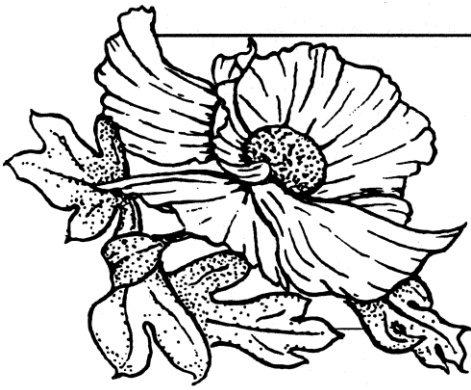


July 2013



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CALIFORNIA NATIVE PLANT SOCIETY  
*San Diego Chapter Newsletter*

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## CHAPTER MEETING

**Tuesday, July 16; 7 p.m.**  
**Room 104, Casa del Prado**  
**Balboa Park**

Presentation

### **Orchids of Southern California** by **Robert Lauri**

This presentation will detail the 16 species in 7 genera of orchids that grow in southern California, including their locations and habitats. The somewhat controversial topic of placing the well-known genus *Piperia* within *Platanthera* will also be discussed. This presentation is based on a publication that Robert will submit to *Crossosoma*, the journal of the Southern California Botanists, later this year.

**Robert Lauri**, Ph.D. Botany, Claremont Graduate University and Rancho Santa Ana Botanic Garden, 2010. Dr. Lauri's dissertation title was "A systematic study of *Piperia* (Orchidaceae) and close relatives in *Platanthera s.l.*" He currently works as an adjunct professor at San Diego State University teaching biology.

Chapter meetings are free and open to the public. They are held on the third Tuesday of the month in the Casa del Prado, just west of the San Diego Natural History Museum in Balboa Park.

**6:30 p.m. Natives for Novices:** Will Johnson (Seco Landscapes) will enlighten us about IRRIGATING NATIVES: Planning and maintaining an irrigation system. Hear it from an expert.

**7:00 p.m.** – refreshments, book browsing, socializing.

**7:30 p.m.** – presentation.



Dense flowered rein orchid (*Piperia elongata*). Photo from [www.smmflowers.org](http://www.smmflowers.org)

Announcing the 2013 San Diego  
**Native Gardening Symposium**

Saturday, September 28  
Girl Scouts Balboa Campus  
1231 Upas Street, Balboa Park

*Learn to garden with native  
plants, even if you are new!*

[LearnNativeGardening.org](http://LearnNativeGardening.org)

# BOARD MEETING

**Wednesday, July 3, 6:30 - 8:30 p.m.** The San Diego Chapter Board Meeting will be held at 4010 Morena Blvd, Suite 100, San Diego (Thomas Guide 1248 C4). Board meetings are always the first Wednesday of the month. Future 2013 Board Meeting dates are August 7, September 4, October 2, November 6, and December 4.

**Directions:** Exit I-5 to Balboa Dr. east and turn north on Morena Drive. Proceed 1/2 mile and make a u-turn at the Avati Street signal and turn into the driveway for 4010. Drive to the parking lot on the west side (away from Morena). Members are welcome to attend as observers. If you want to discuss an issue, please ask to get on the agenda by sending an email to [president@cnpsd.org](mailto:president@cnpsd.org).

## June 5, 2013 Board Meeting Report

- Long-time member and book-sales co-chair **Sue Marchetti** was nominated for and accepted the position of the 11<sup>th</sup> board member, filling in for the term until elections in November.
- The Board discussed how to encourage the best possible minigrant applications, which generally range from \$250 to \$500. We receive many applications from schools interested in planting native plant gardens. The Board members generally felt that native plants need to be installed to have educational value, not just be pretty! Our first message to potential school native plant garden applicants is to download "Native Plant School Garden Program" from the CNPS-SD website so they can get clear ideas for integrating natives into curricula, and include those ideas in a proposal. A \$500 mini-grant proposal from a group of parents and teachers at Holmes Elementary School met these standards and was approved by the Board.
- The Board provided its support for **Susan Krzywicki** and the Garden Committee for a one-day seminar on gardening with native plants on September 28, two weeks before the annual plant sale.

## NEWSLETTER CHANGE OF VIEW

Now that the field trips are mostly over for the year, we will focus on gardening with natives for a few months. Gardening and other articles about caring for and managing our native plants will be first in the newsletter, and other articles will follow.

The paper presented by James Lightner at the May 2013 Chapter Meeting, "San Diego County Native Plants in the 1830s: The Collections of Thomas Coulter, Thomas Nuttall, and H.M.S. Sulphur with George Barclay and Richard Hinds," is now available at [sandiegoflora.com](http://sandiegoflora.com).

## GARDENING WITH CALIFORNIA NATIVES Gardening Committee

The Gardening Committee will be meeting on **July 10th** at the home of Sue Marchetti - as always, a pleasant place to be. Her address is 4234 Tacoma Street, San Diego CA 92117. Email me at [gardening@cnpsd.org](mailto:gardening@cnpsd.org) if you would like to attend and are not on our regular mailing list.

The Fall Seminar is shaping up under the guidance of **Jake Sibley, Will Johnson** and **Sue Marchetti** and we look forward to their report. We will have some discussion, of course, about the 2014 Garden Tour. **Steve Miller** and **Hei-ock Kim** are deep into planning for that event.

