



**UC Master Gardeners of Napa County**  
**<http://napamq.ucanr.edu/>**

*Our mission: "To extend research-based knowledge and information on home horticulture, pest management, and sustainable landscape practices to the residents of California and be guided by our core values and strategic initiatives."*

# Irrigation For Low-Water Gardens



# FEDERAL PROGRAMS

- State Water Efficiency and Enhancement Program (SWEEP)

[www.cdfa.ca.gov/oefi/sweep/](http://www.cdfa.ca.gov/oefi/sweep/)

- Conservation Agricultural Planning Grant Program

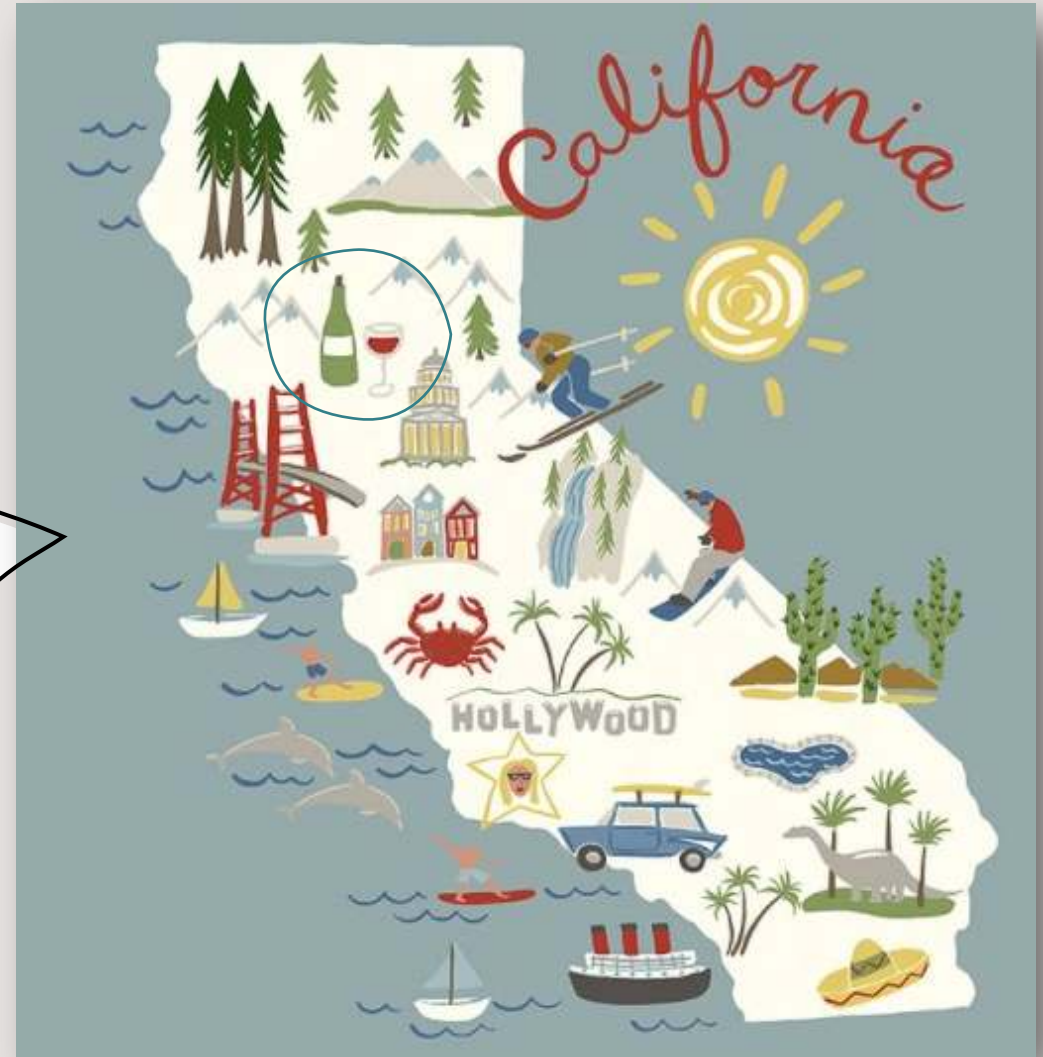
[www.cdfa.ca.gov/oefi/planning/](http://www.cdfa.ca.gov/oefi/planning/)

- (International level: Sustainable Wine Roundtable)

<https://swroundtable.org/>

# STATE PROGRAMS

- Healthy Soils Program (HSP) [www.cdfa.ca.gov/oefi/healthysoils/](http://www.cdfa.ca.gov/oefi/healthysoils/)
- Testing 25,000 acres in CA
- <https://www.cdfa.ca.gov/oefi/healthysoils>
- Promotes farm management practices that include but are not limited to cover cropping, no-till/reduced-till, mulching, compost application, and conservation plantings.  
Funding available: e-mail [cdfa.hsp\\_tech@cdfa.ca.gov](mailto:cdfa.hsp_tech@cdfa.ca.gov).
- UC Davis Viticulture and Enology Dept.



