Small Mammal Presence and Predation of Boreal Bird Nests in Forested vs. Open Peatlands in the Northern Adirondack Park, NY

By Carly A. Beckstrom

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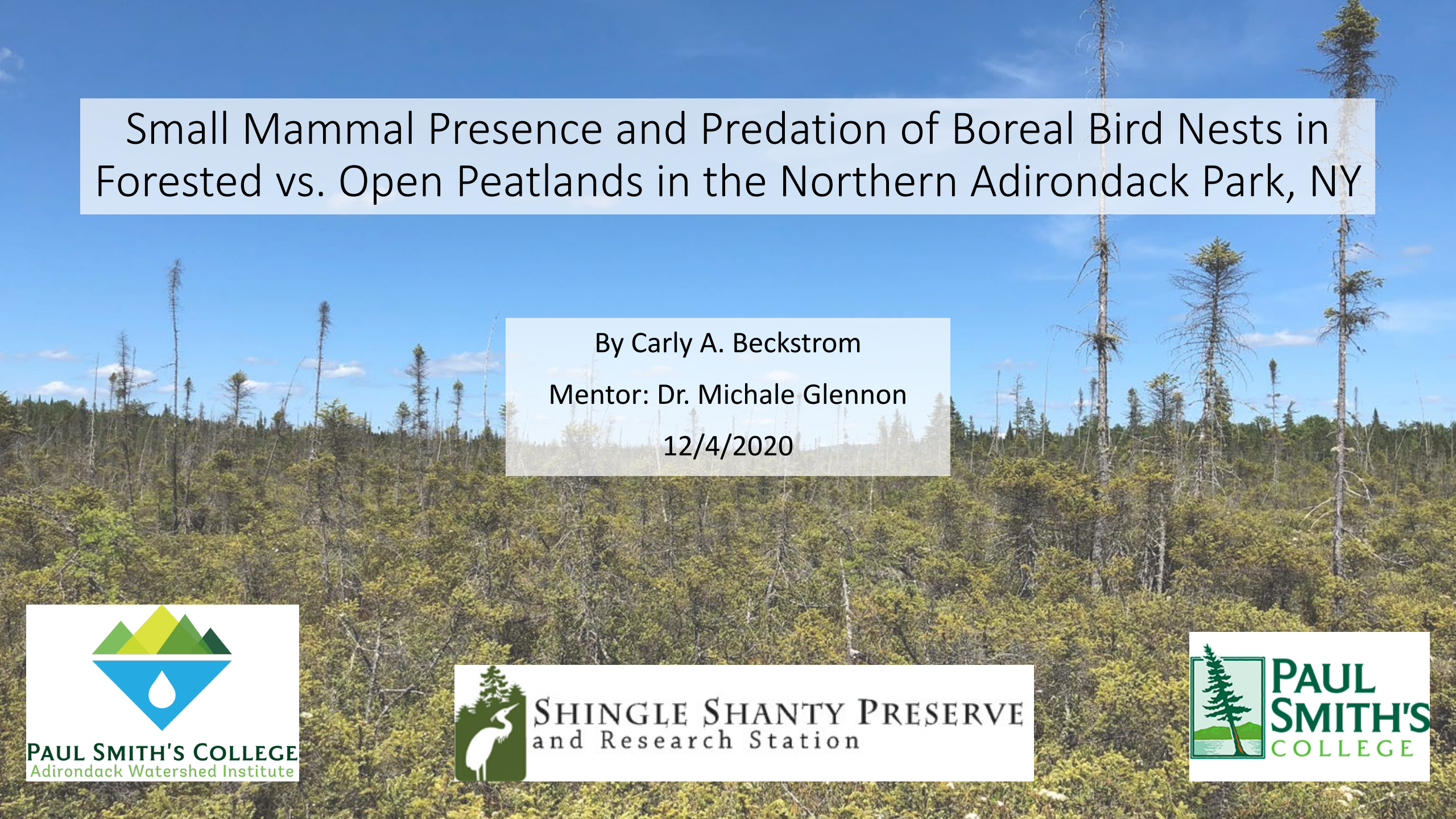
12/4/2020



Acknowledgements

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Adirondack Watershed Institute

