A pheasant researcher notebook:
what we are learning about pheasants and pheasant hunters in Nebraska

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Managing pheasants is challenging
Challenge 1: What is habitat?
Challenge 1: What is habitat?

Regional Policy
Challenge 1: What is habitat?

- Nesting
- Home range

Local Management
2010-2012 pheasant habitat in Nebraska

- Surveyed 155 sites

Map: C. Jorgensen
Locally More CRP = More pheasants

Proportion of a section enrolled in CRP

Pheasant abundance

Section
Challenge 2: Habitat is context dependent
Even habitat the looks the same may not have the same value
How can two CRP fields have different habitat value?
How can two homes have different value?
Update your kitchen

$ to $$$
Update your CRP

Matthews et al. 2012
Even fields with the same management can have different habitat value?
How can two updated homes have different value?
How can two updated homes have different value?

Location! Location! Location!
GIS to look at land-use in the ‘neighborhood’ around a CRP field
What is in the neighborhood can be good or bad

Proportion of the township in a land-use practice

Local CRP habitat value
CRP adds habitat value

Pheasant abundance

- Township with no small grain

- 15 roosters

Proportion of a section enrolled in CRP
CRP adds habitat value

- Township with no small grain

- 15 roosters

- 40 roosters

Pheasant abundance vs. Proportion of a section enrolled in CRP
CRP adds habitat value

Proportion of a section enrolled in CRP

Pheasant abundance

- Township with no small grain
  - 15 roosters
  - 40 roosters
  - 85 roosters
The neighborhood shapes the value of CRP

- Township with 15% small grain
- Township with no small grain

Proportion of a section enrolled in CRP vs. Pheasant abundance

- 15 roosters
- 45 roosters
- 40 roosters
- 85 roosters
The neighborhood shapes the value of CRP

Proportion of a section enrolled in CRP

Pheasant abundance

Township with 15% small grain
Township with no small grain

15 roosters
45 roosters
95 roosters
40 roosters
85 roosters
The neighborhood shapes the value of CRP

- Township with 15% small grain: 200 roosters
- Township with no small grain: 85 roosters

Pheasant abundance

Proportion of a section enrolled in CRP
The neighborhood shapes the value of CRP

- Township with 15% small grain
- Township with no small grain

Pheasant abundance

- 15 roosters
- 40 roosters
- 85 roosters
- 95 roosters
- 200 roosters

Proportion of a section enrolled in CRP
The neighborhood shapes the value of CRP

![Graph showing the relationship between the proportion of a section enrolled in CRP and pheasant abundance.](image)

- Township with no trees
  - 17 roosters
  - 37 roosters
  - 72 roosters

Proportion of a section enrolled in CRP

Pheasant abundance
The neighborhood shapes the value of CRP

- Township with no trees: 72 roosters
- Township with 15% trees: 21 roosters

Proportion of a section enrolled in CRP vs. Pheasant abundance

- 4 roosters
- 10 roosters
- 17 roosters
- 37 roosters
- 21 roosters
- 72 roosters
Neighborhoods can be good . . . or bad
What makes a neighborhood bad?

- Poor schools
- Narrow streets
- High crime
What makes a neighborhood bad?
2013 Nest predation study

- Monitored 150 artificial nests on CRP fields
- Measured land-use in the surrounding neighborhood
Increasing CRP, wheat, and pasture around a nest increases nest survival.

