Sustainable, Time-Efficient Landscapes

Mountain View Library

March 20, 2012

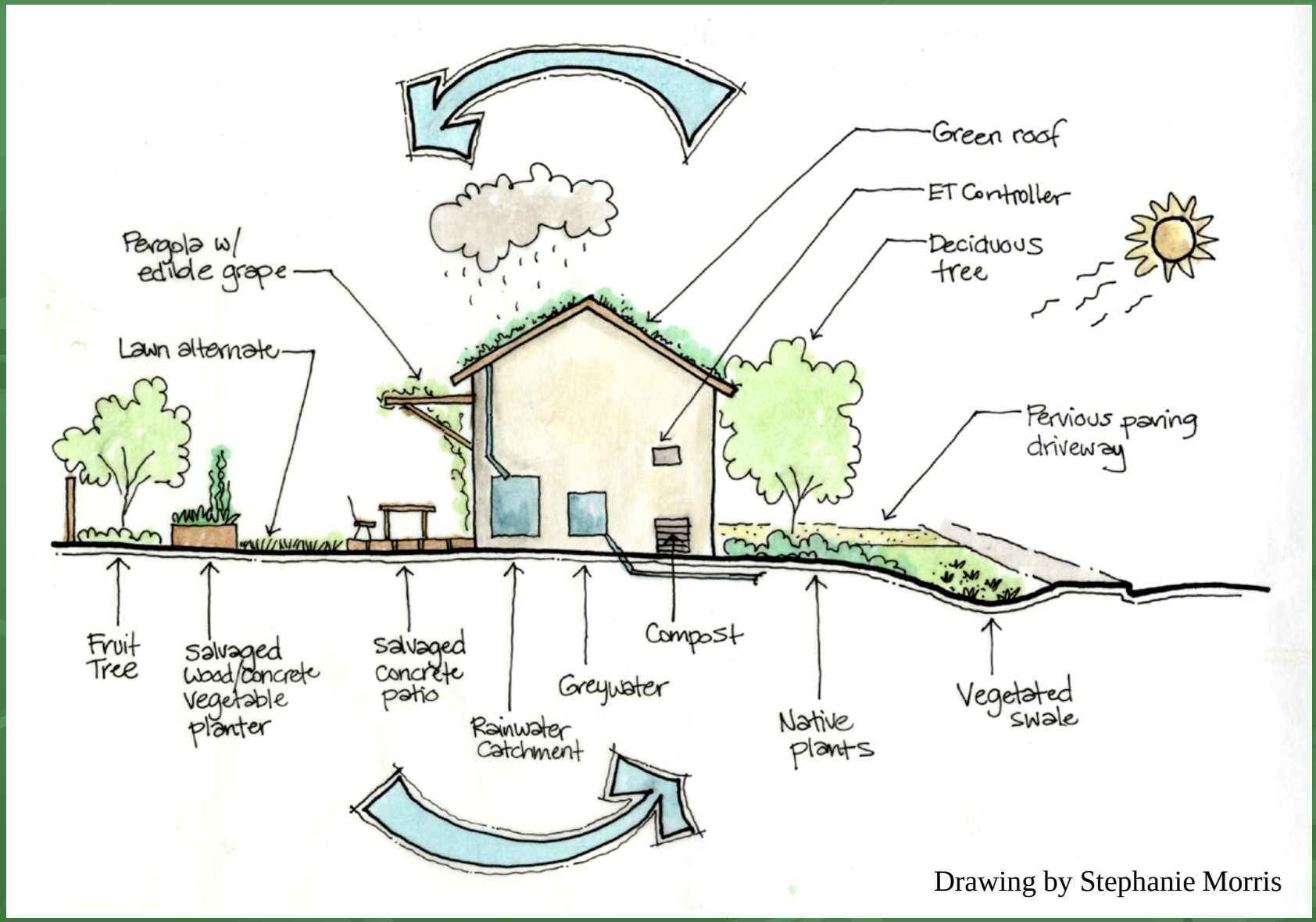
Sherri D. Osaka

Sustainable Landscape Design

www.sustainable-landscape.com

What is Sustainable?

- ***"Meets present needs without compromising the ability of future generations to meet their needs"*** *(UN Conference,1987).*
- *Preserves and builds "natural capital" i.e. clean air, water, good soil, forests, wetlands, etc.*



Drawing by Stephanie Morris

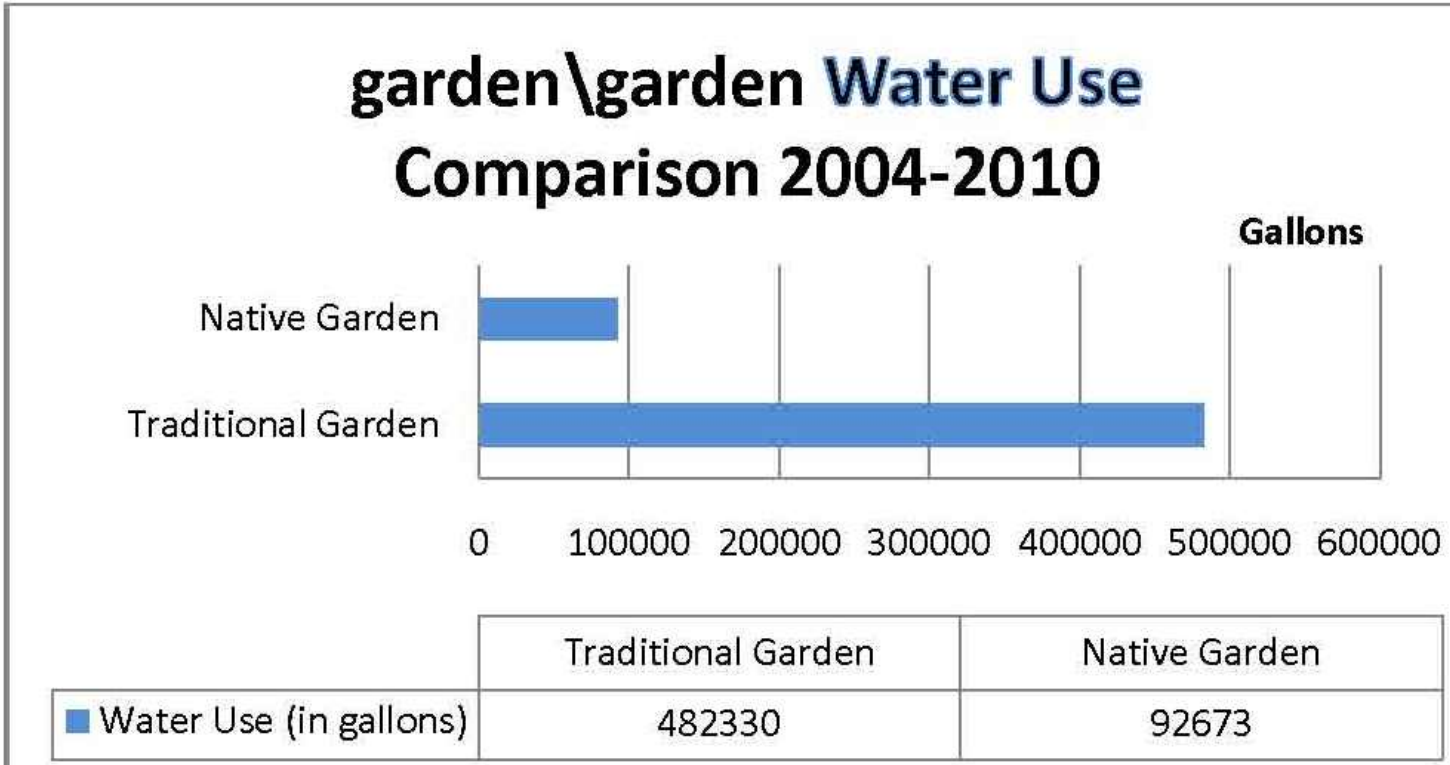
WHOLE SYSTEMS APPROACH

Garden/ Garden Study
City of Santa Monica

Traditional Garden

Native Garden

Garden /Garden Study
City of Santa Monica



	Traditional Garden	Native Garden
Water Use (in gallons)	482330	92673

Garden /Garden Study
City of Santa Monica

	Traditional Garden	Native Garden
Green Waste (in pounds)	2385	1491

Garden /Garden Study
City of Santa Monica

Least Favorite Garden Activities?

