



2019

Annual Report

Taking the Pulse of Our Planet

The USA National Phenology Network serves science and society by promoting a broad understanding of plant and animal phenology and its relationship with environmental change.

LETTER FROM THE DIRECTOR

Greetings! I hope 2019 brought all good things to you and yours. At the USA-NPN, we are starting a new season, both literally and in terms of leadership. After 12 years as the director of the USA National Phenology Network, Jake Weltzin has taken a new role at the US Geological Survey as the Acting Senior Science Advisor for its Ecosystems Mission Area. Though USGS remains committed to supporting the Network, leadership and direction has been transferred to the University of Arizona. And, I'm honored to serve as the new director for the Network. It's an exciting new role for me to play in this organization I've been a part of for over a decade. I look forward to working with the entire Network to continue to support management, advance science, and communicate broadly and inclusively about the value of phenology!



We have much to share from the past year. On the science front, we pushed further into the realm of ecological forecasting, expanding our suite of Pheno Forecast maps to encompass 12 insect pests and an invasive plant, buffelgrass (see facing page). These maps, driven by stakeholder requests, clearly demonstrate how we develop and deliver phenology information products tailored to end-users' needs. Along similar lines, we released our first suite of Land Surface Phenology data products—maps depicting the progression of greenness over the course of the season as seen from satellites.

Our data, models, and products continue to support scientific advances. In 2019, 12 peer-reviewed manuscripts were published using USA-NPN data or products, bringing the total since our inception to nearly 80 papers. We anticipate this number to grow more rapidly now that the plant phenology records collected at National Ecological Observatory Network (NEON) sites are being ingested into the National Phenology Database we curate, including 2.5 million records imported in December.

Enthusiasm and participation in *Nature's Notebook* continues to grow as well. Midway through the year, we launched the Observer Certification Course, a series of self-paced online learning modules. Several hundred participants promptly completed the course—a testament to the dedication of *Nature's Notebook* observers! We also released a completely redesigned mobile app and hosted our first clinic for Local Phenology Leaders. And, we were delighted that our program and two of our star observers were featured in the PBS Nature production, *American Spring LIVE!*

Finally, we undertook a major effort to update our Strategic Plan in 2019. As a part of this long-range planning, we identified core values that define our team and our aims: Inclusion, Dedication, and Innovation. We also acknowledged the very real and important aim of explicitly growing and nurturing a diverse network. Read more about our plans and commitments to these values on pages 5 and 6 of this report.

Thank you for your continued support as we learn, grow, and diversify. I'm excited to work with you to tackle new challenges and opportunities in this new phase of our journey!

A handwritten signature in black ink that reads "Theresa M. Crimmins".

Theresa M. Crimmins
Director

The logo for "American Spring LIVE". It features the words "American Spring" in a cursive font, with a yellow bird icon above the word "Spring". Below "Spring" is the word "LIVE" in a bold, sans-serif font.



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.

