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EXTENSION

SES-026872
Advising New Vineyards

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Every vine can take only so much...

acidic soils

pest and disease pressure

spring frosts

labor

Site selection

For vineyard – Possibly the most important decision a grower can make

- Choosing a good site can
  - Reduce crop loss
  - Make a good grape variety better!
  - (and) Make an okay grape variety better!

For winery –

- Where people will visit

Cultivars

- Choosing:
  - *V. vinifera*
  - Hybrids
  - American bunch grapes
  - Muscadines

Wine? Table?
Commercial? Home?

Site selection

No location is perfect.

Some are just better.

More suitable

Less suitable

Depending on vineyard goals, Georgia is not a cheap place to have a vineyard

Vineyard Site Score Sheet

Accessibility		
Elevation		
Direction of slope		
Degree of slope		
Soil characteristics		
Water		
Wildlife		
Adjacent Agricultural Operations		
Suitability for desired vineyard goals		

Cultivar/Variety Selection

- Your (potential) site
  - Do you already have a site? What CAN you grow there?
  - What are the stressors?
- Business goals
  - What do you want to grow? Making wine? Selling grapes – to whom?
- Effort
  - How much labor are you willing to put in long term? Do you know where/how you can get help?

Site selection - Climate

Human Factors

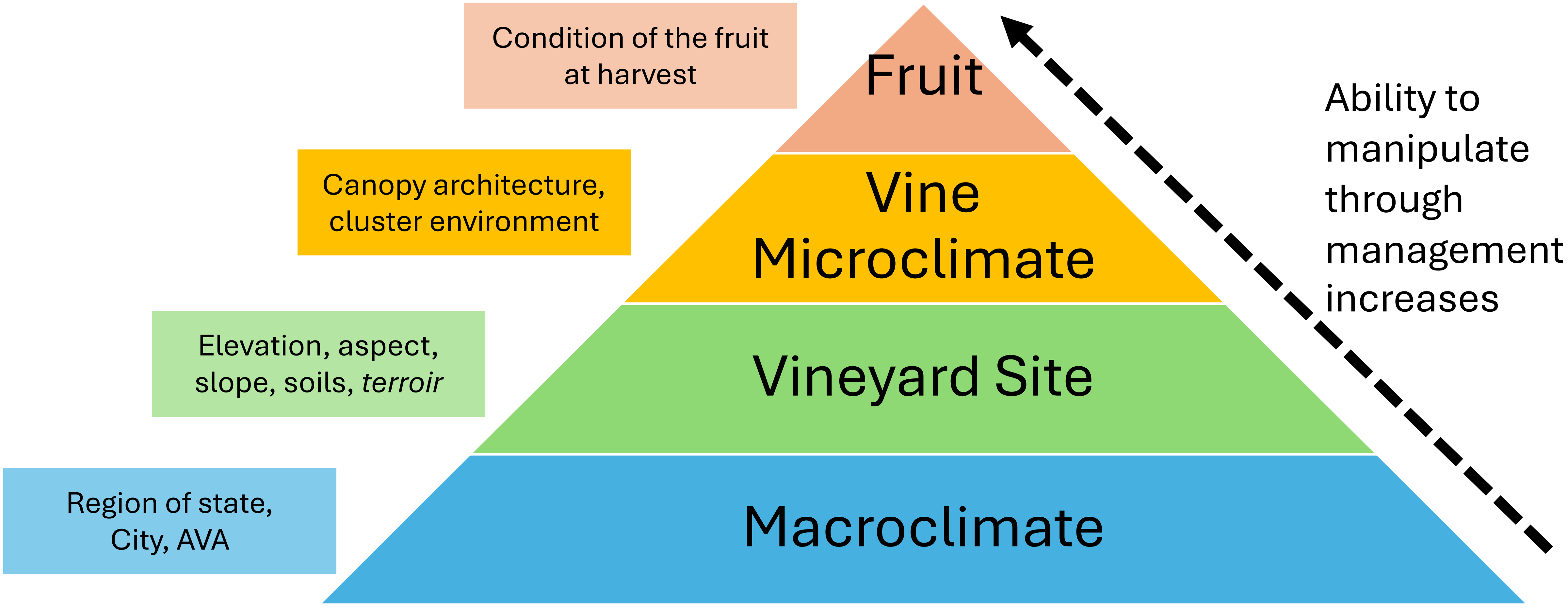
Vineyard decisions

- Variety/rootstock
- Type of trellis & training system
- Pruning
- Irrigation
- Fertilization
- Pest control
- Floor management
- Time of harvest

Winery decisions

- Time of harvest
- Use of oak
- Cultured or wild yeast
- Length of maceration
- Time in contact with lees
- Fermentation temperature
- Filtration

Levels of site suitability and management



Vineyard Requirements

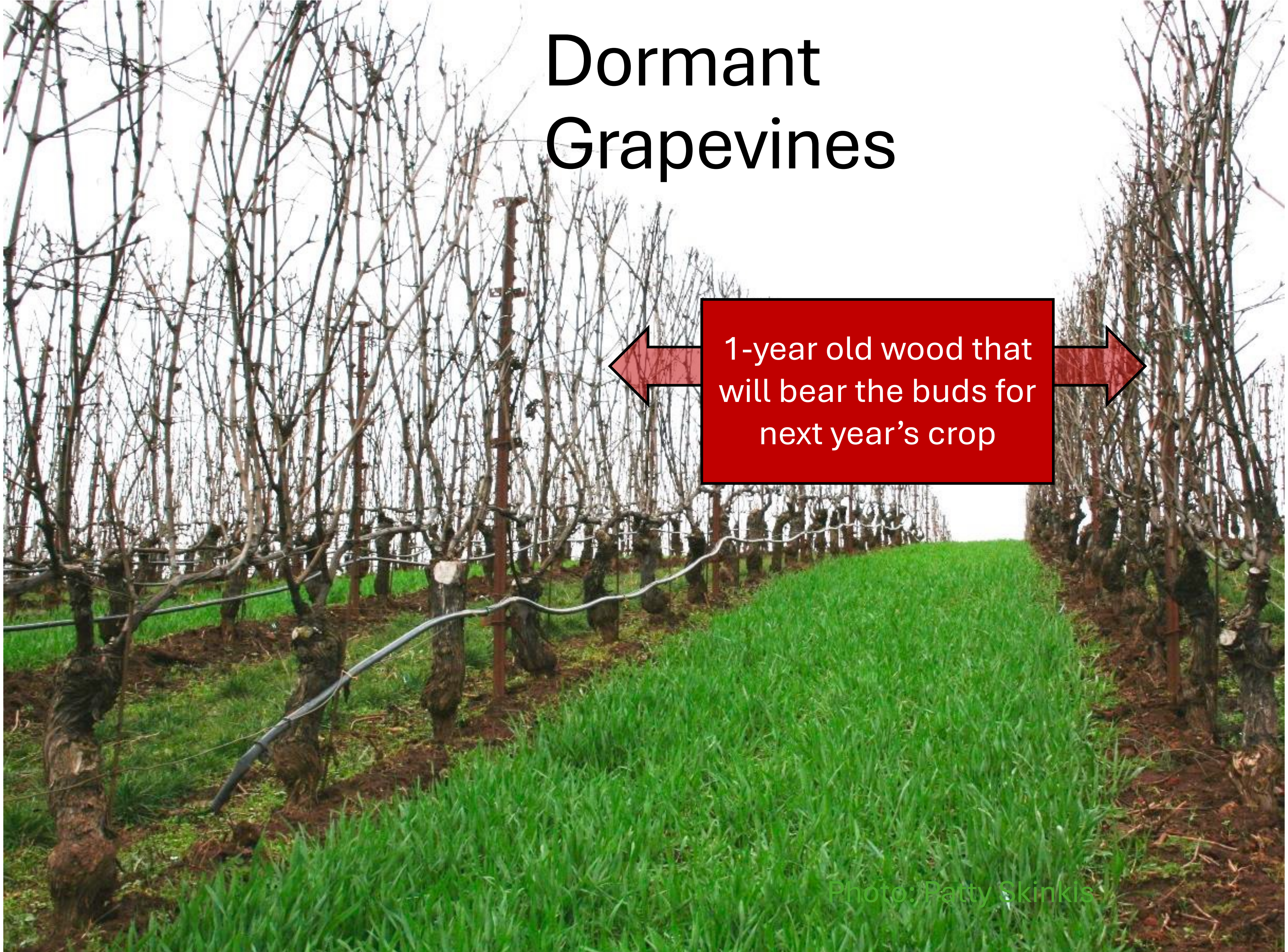
- Minimum winter temperature
- Season length (frost window)
- Heat summation – growing season
- Manageable disease
- Topography – not too steep
- Soils – good drainage

