Master Gardener Program

University of California Cooperative Extension

HOME VINEYARDS - SPRING

University of California Cooperative Extension UC
MASTER GARDENERS OF NAPA COUNTY

Need more Information:

Help Desk
Monday, Wednesday, Friday
9:00 AM – 12:00 Noon
253-4143

E-mail: mastergardeners@countyofnapa.org

http://NapaMG.org

WEB SITE: WWW.IPM.UCDAVIS.ED Integrated Pest Management PEST NOTES

What questions do you have for us??

- How many have vineyards?
- How Big?
- What varieties?
- Where are they located?
- Are you aware of Integrated Pest Management (IPM)?
- Do you sell your grapes?
- Vineyard Management (DIY or Professional)

OUTLINE OF WHAT WE ARE COVERING TODAY

- INTRODUCTION – Carolyn (9:30 – 9:40)
- CALENDAR OF EVENTS IN A VINEYARD, BASIC BOTANY , ANNUAL GROWTH CYCLE, - Carolyn (9:40 – 10:00)
- VINEYARD FLOOR MANGEMENT/ COVER CROP (10:00 – 10:10)- Carolyn
- FROST PROTECTION – Dan (10:10 – 10:30)
- PRUNNING – Tony (10:30-10:40)
- CANOPY MANAGEMENT – Carolyn (10:40 – 11:00)
- PETIOLE TEST REVIEW – Barbara (11:00 – 11:10)
- POWDERY MILDEW – Dan (11:10 - 11:35)
- INTERGRATED PEST MANAGEMENT– Carolyn (11:35 – Noon)

LUNCH (Noon – 12:30)

- PRUNING IN THE VINEYARD – Team (12:30 – 12:50
- CROP LEVELS AND THINNING – Dan (12:50 – 1:00)
- VINE NUTRITION AND FERTILIZATION – Barbara (1:00 – 1:10)
- IRRIGATION TIMING AND TECHNIQUES – Dan (1:10 – 1:20)
- DROUGHT AND DRY FARMING – Carolyn (1:20 – 1:30)
- Questions (1:30 – 2:00)

Online Presentation

MG Website: NapaMg.org

Materials Access using our QR Code

Our Presentation

CALENDAR OF EVENTS FOR VITICULTURE MANAGEMENT

- HARVEST
- VITICULTURE OPERATION
- PEST MANAGEMENT

Calendar of Events

WEATHER

- Rain
- Or lack of !
- Frost Danger
- Heat spell hazard
- We will be covering this in detail today-

Calendar of Events

HARVEST

- Wine Grapes

  early (sparkling wines)

  mid season (whites /pinot noir)

  late (Cabernet Sauvignon, Merlot)

Calendar of Events

VITICULTURE OPERATIONS

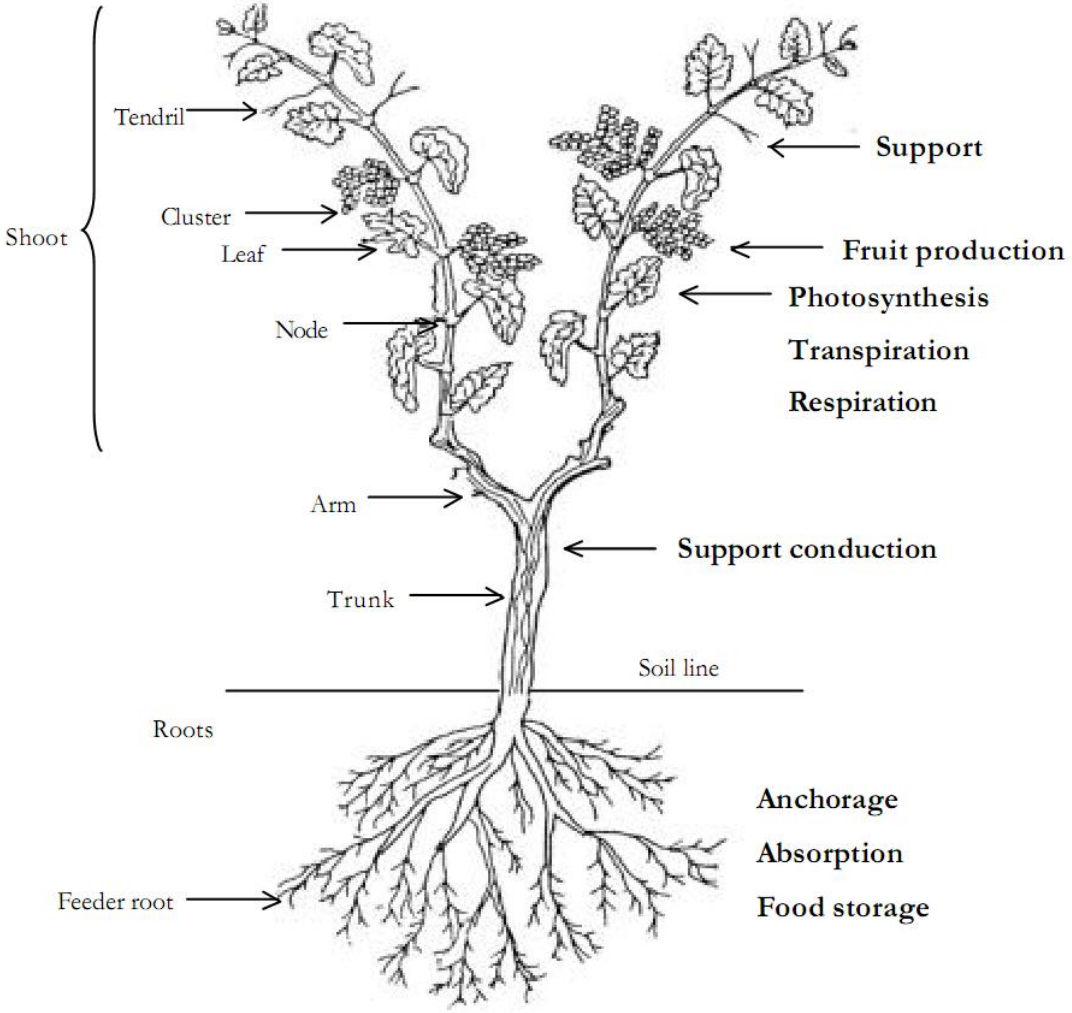
- Shoot removal
- Plant Cover Crop
- Irrigation
- Pre Harvest vine preparation

Calendar of Events

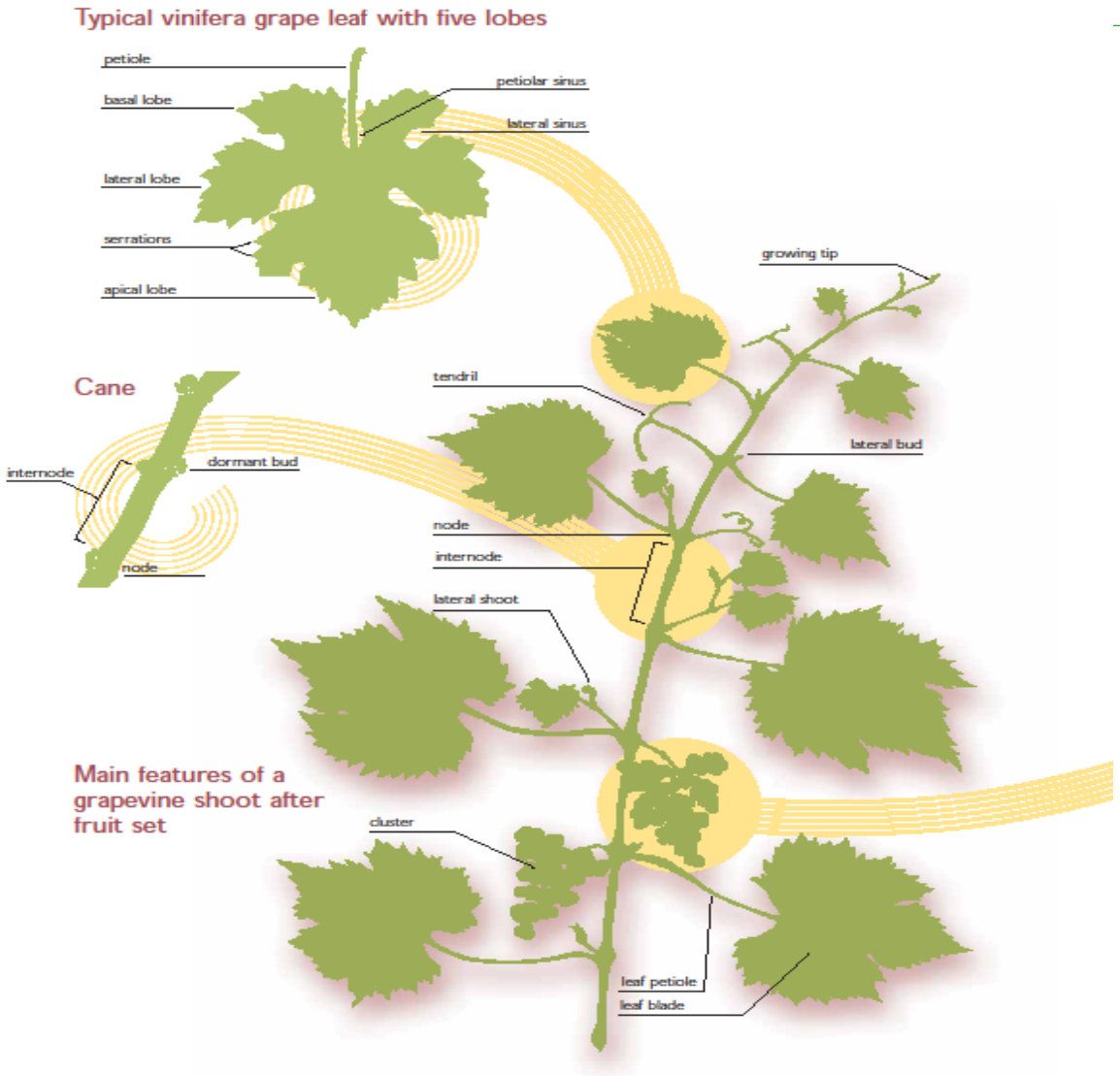
PEST MANAGEMENT

- Insects and Mites
- Nematodes
- Diseases
- Vertebrates
- Weeds

Vine


Shoot
Tendril
Cluster
Leaf
Node
Arm
Trunk
Soil line
Roots
Feeder root
Support
Fruit production
Photosynthesis
Transpiration
Respiration
Support conduction
Anchorage
Absorption
Food storage

Wine Grapevine Structure



BASIC BOTANY

- What factors effect growth and ripening
- Temperature and light influences
- Carbohydrate nutrition
- Understand irrigation, nutrition, ripening and fruit quality

