USA npn National Phenology Network

Making the most of volunteer-contributed observations

Theresa Crimmins

USA National Phenology Network

ARIZONA

USGS science for a changing world

U.S. FISH & WILDLIFE SERVICE

NATIONAL WILDLIFE REFUGE SYSTEM

NSF

NASA

USDA

USA National Phenology Network

- Collect • Store • Share
  Phenology data and information

- Advance Science
- Inform Decisions
- Communicate & Connect
- Grow an Equitable and Inclusive Network

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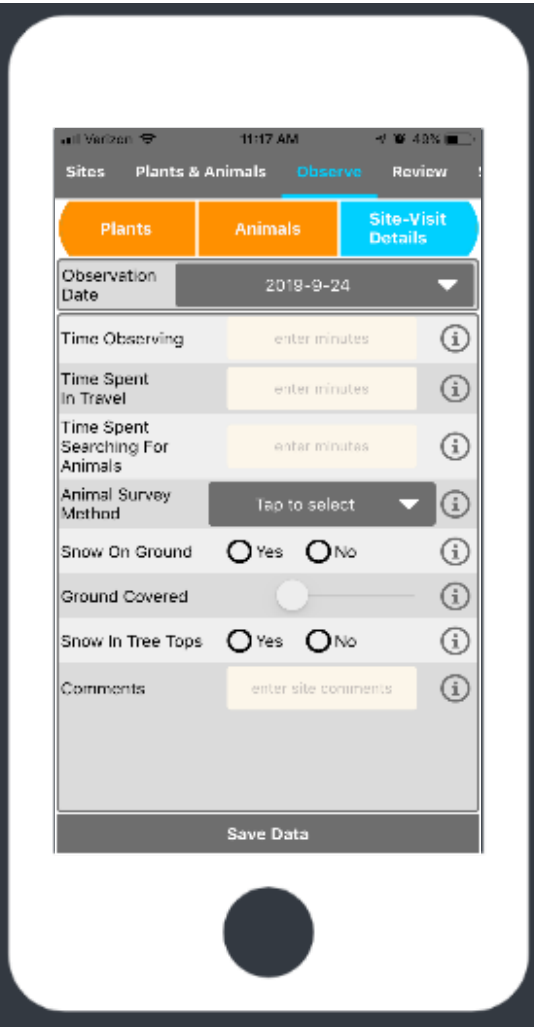
Volunteer phenology observing platform

- 1,600 species of plants and animals
- Standardized **status & intensity** observation protocols (Denny et al. 2014)

nature's notebook



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Observation Date: 2022-4-6

Desert willow

Young leaves	Y	101 to 1,000
Leaves	Y	75-94%
Colored leaves	N	
Falling leaves	N	
Flowers or flower buds	Y	1,001 to 10,000
Open flowers	Y	5-24%

Save Data | Next Plant

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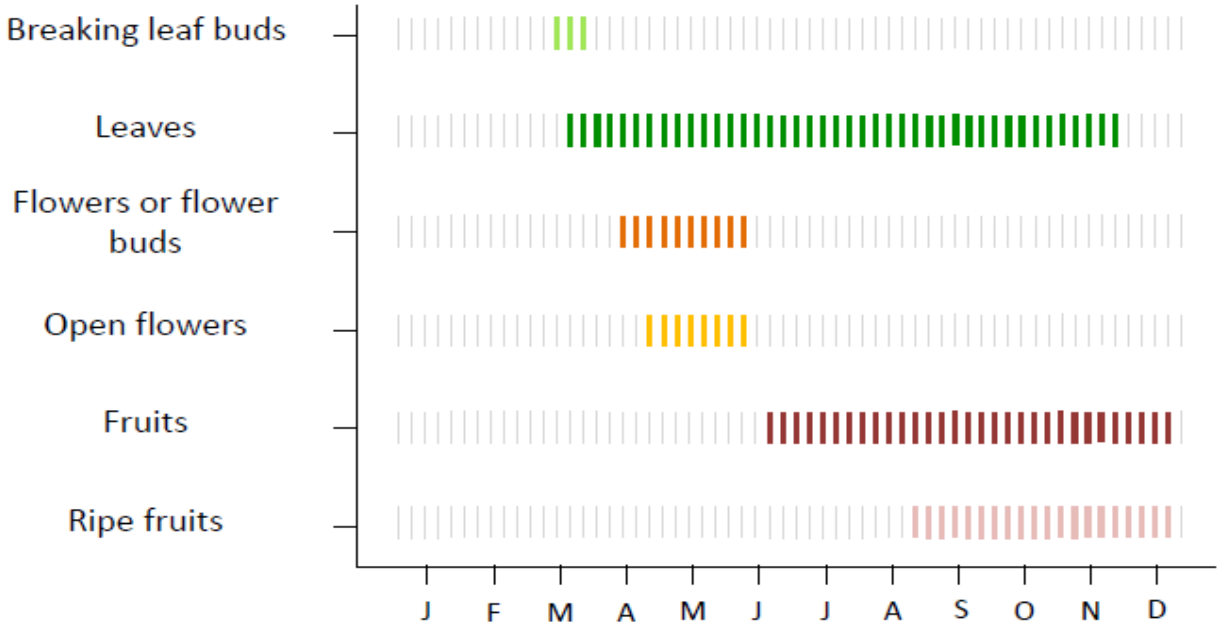
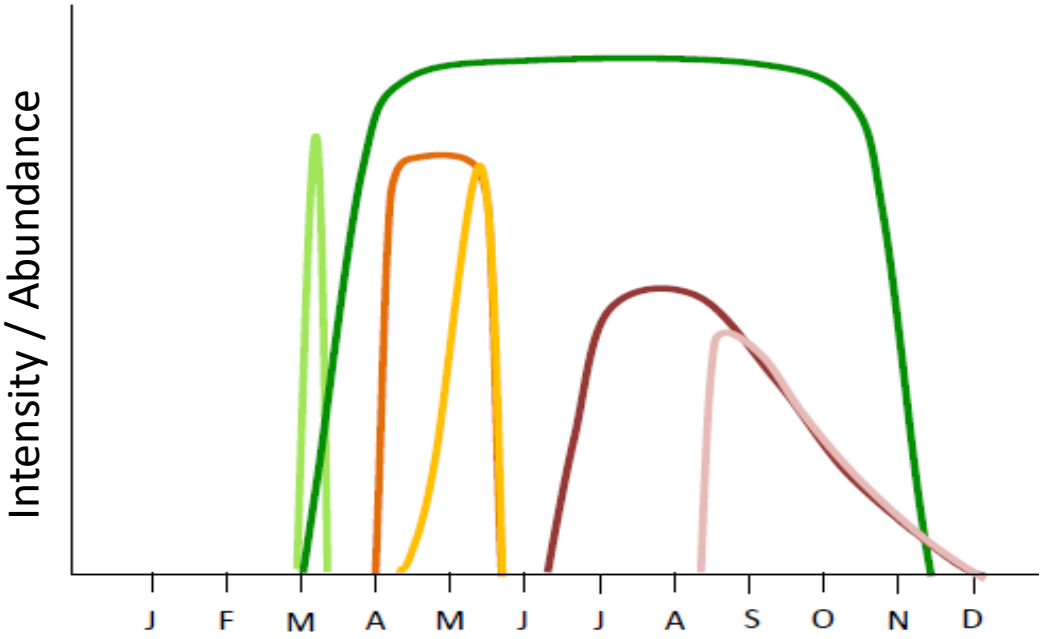
Status & intensity protocols





nature's notebook

Enhancing data collection strategies

Data collection campaigns

Green Wave

Flowers for Bats

Nectar Connectors

Pest Patrol

Quercus Quest

Mayfly Watch

The Redbud Phenology Project

Pesky Plant Trackers

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Local Phenology Programs

nature's notebook

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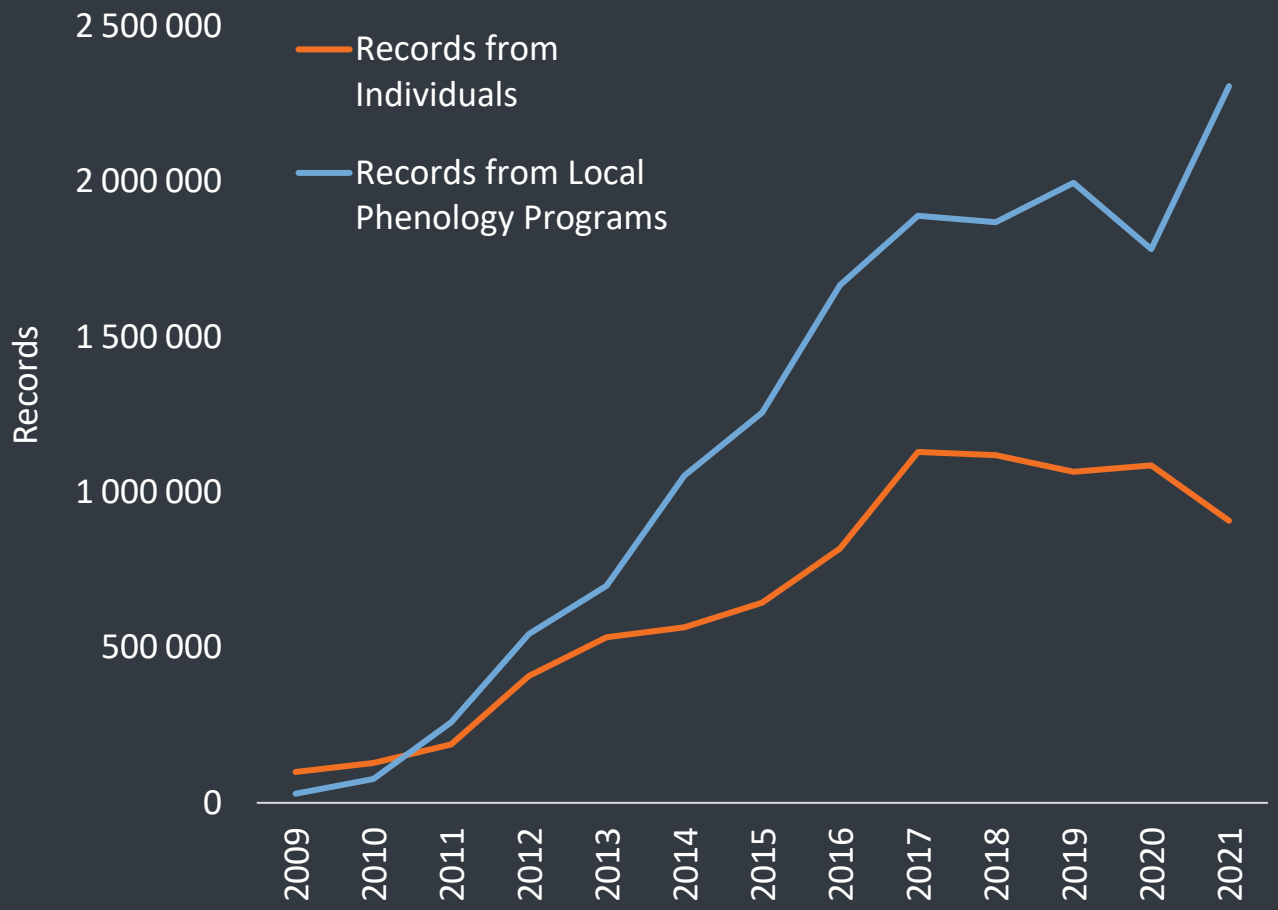
Local Phenology Programs



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Guide to Your First Visit & How to Observe in the Field with *Nature's Notebook*

Choosing a Site

A **site** is the area within which you will look for your chosen animal species, and which encompasses any plants you choose to observe. When you select a site, such as your yard or a nearby natural area, consider these guidelines:

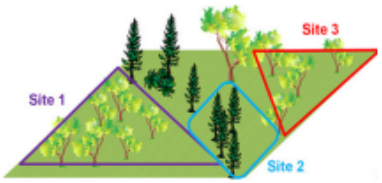
Convenience: You will be visiting your site(s) regularly, so it should be conve accessible.

