

DEVELOPING AND EVALUATING NOVEL TECHNIQUES FOR MOOSE MONITORING IN NH 2022-2025

Wildlife Modeling &
Management Lab
Dr. Remington Moll
Msc. Candidate Lily Hall



Earth Systems Research Center
Dr. Michael Palace
Research Scientist Franklin
Sullivan



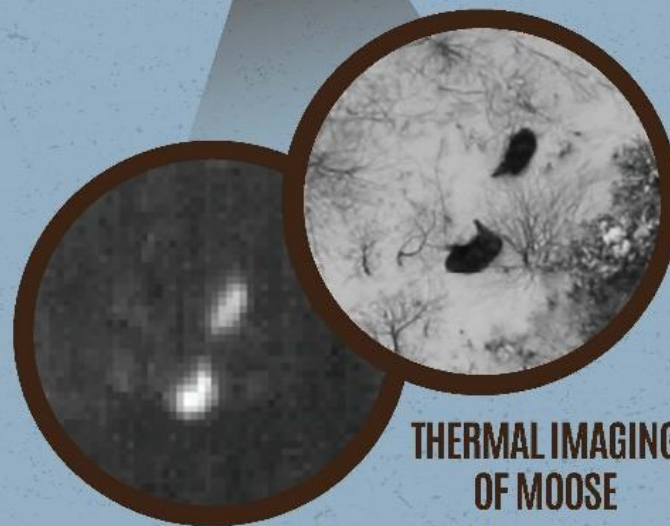
Henry Jones
NH Fish and Game Moose Project Leader

MOOSE ABUNDANCE: DEER HUNTER SURVEY

MOOSE SIGHTING RATE BY DEER HUNTERS



AERIAL INFRARED SURVEY OF MOOSE "TRUTH LAYER"



THERMAL IMAGING OF MOOSE

DEER HUNTER SURVEY FORM – RETURN ON OR BEFORE DEC. 2, 2019

TOWN OF RESIDENCE: NEW TOWN STATE: NH
 NAME (optional): JOHN Q. HUNTER PHONE # (optional): 555-1000
 ADDRESS (optional): 46 MAIN ST. NEWTOWN, NH 03000 DATE OF BIRTH (optional): 5/10/65

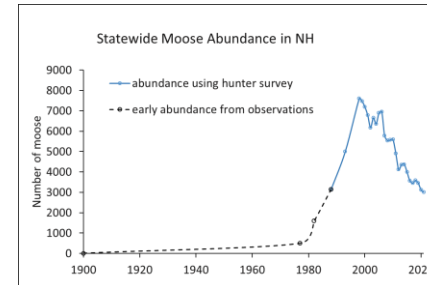
MONTH	DAY	WMU	TOWN HUNTED	# HOURS HUNTED	# DEER SEEN	# BEAR SEEN	# MOOSE SEEN				# BOBCAT SEEN
							BULL	COW	CALF	UNK	
11	02	A1	PITTSFORD	7.5	2	1		1	2		
11	03	A2	PITTSFORD	3.0	2	3					
11	13	H1	MARLOW	2.0							
11	14	P2W	LYMAN	1.0	3			1			

REASSESS ACCURACY OF DHS

- 24 years since last checked with a thermal survey.
- Moose density is lower.
- Change in deer hunter behavior?

IMPORTANCE OF MOOSE ABUNDANCE

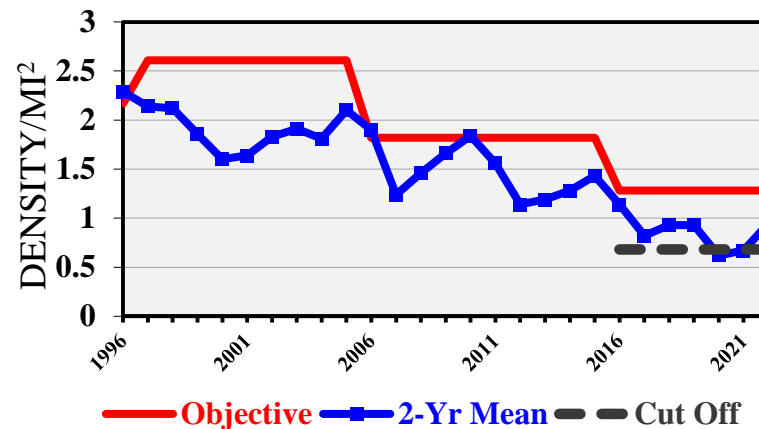
- Widespread social concern about decline.



- Winter ticks are influenced by moose density.



- Management system linked to moose density.



