

Identifying nesting attempts of Northern Pintail (*Anas acuta*) outside of the primary breeding areas

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Background

- Surveys like the Waterfowl Breeding Population and Habitat Survey (WBPHS) may miss nesting attempts outside core areas, especially during drought years.
- Pintail abundance has declined ~70% since the 1980s. Recovery has remained poor despite improved wetland conditions, suggesting other limiting factors.
- Agricultural intensification and habitat fragmentation in core regions reduce nest success and may push pintails into peripheral breeding areas.
- It remains unclear whether displaced females nest successfully outside traditional ranges, representing a gap in demographic models.

Objective

Our objective is to estimate the proportion of female Northern Pintails that initiate nesting outside of the Prairie Pothole Region and interior Alaska using GPS-GSM and accelerometer data from birds captured across their U.S. wintering range.

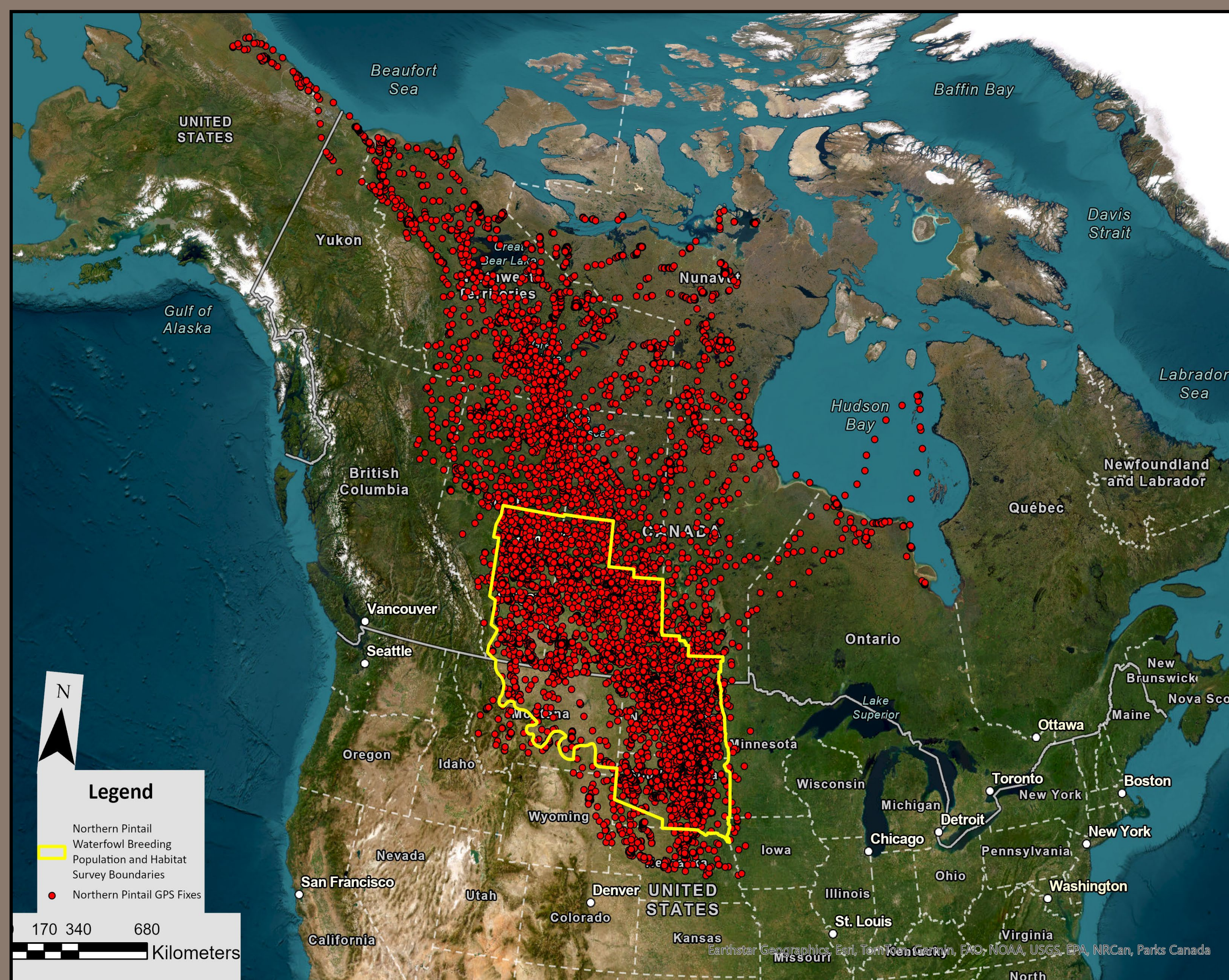


Figure 1: Locations of female Northern Pintails marked with GPS-GSM devices in relation to the traditional survey area from May-June 2019 to 2024. Map created by Jack Rogers

