**Preserve Calavera Pollinator Pathways**

**TASKS 1 & 2:** Identify the target pollinator species for north coastal/ near inland San Diego County and their needs for host and nectar plants.

[iNaturalist data](https://www.inaturalist.org/projects/preserve-calavera-nature-in-place-bioblitz?tab=species:)1 was utilized to find the top 40 most reported, research-grade observations in the region of north coastal and near inland San Diego County. Further search limitations focused on native species and members of the classes insecta and aves. The time frame was unlimited and was updated on August 2, 2020. From this list, only species that participate in pollination were pulled.

Further, species’ host and nectar plants of preference were found via CNPS and the Resource Conservation District of Greater San Diego.2, 3, 4, 5

BEETLES

BEES

BIRDS

BUTEERFLIES

FLIES

MOTHS

WASPS

1. Anna’s Hummingbird (Calypte anna)

Native Manzanitas [(Arctostaphylossp.)](http://calscape.org/loc-California/Arctostaphylos%20%28all%29?srchcr=sc5aa07a107084e)

[**Chaparral Currant**(Ribes malvaceum*)*](http://calscape.org/Ribes-malvaceum-%28Chaparral-Currant%29?srchcr=sc5ab025d931e3f)

[**Pink-Flowering Currant**(Ribes sanguineum glutinosum*)*](http://calscape.org/Ribes-sanguineum-var.-glutinosum-%28Blood-Currant%29?srchcr=sc5ab02623151c4)

[**Fuchsia-Flowered Gooseberry** (Ribes speciosum)](http://calscape.org/Ribes-speciosum-%28Fuchsiaflower-Gooseberry%29?srchcr=sc568874c201a0b)

[**Black Sage**(Salvia mellifera)](http://calscape.org/Salvia-mellifera-%28Black-Sage%29?srchcr=sc5ab02a65aa701)

[**Sticky Monkeyflower** (Mimulus aurantiacus)](http://calscape.org/view.php?pl=2512&img=4666)

[**Liveforever** (Dudleyasp.)](http://calscape.org/loc-California/Liveforever%20%28all%29?srchcr=sc5ab02ea98bb14)

[**Scarlet Bugler** (Penstemon centranthifolius)](http://calscape.org/Penstemon-centranthifolius-%28Scarlet-Bugler%29?srchcr=sc5ab02eeaa1f74)

[**California Fuchsia** (Epilobiumcanum)](http://calscape.org/Epilobium-canum-%28California-Fuchsia%29?srchcr=sc5ab02f3c0bbf9)

1. Monarch (Danaus plexippus)

**Host Plants**

Narrow-Leaf Milkweed (Asclepias fascicularis)

Indian Milkweed (Asclepias eriocarpa)

California Milkweed (Asclepias californica)

**Nectar Plants**

Native Asters

White Sage (Salvia apiana)

Black Sage (Salvia mellifera)

San Diego Morning Glory ([Calystegia macrostegia ssp. tenuifolia](https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=1359))

Red Thistle (Cirsium occidentale)

Blue Dicks (Dichelostemma capitatum)

1. Hooded Oriole (Icterus cacullatus)

[**Liveforever** (Dudleyasp.)](http://calscape.org/loc-California/Liveforever%20%28all%29?srchcr=sc5ab02ea98bb14)

1. Yellow-Faced Bumblebee (Bombus vosnesenskii)

All native nectar-producing flowers, with preference for high diversity of flora

1. Mourning Cloak (Nymphalis antiopa)

**Host Plants**

Willow (Salix lasiolepis, S. laevigata, S. exigua S. gooddingii)

Fremont Cottonwood (Populus fremontii)

**Nectar/ Adult Food Sources**

Native oak sap

Toyon (Heteromeles arbutifolia)

 Indian Milkweed (Asclepias eriocarpa)

 Narrow-Leaf Milkweed (Asclepias fascicularis)

1. Allen’s Hummingbird (Selasphorus sasin)

(See Anna’s Hummingbird #1)

1. Fiery Skipper (Hylephila phyleus)

**Host Plants**

California Brome (Bromus carinatus)

Bobtail Barely (Hordeum intercedens)

Smallflower Melic (Melica imperfecta)

Deergrass (Muhlenbergia rigens)

San Diego County Needlegrass (Stipa diegoensis)

San Diego Sedge (Carex spissa)

**Nectar Plants**

Native Asters

California Thistle (Cirsium occidentale var. californ)

 Common Yarrow (Achillea millefolium)

Blue Dicks (Dichelostemma capitatum)

 Buckwheats (Eriogonum sp.)

