# **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 OfFlyover 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.