Songbirds as Pollinators? New Insights into Flower Visitation by the Birds of Vancouver Island and Beyond

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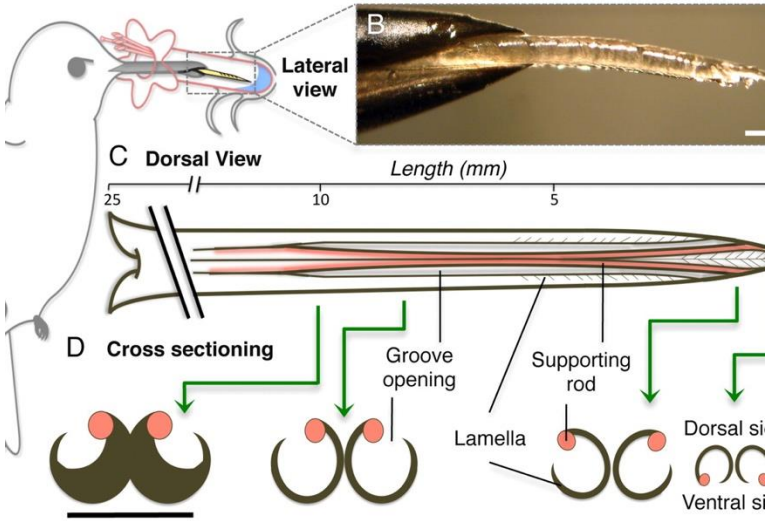
Avian Pollinators in North America

Specialized Flight Function

Macaulay Library – Matthew Pendleton

Specialized Tongue Form



Rico-Guevara and Rubega (2011)

Specialized Bill Morphology

Macaulay Library – Fernando Burgalin Sequeria

However, avian pollination in North America may not be restricted to specialists.

iNaturalist user Naturenut2006

iNaturalist user gwynnemb

iNaturalist user johnnyrhomboid

Has No One Looked Into This Before?

iNaturalist user Rory62

--- 1928 ---

Frank F. Gander, a young botanist, observes flock of Orioles and Waxwings in California, foraging in a **blue gum** tree**,** probing “the heart of flowers”

iNaturalist user abcdefgewing

--- 1977 ---

Robert Cruden & Victor Toledo notice that flocks of Tanagers and Orioles visiting **shortflower monkeyflower** are likely the primary pollinators for that species

iNaturalist user gwynnemb

--- 1991 ---

Ken Rosenberg observes an Orange-crowned Warbler visiting his hummingbird feeder, and notes through years of observation, warblers and orioles preferentially foraging in flowering shrubs, such as mesquite

iNaturalist user scmayo

Project Feederwatch, Heide Stover

--- 2019 ---

Dusty Gannon and I observe warblers foraging in vine maple flowers and set up an exclusion study to test their pollinator effectiveness.

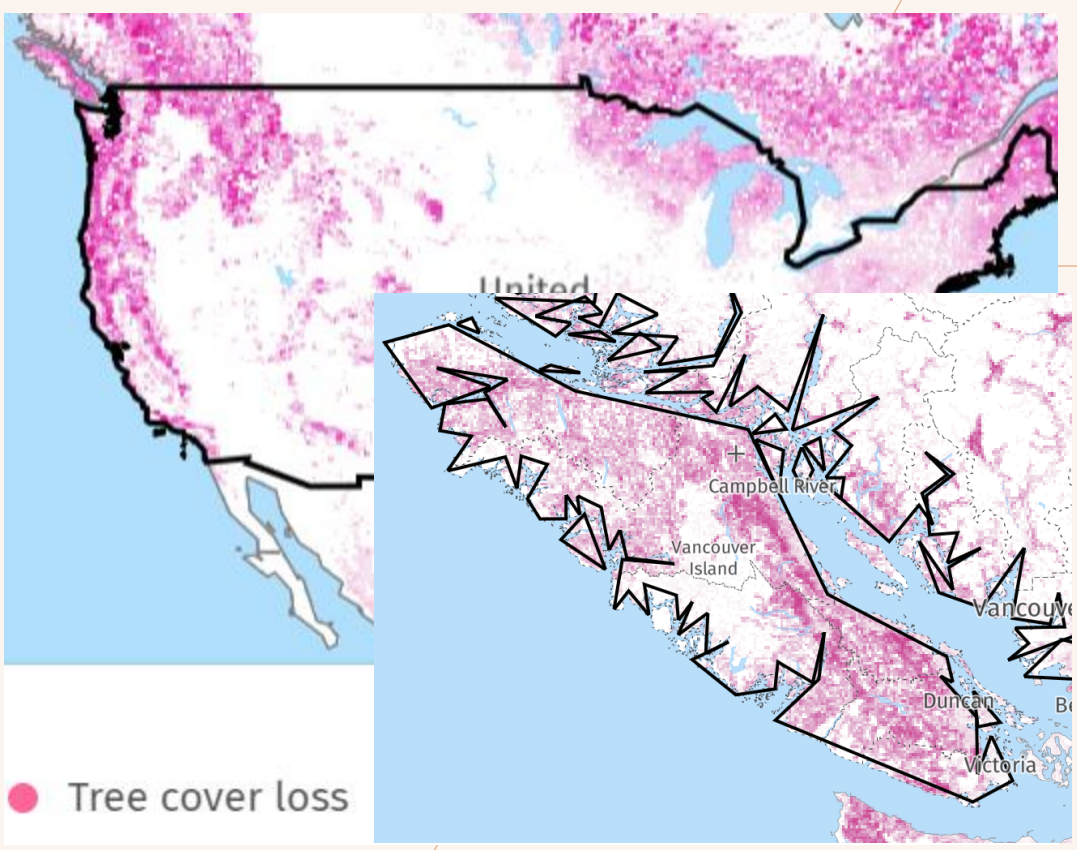
Aaron Liston

MOTIVATIONS

Motivations

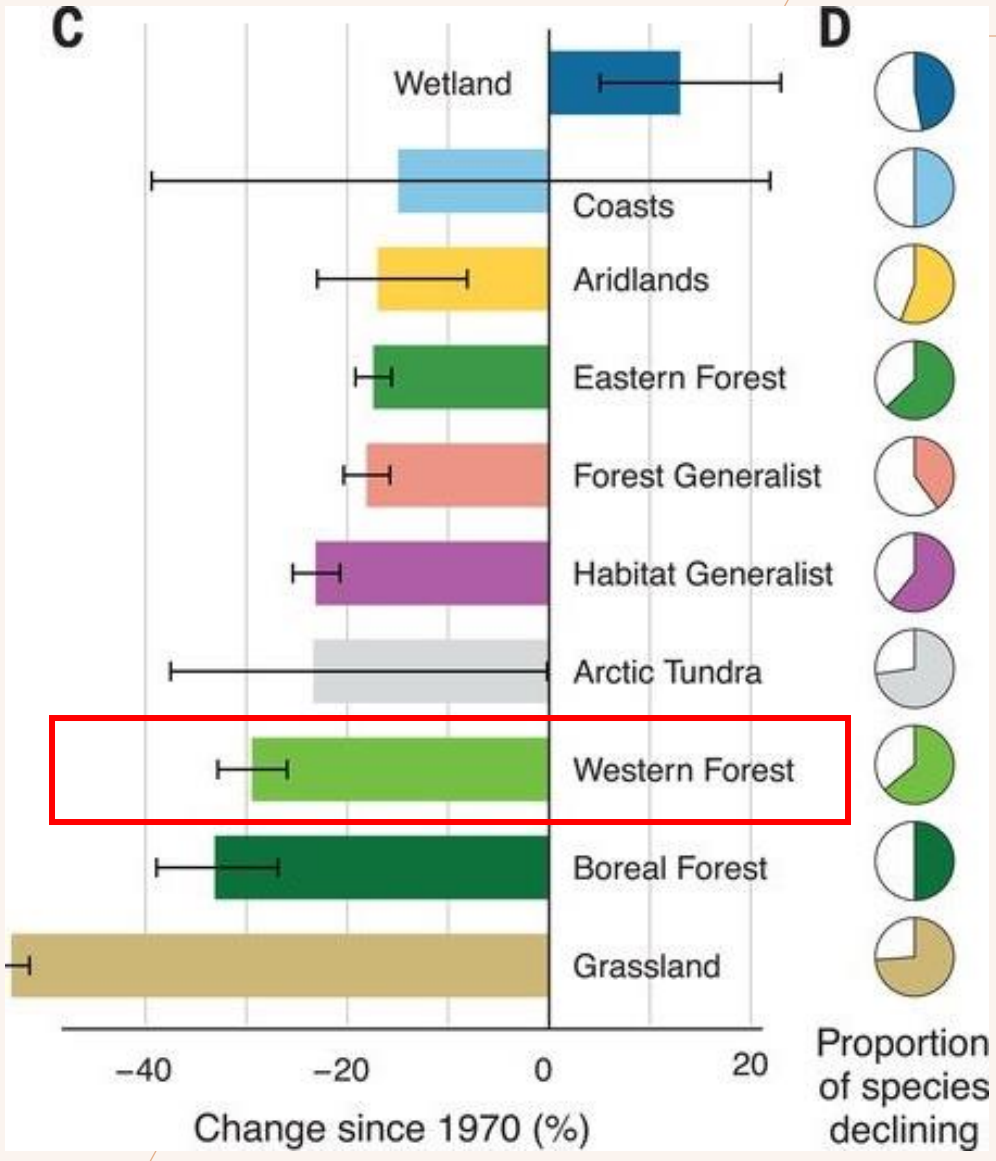
Songbirds may transport pollen across fragmented landscapes

- Western Forests = Highest rate of interior forest loss
- British Columbia has lost 1.24 million hectares of natural forest since 2023
- Songbirds may transfer pollen across long distances, helping plants



Motivations

Western Forests have seen one of the largest declines in breeding birds.



