High-resolution mapping of population specific flyways using DNA sequencing




Rachael Bay

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Challenge 1: To produce clean, renewable energy that will help reduce the pace of climate warming while having a minimal impact on natural populations.

Challenge 2: Few animals are more extensively impacted by renewable energy development than migratory birds, but understanding the population specific impacts of disturbance has been hampered by the ***lack of an efficient, reliable, and accurate methodology for identifying migrant populations***.

Our Solution: High-Resolution Genetic Tags

Tissue at base of feather contains DNA

Identify unique genetic code that allows us to *trace the breeding origin* of migrants captured anywhere along their migratory trajectory

How does it work?

Case Study - Yellow Warbler

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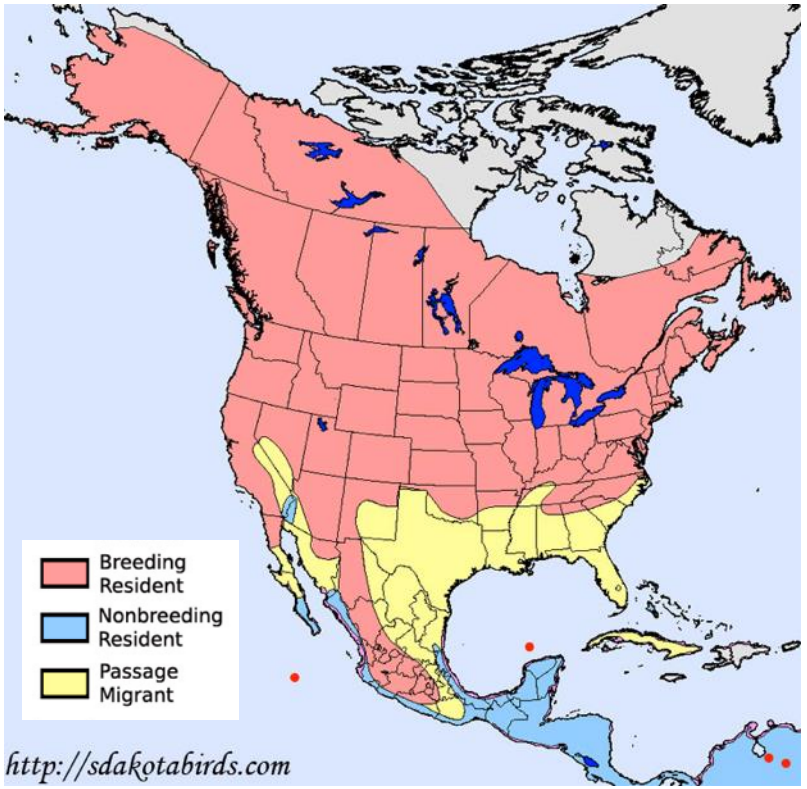

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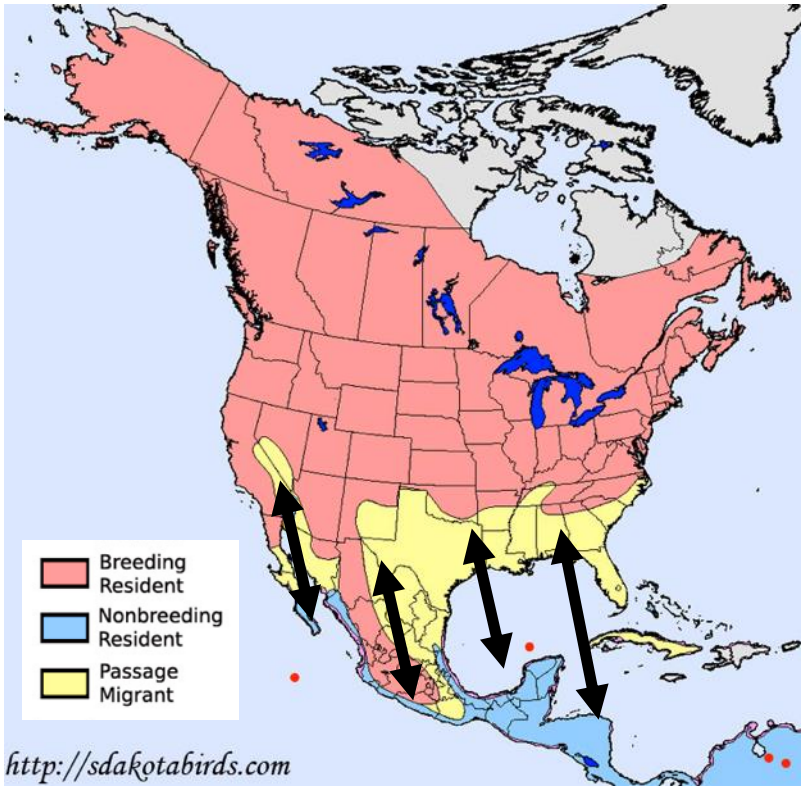

Little was known about *population specific* migration patterns

Yellow Warbler - Conservation Status

IUCN status: Least concern

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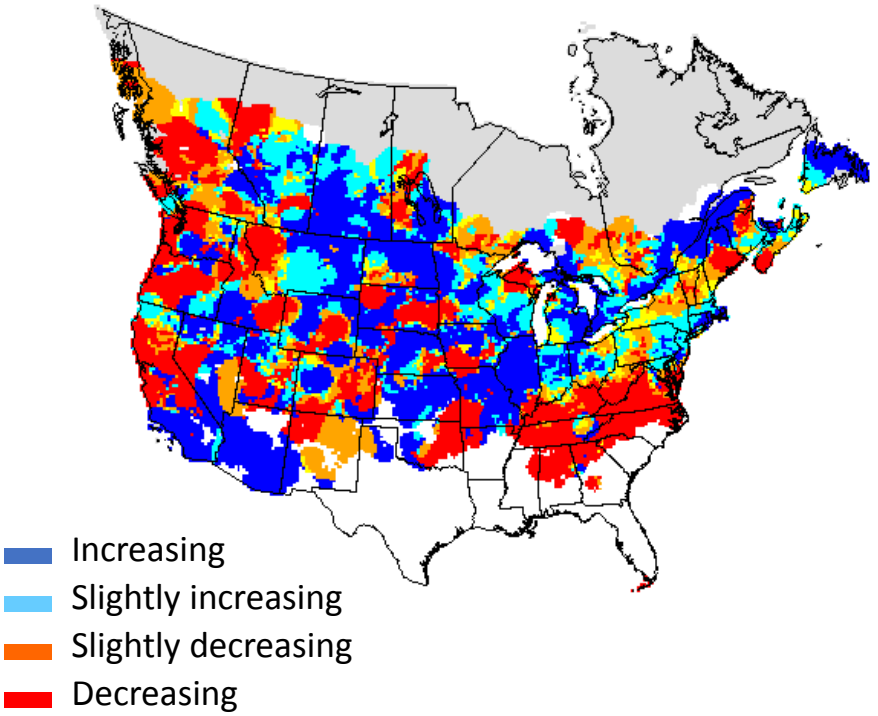
Breeding Bird Survey Trends



