## Contents

## Intro

In this document, we will review the steps taken to clean and present the bird population data in a Power BI dashboard.

We will begin with importing the datasets, which consist of csv and xlsx formats.

## Clean and organize data in Power Query

First is SpeciesList.xlsx, which has multiple inconsistencies to correct before analyzing:
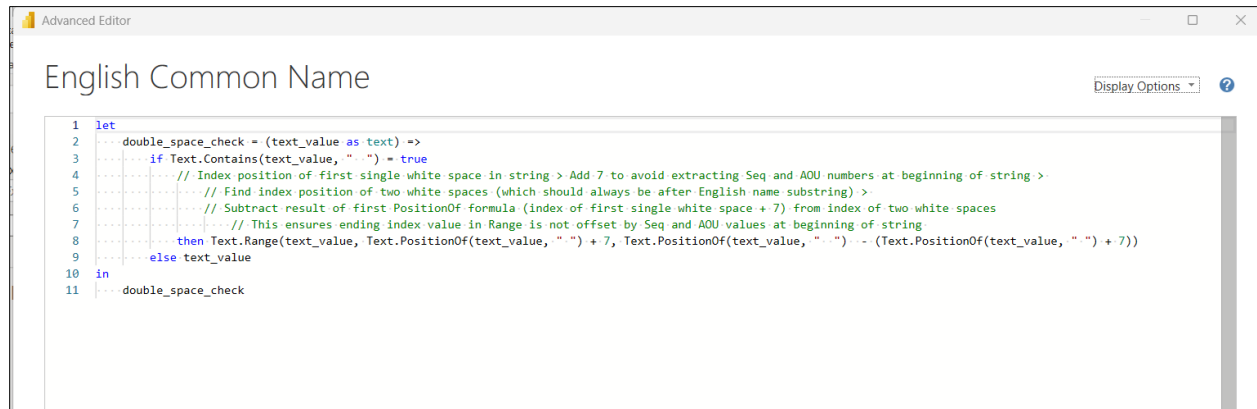


The first 14 rows are irrelevant descriptions and a column has no data, so we will remove them.

The next issue is how the first column contains independent data values (unique identification numbers and the names in English, Spanish and French). Additionally, they are separated inconsistently with different lengths of whitespace between each value.
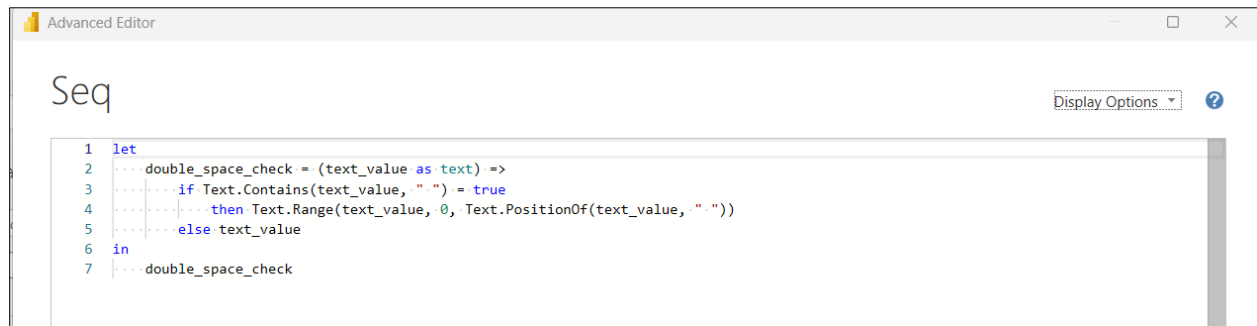
This will be complicated to split to columns, and the standard Power Query function is unable to do it consistently, so we will write custom functions with the M language to dynamically split the column.
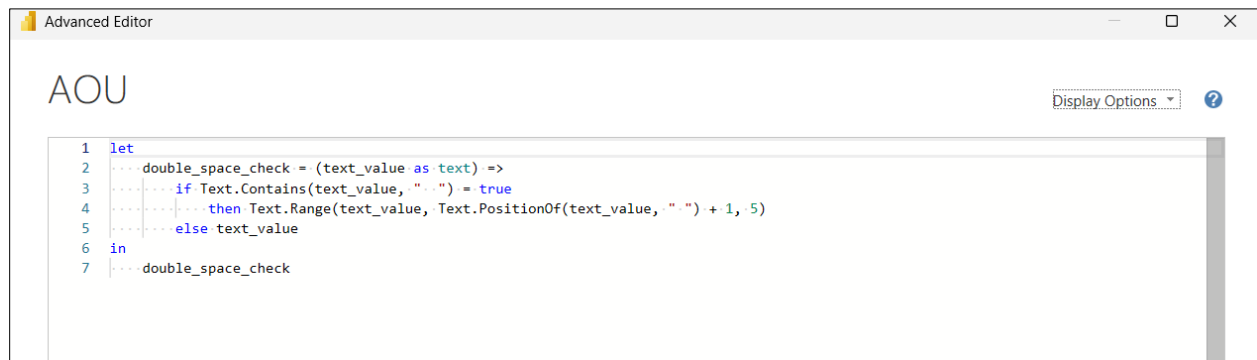
Split names:

```
Advanced Editor                                                    —  □  ✕

English Common Name                                    Display Options ▾  ❓

1   let
2       double_space_check = (text_value as text) =>
3           if Text.Contains(text_value, " ") = true
4               // Index position of first single white space in string > Add 7 to avoid extracting Seq and AOU numbers at beginning of string >
5               // Find index position of two white spaces (which should always be after English name substring) >
6               // Subtract result of first PositionOf formula (index of first single white space + 7) from index of two white spaces
7               // This ensures ending index value in Range is not offset by Seq and AOU values at beginning of string
8               then Text.Range(text_value, Text.PositionOf(text_value, " ") + 7, Text.PositionOf(text_value, "  ") - (Text.PositionOf(text_value, " ") + 7))
9           else text_value
10  in
11      double_space_check
```