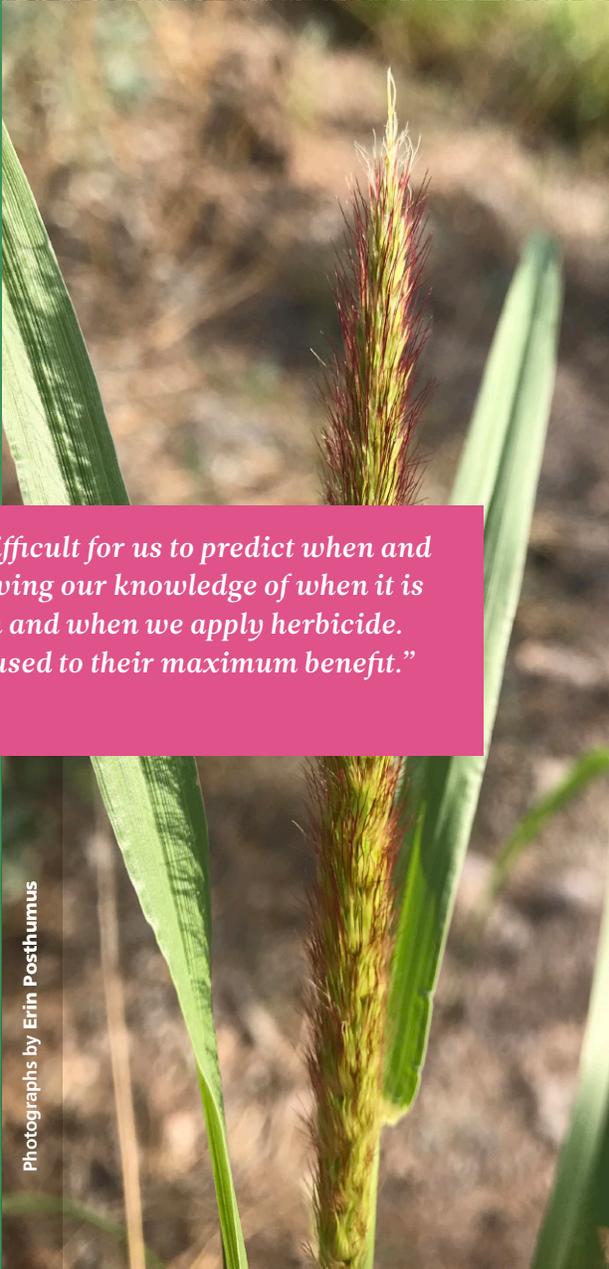
Short-term forecasts of ecological phenomena can greatly enhance planning and management activities. These products offer the most value when they are developed in collaboration with managers and stakeholders dealing with a problem in the field.

Together with scientists and stakeholders representing a range of state and federal agencies, the USA-NPN developed short-term forecasts of green-up in buffelgrass (*Pennisetum ciliare*), an invasive grass dramatically impacting the Sonoran Desert. Controlling the growth and spread of this plant is best accomplished through herbicide applications when the grass greens up following summer monsoon rains. These maps supported managers in prioritizing locations to scout for and treat green buffelgrass.

Stakeholders expressed strong satisfaction with the product development process as well as an interest in supporting product refinement in 2020.

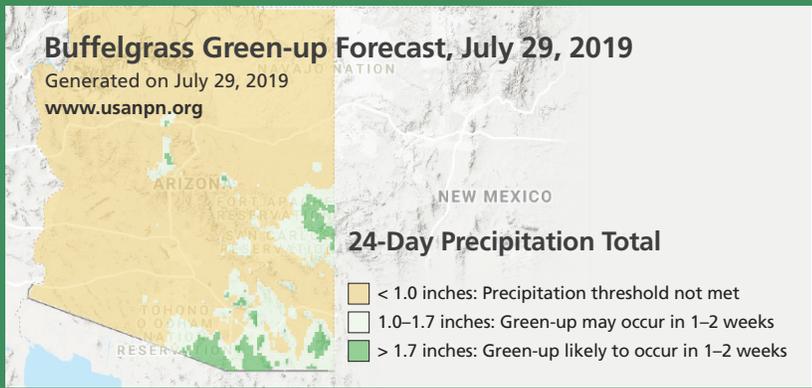
These maps are one of several Pheno Forecasts offered by the USA-NPN to support planning and management.

Learn more: www.usanpn.org/data/forecasts/buffelgrass



“The localized nature of our rainstorms during monsoon make it difficult for us to predict when and where buffelgrass will green up, and likewise brown down. Improving our knowledge of when it is green will allow us to be more efficient and effective when we plan and when we apply herbicide. Better greenness maps will make sure that our scarce dollars are used to their maximum benefit.”

Perry Grissom, Restoration Ecologist, Saguaro National Park



Photographs by Erin Posthumus

ADVANCING SCIENCE

Urban heat islands are developed areas that are noticeably warmer than surrounding rural areas, especially in summer and winter seasons. The warmer urban temperatures have been shown

to advance the timing of leaf out and flowering in highly developed areas. However, a recent study spanning multiple continents and evaluating over 22 million data points revealed some surprising findings.

