

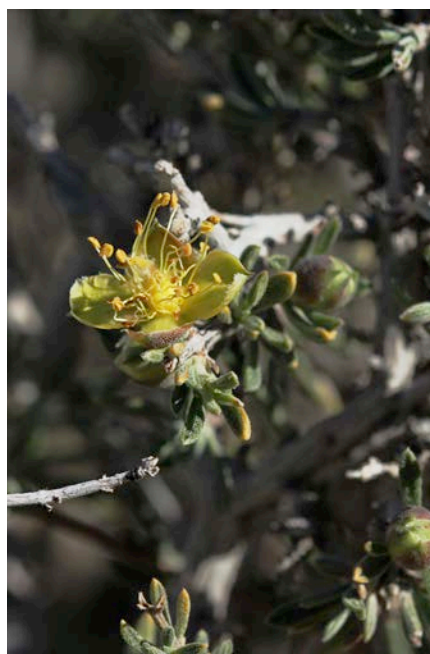
Phenological monitoring guide:

Joshua Tree National Park

A designated monitoring site of
The California Phenology Project



Yucca brevifolia



Coleogyne ramosissima



Prosopis glandulosa



Larrea tridentata

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Yucca schidigera
Larrea tridentata
Prosopis glandulosa

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Frequency of monitoring and estimated time investment (must write text)

Suggested strategies for achieving monitoring goals

Assign a team of two people for each trail/location
Monitoring: 2 days/week at each trail/location
 ~30 plants: 90 minutes monitoring + 30-45 minutes walking)
Place data sheets in a 3-ring binder as they are completed
Data uploading: one day per month

Data sheets

Instructions for downloading data sheets from usanpn.org (must write text)
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Yucca brevifolia
Yucca schidigera
Larrea tridentata
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Data entry into National Phenology Network database

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Introduction to the California Phenology Project

Pacific West Region Fact Sheet

National Park Service
U.S. Department of the Interior



The California Phenology Project

Tracking nature's pulse to assess climate change response across California landscapes and national parks.

Background

Phenology is the study of seasonal or periodic biological events such as flowering, leaf-out, insect emergence, and animal migration. The dynamic seasonal status of plants and animals (i.e., the timing and intensity of phenophases) is closely linked to ecological and climatic variables, and provides an integrative signal of environmental quality. Phenology has been recognized by the Intergovernmental Panel on Climate Change as a key indicator of biological responses to climate change, and by several national assessments as perhaps our best opportunity to detect the impacts of climate change on our natural resources.

Compelling to observe and simple to record (through a standardized system developed by the USA National Phenology Network), phenology offers a common framework for professional and citizen scientists of all ages to connect with the dynamic pulse of our planet through direct engagement in scientific observation, thereby providing an accessible platform from which to educate the public about climate change.

The California Phenology Project (CPP) is in the initial stages of developing an integrated phenological monitoring program. The project incorporates public education and outreach along with sound scientific practices and outcomes to inform natural resource management, for 19 National Park Service (NPS) units in California. Project work initially will be conducted in six pilot parks, representing five park networks, and is building upon existing monitoring protocols and programs of project collaborators: the Phenology Stewardship Program at the University of California, Santa Barbara (UCSB-PSP), the US Geological Survey (USGS), and the National Coordinating Office of the USA National Phenology Network (USA-NPN). The project also emphasizes and encourages partnerships with the wider education and natural resource science communities including the University of California Natural Reserve System, sister federal and state agencies, and others.



California's dynamic wildflower blooms, like this hillside of *Clarkia* (farewell-to-spring) in the southern Sierra Nevada Mountains, support activities of pollinators, scientists, nature enthusiasts, and ecotourists. Photo: Brian Haggerty.

Purpose & Scope

The primary goal of the CPP is to organize and implement integrated phenology monitoring projects under a collaborative science framework across California parks and partners. The project will assess how phenology can best be used to monitor the response of natural resources to climate change across California's diverse landscape. Initially focused on plants and open to public participation, the CPP also aims:

1. to develop a monitoring framework, target species list, and sampling scheme that can support the participation of 19 NPS units, UC Natural Reserves, and other partners and landscapes in California;
2. to establish science and interpretation frameworks that can be applied to long-term timeframes;
3. to cultivate phenological and climate change literacy among scientists and the public through coordinated training and educational materials developed for participation in phenology monitoring projects; and
4. to identify and summarize legacy phenology datasets in California to provide a historical context for current monitoring and educational activities.