Split Seq Number:

```
Advanced Editor                                                    —  □  ✕

Seq                                                    Display Options ▾  ❓

1   let
2       double_space_check = (text_value as text) =>
3           if Text.Contains(text_value, " ") = true
4               then Text.Range(text_value, 0, Text.PositionOf(text_value, " "))
5           else text_value
6   in
7       double_space_check
```

AOU:

```
Advanced Editor                                                    —  □  ✕

AOU                                                    Display Options ▾  ❓

1   let
2       double_space_check = (text_value as text) =>
3           if Text.Contains(text_value, " ") = true
4               then Text.Range(text_value, Text.PositionOf(text_value, " ") + 1, 5)
5           else text_value
6   in
7       double_space_check
```

Next is weather.csv, where we will filter to only show data from Pennsylvania (i.e. StateNum = 72):

The remaining datasets (Pennsyl.csv, fifty8.csv, and routes.csv) are imported with minimal formatting changes.

Last, we create a custom table within Power Query (Goal) to be used later for our KPI goal threshold:
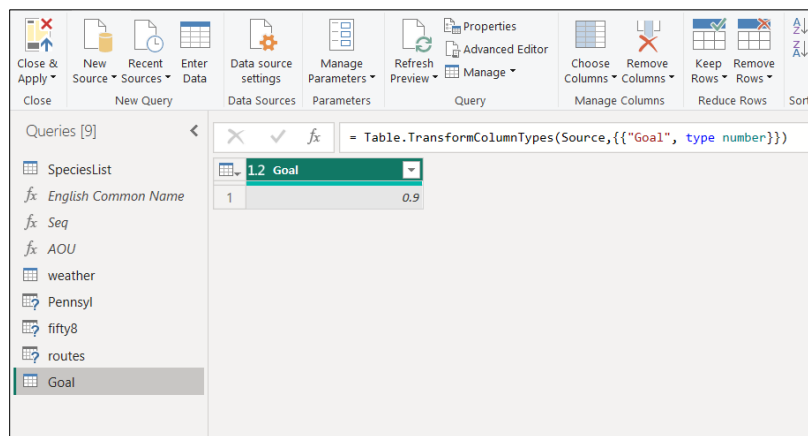


Now we are ready to import the sources to Power BI!

