



# Vineyard Establishment

(vine training, trellis, planting, early vine training, nutrition, & canopy management)

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# What is a Vine Training System?

The **system** or **form** in which a vine is cultivated

- Large area of healthy leaves exposed to sunlight



# Training Systems Vary in:

- **Applicability to a situation**
  - Site + variety + goal = situation
- **Quality**
  - Quantity
  - Wine quality potential
- **Labor**
  - Shoot positioning, leaf pulling, pruning, etc.
- **Suitability for varieties**
  - Upright or trailing shoot growth
- **Suitability for climates**
  - Wet, dry, cold, hot
- **Cost of establishment**

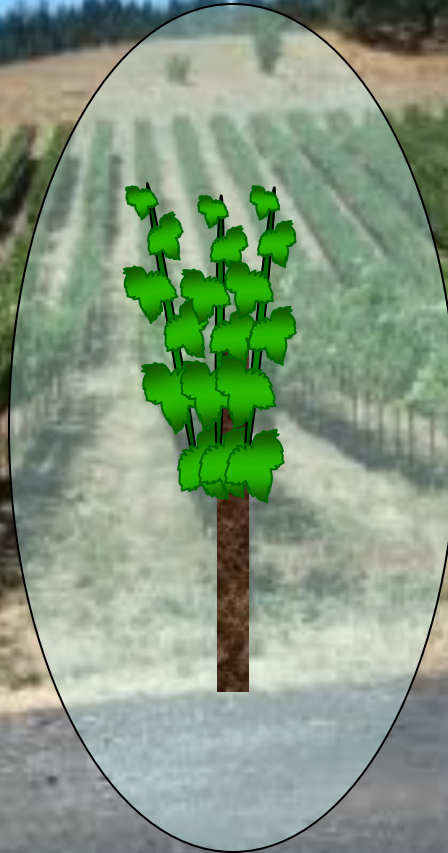


**Upright**

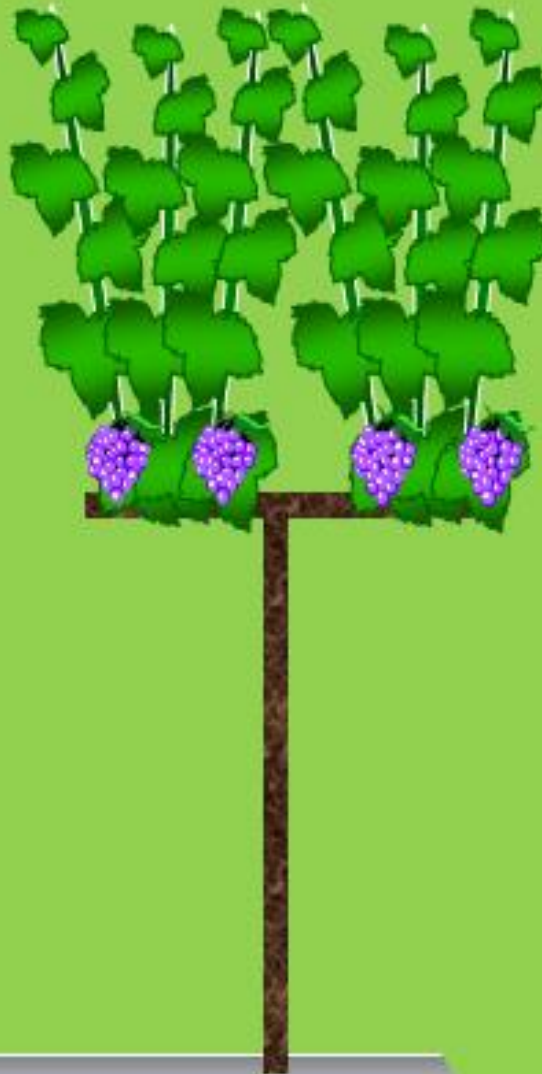
**Trailing**

**Varietal growth habit**

# A Review of Some Common Vine Training Systems

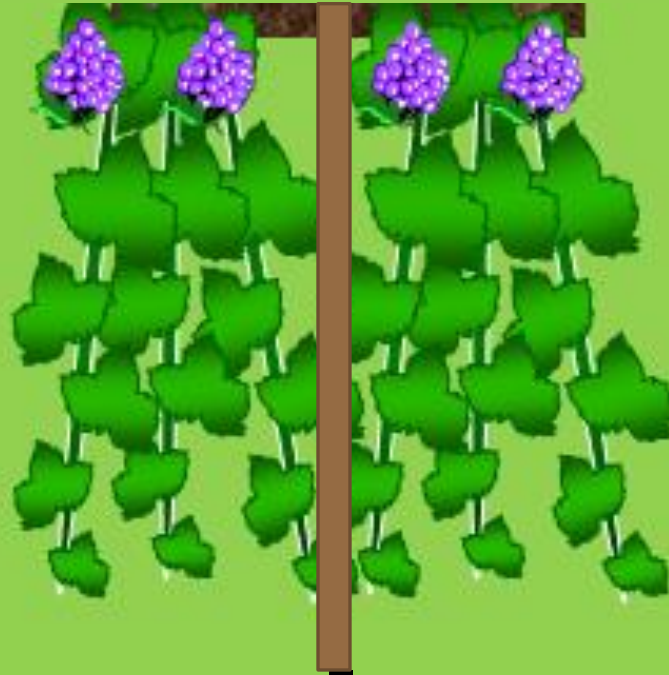


- # Canopy
- Growing upward



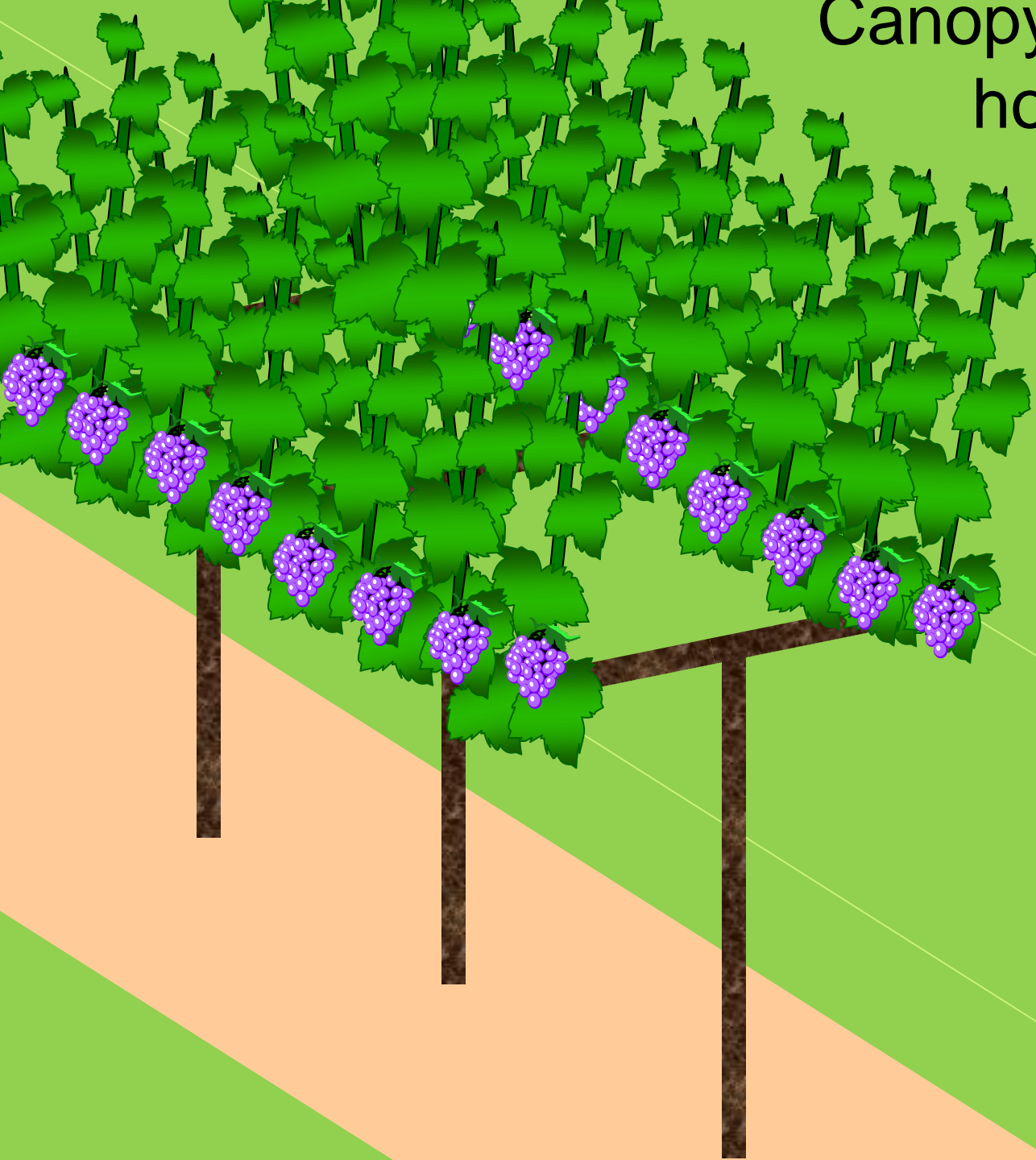
Canopy

Growing downward





Canopy division  
horizontal



# Vertical Division

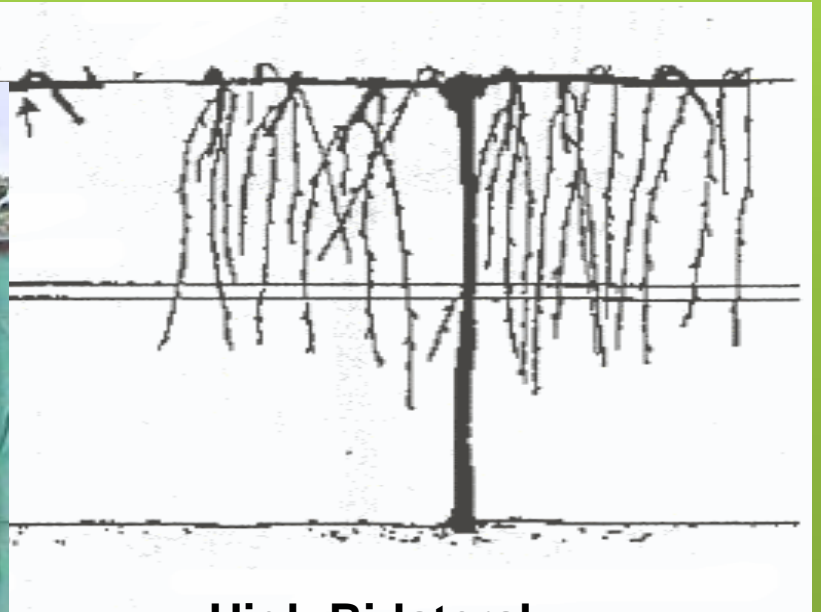




