

# The influence of hunting on Canada goose (*Branta canadensis*) landscape use

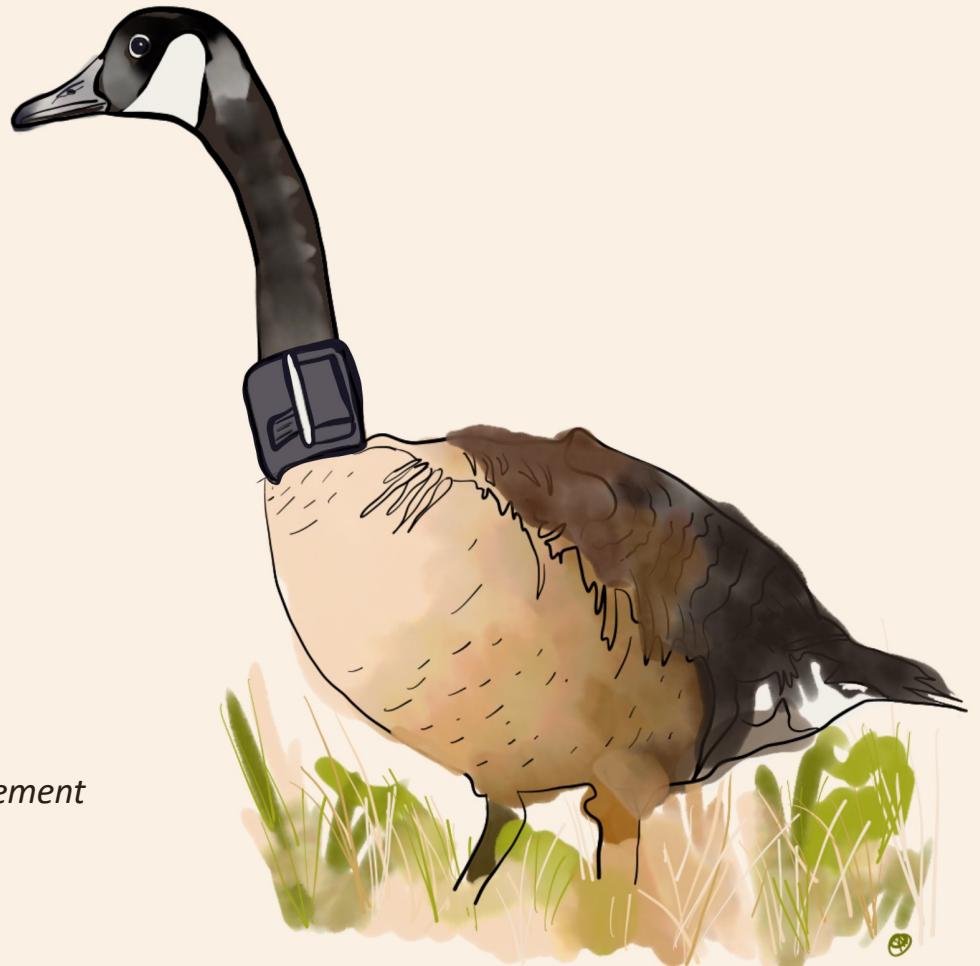
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# Understanding habitat preference can inform land and population management



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Boyce & McDonald, 1999  
Matthiopoulos et al, 2020