**Dave Flietner** has his Sunset Cliffs Adopt-A-Plant program on a roll and he'll give us the latest on the planned implementation.

And, Natives for Novices will be a topic: upcoming speakers and subjects are being planned into early 2014.

Please join us - we always have fun!

~ **Susan Krzywicki**, Native Gardening Chair

## Sunset Cliffs Native Demonstration Garden

After a series of on-and off-site consultations between members of our Garden Committee and the Sunset Cliffs Advisory Council, a final plan has been approved for a Native Plant Entry Garden at the extreme north end of Sunset Cliffs Natural Park. The new garden will be located west of the intersection of Sunset Cliffs Boulevard and Adair Street, where Sunset Cliffs first meets the ocean as you head south from Ocean Beach.

It is a high-profile, high-traffic site that serves the Gardening Committee's goal of creating a native garden that will raise public awareness of native gardens and

demonstrate that they can be both attractive and economical. The garden's location also fulfills goals of the Sunset Cliffs Master Plan to create an attractive entry point at the north end of the park and to restore native plants to the entire cliff area.

In designing the Garden, CalNative Director and CNPS member **Clayton Tschudy** was faced with a number of constraints: plants' heights couldn't block pedestrian views of the cliffs and ocean, adequate space had to be left for rescue vehicles to reach the cliffs, and public use of the spot for activities from yoga to Sunrise Services should be preserved. On top of all these, the soil surface is hard-packed fill dirt that had been used as an unofficial parking lot for years. In addition, we kept the plant palette to species we observed growing near the ocean between Point Loma and Torrey Pines.

The design addresses these issues by massing plants into various ovoid-shaped beds that cover about 1/4 of the land surface. Except for the north end next to an apartment building, where taller jojoba, toyon, and lemonade berry will nestle around a viewing bench, the open design will emphasize small shrubs, such as Cleveland sage, cliff spurge, California sagebrush, and golden bush, and low-growing plants such as ladyfinger dudleya and sea dahlia. A low hedge of evergreen bush rue will visually unite the garden, and we hope eventually continue along the entire proposed seaside walking trail.

### What's Next?

Garden installation is scheduled for November, and much remains to be done in the meantime. **Jim Wadman** and the **Plant Propagation Committee** have already started seed germination for about half the plants that will be needed. With the help of additional seeds donated by **RECON Native Plants**, they hope to get grow almost all the 259 plants that will be needed themselves.

The **Gardening Committee** is seeking to build our team of Garden Stewards -- now consisting of **Dave Flietner**, **Hei-ock Kim**, **Scott Opis**, and **Susan Marchetti** -- to a full complement of eight. Garden Stewards will collectively take on responsibility for maintaining the garden weekly, hosting occasional public garden events (such as planting days or pruning classes), and interacting with the public while at the garden site. We are looking for four more Garden Stewards who can take on the hard work of putting in this garden a couple days a month while listening to the waves crashing a few feet away.

Finally, we still need to raise funds for the project -- mostly to purchase high-quality mulch and topsoil, and to rent jackhammers! Our first-year budget is \$4,100, towards which our Executive Board has generously donated \$2,050; so far we've raised an additional \$250

from members participating in our Adopt-a-Plant fundraiser, where you can sponsor a needy native for \$5 to \$20.

If you want to donate toward the project or would like to join our crack team of Garden Stewards, please visit our table at the next monthly meeting or email me at [flietnerd@gmail.com](mailto:flietnerd@gmail.com).

- **Dave Flietner**, Garden Committee member

## Bulrush Planting at the Alamo River Wetlands Imperial County

On Saturday, April 27, 2013 from 8 to 10 a.m., Imperial Valley students, parents, and associated volunteers traveled to the Alamo River Wetlands, which is located east of Brawley on SR 78 then north on Highway 115 and west at the Alamo Wetlands sign and down the dirt road to the wetlands. They participated in a fun morning improving the Alamo River Wetlands wildlife habitat and water quality (and the Salton Sea) by planting bulrushes along the banks of treatment cells. Leon Lesicka, President of Desert Wildlife Unlimited, used his backhoe to dig small holes in which to place the bulrushes. The bulrushes were recycled from an adjacent treatment cell that had abundant plants. The volunteers were treated to the sight of black-necked stilts, killdeer, coots and soaring raptors in the area while they were planting.

Desert Wildlife Unlimited has received funding of \$340,000 through an agreement with the State Water Resources Control Board and the U.S. Environmental Protection Agency under the Federal Nonpoint Source Pollution Control Program (Clean Water Act Section 319) to construct roads, wetlands planting and monitoring at the Alamo River Wetlands.

**Marie Barrett**, CNPS-SD Imperial County membership chair, helped organize the volunteer effort.



Bulrush planting at the Alamo River Wetlands in April.

# Fragrant Garden in the News for Civic Landscaping

On June 4, 2013, a novel event for the South Bay occurred in the native plant world. The Fragrant Garden of the Chula Vista Library (South Branch) was awarded first prize in Civic Landscaping by California Garden Clubs, Inc., a statewide organization of over 350 clubs. Why is this surprising for the South Bay? Because awareness of native plants has been generally low in this area. And also because garden clubs in the past have tended to be horticulturally oriented and not so concerned with issues such as preservation of native plants. But why should you, the members of CNPS-SD, care about this little garden anyway? Because you funded it! Yes, the 27 plants of eleven different native species were purchased, mostly from the October 2012 plant sale, with a mini-grant of less than \$200 from your Board.

