

Moose Monitoring Database Application

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Overview

NPS Moose Monitoring Database Application

Overview

Moose population structure and abundance are monitored the National Park Service in Alaska. Methods follow the protocols developed by the [Arctic](#) and [Central Alaska Inventory and Monitoring Networks](#) and rely on the GeoSpatial Estimator toolset described in [Kellie and Delong, 2006](#).

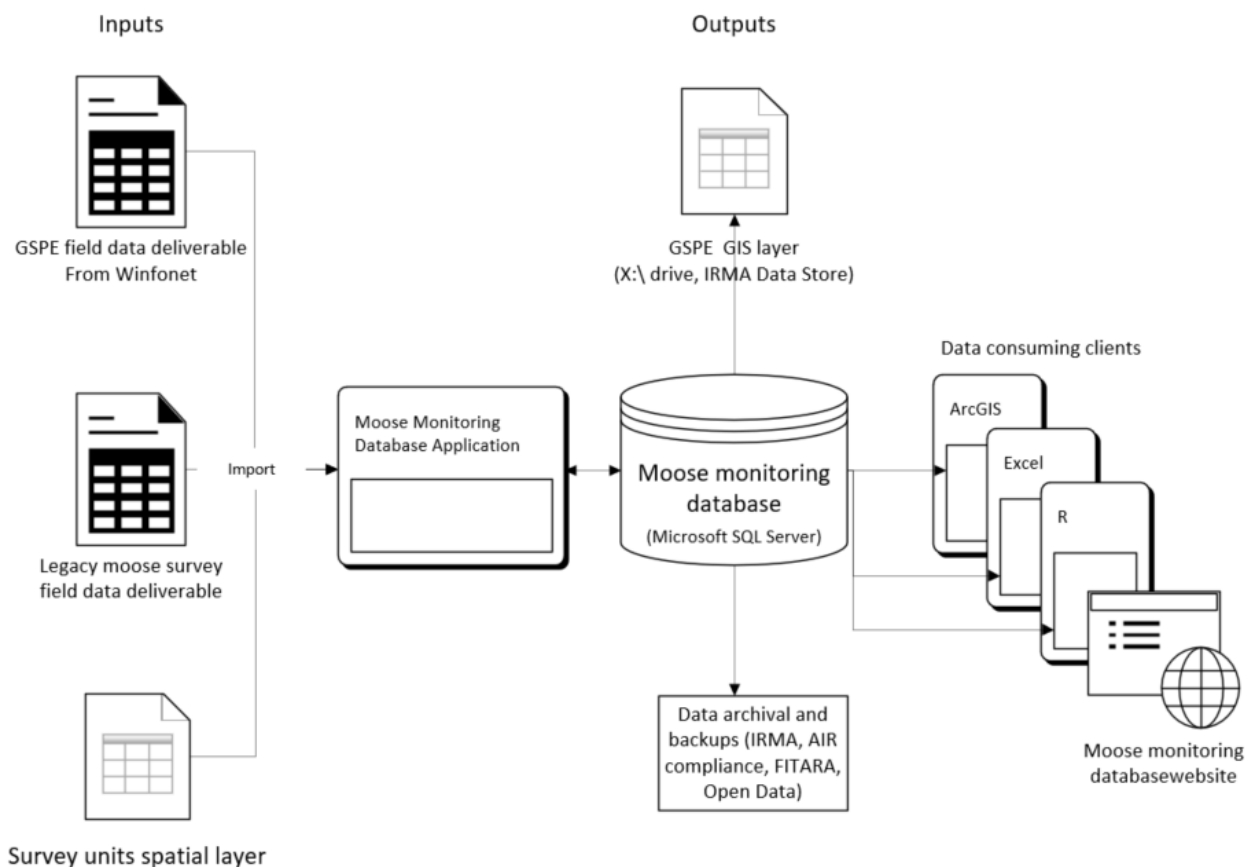
From 2006 until 2016 moose monitoring data was stored in ADF&G's [Winfonet](#) system. NPS policy now requires that the data reside in an authorized Department of the Interior data store. Development of a database began in 2015, data migration started in 2016 and was substantially finished in 2022, at which time a front-end application was developed. This document describes the moose monitoring data management system, database and front-end application.

Sensitivity statement

The Moose Monitoring Database Application contains information about a species of commercial interest, some or all of which may be subject to data sharing agreements with partner agencies. Please see [Dataset sensitivity](#)

Conceptual diagram

The heart of the moose monitoring system is the Moose database hosted on an SQL Server at the NPS Fairbanks Administrative Center.

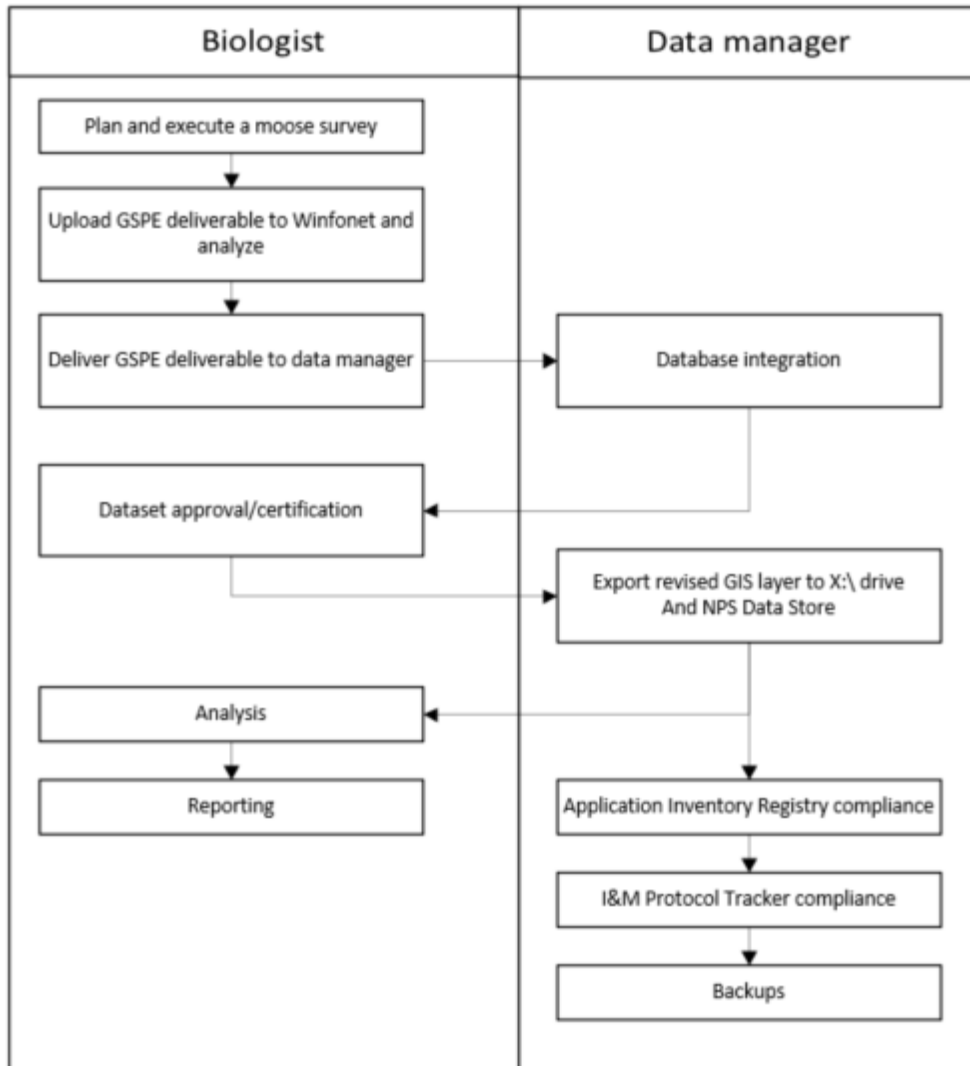


Work flow

The moose monitoring work flow can be summarized simply in the steps below

1. Collect data according to ARCN/CAKN protocol

2. Process GSPE deliverable in Winfonet
3. Integrate GSPE deliverable to ARCN/CAKN moose monitoring database
4. Analyze
5. Report



Resources

Resources available to moose monitoring personnel include:\

Resource

Data deliverable files

Location

ARCN O:\Monitoring\Vital Signs\Moose\Data

CAKN J:\Monitoring\Moose\Data

Moose monitoring master Project reference in the IRMA Data Store

ARCN: [DataStore - Project - \(Code: 2222140\) \(nps.gov\)](#)

CAKN: [DataStore - Project - \(Code: 2220369\) \(nps.gov\)](#)

Moose monitoring database

See [Database documentation](#)

Moose monitoring database application

[NPS-ARCN-CAKN/Moose3 \(github.com\)](#)

Alaska Department of Fish and Game's Winfonet database

[Home \(alaska.gov\)](#)

System administration

The moose monitoring database is administered by the ARCN/CAKN data managers and supported by the information technology staff at the Fairbanks Administrative Center, 4175 Geist Rd, Fairbanks, AK.

Dataset sensitivity

Dataset sensitivity

Wildlife data may at times be legally classified as sensitive if they are a species of commercial interest and moose meet this definition. A close reading of the legal justification for withholding such information suggests that the moose monitoring data is not protected:

Under [National Parks Omnibus Management Act, Section 207, of 16 U.S.C. § 5937](#); Specific location (geographic coordinates) of these harvestable (commercial) species will not be released to the general public due to their "commercial" value. Any such data collected will be redacted from the publicly released datasets. This protects collaborating agencies data as well; but does not preclude sharing between collaborating agencies. Processed data with coordinates redacted (such as summaries, processed maps, or products) remain publicly available.

The moose monitoring database does not contain specific locations of harvestable species as the data is rolled up to the survey unit level and the official policy expressed by the various Park superintendents aligns with the statement above:

Network	Park	Protected data memorandum
ARCN	BELA	https://irma.nps.gov/DataStore/DownloadFile/624889
CAKN	DENA	Unpublished
ARCN	GAAR	https://irma.nps.gov/DataStore/DownloadFile/624888
SWAN	KATM	https://irma.nps.gov/DataStore/DownloadFile/624924
SWAN	KEFJ	https://irma.nps.gov/DataStore/DownloadFile/624922
SWAN	LACL	https://irma.nps.gov/DataStore/DownloadFile/624923
ARCN	WEAR (CAKR, KOVA, NOAT)	https://irma.nps.gov/DataStore/DownloadFile/624887
CAKN	WRST	Unpublished
CAKN	YUCH	Unpublished

Moose monitoring data may be subject to data sharing agreements between the NPS, Alaska Department of Fish and Game and possibly Yukon Fish and Game Association. As of this writing, I am unaware of any such written agreement. Should they turn up they can be added to the section [Data sharing agreements](#)

Current policy

Despite the guidance above indicating that moose survey data belongs in the public domain and despite the lack of any written data sharing agreements, Park biologists have communicated a preference to keep moose monitoring data internal to the NPS in order to lubricate working relationships with Alaska Department of Fish and Game on whom they are dependent for cooperation in making future surveys happen. As the data manager administering the system it is not my decision to withhold data. Consequently I will take a conservative approach and **withhold the moose monitoring data from the public domain until directed otherwise in writing by the park superintendents or their delegates.**

Data sharing agreements

Data sharing agreements

None known as of 2022

[Publish here as they are discovered]

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Security

Security

This section describes the moose monitoring database and dataset security model.

Database

The moose monitoring database resides in an SQL Server at the Fairbanks Administrative Center. Access rules are enforced by the database and managed by the database administrators (CAKN/ARCN data managers). Permissions are granted via Windows Authentication; the same credentials used to log into your NPS computer are passed through to the SQL Server. Permissions will be granted to Park biologists, biometricians, data managers and biotechnicians with minimum permissions granted to accomplish goals.

Summary

- No one may access the Moose database without permission.
- Permissions on the Moose database are managed by the database administrators (data managers).
- Permissions are enforced by the database, regardless of client software.
- Minimum permissions are granted to accomplish tasks (analytical tasks require only read-only permission, for example. Editing/importing data require read-write permissions. Changing the database schema requires admin privileges).
- No passwords or user accounts are needed (Windows Authentication)
- Permissions on the database are global - there is no ownership of certain surveys or data related to a certain park or network, for example. If you have permission to access data in the database, you have permission to access all the data in the database.

Dataset

For the purpose of this section 'Dataset' refers to the analytical product produced by the moose monitoring database. The primary product is a shapefile published to the IRMA Data Store (see [Dataset publication](#)). We will take a conservative approach to dataset publication. Within IRMA Data Store the certified Geospatial Dataset Reference will be tagged 'NPS Internal' and file access will be restricted to specific individuals including wildlife biologists, biometricians and data managers.

Summary

- The moose monitoring dataset will be published in IRMA Data Store using maximally restrictive security options.
- The dataset will consist of a shapefile or geodatabase of certified records.
- Only certified data will be published (see [Dataset certification](#) on how records are tagged as 'Certified').
- Records tagged 'Raw' or 'Provisional' will not be published. You may store and develop such records in the database without having to worry about them being published prematurely.
- IRMA Data Store is capable of restricting file access to specific individuals and the product will be published using that functionality.
- IRMA Data Store is capable of restricting References to NPS-only and the product will be published

using that functionality.

- The certified moose monitoring data product will be published to a single, authoritative Geospatial Dataset Reference in IRMA Data Store.
- The product will be versioned by date and each version will contain an incrementally cumulating set of records.

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Obtaining/installing the Moose Monitoring Database Application

Obtaining/installing the Moose Monitoring Database Application

The NPS ARCN/CAKN Moose Monitoring Database Application is available to authorized NPS wildlife biologists through the IRMA Data Store (<https://irma.nps.gov/DataStore/Reference/Profile/2295016>).

Database permissions

Contact either of the Arctic or Central Alaska Network data managers for database permissions.

Installation

Installation is simple: just download the zipped file archive to your computer and unzip it. Double click Moose.exe to start the application. A help file is included.

Contact either of the Arctic or Central Alaska Network data managers if you have any problems.

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Adding a new moose survey and GSPE data deliverable to the moose monitoring database

Adding a new moose survey and GSPE data deliverable to the moose monitoring database

Adding a new survey to the Moose Monitoring Database Application involves two (or possibly three) steps that must be performed in order:

1. Add a Survey record to the GSPE_Surveys database table
2. Add related GSPE records to the GSPE database table
3. If you are trying to add legacy moose survey data rather than standard GSPE data then it's possible the survey units do not exist in the database. In this case add the data as above but leave the SurveyUnitSet fields blank or NULL. You will have to get your data manager to add the survey unit polygons to the database and relate them to the survey data. There is currently no within-application functionality to accomplish this task.

