Planting for Pollinators
May 22, 2022

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

UC Master Gardener Program
Napa County

UC Master Gardeners of Napa County

http://napamg.ucanr.edu/

Our mission: "To extend research-based knowledge and information on home horticulture, pest management, and sustainable landscape practices to the residents of California and be guided by our core values and strategic initiatives."


Pollinators and the
Plants they Love

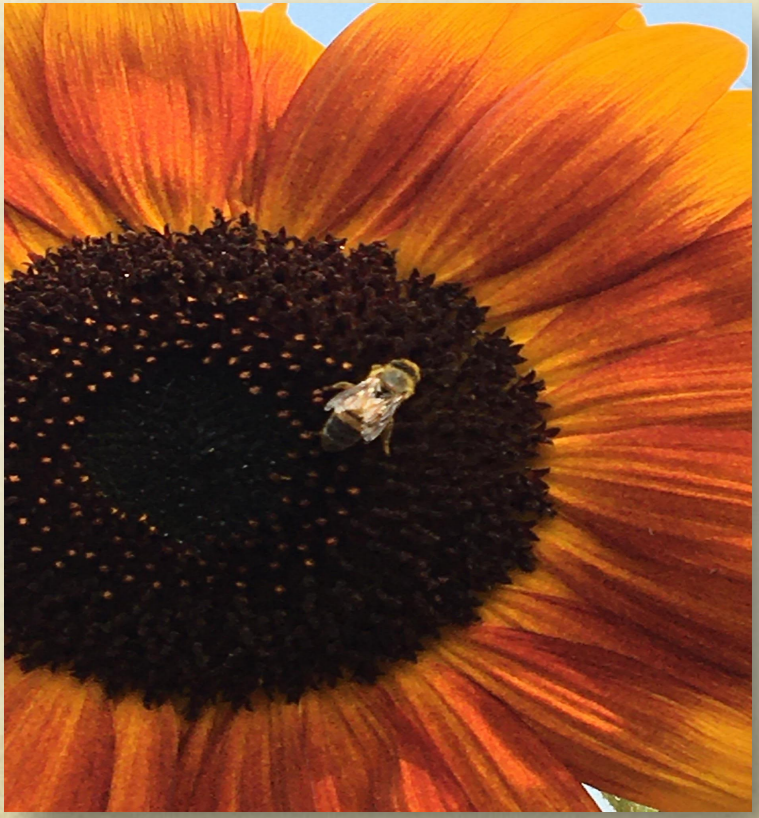
Methods of Pollination

Wind/Water-Abiotic

Some flowering plants, like the grasses (345), sedges (197), and rushes (63), are pollinated by the wind. Grains, nut trees, conifers and grapes are also pollinated by wind.

Water pollinated plants are aquatic

Biotic Pollination
Use of a pollinator-or living creatures



More Common Pollinators

Not major pollinators, yet pollinators all the same.

Even we can be a pollinator

Coevolution

The Flower and the Bee

Bombus terrestris, Bumble Bee

Carpenter Bee

Sweat Bee

Buzz Pollinators

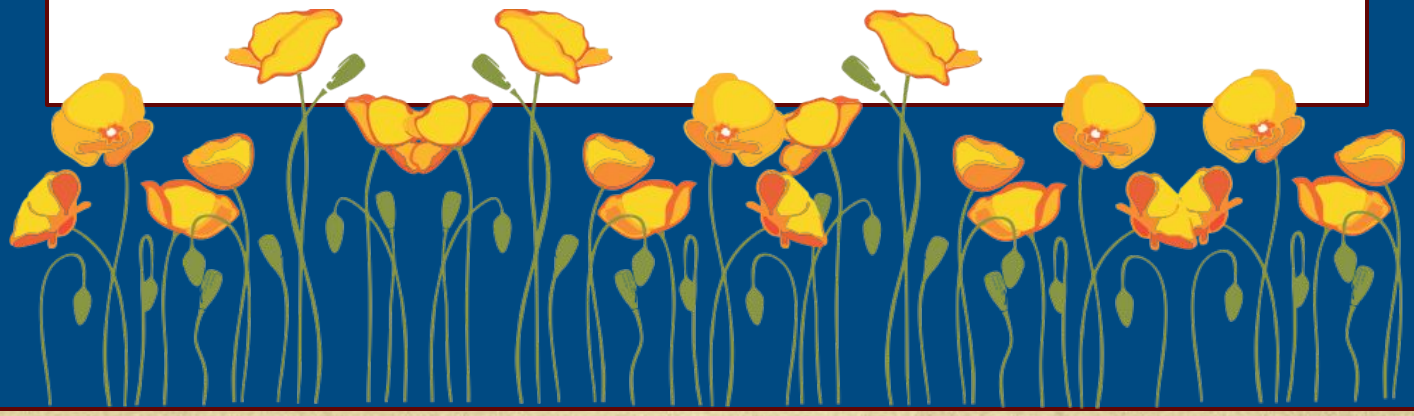
Plants that rely on the buzz pollination have a unique anther shape compared to other flora.
These plants include:
The Solanaceae family, Eggplants, Potatoes, and Tomatoes.

Also Buzz Pollinated

Blueberries

Cranberries

Significant body attributes make pollination possible



Pollen Baskets/Sacs

Hairy bodies

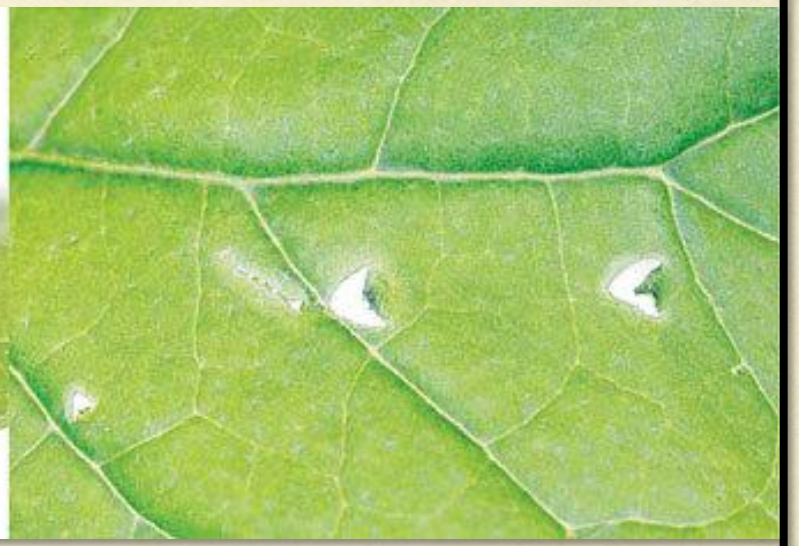
Beaks and proboscises

Other pollinator habits

Flower Constancy
Flower gets the advantage

Nectar Robbing (no pollination)
Bee gets the advantage

How the Bumble Bee manipulates the plant for its survival



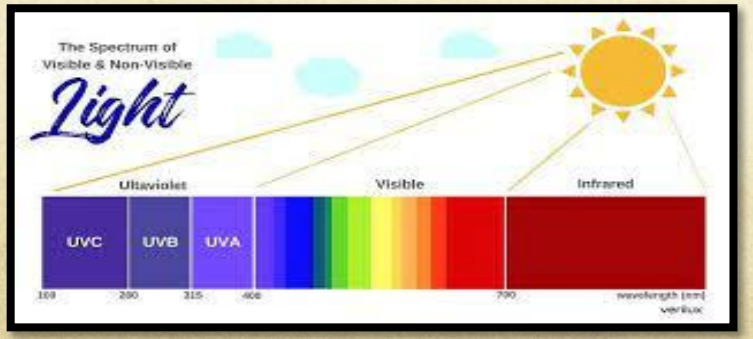
Pollination Syndromes

Are suites of flower traits that have evolved in response to natural selection imposed by different pollen vectors, which can be abiotic (wind and water) or biotic, such as birds, bees, flies, and so forth.

These traits include color, scent, shape, size, and reward, nectar and pollen.

These traits have evolved for all manner of pollinators. Most common would be bees, moths, butterflies and birds.

Color
As bees see it.



More Color

Birds prefer the colors in the red/pink and orange range.

While Moths and Bats like to color white, it's easier to see at night .

Size Matters

Flowers with **big "landing pads"**.

Plants with **many small flowers**.

Shape of the flower

Beetles on large open flowers.

Hummingbird on Monarda

Small native bee on a thyme flower

It's not all about the Nectar

Pollen is food for a number of pollinators.

They are; Bees, wasps, ants beetles, flies, butterflies, moths, mites, spiders, and birds.

Pollinators you can have in your Garden and their needs

Home is where the brood is (Solitary bees)

Tawny mining bee
Andrena fulva

Carpenter bees
Apidae

Mason and wild bee house

Social Bees

(colony or social nesters)

Commercial hive

Feral hive

Bumble bee nest

Was found under a shed

Honey bees nest in tree hollow

Another common pollinator is the Butterfly

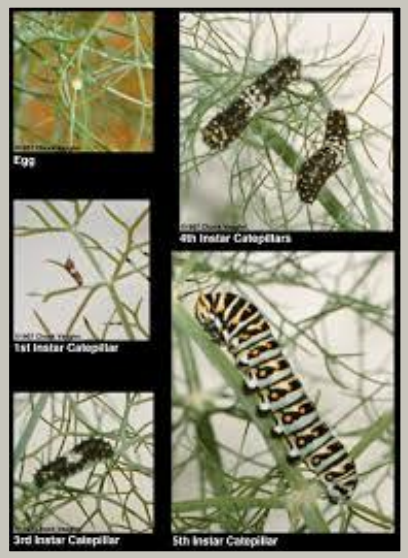
Cabbage White Butterfly

A California native Butterfly

Pipevine Swallowtail

Battus Philenor

Anise Swallowtail Butterfly
A native to the North America



Monarch Butterfly (species of concern)

Monarch Butterfly
(Danaus plexippus)

Please help the Monarch Butterfly

Consider planting one or both of the native milkweed:

Showy milkweed

(Asclepias speciosa)

or

Narrow Leaf milkweed

(Asclepias fascicularis)

Why it's best to use every means possible to control garden pest before resorting to pesticides.