RESEARCH PROJECT TECHNIQUES

Camera traps



Drones with thermal and red-green-blue sensors

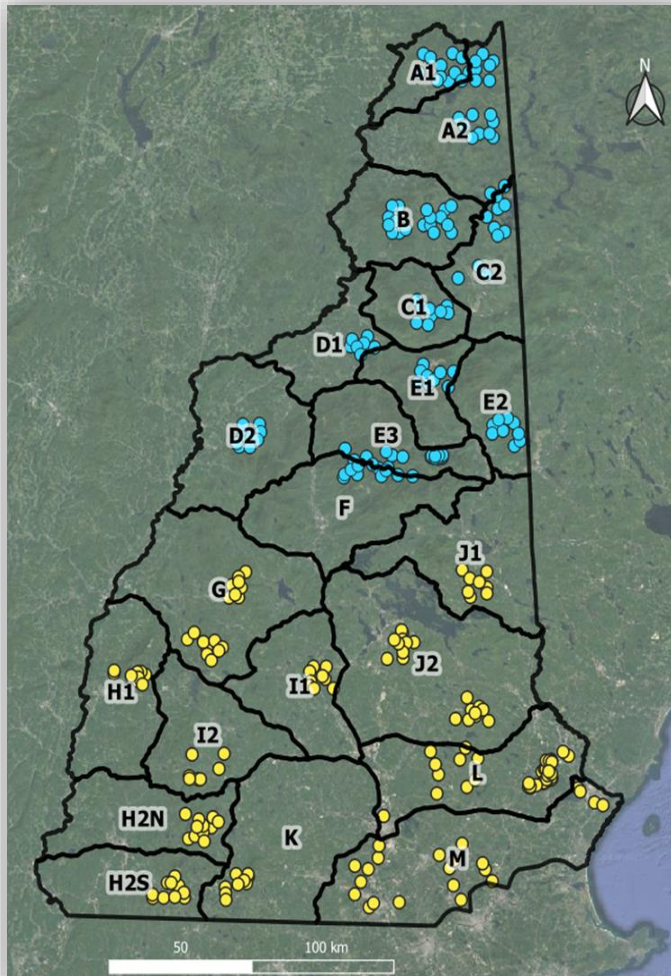


PROJECT TIMELINE

	2022		2023			2024			2025	
	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer
Deploy cameras	█									
Camera checks		█	█		█	█		█		
Drone flights			█			█				
Final analysis and reporting							█	█	█	█

