

WRST Caribou Monitoring Standard Operating Procedure #6: Ver. 2024- 03-11

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Introduction

Introduction

This standard operating procedure (SOP) covers data management operations for the Mentasta and Chisana caribou long term monitoring program at Wrangell St. Elias National Park and Preserve. Long-term monitoring is different than a typical research project in that maintaining the informational content of the data for decades requires that data be collected consistently over the decades and products be well documented and, most importantly, made available to the future personnel who will carry on the monitoring. This SOP defines the generation and handling of field data deliverables. Field data collection procedures are covered elsewhere. Background information on the caribou monitoring program is at <https://irma.nps.gov/DataStore/Reference/Profile/2217176>

Objectives

We monitor caribou in Denali and Wrangell-St Elias national parks and preserves to:

- Determine changes in abundance, distribution, and demographics of caribou in the Central Alaska Network.
- Estimate calf survival and recruitment in the Central Alaska Network.
- Estimate mortality of caribou in and around the Central Alaska Network.

Data collection and management overview

Four major data streams are collected regarding the Mentasta and Chisana caribou herds with the resulting data stored in two major databases hosted by the NPS.

1. Radiotracking surveys.
2. Census surveys including population and composition count surveys.
3. Capture (data collected during caribou capture events).
4. Animal movements recorded via GPS or VHF collared caribou.

Collared caribou provide movement data as well as the ability to track animal groups during aerial surveys. Collar information and positional data is stored in the Alaska Region's Animal Movement database (Table 1). Individual caribou attributes are recorded at the time of collaring and stored in the WRST Caribou monitoring database, as well as information collected subsequently during aerial surveys. Data is matched and synchronized between the databases using a consistent caribou identifier called AnimalID.

Table 1. Caribou monitoring data streams and databases.

Information	WRST Caribou database	Animal Movement databas
Animal capture	X	
GPS/VHF collar management		X
Spatial GPS movements monitoring		X
Aerial surveys	X	
O Composition count		
O Population estimate		
O Radiotracking		

The caribou monitoring data model is complex and, because the data is shared among two disparate databases, we cannot rely on built-in database constraints and rules enforcement to maintain high data quality. This means that the all partners must participate in ensuring the dataset is coherent and informative. In the absence of database-enforced rules we built, and continue to build quality control queries, scripts and stored procedures that can point out issues to be addressed. We have also built into the database a system that allows us to isolate raw data that has not been approved for use from provisional or certified data that is

of analytical quality. Last, data analysis is often the best method for improving data quality as problems become apparent through statistics and graphics. Prompt analysis and reporting is encouraged.

Resources

Important assets, exclusive of the two main databases discussed above, related to data management appear in Table 2.

Table 2. Digital assets

Asset	Location
Project Reference	https://irma.nps.gov/DataStore/Reference/Profile/2217176 The master Project reference describes the monitoring program and provides links to all important files including the monitoring protocol, standard operating procedures, reports, datasets and other digital resources. Mission critical assets should always be linked as products of this reference. This reference should always be the starting point for bringing new personnel up to speed on all aspects of the monitoring.
Protocol	https://irma.nps.gov/DataStore/Reference/Profile/2256522
Standard Operating Procedures	https://irma.nps.gov/DataStore/Reference/Profile/2255990
Data Quality Standards	https://irma.nps.gov/DataStore/Reference/Profile/2256561
Field data deliverables	https://irma.nps.gov/DataStore/Reference/Profile/2255990 Note: field data deliverables are products for analysis; rather they are informational items collected during data collection intended for ingestion into the master databases. They are archived at the URL above solely in case they are needed in the future to validate data in the database.
Certified dataset	Certified dataset references are finished data products intended for analysis and reporting. Datasets will be published to the Data Store as soon as possible after database ingestion and quality control procedures have been done. Datasets will be versioned and published iteratively - each version will include the entire dataset with the newest data appended. Data Store has functionality to point users from older dataset versions to newer ones, ensuring data consumers are always guided to the latest dataset. Certified datasets will be linked to the master Project reference above in order to be maximally discoverable.

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Dataset sensitivity

Dataset documentation and publication

Portions of the WRST caribou monitoring data may be considered sensitive because caribou are a species of commercial interest (see <https://irma.nps.gov/DataStore/Reference/Profile/2300967> and <https://irma.nps.gov/DataStore/DownloadFile/626221>). Care must be taken not to provide publicly the exact locations of GPS collared animals. Such data may be published where specific locations are from long ago or are obscured with other value added products such as range maps.

Questions regarding the publication of WRST caribou monitoring data should be resolved with the input of the park biologist, the CAKN program manager and the WRST Chief of Resources. A good overview of the legal framework and NPS's rationale for withholding data is at <https://irma.nps.gov/DataStore/DownloadFile/626221>.

Project life cycle

Data management life cycle

The WRST caribou monitoring data management life cycle appears below (Figure 1). Field data deliverables (Appendix A) are collected according to the caribou monitoring standard operating procedures. These deliverables are archive 'as is' from the field and copies are used to improve the data quality before they are ingested into the monitoring databases and archived in Data Store. Once the data are integrated with the databases, various quality control scripts can be run to elucidate problems for repair. Once the data quality is maximized it may seem logical to certify the dataset for analysis. In reality, it makes more sense to analyze and report on it first as this often elucidates undetected problems. For this reason it is advantageous to analyze and report before certifying and publishing the dataset to Data Store. Minimally, a Natural Resource Data Series (NRDS) report should be issued for each survey accomplished. NRDS reports do not include in-depth analyses, but rather are intended for the timely summarization of data until such time as more thorough analyses can be done and reported.

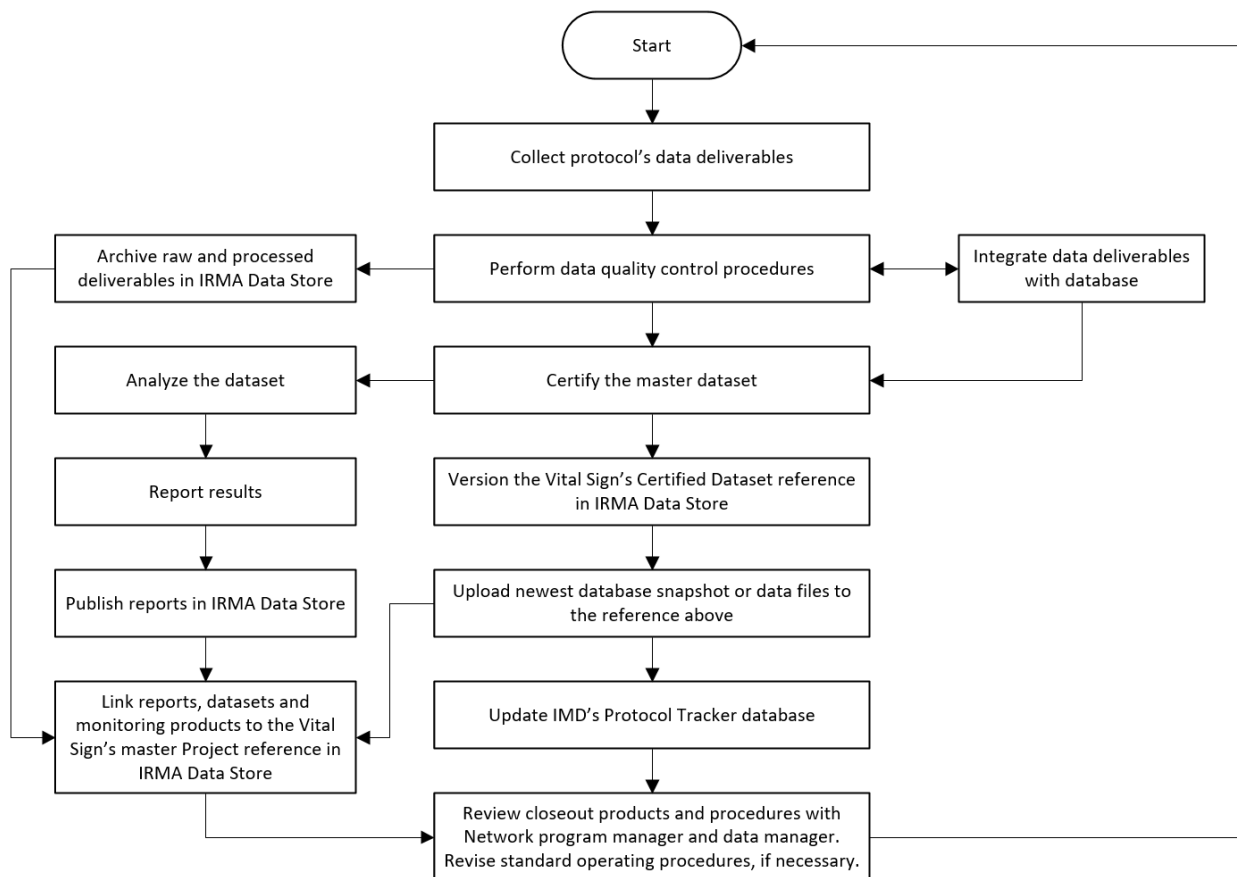


Figure 1. Caribou monitoring data management life cycle.

GPS Collar data

GPS Collar Data

GPS Collar data for the Chisana and Mentasta caribou herds is managed in the NPS Alaska Region's [Animal_Movement](#) database. The Animal_Movement database stores information about

- GPS collars and their specifications
- Collar deployments on animals
- Spatial data fixes over time

Important things to note about the GPS collar dataset and databases:

Because WRST caribou data management is divided between two databases (Animal_Movement and WRST_Caribou), it's important to understand certain things:

- The Animal_Movement database and the WRST_Caribou database manage information regarding the same animals. The AnimalID attribute is common between the two databases.
- Coherence of relationships between the two database based on AnimalID must be maintained manually; there are no automated functions to enforce constraints and relationships across the databases.
- Some of the Animal_Movement views (queries) are available virtually (through SQL Server Linked Table functions) through the WRST_Caribou database. Because of the physical distance between the SQL Servers, these views tend to be slow. To speed up querying, some of the Animal_Movement data is pulled into the WRST_Caribou database as temporary 'snapshot' tables. Such tables are prefixed by 'tmp'. These temporary tables are fast, but may not always have the latest data. To refresh the tempory, execute the spPullAMTables stored procedure.

