

Bird Migration and Climate Patterns

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Introduction

Goal

Our team aims to visualize the spatiotemporal relationship between bird migration patterns and climate change.

Dataset

- 1) ScienceBase Bird Migration Datasets for:
 - American Goldfinch
 - Song Sparrow
- 2) Temperature data from NCEI

Modality Decision

Our team has opted for the "Design Studio" modality. We aim to develop a comprehensive data visualization interface to visualize the impact of temperature on birds migration

Possible clients

- **Who's Interested?**

Department of Ornithology and Climate Studies at a leading university.

- **What's Their Focus?**

They're keen on understanding how temperature impacts bird migration in the U.S.

- **Our final Goal:**

Deliver a tool that:

- Tracks Time: Shows how bird migration and temperatures have evolved over time.
- Interactive Exploration: Allows deep dives into specific species and regions.

Data Preparation and Description

Bird Data Insights:

LAT_DD	LON_DD	PERMIT	BAND_STATUS	PRESENT_CONDITION	species	State
49.65944	-110.2986	P9839933	0		Song Sparrow	Alberta
52.90833	-118.1083	P8835568	0		Song Sparrow	Alberta

EVENT_DATE
2015-07-13
2015-07-14
2015-07-15
2015-07-16

- Focused on *American Goldfinch* and *Song Sparrow*.
- Records since **2000**, across the **continental United States**.
- Data points include **date**, **location** (latitude/longitude), and **species**.

Temperature Data Insights:

Date	Value	year	month_num	month_lab	name
200001	46.5	2000	1	Jan	Alabama
200002	52.3	2000	2	Feb	Alabama

- **Monthly average temperatures** per state since 2000.
- Data points include **date**, **average temperature**, and **state** name.

Data Preparation Steps:

- Read and filtered **top 10,000** rows for efficiency.
- Combined bird species data with geographical information.
- Mapped bird locations to corresponding states/provinces.
- Cleaned and formatted for spatial-temporal analysis.



Visualization



Interactive Visualization with Shiny

Bird species summary

Explore the geographical distribution of bird sightings across the United States.



Temperature overview

Delve into the climatic backdrop of these migratory movements. Here, you'll find time series and spatial plots illustrating temperature trends over the years.

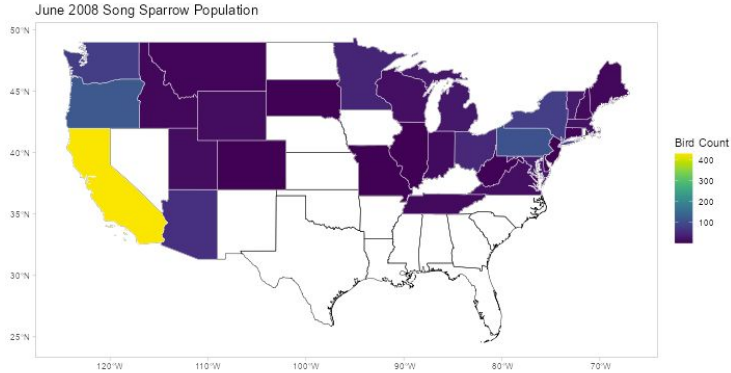


Temperature impact on birds

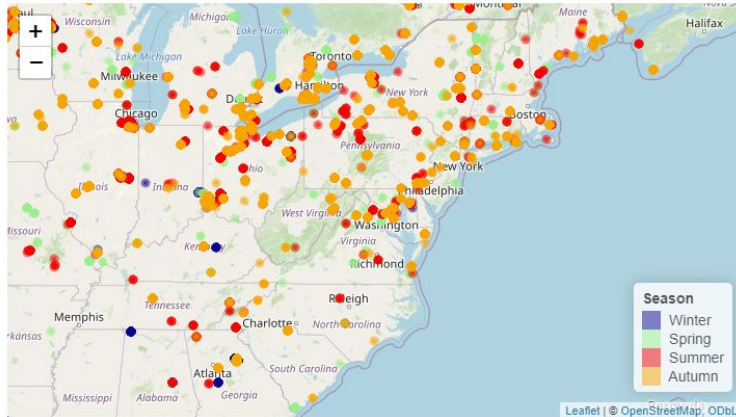
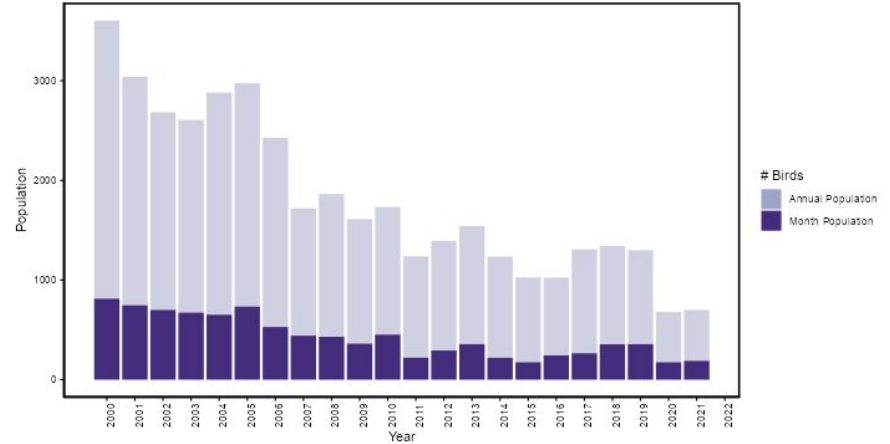
Correlate bird sighting frequencies with temperature data to unearth potential patterns and relationships.