# Non-Divided Canopy

- More “traditional” or “mainstream” training systems

VSP



**High Bi-lateral  
High Cordon**

# Divided Canopies

**Geneva Double Curtain**



**Lyre**



**Smart-Dyson**



# Some Common Training Systems

## Vertical Shoot Positioned **VSP**



# Bi-lateral cordon, vertical shoot positioned VSP

- A “standard” system
- Height of fruiting wire
  - Vertical division
  - Efficiency
  - Ease of work
- One fruiting zone



# Vertical Shoot Positioned Pros

- ✓ Simple concept, relatively cheap installation
- ✓ Can be modified into vertically divided canopy if cordon is high enough





# Vertical Shoot Positioned Cons

- ✓ Low to moderate yield potential
- ✓ May require frequent maintenance in high vigor site



# Some Common Training Systems

Smart-Dyson

“Ballerina”



**Smart-Dyson**



# Smart-Dyson Pros

- ✓ Increase leaf area –
  - ✓ Yield increases of about 50-70% over non-divided VSP
- ✓ Suitable to most high-vigor situations
- ✓ Efficiently utilizes trellis space



# Smart-Dyson Cons

- ✓ Variety
- ✓ Timing weed control
- ✓ Additional labor
- ✓ Disease pressure?



# Some Common Training Systems

## Geneva Double Curtain GDC



Photo: T.K. Wolf

# Geneva Double Curtain

- Cordons at top of trellis, separated by 4'
- Use only in high vigor situations (i.e., > 0.3 pounds of cane prunings/foot of canopy realized or expected)
- Shoot positioning required, typically 2X/year
- Suitable for American, hybrids, and some *vinifera* cvs.



# Geneva Double Curtain Pros

- ✓ High yields; high phenols also possible
- ✓ Good fruitfulness reported
- ✓ Reduced vigor on downward growing shoots





# Geneva Double Curtain Cons

- ✓ Over-exposure of fruit a concern in hot climates



- ✓ Not suitable for some *vinifera* cvs.
- ✓ Slightly more **rot** reported, than vertical shoot systems



# Trellis Construction

- 25 years of abuse
- Think through work before you begin
- Use Only Highest Quality Materials Available
- Wire Source – packed and wound under tension
- Posts – Line and End: deep enough, tall enough, pound in, do not auger in
- Right Equipment for Installation
- Install before or after plants? Irrigation? Drain tile?
- Wire Positions
- End Assemblies

