

Obispoensis

Newsletter of the San Luis Obispo Chapter of the California Native Plant Society



: Southern goldenrod *Solidago confinis* at Shark Inlet, Montana de Oro State Park.
Photo: David Chipping

October 2020 Electronic Version

President's Message

As I'm sitting here in my office this morning with the eerie orange smoky fog outside, I'm thinking of my time in the Sierra range in August of this summer. And I'm so thankful that I was able to spend that time without the incredible drama of the fires that so many others have been dealing with in these last few weeks. My heart goes out to the solo hiker who set out to hike the John Muir Trail only to be stopped one week in, due to smoke on the trail, and who was airlifted out. To those who had to be rescued near Shaver Lake, a place I've driven by regularly on my way to Florence Lake, a little further up the road. I feel lucky, but so saddened to see the forest and the chaparral, and even historic structures in Santa Cruz on the coast, burn like this.

But my, I don't want to bring us down. We can hope for renewal, and think of the spring when the forest floor will bloom with the fire-followers, and hope that next year, yes, next spring, we will be able to have a real spring field trip, many spring field trips, and perhaps a celebration of being outdoors again together. It's been a strange year to be President. We've had to cancel or postpone field trips, workshops, even our usual in-person, "expert-right-there" way of selling native plants at our fall plant sale. But we've also learned how to use Zoom. The Board has met almost monthly during this time of pandemic. We've seen new people at our Board meetings; people who couldn't always make it when we met in person. We had over 70 people at our August webinar with Dana York! Thanks, Kristen Nelson! And in October, we're trying something new again with the member slide show – if we can't do it in person, we'll do it on-line. David Chipping has been inspiring with his newsletters.

I fear we've overloaded our webmaster – she has so much to do – thanks so much to Judi Young for all her real and volunteer work in making the July, August and September on-line plant sales successful. And thanks to her co-hort David Krause, and to John Doyle and Bill Waycott for donating plants, and for being there to help with pick-up.

Which brings me to one final announcement and one final new way of being – and that is, that we will most likely focus the November 7 fall plant sale on plant pick-up on that date, likely with appointments, after on-line purchase of plants. More specific info will come in announcements to follow. As you know, the plant sale is our main fundraiser for the year; without it and our sales table at the general meetings, we could suffer from greatly reduced income for the year. This online sale will be our way of making up those funds. And if you happen to find yourself with extra funds in these frugal times, think of CNPS SLO and make a donation to support our mission of increasing understanding and appreciation of California's native plants. Contact David Krause at dkincmbria@aol.com.

And if you'd rather have a spring 2021 picnic instead of a January 2021 banquet, email me (mjmoon@charter.net) or Lauren Brown (lbrown805@charter.net) and let us know your thoughts. **Melissa Mooney**

A Call for Nominations - Community Award

CNPS SLO greatly values the individuals, organizations, and businesses that support and promote its mission in the local area. The Community Award is intended to highlight the important work that is conducted outside of the CNPS organization. For example, last year we honored the Atascadero Land Preservation Society (ALPS) for their work in purchasing and preserving land in the City of Atascadero.

This award is for any local individual or organization/business with a strong local presence that has made a significant contribution(s) to promoting native plants or the general natural environment within San Luis Obispo County. A significant contribution can include, but is not limited to, the following:

(a) Outstanding record of protection of native plants and habitats; (b) Inspiration of students and promotion of native plants; (c) Excellence in collaboration, commitment, innovation, and/or leadership* (d) Consistent demonstration of a cooperative and positive attitude; or (e) Exemplary service in a leadership position.

To nominate an organization, please contact the President (mjmoon@charter.net) and include the name of the organization and why you feel the organization should be honored. Final evaluation and award determination is made by the CNPS-SLO Board using the above criteria. This is not necessarily an annual award; it is presented when there is a desire to recognize a deserving recipient. The award is usually presented at the annual January banquet, and will consist of a framed certificate of recognitionnn. **Melissa Mooney.**

Plant Sale News

We are sad to report we will not hold our annual plant sale at Pacific Beach High School in November. But flexibility is key in COVID times so we are instead holding online sales throughout the summer! It works like this: Order ahead and pick up in San Luis Obispo at a designated time/date. Our plant sale team is working with growers and volunteers to offer you a nice selection of plants, but please note that some quantities are limited and sell out quickly.

