The times they are a-changing… Phenology and changing springs

Theresa Crimmins, Director

and the USA-NPN team

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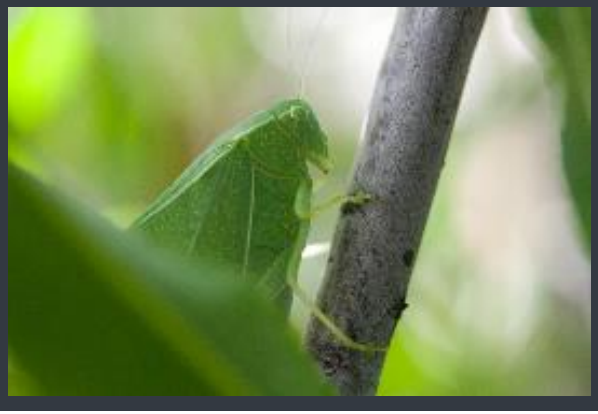
What is phenology?

Recurring plant and animal life-cycle stages and their timing and relationships with weather and climate

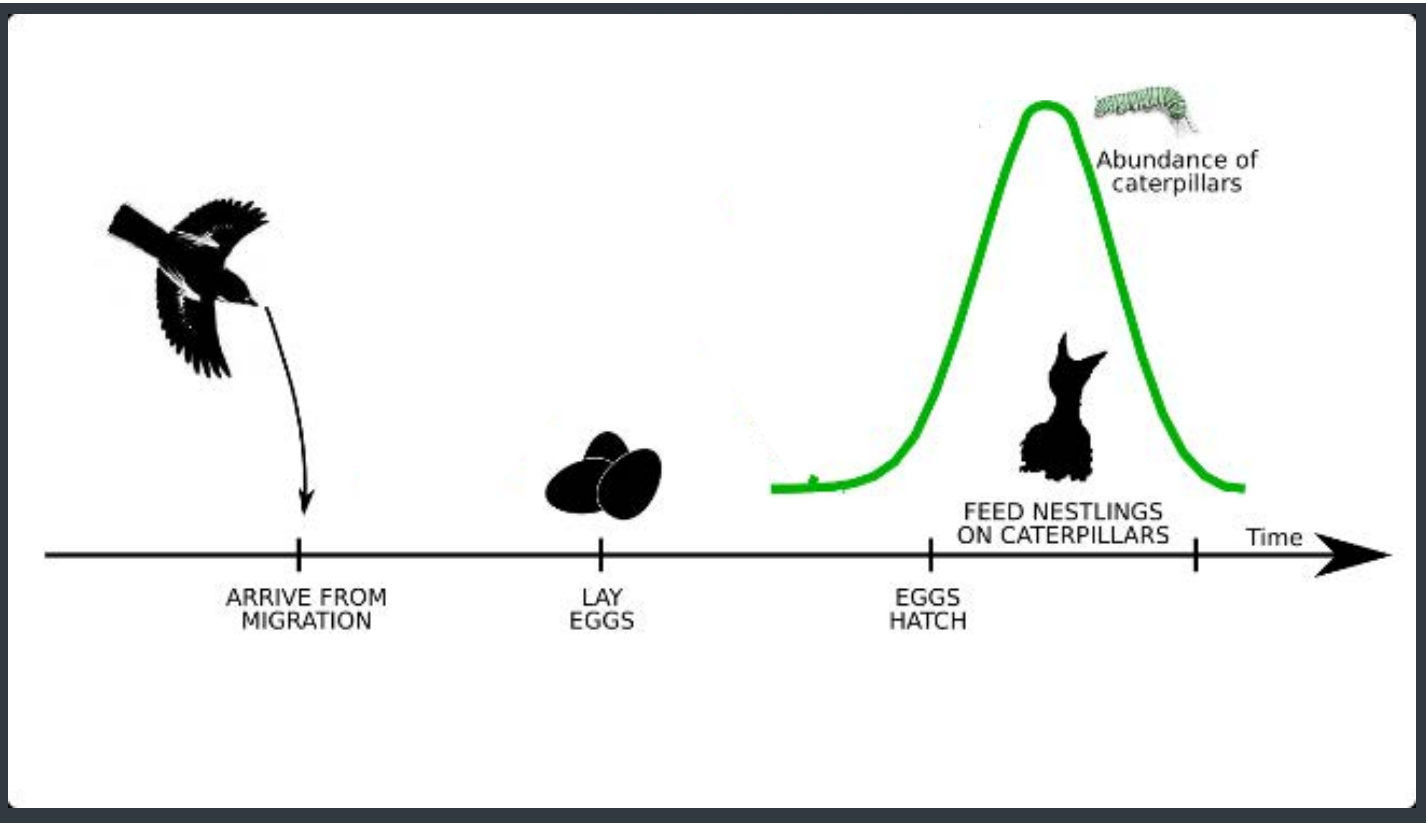
Photos: Brian F Powell

Why phenology?



- Invasive species control
- Crop harvesting
- Pollination
- Cultural events
- etc…

Why phenology?



nadiah.org/phenology.html

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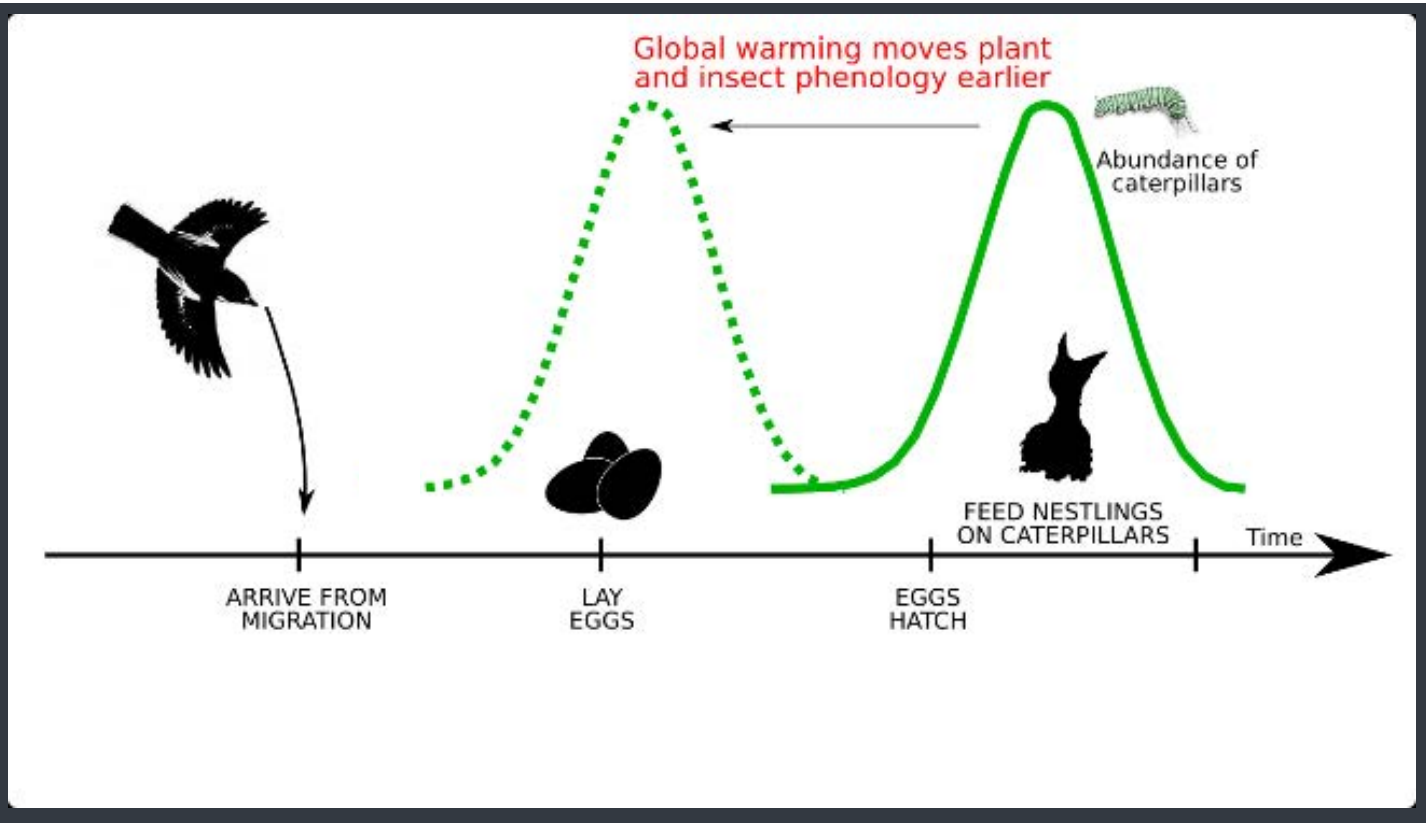
Why phenology?



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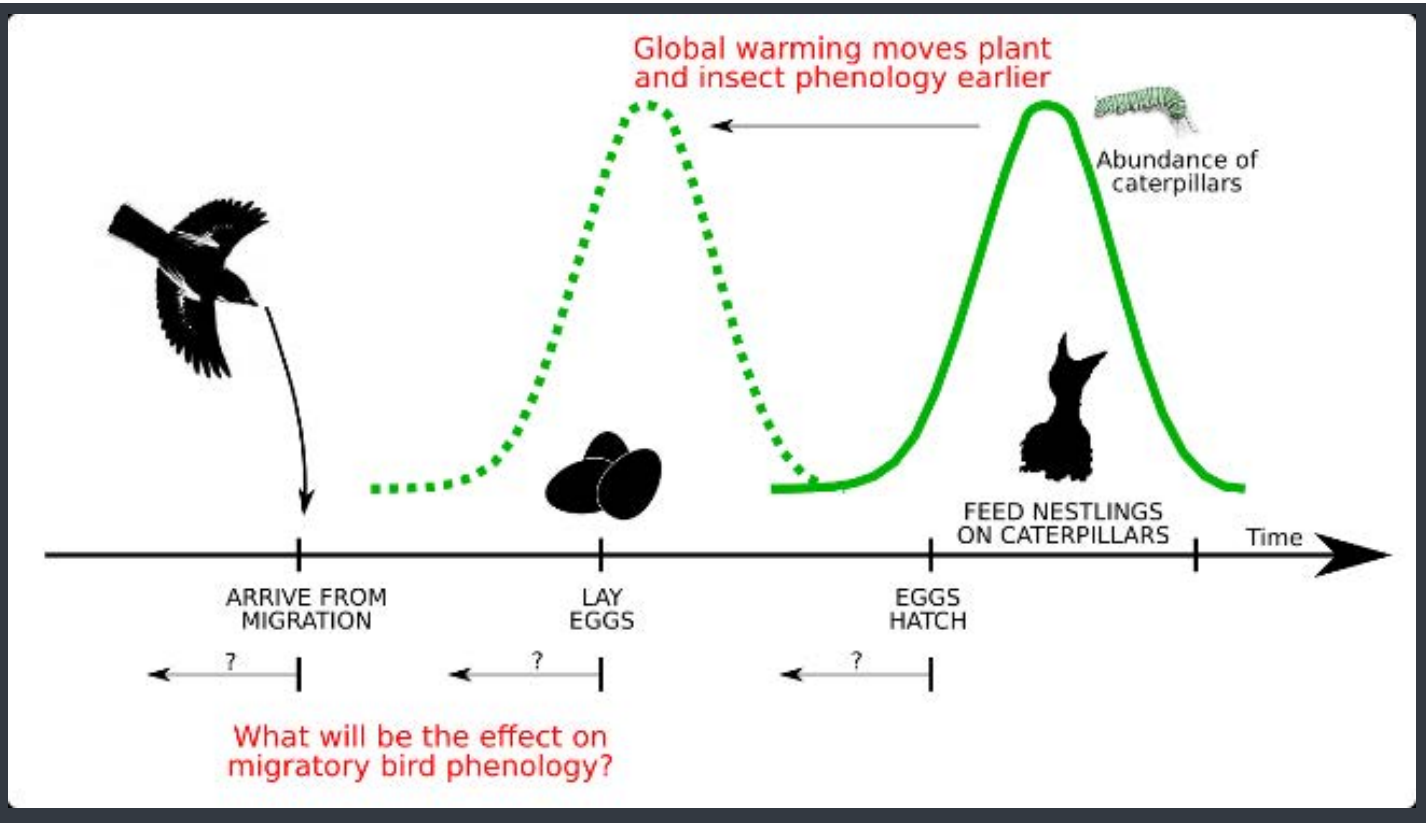

nadiah.org/phenology.html

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How is spring changing?