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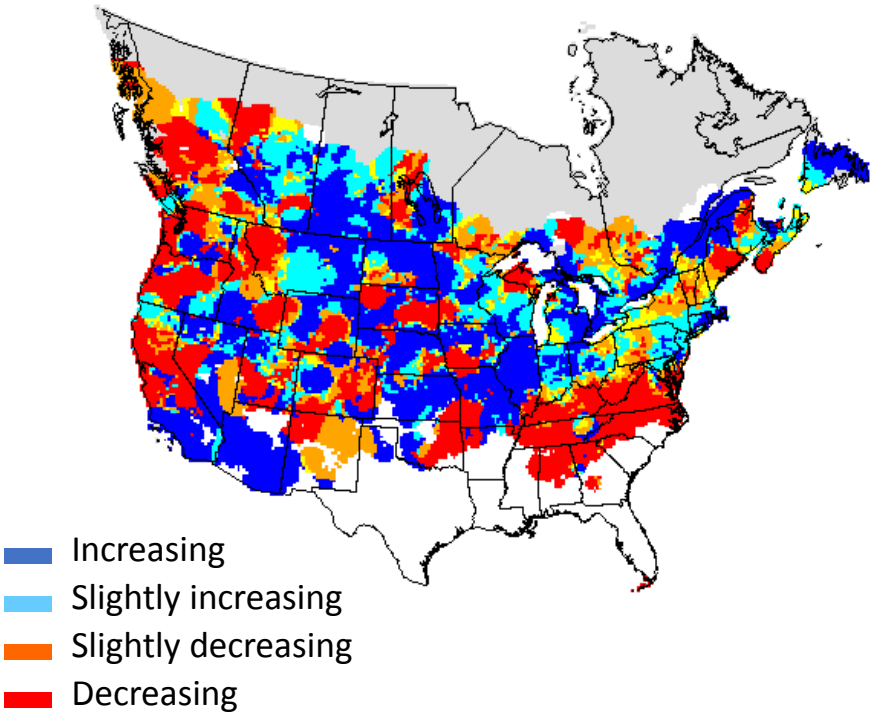
Breeding Bird Survey Trends



Patterns of declines in the Yellow Warbler are *population specific*

Yellow Warbler - Conservation Status

What we need is a *population specific* map of migration flyways

Patterns of declines in the Yellow Warbler are *population specific*

Step 1: Build a Map of Genetic Variation Across Geographic Space

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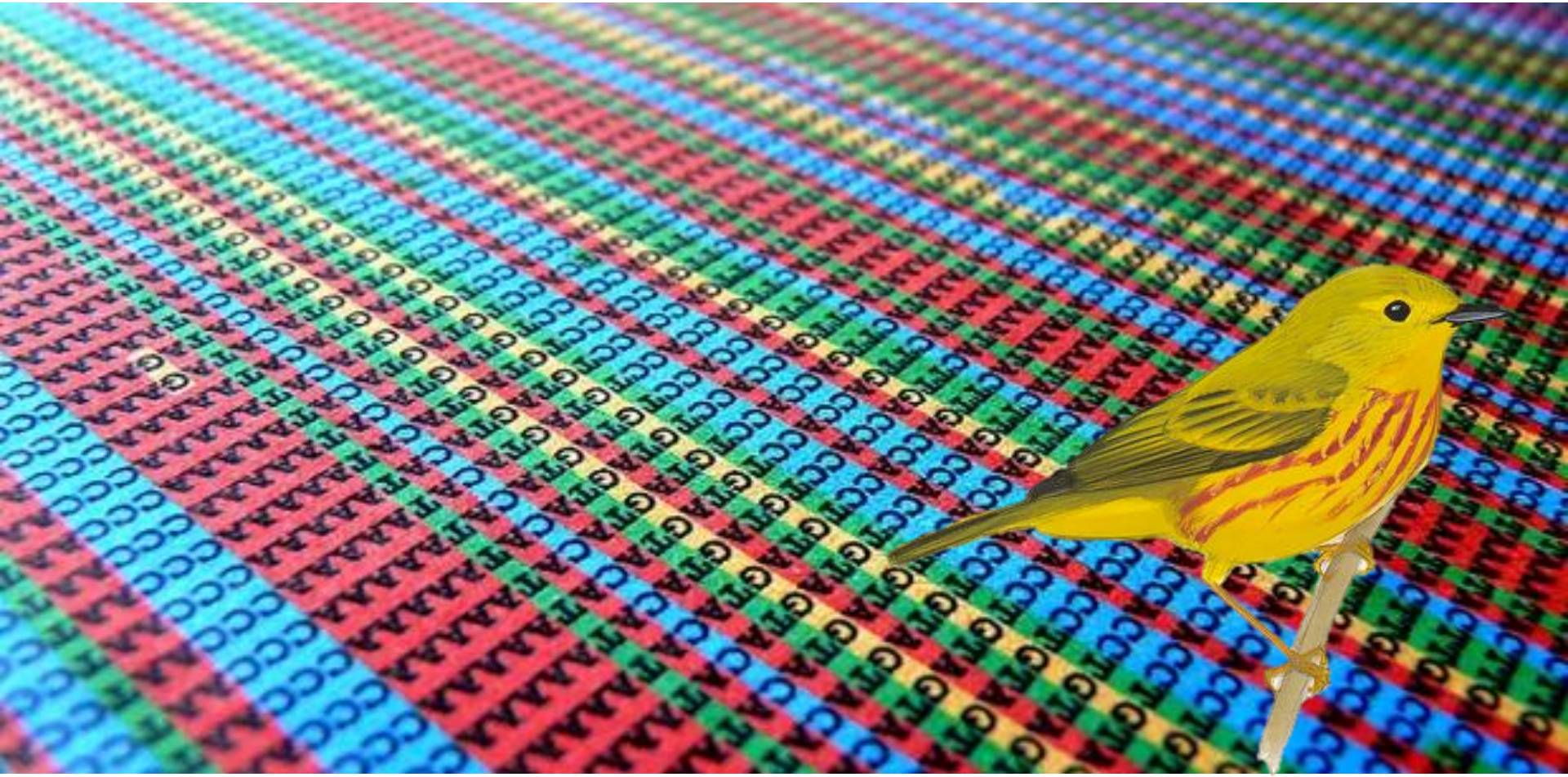

