

SUSTAINABLE POLLINATOR CENTRAL VALLEY GARDEN DESIGN

A Senior Project by Kim Chacón



Illustration 1 - *Bee on Flower*



Illustration 2 - *Project Context Map*

University of California, Davis
Landscape Architecture
June 2009

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Photo 1 - Kim at the Teaching Nursery

PROJECT ABSTRACT



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For my Senior Project in Landscape Architecture at UC Davis I have researched and designed sustainable demonstration gardens to be built on the UC Davis campus. My project was divided into two phases. Phase One included a native pollinator planting bed within the Arboretum's new Teaching Nursery located at the West end of the Arboretum. The planting bed is one of a series of demonstration gardens including the following sustainability themes: Native Pollinator, Wildlife, Arboretum All-Star and Native Plants. Phase Two includes the approximately five acre area surrounding the Teaching Nursery and will be themed large scale pollinator-friendly.

These Central Valley planting beds and surrounding area are designed to be sustainable in the Central Valley's climate and will help address dramatically decreasing pollinator populations. I have worked with horticulture and entomology experts on campus as well as the Arboretum staff to make informed landscape design decisions.

Over the past quarter-century, declines in wild pollinator populations have been reported on all continents (National Research Council 2007). It is essential to use appropriate plants in our future landscapes and to educate the designers and managers of those future landscapes. Gone are the days of simply artistic landscapes. Landscape form is important, but a landscape's ecological *function* is paramount. Future Central Valley gardens and plants will need to provide food and habitat for our native pollinators and wildlife, as well as being drought tolerant and beautiful.

BIOGRAPHICAL SKETCH

Kim was born in Edmonds, WA. Now, she resides in lovely Davis, CA, with her husband Ben. She spends most of her spare time in her shade garden or finding new plants for her succulent collection.

Kim's Senior Project has opened a world of opportunity for her. Next year, she will continue her bee friendly landscape studies while earning her masters here at UCD.

Feel free to see what Kim's been up to by visiting her website at:

<http://kimchacon.co.cc/>



Photo 2 - Kim Chacón



SUSTAINABLE POLLINATOR CENTRAL VALLEY GARDEN DESIGN



A Senior Project presented to the faculty of the program of Landscape
Architecture in partial fulfillment of the requirements for the degree of
Bachelors of Science of Landscape Architecture

Accepted and Approved by:

Mark Francis, Faculty Committee Member/Faculty Senior Project Advisor

Ellen Zagory, Committee Member

Stephen Wheeler, Committee Member

by

Kim Chacón
June 12th, 2009

DEDICATION

Dedicated to my wonderful husband, Ben. I am so grateful for your encouragement and support in my return to school.

It has been a really difficult year; thanks for sticking with me.

Thank you for everything.

I love you very, very much

ACKNOWLEDGEMENTS

**Mark Francis
Ellen Zagory
Stephen Wheeler**

I enjoyed learning and interacting with all of you. You made my project come alive and grow. Thank you for all your time, patience, insight and criticism. My project would not have been a success without you.



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PROJECT BACKGROUND



Bees and other pollinators world-wide have been experiencing dramatic population drops in recent years (Shepard 2003). Bees are essential to our landscapes and food sources as we know them today. It is critical that we provide more food and habitat to pollinators because much current landscape today has been (mostly unintentionally) designed to exclude them. Native plants have evolved alongside these native pollinators. They are codependent on each other for life. Encouraging fellow designers and residents at the local scale to create habitat for pollinators, is important for the future.

California is currently dependent on agriculture which utilizes honey bees. Annually, the almond tree pollination done with honey bees represents the largest migration of honey bees on the entire planet. In turn, almond crop production is one of California's largest crops, at close to three billion dollars a

year in 2006 (USDA 2006).

Because honey bee populations have been hard hit in recent years and yet we are dependent on their services more emphasis as now been placed on supporting native bees which, unlike European honey bees, are native to California's landscapes. Native bees currently contribute to



Photo 3 - Female *Agapostemon texanus* bee, photo by R. Coville on Urban Bee Garden Website

current crop pollination (Losey 2006) native pollinators could help to fill a gap in pollination services which has affected non-native honey bees.

Viruses, fungi, parasites, loss of habitat, use of pesticides and overuse of mulch have all contributed to dwindling bee populations (Frankie 2009, Pollard 2009). One way for Landscape

Architects to combat these challenges is to provide more appropriate habitat for native bees (Frankie 2009, Shepard 2009). For my Senior Project I attempted to complete a



design based on conservation techniques which provides the native bees with the plants which they prefer as well as providing space for their habitats and nest sites. It is important to note that many native bees are solitary in nature and do not live in hives, like European honey bees. Therefore, a proposed pollinator-friendly design would include plenty of their favorite plants as well as much free areas for nesting and/or man made bee boxes. Native bees should also have easy access and close proximity to their plants due to their foraging techniques (Frankie 2009).