Representative Location: As much as is practical, the selected site(s) should be repre environmental conditions for your area.

We welcome all observations, even if your site is unusual for your area, but we encourage peo that are representative of the local environment when possible. For example, if possible, we re select a site in a relatively flat or gently sloping area. We also recommend that you avoid areas drifting snow or funneled or channeled winds. The site should ideally be neither excessively d area. In forested areas, the site should be generally similar to the surrounding forest, reflecting composition and stature. If you are observing wild plants, we suggest you avoid locations watered or fertilized. If your site is unusual for your area, just record the unusual characteristic section of the *Nature's Notebook* Add a New Site page when you register your site.

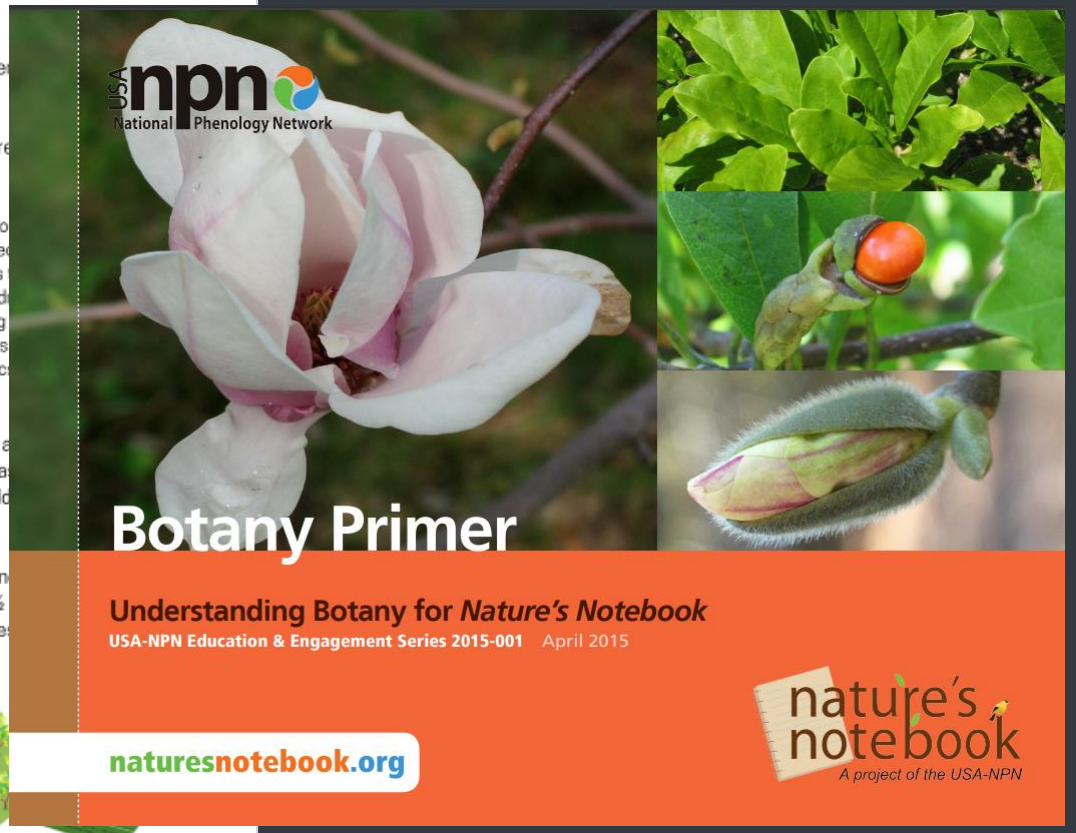
Uniform Habitat: The conditions of your selected site(s) should be relatively uniform a you would like to observe two adjacent but distinct habitats, please document them a For example, a wetland adjacent to or surrounded by a drier grassland or forest should as a separate site from the grassland or forest.

Appropriate Size: A site should be no larger than 15 acres (6 hectares or 250 x 250 m of a pixel from a land surface satellite image), a square with sides the length of 2 ½ site can certainly be smaller than this, and larger areas can be divided into multiple site



In this example, the area has been divided into three sites: Site 1 is deciduous forest, Site 2 is conifer forest, and Site 3 is deciduous forest.

In this example, the site is slightly larger than the length of one football field, so it is well within the recommended 15-acre size limit.



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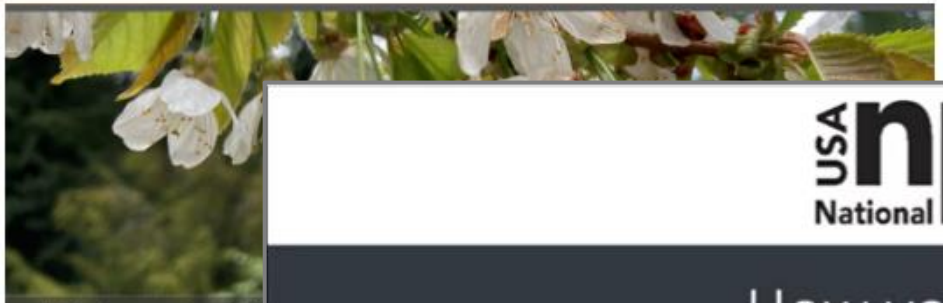

Nature's N

Hi Theresa,

Summer is fast approachi
your sites as spring wane
June 20-26. In celebratior
resources so that you can
health and well-being of

If you are looking for polli
wonderful ideas and reso

If you are not yet docume
to get started! There are
your site under "Add or E

The work that you do to
documents phenological
the species you are obser

Sincerely,

Samantha

Special Feature: Creating Pollinator Habitats

Bee hotels help nesting pollinators

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How your data were used in 2021

nature's notebook
A project of the USA-NPN

Theresa Crimmins
@TheresaCrimmins

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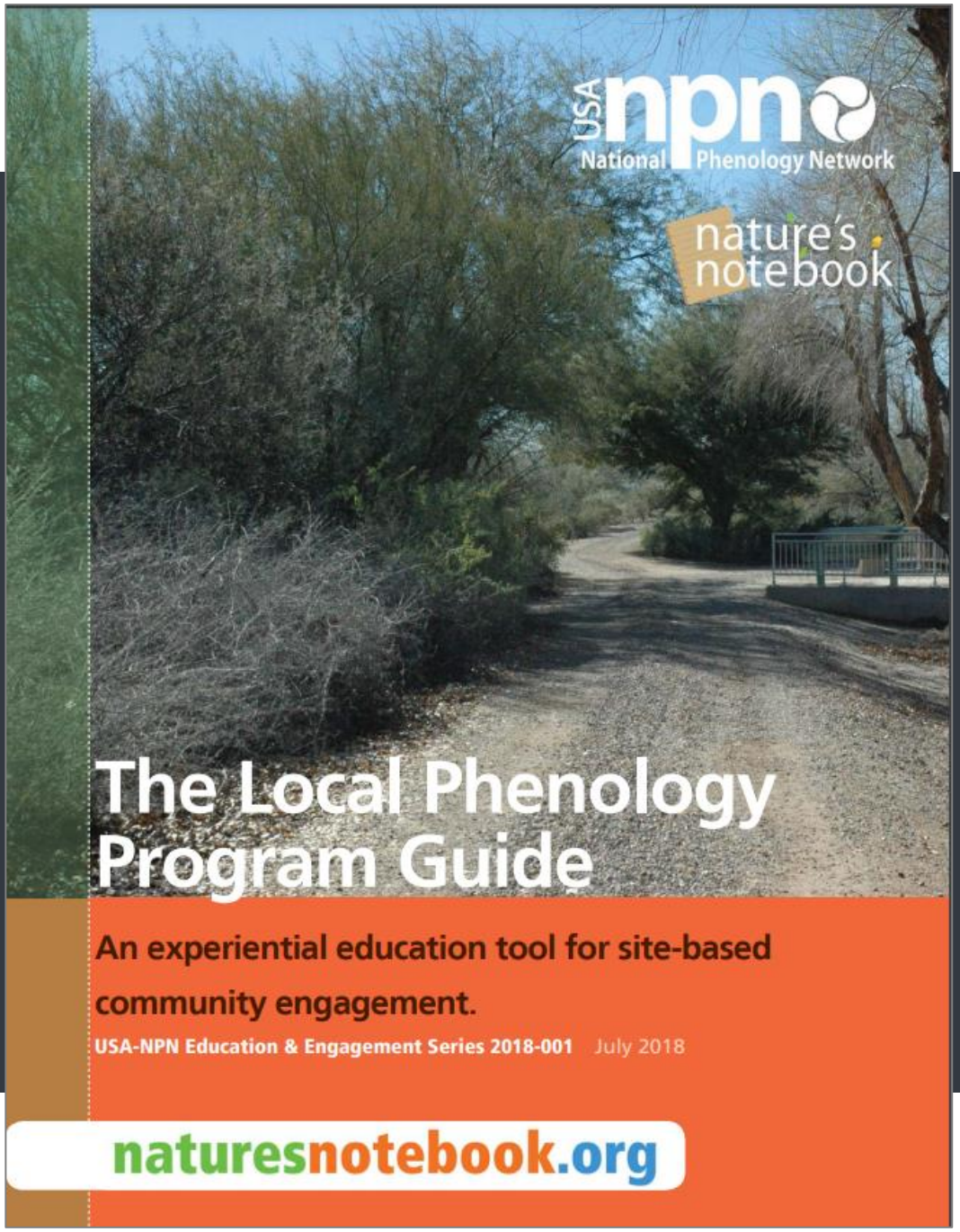