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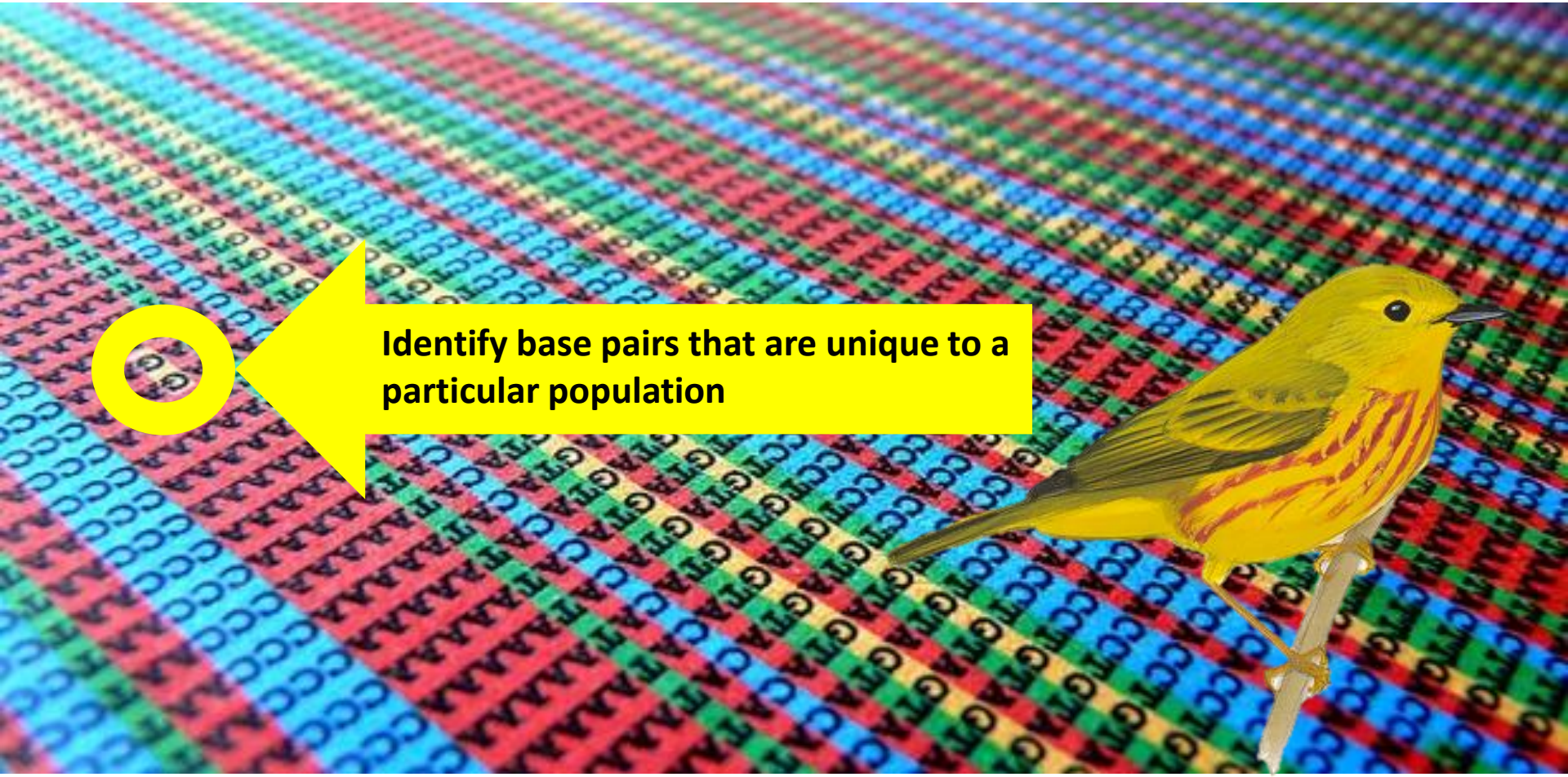

Step 1: Build a Map of Genetic Variation Across Geographic Space

Step 2: Trace the Origin of Migrants using DNA from Feathers

Point Blue Conservation science for a healthy planet

Northern Michigan University

USGS science for a changing world

THE INSTITUTE FOR BIRD POPULATIONS

NATIONAL GEOGRAPHIC

american kestrel partnership
a project of The Peregrine Fund

HAWKWATCH INTERNATIONAL

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

The UNIVERSITY of OKLAHOMA

BOISE STATE UNIVERSITY

Tulane University

Center for Tropical Research

THE PEREGRINE FUND
WORLD CENTER FOR BIRDS OF PREY
Working to Conserve Birds of Prey in Nature

Southern Sierra Research Station
...conserving biological diversity through research

Center for Tropical Research Feather Collection

- *>200,000 feathers*
- *> 50 species*
- *>20 year time series*

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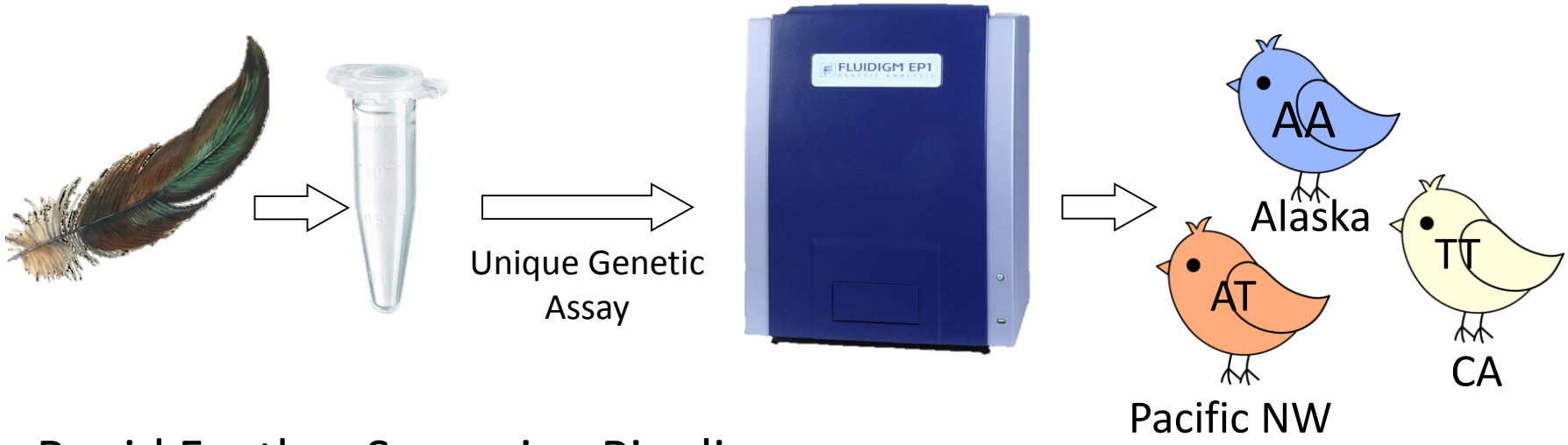
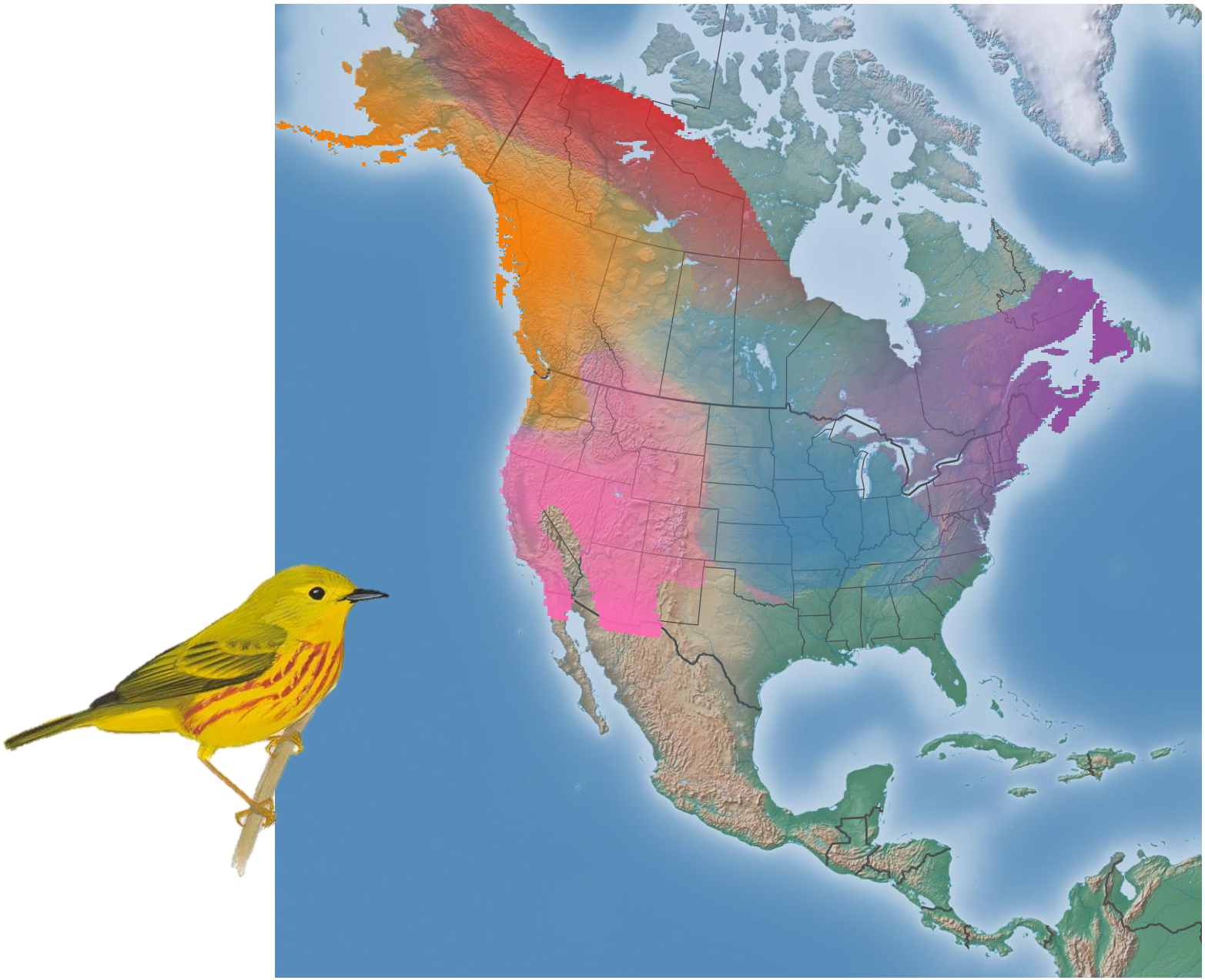