SHINGLE SHANTY PRESERVE
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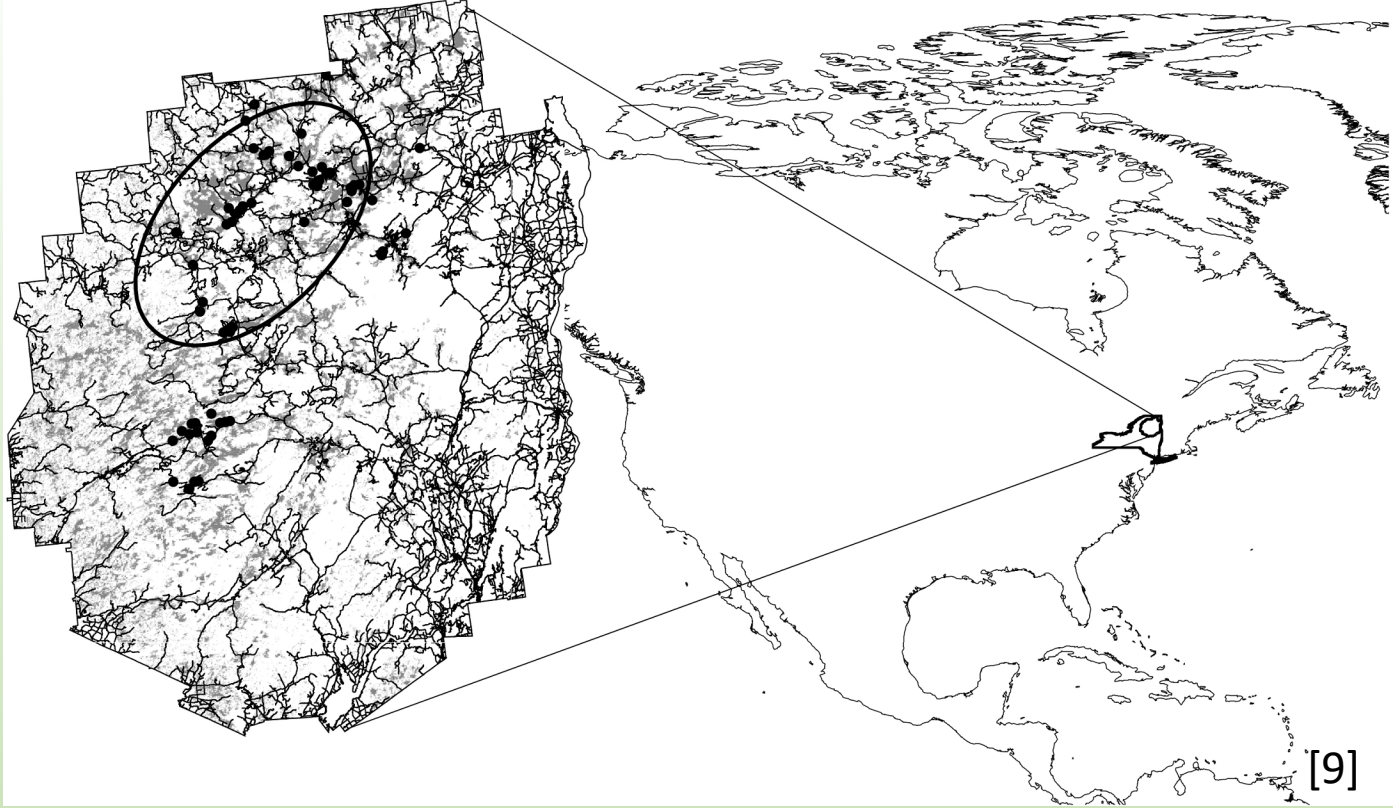
Background

The Adirondack Park located contains large patches of boreal habitat reminiscent of boreal habitats in northern latitudes and rare in the northeastern United States. These patches of boreal habitat are critical for nesting migratory boreal birds[9]


[9]

In the last decade, many boreal bird populations have been declining, specifically in the Adirondack Park which is the southernmost extent of many of their ranges.[9,10]

Bird species that occupy low elevation northern peatland habitat show the lowest amount of population declines, and species that occupy boreal upland forest exhibit the largest declines.[9,10,11]

Background

Red squirrels are a significant predator of passerine bird nests and can cause nest failure of up to 50% in northern conifer forests.[1,3,4,16,17,18,19]

The lack of forest cover in open peatlands could be suboptimal habitat for small mammals due to the lack of food and minimal cover from predators like hawks, in comparison to the more forested edges of peatlands.[8,10]

All images from C. Beckstrom unless noted

Goal and Hypotheses

Examine the difference in small mammal presence in open and forested peatlands and examine if small mammal presence could influence boreal bird nest success.

- Hypothesis 1 - Small mammals are more present in forested peatlands than open peatlands.