CAMERA TRAPS

Camera Trap Locations



Moose Grant

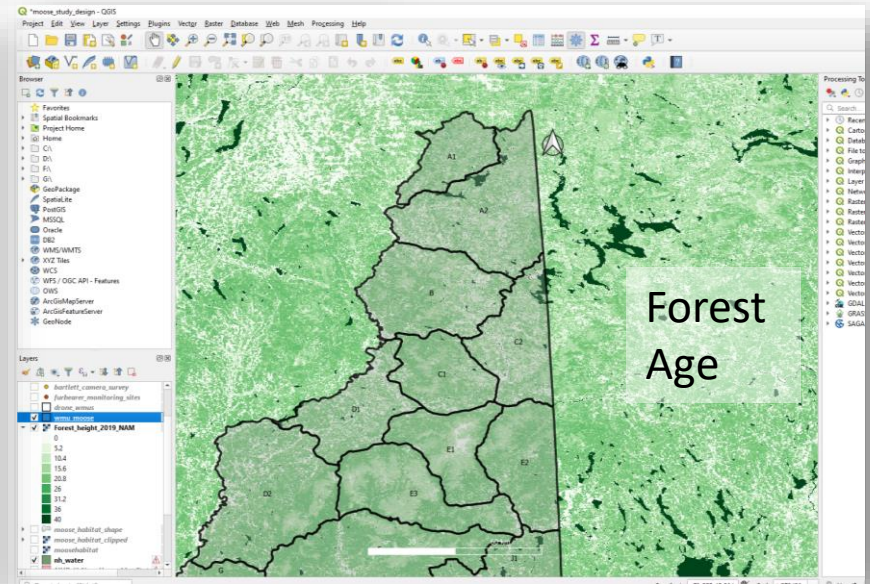
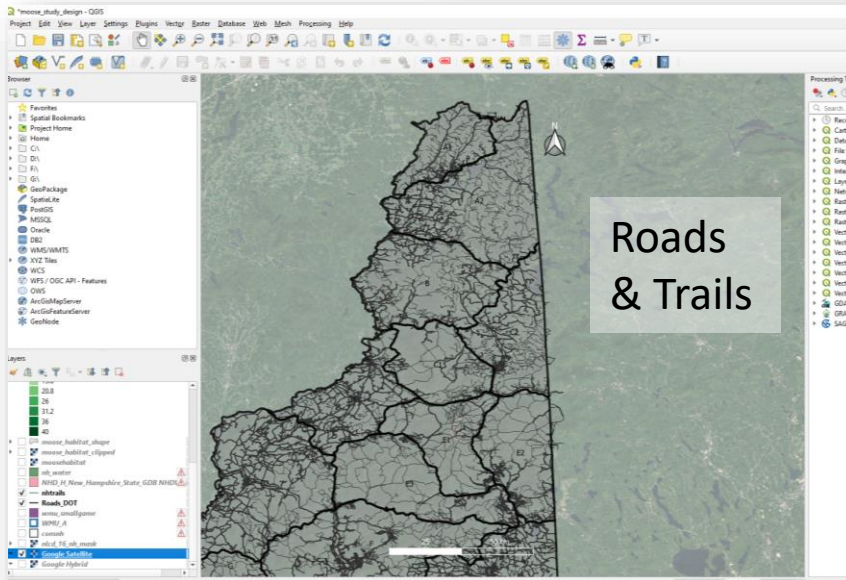
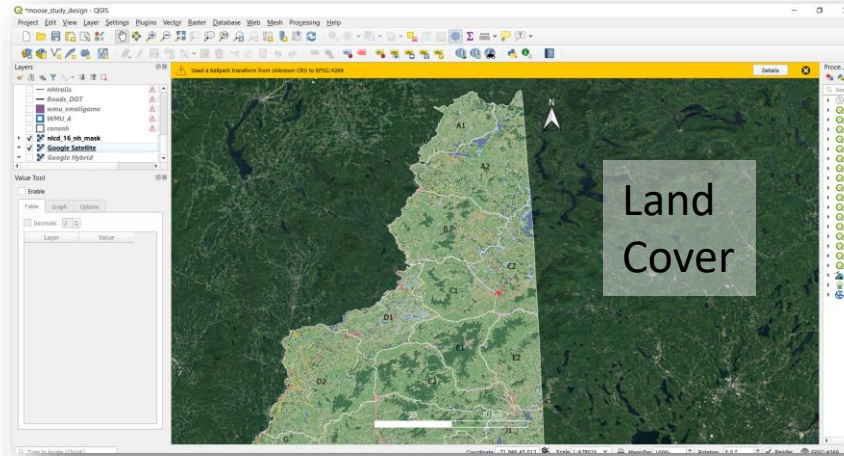
Furbearer Grant



~330

cameras

CAMERA PLACEMENT VARIED BY:



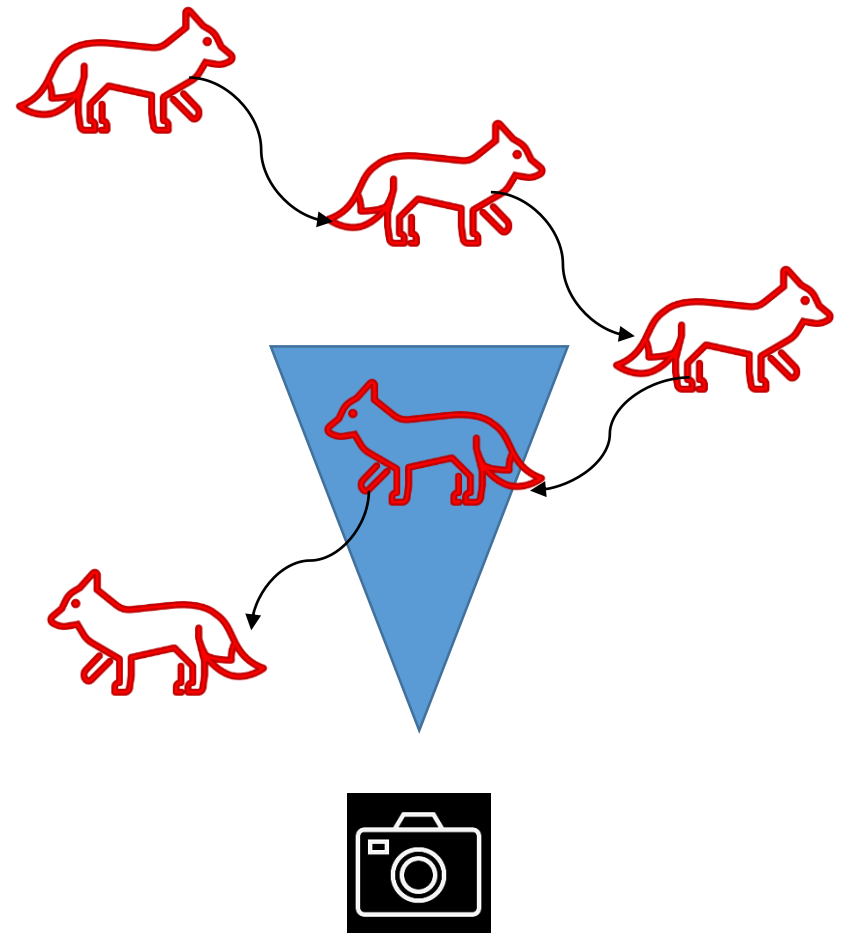
CAMERA DATA ANALYSIS

Two modeling techniques:

1. Time-to-event model

2. REST model

(Random encounter staying time)

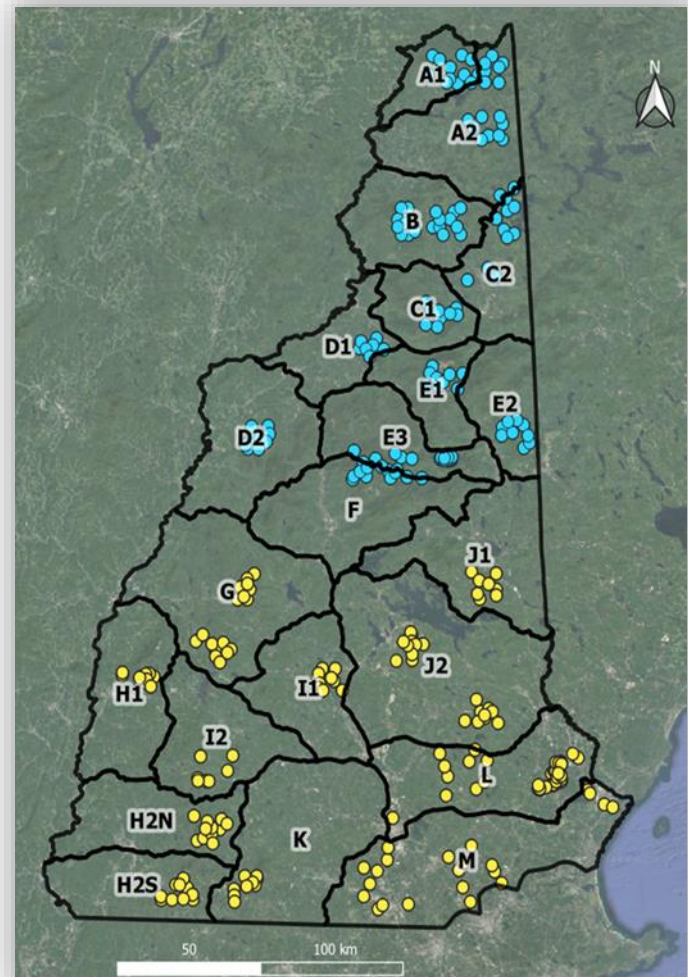


CAMERA TRAPS RESULTS

330 camera traps.

Two camera checks per year.

All 2022 images processed.

