MANZANITA

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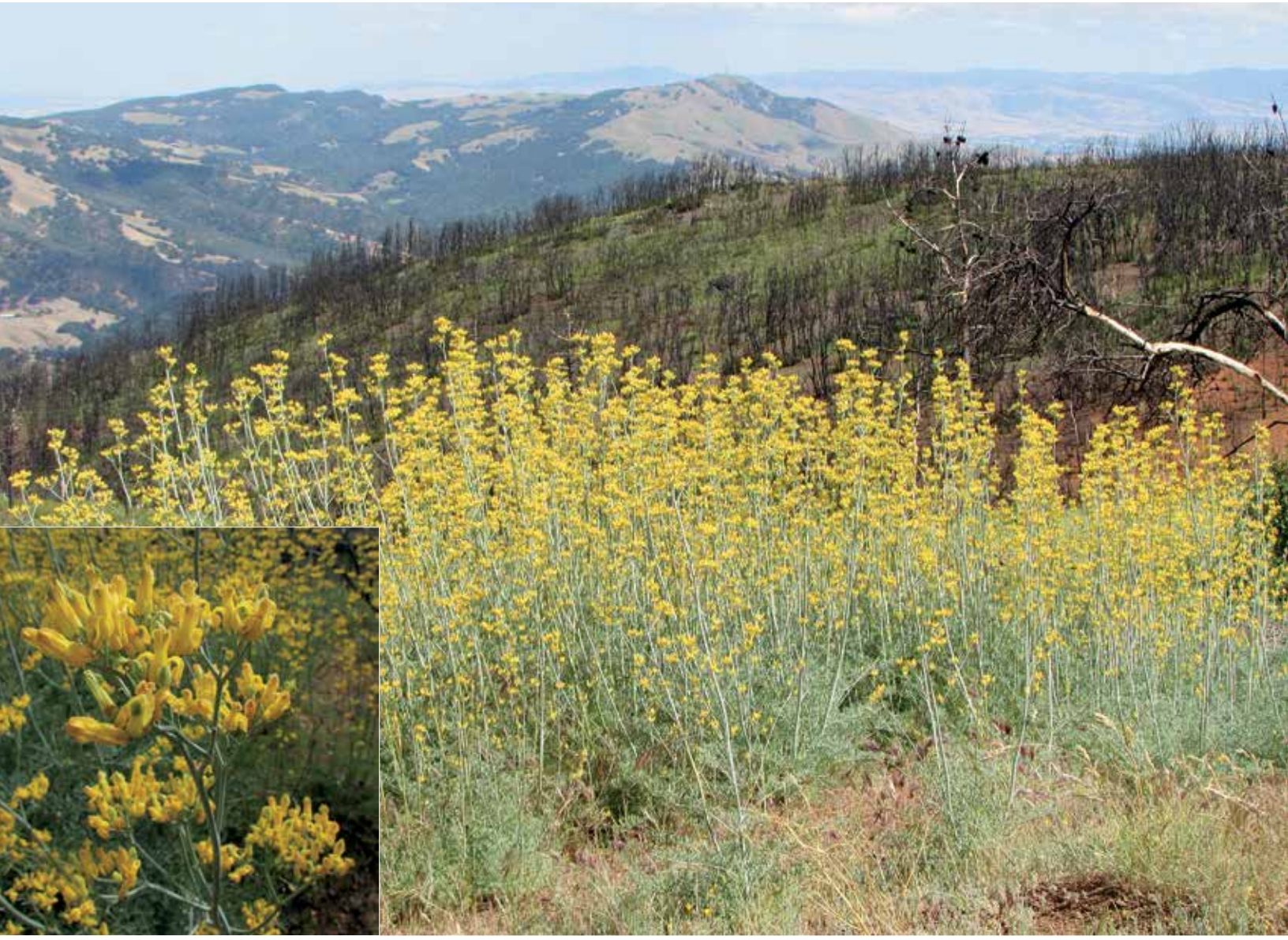
Phenomenal Phenology *by Glenn Keator, PhD*