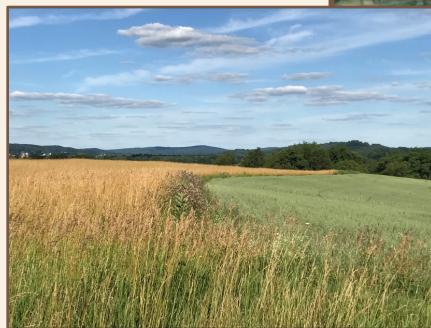
# Study Site



Middle Creek  
WMA



6,200 acres

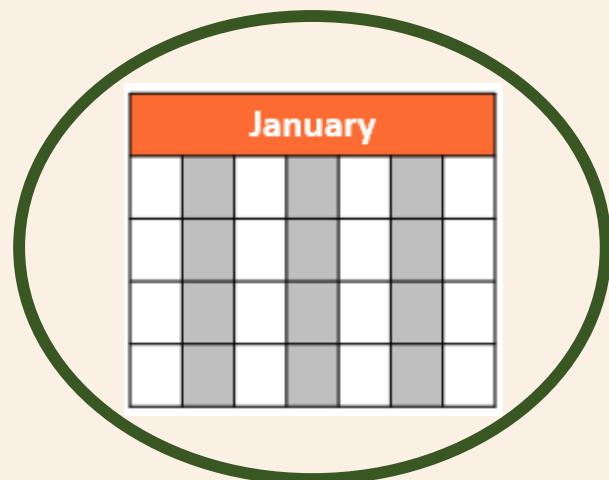
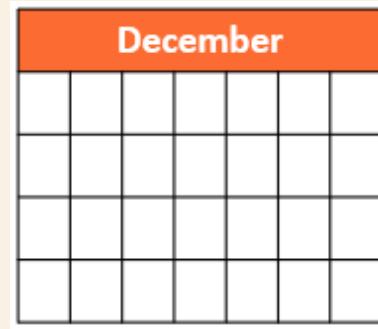
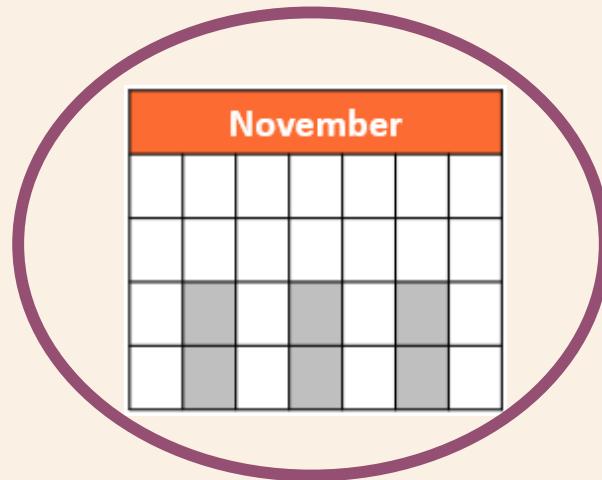