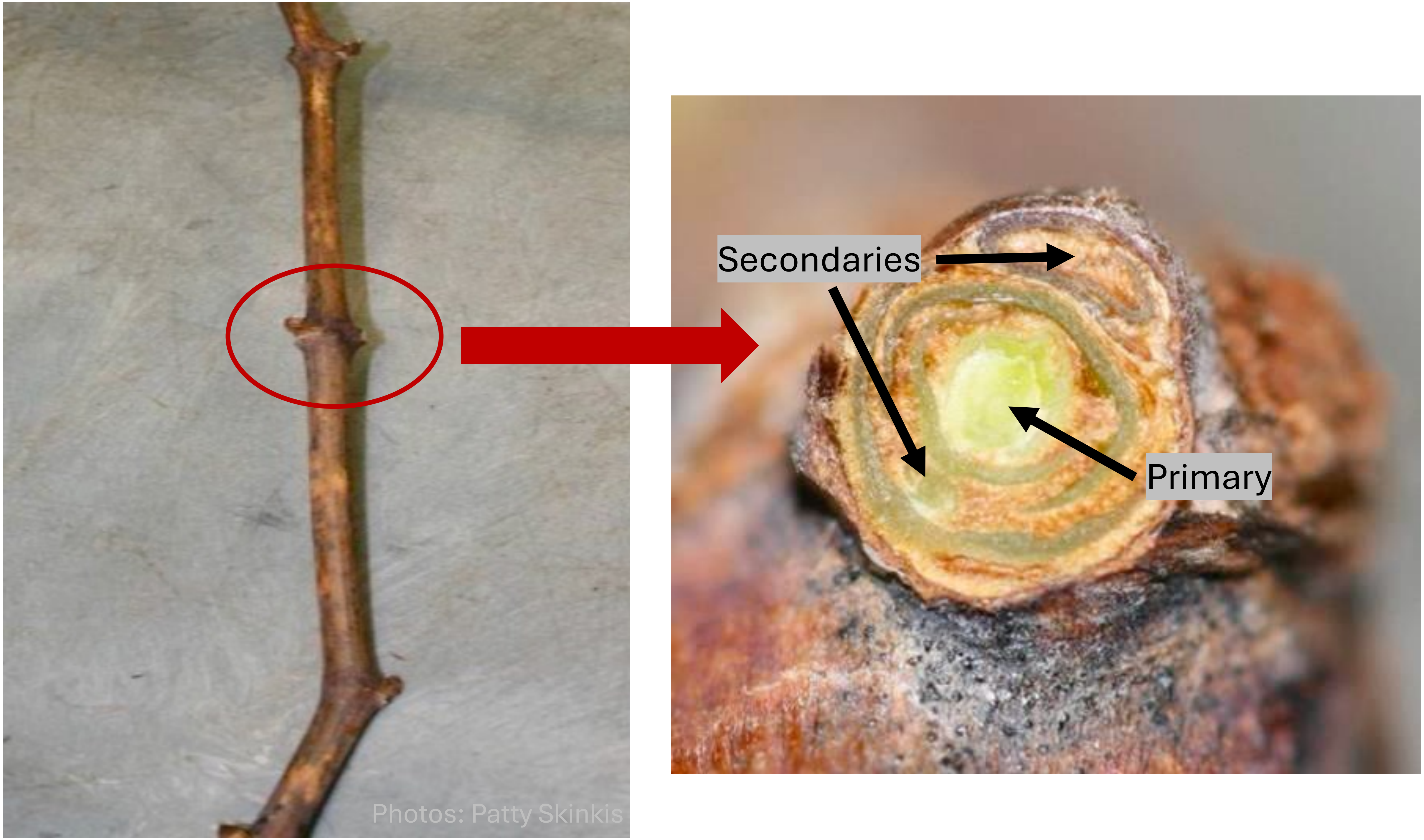
Minimum winter temperatures

In GA, when thinking about winter temps, we are talking about:

- > # of chilling hours in the winter = > synchronization of phenological stages
- Fluctuating winter temperatures are a concern (vine acclimation and deacclimation)
- In Vinifera/bunch grapes, first chilling concern are the buds
- Muscadines, more likely to see damage to permanent vine structure

