How Water Moves Through the Soil

The best place to store water is in the soil.

-Soil and Water Quality

-Drip Technology

Bringing Water to the Farm

- Arid and brittle climate

- California needs to bring water to crops

  - on-site ground or surface water
  - municipal supply
  - recycled water
  - water re-use
  - rain water harvesting

Water Quality

* Source Water Concerns
    - Salinity
    - Bacteria
    - Associated Regulation: FSMA
* Water Runoff Concerns
    - Nutrients
    - Salinity
    - Sediment
    - Bacteria
    - Associated Regulation: Irrigated Lands

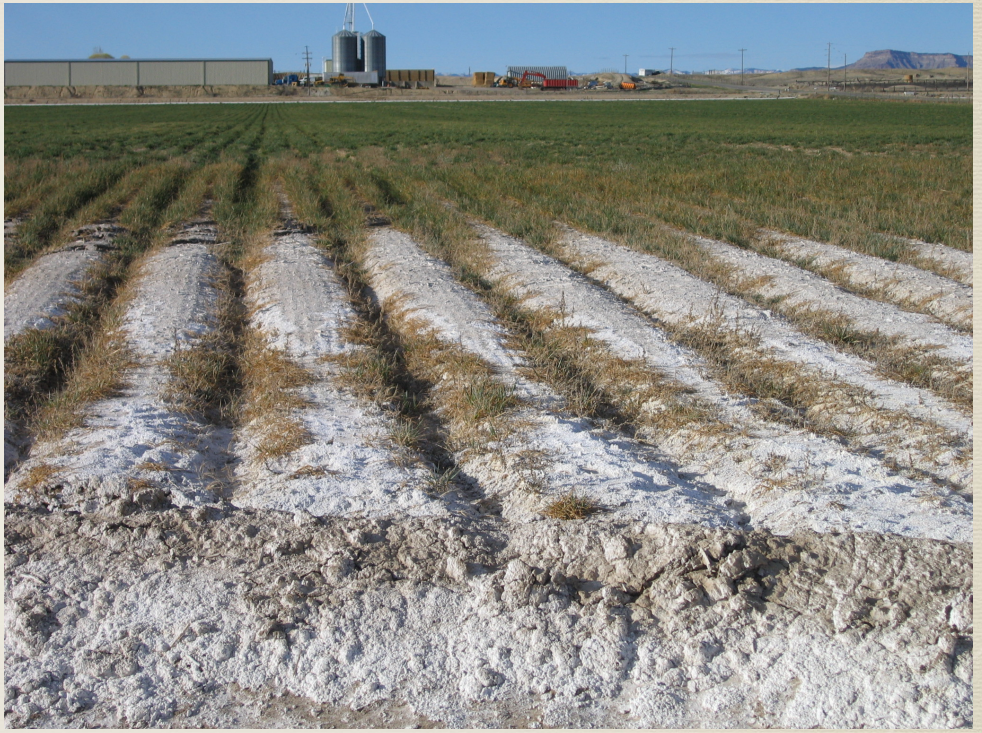
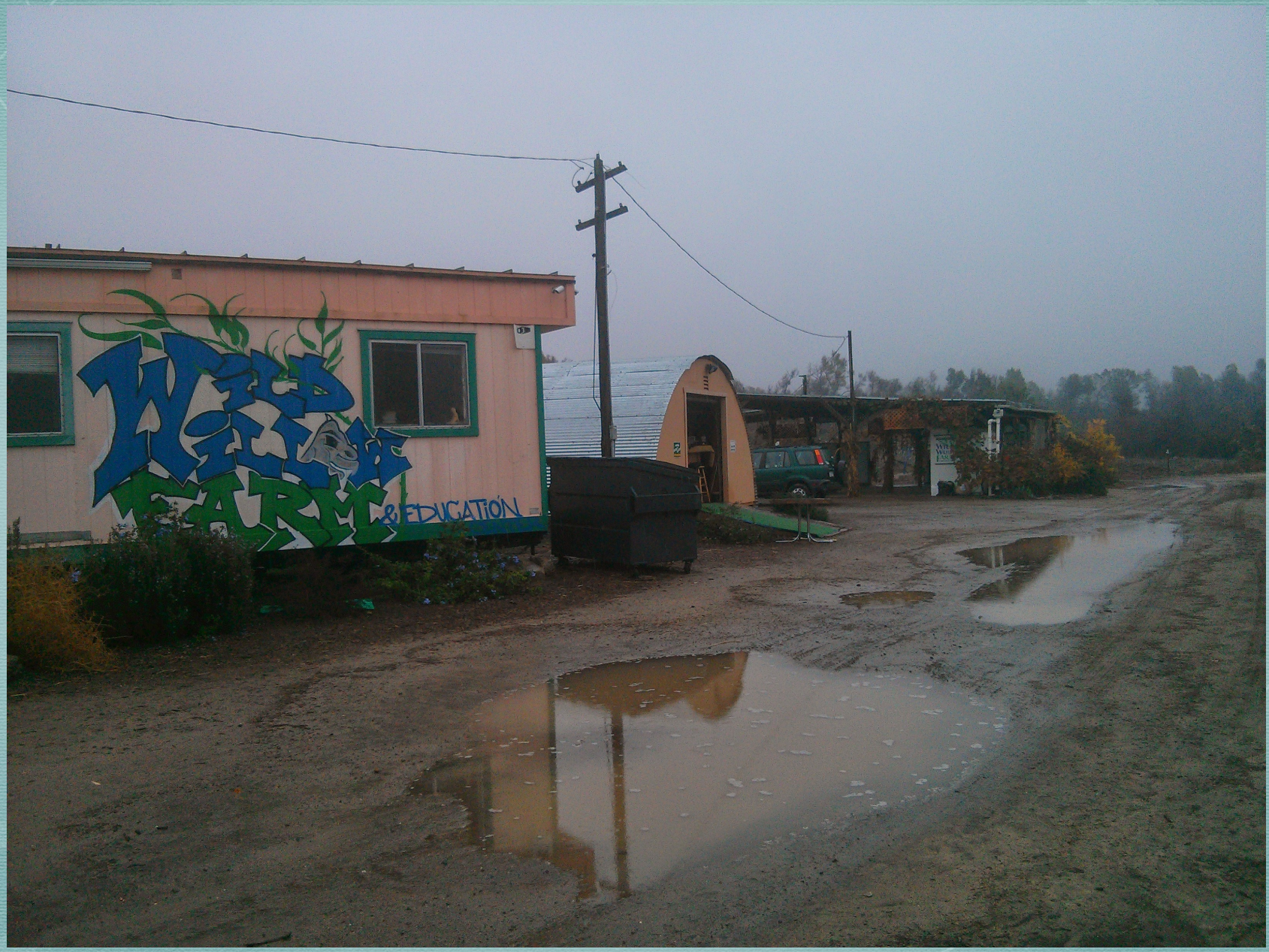


