Changes in Spring Arrival Dates of Rufous Hummingbirds in Western North America in the Past Century

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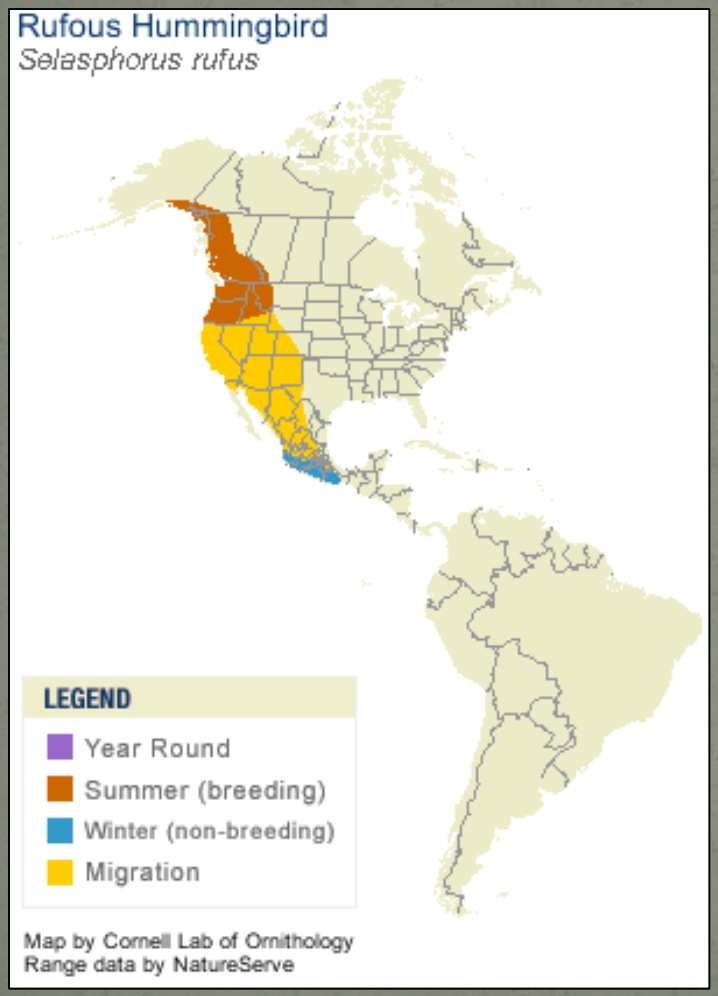
Climate Change and Phenology

Birds and Climate Change

- Many birds arriving earlier since 1960s – day length/temperature cues
- Birds are charismatic and first arrivals noted, sentinels of climate change?
- Provide important ecosystem services, but timing is critical
- Most migration studies at narrow spatial scales in Eastern U.S. and Europe

Courter et al. (2013)

Rufous Hummingbird



WESTERN HUMMINGBIRD *Partnership*

Objectives

- To assess migratory changes in Rufous Hummingbirds in western North America from 1895-2015 in relation to climate variables
- To develop a technique for comparing eBird and NABPP data to understand migratory changes

Recent Migratory Data (2002 – present)

Problems?

Historical Migratory Data (1880-1970)

