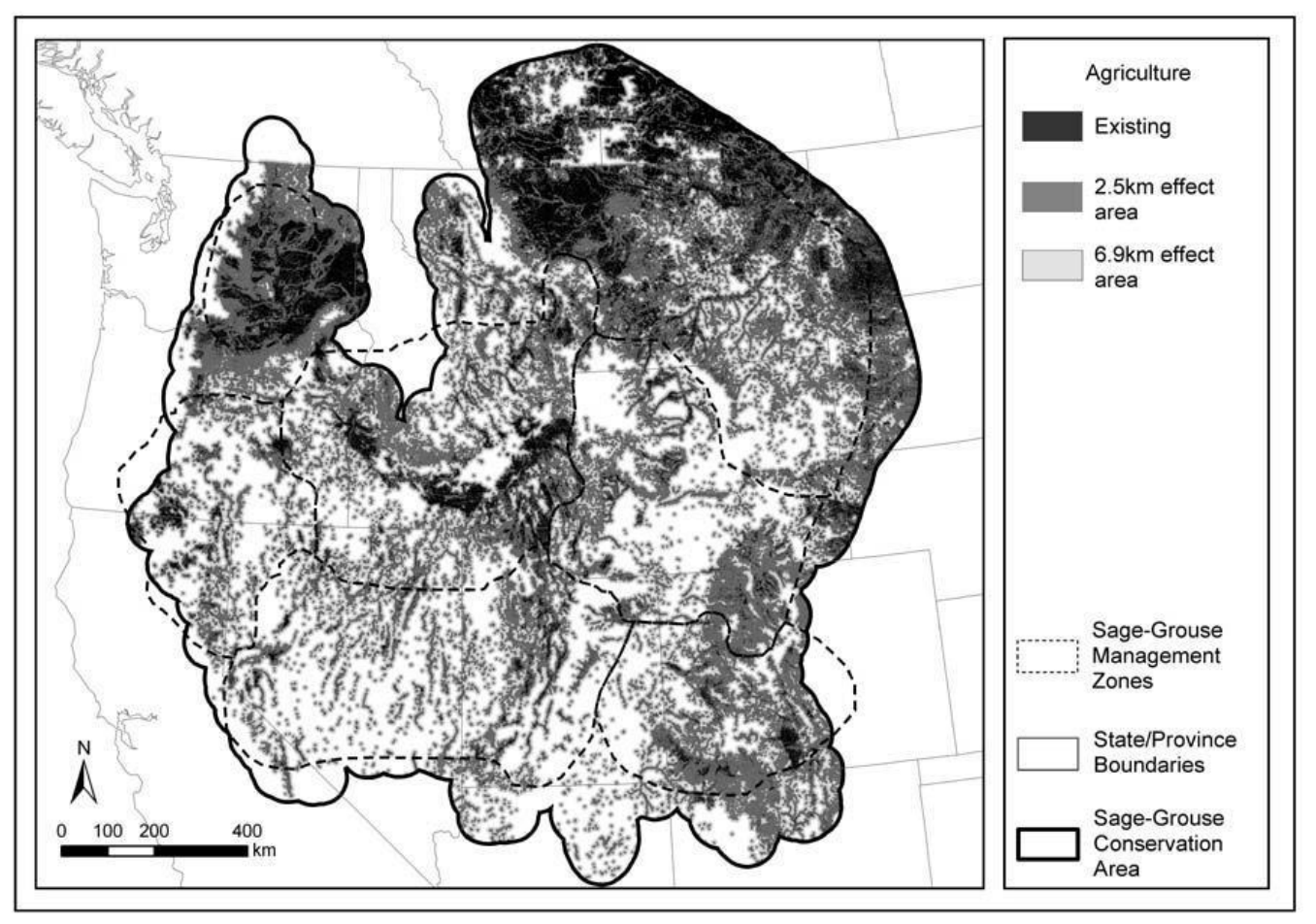
Cumulative Impacts: the human footprint and sage-grouse conservation