Methods

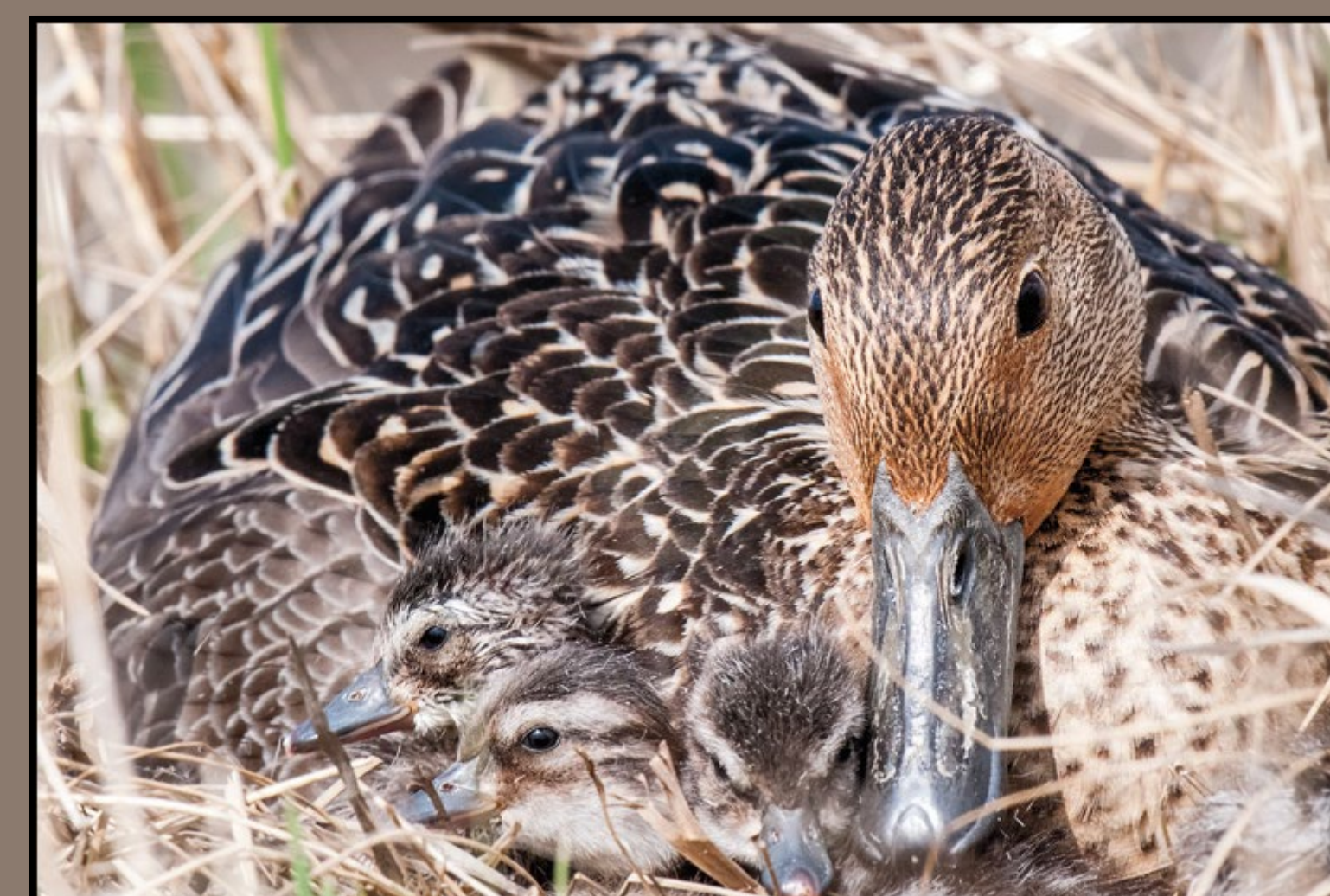
- Location data were filtered to include only female Northern Pintails during the breeding season (April 1–August 1) from 2020–2024.
- Data were limited to birds north of the U.S. border but outside of the Prairie Pothole Region (PPR).
- GPS fixed with speeds >4.9 kph or indicating flooded vegetation/water in the Dynamic World dataset were removed to reduce false positives.
- Points were further filtered by recursion (return visits within 30 m), and landcover during potential nesting periods.
- Analyses were conducted using R and Google Earth Engine (GEE) scripts written by our graduate team.
- Nesting was inferred from spatiotemporal clustering of low-movement behavior over multiple consecutive days (Figure 2).

Results

- Based on 142,509 total locations from our sample of 252 female northern pintails during May and June 2020–2024, we found highly variable proportion of birds outside the traditional survey area across years (Figure 1).
- We found no relationship between the proportion of birds out and our drought index (Table 1).
- We did notice an increase in the proportion of birds outside the traditional survey area as years progressed.
- We found limited evidence of birds nesting outside the traditional survey area each year (Table 2).



Female Northern Pintail with GPS device (Photo Matti Bradshaw)



Female Northern Pintail nest with ducklings (Photo David Stimac)

Table 1. Proportion of female northern pintails located outside the traditional survey area during the survey period including potential nesting sites per year (2019–2024).