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Scientific Approach

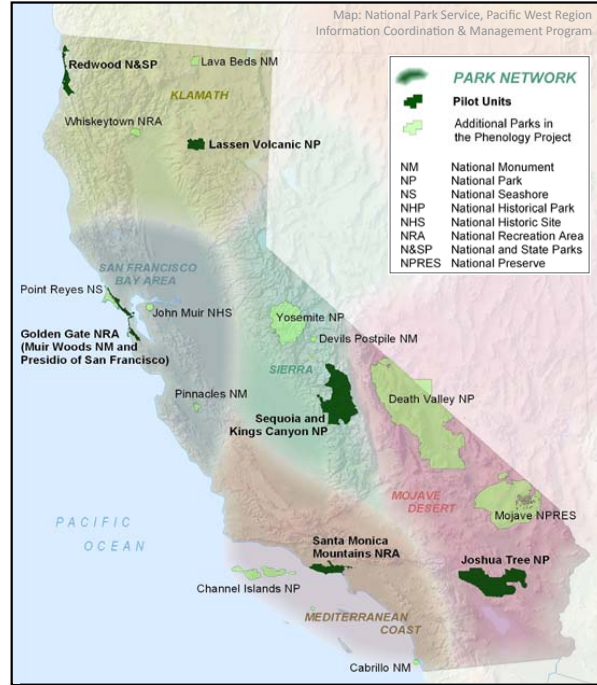
A workshop was convened in November 2010 to develop an initial science framework that supports: the development of tractable ecological questions; target species selection; design of sampling schemes; and the creation of training tools, monitoring materials, activities for park visitors, and curricula for park-associated informal science education programs. The science framework and ecological questions developed by the CPP:

- will enhance our understanding of species-specific and community-wide responses to climate change across coastal, mountain, and desert landscapes;
- outlines a decision-making process for regional (across parks) and local (within parks) implementation;
- can be addressed by phenological monitoring and through a combination of regional and local environmental gradients (e.g., elevation, precipitation, disturbance);
- is conceptually engaging and appealing to the public; and
- can inform natural resource management practices that are vital to the National Park Service mission of maintaining the biological diversity and ecosystem function of its lands.

Implementation

The California Phenology Project was started in fall 2010 and a core project coordination team has been convened with representatives from each pilot park and the principal project partners. Development and testing of scientific and education/outreach protocols is planned for the 2011 and 2012 field seasons in six pilot parks (Golden Gate NRA, Joshua Tree NP, Lassen Volcanic NP, Redwood N&SPs, Santa Monica Mountains NRA, and Sequoia and Kings Canyon NPs). A series of project briefing webinars is planned for the December-January time period to brief all potentially-involved NPS science and interpretation staff on the project – with an emphasis on securing engagement of NPS interpreters in the project.

Concurrently three biogeographically-based work-



The California Phenology Project is integrating phenological monitoring and interpretation activities across 19 NPS units - including 6 pilot parks - spanning five Park networks and desert, coastal, and mountain biogeographic regions.

groups are being established: Desert Parks, Coastal Parks, and Mountain Parks. Natural resource and interpretation representatives from all 19 CA NPS units are invited to participate in these workgroups since we will be selecting species and establishing the monitoring and outreach framework for all parks at the start of the project. These teams will develop an overall project science and outreach implementation plan for each of the three biogeographic areas. On-the-ground testing of science and outreach protocols will be conducted by NPS seasonal technicians in coordination with pilot park ecologists, interpreters, and UCSB and USA-NPN project partners.

Desired Outcomes

- Extensive participation in phenological monitoring by scientists, educators, students, and the public through NPS pilot parks and partners.

continued...

Pacific West Region

Fact Sheet

National Park Service
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- Demonstrated value of phenological data, especially to natural resource managers, including linking existing monitoring efforts (e.g., Inventory & Monitoring) to phenological patterns.
- Cultivate phenological literacy and enable people to see effects of climate on our natural resources in the short-term (within seasons) and long-term (across seasons and years).
- Development of a sophisticated but easy-to-use phenology toolbox of science and outreach protocols, tools and products (everything a park needs to engage in phenology monitoring).
- All resulting products, protocols, tools, data and documents made freely available online and electronically.
- Identification and collation of legacy data from NPS units, UC reserves, and partners.
- Solicitation of additional funding to enhance current activities and facilitate the continued development of a California Phenology Network.