Bird species summary

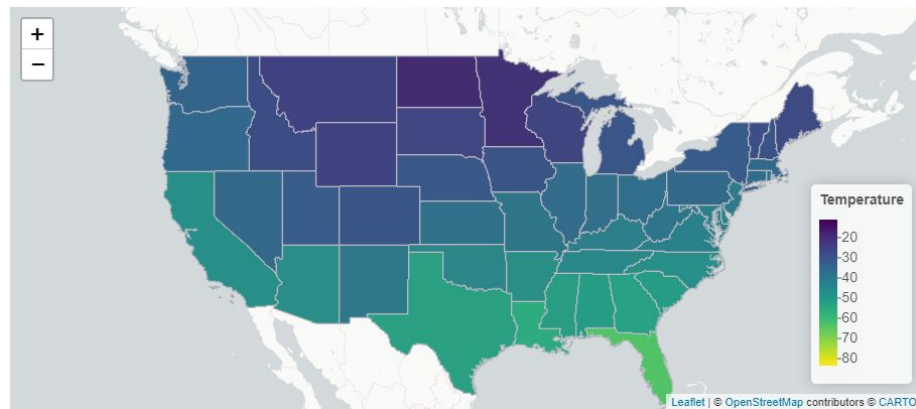
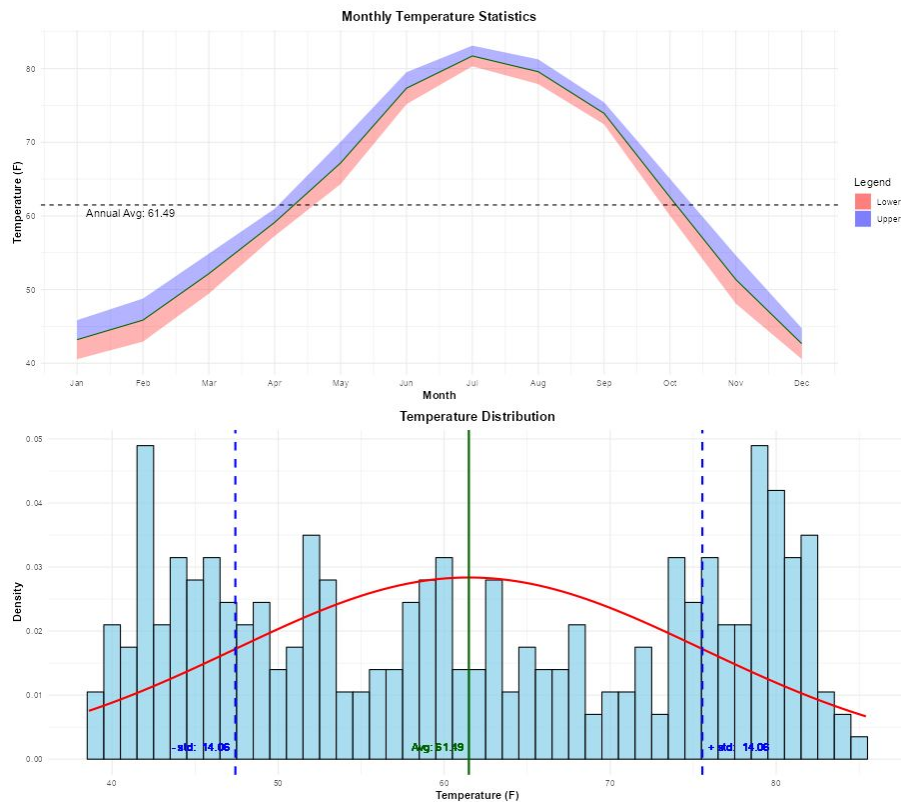


Population of Song Sparrow in California
June vs. Annual



In this tab, you'll see a dynamic map pinpointing locations where species like the American Goldfinch and Song Sparrow have been observed in the user given range and an observation trend chart that captures the frequency of sightings.

