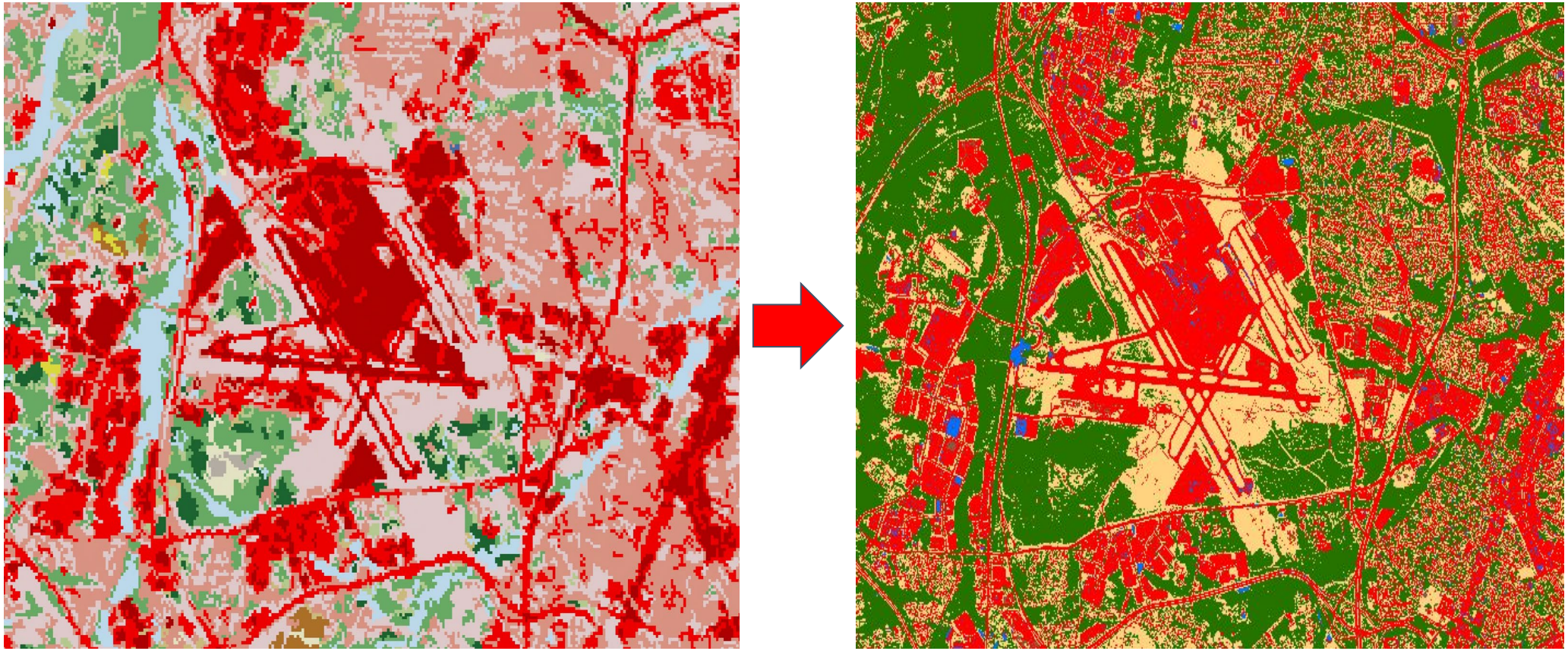
Enhanced Management of Wildlife Hazards Using Geospatial Technology

Using high resolution spatial landcover data to classify habitat on and around your airport



Jason Kougher USDA APHIS WS and Phil Roberts USDA FPAC GEO

Bird Strike Committee USA Meeting | 18-21 July 2022 | Salt Lake City, Utah

Presentation Outline

- Collaborative UMD GIS project
- Introduction to FPAC GEO's Land Change Analysis Tool (LCAT)
- Importance of land use, monitoring, and habitat management
- UMD Capstone Program Projects:
  Investigating wildlife strikes in relation to land use change over time
  - Baltimore/Washington International Thurgood Marshall Airport (BWI)
  - Naval Air Station Patuxent River (NAS PAX)

Partners:

UMD Environmental Science and Policy Program
USDA WS Airport Wildlife Hazards Program
USDA WS' Maryland and Ohio State Programs
USDA WS NWRC
USDA FPAC GEO
BWI Airport
USN CNIC
NAS PAX

Projects:

- Senior Capstone Program – Spring semester
  - Gain real world experience working with clients
  - Support for client to explore, create, and analyze data
  - Investigated wildlife strikes related to land use change over time
    - 2021 Baltimore Washington International Airport (BWI)
    - 2022 Naval Air Station Patuxent River (NAS PAX)

USDA United States Department of Agriculture

Land Cover Analysis Tool - Introduction

Partnership between FSA and FPAC-GEO

- Idea from 2017 Geo Summit
- Project plan materialized September 2018

Utilize high resolution imagery and machine learning

- Bring innovation to geospatial environment at all levels

Streamline CLU compliance

- *CLU's must be drawn correctly based on guidelines in this handbook. Houses, barns, and other structures must be separate CLU's from the remainder of the farm. Cropland, pasture, and rangeland areas should all be contained within separate CLU's. Tracts should not include public roads. – 10-CM Par. 33C*

Automate where possible with human validation

Save time and money, while increasing accuracy

- Identify incorrect records
- Potential to decrease erroneous payments

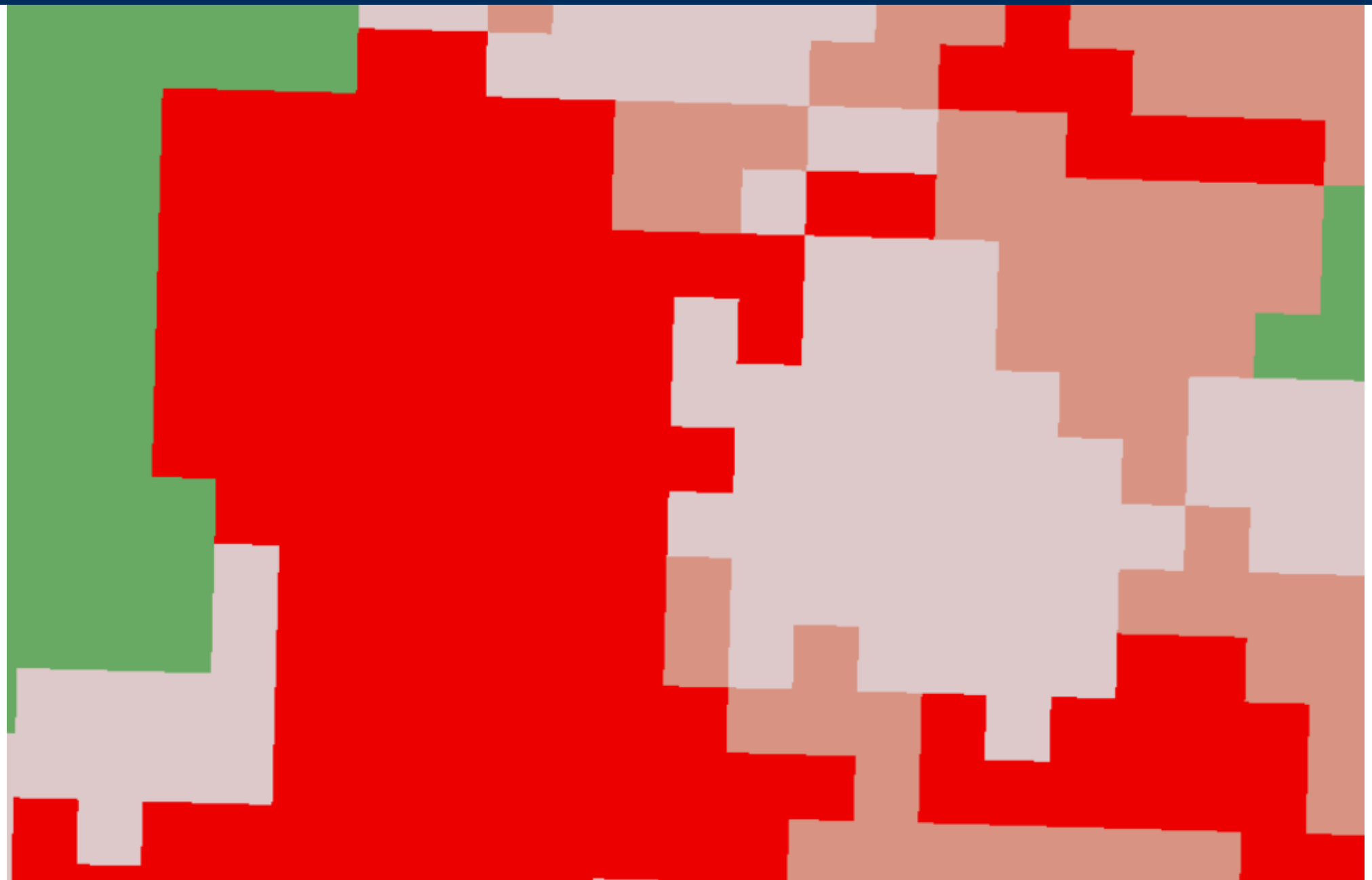
2017 → **2018** → **2019** → **2020** → **2021** → **2022**

- **2017**: Idea from 2017 IT Steering Committee
- **2018**: Project plan materialized September 2018
- **2019**: Implementation of Pilot Project
- **2020**: Testing and Development
- **2021**: Testing and Development
- **2022**: Future Goals