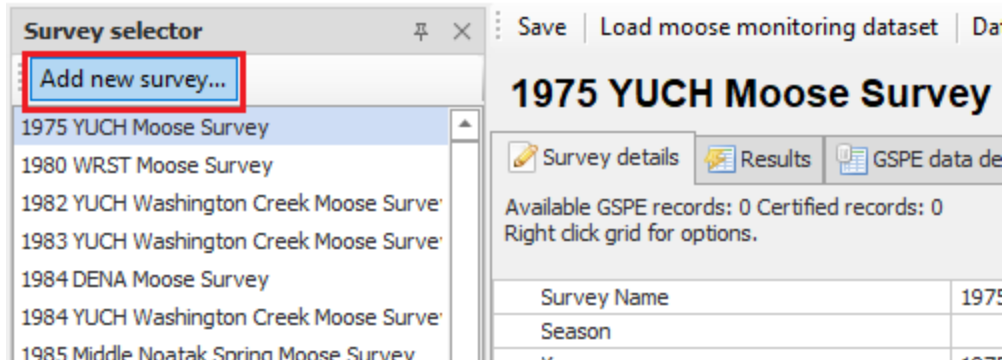
Prerequisites

- At minimum, datawriter privileges on the database. Contact your data manager.
- SQL Server Management Studio software.

Procedure

Adding a new Survey record

1. If the survey does not exist then add a new survey record to the database by clicking the Add new survey... button.



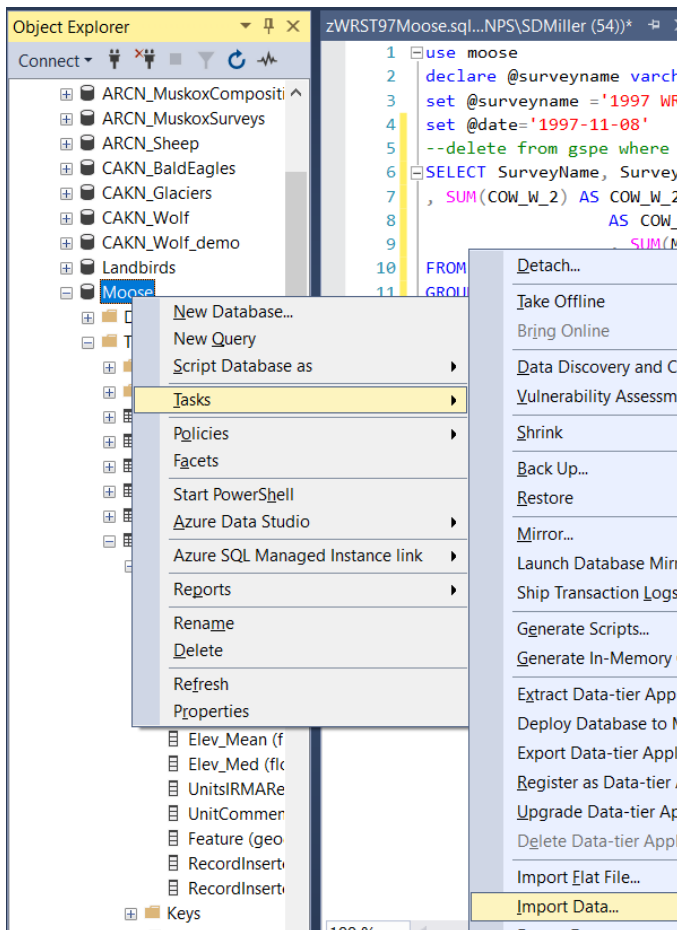
- 2.
3. Answer the wizard questions and save your work after the new survey appears in the surveys inventory.

Importing GSPE records for the new Survey

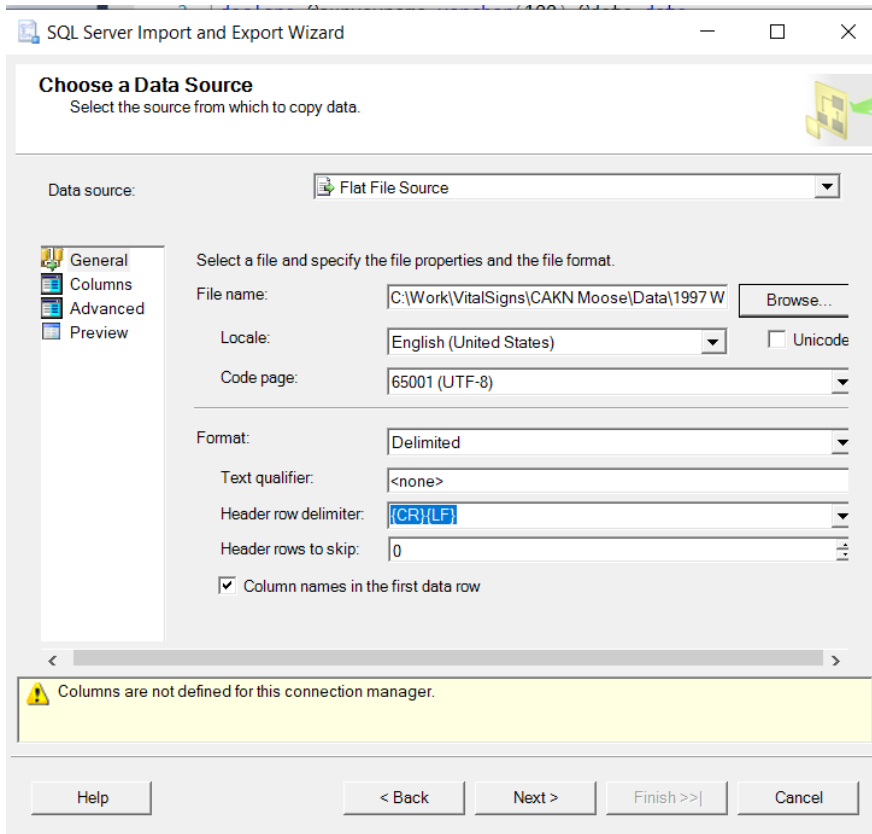
As of 2022 there is no tool in the Moose Monitoring Database Application to directly import GSPE data for a new Survey. You can use Microsoft SQL Server Management Studio to import the records, or other data manipulation software, but really, the easiest way is to give the deliverable to the ARCN data manager for import. The method using SSMS is shown below.

Procedure

1. Start SSMS
2. Navigate to the Moose database and then locate the Sql Server Import/Export Tool: Moose -> Tasks -> Import Data...
3. *TIP: Befor you import the data in the GSPE spreadsheet, make sure the source dataset does not have commas in any of the fields, or, if commas exist, that the text fields are surrounded by quotes.*
4. *TIP: To ensure that the data you import gets associated with the standard GSPE survey unit polygons, make sure your input table has a column titled **SurveyUnitSet** and each cell in this column reads **'ADFG GSPE'**.*
5. Start the Import Data... tool in Sql Server Management Studio by right clicking the database and selecting Tasks -> Import Data...



- 6.
7. Choose the GSPE deliverable as a data source



- 8.
9. Choose the Moose database on the nuna SQL Server (the. Contact the ARCN/CAKN data manager for database details and/or permissions. You must have datawriter privileges at minimum).

The screenshot shows the 'Choose a Destination' step of the SQL Server Import and Export Wizard. The window title is 'SQL Server Import and Export Wizard'. The subtitle is 'Choose a Destination' with the instruction 'Specify where to copy data to.' The 'Destination' dropdown is set to 'SQL Server Native Client 11.0'. The 'Server name' dropdown is set to 'inpyugamsvm01\nuna'. Under the 'Authentication' section, 'Use Windows Authentication' is selected. The 'Database' dropdown is set to 'Moose'. There are 'Refresh' and 'New...' buttons next to the database dropdown. At the bottom, there are 'Help', '< Back', 'Next >', 'Finish >>', and 'Cancel' buttons.

10.

11. Click Next

12. Map the source columns to the database columns. Choose Edit Mappings...

The screenshot shows the 'Select Source Tables and Views' step of the SQL Server Import and Export Wizard. The window title is 'SQL Server Import and Export Wizard'. The subtitle is 'Select Source Tables and Views' with the instruction 'Choose one or more tables and views to copy.' The 'Tables and views' list shows two items: 'Source:' and 'C:\Work\VitalSigns\CAKN Moose\Data\199...'. The 'Destination' is set to 'inpyugamsvm01\nuna_dev'. The 'Edit Mappings...' button is highlighted with a red rectangle. At the bottom, there are 'Help', '< Back', 'Next >', 'Finish >>', and 'Cancel' buttons.

13.

14. Map the columns ensuring the source/destination columns and data types are compatible

Column Mappings

Source: C:\Work\VitalSigns\CAKN Moose\Data\1997 WRST Moose Survey\CM-01

Destination: [dbo].[CM-01 1997 WRST Moose Survey Data Summed By Survey Unit Dr]

☒ Create destination table ☐ Delete rows in destination table ☐ Append rows to the destination table

☐ Drop and re-create destination table ☐ Enable identity insert

Mappings:

Source	Destination	Type	Nullable	Size	Precision	Scale
SurveyName	SurveyName	varchar	<input checked="" type="checkbox"/>	50		
SurveyYear	SurveyYear	varchar	<input checked="" type="checkbox"/>	50		
Season	Season	varchar	<input checked="" type="checkbox"/>	50		
ID	ID	varchar				
DateCounted	DateCounted	varchar				
BULL_ALL	BULL_ALL	varchar				
CALF	CALF	varchar				
CALF_LONE	CALF_LONE	varchar				
COW	COW	varchar				
COW_W_0	COW_W_0	varchar				
COW_W_1	COW_W_1	varchar				
COW_W_2	COW_W_2	varchar				
COW_W_3	COW_W_3	varchar				
LG_BULL	LG_BULL	varchar				
MED_BULL	MED_BULL	varchar				
SurveyUnitSet	SurveyUnitSet	varchar				

Source column: SurveyName str.


Important things:

1. Make sure the source SurveyName is not NULL and matches an existing SurveyName in the destination GSPE_Surveys database table (child GSPE records must have a parent survey record in the GSPE_Surveys table)
2. Make sure the source/destination columns match correctly and have compatible data types and lengths.
3. For GSPE surveys ensure that the SurveyUnitSet field is populated with 'ADFG GSPE' (this tells the database to associate the standard GSPE survey unit polygons with the imported data).

- 15.
16. Double check all settings are correct and execute. If all goes well you should see something like this:

SQL Server Import and Export Wizard

The execution was successful

 **Success** 11 Total 0 Error
11 Success 0 Warning

Details:

Action	Status	Message
Initializing Data Flow Task	Success	
Initializing Connections	Success	
Setting SQL Command	Success	
Setting Source Connection	Success	
Setting Destination Connection	Success	
Validating	Success	
Prepare for Execute	Success	
Pre-execute	Success	
Executing	Success	
Copying to [dbo].[CM-01 1997 WRST Moose S...	Success	3 rows transferred
Post-execute	Success	

Filter Stop Report Close

17.

18. Check your work to be sure the data imported correctly.
19. Validate that the destination data exactly matches the source data. This is most easily done by cross-summing the source numeric values in a pivot table in Excel and comparing them to a similar SQL query or by using the Moose Monitoring Database Application's pivot tool. Scan the comments and text fields visually.
20. Certify the dataset, if warranted. Compare the record counts, summed values, etc., against the GSPE Winfonet report. If a formal report for the dataset exists, then attempt to regenerate any summary tables. If all looks good and the biologist approves, then certify the survey dataset.

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Adding a new set of survey units

Adding a new set of survey units

You shouldn't normally need to add new survey units to the moose database. Adding new survey units is a rare event exclusively associated with importing older moose surveys that did not use the standard GSPE survey units. If you are importing a standard GSPE deliverable then you should not have to add the GSPE units because they already exist in the database. Just make sure the records for your survey in the GSPE table have the field *SurveyUnitSet* set to 'ADFG GSPE'.

If you are importing an older moose survey that did not use the standard GSPE units, then you may have to import survey units from a GIS layer into the database. This is a task requiring advanced database skills and should only be done by an experienced database administrator.

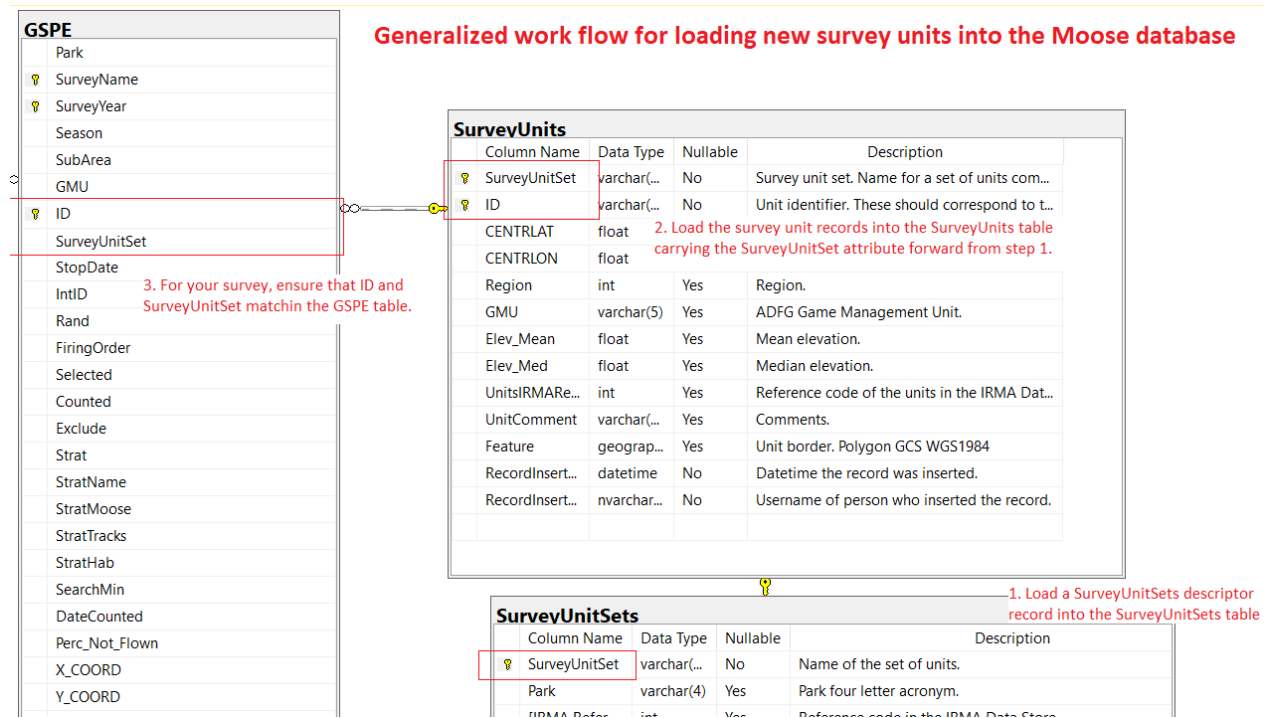
Survey units were often re-used over many years so eliminate the possibility that the survey units don't already exist in the database. The 1978 DENA moose survey re-used the 1974 units, for example.

There is currently (Nov. 2022) no functionality within the Moose Monitoring Database Application to add a new set of moose survey unit polygons. You will have to do this task using GIS/Python and SQL. You can modify the arcpy script in this section to produce a script of SQL INSERT queries that can be executed in SQL Server Management Studio to insert the units.