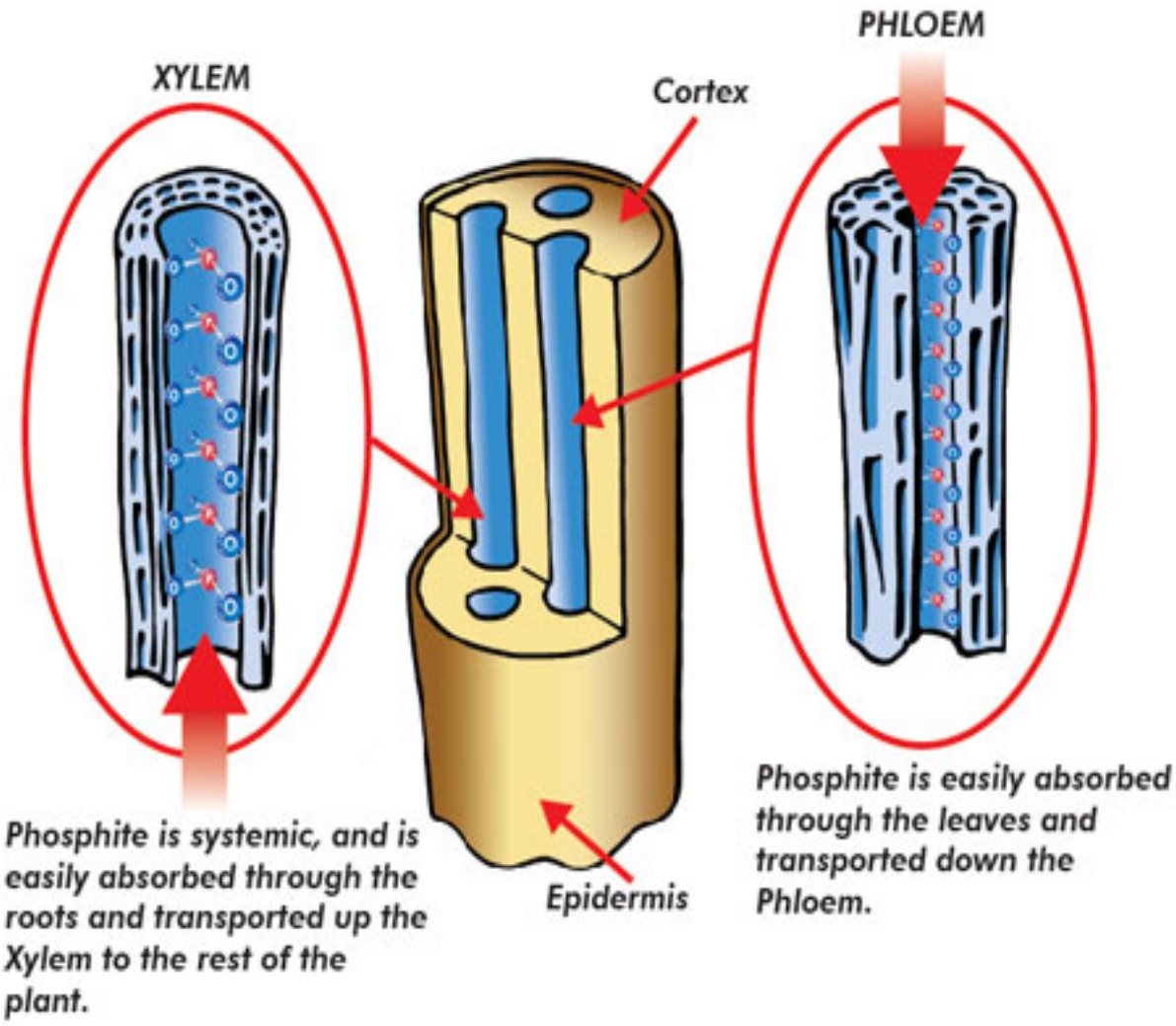
TRANSLOCATION

- Movement of carbohydrates, some nutrients and hormones in the plant
- Occurs in the phloem
- Phloem is made up of living plant cells
- Moves upward and downward in plant

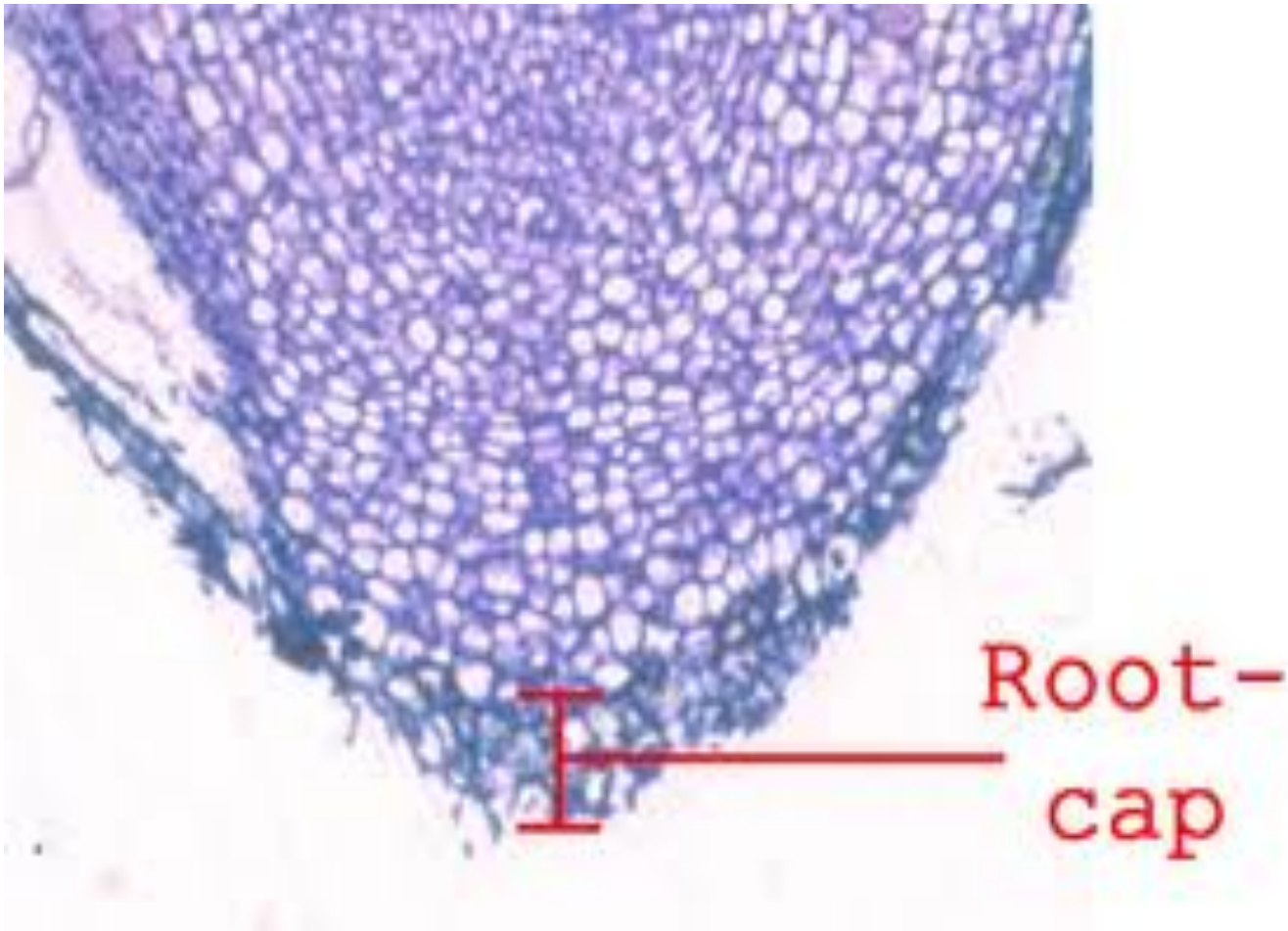
- PHLOEM= FOOD

- Sinks- food goes where needed- leaves, berries, roots

Food Flow


PHLOEM
XYLEM
Cortex
Phosphite is systemic, and is easily absorbed through the roots and transported up the Xylem to the rest of the plant.
Epidermis
Phosphite is easily absorbed through the leaves and transported down the Phloem.

Root Growing Point



Photosynthesis

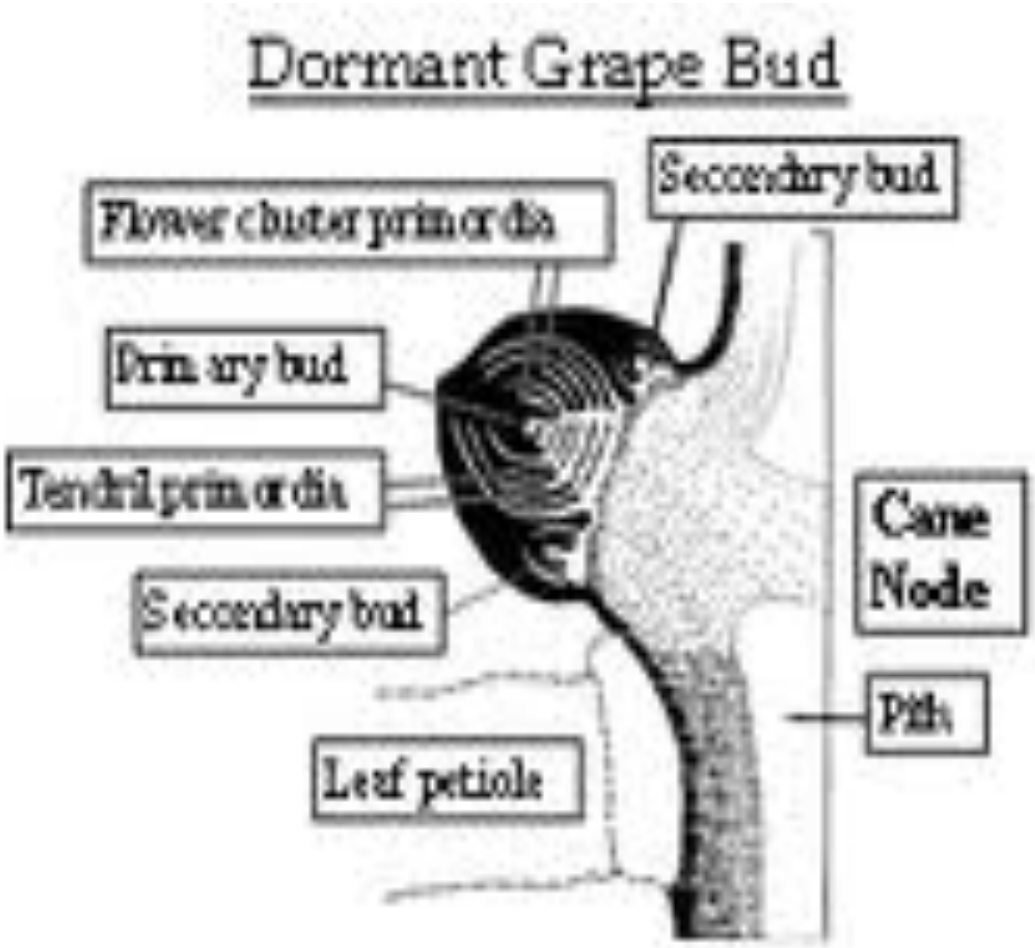
- *The process which enables plants to produce their own food*
- Energy from sun (light) is transformed into stored chemical energy (sugars, carbs)
- CO2 (carbon dioxide + H2O (water) in the presence of light and chlorophyll >>>>> simple sugars or carbohydrates + O2
- Only during daylight Influenced by :Light- Temperature- Water status(wind)

ANNUAL GROWTH CYCLE

-------THREE INTEGRATED CYCLES-------

- VEGETATIVE GROWTH
- CLUSTER INITIATION
- FRUIT GROWTH AND DEVELOPMENT

Bud


Dormant Grape Bud
Secondary bud
Flower cluster primordia
Primary bud
Tendril primordia
Secondary bud
Cane Node
Pith
Leaf petiole

Compound Bud

Bud Break- Dormant bud

Bud Break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Early Shoot Growth- flat leaf stage

Early Shoot Growth- Six inch Shot

Vine Growth at the beginning of bloom

ANNUAL GROWTH CYCLE

CLUSTER INTIATION

- ALL FORMED IN THE BUD – FRUIT CLUSTER OR TENDRIL
- INFLUENCED BY ENVIORMENT
- FLOWER CLUSTER FORMED THE YEAR PRIOR

Bloom


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Bloom Pollination

ANNUAL GROWTH CYCLE

FRUIT GROWTH AND DEVELOPMENT

- GRAPE FLOWERS ON CLUSTER
- SELF-POLLINATING
- FLOWERS BLOOM 6-10 WEEKS AFTER SHOOT GROWTH BEGINS
- FRUIT SET -20-30% FLOWERS REALLY BECOME BERRIES

Fruit Set

Fruit Developing

ANNUAL CYCLE OF GROWTH

FACTORS INFLUENCING GRAPE BERRY GROWTH

- GENETICS
- BIOPHYSICAL CONSTRAINTS
- ENVIRONMENT
- SOURCE/SINK RELATIONSHIPS
- WATER STRESS

Fruit Elements

Fruit Fully Developed - Veraison

Vineyard Floor Management

Floor Management Objectives

- Weed Control
- Soil Conservation
- Water Management

Weeds need to be managed to reduce competition for soil moisture and nutrients.