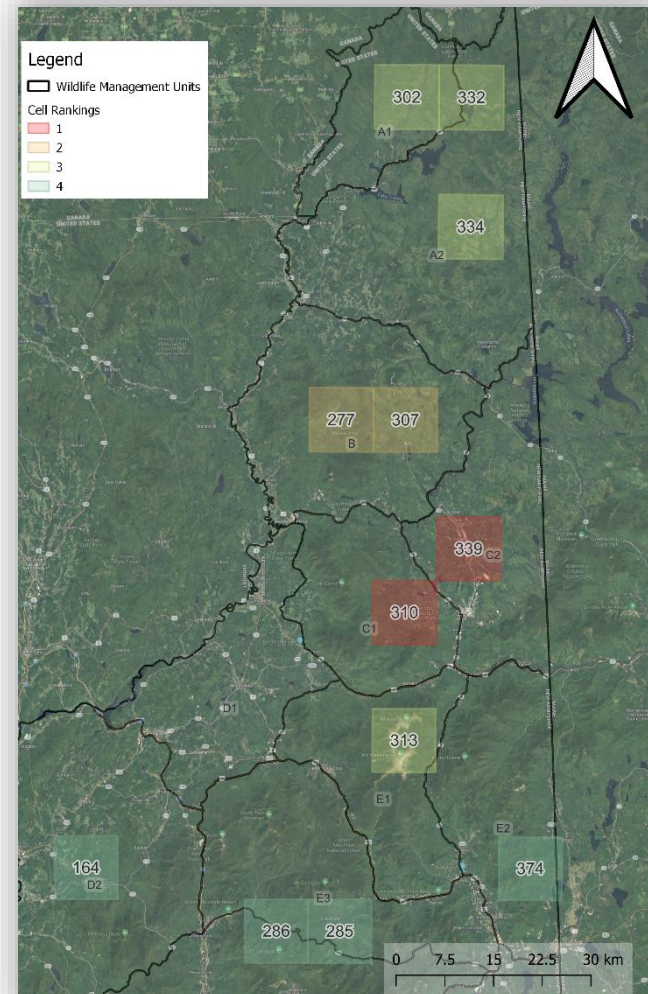


DRONE SURVEY DESIGN

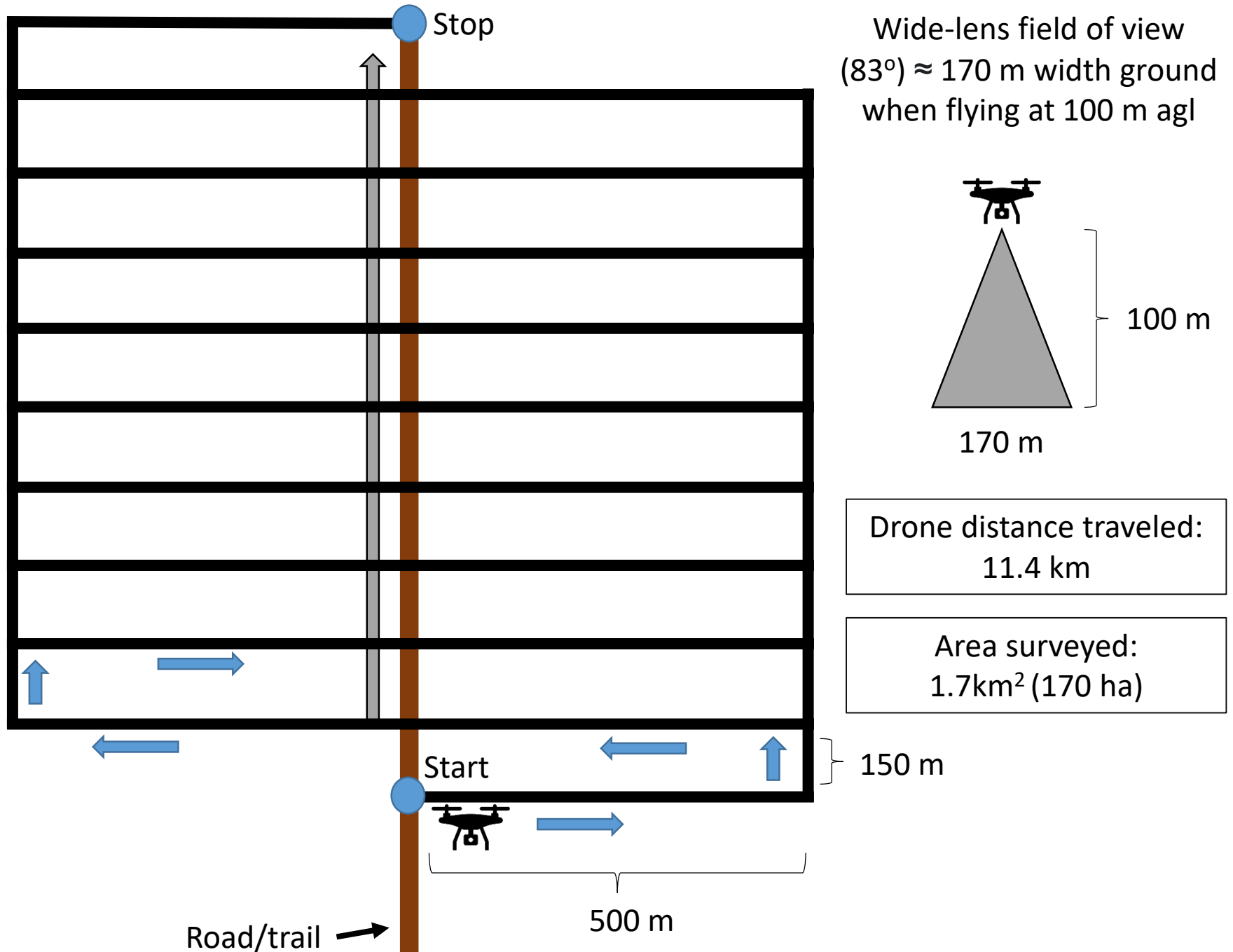
Year 1: refine techniques and determine “sightability”

