

National Park Service

National Park Service
U.S. Department of the Interior



Amistad

National Recreation Area
Texas

Monarch Migration Report Fall 2018



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Introduction

Formal counts of monarchs (*Danaus plexippus*) migrating and at roost sites have occurred in the park since 2015 (NPS, unpublished data & Young 2017). The intent of the counts is to document their arrival date, residence period in the park and habitat utilization. Although roosting behavior is still being researched, monarchs show both adaptability across habitat types and reoccurring use of roosting sites that have favorable conditions (Davis et al. 2012). Revisiting roosting sites at AMIS each year is a good opportunity for estimating abundance of the migration through the park. As of this year, there have only been four Monarch butterfly migration seasons surveyed. As more surveys are completed, more information will be decipherable from the collected data.

Methods

In October 2018, four monarch roost sites were surveyed at AMIS (Figure 1), with one new additional site surveyed briefly. Monarch abundance, roost tree species, and individual tree locations were recorded at each survey site. Abundance was counted individually or estimated for large groupings of monarchs. Two sites were established based on observations of monarch use in 2015 and 2016, including one at the San Pedro Campground adjacent to campsite number one, and one at the 277 N Campground adjacent to the first campsite. The remaining two sites were located opposite 277 N across the lake at 277 S and near the U. S. International Boundary and Water Commission (IBWC) office and named “Monarch Alley”. One new site, Spur 406, was included based on a sighting of roosting butterflies by park law enforcement during the migration this year. Surveys were started in the morning within 15 minutes of sunrise while the monarchs were still roosting, between the hours of 0700 and 0900. The goal of roost surveys was to begin before monarchs arrived in the park and to follow each site until numbers dropped below 15 individuals. Similar routes through the roost sites were followed each day and observations were recorded by one of two methods. The TerraSync software was used on a Trimble YUMA 2 unit to collect weather data (with the help of a Kestrel Weather Meter) and conditions, roost tree GPS locations, roost tree species and number of butterflies on each roost tree. The basic weather data we collected was temperature (°C), wind speed (MPH), wind direction, relative humidity (%), and dew point (°C). When the YUMA 2 was not available, GeoJot software on Getac tablets was used to take pictures, roost tree GPS locations and number of butterflies on each roost tree. Data was loaded into the park’s monarch geodatabase for record compilation and use in ArcMap.