A summary of the virtual versus temporary Animal_Movement tables in the WRST_Caribou database appears below (Table 3):

Table 3. Summary of virtual and temporary Animal_Movement database tables available through the WRST_Caribou database. Virtual tables allow access to Animal_Movement tables through the WRST_Caribou database. These tables are slow, but accurate. Temporary tables contain the same data as tables in Animal_Movement, but are snapshots in time, and need to be manually refreshed periodically.

Virtual database views (slow but accurate)	Temporary tables (fast, but require periodic refreshment via the spPullAMTables stored procedure)
Animals	tmpAnimals
CollarDeployments	tmpCollarDeployments
CollarFixes	tmpCollarFixes
Collars	tmpCollars

Data collection

Animal_Movement automates all aspects of automated GPS collar data collection. See the [Animal_Movement](#) documentation.

Quality control

Animal_Movement users can edit and access data through the front-end application available through the Alaska Region GIS team's X drive at X:\GIS\Apps\AnimalMovement. Contact the GIS team's liason for database access.

Dataset access

GPS collar data can be accessed via the Animal_Movement front-end application described above, or through GIS. See the Alaska Region's documentation for use of the Animal_Movement Application.

More advanced querying can be done by using SQL Server Management Studio, Microsoft Azure Data Studio, R/R Studio, ArcGIS Pro, QGIS or other data analysis tools. Such tools allow for sophisticated and powerful analyses, but are beyond the scope of this SOP. Contact the Central Alaska Inventory and Monitoring data manager for help in shaping datasets for specific analyses.

Database query examples

Because Animal_Movement is a generic GPS collar database, it does not have customized views (queries) to meet the needs of individual scientific programs. The section below has template queries you can use in SQL Server Management Studio/Azure Data Studio for extracting data from Animal_Movement to meet frequently repeated data needs. The list is not exhaustive, but should give an idea about how to retrieve data. The last example shows how to retrieve GPS locations for a caribou and show it in GIS.

Get a list of Animals

```
-- Get a list of Caribou in the Chisana and Mentasta herds
-- Modify the WHERE clause to restrict the herd,
-- or to retrieve data from one or more animals (example: WHERE AnimalID = 'CCH-00F-0461')
USE Animal_Movement
SELECT      ProjectId, AnimalId, Species, Gender, MortalityDate, GroupName, Description
FROM        Animals
WHERE       (ProjectId IN ('ChisanaCH', 'WRST_Caribou'))
ORDER BY   AnimalId
```

Get a list of currently deployed collars

```
-- Get a list of collars currently deployed in the field (alive, collar not retrieved or
disposed of)
USE Animal_Movement
SELECT      CollarDeployments.ProjectId, Collars.CollarId, Collars.Frequency,
CollarDeployments.AnimalId, CollarDeployments.DeploymentDate
FROM        CollarDeployments INNER JOIN
  Collars ON CollarDeployments.CollarManufacturer = Collars.CollarManufacturer AND
CollarDeployments.CollarId = Collars.CollarId INNER JOIN
  Animals ON CollarDeployments.ProjectId = Animals.ProjectId AND
CollarDeployments.AnimalId = Animals.AnimalId
WHERE
(CollarDeployments.ProjectId IN ('ChisanaCH', 'WRST_Caribou')) -- Restrict results to the
Chisana and Mentasta herds
AND Animals.MortalityDate IS NULL -- Animal on which the collar is deployed is alive
AND CollarDeployments.RetrievalDate IS NULL -- Collar must not be retrieved, still in
field.
AND Collars.DisposalDate IS NULL -- Collar has not been disposed.
ORDER BY   CollarDeployments.ProjectId, CollarDeployments.DeploymentDate
```

Get a list of collar deployments

```
-- This query returns a list of all collar deployments over time for the Chisana and
Mentasta caribou herds.
SELECT      CollarDeployments.ProjectId, Collars.CollarId, Collars.Frequency,
CollarDeployments.AnimalId, CollarDeployments.DeploymentDate, Animals.MortalityDate,
CollarDeployments.RetrievalDate, Collars.DisposalDate,
Collars.CollarManufacturer, Collars.CollarModel,
Collars.Manager, Collars.Owner, Collars.SerialNumber, Collars.HasGps, Collars.Notes
FROM        CollarDeployments INNER JOIN
  Collars ON CollarDeployments.CollarManufacturer =
```

```

Collars.CollarManufacturer AND CollarDeployments.CollarId = Collars.CollarId INNER JOIN
                        Animals ON CollarDeployments.ProjectId = Animals.ProjectId AND
CollarDeployments.AnimalId = Animals.AnimalId
WHERE      (CollarDeployments.ProjectId IN ('ChisanaCH', 'WRST_Caribou'))
ORDER BY CollarDeployments.ProjectId, Collars.CollarId

```

Get a spatial dataset of animal movements

-- This query returns all the movements of a certain animal over time

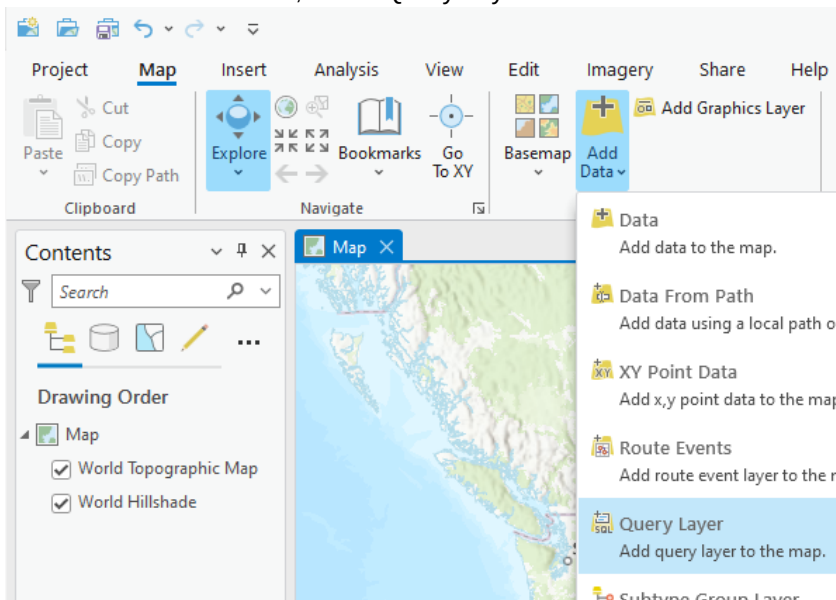
```

SELECT [FixId]
      ,[ProjectId]
      ,[AnimalId]
      ,[FixDate]
      ,[LocalDateTime]
      ,[Year]
      ,[OrdinalDate]
      ,[UnitCode]
      ,[Species]
      ,[Gender]
      ,[GroupName]
      ,[Shape]
      ,[Lat_WGS84]
      ,[Lon_WGS84]
FROM [Animal_Movement].[dbo].[ValidLocationsWithLatLong]
WHERE AnimalId = 'CCH-20F-B21'
-- And (DateDiff(DAY,LocalDateTime,getdate()) < 7) -- Uncomment to further filter
records from the last week only
ORDER BY LocalDateTime

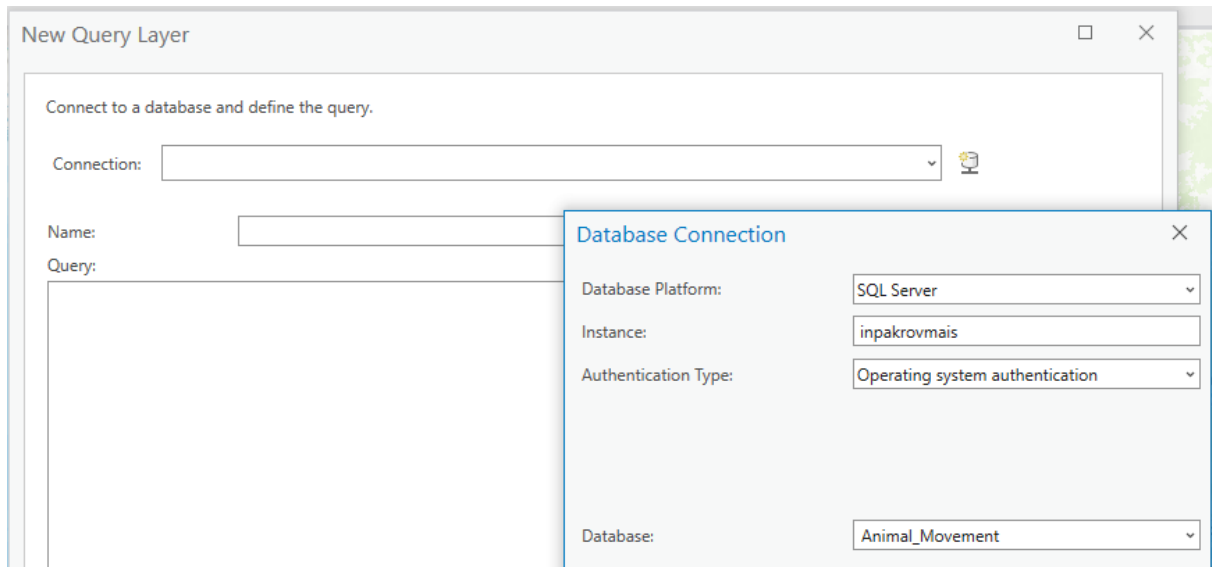
```