# STATE PROGRAMS

American Vineyard Foundation

<https://www.avf.org/>

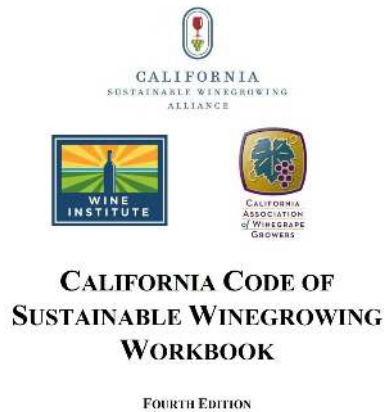
voluntary industry support for research funding

CA Sustainable Winegrowing Alliance

[www.sustainablewinegrowing.org](http://www.sustainablewinegrowing.org)

California Sustainable Wine

<https://californiasustainablewine.com/>



## PROJECT TITLE: ASSESSMENT OF THE VARIABILITY IN SOIL HEALTH INDICATORS AND INCORPORATING HEALTHY SOIL MANAGEMENT PRACTICES INTO THE CONTEXT OF NAPA VALLEY TERROIRS

- 3 ways to measure soil health:
  - water retention,
  - nutrient supply,
  - carbon sequestration
- Goals:
  - establish a baseline of soil health indicators and disseminate information on their variability within the various Napa Valley soil types.
  - examine grower perception and comprehension of these indicators and the desired qualities of a healthy soil relative to production goals.
- Current actions:
  - Currently considering use of cover crops, reduced till, compost and other organic amendments. Even though all many studies show improvements on soil organic matter, the observed benefits for soil health, crop yield and final grape quality are highly variable between studies which prevents the establishment of guidelines and best management practices for wine grapes.
  - 'The research team is currently collecting soil samples to assess the variability and establish benchmarks for those soil health indicators that are desired for wine grape production. Furthermore, they will assess the role of soil organic matter and the soil microbiome with these indicators of soil health.'