Dormant Grapevines




Secondaries
Primary
Photos: Patty Skinkis

Bud cold hardiness

17.6°F

-11.2°F

17.6°F

-14.8 °F

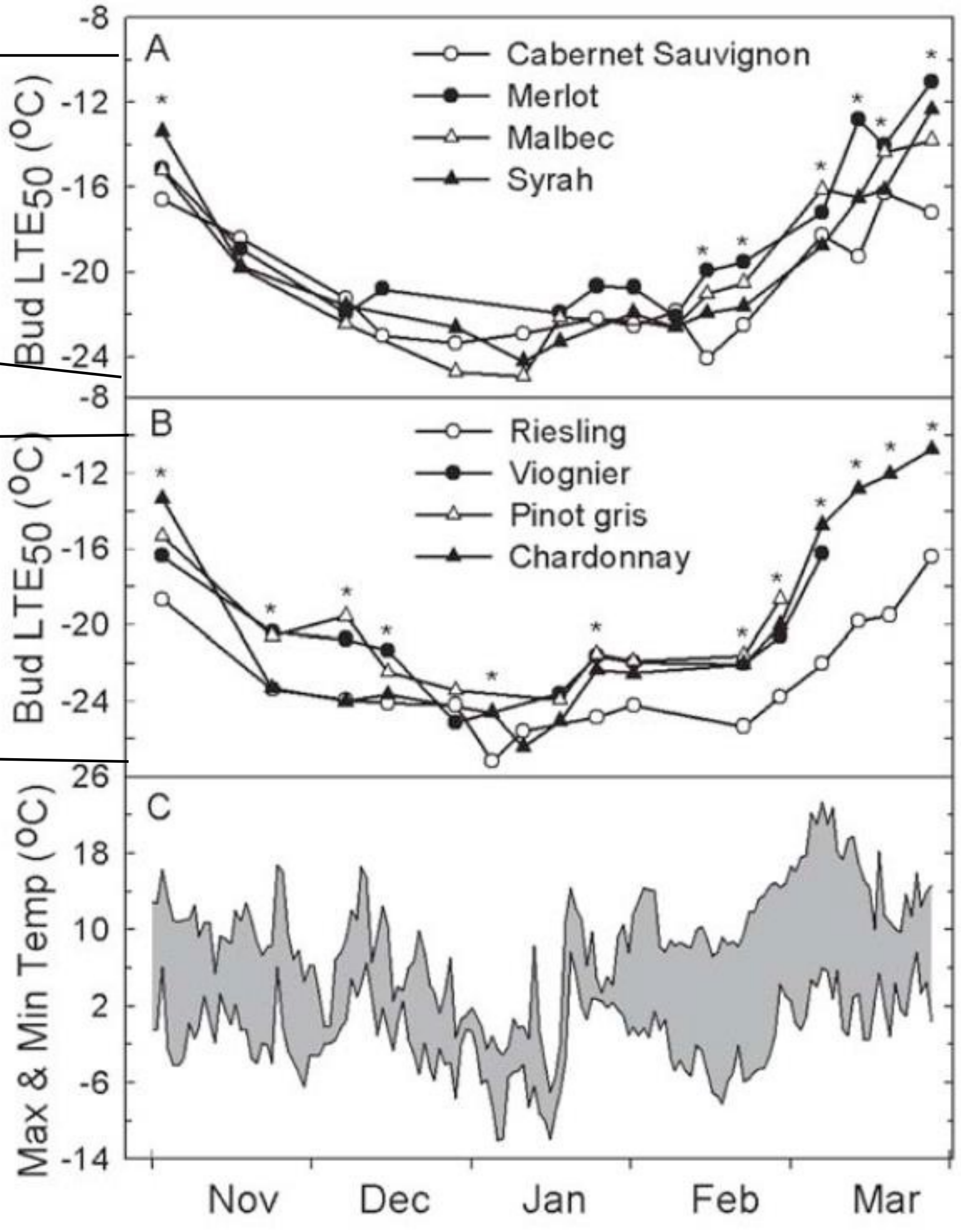


Figure 5 Bud cold hardiness (based on LTE_{50}) of eight *V. vinifera* cultivars from November 2004 through March 2005 in Prosser, WA. Red winegrape cultivars (**A**), white winegrape cultivars (**B**), and daily maximum and minimum temperature (**C**). Asterisk (*) indicates dates at which differences in LTE_{50} were significant at $p \leq 0.05$ (n = 4).

Red

White

Daily max & min temps

Prosser, Washington

Mills et al. 2006

Vine Cold Hardiness

- Avoiding winter damage by:
  - Site selection
  - Cultivar selection

- At greater risk when:
  - vines are stressed
  - recent warm weather

	Minimum winter temperature*
Vitis vinifera	-5°F
American *Vitis* species	-20°F (or lower)
Interspecific hybrids	-10 to -30 °F (or lower)
Muscadines	0°F (? ? ? ?)

*Approximate -> depends on acclimatation

Hardiness level increases

Cold hardiness class	Range of critical temperatures*	Species	Example of varieties
Very tender	5 to -5°F	Most *Vitis rotundifolia*	Carlos, Cowart, Scuppernong, Supreme
		Most *Vitis vinifera*	Chenin blanc, Merlot, Semillon, Syrah (Shiraz), Sauvignon blanc, Zinfandel
Tender	0 to -8°F	Most *Vitis vinifera*	Chardonnay, Cabernet Sauvignon, Gewurztraminer, Pinot gris, Pinot noir, Sangiovese, Viognier
Moderately tender	-5 to -10°F	Some *Vitis vinifera* Some hybrids	White Riesling, Cabernet franc, Lemberger, Gamay noir, Chambourcin
Moderately hardy	-10 to -15°F	Most hybrids	Cayuga White, Chardonel, Traminette, Norton, Seyval blanc, Vignoles
Hardy	-15 to -20°F	Most *Vitis labrusca*	Catawba, Concord, Delaware, Niagara
Very hardy	-20 to -30°F	Some hybrids	Frontenac, Foch, LaCrescent

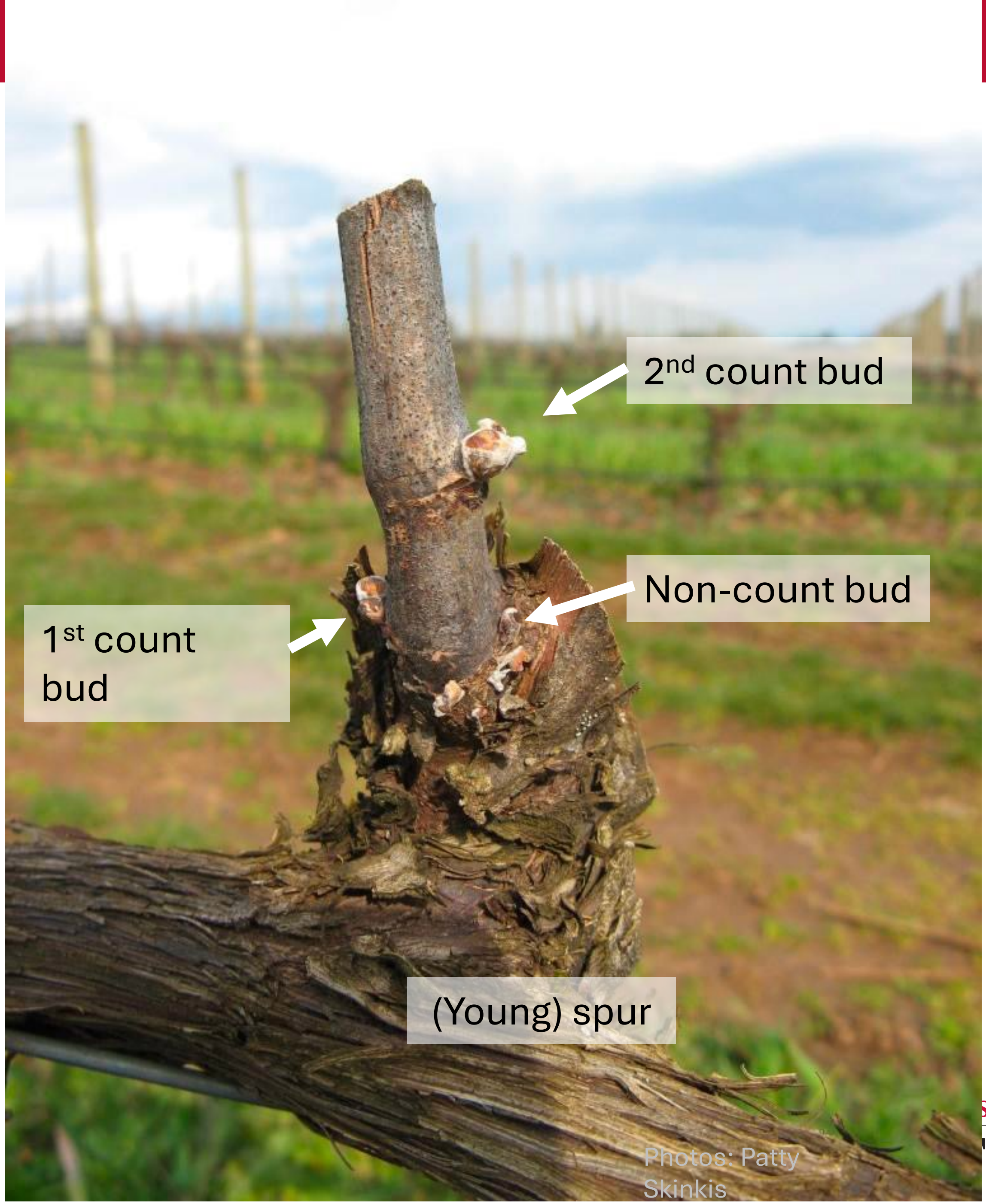
Dami, I. Understanding & Preventing Freeze Damage, 2007

Cold damage stress responses (Post-cold incident)

