



The Effect of Human Disturbance on Habitat Use of Mesopredators in a County Park in South Central Pennsylvania



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Introduction

- Mesopredators contribute to many ecosystem functions, such as population control, habitat changes, and seed dispersal. They can have significant impacts like spreading disease and parasites, and predated a wide range of species (Meachen et al., 2014; Troyer et al., 2014).
- As an increase in encroachment further into wild spaces is seen, there is a greater need to understand interactions between wildlife and humans (Magle, 2012).
- Changes in a species' behavior and physiology may begin to occur with this increase, leading to declines in fitness, abundance, and persistence of a species (Coetzee and Chown, 2015).
- Human disturbance may trigger short-term and long-term behavioral responses such as avoiding frequently disturbed areas that are regularly used by humans (Coppes, 2017).
- Our objective was to determine if there is overlap of habitat use between mesopredators in available habitat types and how human presence impacts habitat use in a county park in Pennsylvania.

Hypotheses

- The targeted species, red fox (*Vulpes vulpes*) and raccoon (*Procyon lotor*), will show different activity patterns and use available habitat types differently.
- The targeted species will show higher activity levels in areas that have limited human activity compared to the areas that have higher human activity.

Study Area

- Richard Nixon County Park is a 187-acre park, located in Pennsylvania, that is open to the public and hosts educational programs, hiking trails, and other recreational activities.
- Habitat types within the park include hardwood mixed forests, open fields, and wetlands. The forested area includes a "human free zone" where hiking and educational programs are not permitted.

Table 1. The schedule of when the three trap sessions started/ended and the target species captured during each of the sessions.

Session	Dates	Target Species Captured
Trap Session 1	February 19, 2019- May 10, 2019	Raccoon (<i>Procyon lotor</i>) and Red Fox (<i>Vulpes vulpes</i>)
Trap Session 2	May 11, 2019- August 1, 2019	Raccoon, Red Fox, and Coyote (<i>Canis latrans</i>)
Trap Session 3	September 20, 2019- December 6, 2019	Raccoon, Red Fox, and Coyote

Methods

- 12 Bushnell 8MP Trophy Cameras (motion sensor) without bait were placed in a paired design with one camera 20 meters from the trail (near) and one camera 60-80 meters from the trail (far) in interior woods, wetland, and open field habitats (Figure 1).
- 3 pairs of cameras were moved between Trap Session 1 and 2 to increase coverage. 1 pair was moved between Trap Session 2 and 3.
- A trap event was defined as any number of pictures that are taken of the same species within 30 minutes.
- Capture success rate was the number of trap events/76 trap nights and is an index of activity.
- Comparisons of mean capture success rate were made using two-way ANOVAs.