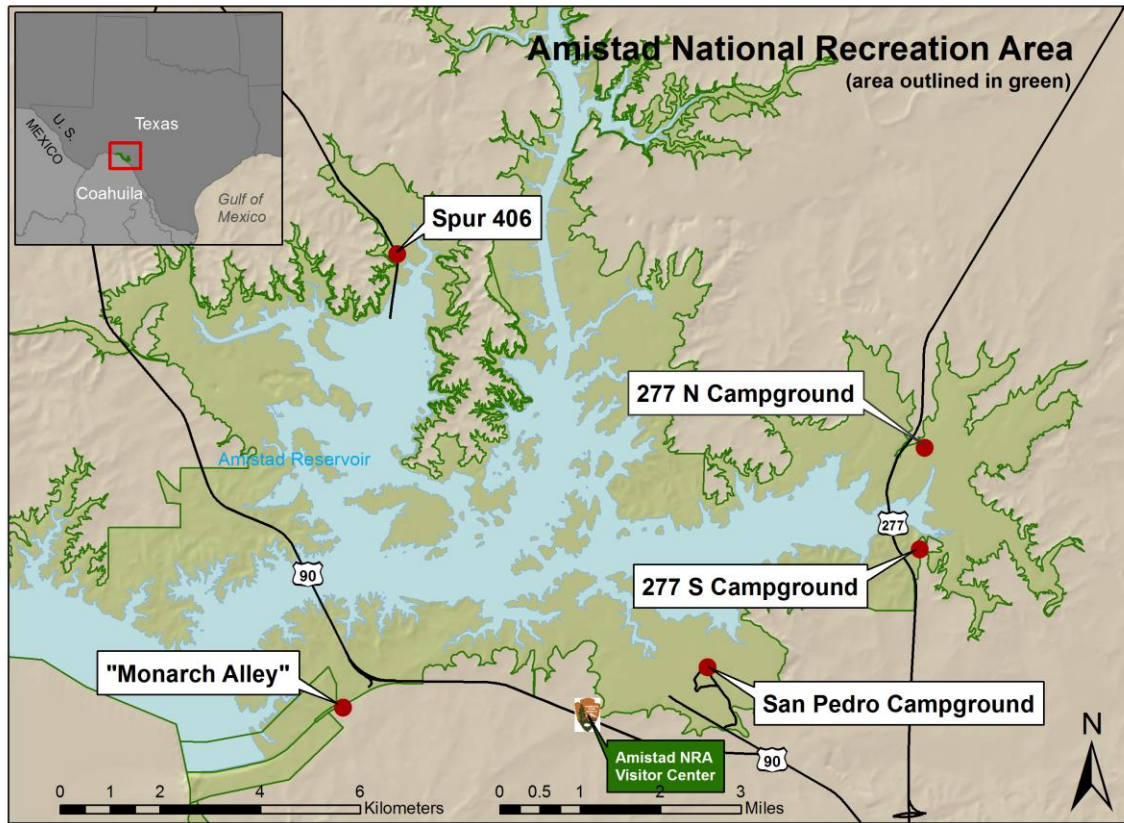


Figure 1. Locations of the five monarch butterfly survey sites at Amistad NRA visited in Fall 2018.

Results

Roost sites were surveyed from October 3 to October 26, usually alternating between roost sites or having paired observers visit different roost sites (Table 1). Monarchs arrived in the park on October 16, albeit in very low abundance. The highest numbers of monarchs were recorded on October 21, but then quickly decreased in the next few days. Across the survey sites, the trees used for roosting were predominately *Acacia farnesiana* (Huisache). Other trees included *Fraxinus* species (Ash), *Celtis laevigata* varieties (Hackberry), *Prosopis glandulosa* (Honey Mesquite), and *Parkinsonia aculeate* (Mexican Palo Verde).

Table 1. Summary of results from monarch monitoring fall 2018 at AMIS.

Site	Date	Count
277 North	10/4/2018	0
277 North	10/5/2018	0
277 North	10/7/2018	0
277 North	10/9/2018	0
277 North	10/11/2018	0
277 North	10/17/2018	0
277 North	10/18/2018	1
277 North	10/23/2018	373
277 North	10/24/2018	107
277 North	10/25/2018	87
277 North	10/26/2018	59
277 South	10/11/2018	0
277 South	10/17/2018	1
277 South	10/18/2018	2
277 South	10/23/2018	82
277 South	10/24/2018	127
277 South	10/25/2018	180
277 South	10/26/2018	58
IBWC Rail Road	10/10/2018	0
IBWC Rail Road	10/12/2018	0
IBWC Rail Road	10/16/2018	1
IBWC Rail Road	10/17/2018	1
IBWC Rail Road	10/18/2018	0
IBWC Rail Road	10/23/2018	57
IBWC Rail Road	10/24/2018	37
Other (406)	10/23/2018	1680
Other (406)	10/24/2018	450
San Pedro Campground	10/3/2018	0
San Pedro Campground	10/5/2018	0

San Pedro Campground	10/7/2018	0
San Pedro Campground	10/9/2018	0
San Pedro Campground	10/10/2018	0
San Pedro Campground	10/12/2018	0
San Pedro Campground	10/15/2018	0
San Pedro Campground	10/18/2018	1
San Pedro Campground	10/19/2018	0
San Pedro Campground	10/21/2018	3614
San Pedro Campground	10/23/2018	197
San Pedro Campground	10/24/2018	196
San Pedro Campground	10/25/2018	220
San Pedro Campground	10/26/2018	11
Total		7542

San Pedro Campground was surveyed 14 times over the course of 23 days (Figure 2). The first day of detection for this location was October 18, with a peak count of 3614 recorded on October 21. This location had the highest peak abundance out of all sites. Tree species used at this location by the butterflies were predominantly *Acacia farnesiana*, with *Fraxinus* species and *Celtis laevigata* varieties also being used.