Photo credit: Donald Suarez, USDA Salinity Laboratory.


WILD WATER
FARM
& EDUCATION

Irrigating your Soil Type

* Clay: thin platelets, close together
  Water penetrates down slowly via gravity and wicks laterally away from source via capillary action

* Loamy: even distribution of soil particles
  Water penetrates down and out evenly

* Sandy: coarse mineral, lots of pore space
  Water penetrates down fast with no lateral capillary action (lack of clay or organic matter)

What's the best way to amend clay soil?

What's the best way to amend sandy soil?

Add Organic Matter!

Sucks water up
(compost will create space for air, water, and microbes!)

Speeds up water in clay
Slows down water in sand

Mulch when possible to cover soil!

High Flow Irrigation Systems (gpm)

* Flood/Passive Irrigation Systems

* Hard Piped System:
  - Know your numbers
  - Pressure and Flow (GPM)
  - Common systems: rain birds, water canons and sprayers
  - Drawbacks: water droplets blow away or evaporate, soil compaction, high water volume

Low Flow Irrigation Systems (gph)

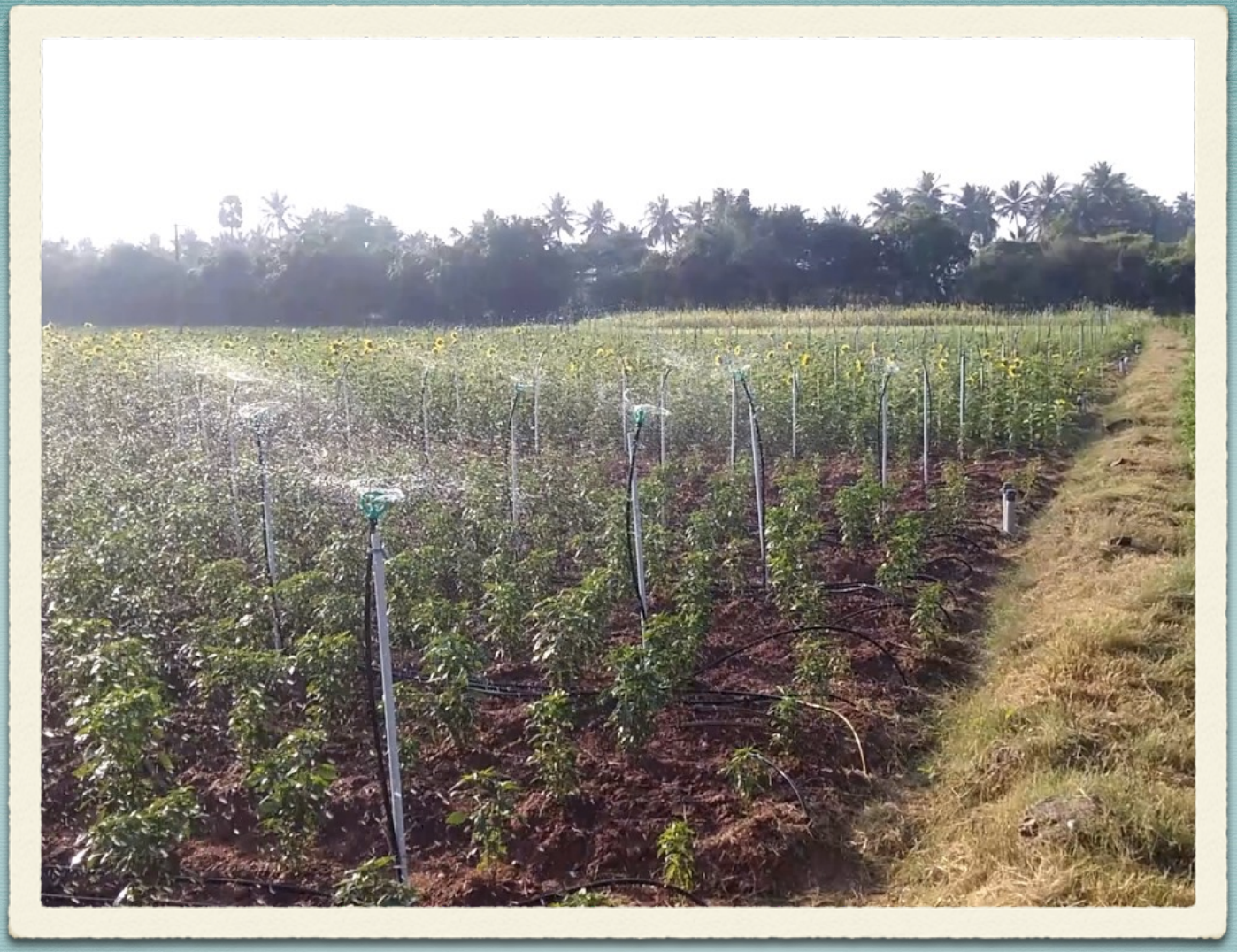
Low Pressure; Low Flow (Gallons per Hour)

- Ideal for low pressure water sources (i.e., low flow well)
- Adaptable with high pressure water sources
- Better application (close to soil, not on foliage +/-)
- Effective with fertigation systems (if using)
- Encourages fewer weeds
- Reduces disease problems
- Reduces soil compaction
- Lower costs!!