At this location it is also essential to provide the best possible sustainable design and important to also take a holistic approach to sustainability. So, creating educational demonstration gardens at the UC Davis Arboretum means encouraging valley-wise gardening techniques which are

viewed by students, researchers, visitors to the Arboretum and gardeners at the annual plant sales.

There were two phases to my Senior Project. The

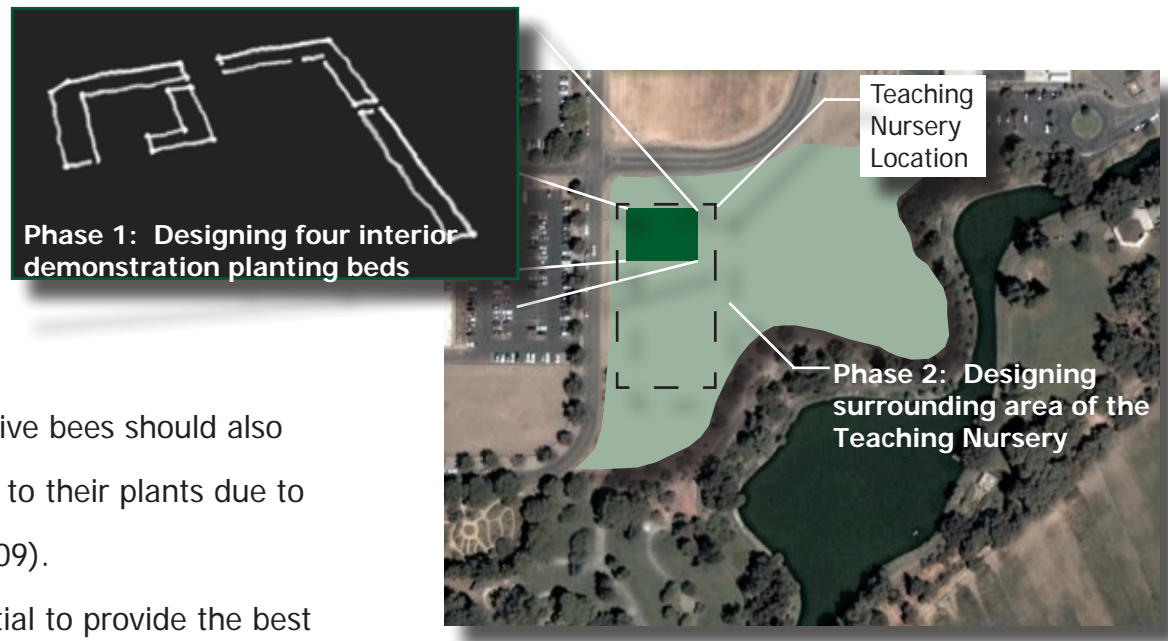
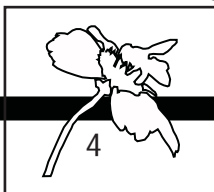


Illustration 3 - Project Phases

first included one of four teaching beds, which will be located within the Teaching Nursery itself. These beds were designed to promote certain plants for the Arboretum's



plant sales via the means of themed planting beds. When fully completed, they will showcase four styles of Central Valley appropriate planting schemes: Native Pollinator, Wildlife, Arboretum All-Star and Native Plants. I made a detailed planting layout for the native pollinator section which will be completed over the 2008/2009 school year.



Photo 4 - Teaching Nursery Demo Beds prior to construction

Phase Two of my project involved my designing the approximately 5 acre landscape which surrounds the Teaching Nursery. I developed a general design plan for for the Phase 2 area. Until large scale funding is secured this part of my project will be purely schematic. My design embraces a pollinator-friendly design theme on a large scale. Additionally, the Phase 2 design area was designed with sustainable drought tolerance

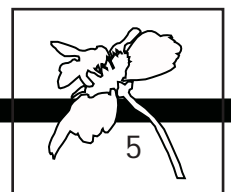
plants in mind. This location will play an important role in



Photo 5 - Pollinator Demonstration Bed with built seat walls, rounded corners and soil fill

the Arboretum's neighborhood within the campus' GATEway plan. If Phase 2 is built it would be the first large-scale pollinator-friendly Central Valley landscape.

Much research is currently being completed on pollinators, especially the unique native bees, but their findings have not been integrated into our current landscape designs much. Sadly, landscape architects have played a part in pushing pollinator populations to the limit by using plants which are unappealing to pollinators. Many pollinators are struggling to survive due to human induced



conditions. If we are to retain pollinators and the rich habitat diversity that they offer us we must immediately start introducing their habitats and food sources within our built landscapes. Since landscape designers are responsible for much the built landscapes today it is necessary to create awareness among them and the general public before it is too late. Native pollinators play an essential role in aiding native plant species to reproduction.

