

Data Release Report: Snowy Plover Monitoring at Point Reyes National Seashore, 2009 – 2025 – Data Release Report (DRR)

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Abstract

The National Park Service (NPS) San Francisco Area Network (SFAN) has been monitoring Western Snowy Plovers (*Charadrius nivosus*) since the 1970s. Snowy Plovers have been selected as a vital sign for monitoring due to their sensitivity to habitat conditions and quality. Given their habitat needs, this vital sign serves as an important benchmark of habitat quality at Port Reyes National Seashore (PORE). This report describes Snowy Plover survey data gathered from 2009 to 2025, where six survey areas were monitored for plovers. These survey areas were traversed in 50-100 m increments, where observers would stop at the end of each increment to scan the shoreline ahead for plovers. When a plover was located, observers would approach the plover no closer than 10 m away to record the plover's age, sex, and leg band color combination if applicable. After recording the date, location, and time of the plover sighting, the observers would continue their traversal of the survey area. In addition, observed nests and plover eggs were monitored for up to 35 days, where the progress of the nest and hatched chicks were tracked. Observed predators and their behavior during the survey were also recorded as ancillary data for the protocol.

Acknowledgements

Thank you to James Brown and Alexa Ron for all their efforts in creating the initial Snowy Plover PORE DRR template being used for this DRR.

Data Records

Data Inputs

The datasets within this data package were pulled from the SFAN Snowy Plover PORE Microsoft Access database at <https://doi.org/10.57830/2318209>. Subsequent process on datasets was done to support creation of the data package metadata in the Ecological Monitoring Language standard.

Summary of Datasets Created

This DRR describes the data package *Snowy Plover Monitoring at Point Reyes National Seashore and the San Francisco Bay Area Inventory and Monitoring Network: 2009-2025 - Data Package*, which contains a metadata file and 6 data files. These data were compiled and processed for dissemination by the National Park Service Inventory and Monitoring Division (IMD) and are available at <https://doi.org/10.57830/2318211> (see Table 1).

Table 1. Snowy Plover Monitoring at Point Reyes National Seashore, 2009-2025 - Data Package: List of data files.

File Name	Size	Number Records	Description
SFAN_SNPL_Bands.csv	3.38 MB	10709	Lists leg band(s) observed on surveyed Snowy Plovers from 2009 to 2025
SFAN_SNPL_ChickBands.csv	0.13 MB	415	Describes leg band(s) placed on Snowy Plover chicks from 2016 to 2025
SFAN_SNPL_Events.csv	1.92 MB	3556	Describes the survey date, time, direction, location, and environmental conditions throughout the survey from 2009 to 2025
SFAN_SNPL_Nesting.csv	0.44 MB	902	Contains information on nesting success/failures, the dates a nest was observed, and what micro-habitat the nest was made in from 1997 to 2025
SFAN_SNPL_Observations.csv	6.53 MB	14338	Lists the number of Snowy Plover individuals observed at a given time from 2009 to 2025
SFAN_SNPL_Predators.csv	3.4 MB	10525	Lists the presence of predators observed at a given time from 2011 to 2025

See the [Appendix](#) for additional notes and examples.

Data Quality Evaluation

Within the context of an annual data lifecycle workflow, data are reviewed and validated through data verification and validation procedures implemented by the San Francisco Bay Area Inventory & Monitoring Network (SFAN). After surveys are completed, monitoring personnel perform data entry validation to confirm entered data matches what was recorded on original data forms. Fields are checked for accuracy and completeness, including correct site names, expected locations and standard date and time entries. Data are checked against field notes when appropriate. After data entry verification has been completed records are given a data processing level of “Provisional”.

Data Validation

Subsequent annual workflow steps are taken to perform formal and informal data validation quality control checks. Formal Data Validation procedures are defined in appendix A. Records identified in the data validation routines were reviewed and corrected. Notes on any data validation steps taken outside of normal corrections are added to the respective narrative notes fields. After completion of data validation records are given a data processing level of “Accepted.” Note only field season 2021 and 2024 data has been through the data validation procedure with accompanying “Accepted” data processing status. Monitoring years 2009 – 2018 and 2019, 2020 and 2022 data have “Provisional” data processing status, and monitoring year 2019 data have “Raw” data processing status.