Motivations

Migrating songbirds may rely on flowers as a food source and settlement cue

Flower power: tree flowering phenology as a settlement cue for migrating birds

Laura J. McGrath[1,2], Charles van Riper III[1] and Joseph J. Fontaine[1,*]

- Flowering honey mesquite = neotropical songbird settlement
- Preferentially forage in trees with more flowers

“While the ecology and evolution of interactions between specialist nectarivorous birds and the plants they pollinate is relatively well understood, very little is known on pollination by generalist birds.”

– ABRAHAMCZYK 2019

iNaturalist user dmgallagher

Research Questions

iNaturalist user alicecaste

1. Which songbirds carry animal-transported pollen? What individual and environmental factors are associated with this pollen presence on a songbird?

2. Are there shared characteristics of plants whose pollen are carried by songbirds?

3. Do hummingbirds and songbirds visit the same or different plants?

4. Can Participatory Science (iNaturalist) be used to visualize flower-songbird interactions?

Research Questions

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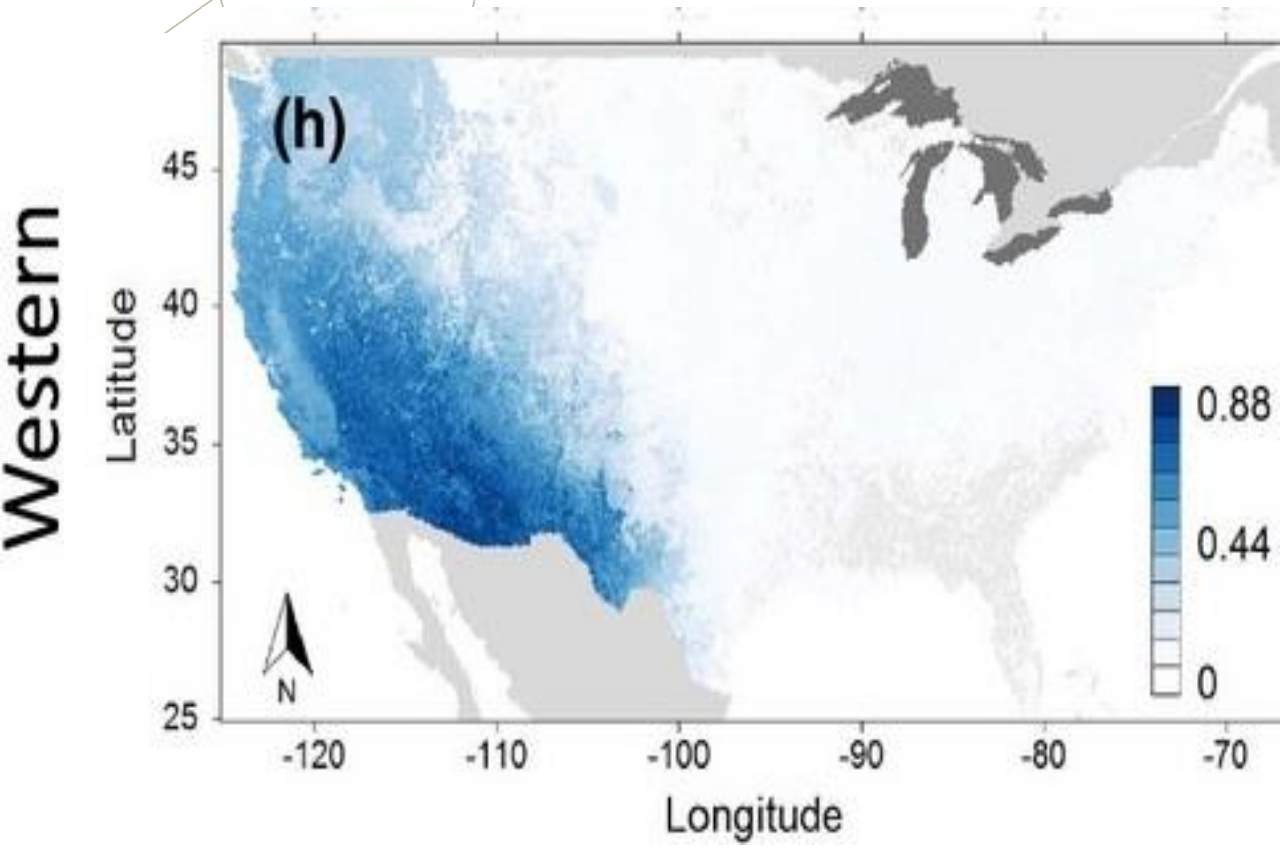
Methods: Working With Bird Banding Groups

Western Flyway: spring migration by songbirds & hummingbirds



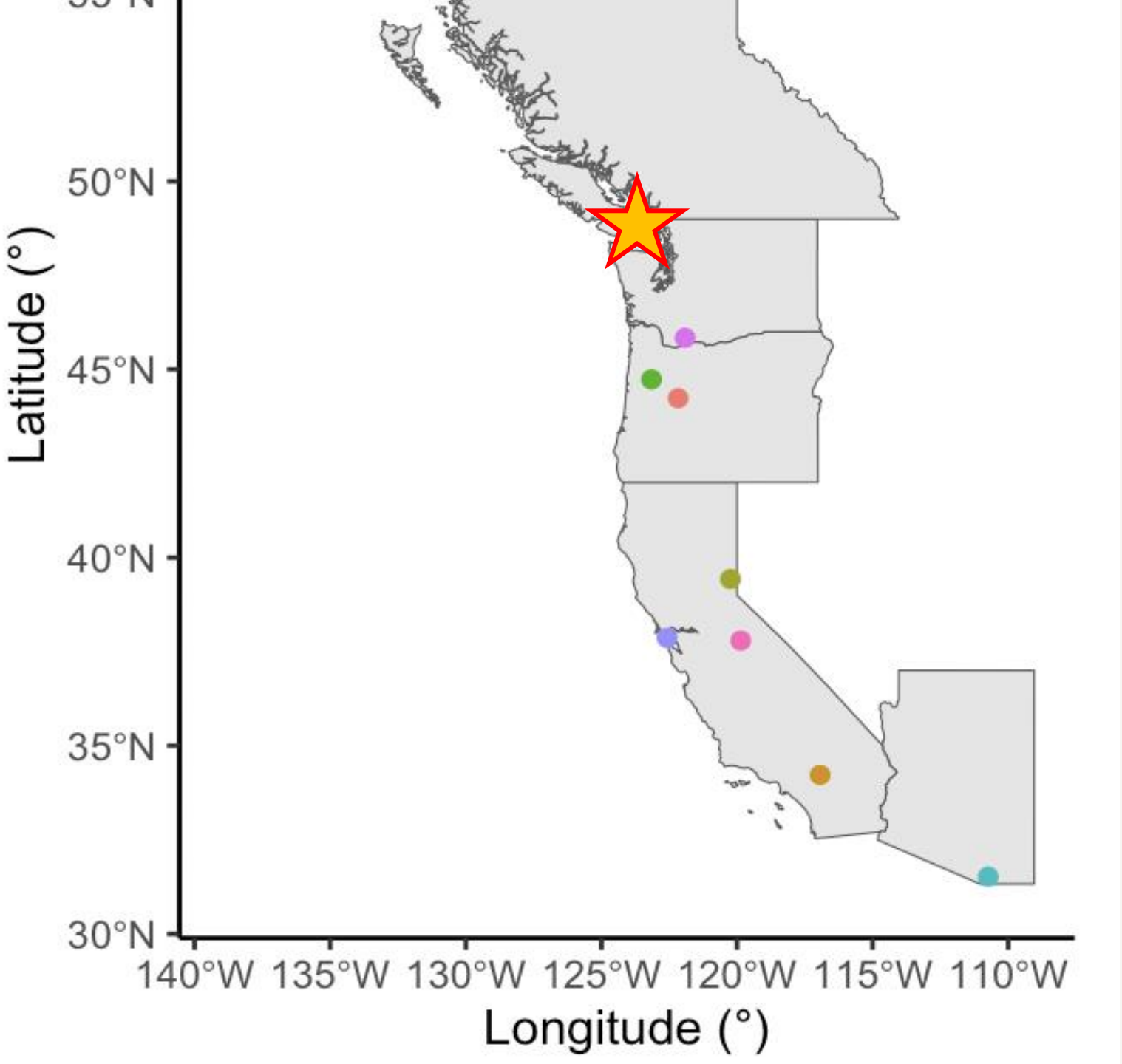
La Sorte et al. 2014

We identified potential sites based on

- Number of birds of interest captured
- Location within the core areas of the Western Flyway