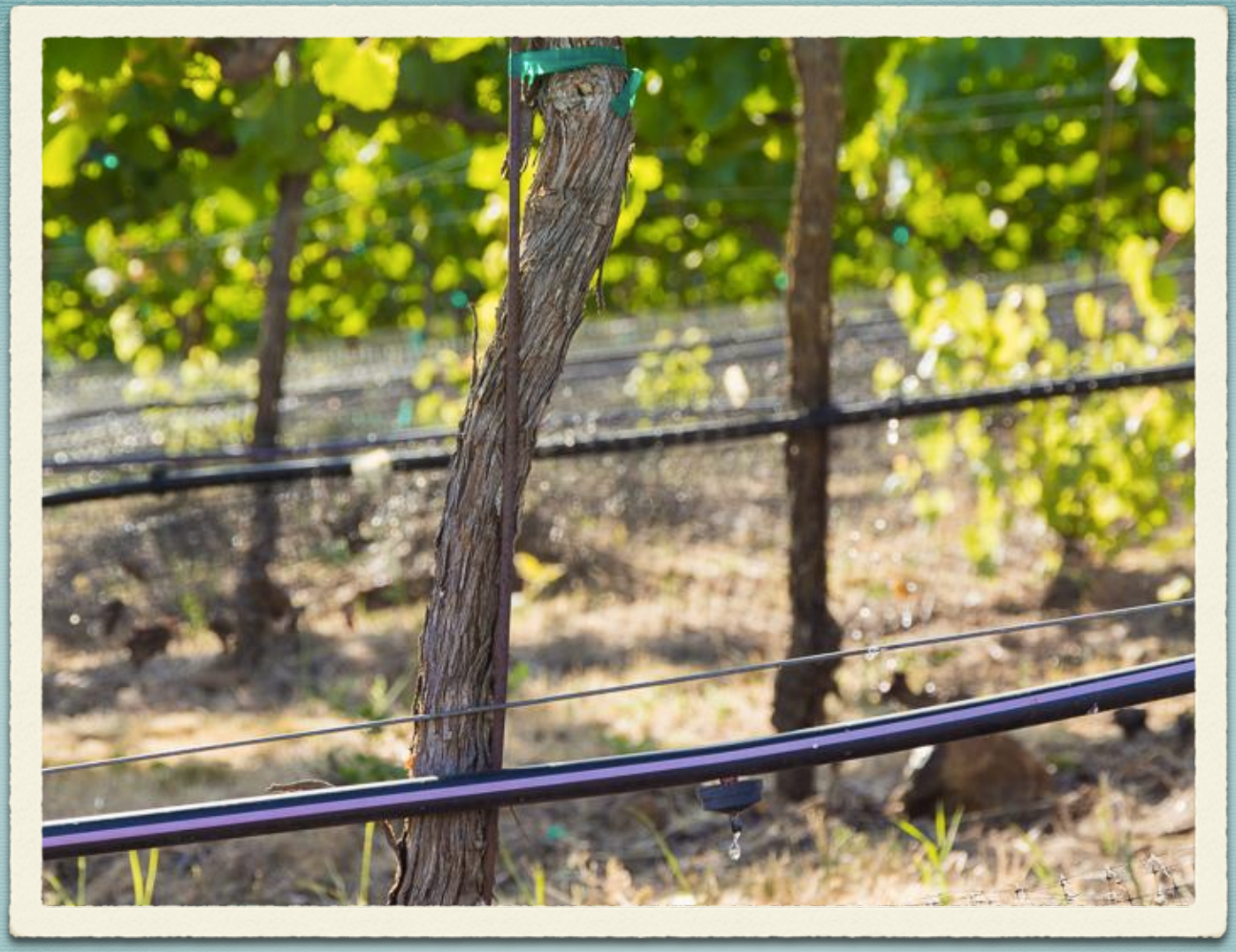
Types of Low Flow Irrigation Systems

Bubblers

Micro-Sprayers

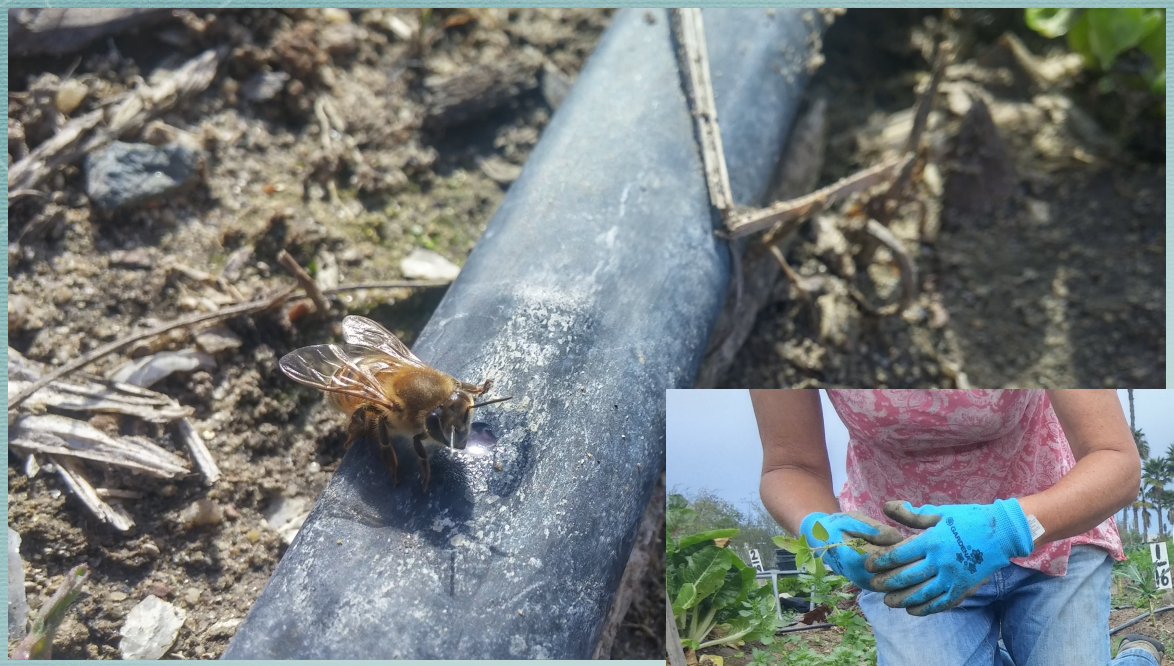