USDA United States Department of Agriculture

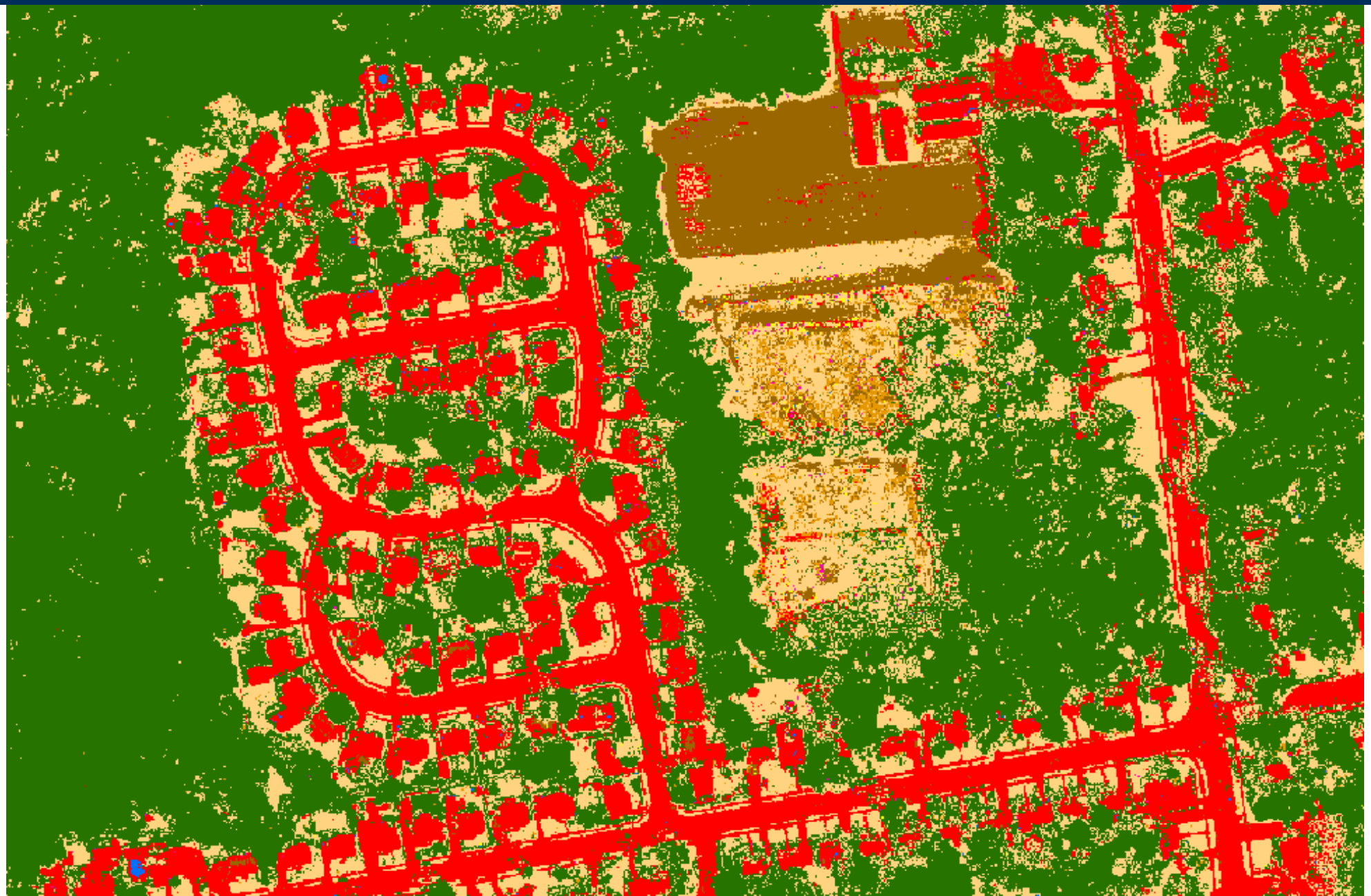
LCAT Example: NAIP Imagery

LCAT Example: Existing National Standard



USDA United States Department of Agriculture

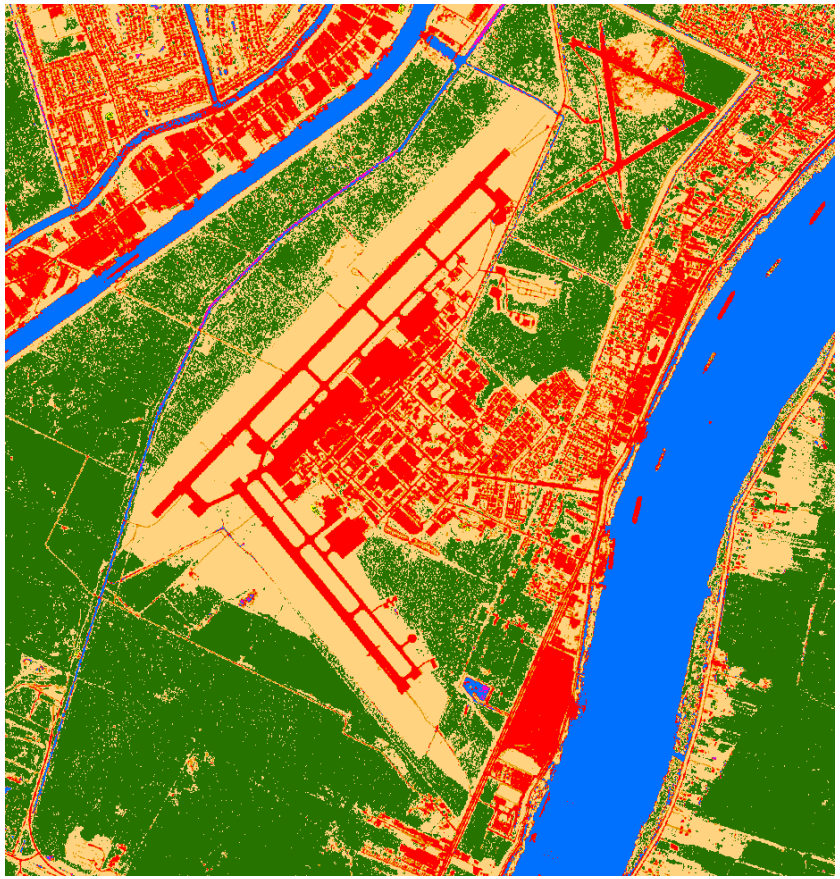
LCAT Example: LCAT hi-res Land Cover



USDA United States Department of Agriculture

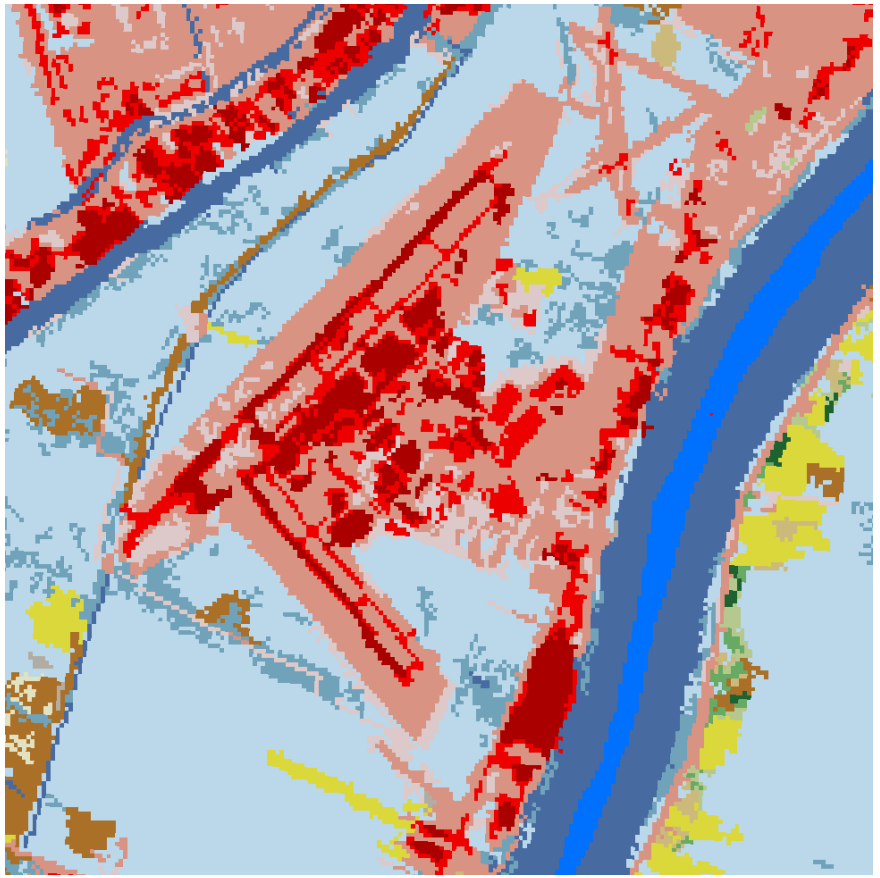
LCAT Example: LCAT hi-res Land Cover

Naval Air Station Joint Reserve Base New Orleans



LCAT

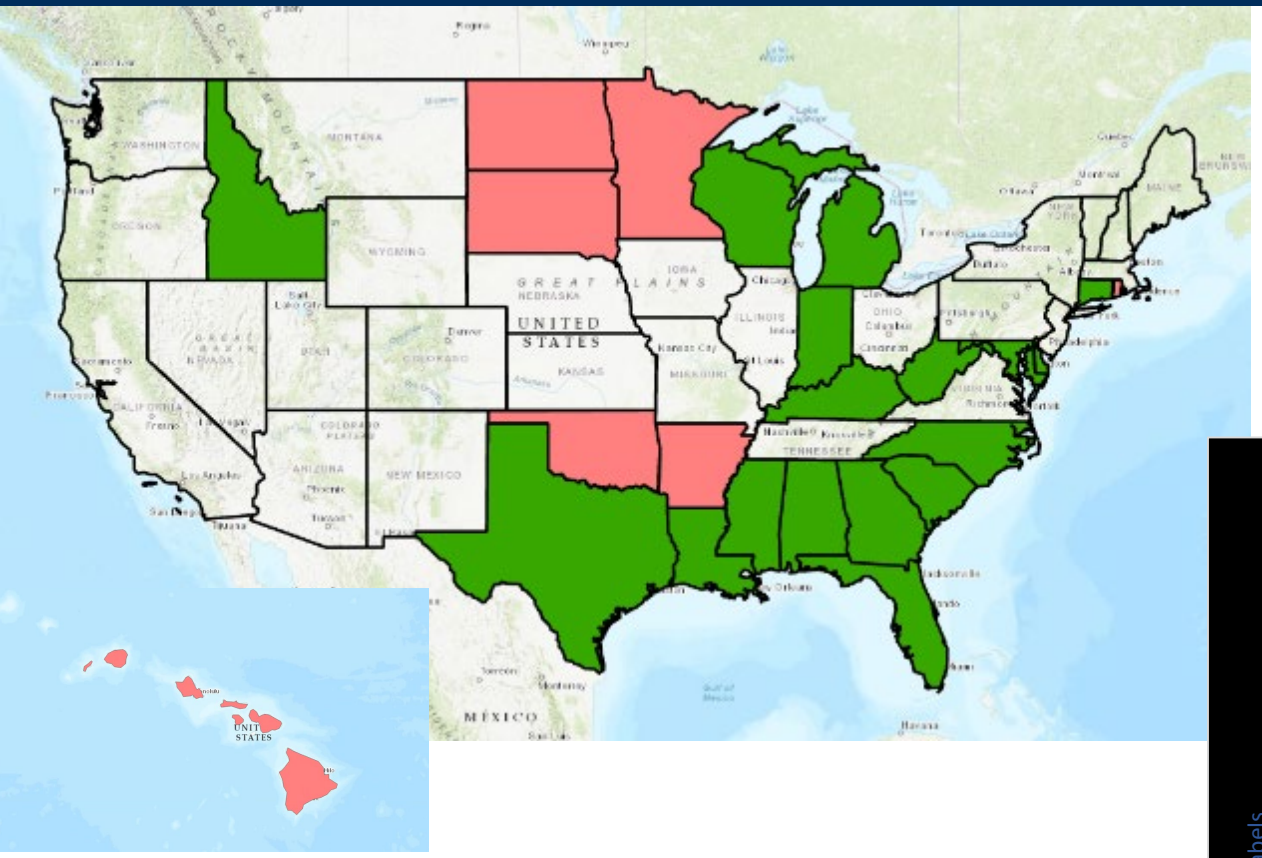
NAIP



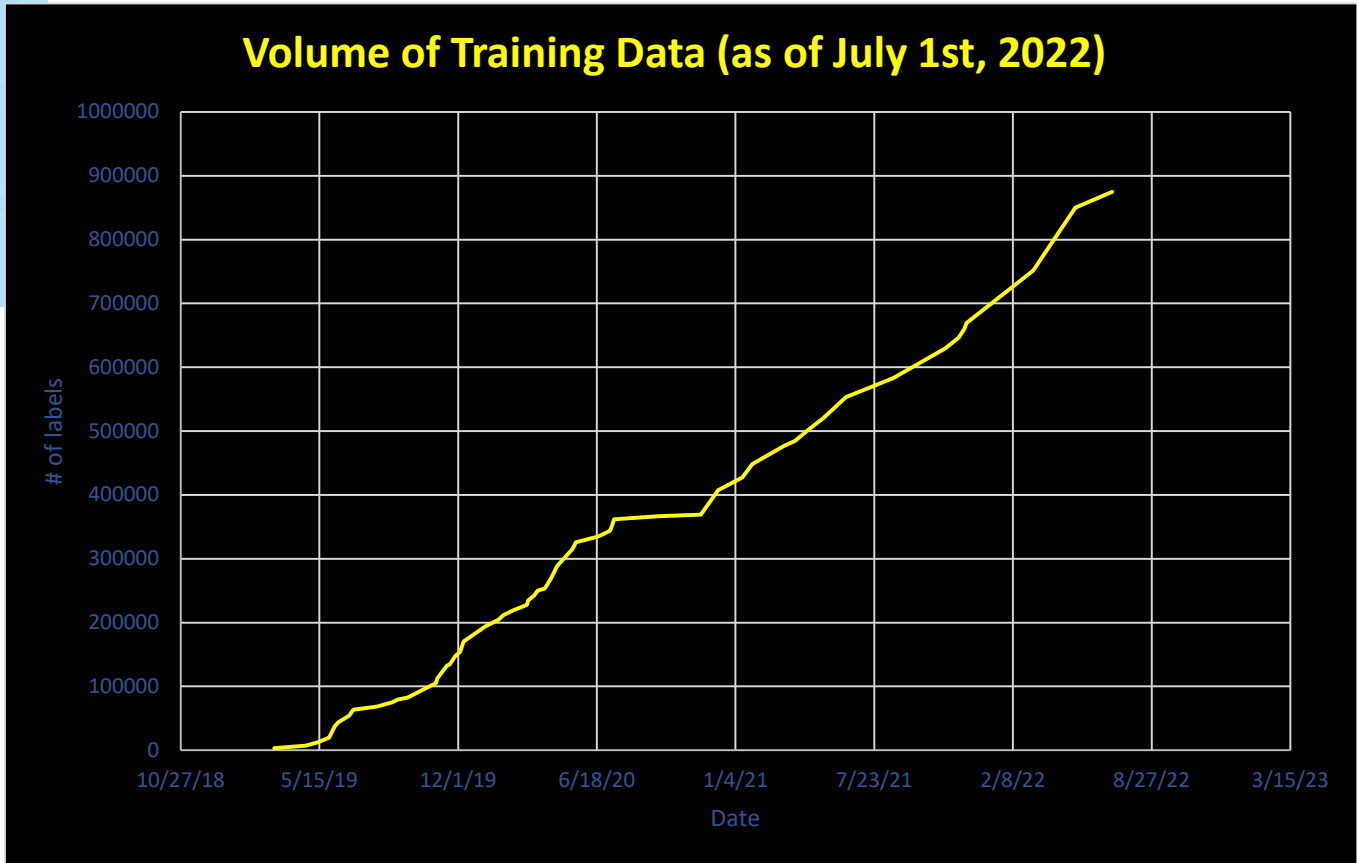
NLCD

USDA United States Department of Agriculture

LCAT Production:



~815 million acres mapped
~875,000 training labels



2016 – CT	1m
2017 - AL, GA, FL, ID	1m
2018 – CT, MI, IN, MD, DE	60cm
2019 – SC, GA, AL, LA	60cm
2020 – MS, WI, KY, NC, WV, HI*, TX*	60cm
2021 – SD*, VA* (New England, TN, OH, NY)	

Airport Wildlife Hazards Program: Land Cover

Why Land Use/Land Cover?