Reached out to stations via the Bird Banding Laboratory (BBL) and the Institute for Bird Populations (IBP)

- Ultimately worked with 11 stations

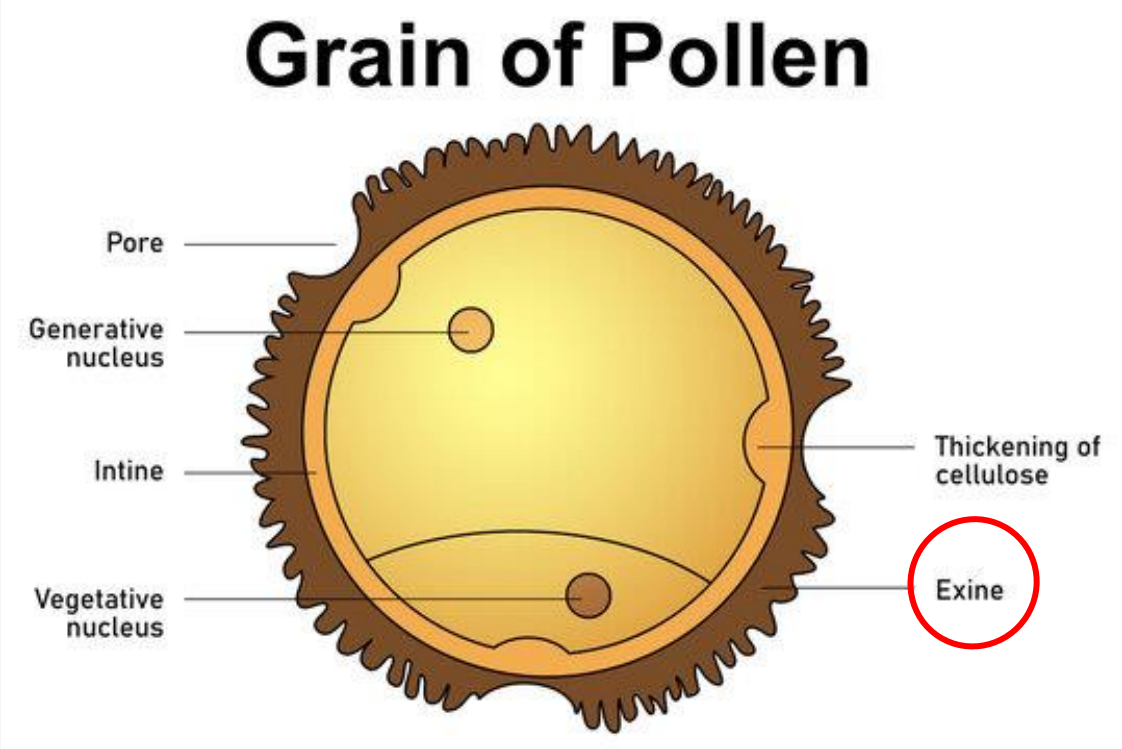

50°N
45°N
40°N
35°N
30°N
Latitude (°)
140°W 135°W 130°W 125°W 120°W 115°W 110°W
Longitude (°)