Manzanita berries “Little Apples”

Least Favorite Garden Activities?

10. Planting
9. Pruning
8. Deadheading
7. Spraying (chemicals)
6. Digging/ tilling
5. Turning Compost Pile
4. **Watering**
3. **Fertilizing/ Amending**
2. **Mowing**
1. **Weeding**

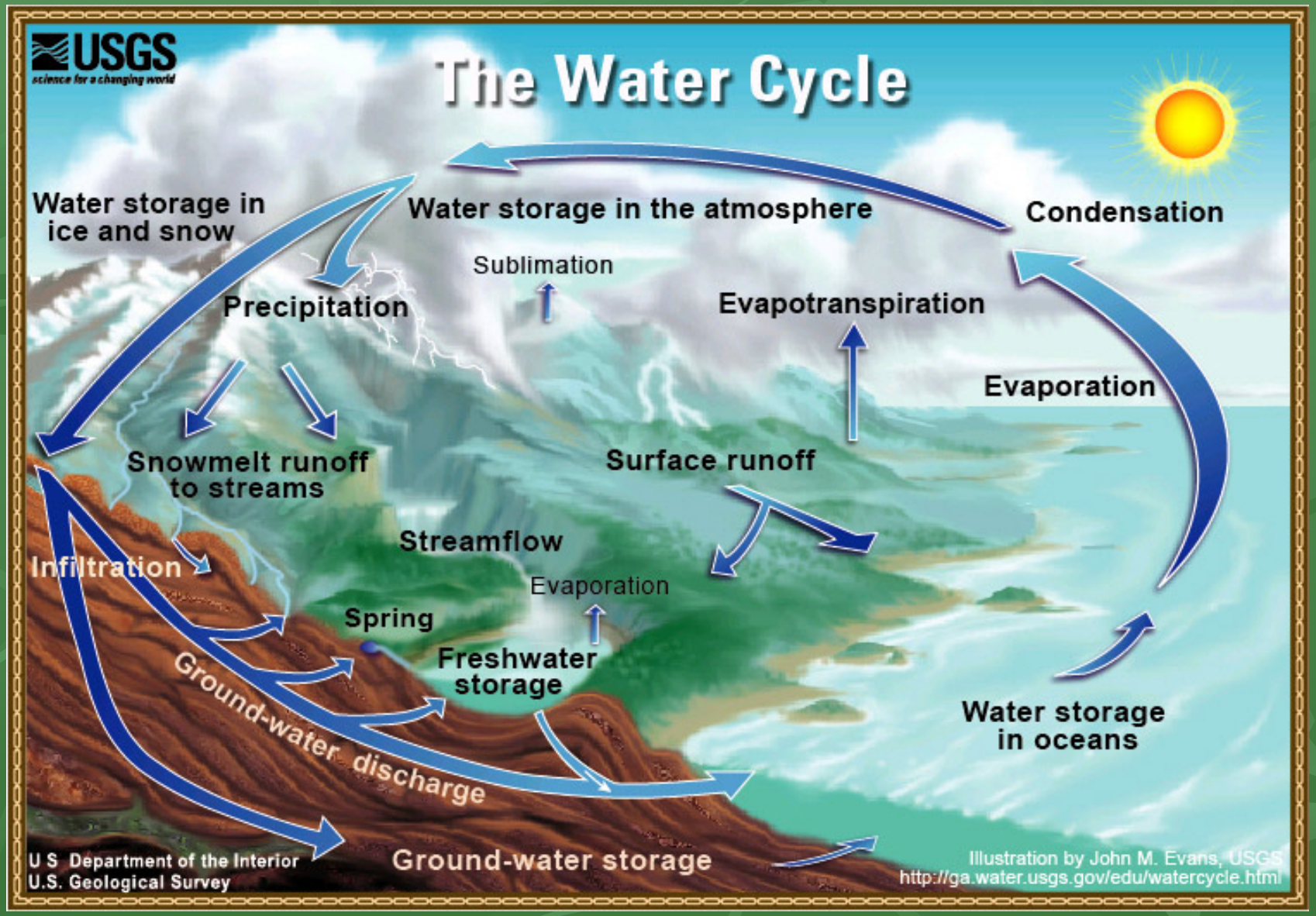
Manzanita berries “Little Apples”

Least Favorite Gardening Task: Watering

There exists a fusion-based desalination technology…,

There exists a fusion-based desalination technology…,

It’s called RAIN!


USGS
science for a changing world
The Water Cycle
Water storage in ice and snow
Water storage in the atmosphere
Condensation
Sublimation
Precipitation
Evapotranspiration
Evaporation
Snowmelt runoff to streams
Surface runoff
Streamflow
Infiltration
Evaporation
Spring
Freshwater storage
Ground-water discharge
Water storage in oceans
Ground-water storage
U S Department of the Interior
U.S. Geological Survey
Illustration by John M. Evans, USGS
http://ga.water.usgs.gov/edu/watercycle.html

How to Read Your Utility Bill Statement

Your utility bill gives you information about your water usage and other charges on your utility bill.

Key Information At-A-Glance

A This area provides the telephone numbers to call for billing and other service-related questions or concerns.

B **Account Information**: A summary of your billing information, including the billing dates, amount due and due date. Note: if payment is not received by due date, finance charges will be added to your next bill.

C **Water**: A breakdown of water usage by tier in the rate structure and is based on meter size, usage and number of days in the billing period. Note: one unit of water equals 748 gallons.

D **Water Usage:** A summary of water usage with a 12-month graph comparing your water usage for the current year to the previous year. Note: single-family residential customers have an additional bar showing the average water usage for all single-family homes.

E **Bill Details**: A breakdown of the *Total Amount Due*.

Water is the total of the *Cost* in section **C**.

Meter Charge is based on your meter size and days in your billing period (this pays for the fixed costs related to water operations and maintenance).