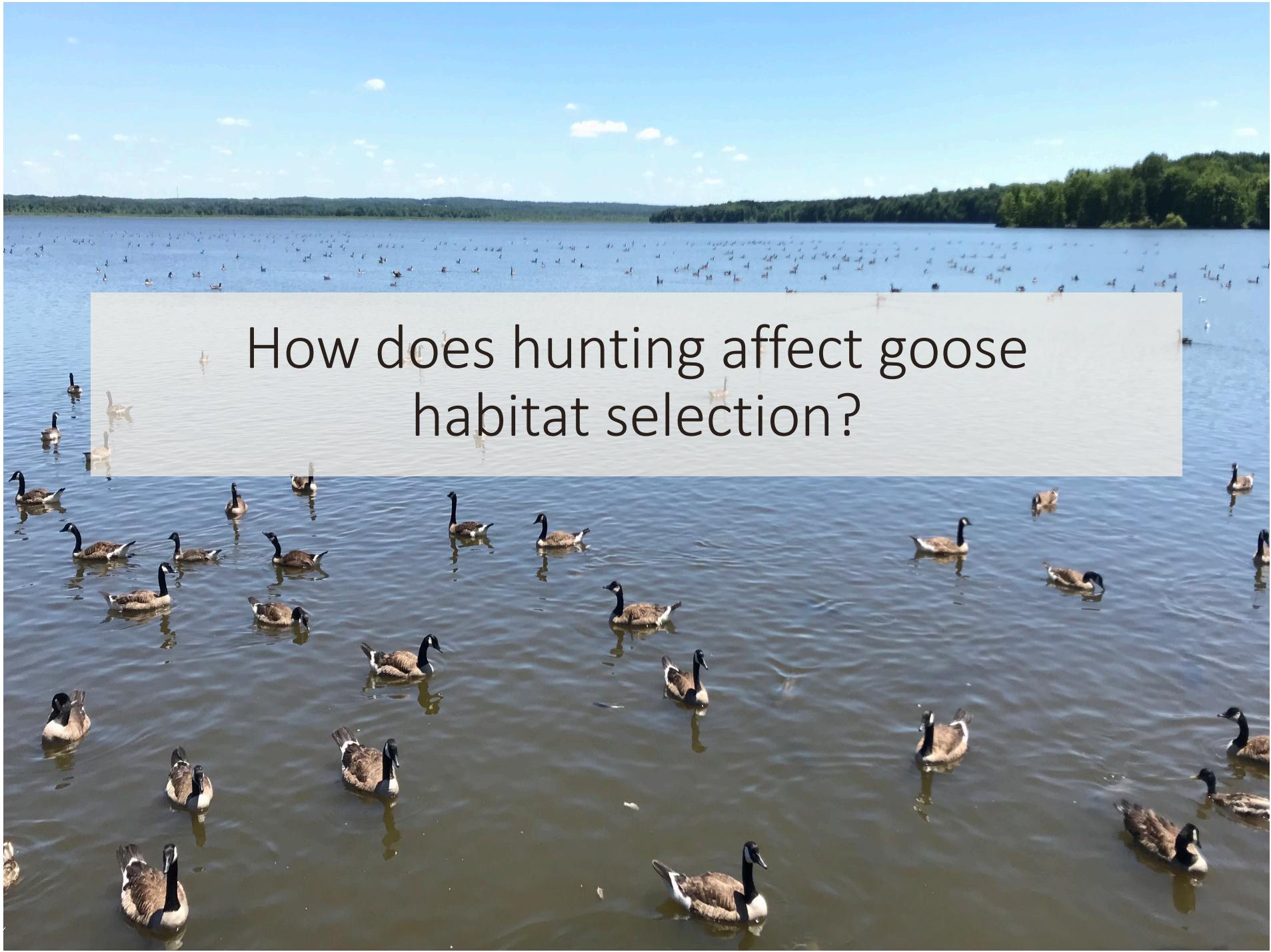
Hunting occurs from  
stationary blinds



# Hunting days alternate within the season

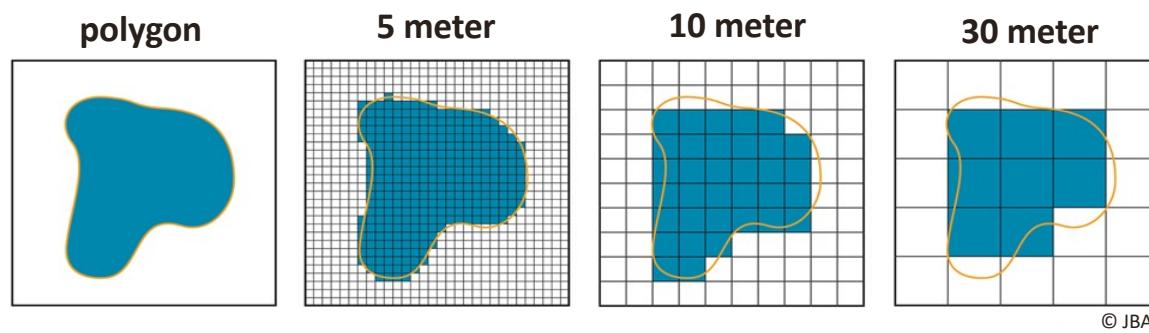


- hunting allowed
- hunting not allowed

A wide-angle photograph of a large body of water, likely a lake or river, filled with numerous geese. The water is a deep blue, and the sky above is a clear, pale blue with a few wispy white clouds. In the far distance, a dense forest line is visible across the water. The foreground is filled with geese swimming in various directions, their dark brown bodies contrasting with the water. A large, semi-transparent white rectangular box is overlaid on the upper portion of the image, containing the following text.

How does hunting affect goose  
habitat selection?