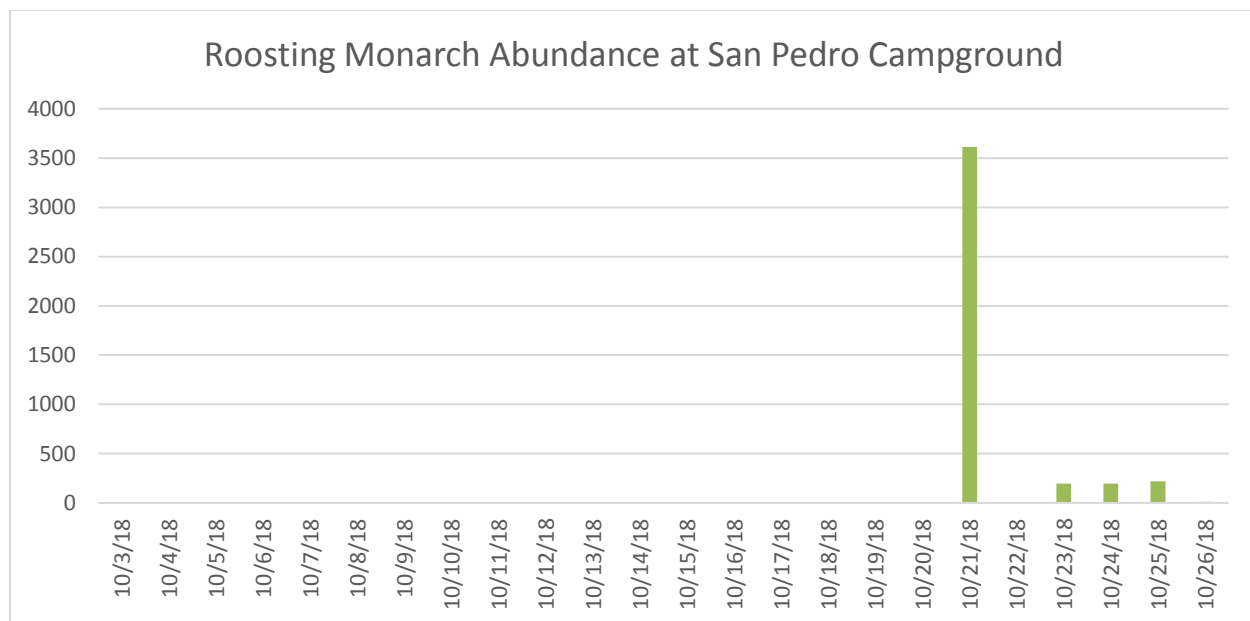


Figure 2. Monarch butterfly abundance documented at the San Pedro Campground site, October 18-26 (no surveys October 4, 6, 8, 11, 13, 14, 16, 17, 20, or 22).

The site at the 277 N campground was surveyed 11 times over the 23 days. The first Monarch observation was made October 18. Numbers peaked at 373 individuals documented on October 23 and dropped significantly by the next day (Figure 3). Roost trees at this location were composed of almost entirely *Acacia farnesiana*.