Bacillus thuringiensis (Bt)
Bt makes toxins that target insect **larvae.** when eaten the toxins are activated. The activated toxin breaks down their gut, and the insects die of infection and starvation. Death can occur within a few hours or weeks. *If using be very careful not to overspray.*

Neonicotinoids
Most **neonicotinoids are very toxic** to **honeybees and other beneficial insects.**

Spinosad
Spinosad is very **highly toxic** to **bees when wet**. However, evidence suggests that spinosad has little or no effect on honey bees and other beneficial insects after sprays have dried. So close attention should be paid when using Spinosad.

The Better Way IPM

is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

- **ID Pest so you know what you're dealing with.**
- **Monitoring amount of damage.**
- **Set guideline to when action is needed-what can be tolerated**
- **Using a combination of biological, cultural, physical or chemical tools**
- **Biological Control –natural enemies such as lady bugs, praying mantis, and many more.**
- **Cultural Control-such as change irrigation practices to reduce weeds and root disease-mulch to control weeds**
- **Mechanical Controls-Traps and barriers.**
- **Last resort-Chemical Control-targeted and follow instructions to the letter.**

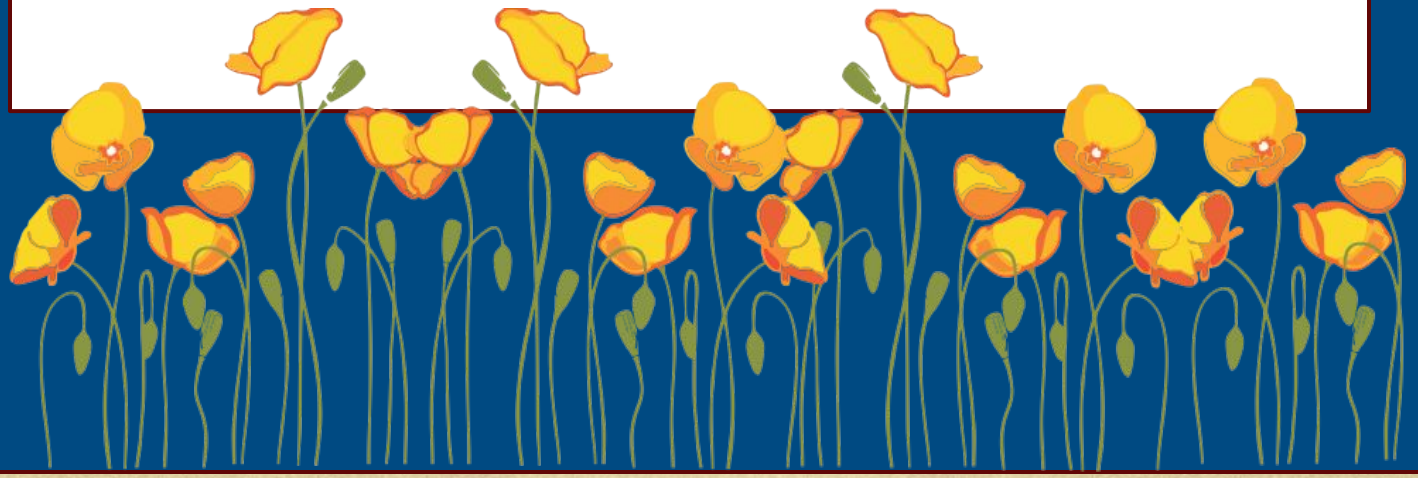
Monarch Butterfly conservation

https://xerces.org/monarchs

https://www.fws.gov/savethemonarch/

Planning a Pollinator Garden

What to provide and consider



Shelter

Food

Size and Shape are Important

Bees

Food that attracts bird, Moths and some the other pollinators

Colors and Heights

Fragrance

Beetle

Moth

Bees

Go Native

California Poppy
Eschscholzia californica

California Flannel Bush
Fremontodendron californicum

Manzanita
Arctosaphylos

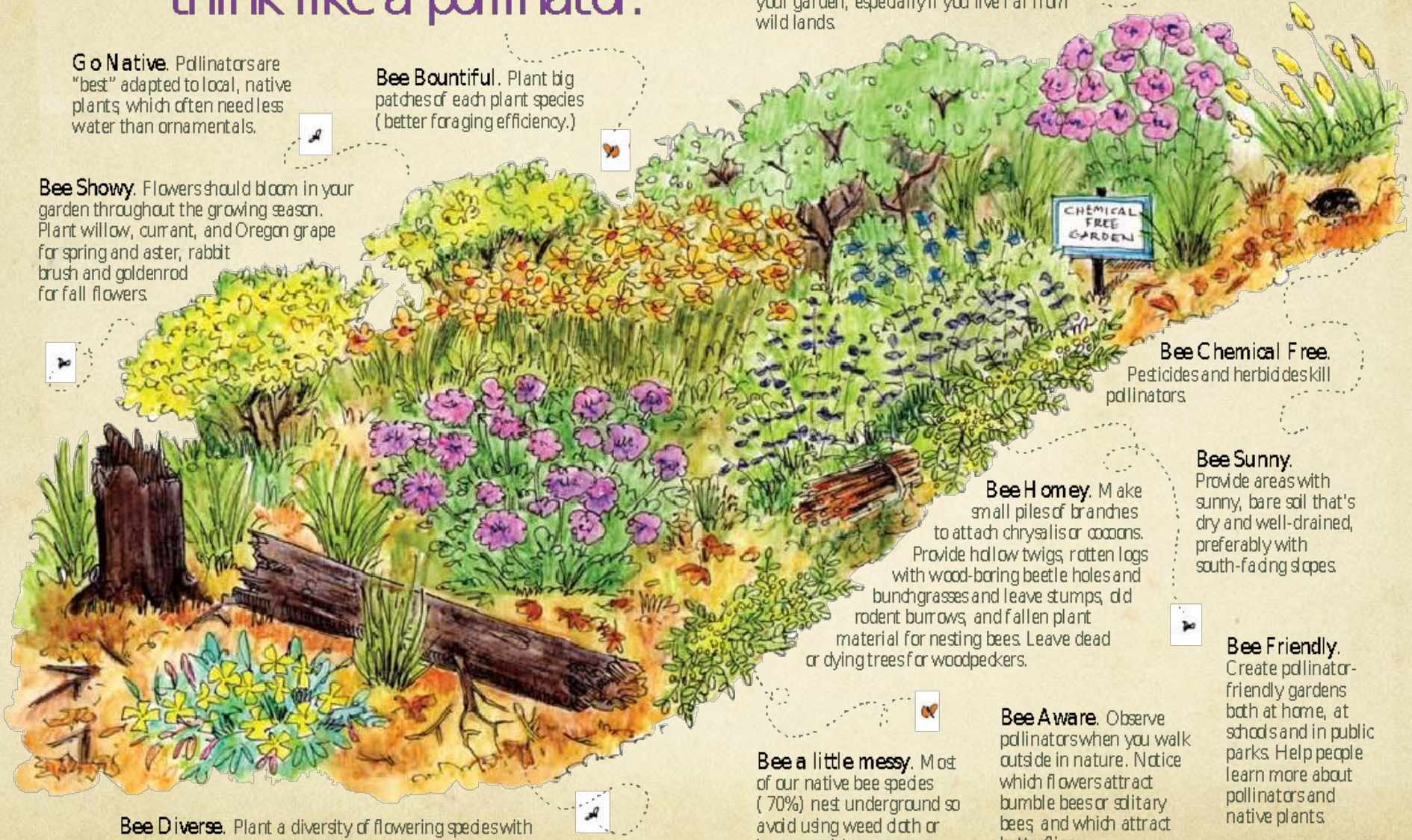
Yarrow
Achillea millefolium

Water

Secure-Safe

Tolerance

Planning your garden – think like a pollinator.



Bee Patient. It takes time for native plants to grow and for pollinators to find your garden, especially if you live far from wild lands.

Bee Gentle. Most bees will avoid stinging and use that behavior only in self-defense. Male bees do not sting.

Go Native. Pollinators are "best" adapted to local, native plants, which often need less water than ornamentals.

Bee Bountiful. Plant big patches of each plant species (better foraging efficiency.)

Bee Showy. Flowers should bloom in your garden throughout the growing season. Plant willow, currant, and Oregon grape for spring and aster, rabbit brush and goldenrod for fall flowers.

Bee Chemical Free. Pesticides and herbicides kill pollinators.

Bee Sunny. Provide areas with sunny, bare soil that's dry and well-drained, preferably with south-facing slopes.

Bee Homey. Make small piles of branches to attach chrysalis or cocoons. Provide hollow twigs, rotten logs with wood-boring beetle holes and bunchgrasses and leave stumps, old rodent burrows, and fallen plant material for nesting bees. Leave dead or dying trees for woodpeckers.