North American Bird Phenology Program

USGS science for a changing world

Patuxent Wildlife Research Center

Mapped

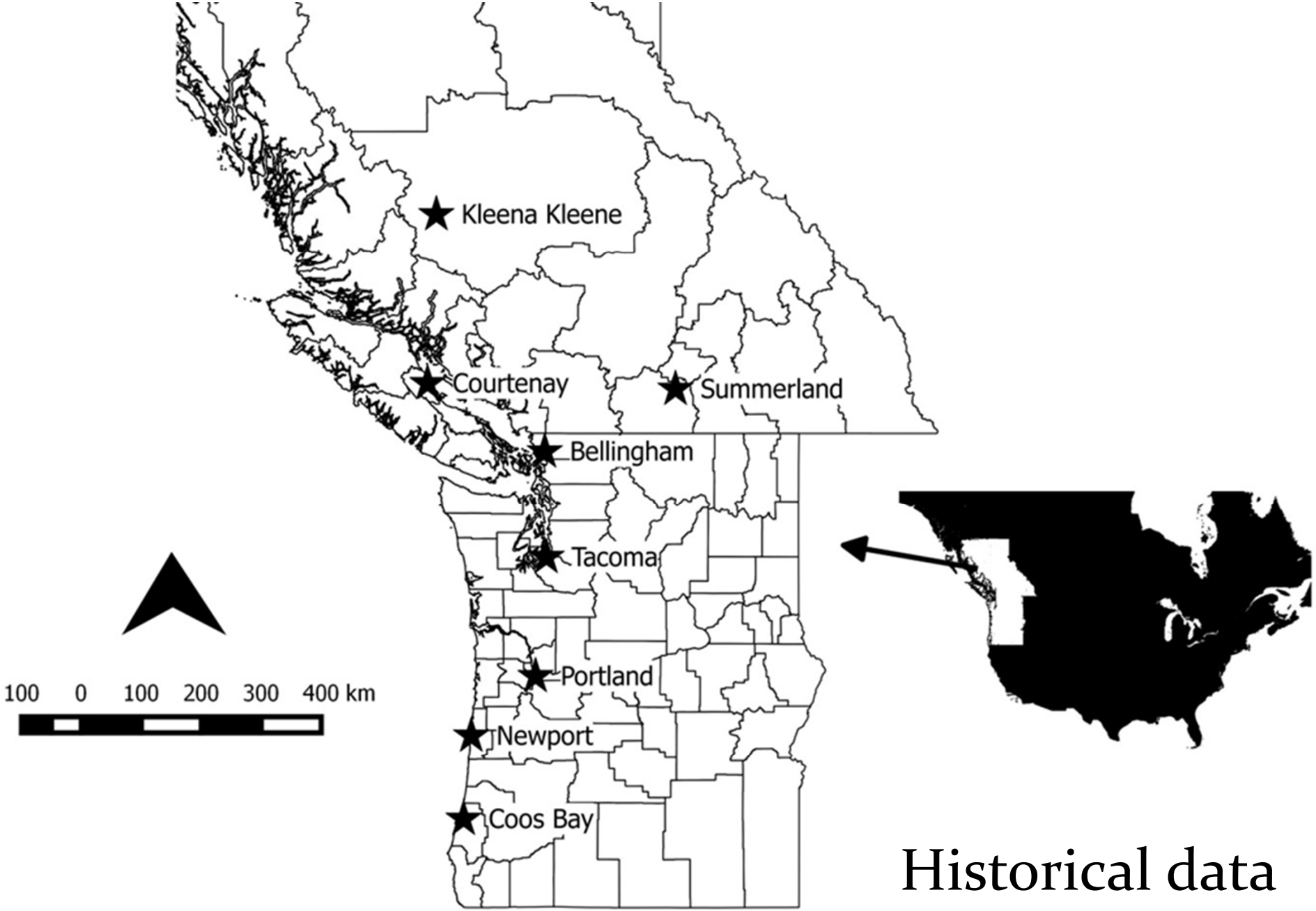
Name of Bird Ruby-throated Hummingbird

Locality N, C. Chapel Hill

Observer E.P. Odum E.R. Taylor &others