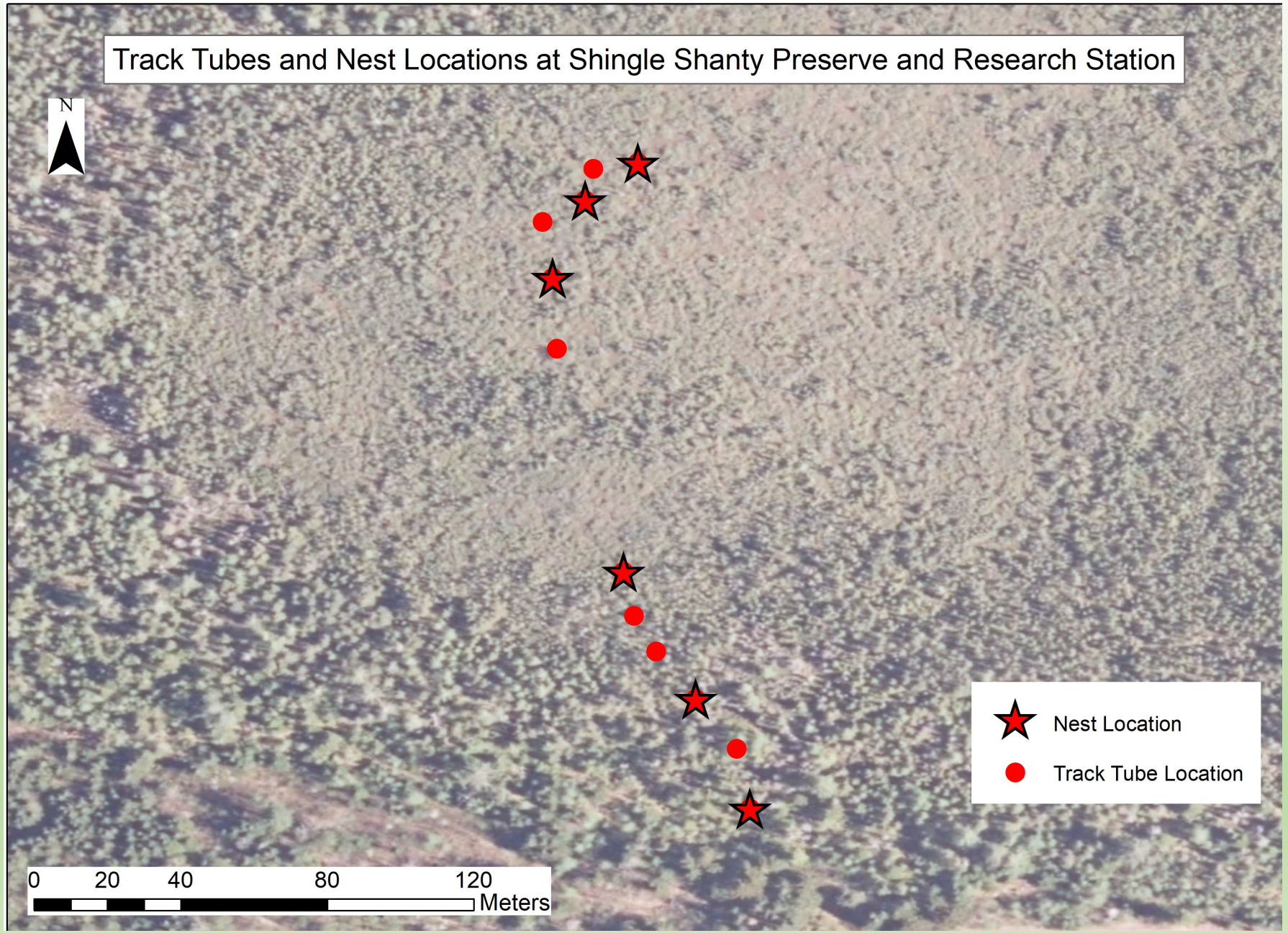
- Hypothesis 2 - Boreal bird nests in forested peatlands are more likely to be preyed on by small mammals than nests in open peatlands.