Cover Crops

- Timing of seeding
- Benefits
- Mowing/tilling timing
- Water Management
- Erosion Control

Compost and Mulch

Mulch is not tilled in

- Erosion control
- Improved moisture

Compost is tilled in to

- Improve porosity
- Add microorganism diversity
- Slow release of nutrients
- Apply 3-4 tons /acre

Frost Protection

Frost Damage

- #1 Cause of weather related economic losses for grape growers
- Freezing causes rupture of cell walls, cells get leaky and get dehydrated.
- Temp less than 32 degrees F (0 C).

Freeze Damage

Frost Damage Occurs Quickly!

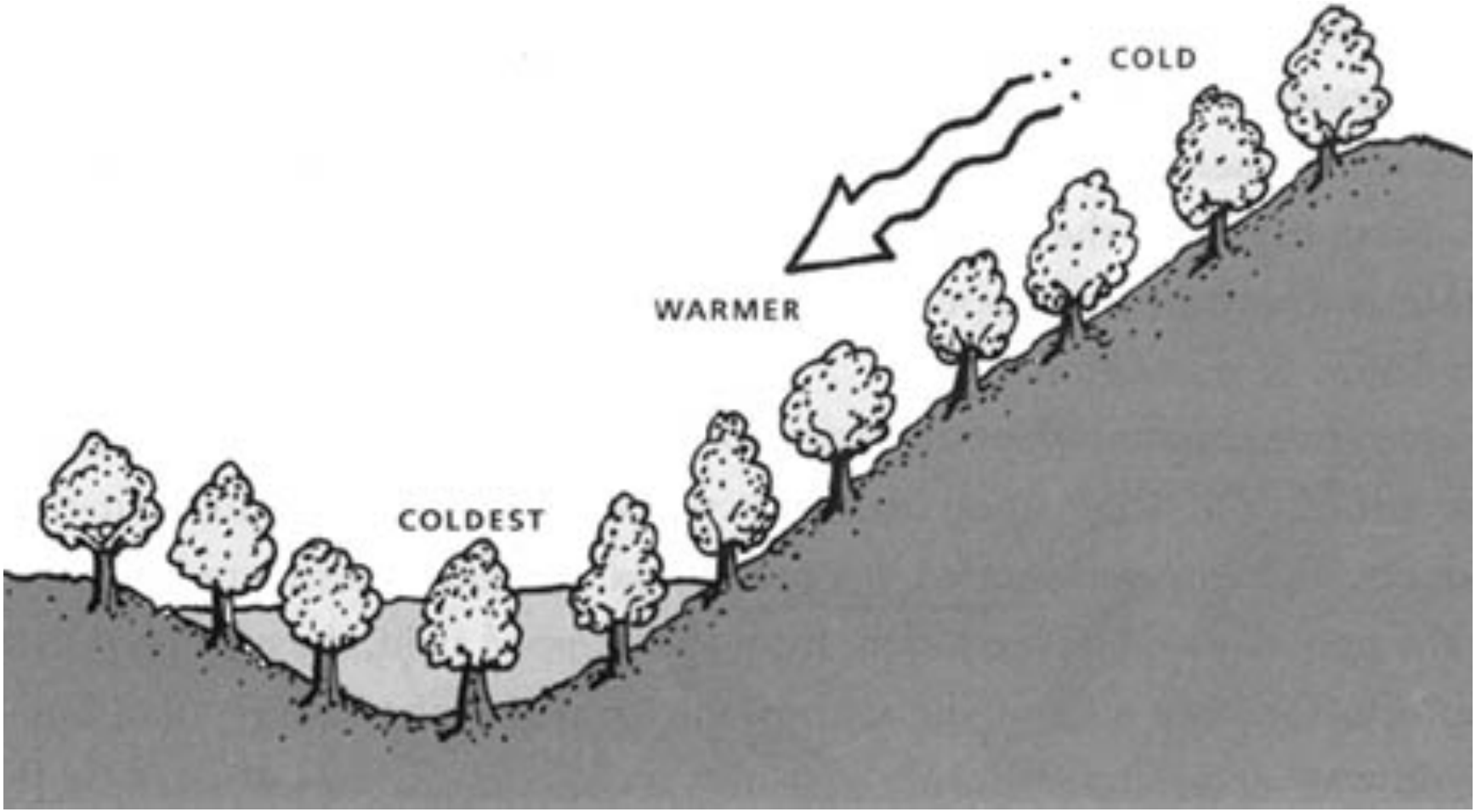
- Damage begins with air temperatures of 31 degrees for only ½ hour.
- Temps of less than 30 degrees lasting several hours will kill growing buds in the spring.
- More mature vines do better.
- Optimally hydrated vines also do better.

Passive Frost Protection

Often get you up to 2 degrees (often all needed):

1. Vineyard site selection –cold air is trapped in low areas and moves down a slope.
2. Clean/bare/firm/wet vineyard floor.
3. Plant later budding varietals.
4. Prune later/double prune – pruned vines bud earlier.

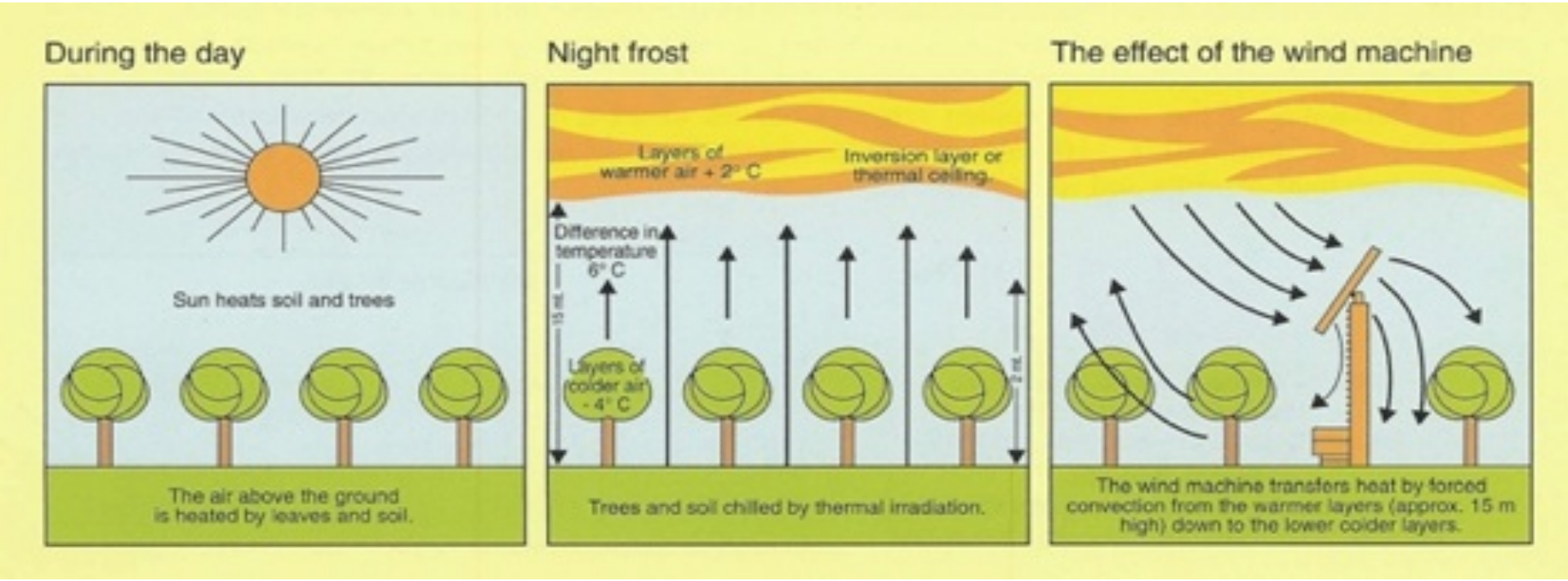
Cold Air Movement



Active Frost Protection

- Overhead Sprinklers – require a lot of water, can get up to 8 degrees of protection.
- Wind Machines – bring warmer air above the vineyard to the colder air at ground level. Good for 1 – 3 degrees protection.
- Heaters – not used much anymore.
- Frost Protection Sprays – (Cloud Cover/Copper)
- Garden Cloths/Lights – works for a few vines.

How Wind Machines Work



FROST PROTECTION

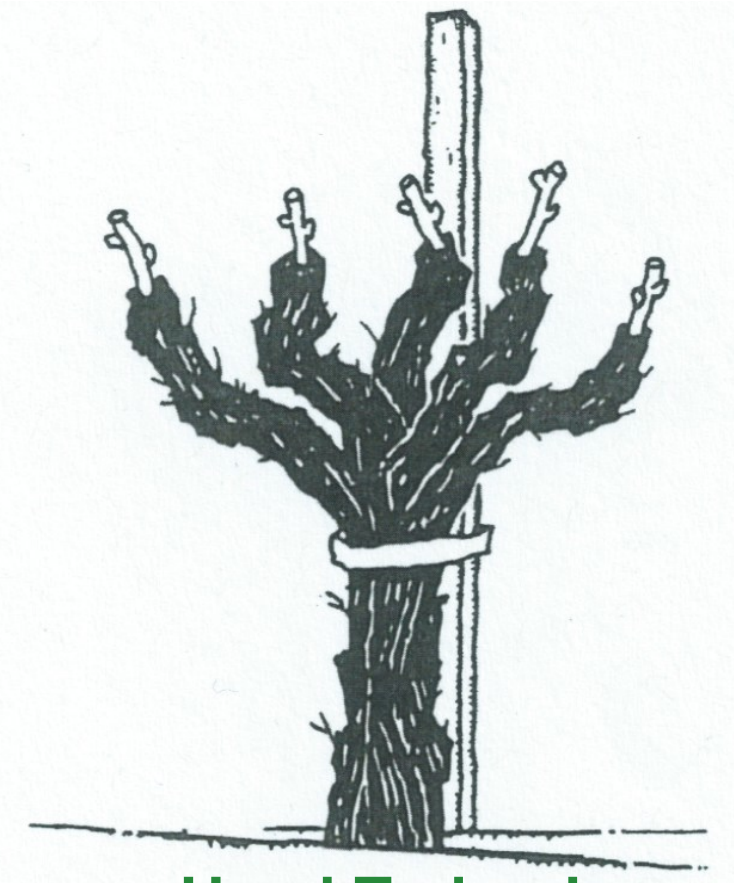
WIND MACHINES

Pruning

Objectives of Pruning

- Controlling the size and structure of the vine
- Regulate crop size
- Maintain a balance between vegetative growth and fruiting
  - maximizing the yield potential while maintaining the health of the plant
- Determined by trellis system