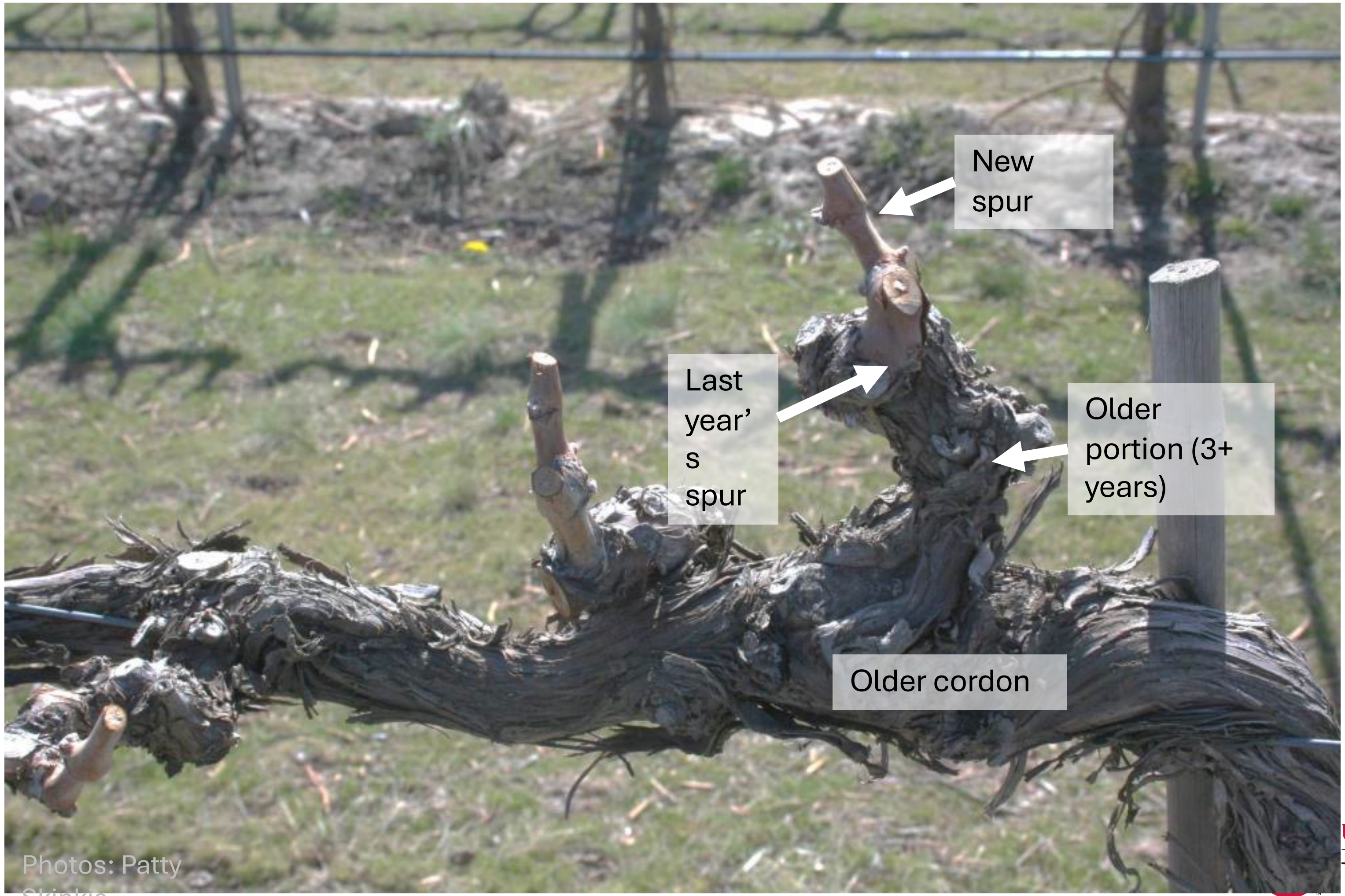
Structure of a spur

Pruning to 2 buds per spur, spurs 3-8 inches apart

When pruning is done later in the season (February), can adjust for # of dead buds



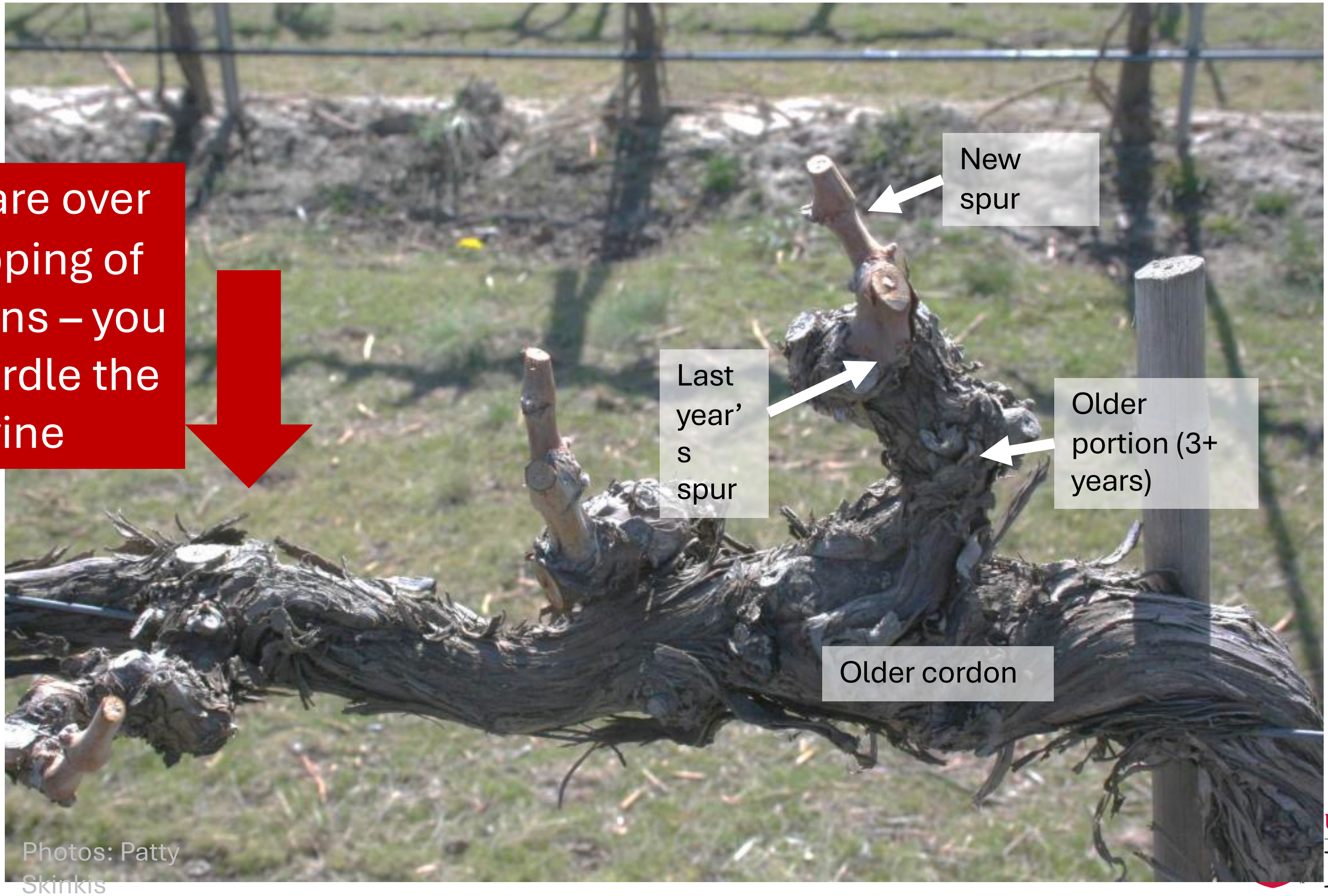
Structure of a spur



Photos: Patty Skinkis

Structure of a spur

Beware over wrapping of cordons – you will girdle the vine



Photos: Patty Skinkis

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Pencil rule

- Canes kept should be:
- **AT LEAST as thick as a pencil**
- **LESS thick than a quarter (bull cane)**

Winter damage ≠ Frost Damage

- Different vine susceptibility AND prevention/protection methods

Damage Type	State of Vine	Timing	What is damaged?
Winter cold damage	Dormant	Winter	Buds, phloem
Frost Damage	Growing	Spring/Fall	Leaves, shoots, flowers/fruit

Spring frost events

- Damage
  - Early Spring: emerging buds
  - Spring: young tissues (leaves, shoot tips, flowers)