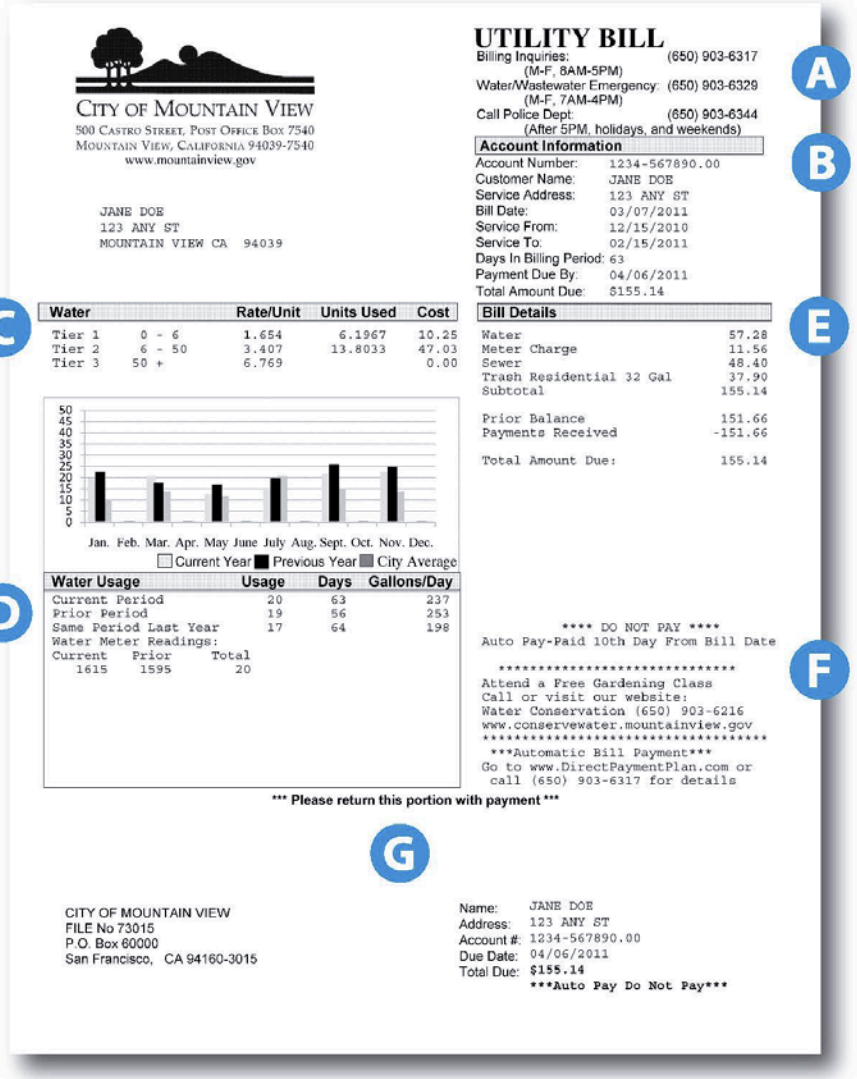
Sewer is a flat rate for residential customers and a variable rate based on water usage for commercial customers.

Trash is a list of the type, size, number and frequency of containers.

F **Messages:** A ****DO NOT PAY**** message indicates that you have signed up with the City to have your bill automatically paid. No payment needs to be sent. This area will also periodically contain special-interest messages from the City.

G **Payment Coupon**: This portion should be returned with your payment made payable to the City of Mountain View and mailed to the address indicated. Please write your account number on your check. Other payment options are:

- Automatic payment through the City (call 650-903-6317).
- Automatic payment through your bank.
- Drop box at City Hall (left of main doors).
- Payment by phone with credit card (call 650-903-6317).
- Payment in person at the Finance and Administrative Services Department (2nd floor of City Hall).



CCF = 100 cubic feet, 1 CCF = 748 GALLONS OF WATER, 1 CF = 7.48 GALLONS

Check for leaks

Read your water meter once a year

Energy Used for Water

The State Water Project

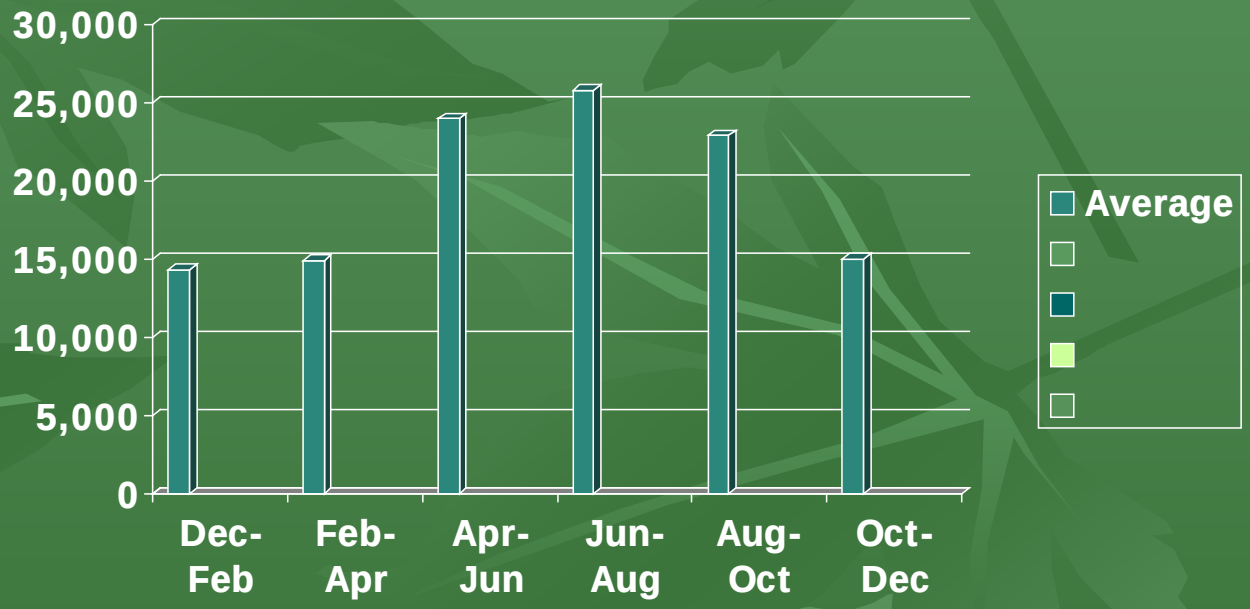
Reservoir high in the Hollywood Hills

15-20% of all energy used in California is water related (cleaning, moving, heating)

Water Use in Bay Area Home

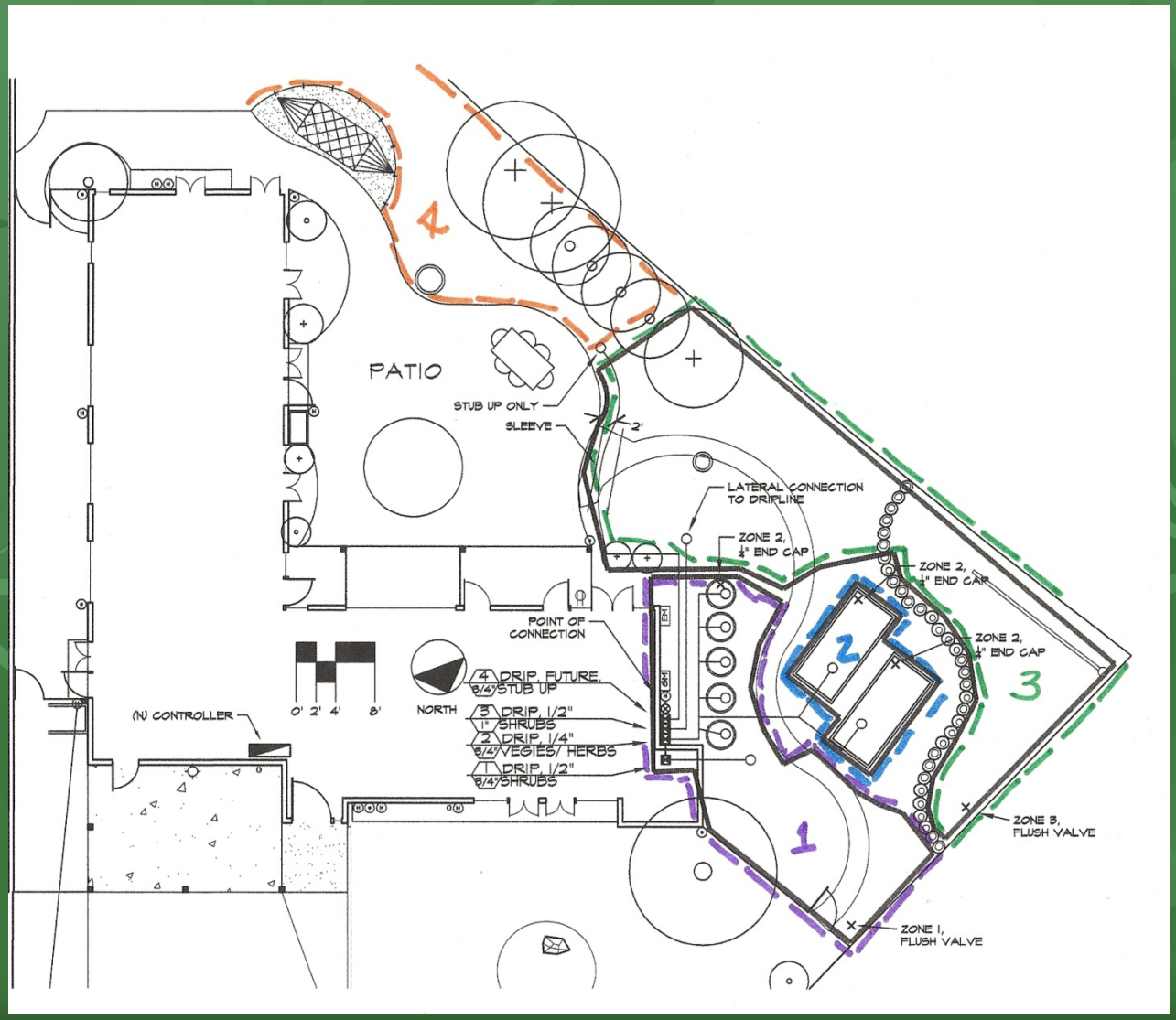
11,000 square foot lot, pool, low water landscape