- Previous investigations using 30m National Land Cover Data (NLCD) raster(pixel) datasets.
  - Summary- ***Ubiquitous*** *= less effect vs* ***Fragmented*** *= more effect on damaging/neg eof strikes*

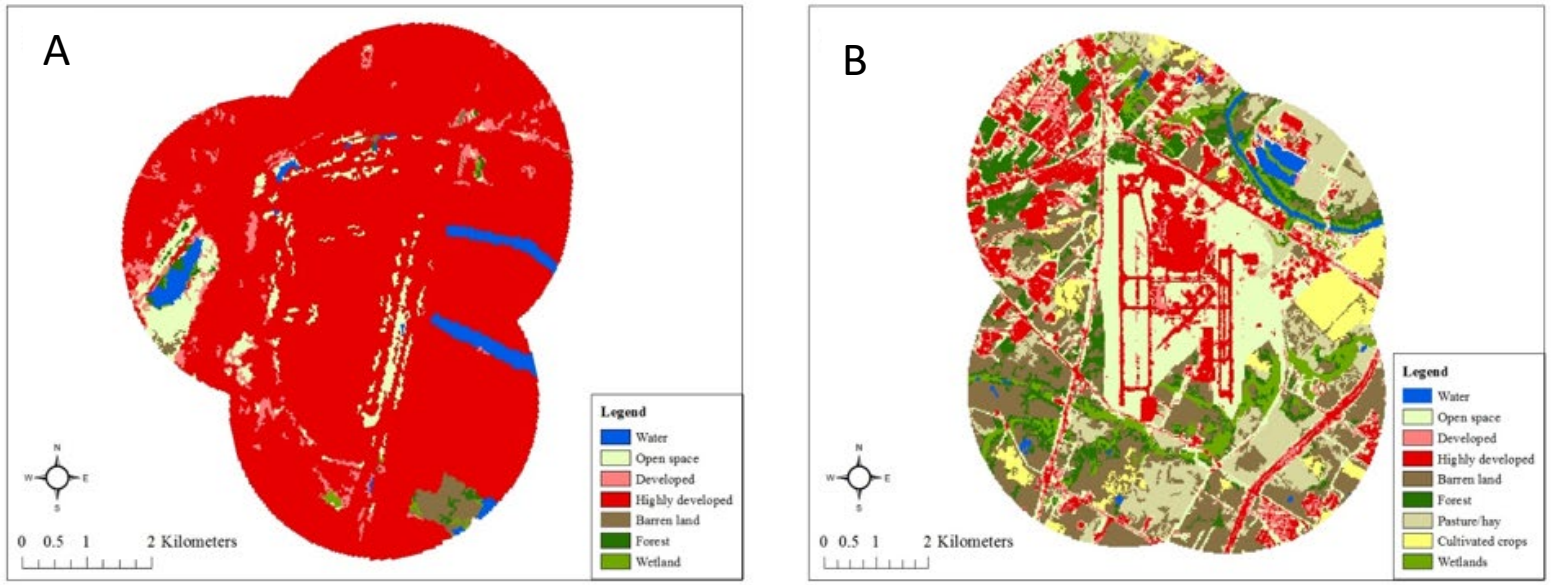
- Urbanization towards airfields
  - Urban generalist species
    - Geese, pigeons, ducks, etc.

- Habitat Management

Civil airports from a landscape perspective: A multi-scale approach with implications for reducing bird strikes

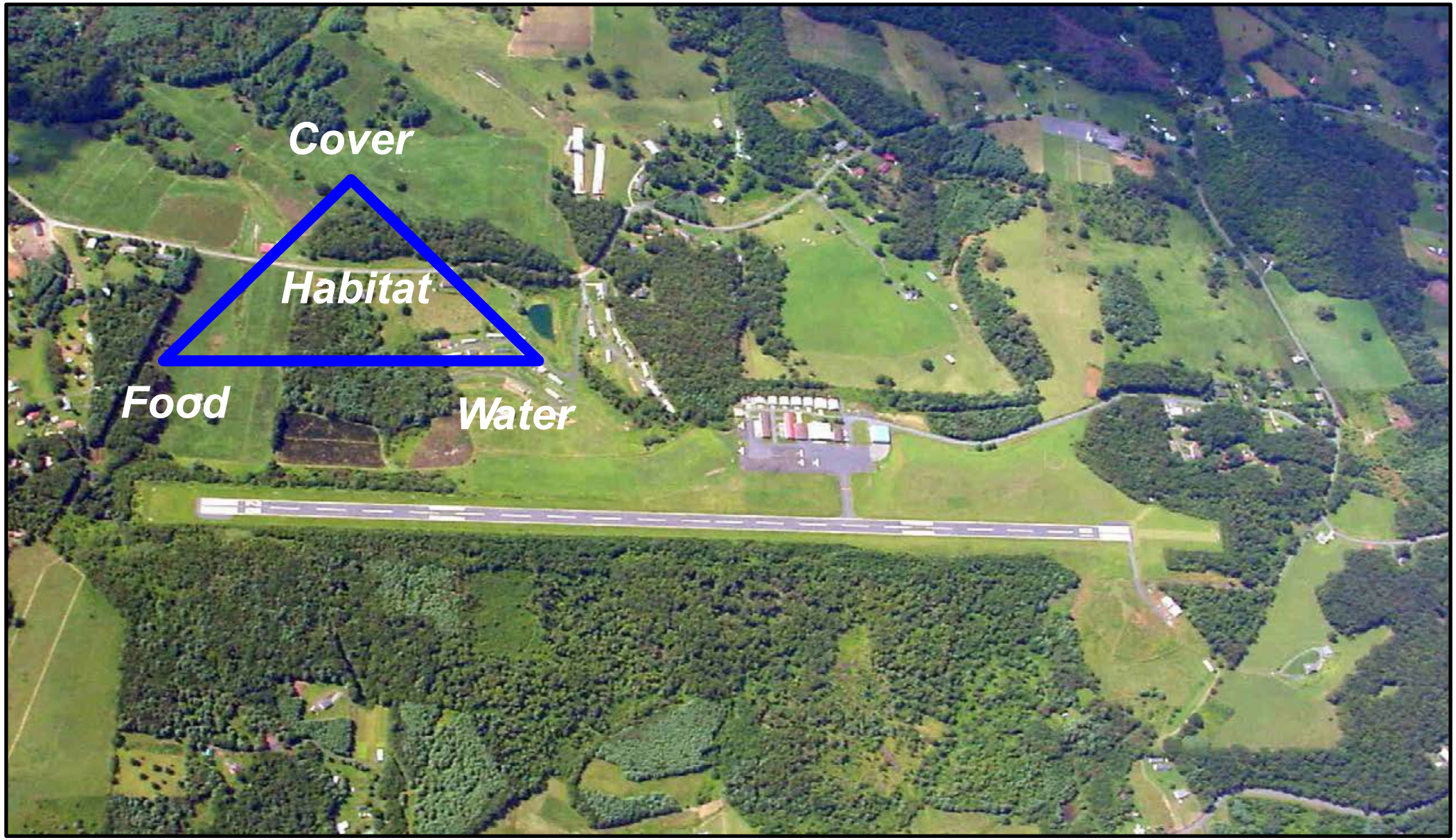
Morgan B. Pfeiffer[a,b,*], Jason D. Kougher[c], Travis L. DeVault[a]

[a] U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Ohio Field Station, 6100 Columbus Avenue, Sandusky, OH 44870, USA
[b] School of Natural Resource Management, Nelson Mandela University, George Campus, George, South Africa
[c] U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Airport Wildlife Hazards Program, 6100 Columbus Avenue, Sandusky, OH 44870, USA



USDA
United States Department of Agriculture

Airport Wildlife Hazards Program: Habitat

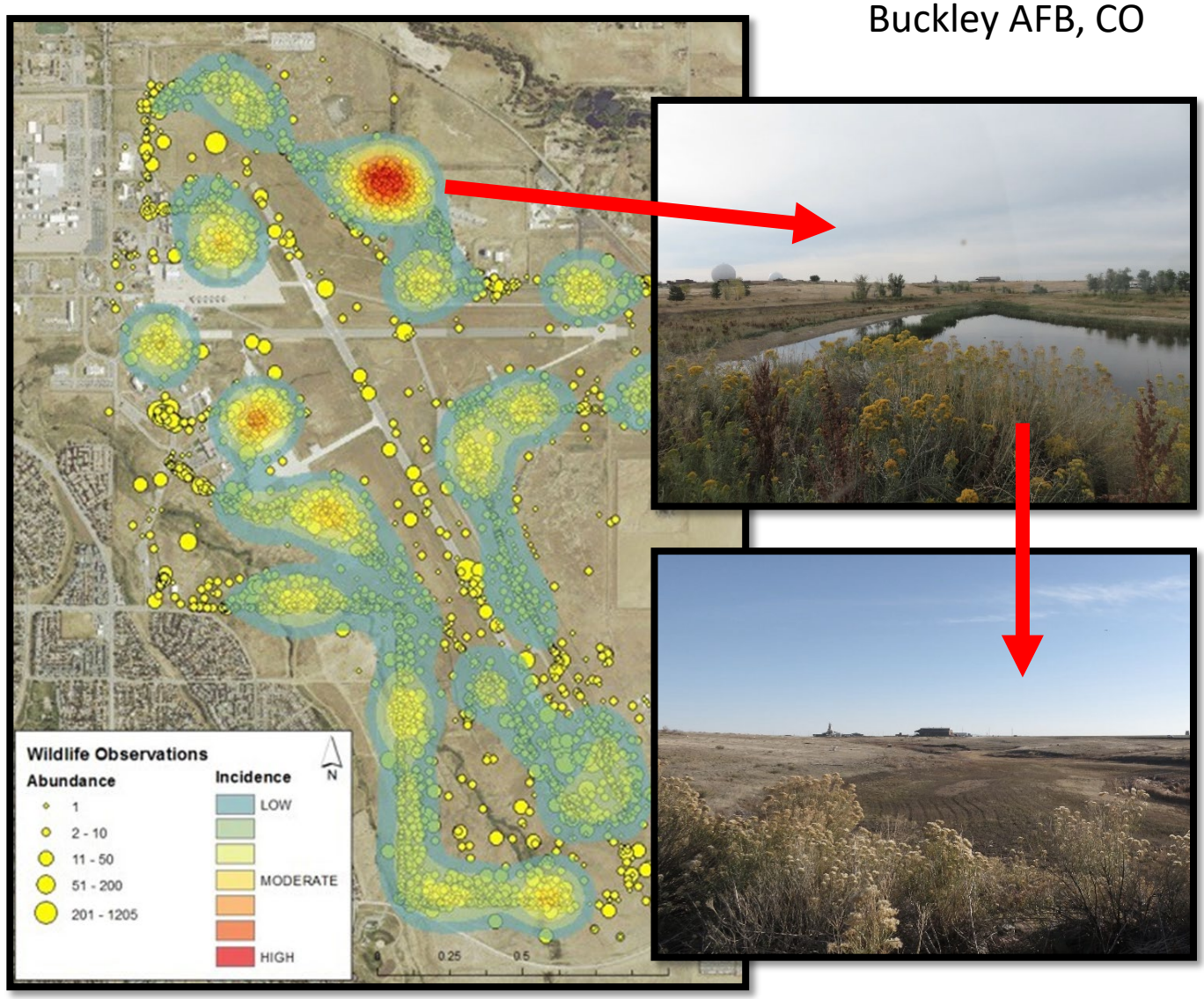


Airport Wildlife Hazards Program: Monitoring

Mobile spatial data collection:

- ID hazards- species and habitat attractants
- Prioritize recommendations to allocate resources
  - *Risk = strike likelihood x damage severity*
- More informed decisions = $ well spent
  - Case study - Buckley Air Force Base, CO
  - Waterfowl/geese highest risk

12-month Wildlife Hazard Assessment (WHA)
Buckley AFB, CO



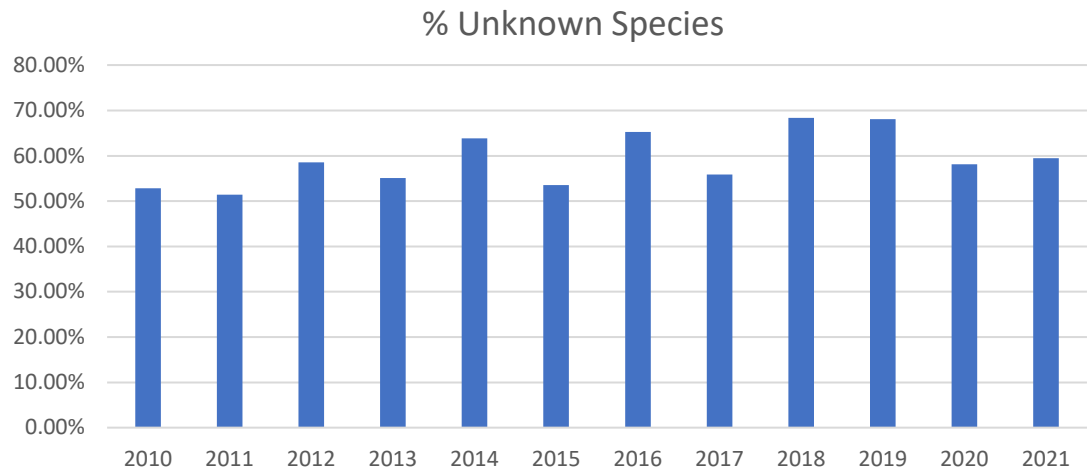
UMD Project - Methods

- Compiled strike data and aircraft movement data for 201 d 2008-2021 NAS PAX
- Created Land Cover data – students labeled thousan ing NAIP imagery
- Summarized species strike composition 2011, 20 strike databases
  - NWSD, RMI, WESS, and local Natural Resou
- Calculated species risk profiles from stri
  - DeVault et al. 2018 *Risk Mode trikes with Aircraft*
  - Pfeiffer et al. 2018 *Quant cations for wildlife management*
- Land use change 2011-20

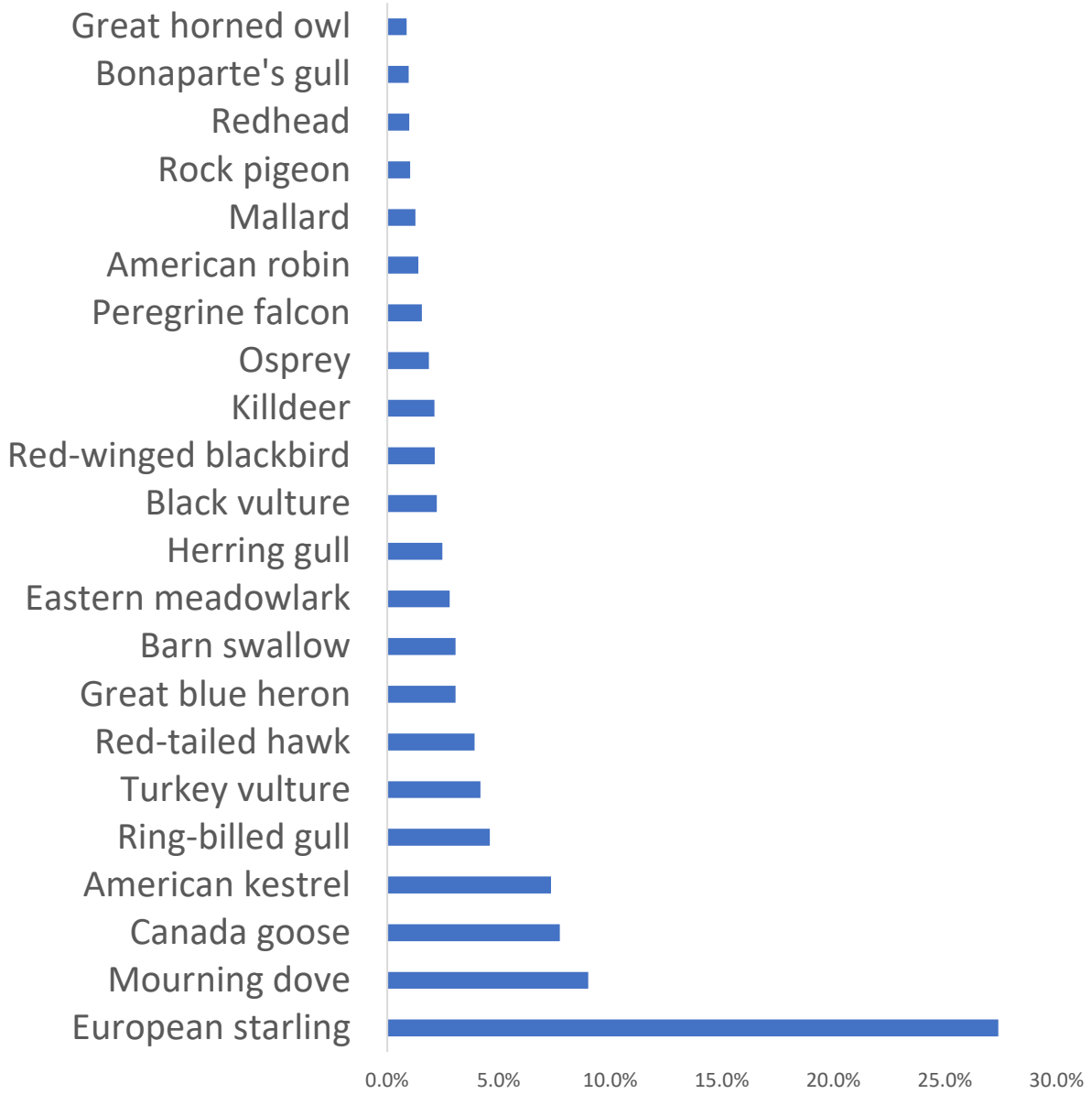
Civil species litary airframes

Results: BWI Wildlife Strikes 2010-2021

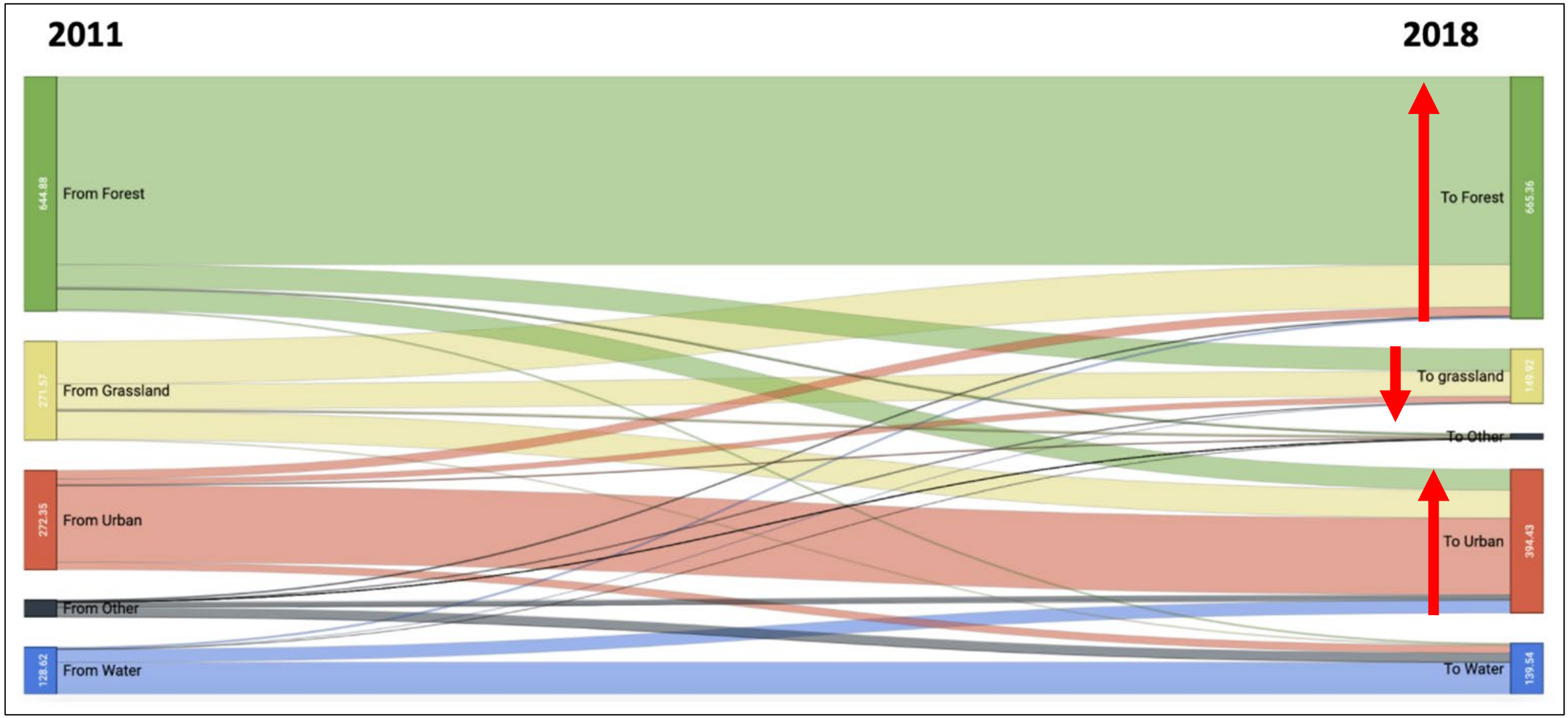
- 1297 total strikes
  - 465 (38)% ID'd to bird species
  - Removed from risk modeling
    - 57% unknown bird
    - 2% mammal
    - 2% unknown mammal
    - 1% unknown bird or bat, reptile, unknown reptile