To show the results of the query above in ArcGIS do the following:

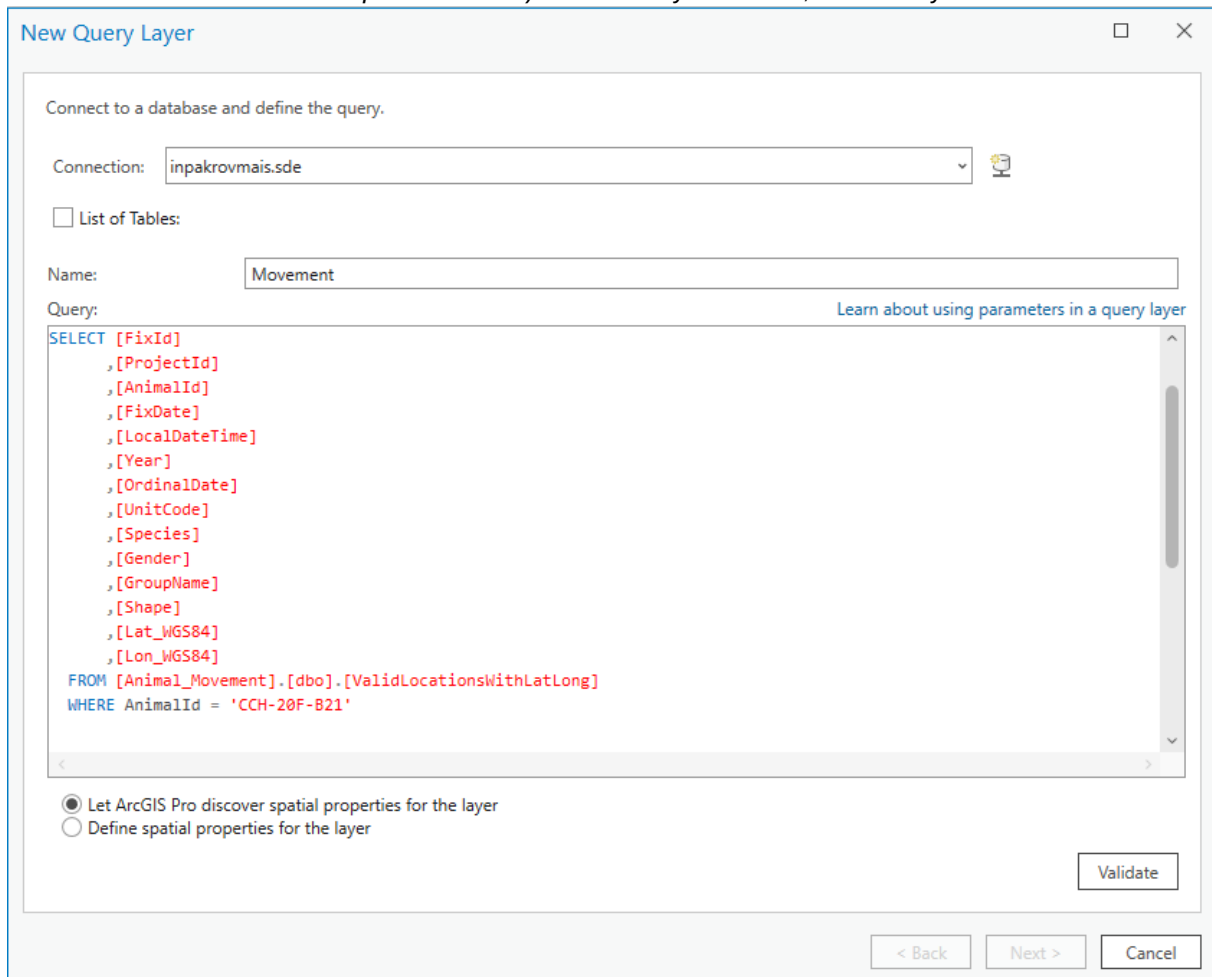
1. Open ArcGIS and create a map
2. From the Add Data menu, select Query Layer



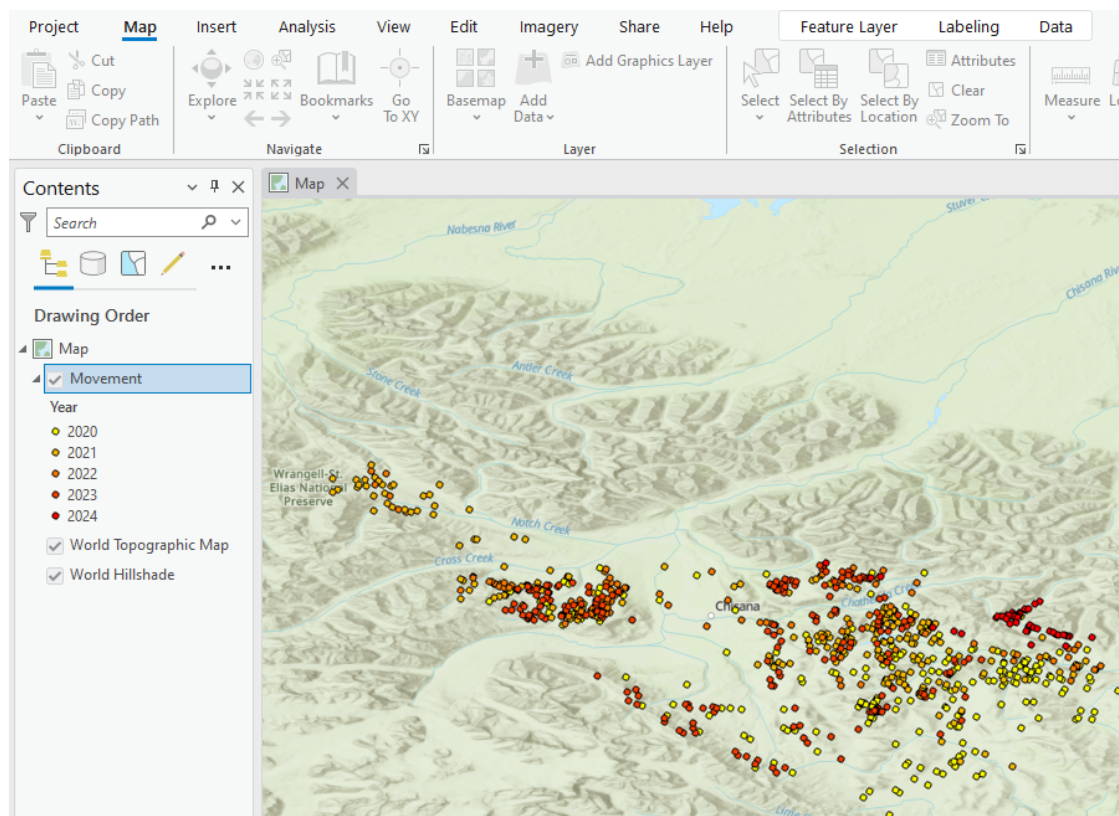
3. Enter the SQL Server, choose Operating system authentication and then choose the Animal_Movement database.



4. Copy the query from above into the New Query Layer dialog (NOTE: ArcGIS did not like the ORDER BY clause so I had to delete that optional clause). Give the layer a name, whatever you want.



5. Choose a unique identifier for each record. FixId is unique in the example.
6. Click Validate to ensure the query will work.
7. Click Next.
8. The data should load into the GIS:



Further reading

[Animal_Movement front-end application](#)

[Animal_Movement front-end application GitHub repository](#)

[Animal_Movement database connection details](#)

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Radiotracking surveys

Radiotracking surveys

Radiotracking surveys involve aerial flights over the park searching for GPS collared animals and recording attributes such as status (live/dead), calves at heel, number of animals in each group, etc. See [SOP #5](#) for more detailed information. The major annual tasks involved with managing radiotracking survey include:

- Creating a new standard data deliverables directory on the CAKN J drive to hold the latest [survey data deliverables](#).
- Creating [data deliverables](#).
- Integrating the data deliverables with the caribou monitoring database and the [IRMA Data Store](#).
- Running quality control procedures.

- Certifying the dataset.
- Publishing the data deliverables.
- Publishing the certified dataset.

Data Model

put the data model here

Important things to know about the radiotracking dataset:

- Radiotracking survey data is stored in the Radiotracking table of the WRST_Caribou database.
- GPS frequencies and collar and animal attributes are stored in the Animal_Movement database.
- After radiotracking data is integrated with the WRST_Caribou database all raw and processed radiotracking field survey deliverables must be archived in the IRMA Data Store at <https://irma.nps.gov/DataStore/Reference/Profile/2293883> with access privileges restricted to required personnel.
- Data deliverables may also be stored in the J:\Monitoring\Caribou\WRST\Data\Radiotracking Survey Data Files directories, but these directories should be regarded as a workbench for adding value until such time that the data are integrated with the database. Authoritative data always resides in the database and IRMA Data Store.
- Radiotracking.SurveyName attribute is sparsely populated and the relationship to the Surveys table is not enforced. Explanation: radiotracking surveys occasionally take more than one day to complete. In order to roll up statistics I needed to add a SurveyName column to the Radiotracking table in order to group results statistically. I quickly learned that, because WRST radiotracked so frequently in the 90s and early 2000s, it was difficult to determine which radiotracking survey days belonged to a single SurveyName, so that attribute remains (2024) sparsely populated and the relationship is not enforced at the database level. This may not be a problem since the ultimate objective is survivorship of caribou, not herd composition and abundance. The SurveyName attribute remains, but we will have to be revisited in the future.

Radiotracking survey data collection

Data collection for the WRST caribou monitoring program consists of fulfilling deliverables [CR-1 through CR-05 and/or MR-01 through MR-05](#). The data collection procedure below assumes the data are recorded on a paper data collection form and keypunched into a spreadsheet that is then imported into the WRST_Caribou database. Data may be collected on a field computer in which case there are no paper forms, or the data may be keypunched directly into the WRST_Caribou database in which case there will be no CR/MR-05 spreadsheet. All the deliverables are therefore optional, but regardless of which deliverables are generated all important files should be archived on the CAKN J drive and the IRMA Data Store.