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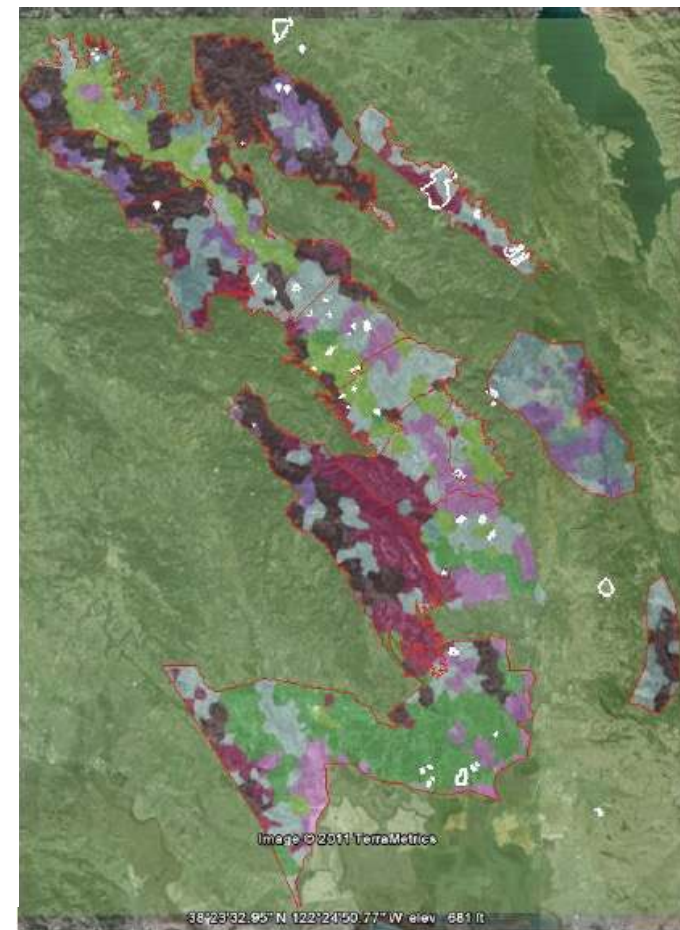
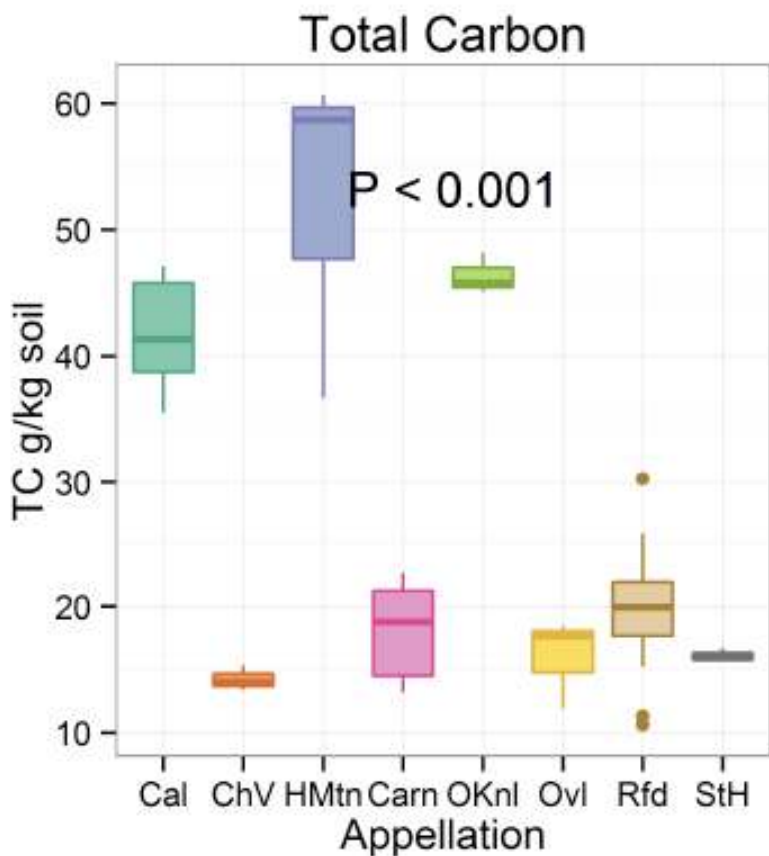
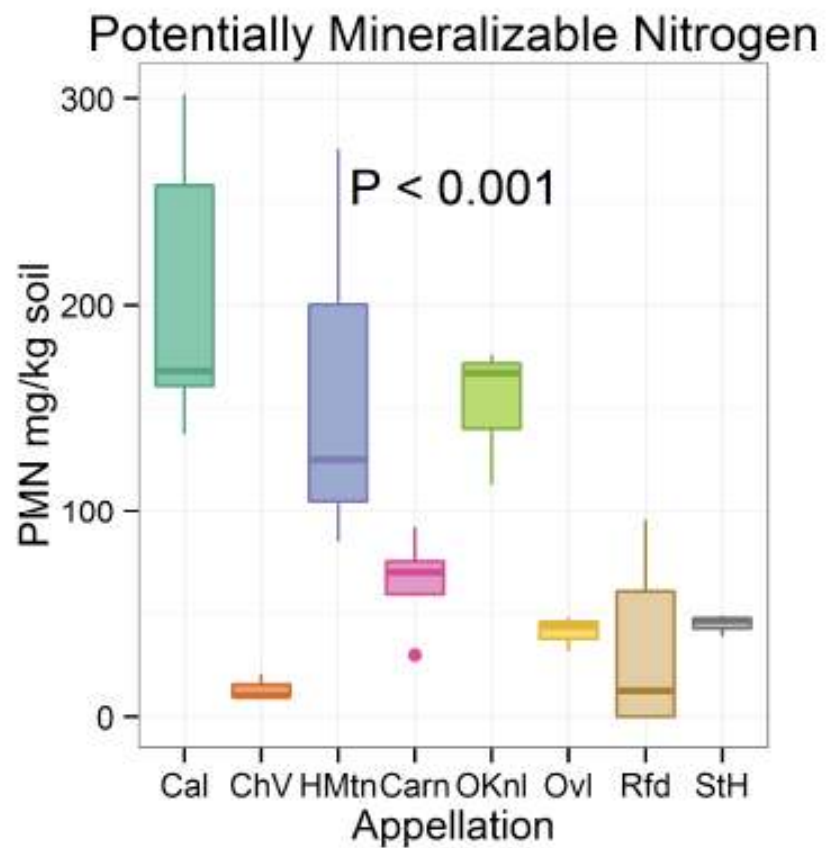
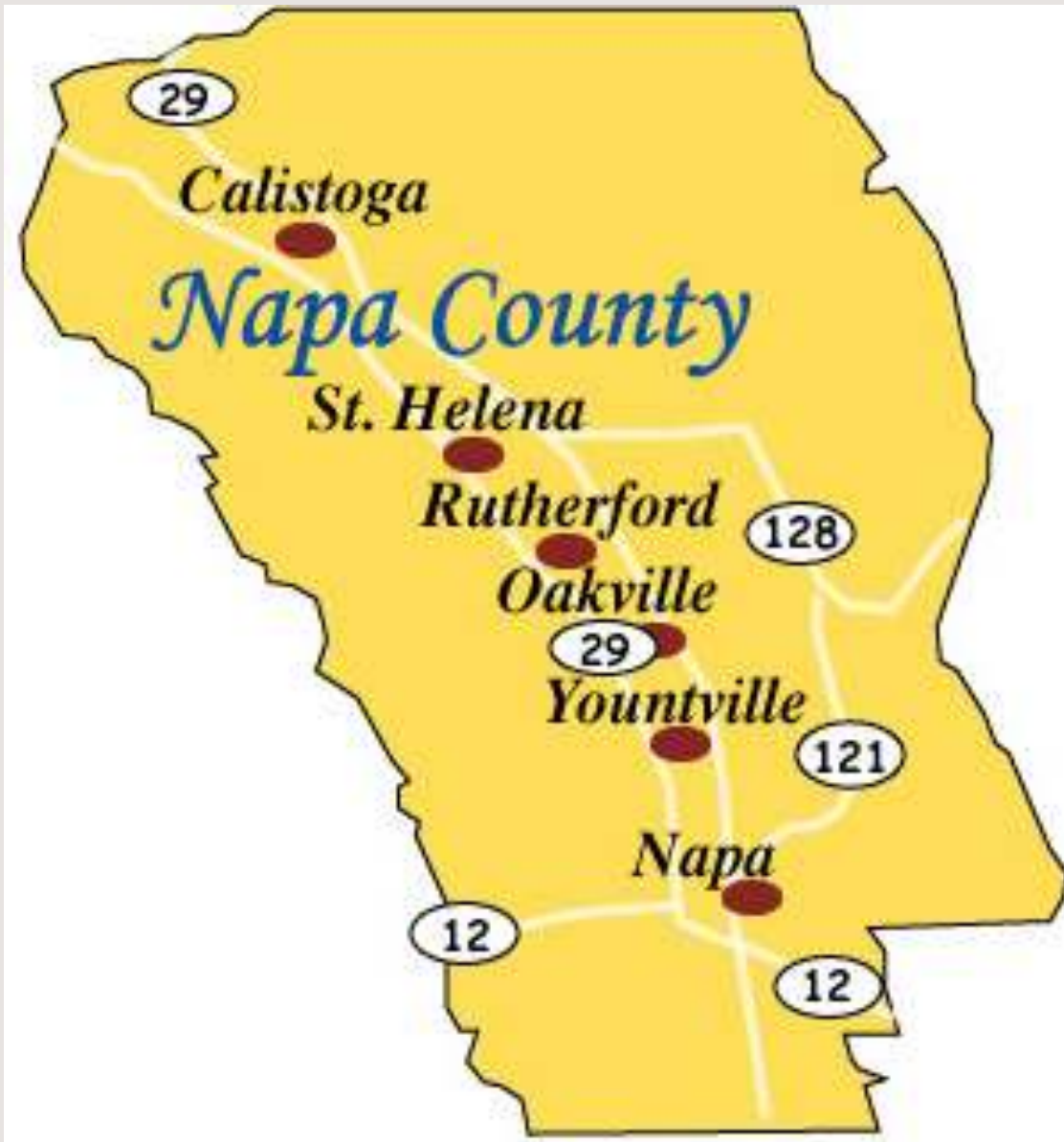