The network will continue to work through the above data quality control backlog when time and resources are available.

Data Quality Flagging

Data quality control (QC) flagging fields were added to the back-end schema in 2023. Flagging fields allow for formal designation via data flag codes and can be used when records have non-normal monitoring conditions (e.g. failed QC checks, adverse weather, pandemic, etc.). The data quality flags that have been realized through field season 2025 are defined in Table 2.

The data quality flags, as well as the explanations of why the flags were placed on their corresponding observation, can be found on each dataset where it applies.

Table 2. Realized data quality control flags.

Flag Code	Flag Definition	Analysis Interpretation
ODEC	Original data entry value corrected during data review	No issues with use in analysis

Flag Code	Flag Definition	Analysis Interpretation
MECBR	Manually Entered Chick Band Record, associated Snowy Plover Observation (i.e. SNPL_Data_ID) not defined	Use with caution in analysis
DFO	Data field omission	Use with caution in analysis
NSBPLE	Number of Summarized Banded Snowy Plovers Logical Error. Summarized number of Bands Snowy Plovers is not the same as the tally of Banded observation records for the survey.	Use with caution in analysis
NSPLE	Number of Summarized Snowy Plovers Logical Error. Summarized number of adults, hatchlings, or fledglings SNPL does not match the observed sum of adult (Male+Female+Unk), hatchlings, or fledglings	Use with caution in analysis
ESBNA	Event Summary Banded Number Not in Agreement with number of records for event in tbl_SNPL_Banded	Use with caution in analysis
LESPB	Logical Error Snowy Plover Banded more than Total Snowy Plover	Use with caution in analysis
LESPC	Logical Error Snowy Plover Checked more than Total Snowy Plover	Use with caution in analysis
LEPST	Logical Error Predator Stop Time is more than the total survey time	Use with caution in analysis
ODEU	Original data entry value updated	No issues with use in analysis
NCD	No Crew Defined	No issues with use in analysis
NGUSDN	No GPS used during data collection, spatial data set to null.	No issues with use in analysis
OUC	Observation value not certain	Use with caution in analysis
LCAC	Location code abbreviation changed	No issues with use in analysis
ONBLE	Observation Number Banded Logical Error. Observation has banded data and summary field SNPL_Banded in observations is 0 or null.	Use with caution in analysis

Flag Code	Flag Definition	Analysis Interpretation
ONBM	Observation Number Banded in plover observation SNPL_Bands fields does not Match the number of records in tbl_SNPLBanded for the survey data and time.	Use with caution in analysis
SNBO	Snowy Plover Band record Omission. Expecting record in Snowy Plover Bands but none are present.	Use with caution in analysis
LEOT	Logical Error Observation Time outside survey start or end time period.	Use with caution in analysis
LCSBC	Location coordinates set to beach centroid due to incorrect original data value	Use with caution in a spatial analysis
RICNC	Record imported from chick nest check table 'tbl_Nest_Checks_Legacy'	No issues with use in analysis

Table 3. Dataset quality control flag fields and monitoring components.

Abbreviated File Name ^a	Flag Field Name	Flag Notes Field	Monitoring Component
Bands	QCFlag	QCNotes	SNPL Bands
ChickBands	QCFlag	QCNotes	SNPL Chick Bands
Events	EventQCFlag	EventQCNotes	Monitoring event metadata
Events	EventDetailsQCFlag	EventDetailsQCNotes	Event Details summary and metadata
Nesting	QCFlag	QCNotes	Nesting
Observations	QCFlag	QCNotes	Observations
Predators	QCFlag	QCNotes	Predators

Note: ^a The SFAN_SNPL_ prefix and .csv suffix have been omitted from the abbreviated file names for brevity.