The garden began as a twinkle in the eye of James Balnis, a library trustee and member of the Chula Vista Garden Club, who noticed that there was an empty courtyard in a part of the library that had been closed off for years. A sign labeled it “The Fragrant Garden,” but it was neither fragrant nor a garden. James discussed putting native plants in the space with **Betsy Cory**, a member of the same garden club and of CNPS-SD. Betsy got approval from the library administration and arranged for the Chula Vista Garden Club to install the plants and for the City Parks Maintenance Department to repair and adjust the irrigation system. The angels of the CNPS-SD Board came through with the mini-grant. And then another CNPS-SD angel fluttered onto the scene: **Kay Stewart**, who agreed to plan the garden and choose the plants. She did not know what a challenging site it was--a small triangular courtyard surrounded by 20-foot walls, with narrow planting areas along two of the walls. But she soldiered ahead and picked out the eleven species, all of which are fragrant in leaf or bloom, and designed a charming arrangement for them on the site. And she printed labels on stakes for every single plant. Then she instructed Betsy on having the soil analyzed and supplemented. Garden Club members prepared the soil and, on October 13, 2012, installed the plants.

The garden won't reach its full splendor for some time, of course, but it is already going great guns! Bladderpod (*Isomeris arborea*), Cleveland sage (*Salvia clevelandii*), desert mint (*Monardella odoratissima*), and others are blooming now, and by the end of the summer all the plants will be large enough to make quite a stunning impression, with swaths of yellow, pink and purple flowers, undulating shades of green and gray foliage, and

carpets of *Satureja douglasii* creeping in between. For those curious about the plant names, all are shown on a poster with photographs of mature plants in a diagram of the garden. And, yes, the Latin names are there, too!

The native plants in the garden have been connected with Native Americans ever since the garden was dedicated and blessed by Randy Edmonds, a Native American elder. And we will continue this association. Chula Vista is holding a pow-wow on August 10 and 11, and we plan to hold one or two Native American events such as demonstrations or dances in the Fragrant Garden during the week leading up to the pow-wow.

The garden will be well used by Chula Vistans as an educational and recreational resource. People of the South Bay will appreciate and understand a little more about our bounty of native plants. Maybe some of them will even be moved to join CNPS-SD. Now that is Civic Landscaping with a purpose!

~ Betsy Cory



View of the Fragrant Garden of the Chula Vista Library (South Branch).

## Fall Plant Sale Saturday, October 12

**Mark your calendars!** The CNPS-SD fall plant sale will be on October 12 at the courtyard next to the Casa del Prado, across from the west entrance to the Natural History Museum in Balboa Park. **The plant sale committee is always looking for help. Some jobs can be done on your own time while others work in groups. Following is a list:**

- **Growing and watering plants at the City of San Diego's nursery near Balboa Park**

- Publicizing and promoting our sale, contacting news outlets, etc.
- Coordinating food coordinator - set up food for the volunteers on plant sale day, solicit donations, etc.
- Packaging and labeling seeds

If you'd like to get involved with one of the chapter's largest fundraisers, please join us. Plant Sale Committee Chairs are Carolyn Martus & Mary Kelly; contact them at [plantsale@cnpsd.org](mailto:plantsale@cnpsd.org).

**Pre-ordering plants for this year's plant sale:**  
**CNPS members - preorder your plants and have them waiting for you on sale day! Details and information will be posted on the chapter's website at the very end of August and preorders are due by September 15, 2013.**

## Native Garden Work Parties

**Old Town Pre-contact Native Plant Landscape Work Party, Saturday, July 13, 1:00 to 3:00 p.m.**

Volunteers collected seeds in June and we will get to plant them in July . We'll also trim some of the large shrubs down a bit, early enough in the year so they will be able to form buds for blooming the next rainy season between October 2013 and June 2014 - whenever the rains decide to arrive.

The Native Plant Landscape illustrates some of the many useful plants that were part of the Native American daily life before the arrival of Europeans in the late 1700's. We have harvested elderberries and if the narrow-leaf milkweed continues to thrive we will want to learn how twine is crafted by using its slender stalks.

The Old Town Native Landscape is at the far west end of Old Town State Historic Park, at the corner of Taylor and Congress Streets, opposite the Trolley/Train/Bus station. Come by trolley, bus or train, or if you drive, park for free in the shady lot at CalTrans across the street from the Native Landscape. Enter the CalTrans lot at Taylor and Juan Street, park, then recross and walk to the corner of Taylor and Congress and enter by the adobe sign Bring gloves and hand tools if you have any and have sun protection and water on hand. Restrooms are nearby. Questions? Contact **Kay Stewart** at: [fieldtrips@cnpsd.org](mailto:fieldtrips@cnpsd.org). See you there!

**Point Loma Native Plant Garden: July 6 and 21, 9:00 – noon.** Rain cancels; bring water; no facilities; tools/supplies provided. Usually the first Saturday & third Sunday of each month. Contact [Richard@sandiegoriver.org](mailto:Richard@sandiegoriver.org) for more info.