How survey units are related to survey records

An understanding of how survey units are related to survey data records is important for success when importing new survey records. To import survey units your objective is to:

1. Create a new SurveyUnitSet record in the SurveyUnitSets table to describe the set of units.
2. Load the new survey units into the SurveyUnits table, matching the new records to the SurveyUnitSet you chose in step 1. The survey unit polygons should be in Geographic Coordinate System, World Geodetic Survey 1984 spheroid. These polygons should be loaded into the Feature field of the SurveyUnits table.
3. Matching the SurveyUnitSet fields in the GSPE table for SurveyName and ID.
 1. If importing data from a spreadsheet simply make a column called SurveyUnitSet and fill it in with the SurveyUnitSet you chose in step 1.
 2. If retrofitting existing GSPE records then write an UPDATE query that isolates the change in SurveyUnitSet to the correct SurveyName. use extraordinary care to isolate the changes to the SurveyName in question so that you do not contaminate other records in the GSPE table. This is a job best left to an experience database admin.



Importing survey units into the Moose database from a shapefile

Prerequisites

SQL Server Management Studio

ArcMap/ArcGIS Pro

datawriter privileges on the moose monitoring database

Procedure

There are many ways to import survey units into the Moose database. Using Python inside ArcGIS is the way all the units were imported into the database from 2016 on. Below is an example ArcPy script that can be modified. The script interrogates a shapefile of survey units and cycles through the rows one by one and converts the unit polygons into an SQL script of INSERT queries that can be executed through SQL Server Management Studio. Each polygon is converted to its Well Known Text representation and from there to an SQL Geography entity.

```
#Written by Scott D. Miller
```

```
#National Park Service, Arctic and Central Alaska Inventory and Monitoring programs
```

```
#2021-08-24
```

```
# Description: This script was written to convert NPS moose monitoring survey units in
# shapefile format to SQL INSERT queries suitable for executing against
# the ARCN/CAKN Moose database. The goal is to reproduce the survey polygons in the
# shapefile in the database's SurveyUnitSets and SurveyUnits tables.
# For assistance, contact the Network data manager.
```

```
# How to use:
```

```
# Point the Shp variable (see Start here below) to your shapefile of survey units
```

```
# In the 'for row in arcpy.da.SearchCursor(FeatureClass,['FID','UNIT','Shape@WKTEXT']):'
# line below, in the second item in the columns list,
```

```
# change the name of the column holding your survey unit identifier. It may be SU, or
# UNIT or ID or some other name.
```

```
# Run the script in the Python window of ArcGIS
```

```
# The output SQL insert queries script will be in the same directory as the input
# shapefile and will have the same name but with '.sql' appended.
```

```
# Open the output .sql script in SQL Server Management Studio
```

```
# Modify the .sql script as needed and execute to insert the survey units.
```

IMPORTANT: The insert queries are wrapped in a transaction. The transaction must be closed out by executing COMMIT if all the queries insert successfully, or ROLLBACK if anything fails.

Failure to close out the transaction will cause the database to hang, rendering it useless until administrative action is taken to fix the problem.

Imports

```
import arcpy
import getpass
import re
import os
```

Function to export a featureclass as a comma separated values text file.

```
def ExportSQLScript(FeatureClass, SurveyUnitSetName):
    try:
```

The output SQL script file.

```
    OutputFile = FeatureClass + ".sql"
```

if the output file exists already then delete it.

```
    if os.path.exists(OutputFile):
        print("File exists: " + OutputFile + '. Deleted')
        os.remove(OutputFile)
```

```
    OutputFile = open(OutputFile, 'a')
```

loop through the data rows, create Sql insert queries and add them to the output file.

```
    OutputFile.write("-- Moose survey units import script.\n")
    OutputFile.write("-- Source FeatureClass: " + FeatureClass + "\n")
    OutputFile.write("-- Generated by " + getpass.getuser() + " on " +
str(datetime.datetime.now()) + "\n")
    OutputFile.write("\n")
    OutputFile.write("USE Moose\n")
    OutputFile.write("Declare @SurveyUnitSet Varchar(100),@UnitsIRMRefCode
Int\n")
    OutputFile.write("Set @SurveyUnitSet = " + SurveyUnitSetName + "'\n")
    OutputFile.write("\n-- Utility queries. Uncomment and use as needed\n")
    OutputFile.write("-- Insert the parent SurveyUnitSet record for the survey
units, if it does not exist already\n")
    OutputFile.write("-- INSERT INTO SurveyUnitSets(SurveyUnitSet)
VALUES(@SurveyUnitSet)\n")
    OutputFile.write("-- SELECT * FROM SurveyUnits WHERE SurveyUnitSet =
@SurveyUnitSet ORDER BY ID\n")
    OutputFile.write("-- DELETE FROM SurveyUnits WHERE SurveyUnitSet =
@SurveyUnitSet\n\n")
    OutputFile.write("BEGIN TRANSACTION -- ROLLBACK COMMIT -- You must rollback or
commit the insert queries in this transaction or the database will be left hanging.
\n\n")
```

Loop through the feature class's rows and convert the units to WKT and create an insert query.

Make sure the column names below match those in the source shapefile.

```
    RowCounter = 0
```

Make sure FID or OBJECTID is the zeroeth columnname, the unit identifier is the first column and the second column is Shape@WKT.

```
    # Example: for row in arcpy.da.SearchCursor(FeatureClass,
['FID','UNIT','Shape@WKT']):
        for row in arcpy.da.SearchCursor(FeatureClass,['FID','UNIT','Shape@WKT']):
```

Get the row items into variables to substitute into the SQL queries below.

```

ID = str(row[1]).strip()
WKT = str(row[2])

# Build up a Geography for the polygon using Well Known Text
representation of the Feature.
Geog = "geography::STGeomFromText('" + WKT + "', 4326)"
InsertQuery = "INSERT INTO SurveyUnits(SurveyUnitSet,ID,Feature)
VALUES(@SurveyUnitSet,'" + ID + "','" + Geog + "');"

# Write the INSERT query to the output script file.
OutputFile.write(InsertQuery + '\n')

# Increment the row counter.
RowCounter = RowCounter + 1
del row

# Output some more information for the user.
OutputFile.write("-- " + str(RowCounter) + " rows.\n")
OutputFile.write("-- Execute the output SQL script in SQL Server Management
Studio to insert the survey unit polygons.\n")
OutputFile.close

except Exception as e:
    ExMessage = '-----\n-- ERROR:
Export failed for FeatureClass: ' + FeatureClass + ' ' + str(e) +
"-----\n"
    print(ExMessage)
    OutputFile.write(ExMessage)

# Start here
try:
    # Shp is the input shapefile whose polygons should be converted to an SQL INSERT
    query
    Shp = "C:/Work/VitalSigns/CAKN Moose/Units/1978-1996 DENA Moose Survey
Units/DENA1978.shp"
    print('Processing: ' + str(Shp))

    # This will be the unique identifier in the Moose database's SurveyUnitSets table
    SurveyUnitsetName = '1978 DENA Winter Moose Survey Units'

    # Convert the shapefile's features to a script of INSERT queries
    ExportSQLScript(Shp,SurveyUnitsetName)

except Exception as e:
    ErrorMessage = str(e)
    print(ErrorMessage)

```

If the script ran without failure you should have an SQL script file in the same directory as the source file, named the same but with the .sql suffix. Execute this script in SQL Server Management Studio to insert the polygons. NOTE: The SQL insert queries are wrapped inside a transaction - be sure to COMMIT if all the records inserted successfully, or ROLLBACK if any of them failed. Failure to do so will hang the database : (

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Quality control

Quality control

Quality control (QC) procedures ensure that data in the database meet expectations. Defects should be repaired or documented.

Primary QC methods involve visual record scanning, database interrogation via scripts, QC queries, and stored procedures. The primary tools for ensuring data quality are the *RunQCOnASurvey* and *DataQualityReport* stored procedures. Read about these tools in this section.

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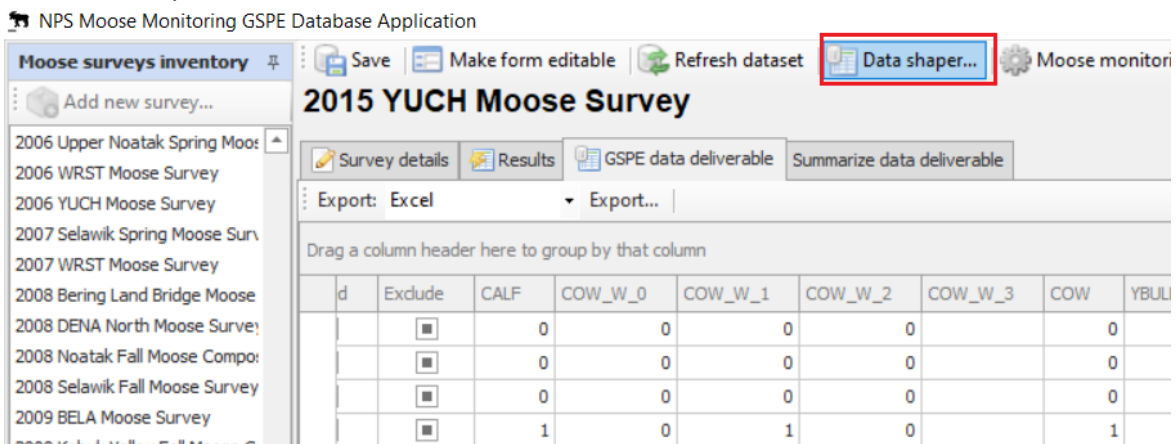
Dashboard

Dashboard query

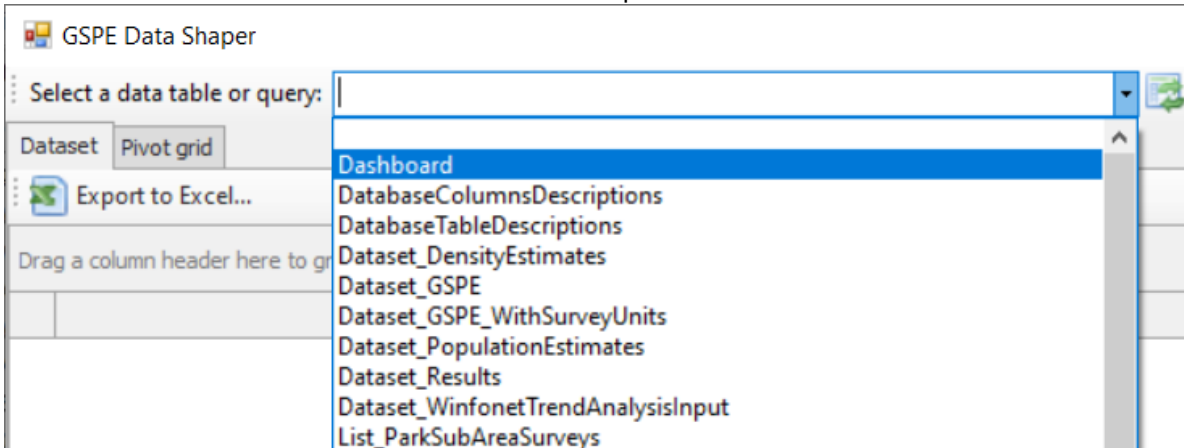
The Dashboard query provides a good summary of the database contents and quality. Run the Dashboard query through (SSMS) or the Moose Monitoring Database Application's Data Shaper tool.

Procedure

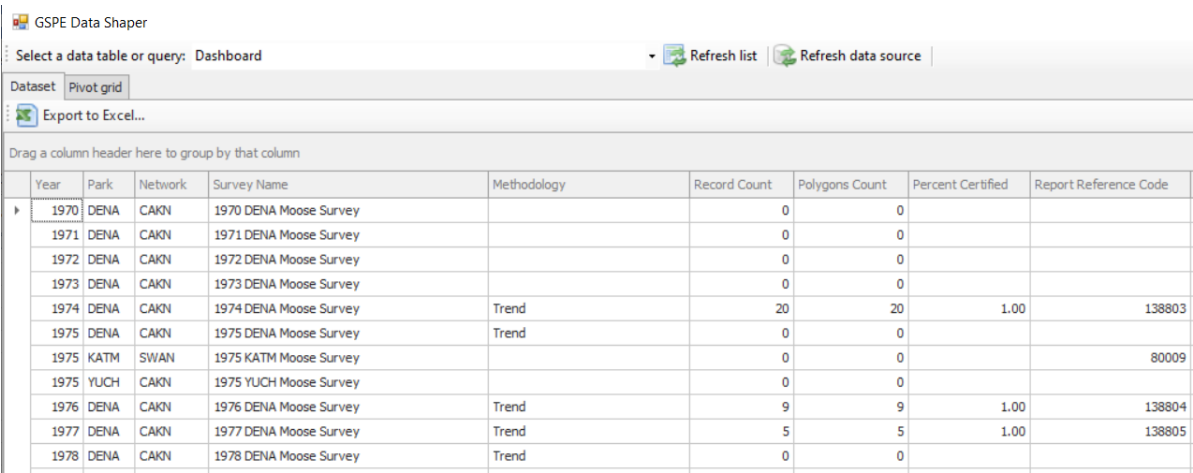
1. Open the Moose Monitoring Database Application
2. Click Data shaper in the toolbar



- 3.
4. Select Dashboard from the list of available database queries:



- 5.
6. The results of the Dashboard query appear:

7. 

The screenshot shows the GSPE Data Shaper application interface. At the top, there's a toolbar with 'Select a data table or query: Dashboard', 'Refresh list', and 'Refresh data source'. Below this is a 'Dataset' tab and a 'Pivot grid' tab. An 'Export to Excel...' button is visible. A message says 'Drag a column header here to group by that column'. The main table has the following columns: Year, Park, Network, Survey Name, Methodology, Record Count, Polygons Count, Percent Certified, and Report Reference Code. The data rows are as follows:

Year	Park	Network	Survey Name	Methodology	Record Count	Polygons Count	Percent Certified	Report Reference Code
1970	DENA	CAKN	1970 DENA Moose Survey		0	0		
1971	DENA	CAKN	1971 DENA Moose Survey		0	0		
1972	DENA	CAKN	1972 DENA Moose Survey		0	0		
1973	DENA	CAKN	1973 DENA Moose Survey		0	0		
1974	DENA	CAKN	1974 DENA Moose Survey	Trend	20	20	1.00	138803
1975	DENA	CAKN	1975 DENA Moose Survey	Trend	0	0		
1975	KATM	SWAN	1975 KATM Moose Survey		0	0		80009
1975	YUCH	CAKN	1975 YUCH Moose Survey		0	0		
1976	DENA	CAKN	1976 DENA Moose Survey	Trend	9	9	1.00	138804
1977	DENA	CAKN	1977 DENA Moose Survey	Trend	5	5	1.00	138805
1978	DENA	CAKN	1978 DENA Moose Survey	Trend	0	0		

Sort, group, filter and/or summarize the information as needed.

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Run quality control checks on data from a single survey

Run quality control checks on data from a single survey

It may be useful to import data into the moose monitoring database and then perform automated quality control checks. This can be done using the *RunQCOnASurvey* stored procedure. The example below shows a QC run on the 2015 YUCH Moose Survey dataset.