Trellis Systems

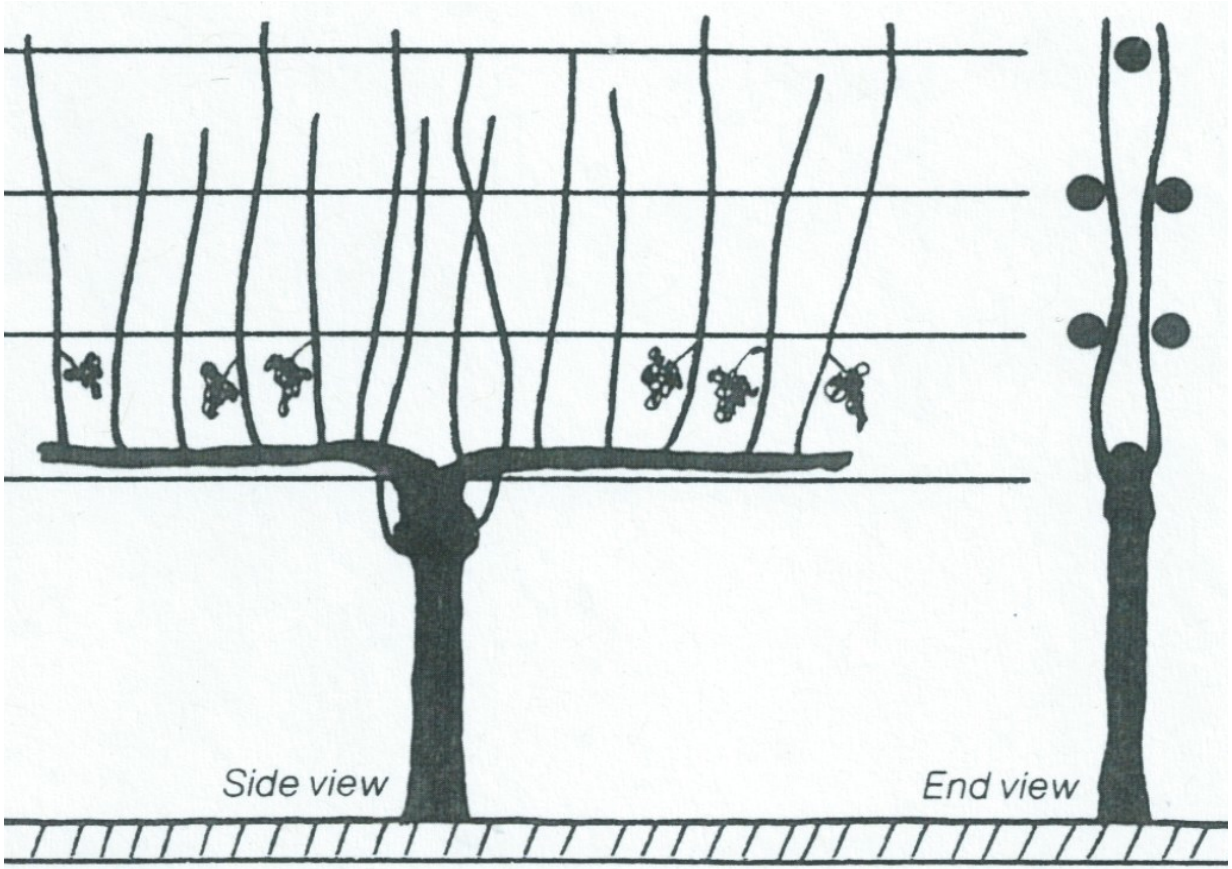


Head Trained

Considerations

- Cultivar
- Site
- Vine vigor
- Harvesting method
- Maintenance
- Cost

Vertically shoot positioned (VSP) trellis



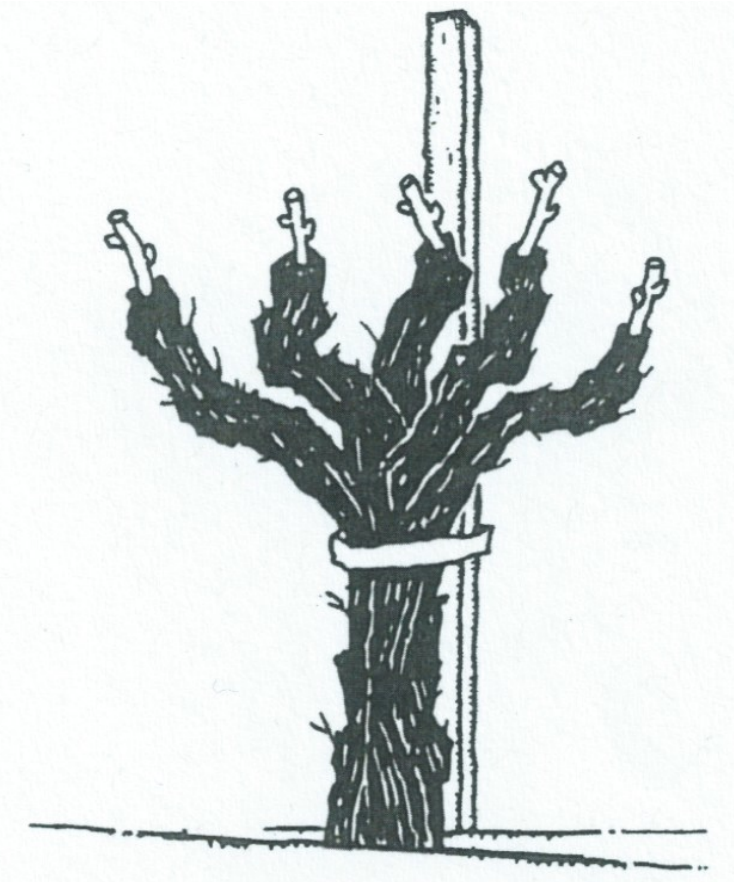
- Dominate the North Coast and Central Coast
- Used in various row widths
- Adjustable side wires

Spur

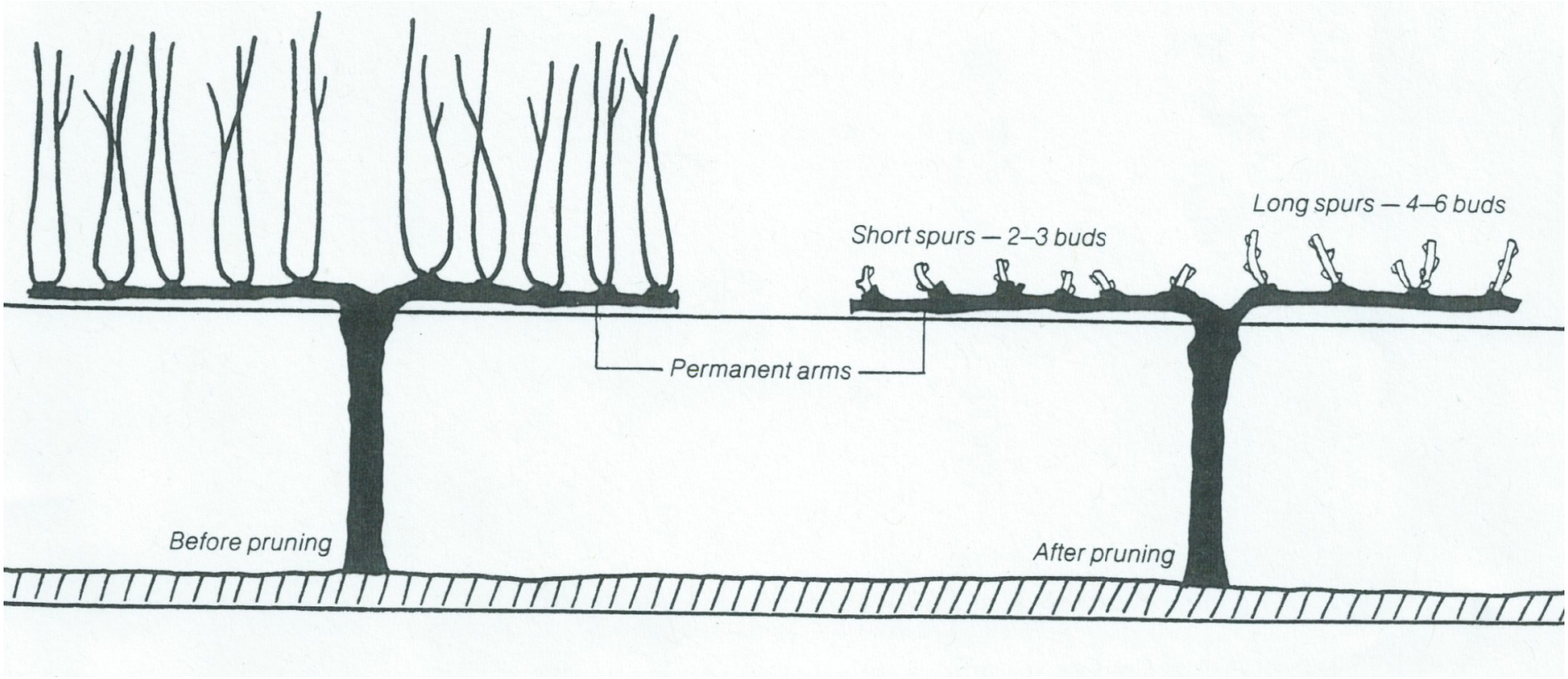
Length of spur is 2 clearly defined buds

Head Trained

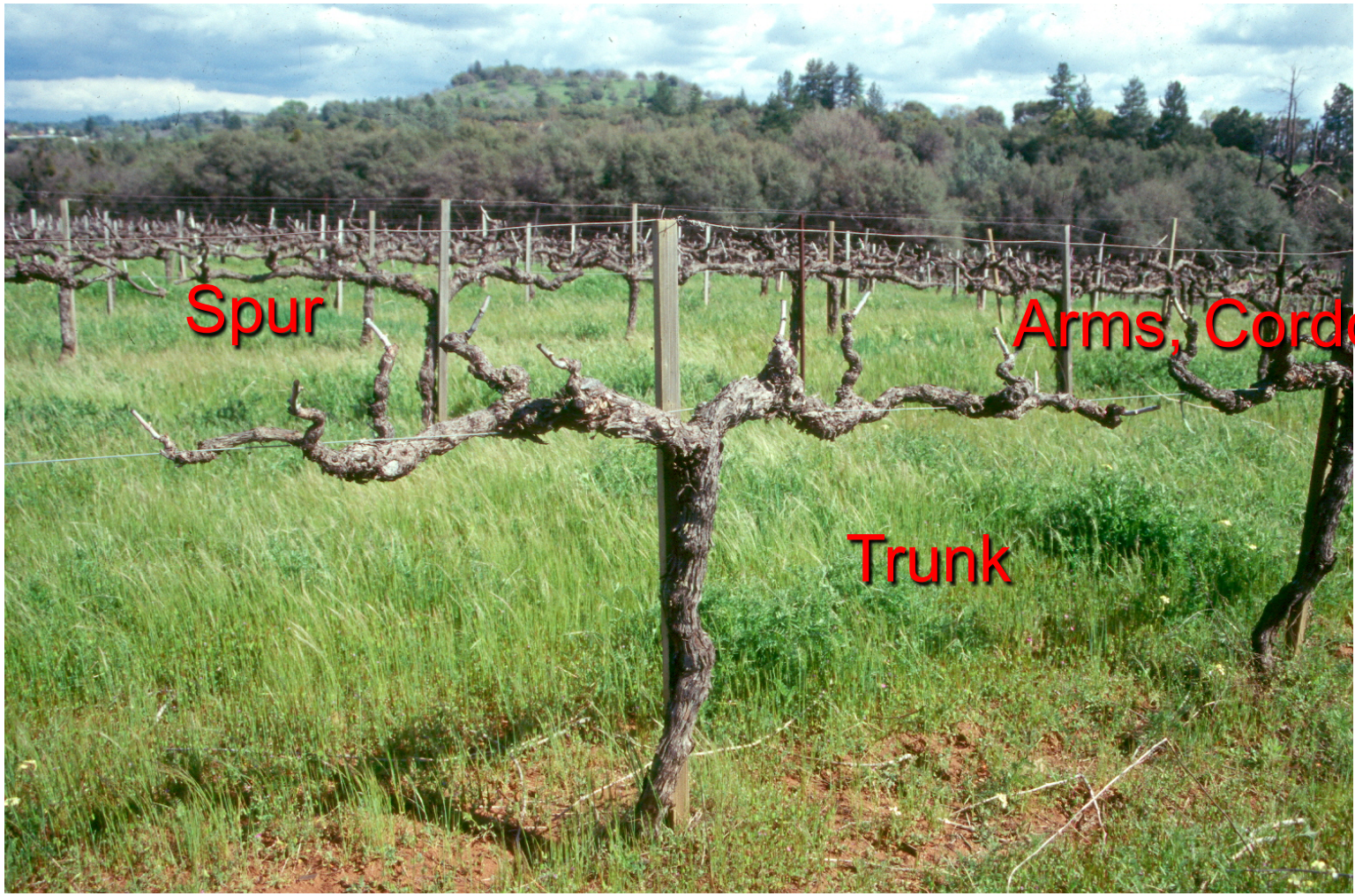
Vine with Spur Pruning



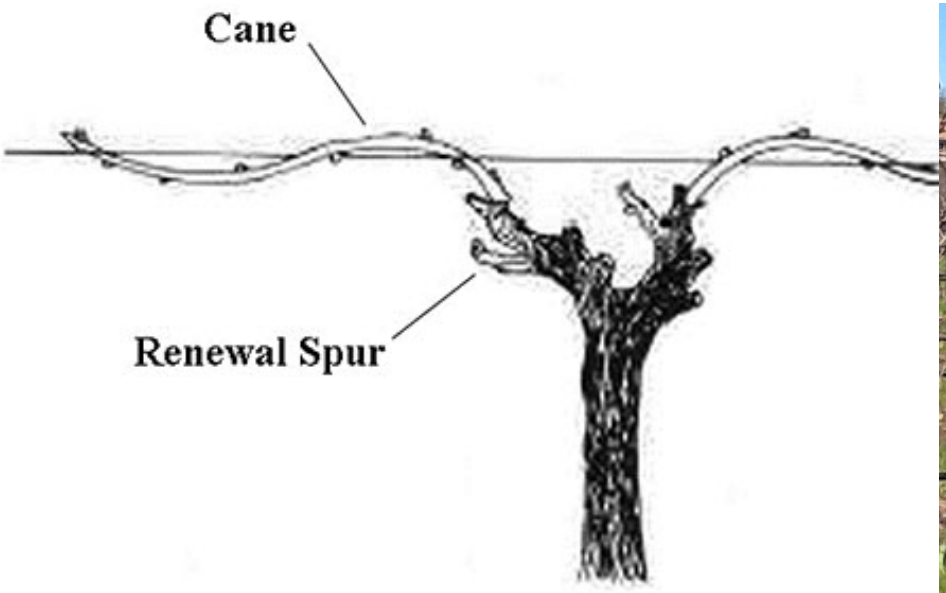
Cordon Pruning



Cordon Pruning



Cane Pruning



Bad Examples

Poor spacing of spurs

No sunlight in canopy
Dead shoots

Wrong Spacing

Clusters well spaced

Canopy Management

Canopy Management

It is all about Balance

Shape, Orientation, Location of shoots and Leaves

Canopy Management

Why we do it

❑ For This Year

✓ To maximize wine grape yield, wine quality or both at the same time,

✓ Essential to being consistently successful from one year to the next.