- About 120,000 gallons per year
- 90,000 gallons inside house
- 30,000 gallons outside house

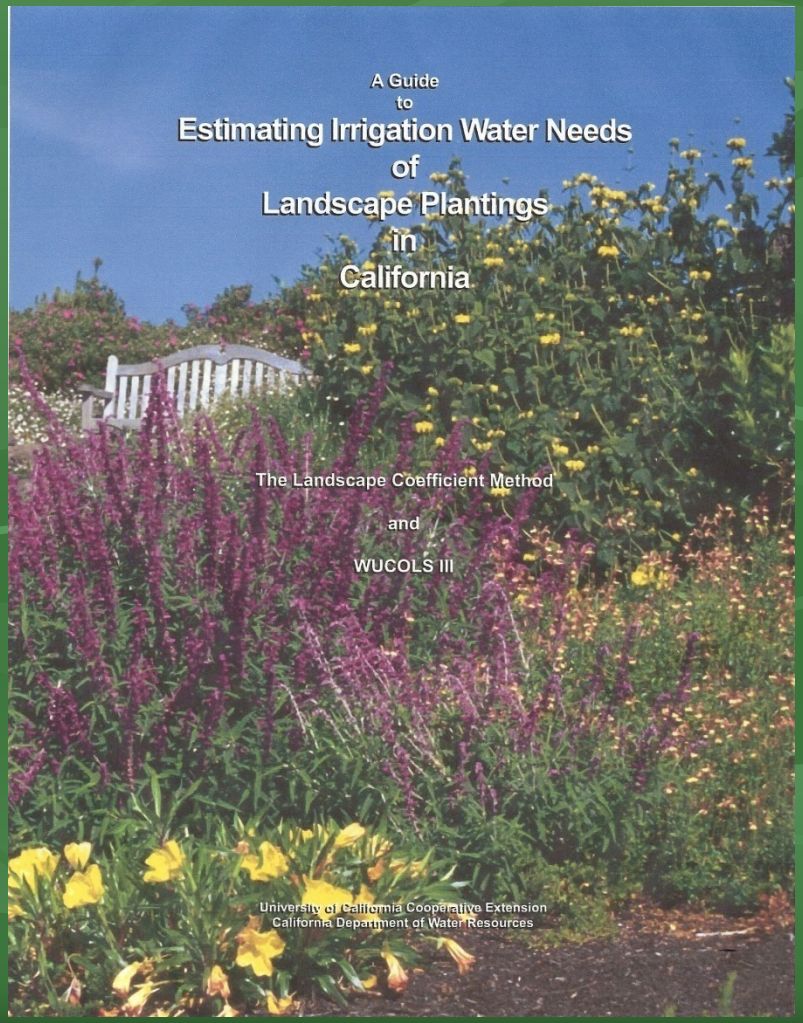


About 30 percent for outdoor use

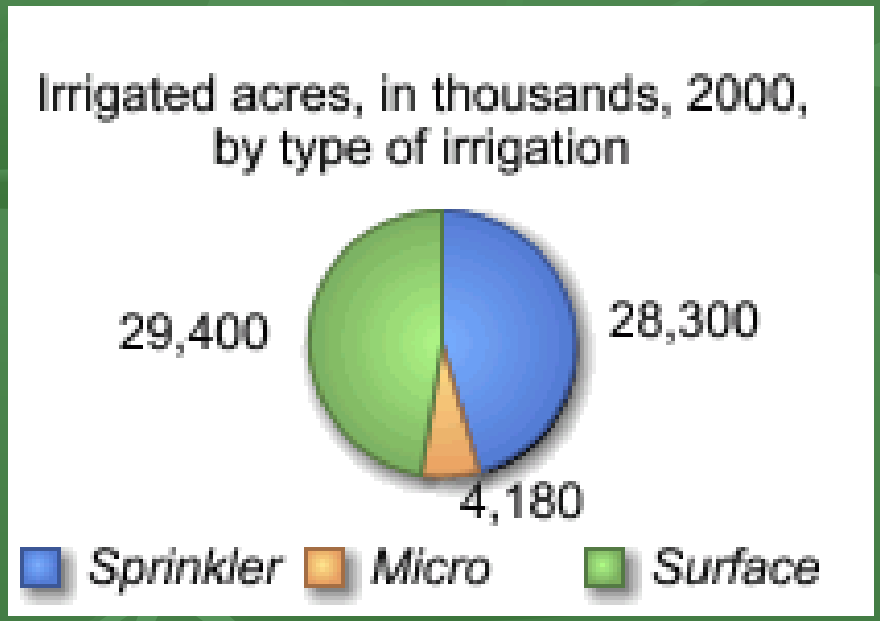
Hydrozoning



Water Use Classifications of Landscape Species (WUCOLS)



Hand water vs. Spray vs. Drip*



- Hand watering – 33% less water than average
- Spray irrigation – 35% more water
- Automatic watering – 47% more water
- Drip irrigation – 16% more water