Yellow trout lily – 7d advanced
Petrauski et al. (2019)

Blueberries – 3-4 weeks advanced
Miller-Rushing and Primack (2008)

Brewer's sparrow
3 weeks advanced
Mayor et al. (2017)

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How is spring changing?

Corydalis ambigua

Kudo & Ida 2013

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How is spring changing?

Georgia peach crop decimated after warm winter

Atlanta Journal-Constitution
May 31, 2017

Photo: The Atlanta Journal-Constitution

How is spring changing?

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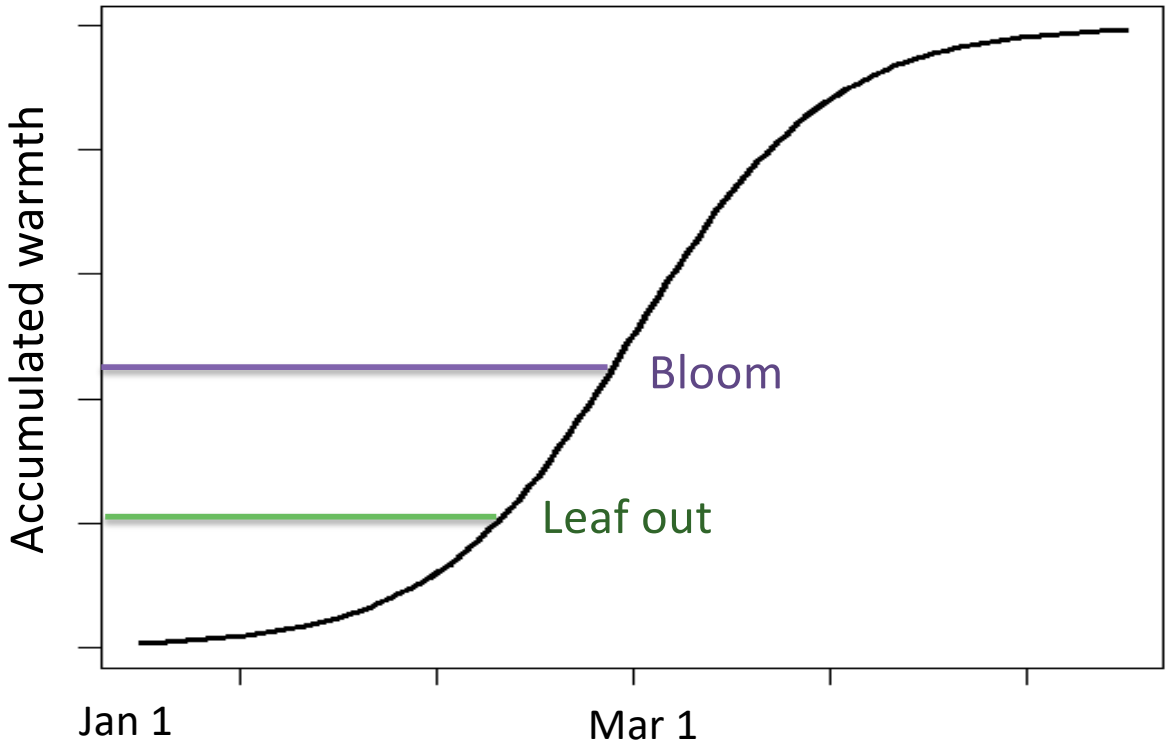
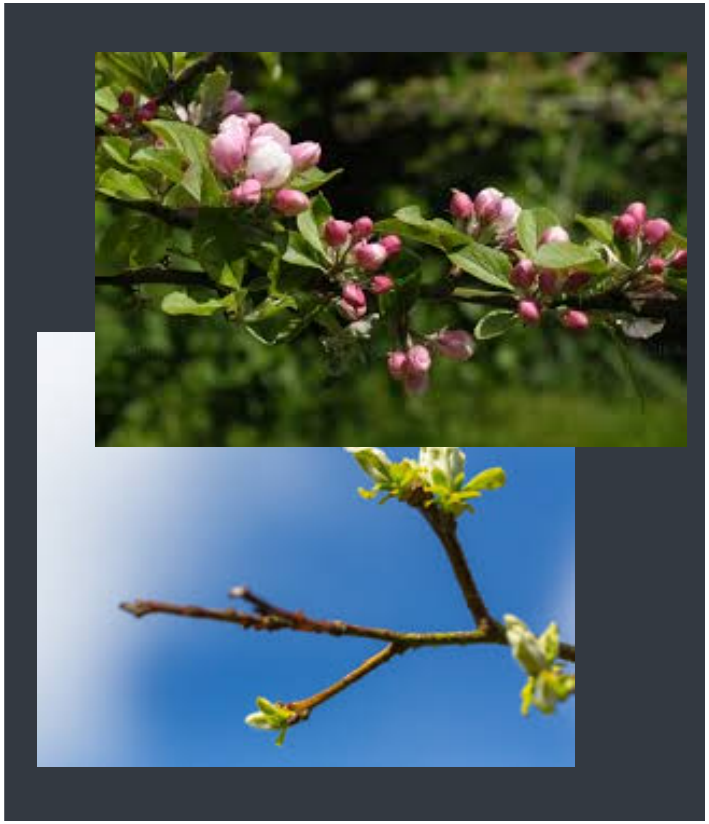
Start of spring





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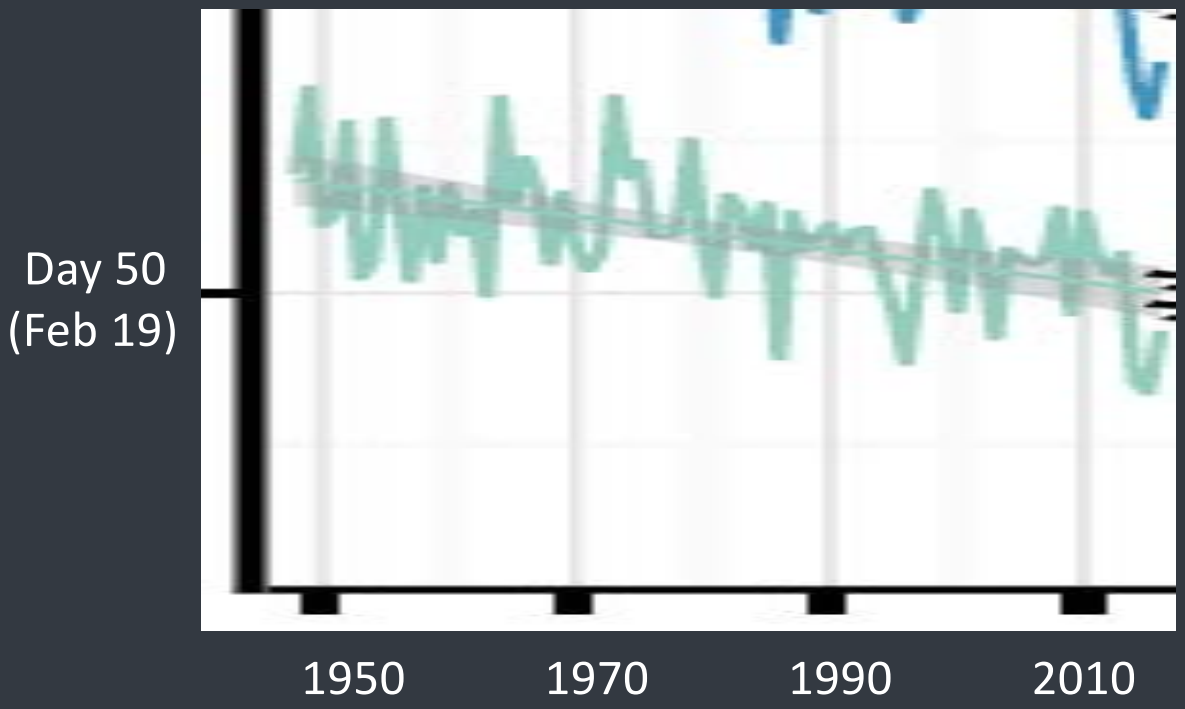
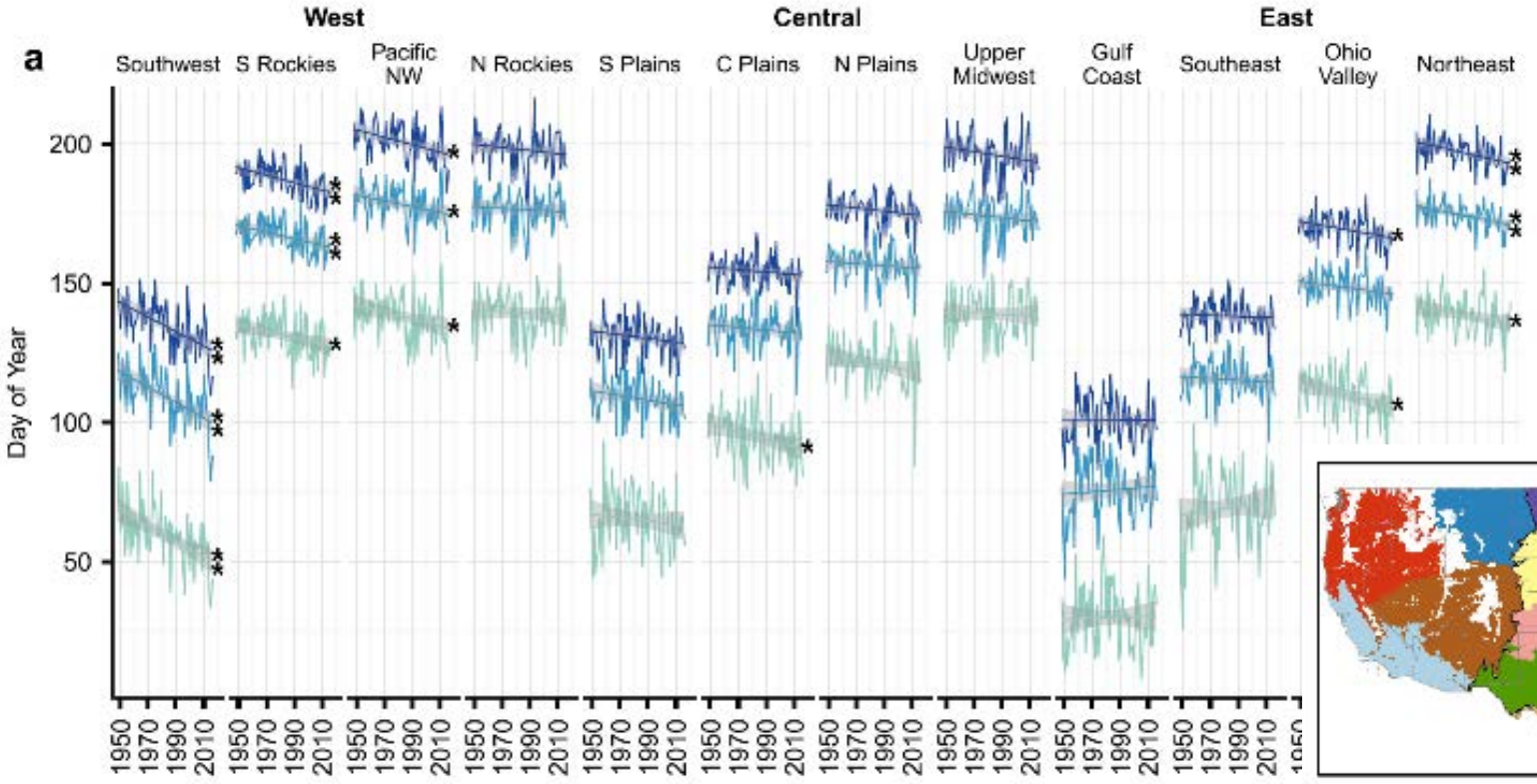
Start of spring



How is spring changing?