A research team based at the University of Florida analyzed records of plant phenology contributed to *Nature's Notebook* with similar data collected across Europe. A key finding from this analysis encompassing 136 species of plants was that leaf-out and flowering occurred earlier in urban areas than in rural areas in cool climates—but this pattern did not hold for warm climates. For example, in New York, a state characterized by cold winters, leaf-out occurs approximately nine days earlier in urban areas than in surrounding rural areas. In contrast, leaf-out in urban areas of Florida is occurring about a day later than in nearby undeveloped areas.

The USA-NPN offers data, models, tools, and resources that lead to advances in understanding of patterns and drivers to plant and animal phenology. A deeper understanding supports and improves decisions related to the environment and human health.

An enhanced understanding of factors affecting phenology can improve our ability to anticipate future changes. This research is an example of the discoveries that are taking place using phenology observations and data products offered by the USA-NPN.

Li, D., B.J. Stuckey, J. Deck, B. Baiser, and R.P. Guralnick. 2019. The effect of urbanization on plant phenology depends on regional temperature. *Nature Ecology & Evolution*. DOI: [10.1038/s41559-019-1004-1](https://doi.org/10.1038/s41559-019-1004-1).

“Our study would not be possible without the extensive data provided by USA-NPN. USA-NPN can continue to inform us about how environmental change is impacting timing of phenological events.”

Daijiang Li
University of Florida

COMMUNICATING AND CONNECTING



Photograph by Dylan Jennings, GLIFWC

Youth at the Sokaogon Mole Lake community show some of their freshly harvested manoomin (wild rice), a main staple for many Ojibwe communities.

The USA-NPN endeavors to understand partners' needs for phenological information through frequent, regular engagement and careful listening. Likewise, the USA-NPN supports a greater understanding and appreciation for phenology among the general public, scientists, and natural resource managers.

A diversity of voices and worldviews shaping the USA-NPN will result in a stronger network and a more complete understanding of phenological change. The USA-NPN seeks representation and understanding from both western and indigenous approaches, valuing relationship-building, bridging among cultures, and amplifying indigenous voices throughout the Network.

Tracking the timing of seasonal events in plants and animals has long been appreciated by indigenous cultures. The USA-NPN aims to learn from and benefit these communities through establishing and growing relationships. As a part of the collaborative Indigenous Phenology Network, the USA-NPN is prioritizing climate resilience for indigenous communities, intergenerational transfer of knowledge and appropriate use of the tools of Western science.

“I really like the holistic, deliberate way the Tribal Adaptation Menu approaches climate adaptation by integrating cultural and spiritual resiliency, not just adaptation strategies based on changing physical parameters.”

Tribal Adaptation Menu workshop participant

The recently published, award-winning Tribal Adaptation Menu, created by tribal, academic, intertribal and government entities in the Great Lakes region is a key resource for understanding how Western and Indigenous approaches can be integrated for climate adaptation. The Menu mentions *Nature's Notebook* as a strategy for engaging community members in documenting changes in seasonal events to support climate change adaptation.

Several Tribal Adaptation Menu authors are part of the Indigenous Phenology Network and are USA-NPN partners. Individuals representing these organizations are working collaboratively to practice respectful observation and reciprocity and ensure data sovereignty in phenology observation efforts.

Indigenous Phenology Network: www.usanpn.org/nn/indigenous-phenology-network

Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin. tinyurl.com/s4ptjkh



Arizona Master Naturalists, the USA National Phenology Network, and the Arizona Association for Environmental Education are working together to better understand the diverse ways people experience the outdoors. The team is using storytelling, community outreach, and a #HowINature social media campaign to create curriculum and programming representative of the Tucson community.

CREATING AN **EQUITABLE** AND **INCLUSIVE** NETWORK

This past year, our team identified the need for an increased awareness and formal commitment to diversity, inclusiveness, and equity in our actions, partners, the communities we serve, and our team. Together, we identified core values of inclusion, dedication, and innovation. Further, we explicitly incorporated these commitments throughout our goals in an update to our 5-year Strategic Plan.