A review of assigned readings and relevant research

Croplands

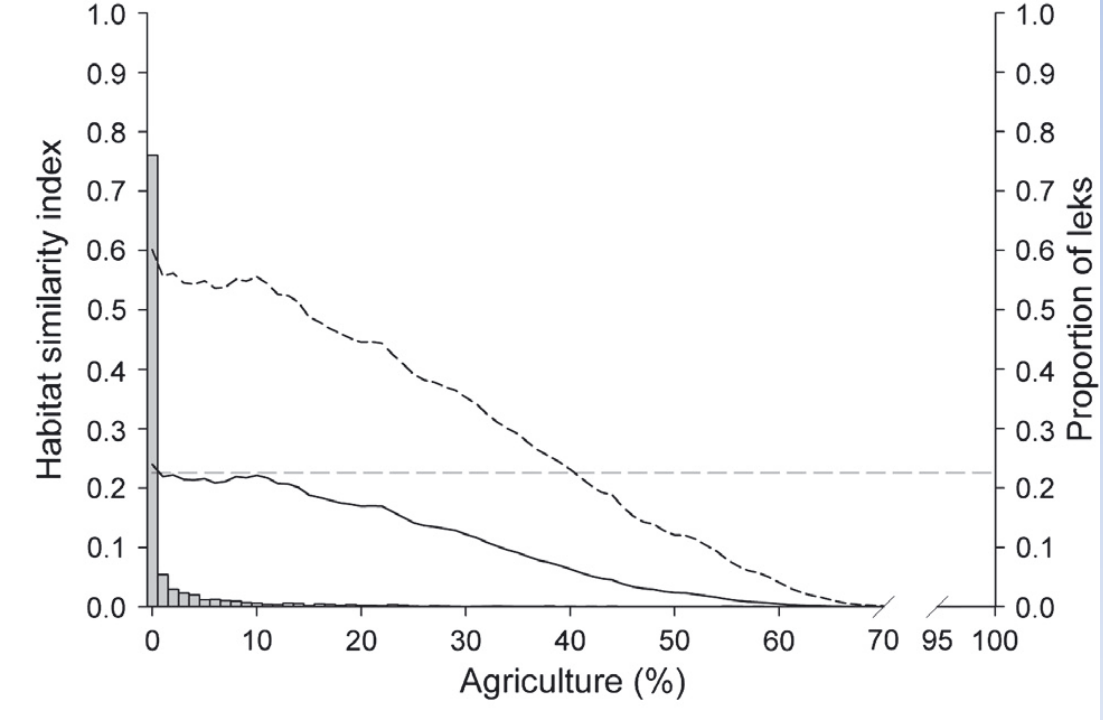
- 47.4 – 83.7% of sagebrush area affected by cropland in Great Plains
- Largest land use across the western U.S.
- “ Range-wide, sage-grouse were more likely to be extirpated from areas containing >25% cultivated cropland and in which <25% of landscape was dominated by sagebrush (Aldridge et al. 2008).”

Croplands


Agriculture
Existing
2.5km effect area
6.9km effect area
Sage-Grouse Management Zones
State/Province Boundaries
Sage-Grouse Conservation Area
N
0 100 200 400
km

Croplands

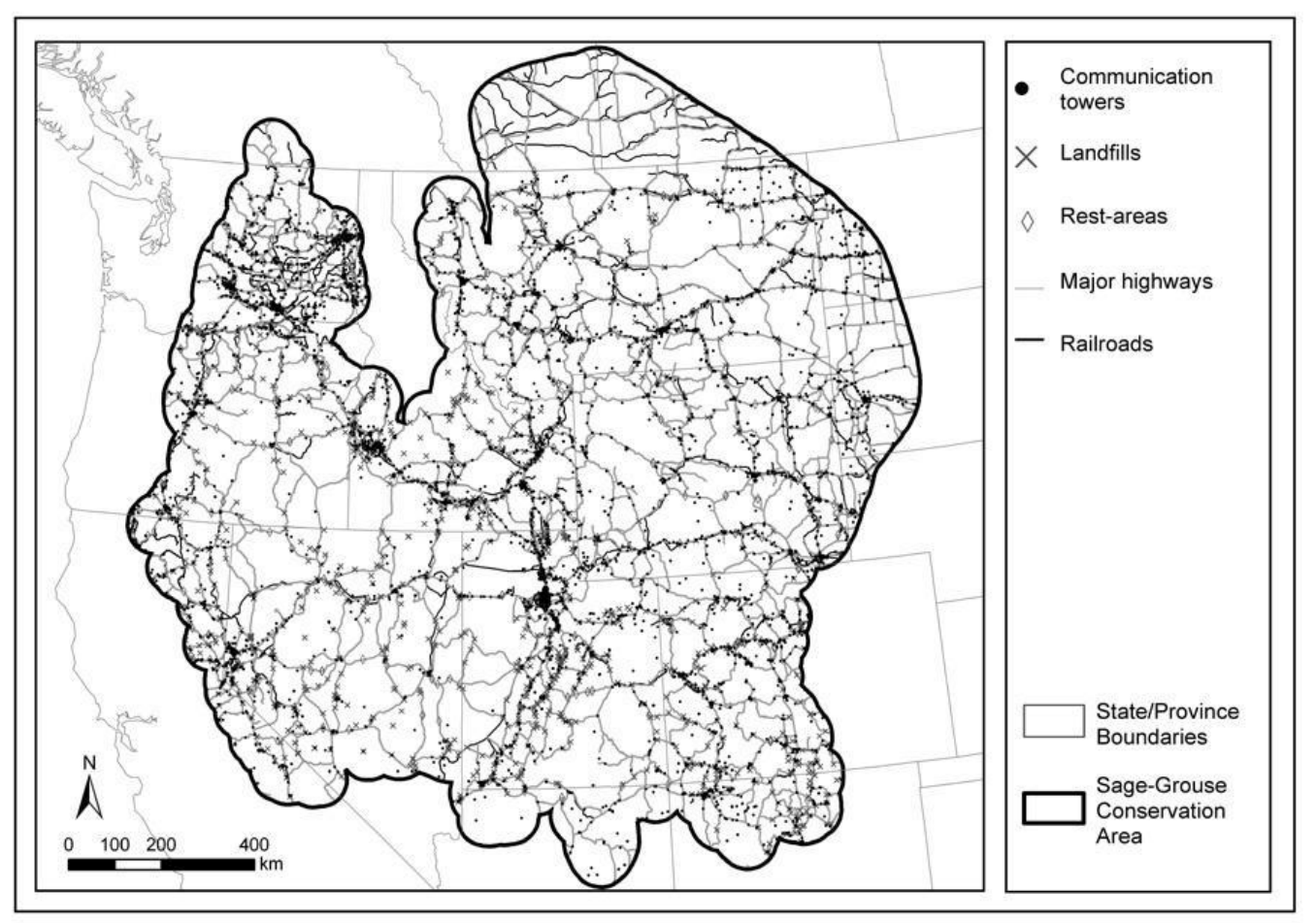
- "…<2% of the leks were in areas surrounded by >25% agriculture within a 5-km radius, and 93% by <10% agriculture…" (Knick et al. 2013)