## Species Population Map

Our first page will show the number of species observed by location in a map format with bubble size representing the count of species observed. We first change the Data Category of the Latitude and Longitude fields to their respective data types to be used by the map visual. We will also input the Species Total field as the values for bubble size.
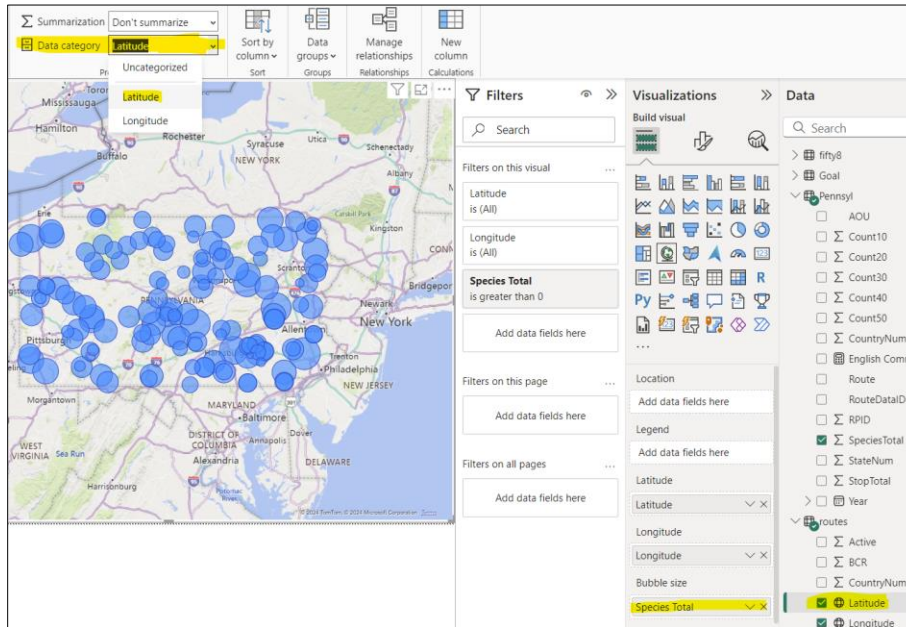
Finally, we filter out any species with a count of zero to only show relevant results in the Filters side pane:



Now we have our map visual, which can show the population count by hovering over a bubble!
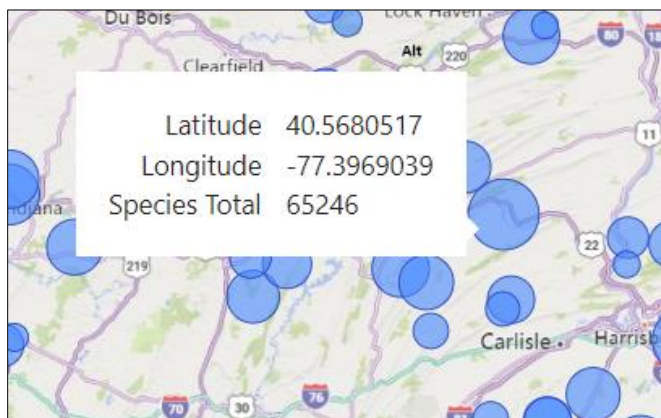
Now we will add some filters for year observed, English Common Name (species) and a table listing the Species Total, which in turn can have its rows clicked on for species filtering as well.
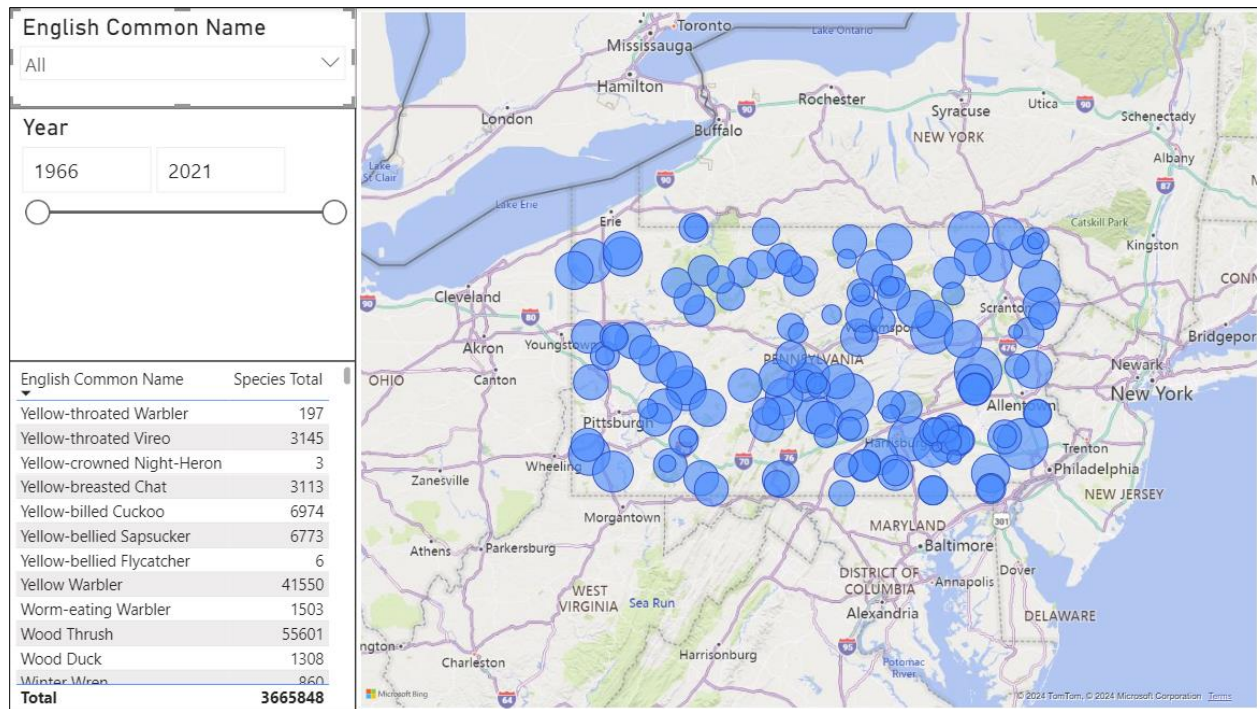