A properly balanced vine, with the right ratio of shoots and leaves to fruit, is the goal, as well as striving for the right fruit exposure to light and maintaining the fruit within an optimum temperature range.

Canopy Management

Why we do it

- **For Next Year**

✓ Two critical elements:

- Production of adequate fruit buds
- Production of sufficient carbohydrate and nutrient reserves for the following year

Canopy Management

What Affects Balance

Vegetative Growth

Fruit Production

Canopy Management

General Crop Load Indices

- 8 Leaves per cluster
- 10 – 14 cm^2 leaf area – gram fruit weight

Canopy Management

Know your microclimate, Orientation to the afternoon sun

- When to Start
  - ✓ Just Prior To or at bloom
  - ✓ Increase light on the bloom
- During rapid shoot growth
  - ✓ Suckers
  - ✓ Water spouts
  - ✓ May need additional leaf pulling
- When to stop
  - ✓ Start of Veraison
  - ✓ Prior to Harvest

Canopy Management

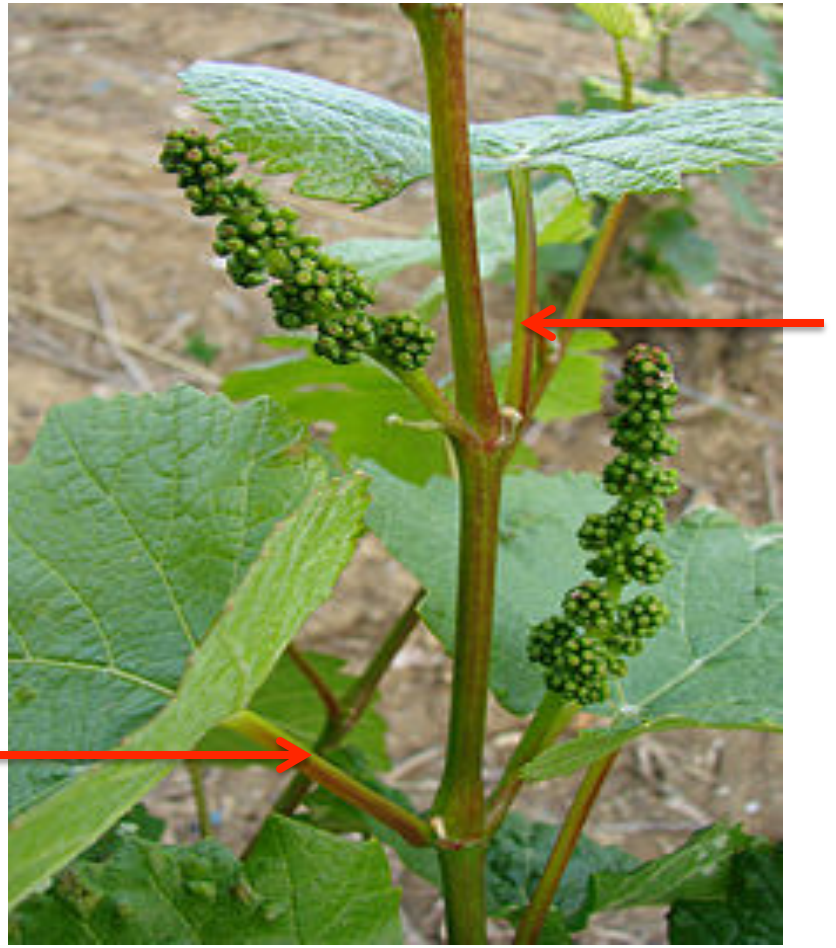
LEAF REMOVAL TIPS

- ✓ At the beginning of berry set take off leaves in the fruiting zone to expose grapes to sunlight as necessary.
- ✓ Be careful of too much leaf removal on the south or western sides because of potential sunburn.
- ✓ A dense canopy is also conducive to the development of bunch rot or mildew because it prevents the sprays from reaching the fruit. Air movement helps reduce moisture which leads to these conditions.

Petiole Test

Petiole Test

- When (At Bloom most common)
- Which (Around cluster – opposite)
- How Many (75 – 100)
- Frequency (Annually)



Petiole Analysis

Client
Property
Project Number BLOOM 2015

Report of Plant Tissue Analysis

Date Sampled 05/11/15
Date Submitted 05/19/15
Date Reported 05/27/15

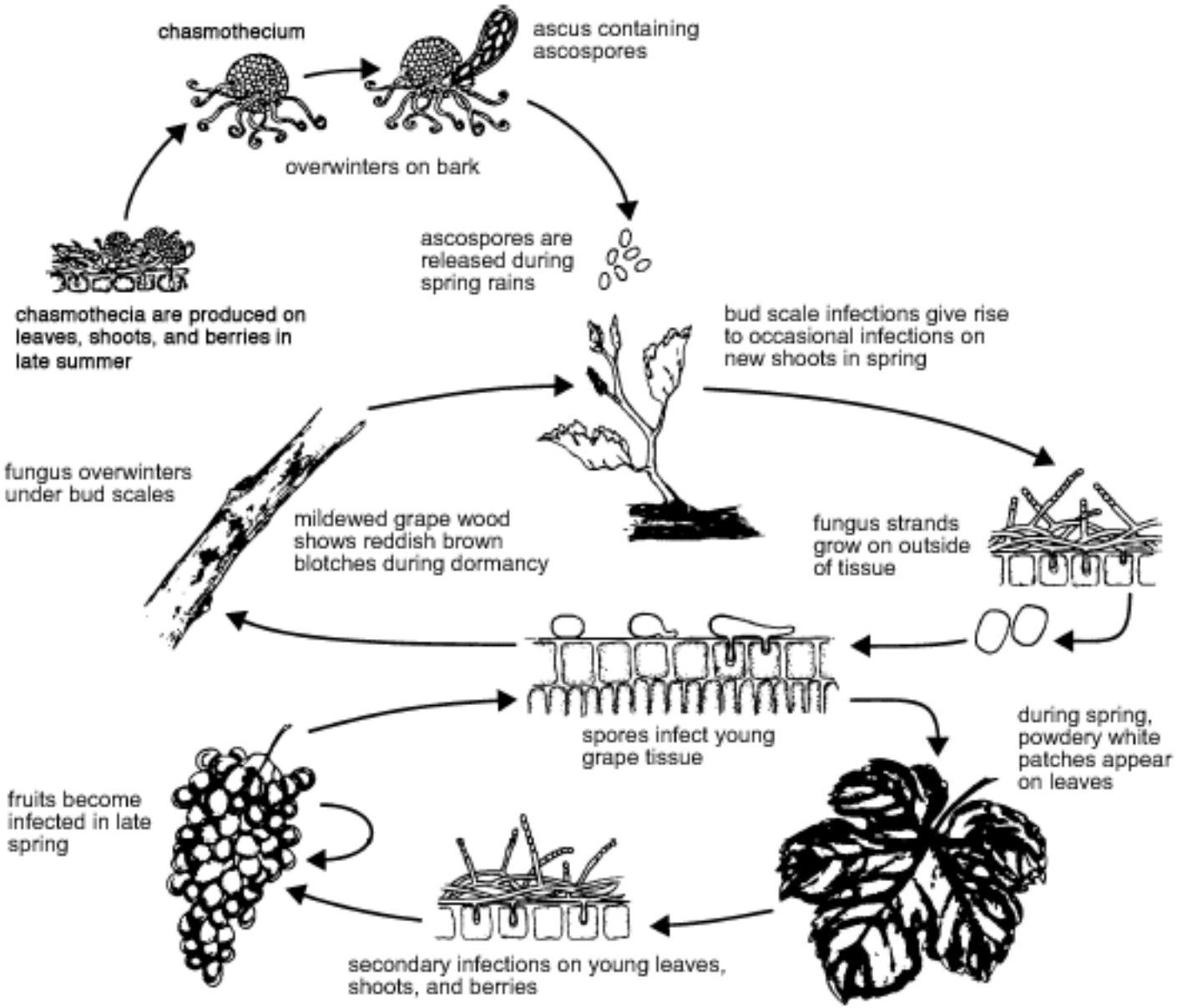
Sampling Date	Lab ID#	Description Block / Variety Rootstock / Growth Stage	N Total Nitrogen %	NO3-N Nitrate Nitrogen ppm	Cl Chloride %	P Total Phosphorus %	K Potassium %	Mg Magnesium %	Ca Calcium %	Na Sodium %	Fe Iron ppm	Al Aluminum ppm	Mn Manganese ppm	B Boron ppm	Cu Copper ppm	Zn Zinc ppm
5/15/15	3	4 / CS 110R / 90% BLOOM	1.01	555	0.13	0.80	2.79	0.62	4.12	0.01	33	18	57	46	8	44
5/11/15	1	1A / CS 3309 / 90% BLOOM	0.89	189	0.26	0.68	3.35	0.79	4.26	0.01	27	13	85	34	8	73
5/11/15	2	1B / CS 3309 / 80% BLOOM	0.95	413	0.27	0.60	3.06	0.83	4.39	0.01	29	20	98	33	7	72
5/11/15	3	2 D-F / ME 3309 / 85% BLOOM	0.92	247	0.32	0.54	3.78	0.76	3.75	0.01	28	19	97	34	7	102
5/15/15	1	2A / CS S04 / 65% BLOOM	0.90	31	0.07	0.50	3.31	0.66	3.78	0.01	34	21	66	37	7	44
5/8/15	1	2B / SB S04 / 80% BLOOM	1.13	107	0.13	0.74	2.72	0.57	3.94	0.01	40	25	147	30	7	56
5/15/15	2	2C / CS S04 / 70% BLOOM	0.85	28	0.11	0.53	2.65	0.62	3.72	0.01	30	21	125	29	6	49
5/8/15	2	2G / CF 3309 / 50% BLOOM	1.03	506	0.33	0.61	4.17	0.80	3.41	0.02	32	15	75	35	7	93
5/6/15	1	2H / CF 3309 / 90% BLOOM	0.95	486	0.35	0.65	3.94	0.51	3.78	0.02	41	31	86	39	6	82
5/6/15	2	3A-1 / CS 3309 / 50% BLOOM	1.03	578	0.28	0.57	2.56	0.67	3.80	0.01	39	26	71	30	7	66
5/8/15	3	3A-2 / CS 3309 / 40% BLOOM	1.09	181	0.30	0.67	2.72	0.58	3.80	0.01	32	20	96	33	6	38
5/6/15	3	3B-1 / PV 420A /	1.45	420	0.15	0.54	2.16	0.54	2.30	0.01	42	25	83	37	6	60
5/6/15	4	3B-2 / PV 3309 / 70% BLOOM	1.30	1014	0.25	0.64	3.65	0.66	2.44	0.01	40	28	65	39	9	72
Critical levels for Wine Grapes		Deficient	<0.5	<100		<0.15	<1.00	<0.20	<1.0		< 30		<20	<25	< 6	<15
		Marginal	0.5 - 0.75	100 - 200		0.15 - 0.25	1.00 - 1.50	0.20-0.30	1.0-1.5		30-40		20-40	25-40	6 - 8	15-50
		Adequate	0.75 - 1.25	200 - 600		0.25 - 0.60	1.50 - 2.50	0.30-0.80	1.5-2.5	<0.1	40-300	<300	40-500	40-70	8 - 20	50-100
		Elevated	1.25 - 1.50	600- 1000	0.5-0.8	0.60 - 1.0	2.5-3.0	0.80-1.0	2.5-3.5	0.1-0.5		300-500	500-1000	70-150	20-500	100-150
		Excessive	>1.50	> 1000	>0.8	> 1.0	>3.0	>1.0	>3.5	> 0.5		>500	>1000	>150	>500	150+

