Dear Friend of the USA National Phenology Network:

Greetings! It is with great pride and excitement that I summarize 2013. This year was an important year for the USA National Phenology Network, with several milestones met or surpassed.

First, this was an exceptional year for the production of high-profile publications that used data or data products collected and curated by the Network. Six peer-reviewed publications, in such top-notch journals as Global Change Biology and Geophysical Research Letters, used our data for applications ranging from refining models of carbon dynamics in the arctic to forecasting timing of leaf-out in the eastern deciduous forest over the next century. As a scientist, I am proud to see this “proof in the pudding”: good data produce good publications.

Second, we got organized on regional and national-scale data collection campaigns (see page 9) focused on a small set of key species. In response, participants in Nature’s Notebook submitted over 1 million phenological observation records on these and other species.

Third, we experienced significant growth in partnering organizations, especially those engaging local members or volunteers in tracking phenology. We rolled out the concept of a “phenology trail” as a framework for connecting organizations with similar interests—from science to resource management to education and outreach.

On the boring but important side, we also revamped our strategic plan this year, clarifying three areas of emphasis for the next 5 years: advance science, inform decisions, and communicate and educate. You will see that we’ve organized this report to follow these main programmatic emphases.

Sincerely,

Jake F. Weltzin
Executive Director

Changes in timing of phenology inform “a globally coherent fingerprint of climate change impacts across natural systems.”

PARMESAN AND YOHE, NATURE, 2003
The USA National Phenology Network (USA-NPN) serves science and society by promoting a broad understanding of plant and animal phenology and its relationship with environmental change. The USA-NPN is you. The Network consists of a National Coordinating Office (NCO), an Advisory Committee, and many partners, including research scientists, resource managers, educators, volunteers, and policy-makers. Anyone participating in our flagship phenology monitoring program Nature’s Notebook, supporting the program, using the data, or interacting with the Network is part of the USA-NPN.
I’m a Texas Master Naturalist doing Nature’s Notebook. I enjoy it. I find that it gets me out to observe the flora & fauna in my yard more. So often I think I don’t have time, but now I consider it a commitment, so I make the time. It’s quite an interesting project.

LINDA B. LANOUE | TREASURER, MID-COAST CHAPTER | TEXAS MASTER NATURALIST, INC.
Advance Science

Through a regional effort encompassing seven national parks, participants in the California Phenology Project have collected nearly half a million phenology records on 30 iconic or ecologically important plant species since 2011. This rich data resource is revealing fundamental relationships between environmental conditions and plant phenology.

The basic relationships that are being revealed are not always consistent across species. For example, following cooler and drier winter conditions, silky beach pea (*Lathyrus littoralis*) and California buckeye (*Aesculus californica*) flower relatively earlier, whereas mountain pride (*Penstemon newberryi*) fruits relatively later. Elevation also plays a key role in the timing of plant flowering: plants at higher elevations tended to flower later than individuals of the same species at lower elevations.

This project also yielded important information about the frequency of monitoring needed to capture patterns and trends. Researchers analyzing these data determined that twice-weekly monitoring was of sufficiently high resolution to detect the effects of local climate on the onset of targeted phenophases.

Learn more: www.usanpn.org/cpp.

California buckeye (*Aesculus californica*) flowers earlier at lower elevations. In 2013, plants at the Santa Monica National Recreation Area at 600 m first flowered in early April, while plants at 900 m flowered in early May.

Following cool, dry winter conditions, California buckeye (*Aesculus californica*) flowers earlier, whereas the phenology of mountain pride (*Penstemon newberryi*) is delayed.
The USA-NPN aims to develop and distribute phenological information to inform human land use, risk management, and natural resource conservation and management decisions in increasingly variable climates and changing environments.

Inform Decisions

Governmental agencies like the US Fish & Wildlife Service face challenges to conserve, protect, and enhance wildlife, plants, and habitats under changing climate conditions. The USA National Phenology Network and the USFWS Inventory and Monitoring Program are partnering to monitor plant and animal phenology to better understand and plan for the ecological consequences of climate change across the National Wildlife Refuge System.