Procedure

1. Start by creating a new directory to store anticipated new survey data in the CAKN J drive at J:\Monitoring\Caribou\WRST\Data. Date the directory with the date of the survey in YYYY-MM-DD format, the herd and type of survey following the general pattern of other directories. Example: J:\Monitoring\Caribou\WRST\Data\2022-09-30 Chisana Caribou Radiotracking Survey
2. Example:

ry Datapool\I&M\CAKN) (J:) > Monitoring > Caribou > WRST > Data > 2022-09-30 Chisana Radiotracking Survey	
Name	Date modified
 CR-05 2022-09-30 Chisana Caribou Radiotracking Sheet.csv	10/7/2022 1:51 PM
 CR-05 2022-09-30 Chisana Caribou Radiotracking Sheet.xlsx	10/11/2023 4:03 PM
 CR-05 2022-09-30 Chisana Caribou Radiotracking Sheet.xlsx.sql	10/11/2023 4:15 PM
 CR-05 2022-09-30 Chisana Caribou Radiotracking Sheet.xlsx.txt	10/7/2022 11:39 AM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.cpg	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.dbf	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.prj	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.sbn	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.sbx	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.shp	10/7/2022 12:01 PM
 CR-05_2022-09-30_Chisana_Caribou_Radiotracking_Sheet.shx	10/7/2022 12:01 PM
 DataStore - Tabular Dataset - (Code- 2293883)	7/5/2022 5:01 PM

3. Now [create the inventory of GPS collars](#). This inventory becomes deliverable C/MR-05.
4. Conduct the survey.
5. Enter the survey data into the data deliverable spreadsheet you created above (alternatively, enter it directly into the database using SQL Server Management Studio or similar tool).
6. Migrate the Lat/Lon coordinates from the GPS waypoints file, and any other ancillary details to the survey data spreadsheet, as needed.
7. Run visual checks, and cross reference everything to ensure the data in the deliverable are as good as they can be before database integration
8. Integrate the deliverable with the database using SQL Server Import Wizard or other tool or method.
9. Run quality control checks (below).

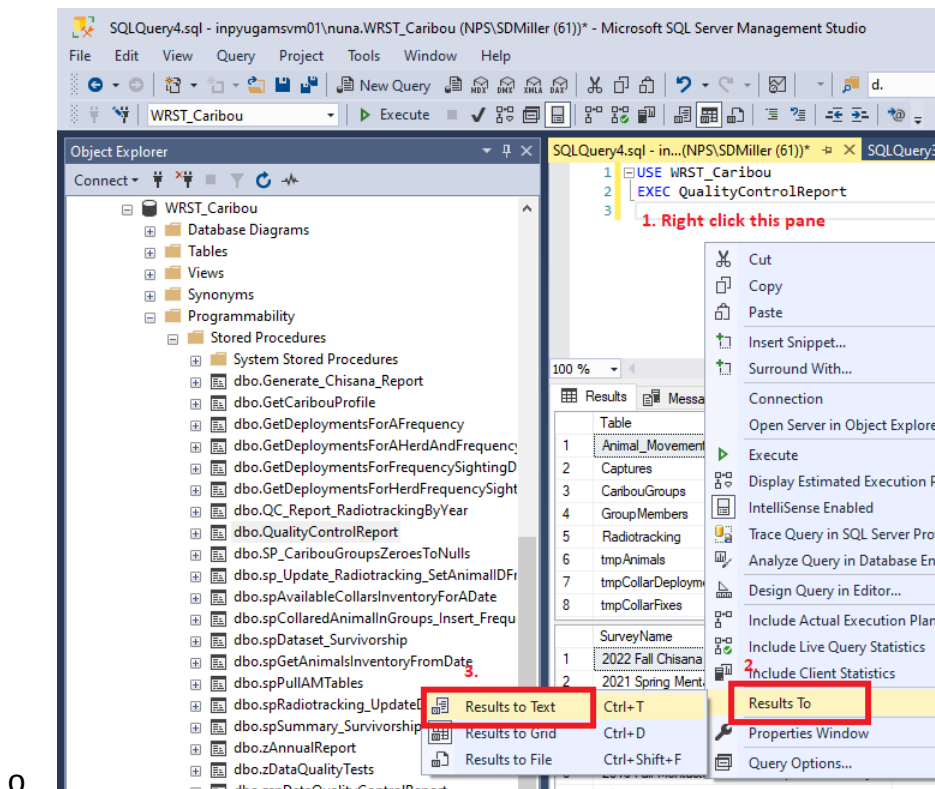
Quality Control

There are a number of quality assurance constraints 'built in' to the database as well as a number of quality control procedures that should be run after a survey data deliverable is integrated with the database. The most important one is a stored procedure called *dbo.QualityControlReport*. This stored procedure interrogates the database looking for problems and reports findings in a text report. No edits are made to the database. The stored procedure may be run as many times as needed.

Hint: You may run the report as described below, or you may find it more helpful to run certain parts of the report in an ad hoc fashion.

Procedure

- Log in to the WRST_Caribou database
- Open a new query file
- Type `USE WRST_Caribou`
- `EXEC QualityControlReport`
- For best results be sure to send the results to text:
 - Right click the file pane
 - Select Results To -> Results to Text



- Execute the procedure
- The stored procedure will output a report in text format consisting of dataset integrity checks and results. Examine the results, rectify problems and re-run the report until the results are satisfactory.
- Example of the QC report and results. RQC-4 tests for animal collar detections after the animal's reported mortality date. No result is no problem. RQC-5 suggests records having a mortality date significantly different than that in Animal_Movement. The description suggests why there might be a problem and how to rectify.

```
SQLQuery4.sql - in...(NPS\SDMiller (61))*  SQLQuery3.sql - in...(NPS\SDMiller (61))*  SQLQuery2.sql - in...(NPS\SDMiller (60))*  SQLQuery1.sql - in...(NPS\SDMiller (60))*
1 USE WRST_Caribou
2 EXEC QualityControlReport
3
```

100 %

Results

```
## RQC-4: Post-mortality sightings
The following records contain post-mortality animal observations
Herd    AnimalID    SightingDate    MortalityDate    DeploymentDate    RetrievalDate
-----

```

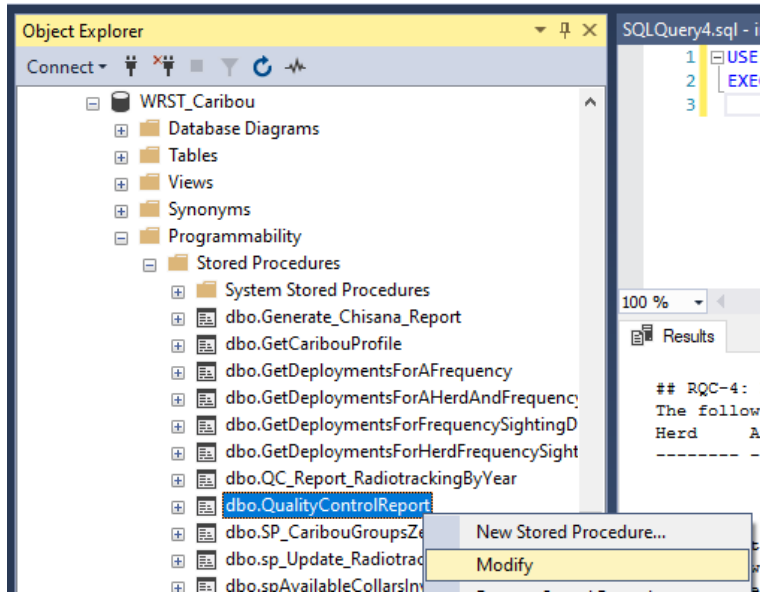
```
## RQC-5: Possible mortality date reconciliation problems between WRST_Caribou.Radiotracking and Animal_Movement.Animals.MortalityDate
Note: Mortality dates that differ by less than a day are ignored (modify the view to see these records).
The following view contains a list of dead animals from the Animal_Movement.Animals table.
Mortalities detected in field radiotracking surveys may have a radically different date.
The records below may show problems to investigate but some judgement may be needed, especially with older VHF collars where the animals
in the months between surveys and an exact mortality date is impossible to determine.
Also, GPS collar Lat/Lon data in Animal_Movement database is collected on the order of hours and will show the mortality date more accurately.
AnimalID    Mode    SightingDate    MortalityDate    DaysDifference    AM_Description
-----
MCH01146    M    2003-01-18 00:00:00.000    2016-06-27 20:00:00.0000000    4909    NULL
MCH01152    M    2002-08-15 00:00:00.000    2005-09-18 20:00:00.0000000    1130    NULL
MCH94002    M    2003-03-20 00:00:00.000    2003-11-13 20:00:00.0000000    238    NULL
CCH-20F-B51    M    2021-04-13 00:00:00.000    2021-05-24 07:00:00.0000000    41    NPS/MDCameron 7/20/2022
```

Alternative procedure

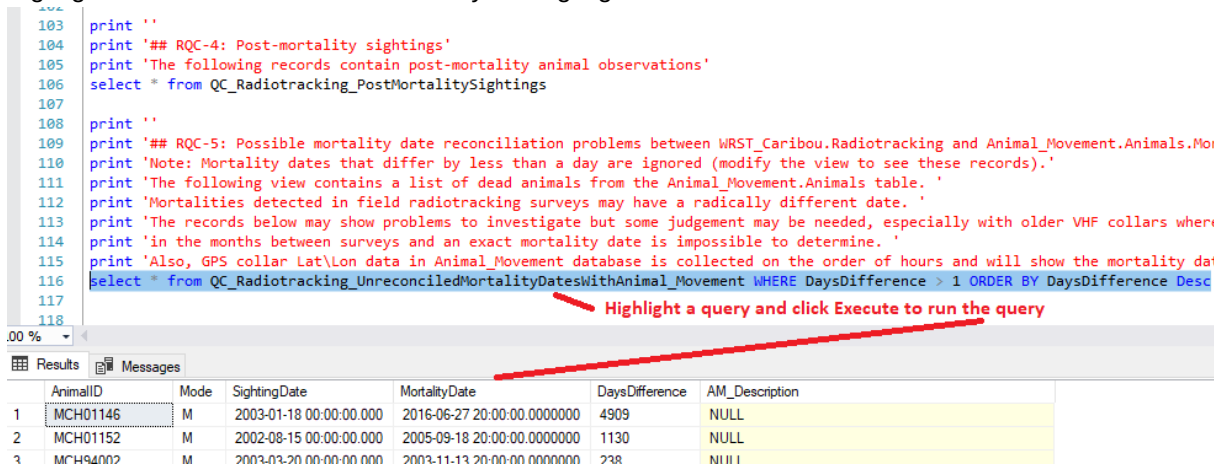
While the report can be useful sometimes it is overwhelming. To focus on one test at a time you may open the stored procedure and run queries singularly. Here's how:

- In SQL Server Management Studio, log into the WRST_Caribou database and expand the Stored Procedures node.