Methods: Samples Collected by Bird Banders

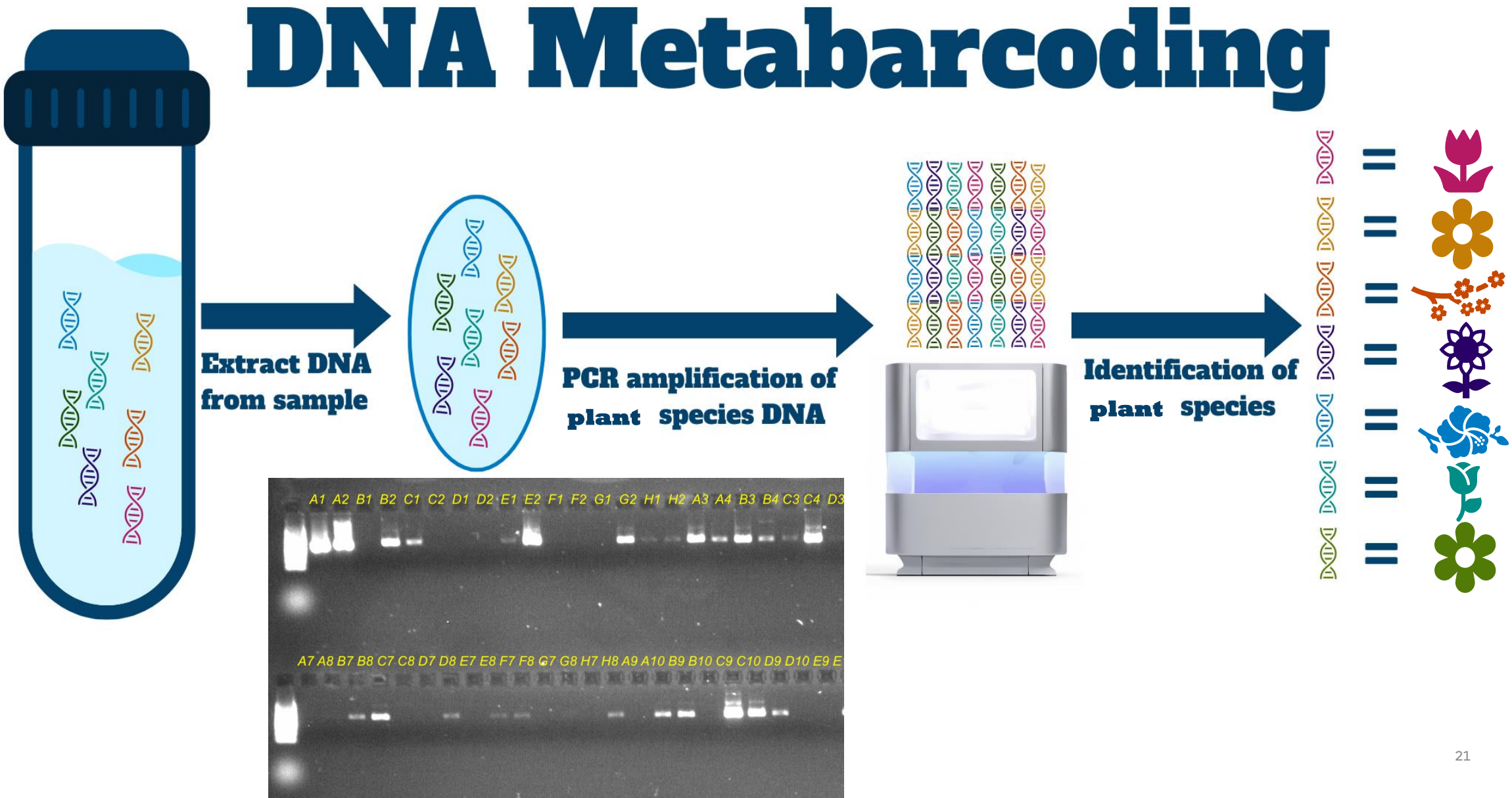

iNaturalist user jscuss

Methods: Samples Collected By Bird Banders

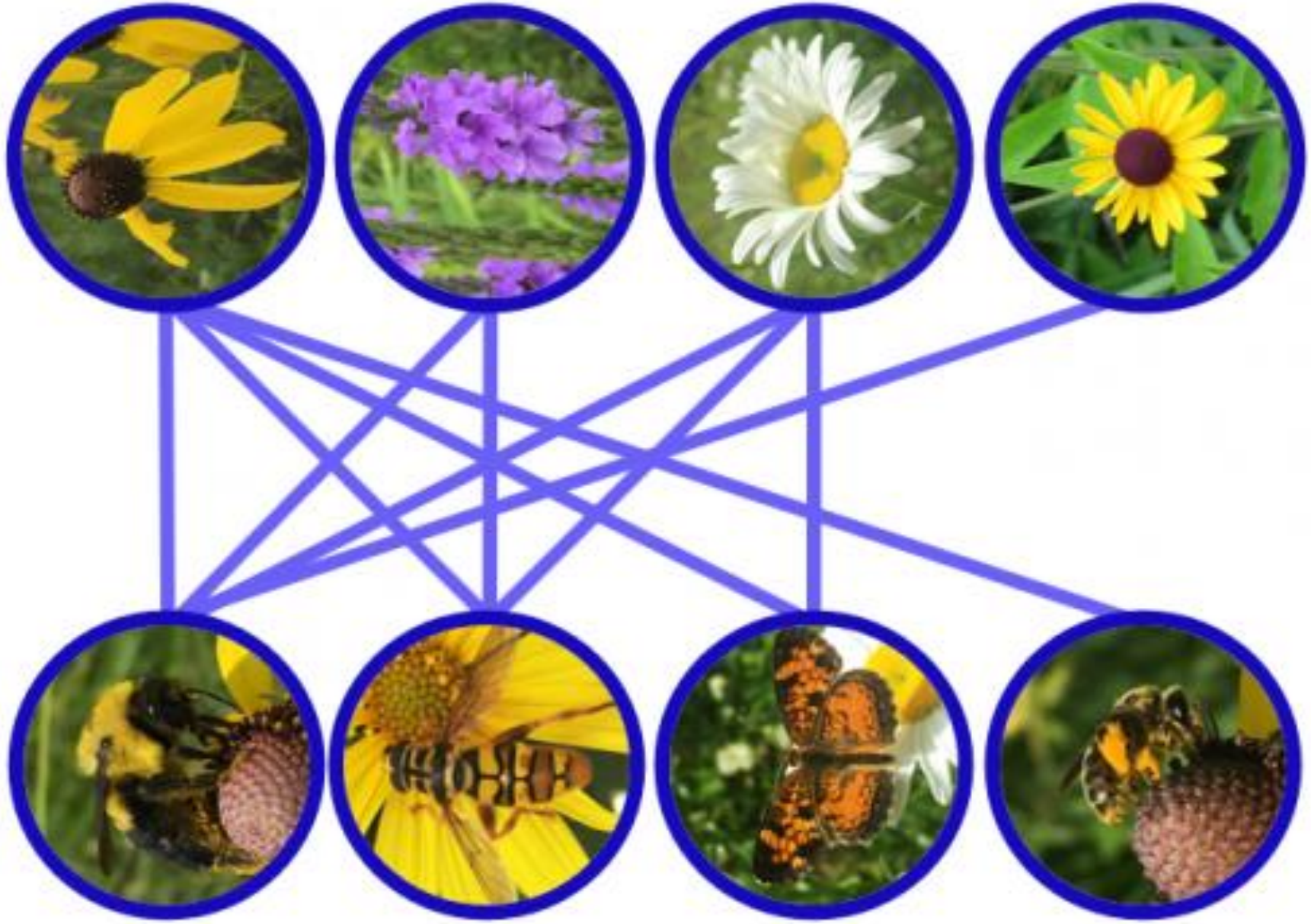
Methods: Back in the Lab...



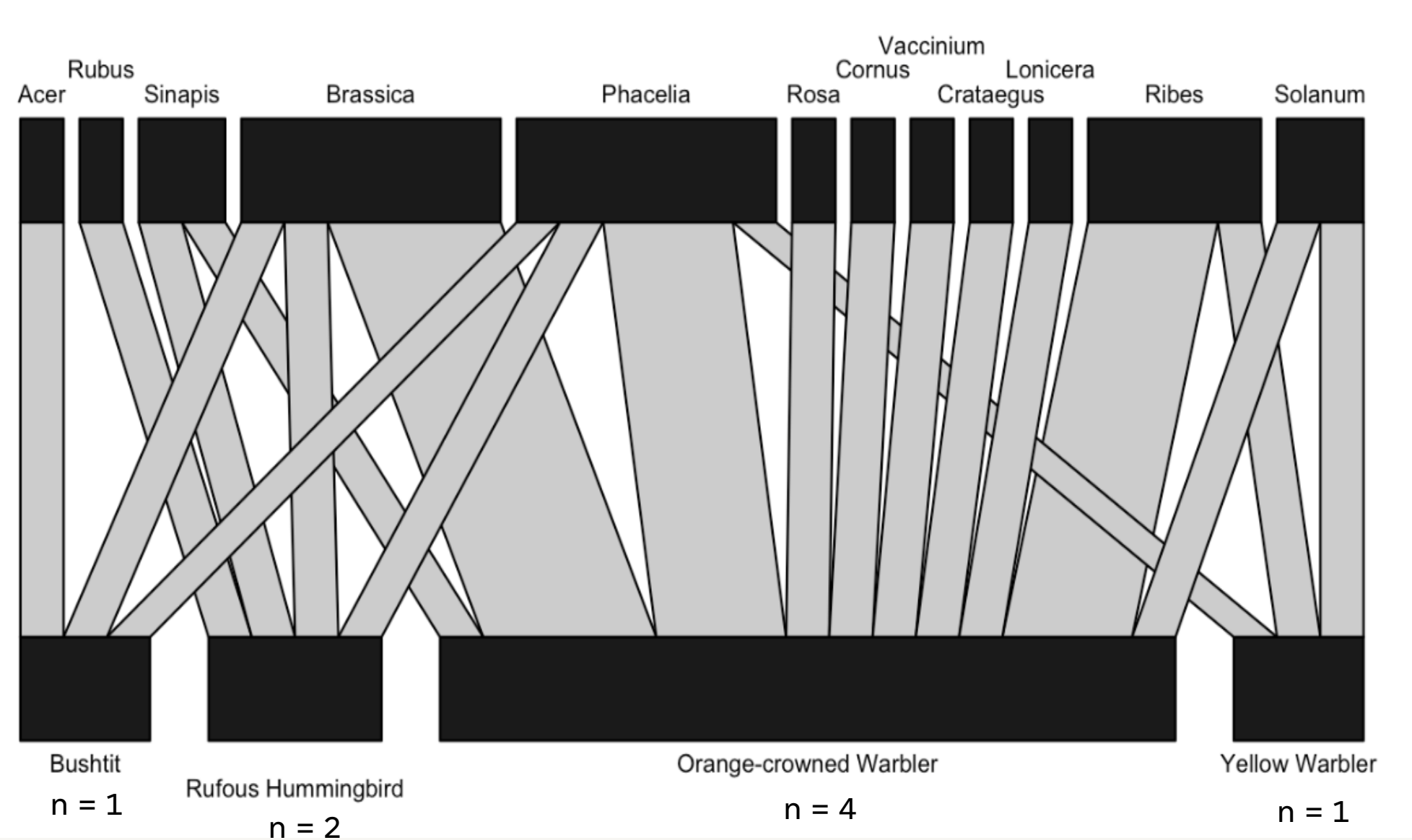
Methods: DNA Metabarcoding



Methods: Building Ecological Bipartite Networks



Methods: Building Ecological Bipartite Networks



Research Question #1: Which Songbirds Carry Animal-transported Pollen?

iNaturalist user quagsire

Study Area: Rocky Point Bird Observatory

Witty's Lagoon Banding Station (SW Witty's Lagoon Regional Park)

- Located in a disturbed **riparian corridor**
- Primary habitat: **temporarily flooded deciduous shrubland**

Power To Be (PTOB) Banding Station – Victoria, BC

- Landscape: former **cut fairways**, natural woodlands, and forests
- Primary habitat: **second-growth Douglas-fir forest**

Results: Orange-crowned Warblers at RPBO

snowbrush - *Ceanothus velutinus*

round-leaf arumroot - *Heuchera cylindrica*

oceanspray – *Holodiscus discolor*

prickly wild rose- *Rosa acicularis*
+other *Rosa* sp.

dyer's rocket – *Reseda luteola*
+other *Reseda* sp.

dwarf raspberry – *Rubus pubescens*

Results: Rufous Hummingbirds at RPBO

hairy-stem rockcress - *Boechera pauciflora*

fireweed – *Chamaenerion angustifolium*

Mahaleb cherry – *Prunus mahaleb*

limber honeysuckle – *Lonicera dioica* (+ many other honeysuckle sp.!)