![Graphs showing the relationship between the percentage of the landscape in each land-use practice (CRP, wheat, pasture) and the predicted daily nest survival.](image)
Where are Nebraska’s best pheasant neighborhoods?
Let's build in the good neighborhoods... right?
Challenge 3: Landscapes are dynamic

Neighborhood is always changing

Figure: Powell et al. 2015
Policies affects land-use change
Change can be profound

2012
Gage County

Increasing habitat value
Transitioning 25% of corn to small grain

2012
Gage County

Gage County

Increasing habitat value
Transitioning 50% of small grain to corn

2012 Gage County

Gage County

Increasing habitat value
Challenge 3: Landscapes are dynamic

Where will the best habitat be in the future?
When future policy is unpredictable, scenario planning has value.
Increasing habitat value

Some locations appear very sensitive to policy shifts
Other locations appear to maintain favorable habitat even under challenging policy scenarios.
Let's build in the most resilient neighborhoods... right?
Challenge 4: Opportunity
What is opportunity?
Is access translating to opportunity?
2014-2017 Hunter field survey
Pheasant hunters depend on public access

Pheasant hunting accounts for half of the highest use days
Regions are unique
Pheasant hunting is uneven

Waterfowl
Pheasant
Quail
Grouse
Dove
Whitetail Deer
Mule Deer
Turkey

n = 69

n = 96

n = 155
Residency differs by region

Rainwater Basin hunter zip codes

Southwest hunter zip codes

Southeast hunter zip codes
Opportunity is a balance

Birds

Time and money
Southwest Nebraska
Opportunity = (+birds)(–dollars/time)
Southeast Nebraska
Opportunity = (-birds)(+dollars/time)
The opportunity balance ultimately affects how people use the resource.
Challenge 5: Hunting affects pheasants
Harvesting only roosters means hunting has no population impact. . .

Right?
Landscapes were more favorable and populations larger

Figure: Powell et al. 2015
2012-present
How does hunting influence pheasants?

12 Study Sites
6 High Hunting Pressure
(Open Access CRP)
6 Low Hunting Pressure
(Private CRP)
Hunting pressure is 12X higher on high pressure sites, but only early on.
How does hunting influence pheasants during the hunting season?

- **Pre-Season**
  - Sep.
  - Oct.
  - Nov.
  - Dec.

- **Early Season**
  - Jan.
  - Feb.
  - Mar.

- **Late Season**
  - Apr.
  - May.
  - Jun.
  - Jul.
Males DO NOT change home range size in response to hunting.

High Pressure

Low Pressure

Hunting Season

Home range size (acres)
Females quadruple their home range size on high pressure sites, but quickly return to normal.
Females move their home range by more than $\frac{1}{2}$ mile on high pressure sites.
Hens move from public to private fields during the hunting season
There movement is not random

**Observed Network**
Edge density: 1.16

**Random Walk Network**
Edge density: 1.34
Does hunting influence pheasants?

- **Yes**
  - Pre-
  - Early
- **No**
  - Late

Hunting pressure is continuous and declines seasonally.
Home ranges increases for females and males
Males and females shift home range center

Hunting pressure at previous home range (log(mean hunters/photo/site/day))

log(distance from previous home range center)
How do pheasants interact with hunters in the field?
Hunters move between sites looking for pheasant
Hunters also move within sites looking for pheasant.
1. Divide sites into grids
2. Monitor hunter and pheasant use
12 hunters, 148 acres
Hunters spend more time near parking areas and along edges

![Graph showing time spent hunting vs distance from edge and parking area.](image)
Hunters are not so good at finding pockets of birds.
Time spent hunting

Vegetation height

Change in hen use (during-before season)

Birds move to thick vegetation but hunters don’t
So is hunting affecting the winter population of pheasants?
Day 11 of the hunting season male mortality is ~20% higher on high pressure sites.
... and female mortality is ~7% higher
... however the survival consequences of hunting diminish as the season progresses.
Does hunting influence pheasants?

Yes

No
Does hunting influence pheasants?

Pre-Breeding: YES
Early Breeding: NO
Late Breeding: ?

2012-present
Does fall hunting pressure affect hens the following spring?

12 Study Sites
6 High Hunting Pressure
(Open Access CRP)
6 Low Hunting Pressure
(Private CRP)
Hunting does not impact female condition the following spring, but
Females on high pressure sites reduce egg size by 10%
Does hunting influence pheasants?