IMPORTANT NOTE: The automated QC checks described below are a *starting point* and the results should be interpreted based on knowledge of the survey before making any corrective edits. Surveys are conducted in different ways and using calculation rules that may be different from the automated database checks. Some surveys collect more or less detailed information about sex and age composition which may throw off QC checks. Project biologists may include or exclude animals tagged UNKNOWN, for summing total ADULT or MOOSE values, for example. Use your judgement before editing the data.

Procedure

1. Open SSMS
2. [Connect to the moose monitoring database](#)
3. Click New Query
4. Type or copy the following into the new query file substituting your SurveyName attribute for 'Your survey name goes here':
5. `use moose`
6. `exec RunQCOnASurvey 'Your survey name goes here'`
7. Execute the procedure

Example QC run showing that the [Adult] attributes have not been calculated in the 2015 YUCH Moose Survey. Other QC checks returned no problems (you should still verify the data visually, by summing and comparing to the source data file, and comparing the results to any report generated on the dataset).

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left displays the database structure, with the 'dbo.RunQCOnASurvey' stored procedure highlighted. The SQL Query Editor in the center contains the following query:

```
1 use moose
2 exec RunQCOnASurvey '2015 YUCH Moose Survey'
3
4
5
```

The Results pane on the right displays the output of the query, which is a table with columns: Possible adult count error, SurveyName, ID, Adult (calculated), CALF, COW, BULL_ALL, and ADULT. The table contains 9 rows of data, all showing 'Possible adult count error' for the '2015 YUCH Moose Survey'.

Possible adult count error	SurveyName	ID	Adult (calculated)	CALF	COW	BULL_ALL	ADULT
Possible adult count error	2015 YUCH Moose Survey	6458-14125	3	1	1	2	NULL
Possible adult count error	2015 YUCH Moose Survey	6458-14130	3	1	3	0	NULL
Possible adult count error	2015 YUCH Moose Survey	6458-14140	3	0	2	1	NULL
Possible adult count error	2015 YUCH Moose Survey	6458-14145	3	2	3	0	NULL
Possible adult count error	2015 YUCH Moose Survey	6500-14105	8	0	2	6	NULL
Possible adult count error	2015 YUCH Moose Survey	6500-14130	1	1	1	0	NULL
Possible adult count error	2015 YUCH Moose Survey	6500-14140	7	1	6	1	NULL
Possible adult count error	2015 YUCH Moose Survey	6500-14150	2	1	2	0	NULL
Possible adult count error	2015 YUCH Moose Survey	6500-14205	1	0	0	1	NULL

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Global database QC checks

Global database QC checks

The DataQualityReport stored procedure provides a good starting point for checking data quality in the moose database.

IMPORTANT NOTE: The automated QC checks described below are a *starting point* and the results should be interpreted based on knowledge of the survey before making any corrective edits. Surveys are conducted in different ways and using calculation rules that may be different from the automated database checks. Some surveys collect more or less detailed information about sex and age composition which may throw off QC checks. Project biologists may include or exclude animals tagged UNKNOWN, for summing total ADULT or MOOSE values, for example. Use your judgement before editing the data.

DataQualityReport stored procedure

Note: for best results, right click the query pane and select **Results to -> Results to text**; otherwise the queries will be shown as grids and some context of what QC process is being run will be lost.

The screenshot shows the SQL Server Enterprise Manager interface. On the left, the Object Explorer displays the 'Moose' database structure, including tables like 'dbo.CertifyGSPEDeliverable' and 'dbo.DataQualityReport'. On the right, the Results pane shows the output of a query. The output includes a title 'Moose Monitoring Dataset Quality Report', a date 'Oct 21 2022 12:11PM', and a user 'NPS\SDMiller'. The report is divided into two sections: 'Section 1 - Database metadata' and 'Section 2 - Certification status'. Section 1 shows 'GSPE records count 33341' and 'GSPE certified records count 29874'. Section 2 shows 'Surveys missing records 68' and a table of survey data.

Year	Park	SurveyName
1970	DENA	1970 DENA Moose Survey
1971	DENA	1971 DENA Moose Survey
1972	DENA	1972 DENA Moose Survey
1973	DENA	1973 DENA Moose Survey
1975	DENA	1975 DENA Moose Survey
1975	YUCH	1975 YUCH Moose Survey
1978	DENA	1978 DENA Moose Survey
1980	WRST	1980 WRST Moose Survey
1982	DENA	1982 DENA Moose Survey
1982	YUCH	1982 YUCH Washington Creek Moose Survey

Examine the output to help isolate possible errors for repair or documentation.

Some results shown in the output may not be errors.

Some records may be flagged not because there is a problem but because of the way the survey was conducted. An example is a population survey that only counts [Adult] and [Calf] data. The [Adult] column will not equal [BULL_ALL] + [COW] in such cases, and may be flagged.

Another example of confused results is where the biologist counted [UNKNOWN] in the [ADULT] tally, throwing off the QC check calculation where that sort of summing is not allowed.

Use expert judgement and please do not try to fix other people's datasets, but rather communicate such issues with the respective Park biologist.

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Dataset certification

Dataset certification

Data certification is an important tool to communicate data quality to data consumers. The moose monitoring dataset consists of data from many surveys done over many parks. In many cases datasets have been recovered many decades after institutional knowledge is gone, often without the benefit of a summary report or other forms of documentation. Certification is accomplished by tagging each record with a CertificationLevel. Three levels of certification are allowed:

Raw Records that have not undergone any quality control procedures. These records are not published or used analytically.

- Provisional** Records that have undergone rudimentary quality control or have been received directly from a park biologist or the Winfonet system, but have not been fully processed and approved for analytical purposes. These records are not published. They may be used provisionally to develop in-house products.
- Certified** Data that have been approved for analysis. These records have been processed for quality, validated against a source dataset, a report or other summary, have defects documented, and are of known quality. These records are published.

Certification process

GSPE records are certified at the record level. This means that each record in the GSPE data table has a column called CertificationLevel (and also CertifiedBy and CertificationDate).

CertificationDate	CertifiedBy	CertificationLevel
2021-10-29 13:21:45.070	NPS\SDMiller	Certified
2021-10-29 13:21:45.070	NPS\SDMiller	Certified
2021-10-29 13:21:45.070	NPS\SDMiller	Certified
2021-10-29 13:21:45.070	NPS\SDMiller	Certified
2021-10-29 13:21:45.070	NPS\SDMiller	Certified
2021-10-29 13:21:45.070	NPS\SDMiller	Certified

During data ingestion and quality control these columns should be null but CertificationLevel should be set to 'Raw' for raw data or 'Provisional' if the data are likely good enough for provisional analysis but not fully processed.

Verify the dataset ingested into the moose monitoring database exactly matches the GSPE deliverable that was submitted and analyzed in Winfonet. An alternative check for old datasets for which a report exists is to attempt to re-generate any summary tables in the report with the ingested data. Any data failing QC checks should have CertificationLevel set to 'Raw'. If the data all check out issue the following Transact-SQL command, substituting the name of your survey.

```
USE Moose
exec CertifyGSPEDeliverable '2015 YUCH Moose Survey'
```

ENSURE THE SURVEYNAME PARAMETER IS CORRECT to avoid contaminating records from other surveys. If you have any questions contact the ARCN/CAKN data manager.

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Data analysis

Data analysis

Winfonet is the primary tool for generating moose abundance estimates, calf/bull:cow ratios, etc., but the Moose Monitoring Database application has tools for accessing and summarizing survey data.

Generating pivot tables

Pivot tables are powerful tools for statistically aggregating data over groups. The Moose Monitoring Database Application offers a tool to quickly generate a pivot table for any survey containing data. Navigate to the survey you would like to summarize, click on the Summarize data deliverable tab and then drag columns from the top of the tool onto the data, rows, or columns area to quickly summarize data. Change

the summary type (sum, avg, count, etc.) by right clicking on a column in the data area and selecting a different summary type.

2012 YUCH Moose Survey

Drag columns from the top of the pivot table tool to the row, column or data areas of the pivot table pane to summarize and aggregate data.

Survey details Results GSPE data deliverable Summarize data deliverable

Export: Excel Export...

Park	Survey Year	Season	StartDate	StopDate	Int ID	Rand	Firing Order	Selected	Exclude	Strat Name	Strat
Y_COORD	BULL_30_40	BULL_30_50	BULL_30_60	BULL_41_50	BULL_GT_50	BULL_GT_60	BULL_GTE_50	BULL_LT_30	BU		
MED_L_BULL	SM_BULL	UNKNOWN	YBULL_ALL	YBULL_GTSF	Pilot	Observer	Personnel	Density	SCF_Plot	Std	I
Sub Area	Area_Sq Mi										
CALF	YBULL_SF	MOOSE	ID	Strat							

Survey Name	Counted	L				H				Grand Total			
		CALF	YBULL_SF	MOOSE	ID	CALF	YBULL_SF	MOOSE	ID	CALF	YBULL_SF	MOOSE	ID
2012 YUCH Moose Survey		0	0	0	340	0	0	0	96	0	0	0	436
	True	8	4	49	54	17	7	174	65	25	11	223	119
2012 YUCH Moose Survey Total		8	4	49	394	17	7	174	161	25	11	223	555

An example of generating summary tables or validating existing summaries

The screenshot below overlays Table 2 of the 2012 YUCH moose survey report with the equivalent summary generated using the Moose Monitoring Database Application's pivot table tool.

Table 2. November 2012, moose survey population estimate, Yukon-Charley Rivers National Preserve, Alaska. Results from the GeoSpatial Estimator. Also see the GeoSpatial Estimator output in Appendix A.

STRATUM	LOW	HIGH	TOTAL
Total no. of survey units	394	161	555
Total area (mi ²)	2197	899	3096
No. of units surveyed	54	65	119
Area surveyed (mi ²)	301	362	663
No. of moose seen	49	174	223
Density with 1.2 SCF			
Point Estimate with 1.2 SCF			
Estimate Standard Error			

Estimates with no SCF applied: Point
80% Confidence Interval = (653, 907
90% Confidence Interval = (617, 943
95% Confidence Interval = (586, 974
(no SCF)

2012 YUCH Moose Survey

Survey details Results GSPE data deliverable Summarize data deliverable

Export: Excel Export...

Park	Survey Year	Season	StartDate	StopDate	Int ID	Rand	Firing Order	Selected	Exclude	Strat Name	Strat
Y_COORD	BULL_30_40	BULL_30_50	BULL_30_60	BULL_41_50	BULL_GT_50	BULL_GT_60	BULL_GTE_50	BULL_LT_30	BU		
MED_L_BULL	SM_BULL	UNKNOWN	YBULL_ALL	YBULL_GTSF	Pilot	Observer	Personnel	Density	SCF_Plot	Std	I
Sub Area	Area_Sq Mi										
CALF	YBULL_SF	MOOSE	ID	Strat							

Survey Name	Counted	L				H				Grand Total			
		CALF	YBULL_SF	MOOSE	ID	CALF	YBULL_SF	MOOSE	ID	CALF	YBULL_SF	MOOSE	ID
2012 YUCH Moose Survey		0	0	0	340	0	0	0	96	0	0	0	436
	True	8	4	49	54	17	7	174	65	25	11	223	119
2012 YUCH Moose Survey Total		8	4	49	394	17	7	174	161	25	11	223	555

Dataset publication

Dataset publication

The moose monitoring dataset is published to the IRMA Data Store whenever new data is added or records are edited. Incrementally cumulative dataset versions will be exported to the Moose Surveys Certified Dataset: NPS Arctic and Central Alaska Inventory and Monitoring Networks Reference at <https://irma.nps.gov/DataStore/Reference/Profile/2295396>. This task involves exporting the **Dataset_GSPE_ToShapefile** view to a shapefile and then uploading the new file to the Reference above. The Dataset_GSPE_ToShapefile view will only contain certified records (records tagged Raw or Provisional will be held back; you may store and work on such records without fear that they will be accidentally published).

Note: Dataset_GSPE is the preferred analytical view for the moose database, but because shapefiles have column length and data type restrictions I had to create the Dataset_GSPE_ToShapefile view; it contains the the exact same data as Dataset_GSPE. A shapefile was chosen as the data publication format because ArcGIS was having problems connecting to SQL Server and the product had to be exported using Ogr2Ogr which does not support proprietary ESRI formats.

Considerations for publishing sensitive data

Consider carefully the permissions of any dataset published to Data Store. Moose monitoring data falls under the category of 'species of commercial interest', which is one justification for tagging a reference as 'Internal'. Additionally the NPS and Alaska Department of Fish and Game may have one or more data sharing agreements in place which should not be violated. Generally a moose monitoring dataset should only be available internal to the NPS or to specific individuals within the Service. Consult the Data Store help for more information on permissions. Also see [Dataset sensitivity](#) and [Security](#).

Generating a dataset for publication

There are multiple ways to export a shapefile from the moose monitoring SQL Server database. Exporting to GIS using ArcGIS Query Layers was the preferred method until late 2022 when something happened inside ArcGIS and Query Layers started failing. Consequently Ogr2Ogr became the best way to export the moose dataset for publication.

Ogr2Ogr

In 2022 I was unable to get the Python script to work in ArcGIS Pro/ArcMap. I successfully exported the dataset to a shapefile using ogr2ogr using the following:

```
ogr2ogr -f "ESRI Shapefile" "O:\Monitoring\Vital Signs\Moose\Data\Certified dataset
for publication\MooseSurveys.shp"
"MSSQL:server=inpugamsvm01\nuna;database=Moose;tables=GSPE;trusted_connection=yes" -
sql "SELECT SurveyName, ID, GEOMETRY::STGeomFromWKB(Feature.STAsBinary(), 4326) AS
Feature, SubArea, Season, Methodology AS Method, DateCounted AS Date, IntID, Selected,
Counted, Exclude, Strat, ADULT, BULL_30_40, BULL_30_50, BULL_30_60,
BULL_41_50, BULL_ALL, BULL_ADULT, BULL_GT_50, BULL_GT_60, BULL_GTE_50 AS BULL_GTE50,
BULL_LT_30, BULL_LT_50, CALF, CALF_LONE, COW, COW_W_0, COW_W_1, COW_W_2, COW_W_3,
LG_BULL, MED_BULL, MED_L_BULL, SM_BULL, UNKNOWN, YBULL_ALL,
YBULL_GTSF, YBULL_SF, MOOSE, SearchMin, Density, SCF_Plot, Std, Int, SurveyUnitGMU AS
SU_GMU, AreaSqMi AS SqMi_Calc, Area_SqMi, GMU, Rand, FiringOrder AS
FiringOrdr, StratName, StratMoose, StratTracks AS StratTrack, StratHab, Perc_Not_FlowN
AS PctNotFlwn, X_COORD, Y_COORD, Elev_Mean, Elev_Med, Network, SRID, CENTRLAT,
CENTRLON, Pilot, Observer, GSPEComment AS Comment, SurveyUnitComment
AS SUComment, ReportReferenceCode AS RptCode, ReportLink,
DeliverablesDatasetReferenceCode AS DlvrblsCod, CertificationLevel AS CertLevel,
CertifiedBy AS CertBy, CONVERT(Date, CertificationDate) AS CertDate, UniqueID,
CONVERT(Date, VersionDate) AS Version FROM Dataset_GSPE" -overwrite -a_srs
EPSG:4326 -s_srs EPSG:4326
```


NOTE: For the Ogr2Ogr method to work you must submit the SQL above - The temptation is to create a view using the SQL above and then call that, but it won't work. I believe Ogr2Ogr needs to see the `GEOMETRY::STGeomFromWKB(Feature.STAsBinary(), 4326)` AS Feature to work, otherwise you get errors saying it cannot work with the binary representation of the Geography column. I wrote a view, Dataset_GSPE_ToShapefile to store the SQL in case it's needed again, but know it won't be useful for Ogr2Ogr.