* American Water Works Association Research Foundation's study

Change your controller at least 4 times per year

Dec – Off Mar – 50% June – 100% Sep – 50%

Case Study - Handwatering

Case Study - Handwatering

Case Study - Handwatering

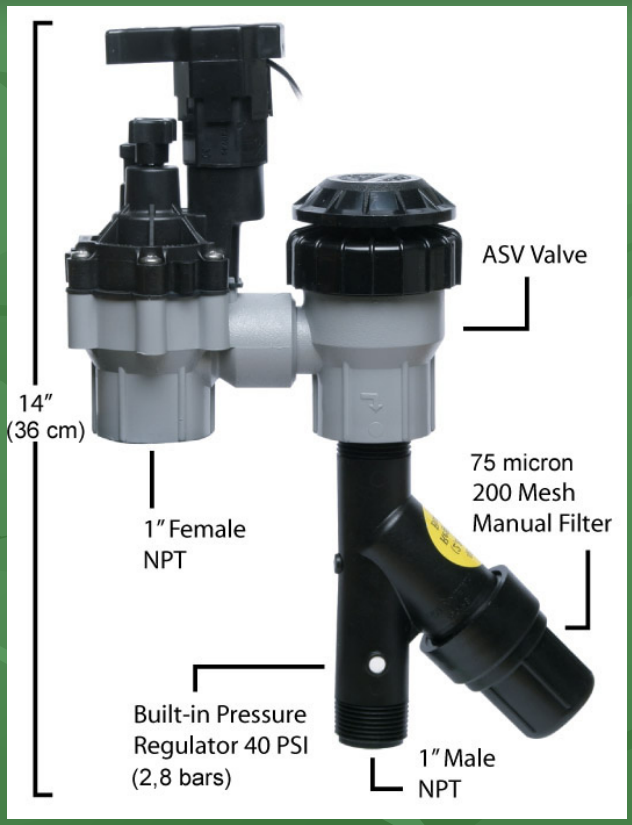
Creating a Lush Garden with CA Natives

Mountain View
Description:
Learn about design techniques for creating a lush look with beautiful CA natives, grasses and low water use plants.
Instructor: Leigh Gronet
Location: Mountain View Library, 585 Franklin St., Mountain View
Date: Saturday, April 14, 2012
Time: 1:00 PM - 4:00 PM

Save more time by adding a little irrigation….

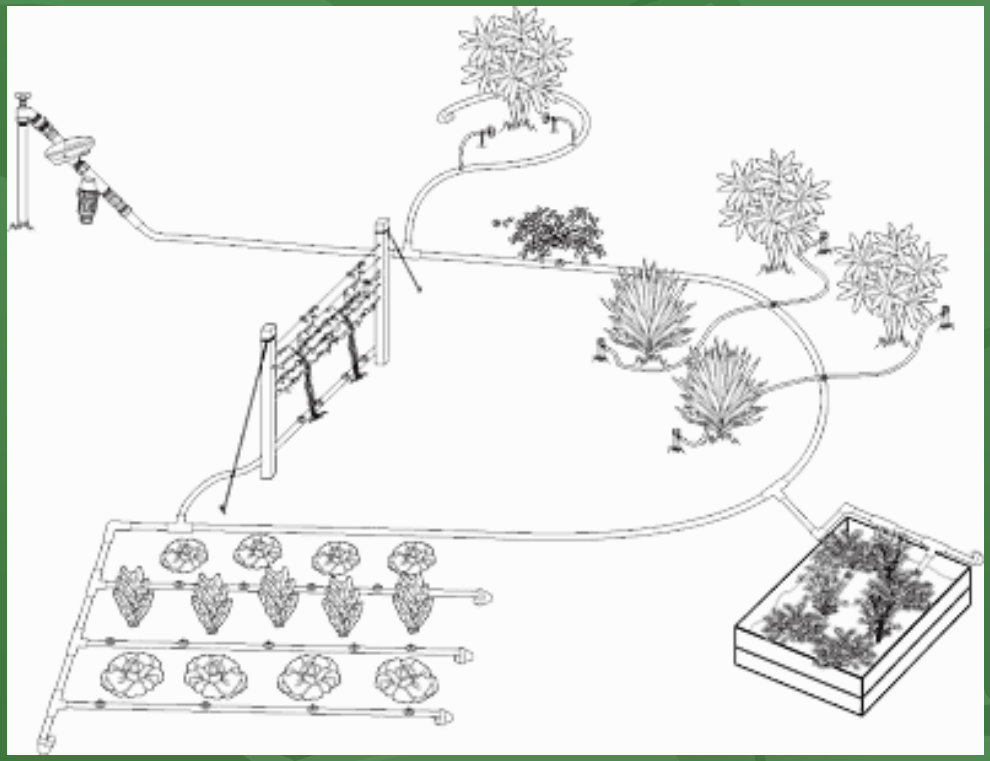
Components of Drip Irrigation

- Valves with filters and pressure regulator
- Drip emitters
- Inline emitters
- End caps



Two Drip Irrigation Methods

- Per Plant Method
  - Add emitters per each plant
  - More efficient when plants are small
  - Less expensive to install
  - Limits root and plant growth
  - Requires more maintenance
  - Some adjustments for differing water requirements



Two Drip Irrigation Methods

- Grid Method
  - Waters all the soil, mimics rainfall
  - Inefficient when plants are small
  - Better long term for growth
  - More expensive to install
  - Must hydrozone!

Subsurface Drip Irrigation for Lawns

Lawn uses subsurface drip irrigation—Recommend Netafim Techline CV products

ET ‘Smart’ Controller

- Use weather information to determine precise water needs, adjusted daily
- Some charge monthly fee for connection to weather station
- Many manufacturers

Landscape Replacement Rebates – Santa Clara Valley Water District

Qualifying Irrigation Hardware and Rebate Amounts

Rain Sensor	Up to $50 per sensor
High-Efficiency Nozzles	Up to $5 per nozzle
Dedicated Landscape Meter	Up to $500 per meter
Rotary Sprinkers or Spray Bodies with Pressure Regulation and/or Check Valves	Up to $20 per set
Weather Based Irrigation Controller, 1-12 Stations*	Up to $300 per controller
Weather-Based Irrigation Controller, 13-24 Stations*	Up to $700 per controller
Weather-Based Irrigation Controller, 25 Stations Or Greater*	Up to $1,000 per controller

Drought-Tolerant Plant References

- “California Native Plants for the Garden” by Bornstein, Fross, and O’Brien
- “Care and Maintenance of Southern California Native Plant Gardens” by O’Brien, Landis, and Mackey
- “Plants and Landscapes for Summer-Dry Climates” by East Bay MUD
- “Landscape Plants for California Gardens” by Bob Perry

Least Favorite Gardening Task: Fertilizing (with chemicals)

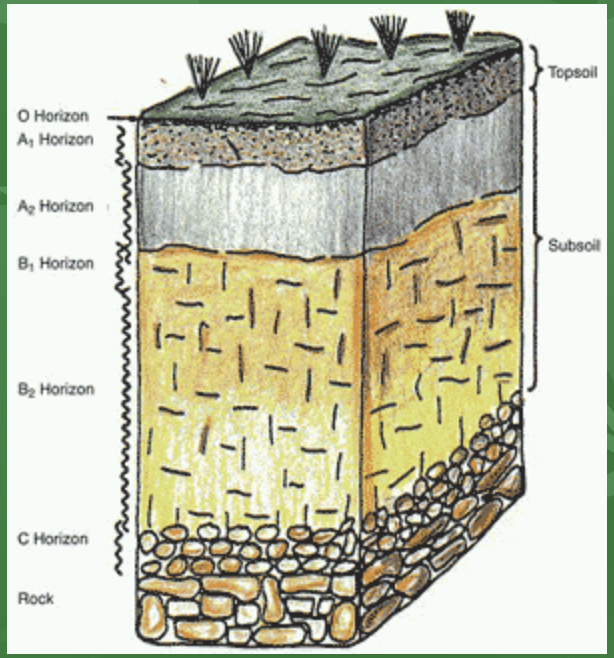
The Soil Problem

Loss of natural capital:

- No top soil
- Lifeless soil

Benefits of healthy soils

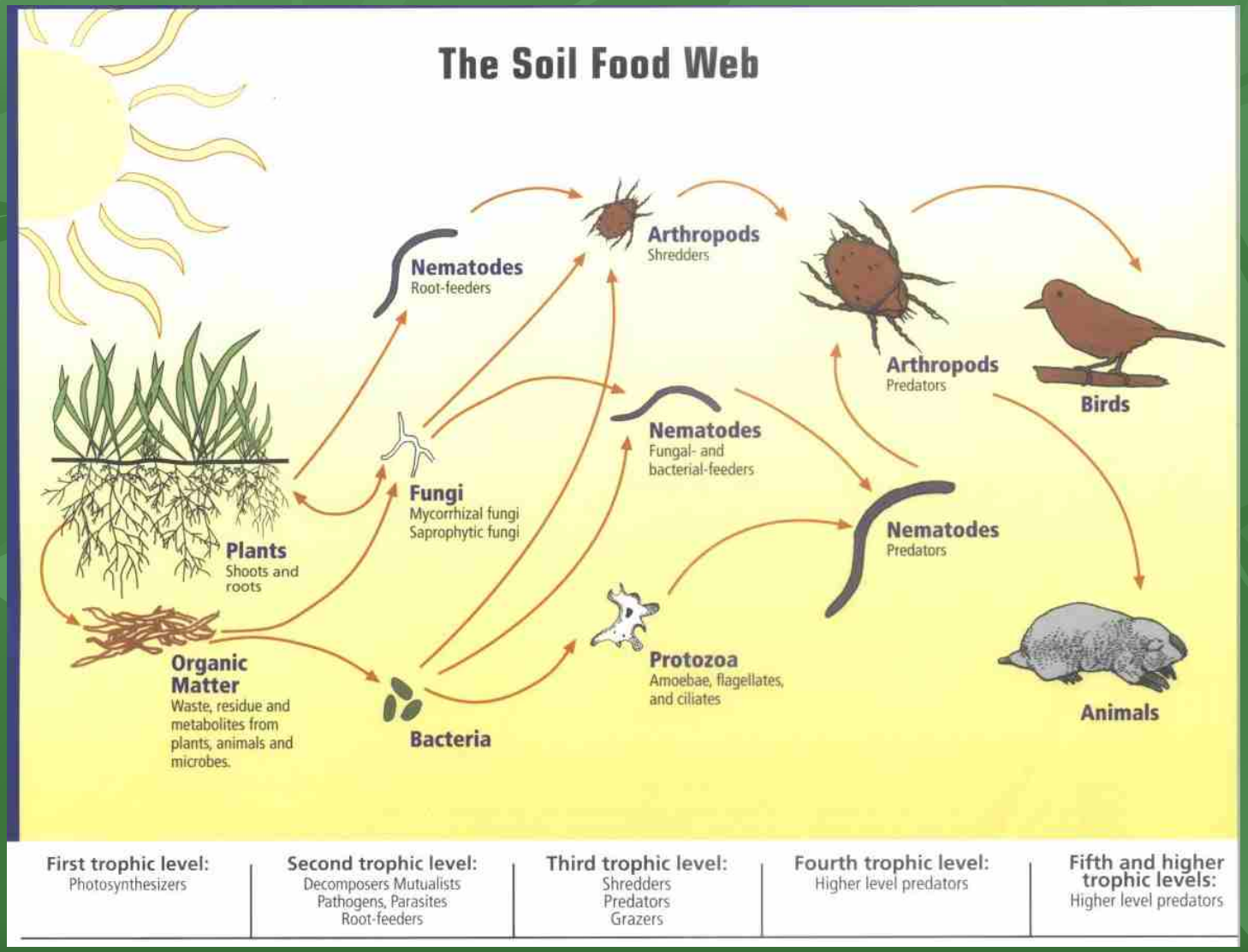
- Support plant growth
- Holds water
- Cleans water



Soil protection

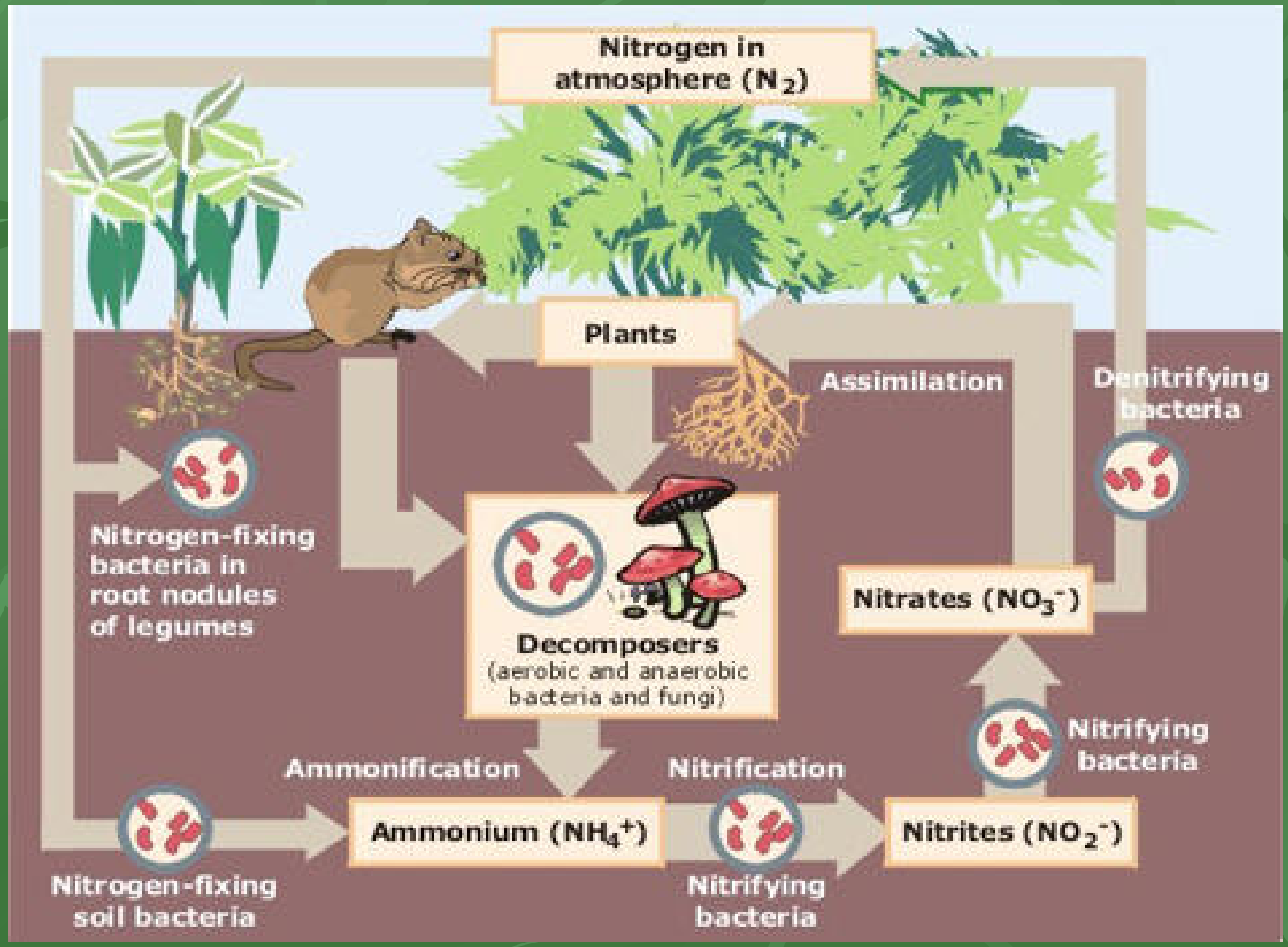
No top soil at new housing development,
Water puddles, won’t soak in
Won’t support plant life

Soil Biology – It's Alive!