# Resolution and extent should be appropriate to answer the research question

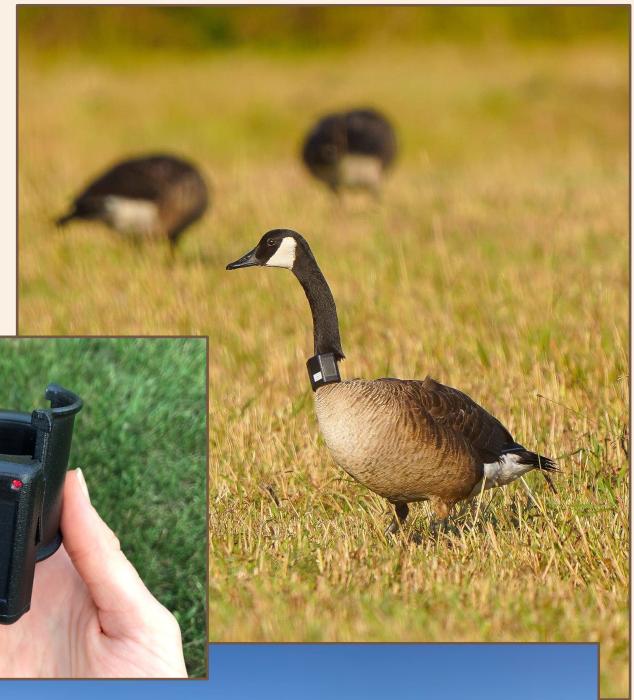
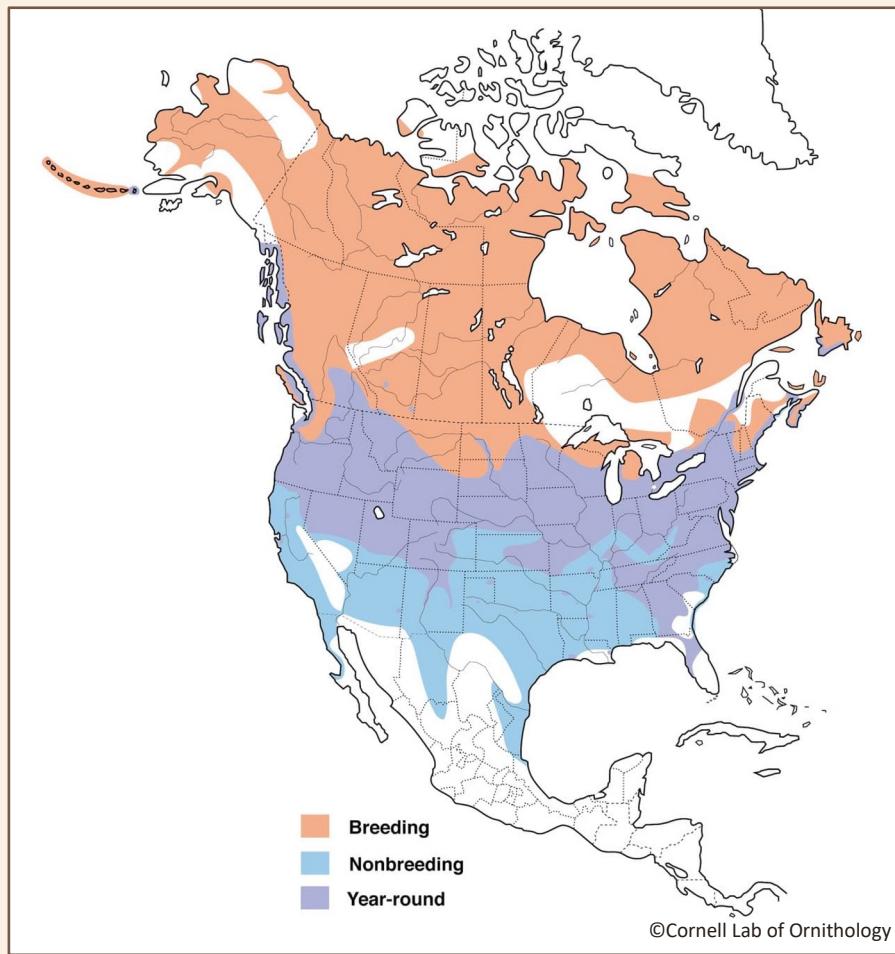