- All plants available for our Saturday **September 26** pickup (9-11 am) are currently posted at <https://cnpsslo.org/bookstore/> and we are accepting orders until September 25.
- We will post plants in October for our **November 7** pickup. Check the website, email newsletters, or Facebook for updates as we get closer. And thank you for supporting our important fundraiser.

OCTOBER ZOOM ‘MEETING’

It's that time of year! We are taking our annual chapter photo show digital this year, and **we need your best pictures**. Chapter members are invited to share your best botanical and natural history most recent pre-COVID pictures. Not many things this year have been ‘normal’, but we are looking forward to carrying on this chapter tradition.

Members that want to participate in the presentation should prepare up to ten photos and email them to Dave Chipping at dchippin@calpoly.edu no later than **September 23, 2020**. Let him know ASAP if you need help or advice.

Please use JPEG/JPG format and keep the file size between 250 KB and 3 MB. (Remember that these slides will be seen as a ZOOM screen on people's monitors, which will have resolutions from 75-200 dots per inch, so sending a high resolution 600 dpi image in RAW or TIF form will be overkill). Indicate the order in which you wish to present the slides within the picture's title. If you don't know how to downsize a photo, just send it to Dave ‘as is’ and he will do it for you. We WILL accept very low resolution photos if that is all you have. Selfies with grizzly bears welcome!

We will compile everyone's slides into a single slideshow presentation to be presented via Zoom webinar. Each presenter will be given approximately 5 minutes to speak about their slides during the meeting (you will not have to share your screen, we will take care of that for you!). Due to time constraints, slides will be accepted and included on a first-come first-served basis.

For those that just want to join and view the October slide show presentation via Zoom, details on joining Zoom will be sent out at a later date.

Invasive Species Report

Bristly Oxtongue *Helminthotheca echioides*

Bristly oxtongue is in the Sunflower (Asteraceae) family. It's easy to spot and is well named. The bright lawn green leaves are covered with pimple like bumps (i.e. papillose) topped with stiff spiny hairs that sting to the touch. The annual or biennial plants emerge in the rainy season as rosettes of simple leaves that grow to 9 inches long and to 2 inches wide. It may grow to 3 ft. tall and produce yellow dandelion like flowerheads usually 1" diameter from May –September. It reproduces only by a dandelion like seed easily dispersed by wind or by lodging.

Bristly oxtongue is native to the Mediterranean and is widespread on the West coast. It is present in disturbed areas such as roadsides, fields with annual grasses, gardens and is common in seasonally wet places and thrives in clay soils. It is controlled by gloved hand pulling of taproots. If cutting with a hoe: chop down to 2 inches below the soil surface. Mowing them on the soil surface allows them to regrow and flower closer to the ground. One interesting medicinal aspect to Bristly oxtongue is that it is used for deworming. –

Mark Skinner



SLO CHAPTER DIGITAL PHOTO ARCHIVE PROGRESS REPORT

The chapter has bought two portable hard drives which are being populated with pictures. All species that will be listed in the upcoming SLO county flora publication from Dr. Keil have dedicated folders that are being populated where possible with pictures taken within the county. The highest priority is given to pictures where the location and date are known, and unfortunately the old slide transparency set often had no more than the species name. The pictures entering the collection, such as “*Pteridium aquilinum*” as an example, may be titled “3. *Pteridium aquilinum* 35.257-120.887 COON” if it is the third photo in the folder for that fern species and has a companion file “3. *Pteridium aquilinum* 35.257-120.887 COON INFO”. See an example below (top).

Photo Name:	3. <i>Pteridium aquilinum</i> 35.257-120.887 COON CREEK
Species	<i>Pteridium aquilinum</i>
Common Name:	Bracken fern
Family:	Dennstaedtiaceae
Location :	Coon Creek
Broad Location:	Montana de Oro State Park
GPS:	35.257-120.887
Date of Photo:	5/16/2013
File format:	jpg
File size:	6.5 MB
photographer:	David Chipping
Copyright:	CC BY-SA 4.0
Notes:	

An example of a folder is also shown below (bottom). Note that nearly all photos have a companion INFO file, Two by Craig Cunningham lacked location data, but are excellent photos of the fern taken by a master photographer.