Figure 1. Values portrayed by American Vineyard Area, or Appellation. Abbreviations are as follows: Cal, Calistoga; ChV, Chiles Valley; HMtn, Howell Mountain; Carn, Los Carneros; OKnl, Oak Knoll; Ovl, Oakville; Rfd, Rutherford; StH, St. Helena.



## LOCAL PROGRAMS

- Flip Your Strip
- \$2/ft<sup>2</sup>
- Cash for Grass
- \$1/ft<sup>2</sup>
- Low-water-use, climate-appropriate plants (covering *at least 50%* of converted area once fully grown), and
- *Permeable* hardscape (not exceeding 50% of converted area)



# LOCAL LEVEL: HOW WE CAN MAXIMIZE AND INCREASE CLIMATE BENEFITS OF LANDSCAPING THROUGH BEST PRACTICES

- Building healthy soils and organic soil matter
- Permanent cover-cropping strategies
- Judicious use of compost
- Planting of native hedgerows and encouraging biodiversity
- Reducing vineyard waste and environmental practices for handling waste
- Reduction of water use
- Habitat restoration
- Monitoring soil carbon
- Monitoring and evaluating fuel use
- Workforce transportation solutions

From: <https://napagrowers.org/climateresilience>

Which one are you?



Regenerative



Sustainable



Organic



Deficit/Precision Farming

# REGENERATIVE: FARM THE SOIL - NOT THE VINES

Regenerative agriculture, a term coined by organic farming researchers at the Rodale Institute in the 1980s, consists of holistic farming practices that aim to improve soil health and reverse climate change by expanding biodiversity, improving the water cycle, increasing organic matter in soil structure, and transferring carbon from the atmosphere to the soil. Proponents of regenerative agriculture avoid using chemical pesticides and advocate for methods like crop rotation, livestock rotation, composting, no-till farming, **agroecology**, and **agroforestry**. Regenerative agriculture increases the amount of **arable** topsoil, which results in a healthier, better food system.

# REGENERATIVE

Feed the biology - not the vine. Till-out!

## Promote biodiversity

- cover crops
- crop rotation

## Eliminate or reduce tillage

- tilling releases CO<sub>2</sub> and disrupts soil bio systems
- Regenerative livestock grazing (goats, sheep)

## Reduce the use of artificial fertilizers

- junk food for vines and microbes



SHEEP

<https://www.winebusiness.com/news/?go=getArticle&dataId=251073>



# SUSTAINABLE



California Sustainable Winegrowing Alliance (CSWA)

<https://www.sustainablewinegrowing.org>

## KEY AREAS OF WIDELY ADOPTED SUSTAINABLE PRACTICES:



[https://library.sustainablewinegrowing.org/amass/doc-get-pub/resource/244/2020\\_California\\_Wine\\_Community\\_Sustainability\\_Report.pdf](https://library.sustainablewinegrowing.org/amass/doc-get-pub/resource/244/2020_California_Wine_Community_Sustainability_Report.pdf)

<https://www.sustainablewinegrowing.us> suggests we only purchase wines from sustaining growers. In CA, NY, OR, and WA.