ArcPy

Modify and execute the Python script below in ArcGIS to generate a shapefile of moose monitoring data. Notice that the SQL query is restricted to certified data only.

NOTE: This didn't work as of Nov, 2022. ArcGIS Pro/ArcMap query layers fail to extract all the survey units and data; unknown reason. See Ogr2Ogr solution below.

```
import arcpy

# Point to the database connection file (use Create Database Connection tool in
# ArcToolbox)
database_connection_file_path = r"C:\Work\Code\ArcPy Scripts\Moose DB to
GeoDB\MooseDBLocalConnectionFile.sde"

# Get a reference to the main data frame; assumes it's the first and only one
df = arcpy.mapping.ListDataFrames(MXD)[0]

# The spatial query to submit to the QueryLayer
sql = "SELECT * FROM Dataset_GSPE_ToShapefile"

# Layer name
layer_name = "GSPE"

# Create the QueryLayer
arcpy.MakeQueryLayer_management(database_connection_file_path, layer_name, sql,
"[UniqueID]", "POLYGON", "4326")

# Create an MXD to hold the new QueryLayer
MXD = arcpy.mapping.MapDocument(r"C:\Work\Code\ArcPy Scripts\Moose DB to
GeoDB\MooseUnits.mxd")

# Get a reference to the created QueryLayer
output_layer = arcpy.mapping.Layer(layer_name)

# Add the layer to the main data frame
arcpy.mapping.AddLayer(df, output_layer, "AUTO_ARRANGE")

# Export the layer to a shapefile
try:
    arcpy.analysis.Select(layer_name, "C:/Temp/zMooseUnits/GSPE.shp", "")
except:
    print("An exception occurred exporting the dataset " + layer_name)
```

Write metadata

Use the tools in ArcCatalog to write metadata for the shapefile generated above. Validate the metadata.

Publish to Data Store

<https://irma.nps.gov/DataStore/Reference/Profile/2295396>

X drive

I considered publishing the data to the X drive, but the feedback I got from biologists was that they preferred a more permissions-restricted environment than the X could provide.

Data access

Data access

Most modern data consuming software can connect to the moose monitoring database. This section shows typical connection methods.

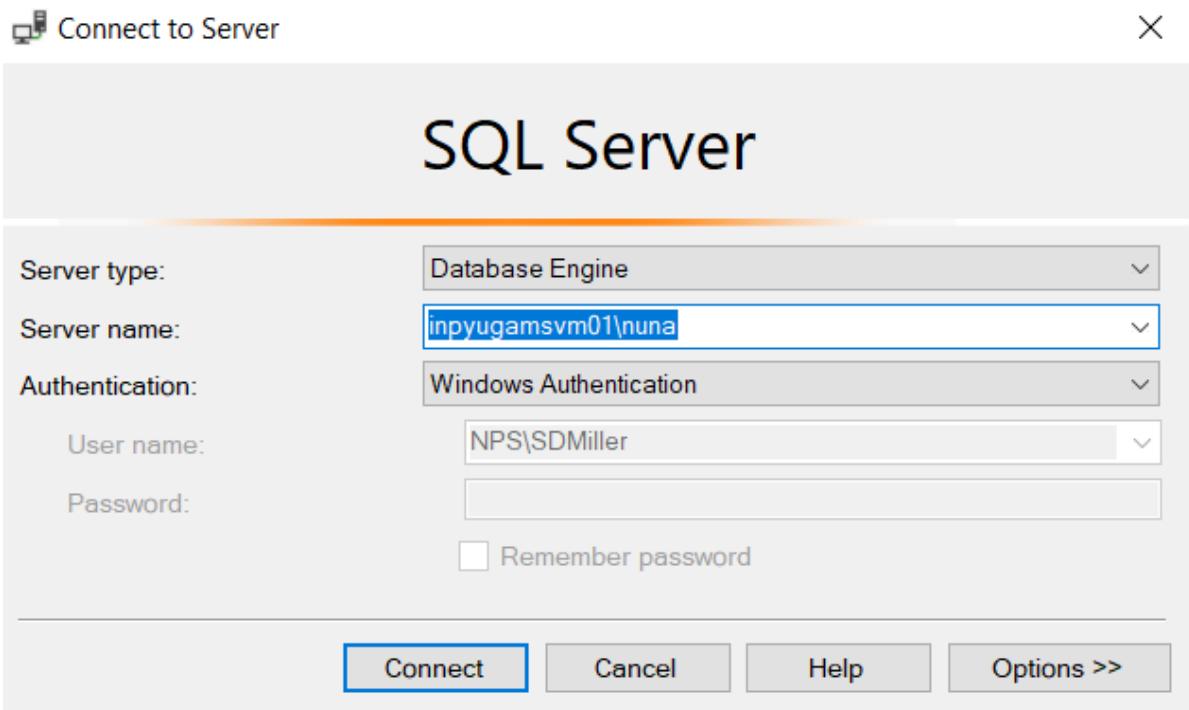
Microsoft Sql Server Management Studio

Microsoft Sql Server Management Studio

[Microsoft Sql Server Management Studio](#) (SSMS) is the best tool for administering the database and has good functionality for querying, analyzing and summarizing results. While the software is not difficult to use, it does require an advanced understanding of relational databases.

Process

1. Open SSMS.
2. In the Object Explorer click Connect
3. In the connection dialog enter the server and [database details](#):



Connect to Server

SQL Server

Server type: Database Engine

Server name: inpyugamsvm01\nuna

Authentication: Windows Authentication

User name: NPS\SDMiller

Password:

☐ Remember password

Connect Cancel Help Options >>

- 4.
5. Expand the server node.
6. Expand the Databases node and select Moose.
7. Consult the SSRS help and online documentation for further information on working with the Moose database.

Microsoft Excel

Accessing the Moose database with Microsoft Excel

Prerequisite

At least datareader permissions. Contact your data manager.

Process

1. Open an Excel workbook
2. From the Data menu select **Get Data -> From Database -> From Sql Server Database**
3. Enter **inpyugamsvm01\nuna** for the Server and **Moose** for the database.

SQL Server database

Server ①
inpyugamsvm01\nuna

Database (optional)
Moose

> Advanced options

OK Cancel

- 4.
5. From the Navigator choose the query you would like to pull. Typically, you will request Dataset_GSPE to pull the whole dataset. Note: this dataset contains tens of thousands of records and may take a minute or so to retrieve depending on your network speed.

Navigator

Search

☐ Select multiple items

Display Options ▾

inpyugamsvm01\nuna: Moose [71]

- Dashboard
- DatabaseColumnsDescriptions
- DatabaseTableDescriptions
- Dataset_DensityEstimates
- Dataset_GSPE**
- Dataset_GSPE_ForExportToGIS
- Dataset_GSPE_Surveys_WithMetric
- Dataset_GSPE_WithSurveyUnits
- Dataset_PopulationEstimates
- Dataset_Results
- Dataset_WinfontTrendAnalysisInput
- List_ParkSubAreaSurveys
- List_ParkSubAreasWithSurveyCounts
- List_SurveyUnitSets
- QC_CertificationStatus
- QC_CowCountsDontAddUp
- QC_CowCountsDontAddUpSummary
- QC_DistinctSurveyUnitSets

Dataset_GSPE

SurveyName
1974 DENA Moose Survey
1974 DENA Moose Survey
1974 DENA Moose Survey
1974 DENA Moose Survey
1974 DENA Moose Survey

i The data in the preview size limits.

Select Related Tables Load ▾

- 6.

7. Click Load or Transform data.
8. The GSPE dataset appears.

	A	B	C	D	E	F	G	H
	SurveyName	Year	Network	Park	SubArea	Season	SurveyYear	P
2	1985 Middle Noatak Spring Moose Survey	1985	ARCN	NOAT		Spring	1985	
3	1993 Middle Noatak Fall Moose Survey	1993	ARCN	NOAT		Fall	1993	
4	1998 WRST Moose Survey, Chisana	1998	CAKN	WRST			1998	
5	1974 DENA Moose Survey	1974	CAKN	DENA		Fall	1974	
6	1994 YUCH Moose Survey	1994	CAKN	YUCH		Fall	1994	
7	1997 YUCH Moose Survey	1997	CAKN	YUCH		Fall	1997	
8	1986 DENA Moose Survey	1986	CAKN	DENA	Slope	Fall	1986	
9	1986 DENA Moose Survey	1986	CAKN	DENA	Slope	Fall	1986	
10	1987 YUCH Moose Survey	1987	CAKN	YUCH	Washington Ck.	Fall	1987	
11	1998 WRST Moose Survey, Chisana	1998	CAKN	WRST			1998	

9.

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ArcGIS Pro

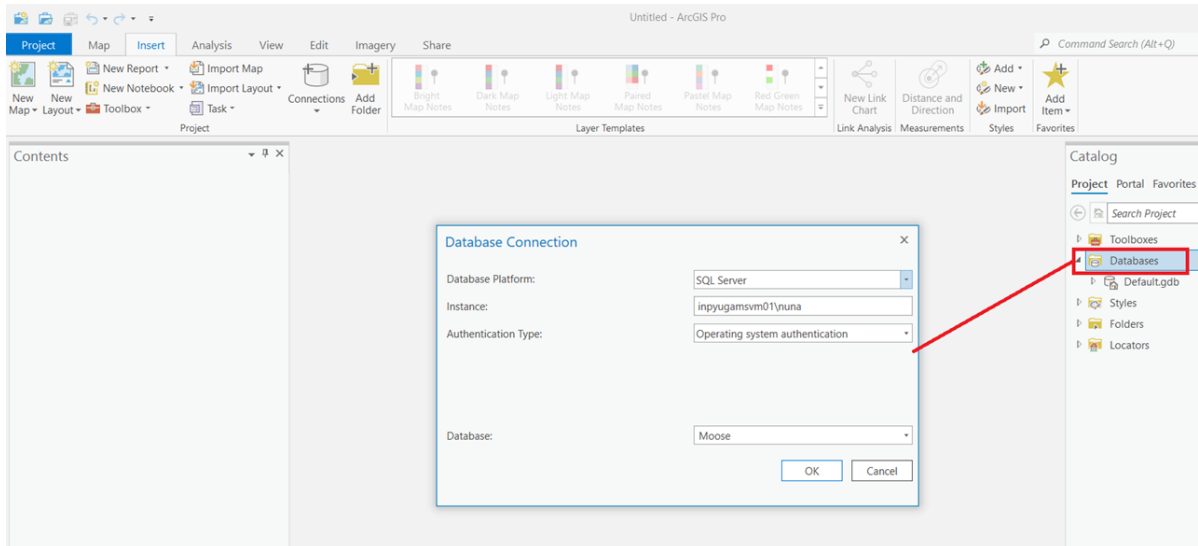
Accessing the Moose database with ArcGIS Pro

Prerequisite

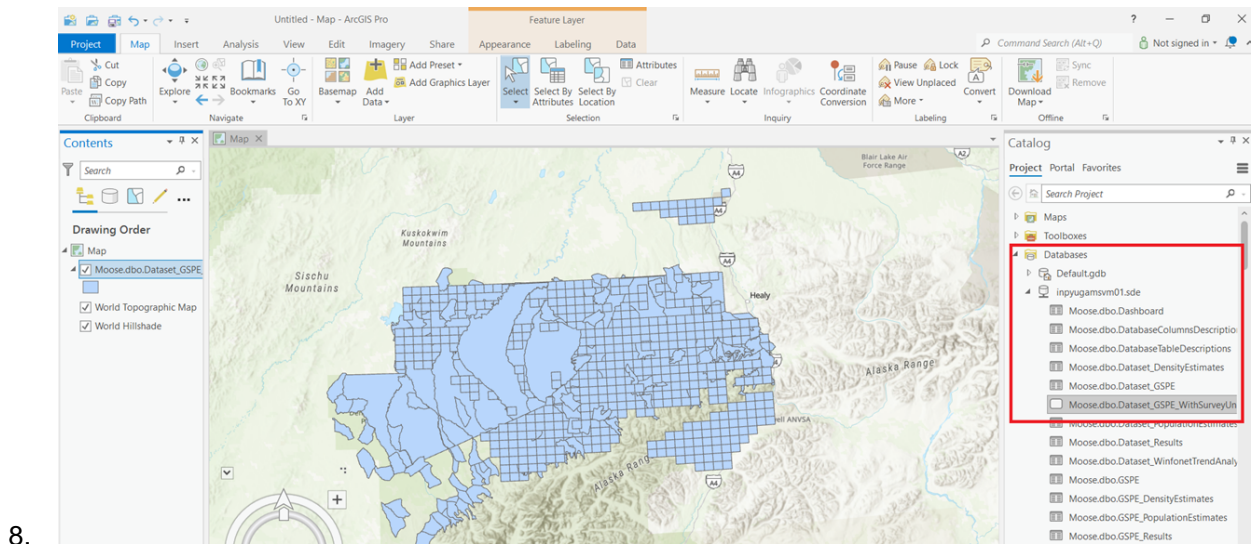
At least datereader permissions. Contact your data manager.

Process

1. Open ArcGIS Pro
2. Locate the Catalog
3. Right click Databases -> New database connection
4. Enter the server/database information as shown in the screenshot below:



- 5.
6. All the database tables and queries become available to you. Select Dataset_GSPE_WithSurveyUnits and drag it onto the map (there are tens of thousands of records which may take a while to load).
7. If all goes well the data will appear on the map



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ArcMap

Accessing the Moose database with ArcMap

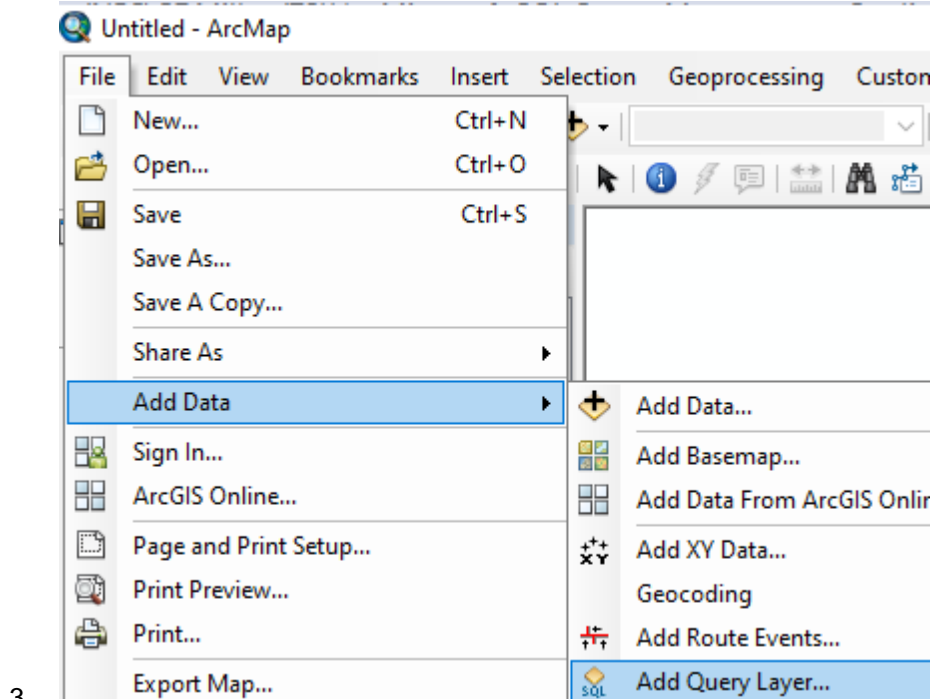
Using ArcMap to access data in the Moose Monitoring database is possible, but not recommended. It just doesn't work well. There is much better support for SQL Server database connections with ArcGIS Pro. See [ArcGIS Pro](#).

