Connecting Bioregions: Migration of the army cutworm moth, *Euxoa auxiliaris*

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Topics

Army cutworm moth

1. Thermal tolerance

2. Migratory patterns and abundance entering the GYE

Thermal tolerance

Better understand the possible ecological consequences of army cutworm moth thermal tolerance

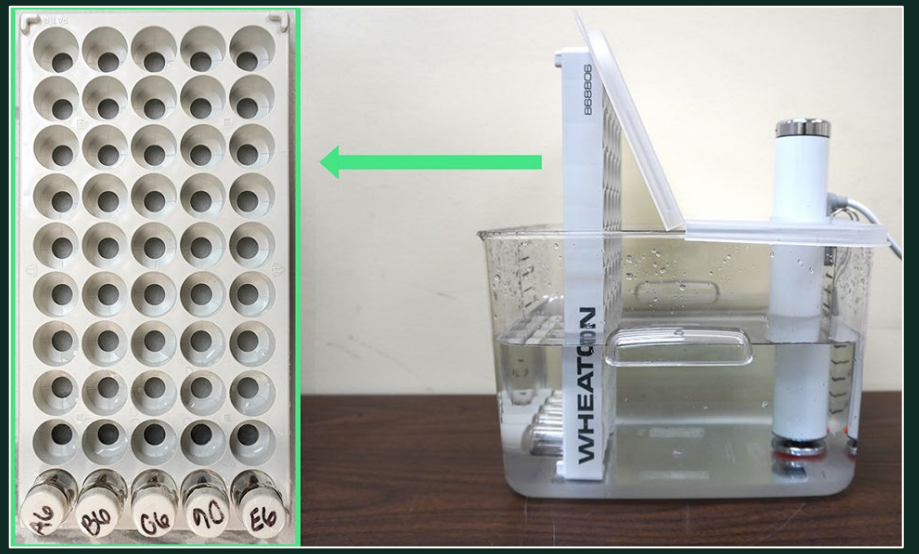
Critical thermal limits (CTL_{max} and CTL_{min}) lab-reared and wild-caught moths

Kennedy TE, Sing SE, Peterson RK. 2025. Critical thermal limits of the seasonal migrant, *Euxoa auxiliaris* (Lepidoptera: Noctuidae). *Environmental Entomology*. nvaf019. https://doi.org/10.1093/ee/nvaf019

Critical Thermal Limits

CTL_{max} and CTL_{min}

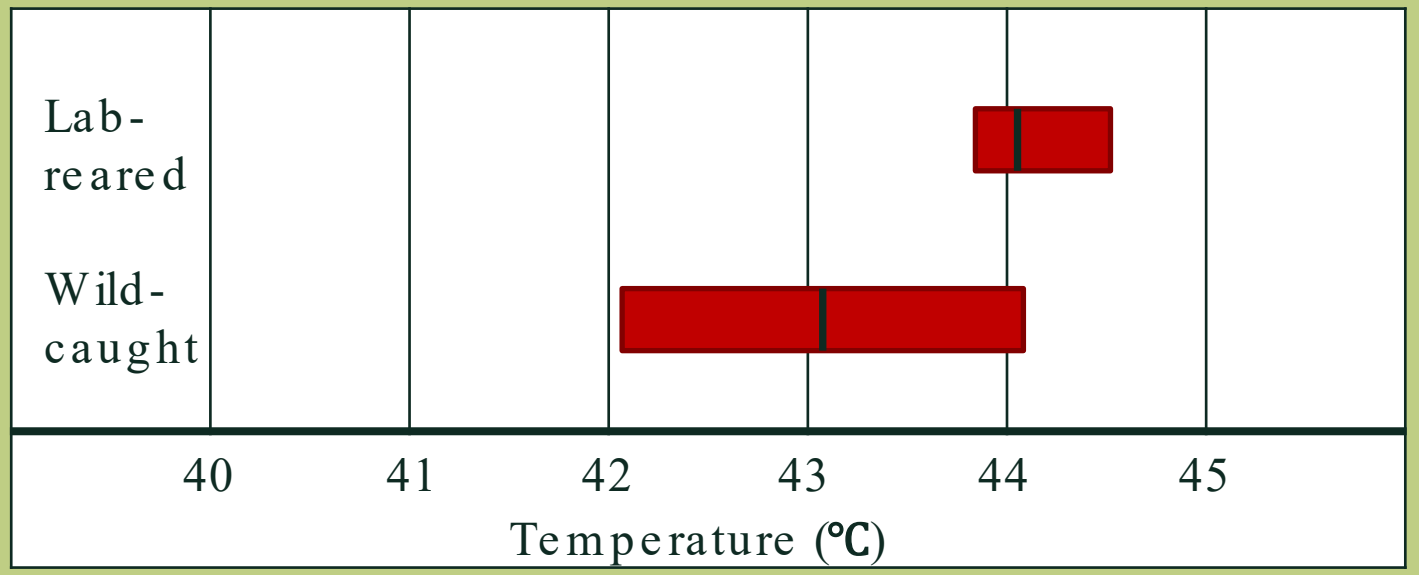
- Critical thermal limit was defined as loss of righting response
- Individual CTL averaged for each trial



