

Using Automated Radio Telemetry to Track Saltmarsh Sparrow Space Use Prior to Habitat Restoration



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Introduction

Saltmarsh Sparrows (*Ammospiza caudacuta*) are a coastal salt marsh obligate that breeds in coastal salt marshes from Maine through Virginia. Saltmarsh Sparrows are an indicator species for habitat health, and their populations have declined at a rate of roughly 9% annually as a result of marsh degradation and sea level rise. Several methods for salt marsh restoration are being explored to reverse marsh degradation. These methods may also preserve Saltmarsh Sparrow populations by improving available breeding habitat and reducing the risk of nest loss due to flooding. However, little research to date has investigated how sparrows respond to these restoration methods.



Figure 1: Adult Saltmarsh Sparrow at Lubberland Creek Preserve.



Figure 2: Saltmarsh Sparrow nest. As a ground nesting species, flooding is the primary cause of nest failure.

We used automated radio telemetry to track the movements of radio tagged Saltmarsh Sparrows at Lubberland Creek Preserve in Newmarket, New Hampshire. This research served as a pilot for using this technology to quantify Saltmarsh Sparrow space use. Future work will compare Saltmarsh Sparrow space use at this site to restoration sites in Wells, Maine.

Study Site

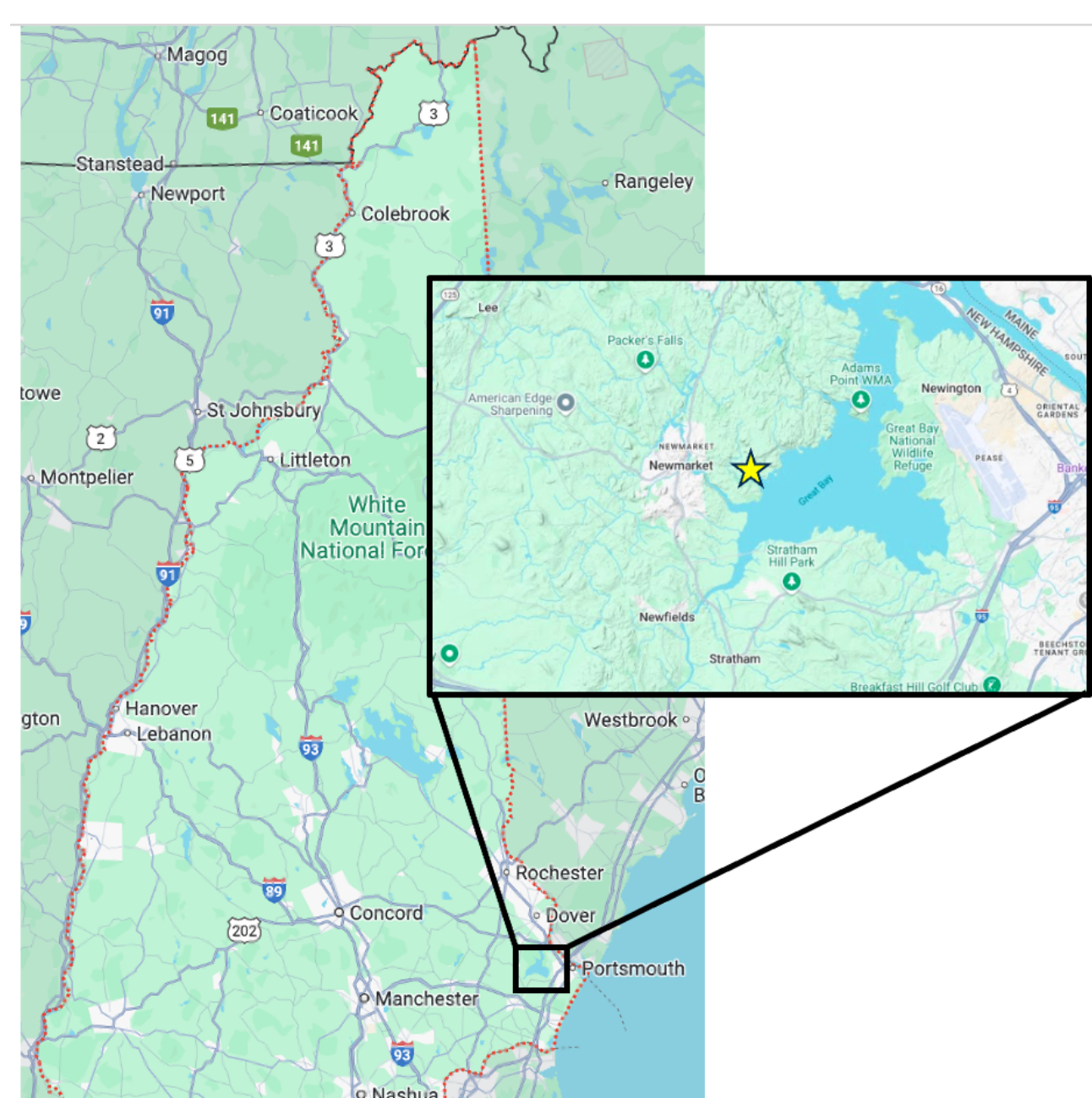


Figure 3: Study site location at Lubberland Creek Preserve along Great Bay in Newmarket, NH.