Over the next few years researchers, undergraduate, and graduate students will use the gardens to track various pollinator populations and the frequencies of their visits at the proposed site. The Arboretum is intent on using its gardens as a place for learning. I have spoken with the Arboretum's Educational Outreach specialists which are planning to use

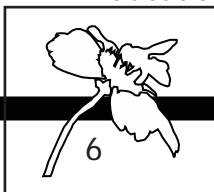
the new demonstration gardens in their Citizen Science Program (Faber 2009). From elementary school students to researchers, many will utilize this area for learning and research. Through completion of this project, we will learn a lot more about our pollinators in Davis and California's Central Valley today.

Additionally, it will be a place of learning and scientific exploration and observation on campus all focused as the Arboretum's part of the campus' GATEway plan. The designed area will also help as a wildlife corridor from Putah Creek, northward, towards the main UC Da-

vis campus. The Phase One and Two scales of plantings will inspire people to plant native plants which will in turn encourage native invertebrates into their own gardens and/or landscape designs.



Photo 6 - Bee covered in pollen from flickr.com

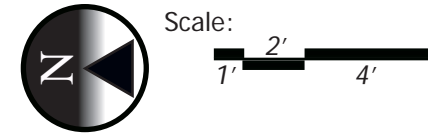
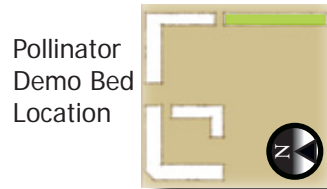


PHASE 1: DEMO BED



PHASE 1: DEMO BED

SITE ANALYSIS



Fence, 10' tall and shade cloth for visibility screening

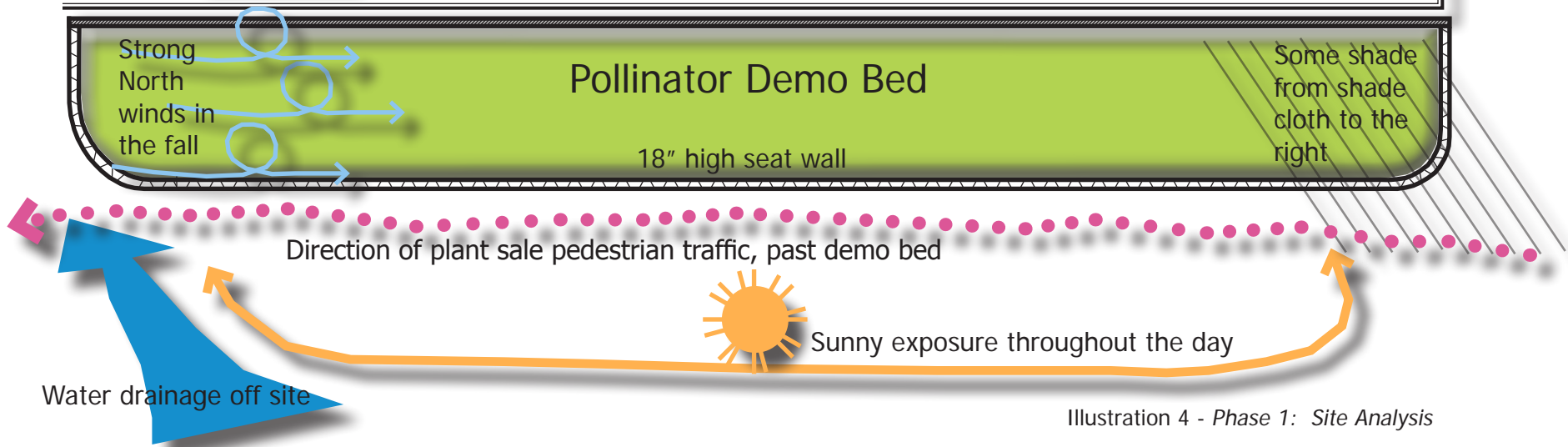


Illustration 4 - Phase 1: Site Analysis

BUILDING MATERIALS



Photo 7 - Partially built demo bed wall



Photo 8 - Blocks for demo bed walls

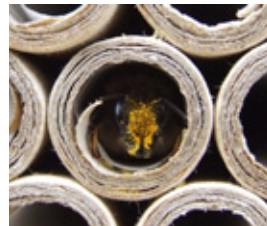


Photo 9 - bee living in a bee tube, from: flickr.com, user eucera



Photo 10 - one style of native bee 'house', from gardeners.com



Photo 11 - CA native plants, from flickr.com



Photo 12 - Arboretum All-Stars



SITE DESIGN

POLLINATOR FRIENDLY PLANTING BED AT THE UC DAVIS ARBORETUM'S TEACHING NURSERY:

BY ELLEN ZAGORY & KIM CHACÓN

NOTE: *Clarkia coccinea* & *Eschscholzia californica* are to be planted throughout the bed annually. *Astrolochia californica* shall be planted to climb up the fence to the East.