Interstates and Highways

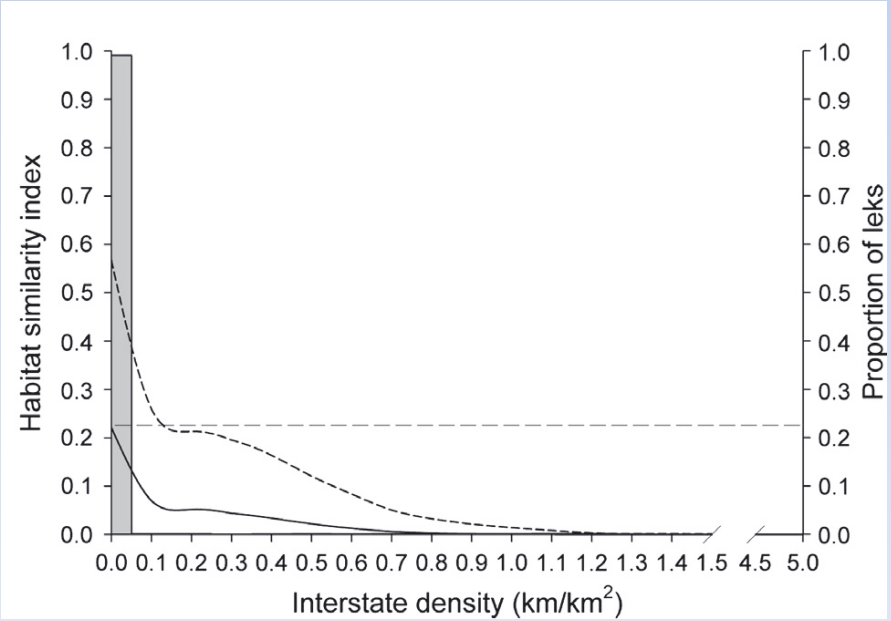
- 13.1 – 35% of sagebrush area affected by interstates and highways in Great Plains
- "…road fragmentation and disturbance from human activities in and around human dwellings (Mitchell et al. 2002) probably make many of these areas inhospitable to sage-grouse and other wildlife…"

Interstates and Highways



Interstates and Highways

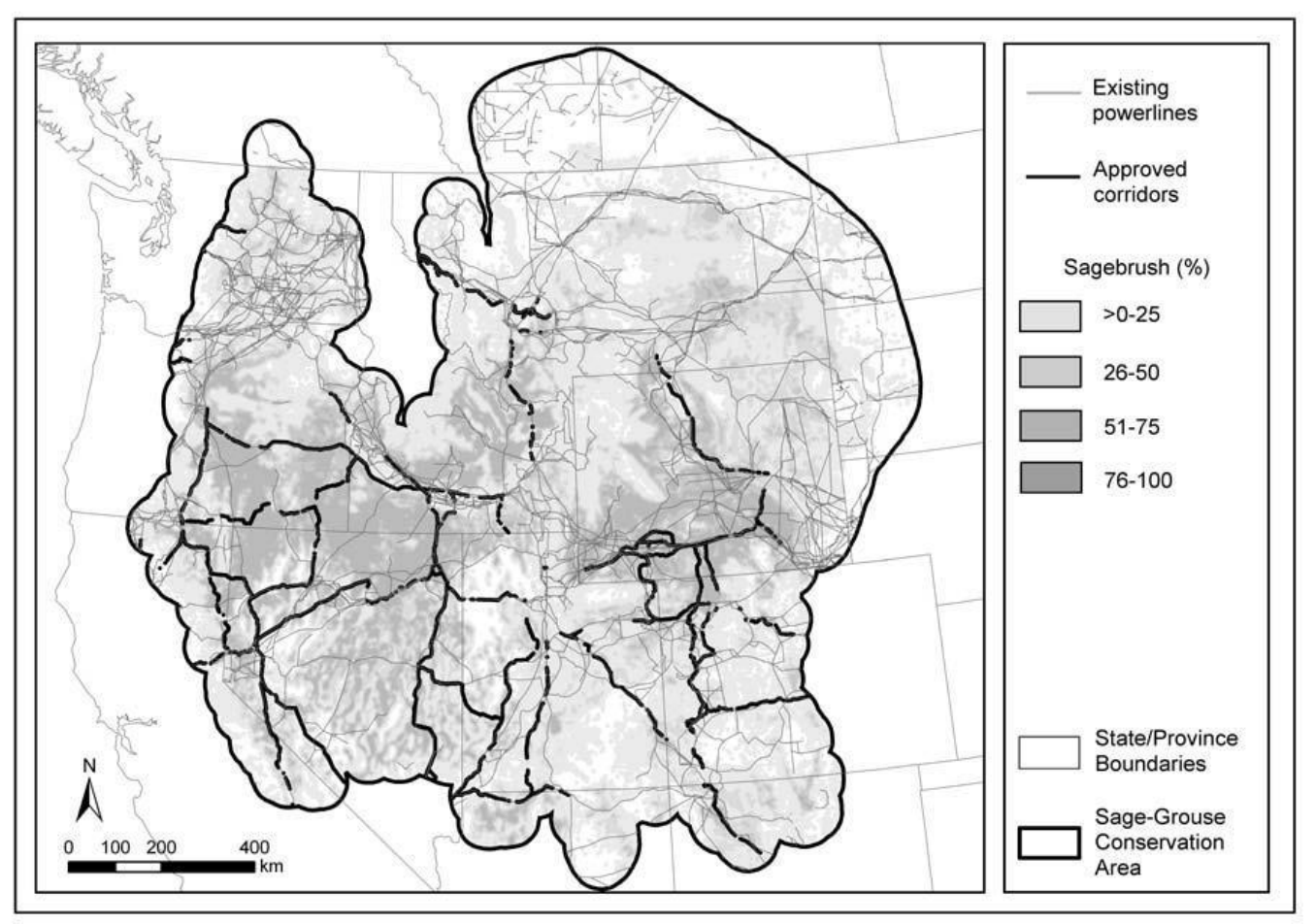
- "Ninety-three percent of active leks fell below this threshold [interstate density of 0.01km/km2] for interstate highways." (Knick et al. 2012)