The collection has two functions. One is a permanent archive of plant pictures, and also pictures portraying chapter history as field trip group portraits, and the other is a supportive role to Dr. Keil’s flora. Thus there is some duplication with the role played by Calflora, which illustrates Dr. Keil’s regional plant lists with photographs from their, and not our, archives. When we do not have a local photograph available, we have used a few photos from the CalPhoto and Calflora collections where we have copyright permission, and these are included in the folder. I have also included pictures of herbarium sheets from the Hoover Herbarium for a species where photos lacked sufficient detail.

It is my intent that the entire collection will be brought into each meeting, and anyone wanting to upload pictures to thier own computers will be able to do so. I think this will be very useful when people bring in a plant for identification, or need a picture for educational purposes.

I know it might seem a little strange to have both a photo file and an INFO file sharing the same name, but unfortunately my original intent to include the information in a metadata file held within each photograph (such as XMP) turned out to be impossible to implement so that the file could be viewed on all platforms.



YOU CAN ADD TO THE COLLECTION



Based on herbarium and other data, we know where plants have been seen and collected, and so it is possible to build a set of potential species-specific target locations. For example, a plant might have been seen at the bridge at Arroyo de la Cruz, but we have no photographs. Once I am a little further along I will send out “Wanted Pastors” and members can see if thay can find the plant, photograph it, and submit it to the collection.

... AND IN A CLOSELY RELATED PROJECT FOR THE HOOVER HERBARIUM

HELP US LOCATE PLANTS IN YOUR AREA

Where are all the flowers?! Thousands of images of plant specimens are now accessible online (cch2.org), but we are unable to map their distributions without latitude and longitude data. Can you help us pinpoint where these plants were collected by reading their location descriptions and putting a pin on the map? Do you have a favorite place that you want to investigate more? There are many plants in your neck of the woods that only you will know about. We are searching for volunteers to help us georeference plant specimens online. We will train you from the comfort of your own home, and you can participate in remote co-working sessions throughout the week. You should be comfortable working in a web browser and in websites like Google Maps. The ability to read maps and an understanding of basic geography is needed. Help us learn about where native (and non-native) plants have occurred in the past and leading to the present, and have some fun virtually exploring California locales along the way! To join our team, contact Katie Pearson, kdpearso@calpoly.edu **JEN YOST**

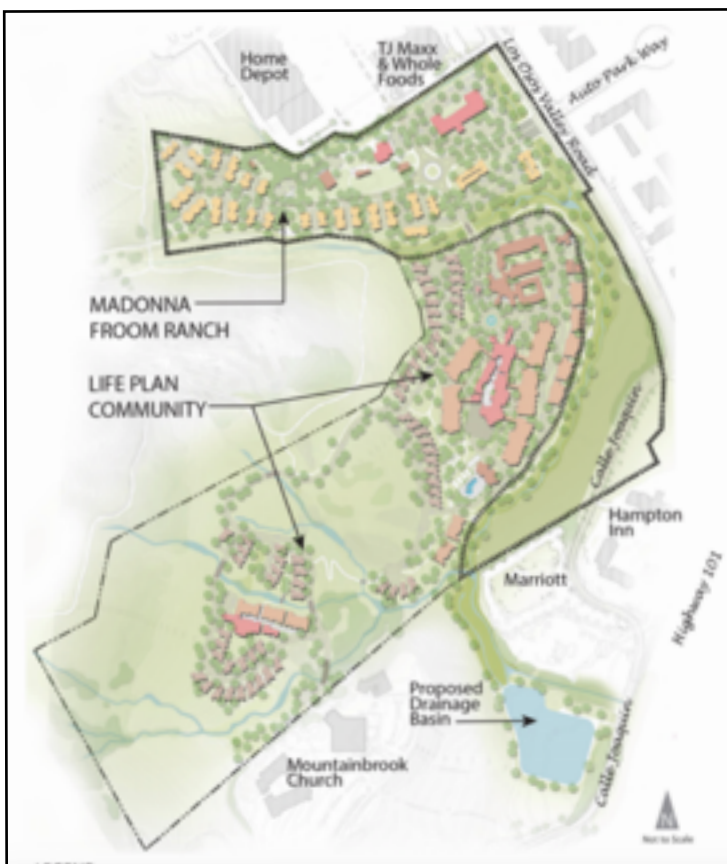
CNPS-SLO wins the fight for a better Froom Ranch Specific Plan

Beginning in 2015, an LA-based investment group, in partnership with a prominent local landowner and local planning firm, began the process of seeking to develop a large residential project in the City of San Luis Obispo at the corner of Los Osos Valley Road and Calle Joaquin. The project, known as the Froom Ranch Specific Plan (FRSP), proposes to develop some 404 units of senior housing, including so-called “memory care”, plus a more standard development of 130 apartments and associated commercial development as a separate but related project on the 110 acre Froom Ranch property. CNPS-SLO has not opposed the FRSP per se, but we have strong reservations about the severe environmental impacts the project would impose on the community in general and the Irish Hills in particular.

