



# Joshua Tree National Park California Phenology Project Summary 2011-2015

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## Introduction

As of 2010, Joshua Tree National Park (JOTR or Park) has participated in the California Phenology Project (CPP), a statewide monitoring program to document the timing of seasonal or periodic biological events such as plant leaf-out and flowering, insect emergence and animal migration. The California Phenology Project is a partnership between the National Park Service, the University of California, Santa Barbara (UCSB), and the USA National Phenology Network (USA-NPN). The project has been piloted in seven national parks within California. A key goal of both the California Phenology Project and the National Phenology Network is to detect and understand how plants, animals and landscapes respond to environmental variation and to climate change over time. For more background information on state-wide phenology efforts, please refer to the California Phenology Project webpage at: <https://www.usanpn.org/cpp/node/8>

Joshua Tree National Park's phenological monitoring efforts have included plant species *only*; thus, this project has been managed within the Resources Management division by the Vegetation Branch Chief, with assistance from both Student Conservation Association (SCA) interns and Great Basin Institute (GBI) research associates. The California Phenology Project is a citizen science project with a heavy focus on outreach and education. JOTR staff recruits and trains volunteers from the local area to assist in capture of phenological observations at Joshua Tree National Park at a frequency that park staff alone would have difficulty achieving. Under the oversight of park staff, volunteers have been monitoring plants at 4 locations throughout the Park since 2011. The education and outreach component of this citizen science project helps volunteers and visitors gain a better appreciation of the effects of climate change on the park's resources.

This report is intended to provide an overview of the accomplishments of the California Phenology Project at Joshua Tree National Park. It is also intended to provide incoming Park staff with a comprehensive package that will enable them to continue to oversee continued phenological monitoring by volunteers and interns at JOTR. This report summarizes the locations and sites where monitoring has occurred at JOTR, the species monitored, and the intensity of monitoring activity from 2011 to 2015. Monitoring materials such as species profiles, phenophases descriptions, custom data sheets, site maps, and data download instructions are attached as appendices. Data analyses provided in the results section, below, should be considered preliminary and are meant to be examples of the kinds of analyses that can be conducted with the data and to illustrate some of the phenological patterns that we have detected at JOTR. A discussion of the challenges and successes of the project to date are provided, along with recommendations to help ensure the continued success of the California Phenology Project at Joshua Tree National Park.

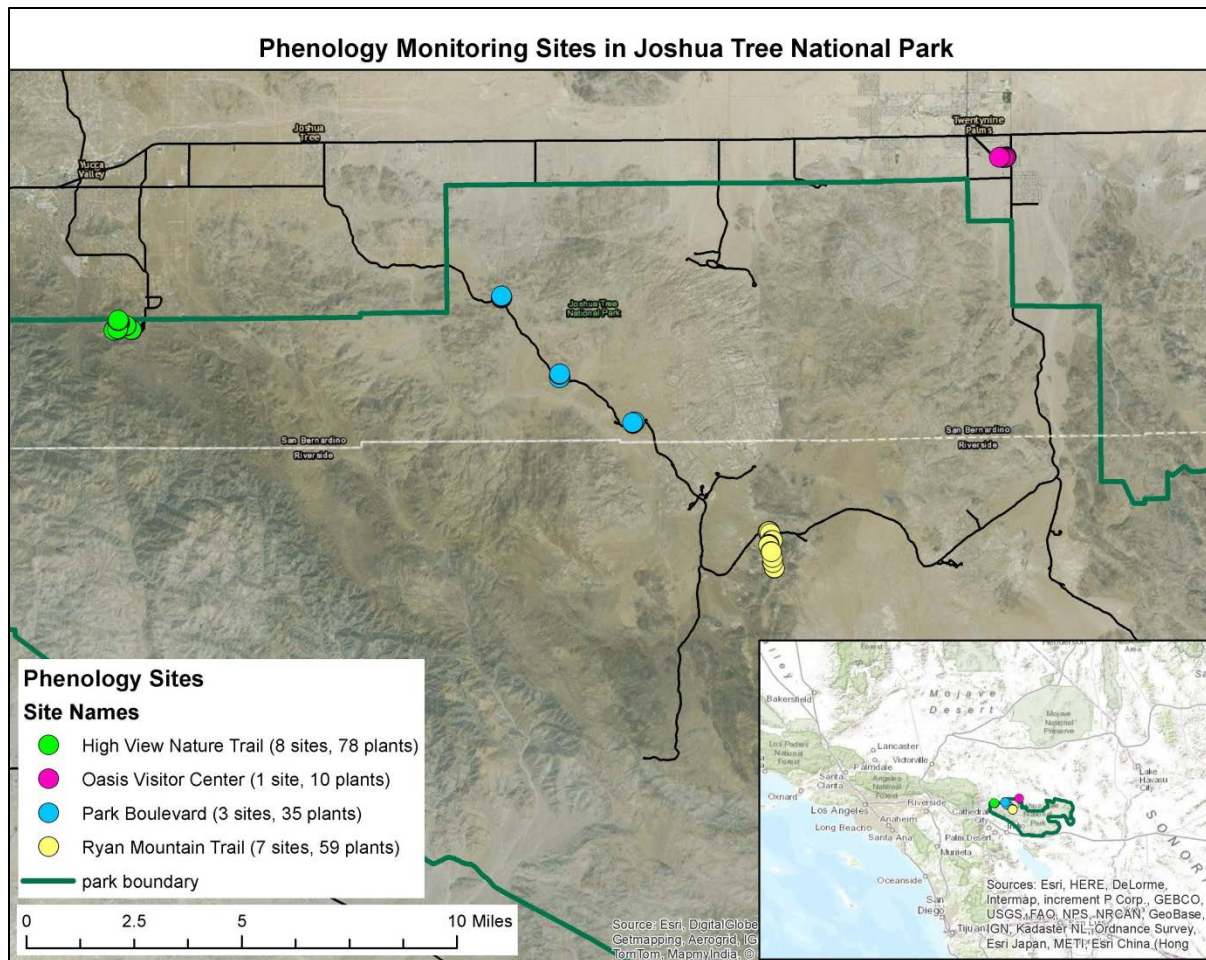
## Methods

### Plants Monitored and Monitoring Locations

Seven plant species were selected for monitoring by Vegetation Branch staff, UCSB personnel, and local area experts in the spring of 2011, and are currently monitored at JOTR. The criteria used to select these species are described in detail in the document titled “Summary of California Phenology Project Species Selection Process (Version 2, October 2011), available for download from the CPP website (<https://www.usanpn.org/cpp/resources>). *Coleogyne ramosissima*, *Eriogonum fasciculatum* var. *polifolium*, and *Prosopis glandulosa* are spring blooming deciduous shrubs. *Acacia greggii* is a summer blooming deciduous shrub. *Larrea tridentata* is an evergreen shrub that may flower multiple times per year, but generally blooms in the spring. *Yucca brevifolia* and *Yucca schidigera* are spring blooming evergreen monocots. For more information about the species monitored at the Park, refer to the “Species Profiles” attached in Appendix B.

A total of 181 plants representing these species are currently monitored at four locations in Joshua Tree National Park (Figure 1 and Table 1). Each location is comprised of multiple sites, at each of which are located 6-12 plants (representing 1-4 species) that have been georeferenced and labeled with small aluminum tags. GPS locations for all plants currently being monitored are attached in Appendix A. Monitoring locations are at: High View Nature Trail (7 sites), Ryan Mountain Hiking Trail (8 sites), Oasis of Mara Visitor Center Trail (1 site) and a short section of Park Boulevard (3 sites). The Ryan Mountain sites were established in April 2011, and all others June 2011.





**Figure 1.** CA Phenology Project monitoring sites in Joshua Tree National Park.

**Table 2.** Number of individuals of each species being monitored at each location in 2015.

| Species (common name) – 4 letter code                              | High View | Park Blvd | Ryan Mtn | Oasis of Mara | Total |
|--|-----------|-----------|----------|---------------|-------|
| <i>Coleogyne ramosissima</i> (Blackbrush) – <b>CORA</b>            | 24        | -         | 16       | -             | 40    |
| <i>Eriogonum fasciculatum</i> (California buckwheat) – <b>ERFA</b> | 18        | -         | 14       | -             | 32    |
| <i>Acacia greggii</i> (Cat claw acacia) - <b>ACGR</b>              | -         | 11        | -        | -             | 11    |
| <i>Larrea tridentata</i> (Creosote bush) – <b>LATR</b>             | -         | 12        | 10       | 5             | 26    |
| <i>Prosopis glandulosa</i> (Honey mesquite) – <b>PRGL</b>          | -         | -         | -        | 5             | 5     |
| <i>Yucca brevifolia</i> (Joshua tree) - <b>YUBR</b>                | 22        | 12        | -        | -             | 34    |
| <i>Yucca schidigera</i> (Mojave yucca) – <b>YUSC</b>               | 14        | -         | 19       | -             | 33    |

Four letter codes are assigned to each species and location for ease of both data entry and tagging purposes. The four letter codes of each location are as follows; Oasis of Mara (OAVC), Ryan Mountain (RYAN), High View Nature Trail (HIVI), and Park Boulevard (PABO).

Each individual plant has been assigned a “plant nickname” that identifies the location, site, species, and individual plant being monitored. For example, the nickname “RYAN6ERFA3” describes the third *Eriogonum fasciculatum* individual at site 6 along the Ryan Mountain Trail. Tags bearing the plant nickname are attached to the base of each plant with a metal wire that surrounds its trunk or a robust lateral branch. There are several “generations” of tags on our monitored plants, as we experimented with which hold up best to sun, wind, and theft, while maintaining ease of plant identification for volunteers. The first tags are small soft aluminum strips with the plant nickname impressed onto them. These were difficult for volunteers to find, and did not hold up well in the wind. The second generation of tags is white plastic cards with the plant nickname stenciled and cut out of the tag, and reinforced with shipping tape (Figure 2). These are much easier to find and hold up well to the elements. However, the conspicuousness of the tags may have led to theft, as a number of them were missing within the first year. The third generation of tags are the same white plastic cards, with the plant nickname and “Please do not remove- long term ecological study” written onto the card, then reinforced with shipping tape.



Figure 2. “Second generation” of tags attached to selected individuals to be monitored. This tag belongs to the third *Eriogonum fasciculatum* individual at site 6 along the Ryan Mountain Trail.

### Protocol and Monitoring Materials

Project coordinators aim to have each plant monitored to record the status of each of the targeted phenophases at least once per week. From 2011 to the present, the first priority has been to monitor each plant at this frequency from January to June (thought to be the most phenologically active time of year), with slightly less emphasis put on the remainder of the year.

On each day of monitoring, volunteers complete data sheets by responding to a series of “yes” or “no” questions regarding the presence or absence of each phenophase exhibited by the individuals that they observe. The targeted phenophases differ slightly among species, depending on their growth form or life history. The phenophases of each species monitored by the CPP are illustrated and described in customized “Species Profiles” created by the CPP. These are available for downloading by selecting a given species’ link from the CPP webpage ([www.usanpn.org/cpp/AllSpecies](http://www.usanpn.org/cpp/AllSpecies)). The Species Profiles

provide guidance to observers on how to answer the Yes/No questions for each species (Appendix B). In addition, the data sheets provided by the USA National Phenology Network include standardized phenophase definitions that apply to all species across the United States.

For each phenophase that is visible (e.g., breaking leaf buds, or open flowers), a follow-up “abundance measure” question is asked, which requests an estimate of the quantities and/or proportion of each phenophase. Abundance metrics were often difficult for volunteers to estimate with confidence, and they were not analyzed in this report.

Along with the species profiles, species specific datasheets with attached “Phenophase Definitions” are available for downloading on the CPP webpage <https://www.usanpn.org/cpp/taxonomy/term/1>. The datasheets were designed to monitor an individual plant per page. It was challenging to manage one page per plant along a trail like Ryan Mountain, which hosts 59 monitored individuals. Custom data sheets were designed by Park staff to facilitate data collection; rather than requesting data to be recorded for an individual plant, each of these customized data sheets record data for multiple plants at a given site. All custom datasheets are attached in Appendix C. Despite not using the species specific datasheets, the attached “Phenophase Definitions” help address frequently asked questions regarding phenophases, and have been attached in Appendix D. Custom maps were also developed by park staff to aid the observer in locating each individual plant at a given location and site. All maps are attached in Appendix E.

It is recommended that observers take with them into the field: a location-specific datasheet, a location-specific map, and the Species Profile and Phenophase Description reference sheets for all species being observed at that location. A more detailed protocol is available on the CPP website here:

<https://www.usanpn.org/cpp/resources>

#### Volunteer recruitment and management

In order to achieve our monitoring and outreach goals, project coordinators and assistants must recruit, train and retain volunteer citizen scientists. Recruitment, training and retention efforts have taken place each year at JOTR since 2012, with varying success. The volunteer recruitment and partnership development for the California Phenology Project (CPP) at Joshua Tree was conducted in stages to successively wider audiences. We initially targeted conservation and botanical organizations. Next, we dedicated our communication and recruitment efforts to the broader community surrounding the park. Finally, we publicized the CPP volunteer opportunities at JOTR to the park’s website via Volunteer.gov. Each of these efforts provided us with insights on how to recruit, train and retain volunteers (see Discussion).

In our first attempt to recruit for the CPP, we reached out to specific organizations that maintain a conservation mission that matches the goals of the California Phenology Project. We approached these groups with the notion that their membership base would find the CPP interesting and of value. We reached out to the local conservation organizations, the Mojave Desert Land Trust (MDLT), the Morongo Basin Conservation Association (MBCA), Master Composter’s group, the Mojave Desert Branch of the

California Native Plant Society (CNPS), and the Desert Studies Club at Copper Mountain College. Through these groups, we initially reached more than 700 people either in person or via email.

These targeted outreach efforts were met with a varying degree of success. By far, the outreach efforts to the MDLT and the MBCA, both local conservation organizations, were the most effective. From these two initial outreach efforts we received several inquiries from people interested in volunteering for the CPP project at JOTR. A small training session was conducted to provide some additional information along with an introduction to the CPP and the monitoring protocol. Out of the training session, approximately 7 people remained interested in the project and collected data. Months later, 3 of these people remain committed to the project and collecting data. In addition to recruitment, the Joshua Tree National Park Association's Desert Institute hosted 4 citizen science lectures and phenology trainings.

During our second phase of volunteer recruitment, we tried to reach a more diverse audience and bring the CPP to the communities of Morongo Basin. The Morongo Basin consists of the gateway cities surrounding JOTR including Twenty-nine Palms, Joshua Tree, Yucca Valley and the surrounding areas. For this effort we strategically selected civic minded groups to approach for involvement in the CPP. The biggest component of this recruitment effort was a presentation at the Basin Wide Foundation (BWF) Breakfast. The Basin Wide Breakfast is a monthly gathering of representatives from many of the nonprofit organizations in the Morongo Basin. Approximately 50 people representing nearly as many organizations attended the presentation. A poster was presented at the Yucca Valley Earth Day fair and a representative from the CPP at Joshua Tree was there to engage visitors, answer questions, and attempt to recruit people. These efforts met little success; approximately 150 people were reached with no new volunteers recruited. In addition to direct recruitment, several volunteers who now consistently monitor CPP sites at JOTR were recruited by word of mouth.

Finally, we have added a volunteer opportunity for the CPP to the Joshua Tree National Park website through volunteer.gov. This has proven to be an excellent recruitment tool. During times when the advertisement is live, there is an average of one application every three weeks, and approximately 1/5 of the applications have resulted in an active volunteer. When we are able to meet the weekly monitoring goals with the current volunteer base, the advertisement is removed. In order to re-advertise the position, we contact the park's Volunteer Coordinator and request the position be re-posted.

In 2015, we were able to recruit enough volunteers to ensure at least once per week monitoring at all sites, through: contacting existing volunteer contacts, advertising on Volunteer.gov, word of mouth, and hosting a CPP workshop led by the CPP Director, Susan Mazer. Volunteer contact information, with notation on seasonality and activity, is located in the CA Phenology Project folder on the Resources share drive. This has proven to be an invaluable tool for recruitment efforts in 2015.

#### Data Entry

Through 2014, volunteers were encouraged to either sign on to Nature's Notebook through a common Nature's Notebook profile (ID: CPP\_JOTR, Password: JOTRpheno#1, Email: [josh\\_hoines@nps.gov](mailto:josh_hoines@nps.gov)) or to hand in their paper data sheets to park staff who would then enter the data under that same generic

profile. Specific observer information was not recorded for that data, so that it is not possible to identify the individual who was responsible for a given set of observations. It is clear that this is not the best approach. It is much preferred that all volunteers create their own profile in Nature's Notebook and enter their own data, which can be subsequently linked to the individual responsible for their data entry and their quality. Step by step instructions for volunteers are provided in Appendix F. Even if an observer is unable or uninterested in entering their own data, creating a Nature's Notebook profile allows a "data entry technician" to enter data under the observer's email address. Data related to numbers of observers from 2011 to early 2015 is largely unavailable due to this original oversight in data management.

### Data Analysis

All entered data are available to download at: <https://www.usanpn.org/results/data>

Summaries of monitoring activity (Tables 2 and 3) were created by downloading raw data from the Nature's Notebook database on August 7, 2015. "Raw data" includes all phenophase observation points, date of observation, and presence or absence data. Data was filtered and sorted to obtain desired metrics.

The Nature's Notebook "Data Visualization Tool" was used to create phenology calendars for all phenophases per species, per year, on September 8, 2015. This visualization illustrates the annual timing of phenophase activity for selected species/phenophase combinations.

The mean onset date (or Day of Year, DOY, where January 1 = 1 and December 31=365 or 366 [in leap years]) for select species and phenophases at JOTR was determined by downloading and analyzing "summarized data" from the Nature's Notebook database on September 9, 2015 (except *Yucca brevifolia* which was downloaded in May, 2015). Selecting "summarized data" as opposed to "raw data" combines each individual plant's observations (for each phenophase and year) into a series of consecutive "yes" records interspersed with "no" records, which indicate the dates on which each phenophase is observed or not observed. These data provide – for each calendar year – the onset date(s) of each phenophase for each monitored individual.

Qualitative analysis was performed for each species prior to creating quantitative comparisons between years and sites. Phenophase onset records without a prior "no" within 7 days, was considered imprecise and removed from the data set. Moreover, DOY values (identified when a "yes" occurred less than 7 days after a "no") for which the most recent prior "no" occurred in the previous calendar year were also excluded. In other words, if, as an individual plant was monitored in 2013, a "no" value on DOY = 364 was followed by a "yes" value on DOY = 3 (of 2014), the DOY = 3 would be excluded. This is because the data management protocol of the USA National Phenology Network does not calculate the interval between a "yes" and a preceding "no" if the interval includes the transition between successive years (the data output table displays a value of -9999).



Next, observer errors or problematic phenophases were taken into consideration, and data was removed accordingly. For example, the phenophase data for “young leaves” and “ripe fruit” on *Larrea tridentata* were not included in the quantitative analysis. The entries for “young leaves” were deleted because *Larrea tridentata* is an evergreen, and the emergence of young leaves occurs throughout most of the year. The entries for “ripe fruits” were removed because observers generally have difficulty distinguishing “ripe fruits” from “fresh fruits”, and ripe fruits can persist on the plant into the next flowering/fruitleting event, creating ambiguity of actual onset. There may be other issues like these that we are unaware of due to the nature of data collection and the lack of mandatory training events at this time.

In order to compare mean onset dates across years, the remaining data were reduced further. Either due to observer error or recurring episodic phenophases, multiple onset dates per year were present for a number of species and phenophases. Only the first onset date entries for each individual and each phenophase were analyzed. In the special case where the onset dates among a group of plants spanned across the New Year, the mean values for the onset day of year were not calculated and compared between years or between sites because the average values would be highly misleading. For example, if some DOY values were 340-365 and others were 1-20, the average value would be ~180, a highly deceptive value.

If data for a particular phenophase only existed for one year, it was not included in the summary as we are not able to compare onset dates for multiple years.

In addition to mean onset day of year, simple counts of individuals exhibiting important phenophases (flowers and fruit) are also provided.

Weather data (temperature and precipitation) for three weather stations near the monitoring sites have been provided as a reference in Appendix G. Analysis of the results should be correlated with temperature and precipitation patterns, but analysis of that scale was deemed to be beyond the scope of this report.



## Results

The results presented below are not meant to provide an exhaustive or highly quantitative summary of all data collected, but rather to offer examples of how the data can be analyzed and compared.

Monitoring activity has been inconsistent from year to year and between different locations (Tables 2 and 3). The highest number of observations was made in 2012, and the lowest in 2013. During 2013, there was no paid staff dedicated to overseeing the CPP at JOTR. Only 8 months of the year are represented in 2011, and 2015. If the monitoring frequency for 2015 is maintained through December, it will surpass the number of observation records for 2012. The High View Nature trail has the highest number of visits 2011-2015; Park Boulevard, the least. The Oasis of Mara Visitor Center has been the most consistently monitored, with at least one and up to 8 monitoring visits per month since June 2011 (Table 3).

**Table 2.** Summary of phenological monitoring activity at Joshua Tree National Park by year. Data were downloaded August 7, 2015. \*Years 2011 and 2015 represent partial years (2011 Apr-Dec only; 2015 Jan-Jul only).

| <b>CA Phenology Project observations in Joshua Tree National Park</b> |        |        |       |        |        |         |
|---|--------|--------|-------|--------|--------|---------|
|   | 2011*  | 2012   | 2013  | 2014   | 2015*  | Total   |
| Total number phenophase records                                       | 20,590 | 38,485 | 9,406 | 20,888 | 32,247 | 121,616 |
| Percent of total observations   | 16.9%  | 31.6%  | 7.7%  | 17.1%  | 26.5%  | -       |
| Number of observation days  | 48     | 107    | 79    | 100    | 83     | 417     |
| Number of time each location visited:                                 |        |        |       |        |        |         |
| High View   | 26     | 40     | 14    | 52     | 43     | 175     |
| Park Boulevard  | 25     | 56     | 4     | 18     | 23     | 126     |
| Ryan Mountain   | 31     | 33     | 8     | 30     | 31     | 133     |
| Oasis of Mara   | 24     | 49     | 8     | 31     | 25     | 137     |
| Number of plant species observed                                      | 5      | 7      | 7     | 7      | 7      | 7       |
| Number of individuals observed  | 159    | 198    | 168   | 181    | 181    | 181     |

**Table 3a.** Number of phenological monitoring visits to High View Nature Trail and Park Boulevard, per month and year. Data were downloaded August 7, 2015. \*Years 2011 and 2015 represent partial years (2011 Apr-Dec only; 2015 Jan-Jul only).

| Month     | High View Nature Trail |      |      |      |       | Park Boulevard |      |      |      |       |
|-----------|------------------------|------|------|------|-------|----------------|------|------|------|-------|
|           | 2011*                  | 2012 | 2013 | 2014 | 2015* | 2011*          | 2012 | 2013 | 2014 | 2015* |
| January   | -                      | 5    | 3    | 0    | 1     | -              | 5    | 0    | 0    | 1     |
| February  | -                      | 4    | 3    | 2    | 5     | -              | 4    | 1    | 2    | 1     |
| March     | -                      | 3    | 5    | 11   | 13    | -              | 3    | 2    | 1    | 4     |
| April     | -                      | 6    | 3    | 8    | 2     | -              | 7    | 1    | 0    | 1     |
| May       | -                      | 6    | 0    | 7    | 8     | -              | 7    | 0    | 4    | 7     |
| June      | 3                      | 4    | 0    | 7    | 8     | 3              | 7    | 0    | 4    | 7     |
| July      | 2                      | 3    | 0    | 1    | 6     | 3              | 9    | 0    | 4    | 2     |
| August    | 5                      | 2    | 0    | 3    | -     | 5              | 6    | 0    | 3    | -     |
| September | 3                      | 0    | 0    | 7    | -     | 3              | 3    | 0    | 0    | -     |
| October   | 2                      | 1    | 0    | 6    | -     | 3              | 3    | 0    | 0    | -     |
| November  | 6                      | 4    | 0    | 0    | -     | 4              | 1    | 0    | 0    | -     |
| December  | 5                      | 2    | 0    | 0    | -     | 4              | 1    | 0    | 0    | -     |

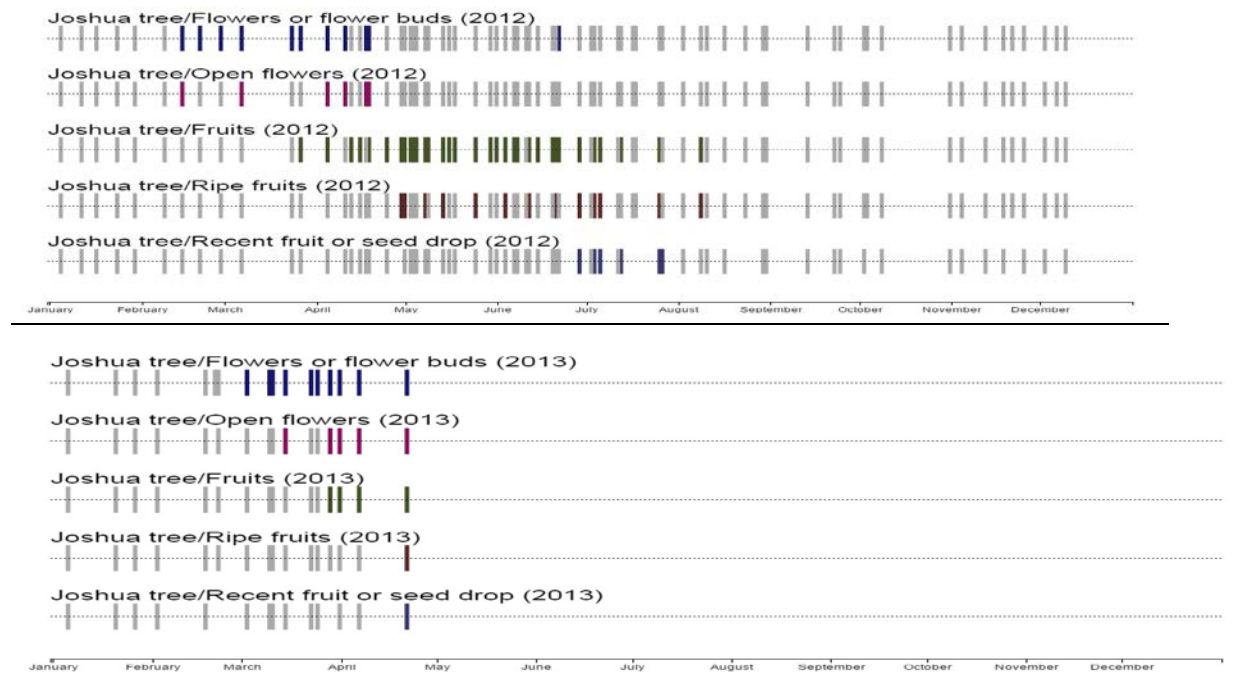
**Table 3b.** Number of visits to Ryan Mountain and Oasis visitor center, per month and year, for phenology monitoring in Joshua Tree National Park. Data were downloaded August 7, 2015. \*Years 2011 and 2015 represent partial years (2011 Apr-Dec only; 2015 Jan-Jul only).

| Month     | Ryan Mountain Trail |      |      |      |       | Oasis Visitor Center |      |      |      |       |
|-----------|---------------------|------|------|------|-------|----------------------|------|------|------|-------|
|           | 2011*               | 2012 | 2013 | 2014 | 2015* | 2011*                | 2012 | 2013 | 2014 | 2015* |
| January   | -                   | 5    | 0    | 0    | 2     | -                    | 5    | 6    | 3    | 2     |
| February  | -                   | 4    | 2    | 3    | 1     | -                    | 4    | 5    | 2    | 2     |
| March     | -                   | 4    | 3    | 5    | 4     | -                    | 4    | 4    | 2    | 3     |
| April     | 1                   | 3    | 3    | 3    | 2     | -                    | 5    | 6    | 5    | 1     |
| May       | 4                   | 5    | 0    | 5    | 7     | -                    | 3    | 5    | 4    | 4     |
| June      | 2                   | 4    | 0    | 6    | 9     | 3                    | 4    | 6    | 3    | 8     |
| July      | 5                   | 3    | 0    | 5    | 6     | 3                    | 4    | 5    | 2    | 4     |
| August    | 4                   | 4    | 0    | 3    | -     | 5                    | 3    | 6    | 2    | -     |
| September | 4                   | 0    | 0    | 0    | -     | 3                    | 4    | 4    | 2    | -     |
| October   | 2                   | 0    | 0    | 0    | -     | 2                    | 3    | 2    | 2    | -     |
| November  | 5                   | 1    | 0    | 0    | -     | 4                    | 5    | 5    | 2    | -     |
| December  | 4                   | 0    | 0    | 0    | -     | 4                    | 5    | 3    | 2    | -     |

Yucca brevifolia

Flowers on *Yucca brevifolia* have been observed as early as mid-February (2011 and 2014) or as late as mid-May (2015). Fruits can persist into the fall and perhaps into winter (Figure 3). Ripe fruits observed in February of 2014 were likely persistent from 2013. The duration between the first open flower observed and the last open flower observed is generally 2 months, between mid-February and mid-May. Observations did not capture the full duration of any phenophases in 2013.