Golden eardrops (*Ehrendorferia chrysantha*), a fire-following perennial, bloomed in the burn area on Mount Diablo during the first spring after the 2013 Morgan Fire. Photos: Rosie Andrews

Are you an avid gardener? A wildflower enthusiast? A dedicated birder? Then you are engaged in phenology, the all-encompassing phenomenon of observation—the climate, the rhythm of the seasons, the minutiae and grand sweep of change, in other words, the ways of nature. Whether it's noticing when those poppy leaves first emerge during the rainy season, when brodiaea blossoms open, when veggies and fruits are ready for harvest, which pollinators visit in March, or any of the numerous patterns in the sway of events, you're engaged in phenology, a study that most likely originated with the first peoples, whose lives were interlinked by necessity with the ebb and flow of the natural world.

Phenology is the study of periodic events in the life cycle of a plant or animal and how those events are affected by variations in climate and local habitat. When I teach people to identify plants, I'm engaging in a very different view of things—a short window in time of how a particular flower looks in bloom, but only a short

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Manzanita, a quarterly newsletter of the *Friends*, and *The Four Seasons*, an annual publication of the garden, are benefits of membership. The nurseries listed below offer discounts to *Friends*. These participating nurseries are sources for native plants.

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Your membership in the *Friends* of the Regional Parks Botanic Garden supports the important work of the garden in educational programs, conservation, and horticultural experimentation. Funds raised by the Friends help provide long-term financial security for the garden as well as new facilities and programs.

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The Board of the *Friends* generally meets at the Visitor Center in the Regional Parks Botanic Garden the second Wednesday of the month at 10:00 AM. All members are welcome. Call ahead to verify meeting date and time.

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www.nativeplants.org

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window. The truth is that to truly know a plant, you need to observe it through all of its manifestations from seed to mature plant: from emerging from its roots to leafing out, from leafing out to blooming, and from blooming to setting seed. Then and only then will you truly know a particular plant.

Two very practical applications of phenological studies are learning when plants come up and bloom in the garden and how to predict a good wildflower year. The second is far more challenging; the first, something you can truly embrace with careful observation.

For plants that are dormant in winter, factors that influence emergence include day length, temperatures and temperature fluctuations, and rainfall. As far as we know, dormant plants have no way of relating to day length (while flowering often depends on it), but the combination of temperatures, their fluctuations from night to day and season to season, and availability of water are useful clues to use in making accurate predictions. Some plants seem to be more sensitive to one set of factors, while others are affected by a different set.

For example, rainfall is especially important in germination of seeds of desert annuals, and early rains may bring about premature germination, which spells doom to the early germinators when followed by a drought. Bigger, longer-lived plants may also be influenced by rain, since root development underground is prolonged and activated by sufficient soil moisture.

Temperature variations are more difficult to interpret: Unseasonably warm weather in winter, for example, can promote early appearance of new shoots, but if a significant frost should follow, the growth of the plant that year may be greatly reduced. Many plants are sensitive to variations in air temperature from day to night and night to day, but for others, the important factor is how warm or cold the soil is. Many species, like the milkweeds (*Asclepias* spp.), don't respond to warm temperatures until the soil itself has become sufficiently warm. Most plants from permanent wetlands are winter dormant, their new growth appearing mostly in late spring to early summer. An example of this is the re-emergence of cattail shoots (*Typha* spp.) after a long winter rest.

Because there is so much interaction between climate and other environmental factors, the best policy for the gardener is to keep a log from year to year, recording rainfall times and amounts as well as temperature changes, especially periods of unusually warm weather, unusual droughts in winter, or prolonged times of frost.

Factors influencing flowering are perhaps better understood, the main determinants being temperature and day length (technically, plants sensitive to day length actually measure the length of the dark period or night). You'll soon learn which plants are reliably "on time," blooming on schedule from year to year despite other environmental conditions. These are the plants that rely solely on day length. You'll also learn that other plants bloom less predictably, and in some years their blossoms appear much earlier than others. These are the plants sensitive to temperatures. Again, keeping careful records helps the gardener plan, since color in the garden is a valuable asset and coordinating the color scheme may become an important parameter of design.