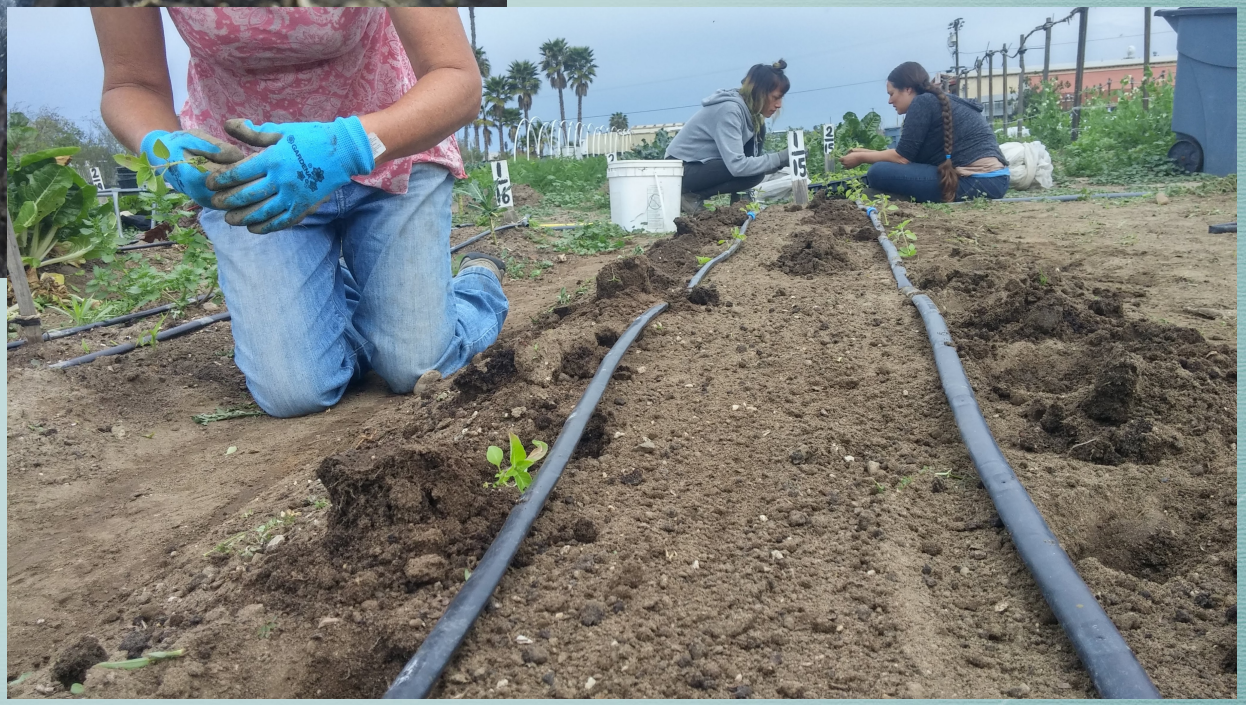
Mini Sprinkler Systems



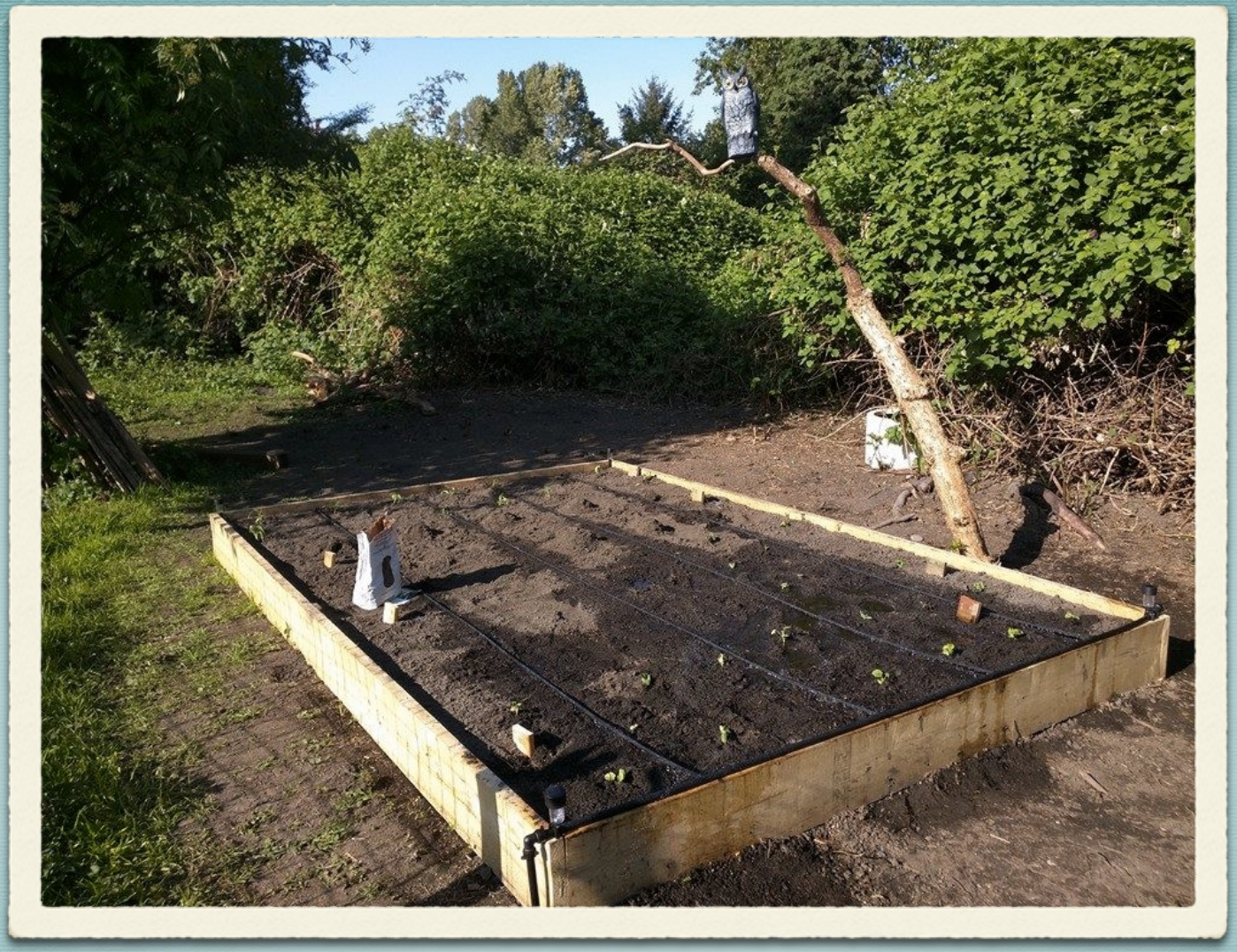
Weber E, Grattan S, Hanson B, Vivaldi G, Meyer R, Prichard T, Schwankl L. 2014. Recycled water causes no salinity or toxicity issues in Napa vineyards. Calif Agr 68(3):59-67. https://doi.org/10.3733/ca.v068n03p59.

