#### **Successful Vine Establishment**

Advanced Beginner Grape School March 6, 2020 Dean Volenberg Viticulture and Winery Extension Specialist Grape and Wine Institute



Grape and Wine Institute University of Missouri

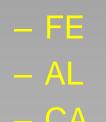
#### Establishing A New Vineyard Soil and Nutrient Basics

- Establishing new vineyard soil sampling
  - P and K must be amended before planting
  - P and K non-mobile in soil-incorporate into soil
  - Acidic soils, amend with lime before planting
  - Alkaline soils, amend with sulfur before planting
- Established vineyard (year 3) petiole analysis
   Perform yearly to start tracking nutrients
   Perform if nutrient deficiencies visually apparent

#### Establishing A New Vineyard Soil and Nutrient Basics

- Soil Test Results
  - $-P_2O_5$
  - $-K_{2}O$
  - -N
- Plants take up  $- H_2 PO_4^- \text{ or } HPO_4^{2-}$ 
  - K+
  - $\mathrm{NO_3^+}\mathrm{or}$   $\mathrm{NH_4^+}$

- Soil mainly negatively charged
  - Clay particles
  - Organic matter
- H<sub>2</sub>PO<sub>4</sub><sup>-</sup> or HPO<sub>4</sub><sup>2-</sup> form complexes with



These complexes are relatively insoluble

UW 845 Ver	Soil 8 2 Mine ona, W 8) 262		Lab SOIL TEST REPORT Results also available on-line at http://uwlab.soils.wisc.edu/reports lab number: 5839 access code: q8h55 This Beport is for:									Universi Univer	OPERATIVE ity of Wiscons sity of Wiscor Department of	in-Extension sin-Madison
County Door Date Rec 4/16/	peived	Account No. 555015 Date Processed 5/1/2009	CO GOVERNM	DOOR CO UWEX OFFICE - CO GOVERNMENT CTR, 421 NEBRASKA ST STURGEON BAY, WI 54235										
			NUTRIENT RECOMMENDATIONS											
Slope 0%	5 5	Plow Depth Irrigated 7" No	Cropping Sequence	Yield Goal	Grop N	P2O5		legume N	Fertilzer Manure N	Credit P2O5	К20	N	lutrients to App P2O5	<sup>ply</sup> к2О
Soil Nam unkna		roup D)	Grape, establishment	all	see below	— Ibs/a — 0	250	— ibs/a — 0	0	- 165/a 0	0	see below	— Ibs/a — 0	250
Field Name WI			(no crop) (no crop)	n/a n/a										
Previous Crop NO Crop			(no crop) There is no lime recommendat	n/a tion.										

#### ADDITIONAL INFORMATION

Lime recommendations for apples and cherries apply only to pre-plant tests. Adjustment of pH is impractical once an orchard is established. Other perennial fruit crops must also be limed or amended with an acidifying material and incorporated prior to establishment.

Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.

This soil should be monitored more closely because of it has a relatively low potassium buffering capacity.

P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O nutrient application rates are provided for establishment of fruit crops. Nutrient application rates after the establishment year should be based on tissue testing with the goal of achieving and maintaining tissue nutrient concentration sufficiency.

Because of very high P levels, P<sub>2</sub>O<sub>2</sub> applications from fertilizer or manure should be reduced and crops with a high P removal should be grown

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#### N.R.=Not required for calculation of lime requirement when soll pH is 6.6 of higher.