western snowberry – *Symphoricarpos occidentalis*

thinleaf huckleberry– *Vaccinium membranaceum*

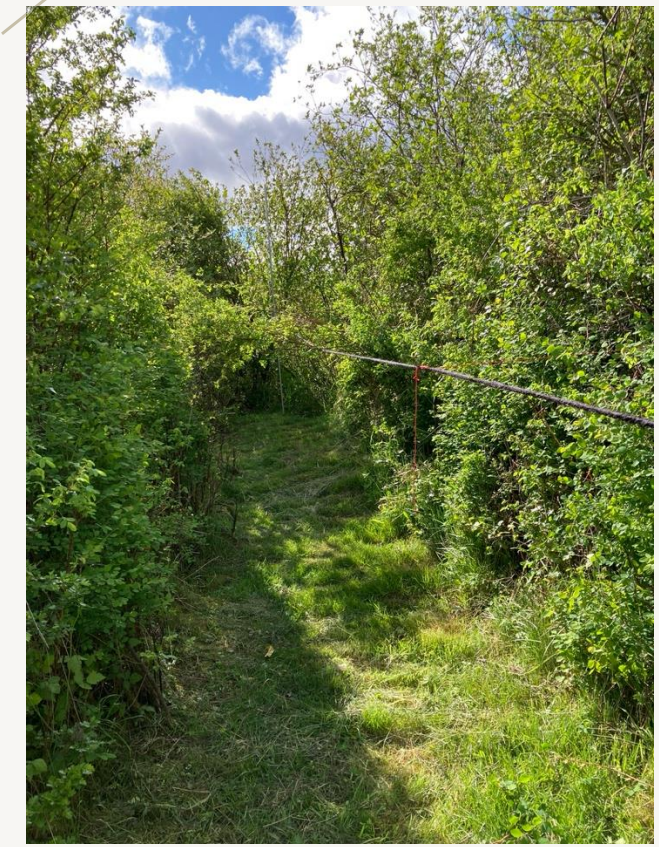
Results: Orange-crowned Warblers & Rufous Hummingbirds at RPBO

prickly wild rose- *Rosa acicularis*

dyer's rocket – *Reseda luteola*

dwarf raspberry – *Rubus pubescens*

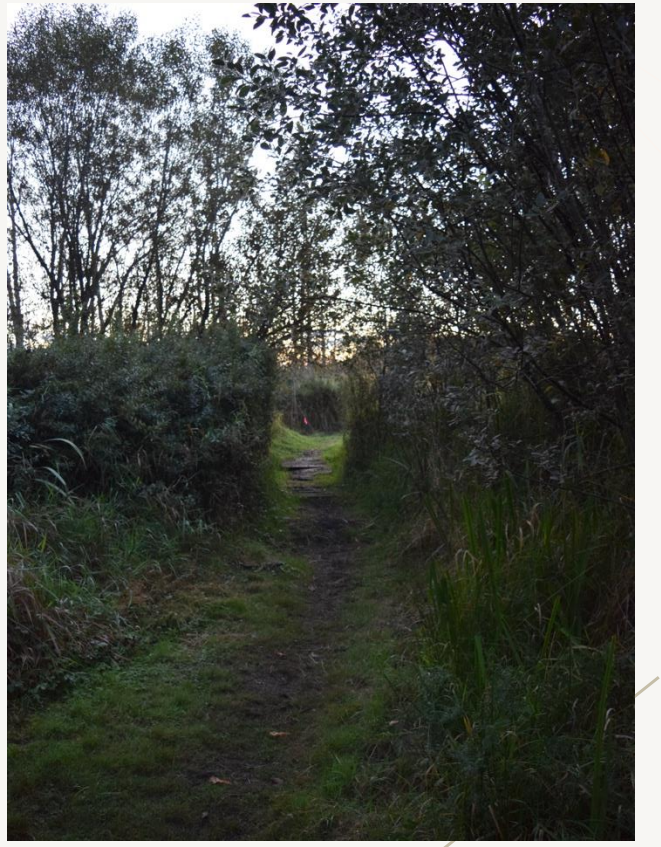
Study Area: Vancouver Island University Banding



Old-field habitat (10 nets)
- Dominated by reed canarygrass (*Phalaris arundinacea*)
- Shrub/tree patches: hardhack (*Spiraea douglasii*), willows (*Salix* spp.)

Upland forest habitat (5 nets)
- Tree species: Douglas fir, western red cedar, bigleaf maple, red alder, English oak
- Understory: thimbleberry, salmonberry, ocean spray, hardhack, Himalayan blackberry

Riparian habitat along Millstone River (5 nets)
- Vegetation: Nootka rose, hardhack, salmonberry, hawthorn, Himalayan blackberry



RESULTS: ORANGE-CROWNED WARBLERS & OTHERS AT VIU SITES

oceanspray – *Holodiscus discolor*

osoberry – *Oemleria cerasiformis*

mallow ninebark – *Physocarpus malvaceus*

Results: Yellow Warblers at VIU Sites

perfoliate honeysuckle - *Lonicera capirifolum*

hairy hedge-nettle - *Stachys pilosa*

common hawthorn - *Crataegus monogyna*

prickly wild rose - *Rosa acicularis*

dwarf raspberry – *Rubus pubescens*

cascara - *Frangula purshiana*

Results: Yellow Warblers & Others at VIU Sites

dyer's rocket – *Reseda luteola*

red-osier dogwood – *Cornus serica*

red elderberry - *Sambucus racemosa*

Alaskan paintbrush - *Castilleja unalaschcensis*

Results: Anna's Hummingbirds at VIU Sites

hairy-stem rockcress - *Boechera pauciflora*

Pacific madrone – *Arbutus menziesii*

mountain cornflower– *Centaurea montana*

field pansy – *Viola arvensis*

lilac – *Syringa vulgaris*

highbush blueberry – *Vaccinium corymbosum*

Results: Rufous Hummingbirds and Anna's Hummingbirds at VIU Sites

sticky currant - *Ribes viscosissium*
+ Other Ribes sp.

dyer's rocket – *Reseda luteola*
+other *Reseda* sp.