Valle de Oro National Wildlife Refuge, located in Albuquerque, New Mexico, was established in 2012 as the first urban refuge in the Southwest. With the central objectives of community outreach and ecological restoration, refuge staff and volunteers are using Nature’s Notebook to engage community groups and refuge visitors in collecting phenology observations. Data recorded in Nature’s Notebook will be used to track the effects of climate change as well as measure the change in habitat quality as the refuge is restored from agricultural fields to wetlands and riparian habitats. Valle de Oro NWR will serve as a model of how tracking phenology can accomplish both management and outreach objectives for refuges across the nation.

Learn more: www.usanpn.org/fws
Communicate and Educate

Non-formal educators collect data and develop curriculum for use at one of the Tucson Phenology Trail sites.

The USA–NPN aims to improve public understanding of science and environmental change to build public support for science and proactive adaptation to environmental change.

Actively observing phenology leads to a heightened awareness of daily and seasonal changes and can lead to further inquiry and understanding. We aim to improve public understanding of phenology and environmental change through a program that contributes high-quality observations to a valuable data resource.

Phenology trails are networks of Nature’s Notebook observation sites and are a key mechanism for engaging members of the public in observing plants and animals. Typically established and maintained by independent organizations such as parks, nature centers, and arboreta, these sites make observation accessible to individuals not yet part of Nature’s Notebook. Using phenology observation as a means for engaging members of the community, such trails can serve to build connections between organizations with similar missions.

The Tucson Phenology Trail is comprised of Nature’s Notebook sites that have been established at ten organizations in southeastern Arizona. Since its creation in 2011, 778 individuals have attended local workshops and 26 trained docents lead regular educational activities along the trail. Following this model, phenology trails are under development along the Appalachian Trail and the Arizona Trail; in Albuquerque, New Mexico; Denver, Colorado; Phoenix, Arizona, and other locales across the country.

Covering over 75 miles from start to finish, the Tucson Phenology Trail offers observation experiences in a wide variety of settings. Phenology observations are used to engage the community in scientific discovery and inform partnering organizations’ management decisions.
To generate phenology data sets of sufficient depth and breadth to advance science and inform decisions, the USA National Phenology Network ran six data collection campaigns in 2013.

Two of these, PopClock and the New England Leaf Out Project, were in partnership with universities to address climate change research questions. Another campaign, the Juniper Pollen Project, resulted in observations used to verify predictions of pollen spread and to inform public health alerts. The remaining three campaigns increased observations on species to support the development of USA-NPN data products.

2013 *Nature’s Notebook* campaigns

- Cloned Plants (cloned lilacs and dogwoods)
- Common lilacs and flowering dogwoods
- Green Wave: Maples, Oaks, and Poplars
- PopClock
- New England Leaf Out Project
- Juniper Pollen Project

Join us! Sign up for a 2014 campaign at www.nn.usanpn.org!
Resources for FY 2013

Base funding for operations is provided primarily by US Geological Survey. The USA National Phenology Network gratefully acknowledges the additional following sponsoring organizations: University of Arizona, University of Wisconsin-Milwaukee, The Wildlife Society, US National Park Service, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, National Science Foundation, Oak Ridge National Laboratory, and US Fish and Wildlife Service.

Our financial reporting follows the Federal fiscal year. The Network’s constituent entities may have different fiscal years and reporting formats; each organization—and agreements between organizations for the Network’s activities—provide for fiscal responsibility and accountability.

### Sources

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Connect with nature, learn and contribute to scientific discovery by observing phenology.

I got interested in participating in something called “citizen science,” and specifically, a forest phenology program...You actually get to know the trees like they're part of your family. This may sound silly, but you notice them as they progress through the season, see whether anything is affecting them, whether or not some pest has appeared, which would be obvious from what you’re observing. It’s a great opportunity to be in the outdoors and contributing to science.”

JIM, VOLUNTEER, THE NEW YORK BOTANICAL GARDEN
Thank You

Our success is your success: thank you.

Partnerships are the heart of the USA-NPN, and participants are critical to Nature’s Notebook. Together, we work to collect, store, and share phenology data and information. We are truly grateful for the support we receive, in its many forms, from our partners, participants, sponsors, and friends.

Our Sponsors

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Lili Gama—page 11 (bottom center and right)