Crimmins & Crimmins 2019

Geophys Res Letts

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How is spring changing?

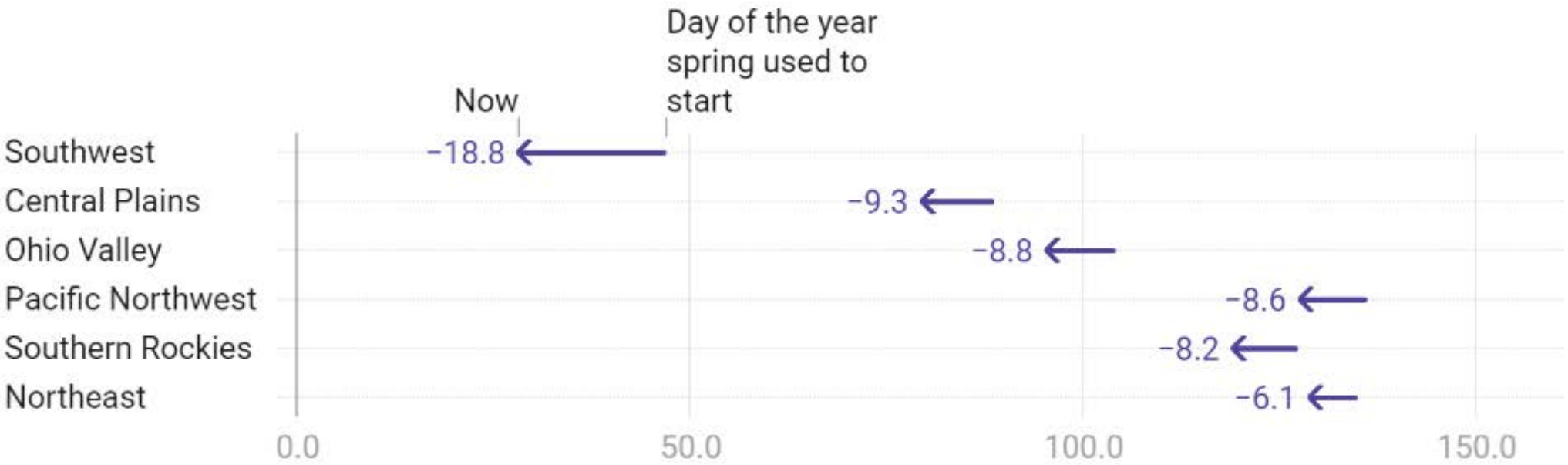

Chart: The Conversation, CC-BY-ND • Source: Crimmins, T.M. and M.A. Crimmins. 2019 • Get the data

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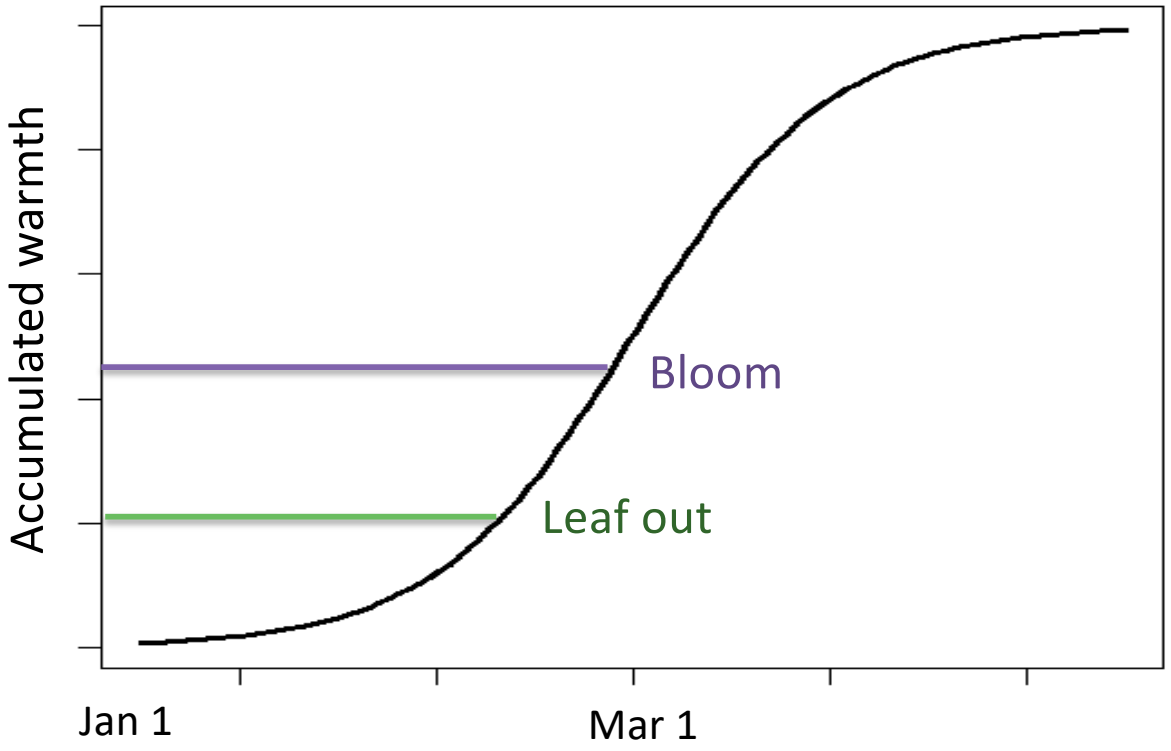
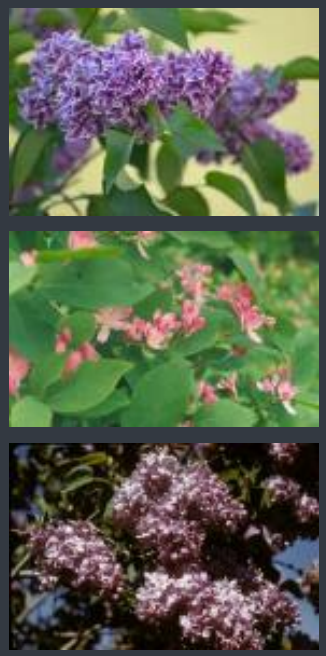
Spring 2020: Spring Indices





Schwartz 1997 (book chapter)

