

Phenology Monitoring On Refuges: Canaan Valley National Wildlife Refuge

The USA-NPN/Refuge Partnership: A commitment to science-based management

Best management practices and refuge goals are driven by science; a thorough understanding of the biological, as well as ecological, needs of natural resources is key to effective resource management. One component of this understanding is phenology, the study of naturally occurring lifecycle events. If land managers are interested in removing invasive plants before they begin to reproduce, phenology can be used to find the best time to increase removal efforts. If naturalists are interested in knowing when particular bird species will be present in a region, phenology can help them plan their visit accordingly.

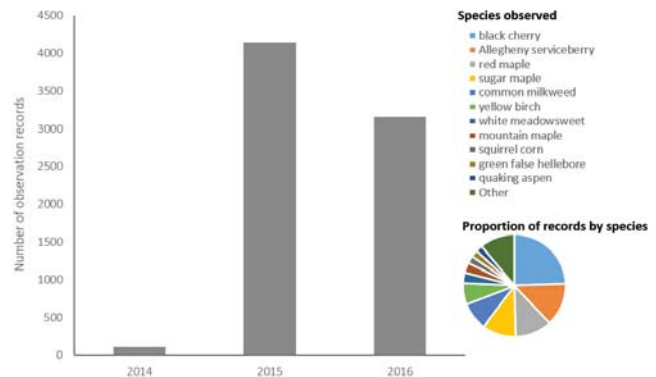
The US Fish & Wildlife Service's National Wildlife Refuge System has partnered with the USA National Phenology Network (USA-NPN) to document changes in phenology across the Refuge System. Refuges utilize the USA-NPN's scientifically-vetted, species-specific monitoring protocols, data management infrastructure, and data visualization tools to make comparisons in plant and animal phenology across refuges and surrounding areas. Since 2009, refuge staff and citizen scientist volunteers have collected over 170,000 observations on focal plants and animals at 22 refuges.



Phenology monitoring volunteers at Canaan Valley NWR are responsible for tracking plants at their own individual sites around the Refuge. Volunteers have input on which species they monitor at their sites, and feel a great sense of ownership of tracking these plants.

Nature's Notebook at Canaan Valley National Wildlife Refuge

In 2014, Canaan Valley National Wildlife Refuge began using *Nature's Notebook* to document the phenology of native plant species. Seven volunteers and two Fish & Wildlife Service staff have collected 7,400 observation records on 29 species at 16 sites on the Refuge.

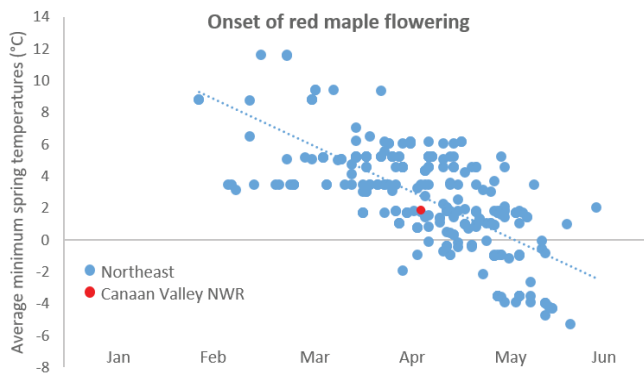


Studying phenology of plants in a unique high-elevation wetlands

Canaan Valley sits at over 3,000 feet above sea level, nestled in a valley that hosts species that typically occur at higher latitudes such as Maine and Canada. By monitoring the life cycle events of these species, Refuge staff will better understand the environmental drivers of phenology for these species in Valley and how this compares to drivers in the rest of the species' range. Plants in temperate regions generally respond to climatic cues such as temperature to leaf out, flower, and fruit. By looking at data collected through *Nature's Notebook* from across the region, we can see how the timing of these events in plants at Canaan Valley NWR compares to plants across the larger landscape.

Red maple (*Acer rubrum*) is a focal species for Canaan Valley NWR, as it serves as important habitat for a variety of wildlife species. When we compare the onset of flowering in red maples across the Northeastern U.S. to the average minimum spring temperatures (March, April, and May) at the same locations in

2009-2015, we see a relationship between warmer temperatures in the Northeast region and earlier flowering onset for the red maple. After additional years of observations, it will be possible to compare onset dates at Canaan Valley NWR to the rest of the Northeast U.S.