# ORGANIC

- Organic agriculture is the practice of growing, raising, or processing goods using methods that do not use sewage sludge, bioengineering (GMOs), ionizing radiation, and most synthetic pesticides\* and fertilizers is prohibited from organic production.
- Selling your grapes? USDA certification starts at the annual income of \$5,000.

\* examples include copper sulfate (which is considered acceptable in organic farming), alcohols, chlorine products, hydrogen peroxide, soaps, organochlorines, organophosphates, carbamates, and pyrethroids

<https://www.ccof.org/page/what-organic>



## Fields, Vineyards, and Orchards

To help protect against embers, maintain infrastructure and keep natural or cover crop vegetation to a minimum height during fire season in the alleys through either mowing or grazing. Hoops, poly tunnels and plastic covers should be kept free of vegetation along the edges. Some crops need space between the rows such as citrus orchards, vineyards, and other row crops which helps with fire protection by maintaining lines of sight and discontinuity of fuels. For crops like avocado orchards that are densely planted and need the mulch layer, consider creating blocks that are separated by roads that can act as fire breaks. Depending on the pruning strategy and ground cover, vines and orchards can act as a fire break or a potential fire hazard.

# DRY FARMING

"Dry farming is more than just avoiding irrigation of the vines. It is an active form of preserving moisture in the ground through the use of cover crops and careful cultivation so that irrigation is not needed. The reward is wines that are deeply connected to the soil and complex in flavor."

<http://dominusestate.com/mb/viticulture-and-enology/grapegrowing/dry-farming>

"You're so much healthier to get the roots down deep past the [diseases] that inhabit the top 18 inches of soil."

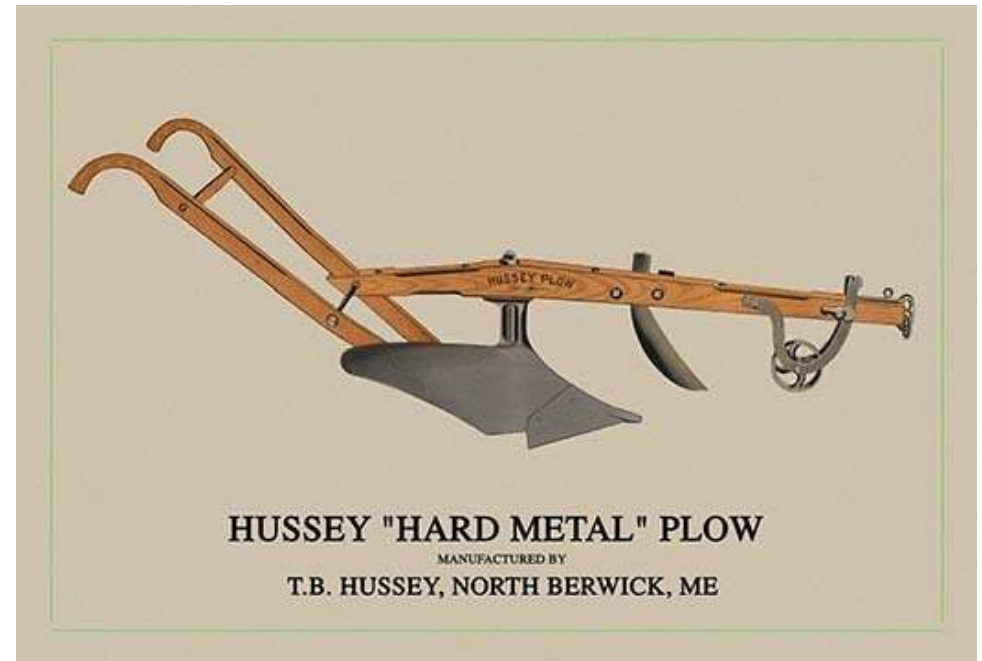
Frank Leeds on: <https://www.arrowoodvineyards.com/blog/dry-farming-good-earth-good-wine>

"For high-quality Cabernet, the goal is to farm for smaller berries." Small berries have a higher skin to juice ratio, so the wines have more complexity, concentration, and ability to age."

Kristina Shideler on: <https://www.arrowoodvineyards.com/blog/dry-farming-good-earth-good-wine>

# DRY FARMING

- During the winter season, precise cane pruning ensures ideal cluster spacing for optimal fruit ripening.
- Dry farming relies on a deep root system to take advantage of natural water sources from rain and underground supplies.
- The French plough removes invasive weeds and encourages deep root growth.
- Cluster thinning optimizes quality through yield regulation.
- Strategic trellising ensures perfect canopy management.
- Frequent grape sampling provides invaluable data for determining optimal ripeness.
- Rinsing the grapes 10 to 15 days before harvest removes dust and enhances the purity of the fruit.
- Hand-picking with small French shears instead of harvest knives minimizes bruising and vine damage.
- Small harvest baskets preserve the integrity of the clusters as they are transported to the winery.
- The sunny side of the vines is picked a few days before the shady side respecting perfect maturity.
- Changes in yield may be due to previous year's irrigation strategy.