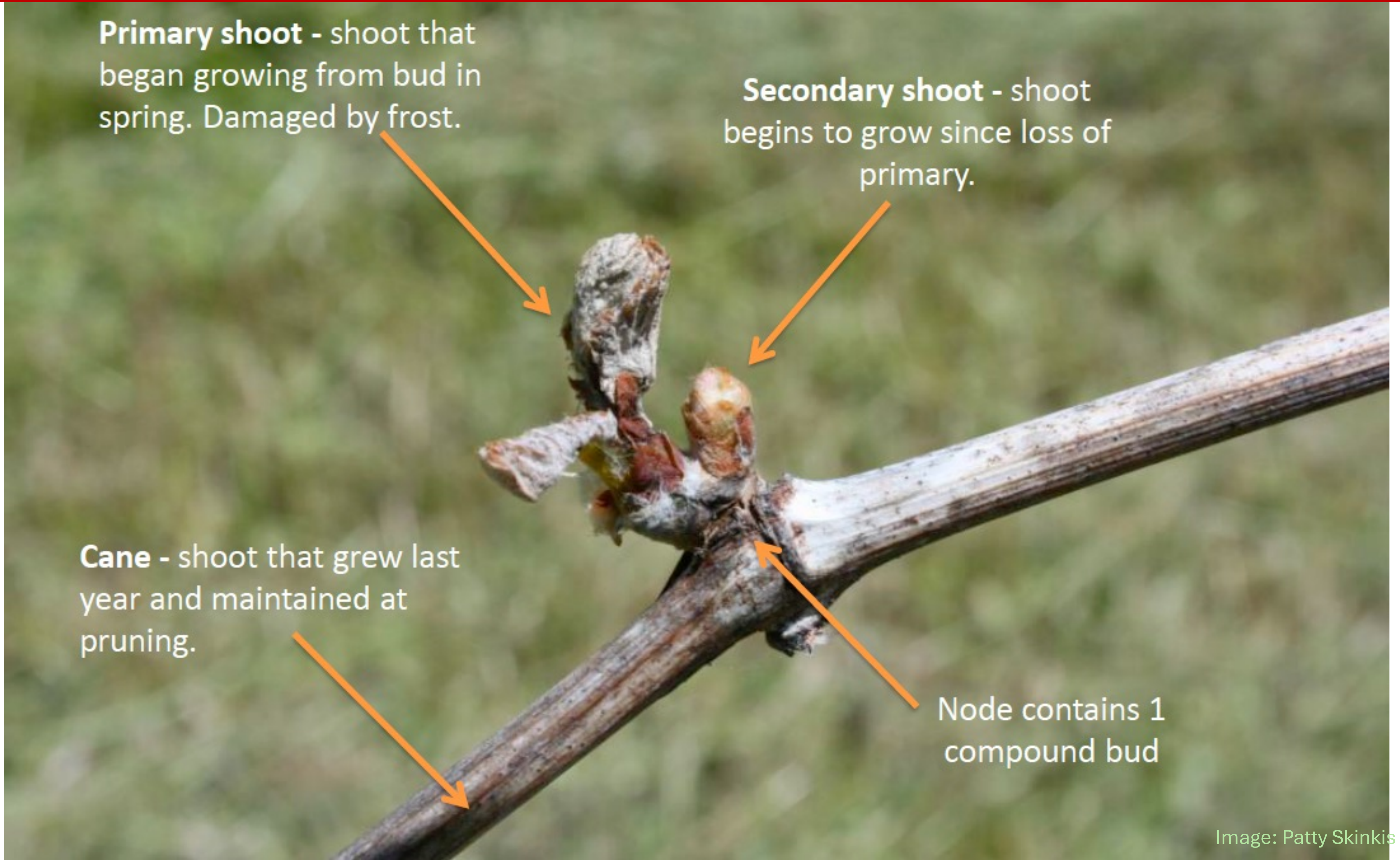
Meristem of primary shoot killed

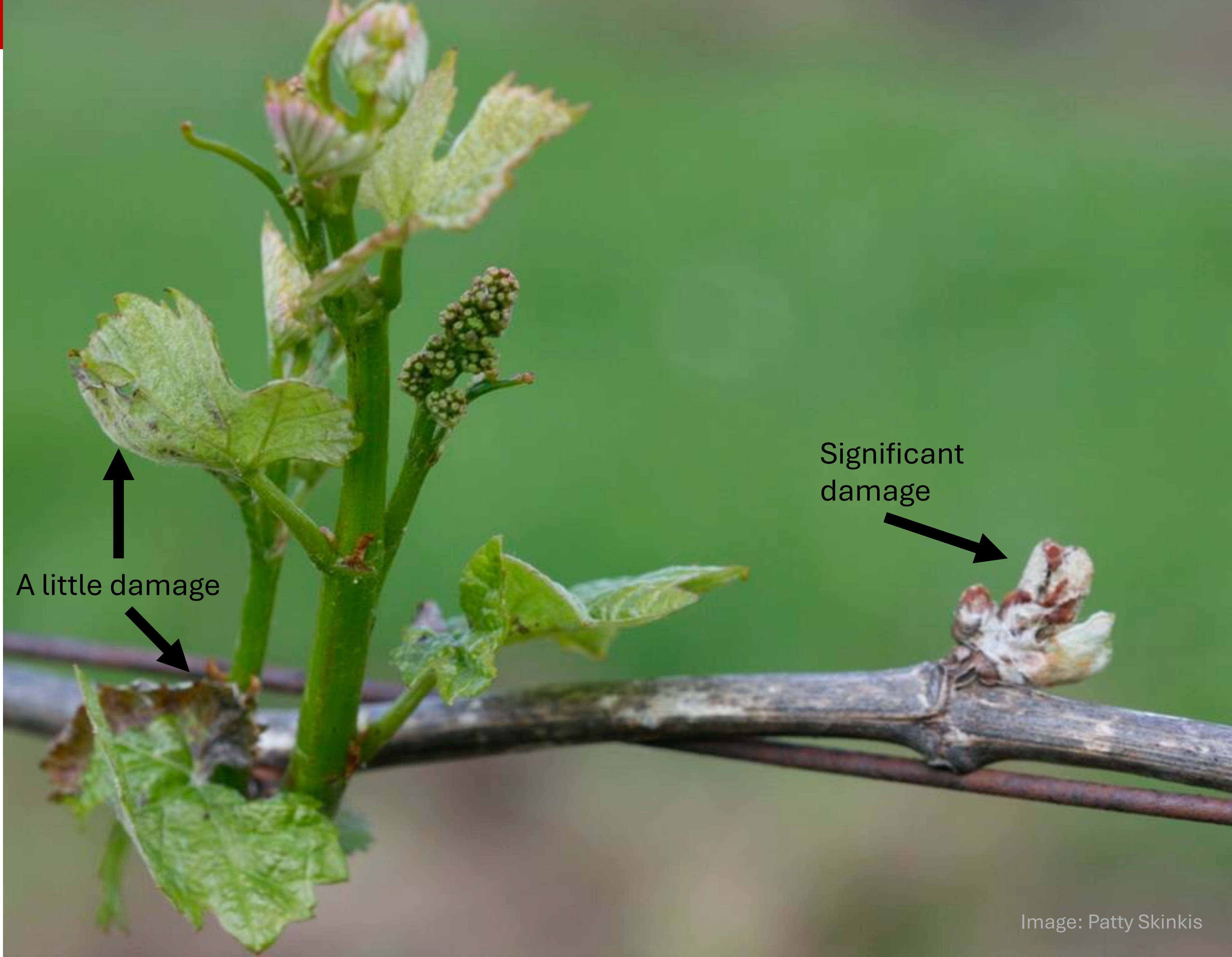
↓

Secondary + tertiary buds will grow

↓

Delay in growth | Yields are reduced


Primary shoot - shoot that began growing from bud in spring. Damaged by frost.
Secondary shoot - shoot begins to grow since loss of primary.
Cane - shoot that grew last year and maintained at pruning.
Node contains 1 compound bud
Image: Patty Skinkis