	TEST INTERPRETATION									
Cropping Sequence	Very Low	Low	Optimum	High	Very High	Excessive				
Grape, establishment	t РРРРРРРРРР ККККККК	РРРРРРРРРРРРРРРРР	РРРРРРРРРРРРРРРР	PPPPPPPPPPPP	РРРРРРРРРРРРРРРРРР	PPPPPPPPPPPP				
(no crop)										
(no crop)		1								
(no crop)		1								
Rotation pH	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		*****	00000000000						
			LABORATORY ANALYSIS							

	LABORATORY ANALYSIS															
Sample Identification	Soil P <sup>H</sup>	0.M %	Phosphorus ppm	Potassium ppm	60-69 Lime Req (17a)	Calcium ppm	Magnesium ppm	Estimated CEC	Baron ppm	Manganese ppm	Z'inc ppm	Sulfate-Sulfur PPm	Sulfur Av ail. Index	Texture Code	Sample Density	Buffer pH
1	7.4	2.7	51	45	0									2	1.10	N.R.
Adjusted Averages	7.4	2.7	51	45												

4

Samples Analyzed By: UW Soil & Plant Analysis Lab 8452 Mineral Point Road COOPERATIVE EXTENSIO UNiversity of Wisconsin-Extensio University of Wisconsin-Extensio University of Wisconsin-Extensio University of Wisconsin-Madis Department of Soil Scien											
Verona, WI 53593 (608) 262-4364	Results als	so available on-line at h lab number: 5839		8h55 .			Department of a	soll Science			
LAB #: 5839	DOOR CO UW			Т	This Report is for						
County Account No. Door 555015		IENT CTR, 421 NEBR/	ASKA ST								
Date Received Date Processed 4/16/2009 5/1/2009	STURGEON B	AY, WI 54235									
Slope Acres Plow Depth Irrigated			RIENT RECO	MMENDATION	NS Fertilzer Credit		Nutrients to Appl				
0% 5 7" No	Cropping Sequence	Yield Goal N	P205 K2	20 Legume N N	Manure N P2O5	K20 N	P205	<sup>у</sup> к20			
Soil Name unknown (group D)	Grape, establishment	all see		50 0	0 0	0 see below	lbs/a 0	250			
Field Name	(no crop)	n/a									
WI	(no crop) (no crop)	n/a n/a									
Previous Crop NO CTOD	There is no lime recommenda										
	There is no line recommende			loot v (							
Lime recommendations for a	apples and cherries apply only i	o pre-plant test	οΖ. Ιν/ρ	nant x c	600 plar	ils/acre	e x z =	it			
	amended with an acidifying ma										
Recommended rates are the	e total amount of nutrients to ap	ply (N-P-K), inc									
This soil should be monitore	d more closely because of it ha	us a relatively lo <mark>r</mark>		68 lk	os/N aci	re					
P2O5 and K2O nutrient applic on tissue testing with the goa	ation rates are provided for est al of achieving and maintaining	ablishment of fre tissue nutrient	_								
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Year 1: Apply 1 ounce of N p testing to guide fertilizer app	per plant two times during the e lication.	stablishment year. This	rate applies fo	r the establishr	ment year only.	After establish	ment use tiss	sue			
N.R.=Not required for calcula	ation of time requirement when	son pH is 6.6 or nigher.									
		TEST INTER	PRETATION								
Cropping Sequence Very	y Low Low	Opti	num	High	Ve	ery High	Exc	essive			
	РРРРРРРРРРРРРРРРРР КККК	PPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP	PPPPPPPP	PPPPPPPPPP	PPPPPPPPPP	PPPPPPPPP	PPPPPPPP	PPPPP			
(no crop)											
(no crop)											
(no crop)											
Rotation pH XXXX	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	*****	xxxxxxxxx							
		LABORATOR									
Sample Soil O.M Identification pH %	Phosphorus Potassium 60-69 Lime ppm ppm Req (17a)	Calcium Magnesium Estim ppm ppm CE		Manganese Zinc ppm ppm		ifur Avail. Texture Index Code	Density	Buffer pH			
1 7.4 2.7 Adjusted 7.4 2.7	51 45 0					2	1.10	N.R. 5			

