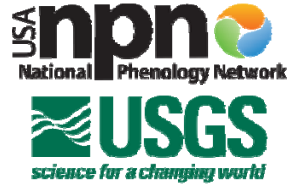


USFWS Phenology Network

A collaboration between the USFWS and the USA-NPN



Valle de Oro National Wildlife Refuge 2014-2015 Phenology Report

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USA National Phenology Network

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Valle de Oro National Wildlife Refuge 2014-2015 Phenology Report

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Introduction

The US Fish and Wildlife Service's Inventory and Monitoring Initiative (USFWS I&M) and the USA National Phenology Network (USA-NPN) have embarked upon a partnership to integrate phenology monitoring within the National Wildlife Refuge System. Phenology, or the study of the timing of recurring life cycle events in plants and animals and their relationship to the environment, is a leading indicator of species response to climate change. Goals for the collaborative project between the USFWS I&M Initiative and the USA-NPN include the utilization of phenology as a key indicator of change on Refuge lands, assisting Refuge managers with management decisions in the near and long-term, and integrating management and science with Visitor Services and Outreach programs in the more than 560 US Refuges.

Valle de Oro National Wildlife Refuge, established in Albuquerque, New Mexico by the Refuge System in September 2012, is the first urban wildlife refuge in the Southwest. Community outreach and ecological restoration are both central objectives of the refuge. In June of 2013, Valle de Oro was selected as the first pilot refuge to intentionally utilize phenology monitoring with *Nature's Notebook*.

Valle de Oro NWR staff established 3 data product needs for Valle de Oro that could be accomplished through phenology monitoring with *Nature's Notebook*:

1. Baseline information (richness, abundance) on a suite of focal bird species at Valle de Oro for Pre-Wetlands and Agricultural/grassland areas.
2. Baseline information on timing of phenological events in native Rio Grande cottonwood and invasive Siberian elm.
3. Information on how species richness, abundance, and the timing of phenological events changes in response to management activities (e.g. restoration) and climate change.

The scope of this annual report is limited to the activities and results of the phenology monitoring conducted at Valle de Oro from 2014-2015. The main objective of this report is to provide information on the amount of data collected (effort) and general patterns in phenological activity observed at Valle de Oro from January 2014 to December 2015, lessons learned, and recommendations for the future. Because this annual report presents two years of monitoring data, comparison between years and broad observations of possible relationships between phenology, temperature and precipitation are included.

Methods

Monitoring Locations, Sites, and Frequency

This section includes an overview of methods. For a complete project history and description, refer to the Valle de Oro NWR Project Summary and Lessons Learned (available at www.usanpn.org/fws/VdO). Major restoration work on the Refuge is scheduled to begin in late 2016/early 2017 to return the Refuge from its current alfalfa fields to riparian habitat. The western half of the refuge is slated to become seasonally-flooded wetlands, while the eastern half will be composed of agricultural demonstration plots and planted grasslands. In order to capture the 2 distinct areas on the Refuge, two plots were initially set up in each of the two halves of the Refuge to monitor a list of bird species (Table 1). These include two pre-wetlands plots on the western half, and two agricultural plots on the eastern half.

Table 1. List of focal bird species monitored in each of the four plots at Valle de Oro NWR

Focal bird species list

Common Name	Scientific Name
American crow	<i>Corvus brachyrhynchos</i>
American kestrel	<i>Falco sparverius</i>
American robin	<i>Turdus migratorius</i>
barn swallow	<i>Hirundo rustica</i>
bobolink	<i>Dolichonyx oryzivorus</i>
Canada goose	<i>Branta canadensis</i>
cliff swallow	<i>Petrochelidon pyrrhonota</i>
Cooper's hawk	<i>Accipiter cooperii</i>
curve-billed thrasher	<i>Toxostoma curvirostre</i>
great blue heron	<i>Ardea herodias</i>
sandhill crane	<i>Grus canadensis</i>
Say's phoebe	<i>Sayornis saya</i>
Swainson's hawk	<i>Buteo swainsoni</i>
western bluebird	<i>Sialia mexicana</i>

In December 2013, two sites were created that each included one Rio Grande cottonwood (*Populus deltoids wislizeni*). In March 2014, Siberian elm (*Ulmus pumila*) was added to the *Nature's Notebook* list of species for monitoring, and an individual Siberian elm tree was marked for observations at each cottonwood site.

In November 2014, a different sampling design was developed and implemented to better cover the area of the Refuge, while maintaining the comparison of the western half of the Refuge slated to become wetlands and the eastern half slated to remain as grasslands and agricultural demonstration

areas. The second design included two driving transects, one on each half of the Refuge, as well as two optional walking transects, one on each half of the Refuge.