Rosie Andrews

Mariposa tulip (*Calochortus venustus*) on Mount Diablo

Now let's turn to nature's roulette: the timing of wildflower displays in spring and summer. While much is known about the approximate bloom time, accurate prediction can be damnably difficult. For those of us who lead field trips and hikes, the ability to predict becomes particularly critical. The first and foremost question is, will it be a good year? The second question is, when will the flower color peak?

You would think that after years of observations, making predictions like these would be relatively straightforward. If we have a large amount of

Whispering bells (*Emmenanthe penduliflora*) covered hillsides on Mount Diablo during the first spring after the 2013 Morgan Fire. Photo above by Mathesont; photo below by Bob Case

winter rain, the flowers should be outstanding, and if the rains continue through spring, the color should be varied and prolonged. But unfortunately, this is not always the case. Let's examine recent history as a guide.

In fall and early winter of 2013-2014, the climate seemed uncooperative: Record droughts persisted through early and mid winter, prompting a bleak prediction of an early and unproductive spring. At that point, we could at least say the desert bloom would be a "wash out." Deserts generally need a thorough soaking in December or January to respond. But what of our regions with less extreme weather? One look at the brown hills seemed to be the answer; there might not even be a spring to witness.

But how wrong that early prediction proved to be: By the middle of spring—and after two really strong cycles of rain—life returned in full and luxuriant measure. The hills were thickly clothed in grasses, the shrubs were burgeoning with new growth, and the wildflowers in many places reached amazing sizes. As an example, the response to the Mount Diablo burn of last fall showed a remarkable recovery, as would be expected in a less-than-droughty year, with all manner of stump sprouting shrubs, blankets of flowering bulbs, and a series of unusual, seldom-seen annuals. So what's going on?

Evidently, those later rains fired up the metabolic processes of germination, growth, and sprouting, while earlier on the plants had been on emergency rations. Could this be a response to the threat of death from lack of water (with some help from fertilizing ash from the fire), promoting growth when conditions suddenly change? Even so, I can only guess the reasons. Nor can I say why my own garden seems lusher than ever, which brings to mind the idea that not just the amount of water but the way it is distributed in time may play a role in garden vigor. To put it another way, rain may be a better promoter of growth than water from a hose, or a drip system, or a gray water source.

Obviously, we still have a lot to learn about these phenomena, and the bottom line is to record the data each year and learn to interpret it. And we are still in a drought. In mid-April, I predicted that if we got no more rain this season, the burst of bloom and seed set would happen quickly, especially when the days turned warm, and within a month or less the show would be over.

As I finish writing this article in early June, some of my April predictions came true, especially because we had a couple of spurts of extreme heat, but the results of those predictions have been uneven. Areas that experienced little rainfall overall, even in our rainy periods, have long since burned out. But other areas—including the summit region of Mount Diablo, where I've spent considerable time monitoring the response to the burn—have stayed unpredictably floriferous: In early June there were still fields of mariposa tulips (*Calochortus venustus*), whole hillsides of whispering bells (*Emmenanthe penduliflora*), swaths of red ribbons clarkia (*Clarkia concinna*), and displays of the fire-following golden eardrops (*Ehrendorferia chyrsantha*), which were uncharacteristically late in growing and blooming.

A recent trip to the Mendocino coast was also an eye opener: The rosebays (*Rhododendron macrophyllum*) were loaded with flowers, the coast lily (*Lilium maritimum*) abundant, and the overall vigor of the vegetation outstanding, including junglelike patches of native shrubs in coastal canyons. Just how long this pageant would last seemed predicated on how cool and foggy the coastal regions remained, and whether we would have additional heat spells inland.