Study Area

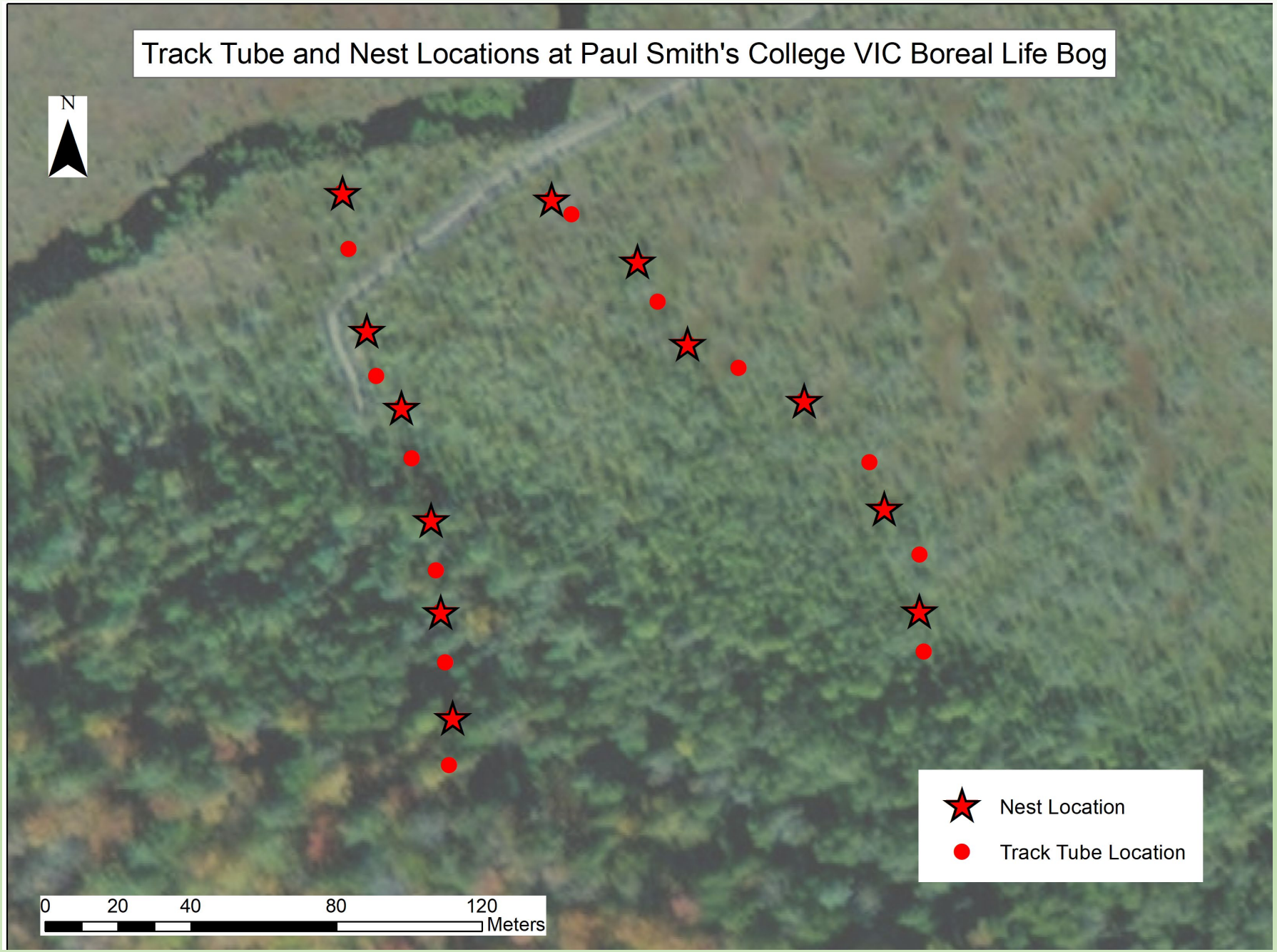
Open Bog (below)

Forested Bog (right)

Study Area


Track Tubes and Nest Locations at Shingle Shanty Preserve and Research Station
N
0
20
40
80
120
Meters
Nest Location
Track Tube Location

Study Area


Track Tube and Nest Locations at Paul Smith's College VIC Boreal Life Bog
N
0
20
40
80
120
Meters
Nest Location
Track Tube Location

Track Tubes

Total of 36 track tubes constructed from:

- Two 30cm sections of rain gutter
- Aluminum strips used as track plates with clear contact paper taped over the top with the sticky side up.
- Felt squares soaked in a 1:1 mix of carbon black ink and mineral oil
- Mix of peanut butter and oats places in the center as bait.

Tracks were collected from animal stepping on ink pad and transferring ink to contact paper.