- Locate the dbo.QualityControlReport stored procedure, right click its node and select Modify:



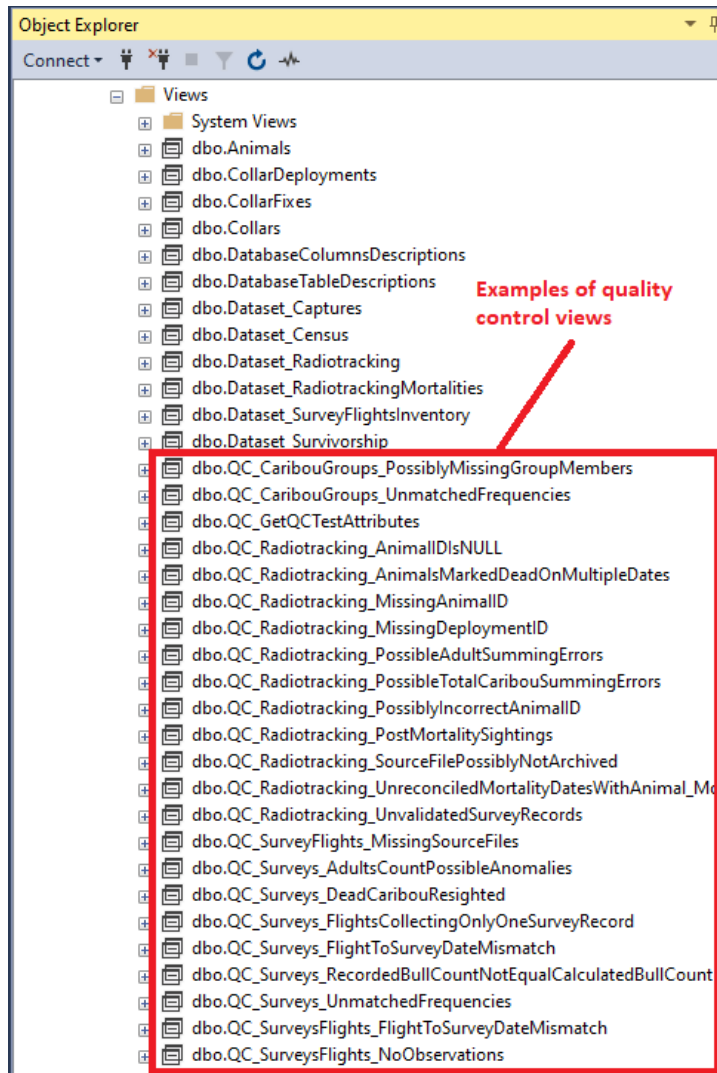
- Navigate to the section pertinent to the quality control test you want to run.
- Highlight the text and click Execute. Only the highlighted text will run.



Quality control views

Some data quality problems arise often enough that a view exists to show which records may have a problem. A convention exists in the database where such quality control views are prefixed by 'QC_', the table name to which the test pertains, an underbar, and a description of the procedure. Examples of quality control views are shown in Figure 2, below.

Figure 2. Database quality control views in the WRST_Caribou SQL Server database.



Dataset certification

When the radiotracking dataset is in a satisfactory condition it should be certified and published in the IRMA Data Store. Certification is done at the record level for the radiotracking dataset. Each record has a CertificationLevel, CertificationDate and CertifiedBy field to indicate the quality level of the record. There are three levels of certification in decreasing level of quality:

Certification Level Description

Certified	A data record that has been integrated from the field or a field data deliverable and exhaustive quality checks have been performed, a project leader has submitted and approved the record for database integration, and ancillary information such as original data collection forms or a report exists for validation and certification. Approved for analytical purposes.
Provisional	A data record that has been integrated from the field or a field data deliverable and basic quality checks have been performed or a project leader has submitted the record for database integration but little ancillary information such as original data collection forms or a report exists for validation. Approved for analytical purposes but undocumented data defects may exist that may require future retraction or re-issuance of results (buyer beware).
Raw	A data record that has been integrated directly from the field or a field data deliverable and no quality checks have been performed. Not approved for analytical purposes.

Certification objective

Certify a subset of records in the WRST_Caribou.Radiotracking table pertaining to a radiotracking survey.

NOTE: It is critically important that any queries that change certification attributes be correctly filtered to avoid certifying records that should not be certified and vice versa. There are no database constraints at this time to prevent such errors.

Also note: Once a record is tagged *CertificationLevel*='Certified', then that record is frozen by a database trigger (Radiotracking_CertifiedRecordsCheckTrigger) and may not be edited again.

Certification procedure

- Ensure all the records to be certified are of highest quality possible with defects documented in the QCComment attribute.
- Begin by developing a filter on just the records to be certified. An example query:
- `SELECT * FROM Radiotracking WHERE (CertificationLevel <> 'Certified') And (Herd = 'Chisana') AND (CONVERT(Date, SightingDate) = '2022-09-30') ORDER BY SightingDate`
- Execute the query to ensure the records to be updated are targeted correctly and are not already certified. Make note of the number of records.
- Write an UPDATE query with the same, proven filter from above. It is also good to wrap the update query in a transaction in case there is an unanticipated error. Example:

```
USE WRST_Caribou
-- Open a transaction and attempt to update the records. Execute COMMIT if all goes well.
ROLLBACK to undo.
BEGIN TRANSACTION -- COMMIT ROLLBACK
UPDATE Radiotracking SET CertificationLevel = 'Certified', CertificationDate =
GETDATE(), CertifiedBy = SUSER_NAME() WHERE (CertificationLevel <> 'Certified') And (Herd
= 'Chisana') AND (CONVERT(Date, SightingDate) = '2022-09-30')
```

- Execute the UPDATE query and if all went well and the number of records affected is correct then issue COMMIT to commit the changes to the database. If there was a problem then execute ROLLBACK to undo the changes.

NOTE: It may be that you want to upgrade the records' CertificationLevel from 'Raw' to 'Provisional'. The procedure is the same except CertificationLevel will be 'Provisional', but CertificationDate and CertifiedBy should be set NULL in such a case.

Radiotracking analytical dataset

Use the *Dataset_Radiotracking* view for analysis. This view combines all the animal observations from composition, population and radiotracking surveys in the WRST_Caribou database, as well as GPS collaring and de-collaring events, and mortality dates from the Animal_Movement database into a single tabular dataset.

Dataset documentation and publication

NOTE: [WRST caribou monitoring data may be considered sensitive.](#)

Certified (and provisional) data are made available at
<https://irma.nps.gov/DataStore/Reference/Profile/2302203>

Procedure

- Export Dataset_Radiotracking view to Excel/CSV
 - In SSMS select all the records in the *Dataset_Radiotracking* view: `SELECT * FROM [WRST_Caribou].[dbo].[Dataset_Radiotracking] order by Herd, AnimalID, SightingDate`
 - Copy all the resulting records into an Excel workbook. Name and save the workbook following

this example *2023-10-03 WRST Caribou Radiotracking Dataset.xlsx*.

- Save the workbook as a Comma Separated Values text file with the same name but append .csv on the end.
- Open <https://irma.nps.gov/DataStore/Reference/Profile/2302203> and [version it](#).
- Update the metadata in the new, versioned Dataset reference.
- Upload the new radiotracking file.
- Ensure the other data files are also uploaded/up to date and available.
- Ensure the Reference's [permissions are set correctly](#) to NPS-internal/Selected individuals.
- Generate Data Release Report to describe the dataset, processing steps and data defects.

