

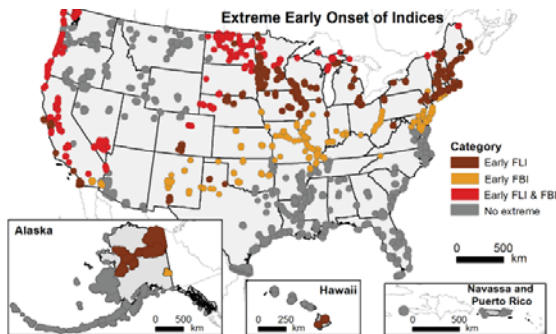
US Fish and Wildlife Service and the USA National Phenology Network

Helping the US Fish and Wildlife Service Achieve Its Mission

Understanding the seasonal cycles of plants and animals, how they are changing, and how they can inform management, operations, and interpretation is critical to the mission of the US Fish and Wildlife Service (FWS): to work with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. Phenology monitoring is particularly relevant to the management of national wildlife refuges.

Improving Resource Management

Observations of phenology describe key aspects of ecological variability, and serve as indicators of climate change impacts on refuge ecosystems. Phenology is an internationally recognized essential biodiversity variable that aids in understanding species interactions, water availability, carbon cycling, and disturbances such as fire and pest outbreaks—the temporal component of nearly all ecosystem functions.

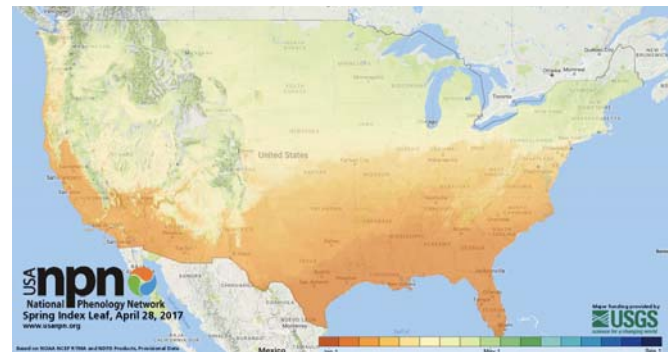


Spring is advancing in 3 out of 4 national wildlife refuges studied, and is now arriving extremely early (exceeding 95% of historical conditions) in 50% of refuges. The USA National Phenology Network provides essential monitoring and research to help refuge managers anticipate and respond to these early spring conditions.¹

Phenology information provided by the USA National Phenology Network (USA-NPN) informs almost all typical refuge resource management practices—e.g., the management of fish and wildlife populations, invasive species, wildfire risk, and water resources—as well as planning activities, such as identifying vulnerable species, anticipating future conditions, and developing annual work plans.

Informing Refuge Planning and Operations

Changes in phenology and lengthening growing seasons influence many basic aspects of managing wildlife refuges, including timing of peak visitation, the timing of staffing and facility needs, and strategies for managing water and landscaped areas. The USA-NPN provides phenology information that is essential for intelligent planning of future refuge staffing, budgeting, and operations.



The USA-NPN has developed short-term springcasts that use weather data to forecast the onset of spring across the country. USA-NPN data are also used in models of longer-term changes in phenology. These forecasts provide essential tools for planning resource management and other parts of refuge operations.²

Engaging the Public in Science

Phenology is one of the best ways to engage people of all ages in science. Day visitors, school groups, volunteers, and local community members can all contribute observations and learn about how park ecosystems are changing. By participating in phenology

citizen science and associated programming, volunteers can improve their science literacy and become better stewards.

Robust Standards and Information Management

The USA-NPN relies on peer-reviewed, published protocols that maximize information content and flexibility of data for analysis. The USA-NPN also provides robust information management tools and data products that are peer-reviewed and compliant with federal information policy, ensuring data quality, discovery, accessibility, reuse, and long-term curation. USA-NPN infrastructure complies with the Privacy Act and Paperwork Reduction Act (OMB Control #: 1028-0103).

Cost-Effective Information

The USA-NPN provides roughly \$232,000 worth of information directly for Refuges each year at a minimal cost. USA-NPN protocols are used by scientists and citizen science volunteers around the country, resulting in a broader value of \$2.8 M worth of data that can be leveraged by FWS for landscape and national-scale inference. The number of USA-NPN-informed publications and data products increase each year.³

USA-NPN in National Wildlife Refuges

- Nearly 200,000 phenology records have been collected on national wildlife refuges.
- 175 species are monitored on national wildlife refuges, including migrant birds such as Sandhill Cranes and Swainson’s Hawks, wildlife forage species such as quaking aspen and diamondleaf willow, and keystone forest species such as cottonwood and maple.
- 80% of refuges report they are meeting their science and outreach goals for phenology.

On-the-Ground Examples

Midway Atoll National Wildlife Refuge used phenology monitoring to determine the best time to treat invasive *Verbesina encelioides*. They are now using the data to time herbicide treatments to occur before seeds reach maturity to limit spread of this damaging invasive plant.

Data from a phenology trail established in Valle de Oro National Wildlife Refuge have informed the timing of restoration activities to promote the establishment of native plants and to inhibit the spread of invasive plants.⁴



Kupu AmeriCorps intern Wieteke Holthuijzen monitors golden crownbeard (*Verbesina encelioides*) at Midway Atoll NWR, Photo credit: Ann Humphrey, USFWS

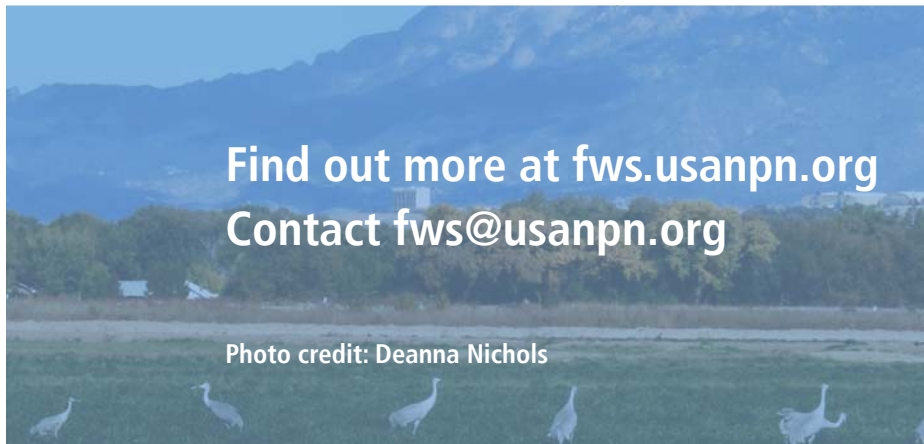
The US Fish & Wildlife Service is seeking to better understand where and when nectar sources are available for endangered lesser long-nosed bats (*Leptonycteris yerbabuenae*) while they are in southern Arizona raising their young. Volunteer observers are tracking the timing of food availability over the course of the summer and fall seasons using *Nature’s Notebook*.⁵

Plans for the Future

The USA-NPN will continue improving phenology tools that refuges can adopt to meet their goals of resource management, education, and operations. The USA-NPN will work with FWS to enable phenology data comparison between refuges and their surrounding landscapes. The network will also continue to cultivate and grow the community of researchers, managers, and educators exploring links between phenology, management, and learning that will help the FWS achieve its mission.

References

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Find out more at fws.usanpn.org
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