Significant
damage
A little damage
Image: Patty Skinkis

Fall frost events

Damage potential:

- Canopy
- Fruit
- Buds for next year

Impacts:

- Fruit ripening
- Carbohydrate and nutrients going into storage reserves

We see these issues more often when there is also high disease levels in the canopy

Determining Probability of FFDs

- Use historical climate data (long-term)
- Use temperatures ~ 30°F

UGA Weather Network:
Georgiaweather.net

UGA Weather Network

College of Agricultural & Environmental Sciences
UNIVERSITY OF GEORGIA

Home | Maps and Summary | Crop Weather | Drought | Calculator | Background Info | Links | Site Map | Contact us

Weather Stations

Select a station from drop down list below

Select a Station

Nearest Stations

Enter a GA ZIP Code to check three nearest stations

Check

First Frost Date

Choose a station : Blairsville

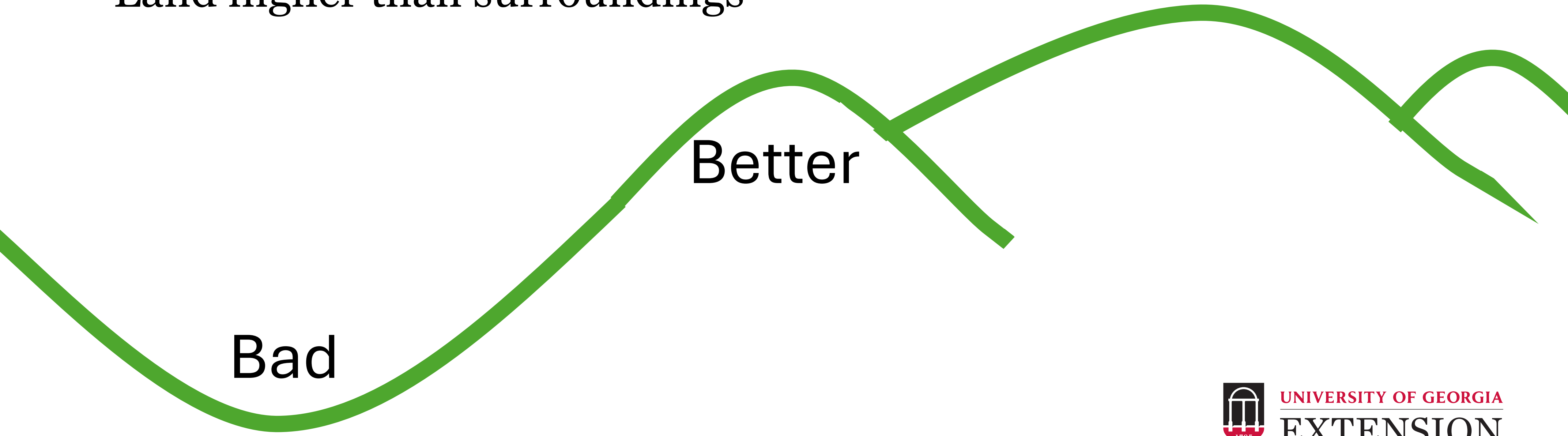
Calculate

BLAIRSVI

From Sep - 1 to - Dec 31	First Frost Date	Frost Temperature (°F)
2023	Oct 09	31.4
2022	Sep 29	31.9
2021	Nov 07	25.9
2020	Nov 02	29.9
2019	Oct 18	30.4
2018	Oct 22	29.2
2017	Oct 26	28.9
2016	Oct 23	29.3
2015	Oct 17	30.1
2014	Oct 05	29
2013	Oct 24	28.8
2012	Nov 01	31.1
2011	Oct 03	31
2010	Oct 05	31.5
2009	Oct 18	30.2
2008	Oct 19	29.8

Vineyard site selection for frost protection

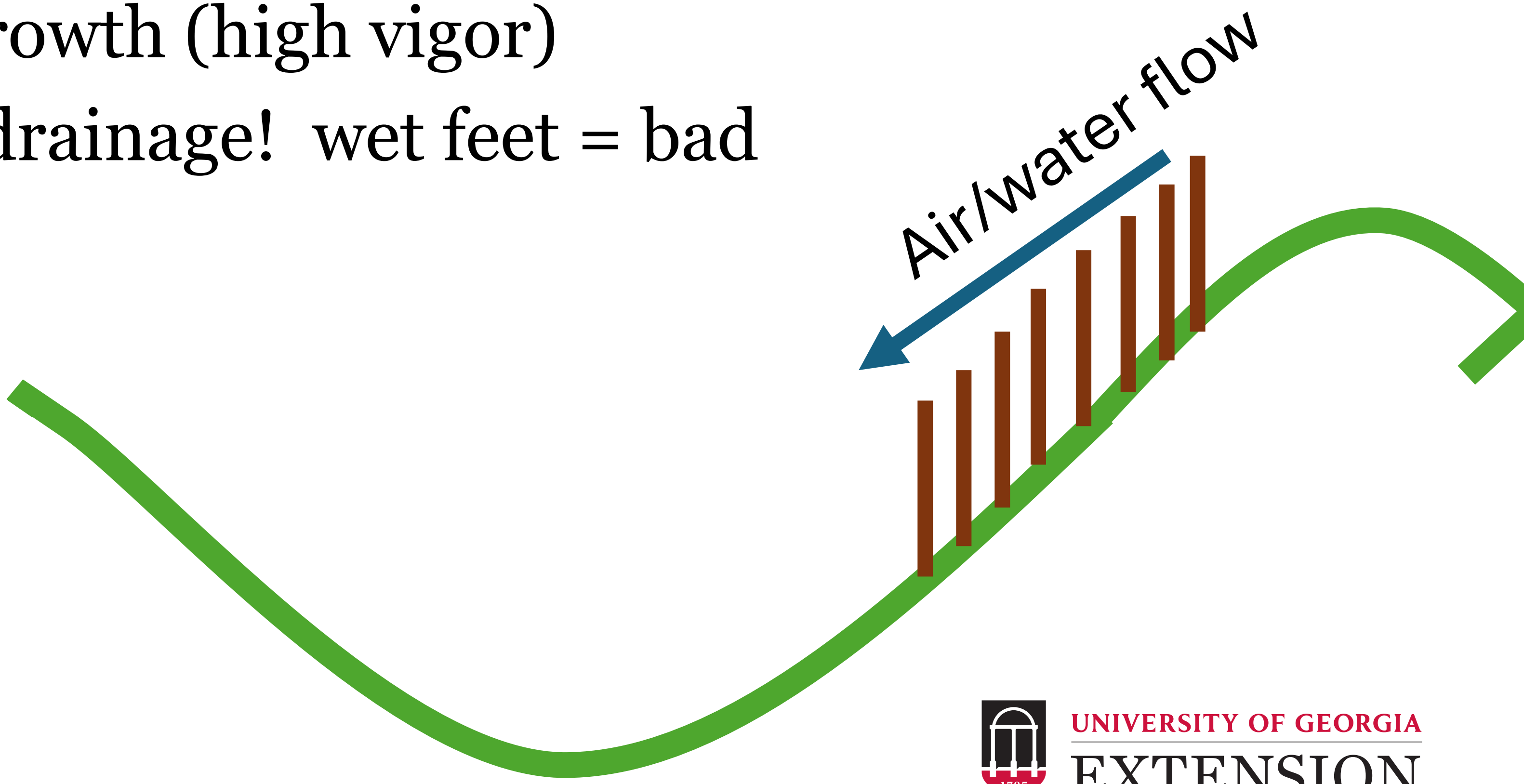
- Choose convex, sloped land
- Land higher than surroundings



Vineyard Site Selection

- Humid climate, often vines have more water than they need
- Causes excess canopy growth (high vigor)
- Vines need good water drainage! wet feet = bad