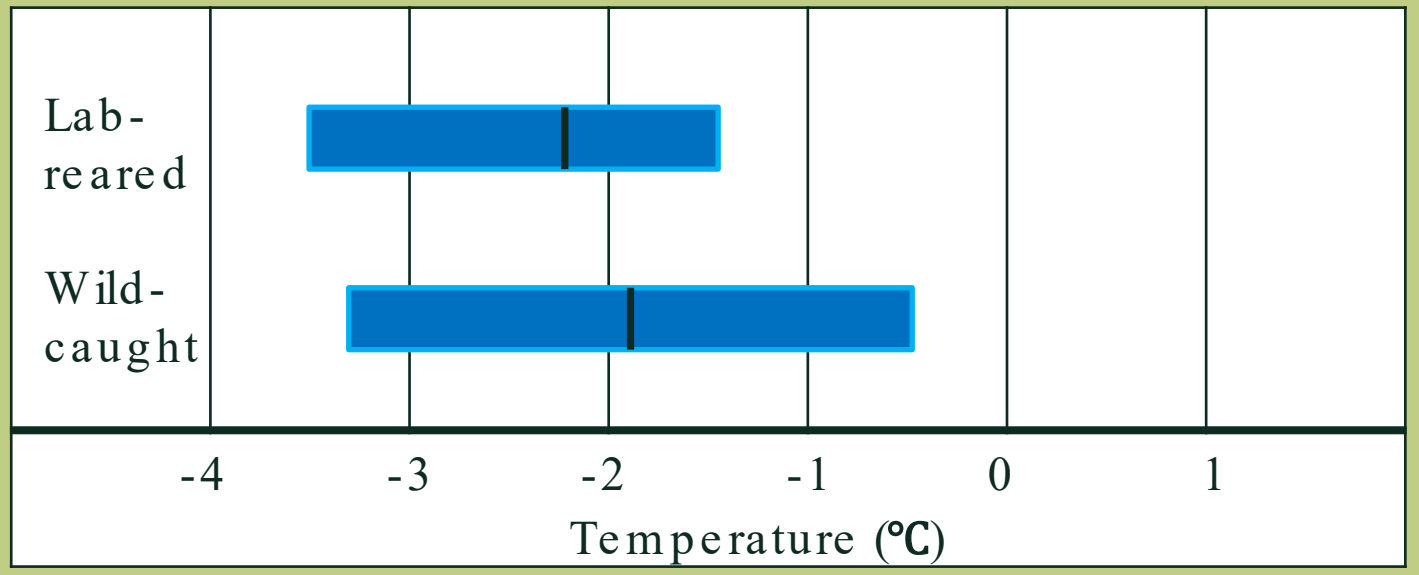
Chown et al. 2009, Bawa et al. 2021, Keosentse et al. 2021

