



**Welcome!**

# **Sustainable Vegetable Gardening, part 1**

February 23, 2020

UC Master Gardeners of Napa County



**University of California**

Agriculture and Natural Resources

■ UCCE Master Gardener Program



## Housekeeping Details

Introduction of Master Gardeners

Did you sign in and verify your email address?

Location of restrooms down the hall



University of California

Agriculture and Natural Resources

■ UCCE Master Gardener Program

# Small Group Discussion:

Why did you sign up for this class?  
What do you hope to learn?



University of California

Agriculture and Natural Resources

UCCE Master Gardener Program

# Sustainable Vegetable Gardening

Class 1 – Climate, Temp, Sun, Soil

Class 2 – Seeds & Seedlings, Garden Planning

Class 3 – Water, Weeds, Cool Season Vegetables, IPM

Class 4 – Warm Season Vegetables, IPM, Summary



# Classifying Vegetables: Perennial vs Annual



# Classifying Vegetables: Cool vs Warm Season

- Warm season crops grow best 65-95 degrees and are injured or killed by frost.
- Cool season crops grow best 55 to 75 degrees and tolerate some (or a lot) of frost.



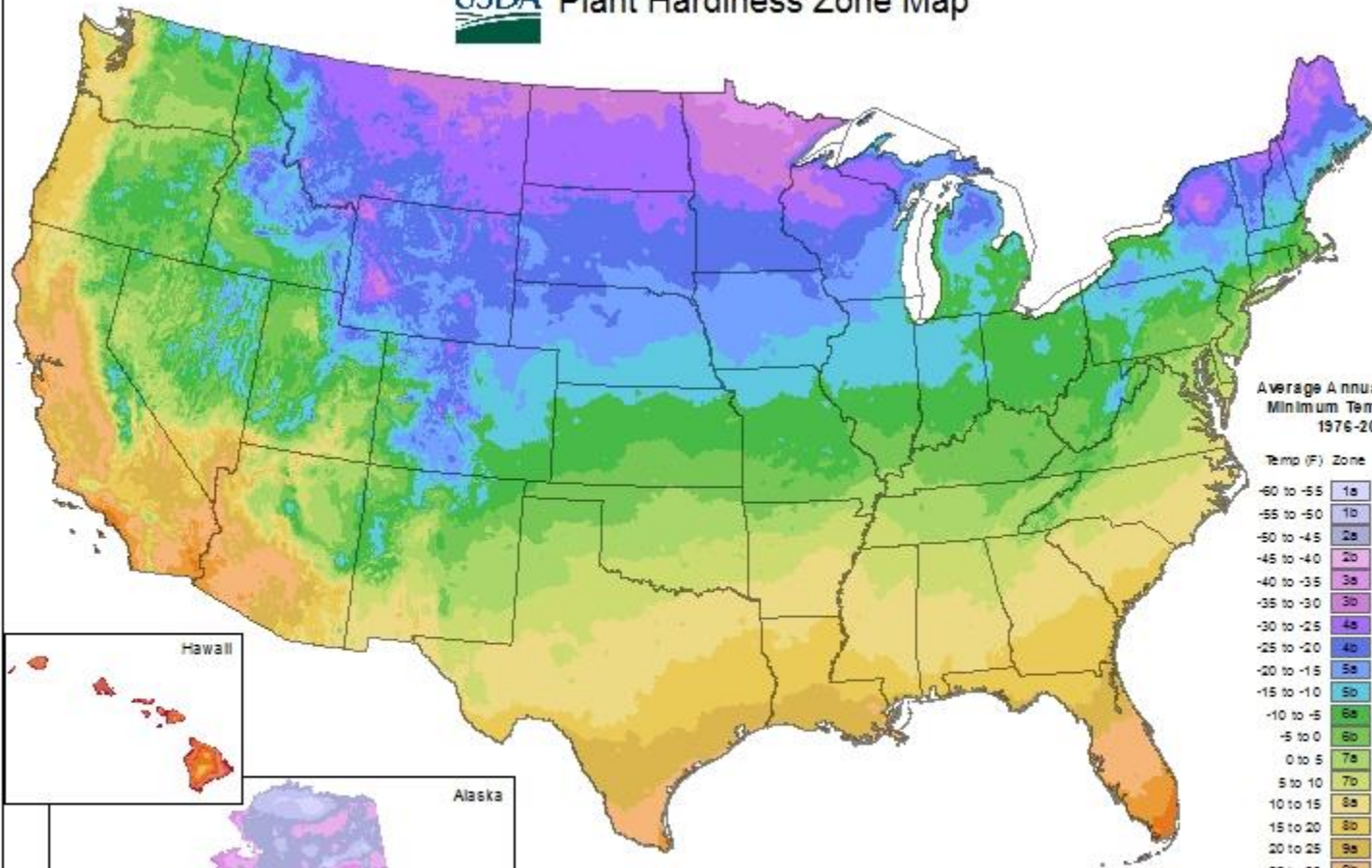
# GLOBAL MEDITERRANEAN CLIMATES



California is one of the few places on Earth with a Mediterranean climate perfect for growing almonds. The Mediterranean climate is characterized by mild winters with a defined rainy season and hot, dry summers, all of which are important for almond orchards.

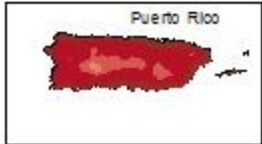
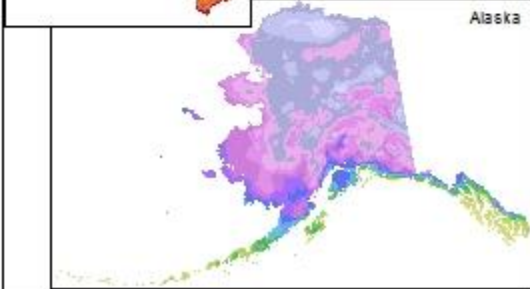
SOURCE: Kottek, M., et al. World Map of Köppen-Geiger Climate Classification. Updated 2006. Meteorol. Z., 15, 259-263.

