

Phenology Monitoring On Refuges: Valle de Oro National Wildlife Refuge

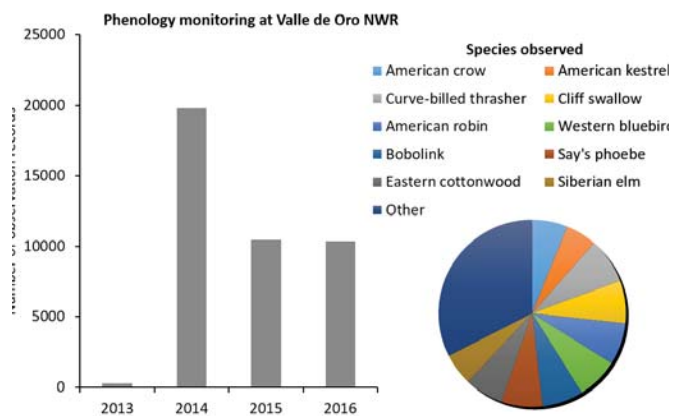
The USA-NPN/Refuge Partnership: A commitment to science-based management

Best management practices and refuge goals are driven by science; a thorough understanding of the functioning of ecological systems is key to effective resource management. One component of this understanding is phenology, the study of naturally occurring life cycle events of plants and animals. 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 is partnering 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.



Valle de Oro NWR demonstrates how refuges can use *Nature's Notebook* to establish a phenological baseline to track the impact of changes in climate and refuge restoration efforts, in addition to using *Nature's Notebook* as a tool for community involvement. Tallie Segel, Rio Grande Phenology Trail Coordinator, noted that, "[at] Valle de Oro NWR, we use *Nature's Notebook* as a community engagement tool—extending volunteer and citizen science opportunities beyond the physical boundaries of the refuge into the community and throughout the watershed."



Nature's Notebook at Valle de Oro National Wildlife Refuge

In 2013, Valle de Oro National Wildlife Refuge (VdO) began collecting *Nature's Notebook* observations as an USA-NPN pilot project within the National Wildlife Refuge System. VdO is located seven miles south of Albuquerque, adjacent to the Rio Grande. Plans are underway to restore VdO's approximately 500 acres of agricultural lands to upland, wetland, and riparian habitats. VdO is using *Nature's Notebook* to establish baseline information

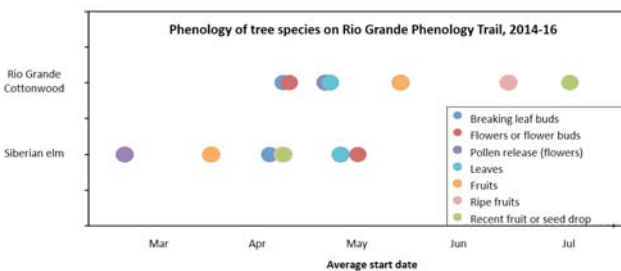
about phenology of species of interest, which will allow staff and volunteers to observe the ecological impacts of different restoration strategies. Observations are now being used by the Refuge to time restoration activities and inform visitors about what species they will encounter during different times of the year.

Phenology monitoring efforts at Valle de Oro spearheaded the Rio Grande Phenology Trail, a collaborative effort between the Refuge, botanical gardens, schools, conservation areas, and the Bosque Ecosystem Monitoring Program with the goal of collecting information on how phenology is changing across the Middle Rio Grande watershed. The Trail partners seek to collect data that can be compared across observation sites, and to engage local community members as well as student groups in citizen science. Since 2013, volunteers and staff across the Trail have collected 40,884 observations on thirty-nine different species.

Using Valle de Oro *Nature's Notebook* observations to establish an ecological baseline

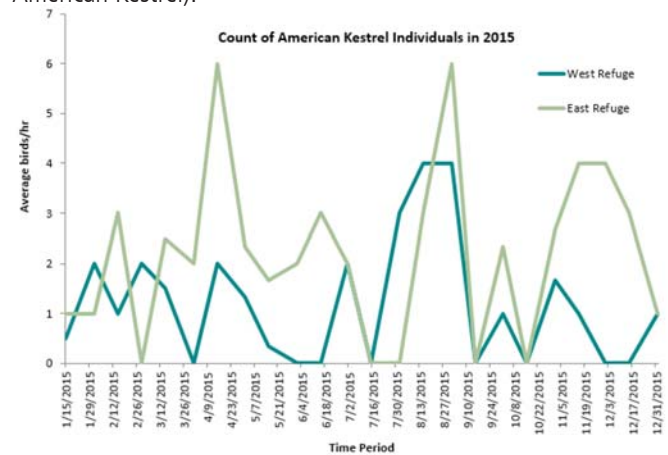
For refuges just starting phenology observations, establishing a baseline of plant and animal presence and activity is an important first step. Each new observation contributes toward understanding how local plants and animals are behaving.

At Valle de Oro, observations are being used both to establish general start dates for flowering and fruiting in plants, and to determine when particular animal species are present on the refuge. The figure below shows the average onset dates for seven different phenophases for the Rio Grande cottonwood (*Populus deltoidss* var. *wislizenii*) and Siberian elm (*Ulmus pumila*) from across the Rio Grande Phenology Trail.



The Rio Grande cottonwood is an important bosque (riparian forest) tree that provides shelter and food for local animals. Cottonwood recruitment is important for habitat restoration. Siberian elm is an invasive species that the Refuge wants to minimize across the Refuge. Knowing when cottonwoods and elm drop ripe seeds will help inform Refuge staff when to flood the wetlands and meadows to encourage germination of native cottonwoods while mimicking natural processes and saving time and money on tree planting.

VdO is divided into two sections: the East refuge, which is designated to become upland habitat, and the West refuge, which will be restored as bosque and seasonal wetlands. By observing these two sections, the Refuge is establishing a baseline to use for comparison after restoration takes place. The figure below shows the number of individuals of American Kestrel (*Falco sparverius*) observed on each section of the Refuge in 2015. Results such as these can be used to (1) compare presence and abundance of certain species on each side of the refuge once the restoration process begins and (2) inform visitors when they might see certain species on the refuge (e.g. all year around for the American Kestrel).



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.



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