7.4 7.4 Adjusted Averages 2.7 51

45

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LAB #: 5839	DOOR CO UW				This	Report is	for:			
County Account No. DOOr 555015 Date Received Date Processed		ENT CTR, 421	NEBRASKA ST							
4/16/2009 5/1/2009			NUTRIENT RE		TIONS					
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Soil Name unknown (group D)	Grape, establishment	all	see 0	250 0	0	— Ibs/a · 0	0	see below	— Ibs/a — 0	250
Field Name	(no crop) (no crop)	n/a n/a								
WI	(no crop)	n/a								
Previous Crop NO CrOp	There is no lime recommendat	tion.								
		ADDITI	1 oz. N	/nlant	v 54	4 nla	ante/	acre	v 2 -	
	pples and cherries apply only to amended with an acidifying mat		1 02. IN	plant	× 0+		anto/	acie	~ 2 -	it
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		TEST I	NTERPRETATIO	N						
	/ Low Low		Optimum		ligh		Very Higl			cessive
	РРРРРРРРРРРРРРРРРРРР КККК	PPPPPPPPPPP	PPPPPPPPPP	PPPPPPP	PPPPPP	PPPPPP	PPPPPI	PPPPPF	PPPPPP	PPPPPP
(no crop)										
(no crop)	102									
(no crop)	lbs P/acre									
Rotation pH XXXX		xxxy	90	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	x					
	$\Delta \frown$	lbs	s K/acre							
Sample Soil O.M Identification pH %	Phosphorus Potassium 60-69 Lime ppm ppm Req (T/a)			Manganese ppm	Zino ppm	Sulfate-Sulfur PPm	Sulfur Av ail. Index	Texture Code	Sample Density	Buffer PH
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no crop	There is no lime recommenda	tion.										
		ADDITION	AL INFO	RMATI	ON							

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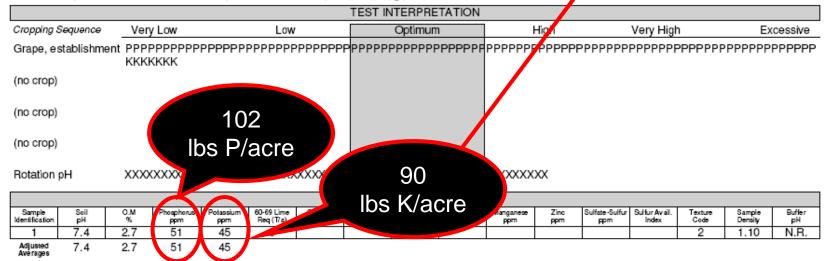
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Soil Name			per acre	see	— Ibs/a —		— Ibs/a —		— Ibs/a —		988	— Ibs/a —	
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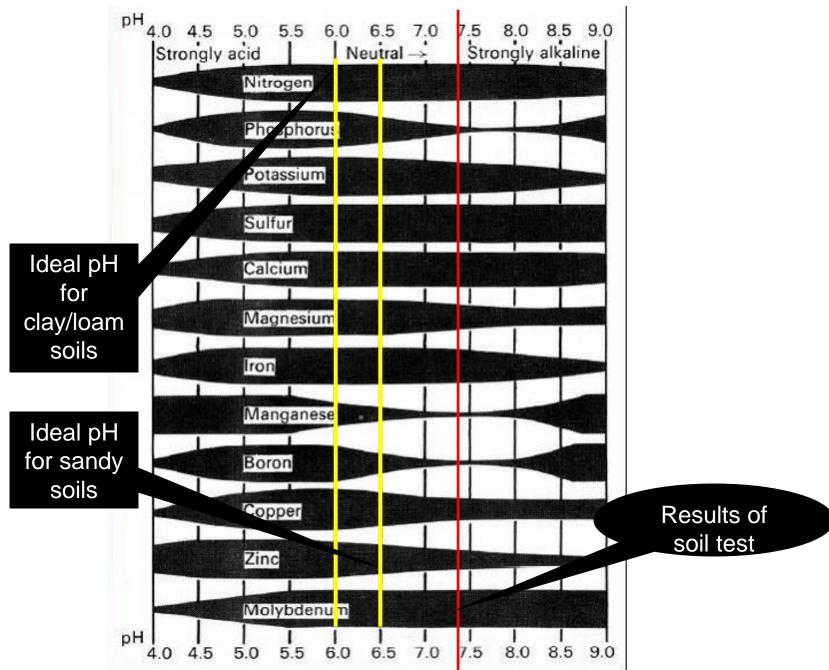
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Avérages