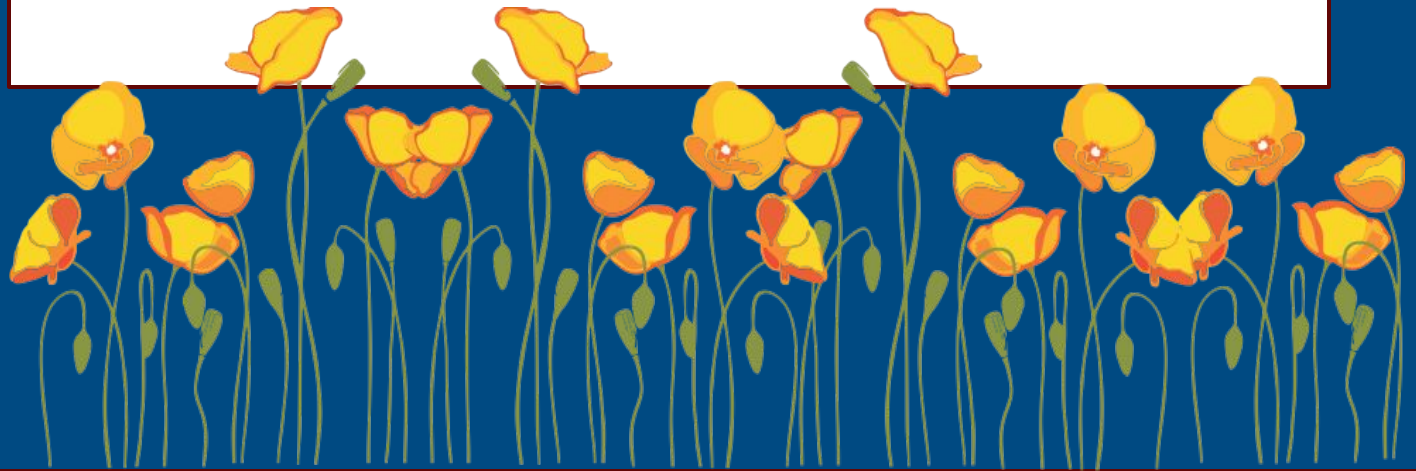
Bee Friendly. Create pollinator-friendly gardens both at home, at schools and in public parks. Help people learn more about pollinators and native plants.

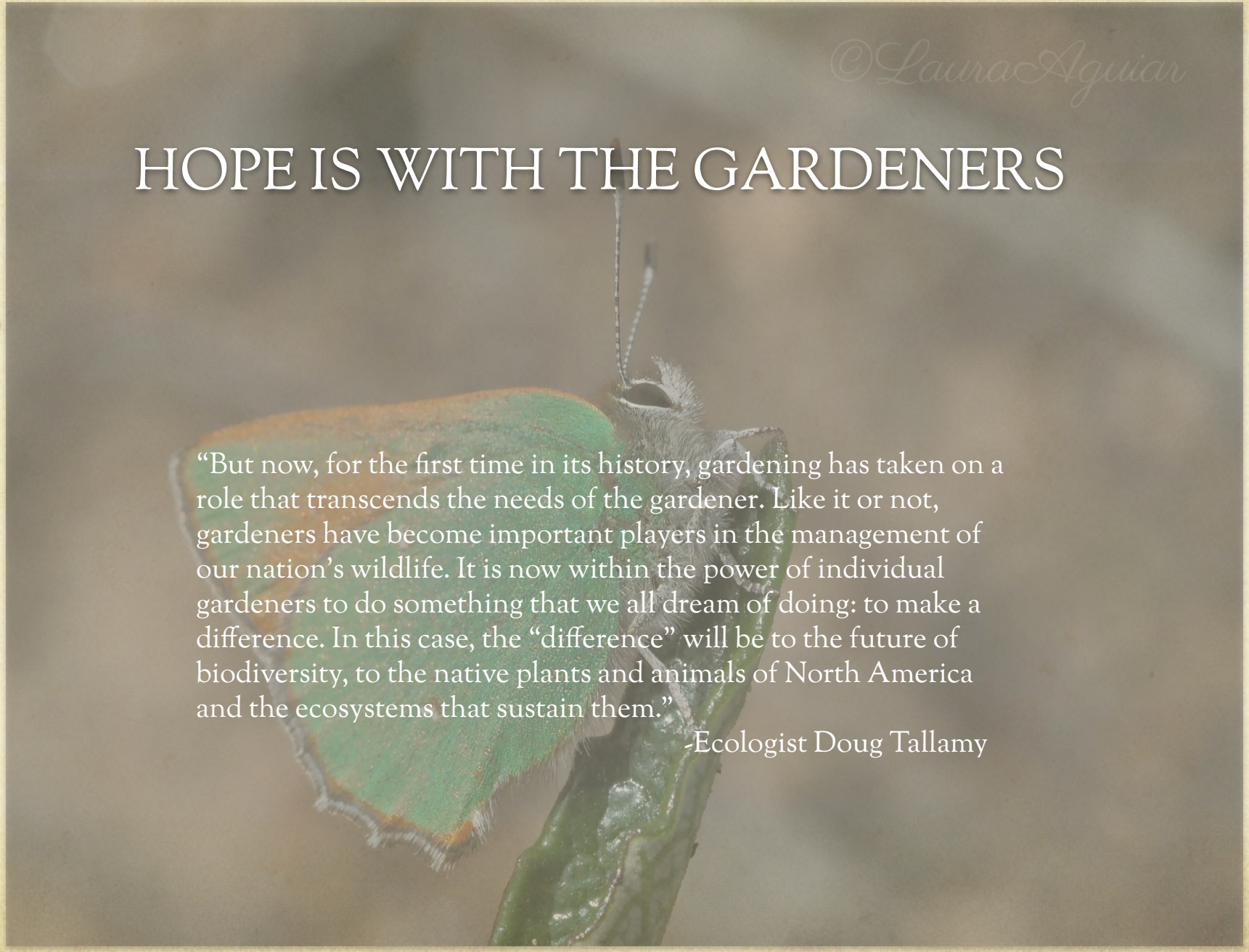
Bee a little messy. Most of our native bee species (70%) nest underground so avoid using weed cloth or heavy mulch.

Bee Aware. Observe pollinators when you walk outside in nature. Notice which flowers attract bumble bees or solitary bees, and which attract butterflies.

Bee Diverse. Plant a diversity of flowering species with abundant pollen and nectar and specific plants for feeding butterfly and moth caterpillars.

For more information on planning a pollinator garden please watch the public workshop available on the Master Gardener's Public website under "Planning a Pollinator Garden", dated October 4th 2020





HOPE IS WITH THE GARDENERS

"But now, for the first time in its history, gardening has taken on a role that transcends the needs of the gardener. Like it or not, gardeners have become important players in the management of our nation's wildlife. It is now within the power of individual gardeners to do something that we all dream of doing: to make a difference. In this case, the "difference" will be to the future of biodiversity, to the native plants and animals of North America and the ecosystems that sustain them."

-Ecologist Doug Tallamy

Pollinators. So What?

- Essential for plant reproduction and healthy genetic diversity in plants
- Vital to sustaining our ecosystem
- Fascinating and beautiful
- Evidence that pollinators - and insects in general - are declining everywhere

“Imminent Danger of Extinction”


Photo by James P. Strange USDA-ARS Pollinating Insect Research Unit

Effective September 23, 2021 the U.S. Fish and Wildlife Service listed Franklin’s Bumble Bee (Bombus franklini) as an endangered species. It has the narrowest distribution of any bumble bee in the world, found only across northern California and Southern Oregon between two mountain ranges - spanning only five counties. No one has seen one of these bees since 2006. This is one example of a pollinator that is in imminent danger of extinction.

USFWS did not however, designate critical habitat for Franklin’s Bumble Bee.

What Do Pollinators Do?

Pollination is the process of moving pollen grains from one flower to another of the same species - from the male anther of a flower to the female stigma.

As a pollinator eats or collects pollen for pollen's protein and additional nutritional characteristics, or as the pollinator sips nectar from the flower, the pollen grains attach themselves to the pollinators body. When the pollinator visits another flower looking for more pollen or more nectar, pollen grains fall off onto the flower's stigma hopefully resulting in successful reproduction!

So, pollinators obtain food in the form of energy-rich nectar and/or protein-rich pollen, from the flowers they visit and in return, the flowers receive their services of moving the pollen grains from one flower to another.

WANTED
Pollinators!

- Most plants - about 85 percent of all flowering plants - require an animal, usually an insect, for pollination
- Nearly all ecosystems on Earth depend on the pollination of flowering plants for survival
- Pollinators enable the reproduction of plants, sustaining the species that rely on those plants for food, such as the fruits and seeds birds eat
- Pollination is vital to our food supply and therefore to us as humans who need to eat
- Pollinators enable the reproduction of plants, and plants enable the reproduction of pollinators and other insects which in turn sustain the species that eat them

Why Native Plants?

- They are the foundation of our native ecosystem.
- Native plants have coevolved with animals, fungi and microbes, to form a complex network of relationships. Insects have had to evolve the ability to find their host species among the thousands of plants and synchronize their life cycle with when the parts of the plant they depend on appear.
- If a plant has evolved locally, it likely performs important ecosystem functions. A plant outside of its regional habitat does not support diversity of insects and in turn will not supply as much food for animals as it would in its native ecosystem.
- Native plants do the best job of providing food and shelter for native, wild animals.
- Native plants evolved to live with the local climate and local soil types.

Native Plants in Our Gardens

- Gardens are groups of plants and have the potential to perform the same essential biological roles fulfilled by plants in healthy,"wild" ecosystems.
- The plants we have in our gardens can make or break beneficial insect reproduction, bird reproduction, and so on.
- Our plant choices impact the way species interact with one another and the very diversity of those interactions altogether - all of which impact ecosystem function.
- Conserving only separate and remote places on our planet as "wild" and "native" leaves our native, local plants and pollinators out and in peril.
- Native gardens can help the web of interactions that abundant non-native plants are breaking.