Power lines

- 15.4 – 33.5% of sagebrush area affected by power lines in Great Plains
- “The connecting infrastructure of roads, motorized trails, railways, power lines, and communications corridors fragment or remove sagebrush land cover…” (Chap. 13)

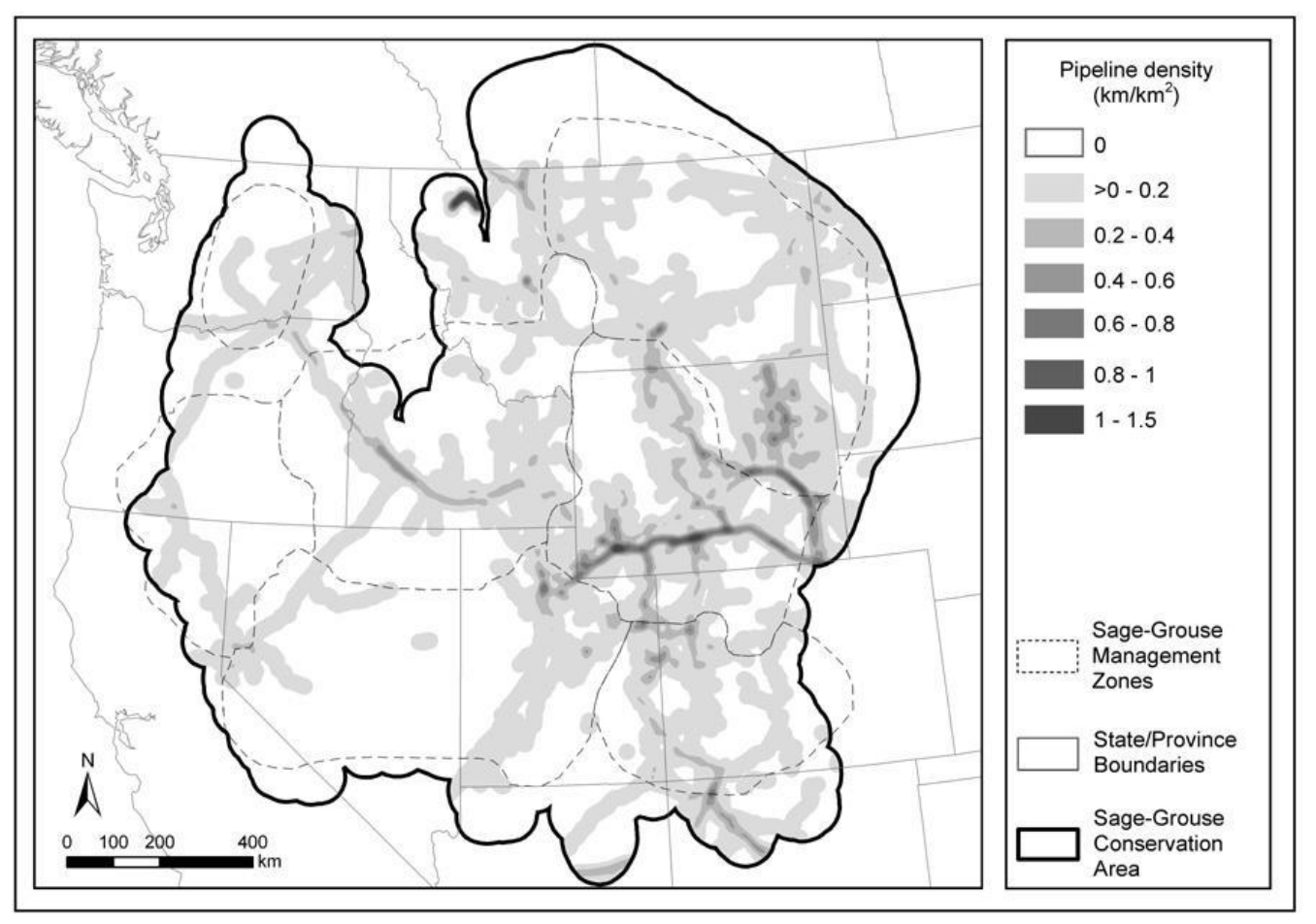
Power lines


Existing powerlines
Approved corridors
Sagebrush (%)
>0-25
26-50
51-75
76-100
State/Province Boundaries
Sage-Grouse Conservation Area
N
0 100 200 400
km

Pipelines

- 1.3% of sagebrush area affected by pipelines in the Great Plains
- "…direct and indirect effects on the surrounding landscape from roads, power lines, compressor stations, and pipelines remain following construction."