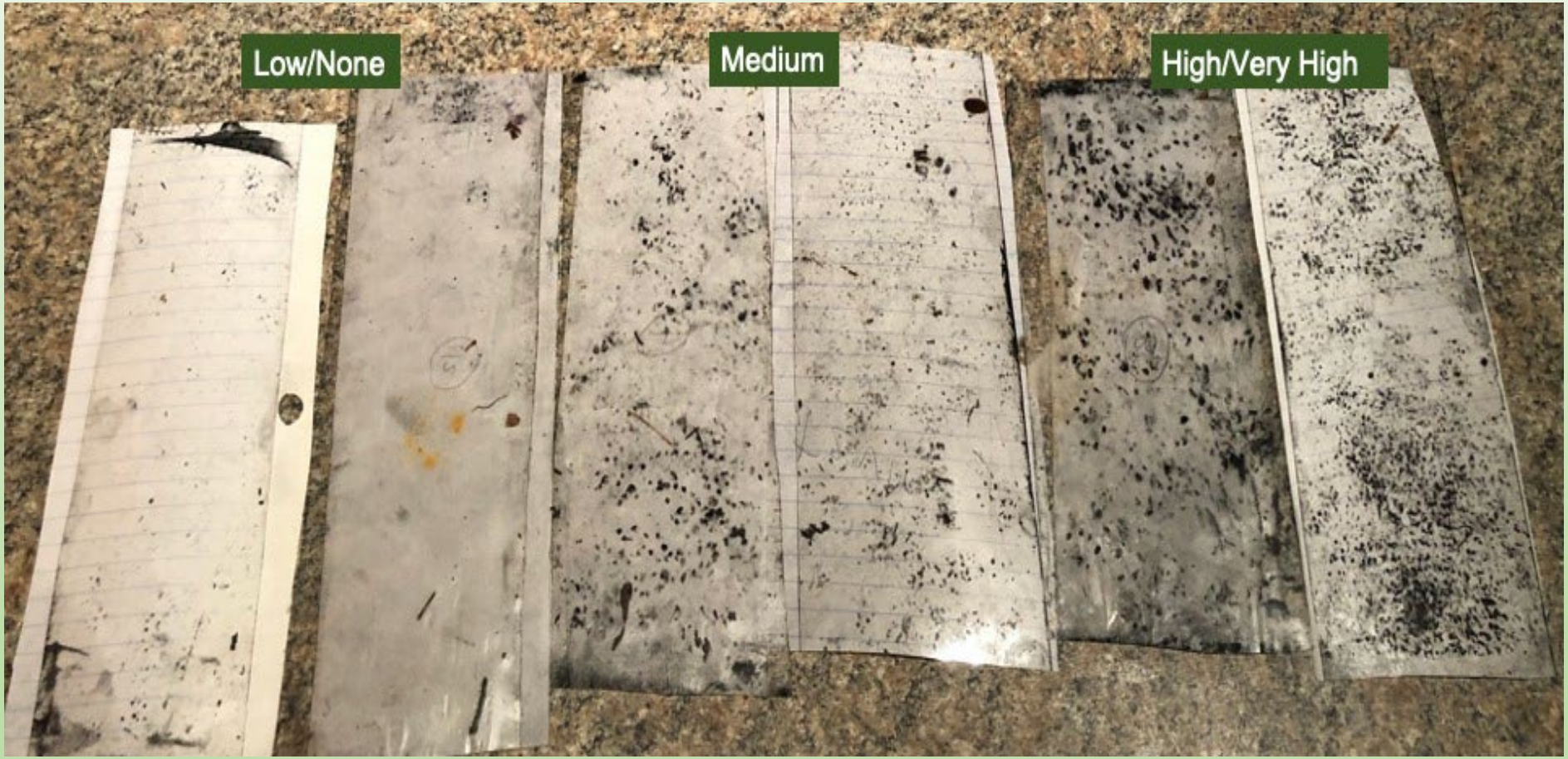
Track tubes are an acceptable way to estimate small mammal abundance in comparison to live trapping, in situations where live trapping is not necessary.[5,10]

Track Tubes

12 track tubes at the medium bog at Shingle Shanty
- 6 in the forested bog and 6 in the open bog
    - Placed June 14 and collected June 24, 2020

24 track tubes placed at the boreal life bog at Paul Smith's VIC
- 2 transects of 12
    - 6 in the forested bog and 6 in the open bog
    - Placed July 9 and collected July 24, 2020

Track Tubes



After collection track plates were placed into 3 activity categories based on quantity of tracks. Two-factor chi square analysis was used to compare track data from the forested vs open bogs.