Schwartz et al. 2013 *Int J Climatol*

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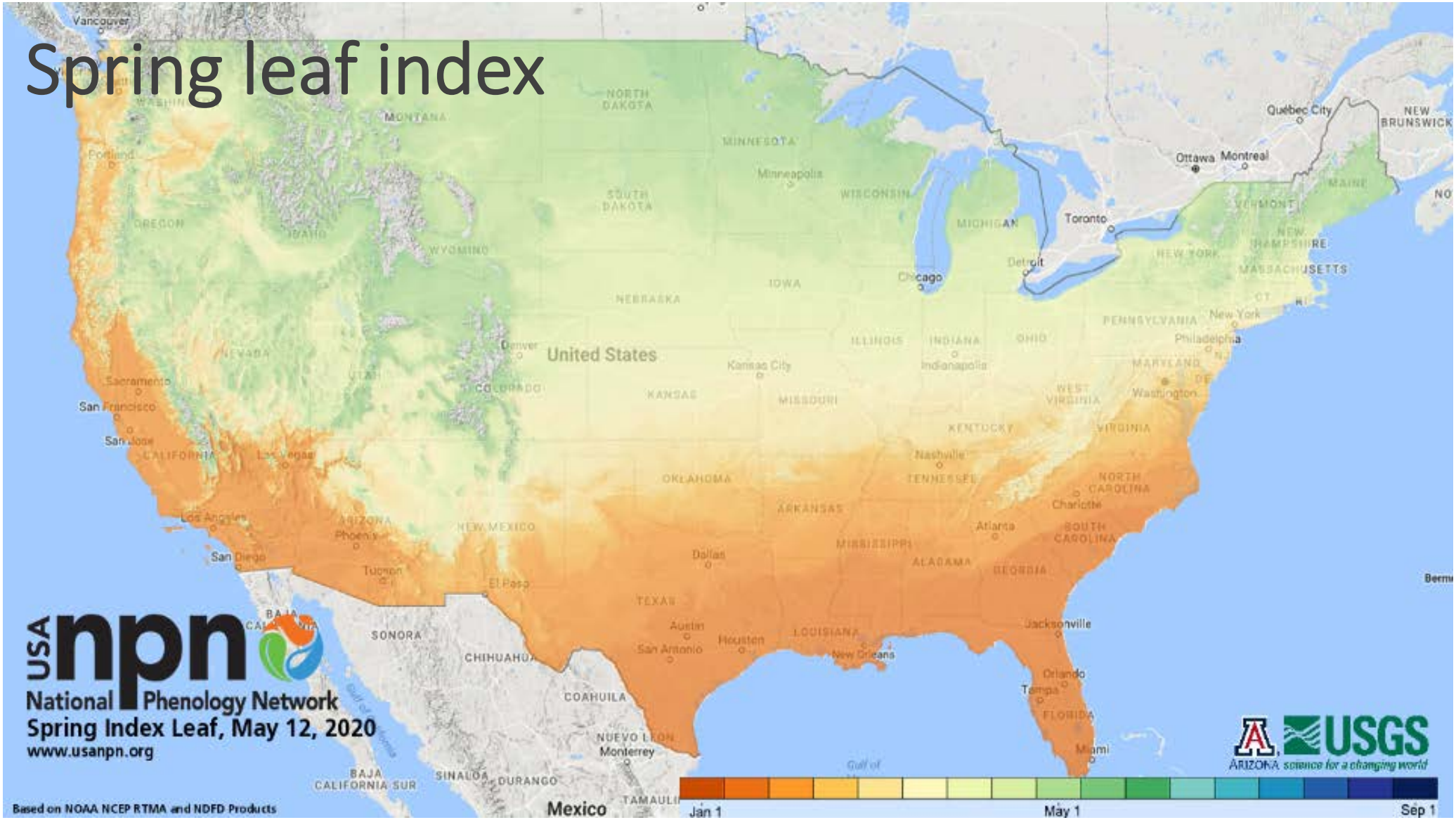
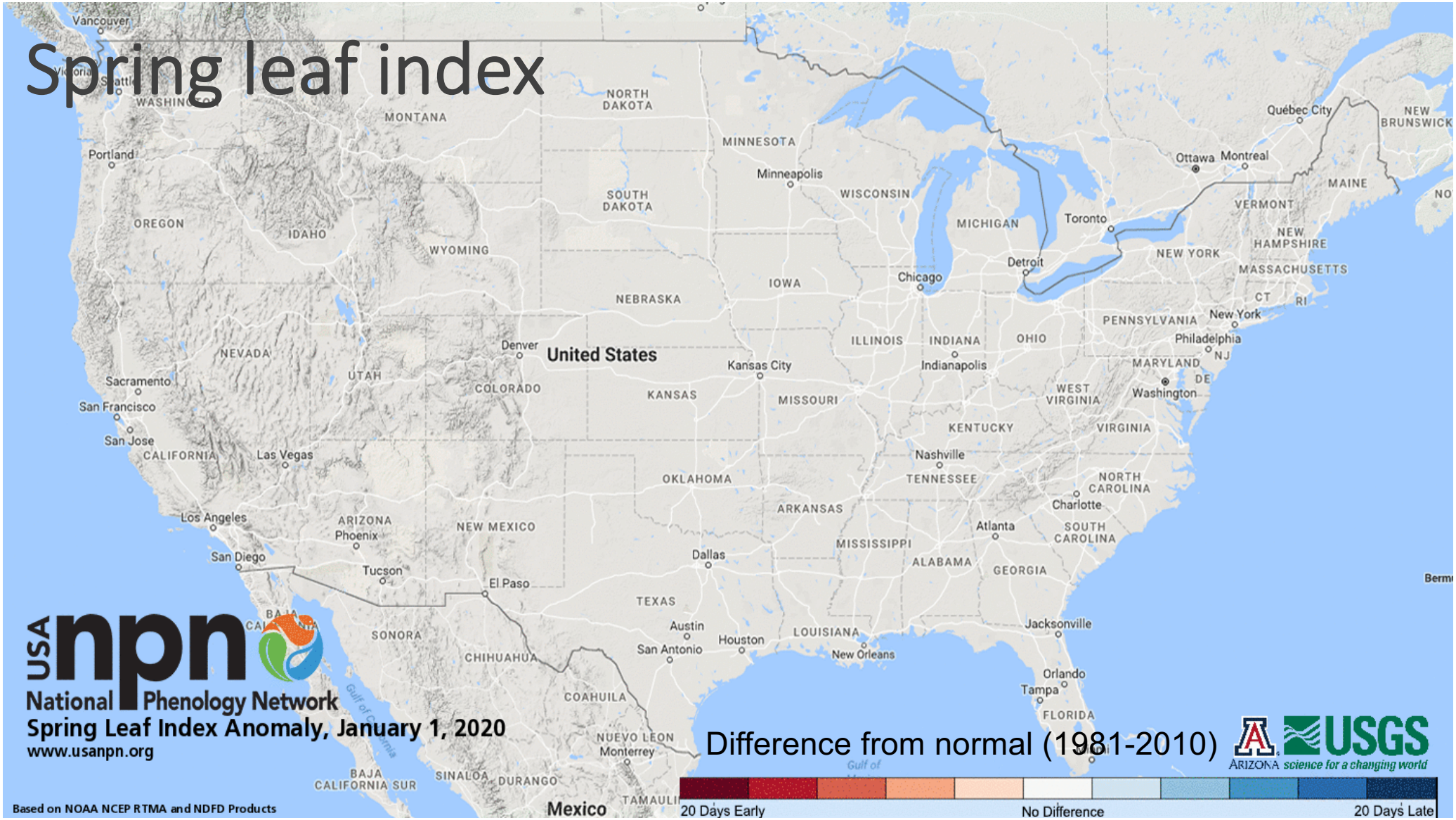
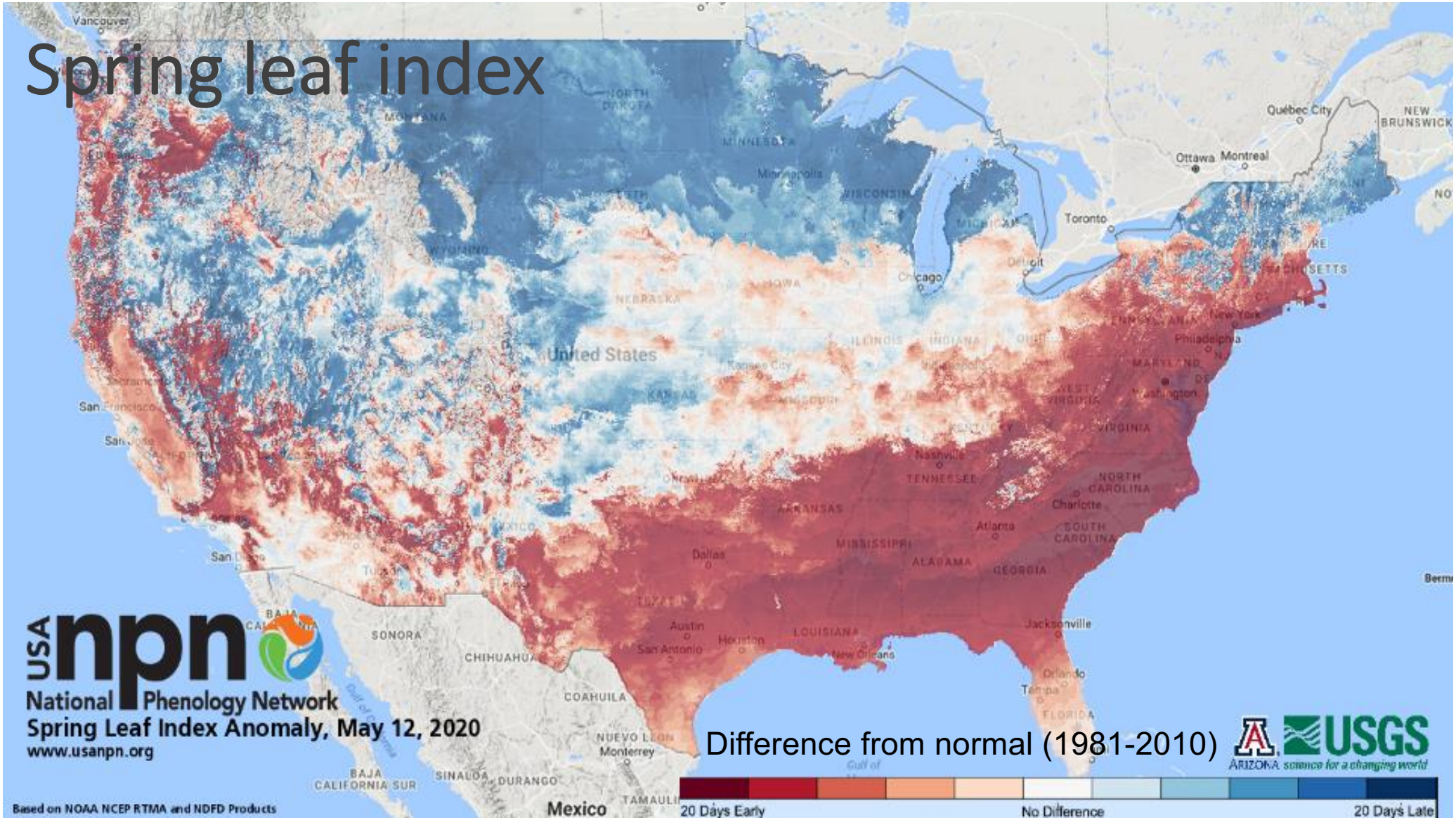
Spring leaf index



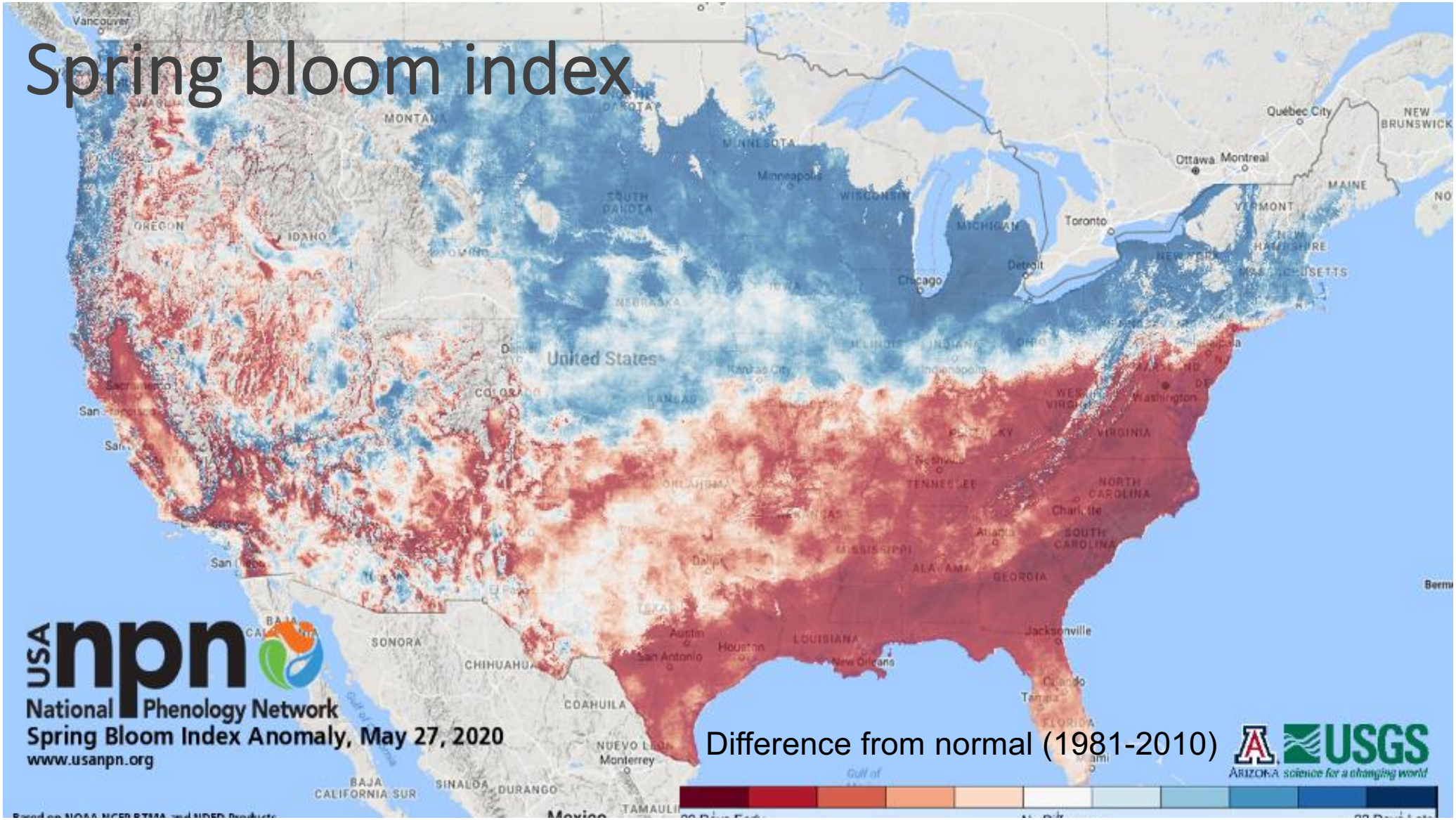
Spring leaf index



Spring leaf index



Spring bloom index



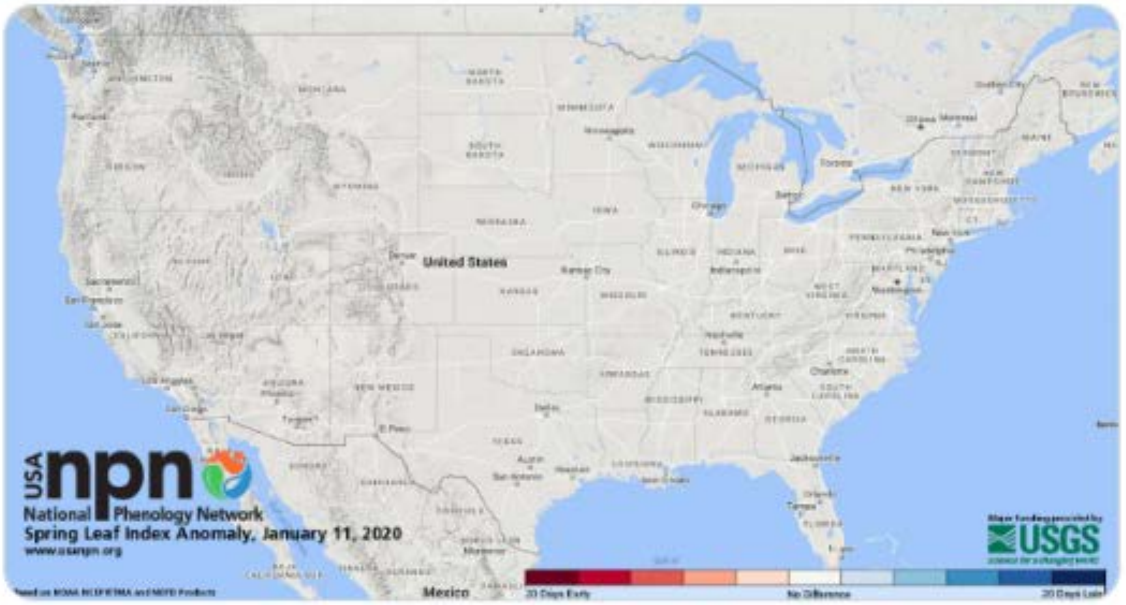
How are these maps being used?