dwarf raspberry – *Rubus pubescens*

Results: Rufous Hummingbirds at VIU Sites

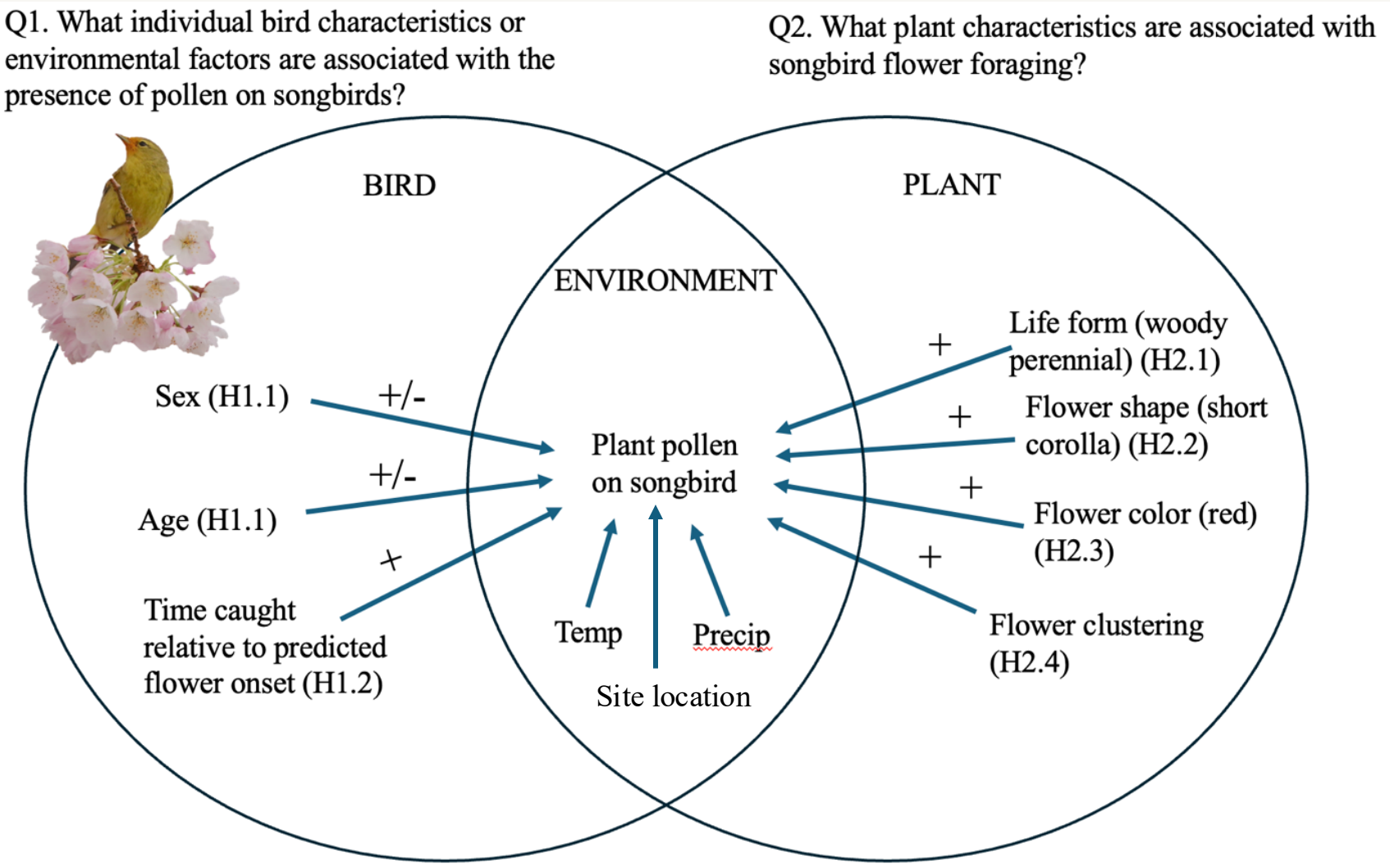
vine maple – *Acer circinatum*

Mahaleb cherry – *Prunus mahaleb*

Next Steps

Q1. What individual bird characteristics or environmental factors are associated with the presence of pollen on songbirds?

Q2. What plant characteristics are associated with songbird flower foraging?



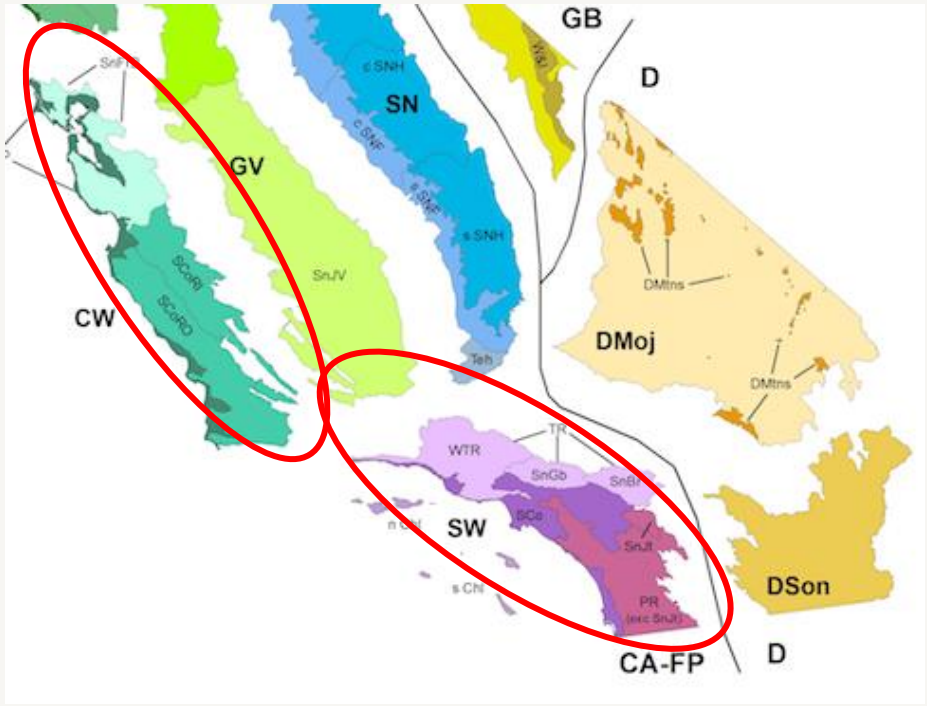
Research Question #4: Can Participatory Science (iNaturalist) be Used to Understand Flower-Songbird Interactions?

iNaturalist user linzyl

Methods: Collecting Photos From iNaturalist

SaP - CW Jepson District

SaP - SW Jepson District



floristic district	bird species	number of total observations
SW	Orange-crowned Warbler	6,918
SW	Townsend's Warbler	3,407
SW	Ruby-crowned kinglet	3,883
SW	Tennessee Warbler	141
CW	Townsend's Warbler	6,347
SW	Bullock's Oriole	2,191
SW	Verdin	1,651
SW	Baltimore Oriole	117
SW	Pygmy Nuthatch	771
SW	Lucy's Warbler	133
SW	Orchard Oriole	122

Methods: Collecting Photos From iNaturalist

SaP - CW Jepson District

SaP - SW Jepson District

iNaturalist user owenbowie

Plant Taxon Eaten

Red-flowering Gum

Add

Native or Non-native?

Non-native

Add

if non-native: (Cultivated / Naturalized / Unknown)

cultivated

Add

if native: Cultivated or Wild?

cultivated

Add

if native: Distribution

widespread

Add

Widespread|Localized Endemic|Rare

Methods: Image types

Flower Foraging

iNaturalist user mbeisen

Head NEAR flower

iNaturalist user reallifepokemonwatcher

Nectar robbing

iNaturalist user richbreisch

Methods: Image types

Pollen on face

iNaturalist user quagsire

Pollen Horn

iNaturalist user samrawlins

iNaturalist user charadrius

Results: iNaturalist Flower-foraging network (SW)