Species with ≥1% of the risk



Results: BWI Land Use Change with LCAT

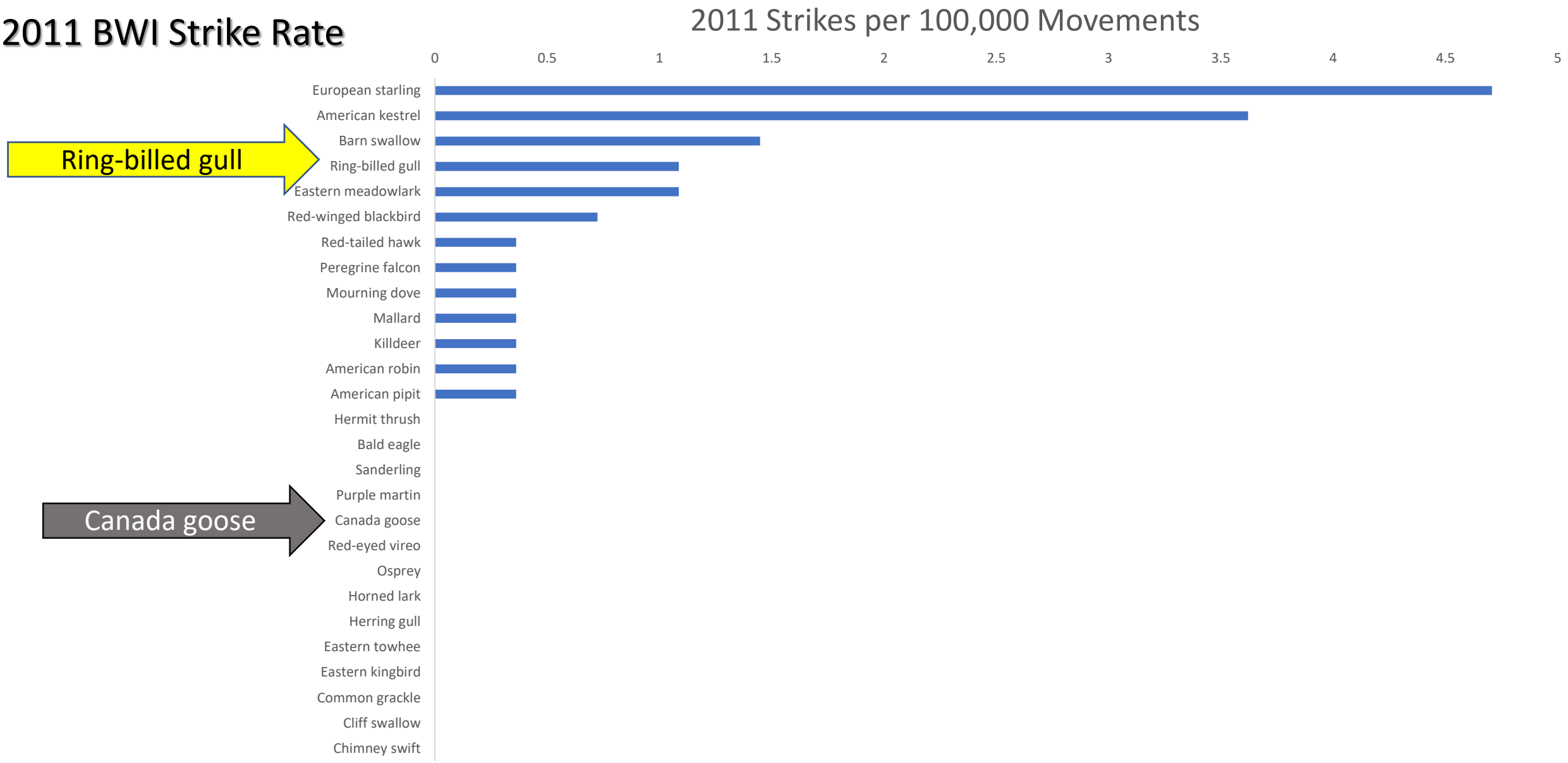


+2%

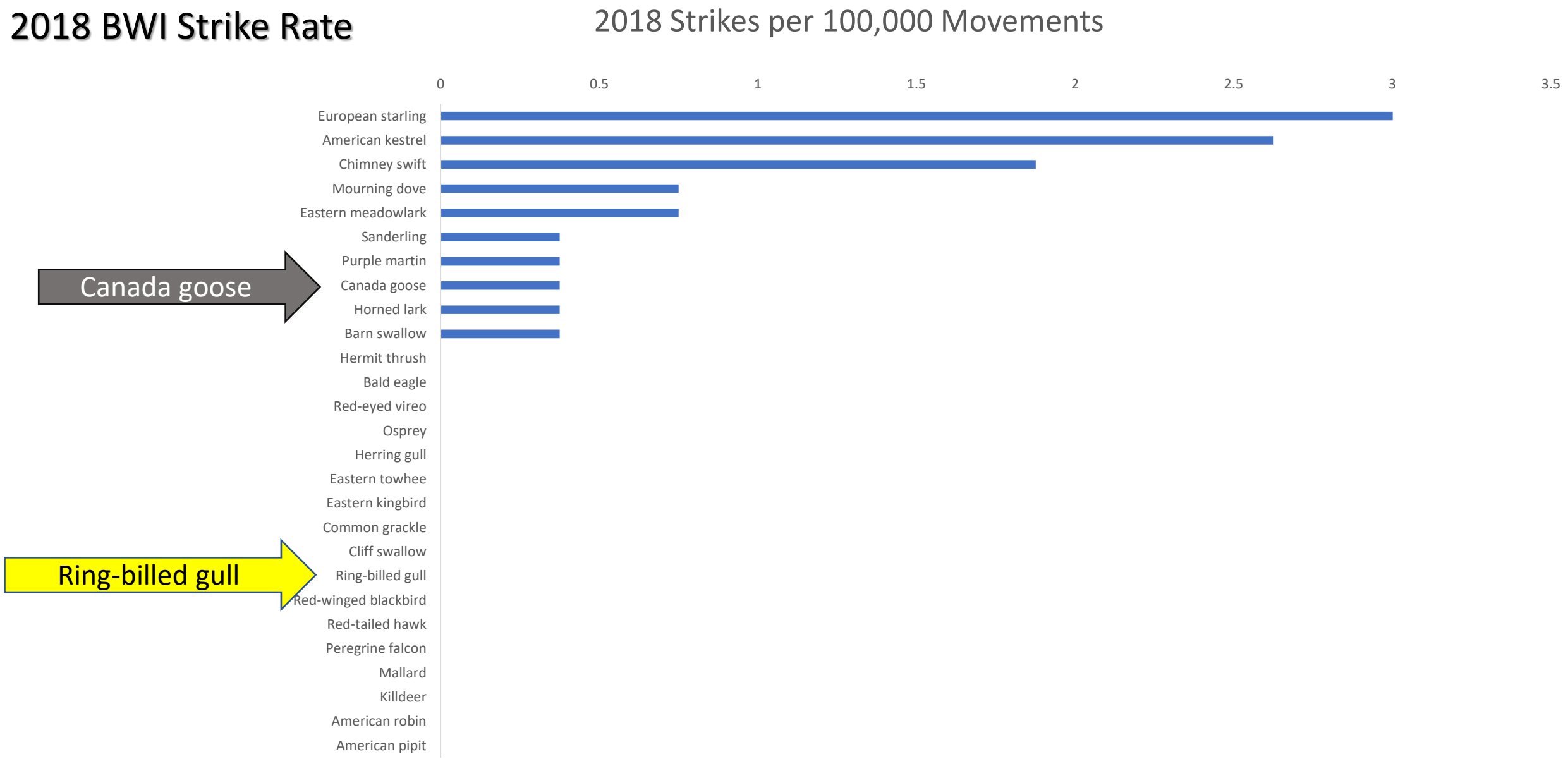
-9%

+9%

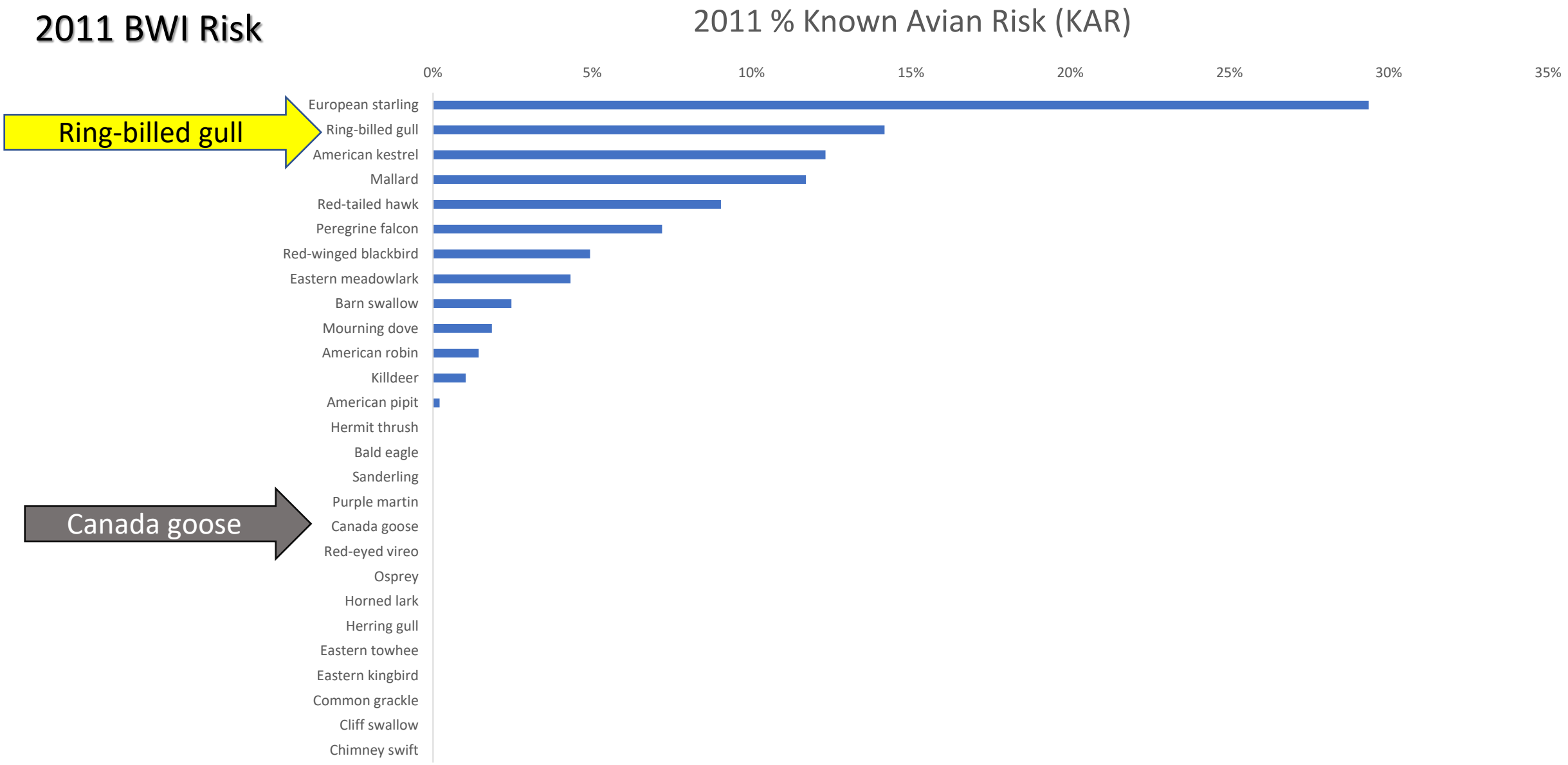
2011 BWI Strike Rate



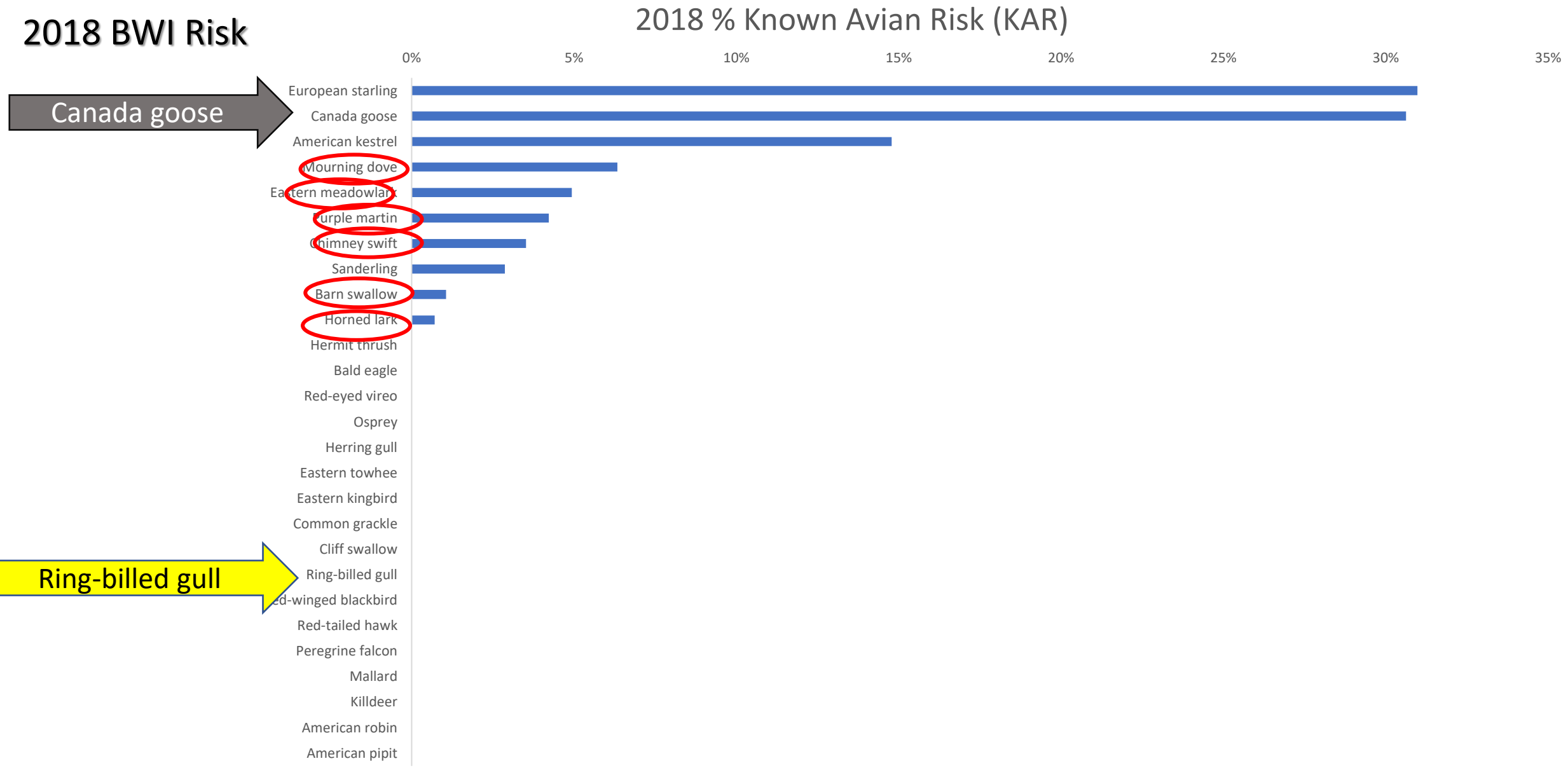
2018 BWI Strike Rate



2011 BWI Risk



2018 BWI Risk

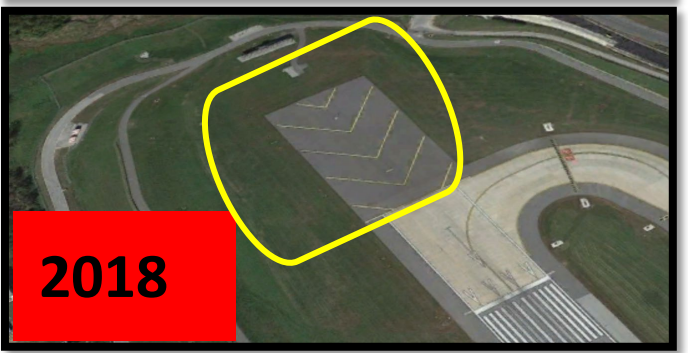