Data Summaries

For climate summaries, we downloaded monthly average temperature and total precipitation data for 2013-2014 from NOAA's National Climatic Data Center at <http://www.ncdc.noaa.gov>. This website also provided 30-year normal data, available at <http://www.ncdc.noaa.gov/cdoweb/datatools/normals>. We used data from the weather station ALBUQUERQUE VLY, NM US, which is approximately 4 kilometers Northwest of the Refuge.

To document monitoring effort, we summarized the average and maximum days between visits for each month in 2014 and 2015. We also summarized the total number of visits, observation records, observers, sites monitored, animal species monitored, and individual plants monitored in 2014 and 2015. A detailed description of the study design and survey methods can be found in the [Valle de Oro National Wildlife Refuge Project Summary and Recommendations](#).

We used the USA-NPN's [Phenology Visualization Tool](#) to prepare bar graphs of species presence for the 14 focal bird species as well as Rio Grande cottonwood and Siberian elm. The trees are represented by 2 locations on the Refuge that each have one individual of each species.

We used Microsoft Excel to create graphs to show abundance of birds for each observation date in 2014 and 2015.

A comparison of pre- and post- restoration activities (as well as long-term effects of climate change) will require a knowledge of the baseline species richness and number of individuals of each species. We summarized observations of species richness and counts of individuals of each species by those made in the western half of the refuge and those made in the eastern half.

Results and Discussion

Annual Climate Summary

The winters (January-March) of 2014 and 2015 were warmer than the 30-year normal (Table 2), with below-normal precipitation in all winter months of 2014 and above-normal precipitation in January and February of 2015 (Table 3). There was not a strong trend in average temperature for the spring, summer, or fall seasons of 2014 and 2015 (Table 2). 2014 continued to have below-normal precipitation for all months except July and December, which saw above-normal precipitation. 2015 had above-normal precipitation for all months except March, June, and August (Table 3). Additional years of data are needed before looking for a connection between climate and plant and animal phenology.

Table 2. Temperature summary table for Albuquerque VLY, NM US weather station. Departure from 30-year normal is based on years 1981-2010.

	2014		2015	
	Ave Temp (F)	Departure from 30-yr Normal	Ave Temp (F)	Departure from 30-yr Normal
January	36.3	0.7	36.7	1.1
February	45.1	4.2	42.8	1.9
March	49.1	1.5	52.2	4.6
April	55.2	-0.2	56.1	0.7
May	62.6	-1.2	61.3	-2.5
June	74.7	2.4	76.1	3.8
July	77.7	1	75.9	-0.8
August	72.9	-2.4	76.8	1.5
September	70.3	2.5	71.6	3.8
October	59.5	3.6	60.4	4.7
November	43.5	-0.2	44.6	0.9
December	38.5	3	36.3	0.8

Table 3. Precipitation summary table for Albuquerque VLY, NM US weather station. Departure from 30-year normal is based on years 1981-2010.

	2014			2015		
	Total Precip. (in)	Departure from 30-yr Normal	Percent of 30-yr Normal	Total Precip. (in)	Departure from 30-yr Normal	Percent of 30-yr Normal
January	0.00	-0.46	0%	1	0.54	217%
February	0.23	-0.30	43%	0.56	0.03	106%
March	0.37	-0.30	55%	0.13	-0.54	19%
April	0.08	-0.54	13%	0.99	0.37	160%
May	0.48	-0.06	89%	1.68	1.14	311%

June	0.03	-0.55	5%	0.56	-0.02	97%
July	3.97	2.53	276%	3.52	2.08	244%
August	1.38	-0.34	80%	1.28	-0.44	74%
September	1.06	-0.19	85%	1.33	0.08	106%
October	0.33	-0.80	26%	1.21	0.09	108%
November	0.17	-0.47	27%	0.43	-0.21	67%
December	1.23	0.60	195%	1.14	0.51	181%

Monitoring Effort

Volunteers maintained average weekly monitoring for 40% of the months in 2014 and 33% of the months in 2015 (Table 4). Total number of visits decreased slightly from 2014 to 2015 (Table 5). The large decrease in number of observation records between 2014 and 2015 can be attributed to the change in survey methods, which cut the number of sites in half. The decrease in the number of observers from 2014 to 2015 can be attributed to the gradual attrition of the initial group of volunteers, which by the end of 2015 solidified into a small core group of volunteers who alternated in making weekly observations.

Table 4. Monitoring effort (visits) at all Valle de Oro NWR sites in 2014 and 2015.

# Days Between Visits					
2014	Average	Max	2015	Average	Max
January	5.2	8	January	10	14
February	7.5	9	February	5.6	7
March	5.6	9	March	5.8	10
April	14.5	15	April	8.5	13
May	9.333	14	May	7.25	8
June	12.333	19	June	9.333	12
July	7	7	July	27	27
August	7.6	12	August	11.666	15
September	9.666	13	September	9.333	14
October	14.666	24	October	6.8	9
November	9.5	12	November	11	13
December	9.333	11	December	18.5	22

Table 5. Total visits, observation records, observers, and sites, individual plants and animal species monitored at all Valle de Oro NWR sites in 2014 and 2015.