# How to:

- Drive posts, do not plant them
- Line posts: 2-3' deep, 6 - 7' above (non-divided, vertical division). 15-20 feet between posts. All must be same height – hedger, harvester.
- End posts: steel w/ spade or min 5-8", 4' deep
- Wire: use a spinning jenny to apply, splice correctly, leave enough length at ends to work with
- Tie offs: double wrap with staple or wire vise on steel
- Anchors – screw in straight down with bobcat auger or steel bar or bury, always to eye depth
- Anchor wires: white pvc tubes for visibility
- Strainers/tensioners – for individual catch wires



# Trellis options



# Trellis options



# Trellis options

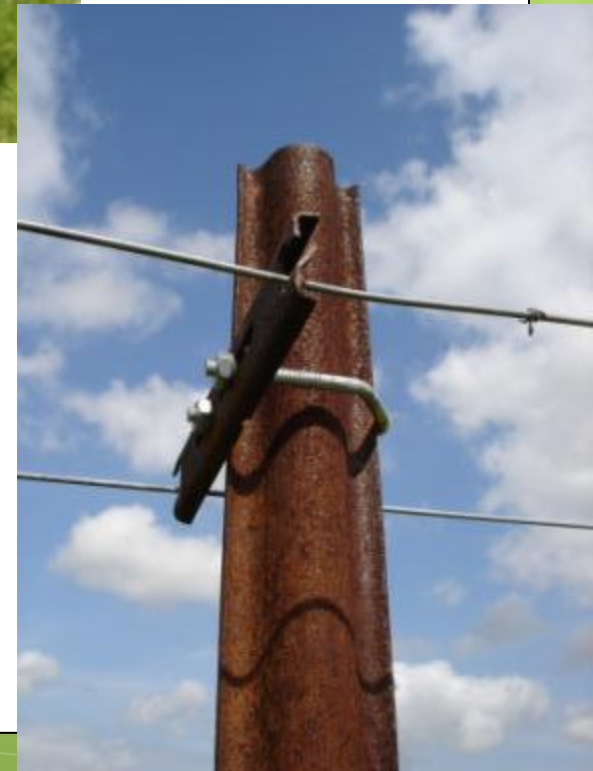




Not all posts are created equal







Wire catches & line post extensions



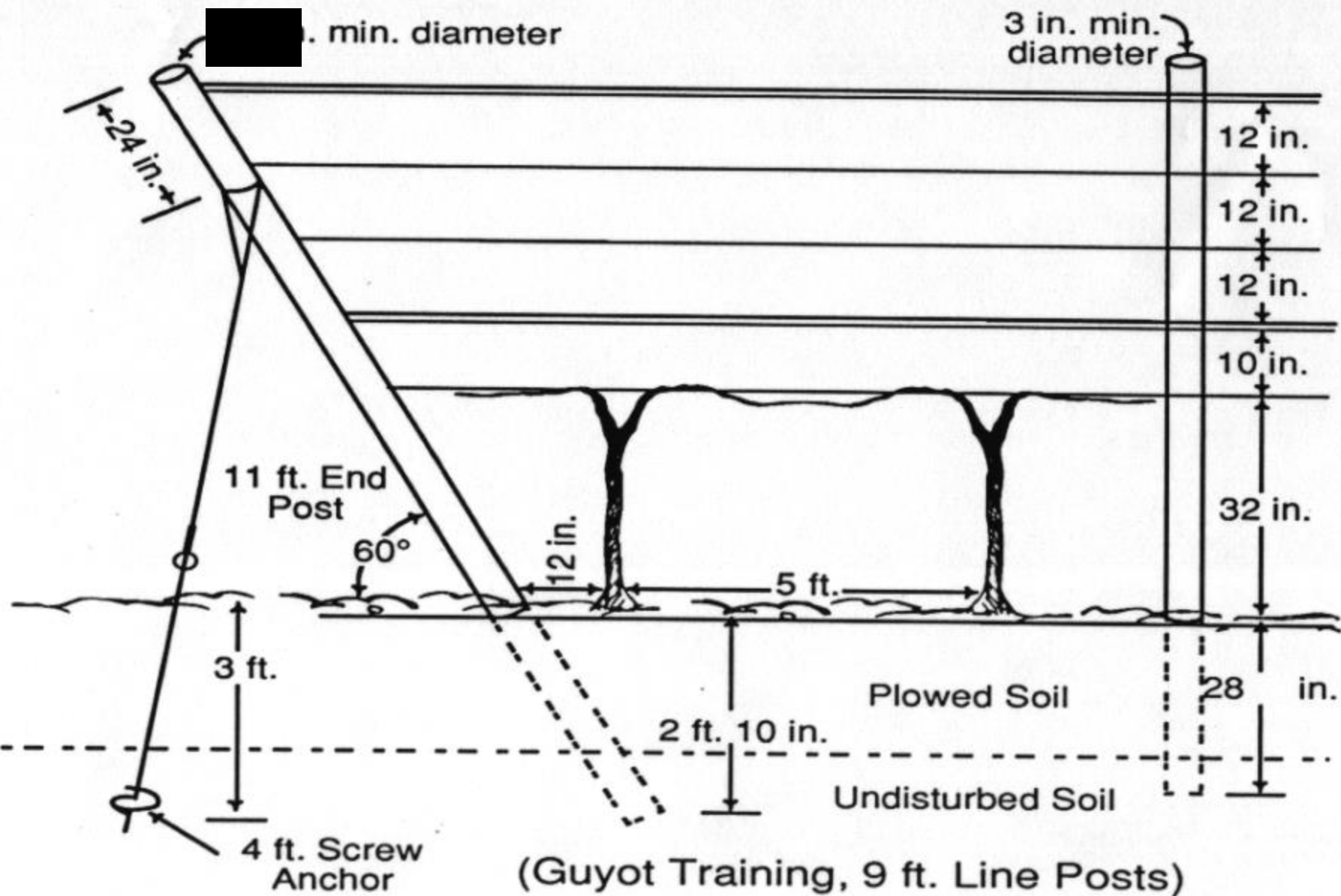
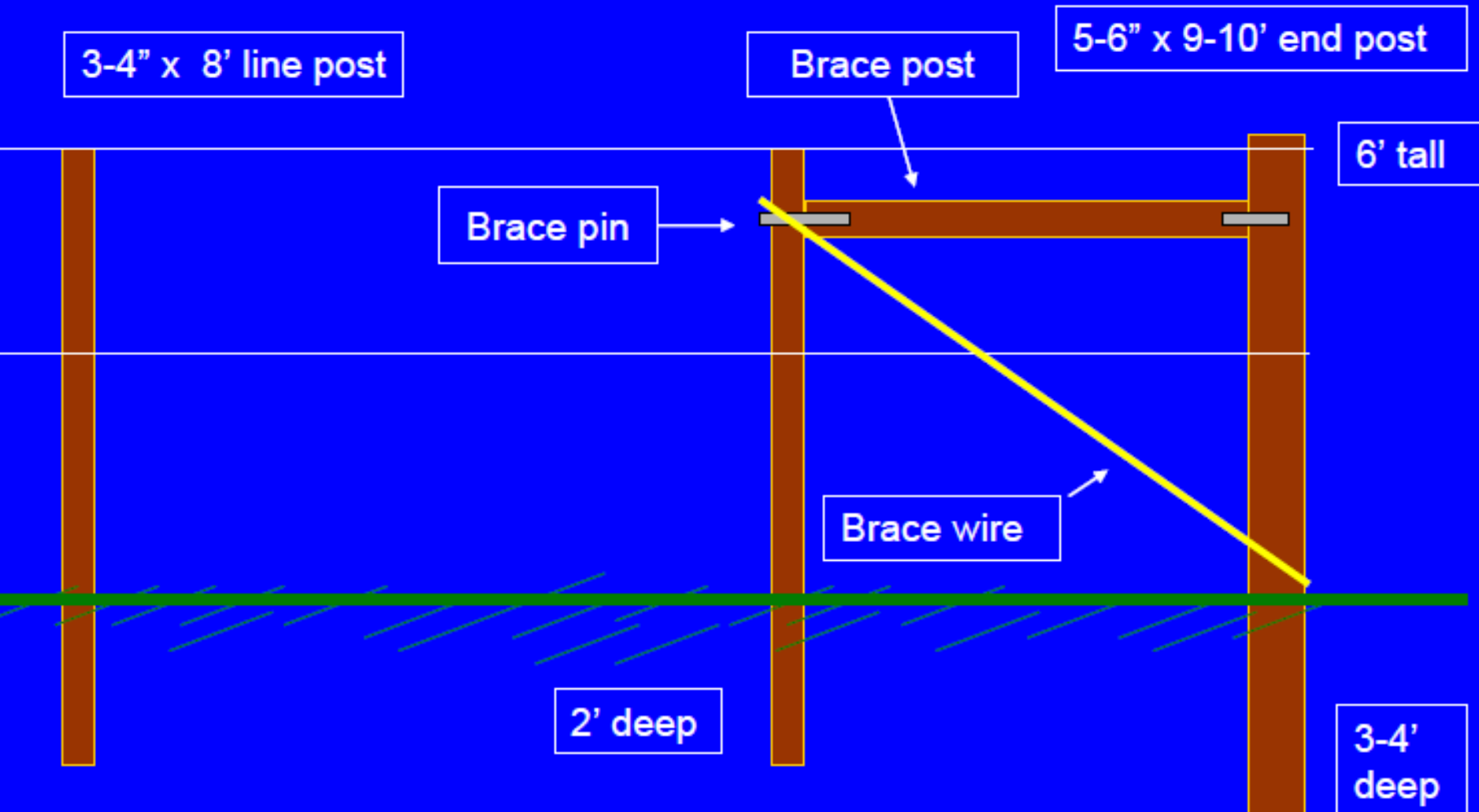