Community of Practice
Monthly calls

Online forum

Phenochampion Award

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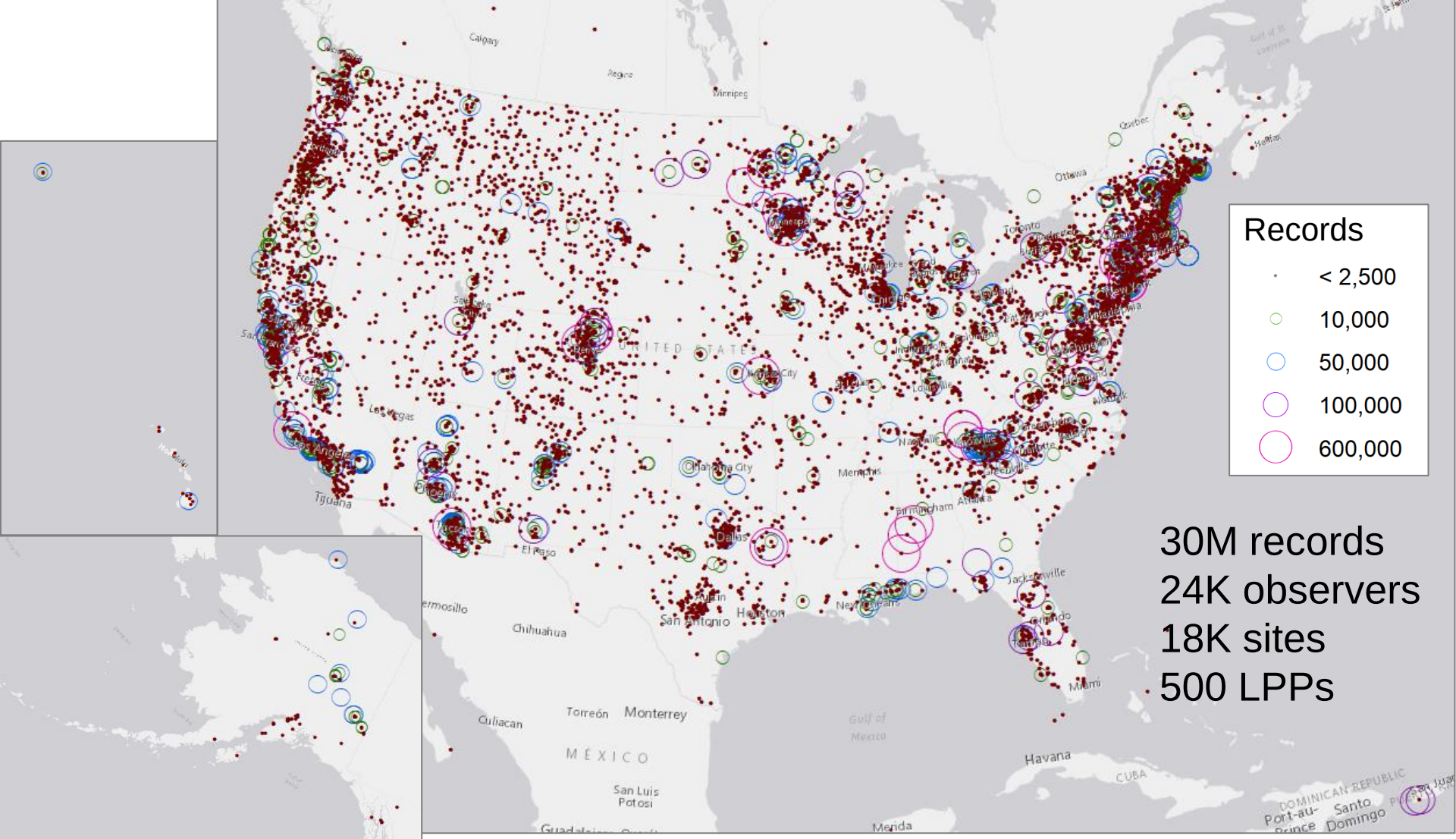
Records
< 2,500
10,000
50,000
100,000
600,000
30M records
24K observers
18K sites
500 LPPs
Updated 1-21-21
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neon
National Ecological Observatory Network
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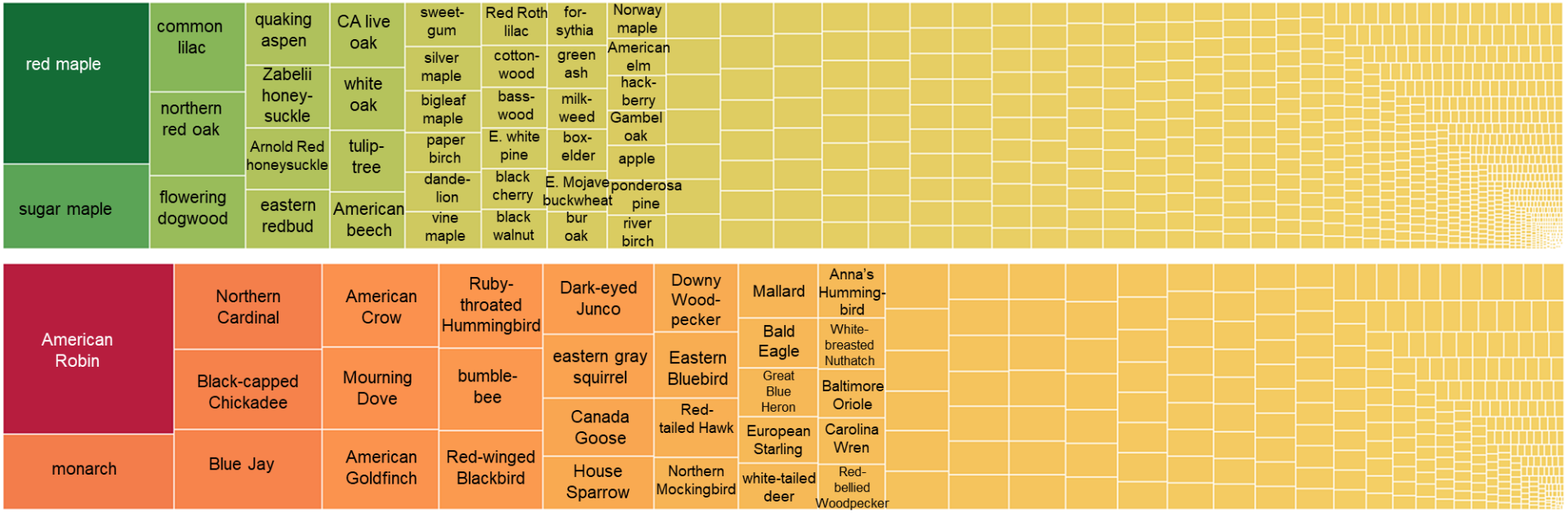
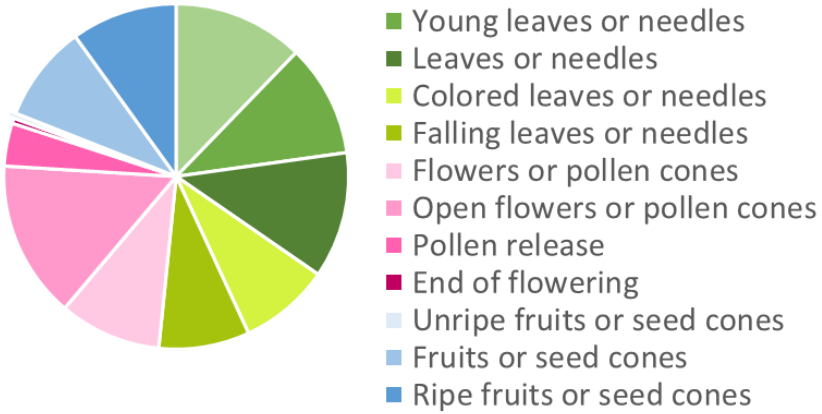
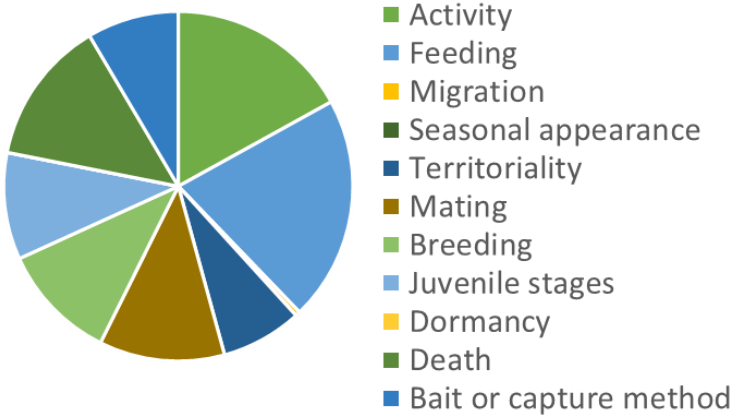
What is the “shape” of the data?







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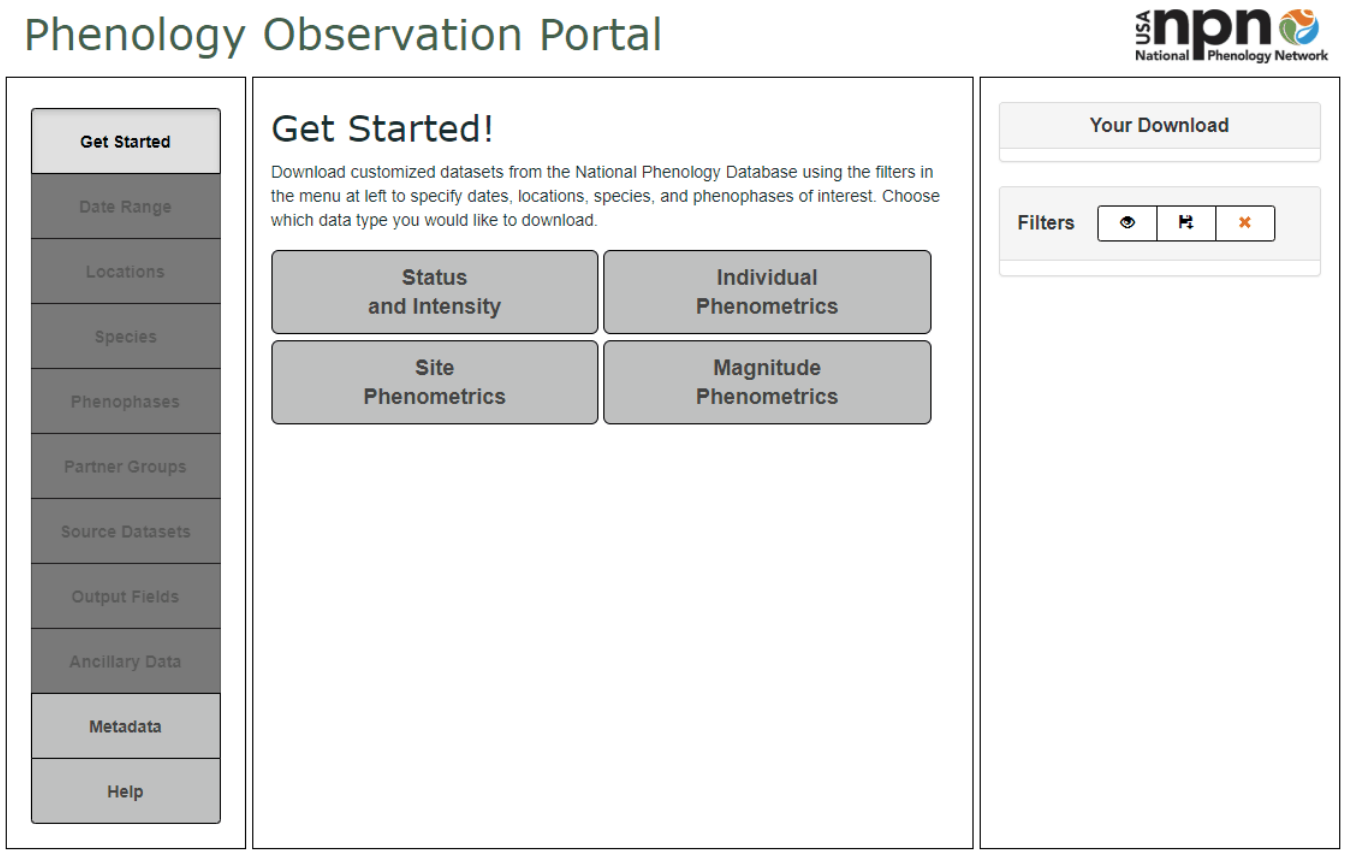
Easy data access