## FIELD TRIP REPORTS

### Cottonwood Creek May 12, 2013

We thought at first that Neil Bouscaren, who suggested this location but didn't go, was probably having a good laugh, just thinking about us getting down the first part of the trail - we had to make like mule deer to get under the canopy of desert ceanothus (*Ceanothus greggii*) and the rest of the evergreens in several places.

But later we thanked Neil for insisting that I schedule the field trip there. What a lush little elfin forest that is with herbaceous plants carpeting the soil under the evergreens! And when we hit the valley floor, a whole different array of plants were flowering. Forest clarkia (*Clarkia rhomboidea*) was sparkling with various lupine species in the gravelly floodplain in the partial shade of oaks and huge gorgeous Mexican manzanita (*Arctostaphylos pungens*). Our favorite plant for the day though was a colony of California milkweed (*Asclepias californica*) scattered across a rolling hillside between very low patches of California buckwheat (*Eriogonum fasciculatum* var. *polifolium*). The milkweeds were the most beautiful that any of us had ever seen, with huge black carpenter bees and tarantula wasps busy working them over.

Altogether we tallied 87 native species, though a few weren't yet in bloom so we weren't sure what species they were - a mariposa lily (*Calochortus* sp.) and a bird's beak (*Cordylanthus* sp.); and we didn't attempt to i.d. the popcorn flowers. After the field trip I took a drive south along Buckman Springs past the irrigated ranch and the high school, on to Lake Morena, to see where Cottonwood Creek ends. The diversions are clearly changing the face of the area, since the lake is about 50' low, and the Ranger told me the last time it was full was 1998. As I drove back north, I could see where Cottonwood Creek has carved slickrock waterfall tracks down the face of its canyon to the east of I-8, in its wild habitat. That must be a pretty sight when the creek is flowing strongly.

~ **Kay Stewart**, Field Trip Co-Chair

# McCain Valley – May 19, 2013

**Tim Cass** led a great field trip up McCain Valley and beyond. He told stories about the history of the region and the life of a field biologist, including recollections of Reid Moran and other botanists who put San Diego on the natural history map. High points were seeing a huge cluster of the rare Fremont barberry (*Berberis fremontii* [=higginsiae?]) and a very pretty rare plant, the Jacumba milk vetch (*Astragalus douglasii* var. *perstrictus*), at the peak of bloom and fruit. It would be a lovely in gardens, I think.

Learning to identify transition-zone oak species and hybrids continues to be tricky but 30'-plus tall trees of interior live oak (*Quercus wislizenii*) fit the description for subspecies *wislizenii*, not the subspecies *frutescens*. **John Randall** took photos, and spotted San Bernardino larkspur (*Delphinium parryi*), a giant swallowtail collecting nectar on yerba santa (*Eriodictyon californicum*), a shrubby species of *Senecio*, and especially captured the beauty of giant four o'clock (*Mirabilis multiflora*).

I am so glad we got to see this wild and quiet valley before dozens of wind turbines are built all over it and on Cuyapaaay Mountain to the west. I think that the drivers - including **Bob Greenberg** - agreed that going all the way to Bow Willow Creek past Cottonwood Campground was worth the long drive. If any of you can get up to that beautiful, peaceful campground, be sure to do it soon. Construction is due to start next year.

~ **Kay Stewart**, Field Trip Co-Chair



Tim Cass, Kay Stewart and Bob Greenberg at the McCain Valley Field Trip. Photo by John Randall.

## TECOLOTE CANYON NATURAL PARK



**July 7; 9 a.m. to noon.** A relaxed opportunity to learn plant lore of this coastal natural reserve from a CNPS member. Meet at the Tecolote Nature Center. Wear sun protection and comfortable walking shoes, bring water. Rain at 8 a.m. cancels the walk. Directions: exit I-5 at Seaworld/Tecolote exit. Go east (away from Mission Bay) on Tecolote, past the ball fields, along the driveway to the very end. Free and open to the public, and parking is also free. The walk is repeated the first Sunday of each month.



Giant four o'clock (*Mirabilis multiflora*). Photo by John Randall.

## CONSERVATION

### Dude, and then there's the mycorrhizae...

Okay, I'm being sarcastic, since I know full well that SDSU had a nice mycorrhizal research program going a few years back, and people here aren't quite as clueless as are those elsewhere. Still, I've heard enough misconceptions recently that I think it's time for a refresher on the field.

What is a mycorrhiza (plural mycorrhizae)? We're in bastardized Greek and Latin land here: mykos is greek for fungus, rhizos is Greek for root, and ae is how you conjugate them as if they're Latin. Still, it sounds better than "fungoradix" which is the purely Latin equivalent. Ahem. The term is (for once) fairly accurate, because we're talking about a symbiotic structure made from a fungus and a plant root. *A mycorrhiza is not a fungus!* It's the composite of plant and fungus living in sym. All is not bliss, though.

Let's talk about the "dude" part before it festers. Mycorrhizae are the bad boys of botanical science, and they're usually studied by mycologists, the bad boys (and girls) among botanists, primarily because mycologists know that fungi are closer to animals than plants (botany was classically the study of all organisms that don't try to bite you or pee on you).

