

# Recommendations for Monitoring Saltmarsh Sparrows on Salt Marsh Restoration Projects

Version 1.0



*Collaboratively developed guidance by:*  
*Saltmarsh Habitat and Avian Research Program (SHARP)*  
*Atlantic Coast Joint Venture (ACJV)*  
*Ducks Unlimited (DU)*  
*US Fish and Wildlife Service (USFWS)*



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## SCOPE

This document was developed to encourage monitoring for Saltmarsh Sparrows and other tidal marsh sparrows at salt marsh restoration sites from Maine to Virginia. We provide guidance for effective Saltmarsh Sparrow monitoring for salt marsh restoration projects which includes considerations for monitoring implementation, including methods, sampling/design, timing, cost estimates, and strategies for prioritizing work when resources are limited. This document will be updated regularly as we learn more about this system and the effects of restoration on tidal marsh birds.



*Staff set up mist nets as part of the rapid assessment approach for Saltmarsh Sparrow monitoring at restoration sites. Lauren Owens Lambert*

## RATIONALE

Partners across the breeding range of the Saltmarsh Sparrow have been working together for over a decade to produce regional applied science for this tidal marsh specialist species. This small ground-nesting bird has shown a recent population decline (Correll et al. 2017) and without intervention is predicted to go extinct mid-century (Field et al. 2017, Roberts et al. 2020), largely due to increased nest flooding during extreme high tide events exacerbated by sea level rise. Emerging evidence also suggests that the Saltmarsh Sparrow can act as an early warning signal of increased flooding rates before other ecosystem changes (e.g., vegetation) become apparent.

Salt marsh restoration efforts to support this species and protect the important ecosystem services provided by coastal marshes have increased significantly over the past 5 years. Current restoration techniques can include sediment placement, tidal restriction mitigation (including culvert replacement, berm removal, etc.), and hydrological restoration (runnelling, ditch remediation, etc.) often coupled with vegetation planting. In order to understand how these restoration approaches impact Saltmarsh Sparrow populations and the larger tidal marsh bird community, it is vital to monitor before, during, and after restoration implementation occurs to fully measure avian response to restoration efforts.

## A SPECIAL CASE IN BIRD MONITORING

Until recently, monitoring of tidal marsh bird communities has been completed either through extensive point count surveys or intensive demographic study at small study areas with high bird abundance. Point counts can be used to estimate population size and trends over broad areas, and are logistically simpler than other avian population sampling approaches including bird capture and reproductive monitoring. This type of work typically requires much more field effort and specialized training but can inform population viability assessments by providing information on reproductive success and female abundance, which are known to be drivers of Saltmarsh Sparrow declines. Because point counts are relatively easy to implement and monitoring resources are limited, point counts alone have sometimes been used to monitor Saltmarsh Sparrow populations for restoration projects. However, point counts do not assess whether females specifically are present or whether they are nesting successfully, which is problematic given the unusual life history of the Saltmarsh Sparrow (females are responsible for all reproductive effort after mating). ***Prior studies have shown that abundance measured by point counts cannot measure the quality of Saltmarsh Sparrow breeding habitat (e.g., Field et al. 2018), making them inappropriate for understanding sparrow response to restoration in occupied areas.*** Consequently, it was critical to develop a method to directly monitor reproductive success that could be implemented more rapidly than conventional Saltmarsh Sparrow demographic monitoring.



## EVOLVING METHODS FOR Saltmarsh Sparrow MONITORING

The [Saltmarsh Habitat and Avian Research Program \(SHARP\)](#), initiated in 2010, is a research collaborative made up of academic partners, government agencies, and non-profit partners spread geographically from Maine to Virginia (across the breeding range of the Saltmarsh Sparrow). Recently, SHARP led a pilot effort to evaluate a set of metrics collected via a “rapid assessment” protocol” to monitor demographic variables at a fraction of the cost and effort of traditional intensive demographic monitoring. The rapid assessment protocol includes mist-netting, point counts, transects, and vegetation data collection. Recent analyses confirm that rapid assessment metrics track well with core demographic indicators of reproductive success (Sanchez 2022). Due to this finding, **SHARP, the USFWS, and partners now recommend the collection of rapid assessment data at occupied Saltmarsh Sparrow areas to measure breeding activity directly (see Decision Tree on next page)**. Monitoring for other tidal marsh sparrows including Acadian Nelson’s Sparrow and Seaside Sparrow can simultaneously be performed through this rapid assessment monitoring within their ranges and is encouraged when possible. The methods for rapid assessment [are available publicly](#) and linked directly below. SHARP also maintains a database to collectively enter, proof, and house data collected following these methods to facilitate regional analysis.