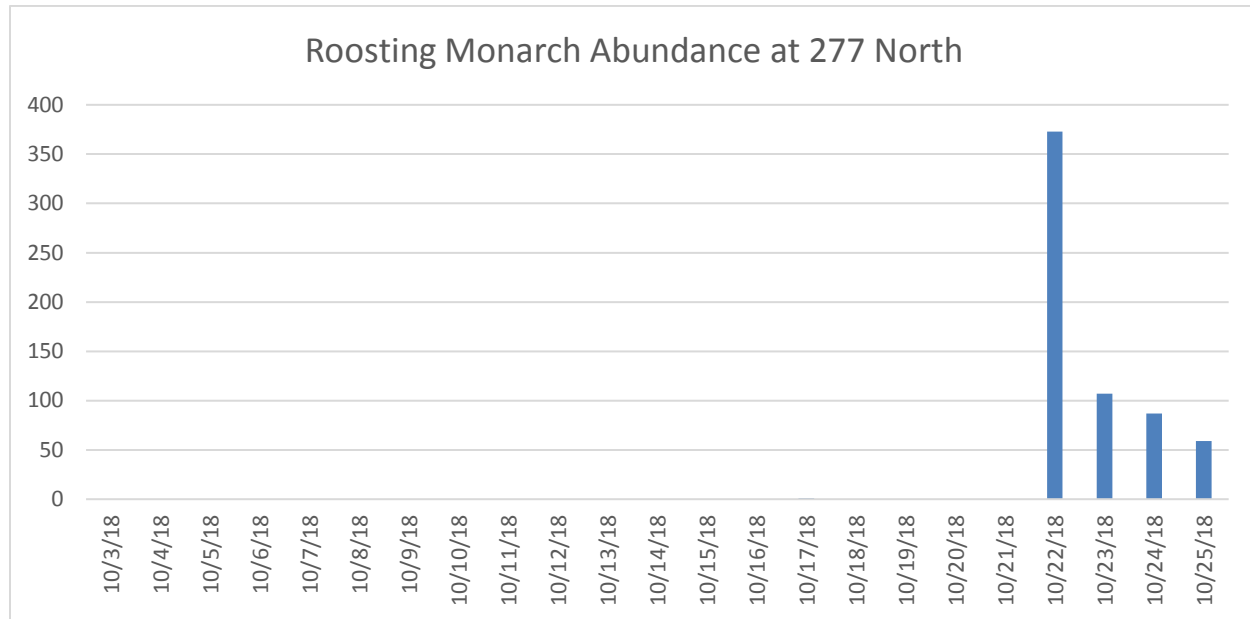


Figure 3. Monarch butterfly abundance documented at the 277 N Campground site, October 18-26 (no surveys October 3, 6, 8, 10, 12-15, and 19-22).

The site at 277 S camp ground was surveyed 7 times over 23 days. The site peaked at 180 individuals on 25 October, and drastically decreased the following day.