Keystone Species/Keystone Roles

First coined by Robert T. Paine when he studied species interactions in 1969 in rocky tidal pools out here in the Pacific Coast. He found that removing certain species from an ecosystem had minimal effect on the populations of species still present but if this one predatory starfish disappeared, the ecosystem collapsed.

Ecologists raced to identify keystone species everywhere. However, their search turned up so many species that influence the fate of other species! As research continues, we now understand that a particular species may play more of a keystone role in sustaining ecosystem function and diversity only *some* of the time.

Great takeaway is: Biodiversity is essential to the existence of stable ecosystems and all species have the potential to "sink or save" the ecosystem.

However, there is such a thing as native species which host many dozen insect specialists and other species that host less insect specialists.

Our native oak trees are known to support 534 species of the Lepidoptera (Butterflies and Moths), alone!

Featured Native Plant With Keystone Roles

Solidago velutina ssp. californica
(California Goldenrod)

Produces masses of flowers in late summer and fall when many other plants are already dormant.

Adaptable to different soil types, various levels of sun exposure, and has very low to low water needs.

It is likely to host at least 39 species of butterflies and moths alone, which means it is likely to be a source of food for many other species, including bees.

You may get to see beautiful emerald moths.

Since roughly 30% of native bee species are tunnel-nesting growing shrubs and plants with hollow stemmed (pithy-stemmed) provides a home for these bees, especially its dead twigs and branches.

You Can Do It! Remember:

Native plants mass well! Create more densely planted gardens!

Build complexity and diversity: Small plants in front, large ones in the back!

Reduce area dedicated to lawn!

There are native plants in all shapes and sizes and many can be pruned or espaliered to your liking!

UC Master Gardeners
Napa County

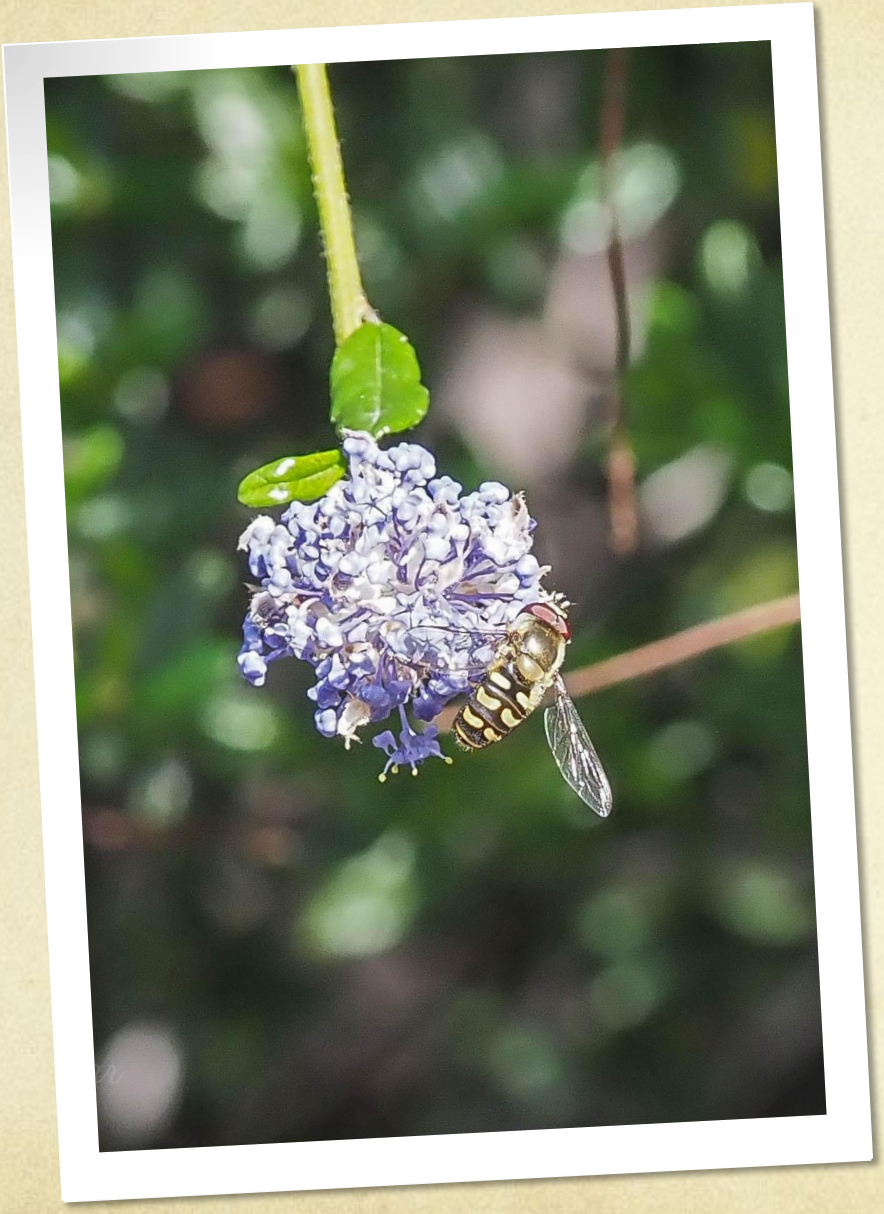
Featured Native Pollinator

Syrphid Fly (also known as Hover Fly, Flower Fly)

- Adults are visible visitors to blossoms and are important pollinators
- Adults can be robust or slender flies 1/8th inch to 1 inch long
- The body of many adults is black with bands or stripes of orange, yellow or white and they resemble wasps
- Most syrphid flies (95%) are in the subfamilies Eristalinae and Syrphinae

But wait, there's more!

Syrphid fly larvae are second only to lady beetles and lacewings in their appetite for aphids!



Adults consume honeydew, nectar, pollen and water.

They have the ability to hover and it is common to see them hovering near flower heads where they obtain nectar.

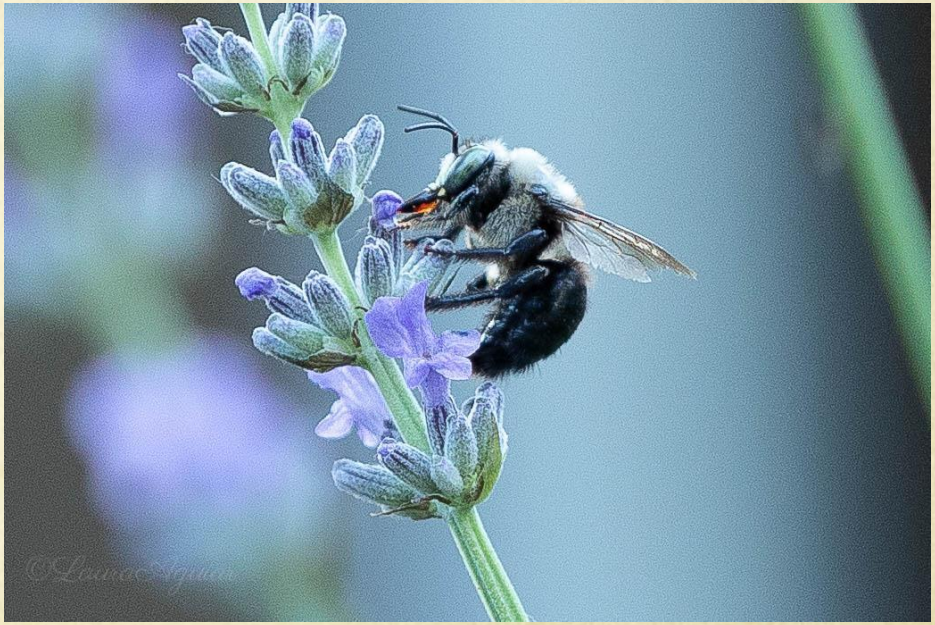
- Syrphid flies have four life stages: egg, larva, pupa, adult.
- Larvae of most species are maggot-like without true legs and taper towards the head.
- Color can be brown, greenish, pink or whitish. This is because their body contents are visible through their covering so their coloration will vary according to what they eat.
- In this photo by Jack Kelly Clark of our UC Integrated Pest Management (UC IPM) Program, you can see a syrphid fly larva preying on aphids. They are capable of consuming anywhere from 100 to 400 aphids before they pupate!
- They can also prey on caterpillars, scales and other insects - and on mites.

Telling Syrphid Flies Apart From Bees

- Flies have much bigger eyes that come around the side of the head
- Flies typically have much shorter antennae
- Flies don't have anywhere to carry pollen, the way bees do
- Flies have fewer wings - only two - but this can be difficult to see without help

Syrphid Fly

Bee



Syrphids have sponge-like mouthparts and a proboscis that they use to feed on nectar and pollen.

Which flowers they visit depends on the size of their body and the size of their proboscis - and even specialized body hair which is denser on some species than on others.

They can actually ingest pollen mid-flight or as they groom improving efficiency by reducing the time it takes to acquire pollen from the anthers of a flower!

The characteristics of their proboscis influences what flowers syrphid flies select to forage. For example, if it's a narrow and pointed proboscis (as opposed to broad and flat) it will more efficiently forage on the nectar of a deeper corolla tube like fuchsia flower or sticky monkey flower.

There are pollen specialist syrphid flies that rely on pollen for energy and resources for reproduction - these are usually smaller in size. Then there are larger syrphid species which rely mainly on nectar to gain their energy.