Pipelines


Pipeline density
(km/km^2)
0
>0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
1 - 1.5
Sage-Grouse Management Zones
State/Province Boundaries
Sage-Grouse Conservation Area
N
0 100 200 400
km

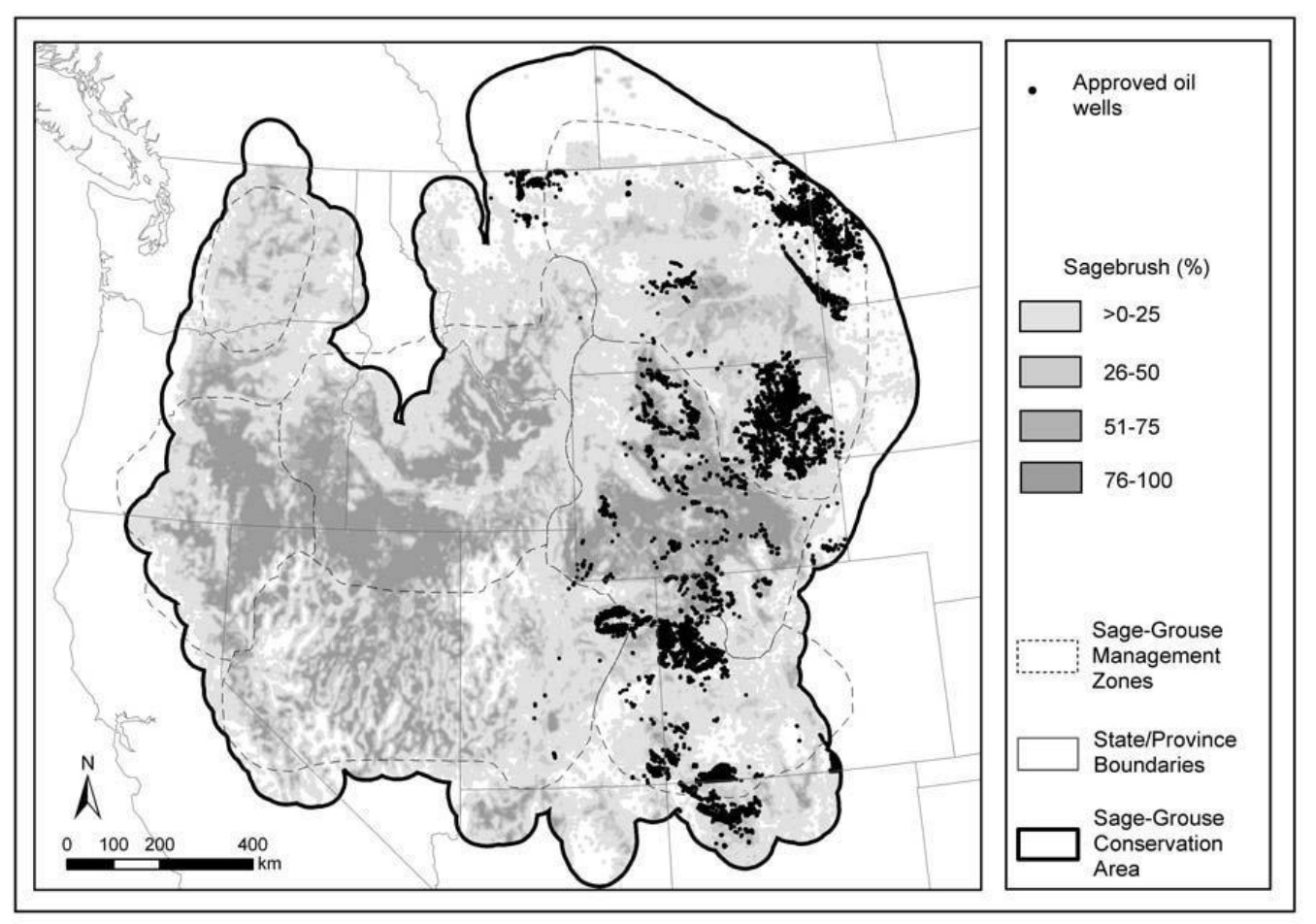
Oil and Gas

- 20.1% of sagebrush area is affected by oil and gas in the Great Plains
- "…Greater sage-grouse avoided suitable sagebrush habitat within 4 km^2 of natural-gas wells (Doherty et al. 2008), and during breeding, lek persistence was negatively influenced by the presence of gas wells within 0.8 and 3.2 km (Walker et al. 2007a).