<http://dominusestate.com/mb/viticulture-and-enology/grapegrowing/dry-farming/>

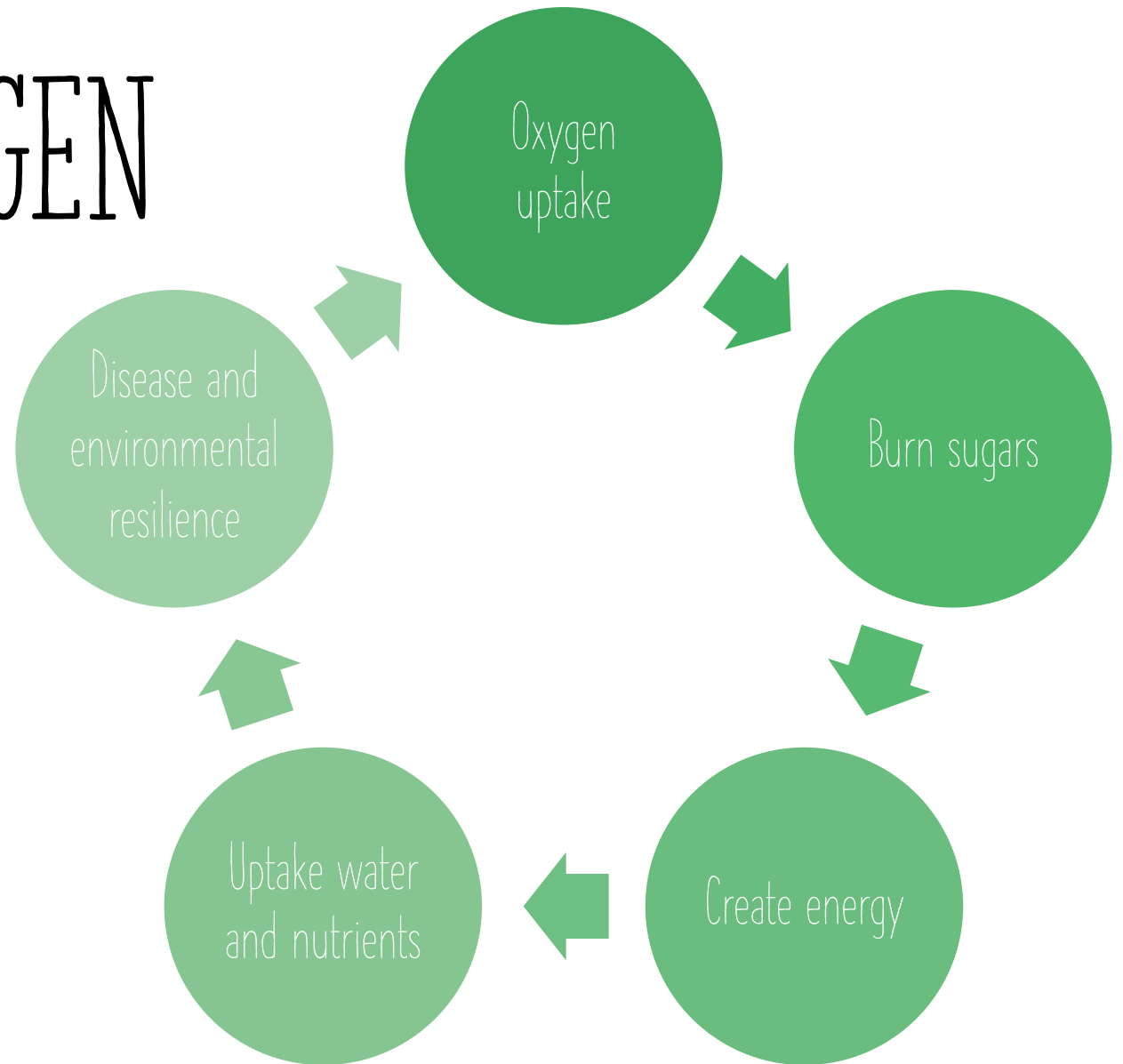




**UNDERWATERED**

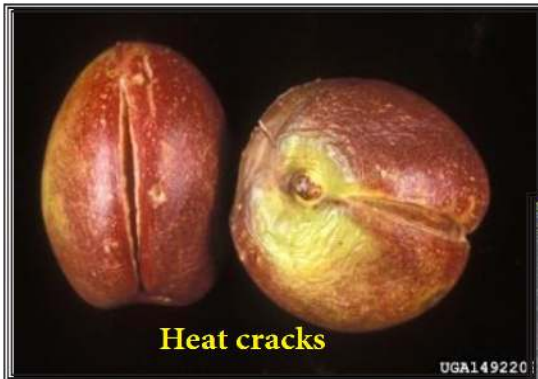
**OVERWATERED**

# ROOTS NEED OXYGEN



## SIGNS OF HEAT STRESS

- \* Leaf drop
- \* Plants stop flowering (blossom drop)
- \* Mottled leaves
- \* Heat cracks
- \* Blossom end rot
- \* Bolting