An Environmental Impact Report on the project was undertaken beginning in mid-2017. That report was finally released in November 2019, and described many impacts from the project. It recommended numerous changes to the project to reduce or eliminate those impacts, and recommended many more “mitigations” to offset those that could not be eliminated.

CNPS-SLO has followed this process closely, as we have long been advocates of the City’s environmental policies, and we have been quite vocal about them. Among the most important impacts we have objected to are:

1. Allowing development above the 150 foot elevation along the base of the Irish Hills, including a sensitive and natural serpentine bunchgrass community;
2. Placing an isolated part of the development in a site surrounded by sensitive woodland;
3. Placing two Chorro Creek bog thistle populations at risk;
4. Rerouting Froom Creek around the project site;
5. Exposing downstream areas to increased flood potential;
6. Potentially damaging the Calle Joaquin wetland and other sensitive wetland habitats; and
7. Eliminating part of an existing conservation easement to accommodate the development.



Froom Ranch original configuration (left) and the final configuration (right). Note the removal of development in the southwest corner, and the reduction of units in the northwest area at the mouth of Froom Creek canyon.



With release of the EIR, the project sponsors themselves saw the severity of one of the most significant impacts and publicly announced that they would drop most of the project above the 150 foot elevation in order to avoid those impacts. They also approached CNPS-SLO to discuss other issues if the project in an attempt to blunt our opposition to other aspects of the project or to modify them if possible.

We called for changes to those parts of the project which compromised the integrity of Irish Hills Natural Reserve, or which degrade the environment of Froom Creek or the Calle Joaquin wetland. Specifically we sought the changes described below, and the current status of those changes is shown in *italics*:

1. Preservation of all lands above 150 foot elevation; dedication to the City of SLO, with conservation easement held by the Land Conservancy. *The project sponsors have offered to dedicate the lands above 150 feet to the City, which is now considering the offer. We have argued forcefully for it and assume it will be accepted.*
2. Preservation of the wooded “cove” area, and its inclusion in the dedication described above. *Done, and included in the above offer of dedication.*

CNPS-SLO wins the fight for a better Froom Ranch Specific Plan (continued)

3. Establishment of a park at the former quarry area, with trailhead, historic buildings, and enhancement project on Froom Creek's north bank and adjacent flood plain (see #7 below). *Largely done; a certain amount of residential development will be allowed in the former quarry area, but the trailhead and historic park will also be there. Modifications to Froom Creek in this area will likely be done, but not to the degree we had hoped.*
4. Presentation of 1, 2, and 3 above, together with adjusted agricultural conservation easement, as a package to justify said adjustment of conservation easement. *Largely done.*
5. Reasonable proof that rerouting of Froom Creek will: (a) result in establishment of healthy native riparian gallery forest plantings (b) include use of appropriate native upland species on any elevated surfaces and (c) result in restoration of ecological functions lost due to destruction of existing detention basins in proposed new basin. *This will be determined by future permitting requirements from the State and Federal governments; however, we are confident that our requests for proof will be met.*
6. Reasonable proof that rerouting of Froom Creek will not: (a) interrupt groundwater flow (b) exacerbate flooding or drying of Calle Joaquin wetland (c) damage the wetland *Similar to the above.*
7. Mitigation for losses of native bunch grass habitat to include enhancement on the flood plain of Froom Creek at the mouth of Froom Creek Canyon where an excellent opportunity exists in an area now dominated by the non-native fountain grass (*Pennisetum*). *We will continue to push for this as an obvious and credible mitigation.*
8. Mutual agreement on boundaries of the development and the nature of the required buffer areas between the new development and lands that will remain in open space uses. *CNPS was not directly involved in boundary determinations, but upon review of the tentative map we are satisfied that they are appropriate and meet our concerns.*

CNPS-SLO will continue to press for the remaining changes right through the approval process, which is expected to take at least a year. However, we can pat ourselves on the back for a job well done.