Prerequisite

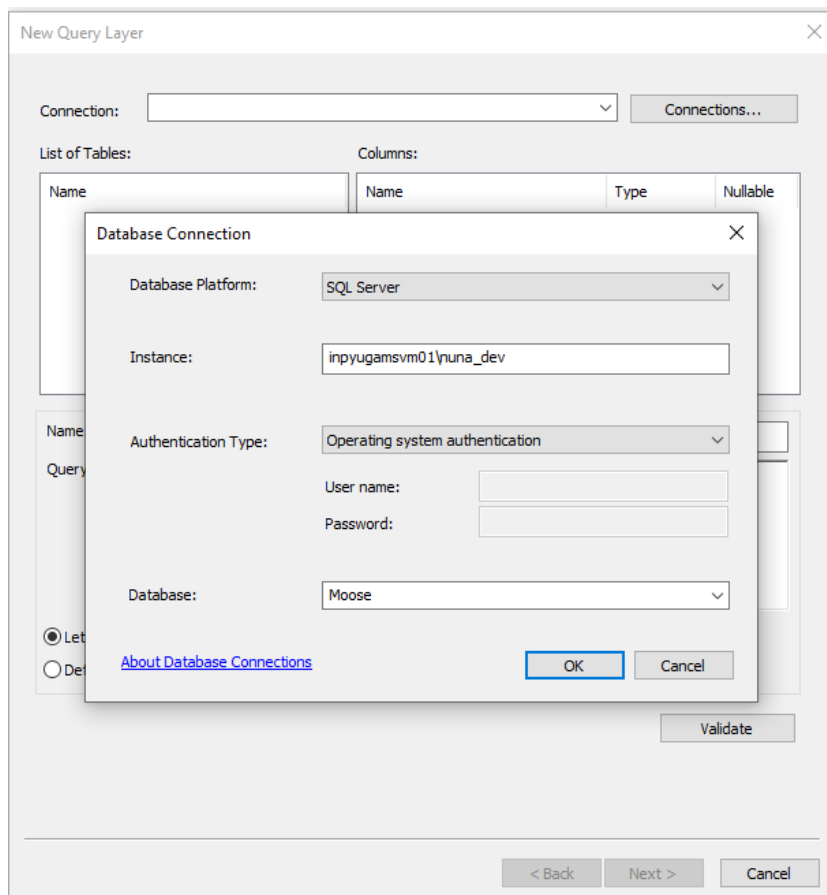
At least datareader permissions. Contact your data manager.

Process

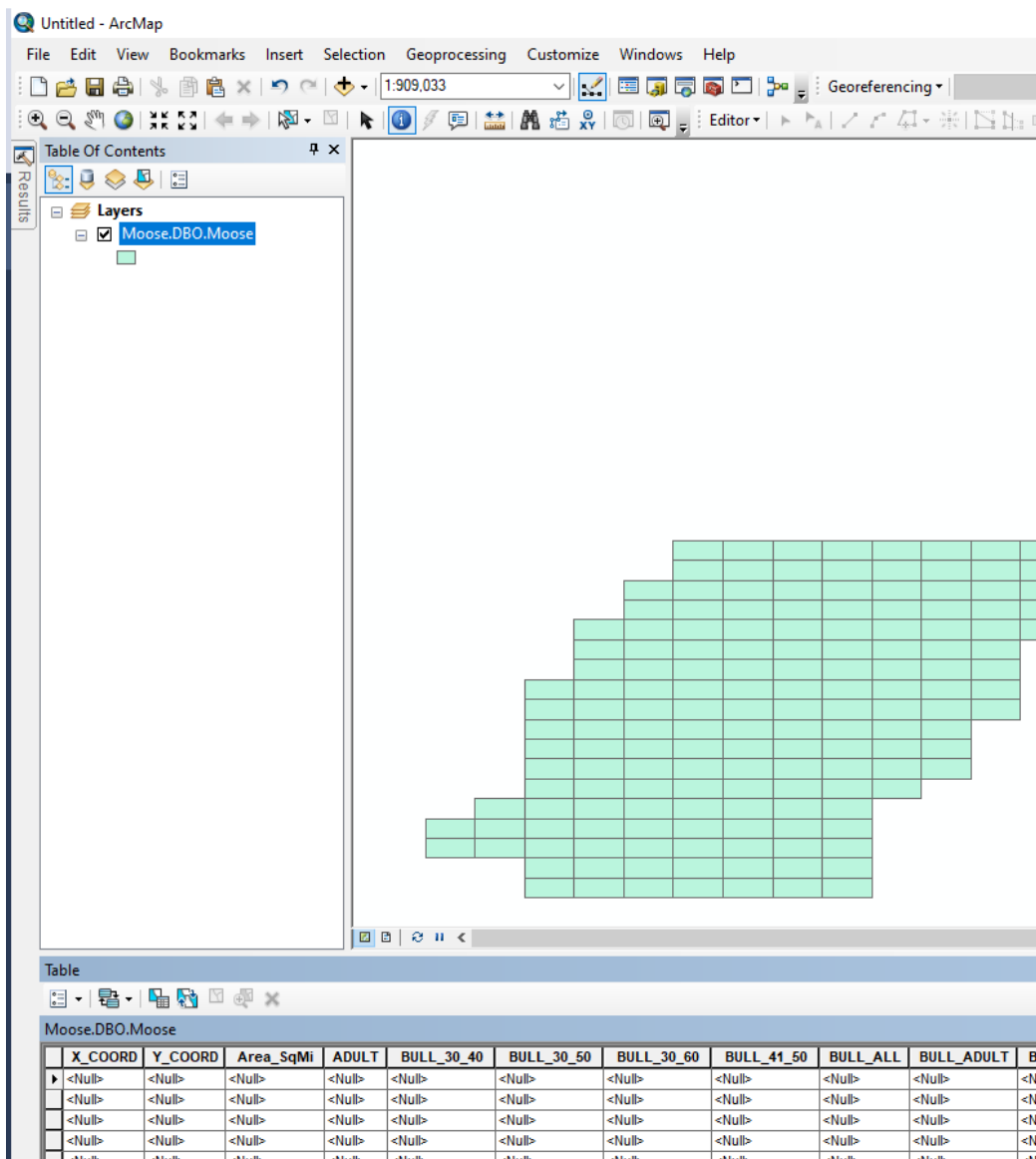
1. Open ArcMap
2. Add a Query Layer: File -> Add Data -> Add Query Layer



4. Make a new connection to the Moose database



- 5.
6. Enter a query. The most likely query you will want is Dataset_GSPE_WithSurveyUnits. This is the same query as Dataset_GSPE but it includes the survey unit polygons with the GSPE data. Note: You will almost certainly want to filter your query with a WHERE clause to prevent overloading ArcMap with tens of thousands of polygons.
7. An example query: `SELECT * from Dataset_GSPE_WithSurveyUnits WHERE SurveyName='2015 DENA Moose Survey'`
8. Click Validate and move through the rest of the wizard.
9. The data should appear:



- 10.
11. Consider exporting the data to a local shapefile or geodatabase to make analysis quicker by eliminating round trip passes over the network which will be slow. Otherwise analyze like any other GIS layer.
12. If you find errors please take the time to communicate them to the I&M data managers so they can be corrected for other users of the dataset!

R

Accessing the Moose database with R

Prerequisite

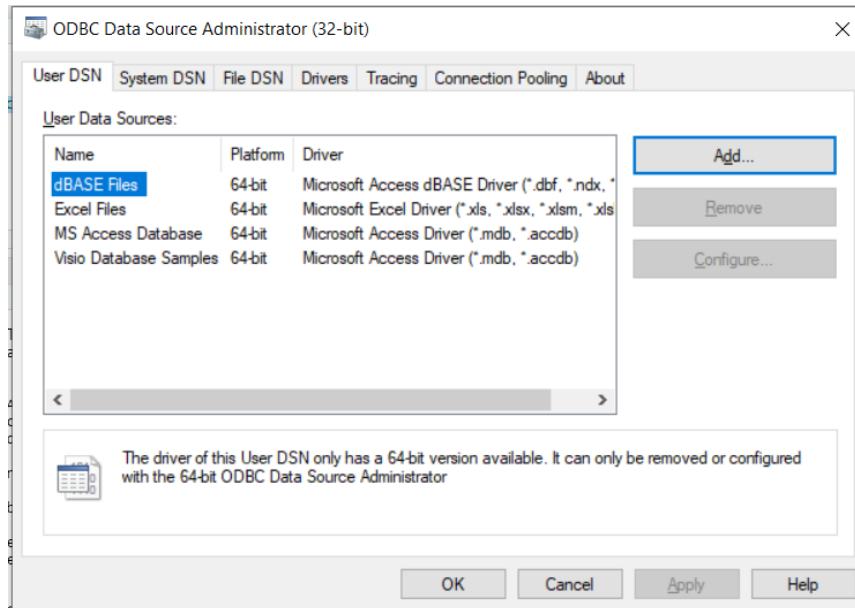
At least datereader permissions. Contact your data manager.
An ODBC database connection to the Moose database.

Create an ODBC connection

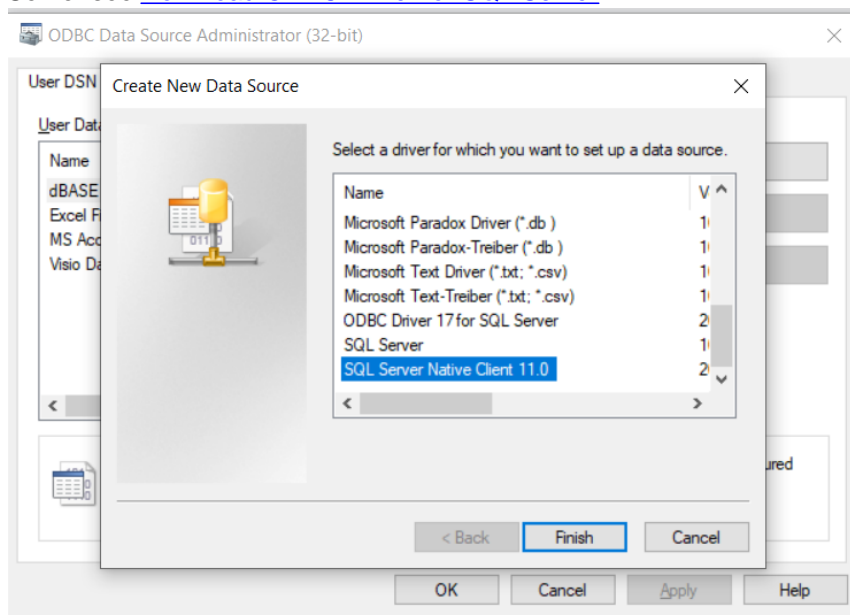
Process

1. Click the Windows key and search 'ODBC' to start the ODBC Data Source Administrator

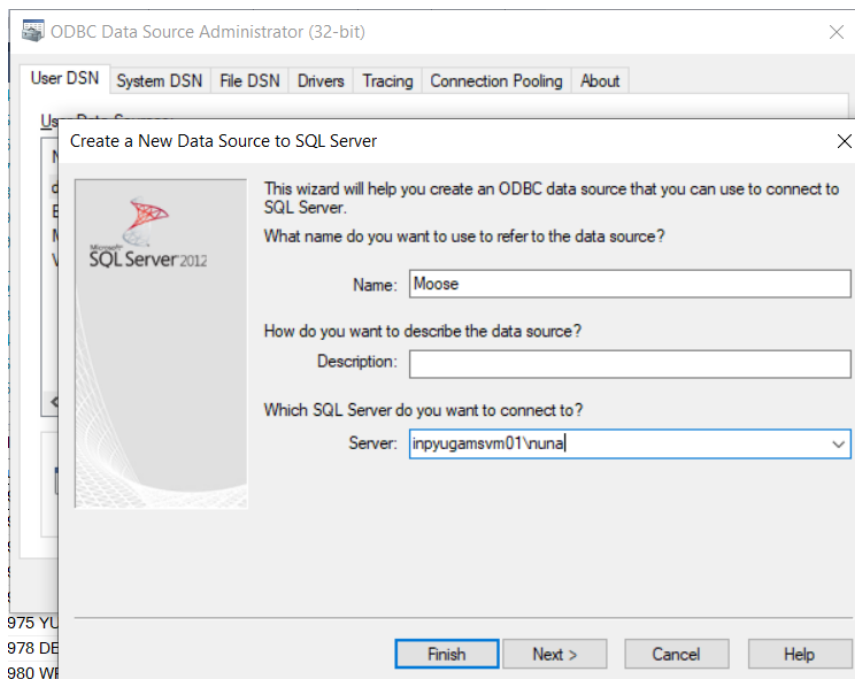
2. Click through the Wizard to create an ODBC connection to the Moose database
3. Click Add...



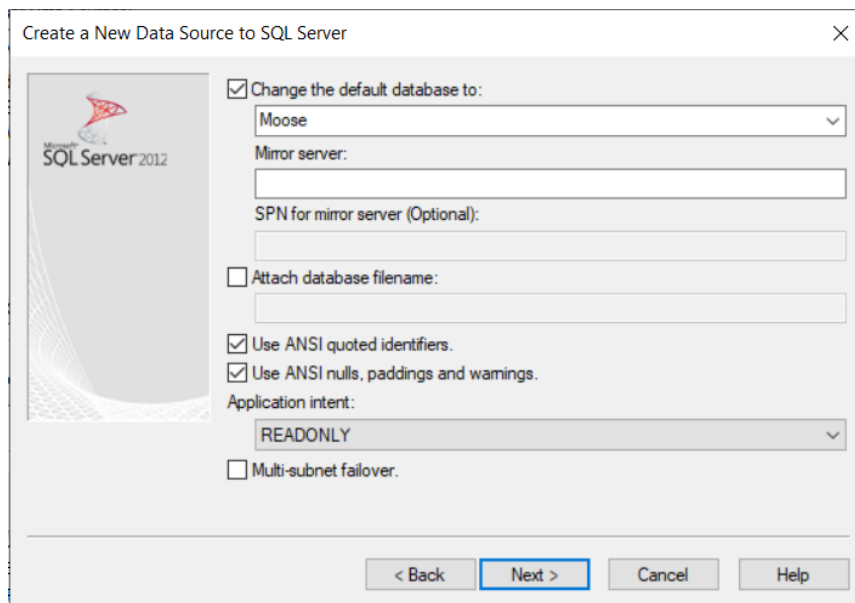
- 1.
2. Scroll down to Sql Server or Sql Server Native Client. If you don't have an ODBC driver for Sql Server see [Download ODBC Driver for SQL Server](#)



- 3.