When I studied mycorrhizae for my PhD, my botanist advisor warned me against giving into my passion and going over to the dark side. Most botanists intellectually know that plants have roots, but in their careers they often get away with assuming that plants are only their aboveground parts. Can you name another field of biology where professionals get away with studying half their favorite organism and calling themselves expert? Well, yes, that's true of internal medicine. Right. To continue.

One "problem" with mycorrhizology is that it goes straight for the roots, which embarrasses aboveground botanists who aren't comfortable having their belowground ignorance exposed. Then there's the whole symbiosis thing. That's a column in itself, but since our society has such a big fetish about red-clawed competition and hardy individualism, we've long had a huge problem with symbiosis. At one point, it was literally regarded as a communist plot. Although symbiotic interactions are more common than bloody competition, the latter hogs the spotlight. Combine symbiosis with roots, and most people prefer to ignore mycorrhizology if they can. Others are drawn to its outsider status.

Before I talk about what mycorrhizae are and do, let me talk about what they do not do: fix nitrogen. Only bacteria do that. People get confused because some nitrogen fixing bacteria are actinomycetes, so called because the people who named them thought they were weird, star-shaped fungi. If you remember that scientists once thought that cyanobacteria were blue-green algae and fungi were non-green plants, you will, of course, forgive those early researchers. Equally, you will remember that mycorrhizae do not fix nitrogen.

Let's talk about the four broad types of mycorrhizae, each of which, of course, is unlike the others. The biggest group is the **arbuscular mycorrhizae** (AM, formerly and erroneously known as endomycorrhizae), which are formed exclusively by fungi in the glomeromycota (aka arbuscular mycorrhizal fungi or AMF).

The AMF are an ancient group. The oldest, 420 million year-old, AMF spores look identical to modern ones. The oldest AM found to date were found in the 410 million year-old Rhynie chert in the rhizomes of the earliest known vascular plant, so arbuscular "mycorrhizae" pre-

date the evolution of roots by something like 20 million years. Since some liverworts and hornworts form AM, mycorrhizasts are pretty sure that, without AM, land plants as we know them wouldn't exist. To put it simply: all living plants, whether or not they have mycorrhizae, evolved from something that had AM. People occasionally ask why plants evolved AM, and the proper answer is that green algae evolved AM to live on land.

The key thing that the ubiquitous AMF do is they extract nutrients from smaller soil pores than plants can access, because AMF are about 10 times thinner than plant root hairs. AMF take up nutrients and trade them to the plant, in return for carbohydrates from the plant and a place to live. AMF are small: their mycelial fungal bodies only get about 10-20 microns wide at the biggest. They're far from forming some giant grid the plants plug into. In certain ecosystems, they have a big impact on plant community diversity (the subject of my PhD), but their ecosystem effects seem to grow out of that little, ubiquitous, ancient exchange: nutrients the plant can't reach for carbs the fungus can't photosynthesize. Indeed, AMF depend on plants and can't live without them.

If you know anything about evolution, you know that, once a system is ubiquitous, evolution favors shortcuts and cheats to it, and that's happened a huge number of times with the AM symbiosis. By far the biggest adaptation are non-mycorrhizal plants. If a plant can get all the nutrients it needs without AMF, it pays the plant to dump the fungal partner. Everything from mosses to annual grasses has done so. Every major group of plants has non-mycorrhizal members.

The next biggest group is the **ectomycorrhizae** (EM). These form almost exclusively on woody plants such as pines, oaks, and eucalypts, but ectomycorrhizal plants have evolved separately at least a dozen times in the plant kingdom and at least five separate times in the fungal kingdom, in the biggest case of convergent evolution known. Never heard this before? One eminent mycorrhizast opined decades ago that evolutionary theories were for people who couldn't do real science, and since his academic heirs dominate the field, basically no one studies EM evolution.

Ectomycorrhizae are where we start seeing the "wood-wide web." Some EM fungi can get quite large, and research has demonstrated that carbon can flow from one tree to another through a connecting EM fungus (AMF don't seem to do this, at least not on the same level). More importantly, many EM fungi can do things that plants can't do like rot wood, parasitize other fungi, or extract nutrients from bedrock or (especially) leaf litter. All of these allow EM plants to tap into nutrient pools that AM plants simply can't reach. Since the whole plant kingdom didn't switch to EM from AM at the end of the

Mesozoic when EM first showed up, EM plants presumably pay some major price for this symbiosis. Still, EM work well enough for them to dominate northern boreal forest, Australian woodlands and even parts of the tropics. You know what the classic EM forest looks like: lots of pines, oaks, or eucalypts, dominated by a low diversity of tree species from a few families.

Now we get into the weird types. There are **ectendomycorrhizae**, which occur on some pines. Briefly, endomycorrhizal fungi pierce the plant cell wall, ectomycorrhizal fungi fuse with the plant cell wall, Ectendos do both. Different from ectendomycorrhizae, despite the fact that they are also ecto/endo, are **arbutoid mycorrhizae**, which are formed by *Arbutus*, *Arctostaphylos*, and their near relatives in the Ericaceae with EM fungi that otherwise grow on conifers. Arbutoid mycorrhizae are quite important in California, because manzanitas (*Arctostaphylos*) serve as alternate hosts for pine EM after fires. Bulldozing manzanita chaparral to encourage conifer regeneration is counterproductive, because the land managers who do so destroy the EM community that would otherwise support the resprouting pines.

