



USA **nprn** 
National Phenology Network

2021 ANNUAL REPORT



USA-NPN 2021 Annual Report | FROM THE DIRECTOR

Greetings! I am filled with gratitude for all our supporters, partners, participants, and collaborators over the past year. You all have achieved amazing things using USA-NPN infrastructure, data, and resources. It is because of the efforts of this entire community that the USA-NPN continues to flourish.

In 2021, we bounced back from COVID-related impacts in a gratifying way, ending the year with more participants and more phenology records contributed than in any previous year! We highlight just a couple of the many ways the phenology data contributed through *Nature's Notebook* are increasingly relied upon in science and management applications in this report.

We are very grateful to the National Science Foundation for providing major support for the Network this year in the form of a “sustaining biological infrastructure” grant and to USDA NIFA for additional support. We also partnered with the USDA Climate Hubs and the Office of the Chief Economist to develop a Winter Wheat Development Forecast – our first agriculturally-aligned data product. We are increasingly partnering to support phenology-aligned research questions. Please reach out if you have interests along these lines!

Lastly, I’m honored to share that our team was awarded the “Enduring Achievement Award” from the Center for Advancing Research in Society in 2021. This award is a clear reflection of the synergy between our team and all our wonderful partners; thank you. Here’s to more great things in 2022!

Warmly,



Theresa Crimmins
Director, USA National Phenology Network



USA-NPN 2021 Annual Report | BY THE NUMBERS

3,640

Active
Nature's Notebook
Observers
22,460 all time



3.8 M

Phenology
Records
28.1 M all time

1

Data products
released
96 all time



17

Publications using
contemporary
data, models, data
products
116 all time

171

Active Local
Phenology Programs
440 all time



24

Local Phenology
Leaders Certified
168 all time

USA-NPN 2021 Annual Report | ADVANCING SCIENCE

The USA-NPN offers data, models, tools, and resources that lead to advances in understanding of patterns and drivers to plant and animal phenology.

Understanding how changing climate conditions are impacting individual species is key to supporting adaptation planning. Rare species are frequently excluded from large-scale phenology modeling and forecasting efforts due to data limitations, restricting managers' ability to plan for the future.

Researchers at The Morton Arboretum, the University of Chicago, and the University of California Davis Arboretum & Public Garden sought to establish predictive models for several rare species of oak (*Quercus*). Models constructed using observations of budburst and leaf-out collected on The Morton Arboretum property combined with observations contributed by *Nature's Notebook* observers across the country showed improved performance over site-specific models for all species. This study demonstrates how *Nature's Notebook* observations can be combined with living collections data to improve predictions for species of conservation concern across their ranges.



"The scale of citizen science observations from the USA-NPN allowed us to gain a better understanding of species that are otherwise too rare or inaccessible to observe. These data provide a powerful tool for information on the conservation, preservation, and protection of rare and at-risk species."

— Lucien Fitzpatrick, The Morton Arboretum, lead author

Fitzpatrick et al. 2021, <https://doi.org/10.1016/j.ecochg.2021.100032>,

Photo Credit: (left) Andrew Hipp, (right) Brendon Reidy



USA-NPN 2021 Annual Report | INFORMING DECISIONS

The USA-NPN provides relevant, timely phenological information to support decision-making in a wide range of applications based on needs expressed by various user groups.

Effective invasive plant management often depends on timing herbicides or other treatments at the right point in a plant's life cycle. But for many invasive species there is not enough information about the timing of these events and how they are linked to climate drivers like temperature.

In collaboration with researchers at the University of Minnesota (UMN), the USA-NPN launched the Pesky Plant Trackers *Nature's Notebook* campaign in 2019 to collect phenology data on wild parsnip, Japanese knotweed, and Bohemian knotweed. As of 2021, 126 observers had collected data on 375 plants across the Midwest and Northeast. With these data, UMN researchers will determine temperature sensitivity of these species and then create predictions of when plants will undergo seasonal activity to help schedule removal and herbicide treatments, enabling managers to more effectively treat these species across the region.



"The efficiency and efficacy of wild parsnip and knotweed management will be improved with detailed information about when to treat infestations at their specific locations."

— Monika Chandler, Minnesota Department of Agriculture

This UMN research is supported by The Minnesota Invasive Terrestrial Plants and Pest Center through the Minnesota Environment and Natural Resources Trust Fund, Photo Credit: Abigail Anderson



USA-NPN 2021 Annual Report | COMMUNICATING & CONNECTING

The USA-NPN supports a greater understanding and appreciation for phenology among all inhabitants of the country.

Since 2018, Indiana Phenology has been working to document phenological change in all 92 counties of Indiana while deepening Hoosiers' connection to their environment. They engage observers of all ages through three parallel programs:

- Indiana Backyard Observers engage individuals and families in tracking plants and animals where they work, live or play.
- Indiana Schoolyard Phenology engages students in the scientific process through outdoor observations on school grounds.
- Indiana Phenology Trail helps partners create their own observation programs to encourage stewardship in public spaces.

In 2021, they reached 200 people through their programming and collected data at nearly 50 sites across 26 counties of Indiana. These stellar achievements earned Indiana the USA-NPN's 2020 PhenoChampion Award.



"Observing phenology is an accessible way to engage with nature, no matter your age. There's always more to see, learn, and understand. I love watching people make new connections to the places they live when they look more closely at the cycles of nature around them."

— Amanda Wanlass, Executive Director, Indiana Phenology



Photo Credit: Amanda Wanlass

USA-NPN 2021 Annual Report | GROWING AN EQUITABLE & INCLUSIVE NETWORK

The USA-NPN listens to diverse stakeholders, leading to a stronger network and an improved understanding and application of phenological information. The benefits of USA-NPN programs, tools, products and partnerships accrue to people from all backgrounds reflected in the US population.

Increasing equity and inclusion in *Nature's Notebook* is a key part of advancing our goal to build an inclusive network. Since 2017, the USA-NPN has partnered with organizations in Tucson, AZ to better understand how people from underrepresented backgrounds participate in nature-based programming, with an eye to better serving diverse interests. "Re-evaluating Representation," led by University of Arizona Master's student Sehdia Mansaray and published in 2021, shares the findings of the effort and charts a course forward.

This work is revealing the structures that prevent equitable access, investing in people and relationships, and working in partnership. We know that we will only make meaningful changes in collaboration with our partners and invite you to join us!



The [Underrepresented Audiences Project] working group seeks to deliver professional development and guidance on using cultural humility to design better programs, which results in a safe space for all to enjoy outdoor experiences."

—Sehdia Mansaray, *Re-evaluating Representation*

A student makes observations during an event co-hosted by Ironwood Tree Experience and Mission Garden in Tucson, AZ in 2016, Photo Credit: Brian F Powell