Year 2: use two UAS setups to survey 12 camera blocks in northern NH

Drone Survey Blocks



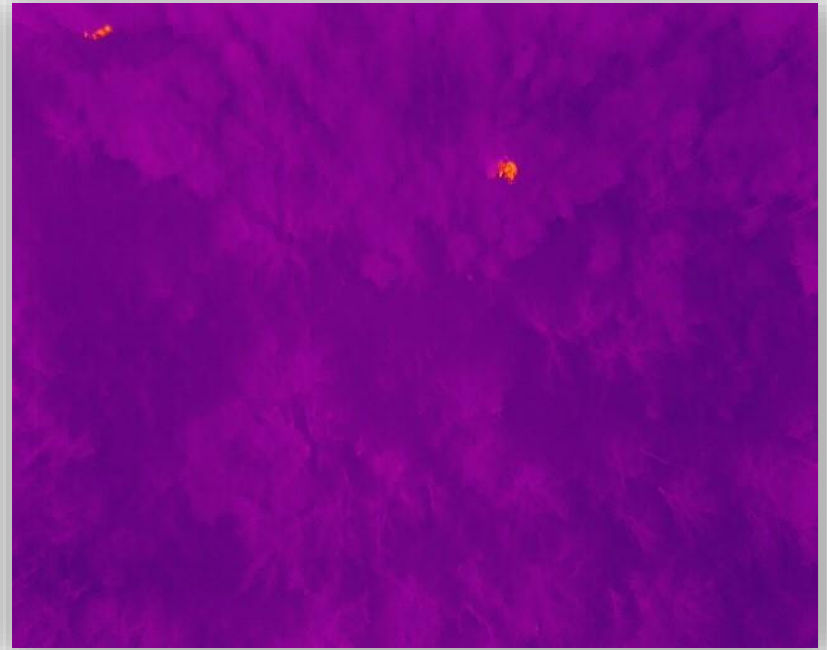
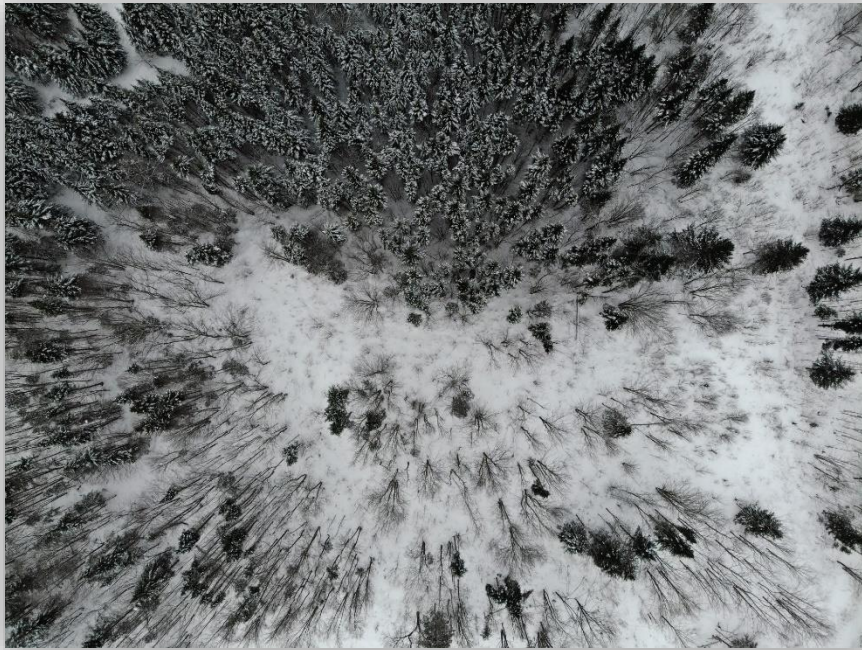
Slide from R. Moll