RESULTS

CTLmax



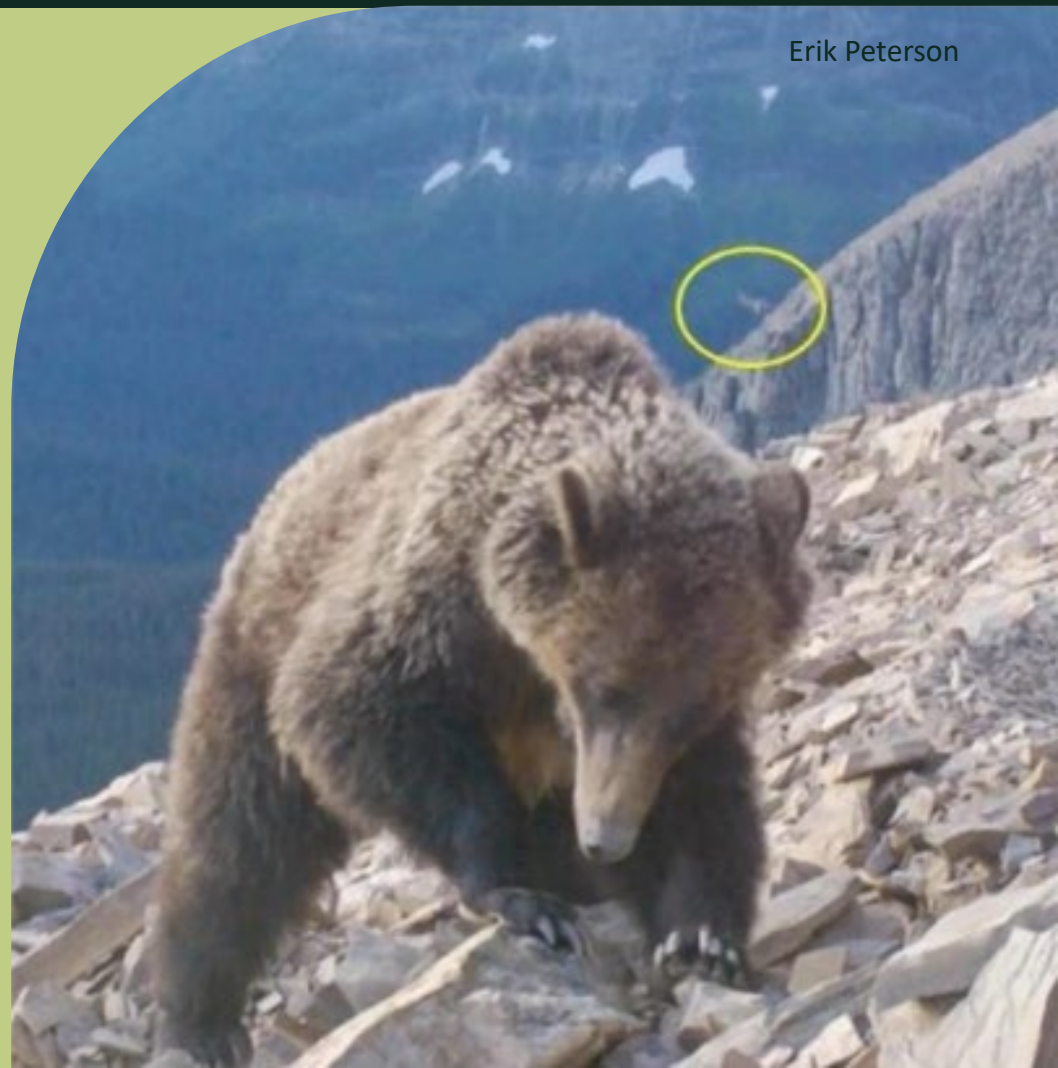
CTLmin



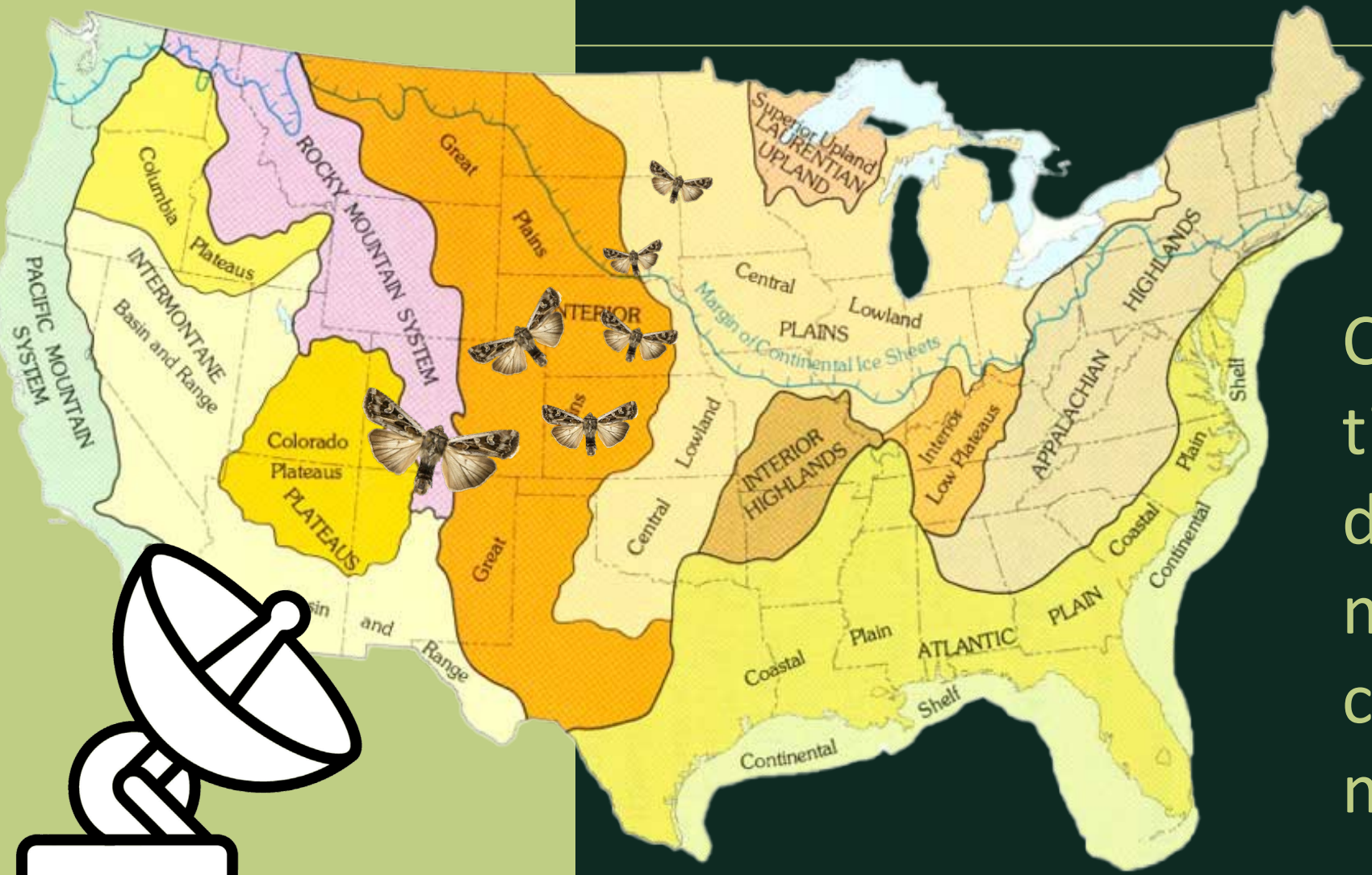
Implications

Thermal tolerance

- Affects where moths choose to aggregate (snowbanks)
- Affects bear foraging behavior
  - Lethargic moths in low-temperatures are easier to catch
- Affect migratory behavior of army cutworm moths