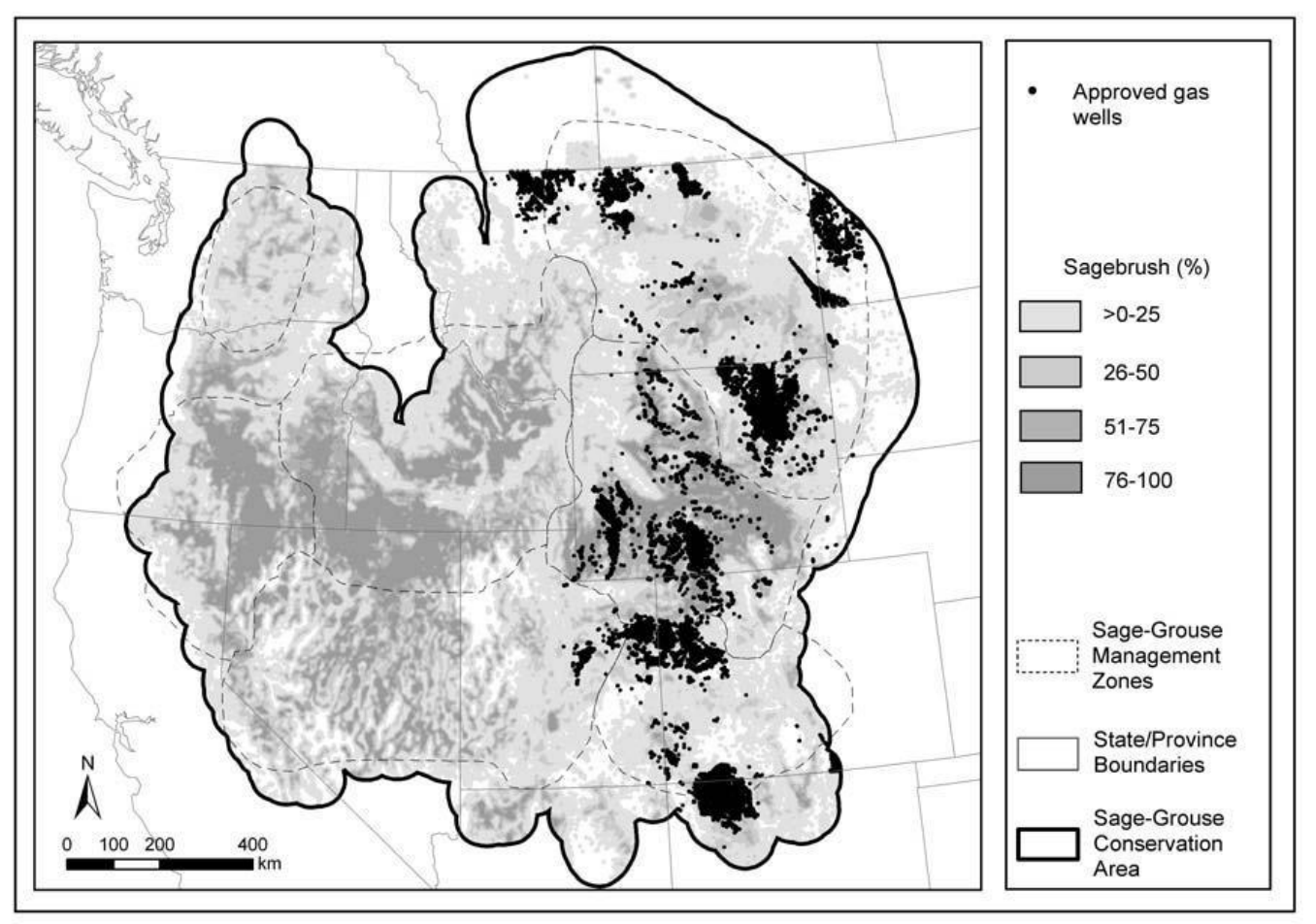
Oil and Gas

- “Sage-grouse continued to use highly fragmented habitats in some oil fields and reclaimed areas, but population levels were below numbers prior to disturbance (Braun et al. 2002)…”

Oil and Gas


Approved oil wells
Sagebrush (%)
>0-25
26-50
51-75
76-100
Sage-Grouse Management Zones
State/Province Boundaries
Sage-Grouse Conservation Area
N
0 100 200 400
km