Rapid Feather Screening Pipeline

- Can screen ***~800 feather samples/week***.
- Works well with ***low quantity*** and ***degraded DNA (97% reliability).***

Step 3: Map Population Specific Migratory Flyways



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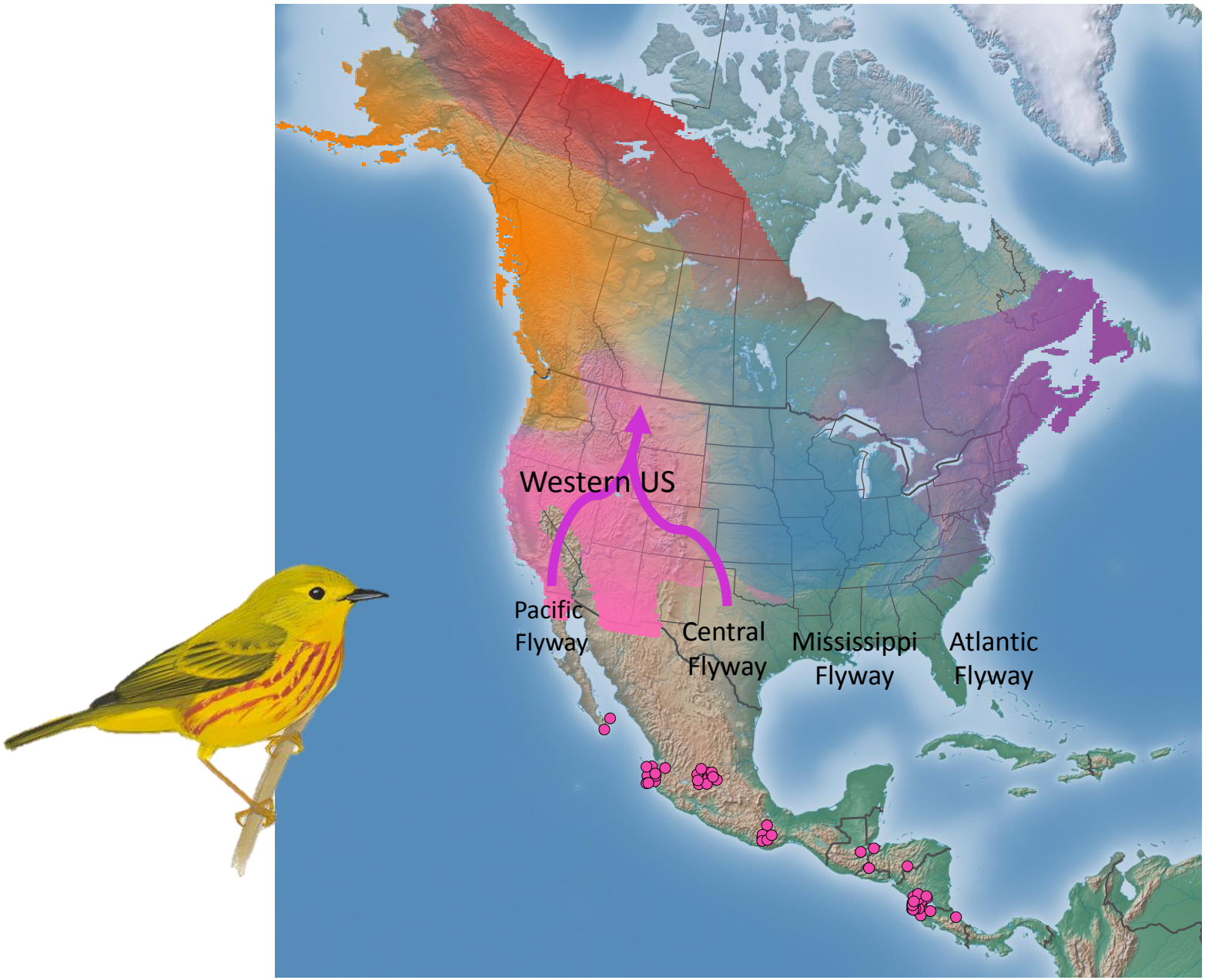