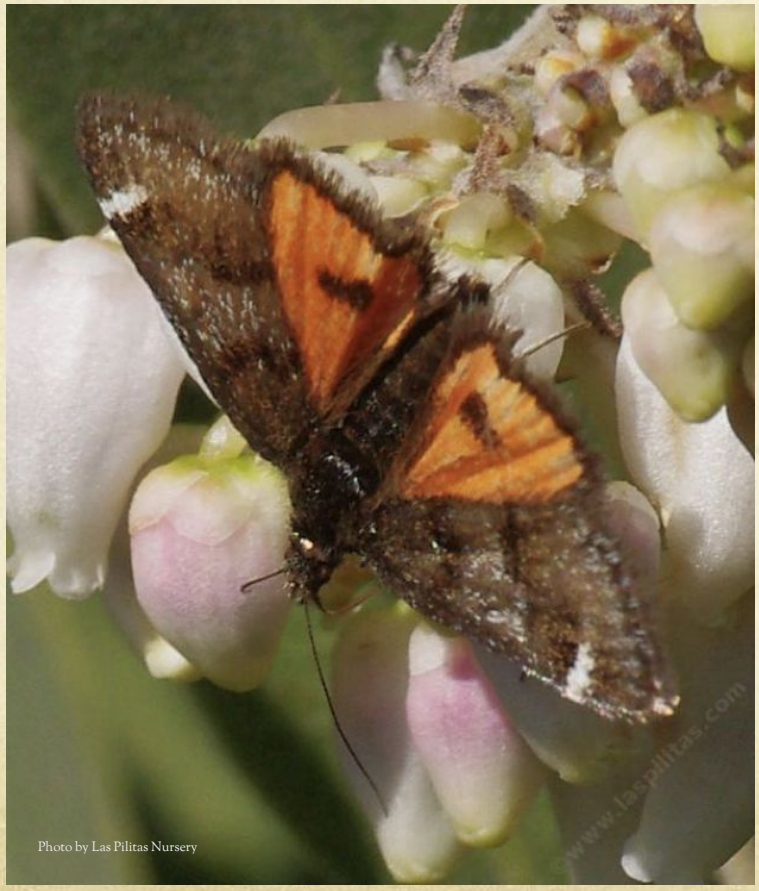
Research is ongoing but in some agricultural systems, especially orchards, syrphid flies have been observed to out-do native bees in pollinating fruit such as apples, mangoes and peppers.

More than 6,200 species of Syrphidae occur in the world and there are over 300 species in California. In your pollinator garden, your syrphid residents will not be difficult to spot!

Overlooked Pollinators: Moths

Moths and Butterflies
What's The Difference?

Underwing Moth on Manzanita



Duskywing Butterfly on Bog Sage

Moths & Butterflies are both insects of the Order Lepidoptera

Most butterflies are colorful and are active during the day

However this is not always reliable as there are less colorful butterflies and a good number of moths with brilliant wings!

Most moths are fairly drab in color and are active at night

Take a close look at their antennas instead:

Butterfly antennas are shaped like tiny golf clubs.

Moth antennas either taper to a point or look threaded and even feathered.

Also: Take a look at their wings when they are resting.

Most butterflies raise them up and against each other.

Most moths flatten their wings out over their bodies.

Pollination Doesn't End At Sunset

Moths take over the nightshift for pollination.

Did you know that while some flowers close when the sun set, most flowers are still accessible at night?

Moths are especially attracted to flowers with pale or white flowers, heavy with fragrance and nectar.

Night-flying moths navigate by the moon and the stars and are also known to use magnetic "clues" from the Earth when moon and star light is not available.

Fairy Longhorn Moth (Adelidae family)

Like the butterflies, moths have a long, tube-like tongue called a proboscis and it works like a straw to suck up nectar. When not in use, the proboscis is coiled up like a tiny garden hose!

Photo of Bumblebee Moth or Snowberry Clearwing (Hemaris species) by Las Pilitas Nursery

Can You Turn Off The Lights?

- Recent research is shedding light on just how effective moth pollinators are.
- Researchers have collected pollen samples from the hairy underbellies of moths and have discovered that moth pollination is much more significant than is generally thought.
- Adult moths tend to travel much longer distances than bees making them effective movers of pollen.

Unfortunately for these invaluable pollinators, (and well…for us) for not yet fully understood reasons, they are attracted to artificial light sources and this disrupts not only their natural behavior, such as their ability to find mates and plants to pollinate, it can also kill them as they fly into dangerous situations.

Please consider making your lighting less disruptive.

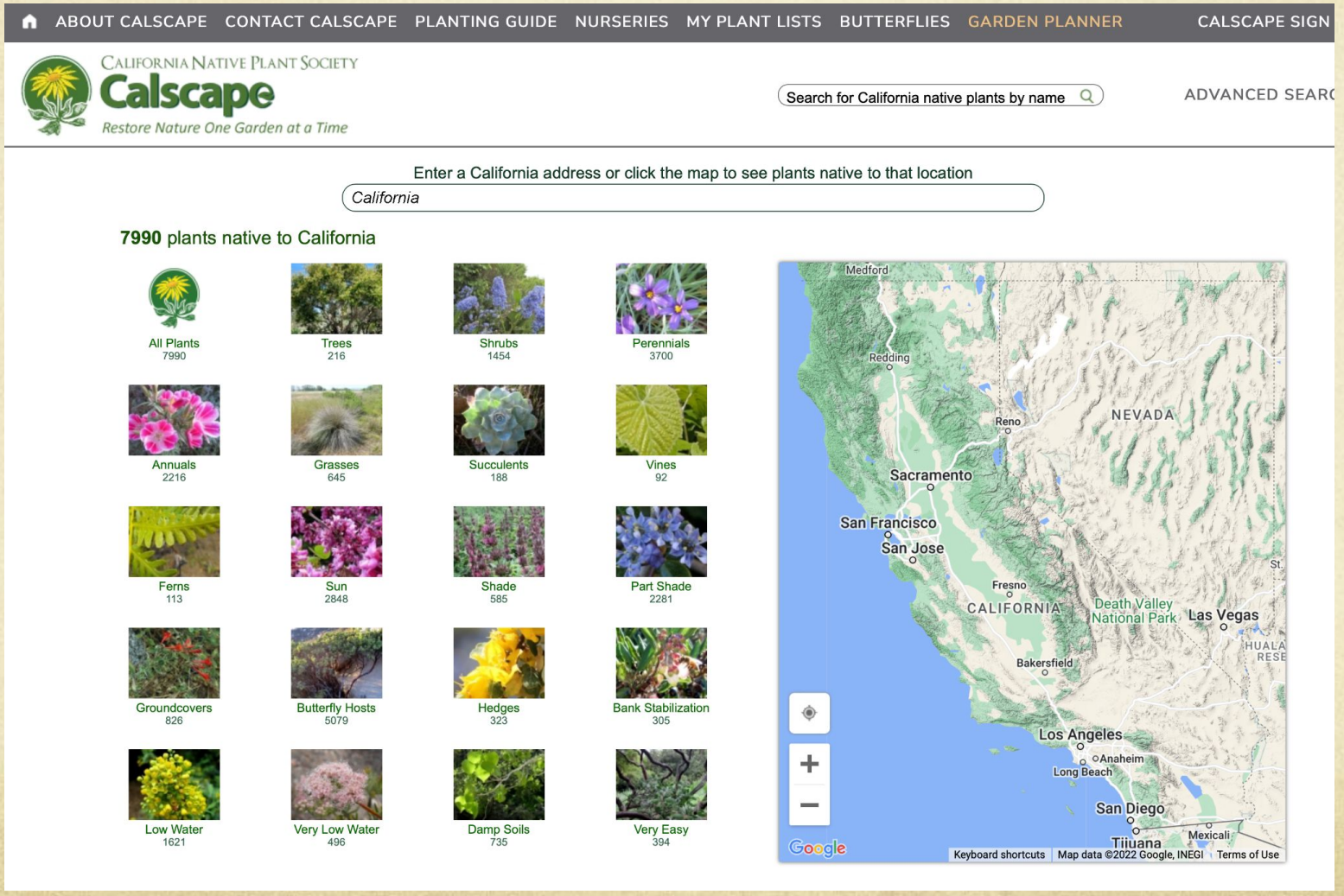
Tips From Xerces

- Remove lights that only serve a cosmetic purpose, such as tree lights and facade lighting.
- Turn off as many other outdoor lights as you can and limit lighting to intended areas like pathways choosing lighting with covers that direct light down.
- Install motion sensors so that light activation is limited.
- Install timers and limit the time your lights stay on past sunset.