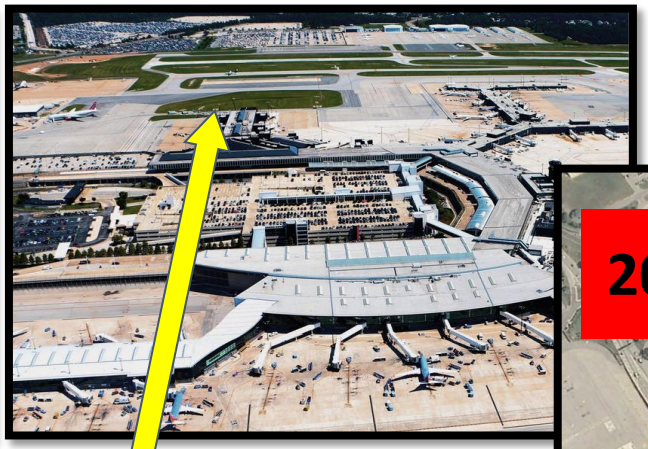
Canada goose

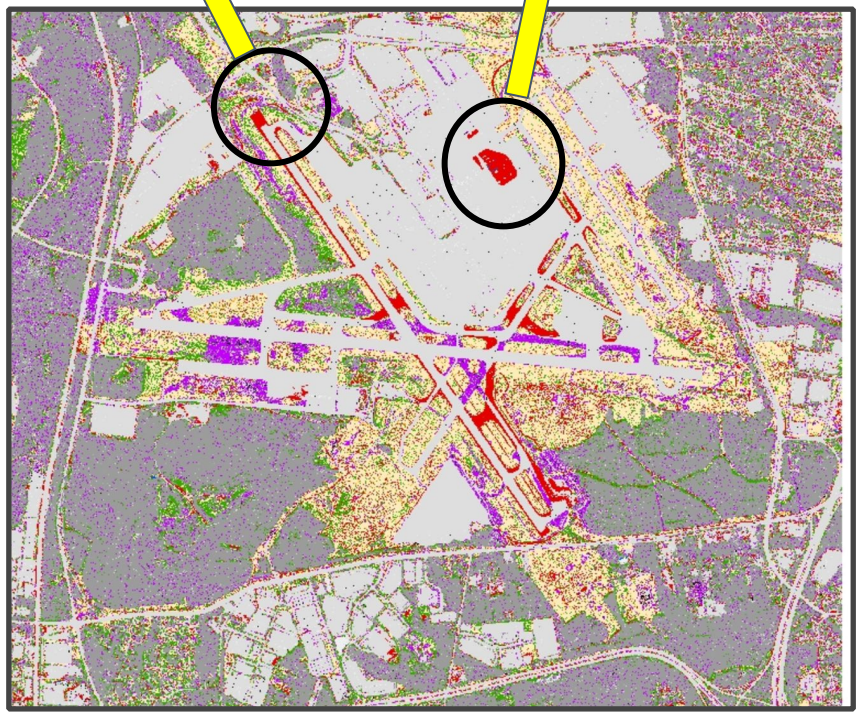
Ring-billed gull

Conversion of grasslands at BWI Airport

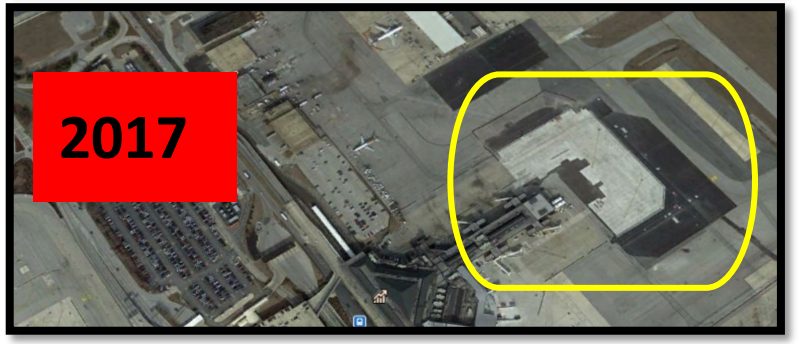
Runway 15R Extension

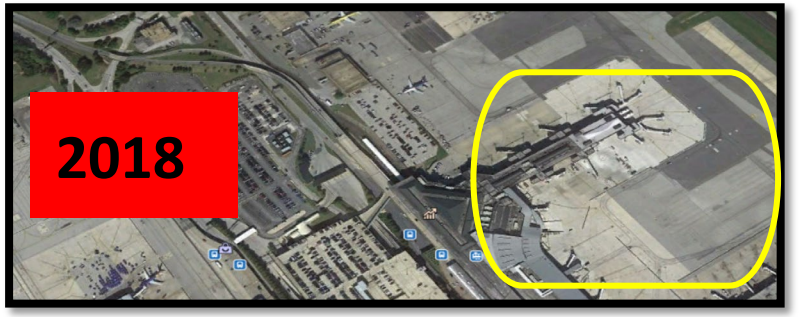






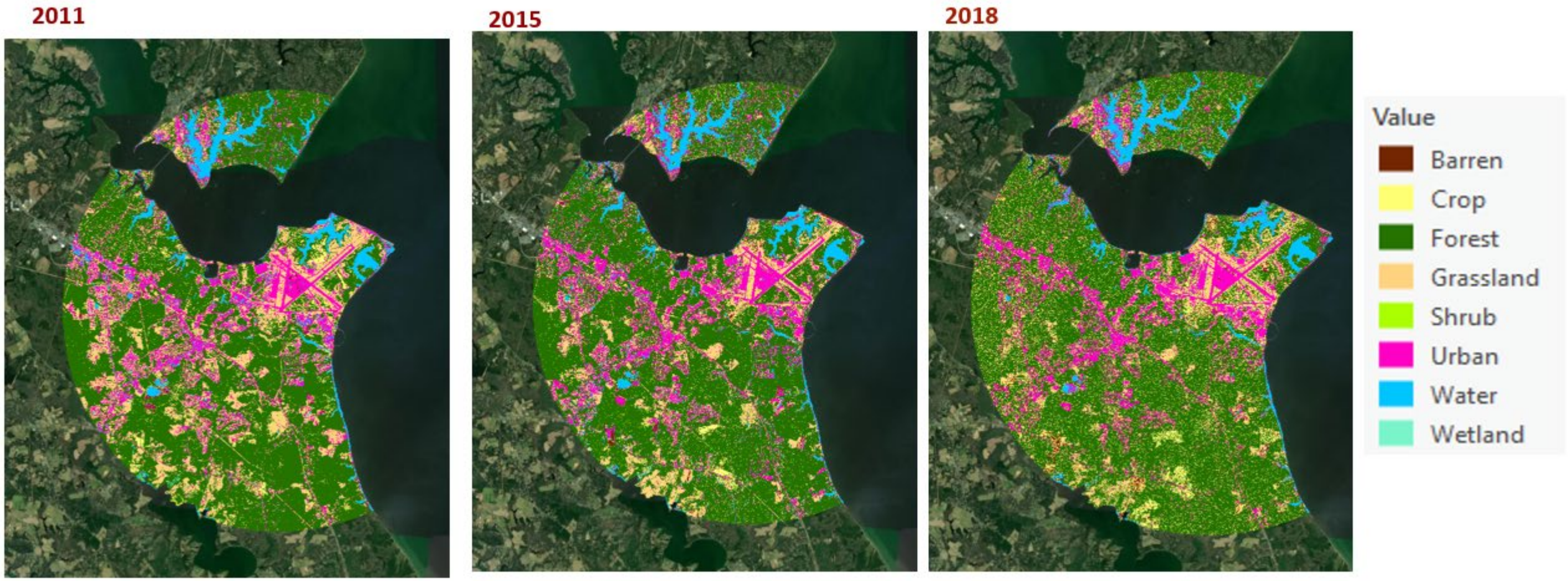
Concourse E



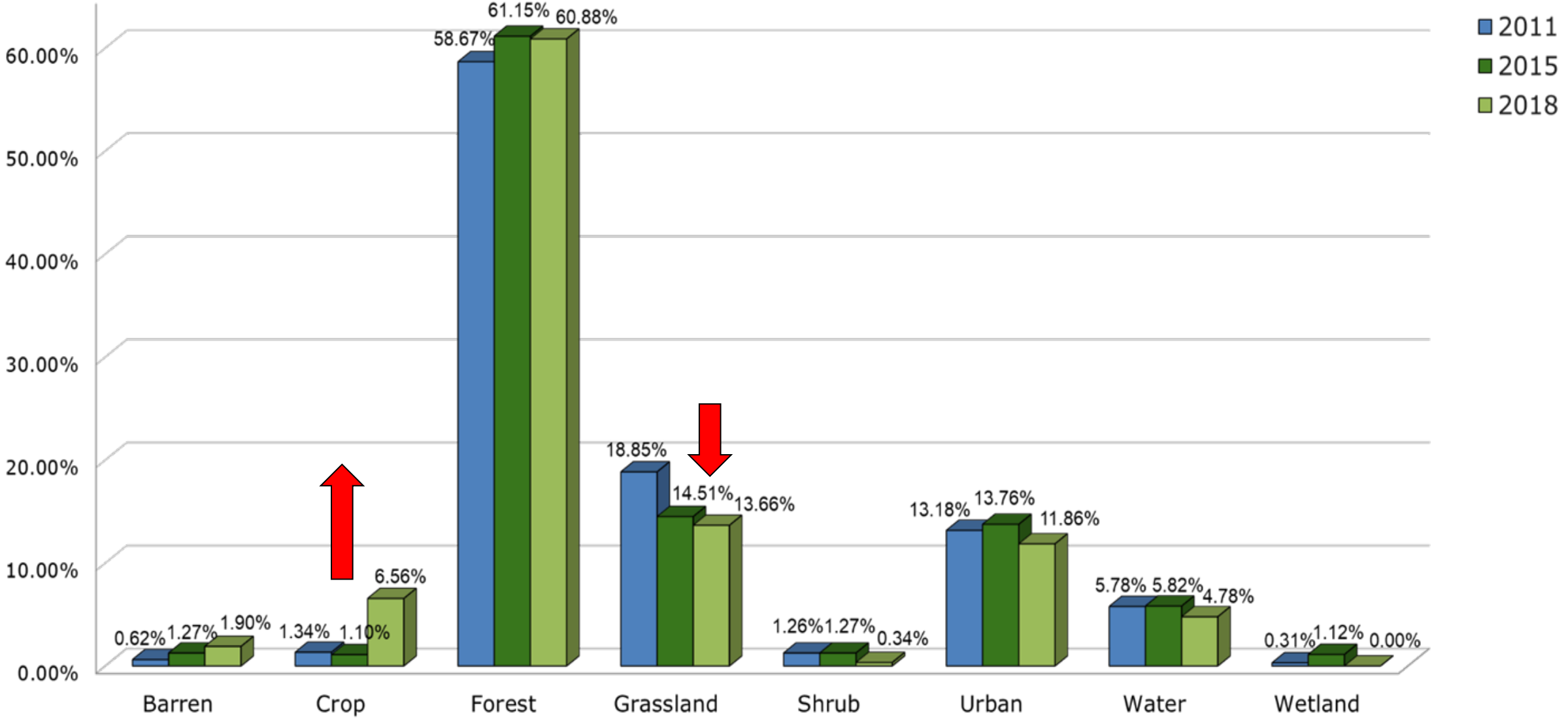


BWI Example:

NAS PAX 1m Land Cover Datasets from USDA PFAC GEO LCAT

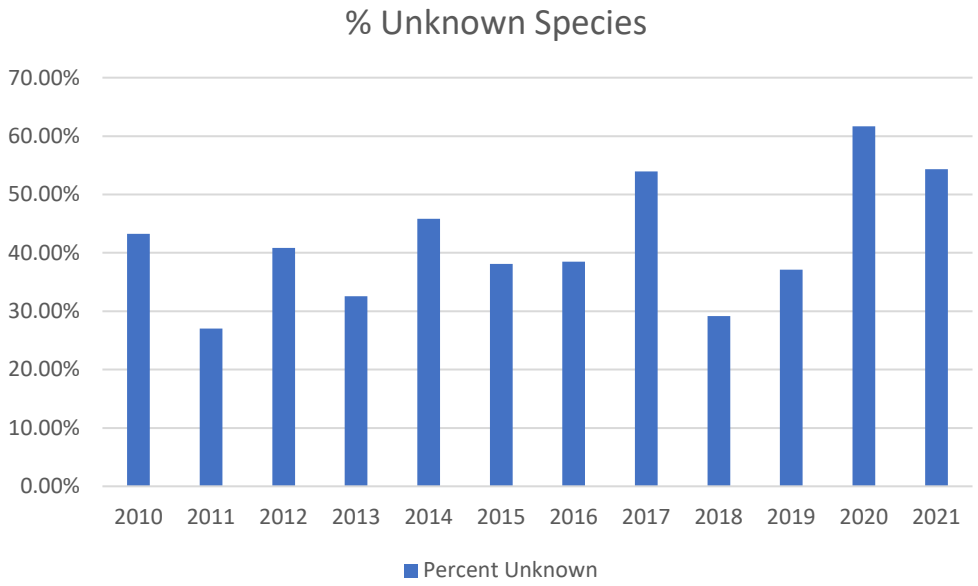


Results: NAS PAX Land Use Change

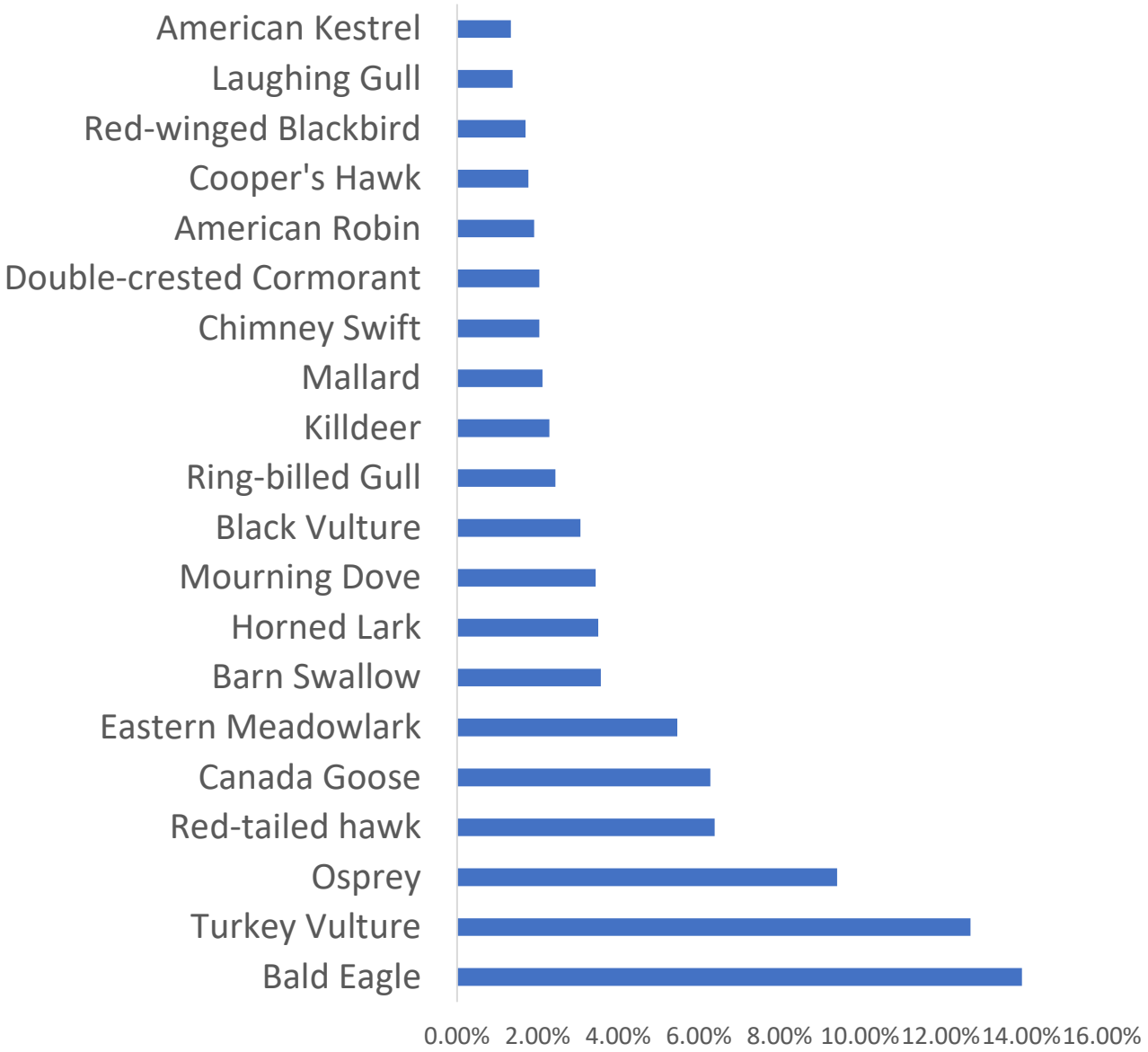


NAS PAX Strikes 2008-2021

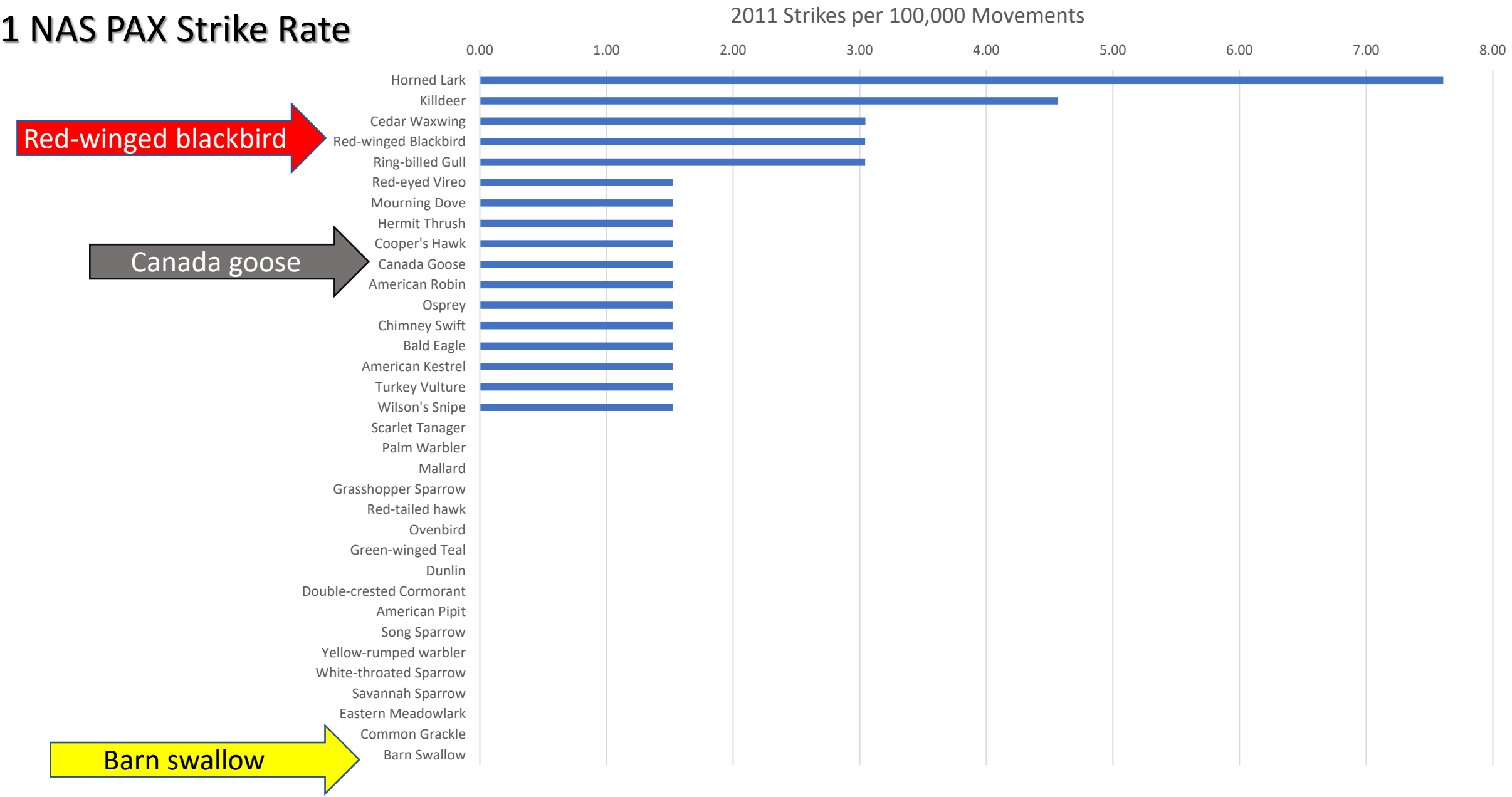
- 608 strikes
  - 309 strikes (51%) ID'd to bird species
    - Removed for avian risk modeling
      - 5% mammals
      - 13% unknown bird
      - 1% unknown insect
      - 30% unknown