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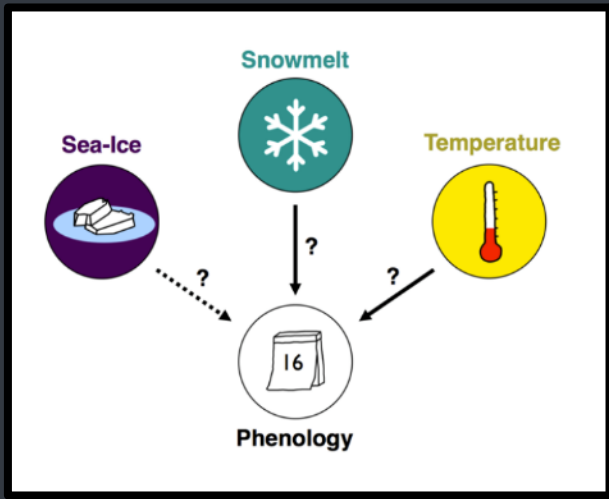
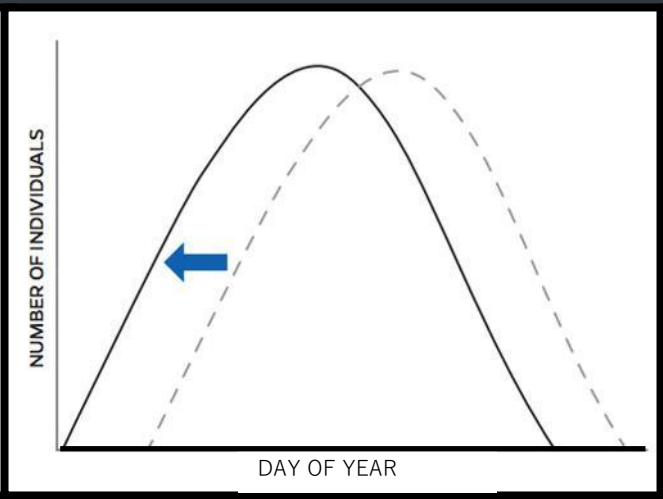
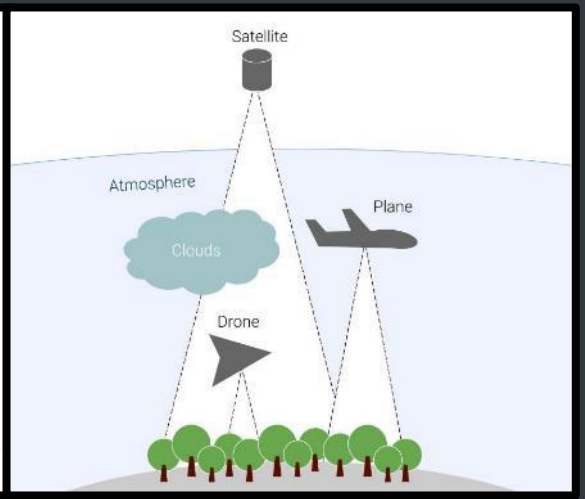
Scientific uses of USA-NPN data & products

>120 peer-reviewed publications



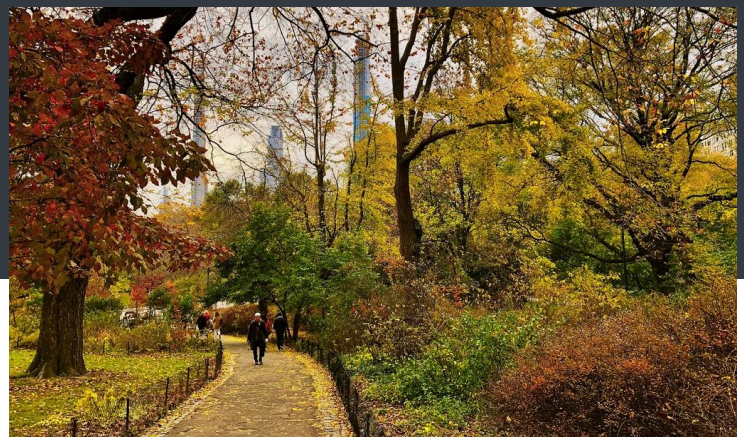


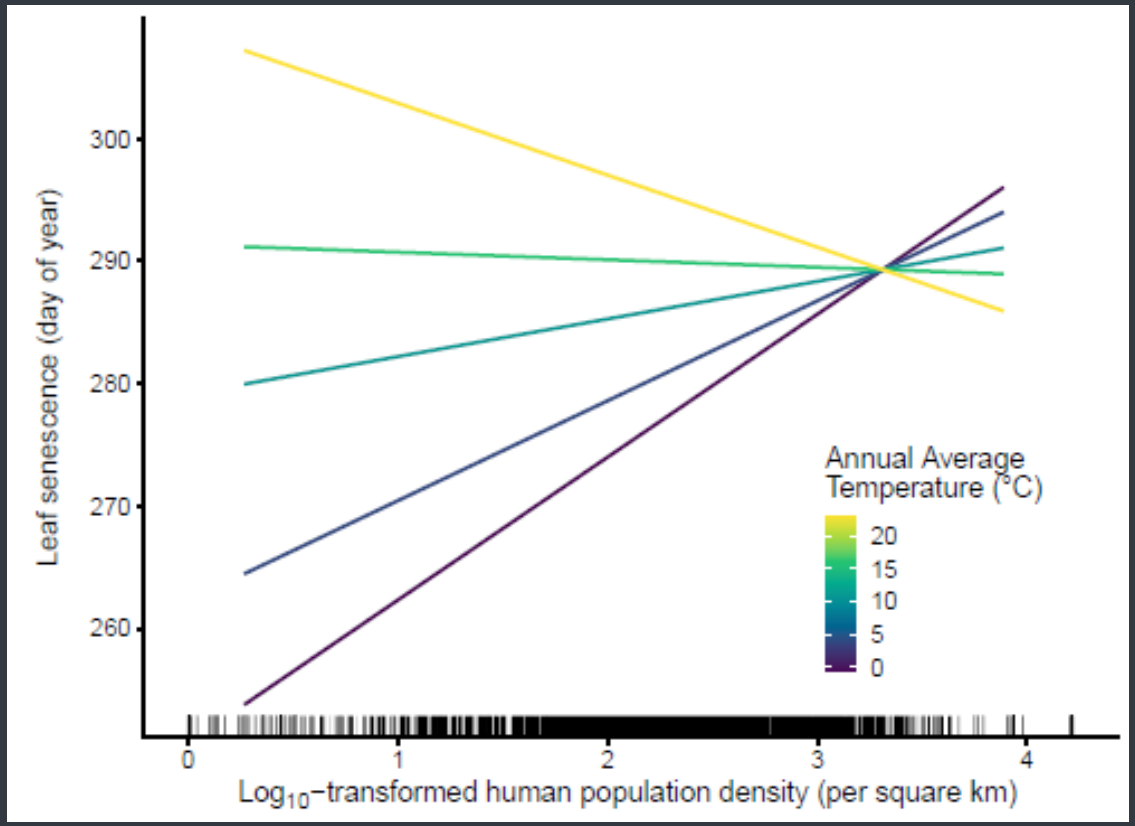


www.usanpn.org/publications

How does urbanization affect fall phenology?

2009-2018, leaf senescence
>196,000 observations





Li et al. 2021, *Global Ecology and Biogeography*

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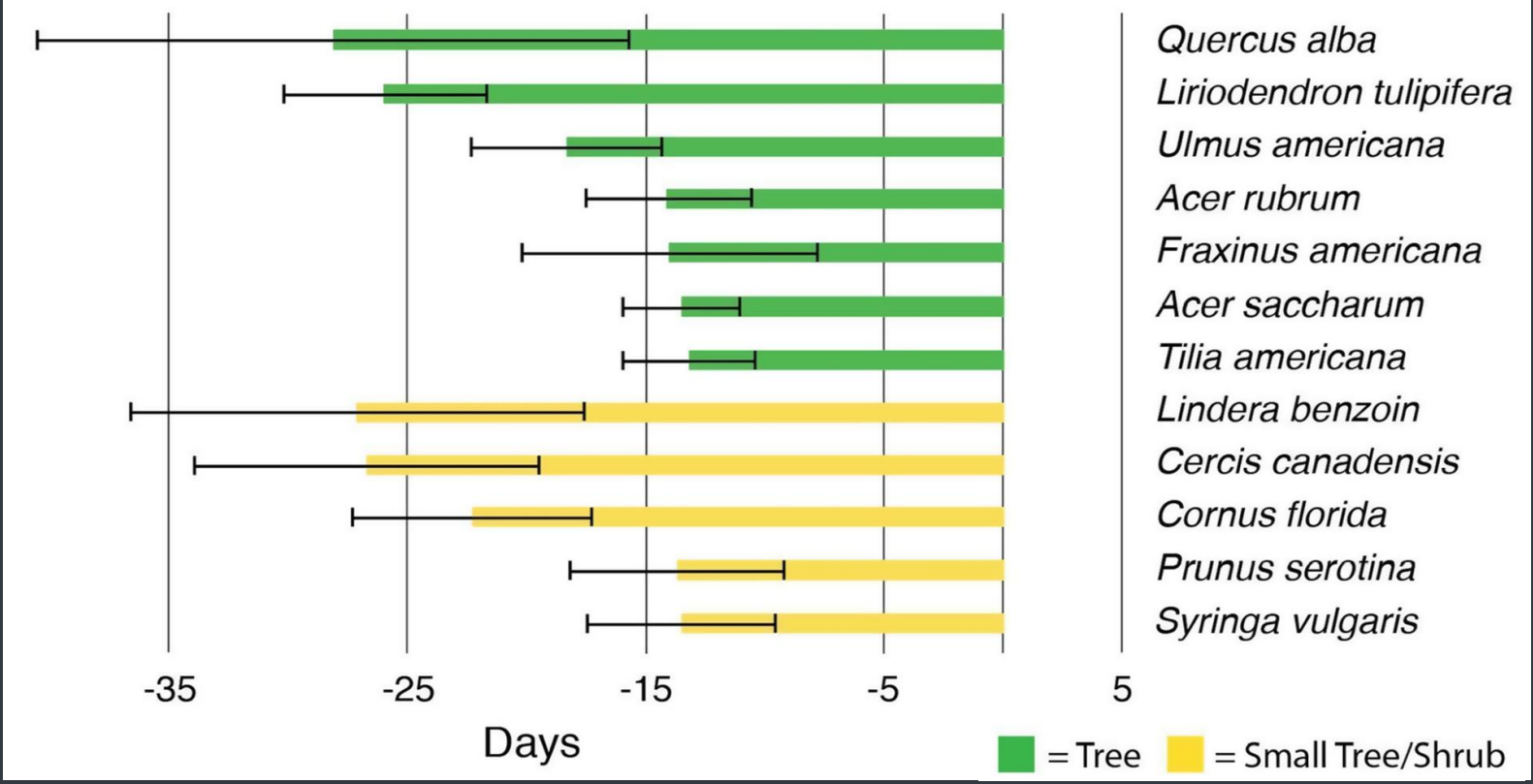
Clear advancement in leaf-out and flowering