Migratory patterns and moth abundance entering the GYE

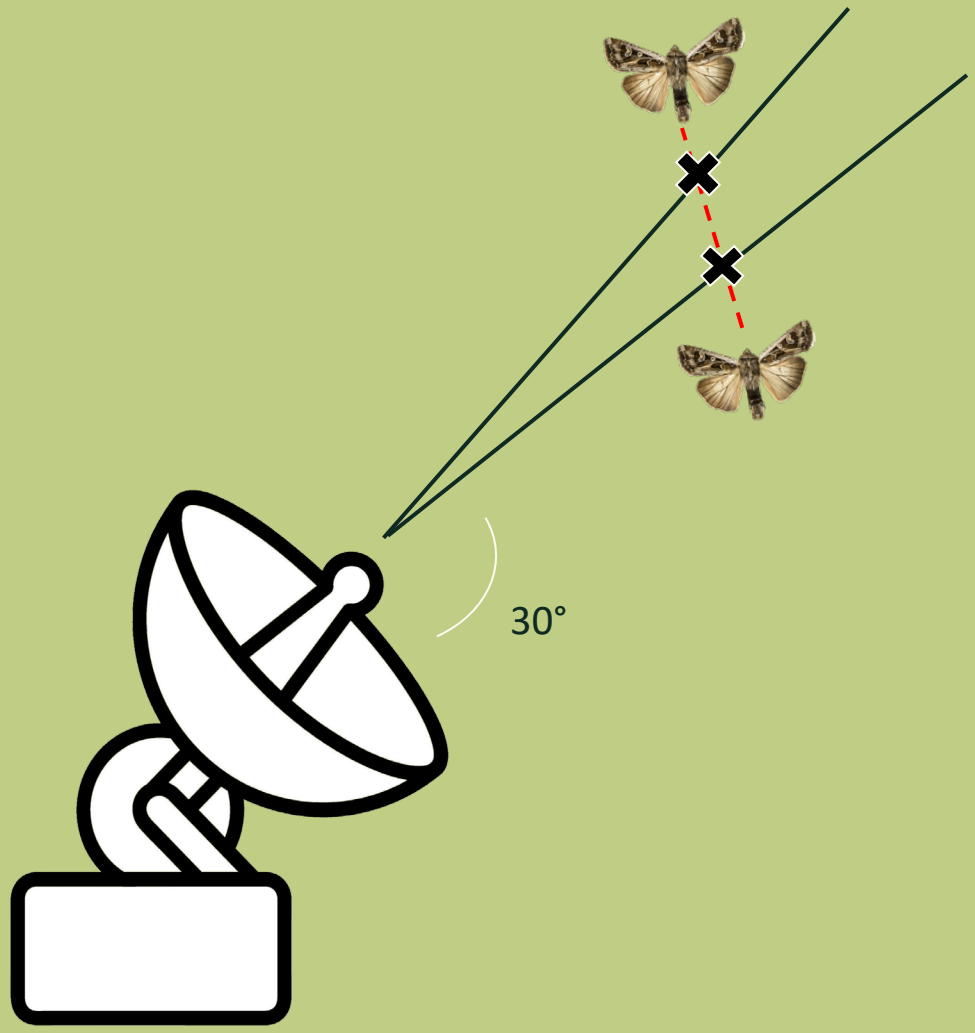


Characterize the timing, duration, direction, and magnitude of army cutworm moth migration into the GYE

Army cutworm moth migration

Radar

Orientation, direction, and altitude stratification



Radar

2023 & 2024 Field Season

- 2 units (99 km apart)
  - Clark's Fork Fish Hatchery
  - Timber Creek Ranger Station
- Units run autonomously
- Collection period (**10:00pm-5:00am**)

2023: CF: June 21–July 8 and July 13–22

TC: June 18, July 1–9, and July 13–20

2024: June 13-July 14

ALTITUDE STRATIFICATION

Median flight height (AGL)