Year	<i>n</i>	Proportion out	Drought Index	Potential Nesting
2020	52	0.17	45.5	3
2021	40	0.20	392	3
2022	102	0.36	116	1
2023	45	0.39	25.4	5
2024	11	0.64	124	3

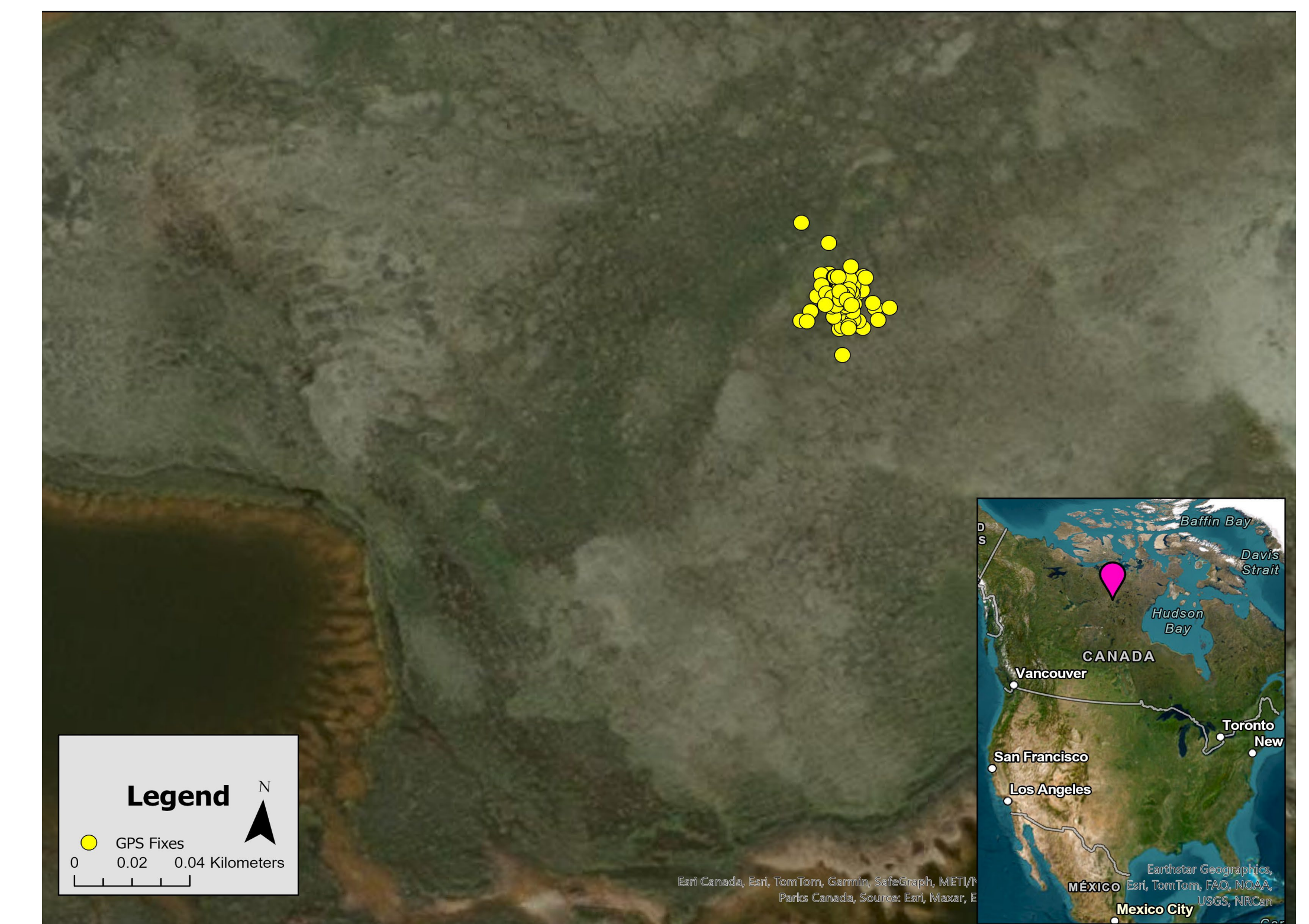


Figure 2. Visualization of likely nest attempt outside of traditional surveyed nesting area. Map by Jack Rogers

Discussion

- Our results suggest that some female Northern Pintails may initiate nesting attempts outside of the traditional core breeding areas, particularly in years with more severe drought in the Prairie Pothole Region. However, we did not find a consistent relationship between drought severity and the proportion of birds located outside the survey area across years.
- Additionally, our ability to detect nesting attempts was limited by the accuracy of the geospatial landcover data. Specifically, we found that Dynamic World had difficulty identifying wetlands in Boreal and Subarctic regions, likely overestimating nesting habitat availability due to misclassification of landcover types. This may obscure true nesting behavior and inflate estimates of suitable nesting habitat.
- Despite these limitations, our multi-year analysis using GPS–GSM data highlights the importance of re-evaluating assumptions about where nesting occurs. Some displaced birds may still attempt to nest outside of core breeding ranges, and future efforts should aim to improve landcover classification and integrate behavioral data for a more reliable inference.

Acknowledgments



References