Then there are the **ericoid** mycorrhizae, which are a type of ecto/endo mycorrhizae that form on the fine roots of many members of the Ericaceae, including *Erica* (heather), vacciniums, rhododendrons, and so forth. The fungi that form ericoid mycorrhizae are quite good at getting nutrients out of litter, and this is why one often finds things like blueberries in bogs, which are mostly organic matter. The fungi can also form EM with nearby bog conifers and even some strange, unnamed mycorrhizae on bog liverworts, but that's probably too much information this late in the article.

Finally, there are the bizarre **mycoheterotrophs**, which are plants that parasitize fungi through their own forms of mycorrhizae. These include the **monotropoid** mycorrhizae, formed by *Monotropa* (Indian pipe) and relatives with fungi that form ectomycorrhizae on nearby conifers. Monotropoid plants get all their carbon from the trees by parasitizing an EM fungi with their monotropoid mycorrhizae.

However, the biggest group of mycoheterotrophs are the orchids, which form **orchidoid** mycorrhizae. All orchids start off from tiny seeds that die unless the right fungus finds them. If these seeds are correctly infected, they will suck all the nutrients they need to grow out of the fungus. Since some of these fungi are serious plant pathogens, this is crudely equivalent to a newborn human sucking blood from a tiger's tail to grow up. Amazingly, orchids routinely get away with it. At least 22 separate genera of orchids never grow up. They survive as pure mycoheterotrophs throughout their lives. The other 820-

plus orchid genera do eventually turn green photosynthesize on their own. They may or may not discard their fungi as adults, and if they do, they live as nonmycorrhizal plants. Some green orchids are life-long parasites, while still others are intermittently non-mycorrhizal. Orchidoid mycorrhizae were once thought to be exclusively orchid parasitizing fungi; however, it appears that in some cases, orchid carbon does get into the fungal partner. Given orchids' predilection for deceptive pollination and parasitic mycorrhizae (not to mention seducing well-to-do humans into spreading them all over the world), I've often thought of them as the ultimate plant gifters. Apparently, some of them aren't totally selfish.

You may have noticed that the Ericaceae have three unique mycorrhizal types: arbutoid, ericoid, and monotropoid. This isn't quite true: some of them also form AM, and one of them may be non-mycorrhizal. No one has determined how all these different mycorrhizal syndromes evolved. Such diversity is unique in the plant kingdom, but as I noted above, mycorrhizasts by custom don't do evolutionary theory.

Still, this hasn't stopped naïve PhD students such as yours truly from trying to come up with a good evolutionary story. Bluntly, it's a mug's game. About a decade ago, a researcher found a South American *Gaultheria* that had arbutoid, ericoid, and arbuscular mycorrhizae on different parts of its root system. They aren't exclusive traits, and they don't map cleanly onto the phylogeny of the Ericaceae. The ability to form arbutoid (or ecto-) mycorrhizae doesn't mean the plant stops being able to form arbuscular mycorrhizae, although (as with oaks) it may not be able to survive on AM alone. Mycorrhizae aren't simple traits that can be coded present/absent into a matrix for phylogenetic analysis. They are symbiotic structures, formed by a plant and a fungus in a particular environment. While some of the mycoheterotrophic plants only grow with one species of fungus, AMF will grow on almost any AM plant species, and some EM fungi will try, even if they kill roots in the process. Ultimately, we're talking about evolution by infection, and evolutionary biology doesn't really have the concepts to comfortably deal with it.

At this point, I should strongly urge you not to be seduced by the dark side of the plant underground, and to go back to enjoying the sunlit world of branches, leaves, and flowers that everyone thinks of as plants. Mycorrhizae are far from the easiest thing to study or even understand. Just remember, without them, plants wouldn't exist, and neither would we. Word, dude.

~ **Frank Landis**, Conservation Chair



# Searching for Representatives of a Previous Era in San Diego County

San Diego County, as we all know, contains a tremendous diversity of habitats. We not only have the coast, mesas, foothills, mountains and deserts, we have a myriad of little habitats within those. A couple of months ago I described a successful search for one representative of a flora that was more widespread here in the past, the Pacific madrone (*Arbutus menziesii*). A number of other San Diego County species are also very interesting, including three that, like the *Arbutus*, are from more northern floras, the California huckleberry (*Vaccinium ovatum*), the big leaf maple (*Acer macrophyllum*), and the California bay laurel (*Umbellularia californica*), and a couple from the southwest mountain regions of the United States, western redbud (*Cercis occidentalis*) and southwestern bitterroot (*Lewisia brachycalyx*). Here I will discuss the genus *Vaccinium* in the Ericaceae (Heath family) and the species *Umbellularia californica* in the Lauraceae (Laurel family).