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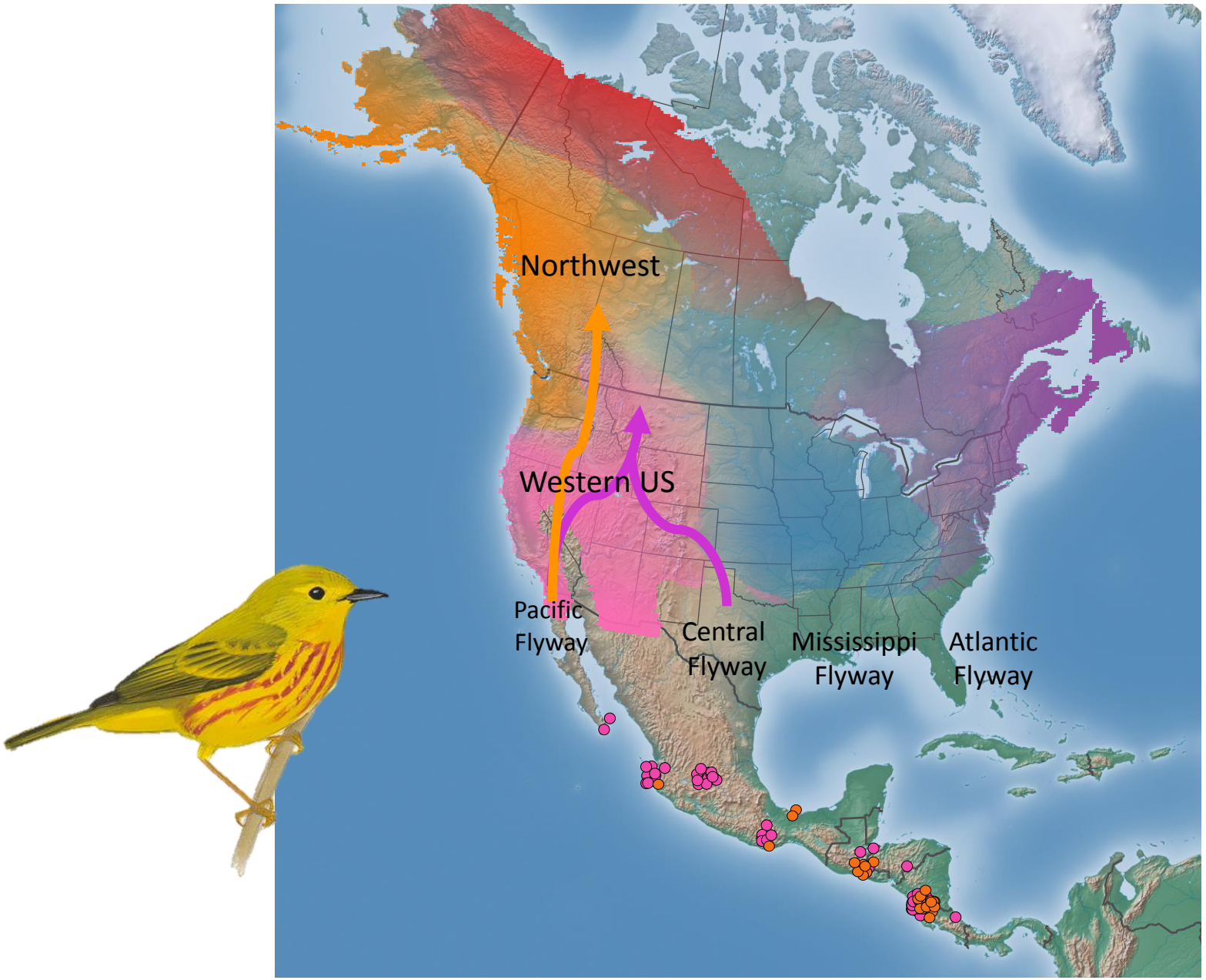

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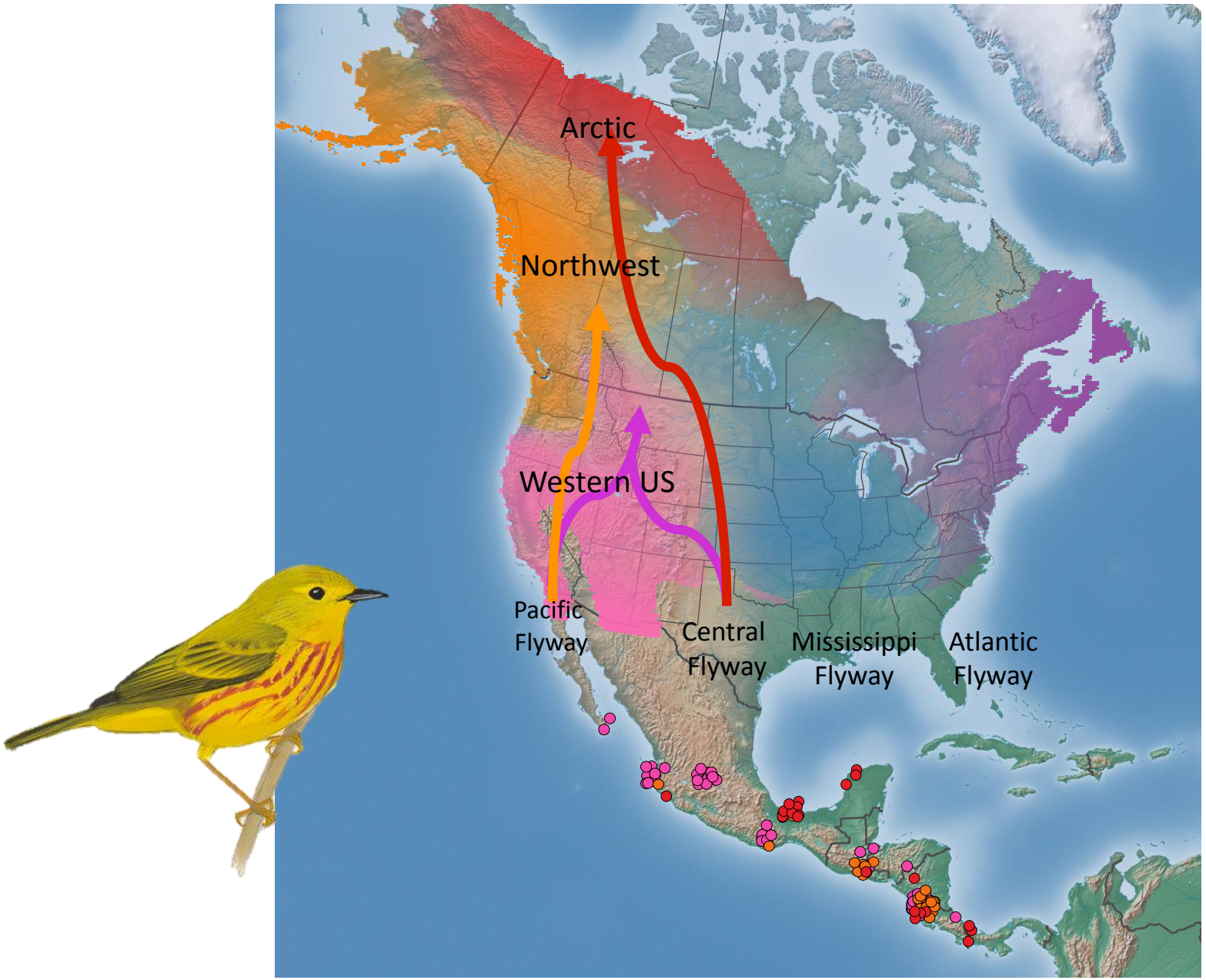