From *Soil Biology Primer* published by Soil and Water Conservation Society

Nitrogen Cycle



Courtesy EPA, Source: http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/earth_system/biogeochemical_cycles.html

Soil Biology & Plant Health

Two Bugs Are Better Than One

In the experiment depicted here, blue grama grass was grown in sterile soil. Bacteria were added to the soil in some pots. Bacteria and bacteria-eating nematodes were added to other pots.

The plants in soil with both bacteria and nematodes grew fastest. Although this was an artificial environment, the study demonstrated that the interaction between two organisms benefited plants.

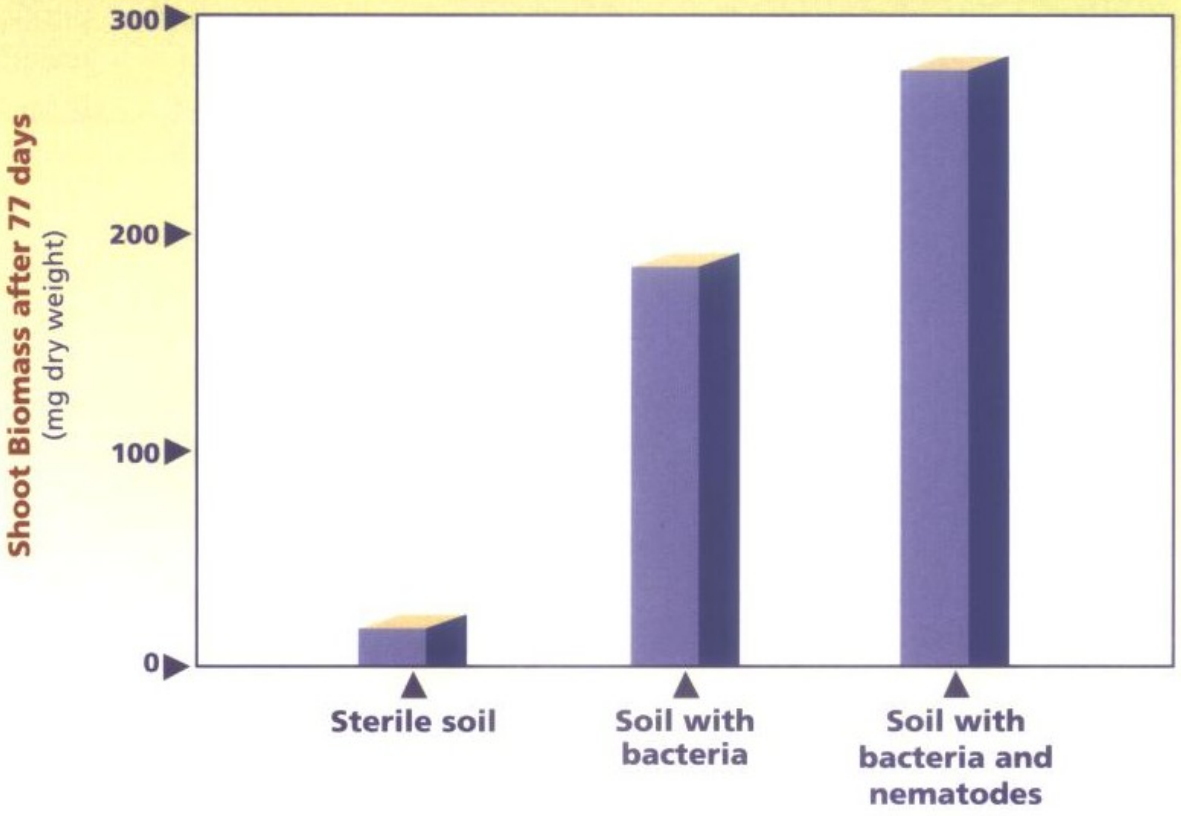


Figure 6

From *Soil Biology Primer* published by Soil and Water Conservation Society

Eliminate Waste - Mulching

- Mulch prunings and removed plants
- Keep “arbor chips” after professional tree service
- Create own mulch with electric chipper

Top: chipped plants to be used as mulch

Below: electric chipper

Right: arbor chips

Eliminate Waste – Grass Cycling

Eliminate Waste, Feed the Soil Compost!

Steve's Earth Engine – Cedar

Biostack compost bin (made from recycled plastic)

Eliminate Petroleum Fertilizers

- Compost & compost tea
- Grass Cycle
- Test soil
- Organic amendments only when needed
- Cover crops – grow your own amendments

Bee and buckwheat blossoms, Vetch blossom
Sustainable Farming Association of Minnesota

Improving Soil Biology

- Add living compost and compost tea
- Keep soil planted
- Keep plant litter on top of soils or add mulch
- Have soil tested
- Add organic amendments only as required
- No tilling
- No chemicals or petrochemicals
- No solarization

Photo: www.denver.gov.org

The Soil Health Cycle Summary

Eriogonum grande var. rubescens
Red-flowered buckwheat

- Protect top soil
- Increase soil biology
- Work with nitrogen cycle

Soil Health References

- “Teaming with Microbes: A Gardener’s Guide to the Soil Food Web” by Jeff Lowenfels & Wayne Lewis
- “Worms Eat my Garbage” by Mary Appelhof
- “Soil Biology Primer” by Soil and Water Conservation Society

Least Favorite Gardening Task: Mowing

Current Plant Problems

Landscape Replacement Rebates – Santa Clara Valley Water District

- $0.75/ square foot ($1.50 in Palo Alto)
- Up to $2000 ($3000 max PA)
- 50% covered with plants
- Drip, microspray emitters or bubblers
- No pop-up sprays
- Mulch

Lawn Alternatives - Shrubs

Ceanothus ‘Yankee Point’ by Stephanie Curtis, Curtis Horticulture

Lawn Alternative - Shrubs

Ceanothus Hearstiorum

Ceanothus ‘Anchor Bay’

Lawn Alternatives - Shrubs

Coyote Bush, *Baccharis pilularis 'Twin Peaks'*

Lawn Alternatives - Perennials

Seathrift, *Armeria maritima* “lawn” by Agi Kehoe

Lawn Alternatives - Perennials

Herb lawn by EarthCare Landscaping

Lawn Alternatives - Perennials

Coyote mint
Monardella villosa obispoensis

California fuchsia
Epilobium species

Creeping sage
Salvia sonomensis ‘Dara’s Choice’

Photo Deva Luna,
Design Sherri Osaka

Sand Hill sage: *Artemisia pycnocephalus ‘David’s Choice’*

Photo: Deva Luna, Design: Sherri Osaka

Walkable Lawn Alternatives

Red fescue: *Festuca rubra*

Walkable Lawn Alternatives

Yarrow Lawn, *Achillea millefolium,* design by Stephanie Morris

Walkable Lawn Alternatives

Photo from Greenlee Nursery, La Jolla, CA

Design/ Photo: Sherri Osaka

Meadow sedge, *Carex pansa*

Case Study – East San Jose

After

Before

Drought tolerant landscapes – Case study bird sanctuary

Before

Pondless waterfall on timer for birds

Before

After

Drought-tolerant landscape
Case study lawn replacement

Before

After: 18 species of native plants

Case Study -- Craftsman Remodel

Pervious Concrete with Brick Bands

Design by Sherri Osaka, Installation by Earthcare Landscaping

Very low water – Western redbud

Cercis occidentalis

Drought-tolerant landscapes
Case study front yard

Landscape Replacement Rebates - Santa Clara Valley Water District

- $0.75/ square foot ($1.50 in Palo Alto)
- Up to $2000 ($3000 max PA)
- 50% covered with plants from approved list
- Drip, microsprays, emitters or bubblers
- No pop-up sprays
- Mulch, 2” minimum

Many Alternatives to a Lawn!