Integrated Pest Management

Powdery Mildew

Uncinula necator

POWDERY MILDEW DISEASE CYCLE


chasmothecium
ascus containing ascospores
overwinters on bark
ascospores are released during spring rains
chasmothecia are produced on leaves, shoots, and berries in late summer
bud scale infections give rise to occasional infections on new shoots in spring
fungus overwinters under bud scales
mildewed grape wood shows reddish brown blotches during dormancy
fungus strands grow on outside of tissue
spores infect young grape tissue
during spring, powdery white patches appear on leaves
fruits become infected in late spring
secondary infections on young leaves, shoots, and berries

Initial Infection

Powdery Mildew

Heavy Mildew Infection

Powdery Mildew

Figure 21.8 Scarring on canes resulting from shoot infection

Management

FUNGICIDES

- Sulfur – actually a protectant, won't kill an active infection but prevents new infection.
- Oils – kills fungal colonies (includes horticultural oils (i.e.: Saf-T-Side Spray Oil, Neem oil, Jojoba oil etc.)
- Synthetic Fungicides
- Other – biologicals, etc. (i.e.: Serenade)

CULTURAL PRACTICES

- Adequate trellis system/training
- Shoot thinning/leaf removal
- Appropriate hedging

When Do You Spray?

Commercial/Sophisticated Approach:

- UC Davis Powdery Mildew Risk Index Model
- Weather Station

Small Home Vineyard Empirical Approach:

- Start spraying at bud break/continue approx. every 2 weeks until grapes get to 12 Brix. Vary interval by temp/humidity.

Spray Residue/Damage

Integrated Pest Management

Integrated Pest Management (IPM)

- Prevention
  - Correct plant in correct place
  - Maintain tree & garden health (correct watering, fertilization, pruning, and sanitation; balanced eco-system)
- Minimize and Target Intervention

Vine Mealybug

Vine mealybug, Planococcus ficus, honeydew and white wax on infested grapevine after mechanical harvest. *Photo by Larry L. Strand.*

Grape mealybug

Grape, Obscure, and Vine Mealybug

Figure II. Reddish orange fluid excreted by grape mealybug (photo: JKC).

Figure III. Clear fluid excreted by obscure mealybug (photo: Kent M. Daane).

Figure IV. Vine mealybug colony in the axils of the petiole and cane (photo: Mark Battany).

Leafroll

Redblotch

Sharpshooters

Sharpshooters

Pierce's disease

Mites


UC Statewide IPM Project
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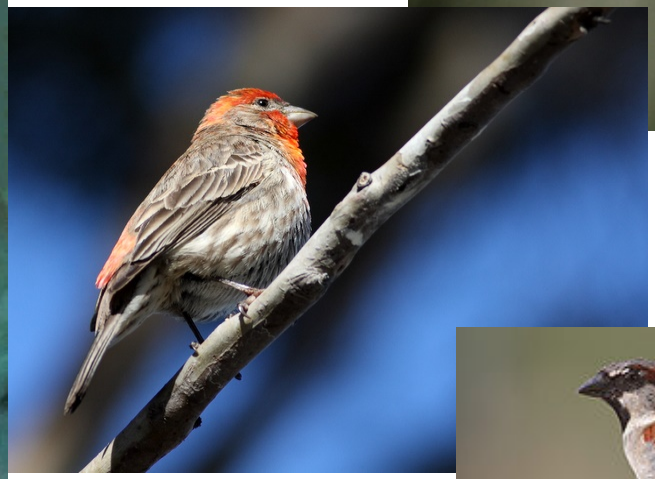
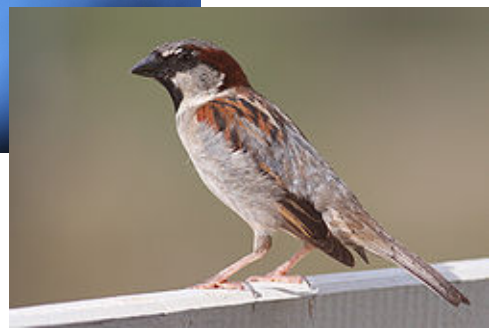
Eutypa

Vertebrate pests

Vertebrate pests

- Birds
  - COVER THE AREA





Vertebrate pests

- MANAGEMENT
  - Protective Netting
  - Frightening Devices
  - Shooting
  - Trapping
  - Repellents

Vertebrate pests

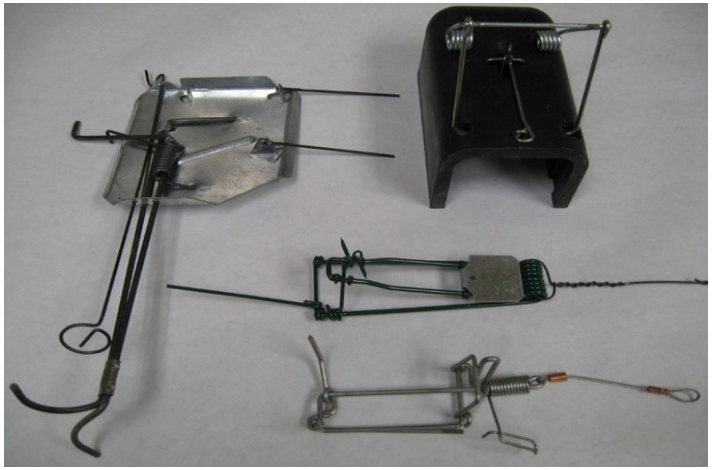
- Deer Proof the area

  Chicken Wire on Ground

Gophers

Adult pocket gopher, Thomo-mys species.

Top view of a pocket gopher mound



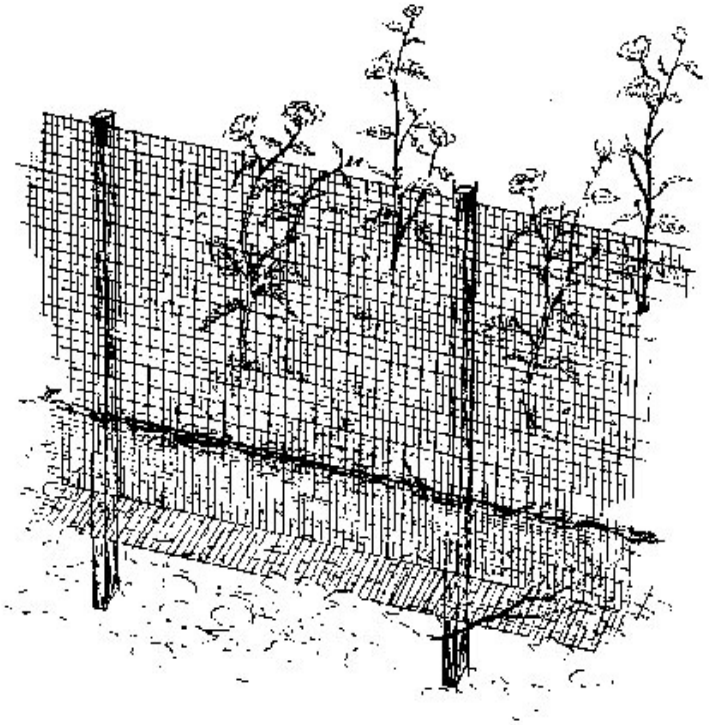
Types and brands of gopher traps include (clockwise from upper right) Victor Black Box, Macabee, Go- phinator, and Cinch.

Top view of a mole mound.

Vertebrate Pests - Rabbits

- Jack
  - Prefer open to semi open
  - Areas
  - 3 – 7 pounds
  - Long black-tipped ears
  - Breed – Jan – August
    - 2 – 3 /litter
    - 5 litters/year
- Cottontail
  - Prefer dense cover, bushy
  - areas
  - 1 ½ - 3 pounds
  - Rounded shape
  - Breed – Dec – June
    - 3 – 4 /litter
    - 6 litters/year

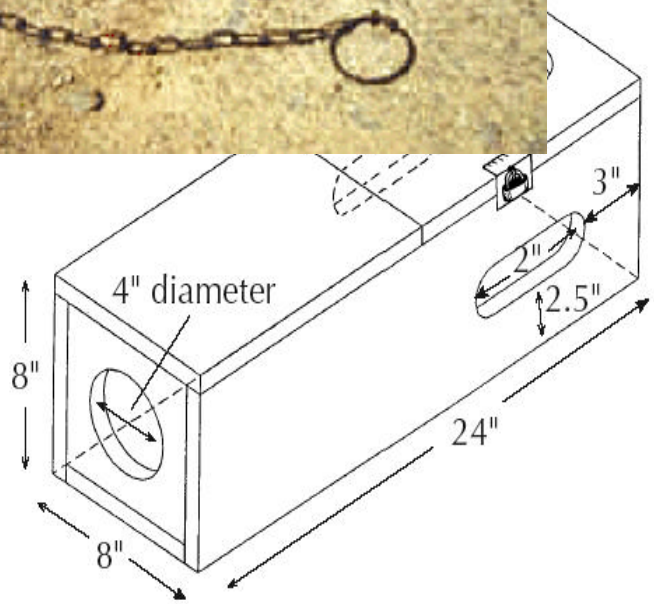
Vertebrate pests



- Rabbit Management
  - Rabbit Resistant Plants
  - Exclusion
    - Fencing
    - Trunk Guards

Vertebrate pests

- Rabbit Management
  - Trapping (cottontails)
    - Box plus conibear trap



  - Rabbit Repellents
    - Chemical with unpleasant taste
    - Application before damage
      - Reapply often
      - Not for plants intended for human

VOLE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VOLE DAMAGE- girdled trunk

Lunch

In the Vineyard
Pruning Exercise

Crop Levels

Over cropping

- *Over cropping = having too much fruit on the vine to ripen*
- *Balance of the canopy to the fruit enough canopy for photosynthesis to ripen the fruit*
- *Too much vegetation can result in undesirable flavors in the wine.*

Crop Thinning

- In June after berry set, remove bunches over two per cane.
- If there is shatter or poor set, leave 3 bunches per cane.
- If the crop is especially heavy or the variety produces large bunches, the bunch arm can also be removed.