For the English Common Name filter, it lists all species from the SpeciesList table, even if they are not observed in any location. To fix this, we will create a measure with DAX and add it to the Filters side pane for the English Common Name dropdown menu. This will be used for all pages that use the English Common Name filter.

## Top Ten Species Population

The second page will illustrate the population size of species observed, with filters for year, species name.

We will add a bar graph and a table to show the count per species. They will be connected to English Common Name and Year filters on this page as well to see specific population counts by species name and year.
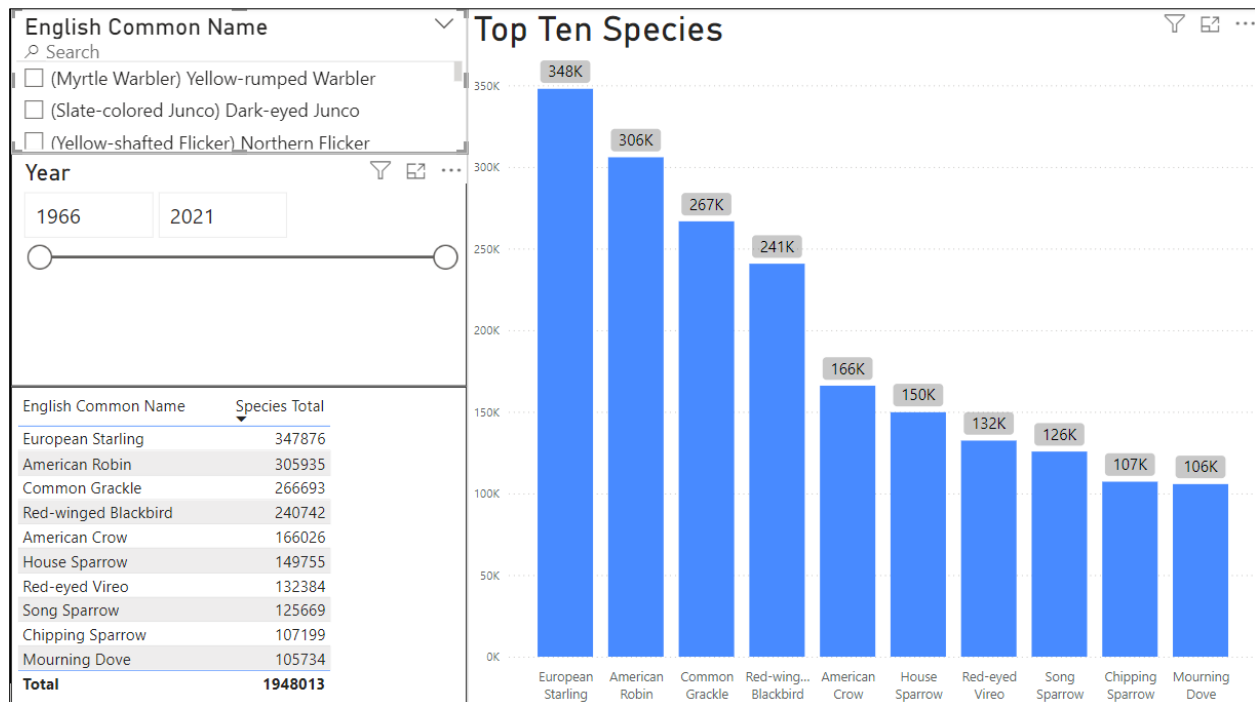


## Population Over Time

The third page will visualize the population over time in years with a line graph. Additionally, we will create groups for common bird categories like owls, hummingbirds, etc.