	2014	2015
Total visits	49	41

Total observation records	19,298	10,333
Total number of observers	15	9
Total number of sites monitored	8	4
Total number of animal species monitored	14	14
Total number of individual plants monitored	4	5

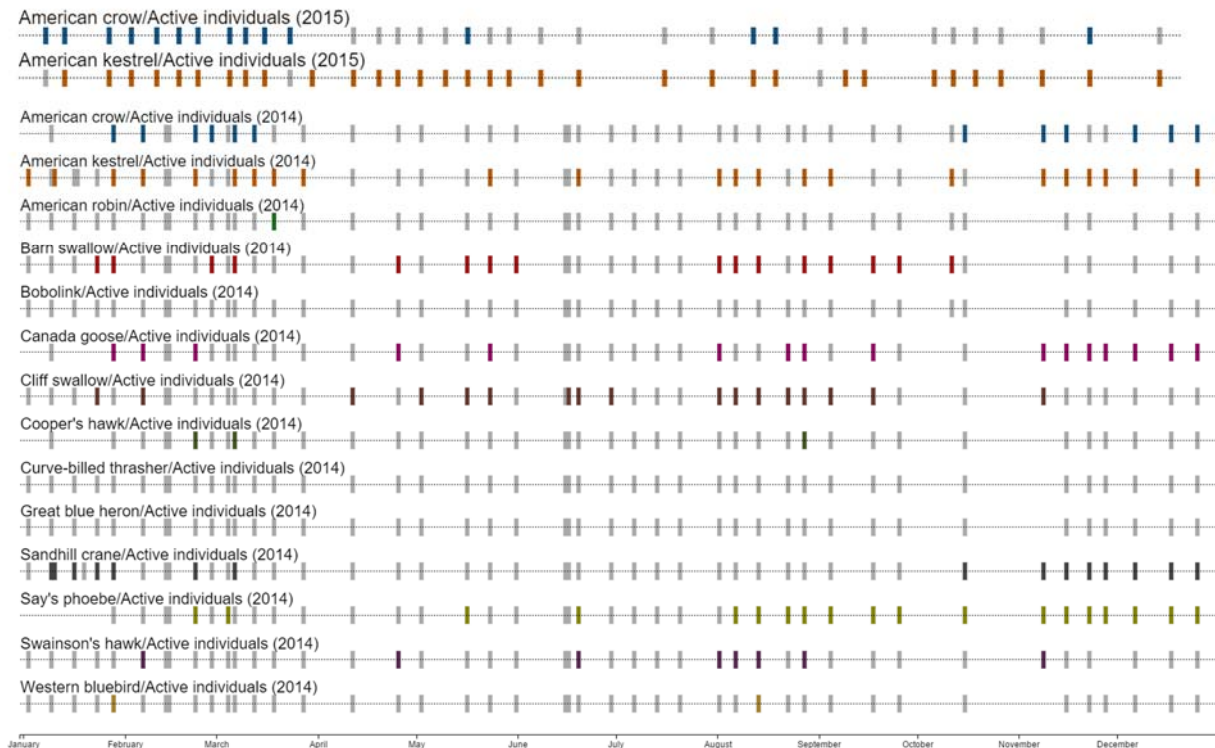
65% of visits in 2014 were made between the hours of 8 and 10am, 27% of visits were made between 4 and 6pm, and 8% of visits were made between 1 and 3pm during the month of July while monitoring was completed by the participants of the Youth Conservation Corps. 82% of visits in 2015 were made between the hours of 8 and 10am, with the remaining 18% of visits made between 4 and 6pm.

Of the 15 people who observed in 2013, 4 people also observed in 2015, in addition to 5 new people.