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Composition/Population Surveys

Census surveys

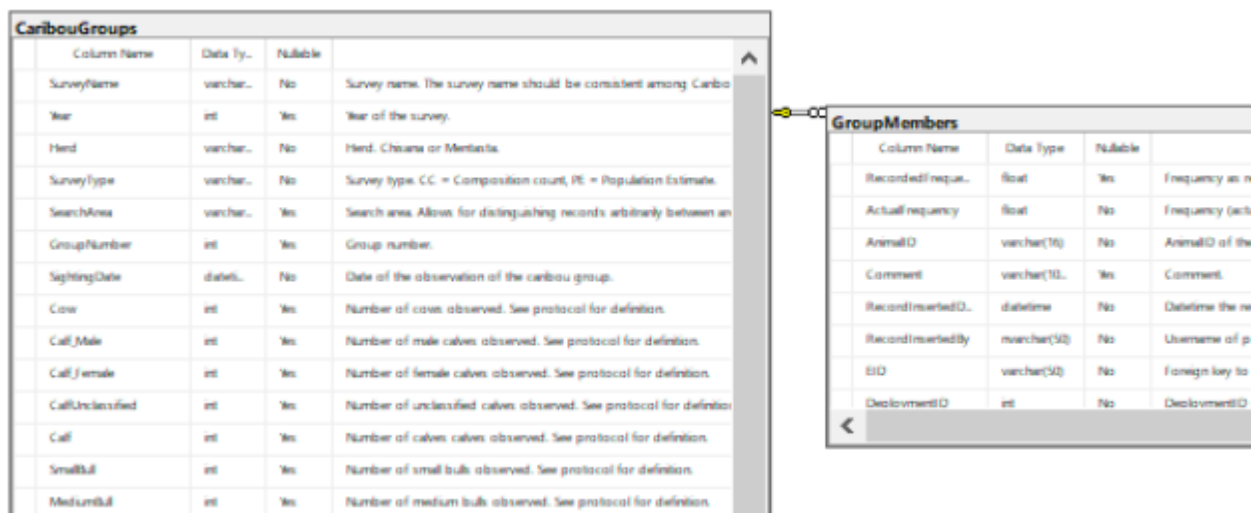
Census surveys consist of aerial herd composition and population surveys. Observers locate caribou groups and record attributes about the group such as sex, age and size classes and group size, as well as any GPS collared animals in the group ([SOP #4](#)). Since radiotelemetry is used during census surveys radiotracking data is picked up opportunistically and stored in the GroupMembers table. These data are combined with the data from the Radiotracking table to generate the Dataset_Radiotracking view.

Data model (replace diagram with addedSurveys table)

Overview

The data model for census surveys is shown in Figure 3, below. The CaribouGroups table stored information about each caribou group observed during a population or composition count survey. The related GroupMembers table stores information about each collared animal detected in the group via GPS or VHF collar telemetry. The two tables are related on their shared EID attributes.

Figure 3. Simplified census surveys data model (diagram available in the WRST_Caribou database).



Collar frequencies management

An explanation of the data flow through the data model diagram below goes as follows: During each survey observers record the attributes of all caribou groups they observe and these attributes destined for a record

in the CaribouGroups table. For any CaribouGroup record, any GPS or VHF frequencies detected are recorded as comma separated values in the FrequenciesInGroup field. These frequencies are later converted to AnimalIDs by looking them up in the Animal_Movement database, one by one, based on the Herd, SightingDate and Frequency values. The AnimalID, if found, is inserted into a related GroupMembers record. CaribouGroups/GroupMembers are related on the EID field.

```

1 SELECT SurveyName, Year, Herd, SightingDate, FrequenciesInGroup, EID, Calf, Cow, Bull
2 FROM CaribouGroups
3 WHERE EID = '2b477a0c-ca45-4a70-b790-b2e992edf9ef'
4 ORDER BY SurveyName DESC
5
6 SELECT ActualFrequency, AnimalID, EID
7 FROM GroupMembers
8 WHERE (EID = '2b477a0c-ca45-4a70-b790-b2e992edf9ef')

```

SurveyName	Year	Herd	SightingDate	FrequenciesInGroup	EID	Calf	Cow	Bull
2022 Fall Chisana Caribou Composition Survey	2022	Chisana	2022-10-14 00:00:00.000	152.55,151.84	2b477a0c-ca45-4a70-b790-b2e992edf9ef	NULL	2	NU

ActualFrequency	AnimalID	EID
151.84	CCH-21F-B44	2b477a0c-ca45-4a70-b790-b2e992edf9ef
152.55	CCH-21F-B53	2b477a0c-ca45-4a70-b790-b2e992edf9ef

Figure 4. A visual example of the relationship between caribou groups and group members in the WRST_Caribou database. Frequencies detected in the field are entered into the CaribouGroups.FrequenciesInGroup attribute as comma separated values. These frequencies are translated to AnimalIDs in post-processing and inserted into the GroupMembers table. The parent/foreign key is EID. In the example two collar frequencies were detected during the survey and translated to AnimalIDs and inserted into the GroupMembers table.

Data collection

Data collection is a matter of fulfilling the [list of deliverables](#) related to population and/or composition count surveys. The major product of data collection is a spreadsheet of survey data (Deliverable CC-05/MC-05 for composition surveys or CP-05/MP-05 for population surveys. C=Chisana, M=Mentasta). See the deliverables schedule for other deliverables such as paper and scans of field data collection forms, waypoint and tracklog files, etc. Many of these deliverables are optional.

Population survey data collection

Procedure

do everything in sop 4
 get inventory of available collars to look for
 build the survey data sheet - use frequencies or animalids, avoid shortcut notation that makes it difficult to translate frequencies to animals
 save the survey sheet on the J in the correct directory
 import the data
 quality control
 analyze/report
 certify
 publish dataset

Start by creating a directory to hold the data deliverables for the planned survey in the WRST caribou monitoring shared drive at J:\Monitoring\Caribou\WRST\Data\Population Survey Data Files\Chisana or J:\Monitoring\Caribou\WRST\Data\Population Survey Data Files\Mentasta, depending on the herd targeted.

Composition count survey data collection

Procedure

do everything in sop 4

get inventory of available collars to look for
 build the survey data sheet - use frequencies or animalids, avoid shortcut notation that makes it difficult to
 translate frequencies to animals
 save the survey sheet on the J in the correct directory
 import the data
 quality control
 analyze/report
 certify
 publish dataset

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Get an inventory of collars

Get an inventory of collars

Getting an inventory of available collars is a critical part of all aerial survey events. This collar inventory represents deliverable C/MR-05 for radiotracking surveys. The collar inventory is not a deliverable for population and composition surveys but will be needed for locating caribou groups in the field and providing 'marked' groups for determining sightability. Animals, collars and collar deployments are stored in the AK Region's Animal_Movement database. You will need to execute a specific query to extract a list of collars that are available in the field, as described below.

Procedure

1. Start by creating a new directory for the survey deliverables at J:\Monitoring\Caribou\WRST\Data. Name the directory with the date in YYYY-MM-DD format, followed by the caribou herd, followed by the survey type. Example: \2022-09-30 Chisana Radiotracking Survey. Use existing directories as a naming pattern.
2. Start SQL Server Management Studio.
3. Log into the [Animal_Movement database](#) (contact the AK GIS team data manager if you require permissions on the database).
4. Modify and execute the following query to suit your radiotracking survey needs. Remove the unneeded herd from the WHERE clause. The query result becomes Deliverable CR-05/MR-05:

```

SELECT Animals.ProjectId, Collars.Frequency, Animals.AnimalId
, NULL AS [Herd]
, NULL AS [SightingDate]
, NULL AS [AnimalID]
, NULL AS [Frequency]
, NULL AS [Vis]
, NULL AS [GroupNumber]
, NULL AS [Mode]
, NULL AS [Accuracy]
, NULL AS [Bull]
, NULL AS [Cow]
, NULL AS [Calf]
, NULL AS [Adult]
, NULL AS [GroupSize]
, NULL AS [RetainedAntler]
, NULL AS [CalfStat]
, NULL AS [Pregnant]
, NULL AS [Location]
  
```

```

,NULL As [Class]
--,NULL As [HabClass]
--,NULL As [ForCov]
--,NULL As [Topog]
,NULL As [Snow]
,NULL As [SnowCov]
,NULL As [Crater]
,NULL As [CraterComment]
,NULL As [Elev_m]
,NULL As [Lat]
,NULL As [Lon]
,NULL As [Observer]
,NULL As [Pilot]
,NULL As [TailNo]
,NULL As [Comment]
,NULL As [Waypoint]
, Animals.Species, Animals.Gender, CollarDeployments.DeploymentDate,
Animals.MortalityDate, CollarDeployments.RetrievalDate, Collars.DisposalDate,
Collars.Owner, Collars.CollarModel, Collars.HasGps, Collars.SerialNumber,
Collars.Manager, Collars.CollarManufacturer, Collars.CollarId, Collars.Notes FROM Animals
INNER JOIN CollarDeployments ON Animals.ProjectId = CollarDeployments.ProjectId AND
Animals.AnimalId = CollarDeployments.AnimalId INNER JOIN Collars ON
CollarDeployments.CollarManufacturer = Collars.CollarManufacturer AND
CollarDeployments.CollarId = Collars.CollarId
WHERE (Animals.ProjectId IN ('ChisanaCH', 'WRST_Caribou')) -- ChisanaCH = Chisana herd,
WRST_Caribou = Mentasta herd
AND (GETDATE() >= CollarDeployments.DeploymentDate) -- Collar must be deployed
AND (GETDATE() <= ISNULL(Animals.MortalityDate,GETDATE())) -- Animal must be alive at the
time this query is run
AND (GETDATE() <= ISNULL(CollarDeployments.RetrievalDate,GETDATE())) -- Collar must not
be retrieved at the time this query is run
AND (GETDATE() <= ISNULL(Collars.DisposalDate,GETDATE())) -- Collar must not be disposed
of at the time this query is run
ORDER BY ProjectId, Collars.Frequency

```

5. Execute the above query and save the results as an Excel spreadsheet. Right-click the upper left corner and select 'Copy with Headers...'

The screenshot shows the Microsoft SQL Server Management Studio interface. The query window displays a SQL query to retrieve collar deployment data. The Results pane shows a table with columns: ProjectId, Frequency, AnimalId, Herd, SightingDate, AnimalID, Frequency, Vis, GroupNumber, Mode, Accuracy, and Bull. The first two rows of data are highlighted, and a context menu is open over the first row, with 'Copy with Headers' selected.

ProjectId	Frequency	AnimalId	Herd	SightingDate	AnimalID	Frequency	Vis	GroupNumber	Mode	Accuracy	Bull
ChisanaCH	150.37	CCH-21F-B35	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
ChisanaCH	150.396	CCH-20F-B03	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

1. Open Excel and paste the records into a new worksheet.
3. If you are preparing for a radiotracking survey then name the worksheet *CR-05IMR-05 YYYY-MM-DD Radiotracking Survey Data.xlsx*. For other survey types give the workbook an informative file name.