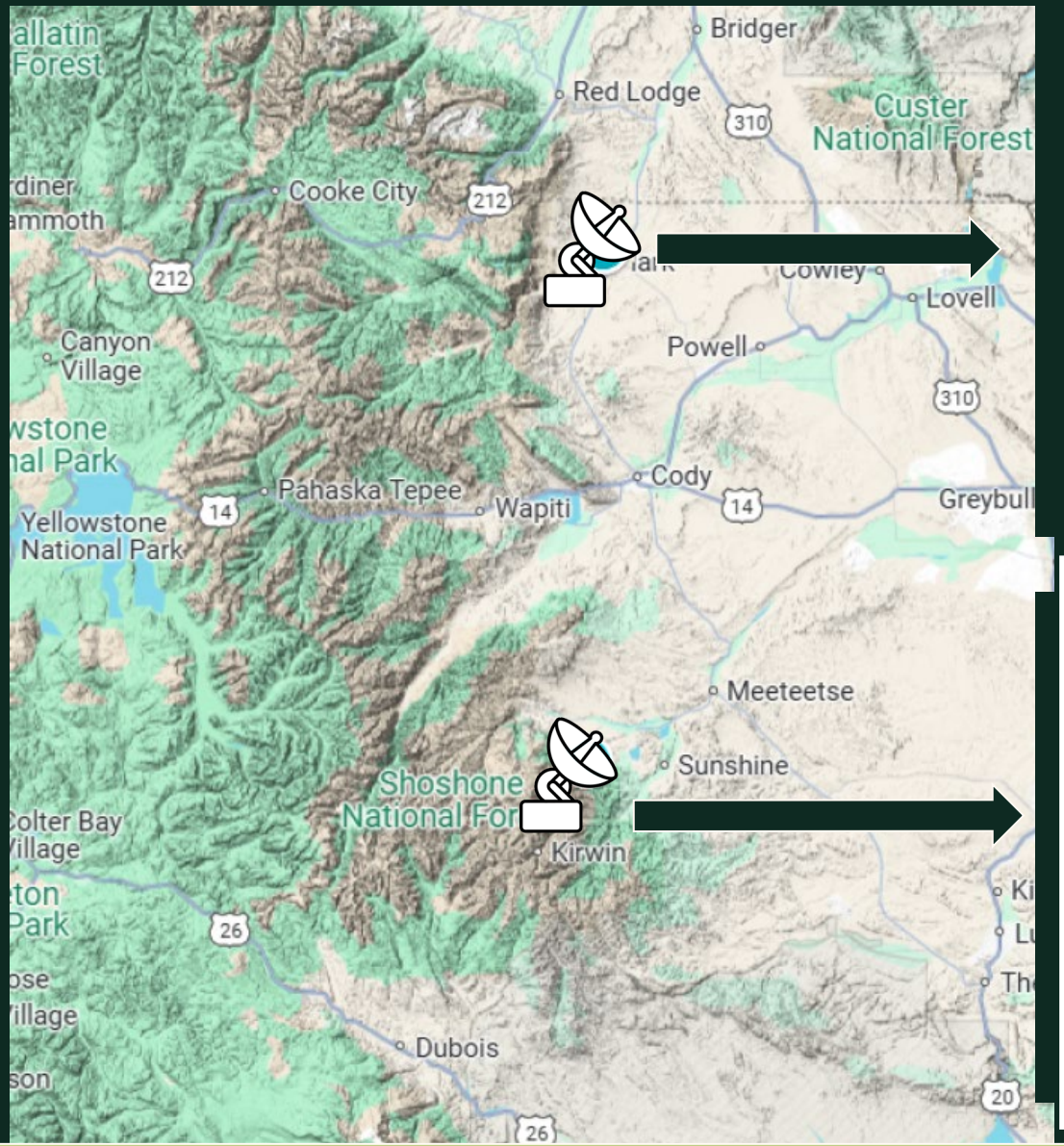
2023: 387-471 m

2024: 394-431 m

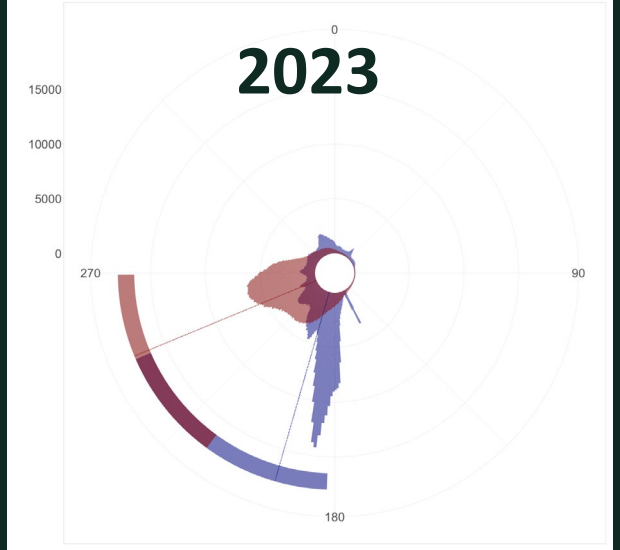
Interquartile range: **221-696 m**

- Nocturnal migrants cluster in 250-500 m range
- Wind assists with movement
- Low-level jet below 1,500 m