COMMITMENTS

To foster an equitable and inclusive network, the USA-NPN will:

- Assess and address organizational practices that may foster or hinder diversity, equity and inclusion, including office norms, hiring norms, and staff development. We will seek expert assistance on these topics.
- Collaborate with like-minded organizations to advance diversity, equity and inclusion in the fields in which we operate, including citizen science, ecology, natural resources.
- Place emphasis on meeting new audiences in their spaces; attend meetings to listen, learn, and build relationships.
- Develop an online presence and tools that are accessible to multiple audiences, in terms of abilities and languages.



Photographs by Brian Forbes Powell

AIM

The diverse stakeholder voices shaping the USA-NPN lead 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.

PHENOCHAMPION AWARD

The USA-NPN Local Phenology Program *PhenoChampion Award* recognizes outstanding achievements by Local Phenology Programs (LPPs). The award program is open to any LPP that actively and consistently collected observational data using *Nature's Notebook* over the previous two years. Winners are selected based on a clear program plan and demonstrated impact toward short-, medium-, and long-term goals.

In 2019, this honor was awarded to the Oregon Season Trackers for exemplary efforts establishing and maintaining volunteer observer activity across the state of Oregon.

Learn more: www.usanpn.org/nn/PhenoChamp-Award



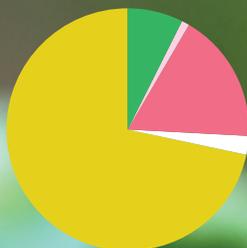
Oregon State University
Extension Service



SOURCES

Base funds for operations were provided by the US Geological Survey. The USA National Phenology Network gratefully acknowledges additional support from University of Arizona, US Fish and Wildlife Service, National Science Foundation, and National Aeronautics and Space Administration.

 USGS Ecosystems Mission Area	\$717,158
 USGS Southwest Climate Adaptation Science Center	\$25,000
 US Fish and Wildlife Service	\$174,354
 National Science Foundation	\$10,383
 National Aeronautics and Space Administration	\$73,866
TOTAL SOURCES	\$1,000,761



THANK YOU

Our success stems from the many partners and individuals who have helped to build our Network by creating and maintaining long-term monitoring phenology programs, consistently collecting high-quality data, and conducting innovative research using USA-NPN data and data products.

Thank you for being part of our Network.

Our Sponsors



USA-NPN National Coordinating Office Staff

Theresa Crimmins, *Director*

LoriAnne Barnett, *Education Coordinator*

Ellen Denny, *Monitoring Design & Data Coordinator*

Kathy Gerst, *Data Product Coordinator*

Lee Marsh, *IT Coordinator*

Stuart Marsh, *Planning and Administration*

Sharon Oliver, *Administrative Associate*

Erin Posthumus, *Outreach Coordinator and US Fish & Wildlife Service Liaison*

Reilly Rodriguez, *Student Administrative Associate*

Alyssa Rosemartin, *Partner and Application Specialist*

Sara Schaffer, *Participant Services Specialist*

Jeff Switzer, *Systems Analyst*

Kevin Wong, *Application Systems Analyst/Developer*

Jake F. Weltzin, *Former Executive Director; Ecologist, United States Geological Survey*

facebook.com/USANPN
@USANPN
@TheresaCrimmins
@LoriAnneBarnett
youtube.com/USANPN1



USA National Phenology Network | National Coordinating Office
1311 E 4th Street, Suite 325 | Tucson, Arizona 85721 | usanpn.org

VISION

Providing data and information on the timing of seasonal events in plants and animals to ensure the well-being of humans, ecosystems, and natural resources.

MISSION

The USA-NPN collects, organizes, and shares phenological data and information to aid decision-making, scientific discovery, and a broader understanding of phenology from a diversity of perspectives.

VALUES

INCLUSION  DEDICATION  INNOVATION

CALL TO ACTION

Explore the millions of records of plant and animal seasonal activity with our Visualization Tool! Find out how early spring arrived in your neighborhood, view patterns in leafing and flowering of plants, and make your own discoveries about birds, insects, and other animals. data.usanpn.org/vis-tool/

Watch two videos that came out in the past year:



bit.ly/USANPN-Video



bit.ly/NaturesNotebook-Video

Cover photographs: left by Luckypic; middle by Brian Forbes Powell; right by Leon Justice.