Phenophase Activity

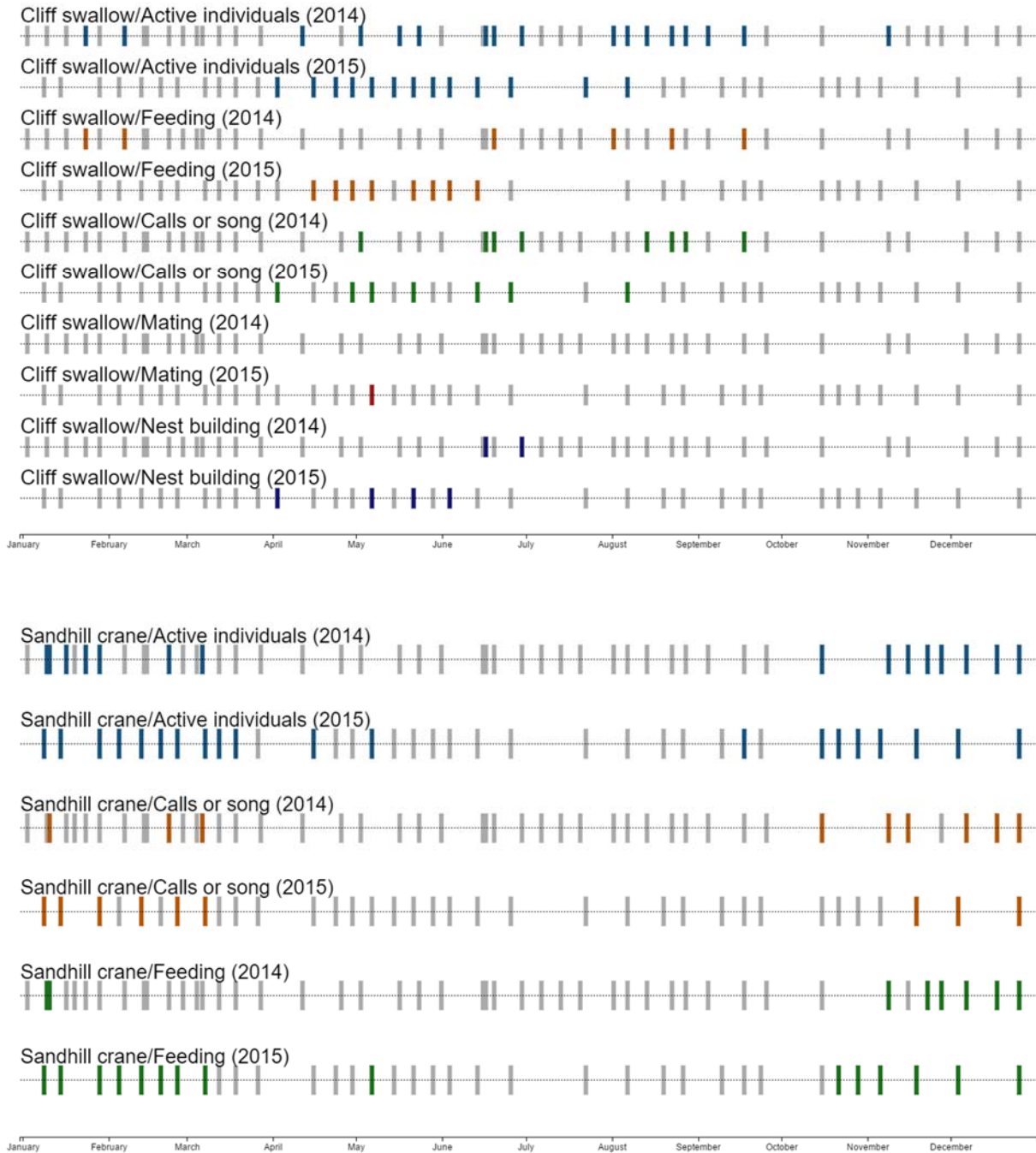
1. Baseline information (richness, abundance) on a suite of focal bird species at Valle de Oro for Pre-Wetlands and Agricultural/grassland areas.

On each observation visit, observers searched for 14 species on the Refuge. The phenophase “active individuals” represents an individual moving about or at rest. In the phenology calendars below, colored