Usage Notes

The “SFAN_SNPL_Predators.csv” dataset details observed potential predators of Snowy Plovers and information related to the observed predators. However, these data points weren’t collected in a systematic and standardized sampling effort. Because of this, the relationship of these data points with plover population counts and breeding success can’t be determined with any statistical estimate of certainty. (Adams et al. 2014)

Acquiring the Data Package

This data package is available at <https://doi.org/10.57830/2318211>, and can be directly imported into R data frames by using the NPSutils package (Baker et al. 2023) and executing the following code:

```
devtools::install_github('nationalparkservice/NPSutils')
NPSutils::get_data_packages(2318211)
dat <- NPSutils::load_data_package(2318211)
list2env(dat, envir = .GlobalEnv)
```

Methods

The sampling methodology written here was sourced from the protocol on Snowy Plover monitoring (Adams et al. 2014).

Given that Point Reyes National Seashore has a small population of Snowy Plovers, an entire census of the population is reasonable. The breeding population is surveyed in six areas: Four on Point Reyes Beach, one on Limantour Beach, and one on Drake’s Beach.

During surveys, observers walk along the shoreline of the survey area and keep the entire width of the beach in sight. Every 50-100 m, observers stop walking to scan the beach ahead of their location with binoculars. If a plover(s) is observed, observers approach the bird(s) no closer than 10 m away to record the age, sex, and leg band colors (if leg bands are present) of the bird(s). Additionally, observers record the date, location, and time of the sighting. After recording, observers walk around the birds to avoid disturbing the birds/flushing, and continue their 50-100 m walking intervals along the shoreline of the survey area.

Plover nests are checked two to four times a week to verify if they are still active. Nests are located either by searching microhabitats where plovers are likely to nest, observing potential breeding adults from a concealed position, and/or following plover footprints in sand. When a nest is located, the UTM coordinates are obtained via GPS units for each nest. The nest is also placed in a 3 m × 3 m square fence enclosure, if no enclosure has been placed around the nest already.

If a nest is found to be inactive during a visit, the cause of loss is determined and recorded. In the event that the adult plovers abandoned the nest, or the eggs in the nest have failed to hatch after 35 days, a plover biologist collects the unhatched eggs for further analysis.

In addition to monitoring Snowy Plovers, information on the presence/absence and abundance of the number of potential Snowy Plover predators is also collected.

Data Processing

Flat file datasets were exported from the SFAN IMD Snowy Plover Access database. Once processed, the output datasets were exported to a UTF-8 CSV file to provide end-users with a more interoperable format.

To bring the datasets up to mini-Darwin Core standards (Darwin Core Maintenance Group 2023) and provide more context to the nature of the data, columns `Type` and `Basis_Of_Record` were added to each dataset.

In dataset “SFAN_SNPL_Events.csv” where observation times were recorded, two additional columns were added to document the local time (`SNPL_Time_Local`) and the time zone abbreviation that the local time was recorded in (`localTimeZone`) for each observation. We’ve added these columns to differentiate between the `SNPL_Time` column that contains the UTC time and offset, recommended by the IMD Data Cleanup SOP (Quevedo and Sherman 2023), while retaining a local time for easier reading for SFAN when referring back to these datasets. Please note that column `Start_Date` in “SFAN_SNPL_Events.csv” reflects the date recorded in the local time zone shown in `localTimeZone` where the observation was made.

In datasets “SFAN_SNPL_Bands.csv,” “SFAN_SNPL_ChickBands.csv,” “SFAN_SNPL_Nesting.csv,” “SFAN_SNPL_Observations.csv,” and “SFAN_SNPL_Predators.csv,” column `Unit_Code` was added to explicitly state which park

unit the observation was recorded in, in accordance with the IMD Data Cleanup SOP (Quevedo and Sherman 2023) guidance for datasets to be self-documenting.