southern silky oak – *Grevillea robusta*

honeybush – *Melianthus major*

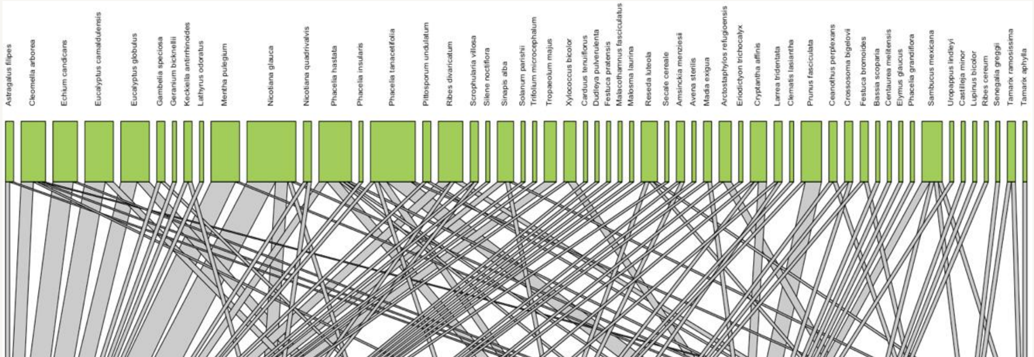
torch aloe – *Aloe arborescens*

RESULTS: So Cal Bander Samples

Images of birds courtesy of Macaulay Library

Pride of the Madeira– *Echium candicans*

Bladderpod – *Cleomella arboreda*



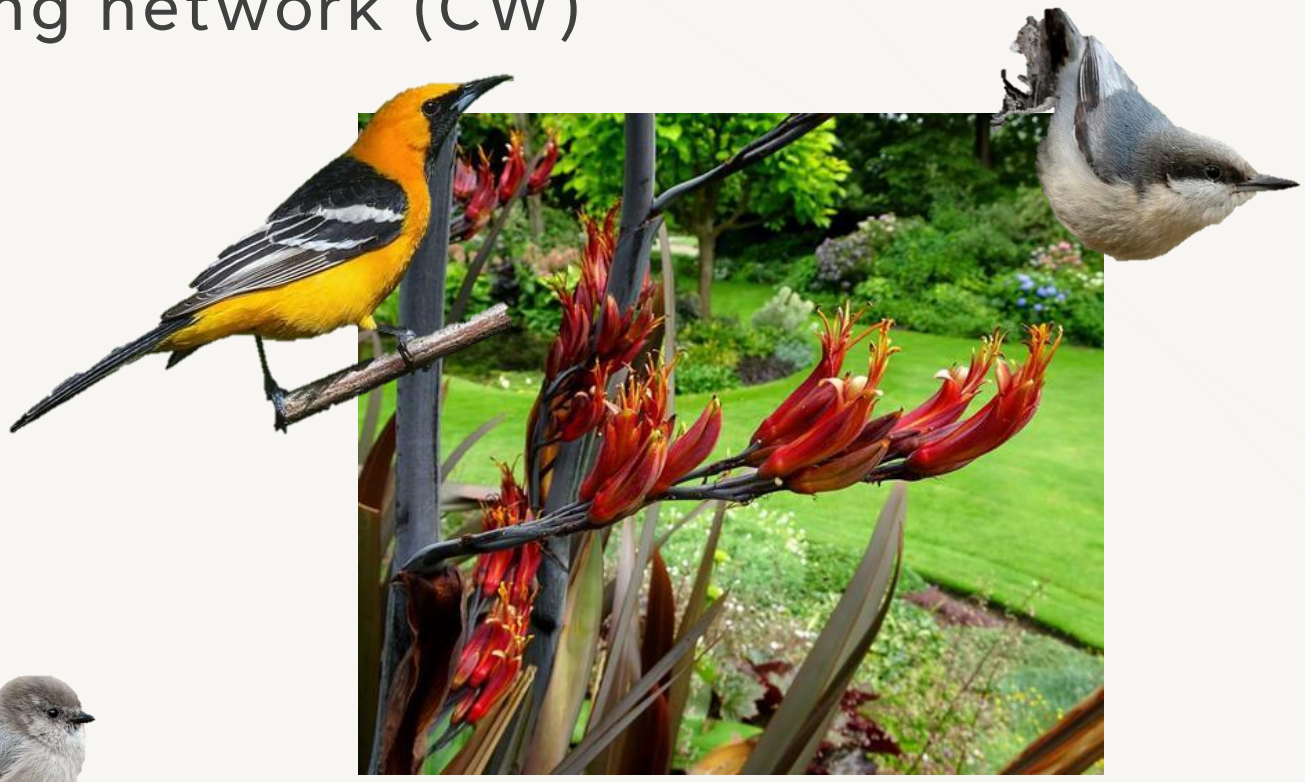
The Intersection Between Photos and Pollen Samples

Pride of Madeira– *Echium candicans*

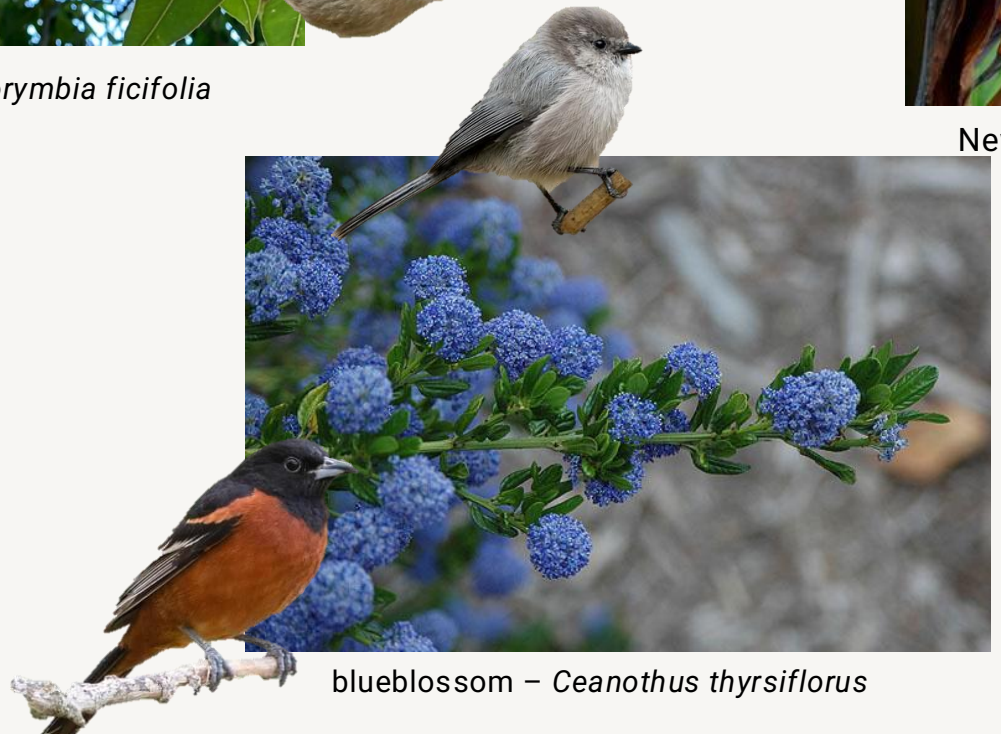
Bladderpod – *Cleomella arboreda*

Results: iNaturalist Flower-foraging network (CW)

red flowering gum – *Corymbia ficifolia*



New Zealand Flax – *Phormium tenax*



blueblossom – *Ceanothus thyrsiflorus*

Results: The Importance of Photographs Uploaded from the Community

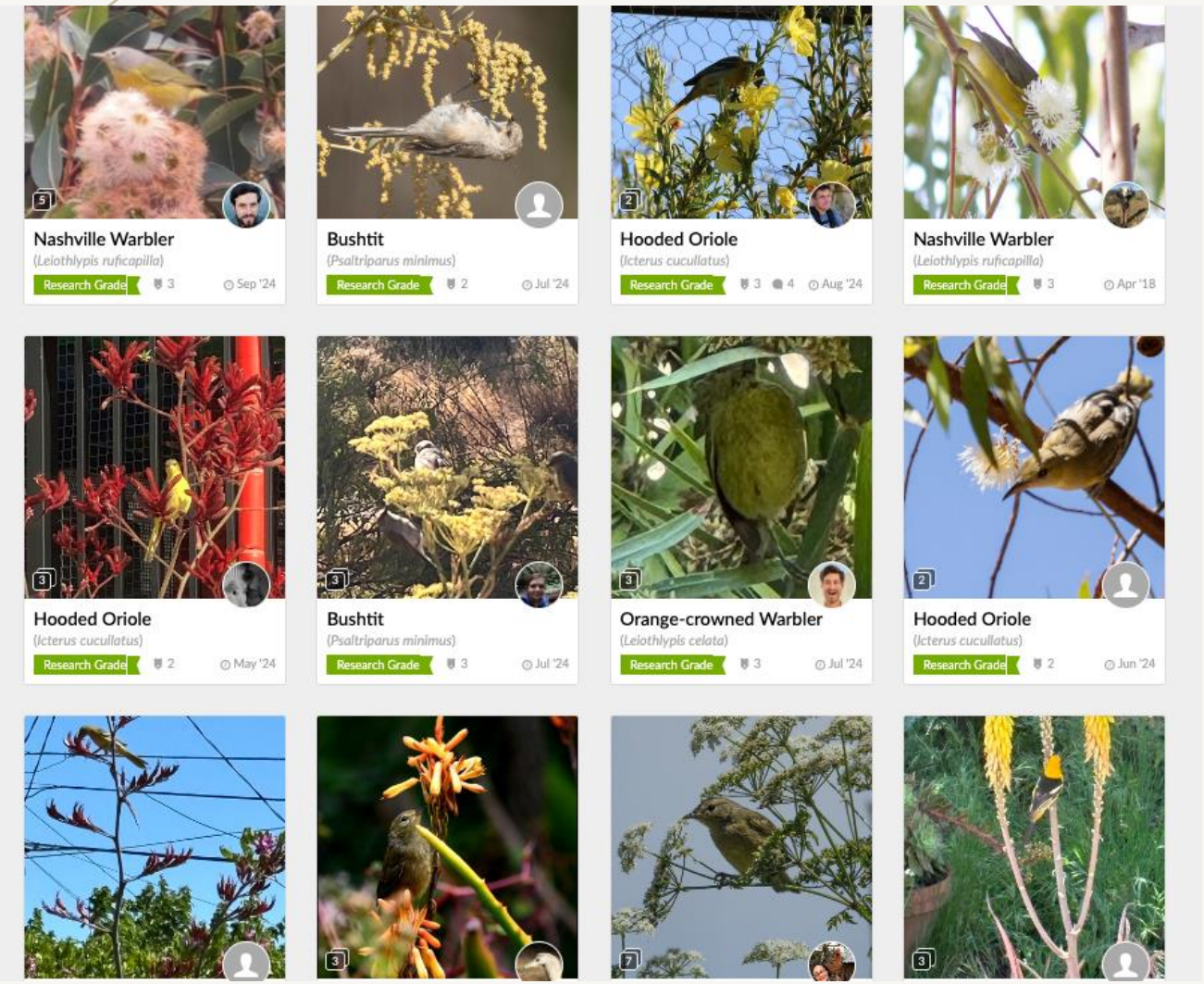


Photo captured by Carla Springinotic

SaP - British Columbia

Add Observations to This Project

Stats

Totals

27 Observations »

6 Species »

25 People »

Most Observations

rory62	2 observations
angusbc	2 observations
nickykay	1 observation
kkuzmawells	1 observation
seanvanderluit	1 observation