Another example of unusual timing this year, reported by my students, pertains to the mountains, where the snowpack was seriously low, melting early and causing a more easily predictable pattern. Lassen National Park, typically most colorful in late

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A Detailed Look at the Phenological Pattern of a Native Shrub

Here's a year's worth of observations of the creek or red-twig dogwood (*Cornus sericea*).

Winter: Twigs are bare, new growth is bright red.
Early to mid spring: New leaves emerge and quickly expand—these plants grow fast with a new spurt of growth following the appearance of the new leaves.
Late spring: Shoots have expanded considerably, with a whole new set of leaves; flower buds are quickly forming. Soon flat-topped cymes of tiny, white, starlike flowers open, each flower lasting just a few days but followed by more flowers.
Beginning of summer: The first flush of flowering is mostly over, and young fruits are ripening.
Midsummer: The fruits have turned white and are ready to be eaten by visiting birds.
Late summer: Most growth has ceased, but often a new flush of flowers may appear, giving the plant fruits and flowers at the same time.
Early fall: The leaves begin to turn dull, then as time passes they take on hues of reds and pinks.
Late fall: The winds have blown off the leaves, and the plants retreat into their winter dormancy.

Questions relating to the phenology of this species:
Does fall temperature determine how vividly colored the leaves are?
What birds feed on the fruits, and are some fruits left behind?
What pollinators visit the flowers, and do they change with the seasons?
What percentage of fruit set results from the flowers?
How many of the seeds find appropriate new homes?
What percentage of the seeds germinates?
Do the seeds require a winter chill before germinating?

Sherwood411

(Clockwise from left) Bare winter stems, flowers, and berries of red-twig dogwood (*Cornus sericea*)

A Detailed Look at Pollination of a Native Wildflower

Observing the California buttercup (*Ranunculus californicus*) during its blooming period reveals some pollination-related events and raises questions about others.

Flower buds form from late winter to early spring.
Flowers open mostly in midday in the sun and close when it's cloudy.
Flowers last only one or two days but are replaced with a succession of many more flowers.
Plants may remain in bloom for more than a month if temperatures are mild.
Many insects visit the flowers, attracted by the shiny yellow petals.
The flower design is wide open, allowing free entrance to most visitors.
Nectar is available near the base of the petals and under the stamens or later the pistils.
The stamens shed their pollen before the stigmas become receptive.
The flowers appear to be cross-pollinated.
Many of the visitors get a free drink of nectar without brushing the anthers or stigmas of the flowers.

Questions relating to this pollination process:
Is nectar available all day?
What is the food content of the nectar and how does that affect visitation?
Which are the most frequent visitors?
Can we find pollen on the bodies of the visitors?
Are the visitors active only part of the day, and if so, which part?
Can flowers be self-pollinated?
What percentage of seed set results from pollination?
Do the same visitors come to the flowers during the entire duration of bloom, or do they change over time?
When does the seed ripen, and what percentage of seed set results from pollination?
When do seeds usually germinate?

Observing the California buttercup (*Ranunculus californicus*) during its blooming period reveals some pollination-related events and raises questions about others. Inset photos, top and bottom: Syrphid fly on California buttercup flower; California buttercup foliage

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July to mid-August, had flushes of flowers that were already passing with the rapid retreat of snowbanks. This early response was around two months sooner than in most other years.

This discussion of recent weather effects demonstrates that phenology is a fascinating study that is frustratingly difficult to grasp but worth the effort.

For those of you just beginning the phenological journey, here are some ideas to take into consideration when you're meeting a new plant for the first time.

- What form and shape does the plant take?
- How large does it grow over time?
- How rapidly does it grow to maturity?
- When does it first leaf out?
- When do the blossoms appear?
- How long do the flowers stay open, and how long does the display last?
- Are the plants setting seed because their blossoming coincides with the presence of pollinators?
- How long does it take for the seed to ripen, and when is it best to gather the seed for propagation?
- When does growth slow down or stop?
- How long is the plant dormant?
- What is the nature of its dormancy—losing leaves, stopping growth, dying back to roots, etc.?