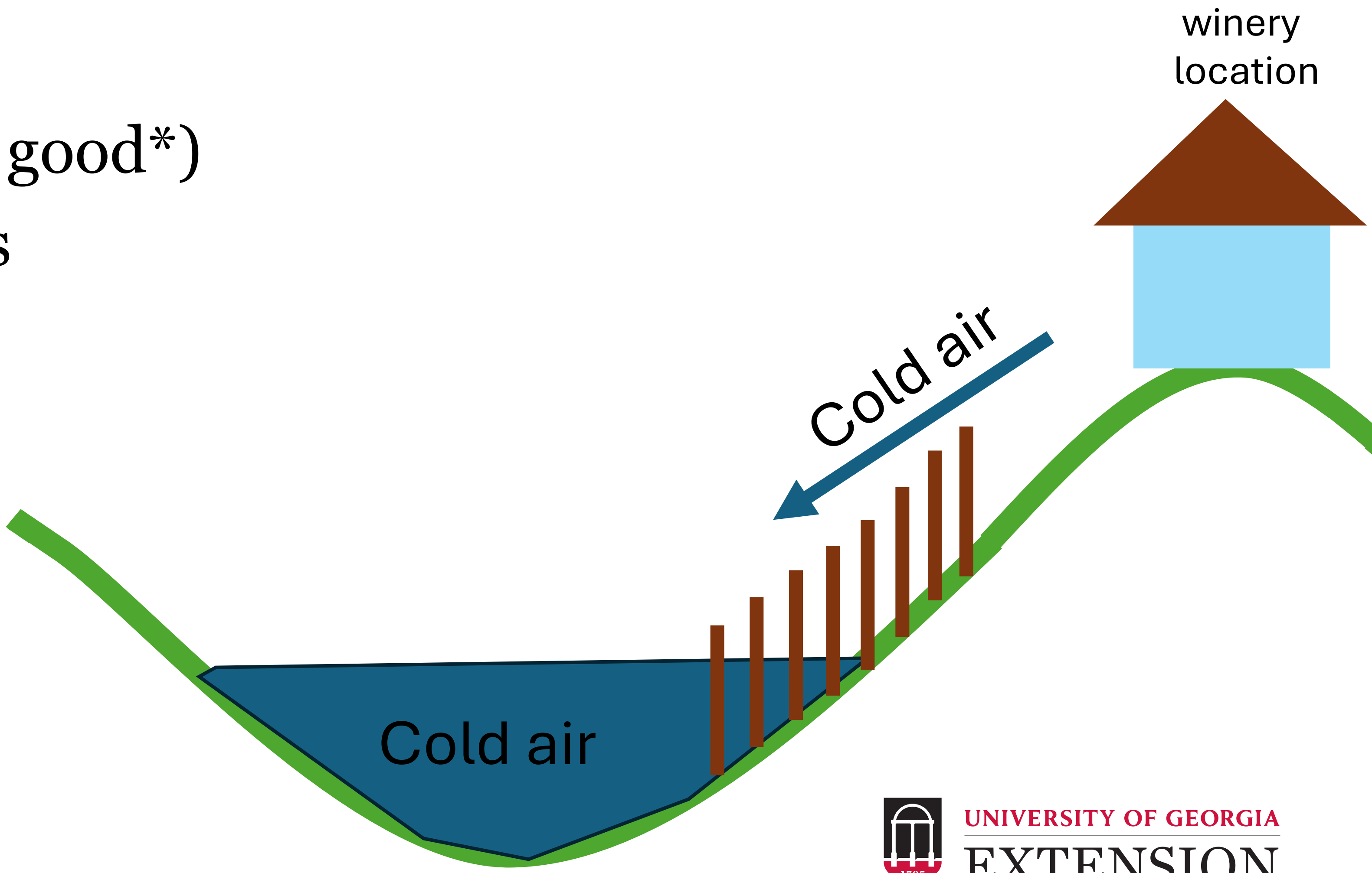
- Air flow can help dry canopy (reducing disease pressure)



Vineyard site selection

- Air movement (windy = good*)
- Beware the frost pockets

*good for frost protection
and somewhat disease control



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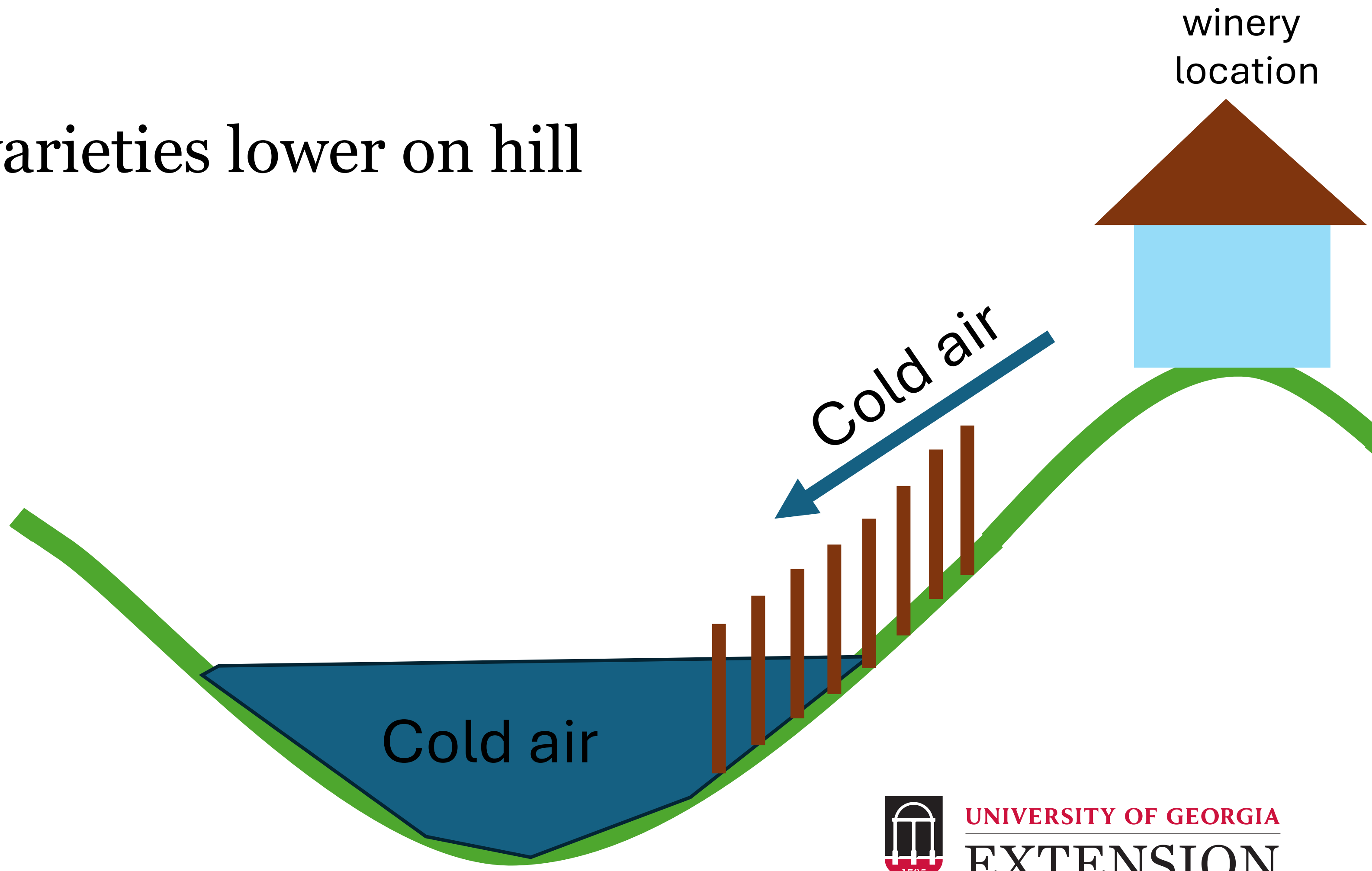
Vineyard site selection