 Golden Yarrow (Eriophyllum confertiflorum)

 Deervetch (Lotus scoparius)

Seaside Heliotrope (Heliotropium curassavicum)

1. Painted Lady (Vanessa cardui)

**Host Plants**

Chaparral Mallow (Malacothamnus fasciculatus)

Bush Mallow (Malacothamnus densiflorus)

Broad-Leafed Lupine (Lupinus latifolius)

Bush Lupine (Lupinus longifolius)

Arroyo Lupine (Lupinus succulentus)

Menzie’s Fiddleneck (Amsinckia menziesii)

Cobwebby Thistle (Cirsium occidentale)

Checkerspot (Sidalcea malvaeflora)

Hoary Nettle (Urtica dioica)

**Nectar Plants**

Native Asters

Cobwebby Thistle (Cirsium occidentale)

1. Marine Blue (Leptotes marina)

**Host Plants**

 San Diego Milkvetch (Astragalus oocarpus)

 Honey Mesquite (Prosopis glandulosa)

 False Indigo (Amorph asp.)

 Rattle pod (Astragalus trichopodus)

 Wild Sweet Pea (Lathyrus vestitus)

 Lupine sp.

 Clovers (Trifolium sp.)

**Nectar Plants**

 Common Yarrow (Achillea millefolium)

 Golden Yarrow (Eriophyllum confertiflorum)

 Buckwheats (Eriogonum sp.)

 Deervetch (Lotus scoparius)

1. Figeater Beetle (Cotinius mutibilis)

**Larval Food**

Compost

**Adult Food**

Fruit

1. Lorquin’s Admiral (Limenitis lorquini)

**Host Plants**

Holly-Leaf Cherry (Prunus ilicifolia)

Bitter-Berry (Prunus virginiana)

Narrowleaf Willow (Salix exigua)

**Nectar Plants**

Holly-Leaf Cherry (Prunus ilicifolia)

1. White-lined Sphinx (Hyles lineata)

**Host Plants**

Hooker's Evening Primrose (Oenothera elata ssp. Hookeri)

California Four O'Clock (Mirabilis laevis var. crassifolia)

California Wild Grape (Vitis californica)

[**California Fuchsia**(Epilobium canum)](http://calscape.org/Epilobium-canum-%28California-Fuchsia%29?srchcr=sc5ab02f3c0bbf9)

Elegant Clarkia (Clarkia unguiculata)

**Nectar Plants**

Red Columbine (Aquilegia formosa)

San Bernandino Larkspur (Delphinium parryi)

Chaparral Honeysuckle (Lonicera subspicata denudata)

 Clovers (Trifolium sp.)

California Thistle (Cirsium occidentale var. californ)

Cobwebby Thistle (Cirsium occidentale)

Jimsonweed (Datura stramonium)

1. Salt Marsh Moth (Estigmene acrea)

Clovers (Trifolium sp.)

1. Gray Hairstreak (Strymon melinus)

**Host Plants**

Indigo Bush (Amorph asp.)

Buckwheat (Eriogonum sp.)

Deervetch (Lotus scoparius)

Lupine sp.

Chaparral Mallow (Malacothamnus fasciculatus)

Bush Mallow (Malacothamnus densiflorus)

Narrowleaf Willow (Salix exigua)

**Nectar Plants**

Indian Milkeweed (Asclepias eriocarpa)

Deervetch (Lotus scoparius)

1. Western Tiger Swallowtail (Papilio rutulus)

**Host Plants**

Willow (Salix exigua)

Western Sycamore (Platanus racemosa)

Fremont Cottonwood (Populus fremontii)

**Nectar Plants**

Toyon (Heteromeles arbutifolia)

1. Anise Swallowtail (Papilio zelicaon)

**Host Plants**

Common Lomatium (Lomatium utriculatum)

Water Parsley (Oenanthe sarmentosa)

**Nectar Plants**

Holly-Leaf Cherry (Prunus ilicifolia)

1. Checkered White (Pontia protodice)

**Host Plant**

Bladderpod (Peritoma arborea)

**Nectar Plant**

Bladderpod (Peritoma arborea)

1. Funeral Duskywing (Erynnis funeralis)

**Host Plants**

Deervetch (Lotus scoparius)

**Nectar Plants**

Buckwheats (Eriogonum sp.)