Higher resolution

Lower resolution

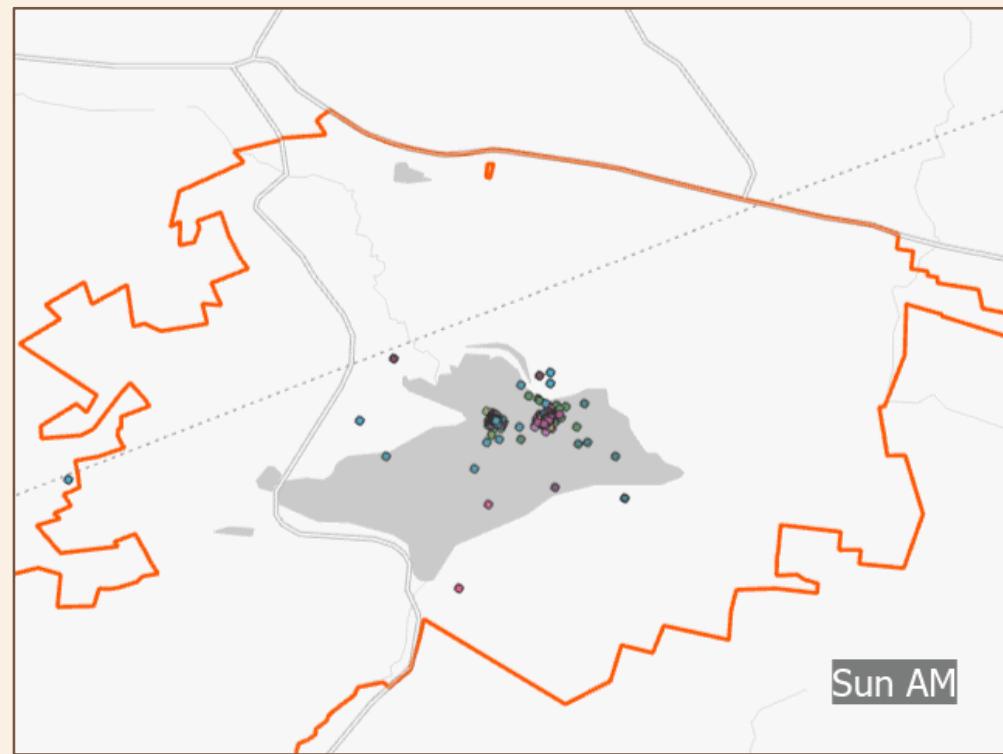


# Tracking only Resident Population birds



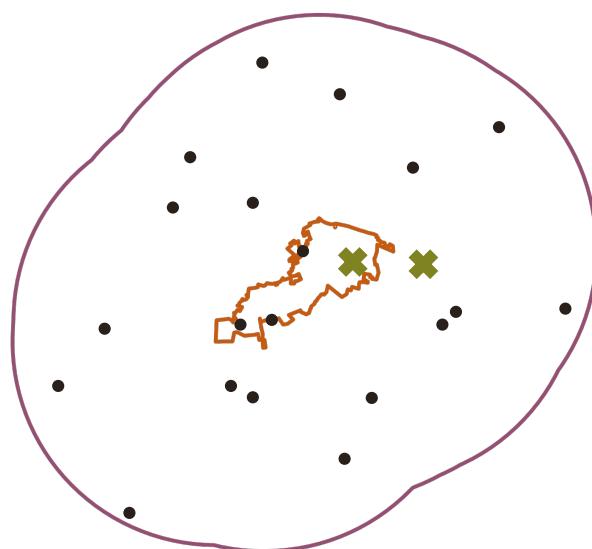
# 10-minute fix rate from 2021-2023

138  
individuals  
+  
27,000  
observations  
per bird  
=  
3,700,000  
data points



# Resource Selection Function → logistic regression model

- Included random effect of individual to account for repeated sampling
- Availability is user-defined
  - Habitat selection inference depends on definition of availability



Coarse Analysis



Fine Analysis

A legend on the right side of the figure. It contains three entries: 'Observed location' with a green 'x' marker, 'Available location' with a black dot marker, and '7-mile buffer' with a purple circle marker.