The decision tree (Figure 1) describes a process that can be used to determine when rapid assessment protocols (including vegetation monitoring) are most appropriate for pre/post restoration monitoring. The decision tree also describes implications of the rapid assessment findings on subsequent restoration actions, including when measures to avoid or minimize any potential negative impacts on Saltmarsh Sparrow should be taken. This tree references two monitoring strategies which each require different levels of training and experience to implement correctly and safely:

### **Point Counts**

[Point counts](#) can be used to assess whether Saltmarsh Sparrows are present at a particular location. They can also be used to survey the broader suite of birds that are using a tidal marsh at a particular location. Point counts cannot be used to indicate nesting activity or assess habitat quality for Saltmarsh Sparrows, which is the goal of many salt marsh restoration projects. Staff need to be able to use binoculars, use a GPS-enabled device to navigate to locations, be physically fit enough to walk through muddy tidal marsh, be trained on bird and plant identification in tidal marshes, be able to hear high-pitch sounds, and see birds in this ecosystem. Training of point count observers usually takes 1-2 weeks, after which an observer can usually conduct point counts independently. Permits are required to access land depending on ownership type, but are not required to conduct a point count.

### **Rapid Assessment Monitoring**

[Rapid assessment monitoring](#) includes point counts, monitoring for nesting activity, and use of mist-nets to capture and band birds to assess reproductive activity for Saltmarsh Sparrows. In addition to the skills and training required for point counts (above), staff need to have previous passerine banding and extraction experience to independently be able to capture birds, and must have permits to band Saltmarsh Sparrows under the U.S. Geological Survey Bird Banding Laboratory (BBL) and the local state wildlife agency. Banding permits are tightly regulated and guided by