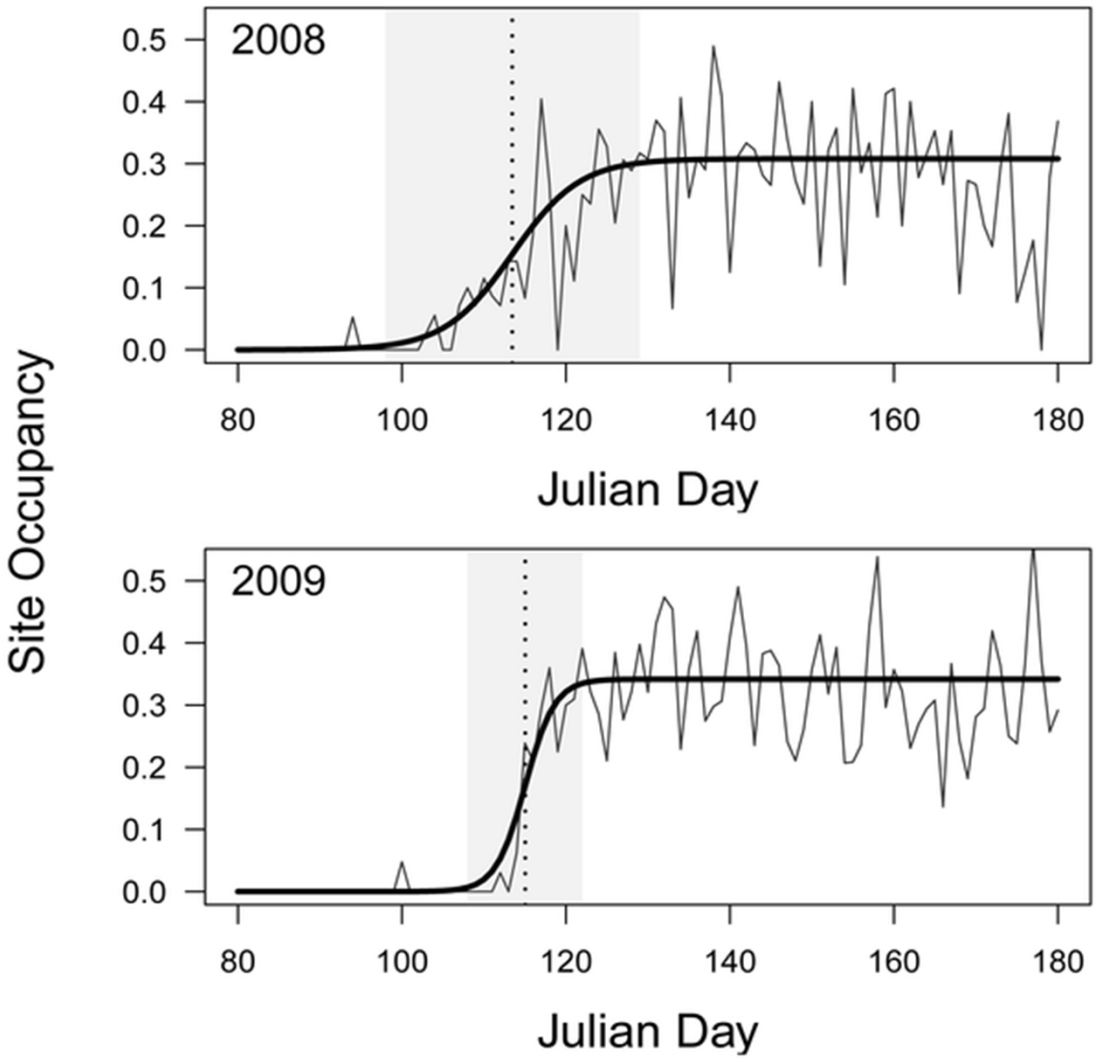
Year 1932

First seen	Number seen	Next seen	Became common	Last seen	Common or rare	Breeds
Apr.16	1	Apr.17	Apr.19		com	yes



Historical data
N = 436

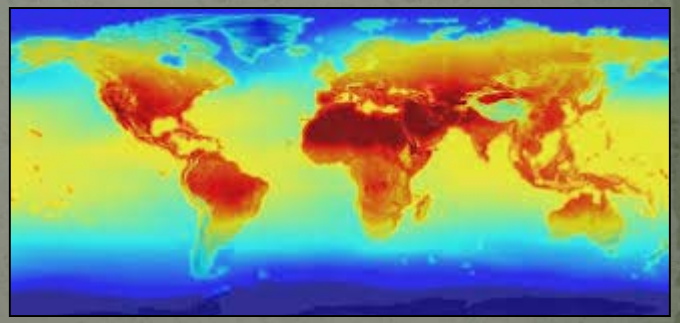
Figure 1. Estimating arrival date from temporal occupancy patterns.