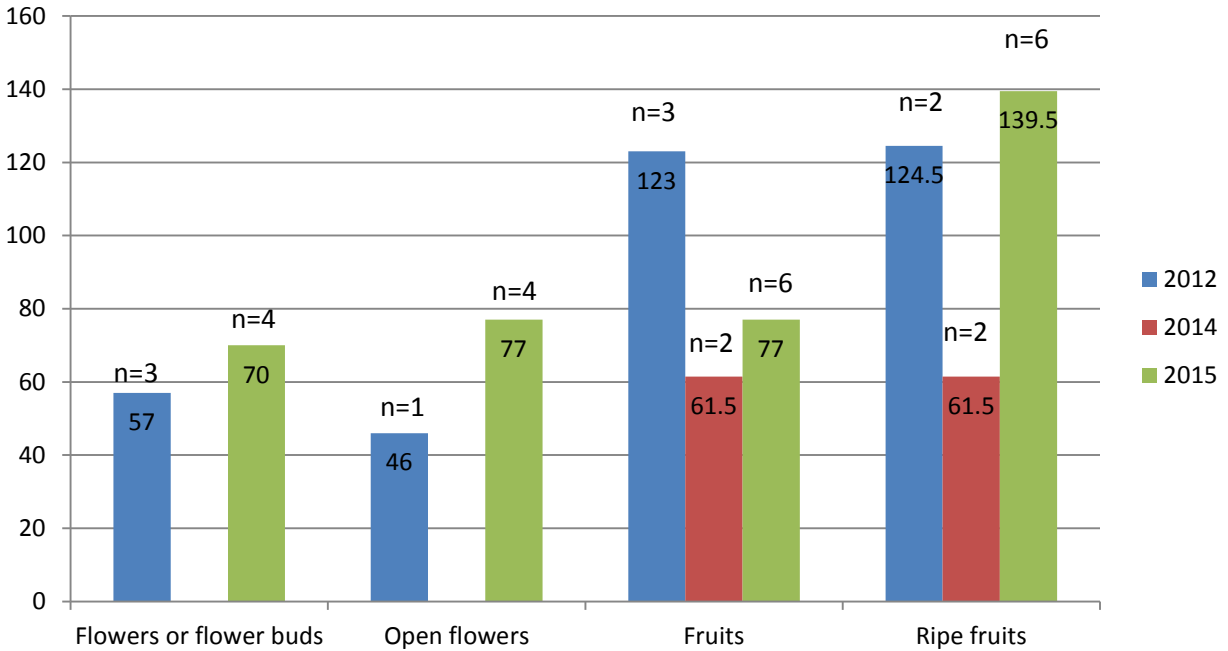
**Figure 3.** Data visualization calendars depicting all *Yucca brevifolia* phenophase activity observed for all locations combined. Colored lines represent a “yes” observation, grey lines represent “no” observation. No “yes” observations were made in 2011 (not pictured).



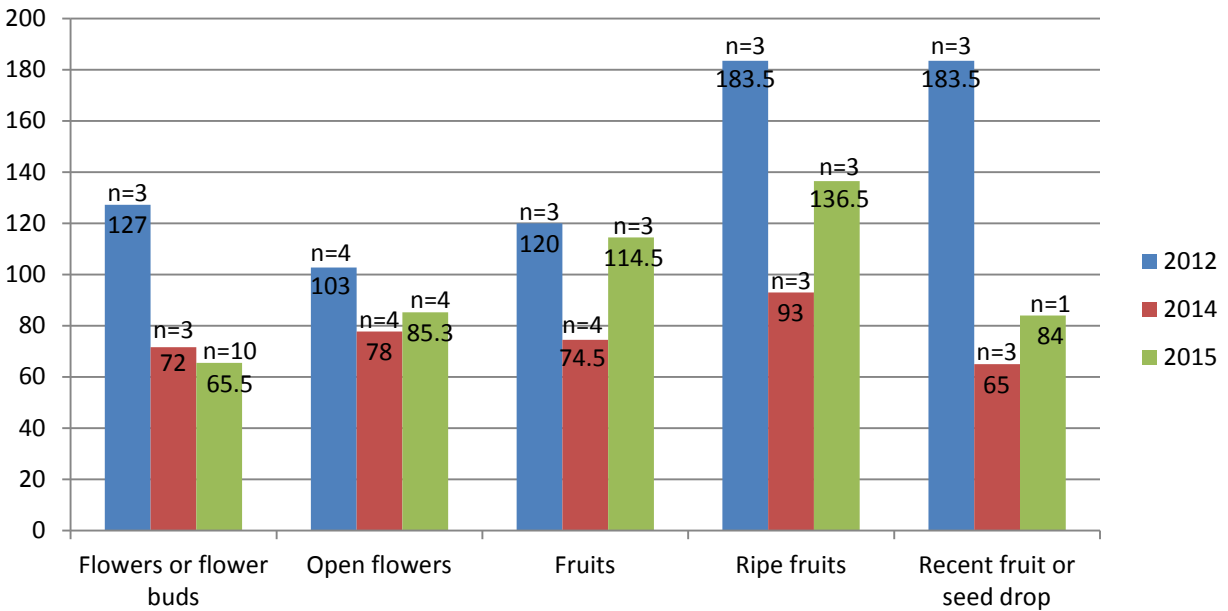


The average onset of Joshua Tree flowers along Park Boulevard in 2012 was in February, and not until March in 2015. The average onset of fruit along Park Boulevard in 2012 was in May, and in March of 2014 and 2015 (Figure 4). The average onset of Joshua Tree flowers along the High View Trail in 2012 was late April/early May, but on average in March in 2015. The average onset of *Yucca brevifolia* fruit along High View Trail in 2012 was early July, April in 2014, and May in 2015 (Figure 5). The average onset of flowers at High View was approximately 2 months later than those at Park Boulevard in 2012, but within one week of those at Park Boulevard in 2015. The average onset of fruits along the High View Trail in 2015 was 5 weeks later than those at Park Boulevard, but average fruit onset at the two sites in 2012 was within one week of each other.

**Figure 4.** Mean onset day of year (y-axis, and inserted in each bar) and sample size for phenophases of *Yucca brevifolia* monitored at **Park Boulevard** sites 1-3 (combined).



**Figure 5.** Mean onset day of year, sample size and mean value for *Yucca brevifolia* phenophases at **High View Nature Trail** sites 1-7 (combined).



With the exception of 2015, a higher proportion of individuals observed at Park Boulevard produced flowers compared to High View Nature Trail (Tables 4 & 5). Most individuals that bear flowers subsequently produced fruit, with the exception of High View Nature Trail in 2015, where less than half the individuals that flowered produced fruit. The highest proportion of flowering individuals was observed at both sites in 2013.

**Table 4.** Numbers of *Yucca brevifolia* individuals observed producing flowers and fruit at the High View Nature trail sites in 2012-2015. There are a total of 22 individuals observed at this location. It is likely that persistent fruit produced in 2013 were recorded in 2014 (Figure 3).

| HIGH VIEW SITES 1-7  | 2012    | 2013     | 2014     | 2015     |
|--|---------|----------|----------|----------|
| # Individuals bearing <b>Flowers</b> (% of total individuals observed) | 5 (23%) | 16 (73%) | 4 (18%)  | 14 (64%) |
| # Individuals bearing <b>Fruits</b> (% of total individuals observed)  | 5 (23%) | 14 (64%) | 10 (45%) | 5 (23%)  |

**Table 5.** Numbers of *Yucca brevifolia* individuals observed producing flowers and fruit at the Park Boulevard sites in 2012-2015. There are a total of 12 individuals observed at this location. It is likely that persistent fruit produced in 2013 were recorded in 2014 (Figure 3).

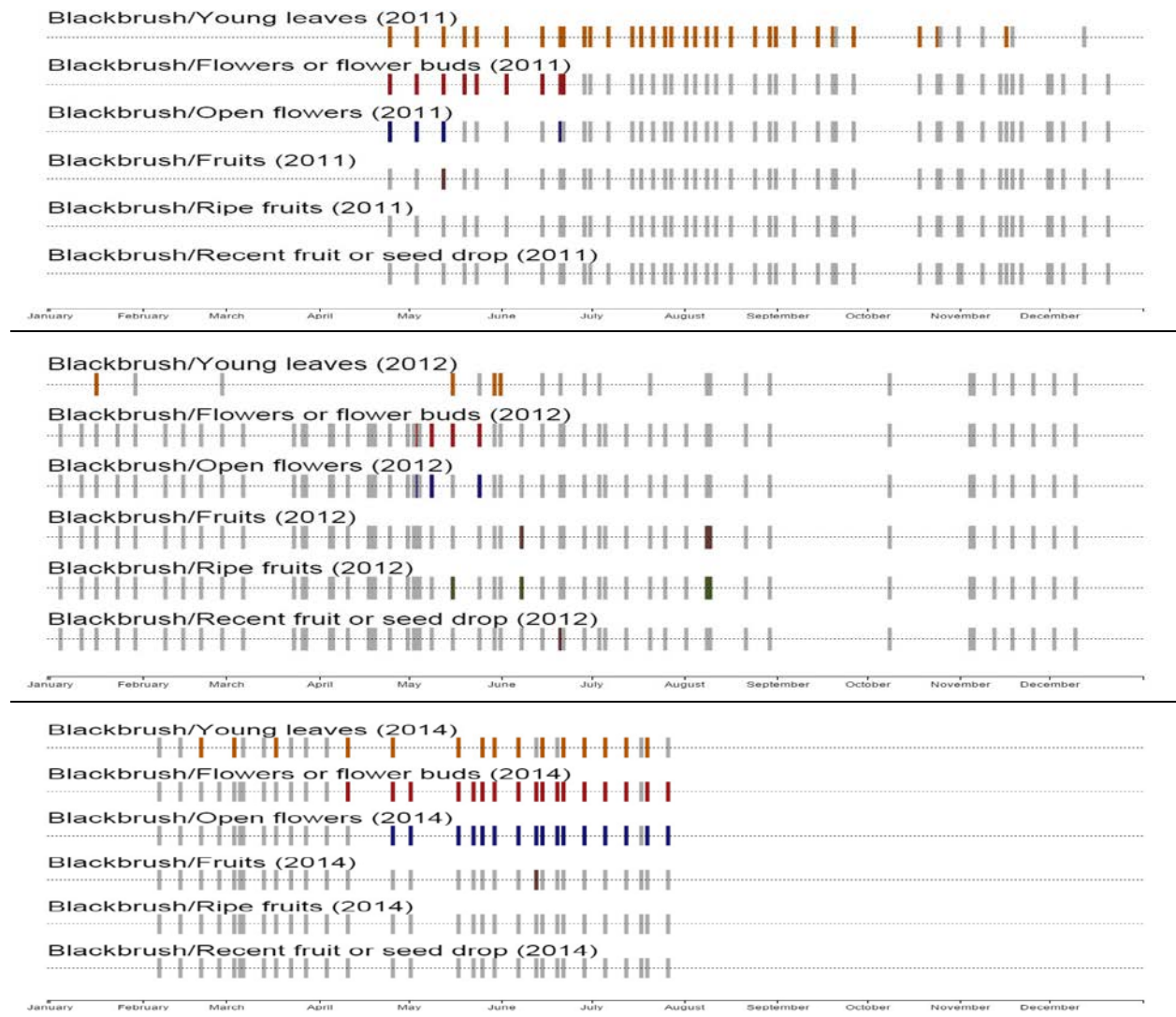
| PARK BLVD SITES 1-3  | 2012    | 2013     | 2014    | 2015    |
|--|---------|----------|---------|---------|
| # Individuals bearing <b>Flowers</b> (% of total individuals observed) | 3 (25%) | 11 (91%) | 4 (33%) | 3 (25%) |
| # Individuals bearing <b>Fruits</b> (% of total individuals observed)  | 3 (25%) | 8 (67%)  | 5 (42%) | 2 (17%) |

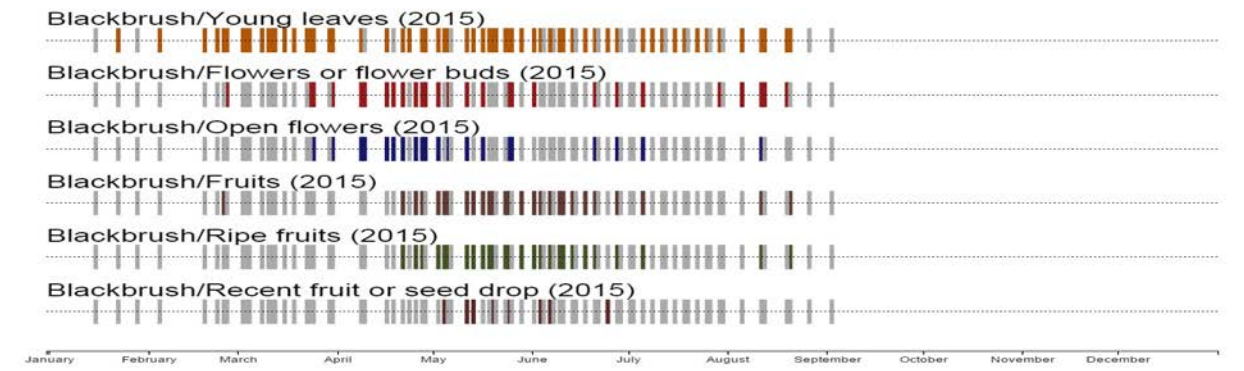


*Coleogyne ramosissima*

Little phenological activity was observed for *Coleogyne ramosissima* in 2012. Flower buds were first recorded in April in 2011, May in 2012, and March of 2015. Young leaves have been recorded as early as January (2012 and 2015) and as late as November (2011). With the exception of 2015, fruits are seldom recorded. (Figure 6)

**Figure 6.** Data visualization calendars depicting all *Coleogyne ramosissima* phenophase activity observed for all locations combined. Colored lines represent a “yes” observation, grey lines represent “no” observation. Very few observations were reported in 2013 (not pictured).





There are not enough data to reliably compare mean onset dates of phenophases for *Coleogyne ramosissima* (Tables 6&7). After data were refined to include only those phenophase onset dates that were preceded by a “no” within a week or less, there were 210 records remaining for CORA (reduced from a total of 693 onset dates). Because the “breaking leaf buds” phenophase is very difficult for volunteers (and staff alike) to observe, it was removed from analysis. Leaves are present for this species most of the year, therefore this phenophase was also removed from analysis. Of the remaining data, for the High View Site, there were only 3 records from 2011 (Flowers or flower buds) and the rest were for 2015 (Table 6). For the Ryan Mountain site, there were slightly more data available following this filtering process, but it was not sufficient to allow a solid comparison of mean onset dates across years.

Despite the low sample sizes, some generalizations can be made about the data presented. The average onset of flower buds for *Coleogyne ramosissima* at High View Nature trail in 2011 was almost a month sooner than that at Ryan Mountain (Tables 6&7). The mean onset of flower buds along Ryan Mountain trail in 2015 was 35 days earlier than that in 2012 (Table 7). The difference in sample size between mean onset of flowers and fruits along High View in 2015 suggests a possible issue with identifying recent *Coleogyne* fruit.

**Table 6.** Mean first onset day of year for *Coleogyne ramosissima* at the High View Nature Trail. Years not shown here are those for which the recorded data were too incomplete to provide reliable DOY values. Some phenophases not included due to difficulty in observation.

| <b><i>Coleogyne ramosissima</i> at High View Nature Trail</b> |                 |           |                 |           |
|---|-----------------|-----------|-----------------|-----------|
| <b>Phenophase</b>   | <b>2011</b>     |           | <b>2015</b>     |           |
|   | <b>Mean DOY</b> | <b>n=</b> | <b>Mean DOY</b> | <b>n=</b> |
| Flowers or flower buds  | 173             | 3         | 91              | 1         |
| Open flowers  |                 |           | 108             | 1         |
| Fruits  |                 |           | 132             | 11        |
| Ripe fruits   |                 |           | 141             | 11        |
| Recent fruit or seed drop                                     |                 |           | 125             | 2         |

**Table 7.** Mean first onset day of year for *Coleogyne ramosissima* at Ryan Mountain. Years not shown here are those for which the recorded data were too incomplete to provide reliable DOY values. Some phenophases not included due to difficulty in observation.

| <b><i>Coleogyne ramosissima</i> at Ryan Mountain</b> |                 |           |                 |           |                 |           |                 |           |
|--|-----------------|-----------|-----------------|-----------|-----------------|-----------|-----------------|-----------|
|  | <b>2011</b>     |           | <b>2012</b>     |           | <b>2014</b>     |           | <b>2015</b>     |           |
| <b>Phenophases</b>                                   | <b>Mean DOY</b> | <b>n=</b> | <b>Mean DOY</b> | <b>n=</b> | <b>Mean DOY</b> | <b>n=</b> | <b>Mean DOY</b> | <b>n=</b> |
| Flowers or flower buds                               | 144             | 3         |                 |           | 101             | 1         | 109             | 4         |
| Open flowers   |                 |           |                 |           | 150             | 3         |                 |           |
| Fruits   |                 |           | 221             | 1         |                 |           | 136             | 6         |
| Ripe fruits  |                 |           | 221             | 1         |                 |           | 140             | 7         |
| Recent fruit drop                                    |                 |           | 172             | 1         |                 |           | 157             | 4         |

“Flowers or flower buds” were observed along the High View Trail in 2011 (5 individuals) and 2015 (1 individual), and “open flowers” only in 2015 (1 individual). No fruits were observed in 2011. However, “fruits” were observed in 2012 on 4 individuals, and in 2015 on 11 individuals (Table 8). Again, this supports the notion that observers were mistaking the hardened, empty calyx of past year’s fruit for fresh fruit. This is a relatively common misunderstanding for observers encountered during training workshops. The number of flowering individuals observed along the Ryan Mountain trail in 2014 and 2015 (10 and 10) is much greater than those observed at High View (0 and 1).

**Table 8.** Numbers of *Coleogyne ramosissima* individuals observed producing flowers and fruit at the High View Nature trail sites 2012-2015. There are a total of 24 individuals observed at this location. “Fruits” observed in 2015 are likely empty calyces retained following a previous flowering event. Monitoring activity in 2013 was not frequent enough to identify unambiguous fruiting or flowering events.

| HIGH VIEW SITES 1-7                  | <b>2011</b> | <b>2012</b> | <b>2014</b> | <b>2015</b> |
|--------------------------------------|-------------|-------------|-------------|-------------|
| # Individuals bearing <b>Flowers</b> | 5           | 0           | 0           | 1           |
| # Individuals bearing <b>Fruits</b>  | 0           | 4           | 0           | 11          |

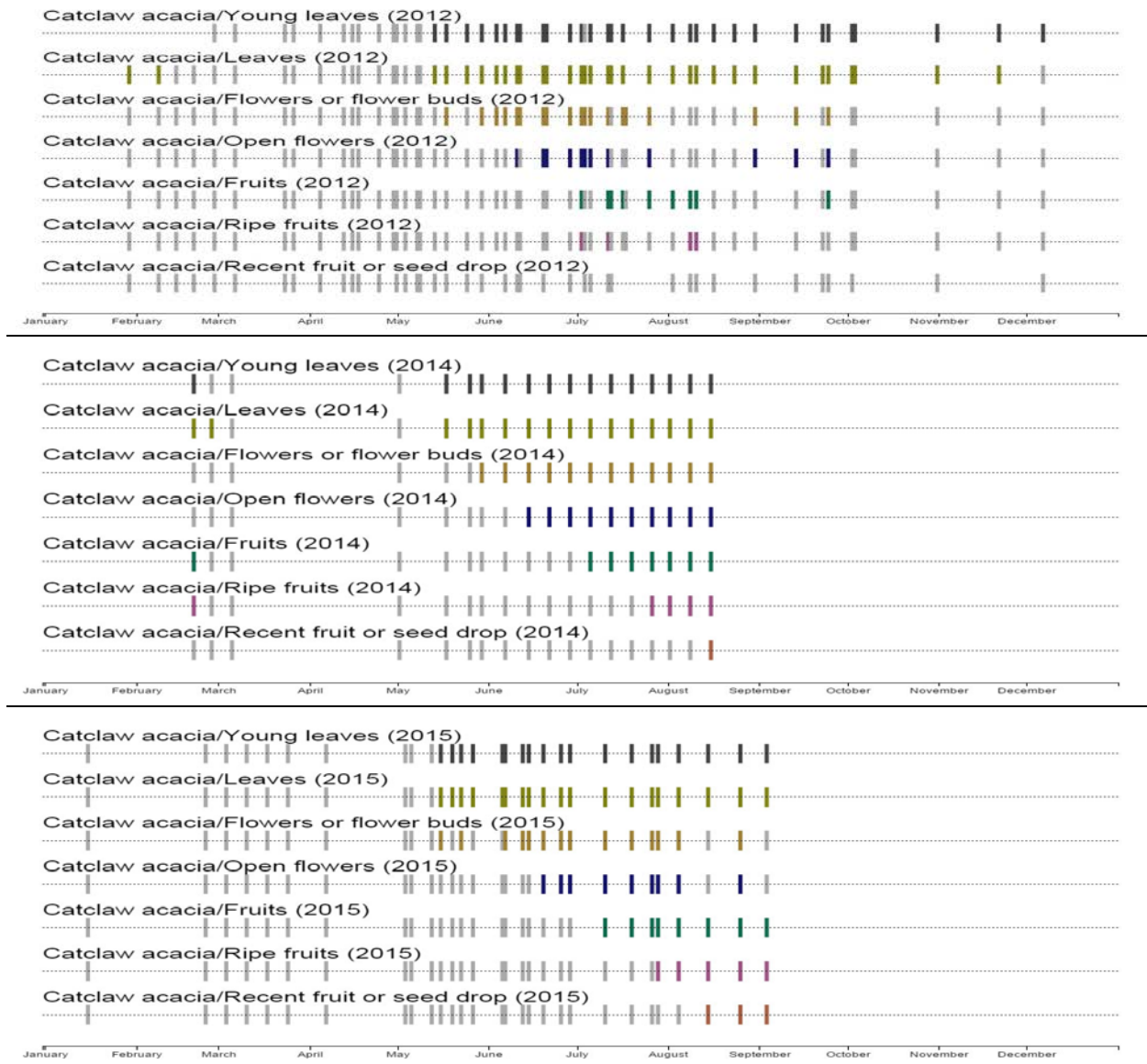
**Table 9.** Numbers of *Coleogyne ramosissima* individuals observed producing flowers and fruit at the Ryan Mountain trail sites in 2012-2015. There are a total of 16 individuals observed at this location. Some “Fruits” observed in 2015 may be empty calyces retained following a previous flowering event. Monitoring activity in 2013 was not frequent enough to identify unambiguous fruiting or flowering events.

| RYAN MOUNTAIN SITES 2-8              | <b>2011</b> | <b>2012</b> | <b>2014</b> | <b>2015</b> |
|--------------------------------------|-------------|-------------|-------------|-------------|
| # Individuals bearing <b>Flowers</b> | 5           | 3           | 10          | 10          |
| # Individuals bearing <b>Fruits</b>  | 1           | 3           | 1           | 12          |

*Acacia greggii*

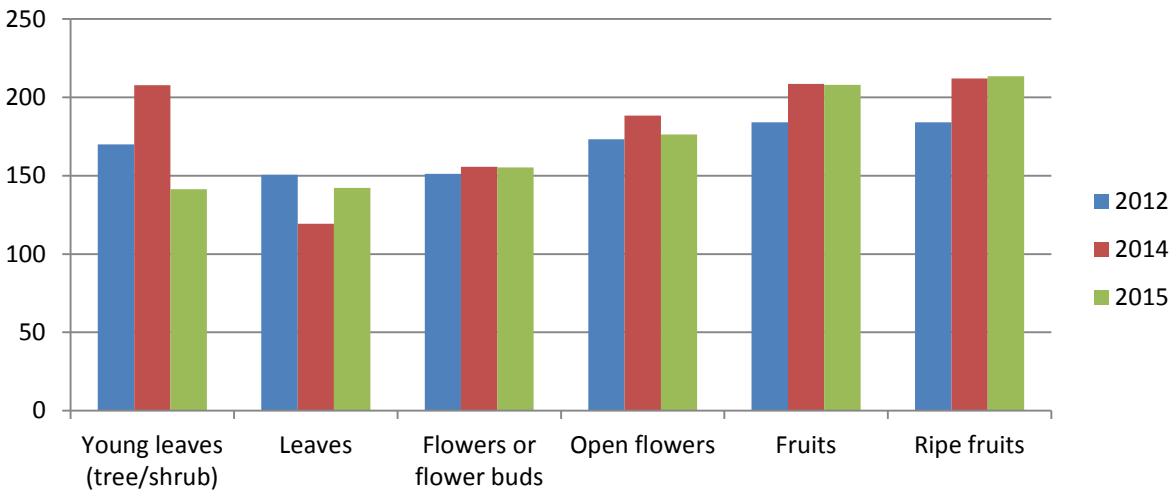
Reports of *Acacia greggii* young leaf production occur from mid-May (2012, 2014, and 2015) until December (2012) (Figure 7). The earliest reports of flower buds are in May 2012, and open flowers are first reported in mid-June (2012, 2014, and 2015). Flower buds and open flowers have been reported as late as September (2012). Data from 2012 and 2015 suggest multiple flowering events; the first in mid-June and the second in early September (2012) and late August (2015). Fruit generally ripen in July and persist through August.

**Figure 7.** Data visualization calendars depicting all *Acacia greggii* phenophase activity observed for the Park Boulevard sites combined. Colored lines represent a “yes” observation, grey lines represent “no” observation. This species was not monitored in 2011, and only a few negative observations were made early in 2013 (not pictured).



The average onset of young leaf production in 2014 was 38 and 67 days later than 2012 and 2015, respectively (Figure 8 and Table 9). The mean onset of the “leaves” phenophase in 2014 is considerably lower than the “young leaves” phenophase onset in both 2012 and 2015. The data is likely reflecting the reporting of persistent leaves from the previous year’s production for 2012 and 2015. The mean onset of open flowers, fruits and ripe fruit phenophases are considerably earlier in 2012 compared to that in 2014 and 2015.

**Figure 8.** Mean onset date (y-axis) for all *Acacia greggii* phenophases at **Park Boulevard** sites 1-3 (combined). There are a total of 11 individuals at this location. See Table 9 for mean values and sample sizes.



**Table 9.** Mean values and sample sizes for mean onset day of year for all *Acacia greggii* phenophases at Park Boulevard sites 1-3 (combined). See Figure 8 for display of annual values.

| <i>Acacia greggii</i> at Park Boulevard |          |    |          |    |          |    |
|---|----------|----|----------|----|----------|----|
| Phenophases                             | 2012     |    | 2014     |    | 2015     |    |
|   | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Young leaves (tree/shrub)               | 170      | 11 | 208      | 7  | 141      | 10 |
| Leaves                                  | 151      | 9  | 119      | 3  | 142      | 11 |
| Flowers or flower buds                  | 151      | 10 | 156      | 4  | 155      | 11 |
| Open flowers                            | 173      | 4  | 188      | 10 | 176      | 10 |
| Fruits                                  | 184      | 3  | 209      | 6  | 208      | 2  |
| Ripe fruits                             | 184      | 3  | 212      | 3  | 214      | 2  |

Reproductive output was greatest in 2015, when all individuals monitored produced flowers and subsequent fruit (Table 10). Interestingly, only a portion of the individuals that produced flowers in 2012 and 2014 subsequently set fruit.