**USDA Plant Hardiness Zone Map**



**Average Annual Extreme Minimum Temperature 1976-2005**

Temp (F)	Zone	Temp (C)
-60 to -55	1a	-51.1 to -48.3
-55 to -50	1b	-48.3 to -45.6
-50 to -45	2a	-45.6 to -42.8
-45 to -40	2b	-42.8 to -40
-40 to -35	3a	-40 to -37.2
-35 to -30	3b	-37.2 to -34.4
-30 to -25	4a	-34.4 to -31.7
-25 to -20	4b	-31.7 to -28.9
-20 to -15	5a	-28.9 to -26.1
-15 to -10	5b	-26.1 to -23.3
-10 to -5	6a	-23.3 to -20.6
-5 to 0	6b	-20.6 to -17.8
0 to 5	7a	-17.8 to -15
5 to 10	7b	-15 to -12.2
10 to 15	8a	-12.2 to -9.4
15 to 20	8b	-9.4 to -6.7
20 to 25	9a	-6.7 to -3.9
25 to 30	9b	-3.9 to -1.1
30 to 35	10a	-1.1 to 1.7
35 to 40	10b	1.7 to 4.4
40 to 45	11a	4.4 to 7.2
45 to 50	11b	7.2 to 10
50 to 55	12a	10 to 12.8
55 to 60	12b	12.8 to 15.6
60 to 65	13a	15.6 to 18.3
65 to 70	13b	18.3 to 21.1