Figure 11-22 Screw Anchor Deadman Assembly

# H-Brace End Post System

Required for rows over 600 ft



**Requires 4 additional posts per row to construct the braces.**

# Irrigation lines



# End post position & Anchors





## Spinning Jenny



## Spinning Jenny on Radio Flyer





# Planting



- When to Plant
- Soil Condition
- Inspect Vines
- Preparing Vines
- Root Pruning
- How to Plant
- Water



# Nurseries and Vines

- # of Vines to Order
- Nurseries
- When to Order
- What to Order
  - Rootstocks
  - Varieties
  - Clones
- Delivery
- Storing Plants
  - Damp
  - Cool
  - Dark



# Care of Nursery Stock and Planting

- ✓ Choose Reputable Nursery
- ✓ Keep Vines Moist Until Planting
- ✓ Plant in Early Spring
- ✓ Water in by Bud Break
- ✓ Cut Back to Two Buds



# Site layout for planting



**Soil preparation**



# Planting and training



**Staking vines**

**Vine protection?**

**Rocks?**

# Water before and after planting!



# Layout and Marking the Field

- Hire a Professional Surveyor or Do It Yourself
- Transit, Distance Wheel and Marking Flags
- Marking Lines
- A Good Eye





## The Way to Straight Rows



Laser Planting means straight and evenly spaced rows





# Milk Cartons and Grow Tubes



# Training young vines

Develop mature vines

primary goal for first three years

Goal: adequate vine size to fill the entire trellis by the end of the third growing season

The resource used to achieve this goal is healthy, exposed, leaf area

Example:

Year 1

establish a healthy root system

Year 2

Establish initial components of intended training system – one trunk

Year 3

Continue to develop and complete training system, harvest a crop and establish a second trunk



Beginning  
of year 1



Virginia Tech  
Invent the Future

# Early vine training

Year 1: Mid-season



Year 2: End of season





Beginning  
of year 2



Virginia Tech  
Invent the Future



# End of year 3



# Early Vine Training

- Straight up!
- Keep graft union above ground
- Keep off ground
- Tie to stake
- 2 trunks
- Trim off suckers and clusters
- Eliminate weed competition



# Early vine training



Two trunks, narrow angle for future cordons (left)

Canes tipped at point where adjacent canes meet (right)

If your grapes are grafted, make sure the graft union is placed above the soil line at planting.



# Grow Tubes

## Benefits

- Animal damage
- Moisture
- Herbicide
- Growth rate
- Replaces stake
- Physical protection

## Limitations

- Cost
- Growth rate
  - Trunk “twist”
- Promotes single trunk
- Diseases, insects
- Removal
- Winter damage



alternatives





Remove young clusters – This will be done for the first 2-3 years.



Training for two or three trunks is insurance against winter damage that could completely kill the vine.

When the vine reaches the cordon wire, it will be trained/tied horizontally



**Train 2 trunks**

# Grapevine Nutrition

- Pre-plant
  - Soil pH and OM
- First-year vine nutrition
  - Mineral nutrients + organic matter and CEC
- Avoidance and correction of common nutrient deficiencies in mid-Atlantic vineyards - a 3-part process
  - soil testing - important in both pre-plant and in vineyard maintenance
  - visual assessments – nutrient deficiency symptoms
  - plant tissue analysis – nutrient concentrations



**... and we can save 700 lira by  
not taking soil tests**

# Essential Grapevine Nutrients

needed for plant life – not replaceable – role in plant function

## Obtained from air and water

Carbon (C)

Hydrogen (H)

Oxygen (O)

## Macro-nutrients

**Nitrogen (N)**

**Phosphorus (P)**

**Potassium (K)**

Calcium (Ca)

**Magnesium (Mg)**

Sulfur (S)

## Micro-nutrients

Iron (Fe)

Manganese (Mn)

Copper (Cu)

Zinc (Zn)