**Table 10.** Numbers of *Acacia greggii* individuals observed producing flowers and fruit at the Park Boulevard sites in 2012, 2014, and 2015. There is no data for 2013. Data collection stopped in mid-August in 2014 which may have affected the reporting of flowers turning into fruit. The mean onset day for fruit in 2014 was July 28<sup>th</sup> (Table 9). There are a total of 11 individuals observed at this location.

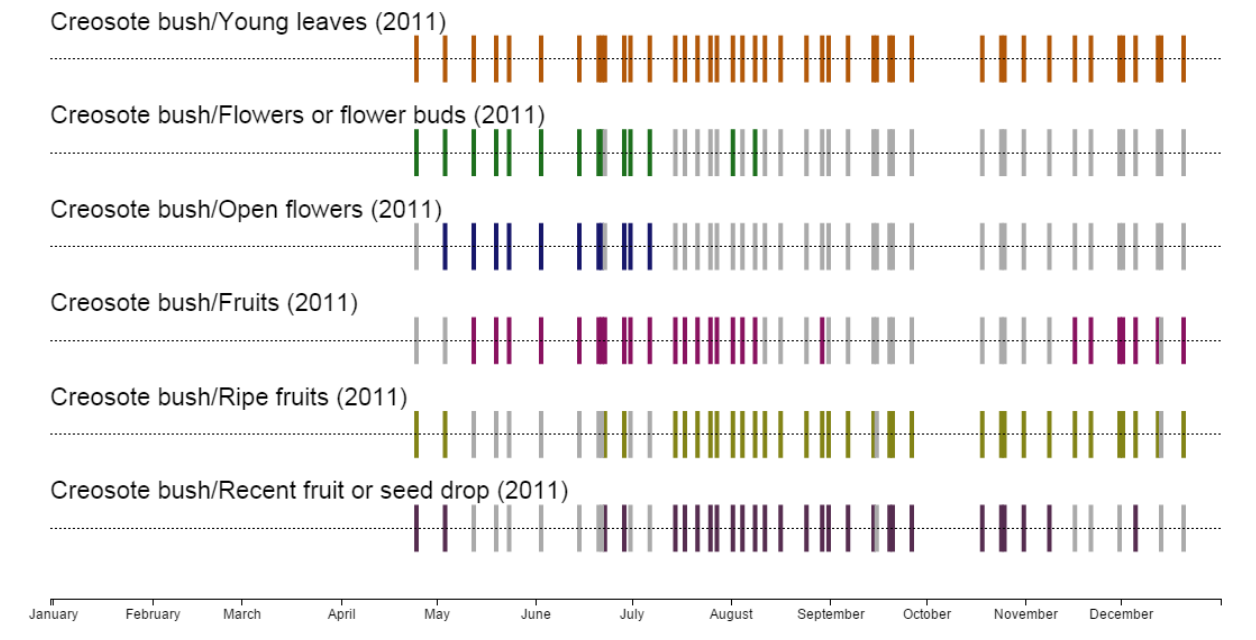
| PARK BOULEVARD sites 1-3                  | 2012 | 2014 | 2015 |
|---|------|------|------|
| # Individuals bearing <b>open Flowers</b> | 10   | 11   | 11   |
| # Individuals bearing <b>Fruits</b>       | 3    | 6    | 11   |

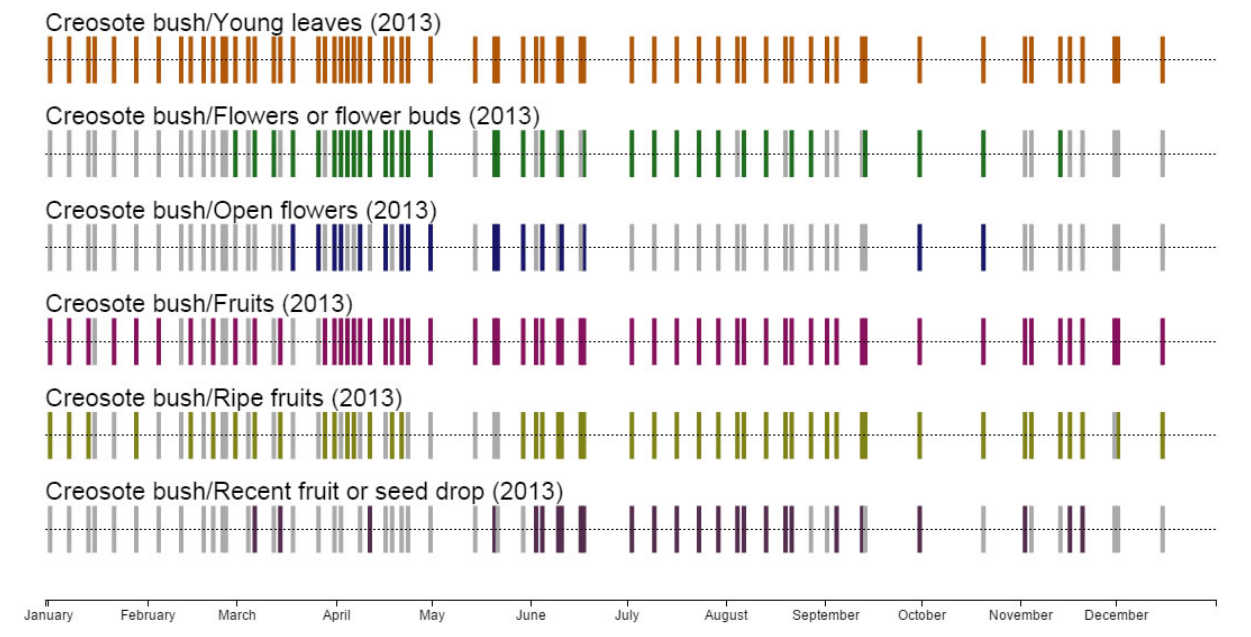
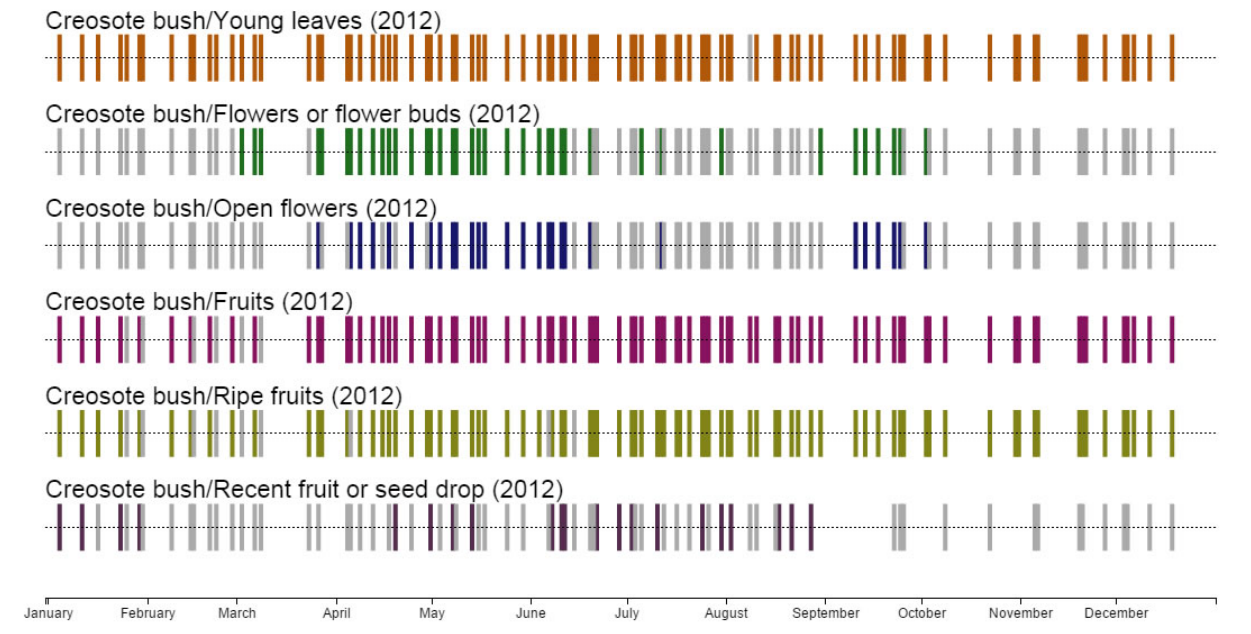


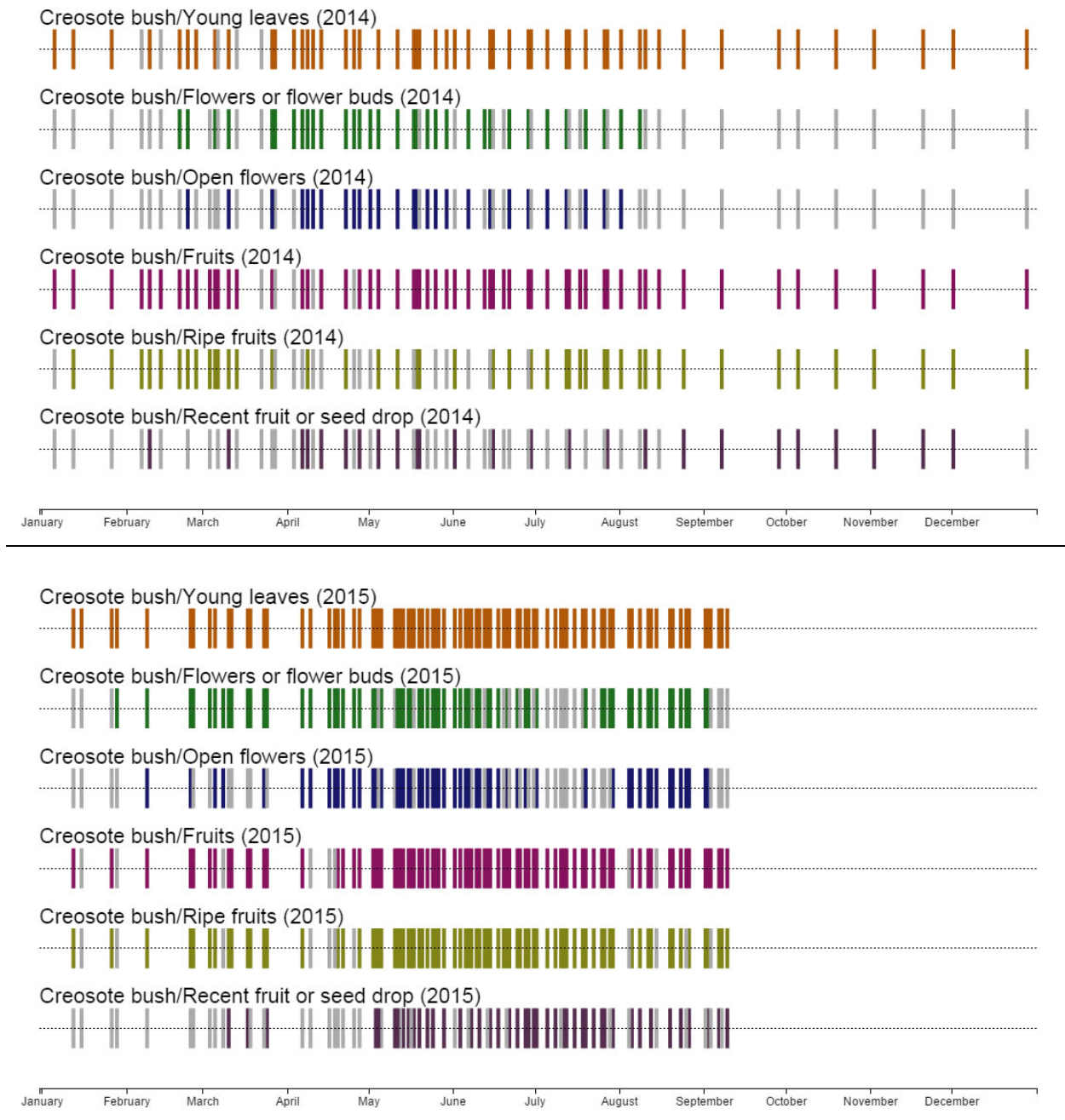
Larrea tridentata

Across all years and sites, the “young leaves” phenophase for *Larrea tridentata* is reported throughout the entire year (Figure 9). The earliest reports of open flowers occur in February (2014 and 2015) and the latest reports occur in October (2013 and 2014). Both spring and fall flowering events were reported for 2012, 2013, and 2015. Open flowers persisted into late summer in both 2014 and 2015. Fruits and ripe fruits are generally reported throughout the year suggesting some fruits can persist many months after their initial onset in the spring.

**Figure 9.** Data visualization calendars depicting all *Larrea tridentata* phenophase activity observed for the Park Boulevard sites combined. Colored lines represent a “yes” observation, grey lines represent “no” observation.



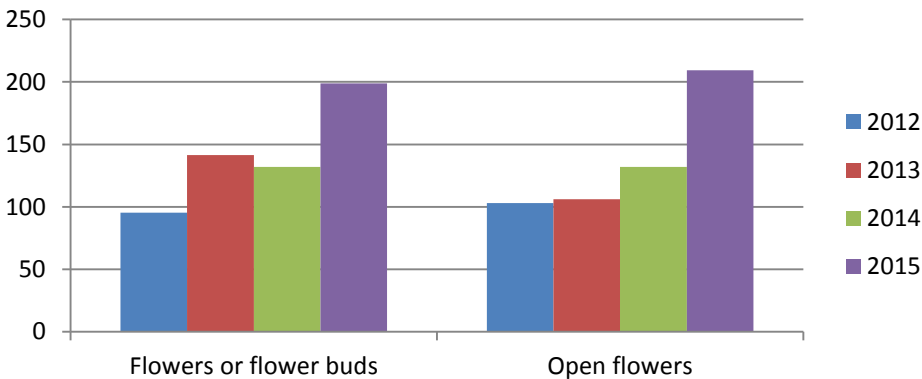




Since young leaves persist throughout the year, as well as fruits, only the flower bud and open flower phenophases are illustrated by the *Larrea tridentata* mean onset figures and tables. Only the earliest reported onset dates with a preceding “no” within 7 days or less were used to calculate the means. For a species like *Larrea tridentata* which has multiple flowering events each year, this approach can cause misleading results. This should be taken into consideration for the following three sets of figures and tables.

At the Oasis Visitor center in 2015, the mean onset of the “flowers or flower buds” phenophase is 8 weeks later than any other year (Figure 10 & Table 11). The mean onset of open flowers in 2015 is 11 weeks later than any other year. This is likely due to a lower frequency of observations during January to April when the first flowering event of the year would be observed (Table 3b). The result is the first onset date reported with a preceding no within 7 days or less in 2015 reflects a second flowering event, whereas the previous years’ data is reflecting the first flowering event of the year.

**Figure 10.** Mean onset date (y-axis) for *Larrea tridentata* flower buds and open flowers at Oasis Visitor Center. There are a total of 5 individuals at this location. See Table 11 for mean values and sample sizes.

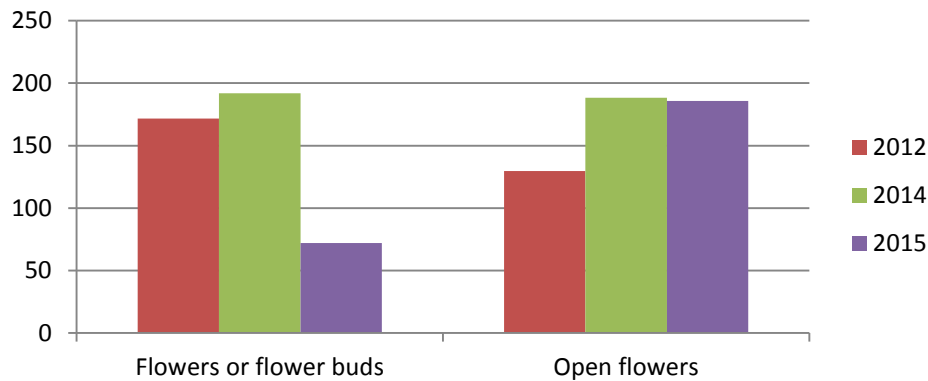


**Table 11.** Mean values and sample sizes for mean onset day of year for *Larrea tridentata* flower buds and open flowers at Oasis of Mara. See Figure 10 for display of annual values.

| <i>Larrea tridentata</i> at Oasis Visitor Center |          |    |          |    |          |    |          |    |
|--|----------|----|----------|----|----------|----|----------|----|
| Phenophase                                       | 2012     |    | 2013     |    | 2014     |    | 2015     |    |
|  | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Flowers or flower buds                           | 95       | 3  | 142      | 4  | 132      | 2  | 199      | 4  |
| Open flowers                                     | 103      | 2  | 106      | 4  | 132      | 2  | 209      | 4  |

Similar to the Oasis Visitor Center mean onset values, the mean onset of the flower bud phenophase at Park Boulevard for 2015 likely represents a separate flowering event than the data for 2012 and 2014 (Figure 11 and Table 12). There is a difference of over 100 days. There is also a difference greater than 100 days between mean flower bud onset and open flowers for 2015. These are also likely highlighting separate flowering events.

**Figure 11.** Mean onset date (y-axis) for *Larrea tridentata* flower buds and open flowers at Park Boulevard (sites 1-3 combined). There are a total of 12 individuals at this location. See Table 12 for mean values and sample sizes.

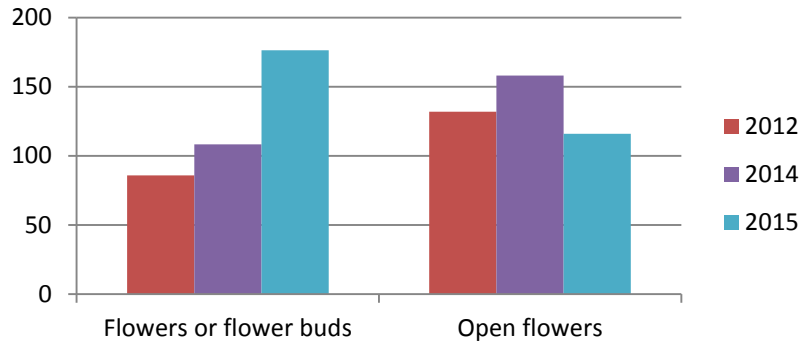


**Table 12.** Mean values and sample sizes for mean onset day of year for *Larrea tridentata* flower buds and open flowers at Park Boulevard. There are a total of 12 individuals at this location. See Figure 11 for display of annual values.

| <i>Larrea tridentata</i> at Park Boulevard |          |    |          |    |          |    |          |    |
|--|----------|----|----------|----|----------|----|----------|----|
|  | 2011     |    | 2012     |    | 2014     |    | 2015     |    |
| Phenophase                                 | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Flowers or flower buds                     | 218      | 2  | 172      | 9  | 192      | 5  | 72       | 11 |
| Open flowers                               |          |    | 130      | 11 | 188      | 4  | 186      | 10 |

The difference between mean flower bud onset and open flower onset at Ryan Mountain in 2012 and 2014 is 48 and 50 days, respectively (Figure 12 and Table 13). This may represent an average duration of bud emergence to open flower, however this pattern is inconsistent across other sites and years. More data is needed to make this conclusion considering the small sample sizes and issues with inconsistent observation frequency and multiple annual phenophase onset events.

**Figure 12.** Mean onset date (y-axis) for *Larrea tridentata* flower buds and open flowers at Ryan Mountain (sites 1 and 4 combined). There are a total of 10 individuals at this location. See Table 13 for mean values and sample sizes.



**Table 13.** Mean values and sample sizes for mean onset day of year for *Larrea tridentata* flower buds and open flowers at Ryan Mountain. There are a total of 10 individuals at this location. See Figure 12 for display of annual values.

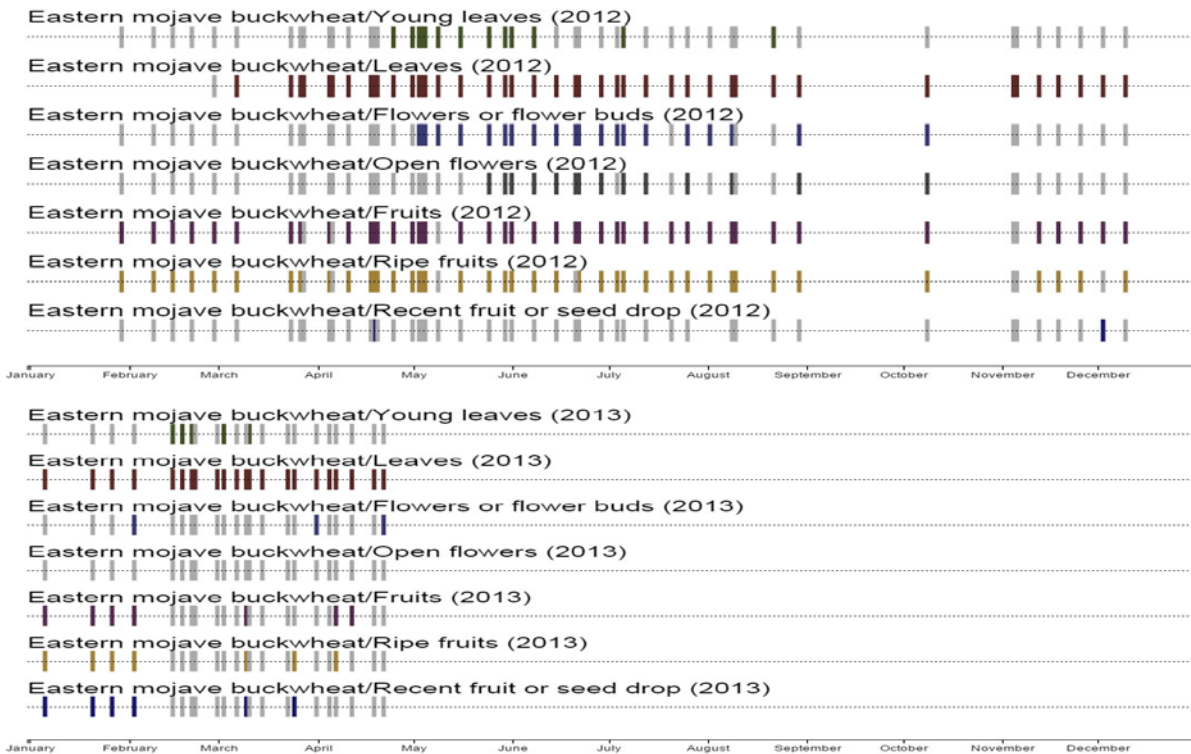
| <i>Larrea tridentata</i> at Ryan Mountain |          |    |          |    |          |    |          |    |          |    |
|---|----------|----|----------|----|----------|----|----------|----|----------|----|
|   | 2011     |    | 2012     |    | 2013     |    | 2014     |    | 2015     |    |
| Phenophase                                | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Flowers or flower buds                    |          |    | 86       | 1  | 81       | 2  | 108      | 5  | 176      | 10 |
| Open flowers                              | 142      | 2  | 132      | 7  |          |    | 158      | 5  | 116      | 10 |

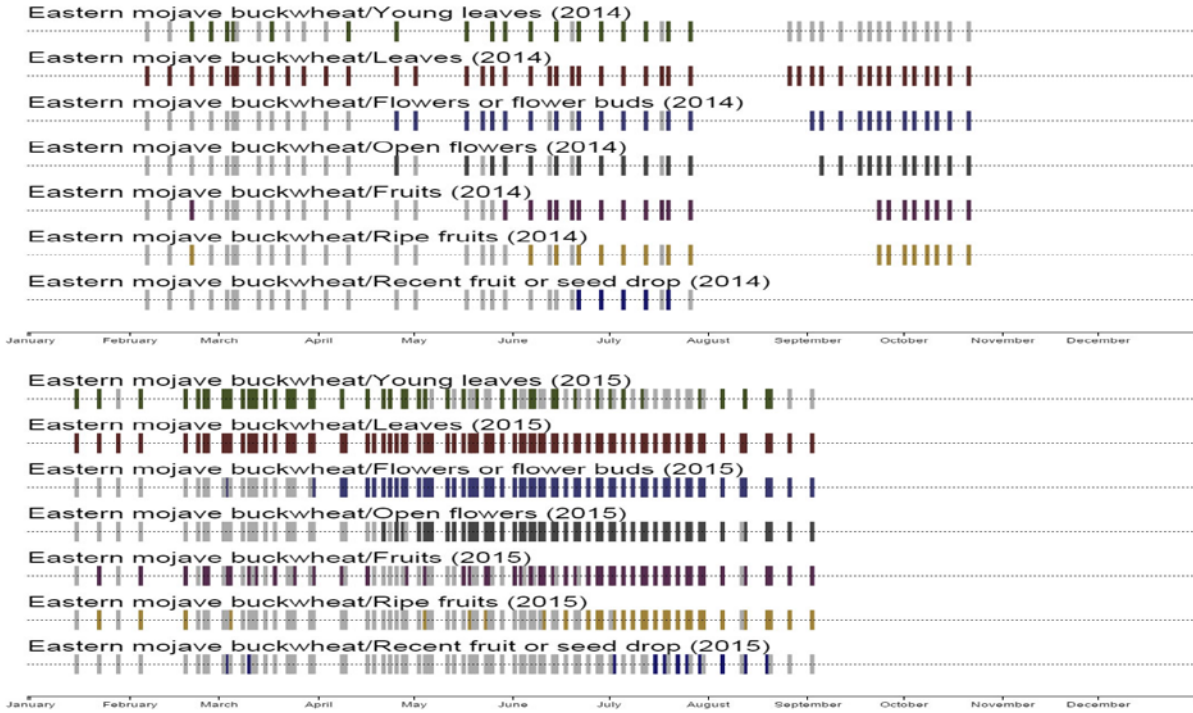


Eriogonum fasciculatum

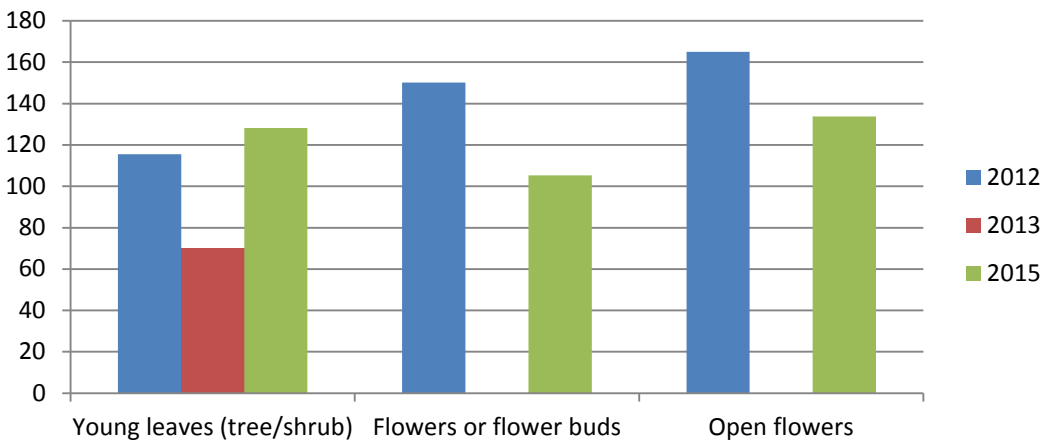
*Eriogonum fasciculatum* is generally reported to bear leaves throughout the year, however “young leaves” are reported much less frequently and not at all from September through December (Figure 13). Flower buds are generally reported from May to October, but as early as April in 2015. Fruits are reported throughout the year suggesting some persist from initial onset in late spring/early summer throughout the year.

**Figure 13.** Data visualization calendars depicting all *Eriogonum fasciculatum* phenophase activity observed for the High View Nature Trail and Ryan Mountain sites combined. Colored lines represent a “yes” observation, grey lines represent “no” observation. No data was recorded for this species in 2011.