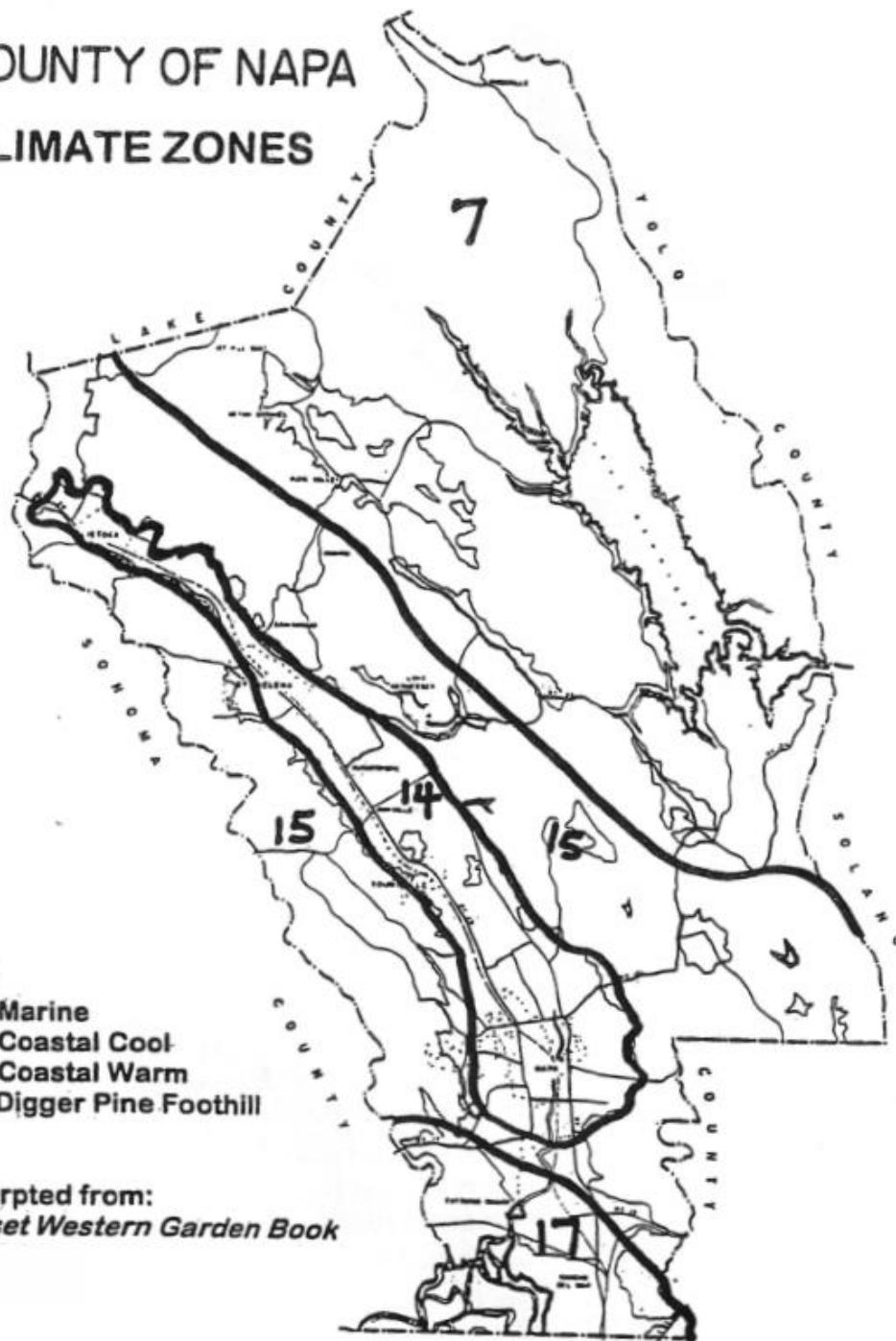


**OSU** Mapping by the PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>, 2012

**ARS** Agricultural Research Service



# COUNTY OF NAPA CLIMATE ZONES



**KEY:**  
17 = Marine  
15 = Coastal Cool  
14 = Coastal Warm  
7 = Digger Pine Foothill

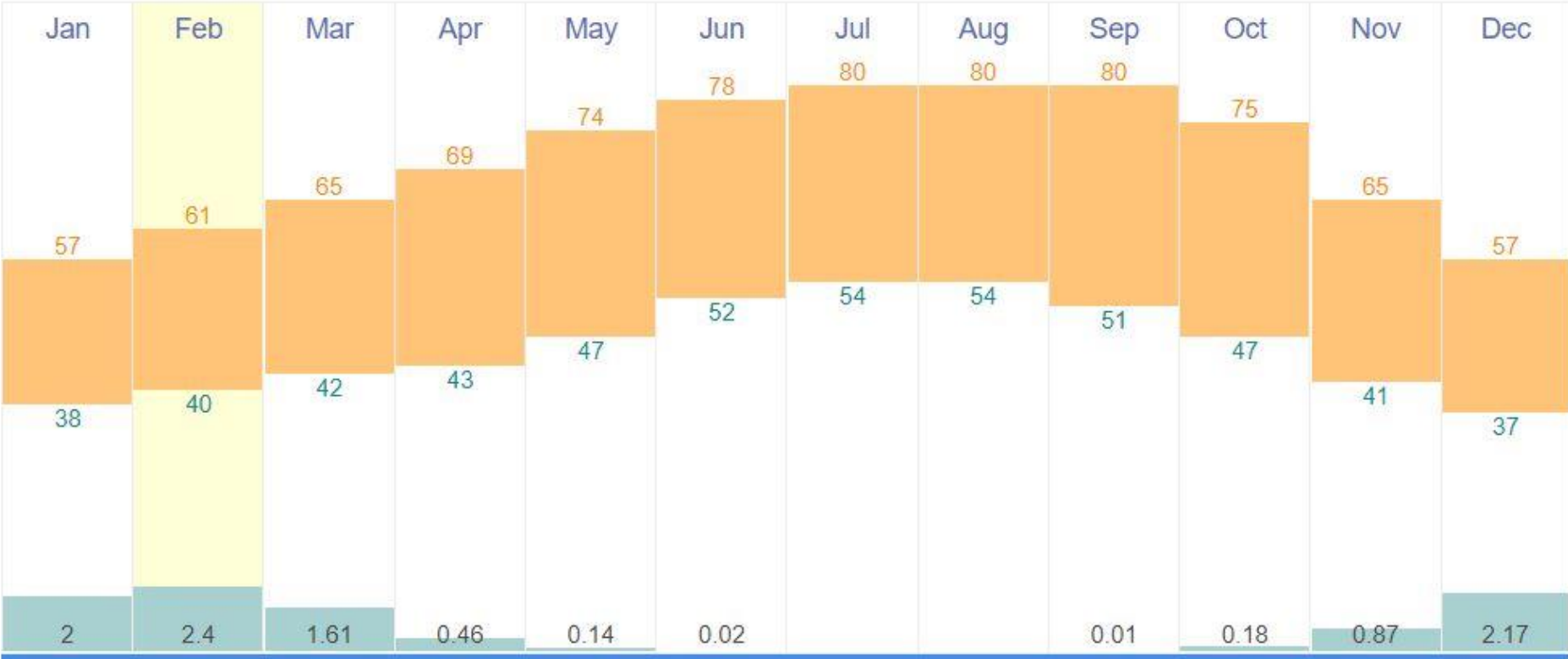
Excerpted from:  
*Sunset Western Garden Book*



# Annual Weather Averages Near Napa

Averages are for Napa County Airport, which is 6 miles from Napa.

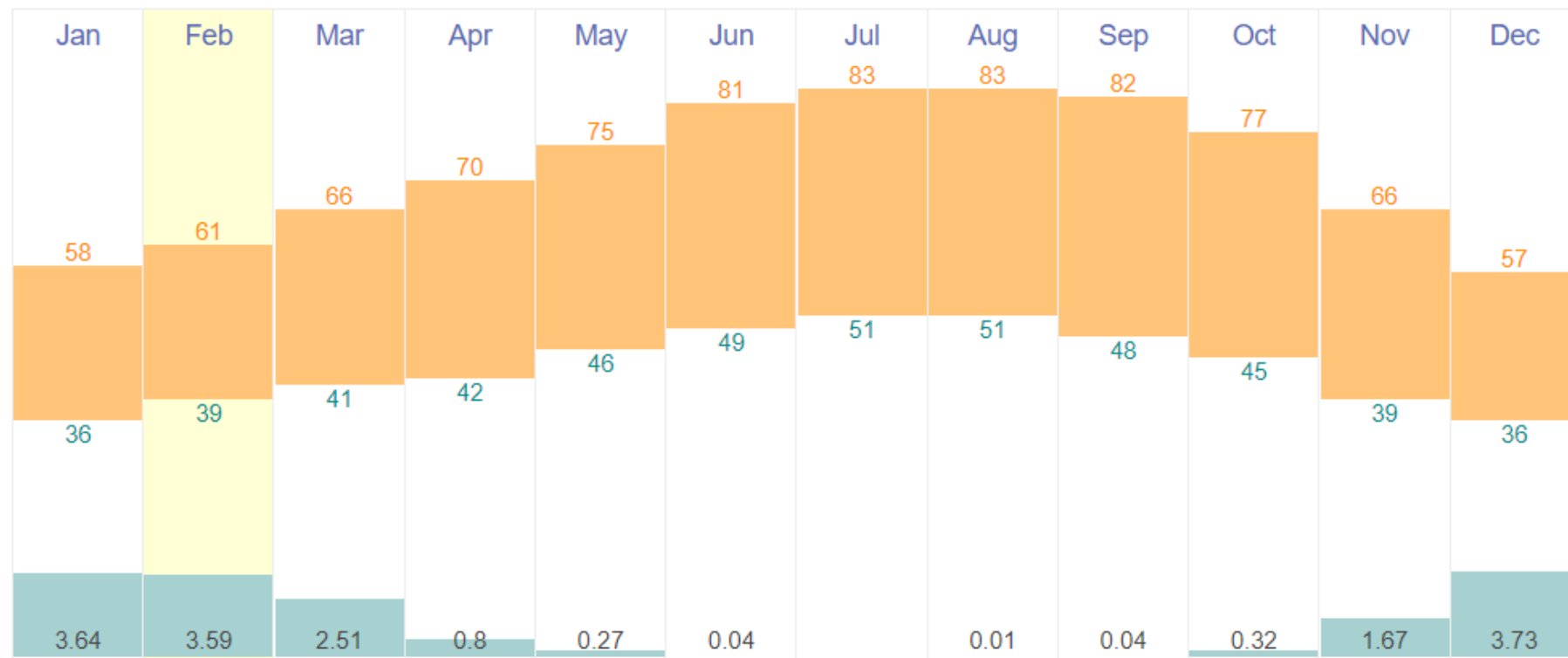
Based on weather reports collected during 1985–2015.



## Annual Weather Averages Near Calistoga

Averages are for Santa Rosa Sonoma County Airport, which is 14 miles from Calistoga.

Based on weather reports collected during 1985–2015.