Change in mean date of first leaf



Fuccillo Battle et al. 2022, *Journal of Ecology*

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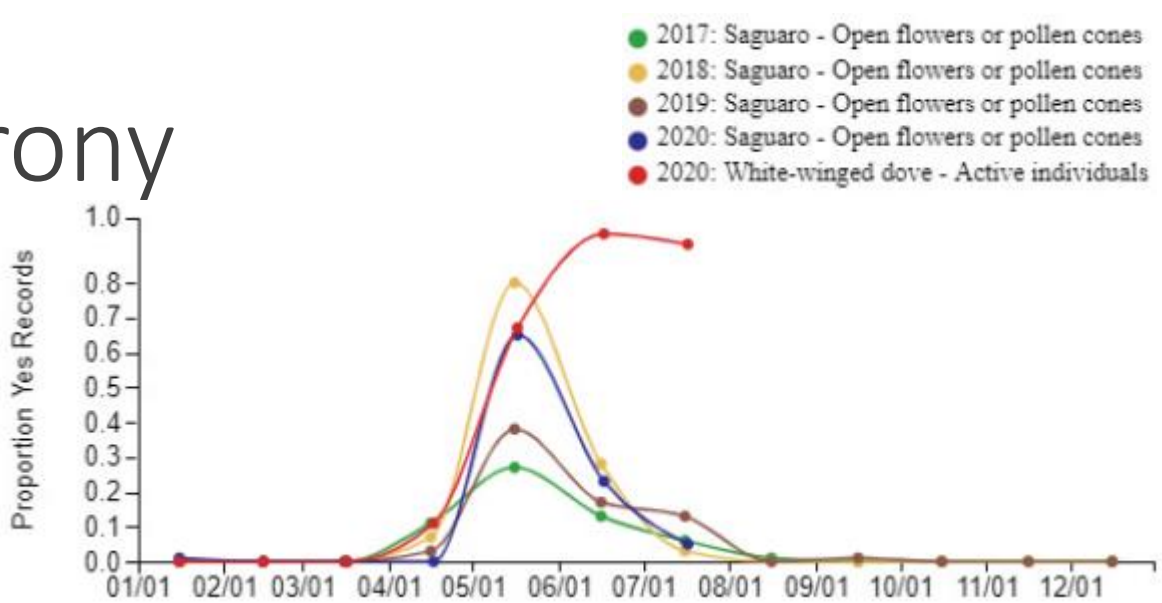
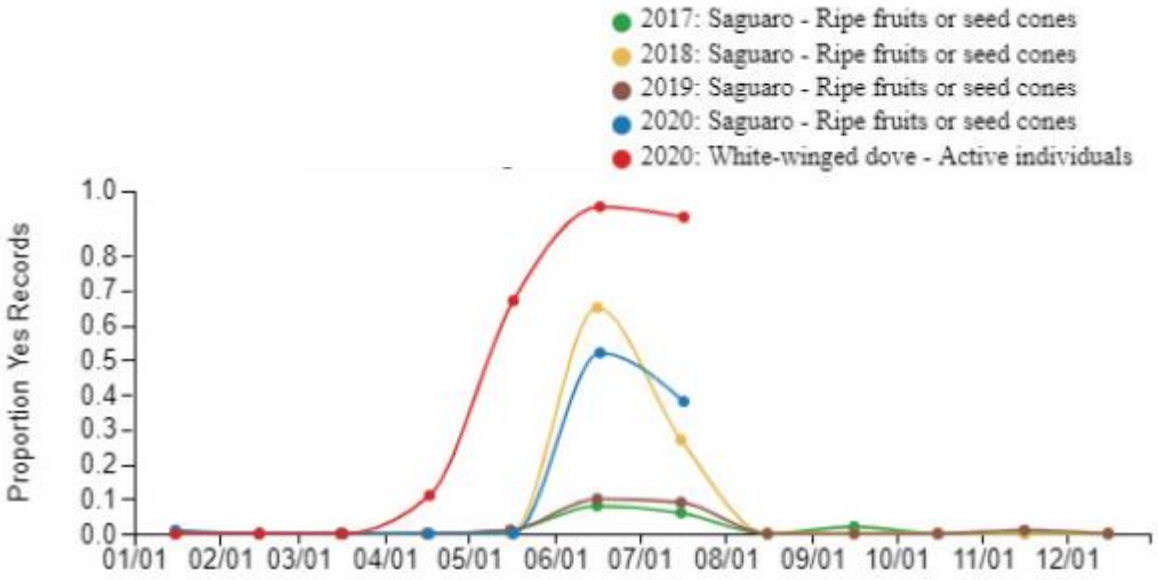
Quickly assessing wildfire risk using phenological status

Emery et al. 2020 *Ecological Indicators*

Tracking synchrony





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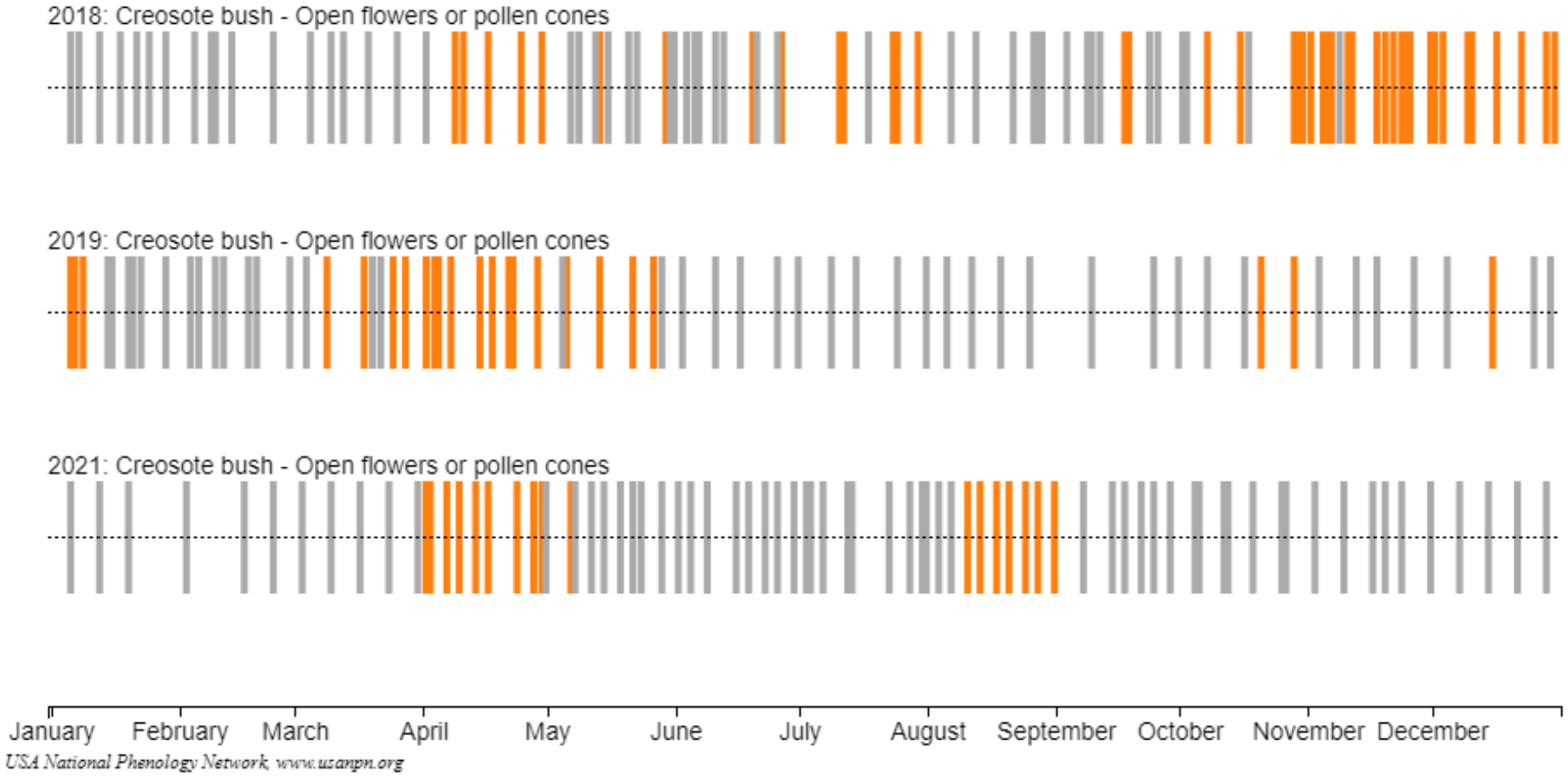
Potential weak points in data use



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Our priority activities

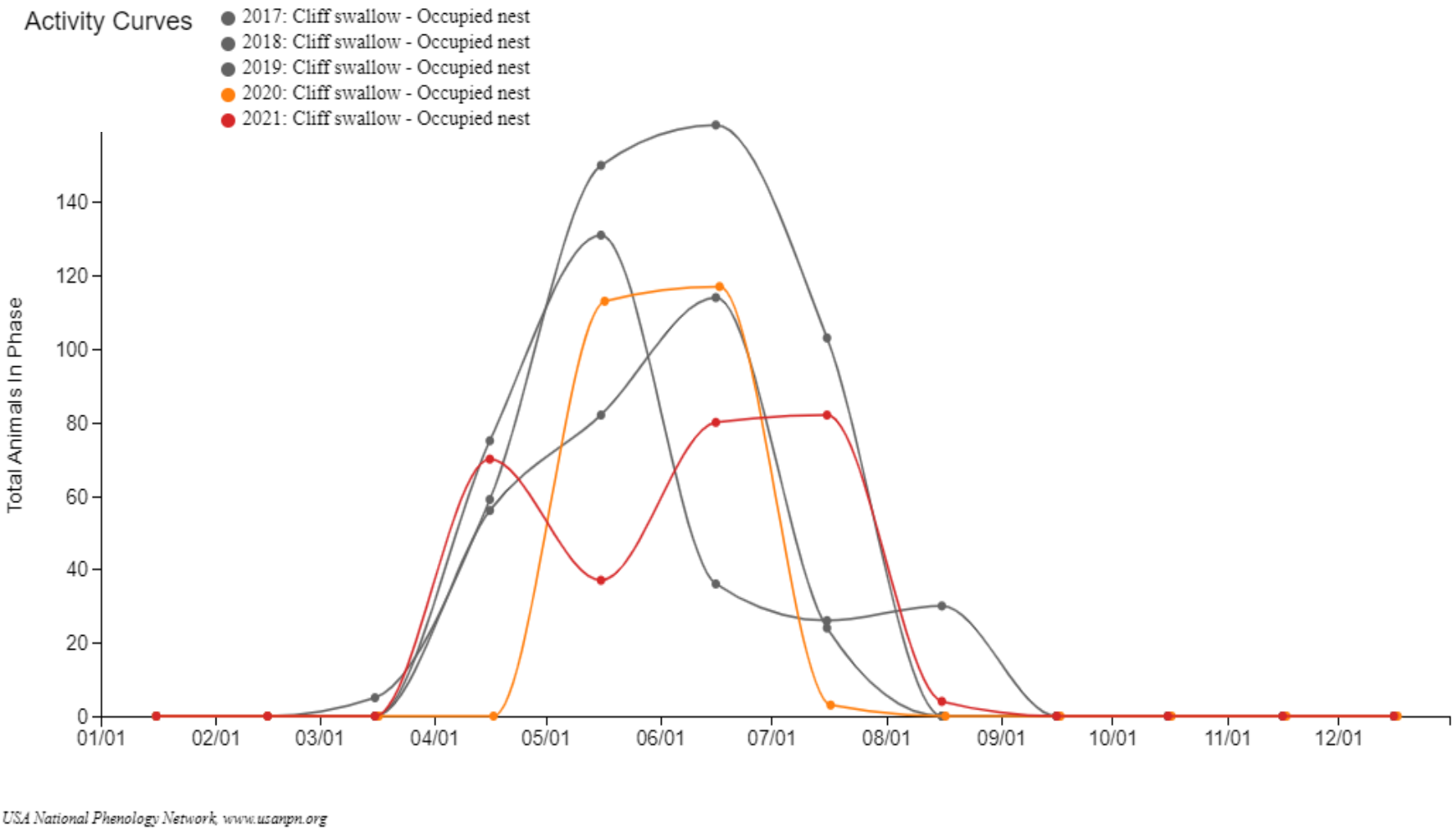
1. Increasing documentation and support for data users
2. Evaluating data suitability internally
3. Enhancing resources for data collectors