Allergie
start fol
than usu

Pollen levels ar
of southwest a

Dennis Todey @dennistodey · Feb 5

This early progression on early dormancy break is concerning. usanpn.org/news/spring. Hearing reports of #wheat and #pasture #greening in the Ohio area and other progress that is too early given chances of freeze still.



ather Means For
ry Blossoms

SHARE

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Collect • Store • Share

Phenology data and information

Advance Science

Inform Decisions

Communicate & Connect

Create an Equitable and Inclusive Network

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Comprehensive community science program

- Standardized protocols for ~1,400 species of plants and animals (Denny et al. 2014)
- Extensive training materials & support
- Mobile apps

nature's notebook

Denny et al. 2014 *Int J Biometeorol*

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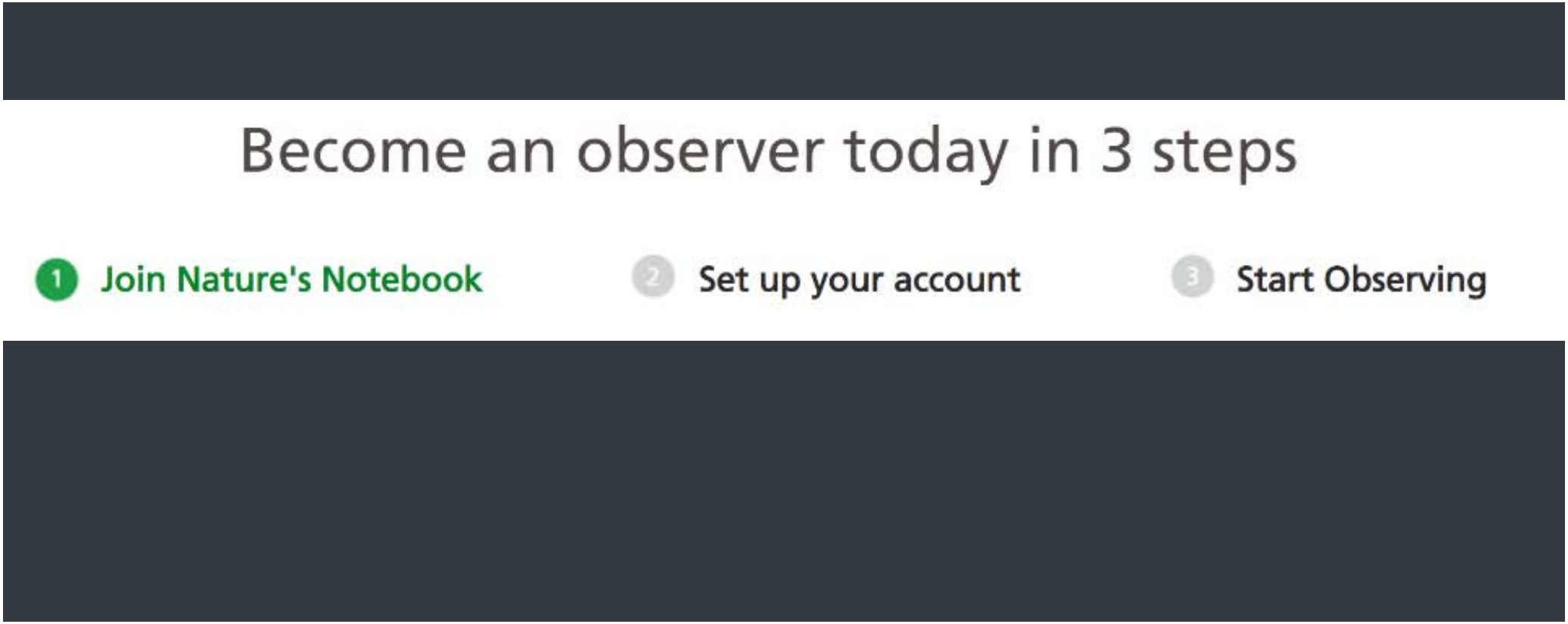
We make it easy to observe phenology



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nature's notebook

21M records
18K observers
14K sites

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neon National Ecological Observatory Network
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Nature's Notebook engagement

- 500+ partners contributing data
  - 53 NPS units
  - 24 USFWS units
  - 98 academic institutions
  - 2 Tribal Colleges and Universities
- Focus on diversity & inclusion, listening
- Formal training: >150 certified leaders

nature's notebook

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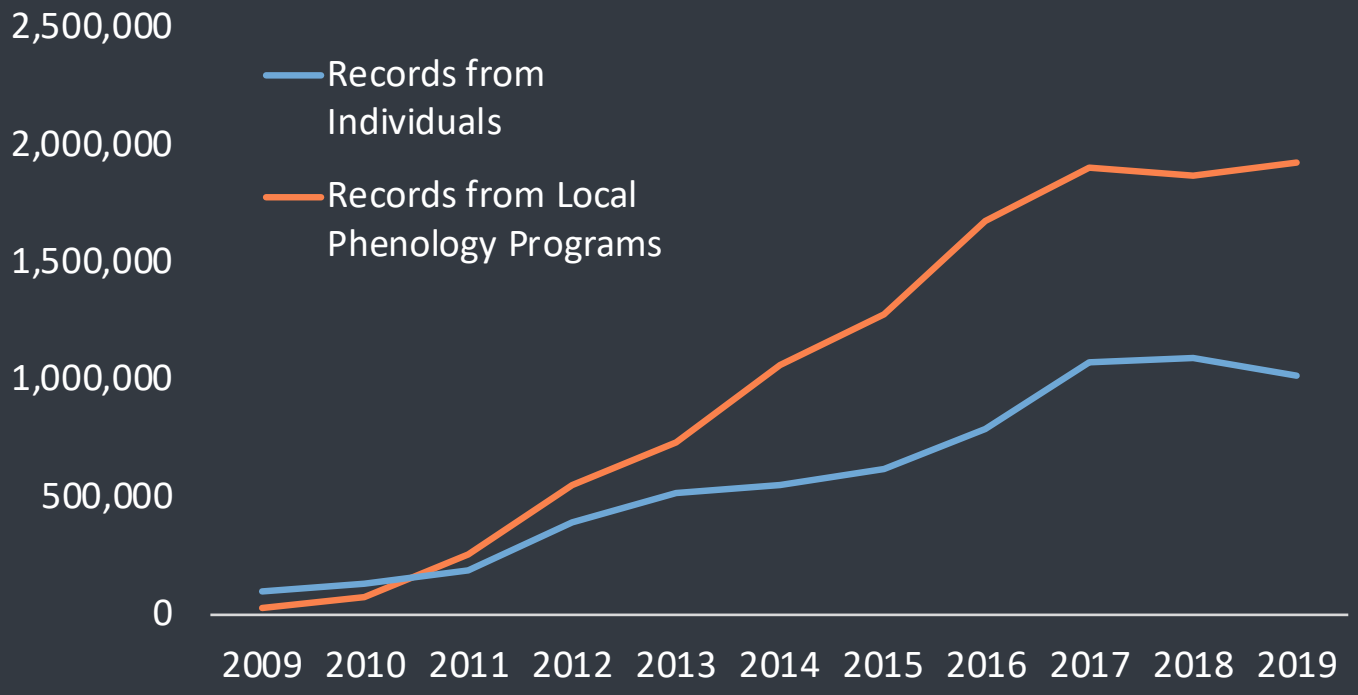
Nature's Notebook engagement



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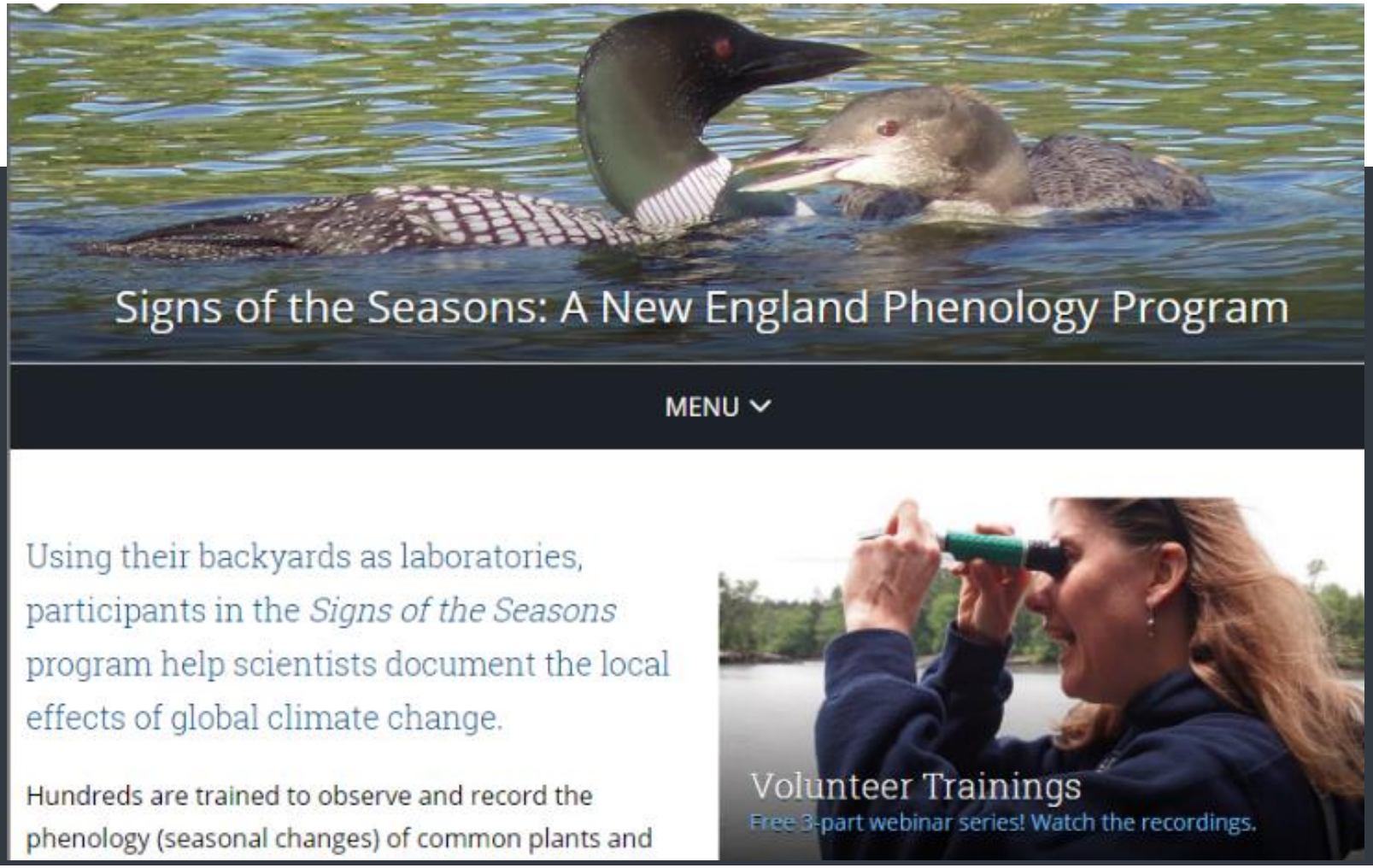

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Red maple (Acer rubrum)

Sugar maple (Acer saccharum)

American toad (Anaxyrus americanus)

Ruby-throated hummingbird (Archilochus colubris)

Common milkweed (Asclepias syriaca)

Rockweed (Ascophyllum nodosum)

Monarch butterfly (Danaus plexippus)

Forsythia (Forsythia sp.)