Drip Line





Drip Tape



Soaker Hose

Common Mistakes when using Drip Irrigation

* Not flushing irrigation system
* Not using filters
* Using the wrong type of connectors
* Improper layout

When and How Much to Water

Empirical vs. Analytical Watering

- Most Immediate: run system for 30 minutes and dig hole to observe soil response to drip irrigation.
    - Long enough for deep watering!
    - Drips close enough for lateral capillary action
- Consider E-T rates

$$\text{DN (Daily Needs), gallons} = \frac{.623 \times \text{area of the root zone} \times \text{Plant Factor} \times \text{ET rate}}{\text{Efficiency of drip irrigation by climate}}$$

Monitor moisture content

- Programmed timers tends to water too much or too little.
- Observe, observe, observe
    - Finger Test: needs water if dry down to 2 knuckles (~2")

When and How Much to Water

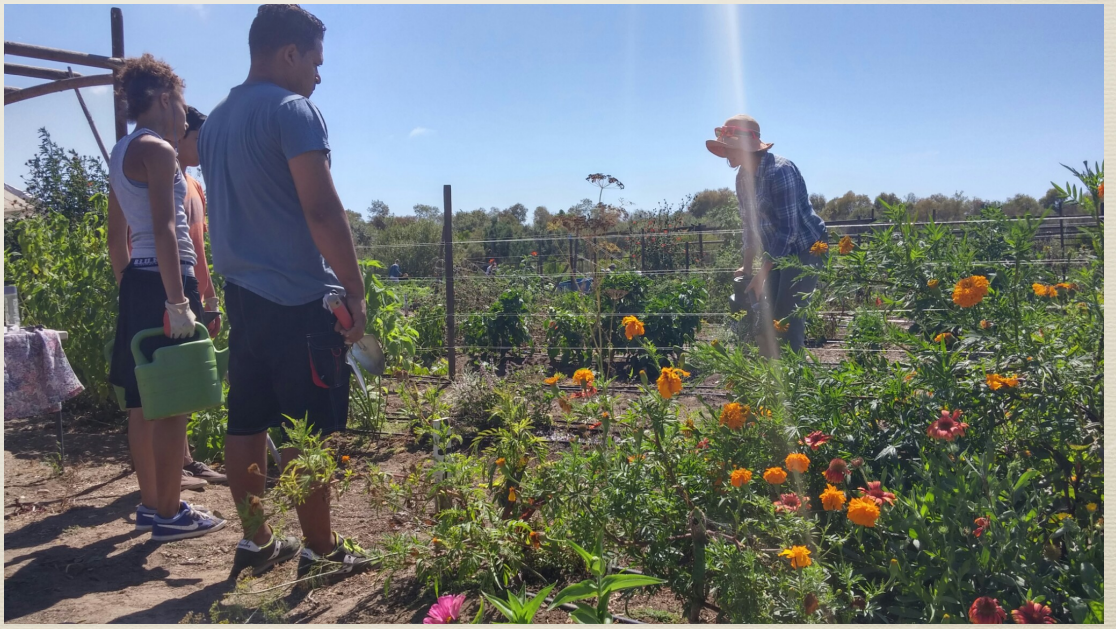
Watering Schedule

- water early in the morning
- early afternoon watering evaporates quickly in afternoon sun
- soil catches thermal energy during the day, late pm watering cools down soil
- frequency: short and shallow vs. long and deep

If a plant is wilting, do you water?

Check the soil!

Could Be:
too little water
too much water
too hot



Irrigation Resources

Online

- DripWorks
- Irrigation Direct

Local Ag Stores

- Granjettos
- Escondido Agricultural Supply