Field Methods



Figure 4: Saltmarsh Sparrow with a solar-powered radio tag attached by a leg-loop harness.



Figure 5: Radio receivers called nodes, which recorded radio signals from tagged sparrows, were placed in a grid pattern at the study site.

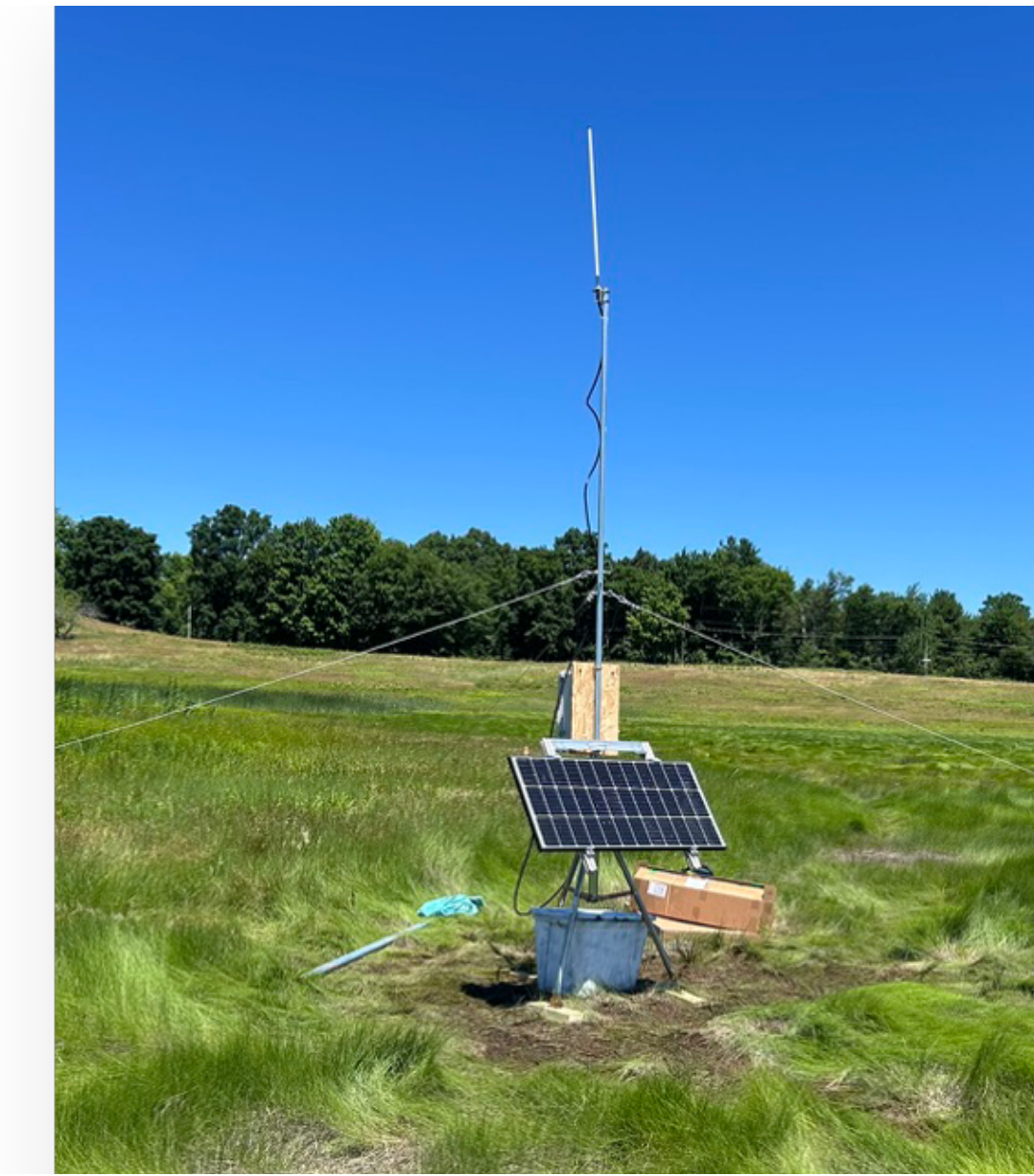


Figure 6: A base station connected to a cellular network collected detection data from each node and transmitted that information to an online database.