To create the groups, we will create a calculated column called "Species Group" in data view with a DAX formula. The logic will look for certain words in each English Common Name value for key words to properly sort them into different categories (i.e. if the name contains "owl", label it with the "Owl" category , so "Barn Owl" would be categorized as "Owl")

```
1  Species Group =
2  IF(CONTAINSSTRING(SpeciesList[English Common Name], "Owl"), "Owl",
3      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Hawk"), "Hawk",
4      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Falcon"), "Falcon",
5      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Hummingbird"), "Hummingbird",
6      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Duck"), "Duck",
7      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Eagle"), "Eagle",
8      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Woodpecker"), "Woodpecker",
9      "Other"
10 )))))))
```

| ORDER | Family | Genus | Species | English Common Name | Seq | AOU | Species Group |
|---|---|---|---|---|---|---|---|
| Strigiformes | Strigidae | Aegolius | funereus | Boreal Owl | 695 | 3710 | Owl |
| Strigiformes | Strigidae | Asio | flammeus | Short-eared Owl | 693 | 3670 | Owl |
| Strigiformes | Strigidae | Asio | otus | Long-eared Owl | 691 | 3660 | Owl |
| Strigiformes | Strigidae | Strix | nebulosa | Great Gray Owl | 690 | 3700 | Owl |
| Strigiformes | Strigidae | Strix | varia | Barred Owl | 688 | 3680 | Owl |
| Strigiformes | Strigidae | Strix | occidentalis | Spotted Owl | 687 | 3690 | Owl |
| Strigiformes | Strigidae | Athene | cunicularia | Burrowing Owl | 684 | 3780 | Owl |
| Strigiformes | Strigidae | Micrathene | whitneyi | Elf Owl | 683 | 3810 | Owl |
| Strigiformes | Strigidae | Glaucidium | brasilianum | Ferruginous Pygmy-Owl | 682 | 3800 | Owl |
| Strigiformes | Strigidae | Glaucidium | gnoma | Northern Pygmy-Owl | 678 | 3790 | Owl |
| Strigiformes | Strigidae | Surnia | ulula | Northern Hawk Owl | 677 | 3770 | Owl |
| Strigiformes | Strigidae | Bubo | scandiacus | Snowy Owl | 676 | 3760 | Owl |
| Strigiformes | Strigidae | Bubo | virginianus | Great Horned Owl | 675 | 3750 | Owl |
| Strigiformes | Strigidae | Megascops | asio | Eastern Screech-Owl | 670 | 3730 | Owl |
| Strigiformes | Strigidae | Megascops | kennicottii | Western Screech-Owl | 669 | 3732 | Owl |
| Strigiformes | Strigidae | Megascops | trichopsis | Whiskered Screech-Owl | 666 | 3731 | Owl |
| Strigiformes | Strigidae | Psiloscops | flammeolus | Flammulated Owl | 665 | 3740 | Owl |
| Strigiformes | Tytonidae | Tyto | alba | Barn Owl | 663 | 3650 | Owl |
| Galliformes | Phasianidae | Pavo | cristatus | Indian Peafowl | 118 | 3095 | Owl |
| Charadriiformes | Scolopacidae | Tringa | melanoleuca | Greater Yellowlegs | 389 | 2540 | Owl |
| Charadriiformes | Scolopacidae | Tringa | melanoleuca / flavipes | unid. Greater Yellowlegs / Lesser Yellowlegs | 385 | 2555 | Owl |
| Charadriiformes | Scolopacidae | Tringa | flavipes | Lesser Yellowlegs | 384 | 2550 | Owl |
| Passeriformes | Icteridae | Sturnella | magna / neglecta | unid. Eastern Meadowlark / Western Meadowlark | 1349 | 5012 | Owl |
| Passeriformes | Icteridae | Sturnella | neglecta | Western Meadowlark | 1348 | 5011 | Owl |
| Passeriformes | Icteridae | Sturnella | magna | Eastern Meadowlark | 1347 | 5010 | Owl |