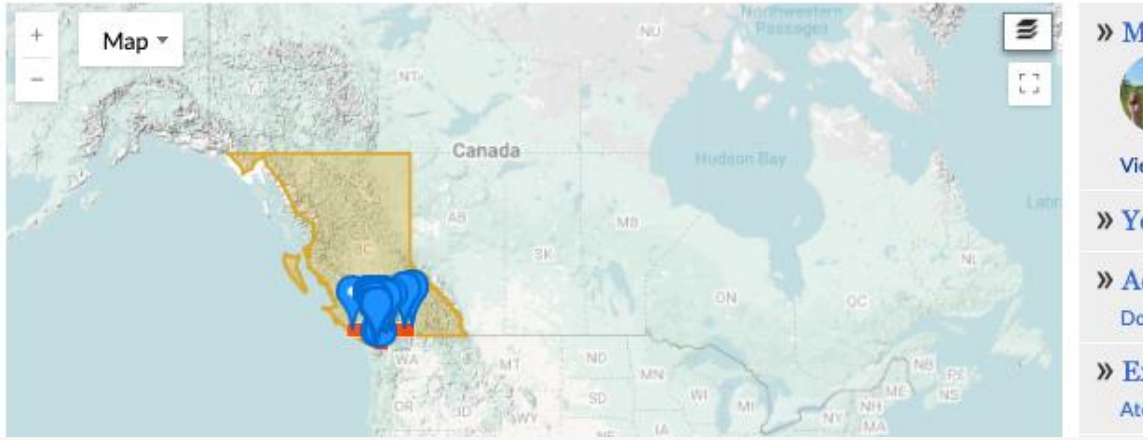
Most Species

angusbc	2 species
rory62	2 species
cgbc	1 species
woodswoman	1 species
nilasivatheesan	1 species

Recent observations

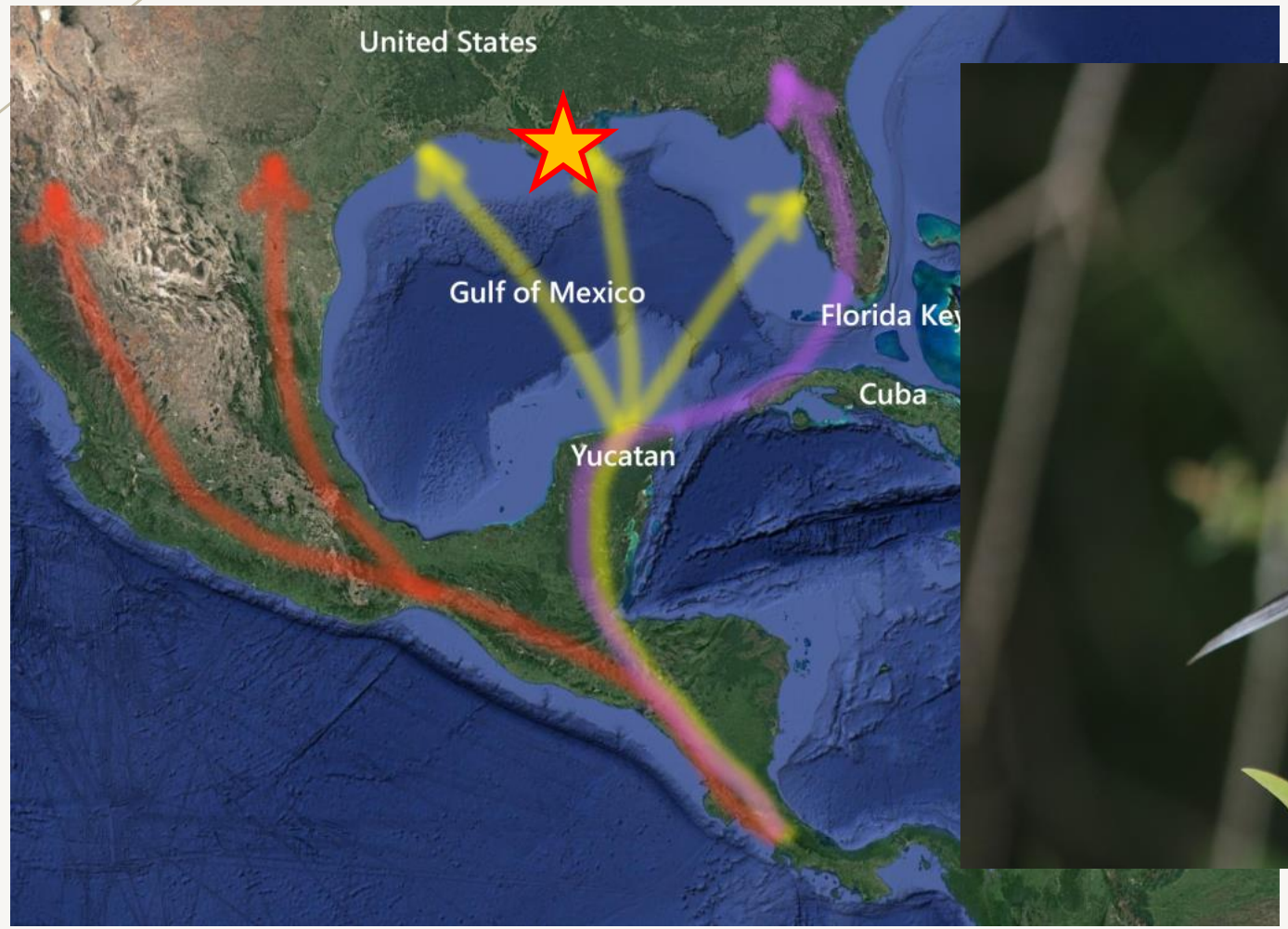
View All »

Grid List



www.inaturalist.org/projects/sap-british-columbia

Side project: Alabama Samples



Key Takeaways

Songbirds may visit many flowering plants across Vancouver Island, possibly pollinating them

Different species of birds had pollens of the same plant on them: redundancy

Photographs and observations by the public can help to confirm pollen records

These results can be important to show what plants could be useful for songbird and hummingbird conservation

What's Next?

In the next year we will...

- Run an additional 1400 samples
- Explore what avian or site characteristics are associated with animal mediated pollens
- Compare songbird floral visitation to hummingbird visitation

Future directions:

- Demonstrate pollination by songbirds
- Ground-truthing pollen observations
- Understanding floral attractants (nectar? insects?)
- Explore the value of flowers for songbirds

Nectar: an energy drink used by European songbirds during spring migration

Jacopo G. Cecere · Fernando Spina · Susanne Jenni-Eiermann · Luigi Boitani

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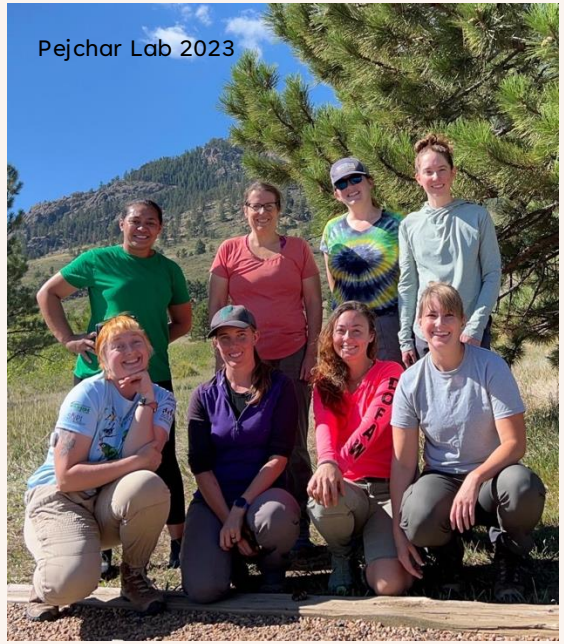

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Banding Groups:
Rocky Point Bird Observatory
Vancouver Island University Banding
St. Cloud Banding Station
Luckiamute Banding Station
H.J. Andrews Experimental Forest (Maddie Sutton)
Yosemite Banding Group
Lake Tahoe Banding Group
Point Blue Bird Observatory
San Francisco Bay Bird Observatory
So Cal Bird Banders
Patagonia, Arizona (Randy Moore)
Banding Coalition of the Americas

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The Garden Club of America & Pollinator Partnership
The American Philosophical Society
American Ornithological Society

QUESTIONS?

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(I am looking for post-PhD opportunities!)

www.inaturalist.org/projects/sap-british-columbia

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