

# Bird Species Observation & Conservation Analysis

## 1. Project Overview

This project analyzes bird species monitoring data from two key ecosystems: **forests** and **grasslands**. The objective is to extract actionable insights on bird distribution, diversity, and ecosystem health. These insights are intended to support informed decisions in conservation planning, land management, and environmental policy.

## 2. Business Objectives

- Identify and track dominant and vulnerable bird species across habitats
- Assess biodiversity levels and trends in forest and grassland ecosystems
- Empower eco-tourism development by highlighting bird-rich regions
- Support environmental agencies and stakeholders in strategic conservation decisions
- Provide early warnings for species decline and ecosystem disruptions

## 3. Business Use Cases

1. **Wildlife Conservation Prioritization:** Help governments and conservationists identify high-biodiversity areas to focus preservation efforts and allocate resources efficiently.
2. **Data-Driven Land Use Planning:** Land managers and urban developers can use species preference data to avoid high-impact construction in critical habitats.
3. **Eco-Tourism Promotion:** Identify locations rich in bird diversity to develop as bird-watching destinations, increasing local revenue while preserving biodiversity.
4. **Sustainable Farming Guidance:** Highlight agricultural regions where adjustments to practices can reduce negative impact on grassland bird populations.
5. **Environmental Policy Formation:** Supply policymakers with credible data to enact conservation laws and protect threatened bird species.
6. **Ecosystem Health Monitoring:** Establish a baseline and tracking mechanism to monitor the ecological health of regions through avian indicators.

## 4. Data Source

- Excel workbook containing two ecosystem datasets:

- Bird monitoring data forest
- Bird monitoring data grasslands

Each sheet includes bird species names, regions, observation counts, years, and habitat types.

## 5. Tools Used

- **Python (Google Colab):** Used for thorough data wrangling, standardization, and exploratory data analysis (EDA).
- **Power BI:** Enabled the creation of visually rich, filterable dashboards for stakeholder decision-making.
- **Streamlit Web App:** Provided an interactive interface for researchers to search, visualize, and analyze bird observation trends.

## 6. Data Cleaning Summary

- Eliminated null or incomplete entries to ensure data quality
- Standardized inconsistent species naming conventions
- Removed duplicates and converted data types where necessary
- Added calculated fields:
  - Species Frequency
  - Habitat Type
  - Observation Count
  - Threatened Status (where applicable)

## 7. Key KPIs in Dashboard

- **Total Bird Species Observed** – Snapshot of biodiversity level
- **Total Observations** – Overall monitoring effort
- **Total Unique Species - Count of Unique species**
- **Total Observers - Number of Observers**
- **Average Temp (°C) - Tells average temperature in the entire region.**
- **Unique Regions by Diversity** – Regional comparison

## 8. Charts Implemented

1. **Stacked Bar Chart** – Top 10 Most Observed Species.
2. **Stacked Bar Chart** – Wind Conditions
3. **Scatter Chart** – Temperature vs Humidity vs Observation Density.
4. **Stacked Bar Chart**– Sky conditions of the regions.
5. **Line Chart - Observation Trend Over Time(Month)**

6. **Donut Chart - Distribution Of Habitat.**
7. **Donut Chart - Distribution Of Flyover Observed.**
8. **Donut Chart - Distribution Of Season across Habitat.**

## 9. Slicers and Filters

Interactive filters applied to all visuals:

- Disturbance - Effect on birds.
- Observer - Name of the Observer
- Habitat - Forest or Grassland.
- Plot Name - Code of Particular area.
- Sex - gender of the birds.
- Visit - Number of times visited.
- ID\_Method - Calling technique of Birds

## 10. Insights & Findings

- **Forest ecosystems** exhibit **higher species richness**, but **grasslands** show **greater frequency** of a few species.
- **Conservation Hotspots**: Specific regions show exceptional biodiversity, demanding focused protection.
- **Decline Detected**: Grassland species counts have dropped in recent years—potentially due to **urban sprawl and agricultural encroachment**.
- Very few species are **common to both ecosystems**, underscoring the **ecosystem-specific nature** of conservation planning.
- **Threatened species** are predominantly seen in forest regions, suggesting greater vulnerability due to logging and habitat fragmentation.

## 11. Recommended Actions

- **Targeted Conservation**: Focus funding and programs on biodiversity hotspots with declining trends.
- **Eco-Tourism Zoning**: Promote protected bird-rich regions as eco-tourism hubs to drive awareness and local employment.
- **Sustainable Land Use**: Recommend buffer zones and green corridors to reduce habitat disruption.
- **Early Detection Frameworks**: Use year-wise trends to flag emerging threats and create rapid response protocols.
- **Cross-Ecosystem Strategy**: Different strategies must be adopted for grassland vs forest conservation due to distinct species profiles.

## 12. Project Impact

- **For NGOs & Environmental Agencies:** Provides a **scientific and evidence-based platform** for conservation prioritization.
  - **For Land and Agriculture Departments:** Enables **balanced planning** by identifying ecological constraints alongside development opportunities.
  - **For Policy Makers:** Empowers formulation of **targeted regulations** backed by real field data.
  - **For Local Communities:** Spurs **eco-tourism**, creating economic opportunities while fostering environmental awareness.
  - **For Researchers:** Offers a **living dataset** with visualization tools to explore trends and correlations over time.
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