NEIL HAVLIK

Editor's Note: Special thanks is given to Neil Havlik for his keen attention to this project, his cogent analysis of the issues, and the numerous meetings he attended.

YET ANOTHER TERRIBLE PROJECT ! DANA RESERVE PROPOSES MASSIVE REMOVAL OF OAKS IN NIPOMO

Dana Reserve is a proposed development on property currently zoned to allow a minimum 5 acre parcel size under current zoning. This would enable about 50 ranchettes, similar to those covering much of the Nipomo Mesa. The developer wants to shove 1,270 units into this space, with the obvious loss of most of the oaks. The developer thinks buying and protecting another oak-covered parcel in the hills to the east of Nipomo, which absolutely cannot be considered mitigation. The project would require a change to the General Plan, and faces water issues. In August a CNPS Conservation team checked out how replacing lost oaks (usually done on a 4:1 basis in past projects), worked out for the mitigation of oak loss on the Willow Road extension. For that, lands of the Dana Adobe were planted with oaks, which we visited in August. We saw that there was a very high failure rate in the planted area, probably because the soil was highly expansive and would never have supported oaks as soil shrinkage in summer terminally damages oak roots. A guestimate was that a maximum of 40% of the irrigated, planted oak sites contained living oaks. This project is currently at a very preliminary stage. The two pictures below are a Google Earth view of the project, outlined in red, and the developers proposed plan.





I am sad to announce that there will not be a seed exchange this October. Coronavirus has gotten in the way of another fun activity. This is very disappointing to some of us as we have had more time to focus on the plants near us and have been busy collecting seeds. If you are one of those, please keep your seeds for next year in hopes that we have an exchange next year. In years past I had requested that seed be of the current year but for next year perhaps we can make an exception. Some native plant seeds can remain viable for some time. We might expect lower germination or maybe even no germination but we aren't out anything but a little soil, water and time if nothing grows. If you do keep them, most are best in paper, not plastic, and in a cool dry room for a year or so. Dara Emery's book, *Seed Propagation of Native California Plants* has some good information on seed storage.

It has occurred to me that there is a way we can share some seeds before the fall planting time. I have collected many from home and from the San Luis Obispo Botanical garden. I am willing to make a list of the seeds that I do have and send the list to those who are interested. Please contact me by email and put "seed exchange" in the header. (slomire@msn.com). We could communicate one on one and figure out the best way to get seeds to you. For many species I don't have a lot of seeds and I would honor the first requests received.

If others are interested in sharing their seeds, please send me a list before October 10th. I can then send that list on to others that are interested. Please put your email somewhere on the list so that I can just forward it to others. I will send the list to interested people. It will be up to the individuals to contact the person who has the seeds to arrange a way to exchange the seeds.

I will be making packets of a few wildflower seeds to sell at our online plant sale in November. Rather than have those be ordered on line there are discussions for having a browsing area for items such as books, T-shirts and seeds at the pickup site. These plans are preliminary but I am hoping that we will have a way of getting native seeds to people to increase the planting of natives in our community. If you have a large quantity of seeds that might be suitable for this please contact me. **MARTI RUTHERFORD**

HOW DOES YOUR GARDEN GROW?

How does your garden grow? And how do climate and soils affect what can be a success or a failure? Over the years I have noted certain plants excel when I planted them and others did not. Digging deeper, I went back to the basics, environmental factors such as natural habitat and range, soil type (geology), and sun exposure (light) proved to be the underlying answer..

Quoting Alfred Austin, English poet (1835 – 1913), "*There is no gardening without humility. Nature is constantly sending even its oldest scholars to the bottom of the class for egregious blunders.*" When I look at the planting that I have done, I see that those natives I planted in the soil and climatic zones that most resemble their native habitat of origin have grown the best. When I tried to plant a Western Redbud (*Cercis occidentalis*) in a coastal yard, I got leaves but no blooms. After doing some investigation, I found that Western Redbud needs at least 20 hours of below 32°F temperature to have a good bloom. This is not going to happen in Los Osos, CA.