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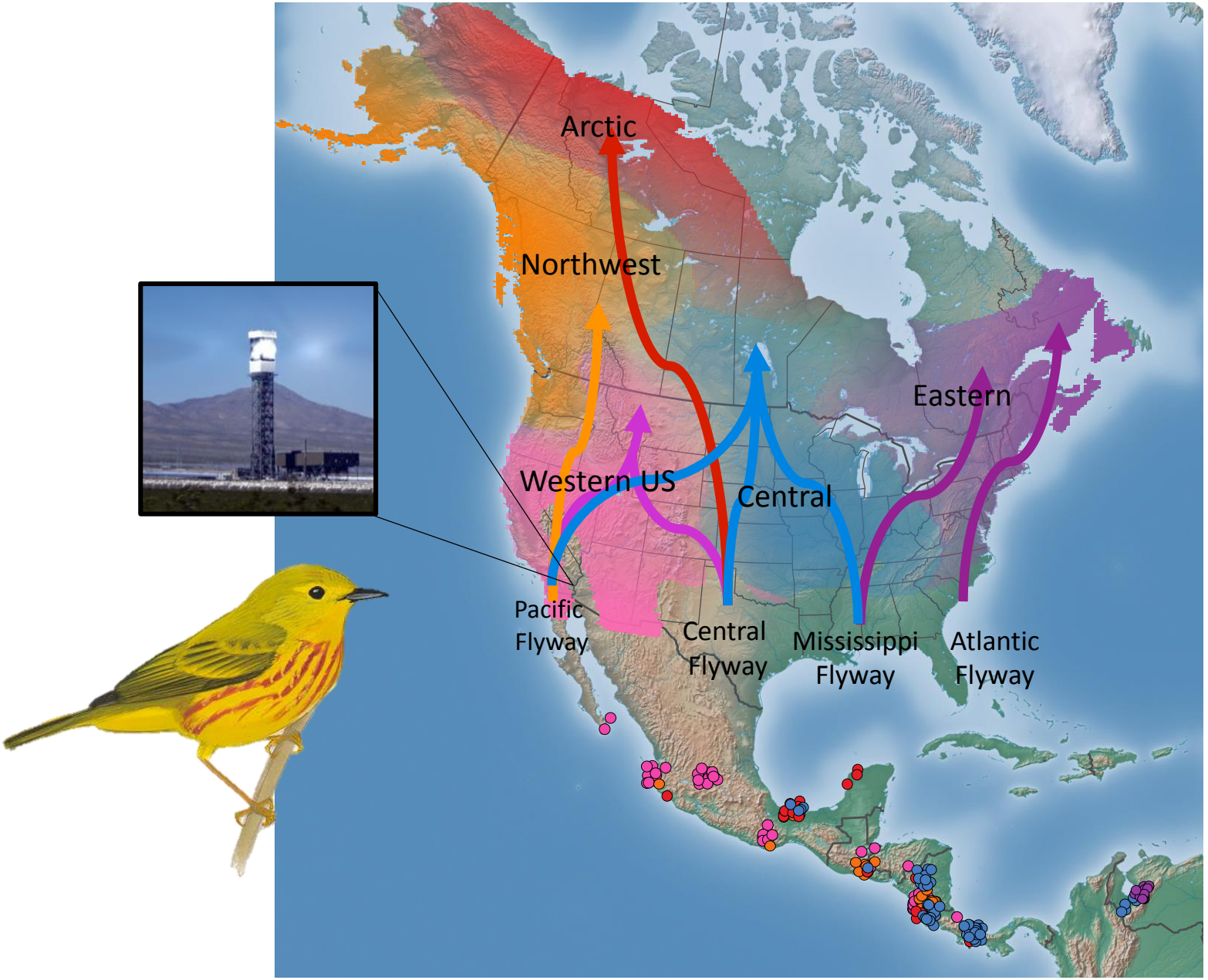

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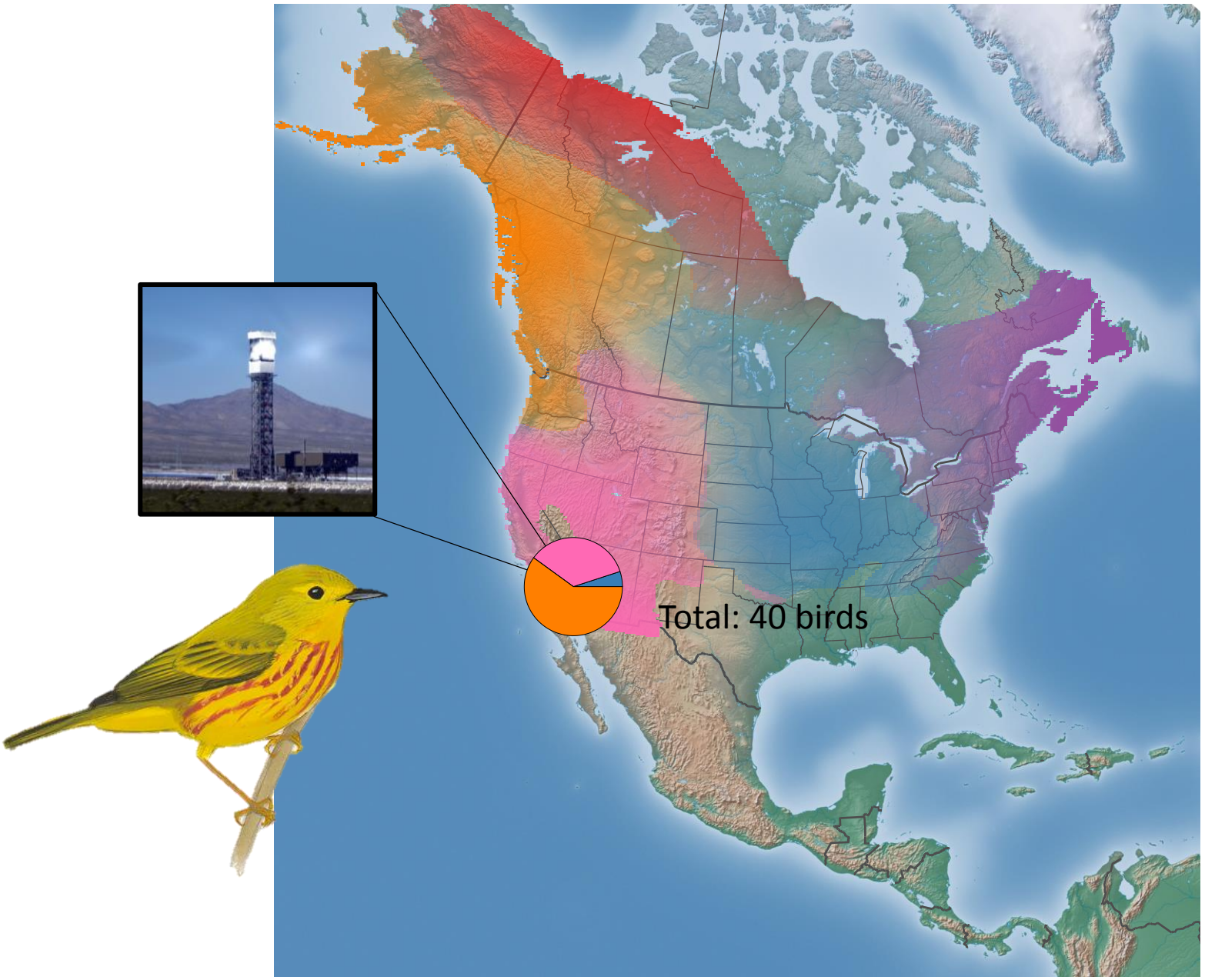