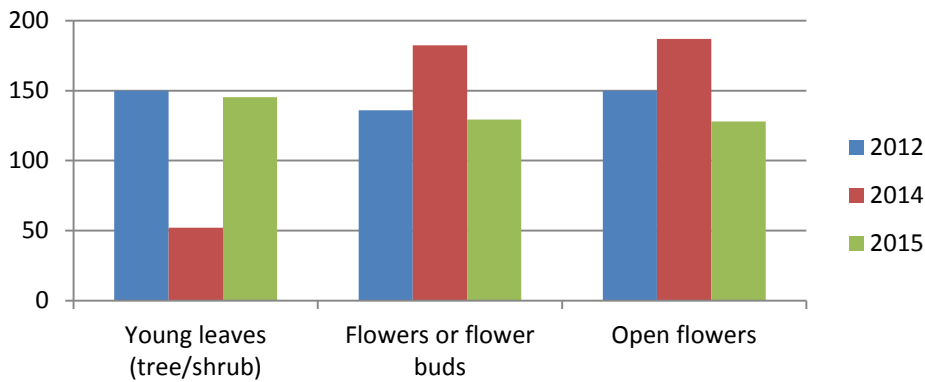
**Figure 14.** Mean onset date (y-axis) for *Eriogonum fasciculatum* phenophases at High View Nature Trail sites 2-6 (combined). There are a total of 18 individuals at this location. See Table 14 for mean values and sample sizes.



**Table 14.** Mean values and sample sizes for mean onset day of year for *Eriogonum fasciculatum* phenophases at High View Nature Trail sites 2-6 (combined). There are a total of 18 individuals at this location. See Figure 14 for display of annual values.

| <i>Eriogonum fasciculatum</i> at High View |          |    |          |    |          |    |
|--|----------|----|----------|----|----------|----|
|  | 2012     |    | 2013     |    | 2015     |    |
| Row Labels                                 | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Young leaves (tree/shrub)                  | 116      | 11 | 70       | 4  | 128      | 11 |
| Flowers or flower buds                     | 150      | 5  |          |    | 105      | 7  |
| Open flowers                               | 165      | 7  |          |    | 134      | 4  |

**Figure 15.** Mean onset date (y-axis) for *Eriogonum fasciculatum* phenophases at Ryan Mountain sites 1-7 (combined). There are a total of 14 individuals at this location. See Table 15 for mean values and sample sizes.



**Table 15.** Mean values and sample sizes for mean onset day of year for *Eriogonum fasciculatum* phenophases at Ryan Mountain sites 1-7 (combined). See Figure 15 for display of annual values.

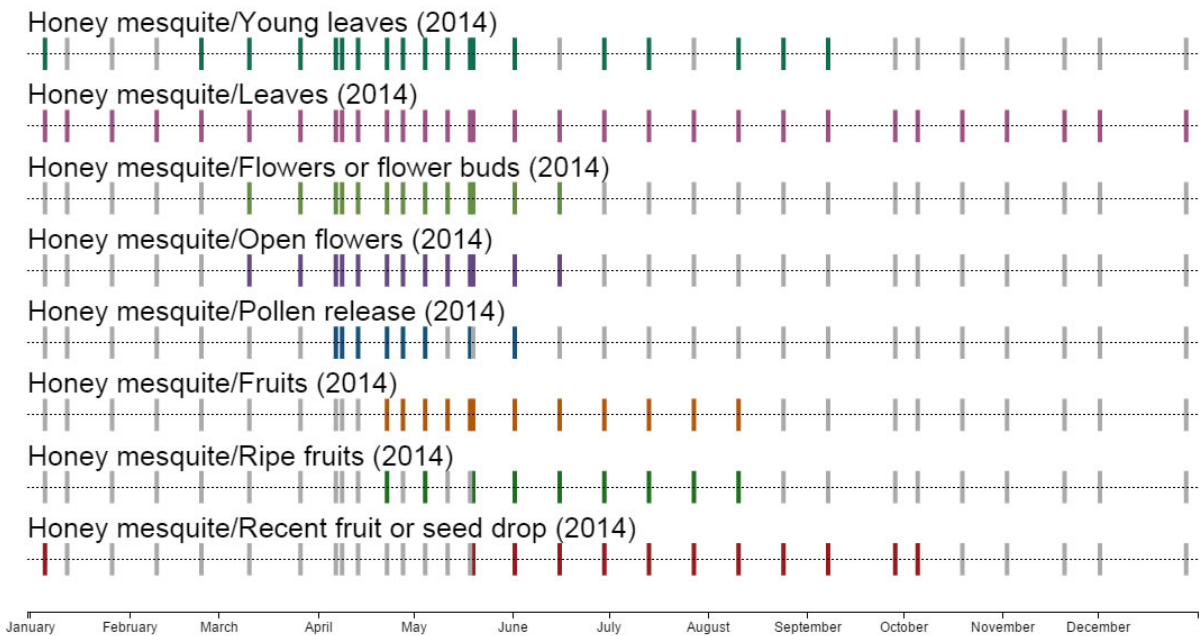
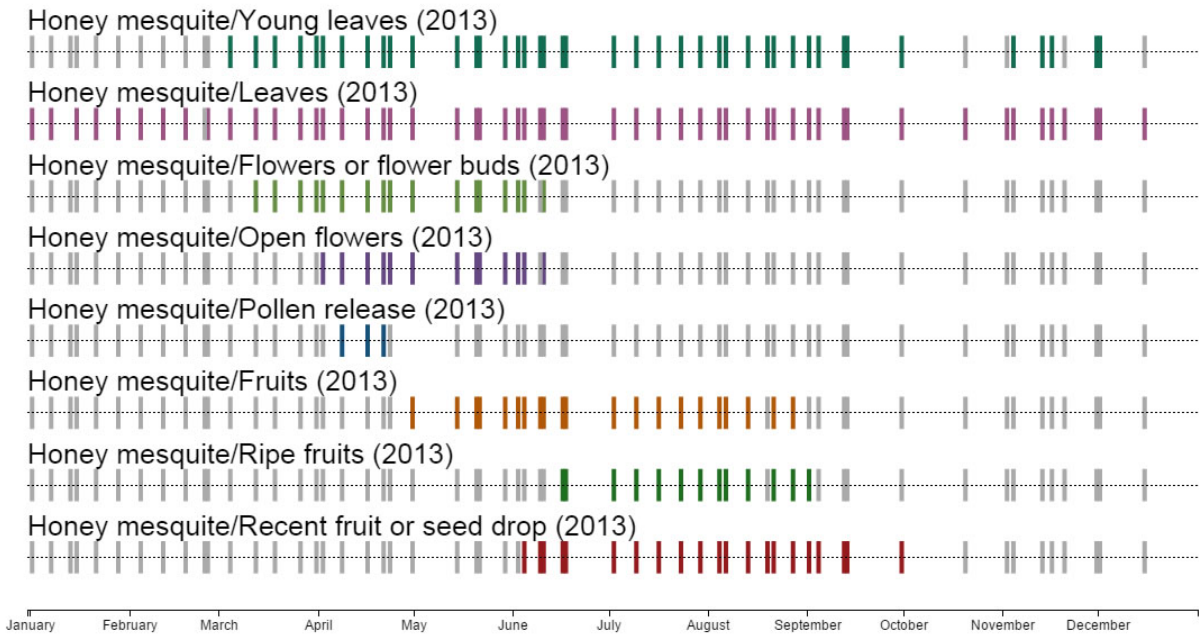
| <i>Eriogonum fasciculatum</i> at Ryan Mountain |          |    |          |    |          |    |
|--|----------|----|----------|----|----------|----|
|  | 2012     |    | 2014     |    | 2015     |    |
| Phenophase                                     | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Young leaves (tree/shrub)                      | 150      | 1  | 52       | 9  | 145      | 14 |
| Flowers or flower buds                         | 136      | 6  | 182      | 3  | 129      | 10 |
| Open flowers                                   | 150      | 5  | 187      | 2  | 128      | 9  |

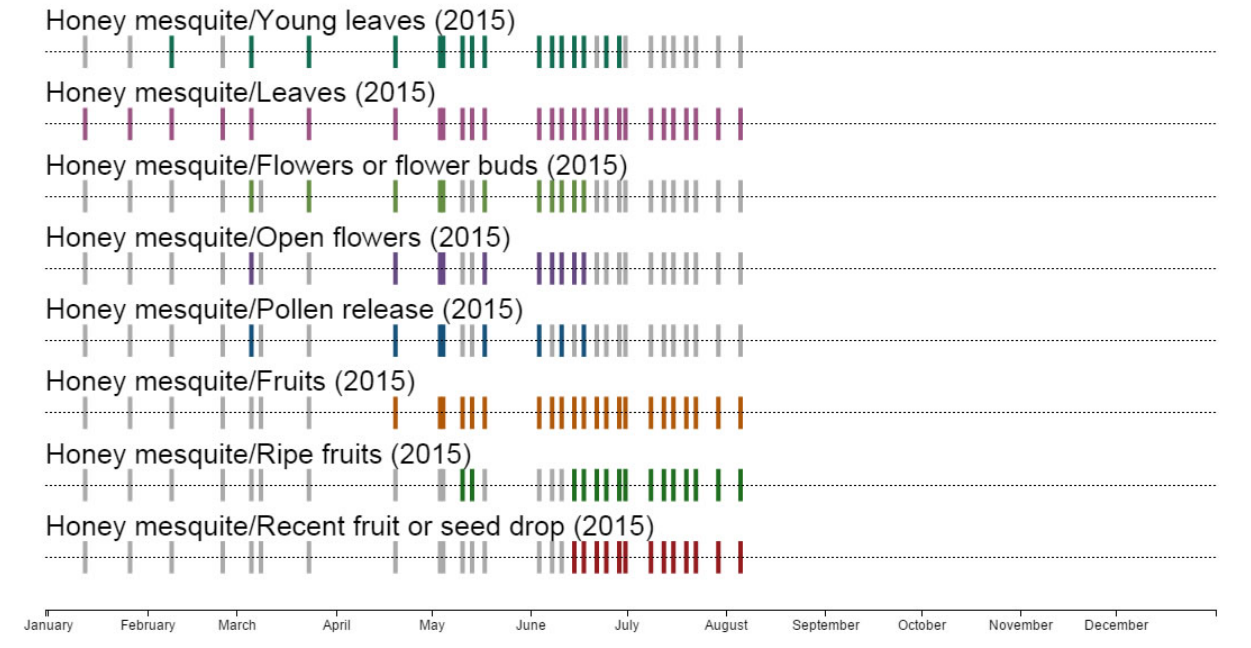
Prosopis glandulosa

It is likely data collection began too late in 2011 to capture the first onset date of leaves, flower buds, and open flowers for *Prosopis glandulosa* (Figure 16). Leaves are reported throughout the entire year for 2012-2015. Young leaves and flowers both generally emerge in March, and fruits are generally first observed in late April or early May. All phenophase appear slightly advanced in 2014 compared to the other years.

**Figure 16.** Data visualization calendars depicting all *Prosopis glandulosa* phenophase observations at Oasis of Mara Visitor Center. Colored lines represent a “yes” observation, grey lines represent “no” observation.

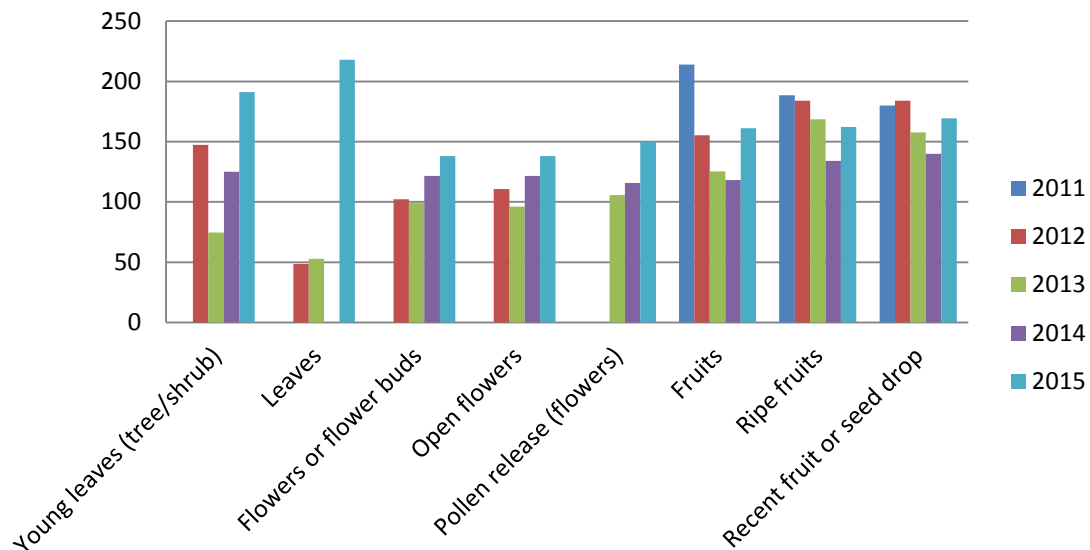






Fruit, ripe fruit, and recent fruit drop mean onset dates in 2014 were earliest. However flower bud, open flowers, and pollen release mean onsets were slightly earlier in 2013 and latest in 2015 (Figure 17 and Table 16).

**Figure 17.** Mean onset date (y-axis) for *Prosopis glandulosa* phenophases at Oasis of Mara. There are a total of 5 individuals at this location. See Table 16 for mean values and sample sizes.



**Table 16.** Mean values and sample sizes for mean onset day of year for *Prosopis glandulosa* phenophases at Oasis of Mara. See Figure 17 for display of annual values.

| <i>Prosopis glandulosa</i> at Oasis of Mara |          |    |          |    |          |    |          |    |          |    |
|---|----------|----|----------|----|----------|----|----------|----|----------|----|
|   | 2011     |    | 2012     |    | 2013     |    | 2014     |    | 2015     |    |
| Phenophase                                  | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= | Mean DOY | n= |
| Young leaves (tree/shrub)                   |          |    | 147      | 5  | 75       | 4  | 125      | 2  | 191      | 4  |
| Leaves                                      |          |    | 49       | 2  | 53       | 5  |          |    | 218      | 1  |
| Flowers or flower buds                      |          |    | 102      | 5  | 99       | 4  | 122      | 2  | 138      | 1  |
| Open flowers                                |          |    | 111      | 5  | 96       | 4  | 122      | 2  | 138      | 1  |
| Pollen release (flowers)                    |          |    |          |    | 106      | 2  | 116      | 3  | 150      | 2  |
| Fruits                                      | 214      | 1  | 155      | 4  | 125      | 5  | 118      | 4  | 161      | 3  |
| Ripe fruits                                 | 189      | 4  | 184      | 2  | 169      | 3  | 134      | 5  | 162      | 5  |
| Recent fruit or seed drop                   | 180      | 2  | 184      | 1  | 158      | 3  | 140      | 1  | 169      | 3  |



*Yucca schidigera*

Open flowers were observed on *Yucca schidigera* in April in 2013 and 2015, and in May of 2012 (Figure 18). Ripe fruits were observed each year. In 2015, a second onset of flowers was observed in August.

**Figure 18.** Data visualization calendars depicting all *Yucca schidigera* phenophase activity observed for the High View Nature Trail and Ryan Mountain sites combined. Colored lines represent a “yes” observation, grey lines represent “no” observation. No phenophase activity was observed in 2011 (not pictured), and no observations were made from May-December in 2011.

Mojave yucca/Flowers or flower buds (2012)



Mojave yucca/Open flowers (2012)



Mojave yucca/Fruits (2012)



Mojave yucca/Ripe fruits (2012)



Mojave yucca/Recent fruit or seed drop (2012)



January February March April May June July August September October November December

Mojave yucca/Flowers or flower buds (2013)



Mojave yucca/Open flowers (2013)



Mojave yucca/Fruits (2013)



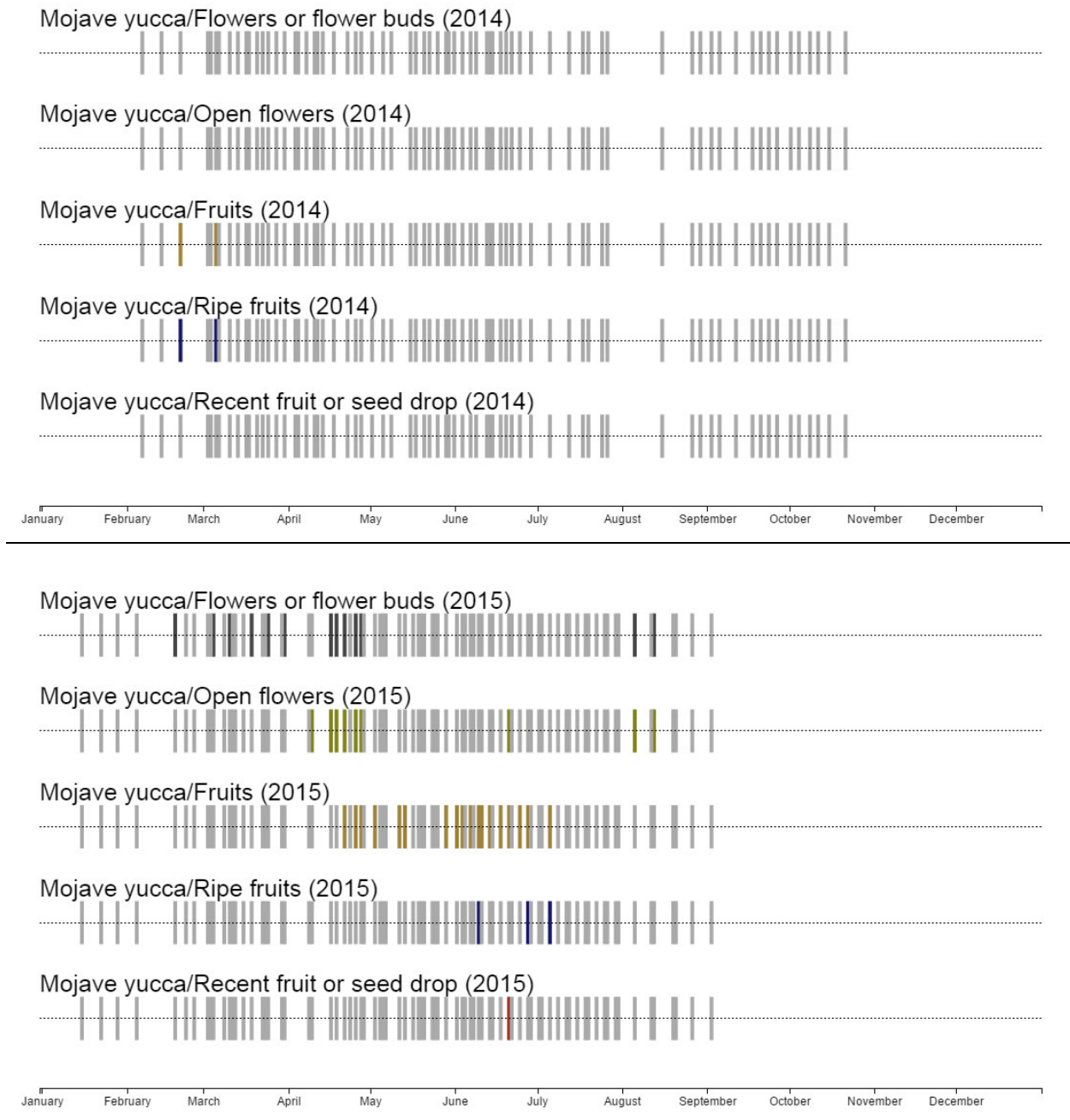
Mojave yucca/Ripe fruits (2013)



Mojave yucca/Recent fruit or seed drop (2013)



January February March April May June July August September October November December



Reproductive output for *Yucca schidigera* was greatest in 2013, when 5/15 individuals monitored along High View Trail, and 4/19 individuals monitored along Ryan Mountain trail produced flowers (Tables 17 and 18). Of those 9 individuals, 5 subsequently set fruit. There may have been more data collection in 2013 stopped in late April. In 2015, 4 individuals along Ryan Mountain Trail flowered, but only 1 had fruit as of September 9 (Table 18).

**Table 17.** Numbers of *Yucca schidigera* individuals observed producing flowers and/or fruit at High View Nature Trail 2012-2015. There is no data for 2011. There are a total of 14 individuals observed at this location. Fruits observed in 2012 and 2014 are likely persistent from previous year. \*Data collection stopped in late April 2013.

| HIGH VIEW SITES 1-7                  | 2012 | 2013* | 2014 | 2015 |
|--------------------------------------|------|-------|------|------|
| # Individuals bearing <b>Flowers</b> | 0    | 5     | 0    | 1    |
| # Individuals bearing <b>Fruits</b>  | 1    | 2     | 1    | 0    |

**Table 18.** Numbers of *Yucca schidigera* individuals observed producing flowers and/or fruit at Ryan Mountain 2012-2015. There is no data for 2011. There are a total of 19 individuals observed at this location. \*Data collection stopped in late April 2013.

| RYAN MOUNTAIN                        | 2012 | 2013* | 2014 | 2015 |
|--------------------------------------|------|-------|------|------|
| # Individuals bearing <b>Flowers</b> | 1    | 4     | 0    | 4    |
| # Individuals bearing <b>Fruits</b>  | 0    | 3     | 0    | 1    |

## Discussion

### Monitoring Activity

In years past, it has been a priority to achieve once weekly monitoring from January - June (thought to be the most phenologically active time of year), and as much as possible throughout the remainder of the year. Upon analysis of the data, a more concerted effort to achieve year-round weekly monitoring schedule would provide a much better picture of phenological activity. Even though most of the phenophase onset dates occur from January - June, during many months of the year, there is a new appearance of one or more phenophases for at least one of the seven targeted species. In addition, throughout the calendar year, for one or more phenophases, several species exhibit multiple onset dates that are separated by periods of inactivity. For example, examination of the visualization calendars above reveals that *Eriogonum fasciculatum* and *Larrea tridentata* exhibit distinct flowering events in both spring and fall. By contrast, *Acacia greggii* usually begins flowering in June, and fruits ripen closer to August. Although not recorded in the CPP data presented here, a few *Coleogyne ramosissima* individuals outside of our monitoring sites have been observed putting on late summer flowers after a particularly active monsoon season.

It is highly recommended that staff overseeing data collection either encourage volunteers to continue monitoring year round, or recruits new volunteers or staff to fill in any gaps in monitoring schedules. Checking in with volunteers every month or so to determine the upcoming month's monitoring coverage has proven to be effective in achieving the once weekly monitoring year-round.

It is highly important for multiple observers monitoring the same site to calibrate their observations on a regular basis. This can be done by doing joint field sessions once per month or more, sharing data sheets (either scanned and sent electronically or photocopied), or promptly entering data into Nature's Notebook. If at all possible, observers should commit to weekly observations for at least one month. Best results have been achieved when one observer monitors a given site weekly for an entire season or longer. When a new observer begins monitoring a site, beyond the required training session, they should shadow an experienced observer at least twice.

Staff oversight of the project has proven to increase monitoring activity significantly. JOTR provided paid staff support to the project from April 2011-Jan 2013 (full time), 2014 (part time), and 2015 (part time). Observation numbers for 2013 are less than half of any other year, and no staff support of the project was provided that year (Table 2). The only location which received consistent monitoring that year was the Oasis of Mara Visitor Center (Table 3). The highest number of observations was achieved in 2012, when the park had a full time Student Conservation Association intern dedicated to the project. If observations for 2015 continue at the current rate, it will be the most active monitoring year thus far.

### Mean Onset of Phenophase difficulty

It is difficult to assess the mean date of onset (DOY) for phenophases when there is inconsistent monitoring activity. The first step in determining the mean DOY for a given phenophase is to exclude any "yes" observations that are not preceded by a negative observation within the previous week. This

allows us to determine the actual onset date of the phenophase with a minimum accuracy of seven days. When analyzing most species and phenophases, excluding imprecise values for DOY (i.e., DOYs that were not preceded by a “no” within 7 days) often reduced the sample size dramatically. Furthermore, for species such as *Larrea tridentata* and *Eriogonum fasciculatum*, which can flower more than once per year, it was difficult to determine which remaining flowering (and subsequent fruiting) events should be averaged to avoid combining separate events (i.e. spring flowering onset versus a late summer flowering onset). The mean onset results for *Larrea tridentata* flower buds and open flowers seem to be comparing different flowering events for some years and locations due to the large variation in values. Suspected errors are highlighted in the result section.

### Abundance Measurements

Abundance measurements were not used in this series of data analysis. Volunteers seem to struggle with this portion of the observation protocol. The estimates of quantity and proportions are quite subjective and answers can vary often between different observers. For this reason, it is highly recommended to observers to bring their previous visit’s data with them to base their answers on. Also, if there are multiple observers for one site, they should regularly inspect each other’s data to calibrate their abundance estimates.

Despite the lack of consistency in data obtained, the abundance measure questions do challenge observers to be confident in their report of a present phenophase. For example, one may see the small leaves of a *Coleogyne ramosissima* green up after a recent winter rain, and mistakenly answer “yes” to “new leaves”. However, in an attempt to answer the question of “how many?” a closer examination reveals they are not “new leaves”, but just refreshed persistent leaves from last spring. The abundance measure questions can provide a chance for observers to second guess their report of the presence of a given phenophase.

### Volunteer recruitment and management

While plants have, for the most part, been monitored on a semi-weekly, weekly, or semi-monthly basis, the frequency of monitoring at JOTR has depended largely on staff and volunteer availability and has been inconsistent at times. Regardless, between June 2011 and October 2014, over 121,000 unique phenophase observations have been made on these 166 plants. Plants at more accessible sites, such as Oasis of Mara, have been monitored more frequently and more consistently than less accessible sites such as Ryan Mountain.

Recruitment of volunteers at Joshua Tree has been an interesting game of numbers. Nearly 1000 people have been approached resulting in only about 10 long-term volunteers. However, there are several lessons learned from which we will refine our efforts and make a plan for sustaining the volunteer efforts at JOTR. The first lesson learned is persistence and follow through. Through our initial recruitment efforts we engaged nearly 1000 people who may have volunteered with additional prompting and many more who might have been reached through secondary associations. For example,

following the Basin Wide Breakfast, we would have been able to reach more volunteers if we had distributed an email to attendees asking for their help. Persistence was also necessary to recruit several volunteers over the summer. There were several interested parties who were traveling or out of touch over the summer. It was only through regular contact that we were able to find time to train and retain these volunteers.

Another important lesson has been that there is a lot of power to just getting the word out. The word “phenology” is unfamiliar or obscure to most people in the general population. We found that once we had saturated the community with phenology and phenological messaging that we were able to recruit volunteers as a result of Visitor Center staff or other people in the community referring people interested in ecology to our project. As a result, it is important to continue to reach out to people through various media. Some possible ideas for future recruitment efforts are: have an informational sign or pamphlet at the visitor centers; recruit through the Desert Institute, either through their mailing list or through their class handouts; partnering with and pursue recruitment through the College of the Desert, Copper Mountain College, and local area high schools.

There are many challenges that have been encountered in the process of volunteer utilization. Beyond the initial hurdle of recruiting volunteers, the frequency and quality of the phenological monitoring depends on the retention, training (including refresher training workshops), and coordination of volunteers.

Volunteer retention has been a big challenge. Only a handful of volunteers who have gone through the monitoring trainings and made a commitment to volunteering on a regular basis have actually collected data on a regular basis. There are several factors that contribute to the difficulty in retaining trained volunteers and seasonal park staff. Some of the factors involved include timing of training, follow-up trainings, inclement conditions, the frequency of observations, difficult to identify phenophases, and the lack of social interactions. In addition, unless seasonal staff (including student interns) are encouraged (and approved by their supervisors) to participate in phenological monitoring as a vital national park objective, it will be difficult to provide the frequent monitoring required for close ecological monitoring of the park’s natural resources.

In order to mitigate these factors, JOTR will be examining the period of observation each year and seek to identify shorter periods of phenological activity for long-term observation. We recommend reducing the period of observation to the time periods where trained volunteers will observe the progression through phenophases, and be able to self-adjust monitoring frequency for the periods of time when there is no recorded change. By concentrating our volunteers during the active periods we can concentrate training periods to specific periods of time, prior to volunteers hitting the trails. Concentrating activities into a shorter window of time each year will overcome a number of the hurdles identified and allow us to effectively use limited staff and volunteers for collecting multiple observations per week at each site and may increase the opportunity for CPP monitoring to become a social event through partnering.