4.



5.

4. Test the connection. If all goes well you can now connect to the database through this connection using R.

Example R script that connects to the Moose database

The example below shows how to connect to the Moose database and access the GSPE dataset. Modify the query as needed or omit the WHERE clause to pull the whole dataset (tens of thousands of records).

```
# Load the RODBC library
library(RODBC)

# Build a connection using the Moose ODBC connection
myconn <- odbcConnect('Moose')

# Load a query
gspe <- sqlQuery(myconn, "SELECT * from Dataset_GSPE_WithSurveyUnits WHERE
SurveyName='2015 DENA Moose Survey'")

# Do something with the dataset
```

```
summary(gspe)
```

2022-08-01 WRST Caribou R Sightability - RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

2010 Chisana PE Survey.r x Untitled1* x

```

1 # Load the RODBC library
2 library(RODBC)
3
4 # Build a connection
5 myconn <- odbcConnect('Moose')
6
7 # Load a query
8 gspe <- sqlQuery(myconn, "SELECT * from Dataset_GSPE_withSurveyUnits WHERE SurveyName='2015 DENA Moose Survey'")
9
10 # Do something with the dataset
11 summary(gspe)
12
13

```

1:1 (Top Level)

Console Terminal Jobs

R 4.2.0 · C:/Work/Analyses/2022-08-01 WRST Caribou R Sightability/

```

> library(RODBC)
> myconn <- odbcConnect('Moose')
> gspe <- sqlQuery(myconn, "SELECT * from Dataset_GSPE_withSurveyUnits WHERE SurveyName='2015 DENA Moose Survey'")
> summary(gspe)

```

SurveyName	Year	Network	Park	SubArea	Season	SurveyY
Length:222	Min. :2015	Length:222	Length:222	Length:222	Length:222	Min. :2
Class :character	1st Qu.:2015	Class :character	Class :character	Class :character	Class :character	1st Qu.:2
Mode :character	Median :2015	Mode :character	Mode :character	Mode :character	Mode :character	Median :2
	Mean :2015					Mean :2
	3rd Qu.:2015					3rd Qu.:2
	Max. :2015					Max. :2

ReportReferenceCode	ReportLink	DeliverablesDatasetReferenceCode	Methodology	ProtocolVersion	ProtocolReferenc
Min. : NA	Mode:logical	Min. : NA	Length:222	Mode:logical	Min. : NA
1st Qu.: NA	NA's:222	1st Qu.: NA	Class :character	NA's:222	1st Qu.: NA
Median : NA		Median : NA	Mode :character		Median : NA
Mean :NaN		Mean :NaN			Mean :NaN
3rd Qu.: NA		3rd Qu.: NA			3rd Qu.: NA
Max. : NA		Max. : NA			Max. : NA
NA's :222		NA's :222			NA's :222

ID	StartDate	StopDate	IntID	Rand	FiringOrder	Selected	Counted
----	-----------	----------	-------	------	-------------	----------	---------

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Python (ArcPy)

Accessing the Moose database with Python (ArcPy)

Prerequisite

At least datareader permissions. Contact your data manager.

The most likely scenario for accessing the Moose database using Python is to extract some or all of the dataset for analysis. There is a Python script at [Dataset publication](#) that loads the GSPE data into ArcMap and exports it as a shapefile. This script can be modified to suit your needs.

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Power BI

Accessing the Moose database with Microsoft Power BI

Prerequisite

At least datareader permissions. Contact your data manager.

Power BI. Download here <https://inp2300sqlsas02.nps.doi.net/PBIReports/browse/Development/CAKN>

Process

1. Open Power BI

2. Click Get data
3. Select Database -> SQL Server database

Get Data

All
File
Database
Power Platform
Azure
Online Services
Other

Database
SQL Server database
Access database
SQL Server Analysis Services database
Oracle database
IBM Db2 database
IBM Informix database (Beta)
IBM Netezza
MySQL database
PostgreSQL database
Sybase database
Teradata database
SAP HANA database
SAP Business Warehouse Application Server
SAP Business Warehouse Message Server
Amazon Redshift
Impala

[Certified Connectors](#) | [Template Apps](#)

[Connect](#)

- 4.
5. Click Connect
6. Enter the server and database names

SQL Server database

Server ⓘ

Database (optional)

Data Connectivity mode ⓘ

☐ Import
☒ DirectQuery

> Advanced options

OK

Cancel

- 7.
8. The database Navigator opens:

Navigator

Display Options ▾

☒ inpyugamsvm01\nuna: Moose [71]

☐ Dashboard
☐ DatabaseColumnsDescriptions
☐ DatabaseTableDescriptions
☐ Dataset_DensityEstimates
☐ Dataset_GSPE
☐ Dataset_GSPE_ForExportToGIS
☐ Dataset_GSPE_Surveys_WithMetric
☒ Dataset_GSPE_WithSurveyUnits
☐ Dataset_PopulationEstimates
☐ Dataset_Results

Dataset_GSPE_WithSurveyUnits

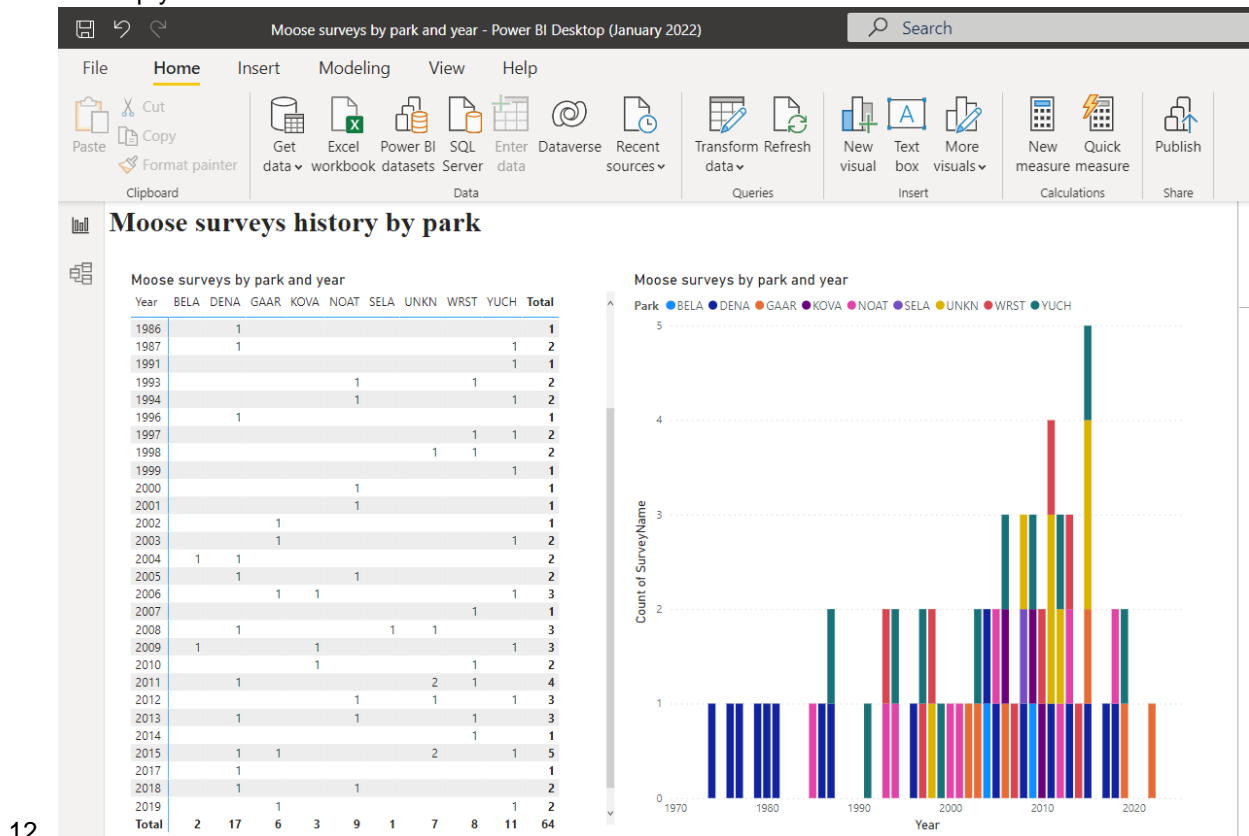
SurveyName	Year	Network
1974 DENA Moose Survey	1974	CAKN
1974 DENA Moose Survey	1974	CAKN
1974 DENA Moose Survey	1974	CAKN
1974 DENA Moose Survey	1974	CAKN
1974 DENA Moose Survey	1974	CAKN

i The data in the preview has been truncated due to

Select Related Tables

Load

- 9.
10. Select Dataset_GSPE_WithSurveyUnits
11. Develop your visuals



12.

Database documentation

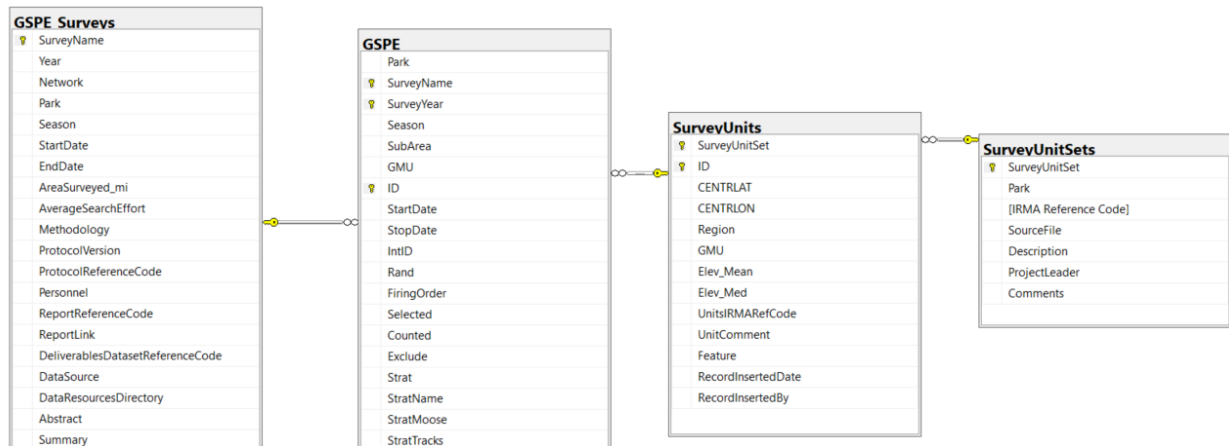
Database documentation

Database details

SQL Server: inpyugamsvm01\nuna

Database: Moose

Data model



Columns descriptions

Table	Column	DataType	Length	Precision	Scale	Nullabl
GSPE	ADULT	int	4	10	0	1
GSPE	Area_SqMi	float	8	53	NULL	1
GSPE	BULL_30_40	int	4	10	0	1
GSPE	BULL_30_50	int	4	10	0	1
GSPE	BULL_30_60	int	4	10	0	1
GSPE	BULL_41_50	int	4	10	0	1
GSPE	BULL_ADULT	int	4	10	0	1
GSPE	BULL_ALL	int	4	10	0	1
GSPE	BULL_GT_50	int	4	10	0	1
GSPE	BULL_GT_60	int	4	10	0	1
GSPE	BULL_GTE_50	int	4	10	0	1
GSPE	BULL_LT_30	int	4	10	0	1
GSPE	BULL_LT_50	int	4	10	0	1
GSPE	CALF	int	4	10	0	1
GSPE	CALF_LONE	int	4	10	0	1
GSPE	CertificationDate	datetime	8	23	3	1

Moose Monitoring Database Application

GSPE	CertificationLevel	varchar	15	15	NULL	0
GSPE	CertifiedBy	varchar	50	50	NULL	1
GSPE	Comments	varchar	255	255	NULL	1
GSPE	Counted	bit	1	1	NULL	1
GSPE	COW	int	4	10	0	1
GSPE	COW_W_0	int	4	10	0	1
GSPE	COW_W_1	int	4	10	0	1
GSPE	COW_W_2	int	4	10	0	1
GSPE	COW_W_3	int	4	10	0	1
GSPE	DateCounted	date	3	10	0	1
GSPE	Density	float	8	53	NULL	1
GSPE	Exclude	bit	1	1	NULL	1
GSPE	FiringOrder	int	4	10	0	1
GSPE	GMU	varchar	20	20	NULL	1
GSPE	ID	varchar	10	10	NULL	0
GSPE	Int	int	4	10	0	1
GSPE	IntID	int	4	10	0	1
GSPE	IsIntensivePlot	bit	1	1	NULL	1
GSPE	IsStdPlot	bit	1	1	NULL	1
GSPE	LG_BULL	int	4	10	0	1
GSPE	MED_BULL	int	4	10	0	1
GSPE	MED_L_BULL	int	4	10	0	1
GSPE	MOOSE	int	4	10	0	1
GSPE	Observer	varchar	50	50	NULL	1

Moose Monitoring Database Application

GSPE	Park	varchar	4	4	NULL	0
GSPE	Perc_Not_Flown	int	4	10	0	1
GSPE	Personnel	varchar	100	100	NULL	1
GSPE	Pilot	varchar	50	50	NULL	1
GSPE	Rand	float	8	53	NULL	1
GSPE	RecordInsertedBy	nvarchar	100	50	NULL	0
GSPE	RecordInsertedBy	sysname	100	50	NULL	0
GSPE	RecordInsertedDate	datetime	8	23	3	0
GSPE	SCF_Plot	bit	1	1	NULL	1
GSPE	SearchMin	float	8	53	NULL	1
GSPE	Season	varchar	20	20	NULL	1
GSPE	Selected	bit	1	1	NULL	1
GSPE	SM_BULL	int	4	10	0	1
GSPE	SourceFilename	varchar	255	255	NULL	1
GSPE	StartDate	datetime	8	23	3	1
GSPE	Std	int	4	10	0	1
GSPE	StopDate	datetime	8	23	3	1
GSPE	Strat	varchar	1	1	NULL	1
GSPE	StratHab	varchar	100	100	NULL	1
GSPE	StratMoose	int	4	10	0	1
GSPE	StratName	varchar	10	10	NULL	1
GSPE	StratTracks	int	4	10	0	1