Improving data user experience

Flagging or removing suspect data

Promoting “research grade” data

Improving data user experience



Improving data user experience

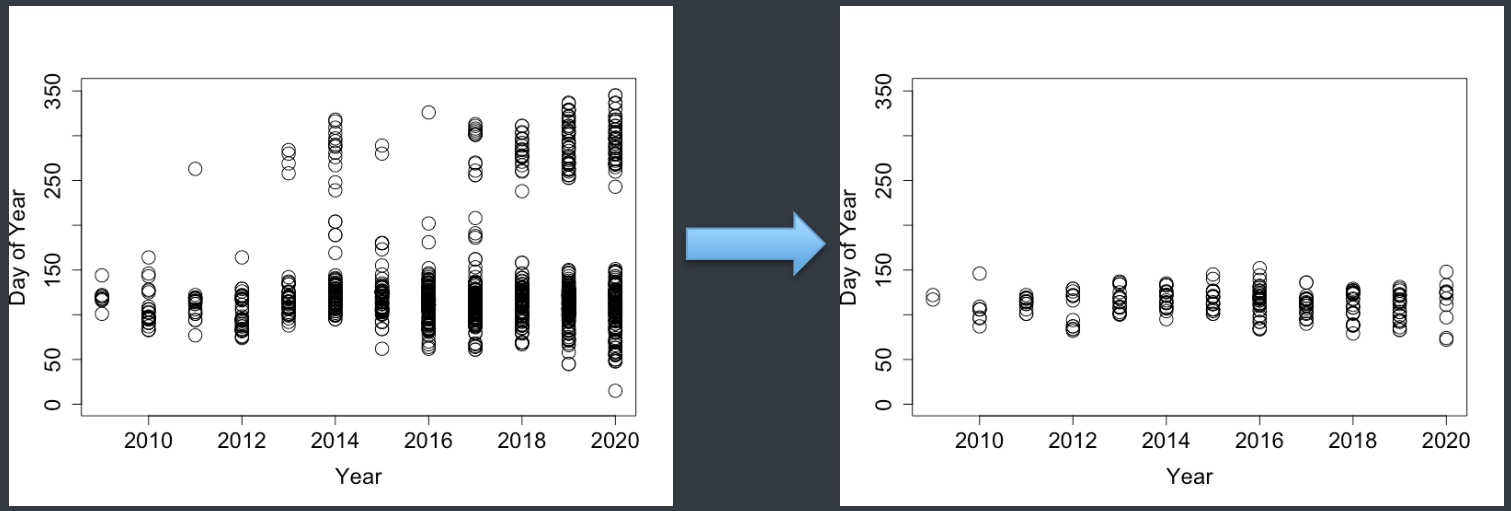
Site_Visit	Travel_Tir	Total_Obs	Animal_S	Num_Obs	Animal_S	Snow_on_	Percent_S	Snow_in_	Site_Visit_Comments
603158	20 minute	132 minut	132 minutes		Area Sear	0		0	
603252	90 minute	135 minut	135 minutes		Area search				
603391	30 minute	2.45 minu	1.56 minutes		Walking				It was overcast and misty. They were working on the bridge road where we observe the swallows.
603902									
604062	20 minute	136 minut	136 minutes		Area Sear	0		0	
604559	25 minute	134 minut	134 minutes		Area search				
605347	25 minute	133 minut	133 minutes			0		0	Peregrine Falcon flyover during survey .
605349	95 minute	133 minut	133 minutes		Area Sear	0		0	Coopers Hawk present in meadow during survey .
605851									
606395	30 minute	2.45 minutes							It was overcast and started to clear as we observed. There were works spraying in Pond "D" and disturbed nesting Killdeer
606589	30 minute	132 minut	132 minutes		Area Sear	0		0	
607337									
607561	131 minut	131 minut	20 minutes		Area Sear	0		0	Coopers Hawk flew over Pond E while there. Also, construction at Campus Bridge definitely had effects on the activities there. Lots of Brown-
608005	25 minute	130 minut	130 minutes		Area search				Warm, clear, breezy morning.
608495	20 minute	132 minut	132 minutes		Area Sear	0		0	
610243	30 minute	2.1 hours							Clear day and they were working on pond 1 removing some vegetation.
610371	30 minute	240 minutes							
610552	90 minute	135 minut	135 minutes		Area search				
611057	25 minute	135 minut	135 minutes		Area search				Mild, overcast morning. Several ponds were very low on water. Path to rear meadow from the Learning Center was taped off to the public.
611322	45 minute	132 minut	132 minutes		Area Sear	0		0	
611323	20 minute	133 minut	133 minutes		Area Sear	0		0	
611324	20 minute	132 minut	132 minutes		Area Sear	0		0	
611676	60 minute	133 minut	133 minutes		Area Sear	0		0	We had 2 Red-shouldered Hawks were present during the survey and likely had an effect on the birds nearby.
611839	20 minute	132 minut	132 minutes		Area Sear	0		0	
612694	30 minute	2 hours							Mowing on meadow area behind Duck Club. Two Peregrine falcons hunting on pond C. Tried to grab Spotted Sand Piper.
613693									
613920	20 minute	134 minut	134 minutes		Area Sear	0		0	Video taping of advertising pieces for IRWD in Learning Center meadow.
614558	25 minute	137 minut	137 minutes		Area search				
616487	20 minute	131 minut	131 minutes		Area Sear	0		0	
617342	20 minute	133 minut	133 minutes		Area Sear	0		0	
617767	90 minute	135 minut	135 minutes		Area search				
618319									
618647	20 minute	132 minut	132 minutes		Area Sear	0		0	Had a Red-tailed Hawk flyover while at Pond E.
618773	30 minute	2.2 minutes							66 Deg and 80 degrees when finished
622136	20 minute	133 minut	133 minutes		Area Sear	0		0	America Kestrel on platform in Pond 4.
622138	20 minute	133 minut	133 minutes		Area Sear	0		0	

Improving data user support

rnpn

Enhancing R package

- Guidance re: “cleaning data”



- Summarizing intensity/abundance measures
- Analysis modules

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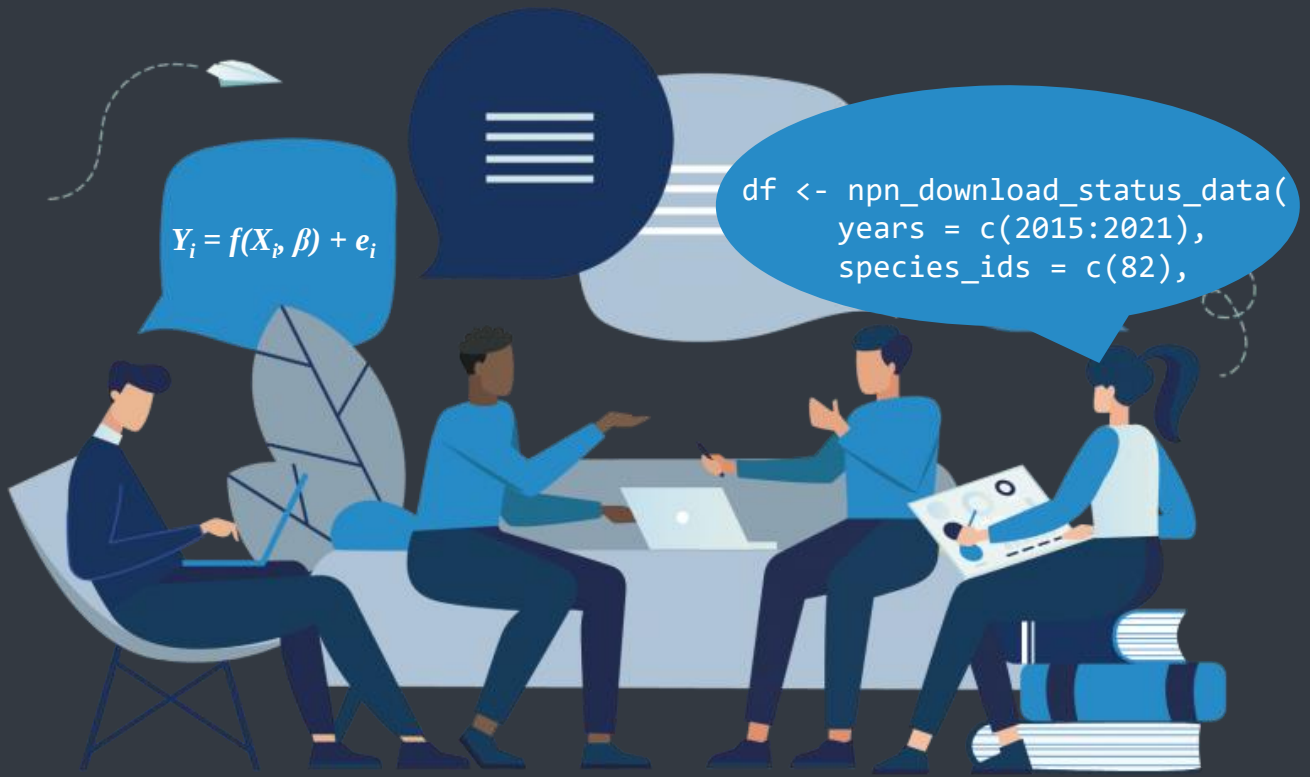
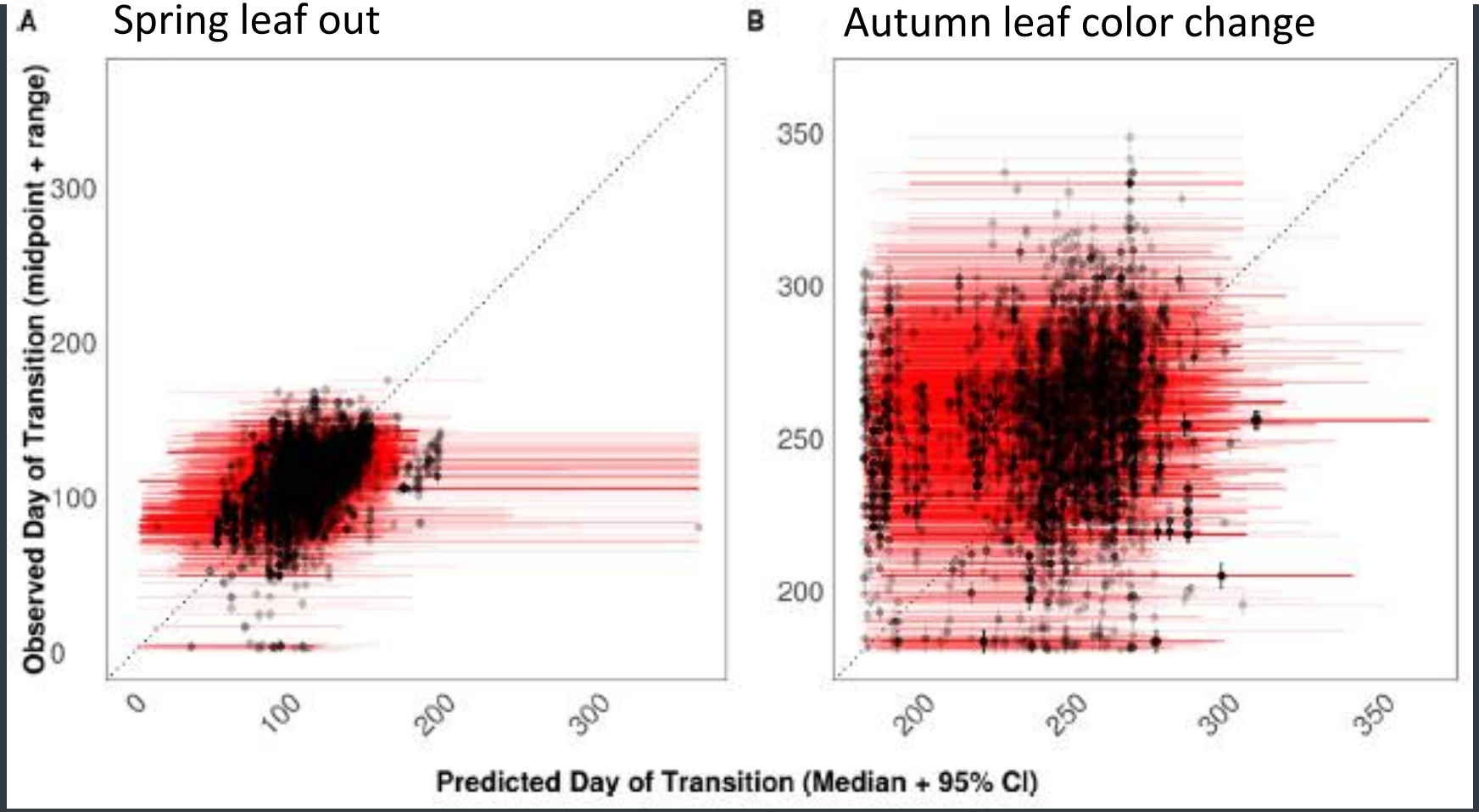
Improving data user experience