Now focusing on soils, Dr. David Chipping would be the first to let you know that certain plants only grow and do well on certain soil types. I had a client who lived on a serpentine ridge and he called me, asking '*John everything that I plant doesn't grow, what's wrong?*' After traveling to the property, I noted that he not only had serpentine soil, but lived on the top of a mountain with heavy coastal winds; not a good place to start Monterey Cypress (*Hesperocyparis macrocarpa*). The trees were struggling, burned from the wind and from the lack of water due to the fact that serpentine soil does not have the capability of holding moisture, because of severe quick drainage.

So how does your garden grow? It's important to look at your soil, is it clay or sand? Do you live on top of a hill of rocks? Are you in a coastal zone with lots of fog and wind? In the summer months, if you live by the coast, the fog is a perfect vector for fungal pathogens, like black spot and mildew on inland Manzanitas (*Arctostaphylos*); such as *Arctostaphylos bakeri* 'Louis Edmunds' or *Arctostaphylos manzanita* 'Dr. Hurd'. As we approach the Fall season, it's important to keep these basic principles in mind when you select new plantings for your landscape.

So this ends the second issue of How Does Your Garden Grow? Be safe and enjoy your garden. If you have any questions, contact me at gritlys@gmail.com.

Until next time, happy gardening. **JOHN NOWAK**

Ethnobotany Notes: or Garden Musings?

Cathy Chambers

Unexpected delights in a year not so delightful. Spring and summer of 2020

In December, I retired from teaching children as a naturalist. I had planned to get more serious about studying ethnobotany, taking courses, travelling, researching. Then all planning went out the window when Covid-19 arrived. My parents needed more care than I had expected, and all of my classes and conferences were cancelled. Instead of spending time exploring the mountains and deserts, I moved to the Bay Area suburbs to the house I grew up in and was shopping, cooking, cleaning, and driving parents to the doctor, (unrelated to Covid). I would like to say that I accepted this change gracefully, but I did not. I was kicking and screaming all the way, in my own head anyway. Outwardly, I kept things together. My saving grace was gardening, and botanizing by mountain bike.

I found that I could bike to local open spaces, and parks, and ride out on the dirt roads, seeing lots of familiar plants. There were beautiful oaks, shrubs, wildflowers, and riparian areas. Some were the same species I knew from the central coast, as well as many new ones. It was comforting to see *Baccharis*, mugwort, yarrow, toyon, grape, *calochortus*, and then tarweeds as the season progressed. Exercising on the landscape has always been my greatest comfort. I guess I love gardening because it brings the landscape to your living space.

I had been helping my Mom with her garden for several years, even more since her husband had died. I had planted native plants from our CNPS native plant sale as well as plants from the local CNPS chapter nursery in Berkeley. All the plants I've written about in this column: yarrow, mugwort, elderberry, oaks, mints, wild cherry, and others were here in the yard and I was looking forward to using them. I've always been interested in growing these plants to use and experiment with rather than taking them from where they are growing in the wild.

The native garden thrived, as well as the extensive vegetable garden that I planted, but I found that I enjoyed the animals that came to the garden as much as the plants themselves. I was especially thrilled when my elderberry, which was several years old now, was eight feet tall and covered with inflorescences. They attracted so many diverse flying insects. There were also huge numbers of insects visiting the Toyons, *Monardellas*, Yarrow, and *Salvias*. There were so many different kinds of bees, flies, and even a resident crab spider taking advantage of the visitors to the elderberry flowers. Time passed, fruit formed, and I was anticipating elderberry jelly. One day, I noticed Bluebirds at the bird bath. It was so much fun watching the young ones learn how to bathe from the parent. Then I saw them on the elderberry, way up high. I thought they were probably eating some kind of insects on the plant, but then I noticed they were eating the berries. I could have picked the berries then, but I enjoyed providing the food and habitat for the birds, so I let them have them.

I also saw hummingbirds raise a family, enjoying the *Salvia microphylla*, and then the later blooming California fuschia. A family of Goldfinches kept pecking at the leaves of my sunflowers. At first I was surprised that they would eat the leaves, but then realized that there were larvae inside of the leaves that they were eating. We shared our plums and apples with a scrub jay family that nested in the *Bougainvillea*. Reciprocally, The Great horned owl family surely helped control the rodent population, which ate part of my vegetable garden.