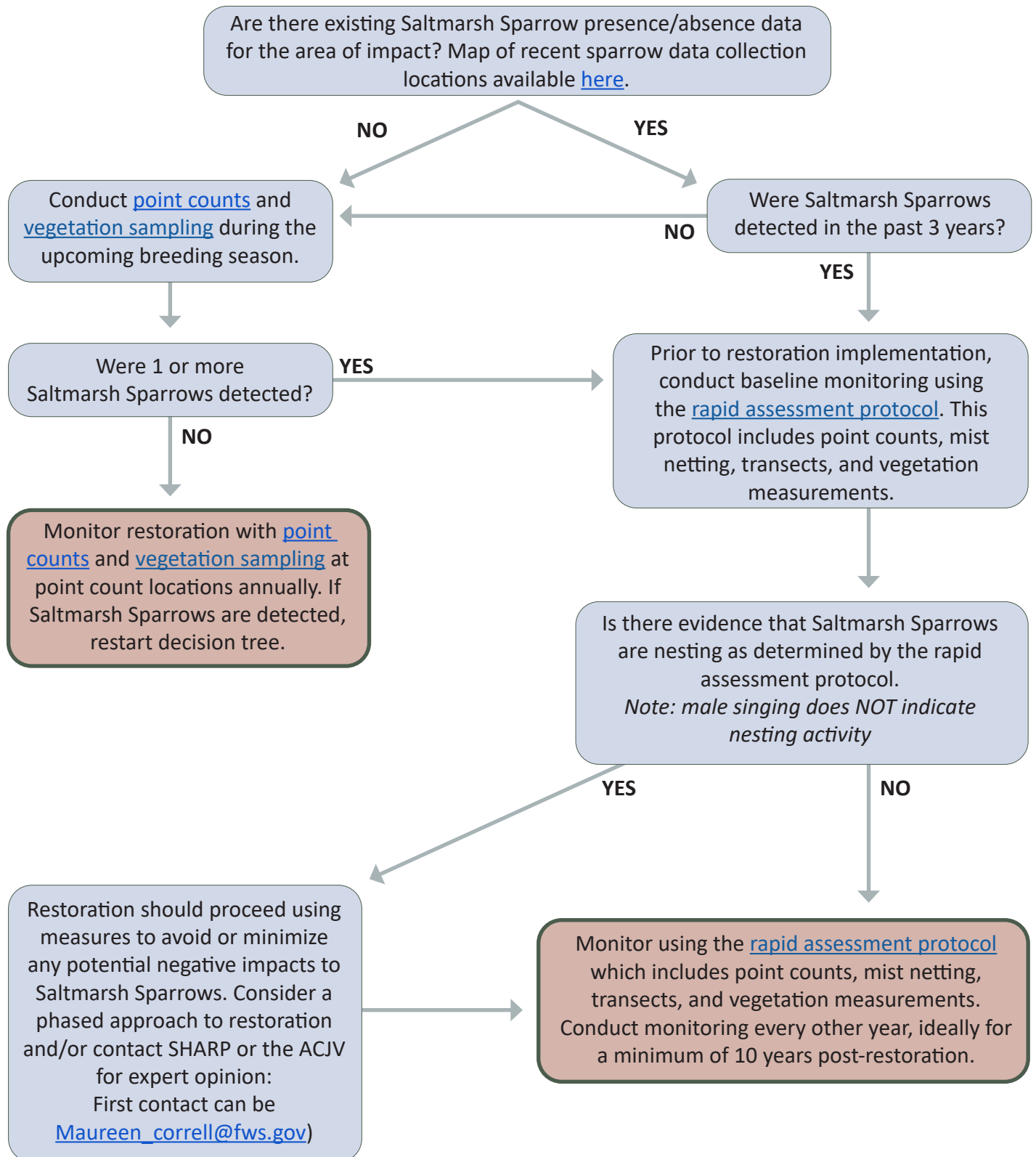


*It is important to have the necessary skills to properly capture and monitor tidal marsh sparrows. Lauren Owens Lambert*



## MONITORING DECISION TREE

*Ideally start before restoration begins*



**Figure 1. Decision tree for use by restoration practitioners to understand what type of monitoring is appropriate for their restoration project. This decision tree is appropriate for use at salt marsh restoration projects from Maine to Virginia.**



the Migratory Bird Treaty Act and individual states' regulatory bodies. Earning a general banding permit under the BBL therefore requires significant banding experience (i.e. hundreds to thousands of birds banded) and requires annual administration time before and after the field season to submit banding records to the BBL, apply for next years' permits, etc. Information on [obtaining a permit from the BBL is available here](#). In addition, tidal-marsh-specific mist-netting experience is necessary to ensure the safety of the birds (e.g., specific measures must be taken during mist-netting to ensure the safety of captured birds in a tidal environment; these measures and skills would not be learned during mist-netting in other habitats). ***This skill set usually takes 1-2 field seasons to build under direct supervision of an experienced bander before a staff person is able to capture and band Saltmarsh Sparrows and other tidal marsh sparrows independently.***

## SAMPLING DESIGN

### Definitions

**Area of Impact:** the area which will be directly affected by a restoration project.

**Data collection point:** a location at which either point count or rapid assessment monitoring occurs (see decision tree for guidance on which to use).

**Control area:** A marsh area outside the area of impact but in similar overall condition to the area of impact before restoration occurs. For small or medium restoration areas, a control area might be a nearby area within the same marsh, or a nearby marsh that is in a similar state to the restoration area. For large or very large areas of impact or projects with multiple restoration areas and/or multiple points in impact areas, control areas would be randomly selected points within the same marsh area but outside the area of impact.

### Approach

Depending on the size of the project area of impact,\* multiple data collection points may be necessary to fully assess a restoration area. One sampling point has an area of inference for birds within a 100-m radius of the sampling point (~3.5 ha) or the entire area of impact, whichever is smaller. Specific suggestions for the degree of sampling will vary based on the size, shape, and composition of the area of impact (i.e., amount of open water, marsh vegetation, upland etc.). A sample size of 1-9 points within a single area of impact, although too small for formal statistical analysis, is still meaningful to assess change over time. For example, an unoccupied area pre-restoration that has documented breeding 5 years post-restoration is a major success for Saltmarsh Sparrows. An area of impact containing 10 or more points is ideal for statistical analysis in a Before After Control Impact (BACI; see below) framework to formally assess restoration impacts over time.

We provide guidelines below for projects with different areas of impact. For projects where the restoration project impact area is <50 ha, the goal is to provide a near-complete census; for impact areas greater than 50 ha, the goal is to use random samples to collect data that are representative of the area of impact.