There are 450 species of *Vaccinium* known in the world including some from Hawaii, Madeira Island, and Madagascar, as well as the highbush blueberry (*Vaccinium corymbosum*) that grows throughout the eastern U.S. and Washington state and adjacent Canada, and cranberry (*Vaccinium macrocarpon*) that has a similar but slightly reduced distribution as the blueberry. *Vaccinium ovatum* is a species that grows from British Columbia generally along the coast ranges into Santa Barbara County (mainland and on Santa Cruz and Santa Rosa Islands) and then, disjunctly, in San Diego County roughly 200 miles to the south. It has not been found growing in the wild between Santa Barbara County and San Diego County. It is typically listed as occurring in Douglas fir, Sitka spruce, redwood and tanbark oak forest and California mixed evergreen forest including Pacific madrone areas but also areas of closed cone pines. *Vaccinium* shrubs produce flavorful berries that are eaten by a wide variety of wildlife including grizzly bears though it is not likely they were eaten here when grizzly's still occurred in San Diego County since *Vaccinium* is so rare here. Axelrod (History of Maritime Closed-cone Pines, Alta and Baja California, Volume 120 University of California Press) indicates that they are related to *Vaccinium confertum* of the mountains of western Mexico.

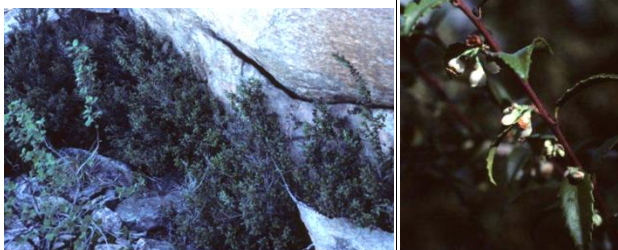
During my time at San Diego State University, I spent a summer mapping vegetation on Vandenberg Air Force Base (AFB). There I became familiar with the closed

cone *Pinus muricata* (Bishop pine) but also *Lithocarpus densiflora* (tanbark oak) and the areas where the fog sits on hill tops and ridges nearly every day during the summer. As a result of the regular and persistent fog, there was a definitive line where the *Vaccinium ovatum* vegetation grew on the hillsides, particularly on Tranquillon Mountain, which is only 2,159 feet in elevation but sits only two miles from the ocean, situated directly behind Point Conception, the western end of the Santa Ynez Mountains and the corner of California. The top is in the fog much of the summer and *Lithocarpus* groves drape the northern slopes. Farther down, *Pinus muricata* covers the ridges on the southern part of Vandenberg AFB. There the *Vaccinium* grows with *Gaultheria shallon* (salal) and *Clinopodium douglasii* (yerba buena), both typical of moist northern areas. The *Vaccinium* shrubs add a reddish maroon tinge to the vegetation that is missing in the normal chaparral there, so they can be seen from below. On Santa Rosa Island, the *Vaccinium* grows with *Quercus tomentella* (island oak) on the north slope of a very wet ridge, surrounded by barren terrain due to many decades of grazing by cattle, sheep, deer and elk. They are all gone now. On Santa Cruz Island, *Vaccinium ovatum* grows in pine forests on a number of high ridges and at some moist canyon locations. Then they skip all the way to San Diego County.

In San Diego County, *Vaccinium ovatum* has been found in four general locations: near the summit of Roderick Mountain (now Rodriguez Mountain, above the location of the *Arbutus menziesii*), on the north slopes between Iron Mountain and Mount Woodson, at the top of Bottle Peak east of Escondido, and on the north slopes of El Cajon Mountain. The San Diego Chapter of CNPS had a field trip to the Bottle Peak area on February 23, 1985 where we climbed up to an area with large boulders and found what is likely a clone of the plant growing in the rocks. It has probably been there for thousands of years, being burned and resprouting as periodic fires occurred. One Mother's Day many years ago, I walked on the spectacular trail that traverses in and among the large granitic domes north of Silverwood Wildlife Sanctuary. *Vaccinium ovatum* grows in the midst of rocks and boulders along the trail on the north side of El Cajon Mountain (sometimes called El Capitan due to its resemblance to El Capitan in Yosemite). I have never eaten any of the fruit from the populations in San Diego County, but I have had huckleberry jam from bushes in the northern part of the State. It tasted a lot like blueberries, but a bit milder. During prehistoric times, birds are likely to have been one of the main dispersing agents for *Vaccinium ovatum*, along with coyotes and grizzly bears, but the question would be how far would they walk or fly to deposit a seed? It is likely that they would not have traveled very far or there would be source plants dispersed along a chain of suitable habitats.

So, here we have again a species that is found far to the north in moist habitats, but growing in the midst of chaparral in San Diego County. The really interesting fact is that it doesn't simply occur in one location, but four separate locations. *Vaccinium ovatum* berries could have been carried by long distance to the locations where they are growing in San Diego County by any number of birds. But, why does it not occur on the mainland between San Diego County and the latitude of Santa Cruz Island? It seems there are plenty of locations that are similar to their habitats in San Diego County. It may be that they will be discovered in some isolated spot in the Santa Monica Mountains or Santa Ana Mountains. However, it is interesting that again the areas in San Diego County support them due to some special condition that exists now or existed in the past. We do know (Stock 1992) that *Sequoia sempervirens* (coast redwood) grew in the vicinity of the La Brea Tar Pits in Los Angeles County along with *Cupressus forbesii* (Tecate cypress), *Cupressus macrocarpa* (Monterey cypress) and *Cupressus goveniana* (Gowen's cypress), *Pinus radiata* (Monterey pine), *Pinus muricata* (Bishop pine) and *Umbellularia californica* (California bay laurel). There are no specific records of *Vaccinium* from the La Brea Tar Pits, but the associated species of the redwoods and central California cypress and pines may be indicators that there was suitable habitat for it but the habitat must have extended farther south to include San Diego County. Is it likely that the locations in San Diego County are the farthest south that the *Vaccinium* ever extended during the Pleistocene when the climate was twice as wet as it is now and cooler? It is possible but it is difficult to fathom that these plants could be the farthest south that the species extended during the Pleistocene and that they are still here after conditions dried significantly. One would expect that they are merely representatives of a previous period, living in microhabitats that are remnants of a broader distribution both north and south. Prehistorically, it is most likely that they filled in the distribution void that now exists to the north and that they occurred further south as well. *Vaccinium ovatum* is another botanical treasure to be found in this county.