In datasets “SFAN_SNPL_ChickBands.csv” and “SFAN_SNPL_Events.csv”, column Scientific_Name was added to explicitly state which organism was surveyed, in accordance with the IMD Data Cleanup SOP (Quevedo and Sherman 2023) guidance for datasets to be self-documenting.

In datasets “SFAN_SNPL_Nesting.csv,” “SFAN_SNPL_Observations.csv,” and “SFAN_SNPL_Predators.csv,” columns and values for UTM coordinates were converted to latitude and longitude coordinates through usage of QCKit’s generate_ll_from_utm() function (Baker et al. 2024b), as recommended by the IMD Data Cleanup SOP (Quevedo and Sherman 2023).

Metadata Processing

Metadata in the data package is in Ecological Metadata Language (EML) and was produced using the NPSdataverse (Baker et al. 2024a) package EMLeditor (Baker and Patterson 2023). The files “SFAN_SNPL_Nesting.csv” and “SFAN_SNPL_Observations.csv” contain entirely blank columns which resulted in parsing issues during EML creation. Data and metadata were run through quality control functions using the NPSdataverse packages QCKit (Baker et al. 2024b) and DPchecker (Baker and Wright 2024) before publication.

Code Availability

A versioned export of the Data Package GitHub repo (https://github.com/NPS-SFAN/SNPL_PORE_DataPackage) with the scripts used to generate the data package and data release report has been exported to the NPS DataStore Reference <https://doi.org/10.57830/2318231>.

References

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Appendix

Appendix A: Data quality validation checks

qa_a102_Unverified_Events - Shows records that have not been marked as verified. No QC Flag applied, data processing level should be “Raw”.

qa_f112_Incomplete_Weather - Returns complete surveys (not marked as incomplete) but are missing weather condition data. QC default value is DF0.

qa_f122_CompleteSurvey_IncompleteSNPL - Returns surveys not marked as incomplete but that are missing SNPL summary data. QC default value is DF0.

qa_f132_MoreCheckedSNPL_ThanTotal - Returns surveys that have more SNPL checked for bands than the total SNPL (SNPL_Adult, SNPL_Hatchling, SNPL_Fledgling). QC default value is LESPC.

qa_f142_MoreBandedSNPL_ThanChecked - Returns surveys that have more SNPL with bands (SNPL_Banded) than were checked for bands (SNPL_Checked_Bands). QC default value is LESPB.

qa_f152_StopTime_MoreThanEvent - Returns surveys where the predator stop time (minutes) is longer than the total survey event time (minutes). QC default value is LEPST.

qa_h102_Missing_Observers - Returns records where there is a blank observer field in for the survey or no observer has been provided. Delete the blank record in the survey form. QC default value is NCD.

qa_j102_SNPL_ObservationTime_Error - Returns SNPL observation records where the observation time is outside the start or end times of survey event. Time should be entered in 24 hour military format. QC default value is LE0T.

qa_j132_NestID_Year_Mismatch - Returns records from SNPL_Obsevation where the survey year of the nest ID used does not match that in tblNestMaster. QC default value is OEYDNM.

qa_j142_Missing_Band_Totals - Returns records where there is data in tblSNPLBanded table for a specific observation time and the SNPL_Bands field in tblSNPLObservations is 0 or blank. QC default value is ONBLE.

qa_j152_Missing_Band_Data_X - Returns records where there are no records in tblSNPLBanded, but where the SNPL_Bands field in tblSNPLObservations is greater than 0. QC default value is SNB0.

qa_j162_Mismatched_Band_Obs - Returns records where there where the SNPL_Bands field in tblSNPLObservations does not match the number of records in tbl_SNPLBanded for the survey data and time. QC default value is ONBM.

qa_j172_Mismatched_Band_Summary - Returns records where there the number of banded SNPL in the event summary is not the same as the sum of records in tblSNPL_Banded for the survey. QC default value is ESBNA.

qa_j182_Predator_ActivityType - Returns records where the predator survey activity type entered is not one of the expected values of A, F, S, and W. QC default value is PAVU.