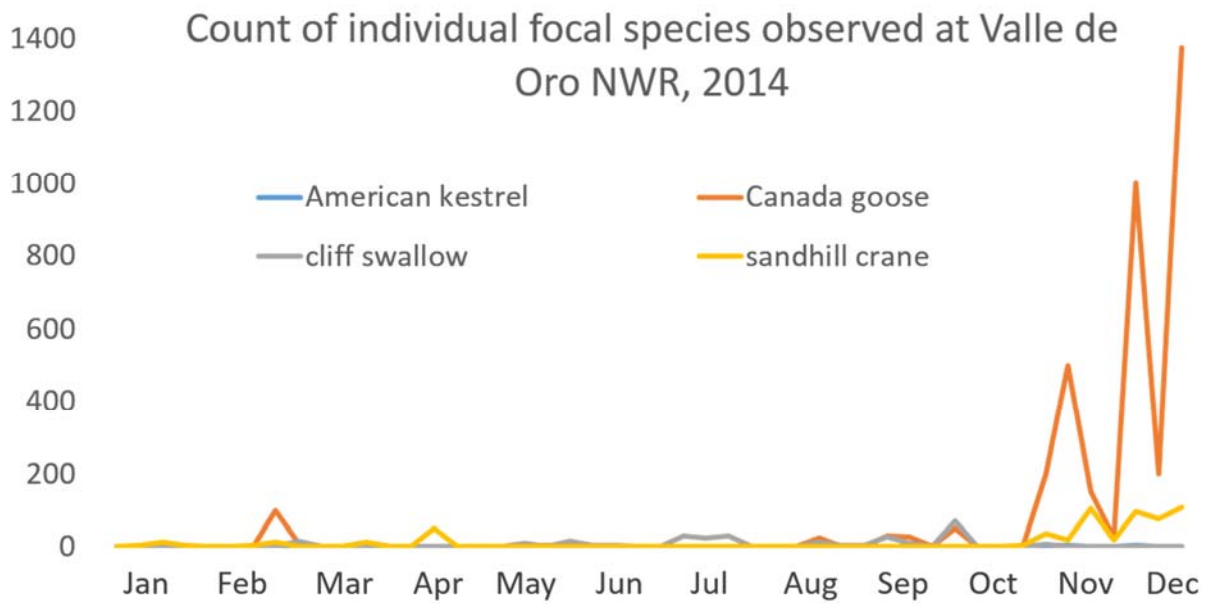


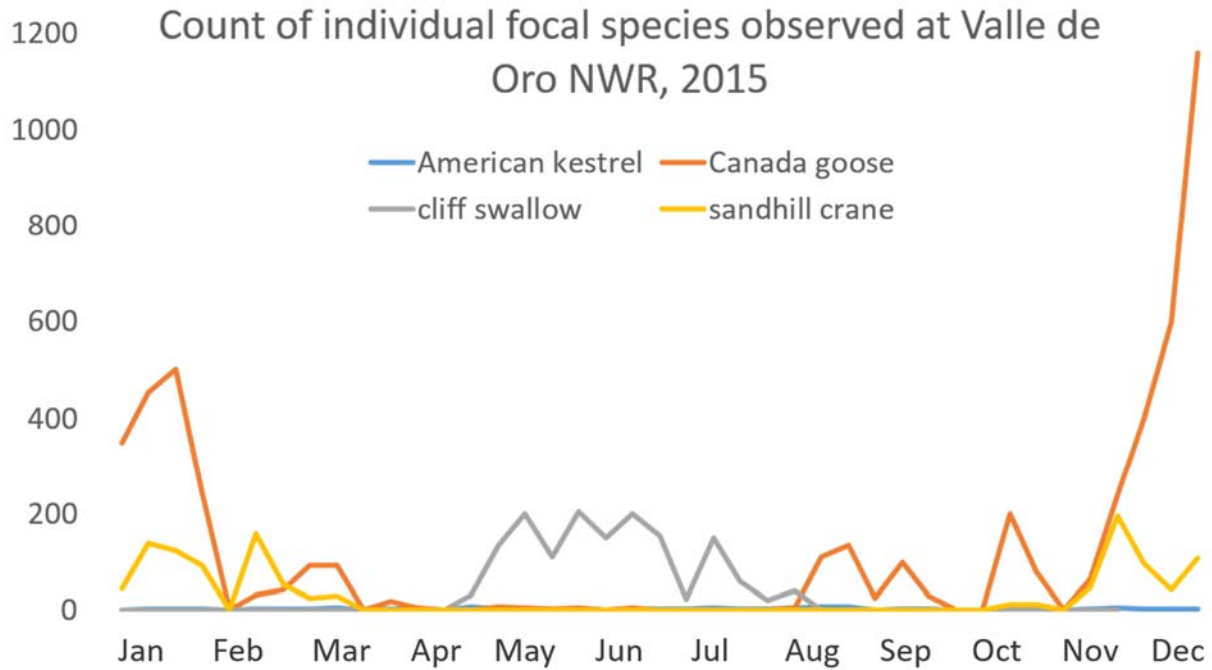
bars indicate when each species was observed on the Refuge. Gray bars indicate when the species was searched for but not located on the Refuge.

Additional phenophases were captured for each species, including feeding, calls or song, mating, and nesting building. The phenology calendar below shows the results of these phenophases for Cliff Swallow and Sandhill Cranes. Colored bars indicate when each phenophase was observed for that species on the Refuge. Gray bars indicate when the phenophase was searched for but not located on the Refuge.