	TEST INTERPRETATION															
Cropping	Sequence	Very	y Low		Low			Optimum	I		Hìgh		Very High	า	Ex	cessive
Grape, e	stablishm		РРРРРР КККК	PPPPPP	PPPPPP	PPPPPP	PPPPPI	PPPPPP	PPPPPP	PPPPPF	PPPPPF	PPPPPP	PPPPPF	PPPPPP	PPPPPP	PPPPPP
(no crop)																
(no crop)																
(no crop)																
Rotation	pН	XXXX	xxxxxxx	~~~~~	xxxxxx	XXXXXX	****	XXXXXX	xxxxxx	XXXXXXX	XX					
							LABORA	ATORY AN	VALYSIS							
Sample Identification	Soil P <sup>H</sup>	О.М %	Phosphorus ppm	Potassium ppm	60-69 Lime Req (17a)	Calcium gpm	Magnesium ppm	Estimated CEC	Baron ppm	Manganese ppm	Zino ppm	Sulfate-Sulfur PPm	Sulfur Avail. Index	Texture Code	Sample Density	Buffer pH
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COORERATIVE EXTENSION



# Lowering Soil pH

			Soil organic matter content (%)										
			.5 - 2	2 - 4	4 - 6	6 - 8	8 - 10	> 10					
					lb S	/acre							
	Desired	0.25	261	784	1220*	1742*	2309*	2700*					
in soil pH		0.50	522	1525*	2439*	3485*	4617*	5445*					
Í	reduction	1.00	1045*	3049*	4879*	5227*	9235*	10890*					

\* Do not apply more than 870 lb/acre per year; retest soil between applications.

# Raising Soil pH

- This will be available on soil test report
- Do not worry about raising soil pH if within 0.2 units of target pH
- Lime recommendations are for plow depth of 0 to 7 inches
  - If tilling deeper for planting use multiplier
- Lime needs to be incorporated into soil

Plow depth (inches)	Lime adjustment multiplier
0 to 7.0	1.00
7.1 to 8.0	1.15
8.1 to 9.0	1.31
>9.0	1.46

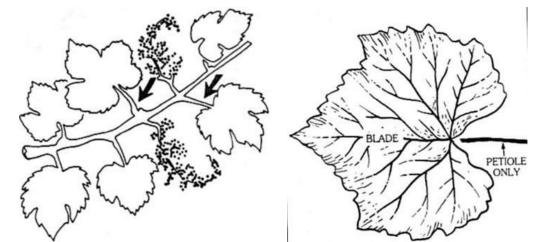
Adapted from: A2809 Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin

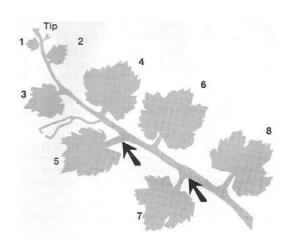
## Established Vineyards Petiole Analysis

- Why petiole sample
  - Gauge needs of vines
  - Response to fertilizers
  - Detect nutrient deficiencies before they manifest
- When to petiole sample
  - Full bloom = 2/3 of caps shed
  - Early verasion
  - Visual deficiency observed
    - Nutrient deficiencies in vineyards are often site specific
      - i.e. top of hill, rock outcrop, etc

### Established Vineyards Petiole Analysis

- What to sample
  - Petioles opposite basal clusters
- When to sample
  - At full bloom
  - Early veraison
     OR
- What to sample
  - Petioles from recently developed mature leaf