Once you know this sequence of events, it's time to add the variations of climate and seasons into your observations of the plant to see how it's affected by the factors I've mentioned (and of course many others that I haven't).

Thus, phenology becomes a lifetime of fascinating observation that helps inform us about the natural world around us. We can apply these techniques to any group of living organisms and in the process learn far more than we otherwise would.

Glenn Keator is the chairman of the Friends *Advisory Council. He is a popular instructor of botany and field trip leader in the Bay Area, and he teaches the docent training course at the Regional Parks Botanic Garden. He is the author of a number of books on native plants.*

Photos by the author except as noted.

Rosebay (*Rhododendron macrophyllum*)

The California Phenology Project

by Maggie Ingalls

"To be honest, I didn't even know what phenology was, and now I can't walk by a plant without checking to see where it is in its life cycle," said Diane Viera. Diane was not interested in native plants before she took up phenology, and she is still more interested in the animals she sees. Her phenology project partner Elaine Jackson, on the other hand, has been interested in native plants for a long time. She told me that studying phenology "really gets you excited about the growth of a plant."

I spent a few hours with them one morning in May of this year at the John Muir National Historic Site, where they do phenological observation almost every Monday. A few weeks later I went out with Lisa Gorrell and Shirley Skaredoff, another pair of phenology partners at the John Muir site. Lisa and Shirley record data on the exact same set of plants on Thursdays.

As I walked around with these two pairs of citizen scientists, they explained to me what they were doing and why they love to tramp around in tall grass on a weekly basis looking closely at native California plants. Lisa, the more experienced native plant observer of the second pair, said, "You get to know a plant intimately because you see it through its entire life cycle. It's really fascinating." These four are some of the people supplying phenological data to the California Phenology Project (CPP). They are "citizen scientists," the backbone of a new project to gather much-needed data on California's native plants.

Let's back up a step. The CPP is part of a bigger endeavor, the USA National Phenology Network (USA NPN), which works to "foster phenology communities of practice." The individual and organizational partners in the USA NPN collect, share, and use phenology data—information about key seasonal changes in plants and animals from year to year—and also work to promote understanding of their science and its relationship to environmental change, especially climate change. The organizers of the USA NPN envision a populace connected to nature by the study of phenology, a nation in touch with the rhythms of the seasons and the details of plant and animal life.

Phenological observations can be made by any observant person with a small amount of training. You can observe phenological phenomena in your backyard or in your neighborhood park. The USA NPN has created a large database where amateurs can contribute the data they collect. We can all join a great scientific endeavor in which we look at the details of how our world works.

The USA NPN has developed a tool called Nature's Notebook, which includes pages for many species of plants and animals. The page for a species explains what to look for when observing it and how to answer a set of questions developed by scientists specifically for that species. Observers enter their data via an easy-to-use website. The data, which is freely available to anyone, is a source of information for both scientists and decision makers.

Long-term collection of this data will provide a detailed picture of the effects of climate change at the local level. In the meantime, the data provides information that scientists have never before had enough staff to collect. For example, before the creation of the CPP, we didn't know that coyote bush can put out new leaves at any time of year. This kind of detail is an important contribution to botanical knowledge.

The USA NPN National Coordinating Office was founded in Tucson in 2007. In 2010, UC Santa Barbara partnered with the USA NPN and the National Park Service to develop a phenology monitoring program for the national parks in California. Seven national park units were chosen for the pilot program: Golden Gate National Recreation Area, John Muir National Historic Site, Joshua Tree National Park, Lassen Volcanic National Park, Redwood National and State Parks, Santa Monica Mountains National Recreation Area, and Sequoia and Kings Canyon National Parks. These seven parks provide examples of many of the ecosystems in California. Thirty plants were chosen for the pilot program, including such common species as California buckeye (*Aesculus californica*), greenleaf manzanita (*Arctostaphylos patula*), coyote bush (*Baccharis pilularis*), and sticky monkeyflower (*Mimulus aurantiacus*). Scientists developed Nature's Notebook pages for each of these species, with customized descriptions of each phenophase (visible phase in an organism's life cycle) and practical tips for observing the species. Each of the national park sites in the pilot program offered training workshops.