A group of NPS staff, citizen scientists, professional scientists, and educators discuss links between native plant and insect phenology at a “Phenology & Climate Change” workshop, led by UCSB collaborators at Santa Monica Mountains National Recreation Area. Hands-on training workshops for NPS staff and project partners, tailored to the California Phenology Project biogeographic regions and NPS units, will take place during the project.
Photo: NPS staff.

More Information

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This document was prepared by Brian Haggerty (University of California, Santa Barbara) & Angie Evenden (NPS).

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Clarkia in full bloom as grasses “brown-down” into summer. Kern River Canyon, Sierra Nevada Mountains. Photo: Brian Haggerty.

version January 2011

Monitoring goals

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Detecting the relationship between phenology and inter-annual climate variation
Detecting the relationship between phenology and long-term climate change

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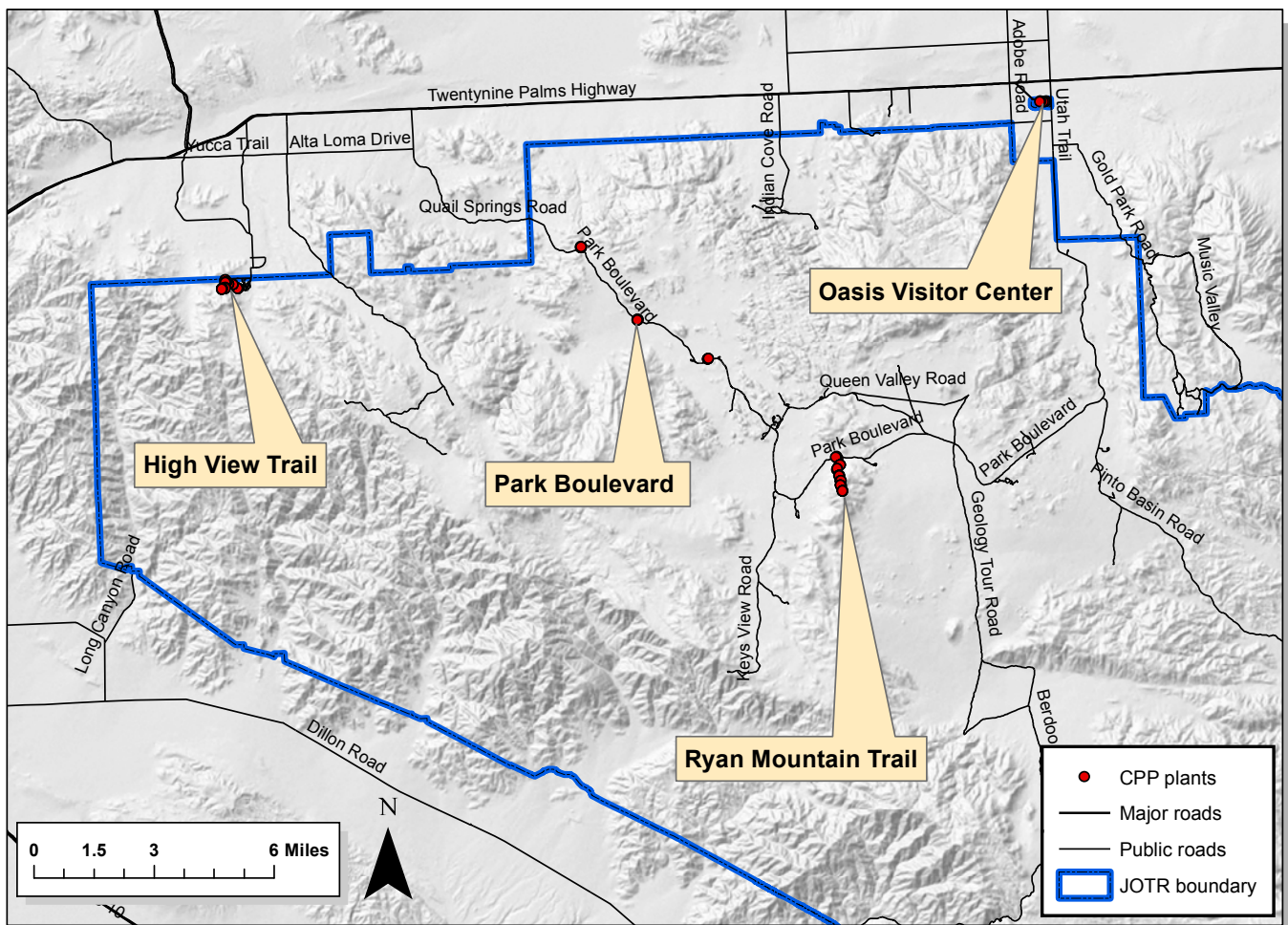
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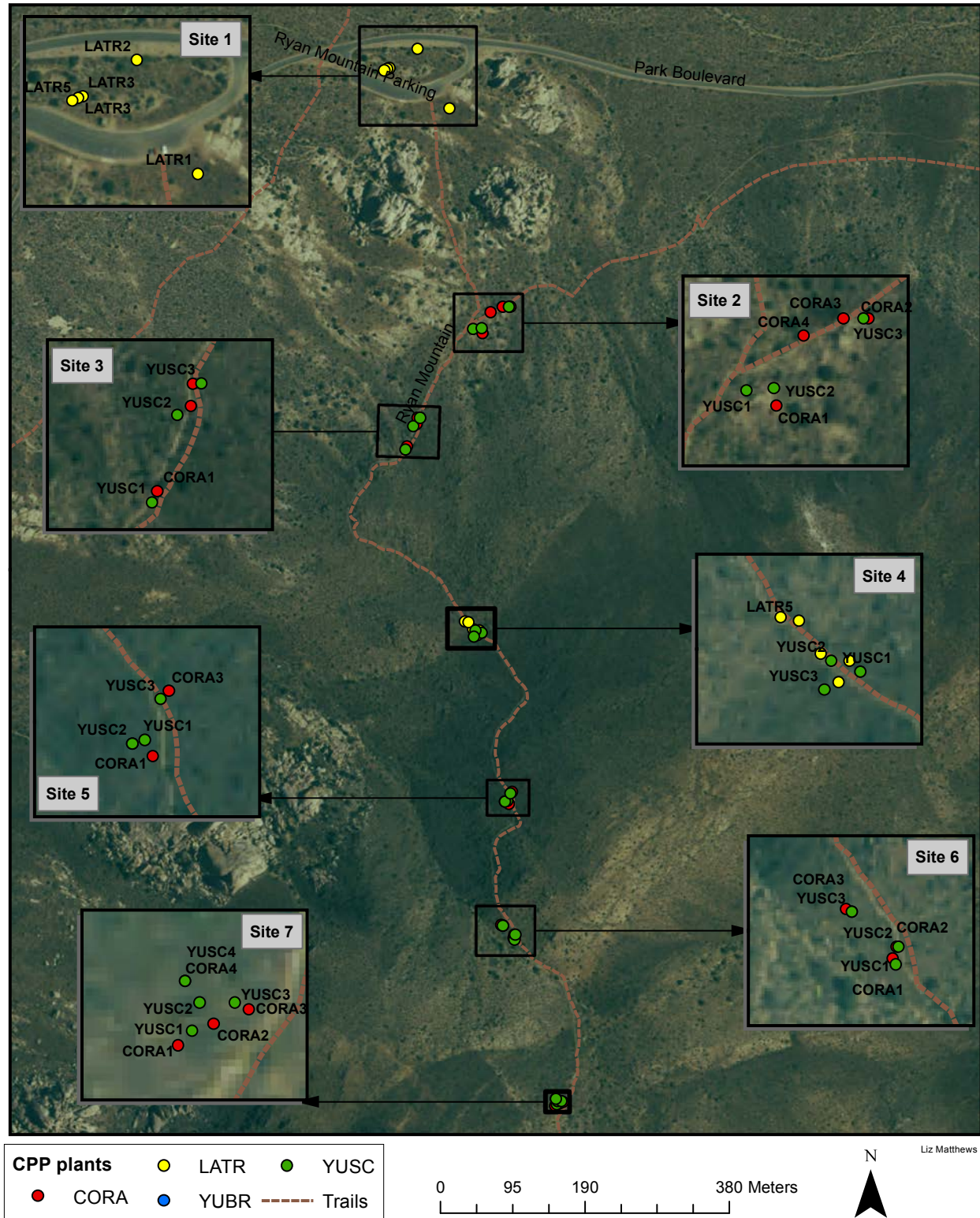
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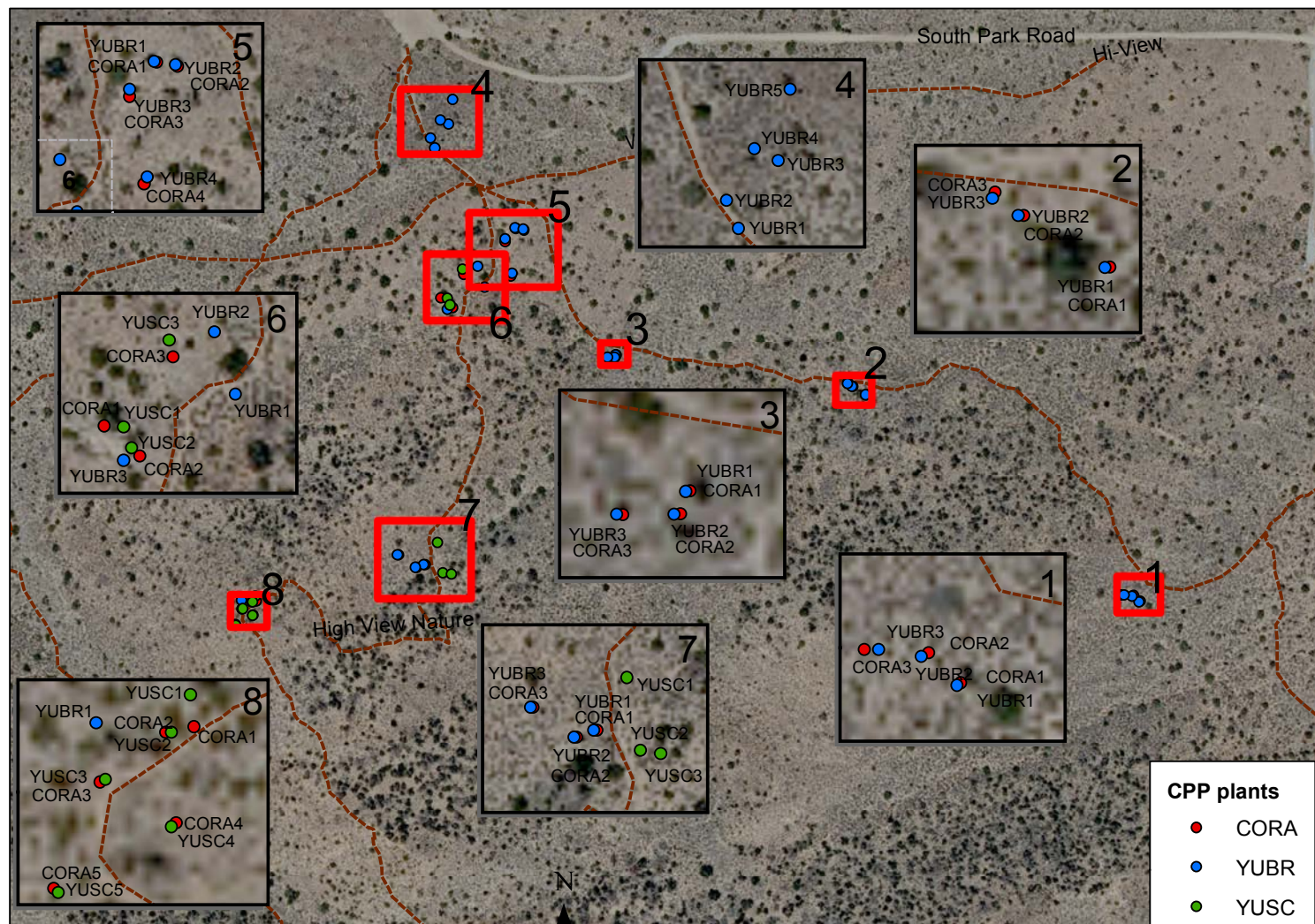
CPP Monitoring Locations at Joshua Tree NP