## Established Vineyards Petiole Analysis

- Don't use petiole analysis results as justification to apply nutrients until ...
  - Nutrient deficiency was visually apparent at petiole sampling
  - Establish nutrient levels over time
    - Track year to year trends and establish baseline
    - Always sample at same time each year
  - Results are only a snapshot at time of sampling
    - If trends develop i.e.
      - Certain nutrients declining over time and deficiencies manifest, then action is required
  - Be aware that nutrients may be available in soil at sufficient amounts, but unavailable to vine because of pH, organic matter, or chemical interactions

## Subsoiler Ripper



#### Site Preparation Weed Management



### Weeds Controlled by Postemergence Herbicides

	Broa	adleaf	Gra	ISSES
Product	Annual	Perennial	Annual	Perennial
Aim	Most			
Venue	Most			
Fusilade			Most	Most
Goal <sup>1</sup>	Most			
Gramoxone Inteon	Most	Suppress	Most	Suppress
Poast			Most	Most

<sup>1</sup>Vines must be trellised and  $\geq$ 3 feet in height.

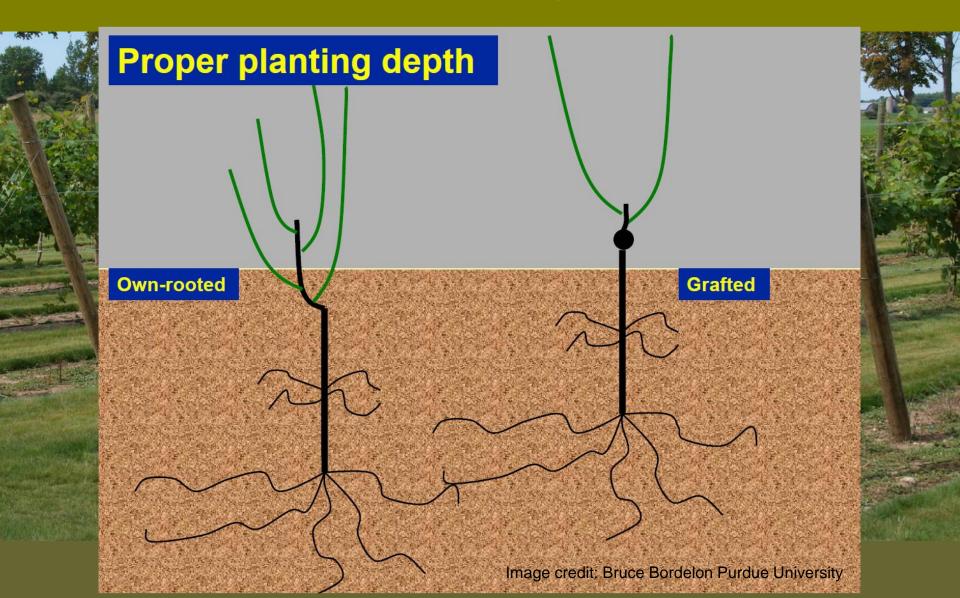
### Weeds Controlled by Postemergence Herbicides

	Broa	adleaf	Gra	ISSES
Product	Annual	Perennial	Annual	Perennial
Reglone	Most		Most	
Rely	Most	Most	Most	Most
Roundup Weathermax	Most	Most	Most	Most
Scythe	Most	Most	Most	Most
Select			Most	Most

#### Planting

 Select North-South row orientation Spring plant into well tilled weed-free soil Row spacing greater than trellis height/ Plant spacing 6-8' apart Root prune vs. plant all roots - Excessively long roots cut back **Prevent twisting and entangling of roots**  Plants pruned back to 2-3 expanding buds Best done after bud swell