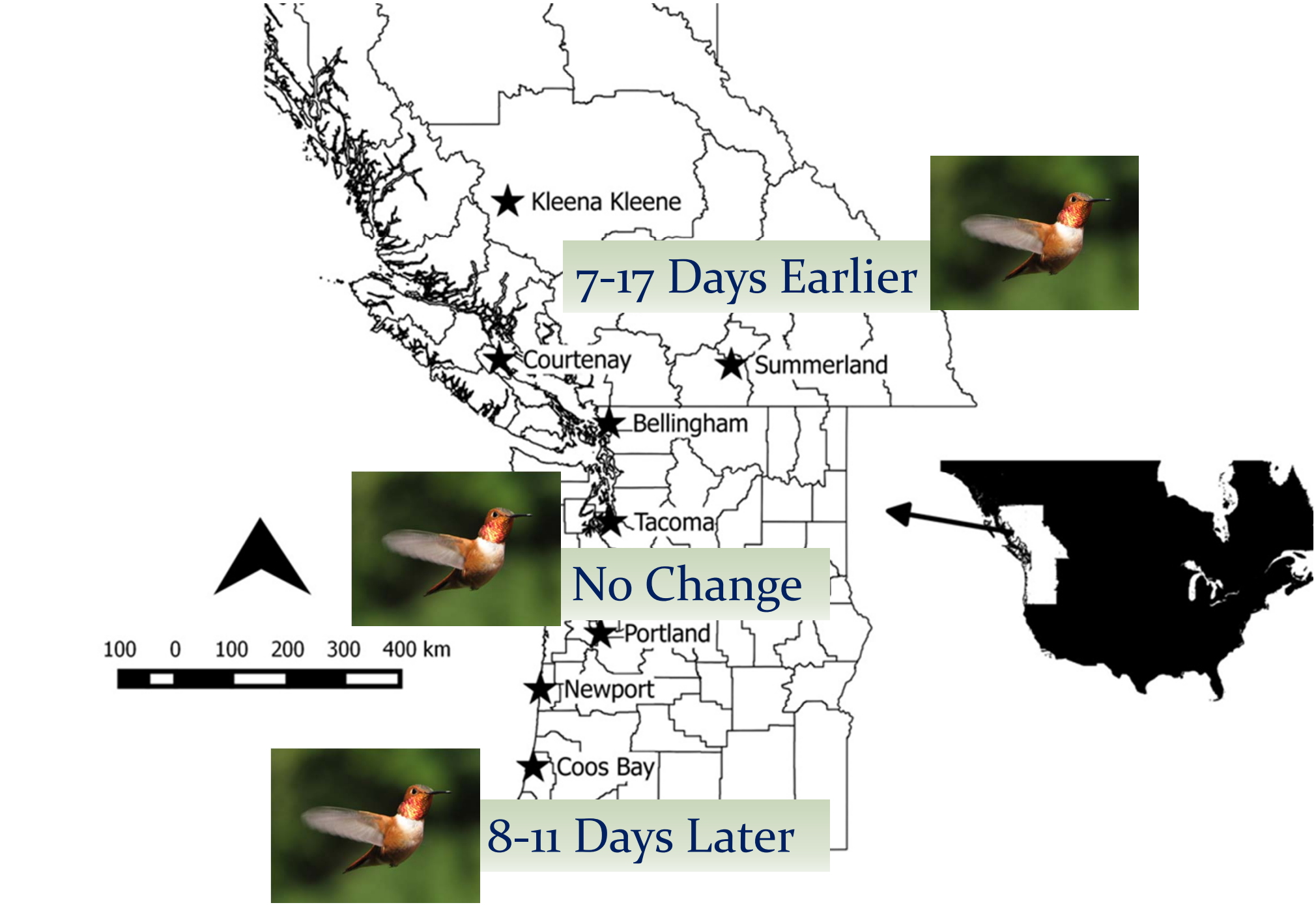


Hurlbert AH, Liang Z (2012) Spatiotemporal Variation in Avian Migration Phenology: Citizen Science Reveals Effects of Climate Change. PLOS ONE 7(2): e31662. doi:10.1371/journal.pone.0031662
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0031662