Coyote bush (*Baccharis pilularis*) phenophases from top: flower buds, male flowers, female flowers entering fruit phase, ripe fruit
Photos by April Shackelford

In 2012 I attended one of the training workshops at the John Muir National Historic Site, along with Elaine Jackson and Lisa Gorrell. It was at this workshop that I first took a really close look at a specimen of coyote bush. This ubiquitous plant was not one of my favorite native shrubs. The flowers are inconspicuous, it is not rare, and the only positive thing I knew about it was its value as a wildlife habitat plant. But I had to spend some time trying to answer questions like how many young leaves are present? Is this a male or a female plant? What percentage of flowers is open? I had to really look at this plant: Is that a new leaf or just a small leaf? I didn't know that coyote bush is dioecious (a particular plant will have either all male flowers or all female flowers). I certainly didn't know what either flower looked like. I have since looked closely at many coyote bushes trying to figure out which gender I am looking at.

Having two people do this together is a very good idea, particularly for novices. One person reads the questions off and records the answers. The other person examines the plant from all angles, maybe even using binoculars to get a look at the top branches. Although one person is the main observer, both people participate in making the estimates needed to answer some of the questions. For example, how many leaf buds are breaking (opening)? Is it less than 3, 3 to 10, 11 to 100, 101 to 1000, 1001 to 10,000, or more than 10,000? A discussion partner provides a reality check on first guesses and an additional memory source for past observations. Having two opinions is very helpful. All four people I interviewed mentioned working with a partner as one of the joys of this activity.

Practicing phenology gets you out in nature on a regular basis. In addition to becoming very familiar with three to four plant species, you see many other plants and animals. Birds are the most common larger animal observed by plant phenologists. Lisa Gorrell is a birder, and she loves having the opportunity to see birds regularly. She also mentioned the thrill of seeing a monarch butterfly caterpillar on a milkweed plant as well as beautiful mushrooms in the winter. Diane is fascinated with the insects she sees and told me that 90 percent of the insects we see need one specific plant species at some point during their lifecycle. Diane's favorite moment was the sight of a big "gorgeous" skunk.

This is an unexpectedly pleasurable activity. You have a reason to wander around a wild area looking closely at what you see, trying to figure out what is going on. There is intellectual enjoyment in figuring out how your environment is put together. Yet there is also a peaceful meditative quality to this time. It's a refreshing break from daily life. And sometimes you have a very exciting encounter with another species.

Here are some phenology tips from Lisa Gorrell:

- Bring binoculars for looking at the tops of trees and tall shrubs (and birds).
- Pick a variety of ages for the three plants of each species you observe, since different ages of the same species will behave differently.
- Don't worry when you don't know what you're doing the first year. It takes a while to know what you're looking at. Just one example: You don't know how big the leaves will get, so how can you tell if they are full size? Just answer "don't know" to start with. In a year or two you will learn the details of each plant's cycle. For example, once any of the leaves on a buckeye go yellow, the leaves are as big as they are going to get for that year.

Lisa feels it is important to see the first occurrence of a phenophase, so visiting your plants frequently is important. On the other hand, the websites for the NPN and the CPP both stress that any data, even if from just one collection date, is helpful.

(L to R) Hollie Briggs and Elaine Jackson with instructor Liz Matthews during a California Phenology Project training class at Mount Wanda, John Muir Historic Site, in 2011
Photo courtesy of California Phenology Project

I hope some of you will be inspired to take up this fascinating activity. There are more and more places to engage in phenology with an already-established organized group of people in the Bay Area. And, of course, you can always establish your own phenology group.