The experience at JOTR has been that a lot of effort is required up front to build inertia for phenological monitoring and to introduce phenology into the shared lexicon of the local communities. We are currently exploring ways to make phenological monitoring of CPP species sustainable at JOTR. Our experience suggests that shortening the period of observation to a concise time frame (and encouraging increased, regular frequency of observations during that time), increasing training and social opportunities, and remaining in regular contact with our current volunteers during the “off-season” will all be essential components to a successful and sustainable volunteer based program.



## **Recommendations**

### Tagging Plants

Park staff should be responsible for ensuring that all plants being monitored are clearly labeled. Staff should revisit the plants at least annually to check their labels and to replace if necessary. A need for more professional looking tags has been identified by upper level management in the Park. A suggested template for such tags would include both the NPS and CPP logos, along with a link to the CPP website.

### Volunteer recruitment and management

Mandatory annual or semi-annual trainings or site visits by park staff to ensure accurate and consistent data collections across sites, species, and observers should be instated. This will provide an opportunity to engage with volunteers, discuss observations, gauge quality and consistency in observations, and to train new volunteers with the help of some seasoned experts.

Maintaining the Volunteer\_Contacts.xls document on the Park's Resources share drive is highly recommended. It has proven to be a great tool for recruitment efforts, and disseminating information pertaining to the project. The document includes current participation level, contact information, training records, and locations monitored. This record will help ensure that contact is maintained with committed volunteers of the past.

Volunteers have expressed the interest in having some interpretive material to hand out on the trail to curious visitors watching them work. One volunteer along the Ryan Mountain Trail in April 2015 counted over thirty visitor contacts while he was performing his weekly duties. A handout has been developed by project staff for volunteers to distribute when approached and to assist them in interpreting the project (attached in Appendix H).

### Data Entry

Through 2014, volunteers were encouraged to either sign on to Nature's Notebook through a common Nature's Notebook profile, or to hand in their paper data sheets to park staff who would then enter the data under that same generic profile. The result is that all of JOTR's electronic data up until 2015 has no observer information associated with it. It is clear that this was not the best approach. It is much preferred that all volunteers who are observing create their own profile in Nature's Notebook. Step by step instructions on how to do this should be provided to new volunteers; these instructions are attached in Appendix F. Even if an observer is unable or uninterested in entering their own data, creating a Nature's Notebook profile allows a "data entry technician" to enter data under the observer's email address. This provides the opportunity to track volunteer activity by observer, better assess observation validity, and track changes in volunteer participation over time. Aside from revisiting stacks of paper data sheets, much of this information has been lost for the first 4 years of the project.

## Data Analysis

The results should be compared to monthly temperature and precipitation patterns. The High View Nature Trail results can be compared to weather data collected at the Yucca Valley RAWS station available here: <http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?caCYUC>. The best source for weather data for the Ryan Mountain and Park Boulevard monitoring locations is the Lost Horse RAWS station, available for download here: <http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?caCLHO>. Climate data associated with the Oasis of Mara Visitor Center can be downloaded from the PRISM database here: <http://www.prism.oregonstate.edu/explorer/> .

A better summary of phenophase activity start dates and duration is needed in order to identify the periods of time each site and/or species should be observed most frequently. Further investigating multiple phenophase onset dates per individual would help clarify if there is a true pattern of reproductive activity in response to favorable conditions or simply observer error skewing results.

## **Conclusion**

The California Phenology Project at Joshua Tree National Park has been largely successful due to the dedication of staff and volunteers. There is much more to learn about the intricacies of phenology in the desert, and how it is affected by climate. The information and recommendations provided in this report, along with the additional resources available on the CPP website and JOTR share drive have laid the foundation for an incredible citizen science project that has only begun to scratch the surface of its full potential.



**Appendix A.** Table A1. GPS points for all monitored plants in Joshua Tree National Park as of Sept 2015. (NAD83)

| Location            | Location Code | Site | Species Code | Individual | UTM Zone | Northing    | Easting     |
|---------------------|---------------|------|--------------|------------|----------|-------------|-------------|
| Ryan Mountain Trail | RYAN          | 1    | ERFA         | 5          | 11       | 3762816.664 | 579734.6125 |
| Ryan Mountain Trail | RYAN          | 1    | ERFA         | 4          | 11       | 3762811.948 | 579746.7098 |
| Ryan Mountain Trail | RYAN          | 1    | ERFA         | 3          | 11       | 3762821.56  | 579742.5138 |
| Ryan Mountain Trail | RYAN          | 1    | ERFA         | 1          | 11       | 3762761.031 | 579813.1836 |
| Ryan Mountain Trail | RYAN          | 1    | LATR         | 1          | 11       | 3762768.668 | 579821.7185 |
| Ryan Mountain Trail | RYAN          | 1    | LATR         | 2          | 11       | 3762845.162 | 579782.7971 |
| Ryan Mountain Trail | RYAN          | 1    | LATR         | 3          | 11       | 3762818.753 | 579744.2717 |
| Ryan Mountain Trail | RYAN          | 1    | LATR         | 4          | 11       | 3762813.575 | 579743.1163 |
| Ryan Mountain Trail | RYAN          | 1    | LATR         | 5          | 11       | 3762812.694 | 579737.2217 |
| Ryan Mountain Trail | RYAN          | 2    | CORA         | 1          | 11       | 3762472.483 | 579864.5987 |
| Ryan Mountain Trail | RYAN          | 2    | CORA         | 2          | 11       | 3762508.388 | 579901.2022 |
| Ryan Mountain Trail | RYAN          | 2    | CORA         | 3          | 11       | 3762507.858 | 579889.4934 |
| Ryan Mountain Trail | RYAN          | 2    | CORA         | 4          | 11       | 3762501.942 | 579874.6223 |
| Ryan Mountain Trail | RYAN          | 2    | ERFA         | 1          | 11       | 3762470.086 | 579860.7912 |
| Ryan Mountain Trail | RYAN          | 2    | ERFA         | 4          | 11       | 3762503.55  | 579872.505  |
| Ryan Mountain Trail | RYAN          | 2    | ERFA         | 3          | 11       | 3762511.094 | 579894.7818 |
| Ryan Mountain Trail | RYAN          | 2    | ERFA         | 2          | 11       | 3762509.515 | 579900.8778 |
| Ryan Mountain Trail | RYAN          | 2    | YUSC         | 1          | 11       | 3762480.088 | 579851.7582 |
| Ryan Mountain Trail | RYAN          | 2    | YUSC         | 2          | 11       | 3762479.304 | 579862.4682 |
| Ryan Mountain Trail | RYAN          | 2    | YUSC         | 3          | 11       | 3762508.525 | 579899.8934 |
| Ryan Mountain Trail | RYAN          | 3    | CORA         | 4          | 11       | 3762360.141 | 579777.6781 |
| Ryan Mountain Trail | RYAN          | 3    | CORA         | 5          | 11       | 3762351.333 | 579777.7636 |
| Ryan Mountain Trail | RYAN          | 3    | CORA         | 6          | 11       | 3762318.065 | 579765.8469 |
| Ryan Mountain Trail | RYAN          | 3    | ERFA         | 3          | 11       | 3762356.996 | 579778.6927 |
| Ryan Mountain Trail | RYAN          | 3    | YUSC         | 1          | 11       | 3762316.912 | 579763.062  |
| Ryan Mountain Trail | RYAN          | 3    | YUSC         | 2          | 11       | 3762348.617 | 579778.5934 |

|                     |      |   |      |   |    |             |             |
|---------------------|------|---|------|---|----|-------------|-------------|
| Ryan Mountain Trail | RYAN | 3 | YUSC | 3 | 11 | 3762358.646 | 579778.876  |
| Ryan Mountain Trail | RYAN | 4 | CORA | 4 | 11 | 3761858.186 | 579904.4769 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 3 | 11 | 3762073     | 579856      |
| Ryan Mountain Trail | RYAN | 4 | LATR | 6 | 11 | 3762085.013 | 579842.3218 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 7 | 11 | 3762085.007 | 579848.5222 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 8 | 11 | 3762080.631 | 579855.6403 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 9 | 11 | 3762074.218 | 579862.1598 |
| Ryan Mountain Trail | RYAN | 4 | YUSC | 3 | 11 | 3762073.963 | 579852      |
| Ryan Mountain Trail | RYAN | 4 | YUSC | 4 | 11 | 3762080.653 | 579858.257  |
| Ryan Mountain Trail | RYAN | 5 | CORA | 6 | 11 | 3761848.617 | 579905.6843 |
| Ryan Mountain Trail | RYAN | 5 | CORA | 5 | 0  | 3761854.756 | 579905.874  |
| Ryan Mountain Trail | RYAN | 5 | ERFA | 1 | 11 | 3761850.736 | 579906.0939 |
| Ryan Mountain Trail | RYAN | 5 | YUSC | 1 | 11 | 3761858.043 | 579906.1865 |
| Ryan Mountain Trail | RYAN | 5 | YUSC | 2 | 11 | 3761852.545 | 579906.2292 |
| Ryan Mountain Trail | RYAN | 5 | YUSC | 3 | 11 | 3761866.058 | 579901.1906 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 5 | 11 | 3761696.227 | 579901.3725 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 7 | 11 | 3761672.217 | 579911.7632 |
| Ryan Mountain Trail | RYAN | 6 | ERFA | 1 | 11 | 3761695.67  | 579901.0693 |
| Ryan Mountain Trail | RYAN | 6 | ERFA | 2 | 11 | 3761691.436 | 579903.1063 |
| Ryan Mountain Trail | RYAN | 6 | YUSC | 3 | 11 | 3761693.258 | 579900.0041 |
| Ryan Mountain Trail | RYAN | 6 | YUSC | 5 | 11 | 3761673.182 | 579911.0831 |
| Ryan Mountain Trail | RYAN | 6 | YUSC | 4 | 11 | 3761692.72  | 579902.3047 |
| Ryan Mountain Trail | RYAN | 7 | CORA | 5 | 11 | 3761475.714 | 579977.1653 |
| Ryan Mountain Trail | RYAN | 7 | CORA | 6 | 11 | 3761467.424 | 579978.2418 |
| Ryan Mountain Trail | RYAN | 7 | CORA | 7 | 11 | 3761464.038 | 579973.2659 |
| Ryan Mountain Trail | RYAN | 7 | CORA | 8 | 11 | 3761456.654 | 579975.8394 |
| Ryan Mountain Trail | RYAN | 7 | ERFA | 1 | 11 | 3761478.787 | 579977.7186 |
| Ryan Mountain Trail | RYAN | 7 | ERFA | 2 | 11 | 3761470.382 | 579974.4574 |

|                     |      |   |      |   |    |             |             |
|---------------------|------|---|------|---|----|-------------|-------------|
| Ryan Mountain Trail | RYAN | 7 | YUSC | 2 | 11 | 3761457.855 | 579975.7874 |
| Ryan Mountain Trail | RYAN | 7 | YUSC | 3 | 11 | 3761468.788 | 579979.056  |
| Ryan Mountain Trail | RYAN | 7 | YUSC | 6 | 11 | 3761465.331 | 579972.9166 |
| Ryan Mountain Trail | RYAN | 7 | YUSC | 5 | 11 | 3761475.377 | 579976.0592 |
| Park Boulevard      | PABO | 1 | ACGR | 1 | 11 | 3766860.596 | 574681.8048 |
| Park Boulevard      | PABO | 1 | ACGR | 2 | 11 | 3766874.679 | 574686.463  |
| Park Boulevard      | PABO | 1 | ACGR | 3 | 11 | 3766884.9   | 574670.2273 |
| Park Boulevard      | PABO | 1 | ACGR | 4 | 11 | 3766903.394 | 574671.7735 |
| Park Boulevard      | PABO | 1 | LATR | 1 | 11 | 3766922     | 574714      |
| Park Boulevard      | PABO | 1 | LATR | 2 | 11 | 3766909     | 574717      |
| Park Boulevard      | PABO | 1 | LATR | 3 | 11 | 3766929     | 574741      |
| Park Boulevard      | PABO | 1 | LATR | 4 | 11 | 3766932     | 574752      |
| Park Boulevard      | PABO | 1 | YUBR | 1 | 11 | 3766912     | 574716      |
| Park Boulevard      | PABO | 1 | YUBR | 2 | 11 | 3766913     | 574729      |
| Park Boulevard      | PABO | 1 | YUBR | 3 | 11 | 3766923     | 574739      |
| Park Boulevard      | PABO | 1 | YUBR | 4 | 11 | 3766933     | 574748      |
| Park Boulevard      | PABO | 2 | ACGR | 1 | 11 | 3768690.808 | 571941.0732 |
| Park Boulevard      | PABO | 2 | ACGR | 2 | 11 | 3768692.253 | 571936.6013 |
| Park Boulevard      | PABO | 2 | ACGR | 3 | 11 | 3768724.953 | 571959.272  |
| Park Boulevard      | PABO | 2 | ACGR | 4 | 11 | 3768718.247 | 571952.401  |
| Park Boulevard      | PABO | 2 | LATR | 1 | 11 | 3768582     | 571944      |
| Park Boulevard      | PABO | 2 | LATR | 2 | 11 | 3768584     | 571953      |
| Park Boulevard      | PABO | 2 | LATR | 3 | 11 | 3768583     | 571964      |
| Park Boulevard      | PABO | 2 | LATR | 4 | 11 | 3768573     | 571951      |

|                              |      |   |      |   |    |             |             |
|------------------------------|------|---|------|---|----|-------------|-------------|
| Park Boulevard               | PABO | 2 | YUBR | 1 | 11 | 3768584     | 571939      |
| Park Boulevard               | PABO | 2 | YUBR | 2 | 11 | 3768593     | 571953      |
| Park Boulevard               | PABO | 2 | YUBR | 3 | 11 | 3768595     | 571959      |
| Park Boulevard               | PABO | 2 | YUBR | 4 | 11 | 3768571     | 571941      |
| Park Boulevard               | PABO | 3 | ACGR | 2 | 11 | 3771610.715 | 569776.0844 |
| Park Boulevard               | PABO | 3 | ACGR | 1 | 11 | 3771598.238 | 569788.3251 |
| Park Boulevard               | PABO | 3 | ACGR | 3 | 11 | 3771627.212 | 569782.5748 |
| Park Boulevard               | PABO | 3 | LATR | 1 | 11 | 3771543     | 569772      |
| Park Boulevard               | PABO | 3 | LATR | 2 | 11 | 3771548.958 | 569773.8263 |
| Park Boulevard               | PABO | 3 | LATR | 3 | 11 | 3771557     | 569765      |
| Park Boulevard               | PABO | 3 | LATR | 4 | 11 | 3771596     | 569764      |
| Park Boulevard               | PABO | 3 | YUBR | 1 | 11 | 3771545     | 569768      |
| Park Boulevard               | PABO | 3 | YUBR | 2 | 11 | 3771565     | 569791      |
| Park Boulevard               | PABO | 3 | YUBR | 3 | 11 | 3771565.275 | 569766.5929 |
| Park Boulevard               | PABO | 3 | YUBR | 4 | 11 | 3771573.509 | 569773.6106 |
| Oasis of Mara Visitor Center | OAVC | 1 | LATR | 1 | 11 | 3776804     | 588627      |
| Oasis of Mara Visitor Center | OAVC | 1 | LATR | 2 | 11 | 3776791     | 588599      |
| Oasis of Mara Visitor Center | OAVC | 1 | LATR | 3 | 11 | 3776790     | 588522      |
| Oasis of Mara Visitor Center | OAVC | 1 | LATR | 4 | 11 | 3776806     | 588430      |
| Oasis of Mara Visitor Center | OAVC | 1 | LATR | 5 | 11 | 3776801     | 588387      |
| Oasis of Mara Visitor Center | OAVC | 1 | PRGL | 1 | 11 | 3776823     | 588640      |
| Oasis of Mara Visitor Center | OAVC | 1 | PRGL | 2 | 11 | 3776798     | 588614      |
| Oasis of Mara Visitor Center | OAVC | 1 | PRGL | 3 | 11 | 3776791     | 588588      |
| Oasis of Mara Visitor Center | OAVC | 1 | PRGL | 4 | 11 | 3776789     | 588509      |

|                              |      |   |      |   |    |             |             |
|------------------------------|------|---|------|---|----|-------------|-------------|
| Oasis of Mara Visitor Center | OAVC | 1 | PRGL | 5 | 11 | 3776812     | 588411      |
| High View Nature Trail       | HIVI | 1 | CORA | 1 | 11 | 3770362     | 555950      |
| High View Nature Trail       | HIVI | 1 | CORA | 2 | 11 | 3770366     | 555945      |
| High View Nature Trail       | HIVI | 1 | CORA | 3 | 11 | 3770367     | 555937      |
| High View Nature Trail       | HIVI | 1 | YUBR | 1 | 11 | 3770362     | 555950      |
| High View Nature Trail       | HIVI | 1 | YUBR | 2 | 11 | 3770366     | 555945      |
| High View Nature Trail       | HIVI | 1 | YUBR | 3 | 11 | 3770367     | 555939      |
| High View Nature Trail       | HIVI | 2 | CORA | 1 | 11 | 3770518     | 555742      |
| High View Nature Trail       | HIVI | 2 | CORA | 2 | 11 | 3770512     | 555752      |
| High View Nature Trail       | HIVI | 2 | CORA | 3 | 11 | 3770520     | 555739      |
| High View Nature Trail       | HIVI | 2 | ERFA | 1 | 11 | 3770525.665 | 555744.5196 |
| High View Nature Trail       | HIVI | 2 | ERFA | 2 | 11 | 3770521.935 | 555738.8515 |
| High View Nature Trail       | HIVI | 2 | ERFA | 3 | 11 | 3770526.343 | 555734.0581 |
| High View Nature Trail       | HIVI | 2 | YUBR | 1 | 11 | 3770518     | 555742      |
| High View Nature Trail       | HIVI | 2 | YUBR | 2 | 11 | 3770512     | 555752      |
| High View Nature Trail       | HIVI | 2 | YUBR | 3 | 11 | 3770520     | 555739      |
| High View Nature Trail       | HIVI | 3 | CORA | 1 | 11 | 3770541     | 555571      |
| High View Nature Trail       | HIVI | 3 | CORA | 2 | 11 | 3770539     | 555570      |
| High View Nature Trail       | HIVI | 3 | CORA | 3 | 11 | 3770539     | 555565      |
| High View Nature Trail       | HIVI | 3 | YUBR | 1 | 11 | 3770541     | 555571      |
| High View Nature Trail       | HIVI | 3 | YUBR | 2 | 11 | 3770539     | 555570      |
| High View Nature Trail       | HIVI | 3 | YUBR | 3 | 11 | 3770539     | 555565      |
| High View Nature Trail       | HIVI | 4 | ERFA | 1 | 11 | 3770693.958 | 555440.5336 |
| High View Nature Trail       | HIVI | 4 | ERFA | 2 | 11 | 3770695.449 | 555446.5461 |
| High View Nature Trail       | HIVI | 4 | ERFA | 3 | 11 | 3770707.996 | 555449.4055 |
| High View Nature Trail       | HIVI | 4 | ERFA | 4 | 11 | 3770707.38  | 555438.9517 |
| High View Nature Trail       | HIVI | 4 | ERFA | 5 | 11 | 3770724.294 | 555455.3073 |
| High View Nature Trail       | HIVI | 4 | YUBR | 1 | 11 | 3770696.485 | 555441.1753 |



|                        |      |   |      |   |    |             |             |
|------------------------|------|---|------|---|----|-------------|-------------|
| High View Nature Trail | HIVI | 4 | YUBR | 2 | 11 | 3770697.432 | 555445.7986 |
| High View Nature Trail | HIVI | 4 | YUBR | 3 | 11 | 3770708     | 555450      |
| High View Nature Trail | HIVI | 4 | YUBR | 4 | 11 | 3770711     | 555444      |
| High View Nature Trail | HIVI | 4 | YUBR | 5 | 11 | 3770726     | 555453      |
| High View Nature Trail | HIVI | 5 | CORA | 1 | 11 | 3770633     | 555498      |
| High View Nature Trail | HIVI | 5 | CORA | 2 | 11 | 3770632     | 555504      |
| High View Nature Trail | HIVI | 5 | CORA | 3 | 11 | 3770623     | 555491      |
| High View Nature Trail | HIVI | 5 | CORA | 4 | 11 | 3770598     | 555495      |
| High View Nature Trail | HIVI | 5 | ERFA | 2 | 11 | 3770633.104 | 555504.7473 |
| High View Nature Trail | HIVI | 5 | ERFA | 1 | 11 | 3770633.239 | 555496.2883 |
| High View Nature Trail | HIVI | 5 | ERFA | 3 | 11 | 3770626.724 | 555488.3297 |
| High View Nature Trail | HIVI | 5 | ERFA | 4 | 11 | 3770602.016 | 555497.856  |
| High View Nature Trail | HIVI | 5 | YUBR | 1 | 11 | 3770633     | 555498      |
| High View Nature Trail | HIVI | 5 | YUBR | 2 | 11 | 3770632     | 555504      |
| High View Nature Trail | HIVI | 5 | YUBR | 3 | 11 | 3770625     | 555491      |
| High View Nature Trail | HIVI | 5 | YUBR | 4 | 11 | 3770600     | 555496      |
| High View Nature Trail | HIVI | 6 | CORA | 1 | 11 | 3770582     | 555449      |
| High View Nature Trail | HIVI | 6 | CORA | 2 | 11 | 3770575     | 555453      |
| High View Nature Trail | HIVI | 6 | CORA | 3 | 11 | 3770599     | 555461      |
| High View Nature Trail | HIVI | 6 | ERFA | 3 | 11 | 3770609.214 | 555464.9033 |
| High View Nature Trail | HIVI | 6 | ERFA | 1 | 11 | 3770579.152 | 555444.0112 |
| High View Nature Trail | HIVI | 6 | ERFA | 2 | 11 | 3770579.016 | 555452.3165 |
| High View Nature Trail | HIVI | 6 | YUBR | 1 | 11 | 3770590     | 555476      |
| High View Nature Trail | HIVI | 6 | YUBR | 2 | 11 | 3770605     | 555471      |
| High View Nature Trail | HIVI | 6 | YUBR | 3 | 11 | 3770574     | 555449      |
| High View Nature Trail | HIVI | 6 | YUSC | 1 | 11 | 3770582     | 555449      |
| High View Nature Trail | HIVI | 6 | YUSC | 2 | 11 | 3770577     | 555451      |
| High View Nature Trail | HIVI | 6 | YUSC | 3 | 11 | 3770603     | 555460      |

|                        |      |   |      |   |    |             |             |
|------------------------|------|---|------|---|----|-------------|-------------|
| High View Nature Trail | HIVI | 7 | CORA | 1 | 11 | 3770389     | 555432      |
| High View Nature Trail | HIVI | 7 | CORA | 2 | 11 | 3770387     | 555426      |
| High View Nature Trail | HIVI | 7 | CORA | 3 | 11 | 3770396     | 555413      |
| High View Nature Trail | HIVI | 7 | ERFA | 1 | 11 | 3770386.526 | 555434.5316 |
| High View Nature Trail | HIVI | 7 | ERFA | 2 | 11 | 3770382.766 | 555423.7883 |
| High View Nature Trail | HIVI | 7 | ERFA | 3 | 11 | 3770393.1   | 555421.1132 |
| High View Nature Trail | HIVI | 7 | YUBR | 1 | 11 | 3770389     | 555432      |
| High View Nature Trail | HIVI | 7 | YUBR | 2 | 11 | 3770387     | 555426      |
| High View Nature Trail | HIVI | 7 | YUBR | 3 | 11 | 3770396     | 555413      |
| High View Nature Trail | HIVI | 7 | YUSC | 1 | 11 | 3770405     | 555442      |
| High View Nature Trail | HIVI | 7 | YUSC | 2 | 11 | 3770383     | 555446      |
| High View Nature Trail | HIVI | 7 | YUSC | 3 | 11 | 3770382     | 555452      |
| High View Nature Trail | HIVI | 8 | CORA | 1 | 11 | 3770362     | 555311      |
| High View Nature Trail | HIVI | 8 | CORA | 2 | 11 | 3770360.111 | 555308.9446 |
| High View Nature Trail | HIVI | 8 | CORA | 3 | 11 | 3770357     | 555301      |
| High View Nature Trail | HIVI | 8 | CORA | 4 | 11 | 3770352     | 555308      |
| High View Nature Trail | HIVI | 8 | CORA | 5 | 11 | 3770345     | 555296      |
| High View Nature Trail | HIVI | 8 | YUBR | 1 | 11 | 3770363     | 555300      |
| High View Nature Trail | HIVI | 8 | YUSC | 1 | 11 | 3770363.875 | 555312.1254 |
| High View Nature Trail | HIVI | 8 | YUSC | 2 | 11 | 3770360.111 | 555308.7085 |
| High View Nature Trail | HIVI | 8 | YUSC | 3 | 11 | 3770357     | 555301      |
| High View Nature Trail | HIVI | 8 | YUSC | 4 | 11 | 3770352     | 555308      |
| High View Nature Trail | HIVI | 8 | YUSC | 5 | 11 | 3770345     | 555296      |
| Ryan Mountain Trail    | RYAN | 1 | ERFA | 2 | 11 | 3762833.087 | 579775.4058 |
| Ryan Mountain Trail    | RYAN | 3 | CORA | 1 | 11 | 3762318.611 | 579764.0885 |
| Ryan Mountain Trail    | RYAN | 3 | CORA | 2 | 11 | 3762350.271 | 579778.3831 |
| Ryan Mountain Trail    | RYAN | 3 | CORA | 3 | 11 | 3762359.619 | 579778.7965 |
| Ryan Mountain Trail    | RYAN | 3 | ERFA | 2 | 11 | 3762347.732 | 579777.0889 |

|                     |      |   |      |   |    |             |             |
|---------------------|------|---|------|---|----|-------------|-------------|
| Ryan Mountain Trail | RYAN | 3 | ERFA | 1 | 11 | 3762315.405 | 579763.7247 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 1 | 11 | 3762079     | 579859      |
| Ryan Mountain Trail | RYAN | 4 | LATR | 2 | 11 | 3762083.328 | 579852.6933 |
| Ryan Mountain Trail | RYAN | 4 | LATR | 4 | 11 | 3762091     | 579840      |
| Ryan Mountain Trail | RYAN | 4 | LATR | 5 | 11 | 3762090     | 579845      |
| Ryan Mountain Trail | RYAN | 4 | YUSC | 1 | 11 | 3762076     | 579862      |
| Ryan Mountain Trail | RYAN | 4 | YUSC | 2 | 11 | 3762083.657 | 579856.1167 |
| Ryan Mountain Trail | RYAN | 5 | CORA | 3 | 11 | 3761864.852 | 579902.6091 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 1 | 11 | 3761673.66  | 579913.3959 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 2 | 11 | 3761678.676 | 579905.115  |
| Ryan Mountain Trail | RYAN | 6 | CORA | 3 | 11 | 3761694.056 | 579901.3599 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 4 | 11 | 3761694.378 | 579898.3834 |
| Ryan Mountain Trail | RYAN | 6 | CORA | 6 | 11 | 3761672.217 | 579911.7632 |
| Ryan Mountain Trail | RYAN | 6 | YUSC | 1 | 11 | 3761673.66  | 579913.3959 |
| Ryan Mountain Trail | RYAN | 6 | YUSC | 2 | 11 | 3761679     | 579906      |

## **Appendix B.** Species Profiles

The following “Species Profiles” provide guidance to observers on how to answer the Yes/No questions for each species.

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# California Phenology Project: species profile for Catclaw Acacia (*Acacia greggii*)

USA **hpn**   
National Phenology Network

UCSB 



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: Stan Shebs

## What does this species look like?

This deciduous shrub or small tree has curved thorns on its stems. The grey-green leaves are made up of many small leaflets. The flowers are arranged in inflorescences made up of many small light yellow flowers. Inflorescences tend to be longer than the leaves and clustered with leaves on short-shoots. The fruit is a brown pod between 5 and 15 centimeters long. It can be curved, twisted, or flat in shape, narrowing between the seeds.