[**Black Sage**(Salvia mellifera)](http://calscape.org/Salvia-mellifera-%28Black-Sage%29?srchcr=sc5ab02a65aa701)

Deervetch (Lotus scoparius)

San Diego Sunflower (Bahiopsis laciniata)

1. Gulf Fritillary (Agraulis vanillae)

**Host Plant**

Johnny Jump-Up (Viola pedunculata)

**Nectar Plant**

Seaside Heliotrope (Heliotropium curassavicum)

1. Western Pygmy-Blue (Brephidium exilis)

**Host Plants**

Fourwing Saltbush (Atriplex canescens)

Largeseed Goosefoot (Chenopodium macrospermum)

**Nectar Plants**

Buckwheats (Eriogonum sp.)

1. Common Buckeye (Junonia coenia)

**Host Plants**

Plantains (Plantago sp.)

Sticky Monkeyflower (Diplacus aurantiacus)

Chaparral Bush Monkey Flower (Diplacus linearis)

**Nectar Plants**

Chaparral Bush Monkey Flower (Diplacus linearis)

Douglas’ Falsewillow (Baccharis glutinosa)

1. Sara Orangetip (Anthocharis sara)

**Host Plants**

California Elegant Rockcress (Boechera californica)

Perennial Rockcress (Boechera perennans)

**Nectar Plants**

California Elegant Rockcress (Boechera californica)

Perennial Rockcress (Boechera perennans)

1. Carolina Sphinx (Manduca sexta)

**Host Plants**

San Diego Nightshade (Solanum xanti)

Indian Tobacco (Nicotiana bigelovii var. wallacei)

**Nectar Plants**

Indian Tobacco (Nicotiana bigelovii var. wallacei)

1. Oblique Stripetail (Allograpta obliqua)

Aphids

1. Western Tussock Moth (Orgyia vetusta)

**Host Plants**

Oaks (Quercus sp.)

Native Manzanitas [(Arctostaphylossp.)](http://calscape.org/loc-California/Arctostaphylos%20%28all%29?srchcr=sc5aa07a107084e)

Holly-Leaf Cherry (Prunus ilicifolia)

Bitter-Berry (Prunus virginiana)

Broad-Leafed Lupine (Lupinius latifolius)

Bush Lupine (Lupinius longiflorus)

Arroyo Lupine (Lupinius succulentus)

**Adult Food**

Tree Sap

Rotting Fruit

1. Silvery Blue (Glaucopsyche lygdamus)

**Host Plant**

Deerweed (Acmispon glaber)

**Nectar Plants**

Aster sp.

1. Common Ringlet (Coenonympha tullia)

**Host Plant**

San Diego Bentgrass (Agrostis pallens)

California Brome (Bromus carinatus)

San Diego Sedge (Carex spissa)

San Diego County Needlegrass (Stipa diegoensis)

**Nectar Plants**

 Common Yarrow (Achillea millefolium)

Western Pearly Everlasting (Anaphalis margaritacea)

 San Diego Milkvetch (Astragalus oocarpus)

 Ceanothus sp.

 Popcorn Flower (Cryptantha clevelandii)

 Buckwheats (Eriogonum sp.)

1. California Sister (Adelpha californica)

**Host Plant**

Scrub Oak (Quercus dumosa)

Coast Live Oak (Quercus agrifolia)

**Nectar Plants**

Toyon (Heteromeles arbutifolia)

1. Margined Calligrapher (Toxomerus marginatus)

**Larval Food**

Thrips

Aphids

Caterpillars

**Adult Food**

Aster sp.

 Common Yarrow (Achillea millefolium)

 Golden Yarrow (Eriophyllum confertiflorum)

Menzies’ Fiddleneck (Amsinckia menziesii)

1. Western Yellowjacket (Vespula pensylvanica)

Insects

Caterpillars

Spiders

1. Cloudless Sulphur (Phoebis sennae)

**Host Plants**

Deervetch (Lotus scoparius)

 San Diego Milkvetch (Astragalus oocarpus)

 Buckwheats (Eriogonum sp.)

 Lotus/ Brooms (Lotus sp.)

 Clovers (Trifolium sp.)

Broad-Leafed Lupine (Lupinius latifolius)

Bush Lupine (Lupinius longiflorus)

Arroyo Lupine (Lupinius succulentus)

**Nectar Plants**

[**Scarlet Bugler** (Penstemon centranthifolius)](http://calscape.org/Penstemon-centranthifolius-%28Scarlet-Bugler%29?srchcr=sc5ab02eeaa1f74)

1. Acmon Blue (Icaricia acmon)

**Host Plants**

 Buckwheats (Eriogonum sp.)

**Nectar Plants**

 Buckwheats (Eriogonum sp.)