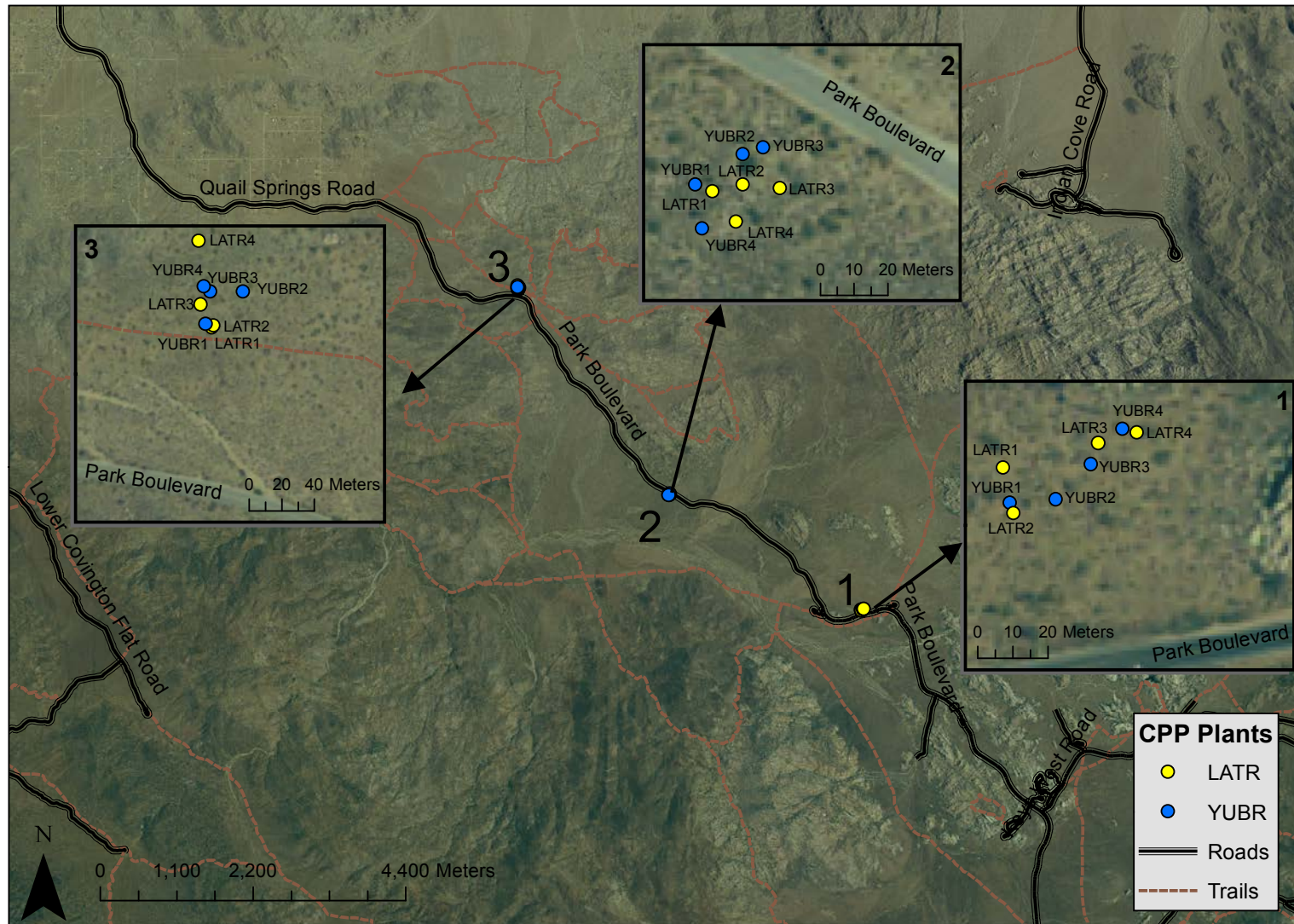
CPP JOTR Ryan Mountain Monitoring Sites and Plants