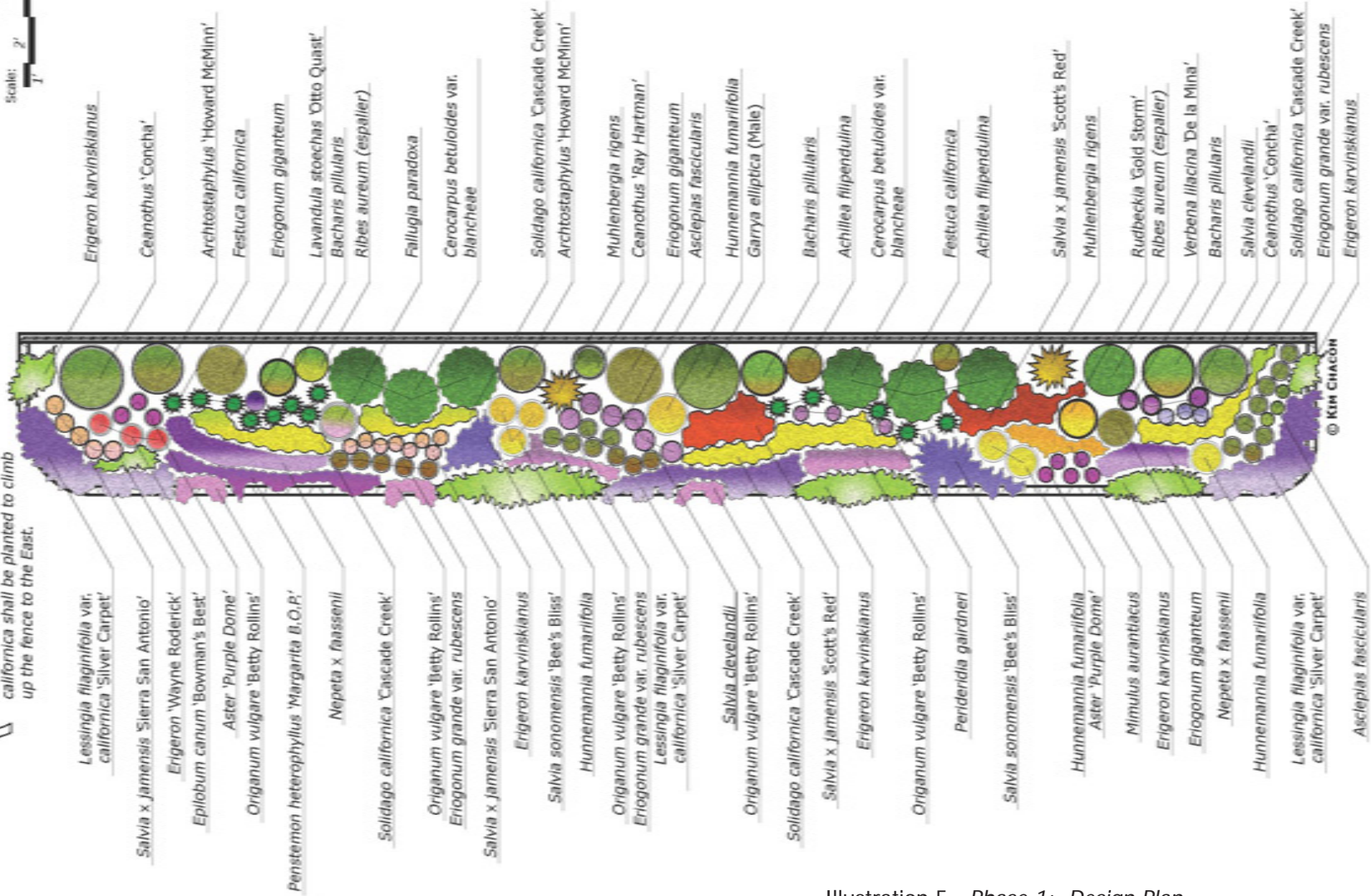


Illustration 5 - Phase 1: Design Plan

PHASE 2: SURROUNDING SITE



SITE ANALYSIS

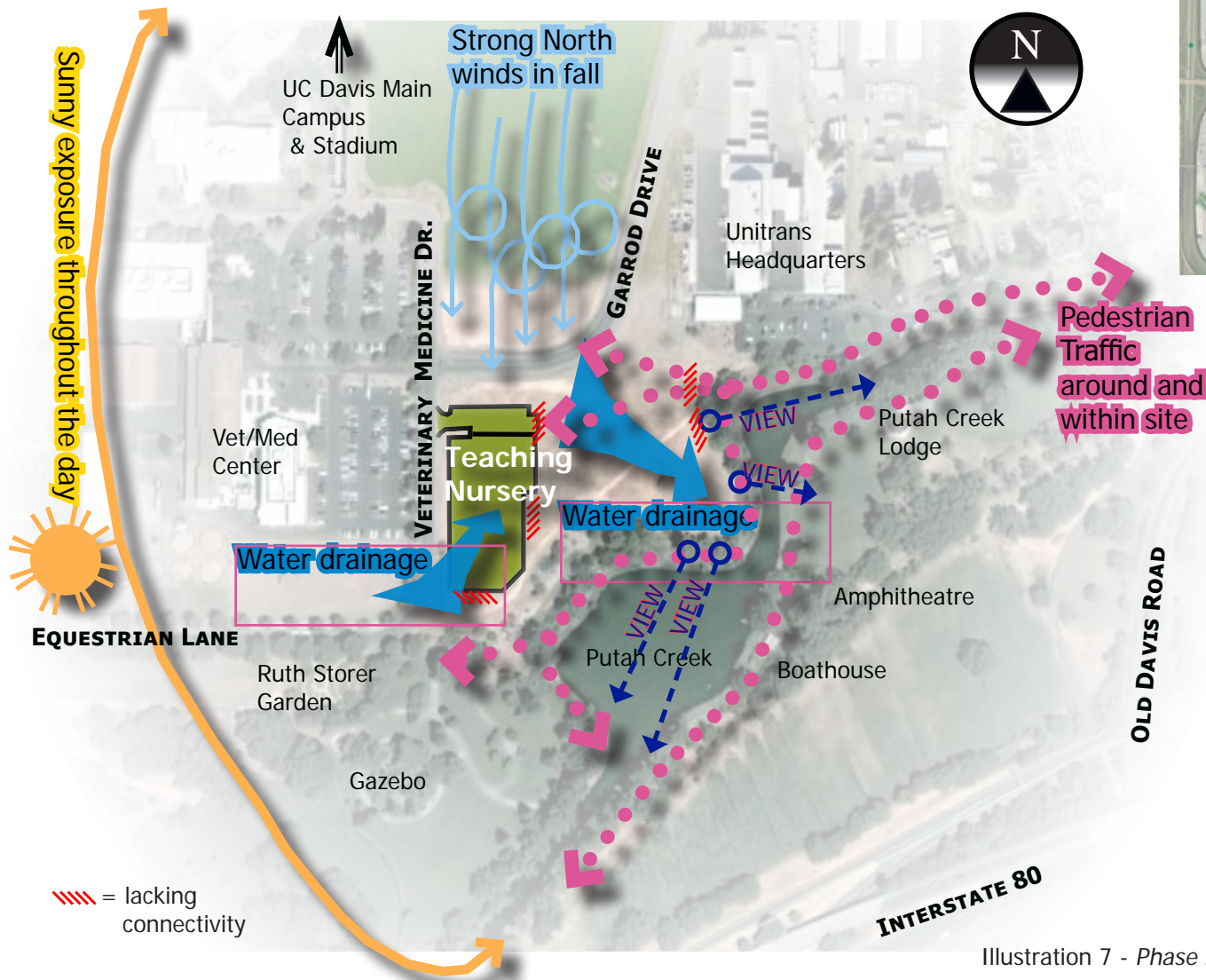
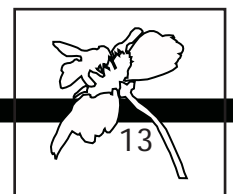


Illustration 6 - Site location on UC Davis Campus Map

"We are glad that our plantings can be of use to so many-and in the process, do just a little more to improve the diversity of our bit of earth. Most importantly, though, we hope that the humans that visit our garden ecosystem have the opportunity to learn and to appreciate all the threads in the web of life."

-Ellen Zagory, UC Davis Arboretum Review, 1997

Illustration 7 - Phase 2 Site Analysis, NTS



CONCEPTUAL DESIGN 'A'