#### Planting

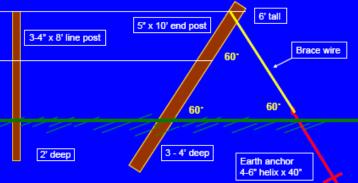


#### Trellis Construction

Trellis responsible for vine + crop weigh Provides platform for pruning and training Needs to function for 20-30 yrs **Construct once and only once** In place year one preferred Wire available for initial shoot 5" x 10' end post 3-4" x 8' line post Keep shoots off of ground **Training systems for trellis** Cane pruning 3 - 4' deep 2' deep - Spur(2-3 bud cane) pruning

#### **Anchored End Post System** with an Earth Anchor

Suitable for rows up to 600 ft, but this is affected by soil texture and anchor's helix diameter.



## Major Trellis Components

#### Posts: Wood (preferred) - Line Posts

- Spaced 21, 24 or 28 ft apart Dependent on vine spacing
   End Posts
  - Anchored: earth anchor or tie-back post for rows less than 600 ft.
     Braced: H-brace or slant brace for rows over 600 ft.

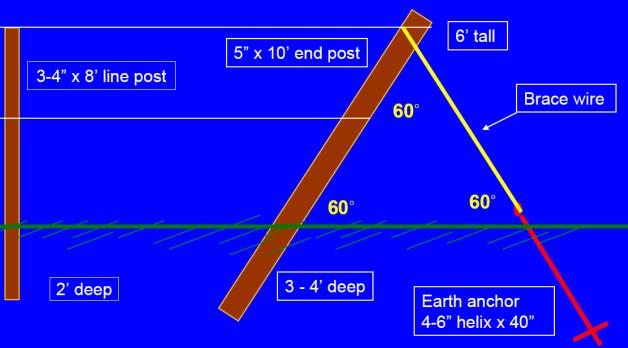
#### Wire Support

- High-tensile galvanized steel wire-12 gauge
  - High cordon, or Kniffen: 1 to 3 wires
  - Vertical shoot positioning: 5 to 7 wires
  - Geneva Double Curtain: 3 or 4 wires

## End Post

#### Anchored End Post System with an Earth Anchor

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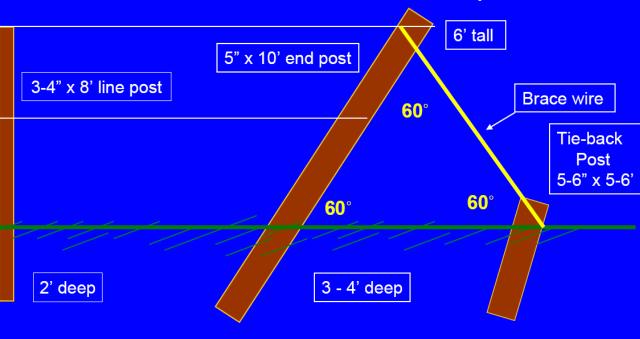




## End Post

#### Anchored End Post System with a Tie-back Post

Suitable for rows up to 600 ft. Cost of materials will often determine whether an earth anchor or tie-back post is used.