*When monitoring this species, use the USA-NPN semi-deciduous trees and shrubs datasheet.*

## Species facts!

- The CPP four letter code for this species is **ACGR**.
- This species got its common name from hooked thorns that are the size and shape of a cats claw and tend to hook unsuspecting wanderers.
- The seeds require scarification to germinate. This often occurs when seeds travel across a landscape due to flash flooding.
- This species has extrafloral nectaries that provide a food and water source for ants.
- Native americans avoided mature fruit of this species because the tissue contains a potentially poisonous compound called prunasin. However, the young unripe fruit was eaten and the stems were used for making tools.



Photo credit: Stan Shebs



Photo credit: Stan Shebs

## Where is this species found?

- Found at elevations between 100 and 1400 meters.
- Occurs along flats and washes
- Found in desert regions from California to Texas and into Mexico.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))

California Phenology Project:  
species profile for  
Catclaw Acacia  
(*Acacia greggii*)

**Young leaves**  
Young leaves are generally thinner and lighter colored than mature leaves.



Leaves

Anthony Mendoza

**Flowers or flower buds**

When monitoring **flower or flower bud abundance** for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.

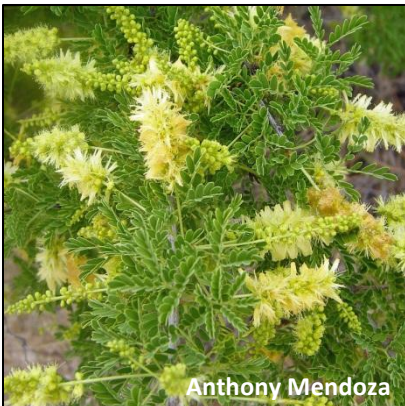


**Open flowers**

You can see the pollen-producing anthers emerging from the flower in the photo to the left. **Proportion of open flowers** should be recorded at the scale of individual flowers, not inflorescences (i.e. estimate the proportion of individual flowers that are open )!

Anthony Mendoza

**Note:** flower phenophases are nested; if you record Y for “open flowers” you should also record Y to “flowers and flower buds”

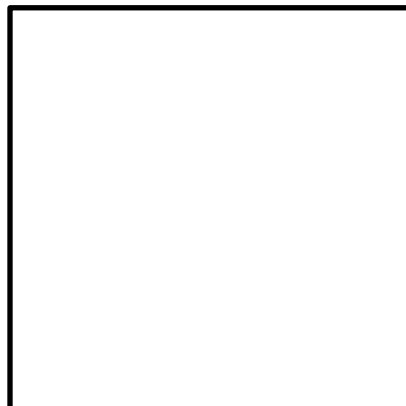


Anthony Mendoza

ACGR flowers and flower buds grow on inflorescence stalks. Before the flowers open they are stalks with many small buds on them (~2-3” long)

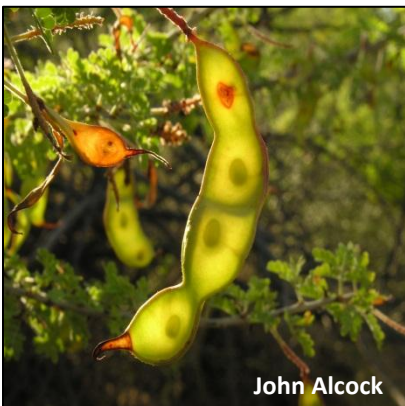
**Fruits**

The fruit is a pod that changes from green to tan, red-brown or brown and splits open to expose the seeds. Do not include empty pods that have already dropped all of their seeds.



**Ripe fruits**

A fruit is considered ripe when it has turned tan, red-brown or brown. Do not include empty pods that have already dropped all of their seeds.



John Alcock

**Note:** fruit phenophases are nested; if you record Y for “ripe fruits” you should also record Y to “fruits”

Phenophases not pictured: **Recent fruit or seed drop**



# California Phenology Project: species profile for Blackbrush (*Coleogyne ramosissima*)

USA **nph** National Phenology Network

UCSB



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: Stan Shebs

## What does this species look like?

This perennial desert shrub grows up to 2 meters tall with short, stiff, branched stems that are spine-like at the tip. The grey bark turns black with age or when wet and the small leaves are aromatic. The flowers lack petals but the thick sepals remain when flowers open. The sepals are yellow on the inside and reddish on the outside.

When monitoring this species, use the USA-NPN *semi-deciduous trees and shrubs* datasheet.

## Species facts!

- The CPP four letter code for this species is **CORA**.
- Member of the rose family.
- *Coleogyne* is Greek for "sheathed fruit" and *ramosissima* is Latin for "many branched".
- Spiny stems protect it from browsing herbivores.
- Depends on rodents for seed dispersal.
- Drought deciduous; it loses its leaves when water is highly limited.
- Primarily wind pollinated.
- Blackbrush is mast-fruiting and only produces fruit and seed in years of abundant resources.



Photo credit: Brewbooks (Flickr)



Photo credit: Brewbooks (Flickr)

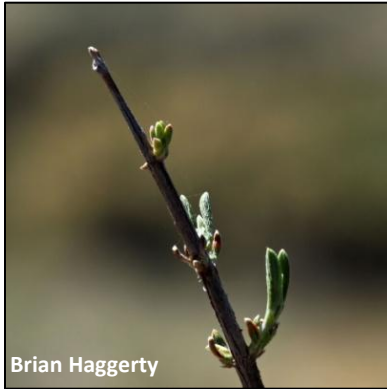
## Where is this species found?

- Mojave desert scrub and Pinyon-Juniper Woodland in the Upper Sonoran life zone.
- Associated with Joshua Tree and Mojave Yucca.
- Dry well-drained sandy, or rocky soil.
- Mesas, open plains, and foothills.
- Elevations between 750 and 2100 meters.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for Blackbrush (*Coleogyne ramosissima*)



## Young leaves

Young leaves appear hairier and thinner than mature leaves.

**Note:** There is no petiole on CORA leaves! This may make this phenophase difficult to distinguish on this species.

Brian Haggerty



## Leaves

Brian Haggerty

Similar to other species in Mediterranean and desert ecosystems, Blackbrush may respond to precipitation events with a flush of new leaf production. If water becomes unavailable after growth is initiated, however, then leaf expansion may be arrested, resulting in many small leaves on the plant. These responses to water availability (initiation of growth followed by arrested growth when resources give out) can be confusing for observers. If you are unsure of what you are seeing, do not hesitate to circle ? on the NPN datasheets. With more experience, observers may be able to distinguish between newly produced young leaves vs. old, small leaves. Throughout the year, take note of the differences between new and old leaves—color, texture, and size may all be used to identify young leaves!



## Flowers and flower buds

Be aware that this species does not produce flowers every year!

Brian Haggerty

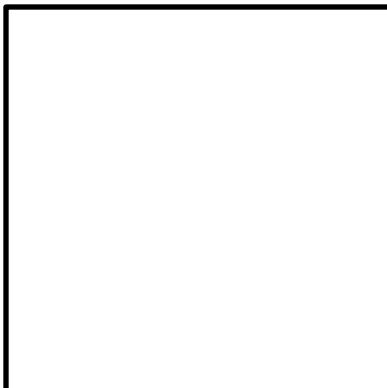


## Open flowers

These flowers appear singly and have both male and female parts.

**Note:** flower phenophases are nested; if you say Y to “open flowers” you should also say Y to “flowers or flower buds”.

Brian Haggerty



## Fruits

The fruit is a crescent shaped tiny capsule that changes from green to reddish brown; it drops from the plant when ripe.



## Ripe fruits

The fruit is ripe when it is reddish brown.

**Note:** fruit phenophases are nested; if you say Y to “ripe fruits” you should also say Y to “fruits”.

Stan Shebs

Phenophases not pictured: **Recent fruit or seed drop**

# California Phenology Project: species profile for Eastern Mojave Buckwheat (*Eriogonum fasciculatum*)



**CPP site(s) where this species is monitored:** Santa Monica Mountains National Recreation Area, Joshua Tree National Park



Photo credit: Stan Shebs

## ***What does this species look like?***

This perennial shrub can be up to 2 meters tall and 3 meters wide. The leaves are clustered at branch nodes and are leathery in texture; some varieties have white fuzz below, whereas others are glabrous. Leaves are a grey-green color, and rolled along the edges. The small flowers are 2.5 to 3 millimeters diameter, white to pinkish in color, and arranged in a dense clusters.

*When monitoring this species, use the USA-NPN semi-deciduous trees and shrubs datasheet.*

## ***Species facts!***

- The CPP four letter code for this species is **ERFA**.
- This species was used by Native American groups to treat headaches, diarrhea, and wounds.
- This species is visited by a variety of butterflies, and is an important source of nectar for honeybees in dry areas.
- Can form associations with mycorrhizal fungi to aid in seedling survival and the colonization of new sites.



Photo credit: Brian Haggerty



Photo credit: wanderingnome (Flickr)

## ***Where is this species found?***

- Found in dry slopes, washes, and canyons.
- A member of sagebrush scrub, desert scrub and coastal sage scrub plant communities.
- Found at elevations less than 2300 meters.
- In California, it is distributed in the Southern Sierra Nevada, Central West CA, Southwestern CA, East of Sierra Nevada, and Deserts.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for Eastern Mojave Buckwheat (*Eriogonum fasciculatum*)



Cait McHugh and Anjanette Garcia

## Young leaves

Young leaves are generally thinner and lighter colored than mature leaves.

*Similar to other species in Mediterranean and desert ecosystems, Buckwheat may respond to precipitation events with a flush of new leaf production. If water becomes unavailable after growth is initiated, however, then leaf expansion may be arrested, resulting in many small leaves on the plant. These responses to water availability (initiation of growth followed by arrested growth when the resources give out) can be confusing for observers. If you are unsure of what you are seeing, do not hesitate to circle ? on the NPN datasheets. With more experience, you may be able to distinguish between newly produced young leaves vs. old, small leaves. As you observe this species throughout the year, take note of the differences between new and old leaves—color, texture, and size can all be used to identify young leaves!*



Brian Haggerty

## Flowers or flower buds

When monitoring **flower or flower bud abundance** for this species, count each inflorescence as a single flowering structure! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.

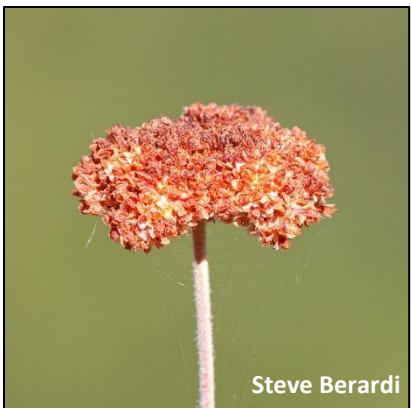


Brian Haggerty

## Open flowers

You can see the pollen-producing anthers emerging from the flower in the photo to the left. **Proportion of open flowers** should be recorded at the scale of individual flowers, not inflorescences (i.e. estimate the proportion of individual flowers that are open )!

**Note:** flower phenophases are nested; if you record **Y** for “open flowers” you should also record **Y** to “flowers and flower buds”



Steve Berardi

## Fruits

The fruit is tiny and capsule-like, partially enclosed in a spent flower base (calyx), with many such spent flower bases tightly clustered together. The spent flower base changes from green to light brown or rusty brown as it dries out.



Arnold Zane

## Ripe fruits

A fruit is considered ripe when the spent flower base enclosing it has turned light brown or rusty brown.

**Note:** fruit phenophases are nested; if you record **Y** for “ripe fruits” you should also record **Y** to “fruits”

The green, pre-ripe fruit phenophase may be difficult to identify on this species. Remember you can circle ? If you are unsure of what you are seeing!

Phenophases not pictured: **Leaves, Recent fruit or seed drop**

# California Phenology Project: species profile for Creosote Bush (*Larrea tridentata*)



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: R.A. Howard, Smithsonian Institute

## What does this species look like?

Creosote bush is a drought tolerant evergreen shrub growing up to 4 meters tall. The stems are generally flexible. The waxy small leaves are dark green and very resinous. After rainfall, these leaves emit a characteristic strong odor. Its yellow flowers have five petals and are bisexual, having both male and female parts. Under particularly dry conditions, the foliage appears greenish-orange from a distance.

When monitoring this species, use the USA-NPN **broadleaf evergreen trees and shrubs (no buds)** datasheet.

## Species facts!

- The CPP four letter code for this species is **LATR**.
- The oldest living plant is a Creosote bush in the Mojave Desert, estimated to be between 9,400 and 11,000 years old.
- The flowers are visited by over 120 bee species; 22 of these exclusively use Creosote pollen as their food source.
- Native Americans used a dry powder prepared from the leaves as an antibacterial treatment for wounds and burns.



Photo credit: Sue in AZ (Wikipedia)



King Clone, the oldest known plant

Photo credit: Klokied (Wikipedia)

## Where is this species found?

- Grows in gravelly and sandy soils that are well drained.
- Can tolerate a wide range of water availability and temperatures (5 to 120°F).
- Found in valley plains, mesas, arroyos, alluvial fans, and gentle slopes within the three Southwest deserts (Mojave, Sonoran and Chihuahuan).

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for Creosote Bush (*Larrea tridentata*)



Mitzi Harding

### **Young leaves**

*In this species, young leaves are thin, bright green in color, and appear in pairs, usually at the stem tips.*

*Similar to other species in Mediterranean and desert ecosystems, Creosote may respond to precipitation events with a flush of new leaf production. If water becomes unavailable after growth is initiated, however, then leaf expansion may be arrested, resulting in many small leaves on the plant. These responses to water availability (initiation of growth followed by arrested growth when the resources give out) can be confusing for observers. If you are unsure of what you are seeing, do not hesitate to circle ? on the NPN datasheets. With more experience, you may be able to distinguish between newly produced young leaves vs. small, old leaves. As you observe this species throughout the year, take note of the differences between new and old leaves—color, texture, and size can all be used to identify young leaves!*



Brian Haggerty

### **Flowers or flower buds**

*The flowers appear singly and have both male and female parts. A flower bud (or unopened flower) can be seen in the background of this photo.*



Brian Haggerty

### **Open flowers**

*Can you see the anthers and stigma?*

**Note:** flower phenophases are nested; if you record **Y** for “open flowers” you should also record **Y** to “flowers or flower buds”



Brian Haggerty

### **Fruits**

*The fruit is capsule-like and fuzzy with white hairs; it changes from green to dark brown, and splits apart into 5 sections.*



Brian Haggerty

### **Ripe fruits**

*The fruit is ripe when it is dark brown; it usually splits into five sections when ripe.*

**Note:** fruit phenophases are nested; if you record **Y** for “ripe fruits” you should also record **Y** to “fruits”

Phenophases not pictured: **Recent fruit or seed drop**

California Phenology Project:  
species profile for  
Honey Mesquite  
(*Prosopis glandulosa*)



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: Homer Price (Flickr)

**What does this species look like?**

This deciduous species is a thorny, nitrogen-fixing large shrub or medium-sized tree that reaches 0.5 – 12 meters in height. The greenish-white to yellowish-white flowers develop simultaneously with the leaves. These flowers are grouped tightly on elongated spikes that are showy and droopy. Flowers are high in nectar and pollinated primarily by bees.

When monitoring this species, use the USA-NPN **semi-deciduous trees and shrubs** datasheet.

**Species facts!**

- The CPP four letter code for this species is **PRGL**.
- Honey mesquite wood is used for fuel, furniture, flooring, utensils, and posts.
- The pods and seeds are eaten by wildlife.
- Native Americans ground the pods and seeds into meal to make bread, mush, and alcohol. Other plant parts were used to make black dye, rope, cement for pottery, and candy.



Photo credit: Melody Lytle



Photo credit: Thomas Muller

**Where is this species found?**

- Grows in warm desert shrub communities and grasslands.
- On plains, terraces, washes, and riparian sites.
- Grows in sites where plants have access to permanent underground water.
- In California, this species occurs at elevations between 60 and 1090 meters.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for

## Honey Mesquite

### (*Prosopis glandulosa*)



Brian Haggerty

#### Young leaves

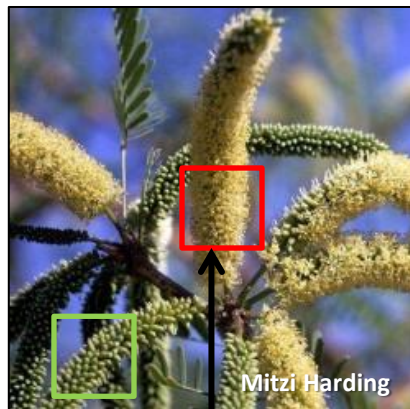
In the photo, the leaves have unfolded to reveal their leaf stalk, but they are not yet full size!



Brian Haggerty

#### Leaves

In this species, each leaf is made up of many smaller leaflets.



Mitzi Harding

#### Flowers or flower buds and Open flowers

Greenish flower buds (in the green box) and whitish open flowers (in the red box) can both be seen in this photo.

For **open flowers**, you must be able to see anthers or stigma.

When monitoring **flower or flower bud abundance**, count each inflorescence as a single flowering structure. When monitoring the **proportion of open flowers**, estimate the number of individual flowers that are open, not inflorescences!

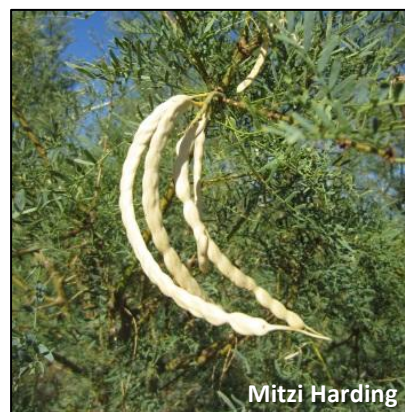
↑ Open flowers  
↑ Flower buds



Mitzi Harding

#### Fruits

The fruit is a pod that changes from green to tan, sometimes tinged with violet.



Mitzi Harding

#### Ripe fruits

The fruit is ripe when it is tan, sometimes tinged with violet, and dry.

**Important Note:** USA-NPN flower and fruit phenophases are nested. If you say "Y" to "open flowers" you should also have said "Y" to "flowers or flower buds" and if you say "Y" to "ripe fruits" you should also have said "Y" to "fruits"

Phenophases not pictured: **Pollen release, Recent fruit or seed drop**

# California Phenology Project: species profile for Joshua Tree (*Yucca brevifolia*)



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: Brian Haggerty

## ***What does this species look like?***

This species is tree-like with a thick, often-branched trunk, growing up to 40 feet tall. The leaves are evergreen and linear, tapering to a sharp point. The creamy flowers are bell-shaped and found in tight clusters at the end of stalks. Most flowers are bisexual.

*When monitoring this species, use the USA-NPN broadleaf evergreen (no leaves) datasheet.*

## ***Species facts!***

- The CPP four letter code for this species is **YUBR**.
- A monocot in the plant family Agavaceae .
- It has been proposed that the Shasta ground sloth was the main fruit disperser of Joshua Tree before these mammals became extinct.
- Joshua Tree is pollinated by the Yucca moth, which pollinates the flowers while laying its eggs inside the flowers. The larvae then hatch and feed on the seeds.
- Native Americans used the leaves for baskets and the seeds and flower buds for food.
- Joshua Tree got its name from Mormon pioneers.



Photo credit: Jack11\_Poland  
(Wikipedia)



Photo credit: David Scriven

## ***Where is this species found?***

- Joshua Tree is an indicator species of the Mojave desert.
- It is found at elevations between 400 and 1800 meters.
- It is found on flat sites, mesas, bajadas, and gentle slopes.
- Prefers well-drained sandy and gravelly soil in alluvial fans adjacent to desert mountain ranges.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for Joshua Tree (*Yucca brevifolia*)



Brian Haggerty

### Flowers or flower buds

When monitoring **flower or flower bud abundance** for this species, count each inflorescence as a single flowering structure!



Stan Shebs

### Open flowers

Can you see anthers and/or stigma? Most Joshua Tree flowers are bisexual, producing both anthers and pistil.

For example, if there are 2 inflorescences with many flowers each, abundance should be recorded as <3.

**Proportion of open flowers** should be recorded at the scale of individual flowers, not inflorescences (i.e. estimate the proportion of individual flowers that are open)!



Young YUBR flower bud



YUBR flower bud, which will open soon to reveal an inflorescence (pictured in the upper left photo)

**Important Note:** USA-NPN flower phenophases are nested; if you say "Y" to "open flowers" you should also have said "Y" to "flowers or flower buds"



Brian Haggerty

### Fruits

The fruit is a capsule that changes from fleshy green to leathery tan, grayish-brown or brown. Sometimes the skin cracks, and the fruit drops from the plant.



Stan Shebs

### Ripe fruits

A fruit is ripe when it is leathery tan, grayish-brown or brown.

**Important Note:** USA-NPN fruit phenophases are nested; if you say "Y" to "ripe fruits" you should also have said "Y" to "fruits"

Phenophases not pictured: **Recent fruit or seed drop**

# California Phenology Project: species profile for Mojave Yucca (*Yucca schidigera*)

USA **nph**   
National Phenology Network

UCSB 



CPP site(s) where this species is monitored: Joshua Tree National Park



Photo credit: Stan Shebs

## ***What does this species look like?***

This is a small evergreen plant that grows up to 5 meters tall with a grayish-brown trunk. Its leaves are long, pointy, and very rigid. The leaves are arranged in a spiral on top of the basal trunk. They have coarse fibers that peel away from the leaf margins. The flowers are 3 to 5 centimeters long, white, and bell-shaped. They are arranged in dense clusters at the tip of a central stalk. The flowers are bisexual; meaning that each flower produces both male and female reproductive parts.

*When monitoring this species, use the USA-NPN **broadleaf evergreen (no leaves)** datasheet.*

## ***Species facts!***

- The CPP four letter code for this species is **YUSC**
- A monocot in the plant family Agavaceae
- Mojave Yucca was used extensively by Native Americans who prepared flour from the seeds, used the leaf fibers for rope and cloth, and prepared soap from the roots.
- This species is pollinated by the Yucca moth, which pollinates the flowers while laying its eggs inside the flowers. The larvae then hatch and feed on the seeds.
- Occasionally hybridizes with Banana Yucca.



Photo credit: Nyenyec (Wikipedia)



Photo credit: Comroques (Flickr)

## ***Where is this species found?***

- Distributed within the Mojave and Sonoran deserts.
- Typically found on well drained soil on rocky slopes and on Creosote flats.
- Found at elevations between 300 and 1200 meters.

For more information about phenology and the California Phenology Project (CPP), please visit the CPP website ([www.usanpn.org/cpp](http://www.usanpn.org/cpp)) and the USA-NPN website ([www.usanpn.org](http://www.usanpn.org))



# California Phenology Project: species profile for Mojave Yucca (*Yucca schidigera*)

USA **nph** National Phenology Network

UCSB



**Flowers or  
flower buds**

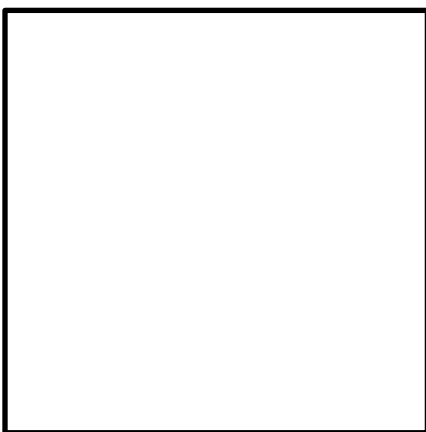


**Open flowers**  
Yucca flowers  
are bisexual.  
Can you see  
anthers or  
stigma?

When monitoring **flower abundance** for this species, count each inflorescence as a flowering unit! For example, if there are two inflorescences with many flowers or buds each, then abundance should be recorded as <3.

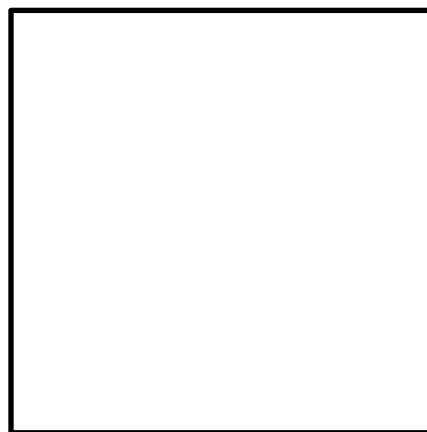
**Proportion of open flowers** should be recorded at the scale of individual flowers, not inflorescences (i.e. estimate the proportion of individual flowers that are open)!

**Important Note:** USA-NPN flower phenophases are nested; if you say “Y” to “open flowers” you should also have said “Y” to “flowers or flower buds”



## **Fruits**

The fruit is a capsule, sometimes constricted, that changes from fleshy green to leathery tan, grayish-brown or brown, and drops from the plant when ripe.



## **Ripe fruits**

The fruit is considered ripe when it is leathery tan, grayish-brown or brown.

**Important Note:** USA-NPN fruit phenophases are nested; if you say “Y” to “ripe fruits” you should also have said “Y” to “fruits”

Phenophases not pictured: **Recent fruit or seed drop**

## **Appendix C.** Custom Datasheets

The following custom data sheets were designed by park staff to facilitate data collection; rather than requesting data to be recorded for an individual plant, each of these customized data sheets record data for multiple plants at a given site.