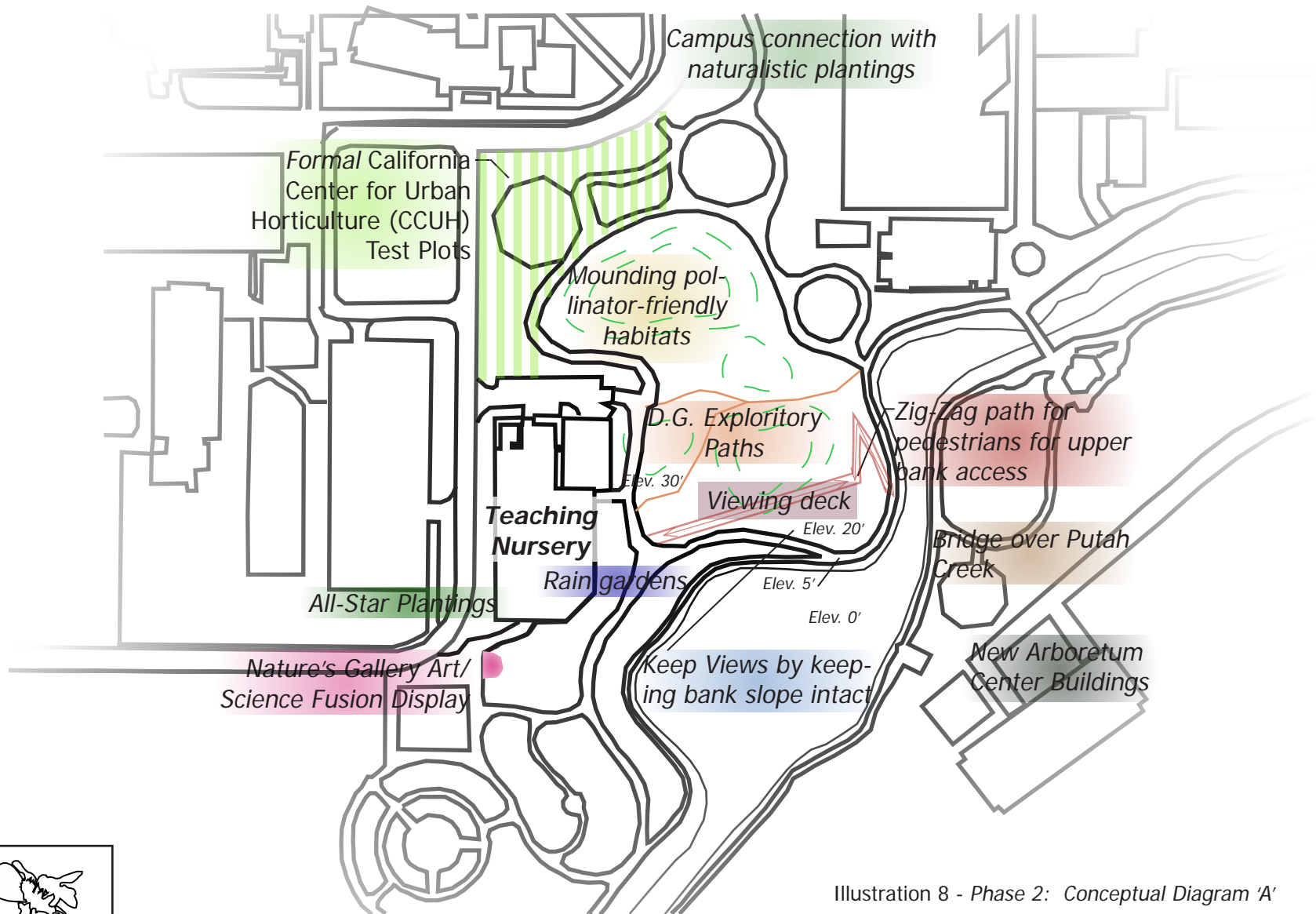


Illustration 8 - Phase 2: Conceptual Diagram 'A'



CONCEPTUAL DESIGN 'B'