## Warm Season Crops

- Grow best 65 to 95 Degrees
- Are injured or killed by frost

## Cool Season Crops

- Grow best 55 to 75 Degrees
- Tolerate some amount of short-term freezing (frost tolerant)

# Sunlight – How much is enough?

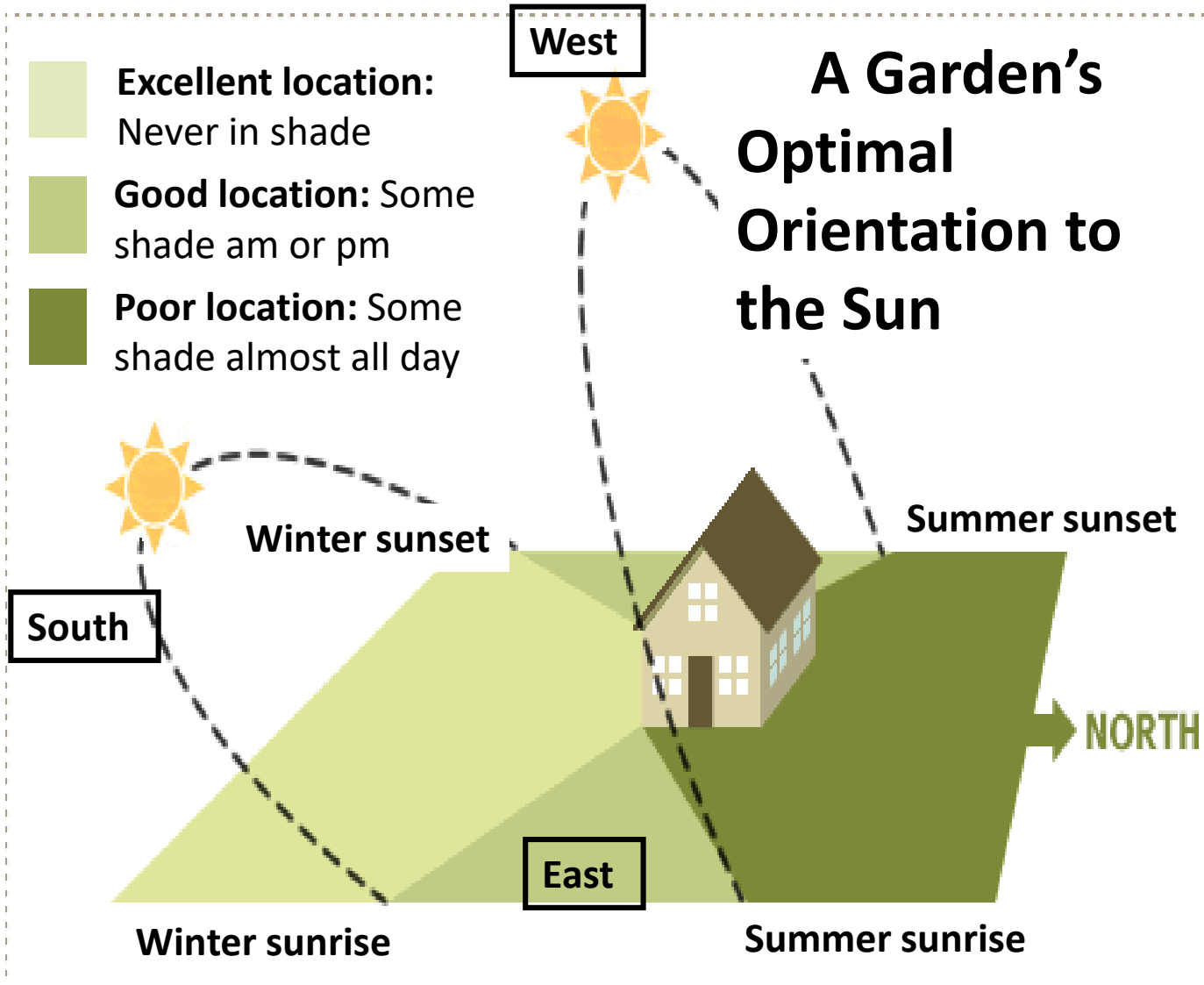
- Eight hours of sunlight is the standard.
- Some leafy or root vegetables will produce a crop with less than eight hours.
- Fruiting crops and warm season crops need the most sunlight.

# Hours of daylight through the year

Source: [timeanddate.com](http://timeanddate.com)

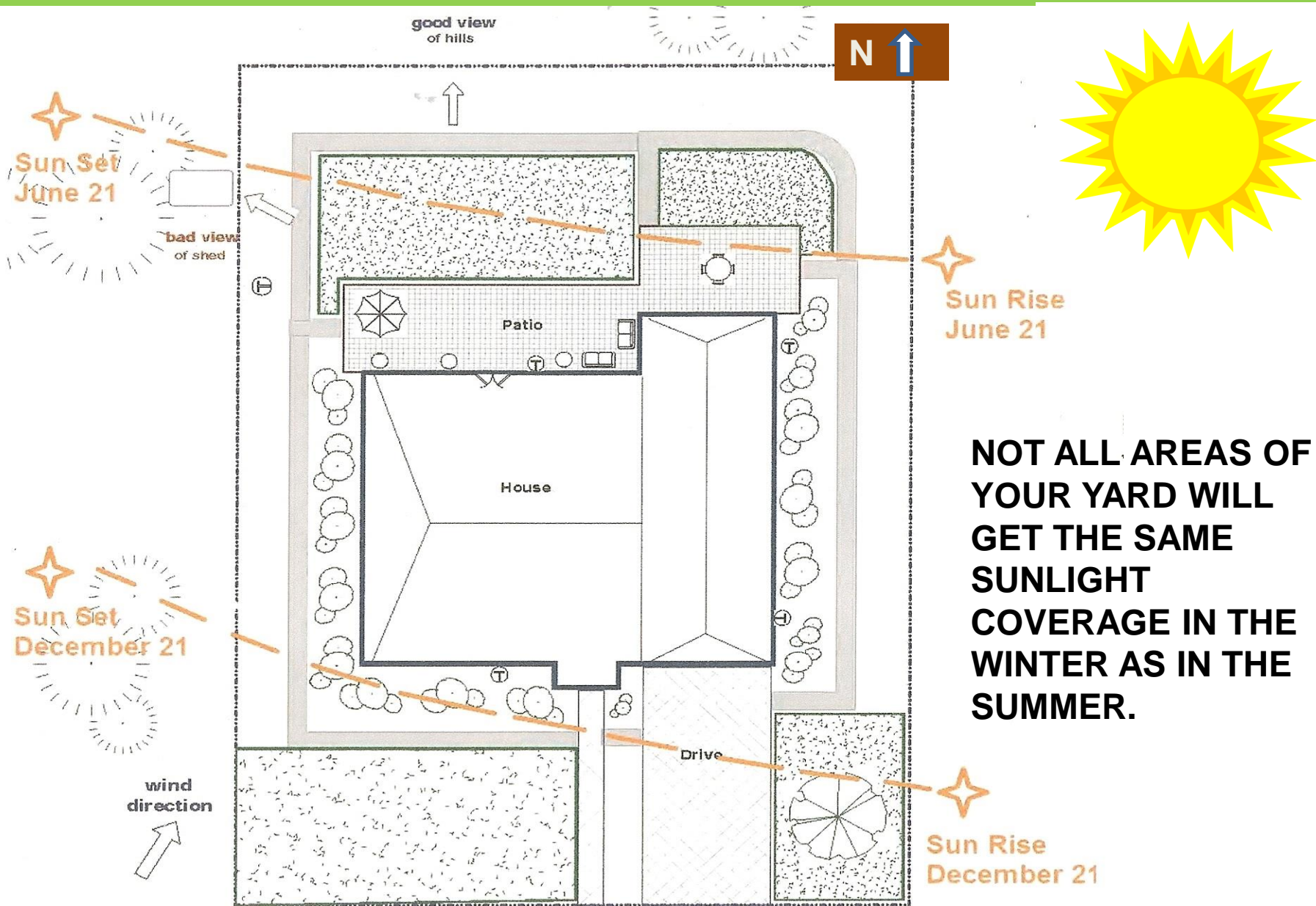
- Spring equinox (3-19-2020) **12 hrs 7 min**
- Summer solstice (6-20-2020): **14 hrs, 50 min**
- Autumn equinox (9-22-2020): **12 hrs 7 min**
- Winter solstice (12-21-2020): **9 hrs 29 min**