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Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 1:** Approx. 1/10 mile from West Side Loop trail head in campground. Plants south of West Side Loop trail, across from small rock outcrop.

| Plant ID   | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|--|---|--|--|---|---|--|---|-------|
|  | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 2:** Approx. 1000 ft west of HIVI1, below large rock outcrop and large pine tree snag. Most plants south of West Side Loop trail, ERFA1 and ERFA3 north of trail.

| Plant ID  | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|---|---|--|--|---|---|--|---|-------|
|   | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC1</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC2</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC3</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA1</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA2</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA3</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 3:** Approx. 500 ft west of HIVI2, in flat area south of West Side Loop trail.

| Plant ID   | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|--|---|--|--|---|---|--|---|-------|
|  | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |



Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 4:** Approx. 250 ft south of High View Nature trail dirt parking lot, and 250ft north of trail intersection. Plants on east side of High View Nature trail.

| Plant ID  | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|---|---|--|--|---|---|--|---|-------|
|   | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR4</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR5</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA1</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA2</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA3</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA4</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA5</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 5:** Approx. 200 ft south of High View and West Side Loop trail intersection. Plants on east side of High View Nature trail.

| Plant ID  | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|---|---|--|--|---|---|--|---|-------|
|   | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits</u> dropped since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA4</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR4</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA1</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA2</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA3</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA4</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 6:** Slightly south of HIVI5 along High View trail. Most plants west of trail, YUBR1 east of trail. Last cluster of plants just before first set of rock steps in trail.

| Plant ID  | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|---|---|--|--|---|---|--|---|-------|
|   | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits</u> dropped since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC1</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC2</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC3</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA1</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA2</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>ERFA3</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 7:** Approx. 700ft south of HIVI6, in small "bowl" just before steep switchbacks.

| Plant ID  | LEAVES  |   | FLOWERS   |  | FRUITS  |   |  | NOTES |
|---|---|---|---|--|---|---|--|-------|
|   | Are young leaves present? How many?             | Are any leaves present? What % of plant has leaves? | Are any flowers or flower buds present? How many? | What % of all flowers (including buds) are open? | Are any fruits present? How many?               | Are ripe fruits present? What % of all fruits are ripe? | Have fruits dropped since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i>    | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUBR2</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUBR3</b><br>Joshua Tree<br><i>Yucca brevifolia</i>        | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUSC1</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUSC2</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>YUSC3</b><br>Mojave Yucca<br><i>Yucca schidigera</i>       | N/A   | N/A   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>ERFA1</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>ERFA2</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |
| <b>ERFA3</b><br>CA Buckwheat<br><i>Eriogonum fasciculatum</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%     | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K   | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K      |       |

Observer:

Date:

# HIGH VIEW NATURE TRAIL (HIVI)

**HIVI 8:** Just below bench at top of hill before trail turns southeast.

| Plant ID   | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | NOTES |
|--|---|--|--|---|---|--|---|-------|
|  | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>CORA1</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA2</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA3</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA4</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>CORA5</b><br>Blackbrush<br><i>Coleogyne ramosissima</i> | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUBR1</b><br>Joshua Tree<br><i>Yucca brevifolia</i>     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC1</b><br>Mojave Yucca<br><i>Yucca schidigera</i>    | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC2</b><br>Mojave Yucca<br><i>Yucca schidigera</i>    | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC3</b><br>Mojave Yucca<br><i>Yucca schidigera</i>    | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC4</b><br>Mojave Yucca<br><i>Yucca schidigera</i>    | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>YUSC5</b><br>Mojave Yucca<br><i>Yucca schidigera</i>    | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer:

Oasis of Mara Visitor Center (OAVC1)

Date:

| Plant ID and location   | LEAVES  |  | FLOWERS  |   |                                      | FRUITS  |  |   | NOTES |
|---|---|--|--|---|--------------------------------------|---|--|---|-------|
|   | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Is <u>pollen</u> visible? How much?* | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits</u> dropped since your last visit? How many? |       |
| <b>PRGL1</b><br>Honey Mesquite- Below Washingtonia  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>PRGL2</b><br>Honey Mesquite- Just before bench   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>PRGL3</b><br>Honey Mesquite- 5 meters past LATR2   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>PRGL4</b><br>Honey Mesquite- 15 meters past LATR3 where trail widens   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>PRGL5</b><br>Honey Mesquite- On R side of concrete sidewalk at far end of sprawling PRGL; on Left side of sidewalk will see lone living palm.  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>LATR1</b><br>Creosote- Just past Washingtonia as you walk from Visitor's Center  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>LATR2</b><br>Creosote- Just past bench   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>LATR3</b><br>Creosote- Inside loop, across from bench and across from interp sign titled "Gold fever"; label located low on plant  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>LATR4</b><br>Creosote- Past PRGL4, as you walk from Visitor's Center, pass Oasis bird sign on Right; see LATR4 in ~15 meters, on left side of concrete path, on side trail ~3 meters from sidewalk | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>LATR5</b><br>Creosote- Continue 35 paces up concrete sidewalk to LATR on Left  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |



Observer:

Date:

# PARK BOULEVARD (PABO)

**PABO 1:** Large paved pullout, north side of Park Boulevard, between Boy Scout Trail parking and Quail Springs picnic area.

| Plant ID                        | LEAVES  |  | FLOWERS  |   |                                      | FRUITS  |  |   |
|---------------------------------|---|--|--|---|--------------------------------------|---|--|---|
|                                 | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Is <u>pollen</u> visible? How much?* | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits</u> dropped since your last visit? How many? |
| <b>LATR1</b><br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>LATR2</b><br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>LATR3</b><br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>LATR4</b><br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>YUBR1</b><br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>YUBR2</b><br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>YUBR3</b><br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>YUBR4</b><br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>ACGR1</b><br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>ACGR2</b><br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>ACGR3</b><br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| <b>ACGR4</b><br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |

\* Pollen release is described by gently shaking the catkin. **"Little"**: only a few grains are released. **"Some"**: many grains are released. **"Lots"**: a layer of pollen covers your palm, or a cloud of pollen can be seen in the air when the wind blows.

**NOTES:**



Observer:

Date:

# PARK BOULEVARD (PABO)

**PABO 2:** The next paved pullout on the north side of Park Blvd, 2.3 miles west of PABO 1. Acacia north of road, Joshua Trees and Creosote are south of the road.

| Plant ID                 | LEAVES  |  | FLOWERS  |   |                                      | FRUITS  |  |   |
|--------------------------|---|--|--|---|--------------------------------------|---|--|---|
|                          | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Is <u>pollen</u> visible? How much?* | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |
| LATR1<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR2<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR3<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR4<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR1<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR2<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR3<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR4<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR1<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR2<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR3<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR4<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |

NOTES:

Observer:

Date:

# PARK BOULEVARD (PABO)

**PABO 3:** Park at Maze Loop dirt parking area, 2.3 miles northwest of PABO 2. LATR1 is a approx. 1/10 mile NW of parking area, towards the rocky hillside.

| Plant ID                 | LEAVES  |  | FLOWERS  |   |                                      | FRUITS  |  |   |
|--------------------------|---|--|--|---|--------------------------------------|---|--|---|
|                          | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Is <u>pollen</u> visible? How much?* | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |
| LATR1<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR2<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR3<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| LATR4<br>Creosote        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR1<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR2<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR3<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| YUBR4<br>Joshua Tree     | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | N/A                                  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR1<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR2<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |
| ACGR3<br>Cat Claw Acacia | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br>Little, Some<br>Lots        | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |

NOTES:



Observer name:

# RYAN MOUNTAIN (RYAN)

Date of observation:

**RYAN 1:** Located near parking lot. Most plants just WNW of restrooms. LATR2 is near the road, and LATR1 and ERFA1 are south of the parking lot, and east of the trail.

| Plant ID                            | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|-------------------------------------|---|--|--|---|---|--|---|-------|
|                                     | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN1-LATR1</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-LATR2</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-LATR3</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-LATR4</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-LATR5</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-ERFA1</b><br>CA Buckwheat  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-ERFA3</b><br>CA Buckwheat  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-ERFA4</b><br>CA Buckwheat  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN1-ERFA5</b><br>CA Buckwheat  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer name:

# RYAN MOUNTAIN (RYAN)

Date of observation:

**RYAN 2:** At trail intersection go east toward sheep's pass campground. ERFA2, CORA2, and YUSC3 are furthest east, just past big boulder and juniper.

| Plant ID                           | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|------------------------------------|---|--|--|---|---|--|---|-------|
|                                    | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN2-CORA1</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | Y N ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-CORA2</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | Y N ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-CORA3</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | Y N ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-CORA4</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | Y N ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-YUSC1</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-YUSC2</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-YUSC3</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-ERFA1</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-ERFA2</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-ERFA3</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN2-ERFA4</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer name:  
Date of observation:

# RYAN MOUNTAIN (RYAN)

**RYAN 3:** Up the trail approximately 500ft from intersection. Look for YUSC3 upslope from the trail.

| Plant ID                           | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|------------------------------------|---|--|--|---|---|--|---|-------|
|                                    | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN3-CORA2</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-CORA3</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-CORA7</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-YUSC1</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-YUSC2</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-YUSC3</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN3-ERFA1</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer name:  
Date of observation:

# RYAN MOUNTAIN (RYAN)

**RYAN 4:** Up the trail approximately 1000ft from Site 3. Look for the only patch of creosote along the trail.

| Plant ID                            | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|-------------------------------------|---|--|--|---|---|--|---|-------|
|                                     | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN4-LATR3</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-LATR6</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-LATR7</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-LATR8</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-LATR9</b><br>Creosote Bush | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-YUSC1</b><br>Mojave Yucca  | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-YUSC3</b><br>Mojave Yucca  | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN4-YUSC4</b><br>Mojave Yucca  | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer name:  
Date of observation:

# RYAN MOUNTAIN (RYAN)

**RYAN 5:** Up the trail approximately 1000ft from Site 4. Just before trail takes a hard right, crossing over a drainage.

| Plant ID                           | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|------------------------------------|---|--|--|---|---|--|---|-------|
|                                    | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN5-CORA4</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-CORA5</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-CORA6</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-YUSC1</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-YUSC2</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-YUSC3</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN5-ERFA1</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |



Observer name:  
Date of observation:

# RYAN MOUNTAIN (RYAN)

**RYAN 6:** Up the trail approximately 500ft from Site 5. Just after steps through large rock outcrop, and before large pine tree and trail crossing large drainage.

| Plant ID                           | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|------------------------------------|---|--|--|---|---|--|---|-------|
|                                    | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN6-CORAS5</b><br>Blackbrush  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-CORA7</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-YUSC3</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-YUSC4</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-YUSC5</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-ERFA1</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN6-ERFA2</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

Observer name:

# RYAN MOUNTAIN (RYAN)

Date of observation:

**RYAN 7:** After trail crosses large wash, in "bowl" with Nolin. Just past rock steps.

| Plant ID                           | LEAVES  |  | FLOWERS  |   | FRUITS  |  |   | notes |
|------------------------------------|---|--|--|---|---|--|---|-------|
|                                    | Are <u>young leaves</u> present? How many?      | Are any <u>leaves</u> present? What % of plant has leaves? | Are any <u>flowers or flower buds</u> present? How many? | What % of all <u>flowers</u> (including buds) are open? | Are any <u>fruits</u> present? How many?        | Are <u>ripe fruits</u> present? What % of all fruits are ripe? | Have <u>fruits dropped</u> since your last visit? How many? |       |
| <b>RYAN7-CORA4</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-CORA5</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-CORA6</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-CORA8</b><br>Blackbrush   | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-YUSC2</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-YUSC3</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-YUSC5</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-YUSC6</b><br>Mojave Yucca | N/A   | N/A  | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-ERFA1</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |
| <b>RYAN7-ERFA2</b><br>CA Buckwheat | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%            | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K          | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%         | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K | y n ?<br><5% 5-24% 25-49%<br>50-74% 75-94% >95%                | y n ?<br><3 3-10 11-100<br>101-1K 1001-10K >10K             |       |

## **Appendix D.** Phenophase Definitions

The following “Phenophase Definitions” reference sheets are designed to help address frequently asked questions regarding phenophases, and should be brought into the field when performing phenology monitoring.

## Catclaw Acacia

(*Acacia greggii*)

### Phenophase Definitions



#### Directions:

As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.

### Leaves

#### Young leaves

One or more young, unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once its entire length has emerged from the breaking bud so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem, but before the leaf has reached full size or turned the darker green color or tougher texture of mature leaves on the plant. Do not include fully dried or dead leaves.

*How many young leaves are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

#### Leaves

One or more live, unfolded leaves are visible on the plant. A leaf is considered "unfolded" once its entire length has emerged from the breaking bud so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem. Do not include fully dried or dead leaves.

*What percentage of the canopy is full with leaves? Ignore dead branches in your estimate.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Flowers

#### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

#### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Acacia greggii*, the fruit is a pod that changes from green to tan, red-brown or brown and splits open to expose the seeds. Do not include empty pods that have already dropped all of their seeds.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits

One or more ripe fruits are visible on the plant. For *Acacia greggii*, a fruit is considered ripe when it has turned tan, red-brown or brown. Do not include empty pods that have already dropped all of their seeds.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Recent fruit or seed drop

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

# Blackbrush

(*Coleogyne ramosissima*)



## Phenophase Definitions

*Directions:*

*As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.*

## Leaves

### Young leaves

One or more young, unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem, but before the leaf has reached full size or turned the darker green color or tougher texture of mature leaves on the plant. Do not include fully dried or dead leaves.

*How many young leaves are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Leaves

One or more live, unfolded leaves are visible on the plant. A leaf is considered "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem. Do not include fully dried or dead leaves.

*What percentage of the canopy is full with leaves? Ignore dead branches in your estimate.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Flowers

### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Coleogyne ramosissima*, the fruit is leathery, crescent-shaped and seed-like and changes from green to reddish-brown.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits

One or more ripe fruits are visible on the plant. For *Coleogyne ramosissima*, a fruit is considered ripe when it has turned reddish-brown.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Recent fruit or seed drop

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**



# Eastern Mojave Buckwheat

(*Eriogonum fasciculatum*)



## Phenophase Definitions

### Directions:

As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.

## Leaves

### Young leaves

One or more young, unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem, but before the leaf has reached full size or turned the darker green color or tougher texture of mature leaves on the plant. Do not include fully dried or dead leaves.

*How many young leaves are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Leaves

One or more live, unfolded leaves are visible on the plant. A leaf is considered "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem. Do not include fully dried or dead leaves.

*What percentage of the canopy is full with leaves? Ignore dead branches in your estimate.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Flowers

### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Eriogonum fasciculatum*, the fruit is tiny and capsule-like, partially enclosed in a spent flower base (calyx), with many such spent flower bases tightly clustered together. The spent flower base changes from green to light brown or rusty brown as it dries out.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits

One or more ripe fruits are visible on the plant. For *Eriogonum fasciculatum*, a fruit is considered ripe when when the spent flower base enclosing it has turned light brown or rusty brown.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Recent fruit or seed drop

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

# Creosote Bush

(*Larrea tridentata*)



## Phenophase Definitions

### Directions:

As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.

## Leaves

### Young leaves

One or more young, unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem, but before the leaf has reached full size or turned the darker green color or tougher texture of mature leaves on the plant. Do not include fully dried or dead leaves. For *Larrea tridentata*, young leaves are slightly more glossy than mature leaves.

*How many young leaves are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

## Flowers

### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Larrea tridentata*, the fruit is capsule-like and fuzzy with white hairs, and changes from green to dark brown and splits apart into five sections.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits

One or more ripe fruits are visible on the plant. For *Larrea tridentata*, a fruit is considered ripe when it has turned dark brown and has split into five sections.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Recent fruit or seed drop

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

# Honey Mesquite

(*Prosopis glandulosa*)



## Phenophase Definitions

*Directions:*

As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.

### Leaves

#### Young leaves

One or more young, unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem, but before the leaf has reached full size or turned the darker green color or tougher texture of mature leaves on the plant. Do not include fully dried or dead leaves.

*How many young leaves are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

#### Leaves

One or more live, unfolded leaves are visible on the plant. A leaf is considered "unfolded" once its entire length has emerged from a breaking bud, stem node or growing stem tip, so that the leaf stalk (petiole) or leaf base is visible at its point of attachment to the stem. Do not include fully dried or dead leaves.

*What percentage of the canopy is full with leaves? Ignore dead branches in your estimate.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### Flowers

#### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

#### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### **Pollen release**

One or more flowers on the plant release visible pollen grains when gently shaken or blown into your palm or onto a dark surface.

*How much pollen is released?*

**Little:** Only a few grains are released.; **Some:** Many grains are released.; **Lots:** A layer of pollen covers your palm, or a cloud of pollen can be seen in the air when the wind blows ;

## **Fruits**

### **Fruits**

One or more fruits are visible on the plant. For *Prosopis glandulosa*, the fruit is a pod that changes from green to tan, sometimes tinged with violet.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### **Ripe fruits**

One or more ripe fruits are visible on the plant. For *Prosopis glandulosa*, a fruit is considered ripe when it has turned tan, sometimes tinged with violet.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### **Recent fruit or seed drop**

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

# Joshua Tree

(*Yucca brevifolia*)



## Phenophase Definitions

*Directions:*

*As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.*

## Flowers

### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Yucca brevifolia*, the fruit is a spongy capsule that changes from fleshy green to leathery tan, grayish-brown or brown, sometimes the skin cracking to expose the seeds. Do not include empty capsules that have already dropped all of their seeds.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits



One or more ripe fruits are visible on the plant. For *Yucca brevifolia*, a fruit is considered ripe when it has turned leathery tan, grayish-brown or brown. Do not include empty capsules that have already dropped all of their seeds.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### **Recent fruit or seed drop**

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

# Mojave Yucca

(*Yucca schidigera*)



## Phenophase Definitions

### Directions:

As you report on phenophase status (Y, N or ?) on the datasheets, refer to the definitions on this sheet to find out what you should look for, for each phenophase in each species. To report the intensity of the phenophase, choose the best answer to the question below the phenophase, if one is included. Feel free not to report on phenophases or intensity questions that seem too difficult or time-consuming.

## Flowers

### Flowers or flower buds

One or more fresh open or unopened flowers or flower buds are visible on the plant. Include flower buds that are still developing, but do not include wilted or dried flowers.

*How many flowers and flower buds are present? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), simply estimate the number of flower heads, spikes or catkins and not the number of individual flowers.*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Open flowers

One or more open, fresh flowers are visible on the plant. Flowers are considered "open" when the reproductive parts (male stamens or female pistils) are visible between or within unfolded or open flower parts (petals, floral tubes or sepals). Do not include wilted or dried flowers.

*What percentage of all fresh flowers (buds plus unopened plus open) on the plant are open? For species in which individual flowers are clustered in flower heads, spikes or catkins (inflorescences), estimate the percentage of all individual flowers that are open.*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

## Fruits

### Fruits

One or more fruits are visible on the plant. For *Yucca schidigera*, the fruit is a fleshy capsule, sometimes constricted, that changes from fleshy green to leathery tan, grayish-brown or brown.

*How many fruits are present?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

### Ripe fruits

One or more ripe fruits are visible on the plant. For *Yucca schidigera*, a fruit is considered ripe when it has turned leathery tan, grayish-brown or brown.

*What percentage of all fruits (unripe plus ripe) on the plant are ripe?*

**Less than 5%; 5-24%; 25-49%; 50-74%; 75-94%; 95% or more;**

### **Recent fruit or seed drop**

One or more mature fruits or seeds have dropped or been removed from the plant since your last visit. Do not include obviously immature fruits that have dropped before ripening, such as in a heavy rain or wind, or empty fruits that had long ago dropped all of their seeds but remained on the plant.

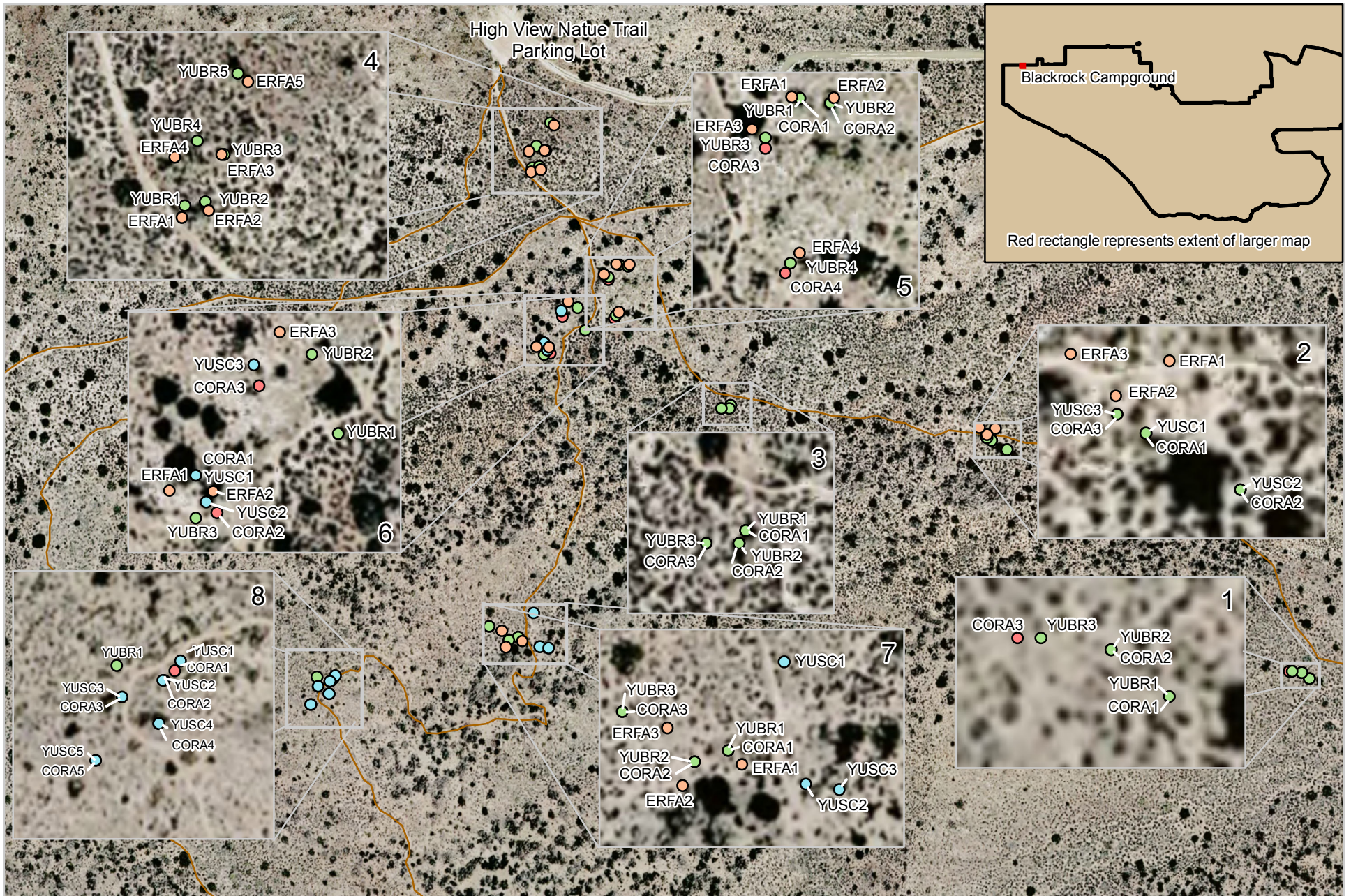
*How many mature fruits have dropped seeds or have completely dropped or been removed from the plant since your last visit?*

**Less than 3; 3 to 10; 11 to 100; 101 to 1,000; 1,001 to 10,000; More than 10,000;**

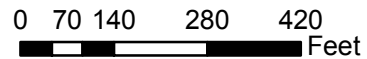
## **Appendix E. Maps**

The following maps were created by park staff to assist new staff and volunteers in locating labeled California Phenology Project sites and individuals. See main report for overview map.





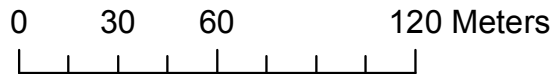
**PHENOLOGY MONITORING LOCATIONS  
HIGH VIEW NATURE TRAIL**






- |                             |                       |
|-----------------------------|-----------------------|
| Cat's Claw (ACGR)           | Honey Mesquite (PRGL) |
| Blackbrush (CORA)           | Joshua Tree (YUBR)    |
| California Buckwheat (ERFA) | Mojave Yucca (YUSC)   |
| Creosote Bush (LATR)        |                       |



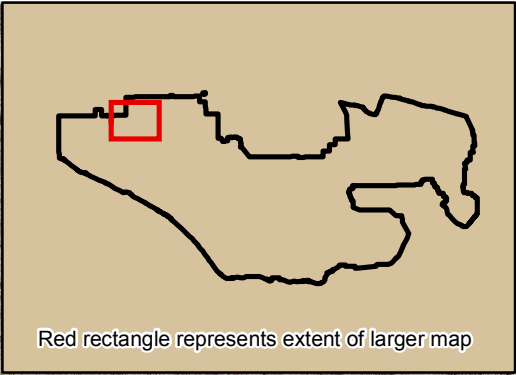
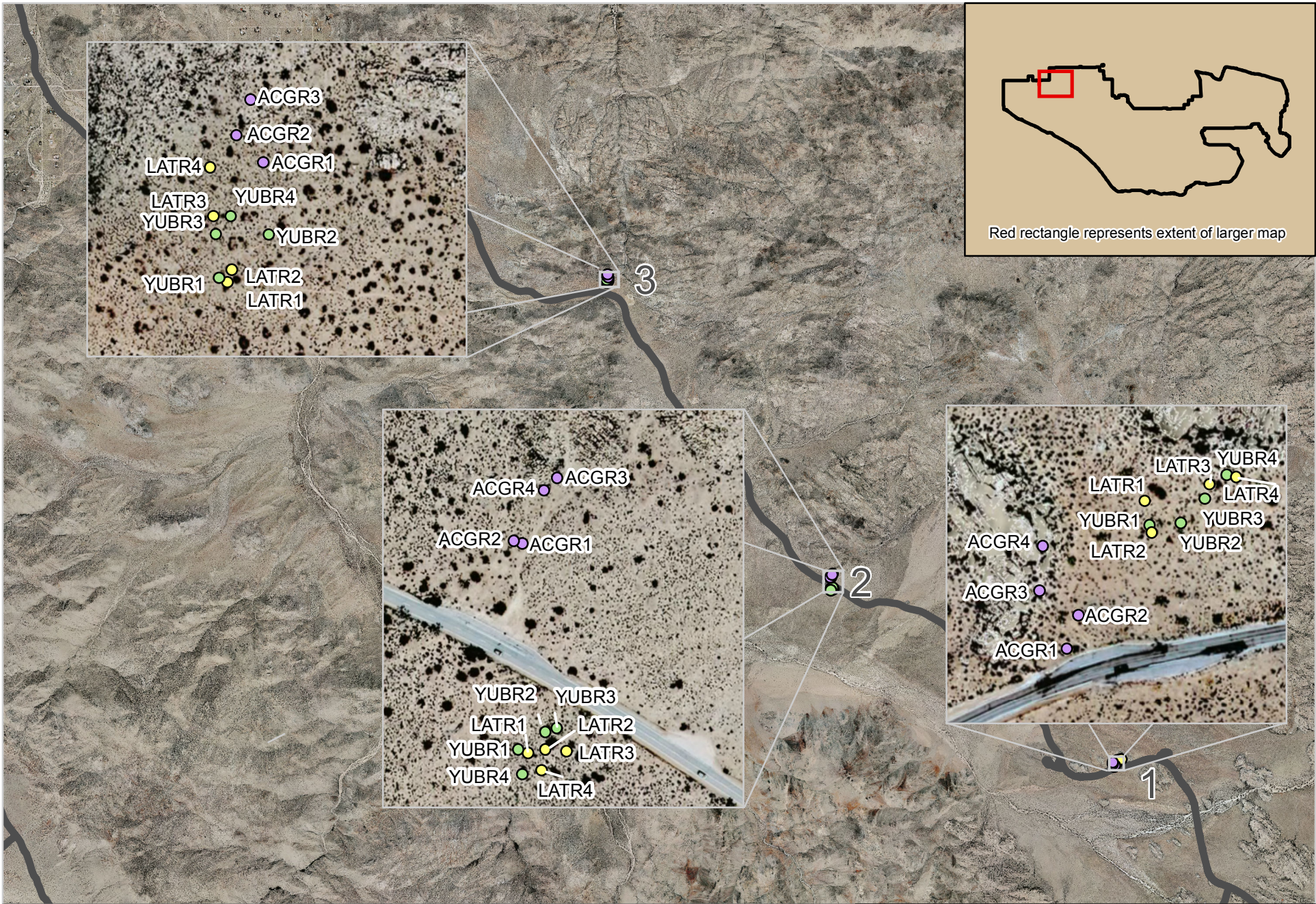
# CPP JOTR Oasis Visitor Center Plants