However, we have run into a bug in the DAX logic. The term "Owl" can be part of words not related to the species such as "Mead**owl**ark", "F**owl**" and "Yell**owl**egs". To fix this, we will revise the formula to include conditions excluding them.

```
1  Species Group =
2  IF(CONTAINSSTRING(SpeciesList[English Common Name], "Owl") && NOT(CONTAINSSTRING(SpeciesList[English Common Name], "Meadow")) && NOT(CONTAINSSTRING(SpeciesList[English Common Name], "yellow")) && NOT(CONTAINSSTRING(SpeciesList[English Common Name], "fowl")), "Owl",
3      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Hawk"), "Hawk",
4      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Falcon"), "Falcon",
5      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Hummingbird"), "Hummingbird",
6      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Duck"), "Duck",
7      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Eagle"), "Eagle",
8      IF(CONTAINSSTRING(SpeciesList[English Common Name], "Woodpecker"), "Woodpecker",
9      "Other"
10 )))))))
```

| ORDER | Family | Genus | Species | English Common Name | Seq | AOU | Species Group |
|---|---|---|---|---|---|---|---|
| Strigiformes | Strigidae | Aegolius | acadicus | Northern Saw-whet Owl | 696 | 3720 | Owl |
| Strigiformes | Strigidae | Aegolius | funereus | Boreal Owl | 695 | 3710 | Owl |
| Strigiformes | Strigidae | Asio | flammeus | Short-eared Owl | 693 | 3670 | Owl |
| Strigiformes | Strigidae | Asio | otus | Long-eared Owl | 691 | 3660 | Owl |
| Strigiformes | Strigidae | Strix | nebulosa | Great Gray Owl | 690 | 3700 | Owl |
| Strigiformes | Strigidae | Strix | varia | Barred Owl | 688 | 3680 | Owl |
| Strigiformes | Strigidae | Strix | occidentalis | Spotted Owl | 687 | 3690 | Owl |
| Strigiformes | Strigidae | Athene | cunicularia | Burrowing Owl | 684 | 3780 | Owl |
| Strigiformes | Strigidae | Micrathene | whitneyi | Elf Owl | 683 | 3810 | Owl |
| Strigiformes | Strigidae | Glaucidium | brasilianum | Ferruginous Pygmy-Owl | 682 | 3800 | Owl |
| Strigiformes | Strigidae | Glaucidium | gnoma | Northern Pygmy-Owl | 678 | 3790 | Owl |
| Strigiformes | Strigidae | Surnia | ulula | Northern Hawk Owl | 677 | 3770 | Owl |
| Strigiformes | Strigidae | Bubo | scandiacus | Snowy Owl | 676 | 3760 | Owl |
| Strigiformes | Strigidae | Bubo | virginianus | Great Horned Owl | 675 | 3750 | Owl |
| Strigiformes | Strigidae | Megascops | asio | Eastern Screech-Owl | 670 | 3730 | Owl |
| Strigiformes | Strigidae | Megascops | kennicottii | Western Screech-Owl | 669 | 3732 | Owl |
| Strigiformes | Strigidae | Megascops | trichopsis | Whiskered Screech-Owl | 666 | 3731 | Owl |
| Strigiformes | Strigidae | Psiloscops | flammeolus | Flammulated Owl | 665 | 3740 | Owl |
| Strigiformes | Tytonidae | Tyto | alba | Barn Owl | 663 | 3650 | Owl |

Now we can create a filter for these Species groups to add an extra dimension to this page's visuals! As an example, here is the page with "Hummingbird" selected:

North American Breeding Bird Survey Dashboard
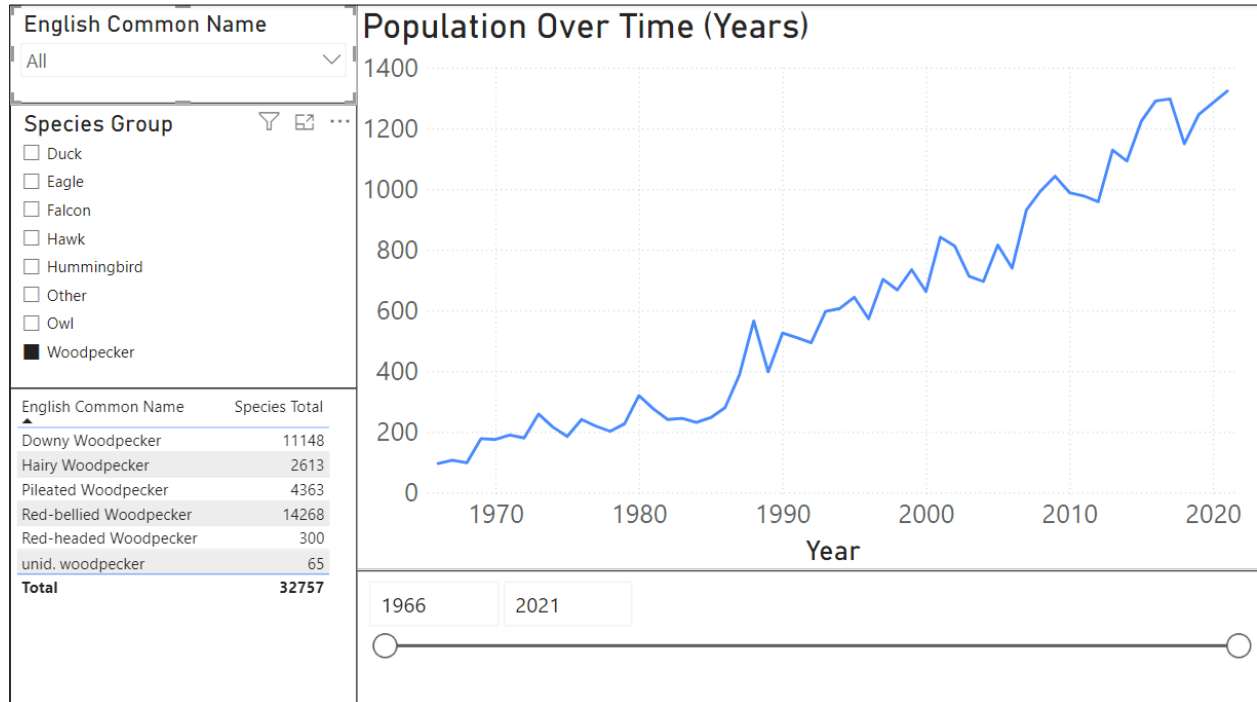
## Data Collection KPI

This final page will create and utilize a Key Performance Indicator visual to measure the Data Collection Success Rate of the most recent year for ensuring the accuracy and integrity of the data.

To calculate the KPI, we will first need to define what counts as a sample being "successful". If a sample does not meet all the survey's criteria to be complete and accurate, it is labelled as a "0" in the RunType column of the weather table. If it meets the criteria, it is labelled with a "1". The criteria includes the weather conditions, time, and location.

We will create a measure for the KPI visual to calculate the success rate named "Criteria Adherence Success Rate". The formula logic will be the percentage of runs that meet all data collection criteria for the most recent year:
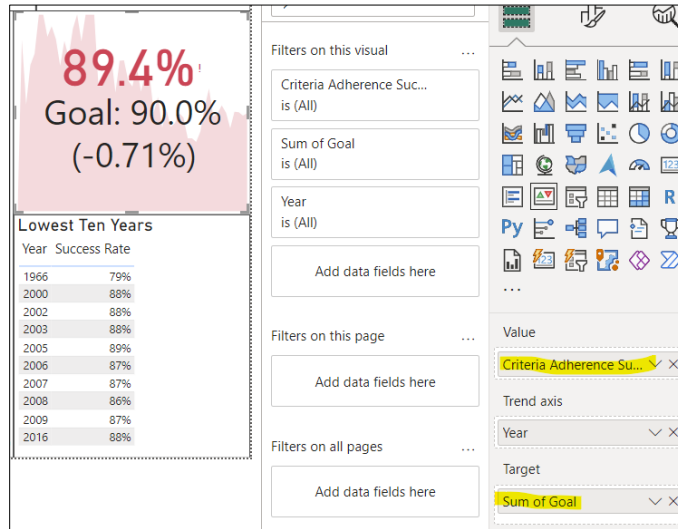
```
1 Criteria Adherence Success Rate = COUNTAX(FILTER(weather, weather[RunType] = 1), weather[RunType]) / COUNTROWS(weather)
```

Next, we will use the Criteria Adherence Success Rate" as the Value in the KPI visual, along with the Year value. Last, we add the Goal value from the Goal table to define the threshold:

A few more visuals are added to add more perspective. One is the "Lowest Ten Years" to highlight the ten lowest years in terms of the success rate. We also add a stacked area chart to show the trend of success rates over time.

Last, we add a general table listing all years and their success rates. However, we will add an additional feature where it highlights each cell based on the value of the success rate. Green is highest, with the color gradient turning yellow the closer it is to the KPI goal/threshold of 90%, and progressively darker shades of red thereafter.

| Year | Success Rate |
|------|--------------|
| 1979 | 98% |
| 1978 | 95% |
| 1977 | 97% |
| 1976 | 94% |
| 1975 | 97% |
| 1974 | 99% |
| 1973 | 98% |
| 1972 | 100% |
| 1971 | 100% |
| 1970 | 96% |
| 1969 | 95% |
| 1968 | 90% |
| 1967 | 97% |
| 1966 | 79% |
| **Total** | **92%** |

In the end, we have our final page complete!