Riley et al. 1995, Wood et al. 2006, Alerstam et al. 2011



Clark's Fork

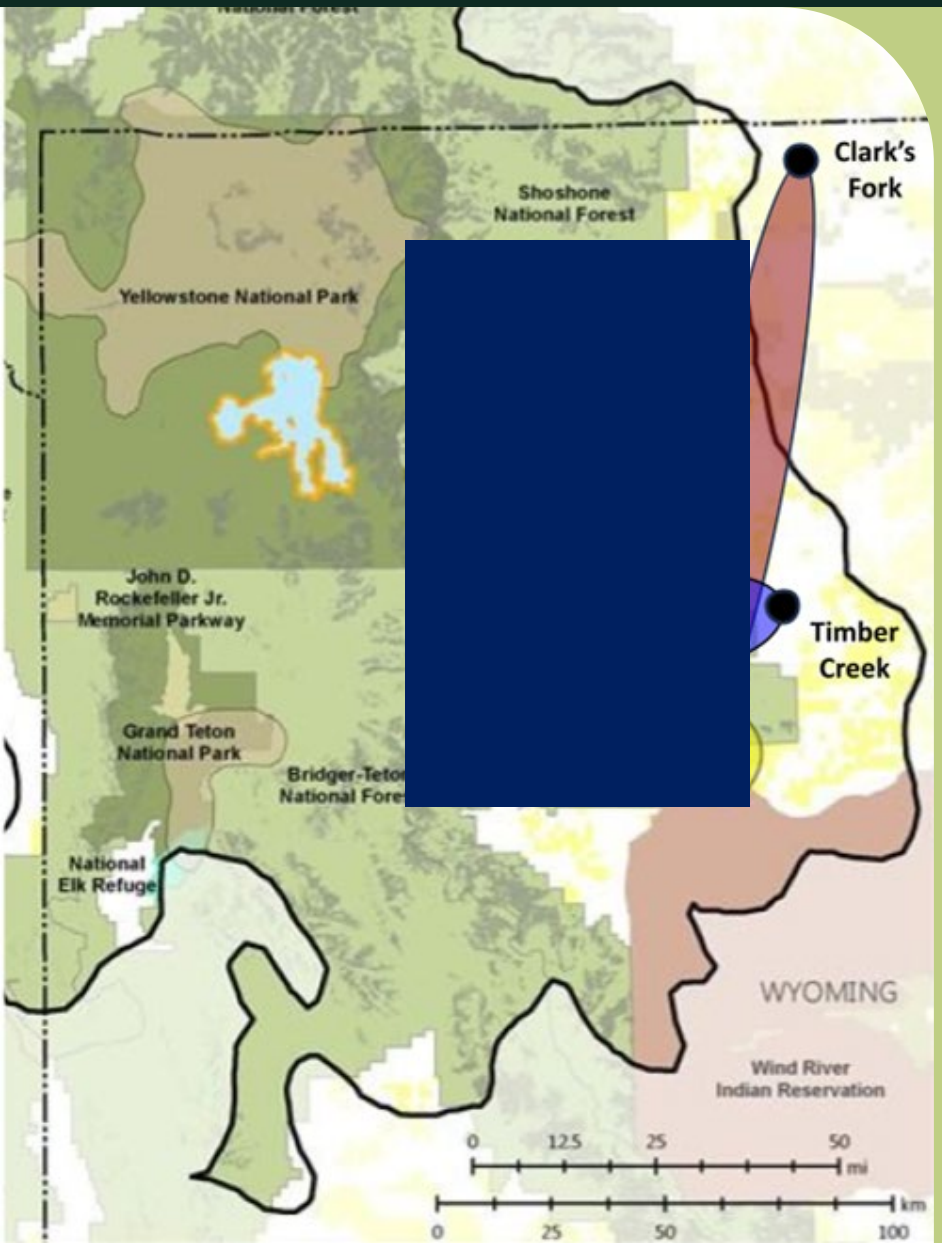


Direction & Orientation

Red - Orientation

Blue - Direction

Aggregation Sites



Moths travel towards some of the most active grizzly bear feeding sites in the GYE