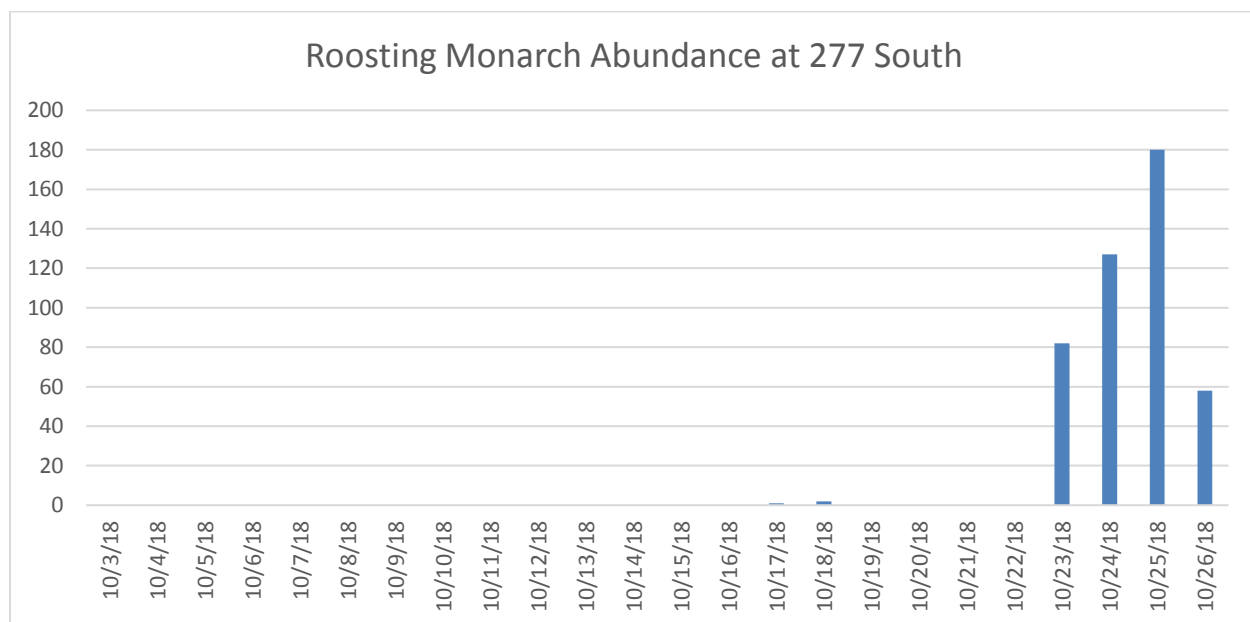


Figure 4. Monarch butterfly abundance documented at the 277 S Campground site, October 13-26 (no surveys October 3-10, 12-16, and 19-22).

The site located near the IBWC, “Monarch Alley”, was surveyed seven times during the survey period, starting October 10 (Figure 5). The peak abundance recorded was 57 individuals on October 23. While the overall abundance was comparatively low at this site, the peak migration day was not surveyed at this location. Tree species at this location included predominantly *Acacia farnesiana* and one *Prosopis glandulosa*.

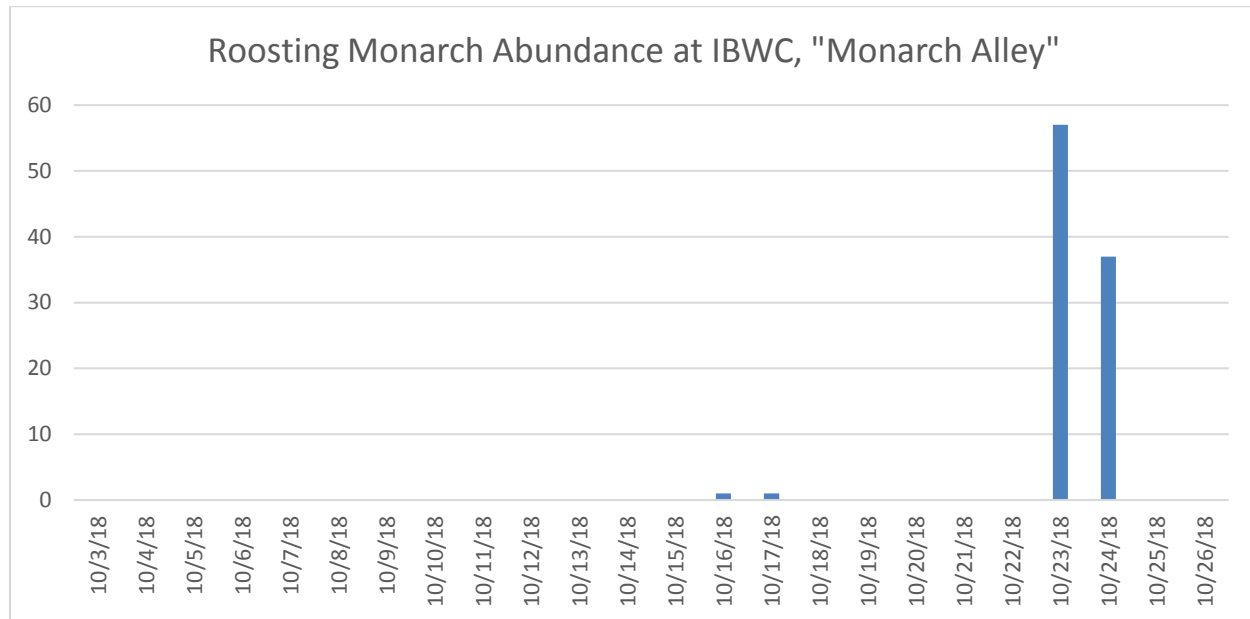


Figure 5. Monarch butterfly abundance documented at the Monarch Alley site, October 19-26 (no surveys October 3-9, 11, 13-15, 19-22, 25, 26).