 Deervetch (Lotus scoparius)

Douglas’ Falsewillow (Baccharis glutinosa)

Narrow-Leaf Milkweed (Asclepias fascicularis)

Indian Milkweed (Asclepias eriocarpa)

1. Black-Tailed Bumblebee (Bombus melanopygus)

Native Manzanitas [(Arctostaphylossp.)](http://calscape.org/loc-California/Arctostaphylos%20%28all%29?srchcr=sc5aa07a107084e)

 Menzies’ Goldensuch (Isocoma menziesii)

 Buckwheats (Eriogonum sp.)

Broad-Leafed Lupine (Lupinius latifolius)

Bush Lupine (Lupinius longiflorus)

Arroyo Lupine (Lupinius succulentus)

[**Scarlet Bugler** (Penstemon centranthifolius)](http://calscape.org/Penstemon-centranthifolius-%28Scarlet-Bugler%29?srchcr=sc5ab02eeaa1f74)

Willow (Salix lasiolepis, S. laevigata, S. exigua S. gooddingii)

White Sage (Slavia apiana)

Black Sage (Salvia mellifera)

 Clovers (Trifolium sp.)

1. California Bumblebee (Bombus californicus)

White Sage (Slavia apiana)

Black Sage (Salvia mellifera)

 Clovers (Trifolium sp.)

California Poppy (Eschscholzia californica)

1. West Coast Lady (Vanessa annabella)

**Host Plants**

Chaparral Mallow (Malacothamnus fasciculatus)

Bush Mallow (Malacothamnus densiflorus)

**Nectar Plants**

White Sage (Slavia apiana)

Black Sage (Salvia mellifera)

1. Yellow-Striped Armyworm Moth (Spodoptera ornithogalli)

**Host Plants**

Clovers (Trifolium sp.)

California Wild Grape (Vitis californica)

Jimsonweed (Datura stramonium)

San Diego Morning Glory ([Calystegia macrostegia ssp. tenuifolia](https://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=1359))

San Diego Nightshade (Solanum xanti)

Indian Tobacco (Nicotiana bigelovii var. wallacei)

1. Dwarf Tawny Wave (Cyclophora nanaria)

Aster sp.

1. Red Admiral (Vanessa atalanta)

**Host Plant**

Hoary Nettle (Urtica dioica holosericea)

**Nectar Plants**

Aster sp.

Narrow-Leaf Milkweed (Asclepias fascicularis)

Indian Milkweed (Asclepias eriocarpa)

California Milkweed (Asclepias californica)

1. Ceraunus Blue (Hemiargus ceraunus)

**Host Plant**

Honey Mesquite (Prosopis glandulosa)

**Nectar Plant**

Honey Mesquite (Prosopis glandulosa)

1. Red-Humped Caterpillar Moth (Schizura concinna)

Willow (Salix lasiolepis, S. laevigata, S. exigua S. gooddingii)

Holly-Leaf Cherry (Prunus ilicifolia)

Bitter-Berry (Prunus virginiana)

***Pollinators of Special Interest***

Monarch (Danaus plexippus)

 (See Danaus plexippus #2)

Quino checkerspot (Euphydryas editha quino)- Endangered

**Host Plant**

Dwarf Plantain (Plantago erecta)

**Nectar Plant**

Dwarf Plantain (Plantago erecta)

California Dogface (Zerene eurydice)-CA state insect

**Host Plant**

False Indigo (Amoprha californica)

**Nectar Plant**

False Indigo (Amoprha californica)

Hermes Copper (Lycaena hermes)- Vulnerable

**Host Plant**

 Spiny Redberry (Rhamnus crocea)

**Nectar Plant**

 Buckwheats (Eriogonum sp.)

**Task #3:** Research locations of existing pollinator plant species and where plants can be added.

To accomplish this, I have created a Collection Project on iNaturalist titled: [Preserve Calavera Pollinator Pathway Collection](https://www.inaturalist.org/projects/preserve-calavera-pollinator-pathway-collection).6 This project includes the above 40 pollinator species along with all of their listed host and nectar plants. Pollinator and plant species can be added in the future, and access will be given to Preserve Calavera board members to manipulate as they see fit. Further limitations include a rough boundary generally defined by major roadways, with Calavera Preserve representing the southern boundary and El Corazon Nature Park representing the northern boundary. Further, species can be added by anyone (and will be added automatically), time is not limited, and species must be native, include a picture, and be research grade.

Individual species can be searched via the boundary map provided to identify where they have been seen. Decisions on seeding/ planting can be based on this information.

**Task #4:** Identify potential open space/ reserve areas where gardens can be planted and estimate plot size to advise for seed and/ or plant numbers needed.