## Data Collection Success Rate: 2021

Year
All

| Year | Success Rate |
|------|--------------|
| 1979 | 98% |
| 1978 | 95% |
| 1977 | 97% |
| 1976 | 94% |
| 1975 | 97% |
| 1974 | 99% |
| 1973 | 98% |
| 1972 | 100% |
| 1971 | 100% |
| 1970 | 96% |
| 1969 | 95% |
| 1968 | 90% |
| 1967 | 97% |
| 1966 | 79% |
| **Total** | **92%** |

**89.4%**
Goal: 90.0%
(-0.71%)

**Lowest Ten Years**

| Year | Success Rate |
|------|--------------|
| 1966 | 79% |
| 2000 | 88% |
| 2002 | 88% |
| 2003 | 88% |
| 2005 | 89% |
| 2006 | 87% |
| 2007 | 87% |
| 2008 | 86% |
| 2009 | 87% |
| 2016 | 88% |
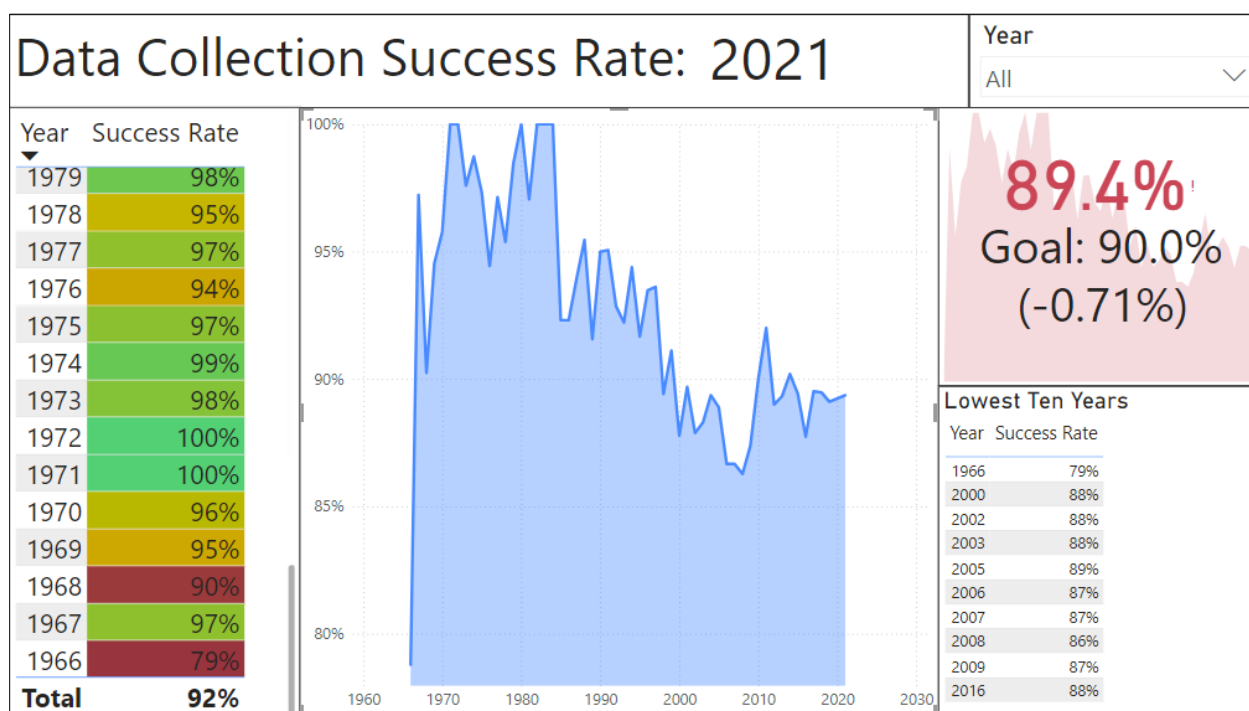
## Citations

1. (Keith_Pardieck@usgs.gov), Keith Pardieck. BBS - USGS Patuxent Wildlife Research Center, www.pwrc.usgs.gov/bbs/. Accessed 24 June 2024.
2. "David Ziolkowski." ScienceBase, www.sciencebase.gov/catalog/item/52b1dfa8e4b0d9b325230cd9. Accessed 24 June 2024.