A new roost site was found this season at Spur 406 and reported to the Natural Resources team by the Law Enforcement division. The area near the boat ramp located at the end of Spur 406 was surveyed only on the 23 and 24 of October; however there were significant numbers there on those two days, with a peak on 23 October of 1680 individuals.

Readings for relative humidity remained consistently high, typically staying at >70%, though there was a noticeable drop on 21 October, which correlated with the peak migration day (Figure 6). The average temperature decreased gradually for a few days until there was a cold snap where the temperatures bottomed out around 8°C on 15 October. After this date, the temperatures began to rise again gradually and the butterflies had their peak migration day during comparatively low humidity and warm temperatures (Figure 7).

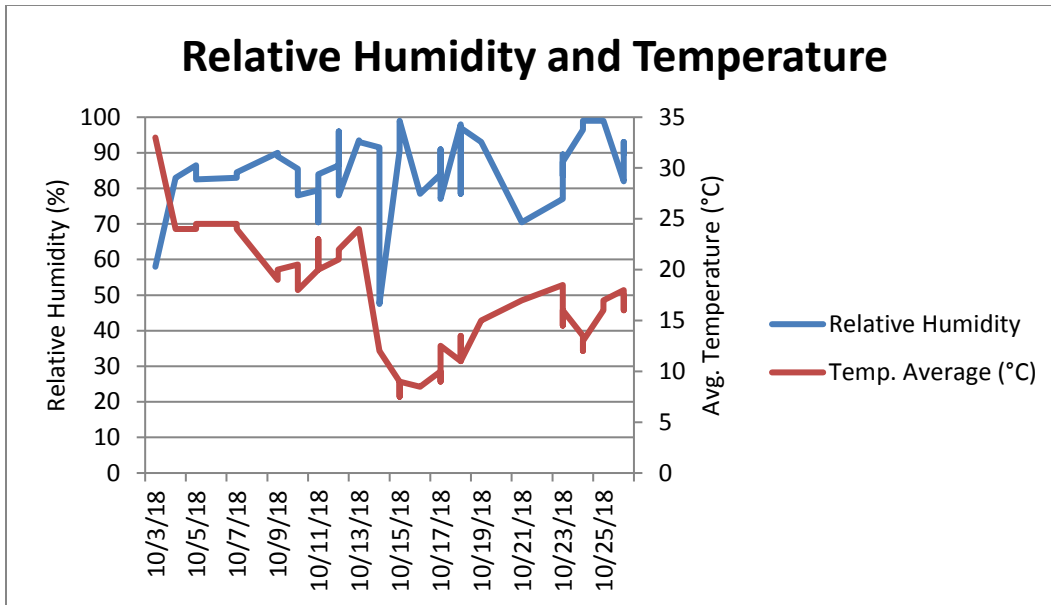


Figure 6. Average relative humidity and average temperature recorded at all 4 survey sites.