Wild strawberry (Fragaria virginiana)

Common loon (Gavia immer)

Wood frog (Lithobates sylvaticus)

Common reed (Phragmites australis)

Eastern white pine (Pinus strobus)

Spring peeper (Pseudacris crucifer)

Beach rose (Rosa rugosa)

Mountain ash (Sorbus americana)

Common lilac (Syringa vulgaris)

Common dandelion (Taraxacum officinale)

American robin (Turdus migratorius)

Gray treefrog (Hyla versicolor)

Lowbush blueberry (Vaccinium angustifolium

TOP

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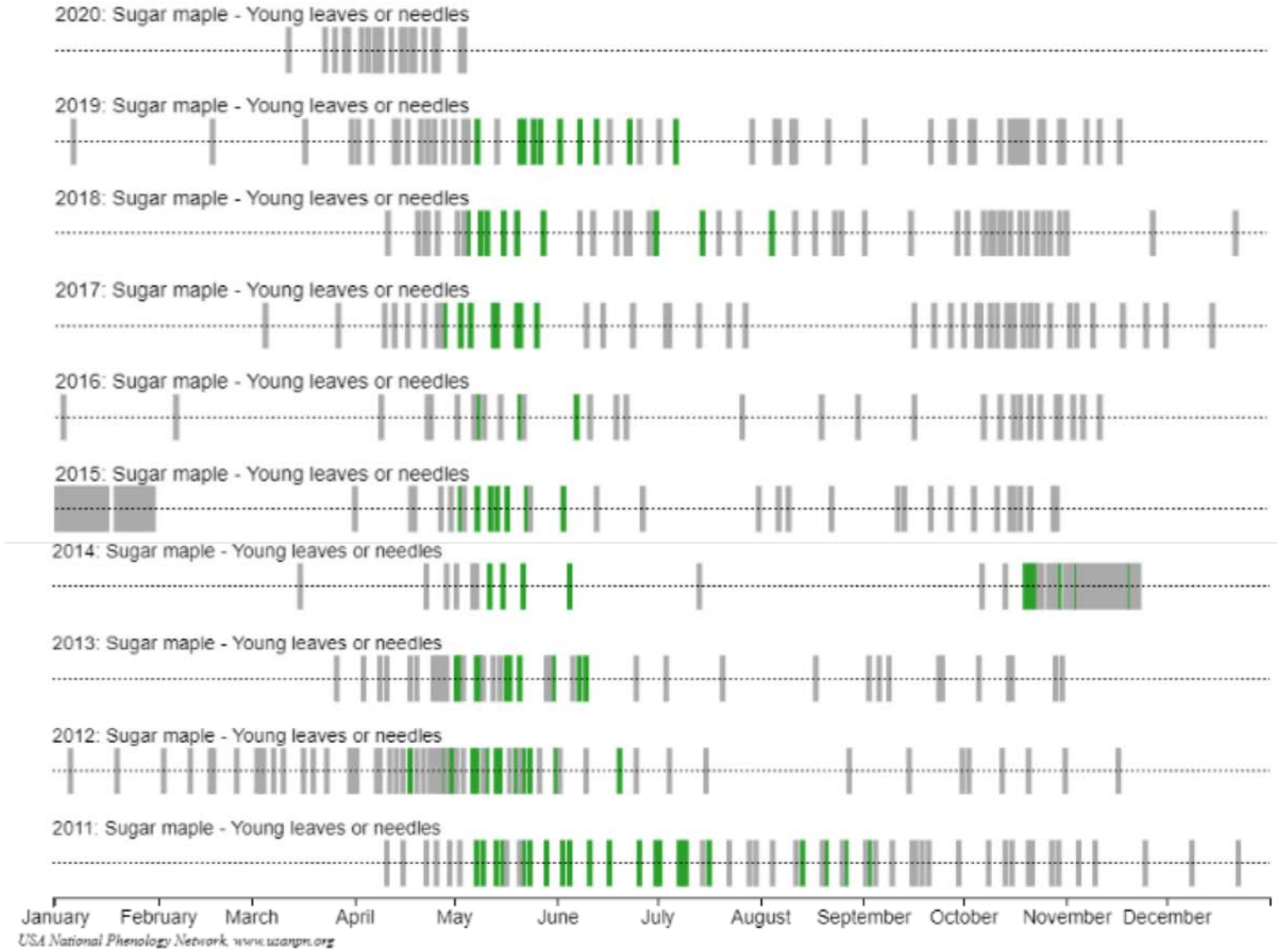

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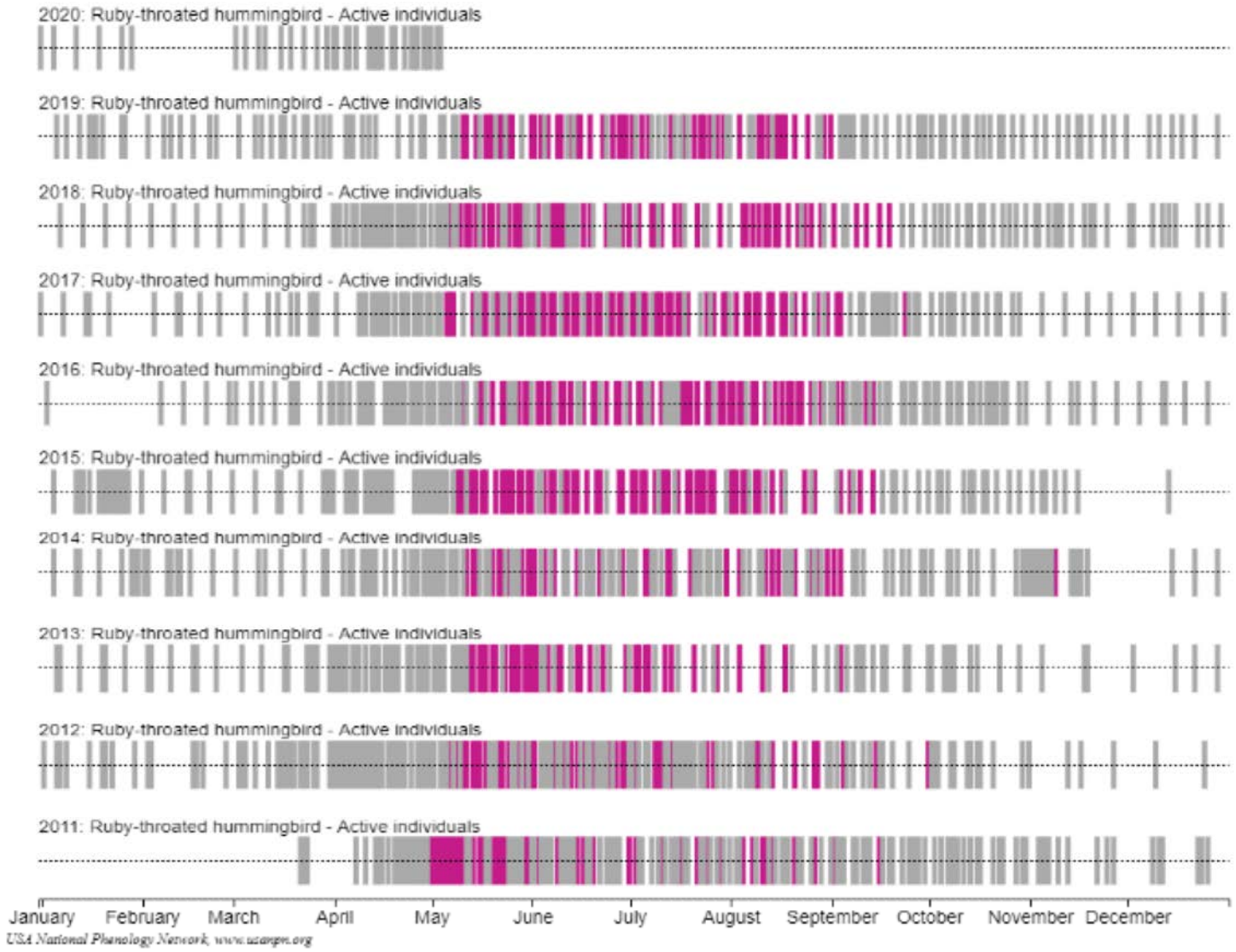
USA npn National Phenology Network