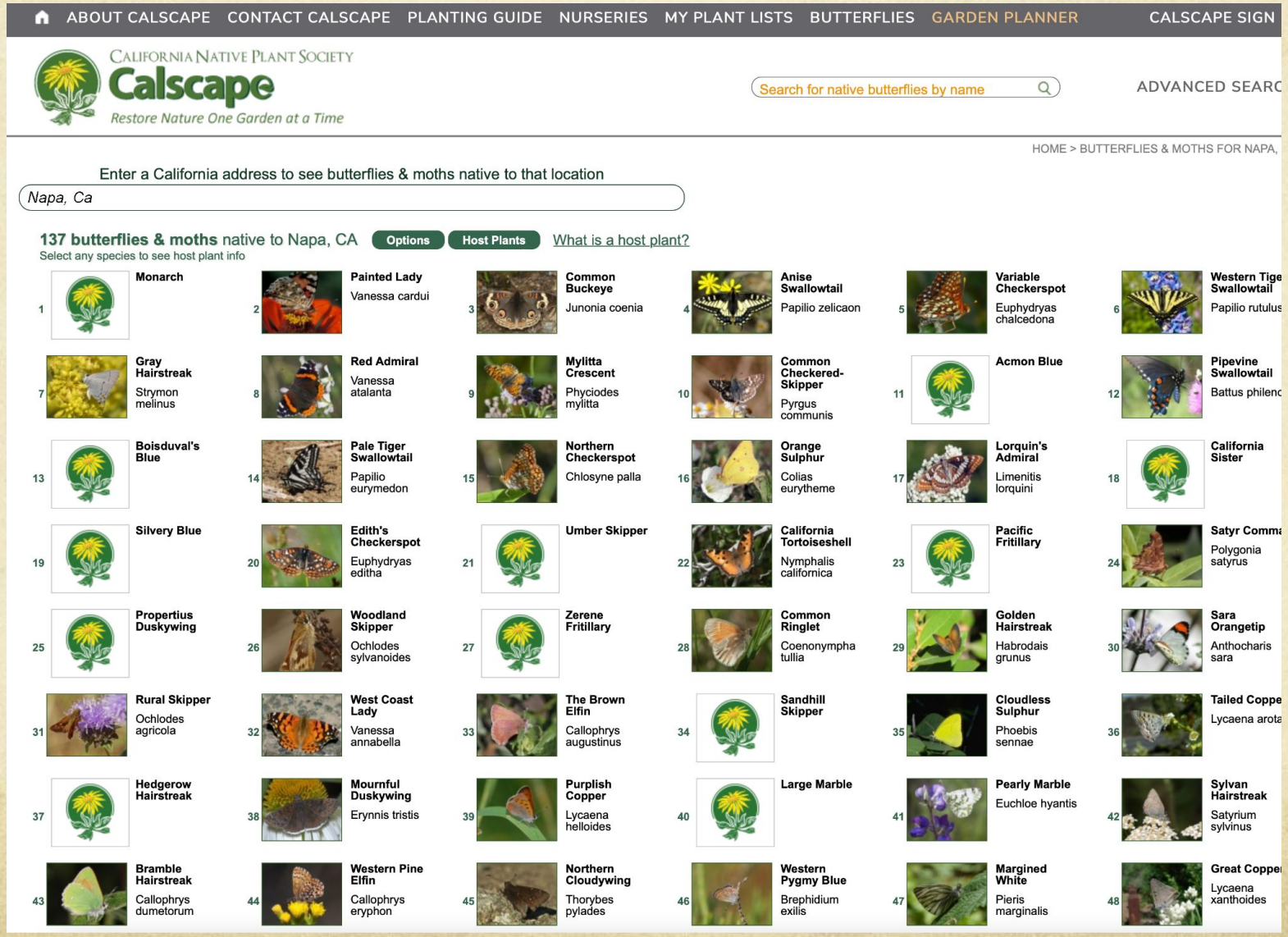
Irreplaceable…

Featured Resource: California Native Plant Society

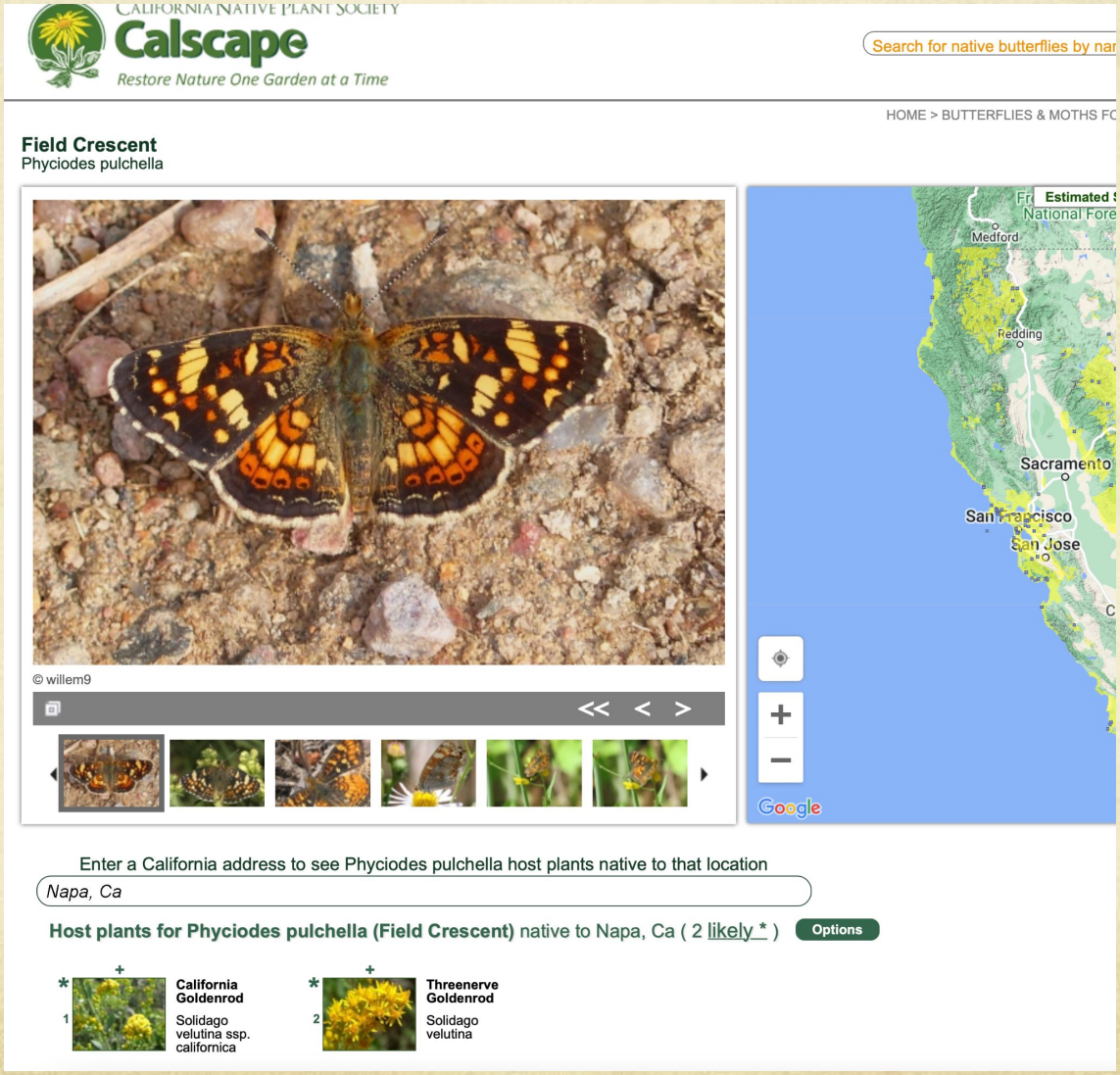
CNPS maintains a website: Calscape Restore Nature One Garden at a Time
A great resource for the native plant and pollinator gardener!
Their Homepage looks like this:



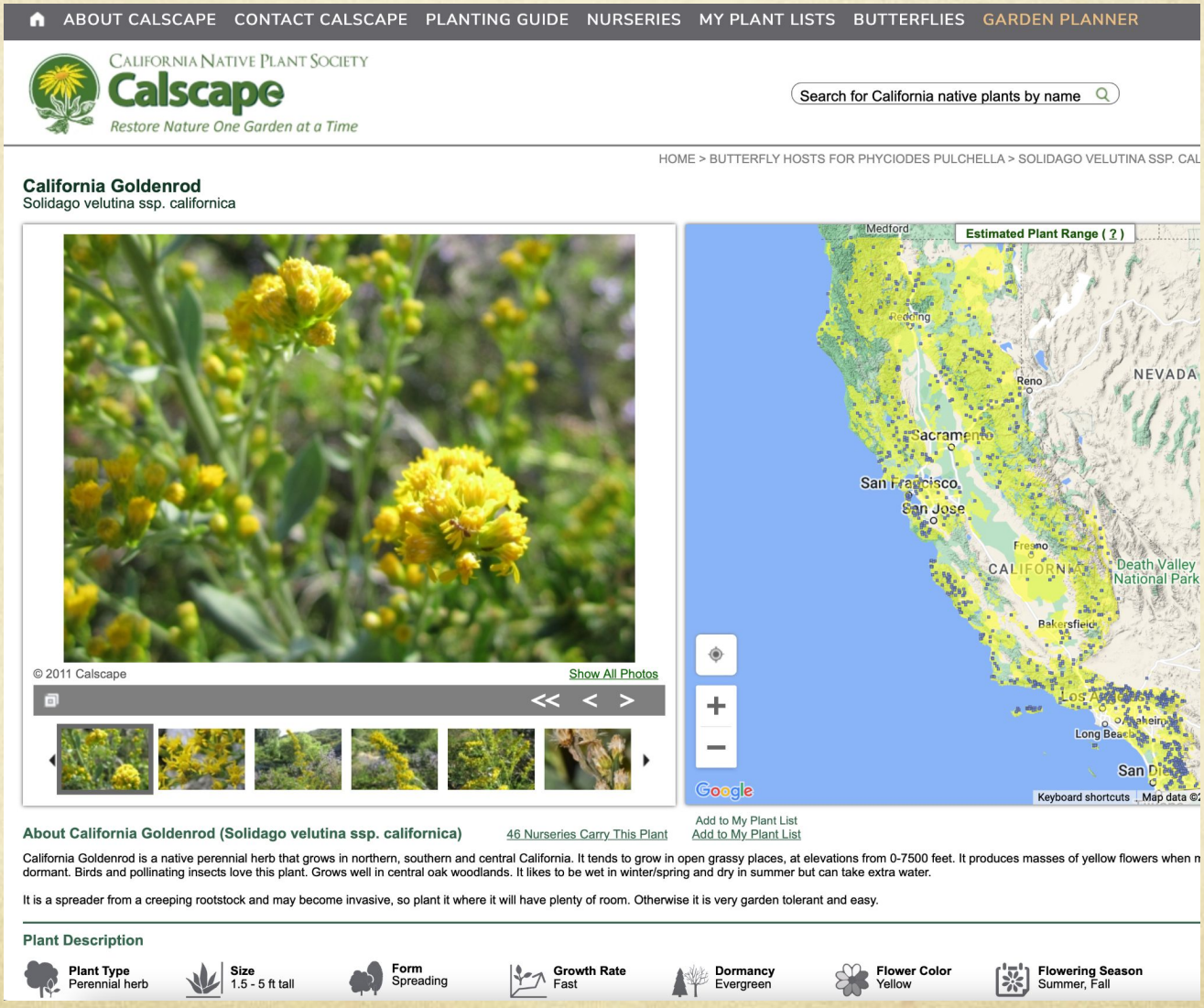
If you click on the Butterflies tab on the bar menu at the top, you will find tiles for 1368 moths and butterflies native to California (to date). Here you have options to narrow down your search by entering a more specific address within California. In the sample below, we entered, “Napa, CA,” and got 137 results.