*Repairing hydrology of the marsh platform is one of several common approaches to salt marsh restoration. USFWS*



Small area of impact ( $\leq 5$  ha): 1 point centered in the middle of the restoration impact area.

Medium area of impact (between 5 and 10 ha): 2 to 3 non-overlapping ( $>250$  m between points) points within the restoration impact area.

Large area of impact (10-50 ha): 2-10 non-overlapping points (2 for every 10 ha\*\*;  $>250$  m between points) within the full restoration impact area..

Very large area of impact ( $>50$  ha): At least 10 randomly-located non-overlapping points across the full restoration impact area.



*Sediment placement on the marsh platform reinvigorates the accretion process, helping marshes make up for reduced sediment input over time. USFWS*

\*For pre-restoration monitoring efforts where an area of impact has not yet been delineated, please apply the above guidance to the entire marsh area.

\*\*This suggestion has minor conflict with suggestions for medium areas of impact, but is included to allow flexibility across different scenarios

### ***Timeline (Ideal Scenario)***

**Pre-restoration:** Monitoring begins 2 years before restoration occurs at the area of impact and at a control area. This allows time to collect rapid assessment monitoring data if initial point counts on previously unmonitored areas detect Saltmarsh Sparrows in year 1 of pre-restoration monitoring. Note: monitoring occurs during the breeding season (May-September annually).

**During restoration:** Monitoring continues throughout restoration during each breeding season (May - September annually) at area of impact and control locations.

**Post-restoration:** If the area of impact is occupied by Saltmarsh Sparrows, SHARP recommends rapid demographic assessment monitoring with a trained crew for a minimum of 2 data collection years post-restoration at the area of impact and control locations. These data collection years can occur every other year if necessary (e.g., collect data in 2024 and 2026, skipping 2025) to minimize impact and maximize resources needed to conduct monitoring. Ideally, monitoring should occur every other year for 10 calendar years after restoration implementation is complete to fully capture bird response to restoration efforts and account for variation across years.



**Table 1. Annual cost estimates for rapid assessment Saltmarsh Sparrow monitoring in 2024. This budget is updated annually to reflect changes in estimated cost over time.**

Regional Coordination Needs	
Program Coordination (Principle Investigator support & field coordinator, includes fringe)	\$87,000
Database Management	\$15,000
Indirect (assume rate of 17.5%)	\$18,000
<b>Regional coordination total</b>	<b>\$120,000</b>
Field Season costs	
Graduate student / crew lead (includes fringe, etc.)	\$56,000
Field crew (includes fringe)	\$28,000
Travel & field supplies	\$15,000
Housing	\$15,000
Indirect (assume rate of 17.5%)	\$20,000
<b>Field season total</b>	<b>\$134,000</b>
<b>Project total (rapid assessment)</b>	<b>\$254,000</b>
Single data collection point - rapid assessment (assuming coordination is covered)	\$6,700
Single data collection point - point count only (assuming coordination is covered)	Estimated on a case-by-case basis, but less than rapid assessment

**Considerations For BACI And Reference Site Data Collection**

There will always be limited resources for monitoring; we therefore provide tiered suggestions below in order of importance.

**First priority:** Monitoring in area of impact during and after restoration

At a minimum, data should be collected at the area of impact during and after restoration occurs, ideally up to 10 years post-restoration, rotating every other year (see timeline for details).

**Second priority:** Monitoring in the area of impact before restoration occurs

Collecting data at the area of impact before restoration occurs is integral to fully assess the impacts of the restoration project on the bird and vegetation communities in the marsh affected. **Whenever possible, we recommend data collection begin 2 years before restoration occurs to be able to track change in bird and vegetation communities at the area of impact over time.**

**Third priority:** Control area monitoring

Monitoring at a control area that occurs simultaneously to monitoring in the area of impact can help assess the local effects of restoration by accounting for local environmental variation unrelated to the restoration action. Similar amounts of monitoring should occur within the area of impact and in control areas.



**Fourth priority:** Monitoring at reference sites

Reference sites are different from control areas in that they represent ideal conditions local to the restoration area of impact. While data collection at reference sites is helpful to add local context, data collection at these sites are lower priority than before implementation or at control areas because significant data collection has already occurred at high-quality sites for Saltmarsh Sparrows and other tidal marsh obligate species (e.g., Field et al. 2017, Ruskin et al. 2018).