I was surprised at how much diversity and habitat we could grow in 1/3 of an acre of suburban habitat. I was also surprised how much joy I got from watching the birds. I had always been a plant person, not a very good birder, but my horizons have been expanded. In the midst of a pandemic, as well as dramatic life changes, I found my place and my solace in the ecology of the garden as well as the natural landscape. The only thing missing, was sharing it with students. That will have to wait until next year. For now, I am looking forward to the next CNPS native plant sales to buy more plants to add to my habitat garden.



Fall Colors
around Los Osos
David Chipping





David Krause has photographed these hybrids between *Abronia latifolia* (yellow), *Abronia maritima* (magenta) and *Abronia umbellata* (pink) in the dunes just north of Arroyo de la Cruz

CNPS FIRE RECOVERY GUIDE FREE FOR DOWNLOAD

SINCE WE TOLD YOU ABOUT THIS IN THE LAST ISSUE THERE HAVE BEEN UNPRECEDENTED FIRES IN THE WEST, PROBABLY THE MOST SEVERE EVER, AS NATIVE AMERICANS REGULARLY BURNED THE LANDSCAPE. AND NEVER ALLOWED FUEL TO BUILD UP .



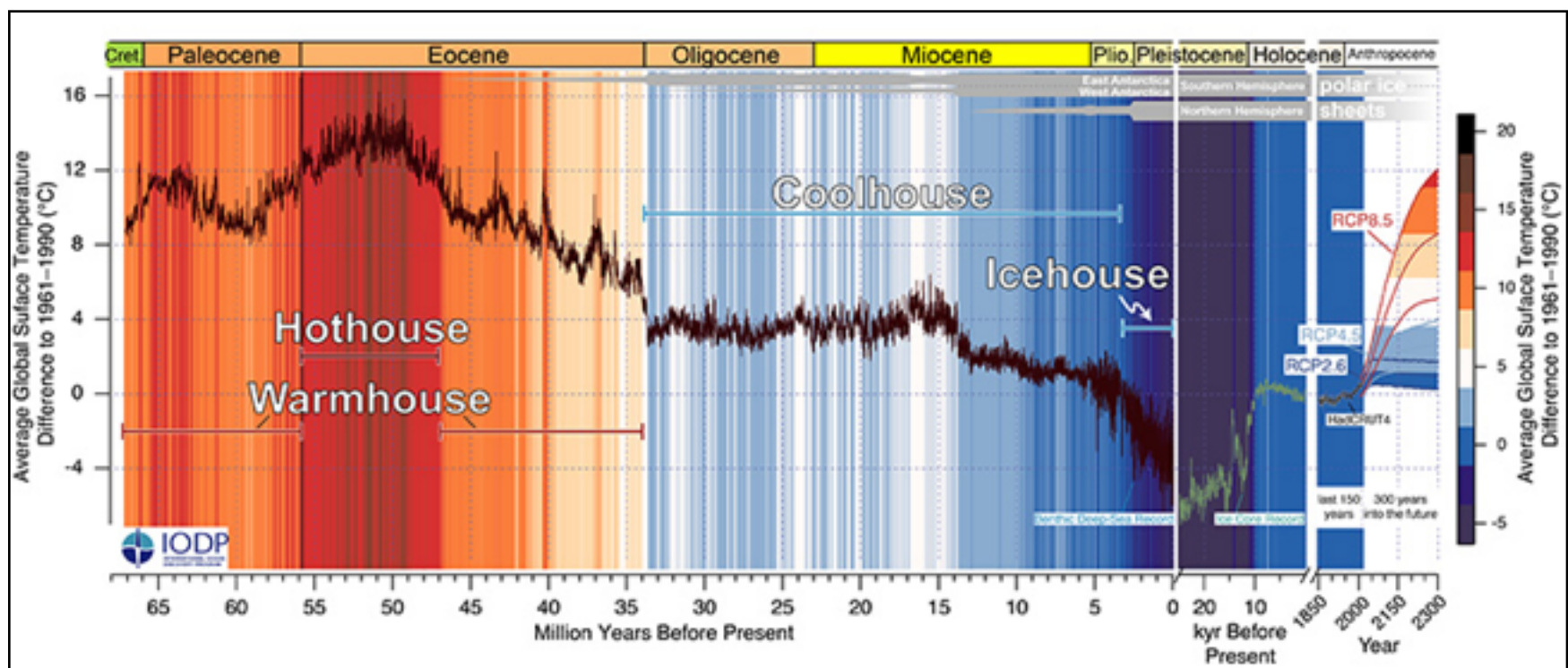
www.cnps.org/give/priority-initiatives/fire-recovery