DRONE SURVEY DESIGN



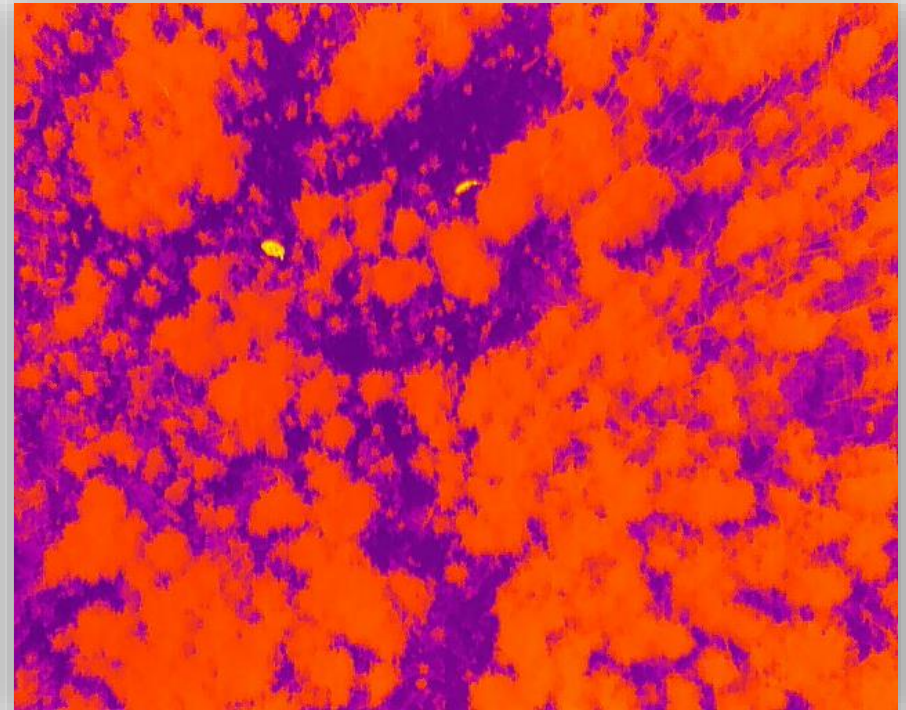
RGB vs. THERMAL



Pictures from R. Moll

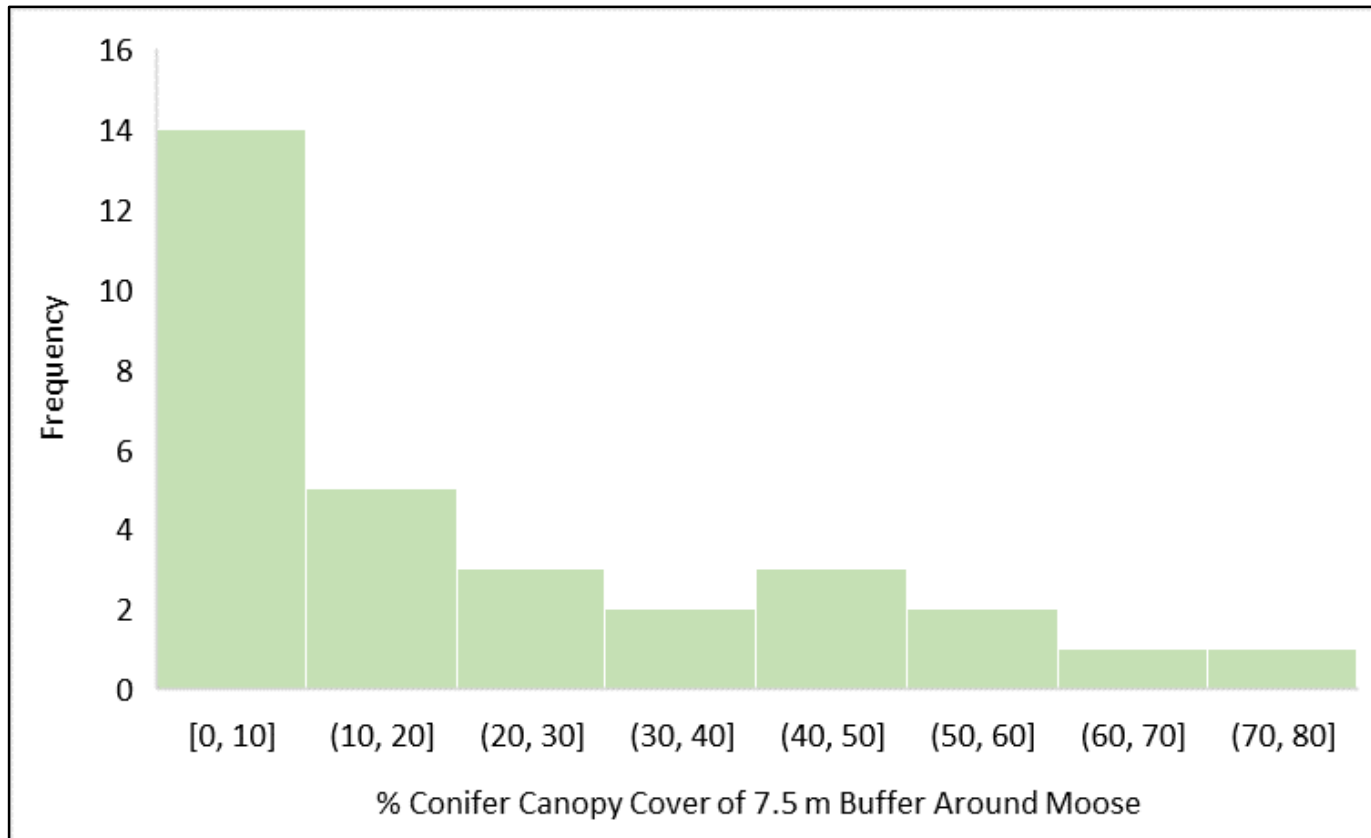
SIGHTABILITY

“Sightability”- How many moose are present but not detected?