Oil and Gas


Approved gas wells
Sagebrush (%)
>0-25
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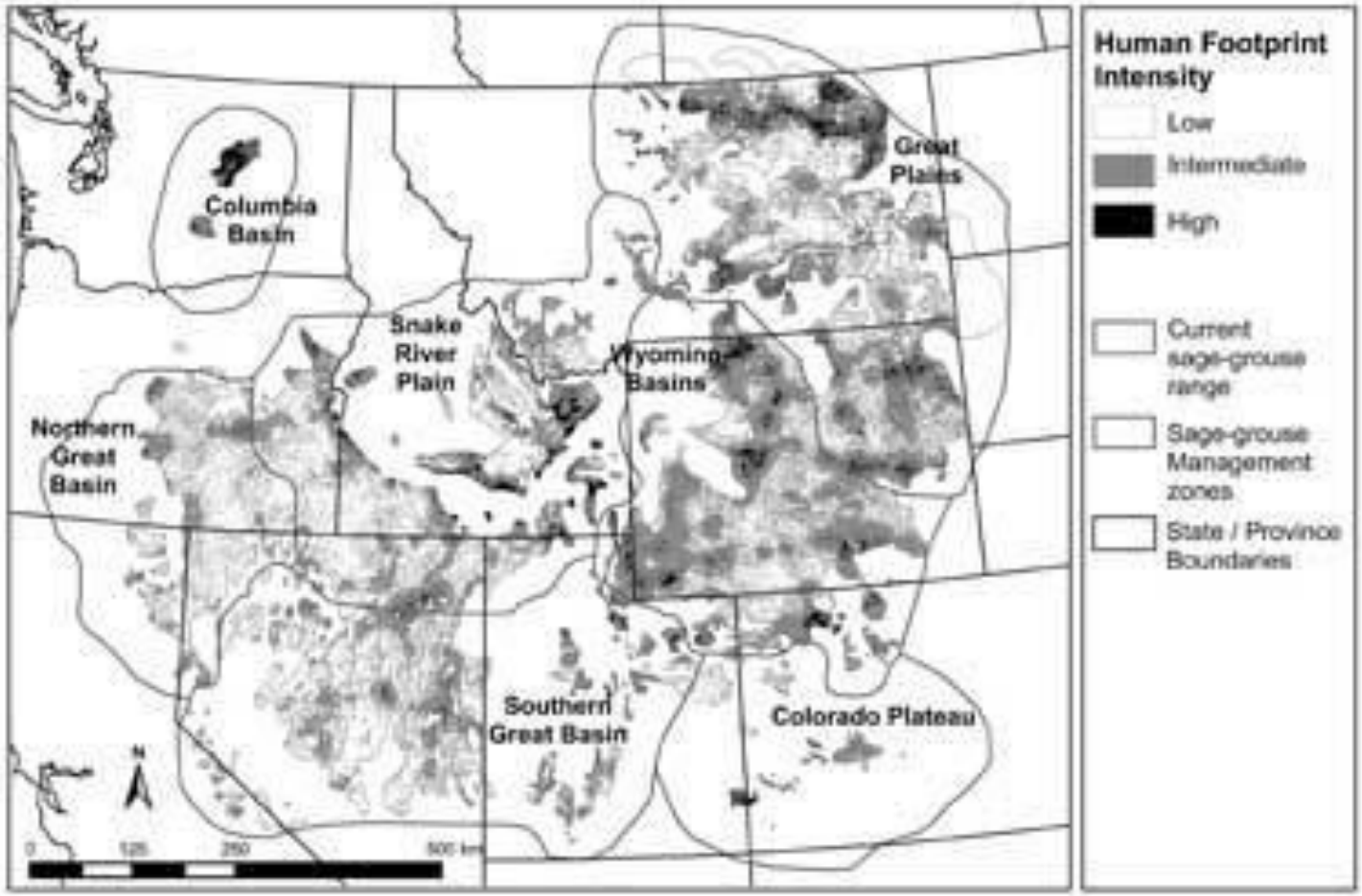
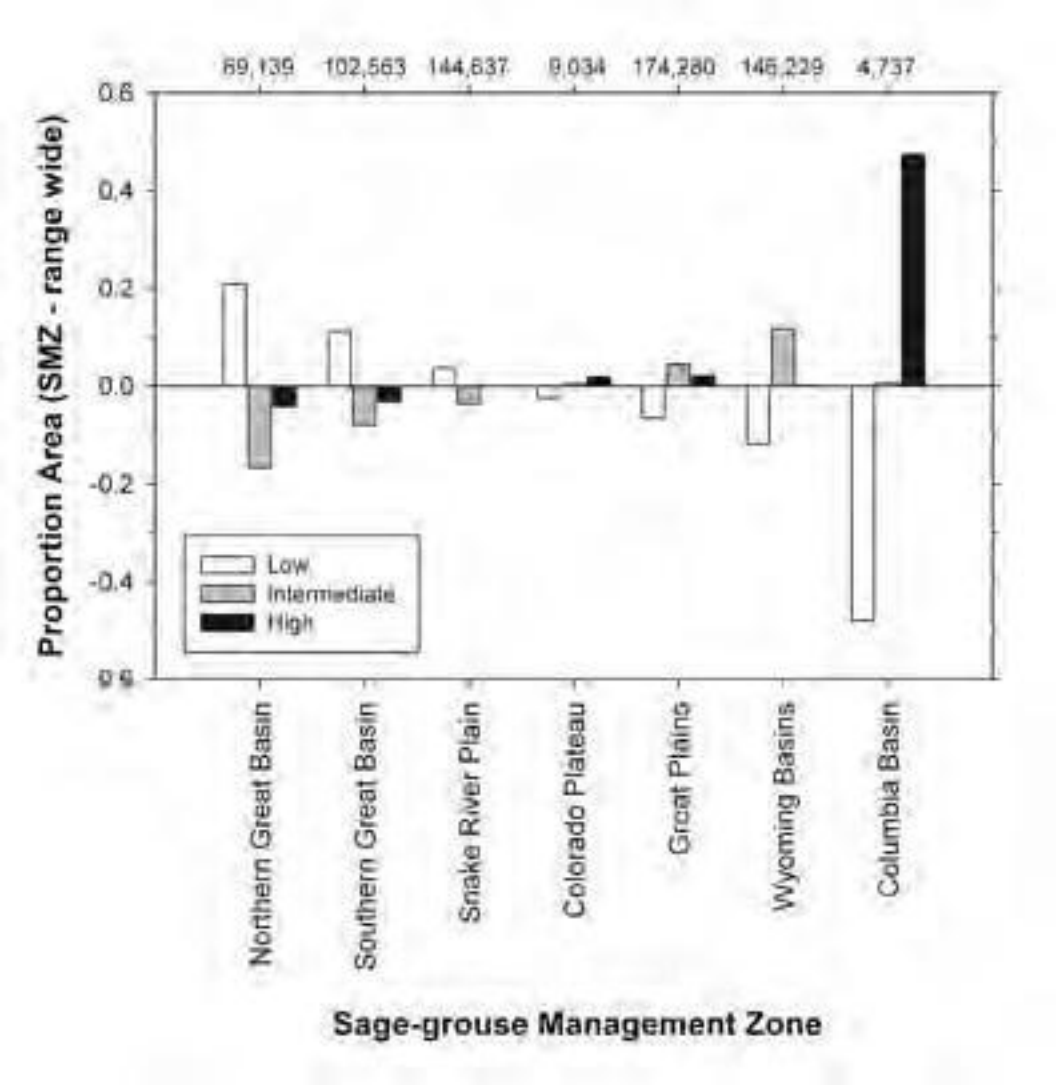
Human Footprint