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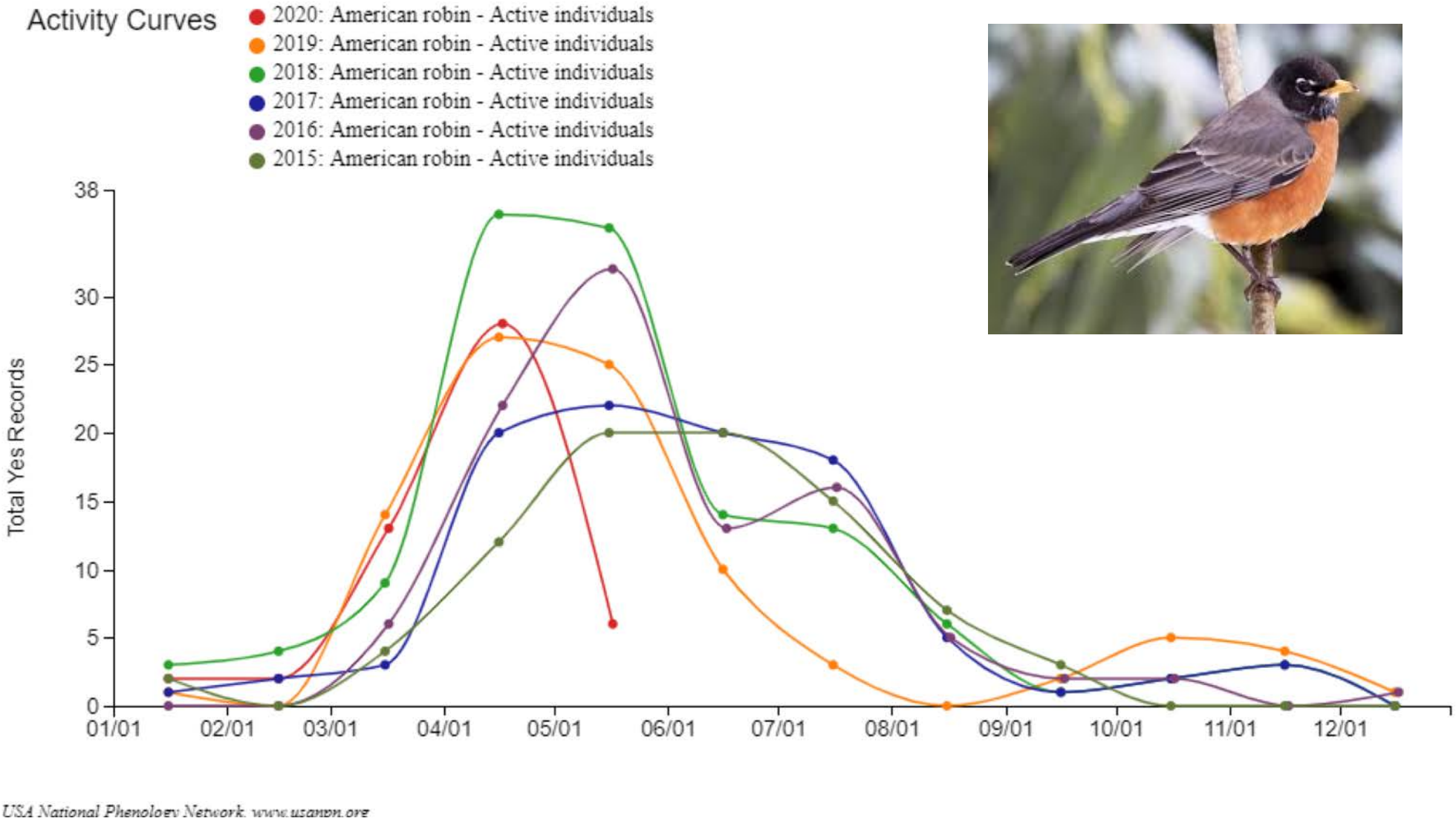
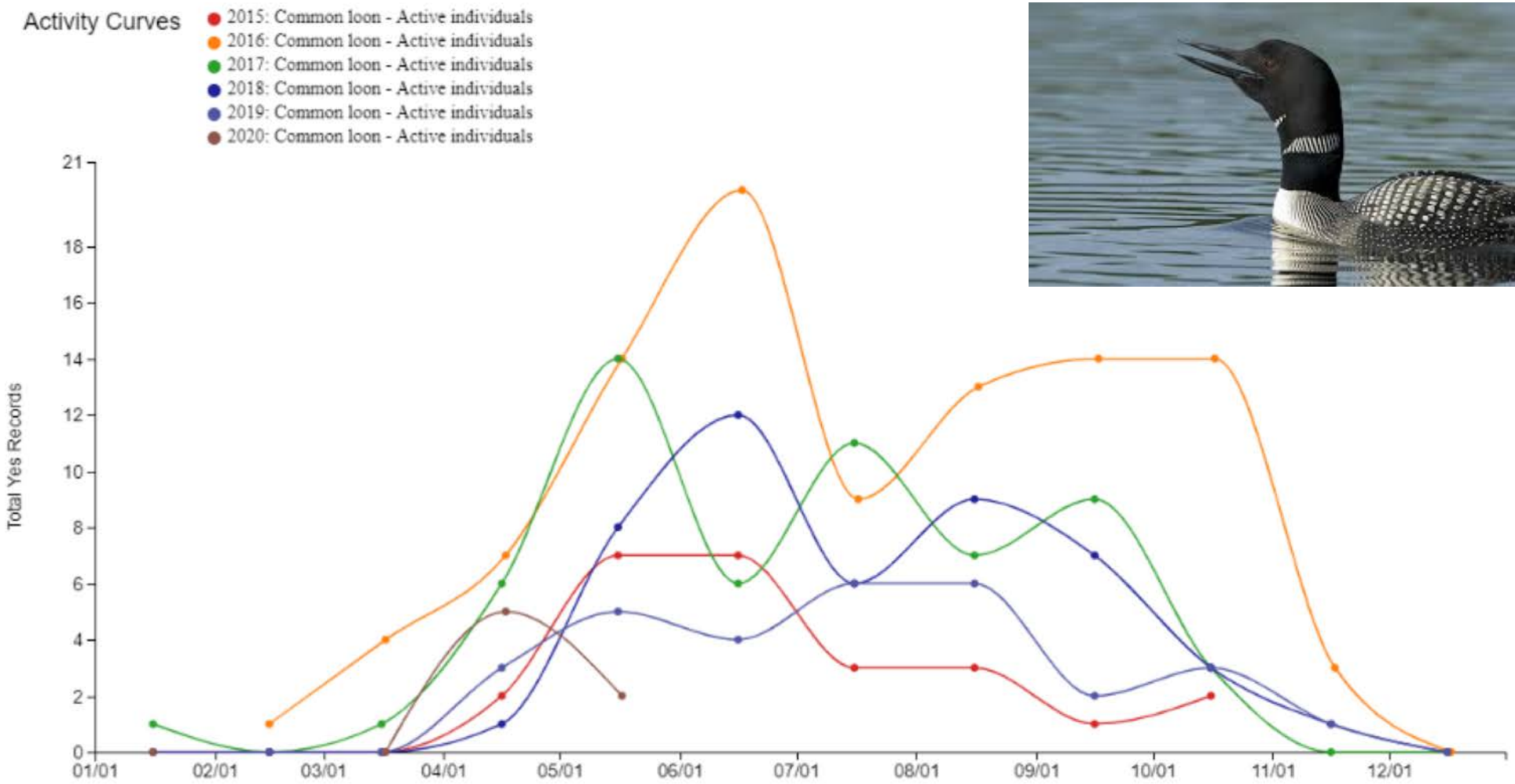


USA National Phenology Network, www.usanpn.org

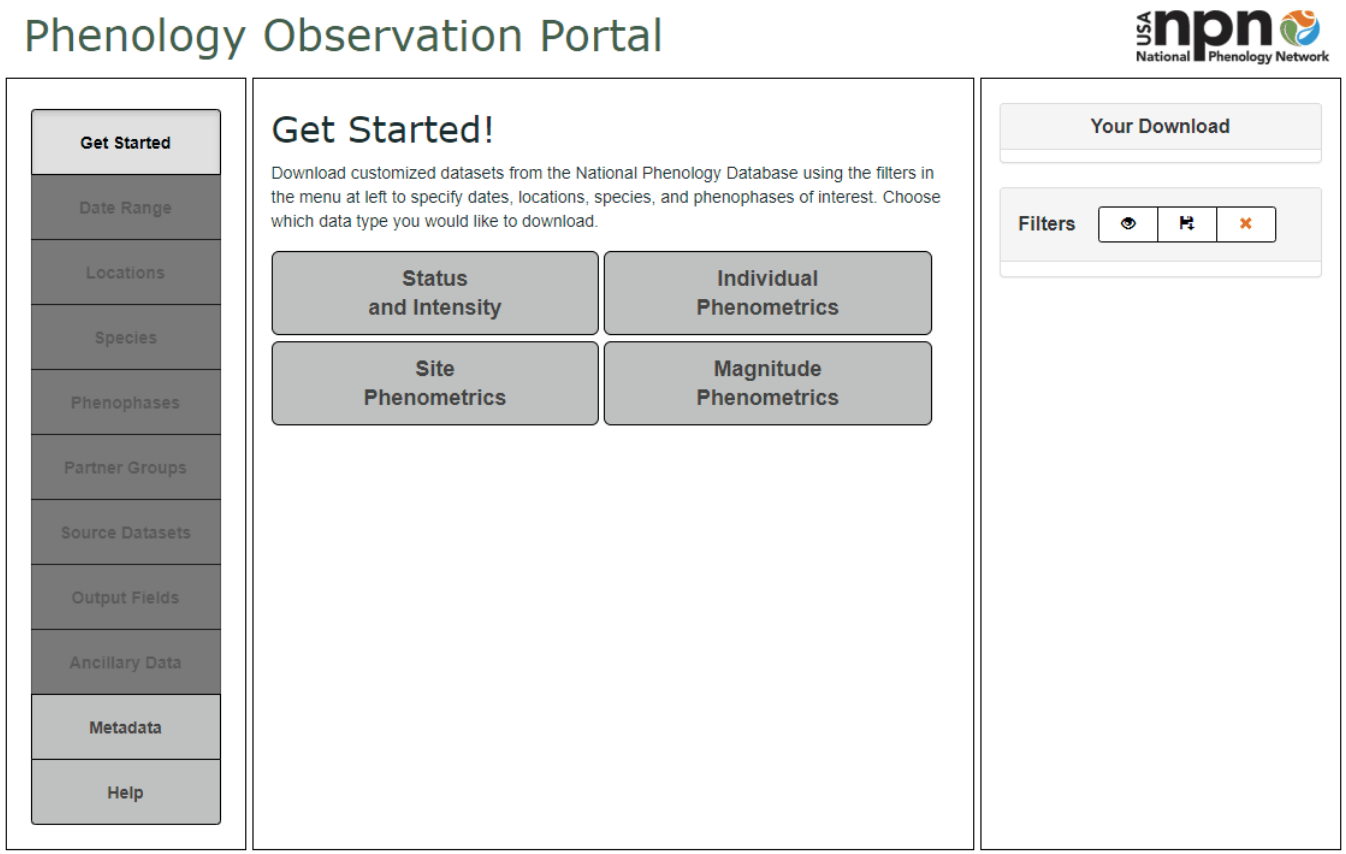
Activity Curves



USA National Phenology Network, www.usanpn.org

Data access

- github.com/usa-npn/
- R package
- APIs
- Online data access
- Visualization tool



data.usanpn.org/observations/get-started

www.usanpn.org

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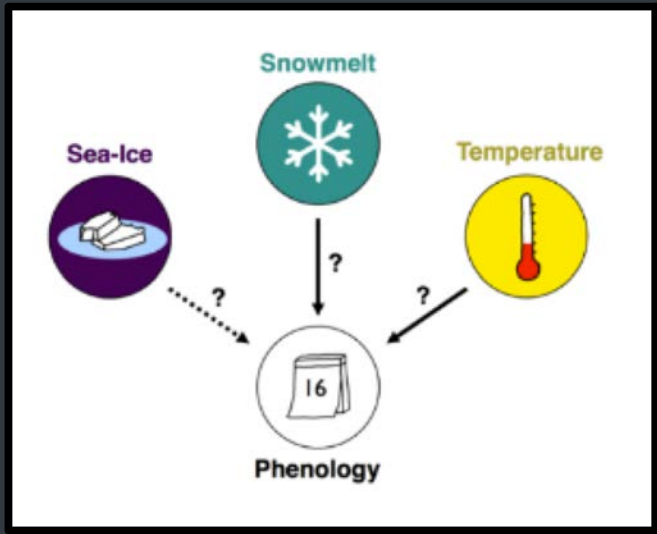
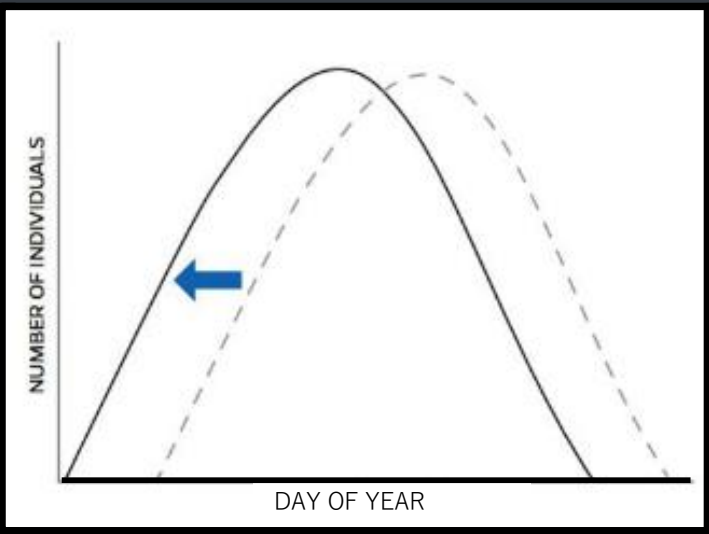
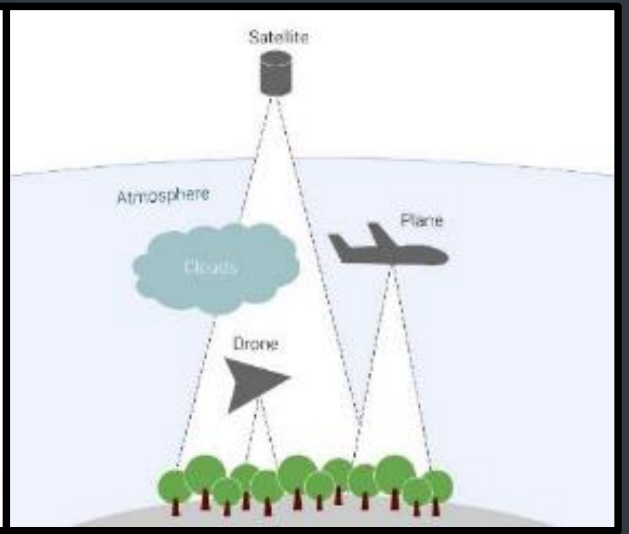
Scientific uses of USA-NPN data & products