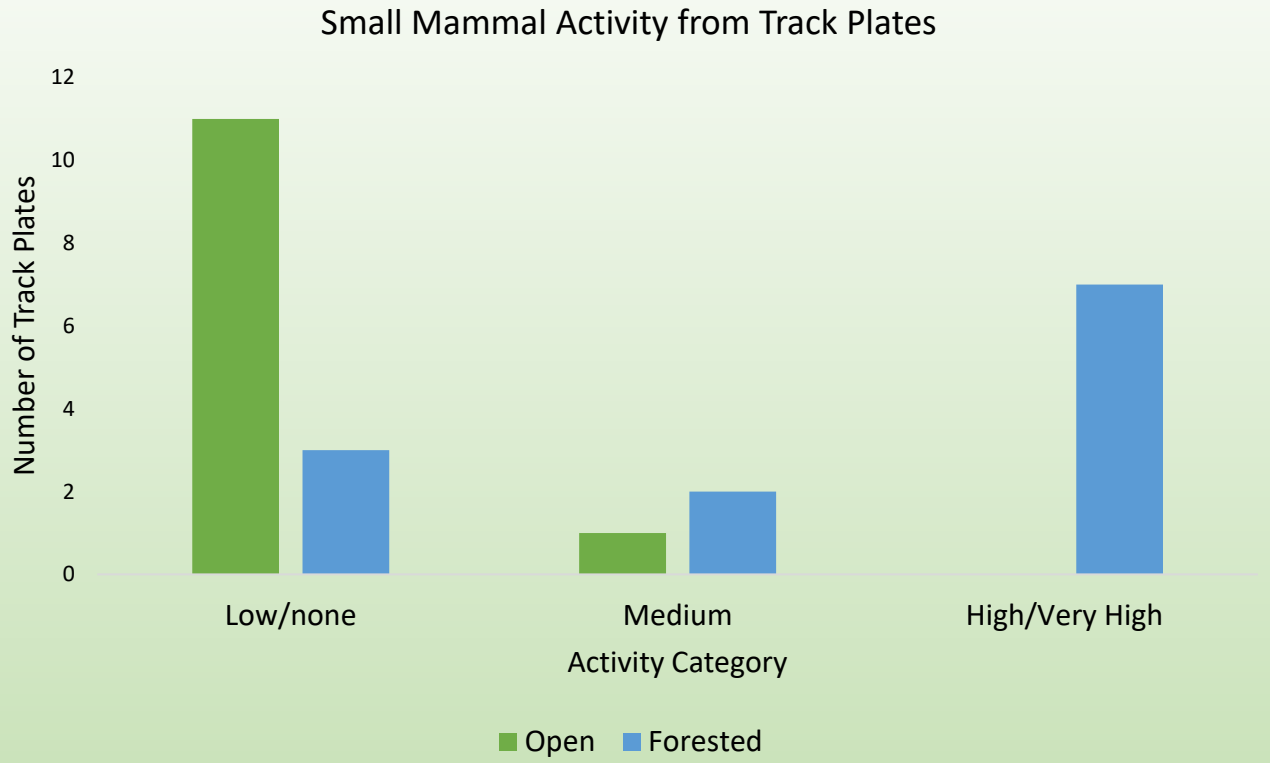
Artificial Nests and Eggs

Total of 18 nests and 54 clay eggs were created from artificial moss.
- 3 clay eggs per nest

At each transect, 3 nests were in the forested bog and 3 nests in the open bog. A game camera was placed level to the nests to capture what animals preyed on the nest.

At time of collection nests were recorded as “damaged” if eggs were missing or there were toothmarks on the eggs indicating predation occurred or “undamaged” if the eggs were all present and not disturbed.