Methods and Climate Data

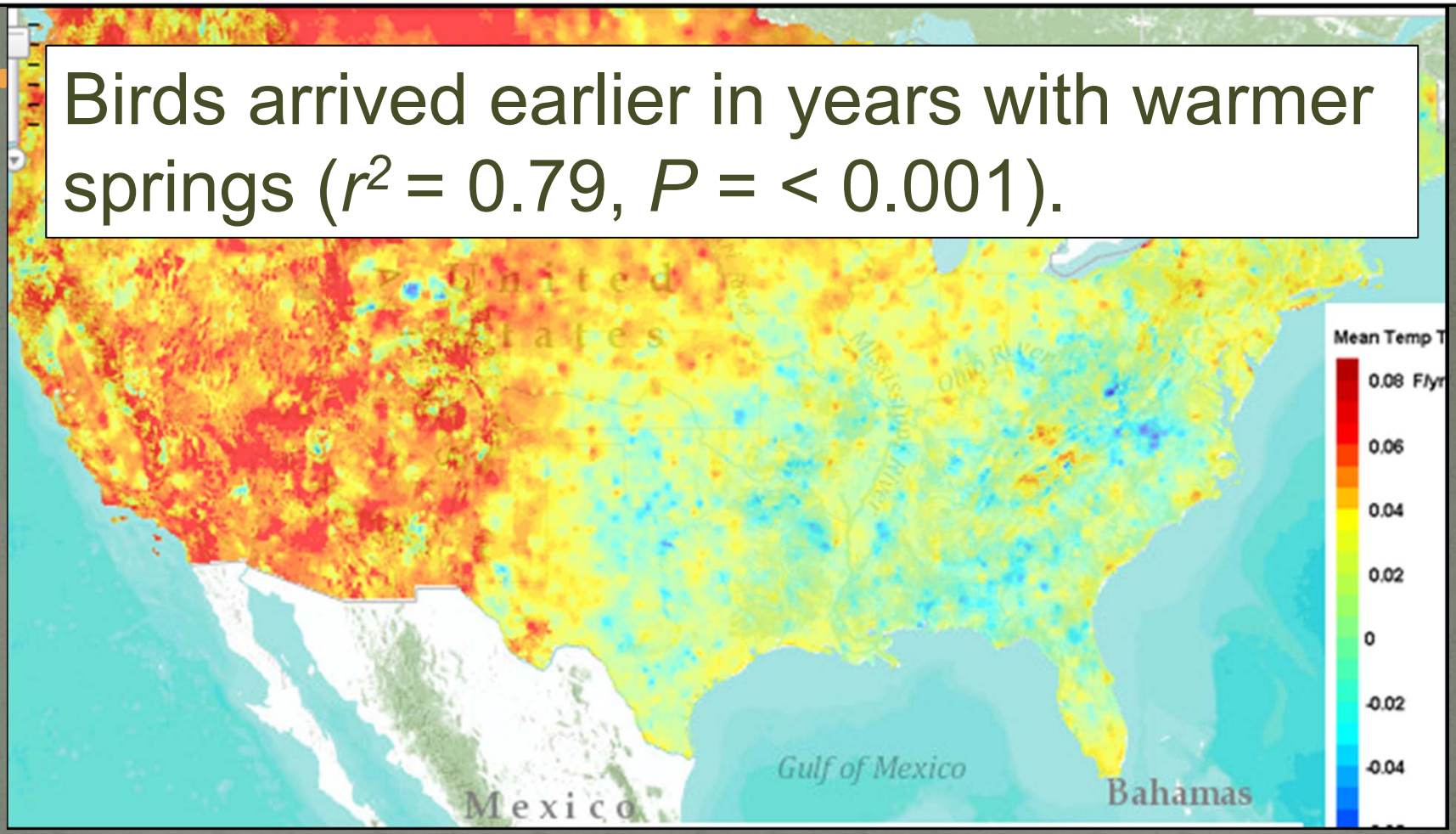
- Mean first arrival dates between time periods compared at each site using t-tests
- Mean spring temperature data matched with each arrival record
- Assessed changes in spring temperatures over time and changes in first arrival dates in relation to spring temp.