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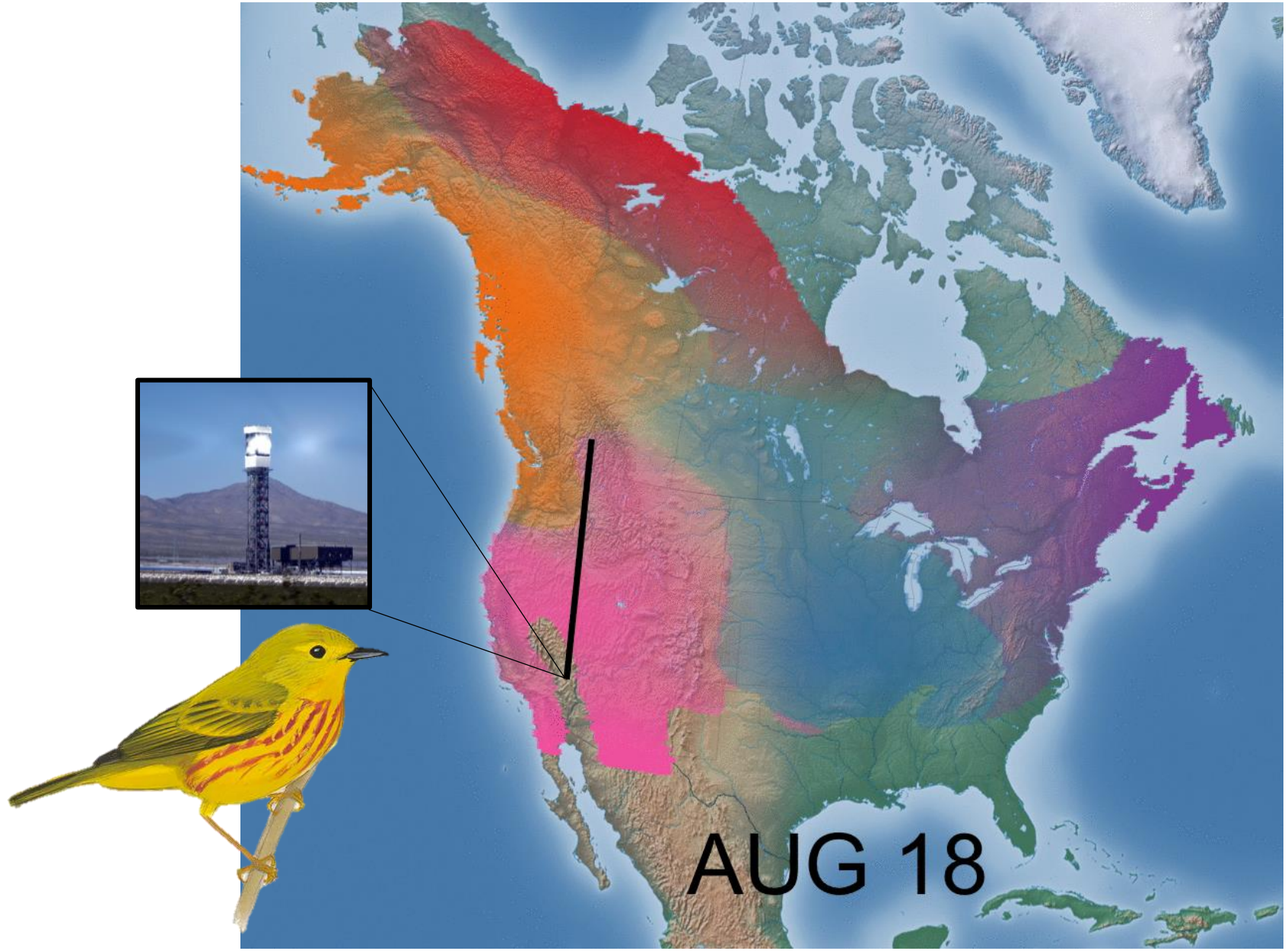

Goal: Map 50 species by 2020

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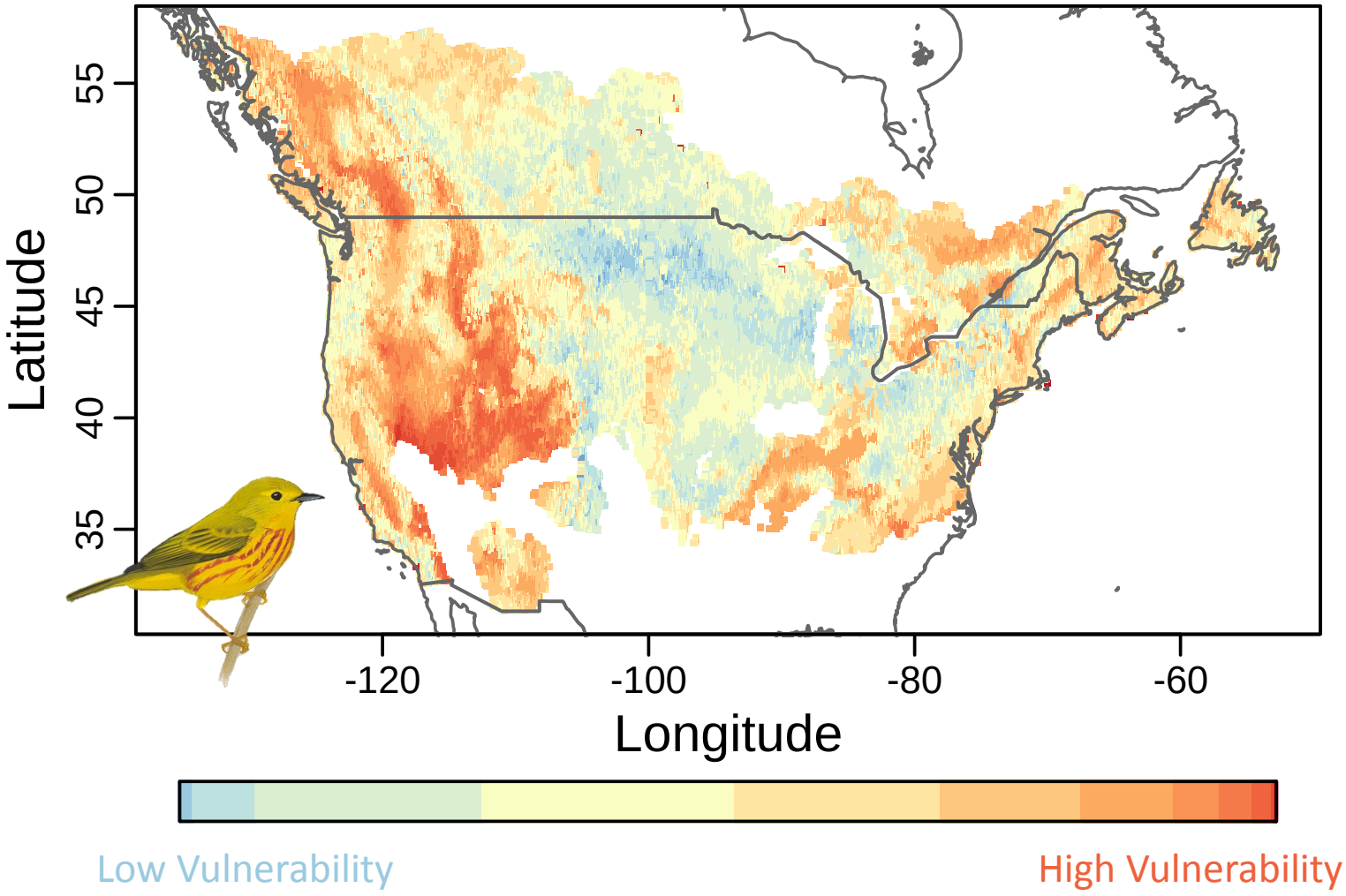
-> we are 20% of the way there!