- Observed location
- Available location
- 7-mile buffer

# What are they responding to in their environment?

	Coarse	Fine
<b>Area</b>	WMA + 7 miles	WMA
<b>Duration</b>	Aug 25 – Jan 29 (5 mon)	Nov 15 – Jan 29 (2.5 mon)
<b>Observation Frequency</b>	60 min	10 min
<b>WMA Presence</b>	On/Off	--
<b>Habitat</b>	NLCD	Ground-truthed
<b>Hunting</b>		
Season	Period	Day
Number of Hunters	per Day	per Blind
Proximity	Distance from blind	Distance from blind

# Habitat selection depends on availability

Portion (%) of Habitat Type within Study Area		
Coarse	Habitat Type	Fine
29	Forest	69
21	Grass	
	<i>Cool grass</i>	5
	<i>Warm grass</i>	9
<1	Open Water	7
37	Crop	
	<i>Corn</i>	5
	<i>Wheat</i>	3
	<i>Hay</i>	2
13	Developed	<1

Estimated Effect Sizes						
Covariate	COARSE			FINE		
	Period		↑ Number of Hunters	Day		↑ Number of Hunters
	Non-hunt	Hunt		Non-hunt	Hunt	
Use WMA	2.3	0.1				
Distance from Blind	-1.5	0.1	0.1	-3.1	-0.3	0.6
<u>Habitat</u>						
Open Water	baseline	0.3		baseline	0.6	
Forested	-3.7	0.3		-2.3	0.1	
Developed	-2.8	-0.3		-3.0	-0.3	
Grassland	-2.0	0.2				
<i>Cool Grass</i>				-1.5	0.5	
<i>Warm Grass</i>				-3.0	0.6	
Cropland	-2.6	-0.8				
<i>Corn</i>				-3.6	-1.6	
<i>Wheat</i>				-3.7	-1.5	
<i>Hay</i>				-4.7	-0.7	

# How does hunting affect goose habitat selection?

## Takeaways

- Geese showed **less preference** for hunting blinds during hunting
- Geese showed a strong preference for **open water**
- Geese **avoided** cropland more than they avoided grassland
  - Planting more grass mix and less crops could entice geese

## Limitations

This type of model has innately poor predictive capacity because of availability dependence

→ Availability **varies** geographically,  
is **user-defined**, and  
is highly dependent on **scale**



Learn more about  
my research:



Thank you!

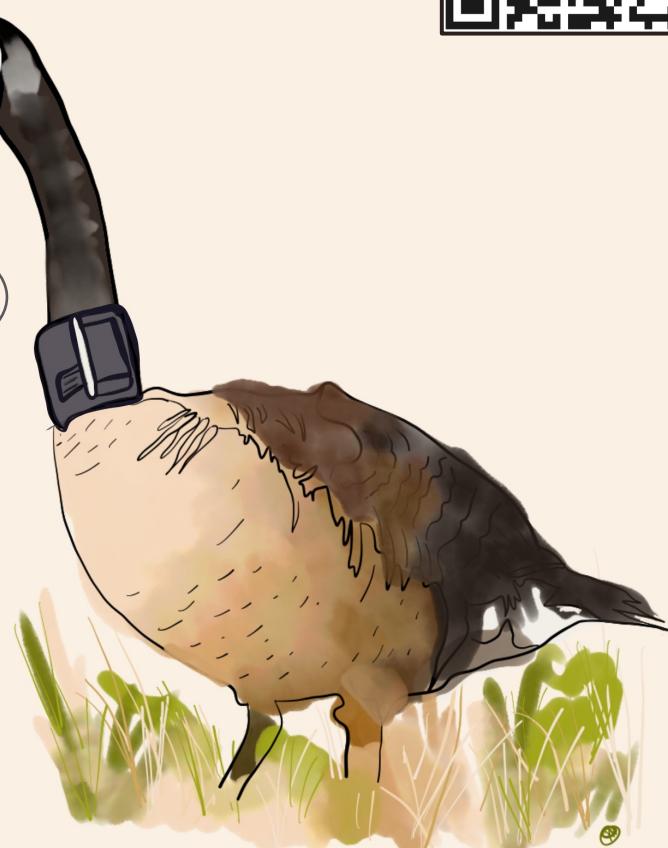
PennState



Quantitative Wildlife Ecology Lab



Pennsylvania Game Commission  
wardens, technicians, & staff



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