Track Tube Results: PSC VIC

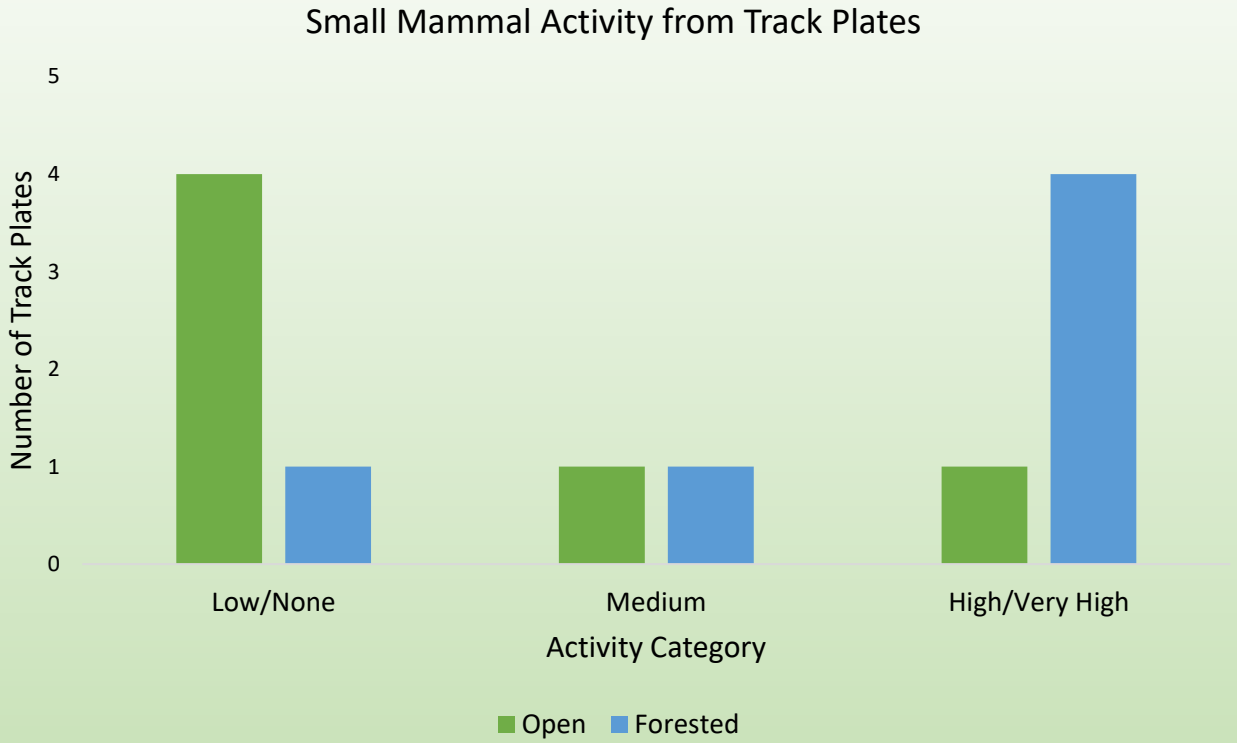


- Significant difference between activity in the forested bog and open bog from chi square analysis (p = 0.002)
  - Hypothesis 1 supported
  - Unreliable due to small dataset

Observed				Expected		
	None/Low	Med	High/ Very High	None/Low	Med	High/ Very High
Open Bog	11	1	0	7	1.5	3.5
Forested Bog	3	2	7	7	1.5	3.5

df	X^2	p
2	11.9048	0.002

Track Tube Results: Shingle Shanty



Observed				Expected		
	None/Low	Med	High/ Very High	None/Low	Med	High/ Very High
Open Bog	4	1	1	2.5	1	2.5
Forested Bog	1	1	4	2.5	1	2.5

df	X^2	p
2	3.6	0.1653

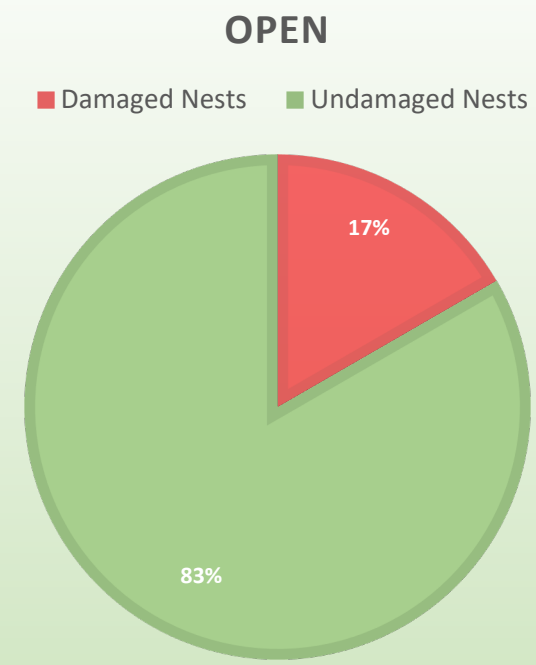
- Chi square analysis did not yield a significant difference between activity in the forested and open bog (p = 0.1653)
  - Hypothesis 1 not supported
  - Results unreliable due to small dataset

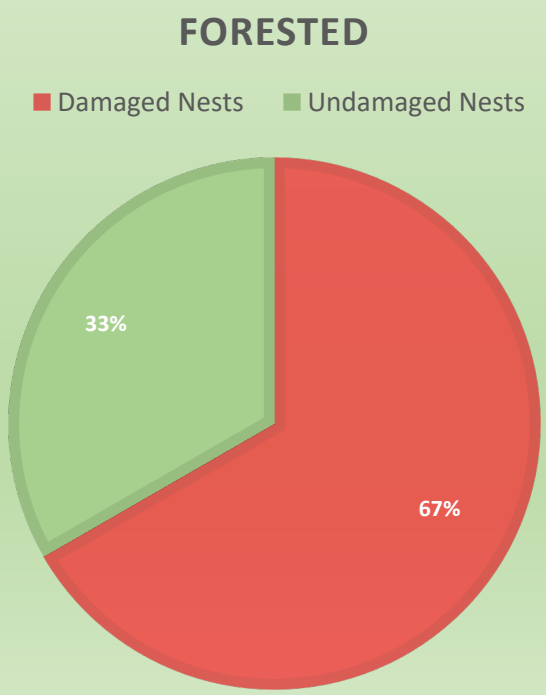
Artificial Nest Results: PSC VIC

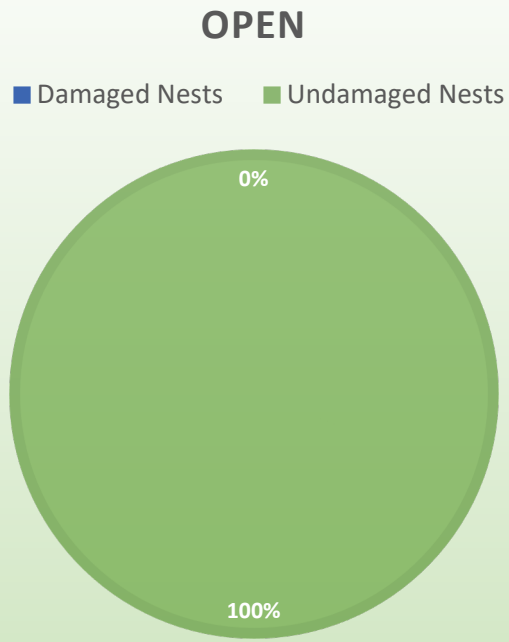
Bite marks on an artificial egg from the forested bog at PSC VIC.