- **Pre-Breeding**
  - Hunting pressure: **YES**

- **Early Breeding**
  - Hunting pressure: **NO**

- **Late Breeding**
  - Hunting pressure: **YES**

- **Breeding**
  - YES
Challenge 6: We still cannot control the weather
Drought clearly impacts the great plains
2013 drought

3\textsuperscript{rd} worst in SW Nebraska history
Population implications of drought
Significant annual variation in body size.
Body size correlates with drought conditions.
Reproductive implications of drought
Pheasant breeding season

![Graph showing nest initiation date vs. Palmer Drought Severity Index](image)
Drought does not affect the peak breeding season
Drought may delay the onset of the breeding season
Drought limits the length of the breeding season
Drought limits the length of the breeding season

Palmer Drought Severity Index

Nest initiation date

28  46  81  102
Drought limits egg size

![Graph showing the relationship between egg volume (cm³) and Palmer Drought Severity Index. The graph indicates an increasing trend in egg volume as the drought severity increases.]

- Egg volume (cm³) vs. Palmer Drought Severity Index

- Egg volume: 23.0, 23.5, 24.0, 24.5, 25.0

- Palmer Drought Severity Index: -5, -4, -3, -2, -1, 0, 1, 2
Hunting pressure also reduces egg size

<table>
<thead>
<tr>
<th>Hunting Pressure</th>
<th>Egg volume (cm$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>21</td>
</tr>
<tr>
<td>Low</td>
<td>23</td>
</tr>
</tbody>
</table>
Drought mediates the ‘cost of fear’

![Graph showing the relationship between Palmer Drought Severity Index and egg volume. The x-axis represents the Palmer Drought Severity Index ranging from -5 to 2. The y-axis represents egg volume in cm³ ranging from 20 to 26. The graph includes data points and trend lines.](image)
Challenge 7: Science to implementation

\[ 0 = b' + \frac{2z(b^2 - z^2)}{(d-2)b(-1 + |f|^2)^2} f' \hat{f}^2 - \frac{2i\omega(b^2 - z^2)}{(d-2)b(-1 + |f|^2)^2}(f\hat{f}^2 - \hat{f}f') \]

\[ - \frac{2\omega^2 z}{(d-2)b(-1 + |f|^2)^2} \]

\[ 0 = f'' - \frac{2z(b^2 + z^2)}{(d-2)b^2(-1 + |f|^2)^2} f'\hat{f}^2 + \frac{2}{(1 - |f|^2)} \left( 1 - \frac{i\omega(b^2 + z^2)}{(d-2)b^2(1 - |f|^2)} \right) \hat{f}f^2 \]

\[ + \frac{2i\omega(b^2 + 2z^2)}{(d-2)b^2(-1 + |f|^2)^2} f'\hat{f}^2 + \frac{2}{z} \left( \frac{z^2 - (d-2)b}{z^2 - b^2} \right) \hat{f} + \frac{i\omega z^2}{(b^2 - z^2)(1 - |f|^2)} \hat{f} \]

\[ + \frac{2\omega^2 z}{(d-2)b^2(b^2 - z^2)(1 - |f|^2)^2} f' + \frac{2\omega^2 z}{(d-2)b^2(-1 + |f|^2)^2} f^2\hat{f}^2 \]

\[ + \frac{2i\omega}{(b^2 - z^2)} \left( \frac{1}{2} - \frac{i\omega(1 + |f|^2)}{2(1 - |f|^2)} - \frac{\omega^2 z^2 |f|^2}{(d-2)b^2(-1 + |f|^2)^2} \right) f. \]
Improving access to information

Managers have limited access to scientific libraries

So much research/monitoring has never been published
Accounting for space and time when translating science

Most research is from the 70s and 80s or even older

Most research is from SD and IA

Almost all research is done on ‘good’ populations
Developing planning tools
Pheasant Habitat Simulator

https://pheasant.shinyapps.io/testversion_10032016/
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