## End Post

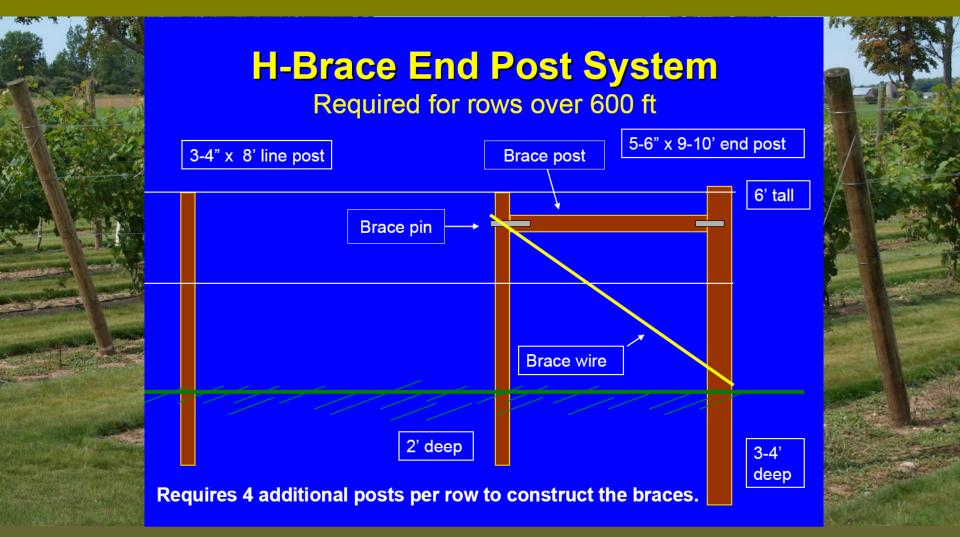


Figure credit: Paul Domoto, Department of Horticulture, Iowa State University http://viticulture.hort.iastate.edu/info/pdf/domototrellis.pdf

### Line Post

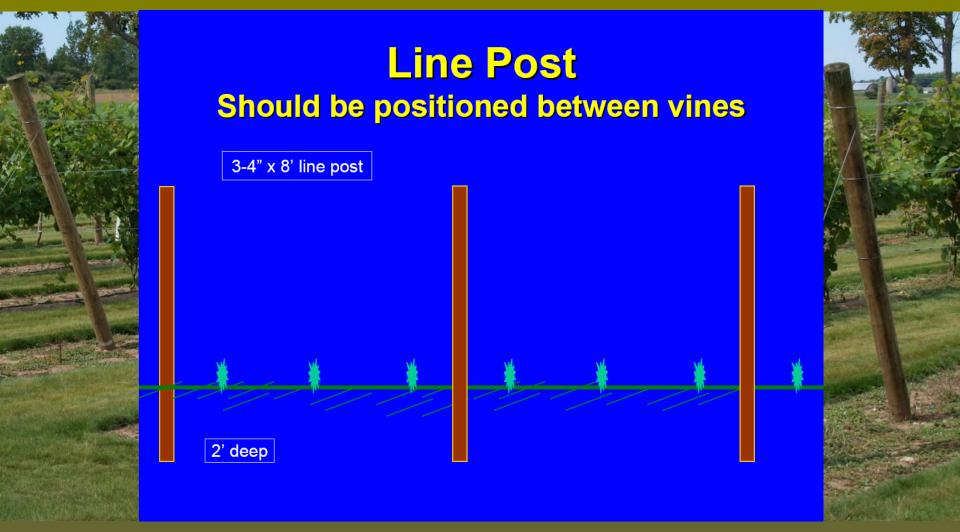
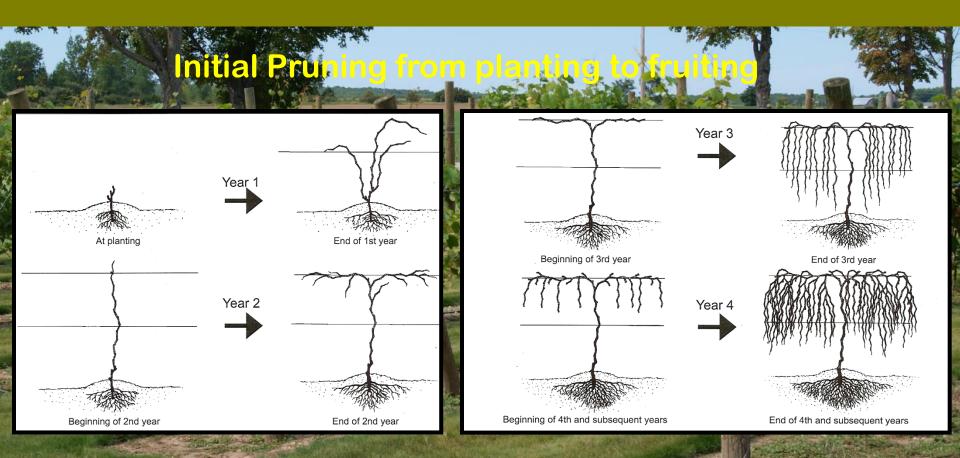