**Boron (B)**

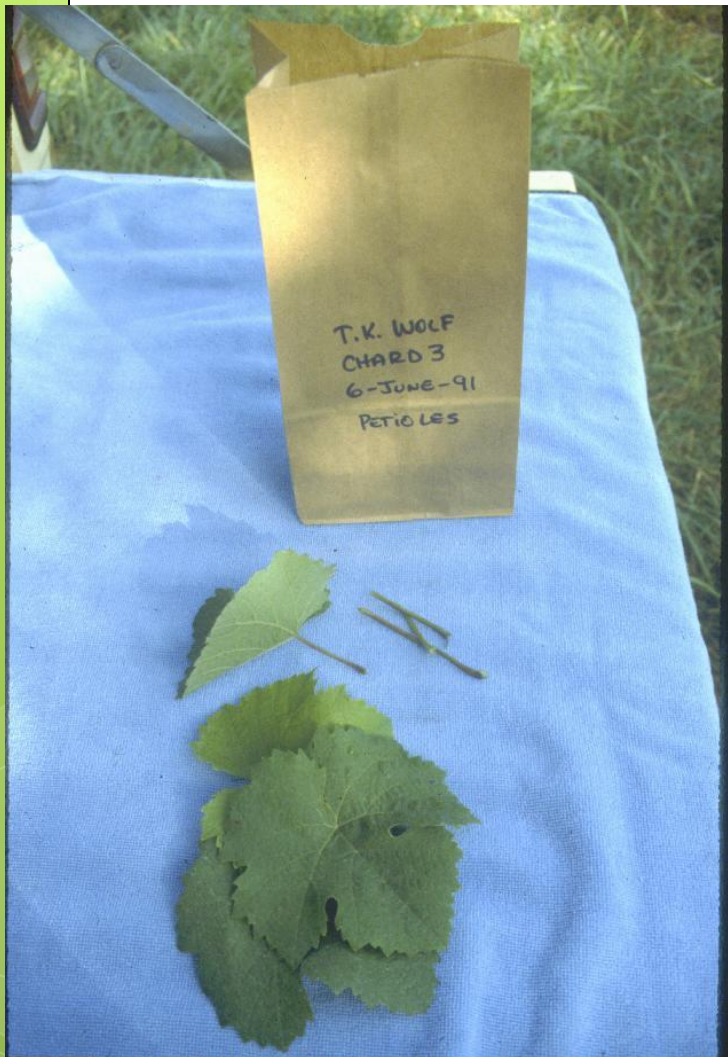
Molybdenum (Mo)



# Newly-planted vines

- **Most** new vineyards DO NOT require a fertilizer application.
  - Apply only as needed to maintain growth
  - Do not mistake need for water vs. need for nitrogen
  - On low OM soils, a small (10-20 pounds of actual N) nitrogen application may advance vine development in the first year.
  - Applying small amounts and splitting applications via drip irrigation is very desirable.

# Plant Tissue Analysis



**Tissue:** leaf petioles from leaves opposite cluster

**Timing:** Bloom, 70-100 days post-bloom (if miss bloom)

**Number:** 75-100 (size of petiole)

**Labs:** Penn State

**[http://www.aasl.psu.edu/plant tissue prog.html](http://www.aasl.psu.edu/plant_tissue_prog.html)**, A and L Lab, Richmond

**<http://al-labs-eastern.com/index.html>**

**Interpretation:** Diagnostic samples related to nutrient sufficiency ranges that have been generated from similar tissues.

# Nitrogen Issues

- Assessing need
  - Visual means (vine size, leaf color, trellis fill)
  - Tissue analysis (timing, tissue, relationship to standards (total N assessed at bloom-time - sufficiency at 1.2 to 2.1% N with this timing)
  - Cane pruning weights (e.g., < 0.2 lbs/ft canopy)
  - Crop history
- Other vigor-affecting factors
  - rootstock (very little difference in VA)
  - soils (depth and organic matter)
  - Weed and cover crop competition
  - Water / irrigation





# Nitrogen: application during periods of active root uptake

- Post harvest
- Around bloom
- Miss-application represents lost money and environmental contamination



# Boron Deficiency

- Critical nutrient for fruit set
  - Deficiency causes “shot berry”
    - Tissue test critical!
  - Corrected with foliar application
  - Grapevines very sensitive to over application (toxicity)
    - Toxicity symptoms



# Boron Toxicity

- Grapevines very sensitive to over application (toxicity)
- Toxicity symptoms similar to deficiency



Don't get confused by the different pictures. Bottom line, know your vineyard and look for things that are abnormal.