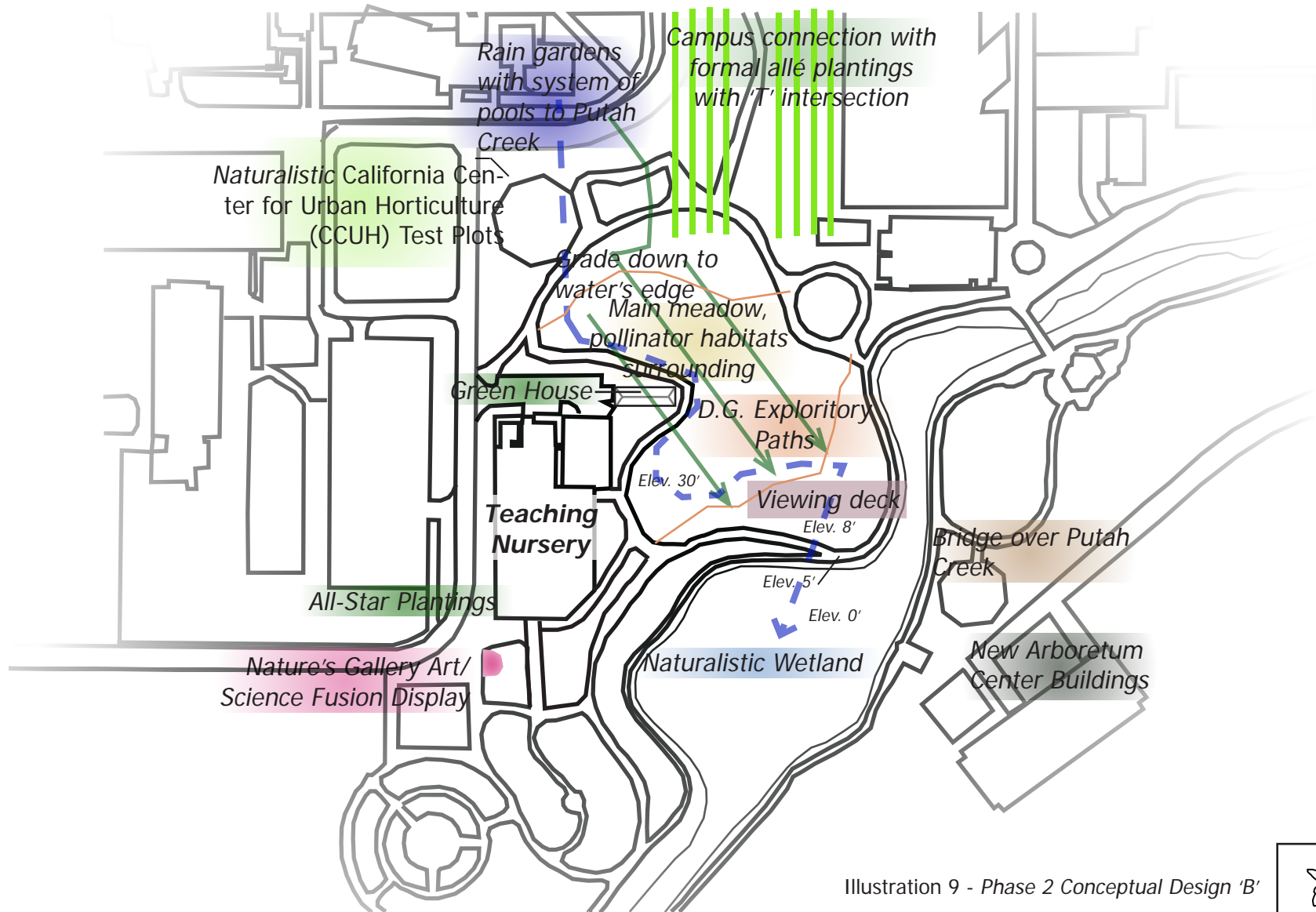
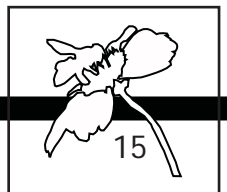
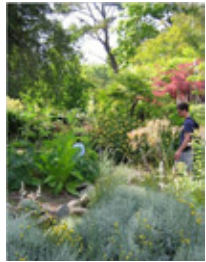


Illustration 9 - Phase 2 Conceptual Design 'B'