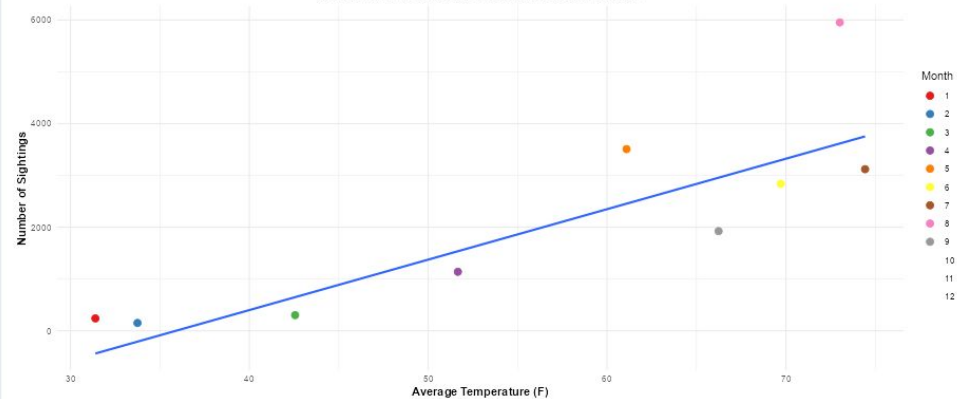
Temperature overview



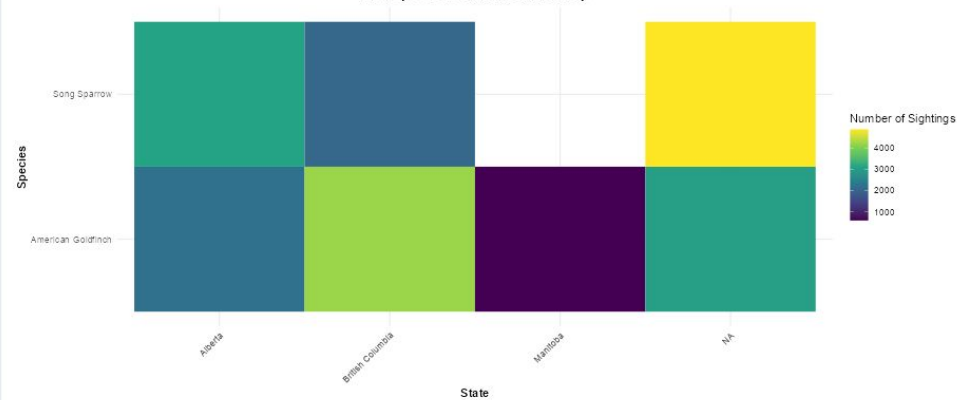
In this tab, time series plot illustrating temperature trends over the years and a distribution plot that provides a statistical view of temperature variations. Interactive sliders let us adjust the year and month range, allowing for a customized view of the data. We'll also see a temperature map that shades each state according to average temperatures,

Impact on birds

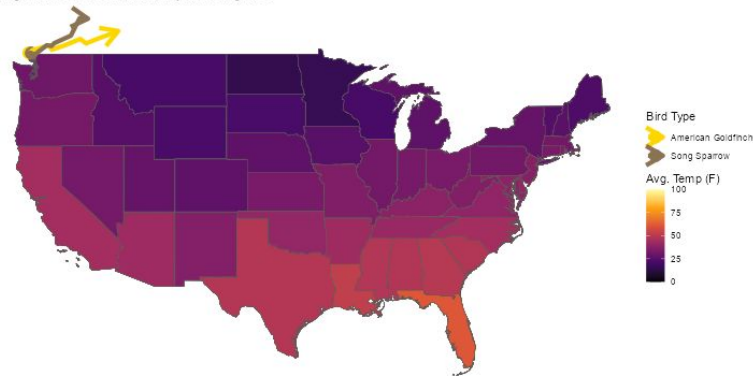
Monthly Bird Sightings vs. Average Temperature



Bird Species Distribution Heatmap



Bird Sightings and Average Temperature
Average across 2000-2022, Month-By-Month Migration



In this tab, you can interact with the visualization to examine how temperature fluctuations may influence migratory behaviors. We will also present a heatmap revealing the distribution of bird species across states, combined with temperature data, to show how different regions and climates play a role in habitat selection.



Live Demo