Moose Monitoring Database Application

GSPE	SubArea	varchar	50	50	NULL	1
GSPE	SurveyID	int	4	10	0	1
GSPE	SurveyName	varchar	100	100	NULL	0
GSPE	SurveyUnitSet	varchar	100	100	NULL	1
GSPE	SurveyYear	int	4	10	0	0
GSPE	UNKNOWN	int	4	10	0	1
GSPE	X_COORD	float	8	53	NULL	1
GSPE	Y_COORD	float	8	53	NULL	1
GSPE	YBULL_ALL	int	4	10	0	1
GSPE	YBULL_GTSF	int	4	10	0	1
GSPE	YBULL_SF	int	4	10	0	1
GSPE_Surveys	Abstract	varchar	-1	-1	NULL	1
GSPE_Surveys	AreaSurveyed_mi	float	8	53	NULL	1
GSPE_Surveys	AverageSearchEffort	float	8	53	NULL	1
GSPE_Surveys	Comments	varchar	-1	-1	NULL	1
GSPE_Surveys	DataResourcesDirectory	varchar	1000	1000	NULL	1

Moose Monitoring Database Application

GSPE_Surveys	DatasetProcessingSteps	varchar	-1	-1	NULL	1
GSPE_Surveys	DataSource	varchar	2000	2000	NULL	1
GSPE_Surveys	DeliverablesDatasetReferenceCode	int	4	10	0	1
GSPE_Surveys	EndDate	date	3	10	0	1
GSPE_Surveys	Methodology	varchar	50	50	NULL	1
GSPE_Surveys	Network	char	4	4	NULL	1
GSPE_Surveys	Park	varchar	4	4	NULL	1
GSPE_Surveys	Personnel	varchar	200	200	NULL	1
GSPE_Surveys	ProtocolReferenceCode	int	4	10	0	1
GSPE_Surveys	ProtocolVersion	float	8	53	NULL	1
GSPE_Surveys	RecordInsertedBy	varchar	50	50	NULL	0
GSPE_Surveys	RecordInsertedDate	datetime	8	23	3	0
GSPE_Surveys	ReportLink	varchar	2000	2000	NULL	1
GSPE_Surveys	ReportReferenceCode	int	4	10	0	1
GSPE_Surveys	Season	varchar	10	10	NULL	1
GSPE_Surveys	StartDate	date	3	10	0	1
GSPE_Surveys	Summary	varchar	-1	-1	NULL	1
GSPE_Surveys	SurveyName	varchar	100	100	NULL	0
GSPE_Surveys	ValidatedBy	varchar	50	50	NULL	1
GSPE_Surveys	ValidatedDate	date	3	10	0	1

GSPE_Surveys	Year	int	4	10	0	0
SurveyUnits	CENTRLAT	float	8	53	NULL	1
SurveyUnits	CENTRLON	float	8	53	NULL	1
SurveyUnits	Elev_Mean	float	8	53	NULL	1
SurveyUnits	Elev_Med	float	8	53	NULL	1
SurveyUnits	Feature	hierarchyid	-1	-1	NULL	1
SurveyUnits	Feature	geometry	-1	-1	NULL	1
SurveyUnits	Feature	geography	-1	-1	NULL	1
SurveyUnits	GMU	varchar	5	5	NULL	1
SurveyUnits	ID	varchar	10	10	NULL	0
SurveyUnits	RecordInsertedBy	nvarchar	100	50	NULL	0
SurveyUnits	RecordInsertedBy	sysname	100	50	NULL	0
SurveyUnits	RecordInsertedDate	datetime	8	23	3	0
SurveyUnits	Region	int	4	10	0	1
SurveyUnits	SurveyUnitSet	varchar	100	100	NULL	0
SurveyUnits	UnitComment	varchar	1000	1000	NULL	1
SurveyUnits	UnitsIRMARefCode	int	4	10	0	1
SurveyUnitSets	Comments	varchar	-1	-1	NULL	1
SurveyUnitSets	Description	varchar	4000	4000	NULL	1
SurveyUnitSets	IRMA Reference Code	int	4	10	0	1
SurveyUnitSets	Park	varchar	4	4	NULL	1
SurveyUnitSets	ProjectLeader	varchar	50	50	NULL	1
SurveyUnitSets	SourceFile	varchar	255	255	NULL	1
SurveyUnitSets	SurveyUnitSet	varchar	100	100	NULL	0

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Source code repository

Source code repository

Source code for the Moose Monitoring Database Application is available through GitHub at <https://github.com/NPS-ARCN-CAKN/Moose3>

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Data mining resources

Data mining resources

Mat Sorum put together a summary in 2016 for ARCN Moose Survey Data_3_23_2016.xlsx	N:\Natural\GAAR\Moose\GAAR Moose Surveys
DENA Moose drive	\\inpdenafiles02\teams\ResMgmt\Wildlife\Moose
CAKN Moose shared drive	J:\Monitoring\Moose\Data
ARCUS has old reports	

. He put data at

: \\inpdenafiles02\teams\ResMgmt

Hey Scott! Sounds like a big lift. You have all the YUCH surveys I have information on. I assume the red ones stem from some information you perhaps got from Shults or Lawler, but I don't have additional information on them. I tasked Mat Sorum with organizing all the ARCN survey data a few years back, which he did. So he may be in the best position to assess where we are at on those surveys. Attached is a spreadsheet that was developed. While I was on a bunch of the western surveys, I didn't end up with the data, Brad did. I assume Raime and Letty manage these datasets now.

For GAAR, we have 2 moose surveys: the Koyukuk and the upper Kobuk. So I would modify your naming conventions to reflect that. The upper Kobuk survey is really upstream of KOVA (ie it doesn't cover much of KOVA) and covers GAAR "boot". All the survey data for these 2 areas can be found here: N:\Natural\GAAR\Moose\GAAR Moose Surveys. Hopefully that will turn some of your reds green.

The Tagagawik (not Tagagawiki as spelled in first 2 lines) and the Tag are the same river, in case that helps you.

Kyle

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An example data entry session using FileToSql

An example data entry session using FileToSql

There are many ways to enter data into the moose monitoring database. The example below shows the step I took to enter the 2013 DENA Moose Survey data into the database.

There are a couple of resources that are ideally at hand for data entry of a moose survey in addition to the ones in the [Data management resources table](#):

Resource	Location
Survey report	Not available as of writing. Probably not written. DENA biologist did not have it.

Data deliverable file (GSPE or older J:\Monitoring\Moose\Data\2013 DENA Moose Survey Gasaway format spreadsheet).

There are a number of ways to import data into a SQL Server database. These include:

1. SQL Server Import and Export Wizard
2. Writing INSERT queries as an Excel formula
3. Scripting with Python, R or other language
4. Using ARCN's FileToSql tool

I used the FileToSql tool but the SQL Server Import and Export wizard would work just as well.

Procedure

Ensure the parent Survey record exists in the moose monitoring database for the data you wish to import. The Survey table must have a parent row before any child GSPE data records can be related to it. In this example I've ensured the parent '2013 DENA Moose Survey' records exists in the Surveys table. Copy down or remember the unique SurveyName because you will need it later.

Start FileToSql

Drag the Excel file to be imported into the database onto the FileToSql tool

The screenshot shows the 'Data file to SQL 3.0' application. On the left, a file tree shows 'Cantwell 13.xls' with 'Sheet1\$' selected. The main area has tabs for 'Source data table', 'Destination data table', and 'Map source data to destination'. The 'Data' tab is active, showing a grid of survey data. Below the data grid is a 'Metadata' section showing column details.

Survey ID	Survey Name	Surveyyear	Season	Description	ID	Intid	Rand
630	DENALI CA...	2013	Fall	CANTWELL...	6312-14915	1530	
630	DENALI CA...	2013	Fall	CANTWELL...	6312-14920	1529	
630	DENALI CA...	2013	Fall	CANTWELL...	6312-14925	1528	
630	DENALI CA...	2013	Fall	CANTWELL...	6312-14930	1527	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14915	1477	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14920	1476	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14925	1475	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14930	1474	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14935	1473	
630	DENALI CA...	2013	Fall	CANTWELL...	6314-14940	1472	
630	DENALI CA...	2013	Fall	CANTWELL...	6316-14910	1425	

Column Name	Units	Caption	Data Type	Average	Minimum	Maximum	Count
SurveyID		SurveyID	Double	630	630	630	87
SurveyName		SurveyName	String		DENALI CANTW...	DENALI CANTW...	87
Surveyyear		Surveyyear	Double	2013	2013	2013	87
Season		Season	String		Fall	Fall	87
Description		Description	String		CANTWELL AR...	CANTWELL AR...	87
ID		ID	String		6312-14915	6418-14905	87
Intid		Intid	Double	1328.363636363...	1109	1530	66
Rand		Rand	String				87
Firingorder		Firingorder	String				87
Strat		Strat	String		h	L	87
Stratname		Stratname	String		h	L	87
Stratname		Stratname	String				87

The spreadsheet and tabs show up in the tree at left. Ensure the data in the Data grid exactly represents what is in the source spreadsheet. The information in the Metadata grid below may help to elucidate any problems with the data. Look at the data types, max and min values.

If the source dataset looks good click on the Destination data table tab

Enter a connection string to the moose monitoring database. As of Oct. 2021 it is

Server=inyugamsvm01\nuna_dev;Database=moose;Trusted_Connection=True;

Enter an SQL query that duplicates the data fields in the source data file you would like to import. In most cases the following query will work: **select top 10 * from GSPE**

Click Execute

If your permissions, connection string and query are all good then you should see some database records

from the GSPE table of the Moose database and a columns mapping tool should appear. The source data should appear under the Source Table grid. On the left is a tool you will use to match source data columns to destination database table columns.

Import

Map source columns to destination columns

Auto-match columns
 Preview transformed data

Destination column name	Source column name	Default value	Validation	Data type
Park				String
SurveyName				String
SurveyYear				Int32
Season				String
SubArea				String
GMU				String
ID				String
StartDate				Date
StopDate				Date
IntID				Int32
Rand				Double
FiringOrder				Int32
Selected				Boolean
Counted				Boolean
Exclude				Boolean
Strat				String
StratName				String
StratMoose				Int32

Source table

Highlight NULLs

SurveyID	SurveyName	SurveyYear	Season	Description	ID	Intid
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6312-14915	1530
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6312-14925	1528
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6312-14930	1527
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6314-14915	1477
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6314-14920	1476
630	DENALI CANTW...	2013	Fall	CANTWELL AR...	6314-14925	1475

1 of 87

Destination table (transformed data)

Highlight NULLs
 Export transformed data to CSV

Park	SurveyName	SurveyYear	Season	SubArea	GMU	ID	St
*							

0 of 0

Click Auto-match columns

Import

Here are the instructions

1. Click Auto-match columns. This will match any source/destination columns with the same name

Map source columns to destination columns

Auto-match columns | Preview transformed data

Destination column name	Source column name	Default value	Validation
Park	Default value	DENA	OK
SurveyName	SurveyName		
SurveyYear	Surveyyear		
Season	Season		
SubArea		CANTWELL	
GMU	GMU		OK
ID	ID		OK
StartDate			
StopDate			
IntID	Intid		OK. Source data cont
Rand	Rand		OK. Source data cont
FiringOrder	Firingorder		OK. Source data cont
Selected	Selected		OK. Source data cont
Counted	Counted		OK
Exclude			
Strat	Strat		OK
StratName	Stratname		OK
StratMoose	Stratmoose		OK. Source data cont
StartTimestep	StartTimestep		OK. Source data cont

Match source columns to destination columns, or provide default values

Source table

SurveyID	SurveyName
630	DENALI CAN
630	DENALI CAN
630	DENALI CAN
30	DENALI CAN
30	DENALI CAN
630	DENALI CAN
630	DENALI CAN

1 of 87

Destination table (transformed)

Park	SurveyName
*	

0 of 0

IMPORTANT: Ensure the default value for SurveyName exactly matches the SurveyName field of the parent Survey record in the database. If this is not done you will get referential integrity errors and the data import will fail. It is OK to override the existing SurveyName source column values.

Map source columns to destination columns

Auto-match columns | Preview transformed data | Export mappings to CSV

Destination column name	Source column name	Default value	Validation	Data Type
Park	Default value	DENA	OK	
SurveyName	Default value	2013 DENA Moose Survey	OK	
SurveyYear	Surveyyear		OK	
Season	Season		OK	

IMPORTANT: Make sure the SurveyName default value exactly matches the parent Survey record.

Ensure the default value for SurveyName matches exactly the SurveyName of the parent Survey record; '2013 DENA Moose Survey', for example.

Match any remaining columns from the source spreadsheet to the database table columns, or provide default values.

Click in the **SourceFilename** row

Right click the Default value column for SourceFilename

The source filename appears, select it to auto-fill the SourceFilename default value to the file name.

Destination column name	Source column name	Default value	Validation
YBULL_GTSF			
YBULL_SF			
MOOSE			
Pilot			
Observer			
Personnel			
Density			
SCF_Plot			
Std			
Int			
Comments	comments		OK. Source data cor
SourceFilename			
RecordInsertedDate			

Cantwell 13.xls

Select the **RecordInsertedDate** row

Right click the Source column name column and select Current datetime

Destination column name	Source column name	Default value
YBULL_GTSF		
YBULL_SF		
MOOSE		
Pilot		
Observer		
Personnel		
Density		
SCF_Plot		
Std		
Int		
Comments	comments	
SourceFilename		
RecordInsertedDate		
RecordInsertedBy		
CertificationDate		
CertifiedBy		

Default value
New GUID
Autonumber
Current Datetime
Current Username

Select the RecordInsertedBy column and set its default value to Current username using the same steps as above.

Set CertificationLevel default value to 'Provisional'

Gotchas




Notice that the source column CALF contains all zeroes where TotalCalves contains count data. Auto-match columns would have gotten this match wrong.

Moose Monitoring Database Application

[illegible]

Other columns that seldom map correctly automatically appear below

Map source columns to destination columns

 Auto-match columns |
  Preview transformed data |
  Export map

Destination column name	Source column name	Default value	Validation
Perc_Not_Flowm			
X_COORD	centrlon		OK
Y_COORD	centrlat		OK
Area_SqMi	AreaMi		OK
ADULT	TotalAdults		OK
BULL_30_40			
BULL_30_50			
BULL_30_60			
BULL_41_50			
BULL_ALL	TotalBulls		
BULL_GT_50			
BULL_GT_60			
BULL_GTE_50			
BULL_LT_30			
BULL_LT_50			
CALF	TotalCalves		OK
CALF_LONE			
COW	TotalCows		OK
COW_W_0	COW_W_0		OK
COW_W_1	COW_W_1		OK
COW_W_2	COW_W_2		OK
COW_W_3	COW_W_3		OK
LG_BULL	LG_BULL		OK
MED_BULL	MED_BULL		OK
MED_L_BULL			
SM_BULL			
UNKNOWN	UNKNOWN		OK
YBULL_ALL	YBULL_ALL		OK
YBULL_GTSF			
YBULL_SF			
MOOSE	totalmoose		OK

Columns that seldom automatically map correctly

Carefully check your mappings and if all looks good click Import transformed data. A dialog appears requesting the database name. Enter 'Moose'.

Table name is required.

What is the name of the destination table?

OK

Cancel

GSPE

[illegible]

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