To track tagged sparrow movements (Figure 4) we established an array of radio receiver nodes (Figure 5), which recorded the tag number, signal strength, and time of detection for tagged sparrows. These nodes then transmitted the tag detection data to a base station (Figure 6), which transferred the detection data to an online database via a cellular network connection.

In total, we tagged 22 sparrows (n=4 females, 17 males, 1 unsexed juvenile) from July 2 to August 28, 2024. We collected detection data for an average of 25 days per individual (range = 1-54 days). Tagging data were collected for these sparrows until tag failure, or until they left the marsh at the end of the breeding season.

Example Home Range

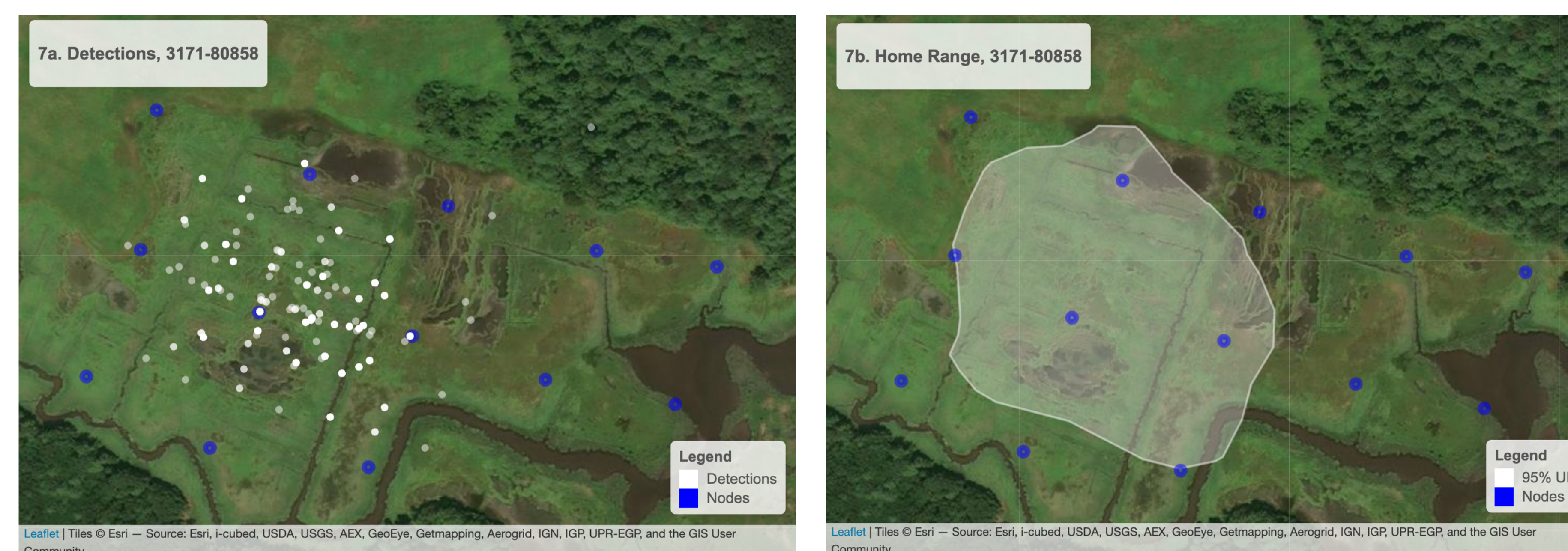


Figure 7: Example of calculated sparrow detection locations and home range generated for one sparrow, male 3171-80858, that was tracked for 14 days from August 7 to August 21, 2024. The blue dots represent radio receiver nodes (n=13), and the white dots (7a) represent approximate locations for the tracked sparrow following multilateration. The white polygon (7b) represents the 95% utilization distribution, or home range, of the tracked sparrow over this time period.

We ran a tag signal strength versus distance analysis to determine how far each sparrow was from each node at its time of detection. We then used multilateration to calculate each sparrow's location at any point in time when it was detected by 3 or more nodes (Figure 7a). With these locations, we calculated home ranges for each tracked sparrow using kernel density estimation (Figure 7b).