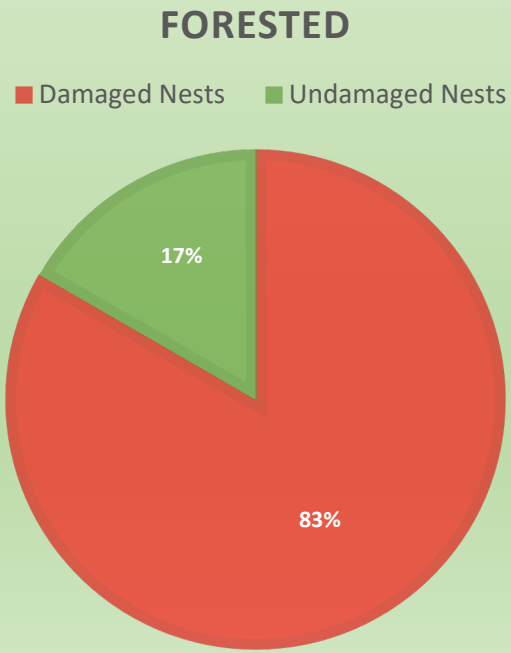
- 17% of nests in the open bog were damaged.
- 67% of nests in the forested bog were damaged.

Datasets were too small to run statistical tests. Hypothesis 2 could not be supported.









Artificial Nest Results: Shingle Shanty

- 0% of nests in the open bog were damaged.
- 83% of nests in the forested bog were damaged.

Again, the dataset was too small to run statistical tests. Hypothesis 2 could not be supported but results from the VIC and Shingle Shanty suggest there could be a pattern.

A chipmunk removed all 3 eggs from nest #1 (red arrow) in the forested bog at Shingle Shanty days before a red squirrel visited the nest.

This was surprising because the expected nest predator was red squirrel, due to the species being a known nest predator and abundant in this habitat. The game camera captured valuable images showing the diversity of potential nest predators and the diversity in species that visited the nest.

The first red squirrel to visit nest #1 in the forested bog at Shingle Shanty was captured on June 23 at 6:20 am.

There were no eggs left by the time the red squirrel visited the nest.

Other species that visited the nest:

Snowshoe hare – top left
Red-backed vole – top right
Shrew – lower left
Vole – lower right

White-throated sparrow visited a nest in the open bog – top left and bottom center

Yellow-rumped warbler visited nest in forested bog – top right

Discussion

- Red squirrel abundance has been found to be correlated with the number of cone-bearing Sitka spruce in Alaska.[19]
  - In the same study, destruction of artificial nests (indicating predation) was significantly correlated with the abundance of red squirrels.[19]
- Other studies have reported the correlation between spruce cone abundance, red squirrel abundance, and the subsequent effect of higher nest failures due to predation.[15,2,3]
- The results of this study were congruent with the findings of other studies examining the relationship between red squirrels and cone mast.
  - In the Adirondack Park the population of eastern chipmunks must also be considered significant nest predators in future studies.

Discussion

- Game cameras were a great asset to the study when they were set up properly to capture images.
- The data collected suggests that there could be a pattern, but there was not enough data to run accurate statistical tests.
  - Much more data is required. If I was to do this again, I would scale everything up by at least x10 to have a larger dataset to work with.
  - A mark-recapture live trap study would be a better way to estimate population and abundance of small mammals in the study area.

Implications and Future Studies

Early stages of red maple encroachment in the forested edge of a peatland at Shingle Shanty.

The relationship between the abundance of small mammals and the predation of nests could be important to study as climate change impacts boreal ecosystems in unprecedented ways.

Open peatland communities at Shingle Shanty Preserve and Research Station appear to be on track to become more forested as they become warmer and drier.[12] Forested peatlands have begun to be colonized by broadleaf deciduous species like red maple and yellow birch.[12]

- If forested peatland habitat increases the likelihood of nest predation this could potentially have a large impact on bird populations.

Implications and Future Studies

Early stages of red maple encroachment in the forested edge of a peatland at Shingle Shanty.

The dynamic between forest cover changes in peatlands, small mammal abundance, boreal bird populations, and boreal bird nest success should be examined further to determine how changes in peatlands of the Adirondack Park could impact boreal birds.

Paul Smith's College has an important role in protecting boreal peatlands. Land owned by the college contains great boreal habitat that needs to remain protected to help our populations of boreal birds.

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Questions and Discussion