Kleena Kleene
7-17 Days Earlier
Courtenay
Summerland
Bellingham
Tacoma
No Change
Portland
Newport
Coos Bay
8-11 Days Later
100 0 100 200 300 400 km

Change in Mar-May Temperature 1951 - 2006

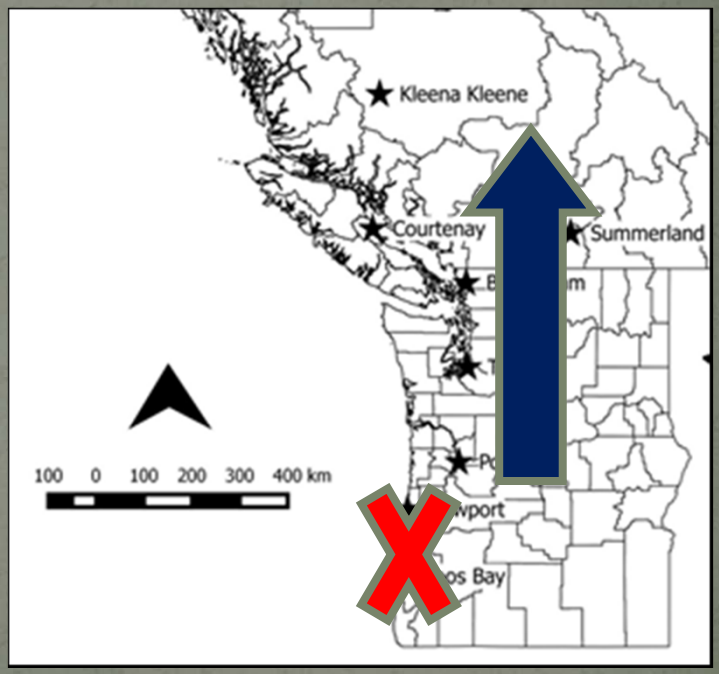
Birds arrived earlier in years with warmer springs ($r^2 = 0.79$, $P = < 0.001$).



Source: Climate Wizard (http://www.climatewizard.org/)

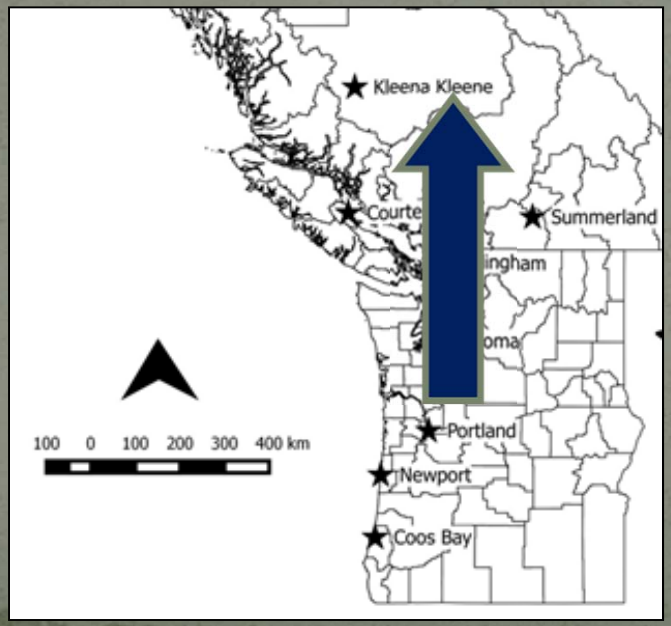
Discussion

- Earlier arrivals in north, likely a climate-related advancement
- Later first arrivals in coastal Oregon – birds now follow a more inland migratory route?
- BBS data indicate population declines – most pronounced in coastal California and Oregon
- Birds that are less abundant in an area would potentially be reported later?



Discussion

- Hummingbirds took fewer days (~24 vs. 34 days) to migrate from Portland to Kleena Kleene in the recent time period (30.4 km/day)
- Supp et al. (2015)



Take Home Points

- A climate-related migratory advancement in western North America
- Phenological delays in one region and advancements in another could be concerning ecologically
- Justification to investigate the impacts of climate change on migration in coastal vs. inland environments
- A framework for comparing two emerging datasets to better understand the impacts of climate change

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Questions?