CPP JOTR High View Trail Monitoring Sites and Plants



CPP JOTR Park Boulevard Monitoring Sites and Plants



CPP JOTR Oasis Visitor Center Plants



0 30 60 120 Meters

CPP Plants

- LATR
- PRGL
- Trails

Frequency of monitoring and estimated time investment

Suggested strategies for achieving monitoring goals

Assign a team of two people for each trail/location

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Coleogyne ramosissima

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Yucca schidigera

Larrea tridentata

Prosopis glandulosa

Coleogyne ramosissima and Larrea tridentate

Trees and shrubs

Broadleaf evergreen

Breaking leaf buds

One or more breaking leaf buds are visible on the plant. A leaf bud is considered "breaking" once a green leaf tip is visible at the end of the bud, but before the first leaf from the bud has unfolded to expose the leaf stalk (petiole) or leaf base.

How many buds are breaking? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Young leaves

One or more young unfolded leaves are visible on the plant. A leaf is considered "young" and "unfolded" once the leaf stalk (petiole) or leaf base is visible, but before the leaf has reached full size or turned the darker green color of mature leaves on the plant. The leaf may need to be bent backwards to see whether the leaf stalk or leaf base is visible.

How many young leaves are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Flowers

One or more fresh flowers or flower heads (inflorescences) are visible on the plant. Flower heads include many small flowers that usually do not open all at once. Do not include wilted or dried flowers that remain on the plant, or heads whose flowers have all wilted or dried.