Formalizing a "NPN data user group"

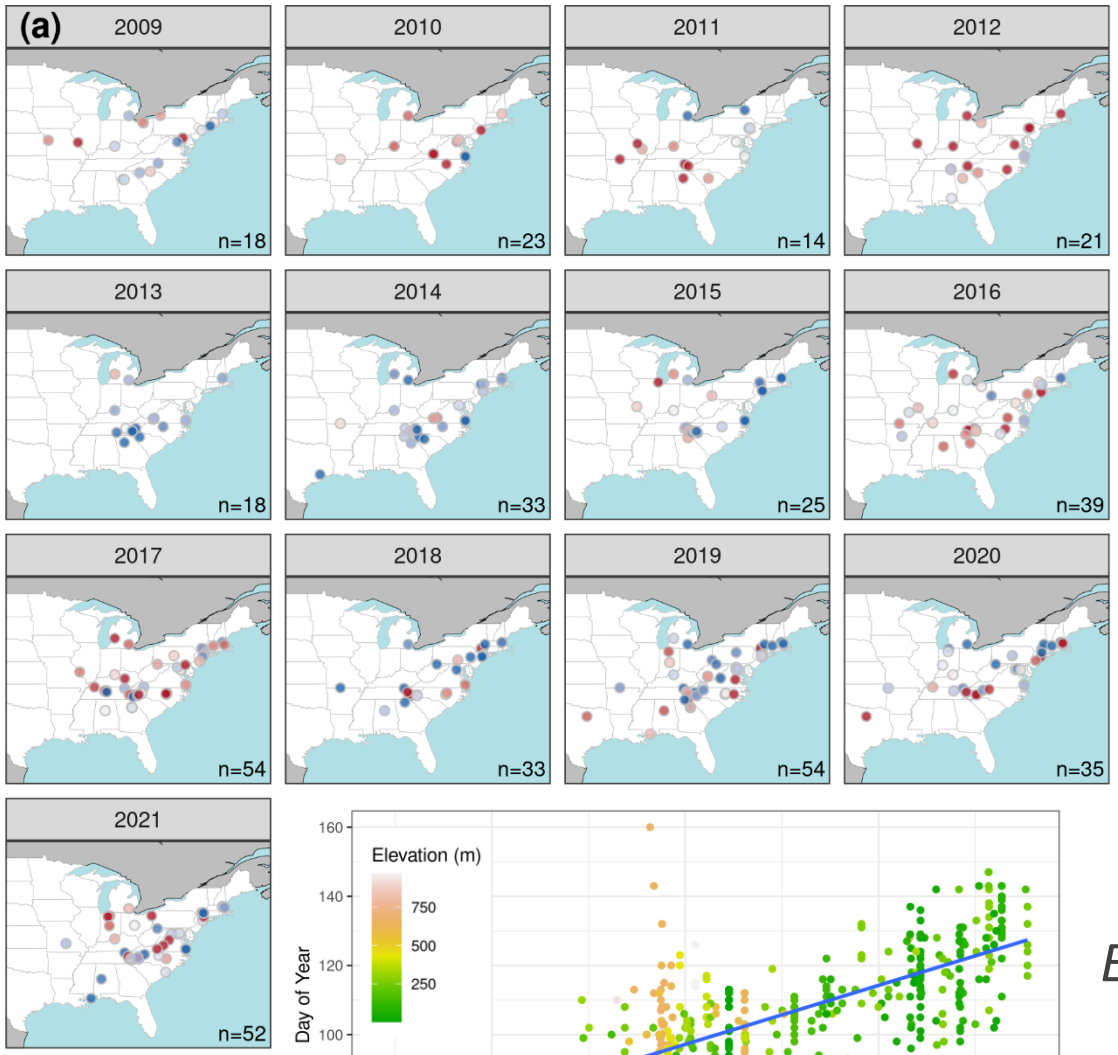


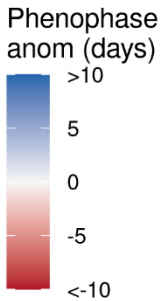
Evaluating data internally

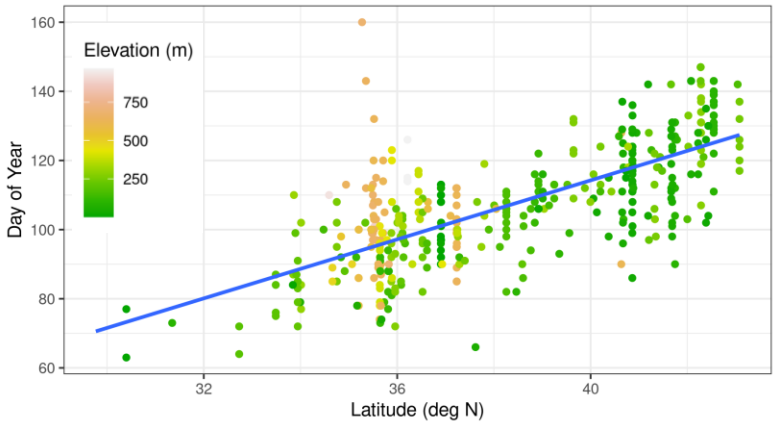


Elmendorf et al. 2019 *Agric For Meteorol*

Evaluating data internally







Flowering dogwood (*Cornus florida*) open flowers

Crimmins and Crimmins 2022
Environmental Research Letters

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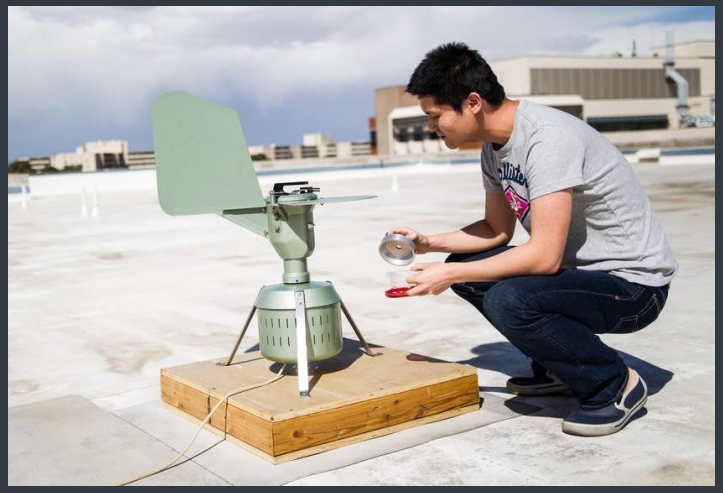
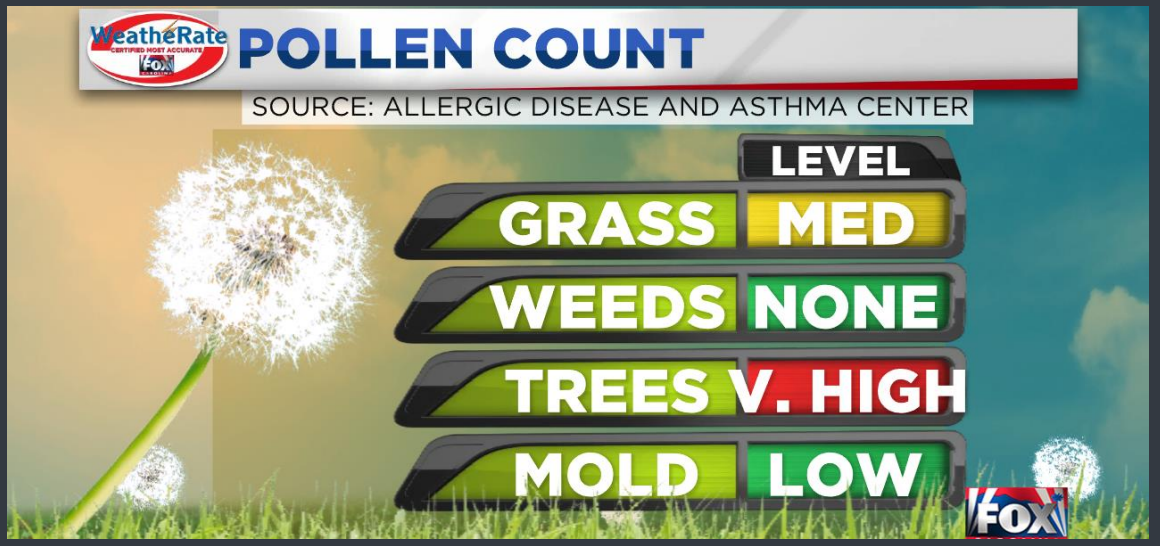
Evaluating data internally