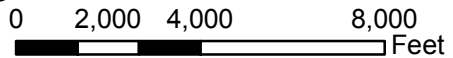
**CPP JOTR Plants**

-  Larrea tridentata (LATR)
-  Proposip glandulosa (PRGL)
-  Trails



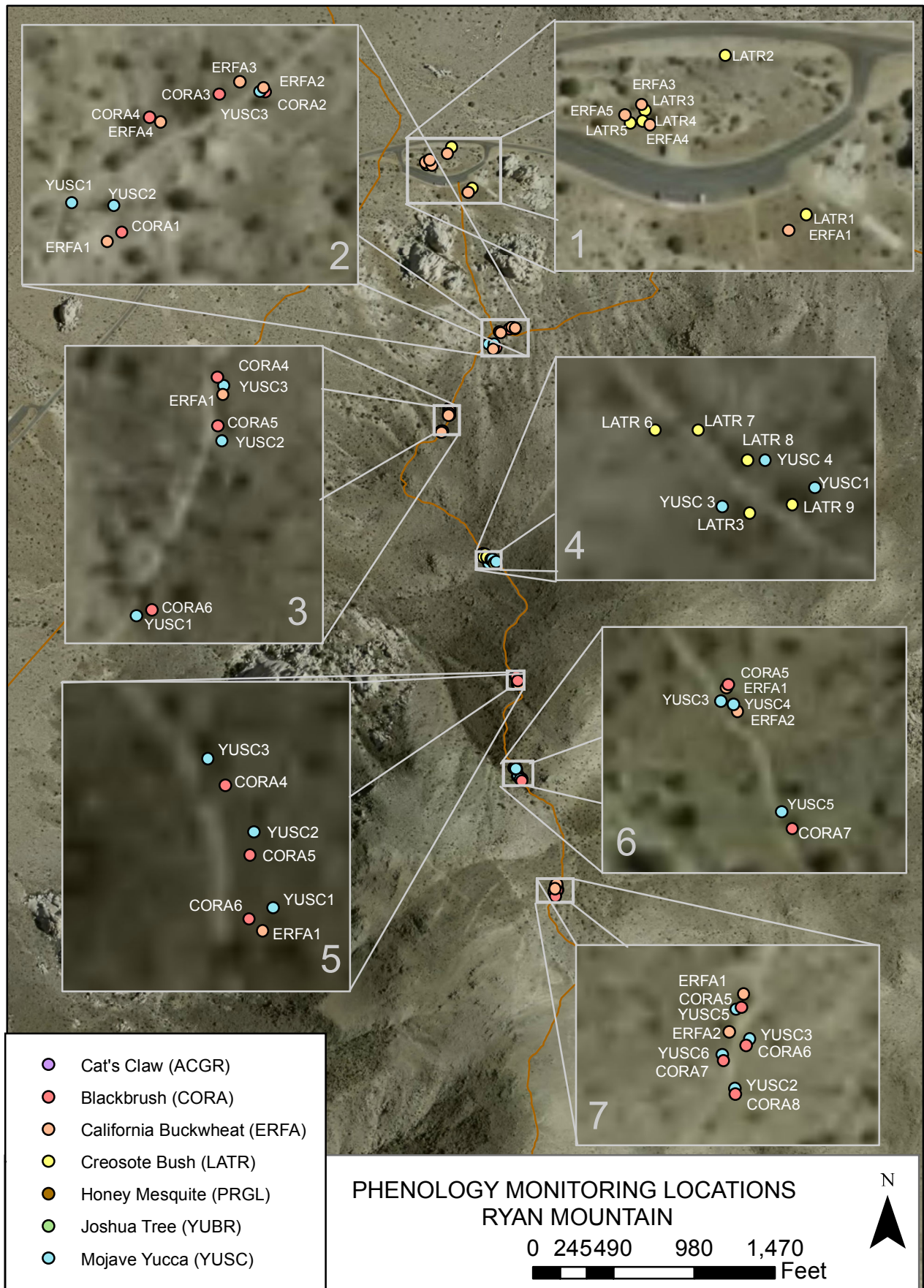


**PHENOLOGY MONITORING LOCATIONS  
PARK BOULEVARD SITES**



- |                             |                       |
|-----------------------------|-----------------------|
| Cat's Claw (ACGR)           | Honey Mesquite (PRGL) |
| Blackbrush (CORA)           | Joshua Tree (YUBR)    |
| California Buckwheat (ERFA) | Mojave Yucca (YUSC)   |
| Creosote Bush (LATR)        |                       |





## Appendix F. Instructions on creating a profile in Nature's Notebook M. Harding 6/26/15

- 1) Go to: [https://www.usanpn.org/natures\\_notebook](https://www.usanpn.org/natures_notebook)
- 2) Click on “Become an observer”(Figure 1)

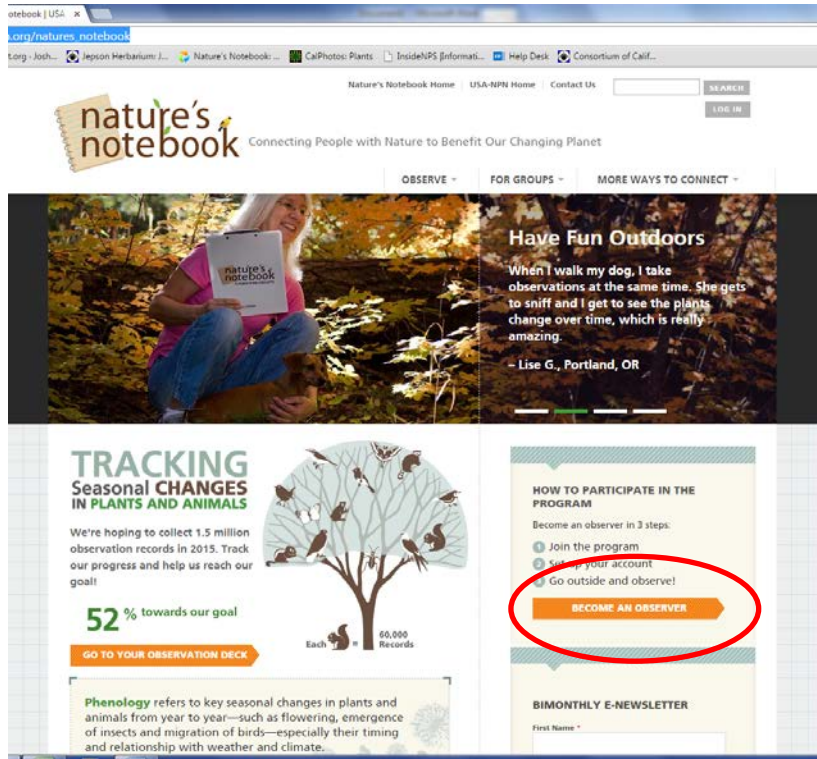


Figure 1. Nature's Notebook home screen

- 3) Click “Become an Observer now”
- 4) Enter a user name, email address, and password
- 5) Under “Partner Groups”, expand the CA Phenology tab, and select “Joshua Tree NP” by clicking the box next to it (Figure 2)

Navigation: Home | About Us | Contact Us

m: J... Nature's Notebook: ... CalPhotos: Plants InsideNPS | Informati... Help Desk Consortium of Calif...

## User account

[Join Natures Notebook](#) [Log in](#) [Request new password](#)

**Username \***  
  
Spaces are allowed; punctuation is not allowed except for periods, hyphens, apostrophes, and underscores.

**E-mail address \***  
  
Your email address will not be publicly viewable or distributed outside USA-NPN.

**Confirm e-mail address \***  
  
Please re-type your e-mail address to confirm it is accurate.

**Password \***  **Password strength:** \_\_\_\_\_

**Confirm password \***

Password must be at least 8 characters.

Nature's Notebook Quarterly

**Participant Information**

I purchased a cloned lilac from Arbor Day Foundation.

I am a NWS Cooperative Observer.

**Partner Groups**

- A.T. Seasons
- Arbor Day Foundation
- Audubon
- Belwin
- BLM Arcata Field Office
- Botanic Gardens and Arboretums
- Boyd Hill Nature Preserve Phenology Trail
- Brazos Bend State Park
- Buffelgrass Monitoring Network, Tucson
- California Phenology Project
  - Audubon Canyon Ranch
  - Coulee Ranch
  - CSU Monterey Bay
  - Don Edwards NWR
  - Death Valley NP
  - Golden Gate NRA
  - HSLHBNWR Experimental Willows
  - John Muir NHS
  - Joshua Tree NP
  - Lassen Volcanic NP
  - Peppercorn
  - Peppercorn Preserve
  - Redwood National Park
  - Redwood/Roberts Regional Parks

Figure 2. Be sure to check this box so the Joshua Tree sites are associated with your profile.

6) Check the box to agree with the terms of use, answer the validation question, and click “create new account”

**Appendix G.** Temperature and precipitation data from Lost Horse, Yucca Valley, and Oasis of Mara.

Lost Horse Valley RAWS weather data April 2011-Sept 2015

<http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?caCLHO>

Latitude: 34° 01' 04"

Longitude : 116° 11' 16"

Elevation: 4200 ft.

| Month  | Average Air Temperature |                 |      |                 |      | Precipitation |
|--------|-------------------------|-----------------|------|-----------------|------|---------------|
|        | Deg F                   |                 |      |                 |      | in            |
|        | Ave.                    | Ave. Daily Max. | Max. | Ave. Daily Min. | Min. | Total         |
| Apr-11 | 57.1                    | 70.67           | 86   | 41.83           | 24   | 0.18          |
| May-11 | 61.22                   | 73.81           | 87   | 43.45           | 31   | 0             |
| Jun-11 | 73.47                   | 86.77           | 99   | 54.73           | 39   | 0             |
| Jul-11 | 79.91                   | 92.23           | 101  | 63.42           | 49   | 0.1           |
| Aug-11 | 82.19                   | 95.97           | 102  | 63.42           | 51   | 0.34          |
| Sep-11 | 73.82                   | 88.73           | 97   | 57.3            | 48   | 0.31          |
| Oct-11 | 61.78                   | 77.87           | 92   | 45.42           | 32   | 0             |
| Nov-11 | 47.75                   | 61.27           | 79   | 34.93           | 23   | 0.41          |
| Dec-11 | 39.43                   | 52.71           | 73   | 28.81           | 16   | 0.28          |
| Jan-12 | 46.67                   | 62.23           | 75   | 33.23           | 20   | 0.01          |
| Feb-12 | 44.88                   | 57.79           | 74   | 32              | 21   | 0.48          |
| Mar-12 | 51.29                   | 64.71           | 77   | 37.13           | 27   | 0.76          |
| Apr-12 | 59.02                   | 72.7            | 91   | 42.17           | 28   | 0.38          |
| May-12 | 69.39                   | 83.68           | 97   | 49.9            | 40   | 0             |
| Jun-12 | 76.51                   | 88.6            | 96   | 58              | 48   | 0             |
| Jul-12 | 79.59                   | 90.03           | 102  | 65.52           | 53   | 0.55          |
| Aug-12 | 80.63                   | 91.39           | 101  | 67.1            | 59   | 0.84          |
| Sep-12 | 75.51                   | 87.27           | 92   | 60.53           | 51   | 0             |
| Oct-12 | 62.66                   | 76.97           | 93   | 47.29           | 36   | 0.01          |
| Nov-12 | 52.05                   | 66.23           | 79   | 38.37           | 23   | 0             |
| Dec-12 | 43.17                   | 53.84           | 73   | 32.1            | 17   | 0.34          |
| Jan-13 | 39.7                    | 50.87           | 68   | 28.74           | 8    | 0.75          |
| Feb-13 | 43.14                   | 54.93           | 66   | 30.61           | 20   | 0.06          |
| Mar-13 | 56.3                    | 68              | 83   | 42.26           | 30   | 0.08          |
| Apr-13 | 61.17                   | 72.8            | 88   | 46.13           | 34   | 0             |
| May-13 | 67.46                   | 78.23           | 91   | 52.16           | 38   | 0.31          |
| Jun-13 | 79.27                   | 91.23           | 104  | 60.77           | 52   | 0             |
| Jul-13 | 82.21                   | 92.13           | 102  | 69.03           | 61   | 0.45          |
| Aug-13 | 78.73                   | 89.06           | 96   | 64.39           | 54   | 0.63          |
| Sep-13 | 71.76                   | 83.83           | 93   | 57.83           | 39   | 0.17          |
| Oct-13 | 56.56                   | 70.42           | 81   | 41.84           | 30   | 0.03          |
| Nov-13 | 49.58                   | 62.5            | 76   | 36.8            | 29   | 0.58          |
| Dec-13 | 42.93                   | 55              | 71   | 31.84           | 21   | 0.06          |

|        |       |       |     |       |    |      |
|--------|-------|-------|-----|-------|----|------|
| Jan-14 | 48.54 | 62.32 | 72  | 34.97 | 28 | 0    |
| Feb-14 | 52.15 | 64.75 | 80  | 38.54 | 19 | 1.12 |
| Mar-14 | 54.44 | 65.81 | 75  | 40.71 | 30 | 0.15 |
| Apr-14 | 60.41 | 71.07 | 84  | 45.8  | 29 | 0.17 |
| May-14 | 68.42 | 79    | 91  | 53.03 | 38 | 0.02 |
| Jun-14 | 77.83 | 88.8  | 98  | 60.43 | 50 | 0    |
| Jul-14 | 82.49 | 92.68 | 100 | 68.16 | 59 | 0.5  |
| Aug-14 | 77.69 | 87.84 | 96  | 64    | 54 | 0.25 |
| Sep-14 | 74.39 | 85.83 | 93  | 60.17 | 45 | 0.15 |
| Oct-14 | 64.49 | 78.71 | 87  | 48.58 | 40 | 0    |
| Nov-14 | 52.62 | 65.37 | 77  | 39.07 | 27 | 0    |
| Dec-14 | 44.29 | 54.42 | 69  | 33.97 | 18 | 0.28 |
| Jan-15 | 45.42 | 57.48 | 71  | 34.65 | 15 | 0.73 |
| Feb-15 | 53.21 | 66.43 | 76  | 39.36 | 34 | 0.41 |
| Mar-15 | 57.09 | 69.03 | 83  | 42.74 | 27 | 0.6  |
| Apr-15 | 57.97 | 69.6  | 84  | 42.73 | 33 | 0    |
| May-15 | 62.08 | 72.48 | 88  | 47.26 | 37 | 0.03 |
| Jun-15 | 79.01 | 89.97 | 100 | 63.13 | 42 | 0    |
| Jul-15 | 76.9  | 87.1  | 95  | 62.9  | 50 | 1.2  |
| Aug-15 | 82.46 | 93.13 | 99  | 66.9  | 52 | 0.05 |
| Sep-15 | 73.9  | 83.94 | 93  | 61.44 | 49 | 0.11 |

| Lost Horse RAWS weather data |            |                |                 |        |
|------------------------------|------------|----------------|-----------------|--------|
| 1991-2013 Normals            |            |                |                 |        |
| Month                        | Temp Deg F |                |                 | in     |
|                              | Ave. Temp  | Ave. Daily Max | Avg. Daily Min. | Precip |
| Jan                          | 43.93      | 56.51          | 32.93           | 1.14   |
| Feb                          | 45.26      | 57.77          | 34.19           | 1.28   |
| Mar                          | 51.51      | 64.62          | 37.69           | 0.54   |
| Apr                          | 57.11      | 70.17          | 41.65           | 0.22   |
| May                          | 66.81      | 79.87          | 49.35           | 0.11   |
| Jun                          | 75.8       | 88.38          | 57.6            | 0.01   |
| Jul                          | 81.48      | 93.46          | 65.3            | 0.30   |
| Aug                          | 80.28      | 92.55          | 64.26           | 0.64   |
| Sept                         | 73.2       | 87.05          | 57.77           | 0.24   |
| Oct                          | 60.79      | 75.36          | 46.18           | 0.26   |
| Nov                          | 50.12      | 63.9           | 36.87           | 0.33   |
| Dec                          | 42.77      | 55.13          | 31.73           | 0.77   |

Yucca Valley RAWS weather data April 2011- Sept 2015

<http://www.raws.dri.edu/cgi-bin/rawMAIN.pl?caCYUC>

Latitude: 34° 07' 24"

Longitude: 116° 24' 28"

Elev: 3260 ft

| Date   | Average Air Temperature |                 |      |                 |      | Precipitation |
|--------|-------------------------|-----------------|------|-----------------|------|---------------|
|        | Deg F                   |                 |      |                 |      | in            |
|        | Ave.                    | Ave. Daily Max. | Max. | Ave. Daily Min. | Min. | Total         |
| Apr-11 | 59.71                   | 72.43           | 89   | 45.57           | 29   | 0.04          |
| May-11 | 63.61                   | 76.55           | 90   | 47.39           | 36   | 0             |
| Jun-11 | 74.96                   | 88.77           | 100  | 56.37           | 41   | 0             |
| Jul-11 | 81.85                   | 93.65           | 104  | 66.26           | 53   | 0.87          |
| Aug-11 | 84.16                   | 97.58           | 103  | 66.39           | 53   | 0             |
| Sep-11 | 77.11                   | 90.83           | 100  | 61.53           | 54   | 0.06          |
| Oct-11 | 65.34                   | 79.65           | 92   | 49.97           | 40   | 0             |
| Nov-11 | 49.66                   | 62.9            | 83   | 37.07           | 30   | 0.24          |
| Dec-11 | 43.38                   | 55.97           | 73   | 31.71           | 20   | 0.18          |
| Jan-12 | 49.65                   | 63.55           | 77   | 36.61           | 24   | 0             |
| Feb-12 | 48.45                   | 60.97           | 74   | 35.69           | 26   | 0.3           |
| Mar-12 | 54.2                    | 67.23           | 78   | 39.84           | 31   | 0.72          |
| Apr-12 | 62.53                   | 75.67           | 94   | 47.07           | 36   | 0.42          |
| May-12 | 72.13                   | 85.94           | 99   | 53.77           | 43   | 0             |
| Jun-12 | 78.89                   | 92.47           | 100  | 59.97           | 54   | 0             |
| Jul-12 | 82.5                    | 93.87           | 106  | 67.81           | 58   | 0.29          |
| Aug-12 | 84.28                   | 95.68           | 105  | 71.74           | 64   | 0.24          |
| Sep-12 | 78.99                   | 91.77           | 97   | 64.5            | 57   | 0             |
| Oct-12 | 65.49                   | 80.52           | 98   | 49.42           | 38   | 0.01          |
| Nov-12 | 55.07                   | 69.43           | 83   | 41.4            | 26   | 0.04          |
| Dec-12 | 45.4                    | 57.52           | 76   | 34.13           | 19   | 0.19          |
| Jan-13 | 44.13                   | 55.45           | 72   | 33              | 14   | 0.64          |
| Feb-13 | 46.78                   | 59.68           | 69   | 33.5            | 25   | 0.08          |
| Mar-13 | 59.78                   | 72.42           | 86   | 46.06           | 36   | 0.06          |
| Apr-13 | 64.26                   | 77.37           | 93   | 49.13           | 39   | 0             |
| May-13 | 70.16                   | 82.71           | 96   | 53.58           | 43   | 0.01          |
| Jun-13 | 81.1                    | 94.97           | 109  | 62.23           | 53   | 0             |
| Jul-13 | 84.53                   | 95.71           | 105  | 71.71           | 63   | 0.57          |
| Aug-13 | 81.58                   | 93.35           | 100  | 66.94           | 58   | 0.6           |
| Sep-13 | 75.27                   | 88.43           | 98   | 61              | 45   | 0.08          |
| Oct-13 | 60.35                   | 74.52           | 83   | 45.58           | 34   | 0.12          |
| Nov-13 | 52.38                   | 65.53           | 78   | 39.73           | 32   | 0.21          |
| Dec-13 | 46.34                   | 58.48           | 72   | 35.55           | 25   | 0.34          |
| Jan-14 | 51.67                   | 65.58           | 76   | 38.81           | 33   | 0             |
| Feb-14 | 54.58                   | 68.25           | 83   | 40.79           | 24   | 1.17          |

|        |       |       |     |       |    |      |
|--------|-------|-------|-----|-------|----|------|
| Mar-14 | 57.86 | 69.87 | 79  | 44    | 38 | 0.53 |
| Apr-14 | 63.26 | 75.47 | 88  | 48.5  | 34 | 0.13 |
| May-14 | 70.31 | 83.23 | 95  | 53.74 | 42 | 0    |
| Jun-14 | 79.37 | 93    | 100 | 61.17 | 53 | 0    |
| Jul-14 | 85.23 | 96.87 | 105 | 71.1  | 63 | 0.05 |
| Aug-14 | 80.48 | 92.29 | 100 | 66.58 | 58 | 0.25 |
| Sep-14 | 78.01 | 90.3  | 99  | 63.83 | 48 | 0.21 |
| Oct-14 | 68.03 | 82.58 | 91  | 52.61 | 44 | 0    |
| Nov-14 | 55.62 | 69.03 | 82  | 42.47 | 33 | 0    |
| Dec-14 | 47.03 | 56.71 | 76  | 37.68 | 23 | 0.95 |
| Jan-15 | 49.13 | 60.71 | 71  | 38.45 | 22 | 0.7  |
| Feb-15 | 55.95 | 70.46 | 79  | 42.46 | 37 | 0.73 |
| Mar-15 | 60.62 | 73.81 | 87  | 45.61 | 31 | 0.41 |
| Apr-15 | 61.66 | 74.53 | 89  | 46.47 | 37 | 0    |
| May-15 | 86    | 87    | 91  | 85    | 79 | 0    |
| Jun-15 | 79.3  | 91.33 | 100 | 70.17 | 48 | 0.01 |
| Jul-15 | 80.12 | 91.58 | 99  | 65.48 | 55 | 0.78 |
| Aug-15 | 85.29 | 97.42 | 104 | 69.58 | 57 | 0    |
| Sep-15 | 78.07 | 84.6  | 98  | 64.53 | 32 | 0.41 |

| Yucca Valley RAWS weather data |            |                |                 |        |
|--------------------------------|------------|----------------|-----------------|--------|
| 1990-2013 Normals              |            |                |                 |        |
| Month                          | Temp Deg F |                |                 | in     |
|                                | Ave. Temp  | Ave. Daily Max | Avg. Daily Min. | Precip |
| Jan                            | 46.27      | 59.55          | 34.22           | 1.35   |
| Feb                            | 48.8       | 61.78          | 36.33           | 1.51   |
| Mar                            | 54.48      | 68.04          | 39.99           | 0.64   |
| Apr                            | 59.93      | 74             | 44.32           | 0.18   |
| May                            | 69.55      | 83.3           | 52.06           | 0.31   |
| Jun                            | 77.31      | 91.09          | 58.88           | 0.5    |
| Jul                            | 83.56      | 96.42          | 67.36           | 0.28   |
| Aug                            | 82.37      | 95.47          | 65.94           | 0.26   |
| Sept                           | 75.98      | 90.64          | 59.82           | 0.2    |
| Oct                            | 63.9       | 79.33          | 48.61           | 0.27   |
| Nov                            | 53.17      | 67.64          | 39.69           | 0.33   |
| Dec                            | 45.12      | 58.05          | 33.58           | 0.92   |



Oasis of Mara PRISM weather data April 2011-Aug 2015

<http://www.prism.oregonstate.edu/explorer/>

Latitude: 34.1280

Longitude: -116.0400

Elev: 2067 ft

| Date   | Average Air Temperature |       |      | Precipitation |
|--------|-------------------------|-------|------|---------------|
|        | Deg F                   |       |      | in            |
|        | Ave.                    | Max.  | Min. | Total         |
| Apr-11 | 67.7                    | 82.2  | 53.2 | 0.02          |
| May-11 | 72.2                    | 86.6  | 57.8 | 0             |
| Jun-11 | 83.5                    | 99.9  | 67   | 0             |
| Jul-11 | 91.1                    | 105.9 | 76.3 | 0.28          |
| Aug-11 | 92.4                    | 108.5 | 76.4 | 0.06          |
| Sep-11 | 85.2                    | 100.4 | 70.1 | 0.36          |
| Oct-11 | 72.6                    | 88.5  | 56.6 | 0.01          |
| Nov-11 | 55.1                    | 68.9  | 41.3 | 0.2           |
| Dec-11 | 46.9                    | 60.4  | 33.5 | 0.43          |
| Jan-12 | 52.6                    | 67.5  | 37.8 | 0.03          |
| Feb-12 | 54.2                    | 68.5  | 40   | 0.17          |
| Mar-12 | 60.6                    | 75.3  | 45.9 | 0.04          |
| Apr-12 | 69.4                    | 84.4  | 54.4 | 0.19          |
| May-12 | 80.6                    | 95.5  | 65.7 | 0             |
| Jun-12 | 87.3                    | 103.4 | 71.3 | 0             |
| Jul-12 | 91.7                    | 105.9 | 77.4 | 0.51          |
| Aug-12 | 93.6                    | 106.4 | 80.9 | 1.7           |
| Sep-12 | 86.6                    | 100.6 | 72.5 | 0.44          |
| Oct-12 | 73.3                    | 88.4  | 58.2 | 0.12          |
| Nov-12 | 60.7                    | 75.7  | 45.7 | 0             |
| Dec-12 | 49.9                    | 62.4  | 37.4 | 0.64          |
| Jan-13 | 46.7                    | 59.3  | 34.1 | 0.43          |
| Feb-13 | 52.4                    | 66.4  | 38.3 | 0             |
| Mar-13 | 65.6                    | 79.9  | 51.3 | 0.13          |
| Apr-13 | 68.6                    | 82.2  | 55.1 | 0             |
| May-13 | 75.1                    | 88.7  | 61.5 | 0.01          |
| Jun-13 | 89.7                    | 105.4 | 73.9 | 0             |
| Jul-13 | 95.3                    | 108.3 | 82.3 | 0.47          |
| Aug-13 | 90.1                    | 104.5 | 75.8 | 0.44          |
| Sep-13 | 83.6                    | 97.2  | 70   | 0.38          |
| Oct-13 | 67.7                    | 83.2  | 52.3 | 0.01          |
| Nov-13 | 57.5                    | 70.9  | 44.2 | 0.5           |
| Dec-13 | 49.4                    | 62.4  | 36.3 | 0.06          |
| Jan-14 | 55.9                    | 70.5  | 41.4 | 0             |
| Feb-14 | 60.2                    | 74.1  | 46.4 | 0             |
| Mar-14 | 64.3                    | 77.6  | 51   | 0.14          |
| Apr-14 | 70.6                    | 84.7  | 56.5 | 0.11          |
| May-14 | 78.6                    | 92.7  | 64.5 | 0.03          |

|        |      |       |      |      |
|--------|------|-------|------|------|
| Jun-14 | 88.5 | 103.5 | 73.5 | 0    |
| Jul-14 | 94.5 | 107.9 | 81.1 | 0.82 |
| Aug-14 | 89.6 | 103   | 76.2 | 0.64 |
| Sep-14 | 86.3 | 99.9  | 73.3 | 0.01 |
| Oct-14 | 75.1 | 91    | 60   | 0    |
| Nov-14 | 60.6 | 74.7  | 46.6 | 0    |
| Dec-14 | 51.3 | 61.5  | 41.6 | 0.37 |
| Jan-15 | 53   | 65    | 41   | 0.5  |
| Feb-15 | 61.9 | 76.1  | 47.7 | 0.09 |
| Mar-15 | 67   | 80.9  | 53.2 | 0.23 |
| Apr-15 | 69   | 83.5  | 54.4 | 0.1  |
| May-15 | 74.4 | 87.3  | 61.5 | 0    |
| Jun-15 | 90.3 | 104.8 | 75.8 | 0.1  |
| Jul-15 | 89.5 | 102.8 | 76.1 | 0.89 |
| Aug-15 | 93.6 | 108.2 | 79   | 0.11 |

| Oasis of Mara PRISM data |            |                |                 |        |
|--------------------------|------------|----------------|-----------------|--------|
| 1981-2010 Normals        |            |                |                 |        |
| Month                    | Temp Deg F |                |                 | in     |
|                          | Ave. Temp  | Ave. Daily Max | Avg. Daily Min. | Precip |
| Jan                      | 49.9       | 62.7           | 37              | 0.54   |
| Feb                      | 53.2       | 66.5           | 39.8            | 0.58   |
| Mar                      | 58.2       | 72.2           | 44.3            | 0.44   |
| Apr                      | 65.4       | 81             | 49.7            | 0.12   |
| May                      | 73.6       | 89.3           | 57.9            | 0.09   |
| Jun                      | 81.8       | 98.3           | 65.3            | 0.01   |
| Jul                      | 88         | 104.3          | 71.7            | 0.42   |
| Aug                      | 86.5       | 101.6          | 71.3            | 0.77   |
| Sept                     | 80         | 95.2           | 64.8            | 0.35   |
| Oct                      | 68.5       | 83.4           | 53.7            | 0.17   |
| Nov                      | 57         | 70.9           | 43              | 0.2    |
| Dec                      | 49.3       | 62.2           | 36.3            | 0.54   |
| Annual                   | 67.6       | 82.3           | 52.9            | 4.23   |

## **Appendix H. Volunteer Handout**

The following half-page hand out was designed for use by CPP volunteers to distribute when approached while performing phenology monitoring.



## California Phenology Project: Joshua Tree National Park



Phenology is the study of seasonal changes that occur in plants and animals annually. Phenological events in plants include the appearance of new leaves, flowering, and fruiting. Major changes in phenological data from year to year can often be linked to environmental changes in temperature and precipitation. The California Phenology Project began in 2010 as an effort to implement citizen science in long term monitoring of these events. Volunteers and interns currently monitor seven different species of plants across various sites within Joshua Tree National Park. For more information visit: <https://www.usanpn.org/cpp/jotr>



## California Phenology Project: Joshua Tree National Park



Phenology is the study of seasonal changes that occur in plants and animals annually. Phenological events in plants include the appearance of new leaves, flowering, and fruiting. Major changes in phenological data from year to year can often be linked to environmental changes in temperature and precipitation. The California Phenology Project began in 2010 as an effort to implement citizen science in long term monitoring of these events. Volunteers and interns currently monitor seven different species of plants across various sites within Joshua Tree National Park. For more information visit: <https://www.usanpn.org/cpp/jotr>