How many fresh flowers or flower heads are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

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 unfolded or open flower parts. Do not include wilted or dried flowers that remain on the plant.

How many fresh flowers are open? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10); Peak flower (P); The plant has a large number of flowers and one half (50%) or more are open and still fresh.

Fruits

One or more fresh fruits are visible on the plant.

How many fresh fruits are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Ripe fruits

One or more ripe fruits are visible on the plant.

How many fruits are ripe? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Recent fruit drop

One or more fresh 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.

How many mature fruits have dropped? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Please see the species profile page for complete information about the phenophases for each species.

Plant Phenophase Datasheet

Directions: Fill in the date in the top row and circle the appropriate letter in the column below.

y (phenophase is occurring);

n (phenophase is not occurring);

? (not certain if the phenophase is occurring).

Do not circle anything if you did not check for the phenophase. In the adjacent blank, write in the appropriate measure of intensity or abundance for this phenophase (see left-hand column for details).

Species: _____
Plant Nickname: _____
Site: _____
Year: _____
Observer: _____



Do you see...?	Date:	Date:	Date:	Date:	Date:
Breaking leaf buds	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Young leaves	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Open flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Ripe fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Recent fruit drop	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Check when data entered online:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:					

Do you see...?	Date:	Date:	Date:	Date:	Date:
Breaking leaf buds	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Young leaves	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Open flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Ripe fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Recent fruit drop	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Check when data entered online:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:					

Yucca schidigera and Yucca brevifolia

Trees and shrubs

Broadleaf evergreen (no leaves)

Flowers

One or more fresh flowers or flower heads (inflorescences) are visible on the plant. Flower heads include many small flowers that usually do not open all at once. Do not include wilted or dried flowers that remain on the plant, or heads whose flowers have all wilted or dried.

How many fresh flowers or flower heads are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

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 unfolded or open flower parts. Do not include wilted or dried flowers that remain on the plant.

How many fresh flowers are open? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10); Peak flower (P): The plant has a large number of flowers and one half (50%) or more are open and still fresh.

Fruits

One or more fresh fruits are visible on the plant.

How many fresh fruits are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Ripe fruits

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How many fruits are ripe? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

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One or more fresh 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.

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Species: _____

Plant Nickname: _____

Site: _____

Year: _____

Observer: _____

Do you see...?	Date:	Date:	Date:	Date:	Date:
Flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Open flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Ripe fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Recent fruit drop	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
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Comments:					

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Flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Open flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
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Ripe fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Recent fruit drop	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Check when data entered online:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:					

Prosopis glandulosa

Trees and shrubs

Deciduous (pollen, no leaf color or fall)

Breaking leaf buds

One or more breaking leaf buds are visible on the plant. A leaf bud is considered "breaking" once a green leaf tip is visible at the end of the bud, but before the first leaf from the bud has unfolded to expose the leaf stalk (petiole) or leaf base.

How many buds are breaking? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Leaves

One or more live unfolded leaves are visible on the plant. A leaf is considered "unfolded" once the leaf stalk (petiole) or leaf base is visible. New small leaves may need to be bent backwards to see whether the leaf stalk or leaf base is visible. Do not include dried or dead leaves.

What proportion of the canopy is full with leaves? Less than 5% (<5%); 5-24%; 25-49%; 50-74%; 75-94%; 95% or more (95+)

Increasing leaf size

A majority of leaves on the plant have not yet reached their full size and are still growing larger. Do not include new leaves that continue to emerge at the ends of elongating stems throughout the growing season.

What proportion of full size are most leaves? Less than 25% (<25%); 25-49%; 50-74%; 75-94%; 95% or more (95+)

Flowers

One or more fresh flowers or flower heads (inflorescences) are visible on the plant. Flower heads include many small flowers that usually do not open all at once. Do not include wilted or dried flowers that remain on the plant, or heads whose flowers have all wilted or dried.

How many fresh flowers or flower heads are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

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 unfolded or open flower parts. Do not include wilted or dried flowers that remain on the plant.

How many fresh flowers are open? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10); Peak flower (P); The plant has a large number of flowers and one half (50%) or more are open and still fresh.

Pollen release

One or more flowers on the plant release pollen when gently shaken or blown. How many flowers release pollen? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10); Peak pollen (P); The plant has a large number of flowers and one half (50%) or more release pollen.