# Sunlight - Summer vs. Winter





# FIND WHERE THE SUN FALLS IN YOUR YARD



**NOT ALL AREAS OF YOUR YARD WILL GET THE SAME SUNLIGHT COVERAGE IN THE WINTER AS IN THE SUMMER.**

# Pat's vegetable garden area



# MICROCLIMATES WITHIN A GARDEN

FULL SUN COVERAGE

SHADED



# Grow your Soil

“We don’t grow plants. We grow the soil.  
The soil grows the plants.”

Isis Loran  
Creator of the Family Food Garden



# Macroscopic soil life





**One teaspoon of healthy  
soil contains:**

**4-8 billion** bacteria

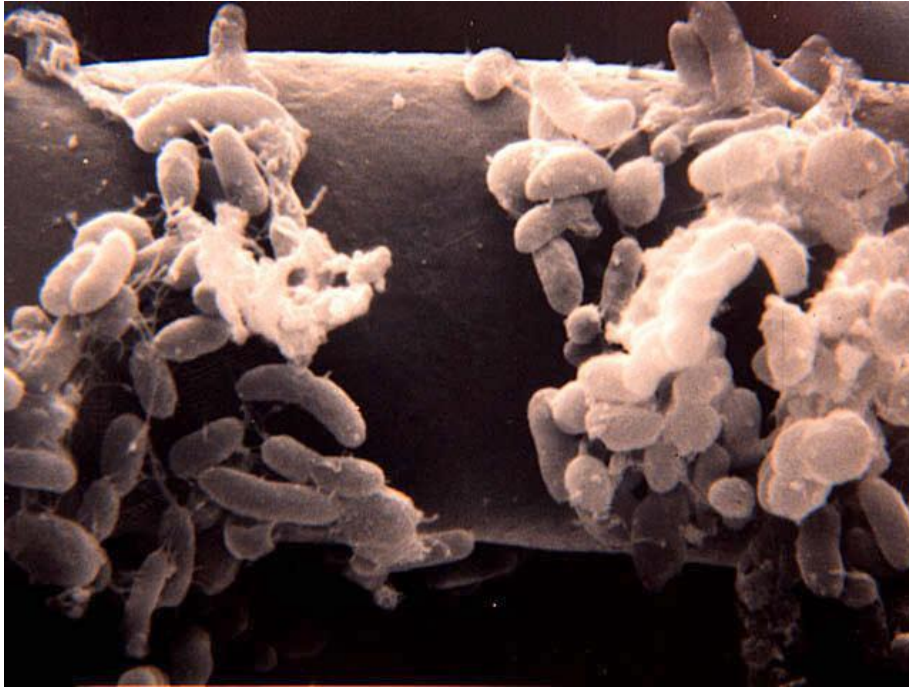
**20 million** actinomycetes (*thread bacteria*)