In the sample below, we chose to click on the Field Crescent butterfly (Phyciodes pulchella) to explore possible host plants to plant in our native garden. Then we chose to click on California Goldenrod (Solidago velutina spp. california).



And here you will find all kinds of information on what California Goldenrod (Solidago velutina spp. california) needs to thrive in your native garden!



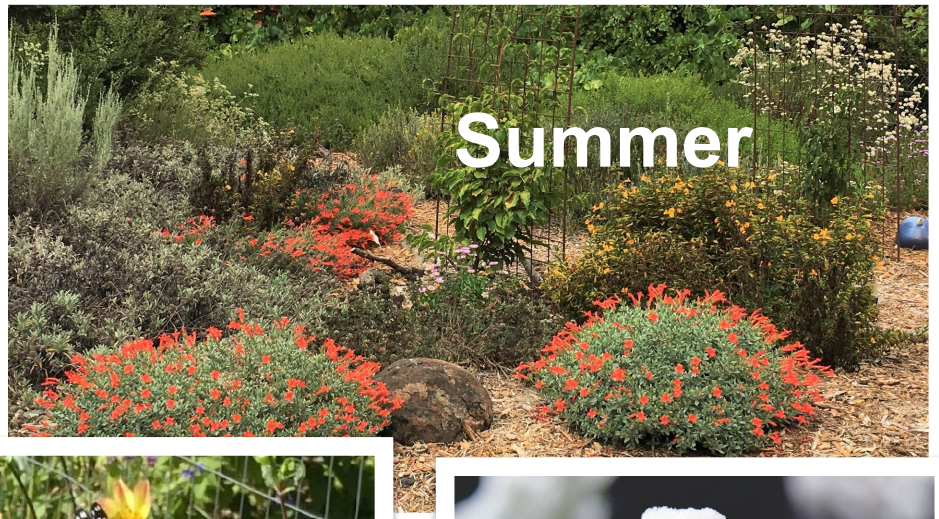
The Flowers

Photo by Jane Callier

Oregon State University

Caring for your Habitat Garden

Country Mouse 13 CC BY 2.0



veronica Bowers CC BY 2.0

Ross CC BY-NC-ND 2.0

PxHere

painting by Helen Allingham, 1909

California Natives

Diplacus aurantiacus

Monkey Flower

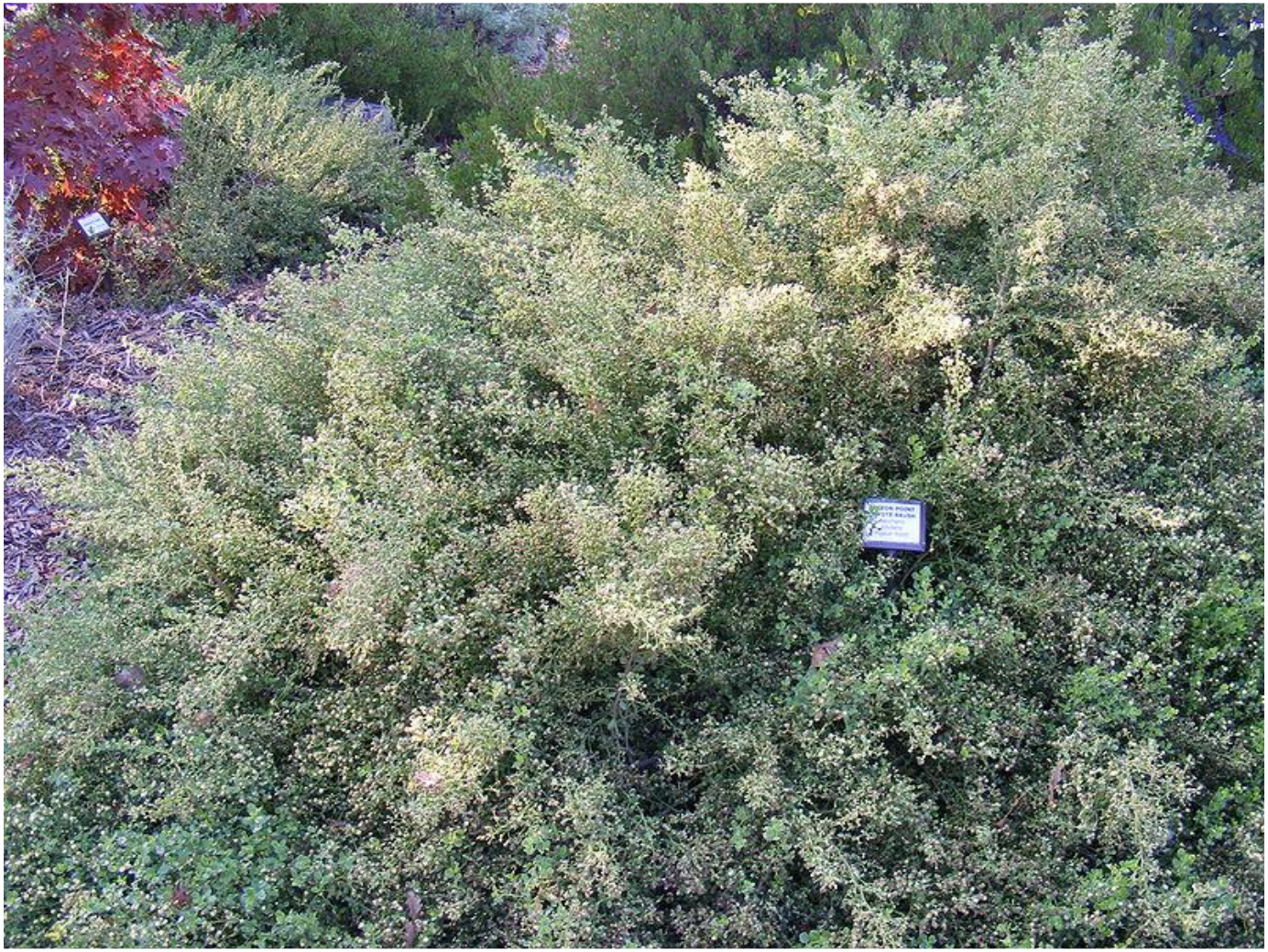
(formerly

Mimulus aurantiacus)

Ceanothus spp. California Lilac

Stan Shebs, CC BY-SA 3.0

Eriogonum fasciculatum California Buckwheat



Baccharus pilularus Coyote Brush

Epilobium canum ‘Catalina’
Catalina California Fuchsia

Epilobium canum
California Fuchsia

Corinne Yoshihara

Penstemon ‘Margarita BOP’