DESIGN PLAN



Photograph 14 - Plan Example: Pathways of William Land Park in Sacramento



Photograph 16 - Plan Example: Switch Back from flickr.com



Photograph 15 - Plan Example: Rain Garden from Stewardship-partners.org



Photograph 13 - Plan Example: Wedding Deck from flickr.com

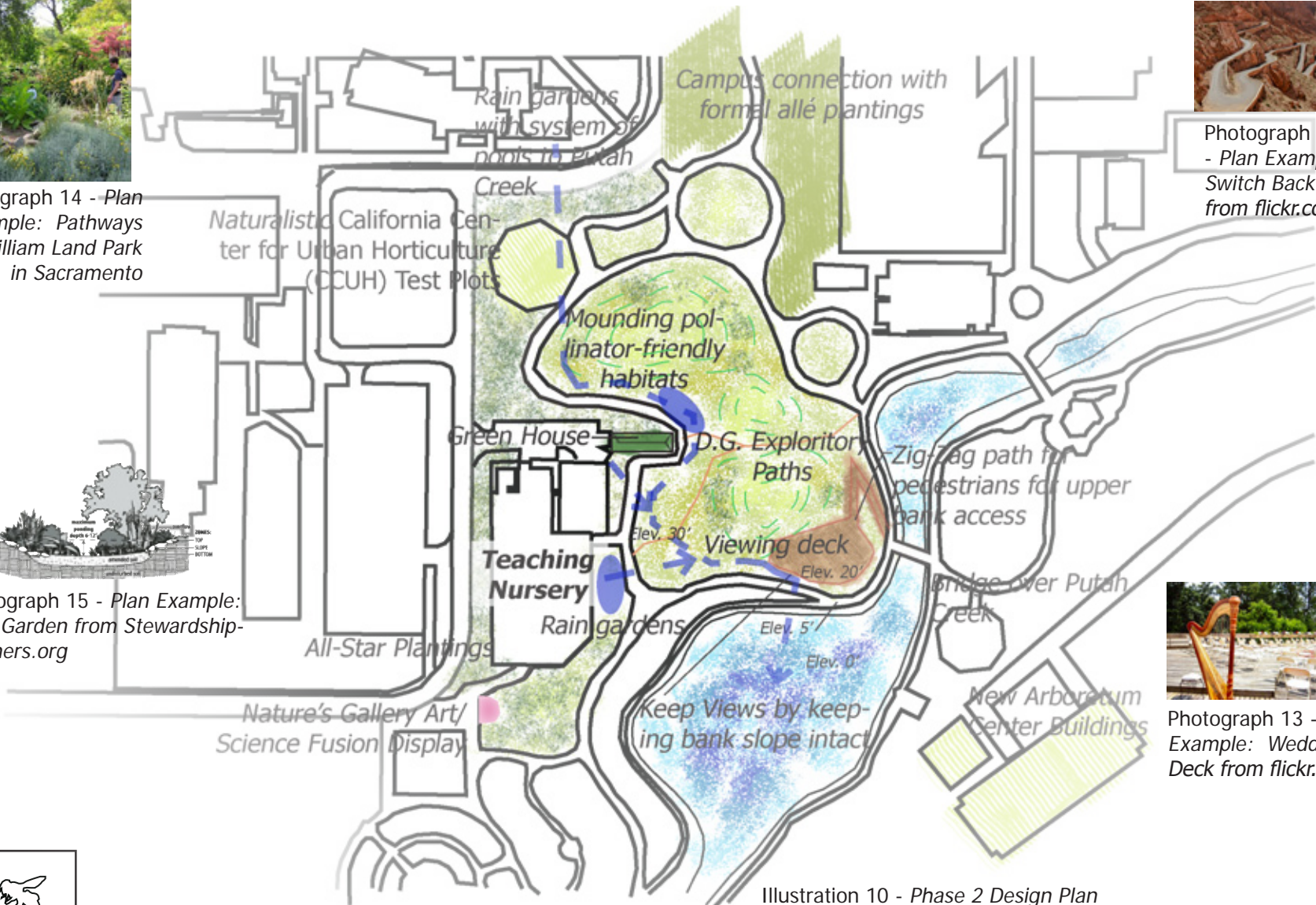


Illustration 10 - Phase 2 Design Plan

CONCLUSION



UC Davis Arboretum's**Characteristics of Sustainable Gardens**

- *Complex mix of vegetation supports diverse fauna*
- *Efficient use of resources*
- *Reduced energy inputs*
- *Plants adapted to local conditions*
- *Green waste recycled as compost*
- *Woody debris chipped for mulch*
- *Recycled or local materials used for garden structures and hardscapes*
- *Provide food, water and shelter for wildlife*
- *Nectar and pollen-producing plants attract and increase beneficial insects*
- *Seed and fruit-producing plants attract birds*
- *Dense shrubbery provides nesting sites for birds*
- *Grasses, leaf litter, and bark crevices provide overwintering refuge for beneficial insects*

Every time we change a landscape its ecological processes are altered, for better or for worse. As Landscape Architects, we are stewards for the environment with our designs and specifically our plant choices. Design should be more than just about 'how it looks'; much more than 'just art'. Additionally, just because a landscape is ecologically balanced does not mean that it has to be unattractive or boring, quite the contrary.

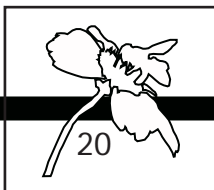
In recent years an emphasis on restoration ecology has come about. Attempts at any restoration work will be much more effective if looked at from an ecologically holistic point of view. We must always remember that those at the top of a food chain will only survive if those below do as well. For that matter, if you want native species of plants to do well in a restoration area be sure to allow your pollinators plenty of food and shelter.

Pollinator-friendly habitats must be a way of the future. By making such habitats we will be protecting our natural landscapes as well as our food supplies. Efforts are needed at the 'local' scale to save our native pollinators before it is too late. As designers, we have tremendous ecological power in our designs. We can consciously choose to design for creation of landscapes that provide ecological services. The choice is yours.



“If we (humankind) and the rest of the backbone animals were to disappear overnight; the rest of the world would get along pretty well. But, if they were to disappear, the land’s ecosystems would collapse. For the fact is, they (insects) were the pioneers, the first animals of any kind to colonize the lands of the Earth.”

-Sir David Attenborough, *Life in the Underworld*



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Art Shapiro's Butterfly Website: <http://butterfly.ucdavis.edu/>

UC Davis Arboretum All-Stars Web site http://arboretum.ucdavis.edu/arboretum_all_stars.aspx

Sacramento Audubon Society Website: <http://www.sacramentoaudubon.org/>

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National Wildlife Foundation Website: <http://www.nwf.org/gardenforwildlife/>

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Photos from: [flickr.com](http://www.flickr.com)

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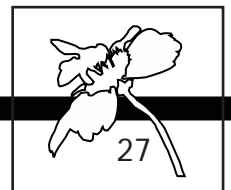
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THE END



Photo 17 - *Bee crawling into crack from flickr.com*