Maggie Ingalls has been a passionate gardener for almost 30 years, first in Southern California, then in the suburbs of Chicago, and now in Benicia. She is a member of both the Friends *of the Regional Parks Botanic Garden and the editorial board of the* Manzanita *newsletter. She is proud to be a docent at the garden, specializing in children's tours. She also volunteers with the Solano Land Trust, where she is restoring native habitat on King Ranch.*

JOIN A PHENOLOGY GROUP

Here are a few of the growing number of northern California sites offering phenology-observing opportunities for citizen scientists:

Regional Parks Botanic Garden (Berkeley)
We hope to start a phenology project in the garden and welcome anyone who is interested in participating and/or helping design the project.
Contact: info@nativeplants.org or 510-544-3169

Bol Park (Palo Alto)
Contact: Claudia Newbold at cknewbold@earthlink.net

Bouverie Preserve of Audubon Canyon Ranch (near Glen Ellen)
Contact: Jeanne Wirka at jeanne@egret.org

California College of the Arts (Oakland)
Contact: Carol Manahan at cmanahan@cca.edu

Don Edwards San Francisco Bay National Wildlife Refuge (Fremont)
Contact: Julie Kahrnoff at juliekahrnoff@sfbws.com or 408-262-5513 x104
http://www.fws.gov/refuge/Don_Edwards_San_Francisco_Bay

Foothill College (Los Altos)
Contact: Gillian Schultz, PhD, at schultzgillian@fhda.edu or 650-949-7292

Pepperwood Preserve (Santa Rosa)
Contact: pepperwoodpreserve.org/
(see the "Contact Us" link on the website)

Santa Clara County (Almaden Quicksilver County Park in south San Jose, Hellyer County Park in east San Jose)
Contact: SVPhenology@gmail.com

Solano Land Trust (various open space sites in Solano County)
Contact: Sue Wickham at sue@solanolandtrust.org or 707-432-0150 x207

UC Davis Stebbins Cold Canyon Reserve (Lake Berryessa site)
Contact: cpp.stebbins@gmail.com
http://cppstebbins.wordpress.com/
https://www.facebook.com/pages/California-Phenology-Project-at-Stebbins-Cold-Canyon-Reserve/294013197418599

UC DavisTahoe Environmental Research Center
(demonstration garden in Tahoe City)
Contact: Alison Toy at antoy@ucdavis.edu or 775-881-7566
http://terc.ucdavis.edu

News from the Garden—September, 2014

by Bart O'Brien, Garden Director

There are a number of exciting changes happening in the Botanic Garden. As I write this column, I am hearing the annoying beep-beep-beep of a tractor backing up—but that's just an incidental auditory reminder of the spectacular construction of three large new rock gardens in the Southern California part of our garden. These great additions to the garden are made possible by a very generous gift from the Bonita Garden Club of Piedmont. Georgia Madden, president of the Bonita Garden Club, presented Gert Allen, president of the *Friends* of the Regional Parks Botanic Garden, with a $90,000.00 check on January 8 for these wonderful additions to the garden. The grant also enabled us to purchase new dissecting microscopes that will allow our staff to thoroughly investigate critical diagnostic characters of plants in order to fully identify our specimens, as well as to check the condition of seed collections.

After many months of preparing the necessary paperwork, contract documents, and board materials, and garnering all the necessary approvals and sign-offs, we were given project approval by the East Bay Regional Park District Board of Directors at their meeting on August 12. Phil Johnson Landscaping, a very well-known and highly regarded creator of naturalistic rock outcrops and rock gardens, was hired to do the work, and we were given the construction go-ahead on September 3. We had a small groundbreaking event on September 15, and the project really got underway the following day with some major demolition.

Currently, all of the site demolition has been finished, and nearly all of the old rocks and boulders have been incorporated into a dry rock wall a few feet inside of our fence-line at the intersection of South Park Drive and Wildcat Canyon Road. This dry rock wall will allow for an even higher rock garden in this location, with a much deeper root-run of our custom-mixed well-drained soil that will enable us to grow and display more of the native flora of Southern California.