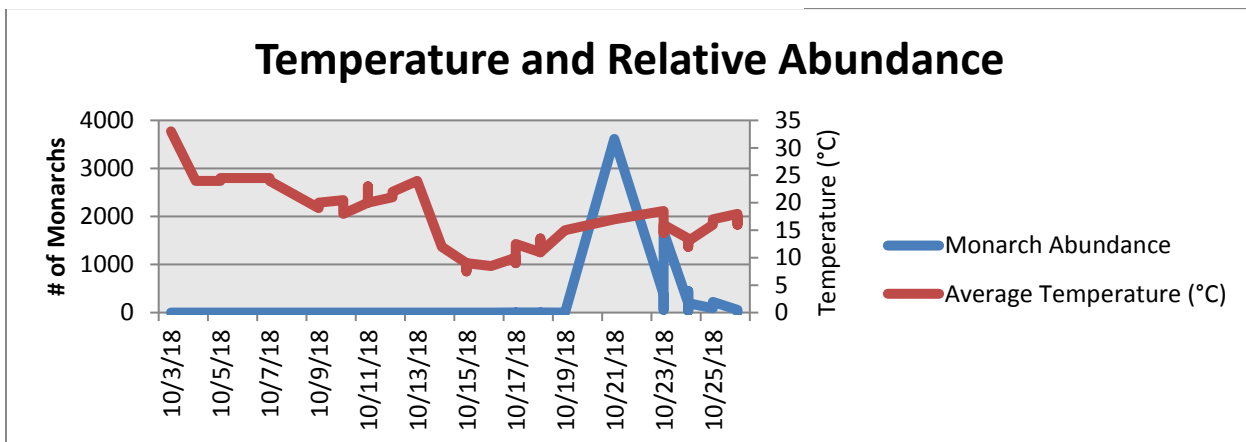


Figure 7. Average temperature recorded at all survey sites with the corresponding total Monarch butterfly abundance.

The overall wind speed was mostly calm, with a survey season average of 2.4 miles per hour. There were a few days where the wind picked up to a maximum of 13 mph. The winds mostly came from the southeast until 15 October when the winds shifted to the north or northwest.

Discussion

The site at San Pedro Campground was the most consistently surveyed location this year and also had the greatest monarch abundance documented. The IBWC “Monarch Alley” site had the lowest abundance and shortest observation period (excluding Spur 406). The newest site, Spur 406, was started after the initial monarch arrival at the park and has the potential to be a large abundance site if surveyed over the whole migration period. It is unknown what the monarch abundance was at this location before the roost site was reported on 23 October. The site at 277 S camp ground had a peak in abundance here later than at other locations, which was likely due to the site not being sampled on the overall peak migration day.

Trends in weather conditions as correlated to monarch abundance add insight into migration patterns. In relation to the fall migration at AMIS, it has been noted for many years that large distance movements of migrating monarchs are linked to cold fronts moving from the Great Plains (Calvert, n.d.). These strong winds likely aid monarchs, and conversely, strong headwinds likely delay their migration. Weather data collected this season shows that the winds shifted as a result of a cold front moving in. Peak Monarch butterfly abundance followed shortly thereafter once the temperatures increased, which lead us to believe the cold temperatures had temporarily halted the migration south. In the past 4 survey years, the highest observed Monarch butterfly roost abundance was on a hot, dry day. In 2015, the peak roosting occurred on 13 October with an observed estimated count of 584 at 277 N Campground on 14 October. The temperature was recorded to be 23.5 °C, slightly warmer than this year’s temperature on the peak roost day at 17 °C. Conversely, the relative humidity was about 15% lower on the peak day in 2015 (54.5%) compared to the peak day in 2018 (70.5%). Total abundance seems to be diminishing in recent years. The high peak abundance found in 2015 is over 6 times the amount found on the peak day in 2018. Surveying was sparse in 2016, but on the days that were surveyed they had already diminished drastically in comparison to the previous year. Monarch butterflies have been arriving in the park progressively later each survey year. In 2015, the butterflies arrived in the park on 16 September, then 9 October in 2016, 11 October in 2017, and finally 21 October in 2018 (NPS, unpublished data & Young 2017).

Identification of individual plant species used as roosts will aid in locating additional sites to survey at the park. At each survey site at AMIS, *Acacia farnesiana* was the primary roost choice for monarchs. Most individual trees were observed being used as roosts repeatedly throughout the migration period. As time and staffing allow, additional measurements could be included in future surveys to contribute information on roost tree preferences at the local level of AMIS.

References

- Calvert, W., Dr. (n.d.). Fall Migration Cold Fronts and Winds. Retrieved from <https://journeynorth.org/tm/monarch/FallMigrationColdFronts.html>
- Davis, A. K., Nibbelink, N. P., and Howard, E. 2012. *Identifying Large- and Small-Scale Habitat Characteristics of Monarch Butterfly Migratory Roost Sites with Citizen Science Observations*. 9pp. International Journal of Zoology, vol. 2012, Article ID 149026, doi:10.1155/2012/149026.
- Young, A. K. (2017). Monarch Migration Report Fall 2017. *National Park Service*.