Least Favorite Gardening Task: Weeding

- Corn meal gluten prevents weed seeds from sprouting

Flamer - use with caution on windy dry days!

Peaceful Valley Farm & Garden Supply

Eliminate Herbicides Sheet Mulching

Newspaper Sheet Mulch

Use Sustainable Landscaping Techniques to Minimize Your Least Favorite Gardening Tasks

Fremontodendron californica ‘Ken Taylor’

Sustainable Landscape Design

Blending artistry and ecology

California Native Plants for Low Water Landscapes -- 2012

Very Low Water-Use *

Type	*Botanical Name*	Common Name	HxW
T	*Aesculus californica*	Buckeye	30'x30'
T, S	*Arctostaphylos spp*	Manzanita	varies
S	*Artemisia spp*	Sagebrush	varies
S	*Atriplex spp*	Saltbush	varies
S	*Baccharis 'Centennial'*	Centennial baccharis	3'x5'
S	*Berberis nevinii*	Nevin's barberry	6'x8'
B	*Brodiaea spp.*	Brodiaea	varies
S	*Ceanothus spp.*	Wild lilacs	varies
T	*Cercis occidentalis*	Western redbud	15'x10'
T	*Cercocarpus betuloides*	Western mountain mohagany	10'x8'
T	*Chilopsis linearis*	Desert willow	15'x15'
S	*Dendromecon rigida*	Bush poppy	2-8'
G	*Festuca idahoensis*	Idaho fescue	3'x3'
S	*Fremontodendron spp*	Flannel bush	8'x8'+
T	*Heteromeles arbutifolia*	Toyon	15'x10'
G	*Leymus spp*	Wild rye	6'x4'
S	*Lupinus albifrons*	Silver bush lupine	4'x4'
S	*Malacothamnus fasciculatus, M. fremontii*	Chaparral, Fremont's bush mallow	6-8'x6'
GC	*Monardella villosa*	Coyote mint	1'x4'
G	*Nassella cernua, N. lepida, N. pulchra*	Nodding, Foothill, Purple needle grasses	varies
T	*Pinus sabiana*	Grey pine	50'x20'
T	*Quercus agrifolia, Q. berberidifolia*	Coast live, California scrub oak	varies
T	*Quercus wislizeni*	Interior live oak	30-75'
B	*Ranunculus californicus*	California buttercup	1'x1'
S	*Ribes malvaceum*	Chaparral currant	4-10'
S	*Romneya coulteri*	Matilija poppy	6'x6'
S	*Salvia apiana*	White sage	3'x3'
P	*Sisyrinchium bellum*	Blue-eyed grass	1'x1'
S	*Trichostema lanatum*	Woolly blue curls	4'x4'
B	*Tritelia laxa*	Ithuriel's spear	1'x1'

Low Water Use *

Type	*Botanical Name*	Common Name	HxW
GC	*Achillea millefolium*	Common yarrow (lawn substitute)	1' x 2'
GC	*Baccharis pilularis cultivars*	Dwarf coyote bush	3'x8'
S	*Carpenteria californica*	California bush anemone	8'x8'
V	*Clematis lasiantha*	Chaparral clematis	18'
S	*Corylus cornuta*	Western hazelnut	15'x15'
GC	*Dudleya spp*	Liveforever	varies

P.O. Box 6335, San Jose, CA 95150-6335, Phone/Fax: (408) 264-742; www.sustainable-landscape.com

P	*Epilobium canum, E. septentrionale*	California fuchsia *(Zauschneria)*	varies
P	*Erigeron glaucus*	Beach aster	1'x2'
S, P	*Eriogonum spp.*	Buckwheats	Varies
GC	*Eriophyllum lanatum*	Dwarf woolly daisy	1'x3'
G	*Festuca californica*	California fescue	3'x3'
S	*Galvezia speciosa*	Island bush snapdragon	4'x5'
S	*Garrya elliptica, G. fremontii*	Coast, Fremont silktassels	12'
GC	*Heterotheca villosa*	Hairy golden aster	1'x3'
P	*Iris douglasiana*	Douglas's iris	1'x3'
S	*Lavatera assurgentiflora*	Tree mallow	10'x10'
S	*Lonicera hispidula*	Hairy honeysuckle	10'x10'
S	*Lupinus arboreus*	Yellow bush lupine	5'x5'
T	*Lyonothamnus floribundus*	Catalina ironwood	30'x20'
S	*Mahonia pinnata, M. repens (Berberis)*	California holly grape, Creeping mahonia	varies
P	*Mimulus spp. (shrubby)*	Monkeyflower	Varies
G	*Muhlenbergia rigens*	Deer grass	3'x4'
P	*Penstemon spp*	Penstemon	varies
T	*Pinus coulteri, P. edulis*	Coulter, Pinyon pines	Varies
T	*Pinus jeffreyi, P. ponderosa*	Jeffrey, Ponderosa pines	Varies
P	*Polystichum californicum*	Sword fern	3'x3'
S, T	*Prunus ilicifolia, P. i. lyonii*	Hollyleaf, Catalina cherries	varies
T	*Quercus kellogii, Q. lobata*	California black, Valley oaks	Varies
S	*Rhamnus californicus, R. croceus*	Coffeeberry, Redberry	8'x8'
S	*Rhus integrifolia, R. ovata*	Lemonade berry, Sugar bush	10'x10'
S	*Ribes aureum, R. indecorum*	Golden, White-flowering currants	Varies
S	*Ribes sanguineum, R. speciosa*	Red-flowering, Fuchsia-floweringcurrants	varies
S	*Ribes viburnifolium*	Evergreen currant	4'x4'
S	*Salvia clevelandii, leucophylla, mellifera*	Cleveland's, Purple, Black sages	varies
GC	*Salvia sonomensis, S. 'Bees Bliss'*	Sonoma sage, Bee's bliss sage	varies
T	*Sambucus mexicana, S. racemosa racemosa*	Blue elderberry, Red elderberry	15'x15'
GC	*Satureja douglasii*	Yerba Buena	1'x1'
GC	*Sedum spp*	Stone crop	varies
S	*Sphaeralcea ambigua*	Apricot mallow	3'x3'
S	*Styrax officinalis californicum*	California storax	12'x6'
S	*Symphoricarpus albus, S. mollis*	Snowberry bush, Creeping snowberry	spreads
P	*Verbena lilicina 'De la Mina'*	Lilac verbena	4'x4'
V	*Vitis californica*	California wild grape	40'
T	*Washingtonia filifera, W. robusta*	California, Mexican fan palms	varies
S	*Yucca whipplei*	Our Lord's candle	3'x6'

T-Tree, S-Shrub, P-Perennial, V-Vine, G-Grass, GC-Groundcover, B-Bulb; San Jose Reference evaporation-transpiration rate (ETo) = 37" of water April-Sept or 23 gallons/ square foot (sf), High water use plants = .7 - .9 ETo or 18 gallons of water / sf; Moderate water use plants = .4 - .6 ETo or 11.5 gallons of water /sf; Low water use plants = .1 - .3 ETo or 4.6 gallons of water/ sf Very low water use plants = < 0.1 ETo and do not require supplemental water once established.
www.water.ca.gov/pubs/conservation/a_guide_to_estimating_irrigation_water_needs_of_landscape_plantings_in_california__wucols/wucols00.pdf *Water requirements from Water Use Classification of Landscape Species (WUCOLS) Rebate: www.valleywater.org/Programs/LandscapeRebateProgram.aspx