Pictures from R. Moll

SIGHTABILITY



Number of moose detections across various conifer canopy cover estimated for a 7.5 m radius buffer around each moose. Data is binned in 10% increments.

DRONE SURVEYS WINTER 2024

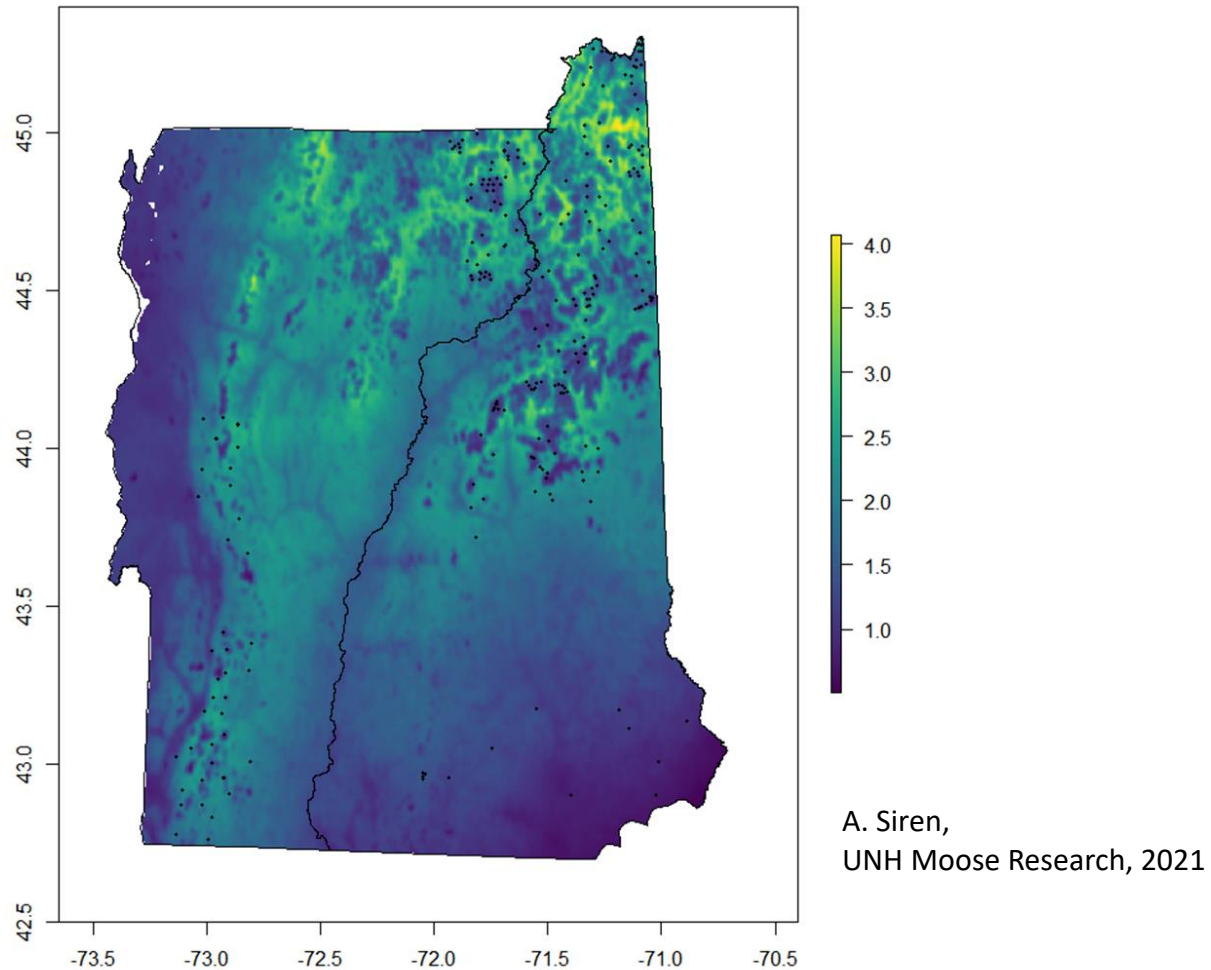


EXPECTED OUTCOMES AND PRODUCTS

- Final report- June-August 2025
- WMU-level moose density estimates/indices.
- Comparison between camera traps, UAS surveys, and hunter surveys
- Training of students at UNH

EXAMPLE HEAT MAP

Predicted moose abundance



QUESTIONS?

Henry Jones

NH Fish and Game Moose Project Leader

henry.f.jones@wildlife.nh.gov