**1 million** fungi

**200,000** algae

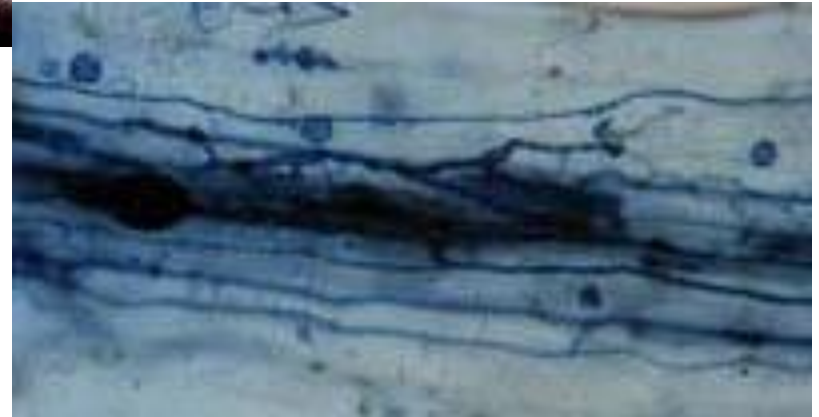
**2,500** linear feet of fungal hyphae

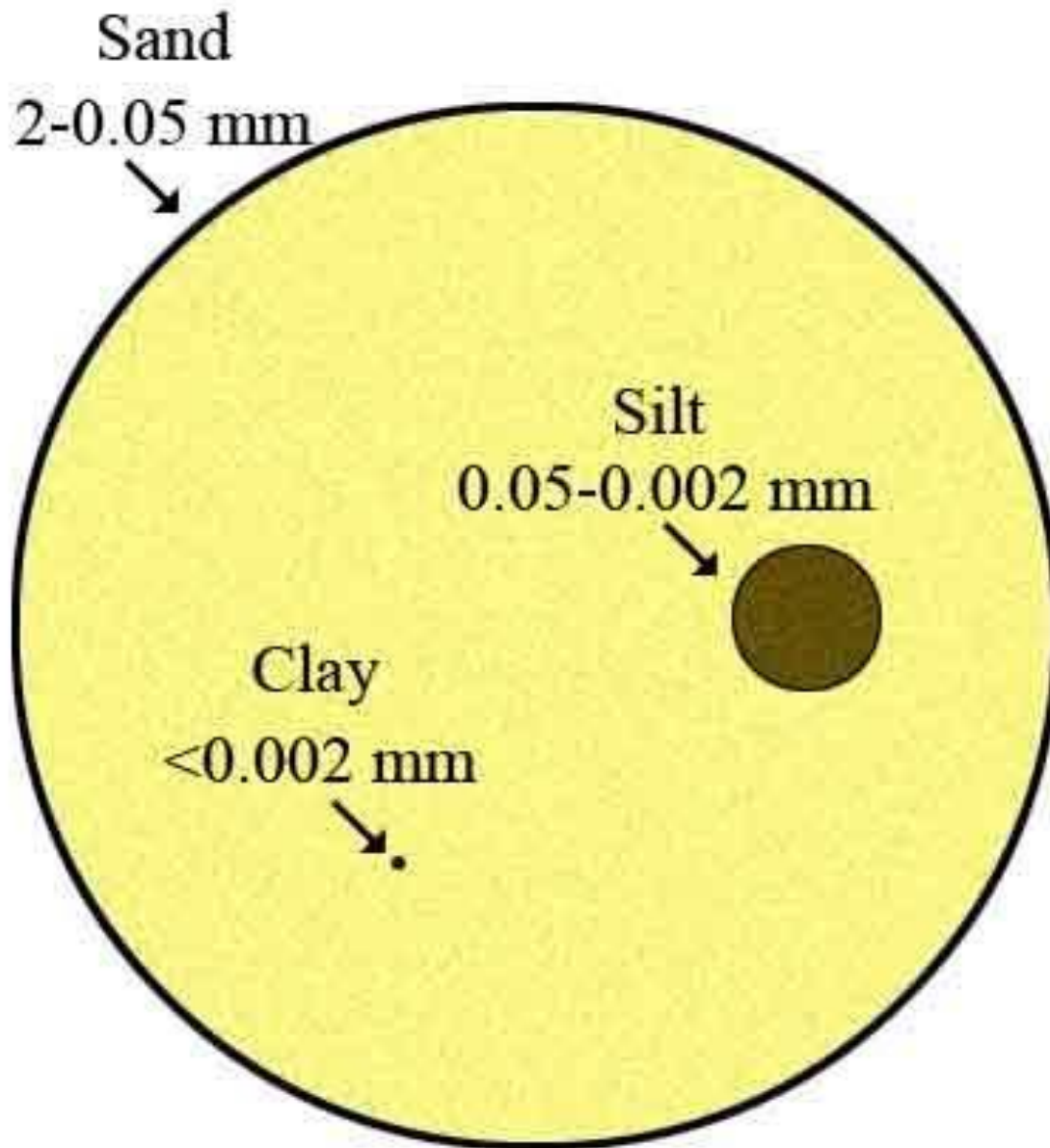
# Microscopic soil life



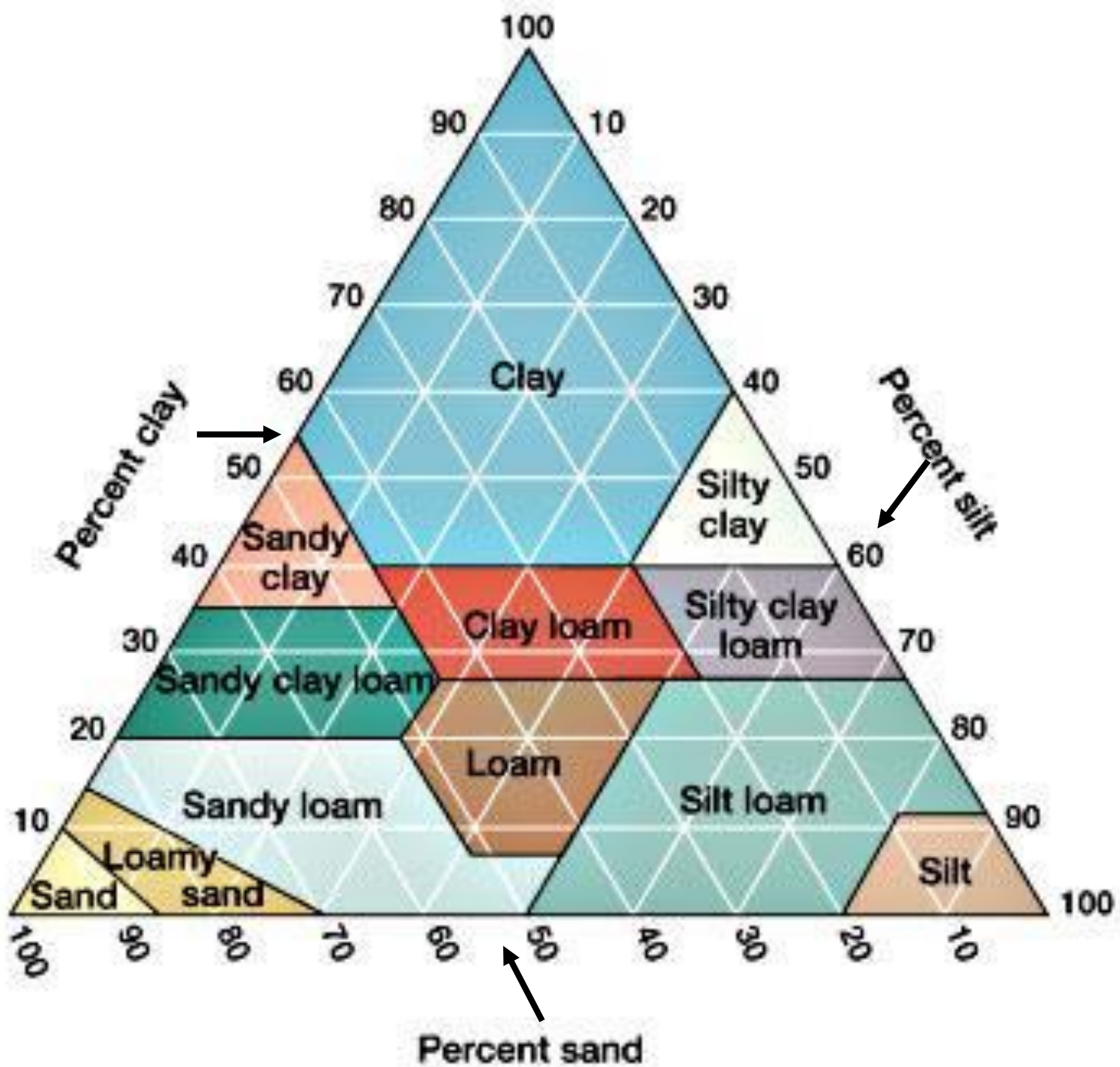
Nitrogen-fixing  
bacteria on root hair

Mycorrhizae in root









# Amending soil



[www.your-healthy-gardens.com](http://www.your-healthy-gardens.com)