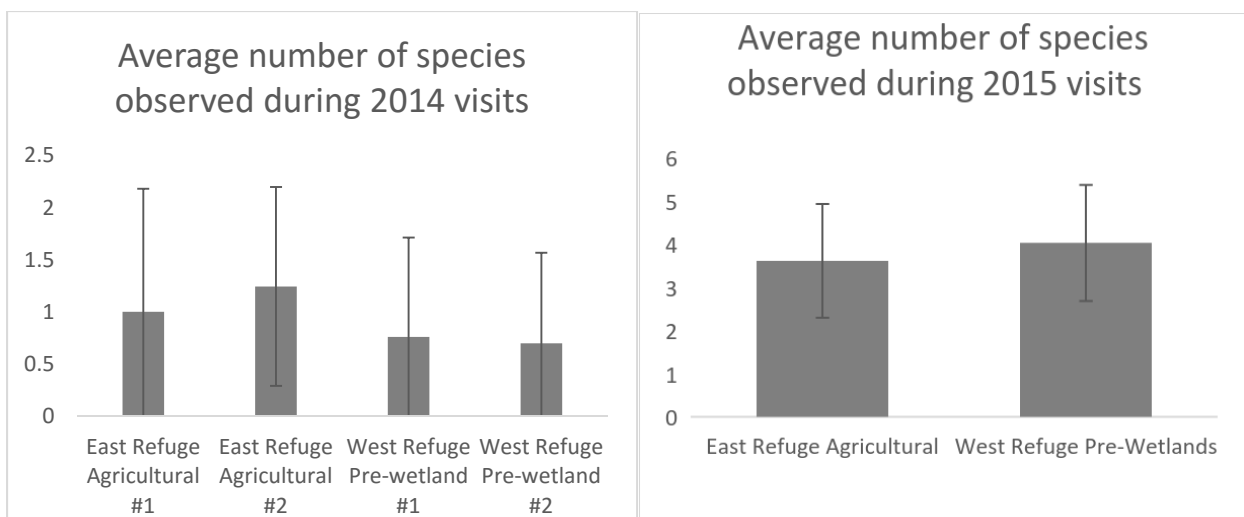
The list of focal species at Valle de Oro contains a mix of resident and migrant bird species. In addition to capturing the phenophases in the calendars above, the number of individuals observed in each of these phenophases is captured. The line charts below show the number