# Key Viticulture Goals

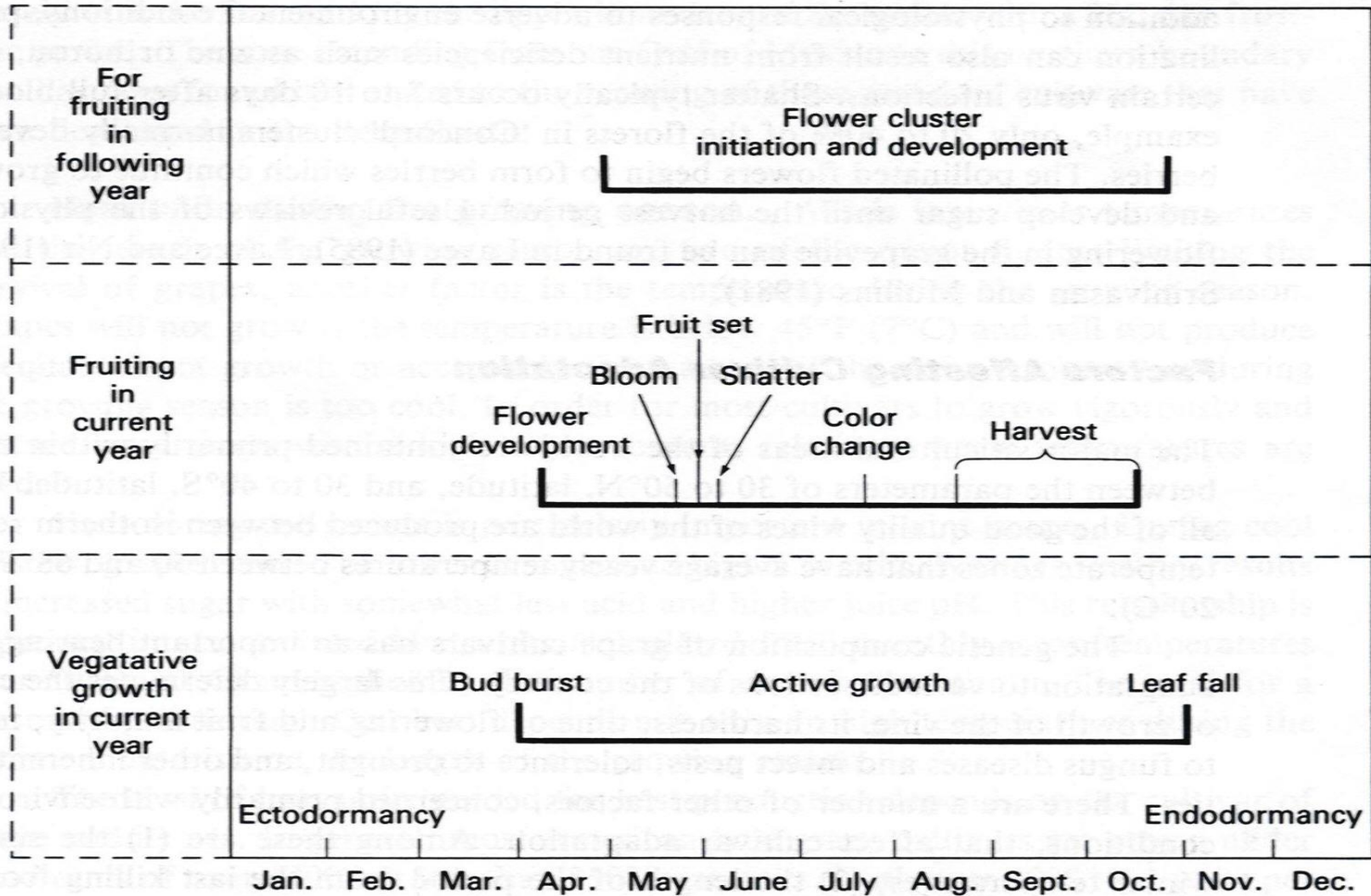
- Balanced vine
  - Healthy, active, exposed canopy
- Uniform, fully mature, pest free grapes
- Ripen wood to maximum maturity for cold hardiness





Light Exposure  
Air circulation  
Pesticide deposition

# Multiple year impact



**FIGURE 10-7** Calendar showing when the stages in the growth and fruiting of a *vinifera* grapevine occur. (Adapted from Pratt 1971; used by permission)

# Benefits of Proper Canopy Management

- Fruit Exposure
  - Vine Balance
  - Vigor management
  - Bud Fruitfulness
  - Uniform Bud Break
  - Uniform Shoot Vigor
  - Ease of harvest
- Uniform Ripening
- Decreased Disease
- Increased Color
- Decreased Acidity
- Increased Volatiles