### **Signs Of Overwatering**

Yellowing of lower leaves

New leaves develop brown tips

The plant stops growing

Wilting that doesn't resolve after watering

Offensive smell from the soil

Mushy, black/brown roots

Leaf edema in early stages

Leaf curling can occur

### **Signs Of Underwatering**

Leaf drop

Brown tips affecting many leaves

Slow growth and smaller leaves

Wilting that improves after watering

Dry soil

Leaves feel papery and thin

Some yellowing, followed by browning leaves

Leaf curling happens earlier

<https://smartgardenguide.com/overwatering-vs-underwatering/>



CHECK  
YOUR SOIL

Rule of Thumb







# WATER STRESS SIGNS





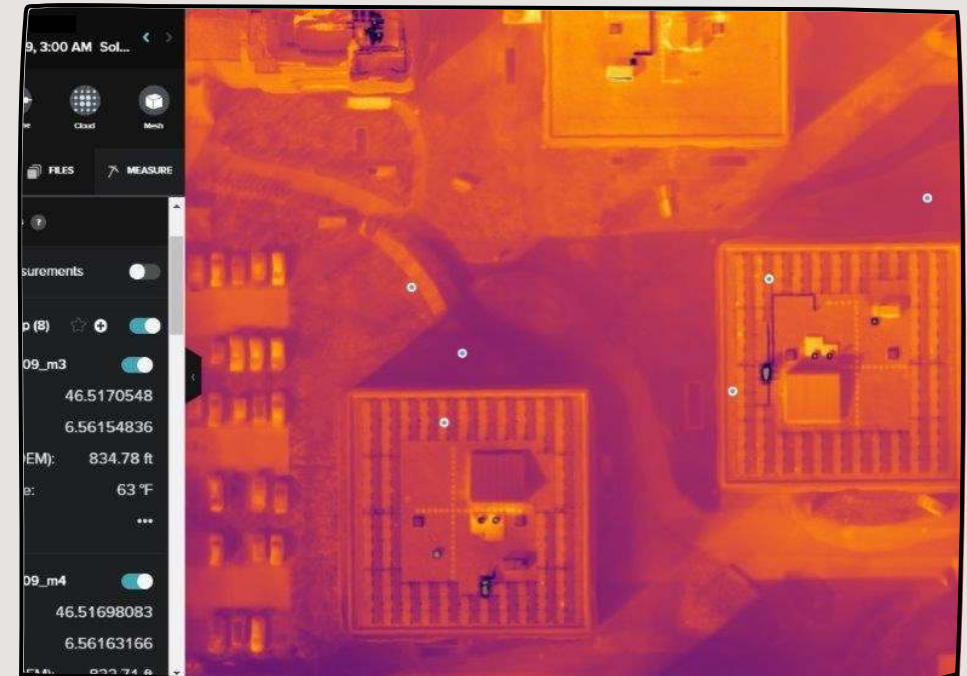
# DEFICIT/PRECISION FARMING



# DEFICIT (PRECISION) FARMING

- Sap Flow Technology
  - Water deficit index (WDI)
- Thermal Imagery to map evapotranspiration
  - ArcGIS: use of drones
  - Drought tolerance indices (DTIs)

Biju S, Fuentes S, Gupta D. The use of infrared thermal imaging as a non-destructive screening tool for identifying drought-tolerant lentil genotypes. *Plant Physiol Biochem.* 2018 Jun;127:11–24. doi: 10.1016/j.plaphy.2018.03.005. Epub 2018 Mar 8. PMID: 29544209.