of each of four individuals that were counted on each observation visit. American Kestrels are resident on the refuge, Canada Geese and Sandhill cranes visit the Refuge in winter, and Cliff Swallows visit the Refuge in summer.



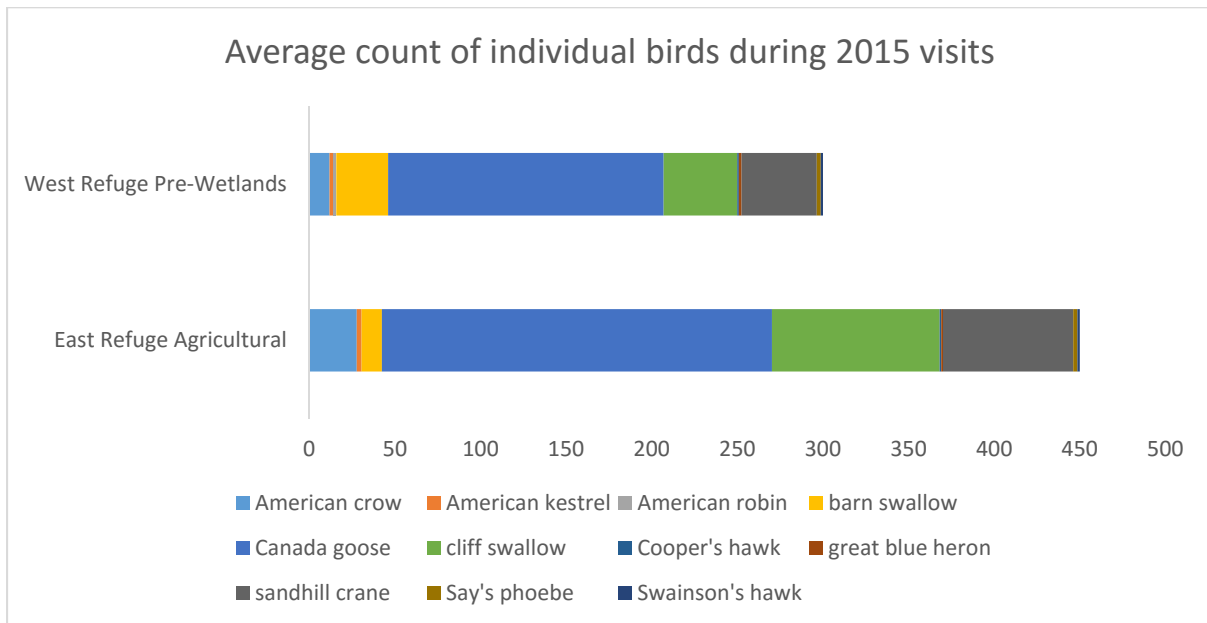
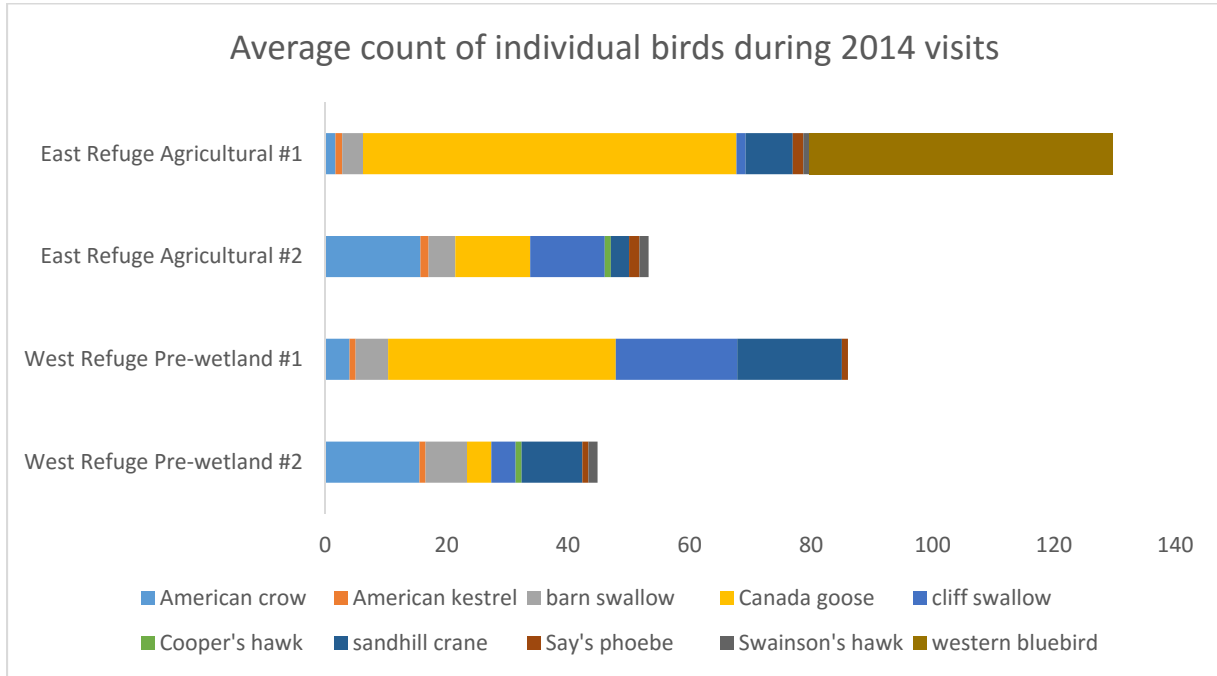