Don Fuller, our gardener-curator for our Southern California plant collections, has carefully lifted and transplanted many of the valuable collections from the three project areas over the past six

months, and has propagated nearly all of the other desirable specimens that were too large or unwieldy to otherwise move. So what has become of our two tall Joshua trees (*Yucca brevifolia*) and the patch of spreading short Joshua trees that were less than a foot tall? The former have been left in place and are carefully being worked around, while the latter were lifted. What appeared to be from five to seven distinct clumps of the spreading Joshua trees were actually all connected underground by thickened roots. There were very few active live roots on the entire "plant." This is expected at this time of year, though the youngest pup had two succulent white roots in addition to the thickened root stock that connected it to the rest of the underground root system. You can now find our large banana yucca (*Yucca baccata*) and Mojave yucca (*Yucca schidigera*) resting in adjacent parts of the garden until the new bed is ready. These plants are primarily stem succulents and do not have the extensive live root systems at this time of year that might otherwise be expected, so they were *relatively* easy to move (they weigh a lot and do have very sharp leaves). The specimens of rock spiraea (*Petrophytum caespitosum* ssp. *caespitosum*) and the clump of Shaw's agave (*Agave shawii* var. *shawii*) at the west end of this bed, along with the short-stemmed buckwheat (*Eriogonum wrightii* var. *subscaposum*) and the hairy Eastwood manzanitas (*Arctostaphylos glandulosa* ssp. *mollis*) at the east end of the bed are remaining in place and function as the respective western and eastern limit of work on this particular rock garden.

If you visit the Botanic Garden soon, you may still see the black waterproofing material on the east wall of the Visitor Center. The second new rock garden will be created here, and we will be mounding up soil and rocks to cover the lower portion of the wall. This will provide us with a mostly east-facing slope (always desirable!) with full-sun exposure and new deep, well-drained soil.

The third new construction will be immediately adjacent to (east of) the rock outcrops that Phil Johnson created for us in 2008 (east of the tool shed) and will be constructed as a direct continuation of that earlier garden. The resulting large rectangular planting bed will be among the largest in our Southern California display area and will be able to comfortably grow some larger plant specimens from Southern California.

A short note for those of you who may like to create similar rock garden conditions at home: Since virtually all of the Botanic Garden's property is sloped toward Wildcat Creek and much of the native soil is heavy clay, for this new construction project all the existing rocks and gravelly soil that were put on top of the clay soil over the years were removed. The underlying clay soil was then excavated and shaped for drainage so there are no depressions where water will be trapped or blocks to the free movement of water beneath the newly placed rock garden—this is especially important at the downhill edges. The new soil mix and new boulders and rock will then be placed, creating the desired depth of new well-drained soil and rock crevices where innumerable wonderful plants can be grown.

Teresa LeYung-Ryan

A large specimen of Mojave yucca (*Yucca schidigera*) was carefully moved as construction began on one of the Desert section's new rock gardens.

Major construction is actively underway five days a week, Monday through Friday. If you come to see the work in progress, please keep a safe distance from the work and away from where the crew is actively working. Some of these boulders are quite large and require full concentration of the workers to skillfully and safely place them. We are expecting roughly 100 tons of new rocks to be placed during this construction! The *Friends* will be having a grand opening event this coming spring—details will be available later this winter.

Friends
of the
REGIONAL PARKS

BOTANIC GARDEN

PO Box 21074, Oakland, CA 94620-1074
East Bay Regional Park District

75th Anniversary Issue of Manzanita

We're planning a double issue of *Manzanita*, combining the Winter and Spring 2015 issues, to celebrate the Regional Parks Botanic Garden's 75th anniversary. Look for this special issue in the spring of 2015.

If you have Botanic Garden photos or stories to share for the anniversary, we'd love to receive them at info@nativeplants.org or by USPS mail:

Rosie Andrews
Regional Parks Botanic Garden
East Bay Regional Park District
P.O. Box 5381
Oakland, CA 94605-0381

Please send copies rather than original photos if you send them by USPS mail. If you know the date your photo was taken, please provide it, along with a descriptive caption.