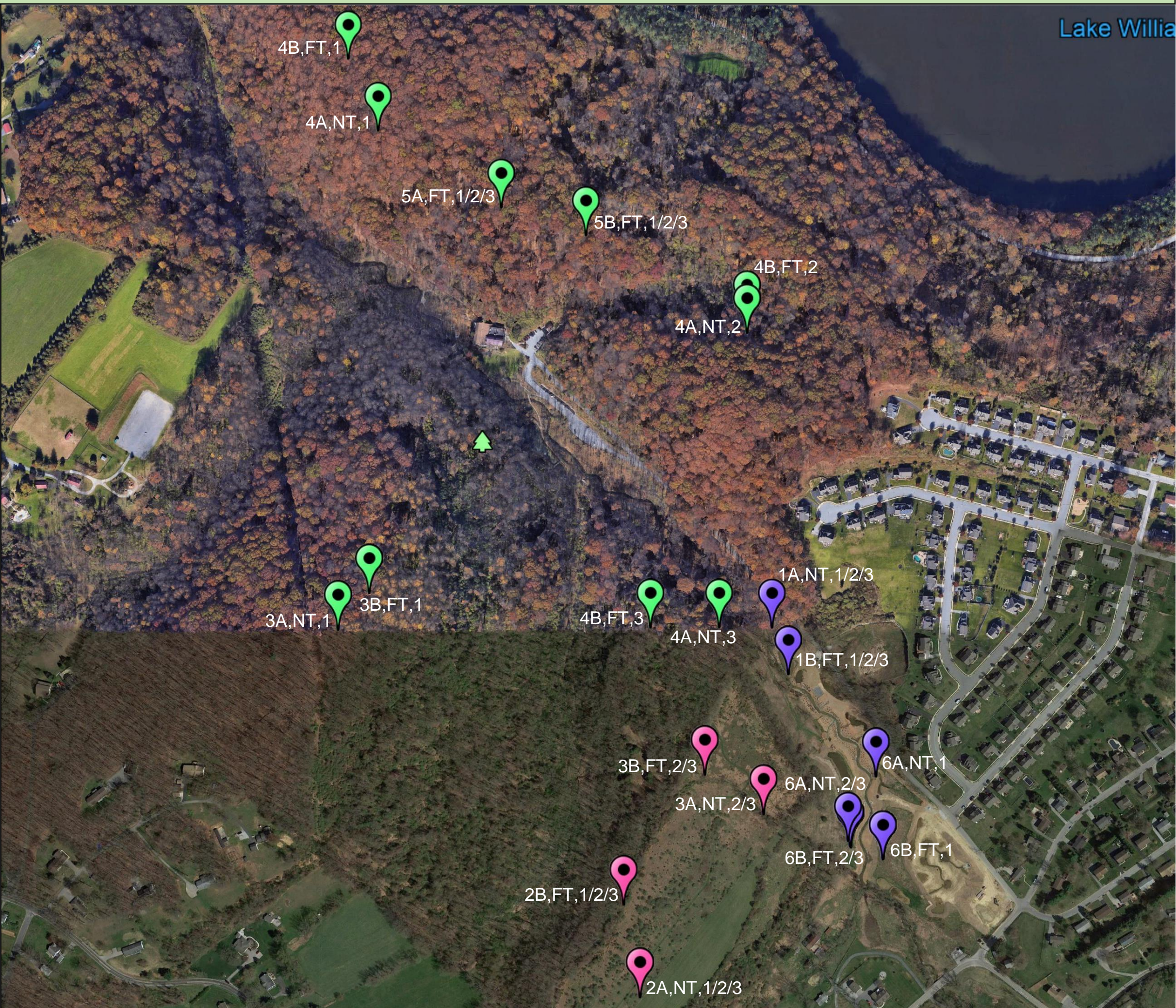


Figure 1. Map of Nixon County Park in Jacobus, PA. Green indicates interior woods, blue indicates wetlands, and pink indicates open fields. Each point is labeled for the camera, distance from trail (NT/FT), and trap session 1, 2, or both.