As Karen suggested, I think we should entertain making two garden plots. One will be in Calavera Preserve and the other in El Corazon Nature Park. This will give us a rough pathway from north to south and vice versa. Outreach can occur in between with institutions like schools, churches, and businesses.

Trailheads are ideal spaces for gardens to garner the most views and, potentially, provide interpretation and resources for getting involved. These will also be easy to get to for volunteer events in the future.

Considering these gardens should be as low maintenance as possible, the plot size should be manageable for events once a month with small groups that will likely require regular hand-weeding. I suggest a patch no more than 900ft2. Using this size and following the plant palette decision and whether [seeds](https://store.theodorepayne.org/trifolium-willdenovii-tomcat-clover-seed.html)7 or plants will be used, numbers of each can be determined.

**Additional Input**

On July 30, 2020, I had a Zoom meeting with Clayton Tschudy and Michael Gonzales of San Diego Canyonlands and [Christina Simokat](https://www.csusm.edu/envs/faculty.html),8 a professor of Environmental Studies at CSUSM. Christina is heavily involved in the [campus pollinator garden](https://sites.google.com/view/csusm-pollinator-garden/home)9 and offered perspective and ideas in regard to the pollinator pathway project.

Christina offered some insights into the construction of the pollinator garden, which was completed in May 2019. She informed us that a student was collecting data on how pollinators can be encouraged to travel along a pathway by providing not only plants, but also favorable habitat. On the campus pollinator garden site, there is a section for data under the heading “Pollinator Study.” Christina can be reached out to for this information.

She also offered that pollinator plantings have a lot of positive feelings around them but not a lot of knowledge as to what the plants will look like over time and what kinds of insects may be attracted to these plants. She stated that sometimes people are surprised that bugs end up eating their garden and mentioned that there have been complaints to various cities about the amount of bees certain plantings attract. These are all things to keep in mind when doing outreach to the public.

 As far as installation of pollinator gardens, Christina has this to offer:

1. Mulching should be avoided, but is not the end of the world. This is because barer ground or ground first laid with cobbles, then covered with sand encourages ground-nesting bees. The kind of structure also allow for water retention.
2. Vermiculture has helped eliminate irrigation needs at the pollinator garden managed at the Del Mar Fairgrounds
3. Drought-tolerant planting has taken hold across most of the county. Perhaps encourage pollinator gardens to be a mixture of these two techniques.
4. On private property or where irrigation may be used, consider the time of day pollinators tend to be most abundant, and don’t water at that time.
5. Consider the restrictions of HOA’s when planting for private gardens
6. Consider installing gardens in open spaces at trailheads to allow for highest likelihood of public interaction. Interpretive panels may also be useful to educate and provide information on how to be involved.
7. Outreach to CNPS, SD Audubon for pollinator plant suggestions and planting for birds.
8. Investigate [BCK SWPPP internship program](https://www.bckprograms.com/swppp-internship.html)10 (provide in-school gardens and design stormwater mitigation on campuses)

**SOURCES**

1. <https://www.inaturalist.org/projects/preserve-calavera-nature-in-place-bioblitz?tab=species>:

2. [https://static1.squarespace.com/static/585dc42c725e25ca57806ffc/t/59b169069f8dce2f6a6813eb/1504798982554/Butterfly+Larval+Food+Plants+San+Diego.pdf](https://static1.squarespace.com/static/585dc42c725e25ca57806ffc/t/59b169069f8dce2f6a6813eb/1504798982554/Butterfly%2BLarval%2BFood%2BPlants%2BSan%2BDiego.pdf)

3. <http://mother-natures-backyard.blogspot.com/2012/06/butterfly-gardens.html>

4. [https://static1.squarespace.com/static/585dc42c725e25ca57806ffc/t/5933a72646c3c4bfed5befac/1496557351155/Butterflies+of+San+Diego+and+Their+Food+Plants.pdf](https://static1.squarespace.com/static/585dc42c725e25ca57806ffc/t/5933a72646c3c4bfed5befac/1496557351155/Butterflies%2Bof%2BSan%2BDiego%2Band%2BTheir%2BFood%2BPlants.pdf)

5. <http://rcdsandiego.org/wp-content/uploads/2018/05/CNPSSD_butterflies_hostplants-1.pdf>

6. <https://www.inaturalist.org/observations?project_id=preserve-calavera-pollinator-pathway-collection>

7. <https://store.theodorepayne.org/trifolium-willdenovii-tomcat-clover-seed.html>

8. <https://www.csusm.edu/envs/faculty.html>

9. <https://sites.google.com/view/csusm-pollinator-garden/home>

10. <https://www.bckprograms.com/swppp-internship.html>