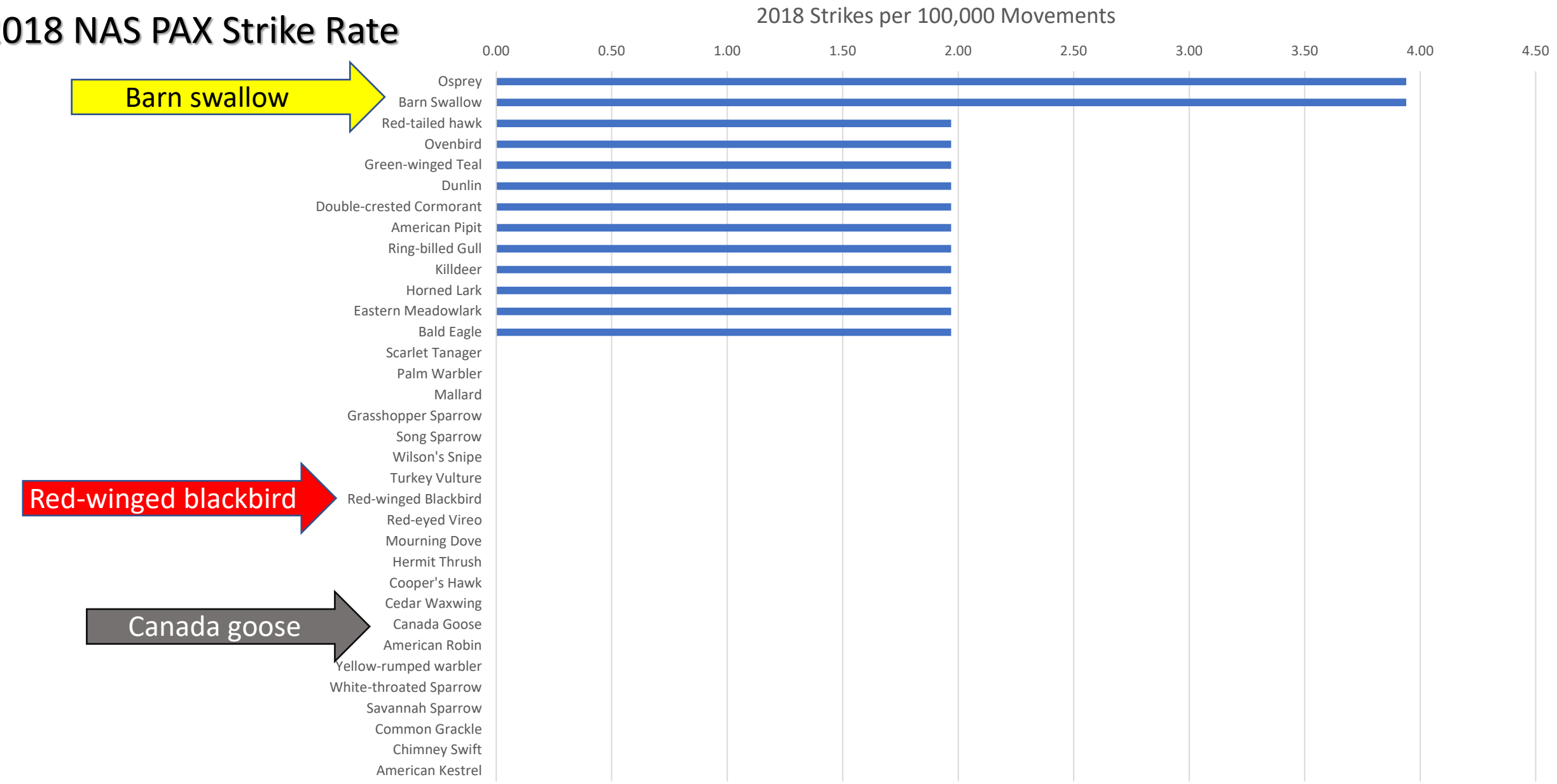
Species with ≥1% of the risk



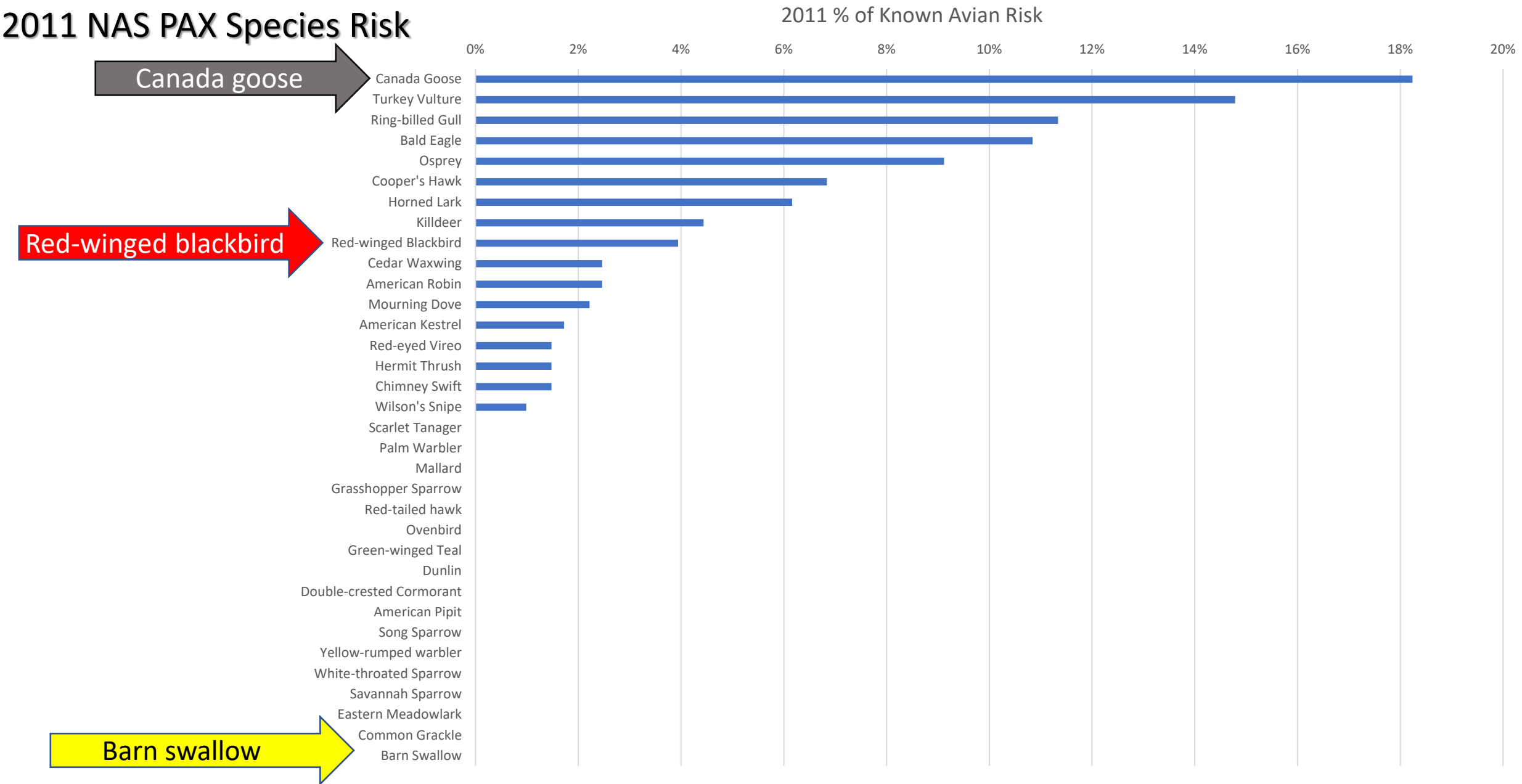
2011 NAS PAX Strike Rate



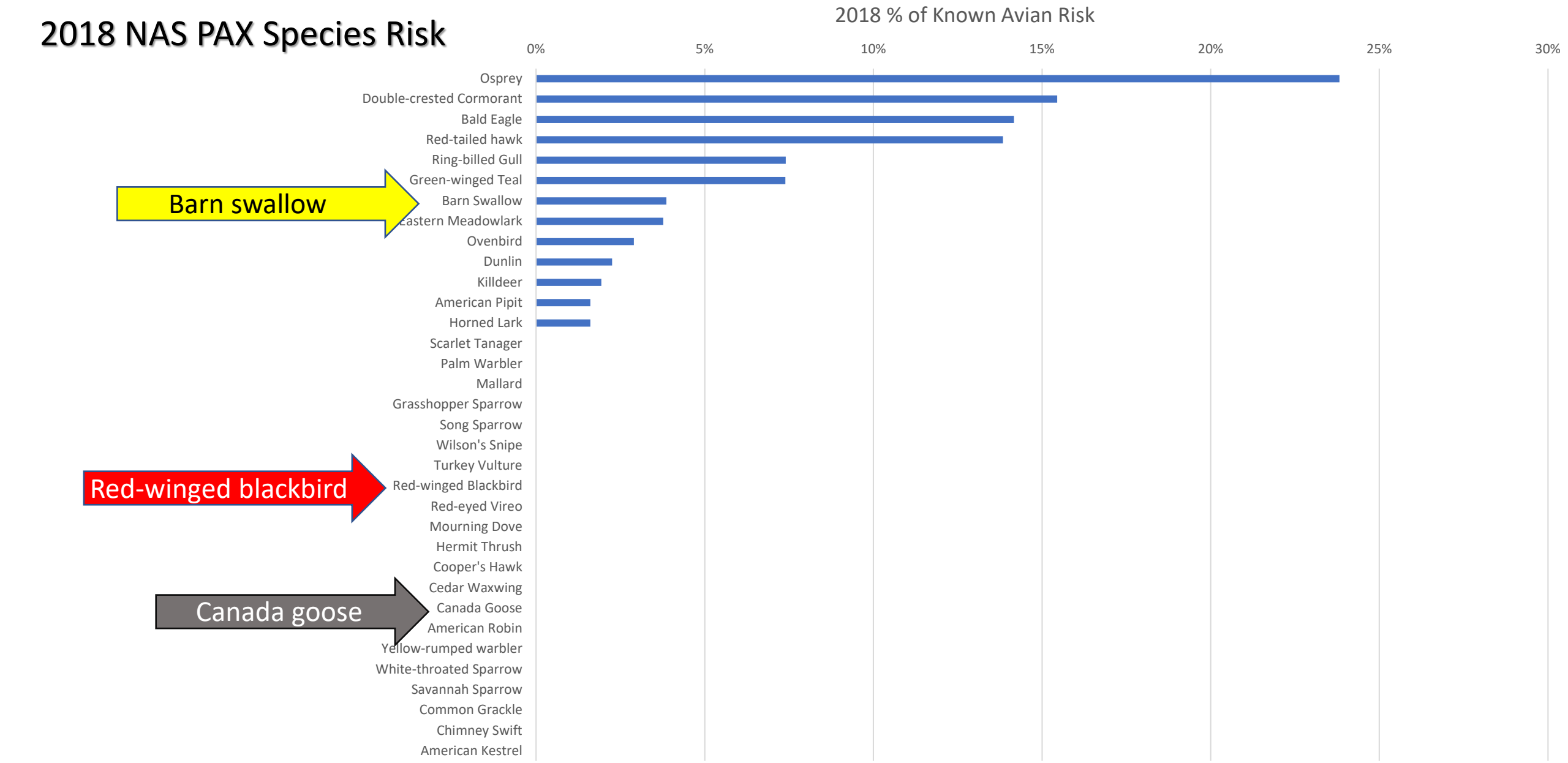
2018 NAS PAX Strike Rate



2011 NAS PAX Species Risk



2018 NAS PAX Species Risk



We have species risk, now what?

What species can benefit with increases in certain habitats? Or frequent transitioning among land uses?

- BWI: urban sprawl and construction projects
- NAS PAX: increases in cropland

THE CONDOR
Ornithological Applications
AmericanOrnithology.org
Volume 122, 2020, pp. 1–14
DOI: 10.1093/condor/duz067

RESEARCH ARTICLE

Barn Swallow (*Hirundo rustica*) fledglings use crop habitat more frequently in relation to its availability than pasture and other habitat types

Chloe K. Boynton,[1,a,*] Nancy A. Mahony,[2] and Tony D. Williams[1]

Does land use change directly correlate with changes in strike rates and risk?

How, or rather at what level of effort does our species management influence strike rate/risk or offset the potential effect of land use/habitat change?

Conclusion

1 – More cowbell

2 – Better data quality

3 – Seamless data integration across systems

- Strike databases
- Air operations
- Survey and management data
- Spatial data
- Radar
- UAS
- GPS/VHF telemetry
- MOTUS
- Autonomous recording units (ARUs)
- BBS and eBird
- Birdcast

Received: 9 December 2020 | Accepted: 17 June 2021
DOI: 10.1111/1365-2664.13971

RESEARCH ARTICLE

Journal of Applied Ecology

Bird strikes at commercial airports explained by citizen science and weather radar data

Cecilia Nilsson[1,2] | Frank A. La Sorte[1] | Adriaan Dokter[1] | Kyle Horton[3] | Benjamin M. Van Doren[4] | Jeffrey J. Kolodzinski[5] | Judy Shamoun-Baranes[6] | Andrew Farnsworth[1]

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- KC Kerr, Ashley Triplet, and Jim Bender, MD WS and their leadership
- Brian Cross and his WS OH leadership
- Levi Altringer