Comparison of western and eastern halves of Refuge:

We summarized observations of species richness and counts of individuals of each species by those made in the western half of the refuge and those made in the eastern half to see if there is any baseline difference between these two areas. In 2014, the average number of species was slightly higher in the eastern half of the Refuge than the west, although there was a high amount of variability between visits, indicated by the bars showing standard deviation for each area. In 2015, there was a not a large difference observed between the eastern and western halves of the Refuge.

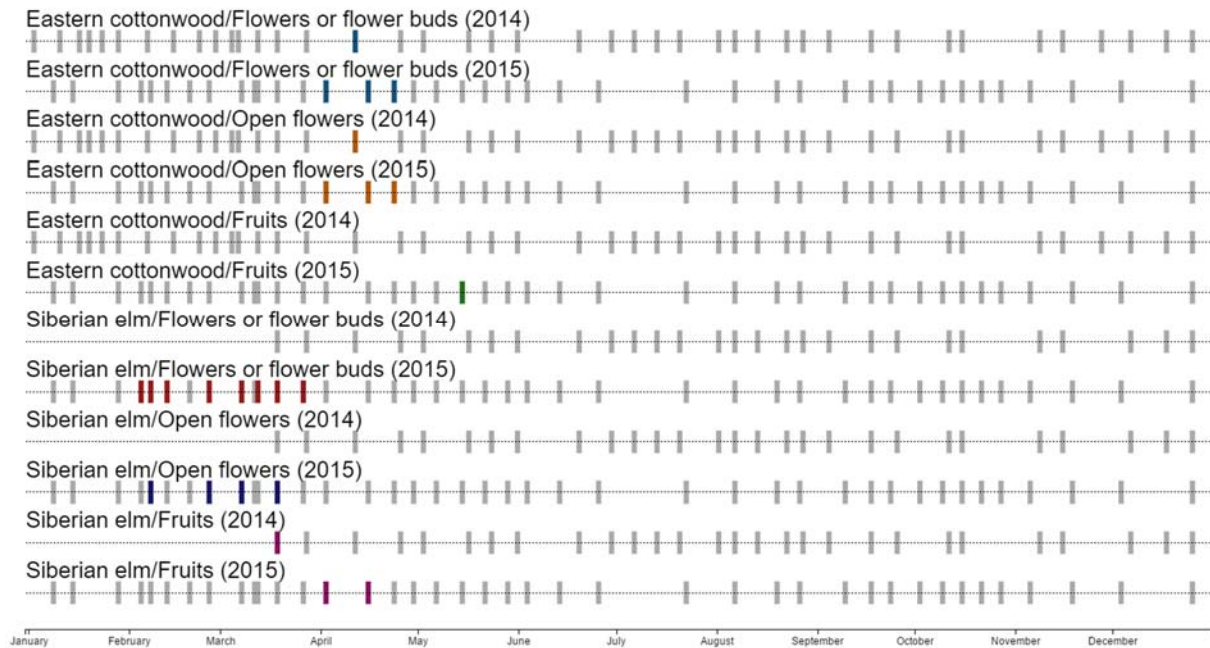


In 2014, the average count of individual birds was greatest in the Agricultural #1 plot. This corresponded to a greater count of individuals on the Agricultural half of the Refuge in 2015. The Refuge should keep these differences in mind once restoration activities begin, and note any changes in species richness or count of individuals of each species in the different areas of the Refuge.



2. Baseline information on timing of phenological events in native Rio Grande cottonwood and invasive Siberian elm.

The phenology calendar below shows the flowering and fruiting of native Rio Grande cottonwood and invasive Siberian elm at Valle de Oro NWR in 2014-2015. Siberian elm had flowers and fruits nearly a month early than cottonwood in both years. This information will be critical in determining the timing of restoration activities on the Refuge, so that managers can avoid spreading the seeds of invasive elm, while promoting the spread of native cottonwood.



3. Information on how species richness, abundance, and the timing of phenological events changes in response to management activities (e.g. restoration) and climate change.

As restoration activities begin on the Refuge in late 2016/early 2017, we will be able to compare the observations made prior and post restoration. The baseline data we are collecting over the years before restoration will allow us to know how species richness and abundance are changing. For example, the eastern half of the Refuge had a higher number of individual birds in both 2014 and 2015.

Long term data from the Refuge can also be analyzed with climate data from nearby weather stations to determine whether there are trends related to climate change.

Lessons Learned and Recommendations

While some observers expressed their lack of confidence in bird identification at the start of the project, nearly all of the core group of volunteers in 2015 were self-identified birders. These observers held special bird identification sessions for the other volunteers, helping them to improve their skills.

Several of the phenophases for the two trees were only documented during one visit of the year. An increase in frequency of observations during February, March and April would better pinpoint the start and end of fruiting and flowering for these species.

Visit frequency varied, and visits were made on a weekly basis for less than half of the year in 2014 and 2015. Increasing the number of volunteers would provide more people to rotate on the schedule, so that members of the core team do not need to make more than one visit per month. Visits were made in the morning more frequently in 2015 than in 2014, which is better for bird detection.

In July of 2014, monitoring was conducted by participants in the Youth Conservation Corps. These observers made their monitoring visits only during the early afternoon, as opposed to the morning or afternoon time slots during the rest of the year. These observers did not observe any birds during this time. Though volunteer schedules do not always allow morning visits, there should be a more concentrated effort to make visits only in the morning hours.

Education and Outreach

The refuge fulfills the goals of President Obama's America's Great Outdoors initiative to work with community partners to establish a 21st century conservation ethic and reconnect people, especially young people, to the natural world. The major outreach efforts for the Refuge are to communicate the ecological patterns and species responses observed to stakeholders and engage the general public in visitation of the urban Refuge. The Refuge engages volunteers in all parts of phenology monitoring, from input on sampling design, collecting observations, and analyzing data, and engages students from local schools and youth conservation groups. In the first two years of the project, Refuge Manager Jennifer Owen-White primarily engaged the public through social media posts, community outreach events, and local media, where she displayed data summaries in graphical form and photos of activities on the Refuge.

Monthly open houses held at the Refuge encourage the public to visit the Refuge and learn about ongoing activities. One such open house, held in October of 2014, was focused on the theme of fall phenology. *Nature's Notebook* volunteers led phenology walks, instructed visitors in how to make observations with *Nature's Notebook*, and recruited new volunteers for the monitoring program.

Beginning in September 2015, a one-year Americorps volunteer was hired to serve as the Rio Grande Phenology Trail Coordinator. The Coordinator is responsible for organizing the activities of the Rio

Grande Phenology Trail, including supporting Local Phenology Leaders at Trail sites with training materials and gathering their feedback to send to the USA-NPN, recruiting and training volunteers for Trail sites, and reporting findings of data collected on the Trail to the public through presentations, events, and social media.

Location of Project Components

All data is entered online via *Nature's Notebook* and is stored in the USA-NPN National Phenology Database, available for download at www.usanpn.org/results/data.

Project documentation and resources for plant and animal identification are available at www.usanpn.org/fws/VdO.