Fruits

One or more fresh fruits are visible on the plant.

How many fresh fruits are present? Less than 3 (<3); 3 to 10 (3-10); More than 10 (>10)

Ripe fruits

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Site: _____

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Do you see...?	Date:	Date:	Date:	Date:	Date:
Breaking leaf buds	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Leaves	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Increasing leaf size	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Open flowers	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Pollen release	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Ripe fruits	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Recent fruit drop	y n ? _____	y n ? _____	y n ? _____	y n ? _____	y n ? _____
Check when data entered online:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Comments:					

Taking the Pulse of Our Planet

Contact: nco@usanpn.org | More information: www.usanpn.org/how-observe



Shared Sites Primer

A 'shared site' is one that many individual users can log into and see in their Nature's Notebook interface. There are two kinds of 'shared sites', a Public Site, to which any registered Nature's Notebook observer can submit observations, and a Group Site, which can only be seen by and to which observations can only be submitted by members of a limited group.

Public Sites:

Any site can be designated public (even if it is already a Group Site). Simply create the site and inform the NCO of the site name and the creator's username so that one of our administrators can set its status to "public".

When an observer wishes to add an existing Public Site to their Nature's Notebook account, they go to the Add Sites page and click the link to "Add a Public Site", which brings them to a map of all of the public sites available. On this page they click on a site to add it. They will then see the public site in their "My Sites" list – the site name is followed by a (P) to denote that it is a Public Site.

Group Sites:

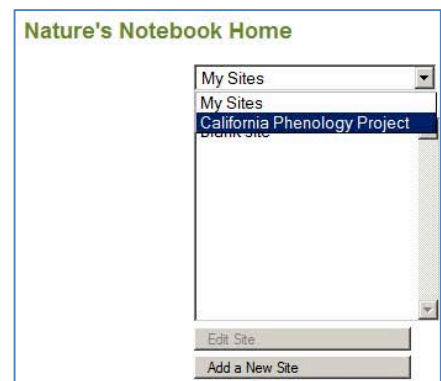
To create a Group within Nature's Notebook, please email lee@usanpn.org, cc-ing Alyssa@usanpn.org, with the Group's name as you wish it to appear throughout our website. You may also associate species with your Group, which will appear when your Group is selected from the Partner dropdown on the Species Search page. One of our administrators will then add your group to our Partner Organization list, and associate any species you specify. Each Group will have one or more Group Admins and multiple Group Members.

Group Admins manage group sites for their group. They can create sites, add or remove plants and animals from the site, and view all the observers who are observing as part of the group. To become a Group Admin, join the appropriate group (see below). Then, let us know that you would like to be an Admin by emailing lee@usanpn.org and cc-ing alyssa@usanpn.org. Please include your username in the email. If you are a new user, make sure you have been into your Nature's Notebook dashboard at least once, so you are active in the system and can be designated an Admin.

Group Members can add plants and animals to sites (but not remove them), and can enter and delete their own observations about plants and animals. They cannot add sites. Group Members join the group by following the instructions below. Admin approval is not needed for them to be accepted in the group, however, Admins can remove users from the group if they see fit.

How to Join the Appropriate Group:


1. When you first sign up, select the correct group name under Partner Organization.
2. If you have already signed up, go to your "My Account" page using the link on the left hand side of any interior



web page on www.usanpn.org, also located at www.usanpn.org/user. Click edit underneath your username, and make a selection under Partner Organization. Don't forget to hit save at the bottom of the page to save the changes to your account.

You may belong to more than one Partner Organization/Group.

Making observations at Group Sites: Observers should look for the drop down in their Nature's Notebook home, where they can toggle between their personal sites "My Sites" and the Group Sites (named by the name of the group; see image).

For the California Phenology Project, observers generally only observe at one site, but will see many Group Sites shared by the members of the California Phenology Project group. An observer can select the single site for which they wish to submit observations, and continue from there as usual. 

Note: Not all Groups/Partner Organizations share sites. Some Groups have many affiliated observers who trained together, support each other etc., but make their observations by themselves in their yards and parks.

Other groups have a mix of shared and personal sites.

In either one of these cases, the observers are affiliated with their Group. If called for, all observations made at personal and shared sites can still be 'counted' towards the Group's contribution to the database. These data can be downloaded separately, and viewed in the visualization tool, as well. In some cases, this is not appropriate (the personal sites are truly personal and not part of the group; in this case the database is queried differently and personal data is not lumped into the group's contribution).