**FREQUENTLY ASKED QUESTIONS**

***Can my staff obtain training to conduct Saltmarsh Sparrow monitoring?***

Yes. Training staff to conduct Saltmarsh Sparrow monitoring is possible with a significant level of commitment before any monitoring occurs. For point counts, staff must be trained for 1-2 weeks on bird and plant ID and point count protocols as well as data entry procedures prior to the start of data collection. Training for point counts can be obtained by attending in-person regional trainings already occurring throughout the region (~1 week long). See prerequisite skills needed for staff conducting point counts above. For rapid assessment, in addition to the point count training, staff must be federally and state permitted to band Saltmarsh Sparrows in the state in which monitoring will occur. Staff must also receive or possess tidal-marsh-specific mist-netting experience to ensure safe data collection and handling for this declining species. These skills generally take 1-2 seasons to acquire, and are dependent on trainer and permit availability. See prerequisite skills needed for staff conducting rapid assessment above. If your organization is interested in attending a training, please reach out to the ACJV through Mo Correll ([maureen\\_correll@fws.gov](mailto:maureen_correll@fws.gov)) for more details.

***Can I contract out monitoring work if my organization does not possess the training or resources necessary to complete it in-house?\****

Yes. Given notice of funding by early January of the year data collection will occur, trained crews can be available for partner organizations implementing a salt marsh restoration project that might lack the expertise or capacity to conduct the rapid assessment protocol in-house. Providing this capacity ensures that proper monitoring happens without overextending individual organizations. SHARP estimates a single 3-person crew (e.g., graduate student and 2 field techs) equipped with a boat, vehicle, and equipment can visit ~20 rapid assessment points during a field season. As an example, Table 1 is a budget summary for annual regional coordination needs (one-time costs regardless of the number of field crews), as well as an estimate for a single roving crew for one field season implemented by SHARP in 2024. Field season costs can be roughly doubled to add a second (or third, or fourth) roving crew to cover ~20 additional points annually. Table 1 includes all costs necessary to coordinate, collect, analyze, and store data from rapid assessment monitoring annually by SHARP. We also provide stepped-down cost estimates for monitoring by point for different types of monitoring (bottom of Table 1). If your organization is interested in contracting out Saltmarsh Sparrow monitoring work to SHARP, please reach out to the ACJV through Mo Correll ([maureen\\_correll@fws.gov](mailto:maureen_correll@fws.gov)) or Ducks Unlimited through Bri Benvenuti ([bri.benvenuti@ducks.org](mailto:bri.benvenuti@ducks.org)) to help facilitate this.

*It is important to note that while SHARP has the training and experience necessary to complete Saltmarsh Sparrow monitoring regionally, it is not the only option for contracted monitoring. Similar costs may be applicable to other entities with the appropriate experience and skill sets necessary to complete this work. We provide cost estimates here as a way for partners to budget for Saltmarsh Sparrow monitoring as part of their restoration proposals, and encourage use of SHARP protocols to streamline analysis and inference from the data collected.*





#### SUGGESTED CITATION

Correll MD, Apgar S, Benvenuti B, Cohen JB, Elphick CS, Kocek AR, Kovach A, O’Brien KM, Ruskin KJ, and WG Shriver. 2023. Recommendations for Monitoring Saltmarsh Sparrows on Salt Marsh Restoration Projects. Collaboratively developed guidance from the Saltmarsh Habitat and Avian Research Program (SHARP) and partners. Available at [www.acjv.org/documents/monitoring\\_guidance\\_SALS.pdf](http://www.acjv.org/documents/monitoring_guidance_SALS.pdf).

#### CONTACT INFORMATION

For more information or to solicit species-level expertise for restoration planning, please contact:

Mo Correll, Science Coordinator (ACJV): [maureen\\_correll@fws.gov](mailto:maureen_correll@fws.gov)

The ACJV can act as a first point of contact to learn more, but any other authors of this document can also be contacted for specific questions. For more information about the partner organizations that informed this document:

ACJV: [www.acjv.org](http://www.acjv.org)

DU: [www.ducks.org](http://www.ducks.org)

SHARP: [www.tidalmarshbirds.org](http://www.tidalmarshbirds.org)

USFWS: [www.fws.gov](http://www.fws.gov)



Ray Hennessy



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