>80 peer-reviewed publications







www.usanpn.org/publications

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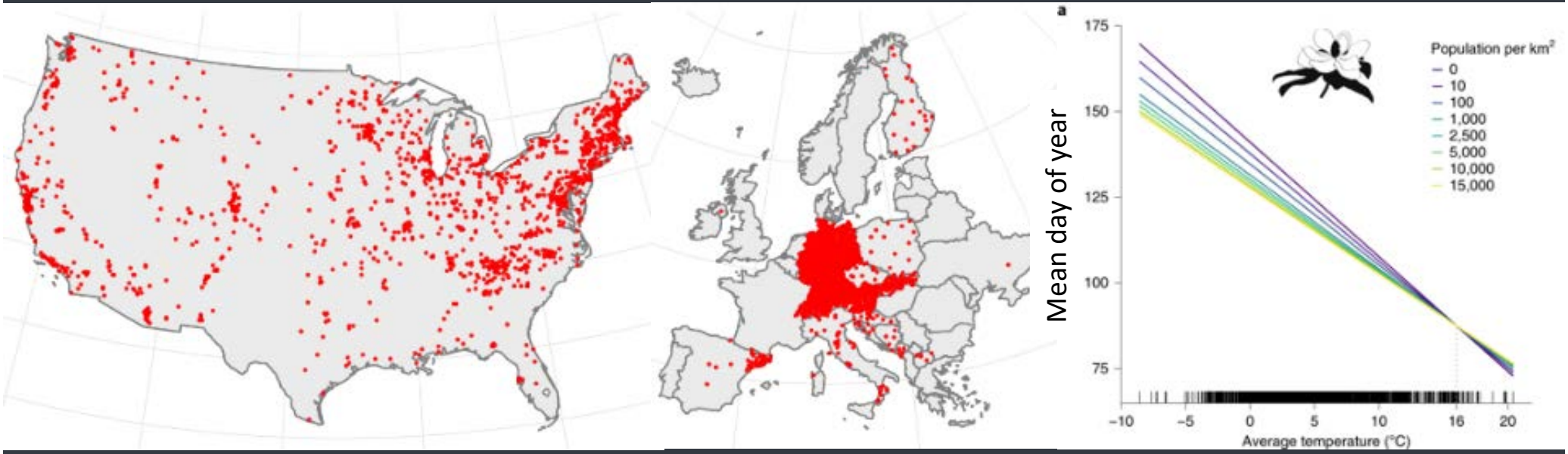
Understanding fundamental relationships



Li et al. 2019 *Nature Ecology & Evolution*

NSF-SAVI 1321595

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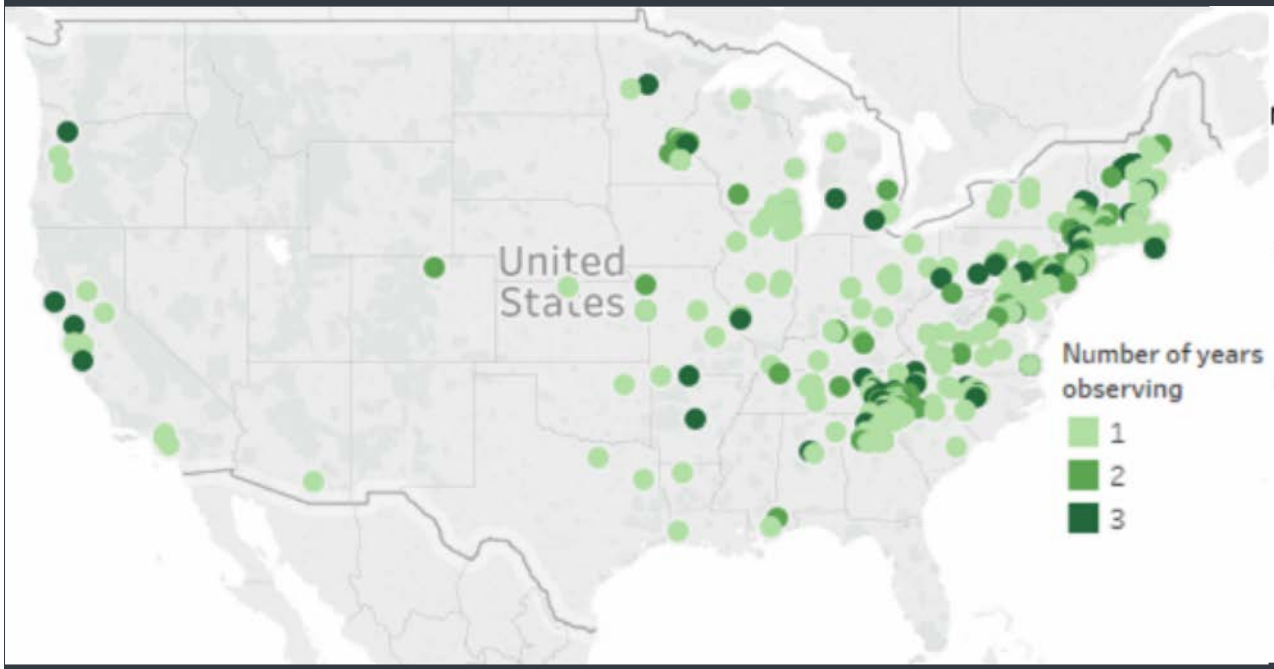
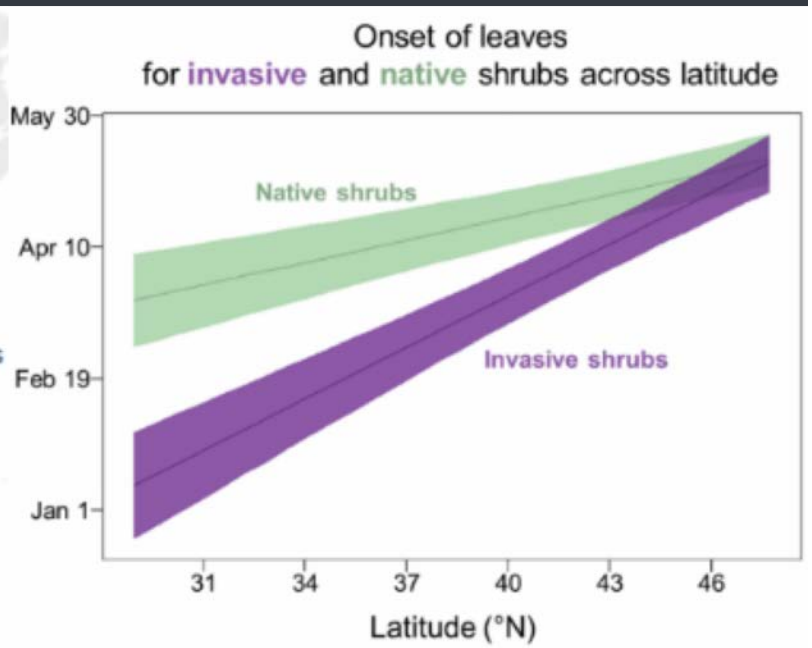
Disentangling relationships





Maynard-Bean et al., in review *Front Ecol Environ*

NSF DDIG-1701740

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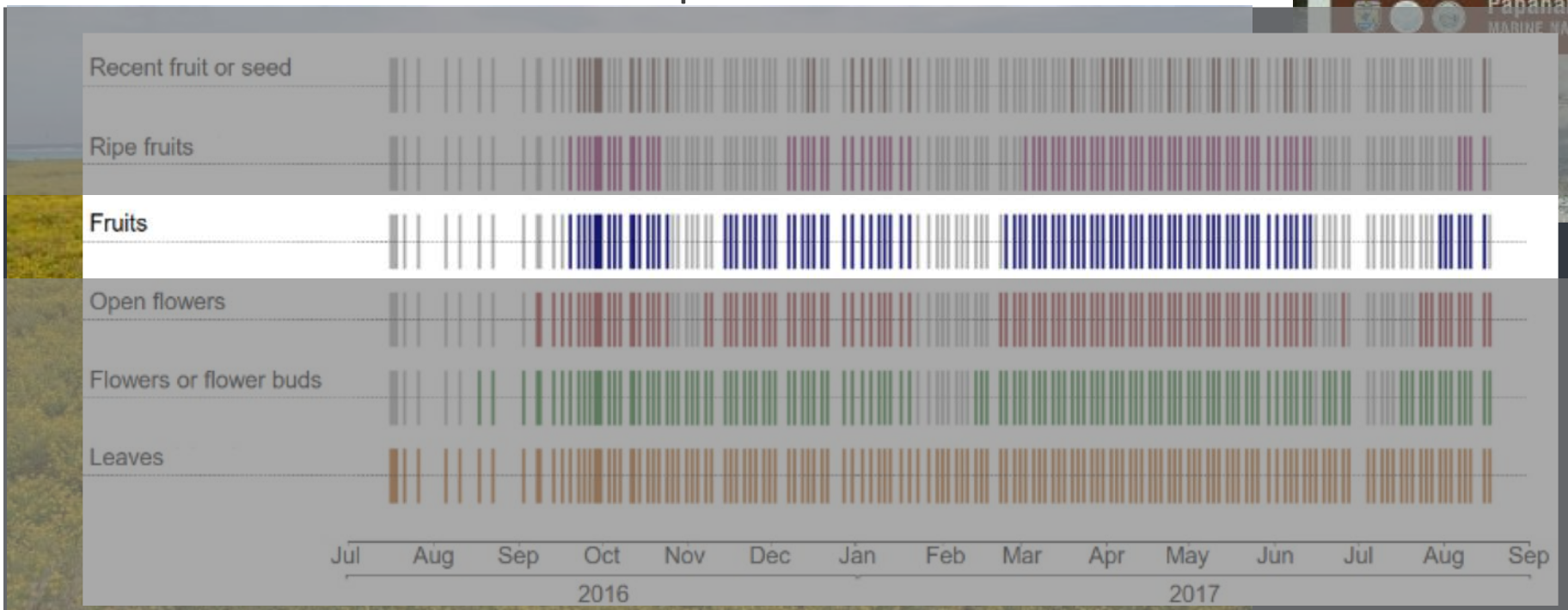
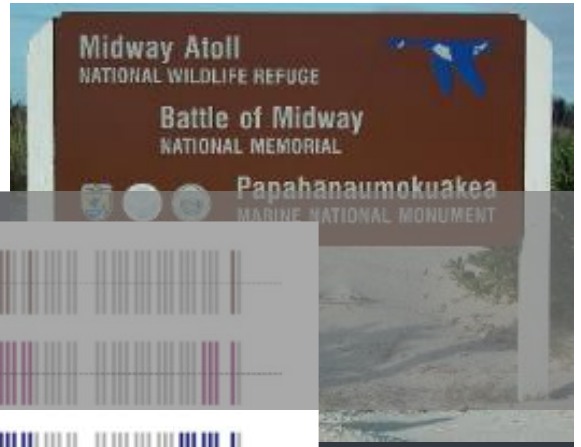
Partnering with USFWS:
When to treat invasive plants?





Taylor et al., in press,
Ecological Solutions and Evidence

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- Explore maps and forecasts
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Thank you!

Theresa Crimmins

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@TheresaCrimmins

and the entire USA-NPN team

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