Sandy

Amended

Clay

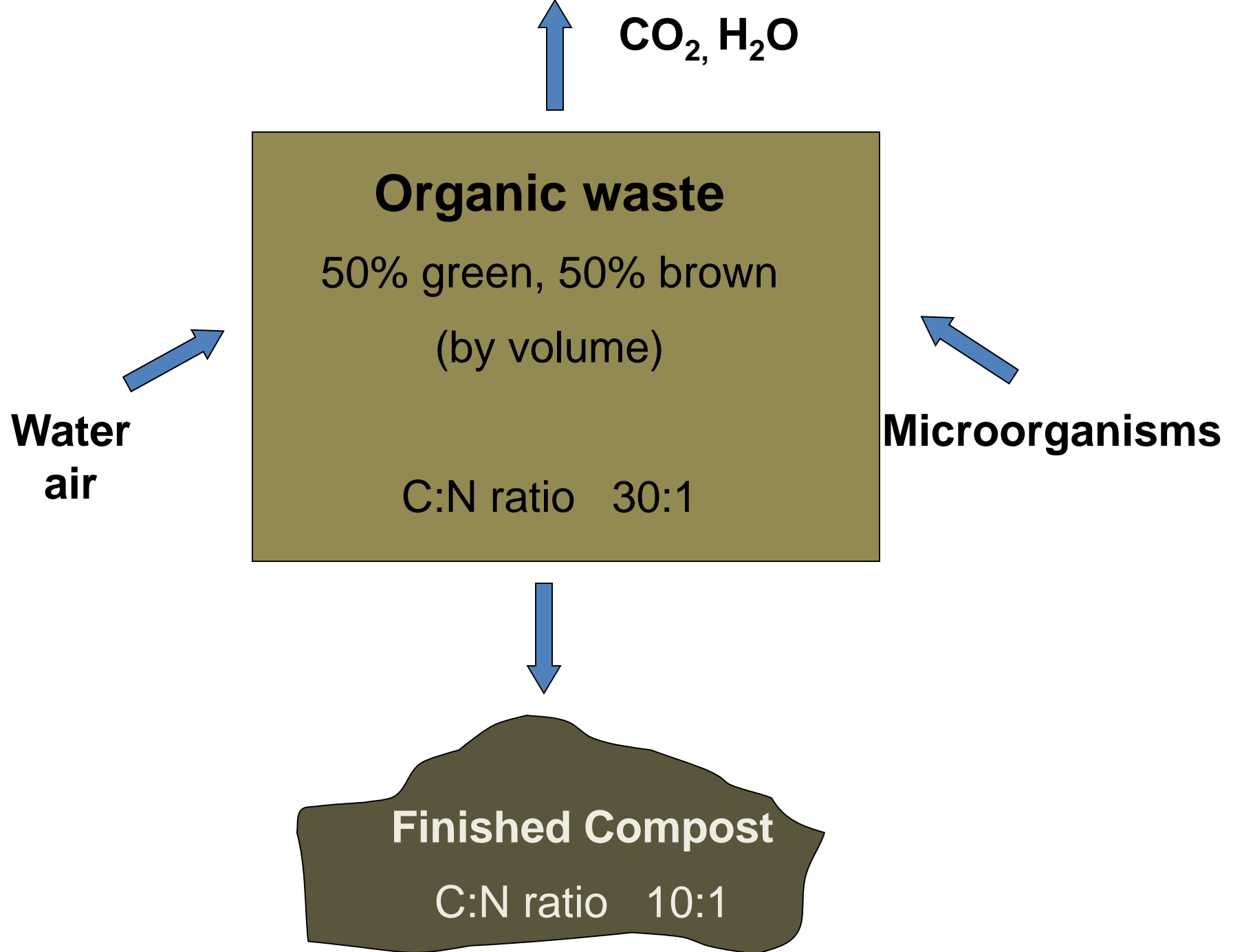
# Compost: garden gold



Commercial organic



Home made



# Essential plant nutrients

1 <b>H</b> 1.0079																	2 <b>He</b> 4.0026	
3 <b>Li</b> 6.941	4 <b>Be</b> 9.0122											5 <b>B</b> 10.811	6 <b>C</b> 12.011	7 <b>N</b> 14.007	8 <b>O</b> 15.999	9 <b>F</b> 18.998	10 <b>Ne</b> 20.180	
11 <b>Na</b> 22.990	12 <b>Mg</b> 24.305											13 <b>Al</b> 26.982	14 <b>Si</b> 28.086	15 <b>P</b> 30.974	16 <b>S</b> 32.065	17 <b>Cl</b> 35.453	18 <b>Ar</b> 39.948	
19 <b>K</b> 39.098	20 <b>Ca</b> 40.078	21 <b>Sc</b> 44.956	22 <b>Ti</b> 47.867	23 <b>V</b> 50.942	24 <b>Cr</b> 51.996	25 <b>Mn</b> 54.938	26 <b>Fe</b> 55.845	27 <b>Co</b> 58.933	28 <b>Ni</b> 58.693	29 <b>Cu</b> 63.546	30 <b>Zn</b> 65.38	31 <b>Ga</b> 69.723	32 <b>Ge</b> 72.61	33 <b>As</b> 74.922	34 <b>Se</b> 78.96	35 <b>Br</b> 79.904	36 <b>Kr</b> 83.80	
37 <b>Rb</b> 85.468	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.906	40 <b>Zr</b> 91.224	41 <b>Nb</b> 92.906	42 <b>Mo</b> 95.94	43 <b>Tc</b> [98]	44 <b>Ru</b> 101.07	45 <b>Rh</b> 102.91	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.87	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.71	51 <b>Sb</b> 121.76	52 <b>Te</b> 127.60	53 <b>I</b> 126.90	54 <b>Xe</b> 131.29	
55 <b>Cs</b> 132.91	56 <b>Ba</b> 137.33	57-70 *	71 <b>Lu</b> 174.97	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.84	75 <b>Re</b> 186.21	76 <b>Os</b> 190.23	77 <b>Ir</b> 192.22	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98	84 <b>Po</b> [209]	85 <b>At</b> [210]	86 <b>Rn</b> [222]
87 <b>Fr</b> [223]	88 <b>Ra</b> [226]	89-102 **	103 <b>Lr</b> [262]	104 <b>Rf</b> [261]	105 <b>Db</b> [262]	106 <b>Sg</b> [266]	107 <b>Bh</b> [264]	108 <b>Hs</b> [269]	109 <b>Mt</b> [268]	110 <b>Uun</b> [271]	111 <b>Uuu</b> [272]	112 <b>Uub</b> [277]	114 <b>Uuq</b> [289]					