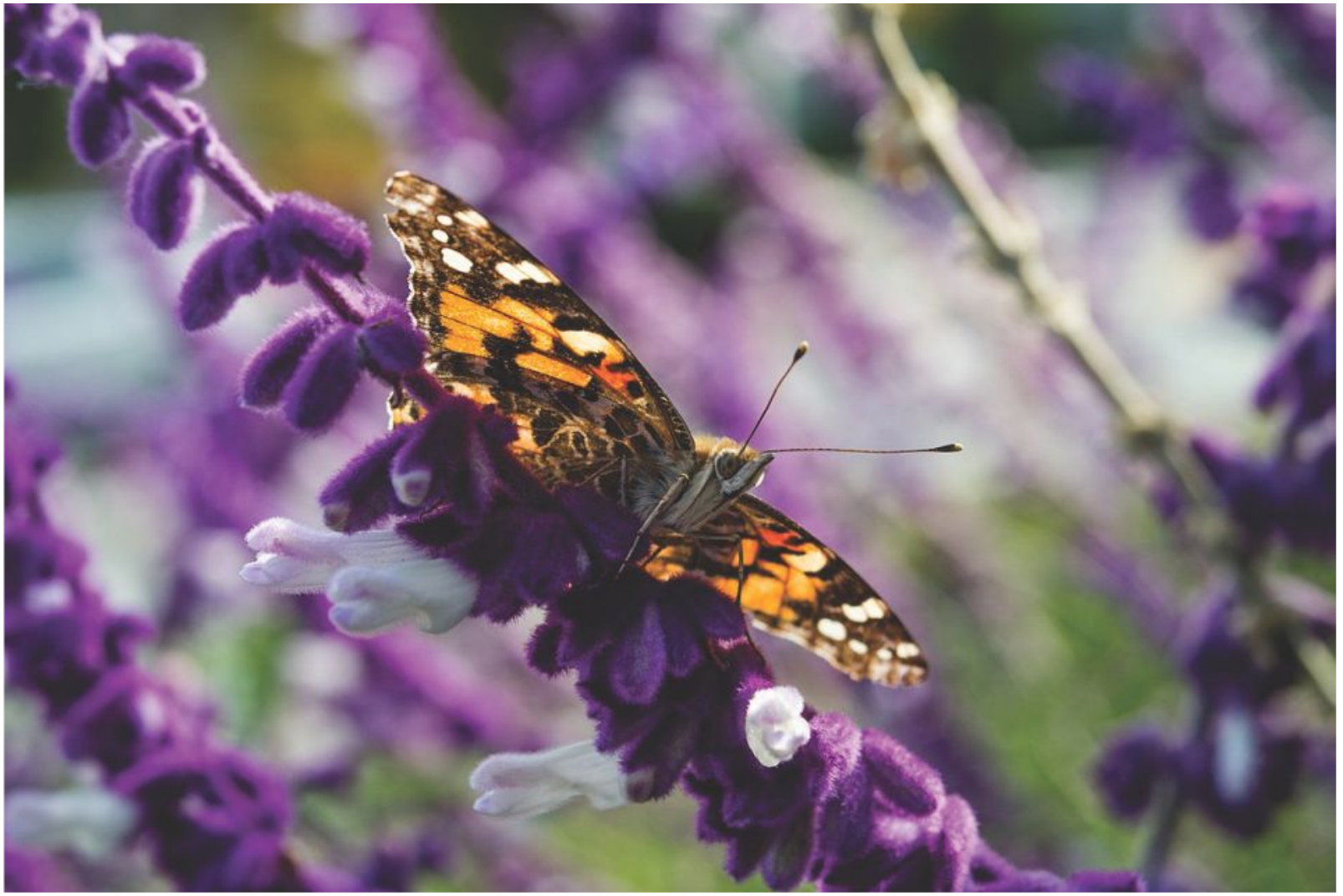
Arctostaphylos spp. Manzanita

Beautiful,

Functional Salvias

Salvia
‘Amistad’

Salvia pachphylla



Salvia leucantha – Mexican sage

Sunflowers

Helianthus annuus
Mammoth Grey Stripe

David's Garden Seeds

David'Te Garden Diary Blog

Helianthus annuus

Lemon Queen

https://www.greatsunflower.org/

Richters

Helianthus maximiliani – Maximilian sunflower

More beautiful plants that attract pollinators

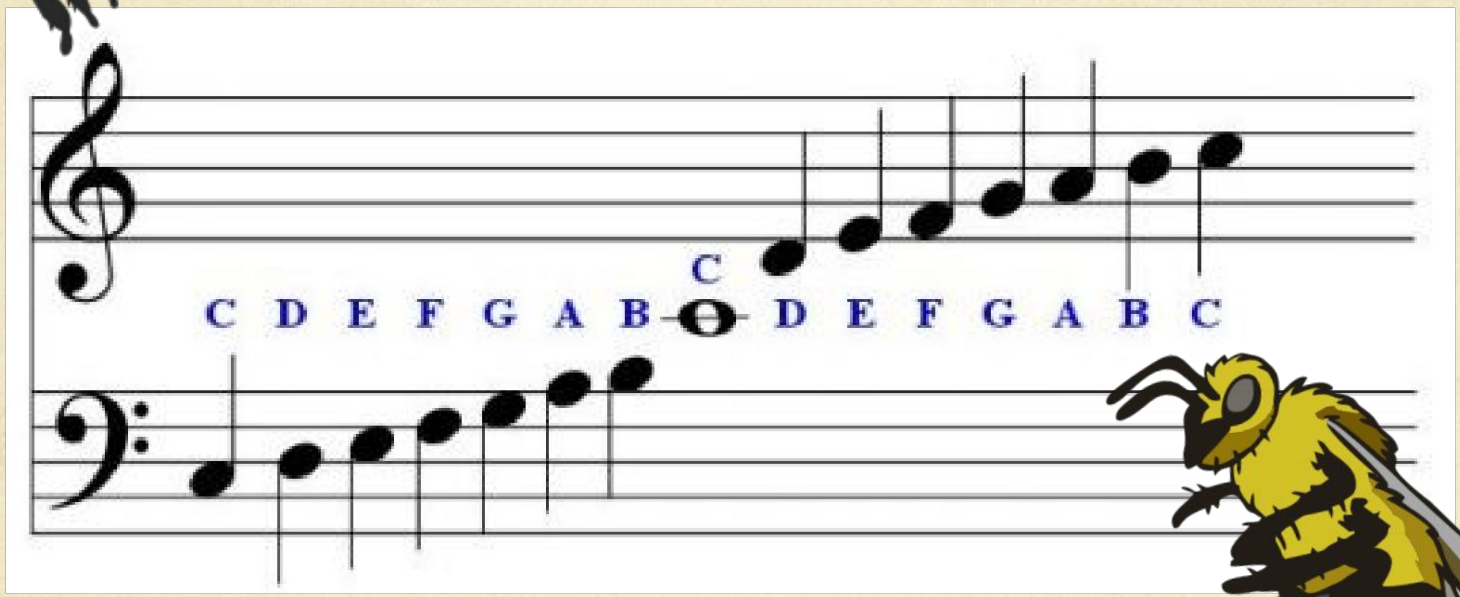
Agastache 'Kudos Ambrosia'

Dwarf Hummingbird Mint

Aster ‘Purple Dome’

Cuphea llavea
Bat-faced cuphea

Cuphea ignea
Cigar plant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Caryopteris x clandonensis ‘Blue Mist’ spirea

Calamintha nepeta

Cosmos bipinnatus

S. Rae from Scotland, UK, CC BY 2.0

Martinevans123, CC BY-SA 4.0

Linaria purpurea

University of Minnesota

Perovskia atriplicifolia – Russian Sage

Pixabay

Photo taken by Steph CC BY 2.0

Phacelia tanacetifolia

anniesannuals, CC BY 2.0

Scabiosa atropurpurea

Teucrium x lucidrus

University of Florida

Coreopsis tinctoria – Plains coreopsis

mijntuinwinkel.org

Gaura

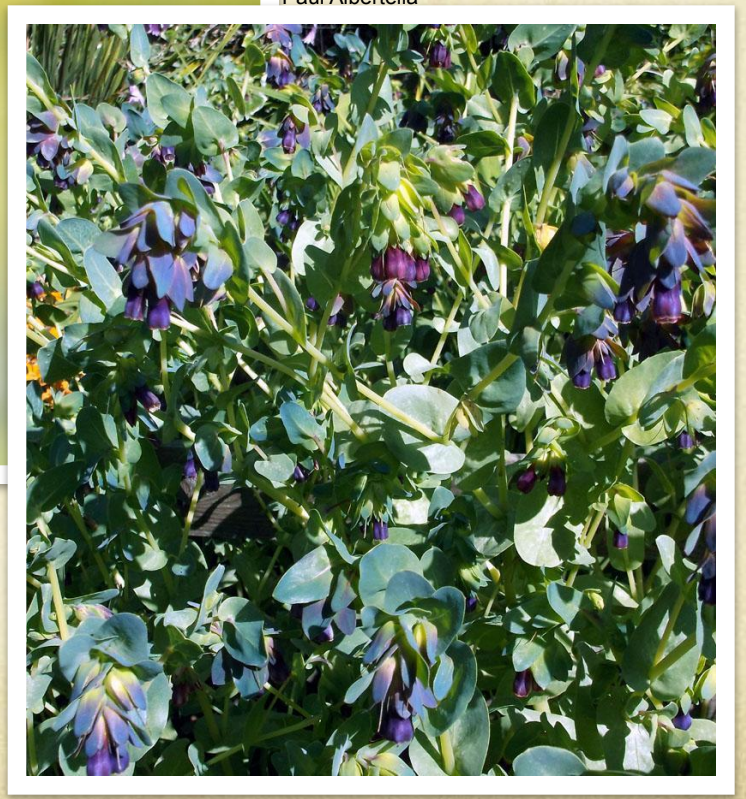
"Gaura lindheimeri4" by KENPEI - KENPEI's photo.

Sedum x

'Autumn Joy'

‘Purpurascens’

Paul Albertella



Cerinthe major

Pineapple Guava

Feijoa sellowiana

California Lilac

Ceanothus pallidus ‘Marie Simon’

Fremontodendron californicum

Cercis occidentalis - Western Redbud

Help Us Better Serve You!

Our follow-up survey provides us the tools we need to grow and improve the quality of our program.

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https://www.laspilitas.com/

https://chapters.cnps.org/napa/

https://arboretum.ucdavis.edu/tags/arboretum-all-stars

https://plantright.org/

https://www.napafirewise.org/wp-content/uploads/2019/04/napa-firewise_FirewisePlants.pdf

http://www.bbc.com/earth/story/20141017-how-flowers-conquered-the-world

https://www.amateuranthecologist.com/2018/03/arctostaphylos-viscida.html

The bee-friendly garden, Kate Frey & Gretchen LeBuhn, Ten Speed Press, Berkeley, CA 2016

California Bees & Blooms, A Guide for Gardeners and Naturalists, Gordon W. Frankie, Robbin W. Thorp, Rollin E. Coville, and Barbara Ertter, Heyday in collaboration with CNPS, 2014

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Books:
Attracting Native Pollinators (Xerces)
The Bees in Your Backyard
Nature's Best Hope
Bringing Nature Home

Websites
Xerces Society
bringbackthepollinators.org
California Native Plant Society
WUCOLS (Water Use Classification of Landscape Species)