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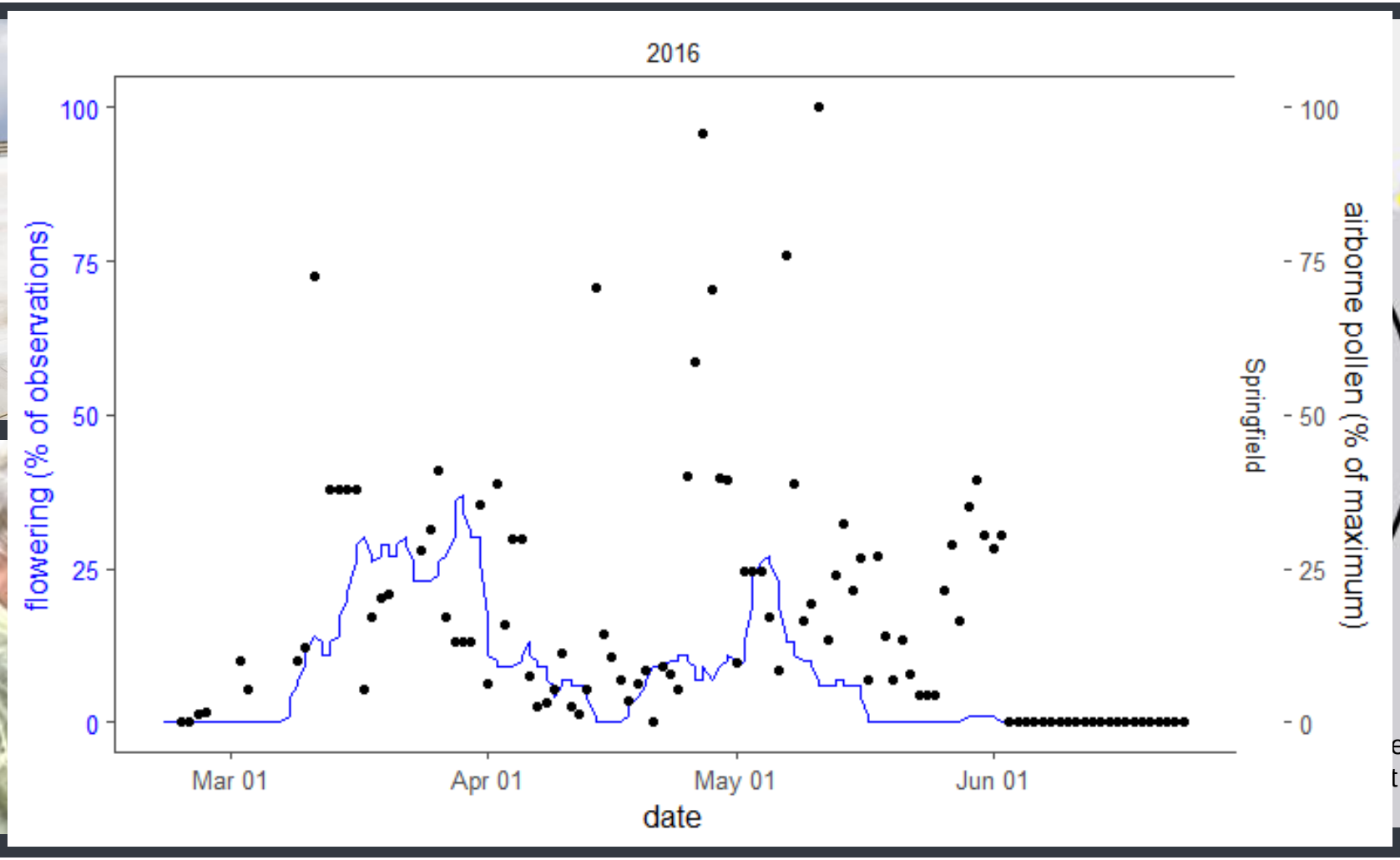
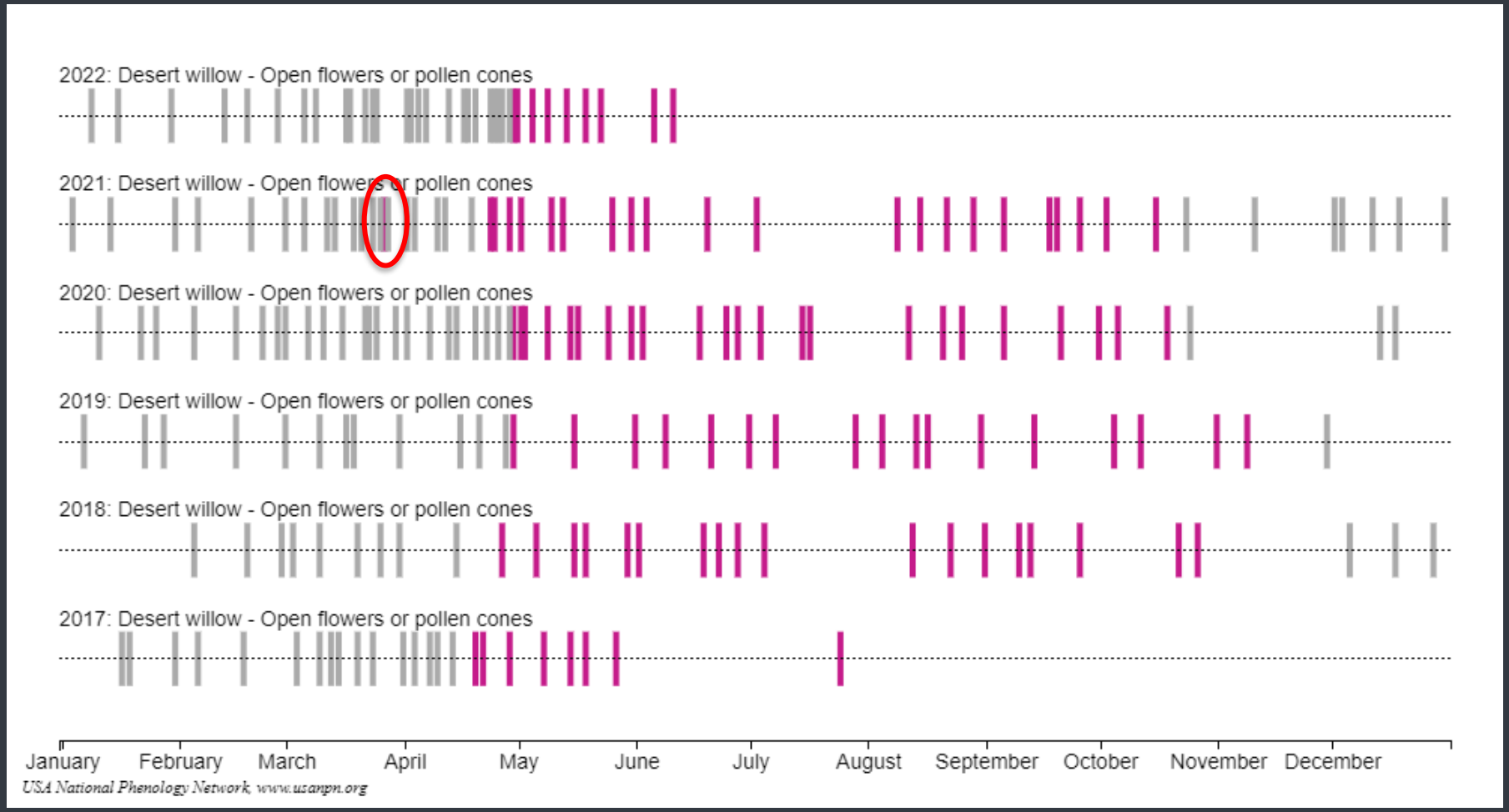
Evaluating data internally



Supporting data collectors



Module 1: How to Observe with Nature's Notebook - Introduction

Introduction

ESTIMATED TIME TO COMPLETE MODULE: 45 minutes

COURSE RESOURCES:

- How To Observe: *Nature's Notebook* Plant and Animal Phenology Handbook
- FAQs
- Glossary

Thank you for choosing to participate in the *Nature's Notebook* plant and animal phenology program! Observations collected by thousands of observers like yourself are very valuable to researchers, land managers, and others interested in better understanding how our planet's species are responding to climate change.

Collecting regular observations on plant and animal phenology and entering them in the National Phenology Database via *Nature's Notebook* creates a long-term record of seasonal and annual life cycles, accessible and usable for generations to come.

This module will guide you through the steps required to:

Module Outline

Supporting data collectors

What questions do you want to answer with your data?

- What's in flower this week?
- Does the phenology of invasive plants vary more than that of native plants?
- Are all phenophases changing at the same rate?
- What drives leaf-out, flowering, etc?
- Are things happening earlier now than in the past?
- Is there a fixed sequence in leaf-out among species?
- What is the impact of microclimate on phenology?

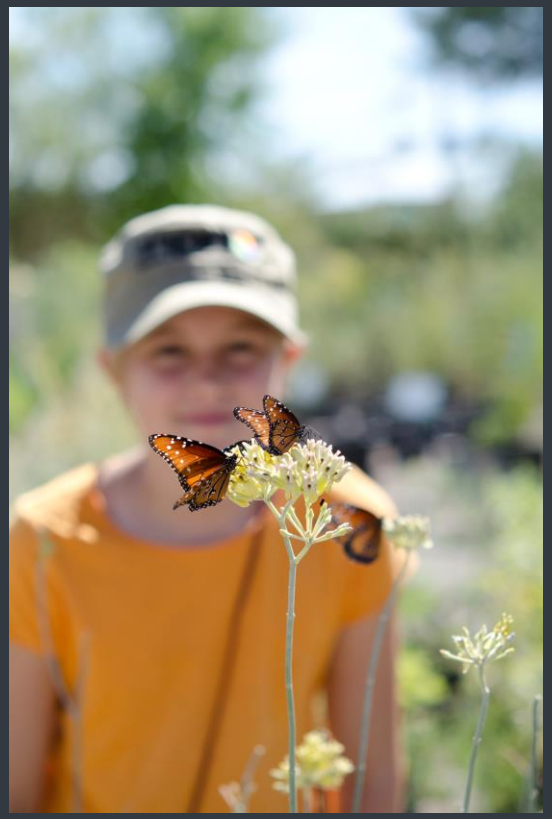
Next steps

- Identify priority questions and species, phenophases; consider spatial sampling design
- Enhance opportunities to engage younger populations
- Deepen ties with Land Surface Phenology community
- Get “phenology” into the public’s everyday vocabulary

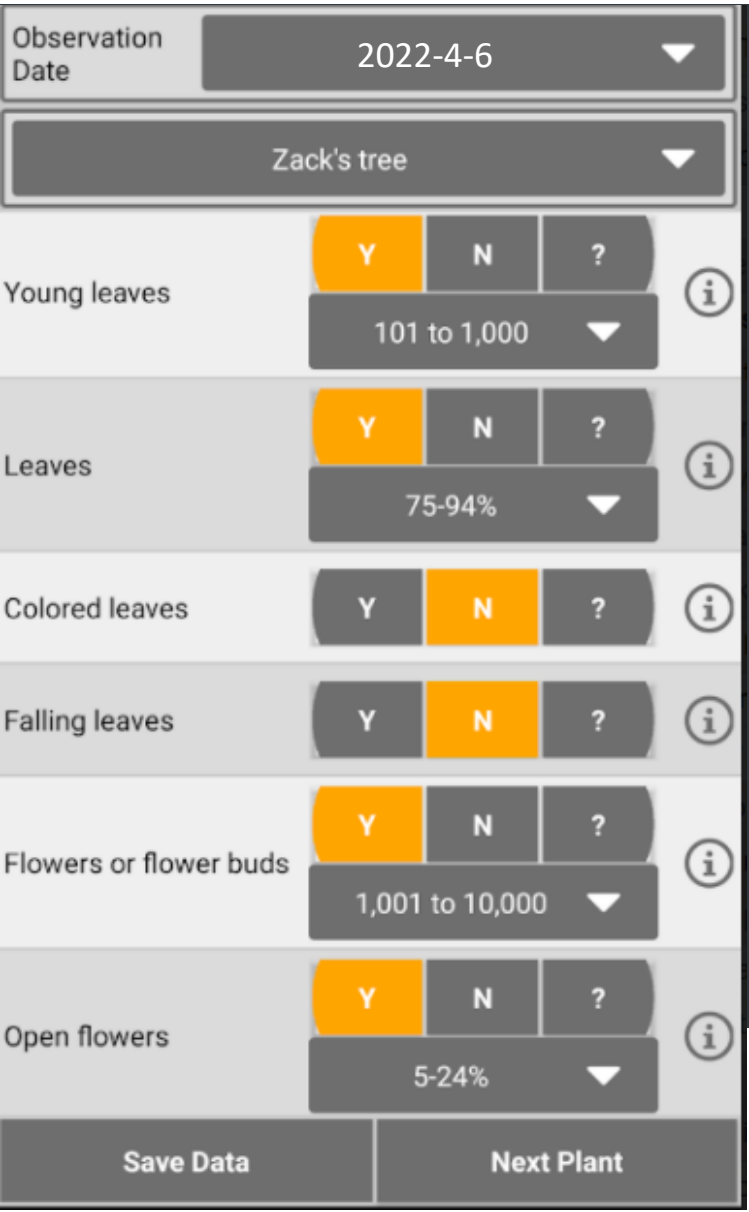
Thank you!

Theresa Crimmins
theresa@usanpn.org
@TheresaCrimmins

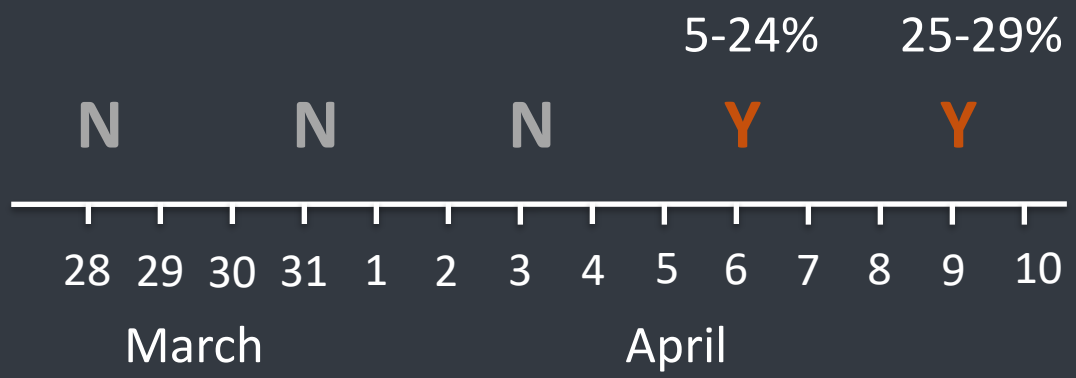
and the entire USA-NPN team



Status & intensity observations



Open flowers



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2. Evaluating data internally