4. Save the workbook to the directory created at the beginning of this procedure.
6. It's also a good idea to cross reference the frequencies in the worksheet above against the last survey and reconcile any problems.
7. Past project leaders have made lists of field frequencies in Excel which is fine but Animal_Movement should be maintained as it is the authoritative source for collar management.

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Capture data

Capture data

Caribou are captured in order to put GPS collars on them. Information about the capture event and each captured caribou's attributes is stored in the Captures table.

[As of 2023, the WRST_Caribou database has accommodated capture data in the Captures data table, however capture data is, except for 2009, still missing - an effort should be made to recover it from the Park and previous project personnel.]

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Population estimates from the literature

Population estimates from the literature

NPS does not have all the field-collected data for every caribou survey that has been done. Historical population estimates for such surveys must therefore be mined from the literature. These estimates, and related herd metrics, have a home in the Report/Results module of the WRST_Caribou database.

The Reports and Results database tables were created in 2024 to assist in validating the data in old data files as they were imported into the WRST_Caribou databases. The goal was to assemble in one location information about important reports and the herd metrics reported in them. The results module was created during the dataset validation project, 2023. In order to validate the data from surveys I needed to look up historical results in various reports. Since these historical results would be required for further reports down the road, it made sense to put them in the database and document them.

Warning: as of 2024 the thinking and execution of this module is very rough and unfinished.

Data model

The Reports and Results database module consists of two tables:

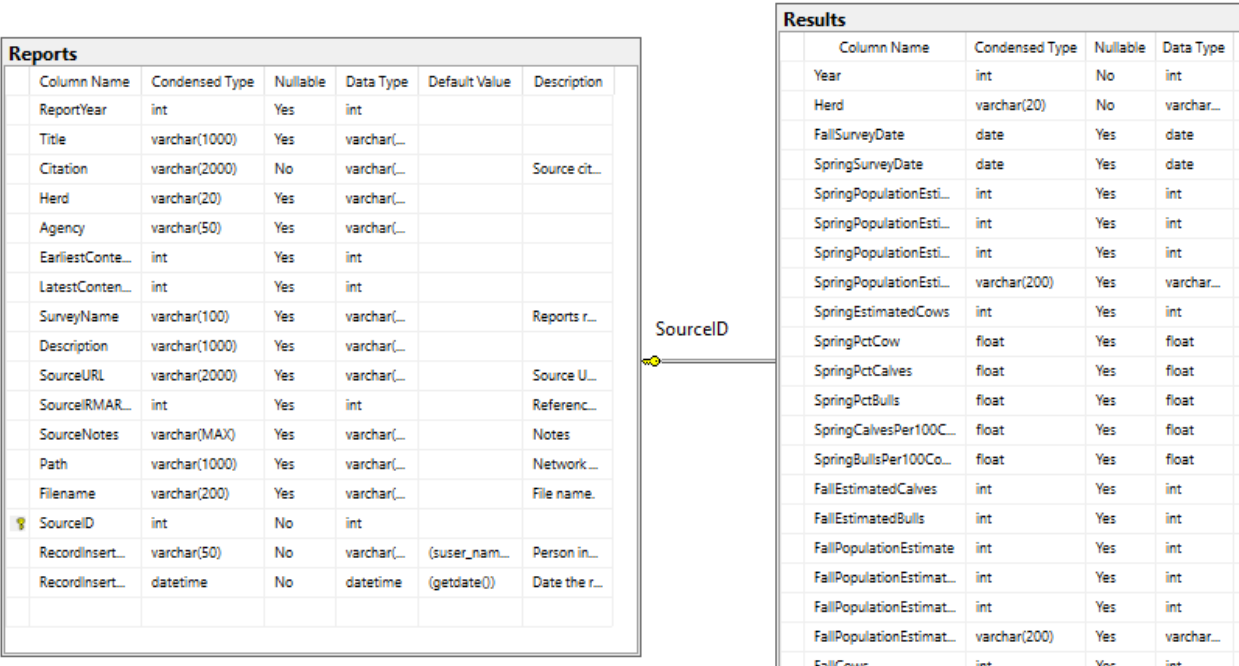
Reports: Information about important reports written about the Chisana and Mentasta caribou herds, and where to access them.

Results: Herd metrics reported in reports, such as population estimates, lower and upper confidence intervals, sex and age ratios, etc.

The two tables are related on SourceID.

The results module was created during the dataset validation project, 2023. In order to validate the data from surveys I needed to look up historical results in various reports. Since these historical results would be required for further reports down the road, it made sense to put them in the database and document them.

Warning: as of 2024 the thinking and execution of this module is very rough and unfinished.



Data access

A flattened view of report metrics is available through the LiteratureResults view.:

Dataset validation and quality control

Results reported in the literature provide a good quality control check for validating old surveys.

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Exporting data for analysis

Analysis

This section of the data management SOP describes processes for accessing data and database-generated summaries. In-depth analysis is covered elsewhere in the protocol and SOPs.

Radiotracking surveys dataset

[to be written]

Survivorship (radiotracking surveys only)

[to be written]

Survivorship (combined radiotracking, Animal_Movement and opportunistic census surveys data)

The Dataset_AnimalObservations view assembles all known caribou observations from the WRST_Caribou and Animal_Movement databases into one flat file for analysis. These records are pulled from 1. radiotracking surveys, 2. composition and population estimate surveys and 3. animal collarings and mortality dates as recorded in Animal_Movement.

The process for publishing the animal observations dataset is not fully fleshed out. Currently:

- Create a new, dated directory at J:\Monitoring\Caribou\WRST\Data\Dataset publications
- In SSMS, execute the Dataset_AnimalObservations view
- Copy the data, with headers into an Excel sheet in the directory created above
- Include a text file with any documentation that might be needed

In the future these sorts of exports will go into Data Store with EML metadata as Data Package reference types.

Population and composition surveys dataset

Herd composition

Population estimates

GPS collar data

Animal_Movement

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Appendix A: Field data deliverables

Field data deliverables

The caribou monitoring program at WRST will collect the following field data deliverables.

Identifier	Deliverable	Schedule
CC-01	Chisana composition count survey completed paper data collection forms	Sample date +1 year
CC-02	Chisana composition count survey scanned data forms	Sample date +1 year
CC-03	Chisana composition count survey waypoints file	Sample date +1 year
CC-04	Chisana composition count survey tracklog file	Sample date +1 year
CC-05	Chisana composition count survey digitized field data	Remeasurement +1 year

CP-01	Chisana population survey paper completed data collection forms	Sample date +1 year
CP-02	Chisana population survey scanned data forms	Sample date +1 year
CP-03	Chisana population survey waypoints file	Sample date +1 year
CP-04	Chisana population survey tracklog file	Sample date +1 year
CP-05	Chisana population survey digitized field data.	Remeasurement +1 year
CPT-01	Caribou capture paper data sheets	Sample date +1 year
CPT-02	Caribou capture data sheet scans	Sample date +1 year
CPT-03	Caribou capture photographs	Sample date +1 year
CPT-04	Caribou capture specimens, swabs, blood, hair, etc.	Sample date +1 year
CPT-05	Caribou capture standard body measurements	Sample date +1 year
CPT-06	Blood sample analysis results	Sample date +1 year
CR-01	Chisana radiotracking survey completed paper data collection forms	Sample date +1 year
CR-02	Chisana radiotracking survey scanned data forms	Sample date +1 year
CR-03	Chisana radiotracking survey waypoints file	Sample date +1 year
CR-04	Chisana radiotracking survey tracklog file	Sample date +1 year
CR-05	Chisana radiotracking survey digitized field data	Remeasurement +1 year
MC-01	Mentasta composition count survey completed paper data collection forms	Sample date +1 year
MC-02	Mentasta composition count survey scanned data forms	Sample date +1 year
MC-03	Mentasta composition count survey waypoints file	Sample date +1 year
MC-04	Mentasta composition count survey tracklog file	Sample date +1 year
MC-05	Mentasta composition count survey digitized field data	Remeasurement +1 year
MP-01	Mentasta population survey completed paper data collection forms	Sample date +1 year
MP-02	Mentasta population count survey scanned data forms	Sample date +1 year

MP-03	Mentasta population survey waypoints file	Sample date +1 year
MP-04	Mentasta population survey tracklog file	Sample date +1 year
MP-05	Mentasta population survey digitized field data	Remeasurement +1 year
MR-01	Mentasta radiotracking survey completed paper data collection forms	Sample date +1 year
MR-02	Mentasta radiotracking survey scanned data forms	Sample date +1 year
MR-03	Mentasta radiotracking survey waypoints file	Sample date +1 year
MR-04	Mentasta radiotracking survey tracklog file	Sample date +1 year
MR-05	Mentasta radiotracking survey digitized field data	Remeasurement +1 year
WC-01	Certified dataset	Sample date +1 year

Deliverable Specifications

CC-01 Chisana composition count survey completed paper data collection forms

SOP: 5

SOP Version: 1.00

Format: Completed paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Completed paper field data collection forms, with annotations.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

CC-02 Chisana composition count survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable CC-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CC-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or CC-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable CC-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CC-03 Chisana composition count survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CC-03 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CC-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable CC-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CC-04 Chisana composition count survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CC-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CC-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable CC-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CC-05 Chisana composition count survey digitized field data

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata.

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: CC-05_YYYY-MM-DD_FieldData.csv

Archival:

CP-01 Chisana population survey paper completed data collection forms

SOP: 5

SOP Version: 1.00

Format: Completed paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Completed paper field data collection forms, with annotations.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

CP-02 Chisana population survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable CP-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CP-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or CP-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable CP-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CP-03 Chisana population survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey.

WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CP-03 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CP-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable CP-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CP-04 Chisana population survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CP-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CP-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable CP-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CP-05 Chisana population survey digitized field data.

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: CP-05_YYYY-MM-DD_FieldData.csv

Archival:

CPT-01 Caribou capture paper data sheets

SOP: 5

SOP Version: 1.00

Format: Paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Paper data collection forms.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

CPT-02 Caribou capture data sheet scans

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable CPT-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: Files will be named according to the following scheme: "CPT-01_YYYY-MM-DD_WRST_Caribou_CaptureDataForms.pdf" where YYYY-MM-DD represents the date the caribou capturing campaign began.

Archival: Deliverable CPT-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CPT-03 Caribou capture photographs

SOP: 5

SOP Version: 1.00

Format: Images in JPEG, JPG or TIFF format

Schedule: Sample date +1 year

Responsibility: PI

Description: Image files with metadata. JPEG, JPG or TIFF format.

Specifications: Deliverable CPT-03 will be in Tag Image File Format. Image files may be delivered in a zip archive.

FileNamingScheme: Image files are named according to the following scheme: "CPT-02_YYYY-MM-DD_WRST_Caribou_CaptureImage-XXX.jpg" where YYYY-MM-DD represents the date the image was captured and XXX is a sequentially increasing number.

Archival: Deliverable CPT-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CPT-04 Caribou capture specimens, swabs, blood, hair, etc.

SOP: 5
SOP Version: 1.00
Format: Physical specimens
Schedule: Sample date +1 year
Responsibility: PI
Description: Physical specimens with inventory, metadata
Specifications:
FileNamingScheme: N/A
Archival:

CPT-05 Caribou capture standard body measurements

SOP: 5
SOP Version: 1.00
Format: Comma separated values text file, with metadata
Schedule: Sample date +1 year
Responsibility: PI
Description: Standard body measurements of caribou captured for collaring.
<http://caff.is/resources/field-protocols>
Specifications: Deliverable CPT-05 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.
FileNamingScheme: CPT-05 Std body measurements.csv
Archival: Deliverable CPT-05 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CPT-06 Blood sample analysis results

SOP: 5
SOP Version: 1.00
Format: Results as received from lab. Human/machine readable transformations. Metadata.
Schedule: Sample date +1 year
Responsibility: PI
Description: Blood sample analysis results as received from the laboratory. Copies of results transformed from proprietary formats into human/machine readable formats such as Comma separated values text files. All formats will include descriptive metadata.
Specifications: Deliverable CPT-06 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.
FileNamingScheme: CPT-06 Blood sample results.csv
Archival: Deliverable CPT-06 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CR-01 Chisana radiotracking survey completed paper data collection forms

SOP: 5
SOP Version: 1.00
Format: Completed paper data collection forms
Schedule: Sample date +1 year
Responsibility: PI
Description: Completed paper field data collection forms, with annotations.
Specifications: Paper data forms. Legible with markup.
FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

CR-02 Chisana radiotracking survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable CR-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CR-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or CR-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable CR-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CR-03 Chisana radiotracking survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey.

WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CR-03 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CR-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable CR-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CR-04 Chisana radiotracking survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable CR-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: CR-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable CR-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

CR-05 Chisana radiotracking survey digitized field data

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: CR-05_YYYY-MM-DD_FieldData.csv

Archival:

MC-01 Mentasta composition count survey completed paper data collection forms

SOP: 5

SOP Version: 1.00

Format: Completed paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Completed paper field data collection forms, with annotations.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

MC-02 Mentasta composition count survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable MC-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MC-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or MC-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable MC-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MC-03 Mentasta composition count survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MC-03 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MC-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable MC-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MC-04 Mentasta composition count survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84

Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MC-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MC-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable MC-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MC-05 Mentasta composition count survey digitized field data

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: MC-05_YYYY-MM-DD_FieldData.csv

Archival:

MP-01 Mentasta population survey completed paper data collection forms

SOP: 5

SOP Version: 1.00

Format: Completed paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Completed paper field data collection forms, with annotations.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

MP-02 Mentasta population count survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable MP-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MP-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or MP-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable MP-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MP-03 Mentasta population survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey.

WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MP-03 will be delivered in human and machine readable (comma

separated values) text file format. Metadata is required.

FileNamingScheme: MP-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable MP-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MP-04 Mentasta population survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MP-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MP-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable MP-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MP-05 Mentasta population survey digitized field data

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: MP-05_YYYY-MM-DD_FieldData.csv

Archival:

MR-01 Mentasta radiotracking survey completed paper data collection forms

SOP: 5

SOP Version: 1.00

Format: Completed paper data collection forms

Schedule: Sample date +1 year

Responsibility: PI

Description: Completed paper field data collection forms, with annotations.

Specifications: Paper data forms. Legible with markup.

FileNamingScheme: N/A

Archival: Filed with project leader in fireproof safe.

MR-02 Mentasta radiotracking survey scanned data forms

SOP: 5

SOP Version: 1.00

Format: Portable Document File (PDF) or Tag Image File Format (TIFF)

Schedule: Sample date +1 year

Responsibility: PI

Description: Data sheet scans. Portable Document File (PDF) or Tag Image File Format (TIFF)

Specifications: Deliverable MR-02 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MR-02_YYYY-MM-DD_Chisana composition count survey scanned data forms.pdf or MR-02_YYYY-MM-DD_TAILNO_Chisana composition count survey scanned data form.tif(f).

Archival: Deliverable MR-02 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MR-03 Mentasta radiotracking survey waypoints file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS waypoints collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MR-03 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MR-03_YYYY-MM-DD_Waypoints.csv

Archival: Deliverable MR-03 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MR-04 Mentasta radiotracking survey tracklog file

SOP: 5

SOP Version: 1.00

Format: Comma separated values text file, with metadata

Schedule: Sample date +1 year

Responsibility: PI

Description: Comma separated values text file of GPS tracklog collected during aerial survey. WGS84 Geographic Coordinate System (Lat/Lon).

Specifications: Deliverable MR-04 will be delivered in human and machine readable (comma separated values) text file format. Metadata is required.

FileNamingScheme: MR-04_YYYY-MM-DD_Tracklog.csv

Archival: Deliverable MR-04 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

MR-05 Mentasta radiotracking survey digitized field data

SOP: 5

SOP Version: 0.00

Format: Comma separated values text file, with metadata

Schedule: Remeasurement +1 year

Responsibility: PI

Description: Digitized field data transcribed from data collection forms. Not required if field data is transcribed directly into the master monitoring database.

Specifications: Human and machine readable text file format.

FileNamingScheme: MR-05_YYYY-MM-DD_FieldData.csv

Archival:

WC-01 Certified dataset

SOP:

SOP Version:

Format: Human/Machine readable database export file, with metadata

Schedule: Sample date +1 year

Responsibility: DM

Description: The WRST caribou certified dataset consists of one or more human and machine readable text files representing the releasable portions of the master monitoring database, including embedded metadata.

Specifications: Deliverable WC-01 will be delivered in human and machine readable (comma

separated values) text file format. Metadata is required.
FileNamingScheme: Suggested file naming scheme includes the database snapshot date and descriptive title. Example: YYYY-MM-DD_WRST_CaribouCertifiedDataset.sql
Archival: Deliverable WC-01 will be uploaded as a holding of a field data deliverables Dataset reference in the IRMA Data Store.

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Appendix B: Database connection details

Database connection details

WRST_Caribou

Database	SQL Server	Database name
Animal Movement	INPAKROVMAIS	Animal_Movement
WRST Caribou monitoring	inpyugamsvm01\nuna	WRST_Caribou

Animal Movement

Database connection details

Database	SQL Server	Database name
Animal Movement	INPAKROVMAIS	Animal_Movement

White paper

[Animal Movement Version 1.0.pdf](#)

Front end application

X:\GIS\Apps\AnimalMovement

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Quality control

Quality control

This section of the WRST caribou monitoring data management SOP covers quality control, the processes involved in ensuring data meet expectations.

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Reconciling mortalities between the WRST_Caribou and Animal_Movement databases

Reconciling mortalities between the WRST_Caribou and Animal_Movement databases

Mortalities may be recorded in three ways:

1. During radiotracking surveys when a detected collar transmits a Mode = 'M'.
2. During composition and population surveys when a detected collar transmits a Mode = 'M'.
3. When the Animal_Movement tool detects no movement for an extended amount of time (I'm not sure if the mortality is recorded automatically in the Animals table, or if a database user needs to intervene - there is no documentation in Animal_Movement on this topic).

Each survey cycle the data management technician should try to reconcile mortalities among the sources described above. A situation where a collar is left in the field for multiple surveys and is subsequently detected multiple times resulting in a quality control problem where multiple mortality dates exist. The WRST_Caribou.QC_Radiotracking_AnimalsMarkedDeadOnMultipleDates view will show these records so they can be repaired.

In reconciling the mortalities observed during flights against mortalities recorded in Animal_Movement you need to understand that some mortalities are auto-detected by lack of movement. To see more information on the animals above execute

```
SELECT      ProjectId, AnimalId, FixDate, Location, FixId
FROM        LastLocationOfKnownMortalities
WHERE       (ProjectId IN ('ChisanaCH', 'WRST_Caribou')) AND (YEAR(FixDate) = 2022)
ORDER BY    FixDate
```

Another potentially useful Animal_Movement query is:

```
SELECT      ProjectId, AnimalId, LocalDateTime, EndLocalDateTime, Year, OrdinalDate,
Duration, Speed, UnitCode, Species, Gender, GroupName, Shape
FROM        NoMovement
WHERE       (ProjectId IN ('ChisanaCH', 'WRST_Caribou')) AND (YEAR(LocalDateTime) =
2022)
```

on the Animal_MovementDatabase. Reconcile any records between the WRST_Caribou and Animal_Movement databases, where necessary.