Crop Levels and Thinning

BUNCH THINNING

- After veraison (coloring) review crop loads

Crop Levels and Thinning

Vine Nutrition and Fertilization

Grapevine Nutrition

What's Needed for Healthy Growth & Development

Macronutrients

Primary

- Nitrogen
- Phosphorus
- Potassium

Secondary

- Calcium
- Magnesium
- Sulfur

Micronutrients

- Iron
- Manganese
- Molybdenum
- Copper
- Zinc
- Boron

Nutrient Requirements

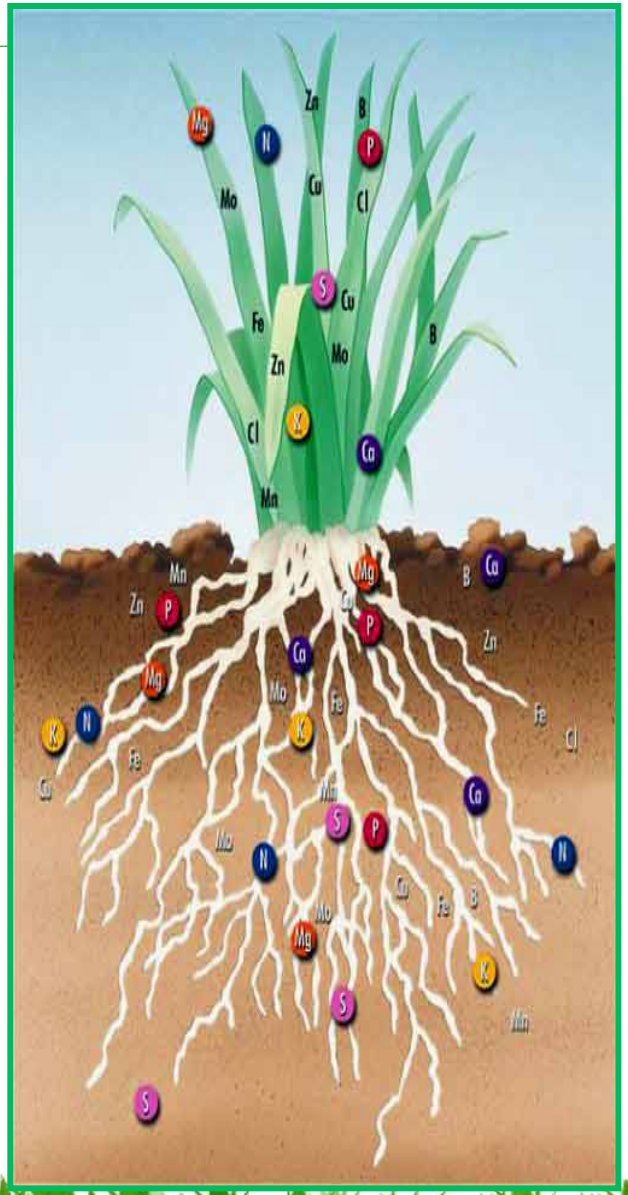
Five critical questions to ask for proper grapevine nutrition.

- Which nutrients are required by the vine?
- What's the function of each nutrient?
- At which physiological stage is the nutrient is mostly required?
- When should I fertilize?
- How much fertilizer should I apply?

When is the Nutrient Required?

Nutrients have different functions and are required during different times of the season.
Most common periods for fertilizer applications are:

- After bud break
- After fruit set
- After harvest
- Foliar applications through the growing season



When is the Nutrient Required?

- Macro elements (N, P, K, Ca, Mg) should be applied to the soil for uptake by roots
- Micro elements (B, Zn, Mn, Fe, etc.) are required in small amounts and can be applied through foliar sprays
- Applications of macro elements should be during periods of active root growth
  - After bud break
  - After harvest
- Applications must be done with irrigation to ensure infiltration to the root zone

All Nutrients are not Created Equal

The Nutrients we <u>Really</u> Care About:

- Nitrogen
- Potassium
- Magnesium
- Boron
- Calcium
- Zinc

The Nutrients we <u>Somewhat</u> Care About:

- Phosphorus
- Iron
- Manganese
- Molybdenum

Grapevine Nutrition Assessment

Visual - Abnormalities of the plant – trunk, stems, leaves, fruit.

Phosphorus

Potassium

Nitrogen

Grapevine Nutrition Assessment

Soil Test - Reflects the nutrient content present in the soil but not necessarily available to the plant.

- Normally done before planting.
- Not normally done after planting unless visual symptoms indicate a problem.

SOIL ANALYSIS REPORT

Analytical Method(s): Mehlich 3

Date Received: 09/ /2010 Date Of Analysis: 09/ /2010 Date Of Report: 09/ /2010

Sample ID / Field ID	Lab Number	Organic Matter %	Organic Matter Rate	Organic Matter ENR lbs/A	Phosphorus Mehlich 3 ppm	Phosphorus Mehlich 3 Rate	Phosphorus Reserve ppm	Phosphorus Reserve Rate	Potassium K ppm	Potassium K Rate	Magnesium Mg ppm	Magnesium Mg Rate	Calcium Ca ppm	Calcium Ca Rate	Sodium Na ppm	Sodium Na Rate	pH Soil pH	Buffer Index	Acidity H meq/100g	C.E.C meq/100g
TOP		1.7	L	54	36	M			208	H	149	M	866	L			4.7	6.32	6.1	12.2

Sample ID / Field ID	Percent Base Saturation K %	Mg %	Ca %	Na %	H %	Nitrate NO_3N ppm	Nitrate Rate	Sulfur S ppm	Sulfur Rate	Zinc Zn ppm	Zinc Rate	Manganese Mn ppm	Manganese Rate	Iron Fe ppm	Iron Rate	Copper Cu ppm	Copper Rate	Boron B ppm	Boron Rate	Soluble Salts SS ms/cm	Soluble Salts Rate	Chloride Cl ppm	Chloride Rate	Aluminum Al ppm
TOP	4.4	10.2	35.5		50.0			26	H	1.9	L	45	H	228	VH	5.0	VH	0.4	L					1261
																								807

NUTRIENTS WE CARE ABOUT

Primary

Nitrogen (N)

Essential to fruit development. Helps improve leaf quality so the grapevine can better convert sunlight into nutrients.

Phosphorous (P)

Helps roots grow deep and strong and ensures the grapes will develop sufficient sugars to be sweet and succulent when ripe.

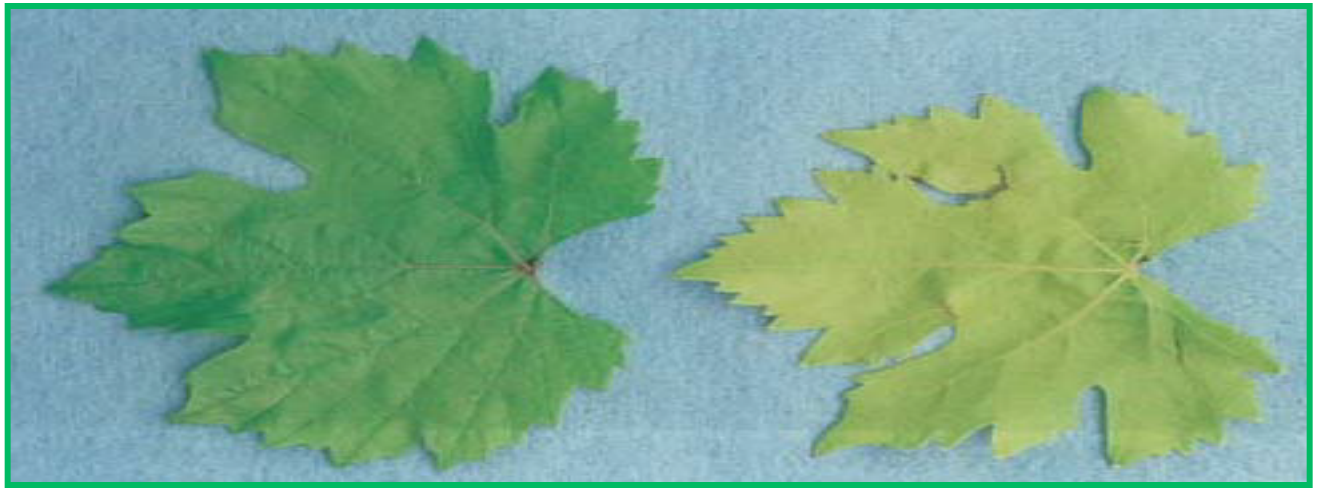
Potassium (K)

Works to build a healthy vine, helping it resist disease. Also helps the vine grow higher-quality grapes.

Nitrogen

Too little – pale green color, weak canopy growth, lower yields.

Good Leaf ***Bad Leaf***



Too much – excessive vigor, fruit shatter, delayed fruit maturity.

Phosphorus

Deficiency: rare in Napa. Usually found in soils with very low or very high pH or originated from volcanic ash.

Potassium

Deficiency: usually found when grapevines have been heavily cropped. Shallow, poorly drained soil and water stress contribute.

Boron

- Essential for plant growth and development.
- Small window between deficiency and toxicity.
- Only a small amount is needed (.4 ppm to 1.0 ppm is toxic).
- Deficiencies occur usually in early spring drought or later in the season with a soil deficiency.
- Toxicities can occur in Napa as we have high levels in soil & water.

Deficiency

Toxicity

Calcium

- Important in organs (shoots, leaves, roots), especially leaves
- Constituent in cell membranes, permeability of cell membranes
- Important for survival during dormant period
- Strength of berry skins

Zinc

- Essential for plant protein synthesis, the production of some plant hormones and in pollination and fruit set.
- Deficiency causes distortion of leaves as well as interveinal chlorosis.

FERTILIZATION

Fertilization Guidelines

- Before applying an ounce of fertilizer STOP and ask "why am I doing this?"
- There is no recipe for nutrition management.
- Low to moderate fertility can improve wine quality.
- Multiple applications are better than a single large one.
- Soil treatments are usually more durable than foliar.
- Foliar feed micronutrients and soil treat the macronutrients
- Most fertilizers, soil and foliar, are best applied between fruit set and veraison, with the exception of Boron and Zinc.
- Don't pollute. Manage nutrients as you would pesticide.

Fertilization Calendar

December, January & February

- Apply boron spray to soil beneath vines if petiole analysis indicates need.
- Apply zinc sulfate to vine cuts if there are indications of need.

March, April & May

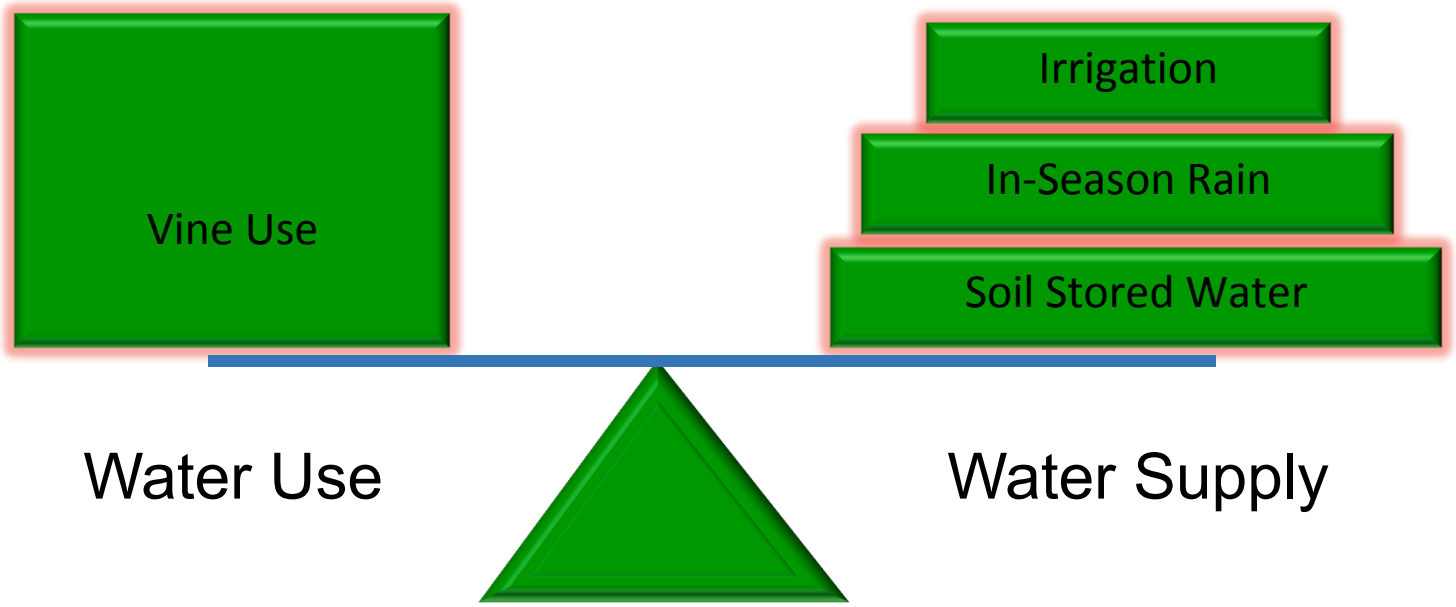
- Mow cover crops
- Apply pre-bloom zinc and boron foliar spray. Usually mixed with wettable sulfur.
- Send petiole samples to laboratory for tissue analysis.