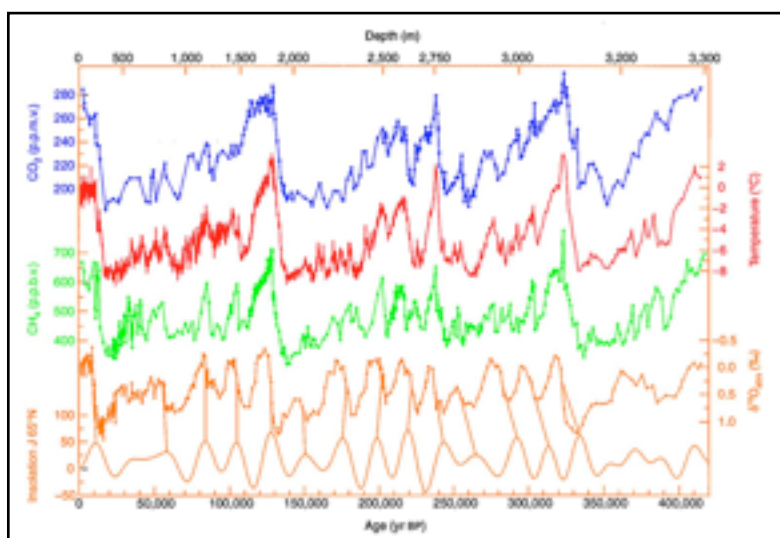
‘I don’t think science knows,’ Trump responds when challenged on climate change at wildfire briefing

Actually ‘Science’ knows a great deal, based on research on past climate and the physics of the atmosphere, combined with projections of future human-induced changes to the atmosphere. Most of you will have seen these facts debated, but I would like to share with you the longer view that a geologist like myself finds of great concern. The September 10 edition of the journal Science had an article by Westerhoff and others of a project called CENOGRID. Microscopic marine animals called foraminifera create calcium carbonate shells in which the ratio of the O18 and O16 oxygen isotopes is a function of ocean temperature. Decades of drilling deep into ocean sediments, dating them and then measuring the temperature of the ocean at the time of deposition reflect the curve shown below. The expanded right side show the planet climbing out of the last ice age, and on the extreme right the post-1850 changes. Future global greenhouse gases are projected forward using four scenarios, and the predicted global temperatures that will be reached under each model. I should note that it seems we are increasing greenhouse gases faster than even the most extreme of the models shown, so by 2300 AD we should have reached the extreme heat of the Eocene epoch. The very broad changes from hothouse to icehouse appear to be due to plate tectonics and the distribution of oceans and continents, plus biosphere changes.

Note that the global temperature was starting to drop just before we started burning coal in vast quantities. On a smaller scale of a few hundred thousand years, climate fluctuates due to orbital changes in the Earth’s orbit, axial tilt, axial precession (like the toppling of a spinning top) and orbital eccentricity. Called Milankovitch cycles, they indicate that the Earth should be starting on a cooling limb on a cycle of 100,000 years in length.



UC Santa Cruz Magazine September 10, 2020



Wikipedia: Public Domain

The short term cycles are illustrated by isotopes and gases caught up in ancient ice (the Vostok ice-core data). The graph to the left shows the present time on the left side, and about 400,000 years BP on the right. Saw-tooth fluctuations in carbon dioxide (blue), methane (green), oxygen isotope ratios (brown) and the temperature (red) are all seen the rise to peaks very quickly, and then descend to the next low more slowly. You can see that it seems we have reached a peak and would be about to enter a sustained cooling trend. This makes our current warming all the more troubling, as we should be cooling about now.

So here is a troubling reality of CNPS. The climate you grew up in, and the plants you and your ancestors grew up appreciating, are going to change. The coming climate changes will not be sufficiently mitigated in your lifetime, based on current global actions, to prevent massive changes in the California flora. All those motor scooters in the streets of Asia are not going to be replaced by Teslas. The good news is that there WILL BE a California flora, The Jepson Manual edition 10 will just be kinda different.

THE GOOD PEOPLE WHO MAKE THE CHAPTER ‘HAPPEN’ AND HOW TO FIND THEM

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