Human Footprint

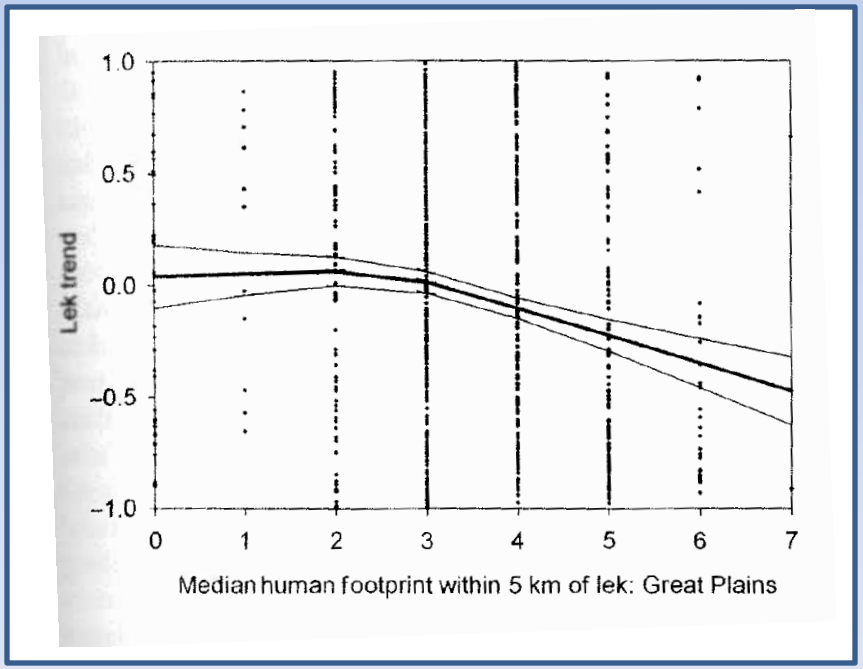
- High-intensity human footprint = 4.8%
- Intermediate human footprint = 47.0%
- Low human footprint = 48.2%
- Great Plains ranked 4th out of 7 for human footprint effect
  - Wyoming Basin ranked 1 higher (higher footprint)
  - Snake River Plain ranked 1 lower (lower footprint)

Human Footprint



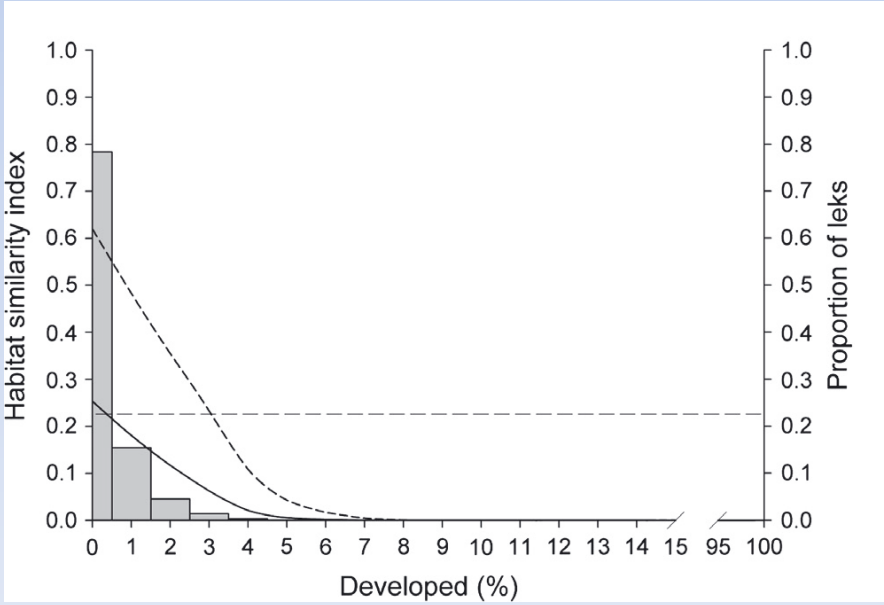
Human Footprint

- Human footprint influences lek trends across the range, regardless of the type of anthropogenic threat (Johnson et al. 2011)



Human Footprint

- "Ninety-nine percent of active leks were in landscapes with <3% developed; all lands surrounding leks were <14% developed" (Knick et al. 2013)



Summary

- “Ultimately, the cumulative impact of the individual disturbances and multiple land uses, rather than any single source, likely has the most significant influence on the trajectory of sagebrush ecosystems.”

Potential Management Options

- No new development (no surface occupancy)
  - Priority habitats or sagebrush range
  - Lek buffers
- Surface disturbance limits
  - Priority habitats or sagebrush range
  - Can be achieved, in part, through consolidating infrastructure, clustering development, etc.
- Continue with voluntary BMPs (non-regulatory)
- Other options?