\* Lanthanide series

lanthanum 57 <b>La</b> 138.91	cerium 58 <b>Ce</b> 140.12	praseodymium 59 <b>Pr</b> 140.91	neodymium 60 <b>Nd</b> 144.24	promethium 61 <b>Pm</b> [145]	samarium 62 <b>Sm</b> 150.36	europium 63 <b>Eu</b> 151.96	gadolinium 64 <b>Gd</b> 157.25	terbium 65 <b>Tb</b> 158.93	dysprosium 66 <b>Dy</b> 162.50	holmium 67 <b>Ho</b> 164.93	erbium 68 <b>Er</b> 167.26	thulium 69 <b>Tm</b> 168.93	ytterbium 70 <b>Yb</b> 173.04
actinium 89 <b>Ac</b> [227]	thorium 90 <b>Th</b> 232.04	protactinium 91 <b>Pa</b> 231.04	uranium 92 <b>U</b> 238.03	neptunium 93 <b>Np</b> [237]	plutonium 94 <b>Pu</b> [244]	americium 95 <b>Am</b> [243]	curium 96 <b>Cm</b> [247]	berkelium 97 <b>Bk</b> [247]	californium 98 <b>Cf</b> [251]	einsteinium 99 <b>Es</b> [252]	fermium 100 <b>Fm</b> [257]	mendelevium 101 <b>Md</b> [258]	nobelium 102 <b>No</b> [259]

\*\* Actinide series

  from air, H<sub>2</sub>O    
   primary    
   secondary    
   micronutrients

# Fertilizers: plant/animal based or synthetic?



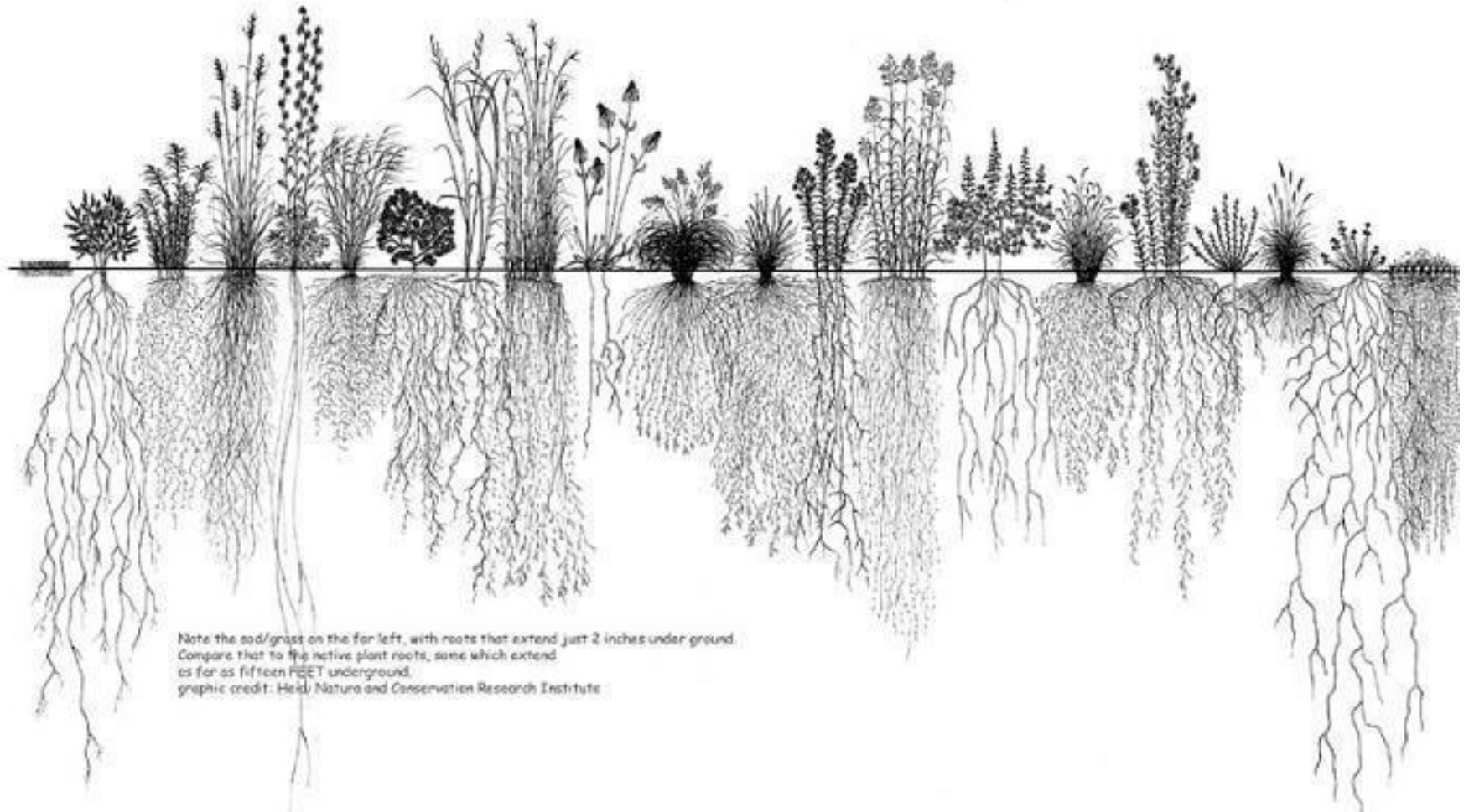
photos by Candace  
Simpson

# Cover crops



© UC SAREP

# Grasses and grains as cover crops



Note the sod/grass on the far left, with roots that extend just 2 inches underground. Compare that to the native plant roots, some which extend as far as fifteen FEET underground.  
graphic credit: Heidi Natura and Conservation Research Institute



# Green manure: fava beans



Photo by Karen Schaffer

# Root nodules



photo by Candace  
Simpson

# How to dig in your green manure . . .





## Sustainable practices: soil

- Vegetables need 8 hrs sun
- “Grow” your soil, don’t replace it.
  - Add organic matter, compost
  - Grow cover crops and green manure.
- Add only the nutrients needed.
- Decide a practice you will implement in your garden



## For next week

- Decide what to grow, planning sheet
- Germination test of 10 seeds.
- Bring small box to carry home seedlings