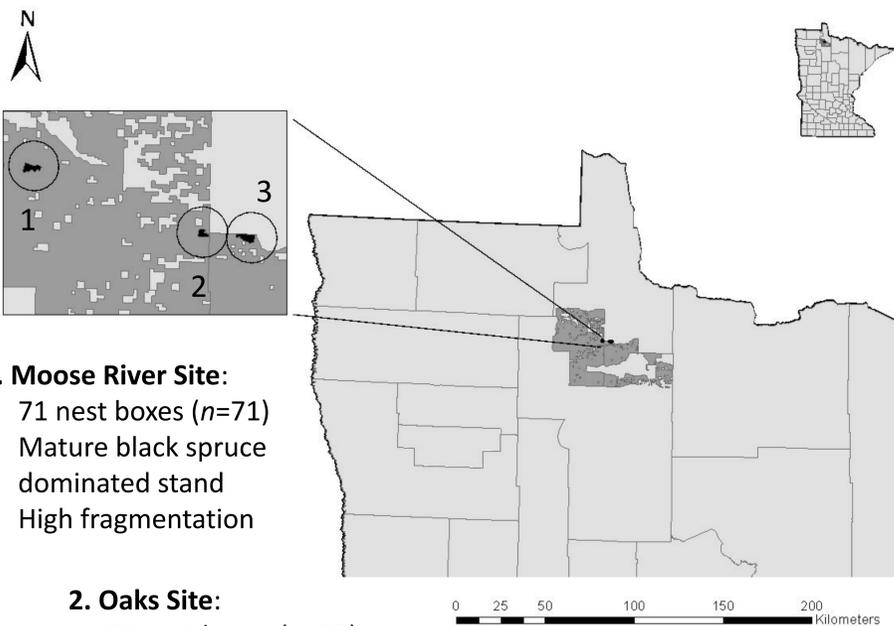


Introduction

- The Boreal Chickadee is listed as a Species in Greatest Conservation Need in Minnesota, with declines attributed to habitat loss, degradation and fragmentation.
- Boreal Chickadee preferred habitat in Minnesota, old growth forested peatlands, are in decline due to climate-change and anthropogenic disturbances.
- There are significant knowledge gaps in Boreal Chickadee ecology and habitat needs.

Sites and Study Design

- Red Lake Wildlife Management Area, northern Minnesota
- Forested peatland, black spruce dominated stands
- Nest boxes ($n=213$) were distributed between 3 study sites



- 1. Moose River Site:**
- 71 nest boxes ($n=71$)
 - Mature black spruce dominated stand
 - High fragmentation

- 2. Oaks Site:**
- 82 nest boxes ($n=82$)
 - Mixed age class black spruce and tamarack
 - High fragmentation

- 3. West Rapid River Site:**
- 60 nest boxes ($n=60$)
 - Mature black spruce and tamarack
 - Low fragmentation

Study Goals

- Identify forest and habitat characteristics that influence Boreal Chickadee nest success, nestling body condition, growth rates, and fledging survival.
- Identify the habitat needs of juvenile Boreal Chickadees.
- Quantify the effects of fragmentation on food availability for Boreal Chickadees during the breeding season.

Diet Analysis: eDNA

- Fecal samples of nestlings were taken to be analyzed for prey DNA using metabarcoding techniques.
- Using eDNA we can calculate the Frequency of Occurrence (FOO) of prey families in nestling diet.
- Coupled with the results from arthropod surveys, eDNA analysis can help determine prey selection and identify important prey items.

Food Availability: Provisioning Rates and Arthropod Surveys

- Provisioning of nestlings was video-recorded 2 times during the nesting period to determine provisioning rates.
- Systematic arthropod surveys were conducted at each study site to quantify abundance and diversity.

Nestling Condition and Growth Rates

- Weight and tarsal measurements were taken 3 times during the nesting period: on day 6, day 10, and day 15/16 (hatch day = 0) to determine growth rates and overall body condition.



Weighing nestlings, Boreal Chickadee nestling (day 15)

Post-Fledging Survival and Dispersal: Telemetry

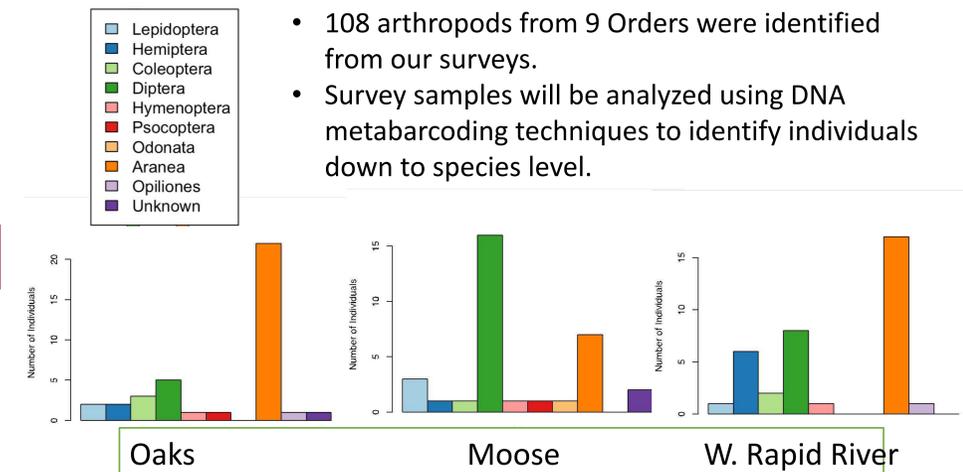
- Fledgling Boreal Chickadees were tracked using radio telemetry to determine dispersal distances and habitat use.
- Vegetation surveys were conducted at tracked bird locations as well as systematically throughout the study area.



L to R: Nestling with transmitter tag, radio telemetry, banded fledgling

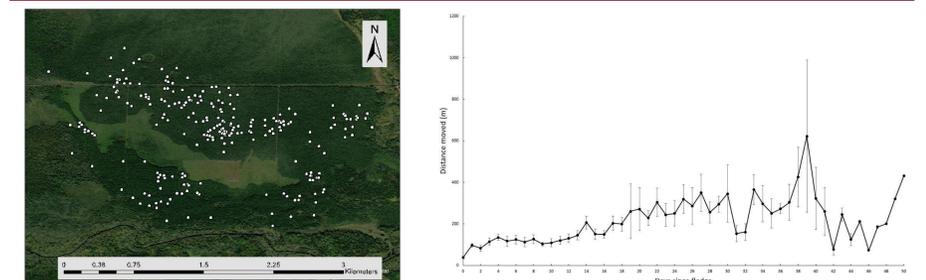
Hannah Toutonghi

Preliminary Results: Arthropod Surveys



- 108 arthropods from 9 Orders were identified from our surveys.
- Survey samples will be analyzed using DNA metabarcoding techniques to identify individuals down to species level.

Preliminary Results: Telemetry



Telemetry points (white dots) of all juvenile Boreal Chickadees tracked in 2021 at the W. Rapid River site.

Average daily distance moved (m) (± 1 SE) of tracked juvenile Boreal Chickadees from 2020 and 2021.

Next Steps

- Second field season for data collection planned for 2022.
- Analyze results from DNA sequencing of fecal samples, identifying important prey items and prey selection.
- Identify habitat factors and stand-level characteristics influencing nestling growth, body condition, post-fledging survival and dispersal.

Discussion

- Management plans are most effective when they are based on comprehensive knowledge of the target species.
- Identifying high quality habitat for Boreal Chickadees is critical for developing and informing forest management plans.

Acknowledgements