Extension: Climate vulnerability



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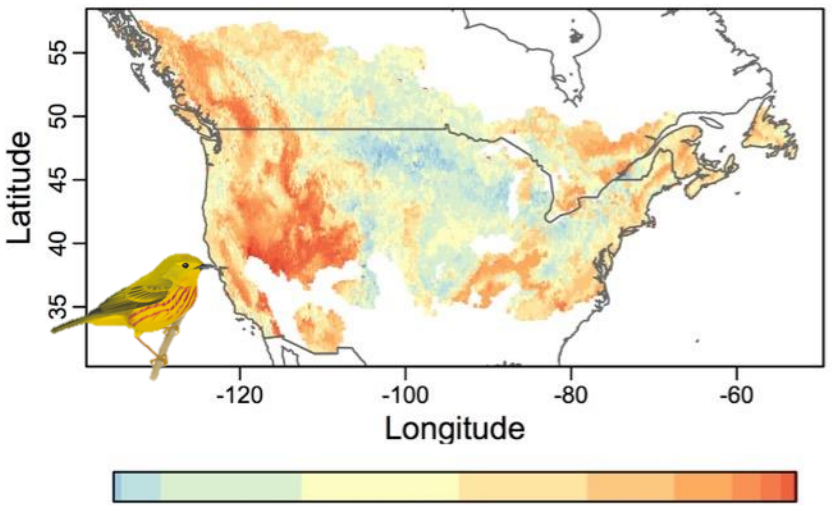
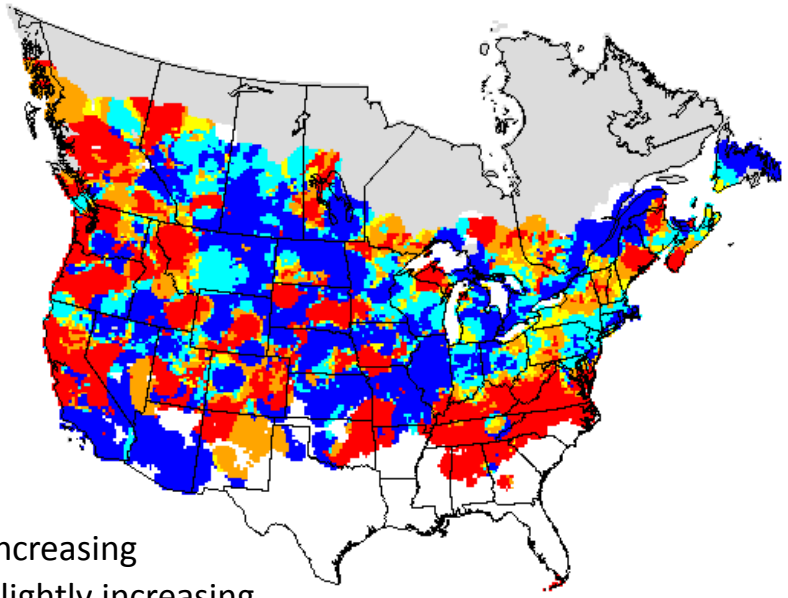


Low Vulnerability

High Vulnerability



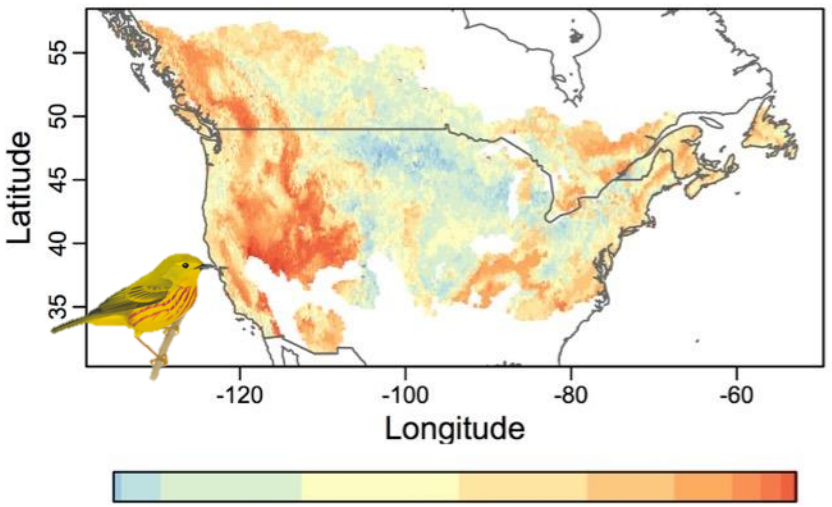
Increasing

Slightly increasing

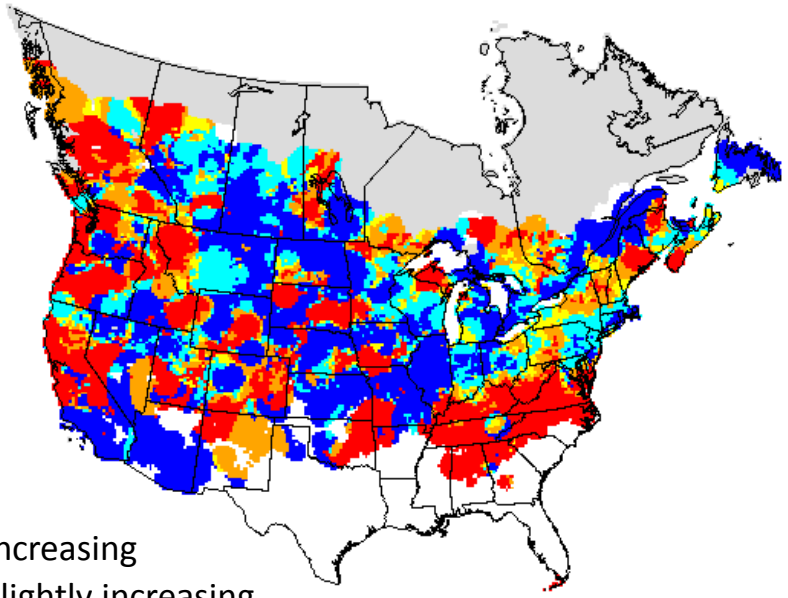
Slightly decreasing

Decreasing

Extension: Climate vulnerability

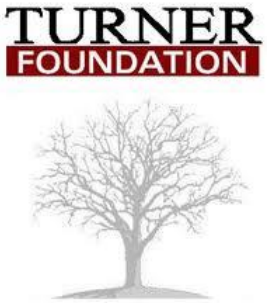


Low Vulnerability High Vulnerability



Regions with high ***vulnerability*** have already experienced population ***declines***

Thank you to our funders:



And several anonymous donors