Results

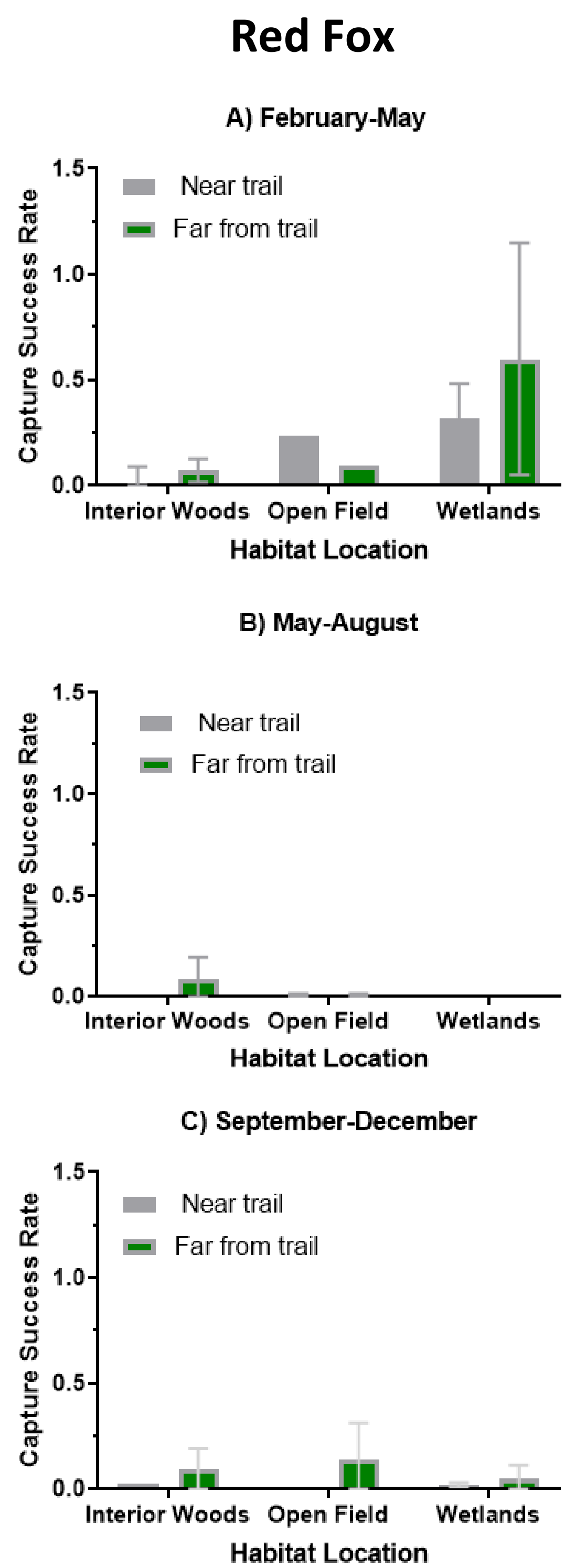


Figure 2. Mean capture success rate (±SD) of red fox (*Vulpes vulpes*) in interior woods, open field, and wetland habitats at Nixon County Park near the trail (20m) and far from the trail (60m) from A) February to May, B) May - August, and C) September-December.

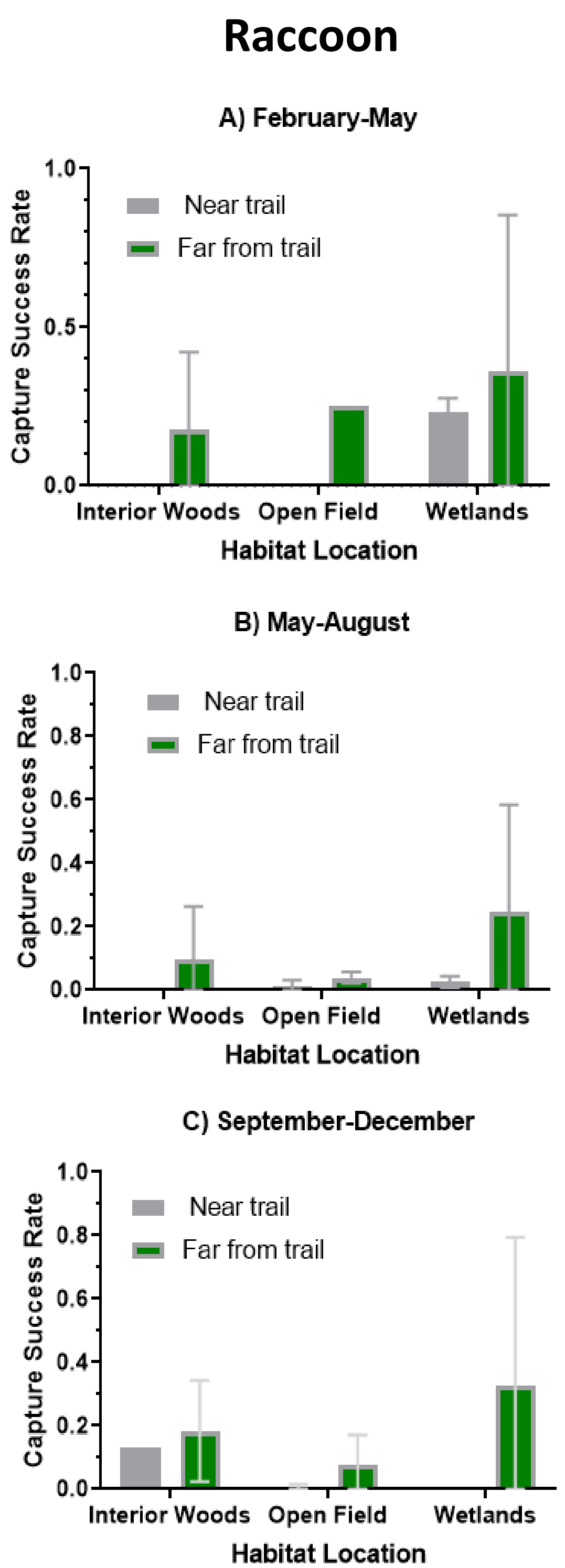


Figure 3. Mean capture success rate (±SD) of raccoon (*Procyon lotor*) in interior woods, open field, and wetland habitats at Nixon County Park near the trail (20m) and far from the trail (60m) from A) February to May, B) May - August, and C) September-December.