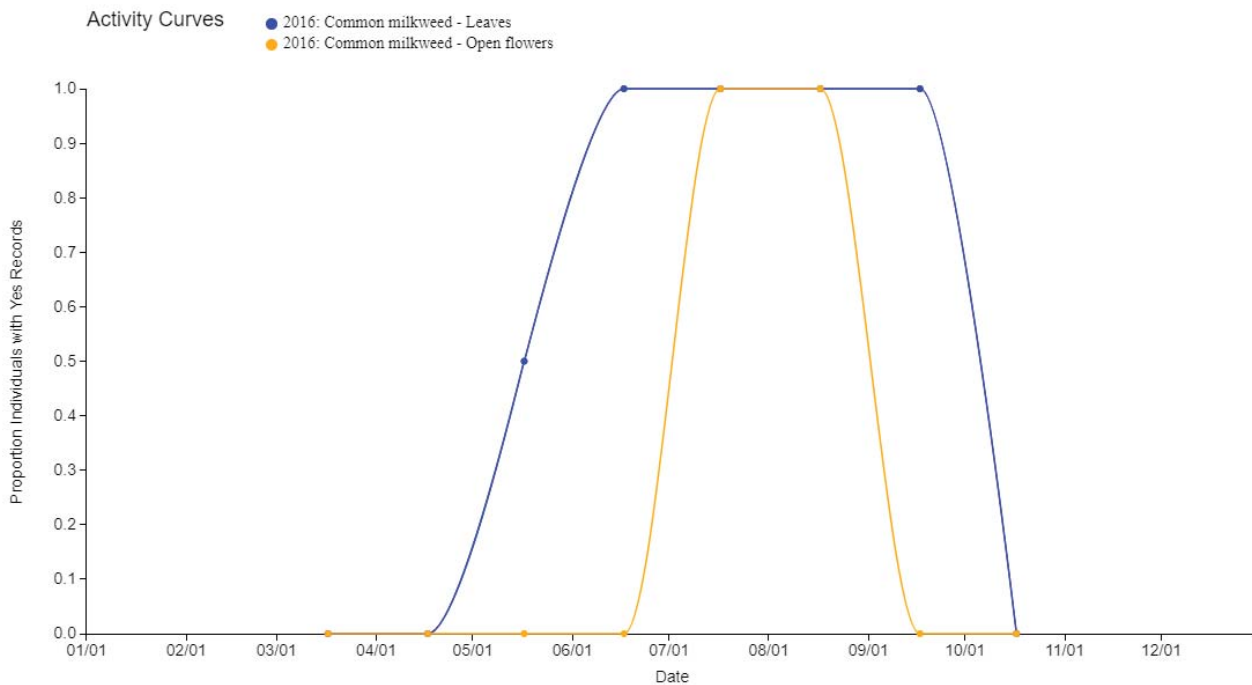


The common milkweed (*Asclepias syriaca*) is an important food source for caterpillars of the monarch butterfly and is also used by adult butterflies for nectar. Canaan Valley NWR supports the ongoing efforts of the USFWS to plant and monitor milkweed to benefit the monarch butterfly, whose numbers have decreased in

recent years. Canaan Valley NWR staff are interested in tracking the phenology of milkweed to optimize the timing of planting and seed collection activities.

The graph below shows that in 2016, observers at Canaan Valley NWR recorded leaves on common milkweed beginning in April, with a peak in the proportion of individual plants with leaves occurring between June and October. Open flowers peaked between July and September. By recording multiple years of data on this species, we can see whether the timing of milkweed phenology changes over time, and whether these phenophases are in sync with activity of the monarch.

Understanding how climate and phenology are interacting across the U.S. and around refuges is vital to natural resource management. *Nature's Notebook* provides an opportunity for refuges to involve staff and volunteers in science, as well as provides a framework to answer questions about climate impacts. With continued observations, *Nature's Notebook* can be implemented as a tool for community engagement and for tracking large-scale ecological changes, one observation at a time.



USA National Phenology Network, www.usanpn.org



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