Future Monitoring

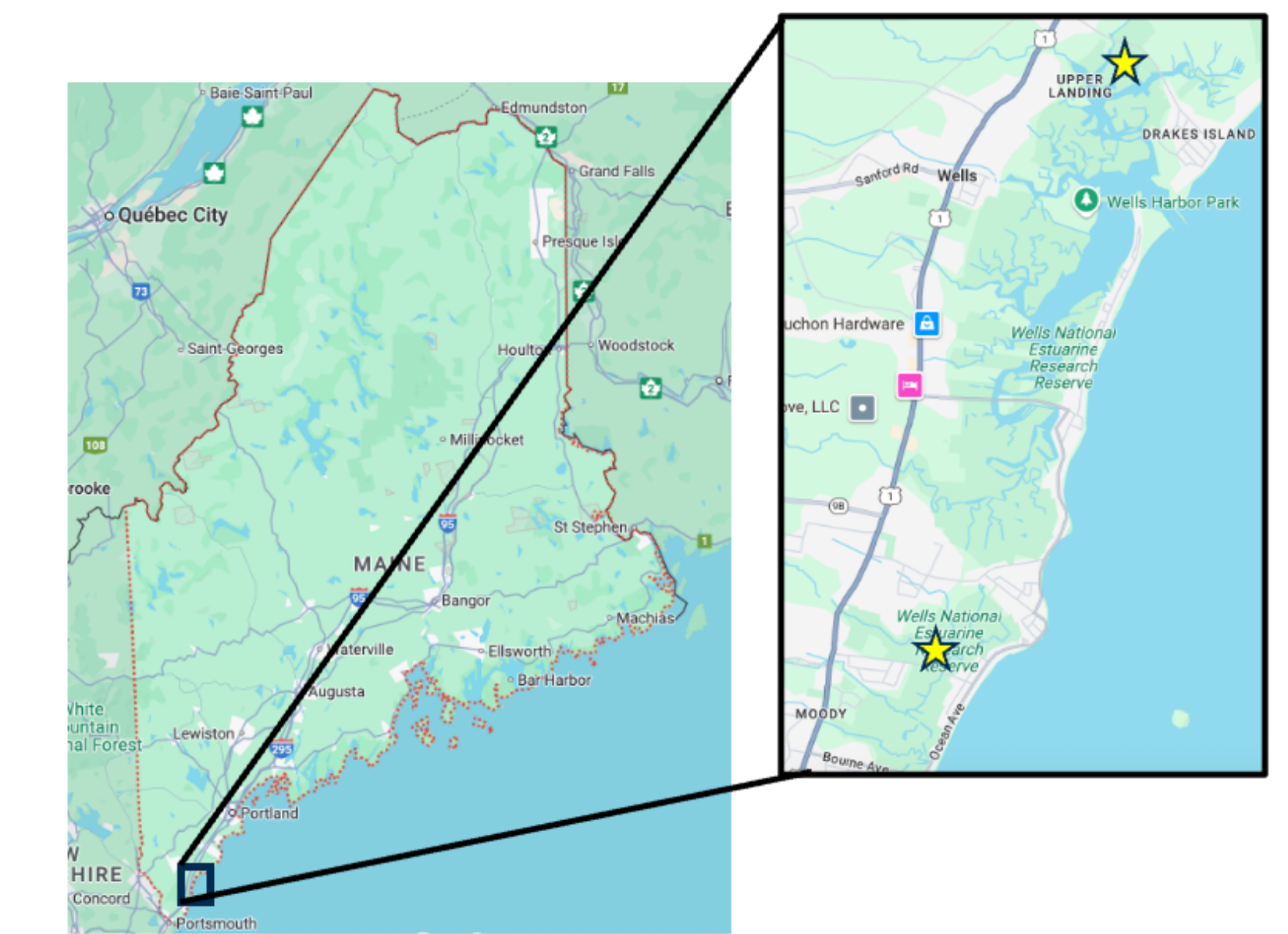


Figure 8: Future monitoring sites at Rachel Carson National Wildlife Refuge in Wells, Maine.

During the summer of 2025, we will continue to track and monitor tagged birds at Lubberland Creek Preserve, which will serve as an unmodified control site. We will also tag and track birds at two sites on Rachel Carson National Wildlife Refuge in Wells, Maine (Figure 8). Both of these sites are currently undergoing restoration via runnelling, thin layer placement (Figure 9), and creation of sediment mounds (Figure 10). At these sites, we will use tracking data collected from tagged sparrows, along with nest monitoring and point count data, to determine how these restoration methods impact Saltmarsh Sparrow space use and nesting success.



Figure 8: Sediment addition via thin layer placement at a marsh in Wells, ME.



Figure 9: Sediment mound made from runnelling spoils in Newburyport, MA.

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