LFLG LOW-  
MAINTENANCE  
IRRIGATION GRID

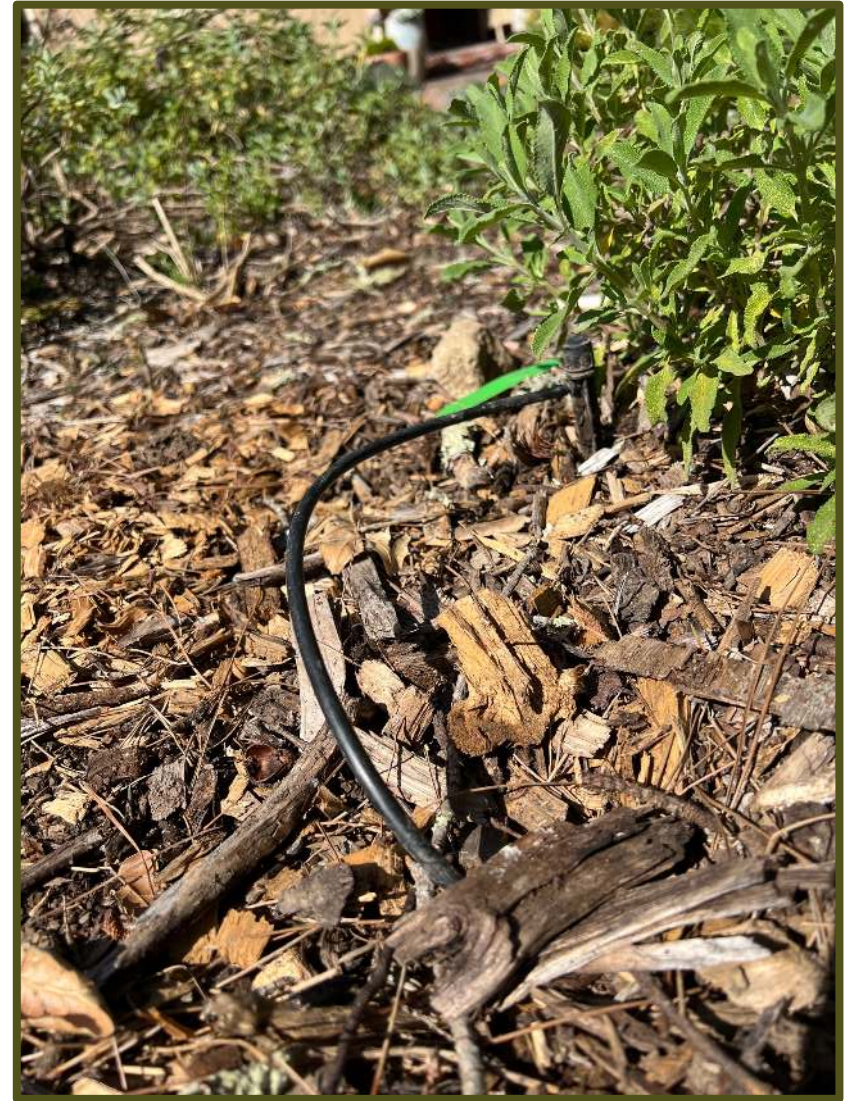








# UNDER-/ABOVE-GROUND TUBING





# Flowering Seasons

Summer	Fall	Winter	Spring
Crepe Myrtle			
Rose			Rose
	Glossy Abelia		
		Little Sur Manzanita	
		Pink Muhly Grass	
		Red Lorapetalum	
Star Jasmine			Star Jasmine
	Strawberry Madrone (Arbutus)		
Yellow Twig Dogwood			
Bottlebrush			Bottlebrush
		Meyeri Fern	

# Watering needs

Low	Low-Med	Moderate	Mod-Wet
Little Ollie	Arbutus	Meyeri Fern	Crepe Myrtle
Little Sur Manzanita		Glossy Abelia	Yellow Twig Dogwood
Little John Bottlebrush		Carpet Rose	
Muhly Grass		Red Lorapetalum	
Rayburn Ash			
White Jasmine			

## WATER NEEDS

- Moderate water-use plants (everyday ornamentals) need watering 2 times per week.
- Low water-use plants need only 1 watering day per week.
- Very low water-use plants will need no more than 1 watering day every other week.



# Possible Pathologies

Plant	Possible Pathologies		
Crepe Myrtle	powdery mildew, leaf spot	water mismanagement	aphids, Japanese beetles
Yellow Leaf Dogwood		too wet or dry	
Flower Carpet Rose	typical rose issues		typical rose issues
Glossy Abelia	mineral or nutrient excess	water management	root knot nematodes
Little Ollie Olive			Olive fruit fly
Little Sur Manzanita	leaf spot, gall, rust		Whitefly, aphids, mealybugs
Meyeri Fern			Thrips
Little John Bottlebrush	Verticillium wilt	too wet soil, not enough sun	
Pink Muhly Grass	Powdery mildew	too wet soil	mealybugs
Raywood Ash	Canker, verticillium wilt		Ash borers
Red Loropetalum	Anthraconose, Powdery mildew, leaf spot		
Star Jasmine	Blight, rust, Fusarium wilt	sunburn	Whiteflies, scale, mites
Strawberry Madrone	Leaf spot, SOD, root dx		

WATERING  
IN HEAT  
REFERENCES

[www.ebmud.org](http://www.ebmud.org)

Book: Right Plant Right Place Brooklyn Botanic Gardens Nicola Ferguson  
Simon & Shuster

Plants for Landscapes for Summer-Dry Climates of SF Bay – EBMUD

<https://www.ebmud.com/water/conservation-and-rebates/watersmart-gardener/plants-and-landscapes-summer-dry-climates>

Emerisa Gardens Santa Rosa <https://www.emerisa.com/nursery-emerisa-gardens>

Urban Tree Farm Santa Rosa

[https://www.urbantreefarm.com/?utm\\_source=local&utm\\_medium=organic&utm\\_campaign=GMB](https://www.urbantreefarm.com/?utm_source=local&utm_medium=organic&utm_campaign=GMB)

Cal Flora Santa Rosa <https://www.calfloranursery.com/>

CNPS [www.cnps.com](http://www.cnps.com)

Calflora <https://www.calflora.org/>

Annie's Annuals <https://www.anniesannuals.com/>

Cynthia's Handout

Wyatt Irrigation Supply <https://www.wyattsupply.com/>

Horizon [https://www.horizononline.com/landscape-supply-store/napa-ca/?UTM\\_source=google\\_local&UTM\\_medium=organic](https://www.horizononline.com/landscape-supply-store/napa-ca/?UTM_source=google_local&UTM_medium=organic)

Spill the Beans Heat Islands:

<https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=54962>



THANK YOU

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