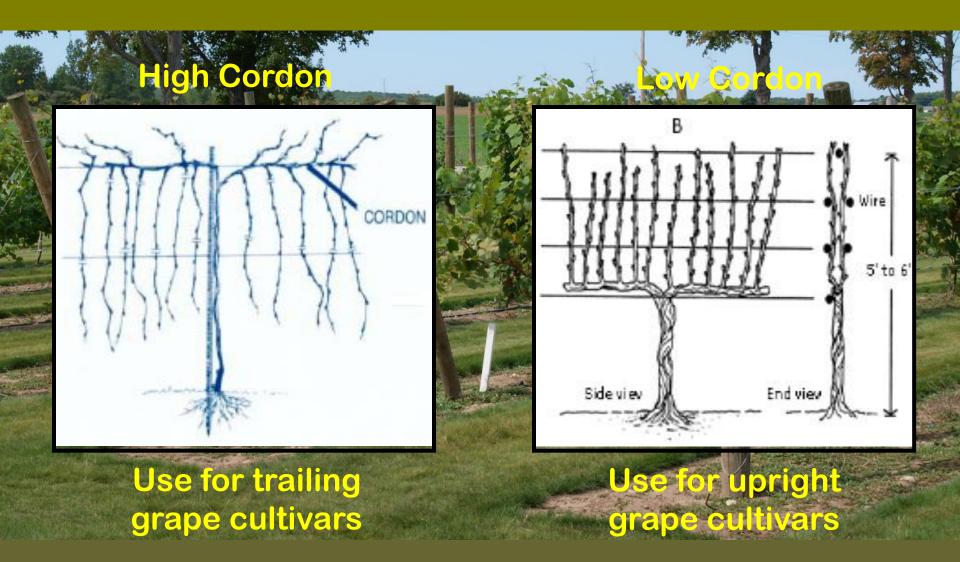
Figure credit: Paul Domoto, Department of Horticulture, Iowa State University <u>http://viticulture.hort.iastate.edu/info/pdf/domototrellis.pdf</u>

#### Pruning and Training



#### High Bi-Lateral Cordon Relies on downward combing of new growth

### Training Methods



#### Training Methods

# Low-Cordon Vertical Shoot Positioning





#### Site Preparation Basics

- 1. Start site preparation at least 1 year before planting vines
  - 1. Weed control
  - 2. Herbicide carryover
- 2. Soil Sampling
- 3. Layout vineyard
- 4. Consider irrigation
- 5. Trellis system materials
  - 1. Vine supports
  - 2. Grow tubes

#### Resources

Sampling Soils For Testing

https://extension2.missouri.edu/programs/soil-and-plant-testinglaboratory

USDA Plant Hardiness Zones

http://planthardiness.ars.usda.gov/PHZMWeb/#

Climate information in Missouri

http://climate.missouri.edu/climate.php



 Midwest Regional Climate Center –County climate data

https://mrcc.illinois.edu/

Web Soil Survey

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

• SoilWeb-Real Time Soil Descriptions

http://casoilresource.lawr.ucdavis.edu/drupal/node/902

#### Resources

• For More Information on Vineyard Site Selection and Layout.

Wolf, T. K. (editor). 2008. **Wine Grape Production Guide**. Natural Resource, Agriculture, and Engineering Service. Cooperative Extension. NRAES-145. Ithaca, N.Y. 336 p.

 ViNEWS IPM Scouting Reports – weekly reports sent weekly during growing season <u>https://gwi.missouri.edu/</u>