*REFERENCECODEDRR*

# Data Release Report: Snowy Plover Monitoring at Point Reyes National Seashore, BEGINYEAR – ENDYEAR – 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 BEGINYEAR to ENDYEAR, 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 and modified from SFAN’s Microsoft Access database. Images of the database used can be found in the project’s associated Raw Data reference.

## 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: BEGINYEAR-ENDYEAR - 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 CODEDP (see Table 1)

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

| **File Name** | **Size** | **Description** |
| --- | --- | --- |
| SFAN\_SNPL\_Bands.csv | 1,919 KB | Lists leg band(s) observed on surveyed Snowy Plovers from BANDSSTART to BANDEND |
| SFAN\_SNPL\_ChickBands.csv | 72 KB | Describes leg band(s) placed on Snowy Plover chicks from CHICKBANDSSTART to CHICKBANDSEND |
| SFAN\_SNPL\_Events.csv | 1,496 KB | Describes the survey date, time, direction, location, and environmental conditions throughout the survey from EVENTSTART to EVENTEND |
| SFAN\_SNPL\_Nesting.csv | 374 KB | Contains information on nesting success/failures, the dates a nest was observed, and what micro-habitat the nest was made in from NESTINGSTART to NESTINGEND |
| SFAN\_SNPL\_Observations.csv | 4,559 KB | Lists the number of Snowy Plover individuals observed at a given time from OBSSTART to OBSEND |
| SFAN\_SNPL\_Predators.csv | 2,601 KB | Lists the presence of predators observed at a given time from PREDSTART to PREDEND |

See the [Appendix](#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 data has been through the data validation procedure with accompanying “Accepted” data processing status.

## 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 2024 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** |
| DFO | Data field omission | 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 |
| LCAC | Location code abbreviation changed | No issues with use in analysis |
| LCSBC | Location coordinates set to beach centroid due to incorrect original data value | Use with caution in a spatial analysis |
| LEOT | Logical Error Observation Time outside survey start or end time period. | Use with caution in analysis |
| LEPST | Logical Error Predator Stop Time is more than the total survey time | 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 |
| NCD | No Crew Defined | No issues with use 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 |
| ODEC | Original data entry value corrected during data review | No issues with use in analysis |
| ODEU | Original data entry value updated | 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 |
| 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 |
| OUC | Observation value not certain | Use with caution in analysis |
| RICNC | Record imported from chick nest check table 'tbl\_Nest\_Checks\_Legacy' | No issues with use in analysis |
| SNBO | Snowy Plover Band Record Omission. Expecting record in Snowy Plover Bands but none are present. | Use with caution in analysis |

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

| **Abbreviated File Namea** | **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/10.57830/2307106*](https://doi.org/10.57830/2307106) (Brown and Ron 2024a), 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(2307106)  
dat <- NPSutils::load\_data\_package(2307106)  
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 exclosure, if no exclosure 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. In order to produce valid EML metadata, versions of these files with placeholder values in the empty columns were used to run the EML script. For the column ChickLoss\_Date4 in “SFAN\_SNPL\_Nesting.csv,” an arbitrary date within the study period was used as a placeholder value. For the column ChickLoss\_Weekend4 in “SFAN\_SNPL\_Nesting.csv” and the columns BehaviorTerritoryCC, BehaviorTerritoryLW, BehaviorTerritoryMD, BehaviorTerritorySC, BehaviorTerritoryCP, BehaviorNestCP, BehaviorNestDC, BehaviorNestAI, BehaviorNestFN, BehaviorChicksAC, BehaviorChicksNA and BehaviorOtherFG in “SFAN\_SNPL\_Observations.csv,” the value Yes was used as a placeholder value. This value was chosen as the placeholder value because it is a possible value for these columns. The files included in the data package do not contain these placeholder values but instead retain the entirely empty columns as they exist in the original database. 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

The R-script used to generate the dataset described by this report can be found at [*https://doi.org/10.57830/2305505*](https://doi.org/10.57830/2305505) (Brown and Ron 2024b). R version 4.4.2 was used when the first version of the processing script was finalized and published (R Core Team 2024).

# 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 DFO.

qa\_f122\_CompleteSurvey\_IncompleteSNPL - Returns surveys not marked as incomplete but that are missing SNPL summary data. QC default value is DFO.

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 LEOT.

qa\_j112\_Mismatched\_SNPL\_Numbers - Returns records where the entered summarized number of adults, hatchlings, or fledglings SNPL does not match the observed sum of adult (), hatchlings, or fledglings. QC default value is NSPLE.

qa\_j122\_Mismatched\_Banded\_Numbers - Returns records where the number of Banded SNPL recorded entered into the SNPL Banded summary results field is not the same as the tally of Banded observation records for the survey. QC default value is NSBPLE.

qa\_j132\_NestID\_Year\_Mismatch - Returns records from SNPL\_Obsevations 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 SNBO.

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.