Lozano 2022, Dittemore et al. 2023, Nunlist et al. 2023

Abundance estimates

4.46 km^2/radar

(1.72 square miles)
Total area sampled

Combined total **number of moths** entering into the GYE each year

44,566,918

2023

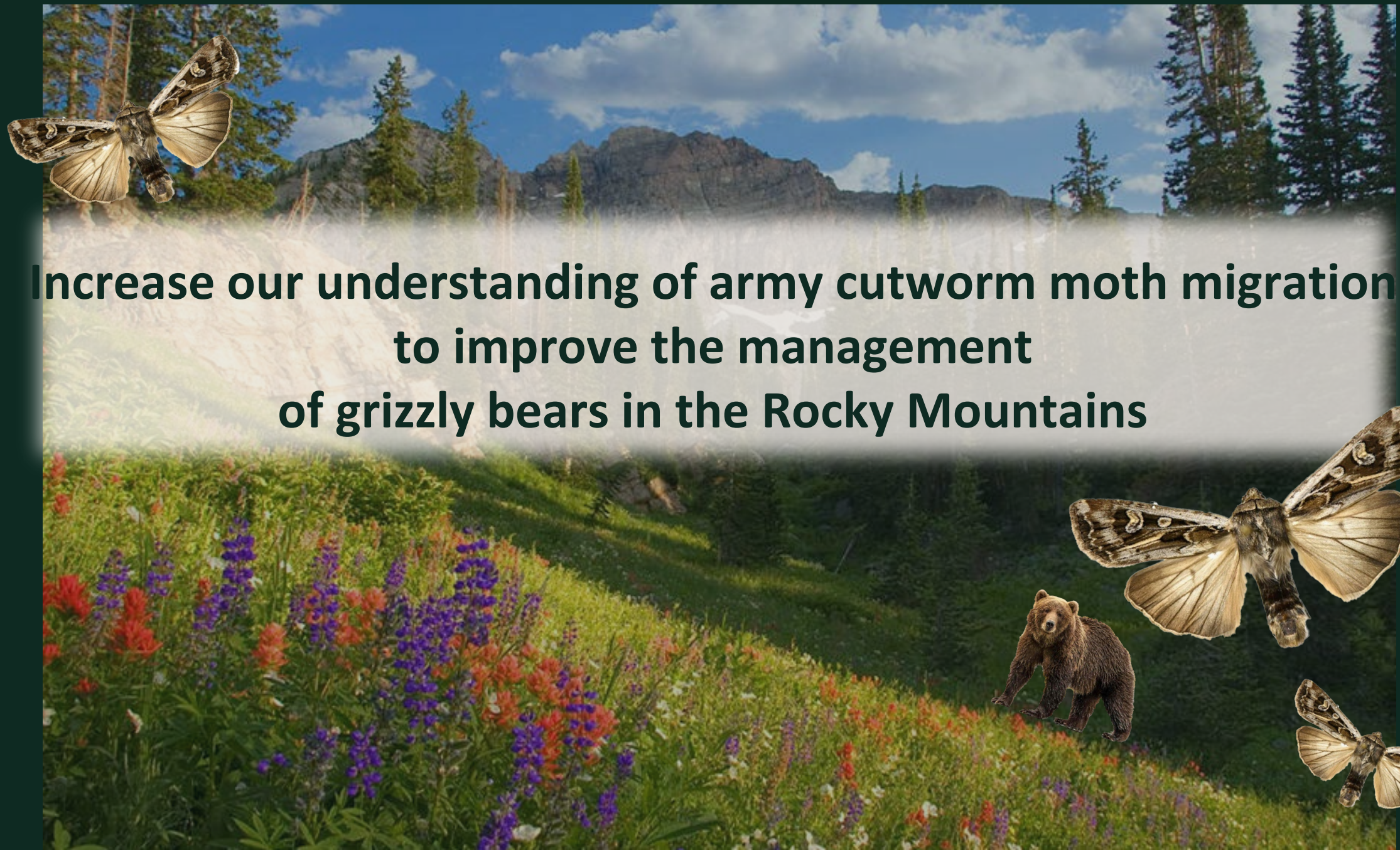
2024

112,259,774

Further Research Directions

Establish long-term population monitoring

- Radar collection begin earlier
- Deploy additional radar units
- Incorporate high-altitude meteorological data


Increase our understanding of army cutworm moth migration
to improve the management
of grizzly bears in the Rocky Mountains

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