June, July & August

- Apply potassium sulfate, if petiole test shows need.
- Apply organic fertilizer or compost directly beneath drip emitters after bloom.

Irrigation Scheduling and Maintenance

When and How Much



Vine Water Use

- *Transpiration* = water loss by plants through their stomata.
- *Evaporation* = Water loss from the leaf surface
- *Evapotranspiration* relates to the rate of water use. It includes the evaporation of water from the soil surface and the movement of water from the soil through the plant and out through the leaves.
- Vines are drought resistant plants. Water only when necessary.
- The best thing is to know your plants: make visual assessments

When to begin

During rapid shoot growth

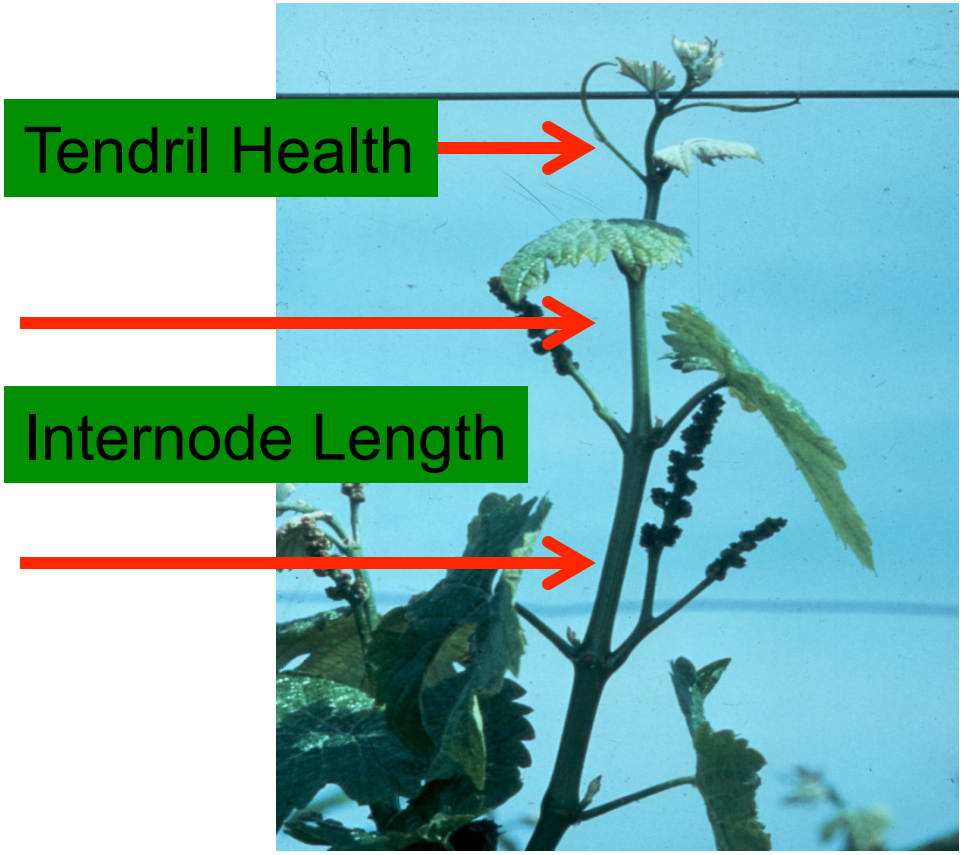
Growing Season

Shoot Length influenced by water deficits

Shoot tip condition

Test Soil Moisture

Visual Assessments



How Much

Know your microclimate

- Each vineyard can be very different in location (climate), soil-water capacity, vigor and trellis design.

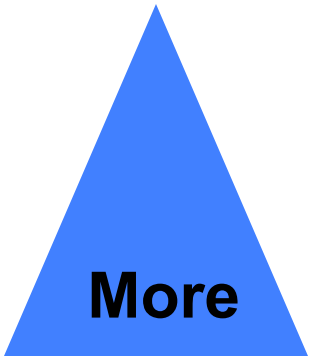
Production Goals

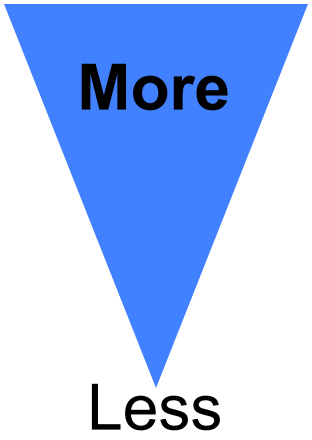
- Variety and wine program to which the fruit is destined.

Know your soil

Soil Texture affects water-storage capacity

Textures	Holding Capacity	Irrigation Needs
Sandy	Less	More
Loamy		
Clayey	More	Less





How Much

New Vines – First Year

Soil Type	First Six Weeks	Second Six Weeks	Remainder of Season
Sandy	1.5 Gals/per Day	1.5 Gals/2nd Day	1.5 Gals/3rd Day
Loamy	1 Gal/ per Day	1 Gal/2nd Day	1 Gal/3rd Day
Clayey	.75 Gal/per Day	.75 Gal/2nd Day	.75 Gal/3rd Day

How Much

New Vines – Second Year

Soil Type	June 1* - Six Weeks	July 15th until October
Sandy	1.5 Gals/3rd Day	2.5 Gals/5th Day
Loamy	1 Gal/3rd Day	2 Gal/5th Day
Clayey	.75 Gal/3rd Day	1.5 Gal/5th Day

* Start time can vary based on rainfall

When

Scheduling

- When we talked about irrigation for this workshop
  - It depends on:
  - the weather
  - the soil
  - the spacing
  - the rootstock….

When

Bloom to Verasion

- Irrigate as needed to continue development of canopy
- Active growth slows down approaching verasion

Verasion to Harvest

- Irrigate to maintain canopy, but not encourage growth
- Too much water can deprive roots of oxygen
- Encourages bunch rot give a vegetate flavor to the fruit from too much canopy

Finding Balance

Excessive shoot growth recognized by:

- Large leaves
- Long internodes
- Excessive lateral shoot growth

But – watch weather conditions, dig to determine moisture soil levels

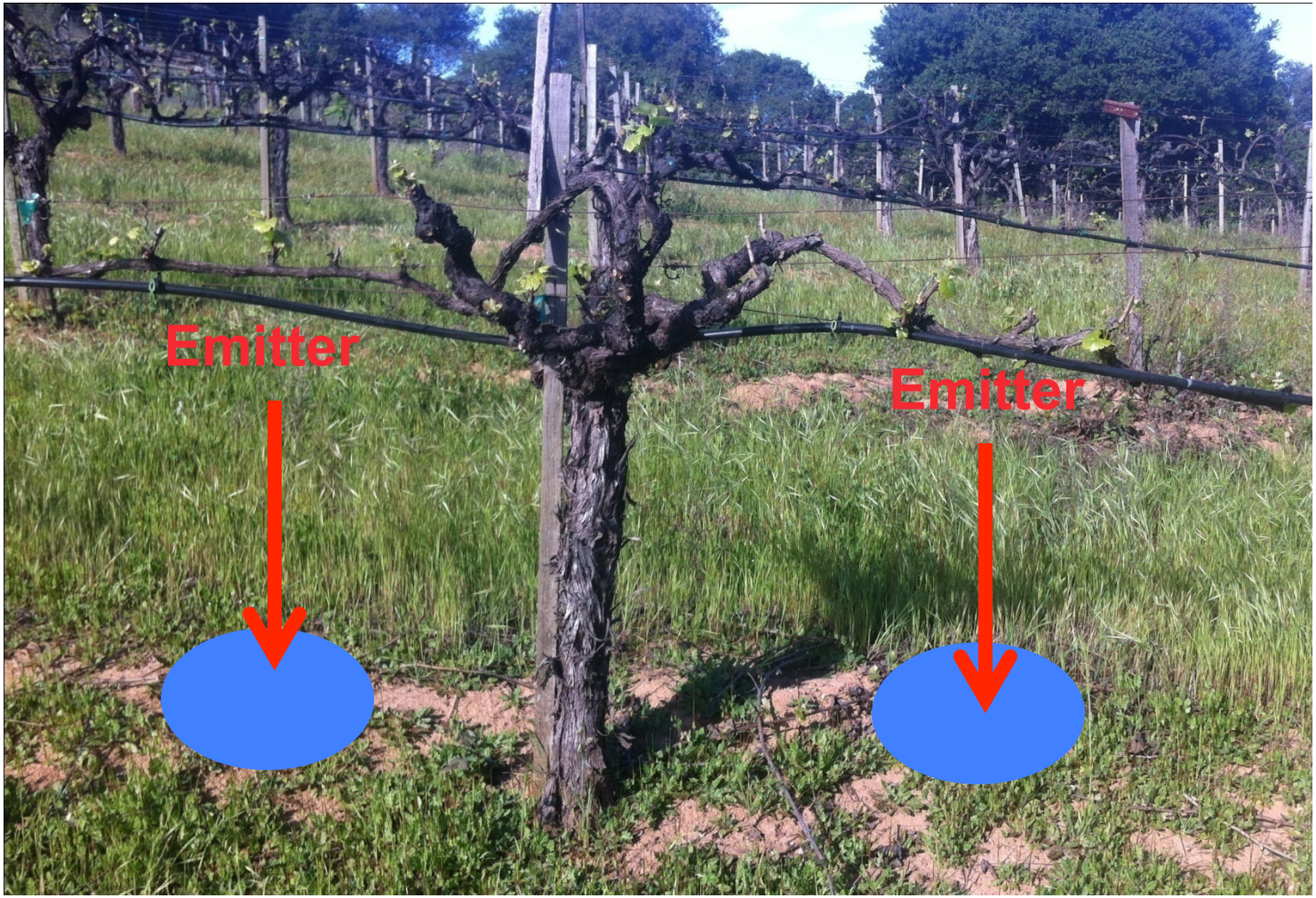
- Don’t Overly Stress vines –Shriveling and yield reduction
- Consider watering to “hang” the fruit until harvest ripeness

Post Harvest

- Irrigate to maintain the foliage for carbohydrate accumulation during the fall.
- 4-8 hours. Drip irrigation

- DO NOT water when plants are dormant

Where - Established Vine

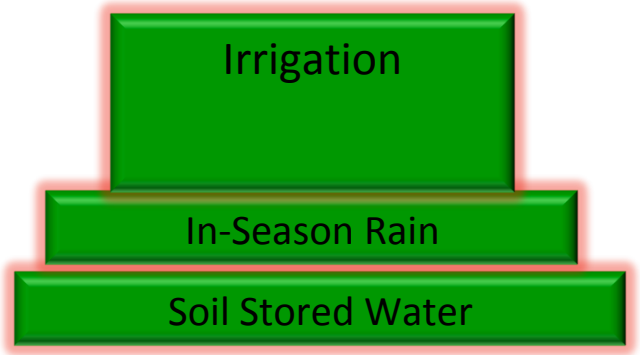


Where - Young Vine

Do not stress new vines

Drought & Dry Farming

- We may need to start prior to bloom
- Check soil moisture levels now
- May need to adjust crop load to available water
- Dry Farming assumes rain!
- Dry farming is typically implemented over a number of years after vines are established



Water Supply

SMALL HOME VINEYARD WORKSHOP

Thank you for your time!

Our Next Workshop: August 20th

Plant Sale – April 14th

UC Master Gardeners of Napa County

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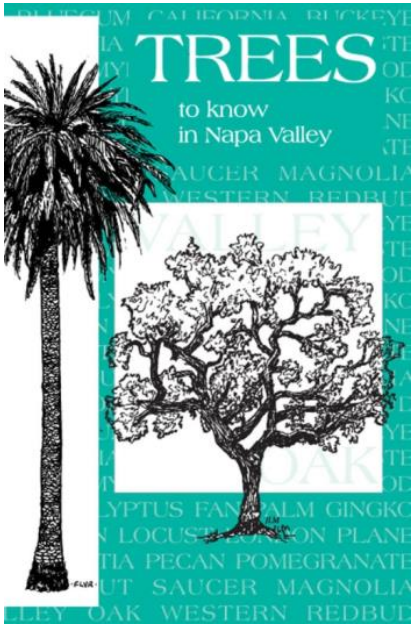

On Sale Now

Please complete our course evaluation