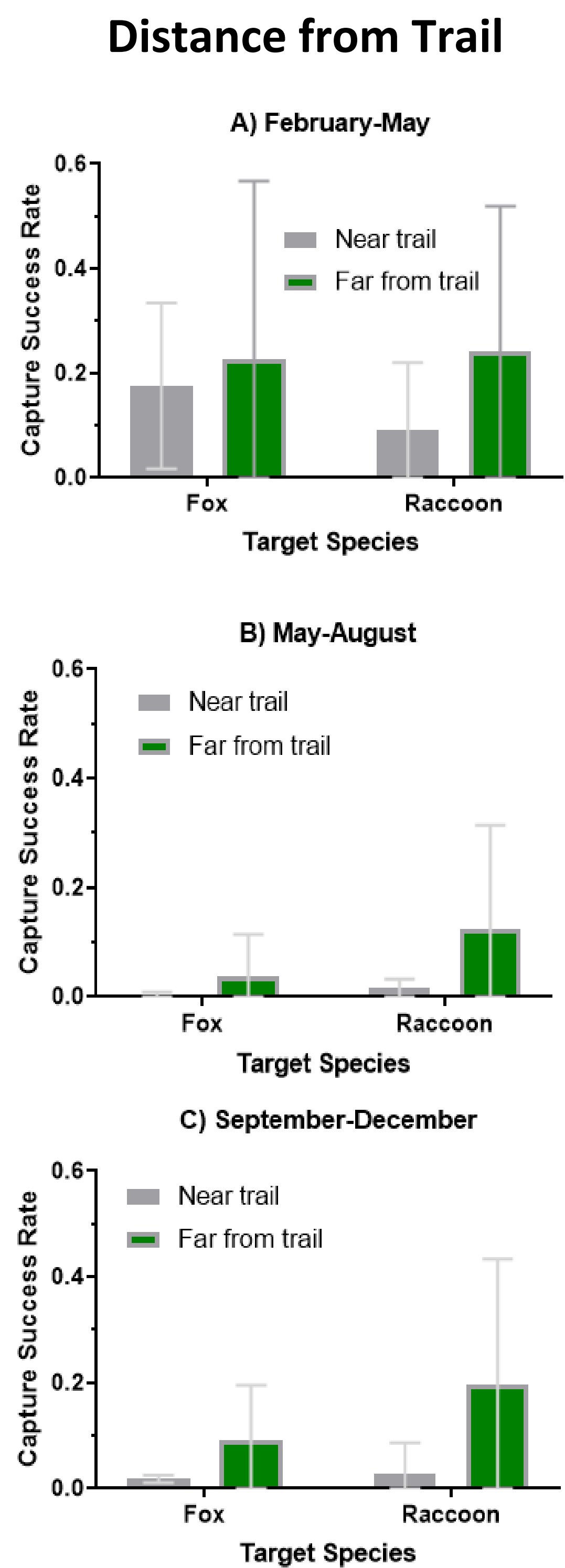


Figure 4. Mean capture success rate (±SD) near the trail (20m) and far from the trail (60m) for red fox (*Vulpes vulpes*) and raccoon (*Procyon lotor*) across all habitat types during A) February-May, B) May-August, and C) September-December.



Figure 5. Images captured during February - May and May - August in Nixon County Park. Left column Red Fox (*Vulpes vulpes*), middle column Raccoon (*Procyon lotor*), and right column Coyote (*Canis latrans*).

- Capture success rate for red fox was highest in the wetland between February and May ($F_{2,6}=6.3$, $P=0.56$) (Fig. 2A), but it declined during the next two trap sessions ($F_{2,6}=0.40$, $P=0.68$) (Fig. 2B) and ($F_{2,6}=0.2$, $P=0.82$) (Fig. 2C).
- Capture success rate for raccoon was highest far from trails in May-August ($F_{1,6}=1.28$, $P=0.30$) (Fig. 3B) and September-December ($F_{1,6}=1.34$, $P=0.29$) (Fig. 3C).
- Both species were captured more often far from trails, noticeably in September-December ($F_{1,20}=4.04$, $P=0.06$) (Fig. 4).

Conclusions

- Red fox and raccoon were detected in the wetlands more than other habitat types; however, raccoons used the interior woods and open field more often than red fox.
- Activity for all mesopredators was lower in areas in close proximity to hiking trails throughout the study.
- Variability in capture success rate was extremely high across individual cameras in all habitat types, requiring additional cameras to improve coverage of the park.

Recommendations

- Implement a monitoring program to determine how many people use the wetlands trails for recreation and potentially limit access or reduce number of trails used during red fox mating season.
- Improve habitat with less human disturbance (e.g., invasive species removal) and continue to educate the public about staying on trails to provide wildlife with areas to avoid human disturbance.

Literature Cited

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