California huckleberry  
(*Vaccinium ovatum*) at Bottle  
Peak. Photos by Tom  
Oberbauer.



*Umbellularia californica* (California bay laurel) is a characteristic tree of northern and central California. It is known for its odor, which is similar to Mediterranean bay leaves (*Laurus nobilis*) that are used for cooking. However, the odor is much more concentrated than the culinary bay leaves. I read somewhere that someone thought they were going to have a very flavorful main course of venison but made the mistake of lining parts of the roasting oven with a number of *Umbellularia* leaves instead of the usual store-bought bay leaves. While they were trying to utilize the local flora in their foods, they found that its flavor was so strong that the meat was nearly inedible.

The California native inhabitants are reported to have utilized the tree for a variety of medicinal and nutrition needs, including using the leaves as pesticides in their bedding material. The fruits are like small avocados with thin fleshy covers over round pits. The cover portion was used to some degree but the seeds were reported to have been roasted and eaten or ground into powder for a variety of uses, including mixing with water for a beverage or made into portable and storable cake-like forms (Goodrich et al. 1980). The wood is also of interest and is apparently useful for luthiers in the construction of lutes and other stringed instruments.

*Umbellularia californica* has a distribution that extends from central Oregon to San Diego County. Unlike the *Vaccinium*, the distribution is generally regular with breaks in some areas, but without the long distance disjunct distribution. *Umbellularia californica* normally grows in redwood forests, yellow pine forest, and oak woodlands. During the Miocene, oak-laurel forests were found in central and southern California (Axelrod 2000; Barbour et al, 2007) and in the Anza-Borrego Desert 4-5 million years ago (Remeika 1995).



California bay laurel (*Umbellularia californica*) tree near Oasis Springs, Mount Laguna. View of tree top killed in 2002 Pines Fire with resprout and closer view of resprout. Photos by Tom Oberbauer.

Currently, *Umbellularia californica* grows in two major mountain ranges in San Diego County. The Santa Margarita Mountains on Camp Pendleton and into the Cleveland National Forest is one of the locations, including within the San Mateo Canyon Wilderness. In San Mateo Canyon, it is growing as a streamside species in Cold Spring Canyon at an elevation of only 700 feet. In the other part of the Santa Margarita Mountains, they grow near *Styrax rediviva* (California snowdrop bush) in the vicinity of Roblar Grade. The other location in San Diego County is along the east side of the Laguna Mountains but also spilling over to the west side in Noble Canyon. One of the places that I have enjoyed viewing them over the years is near Oasis Springs, which is near Garnet Peak on Mount Laguna. I had not seen them for a number of years, in particular, since the Pines Fire of 2002 burned the back side of Mount Laguna and through the area of Oasis Springs. The little road that used to extend to Oasis Springs is being gradually reclaimed by the *Ceanothus*, *Arctostaphylos* and *Quercus* in that area, but as of May 2013, it is still passable on foot. The *Umbellularia* that grew there before the fire consisted of very large trees, but the fire killed off the main trunks and now resprouting stems are growing up to several meters tall. Their elongated, bright green, shiny leaves are very distinctive as is the growth pattern of the branches. They can easily be distinguished from the *Quercus agrifolia* (coast live oak) and *Quercus chrysolepis* (canyon live oak) that grow in the same area. Some of the really large oaks near Oasis Springs were not top killed and still stand in their pre-fire glory.

~ Tom Oberbauer, Chapter President

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## RELATED ACTIVITIES

### Southern California Botanists

**Sunday, October 20, 2013.** Save the Date! 39th Annual Southern California Botanists Symposium. "Origin and Relationships of the California Flora: Was Raven Ravin'?" Pomona College, Seaver Auditorium, Claremont CA. Co-sponsored by Pomona College. For more information, visit [www.socalbot.org](http://www.socalbot.org)

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### CNPS-SD Calendar for June 2013

- 7/3: **Board Meeting**, p. 2
- 7/6: Point Loma Native Garden Work Party, p.5
- 7/7: Tecolote Canyon Walk, p.2
- 7/10: Gardening Committee Meeting, p. 2
- 7/13: Old Town Native Landscape Work Party, p.5
- 7/16: **Chapter Meeting**, p. 1
- 7/21: Point Loma Native Garden Work Party, p.5

#### Planning Ahead

- Aug/Sept, date tbd: Plants of Lake Henshaw & Warner Springs vicinity
- 9/15: Last day for Plant Sale Pre-orders
- 10/12: Fall Plant Sale

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