- Put later bud breaking varieties lower on hill



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Vineyard site selection- Topography

Important factors for sunlight interception and cold air drainage

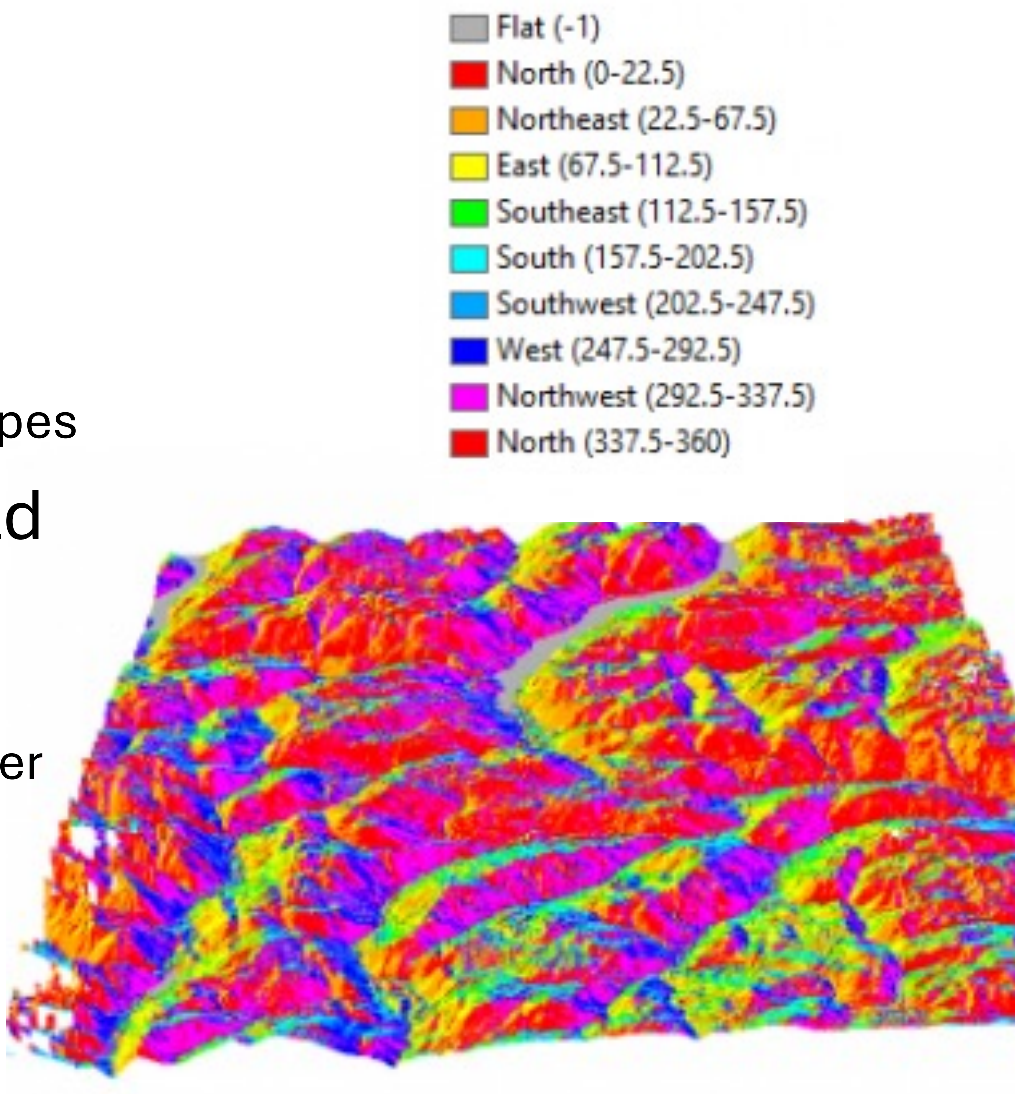
- **Aspect** = direction (N, S, E, W)
  - Solar radiation, heat accumulation
  - South slopes will increase heat units (unnecess
  - <u>East slopes dry off earlier in day</u>

- **Slope** = Percent grade
  - Machinery operation/working conditions
  - Water runoff and soil erosion
  - Water, air drainage
  - <u>No steeper than 15%</u>

- **Elevation –** relative and absolute
  - **GA** – 1800' or higher for Pierce's Disease

Vineyard site selection
Aspect (direction of slope)

- Areas with cooler climates:
  - Choose south to southwest facing slopes
    - Allow mx. Heat accumulation to grow & ripen grapes
- Areas with warm or hot summers and cold winters:
  - Choose north to northeastern facing slopes
    - Vines stay dormant longer, less potential for winter injury & spring frosts
- **Areas with high disease pressure**:
  - Choose east facing
    - for morning sun to dry canopy faster

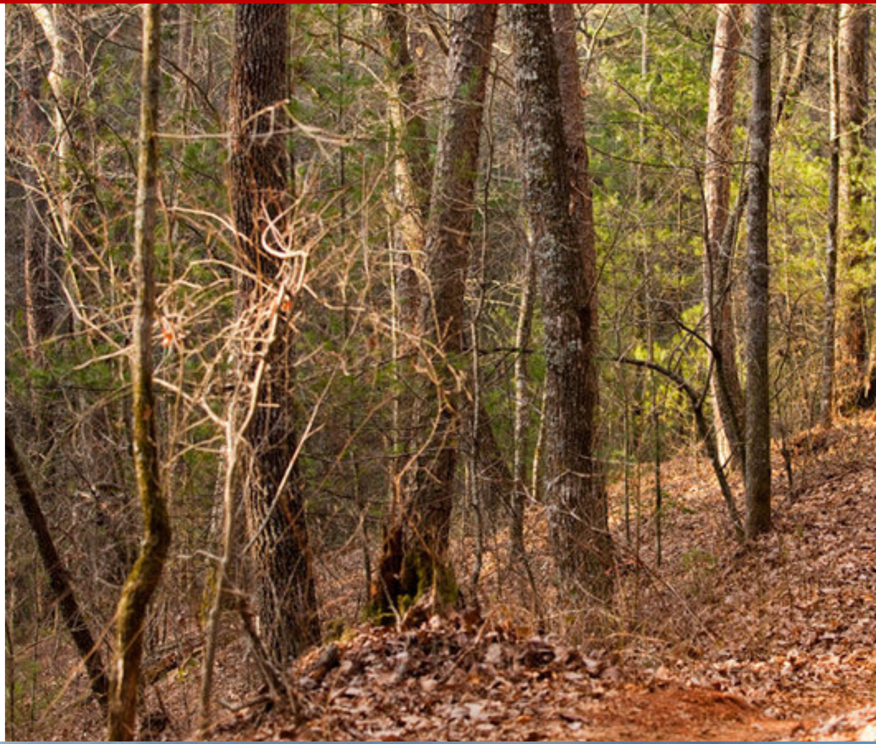


Vineyard Site Development

- Cropping history
- Soil test:
  - pH, P, K, Mg
- Eliminate noxious weeds
- Address shade issues
- Eliminate wet areas in field
- Remove barriers to good air drainage
- Establish a good ground cover on vineyard floor (though there can be lots of variability here…)

Previous land use

- How was the land previously used?
  - (other crops? Forest?)
- What is in the surrounding crops/plant life?
- Land-use and zoning considerations?
- Proximity to urban areas



Soils for Vineyards

- Soil pH – 6.0 to 6.5
- Deep, Minimum rooting depth 30 to 36 in.
- Low to moderate fertility
- Organic matter content

  < 3.5%
- Good water supplying capacity,

  but <u>well-drained</u>, both internally and surface

Adjusting the soil is very hard once the vines are in the ground



A little lime may be needed…

- Many soil testing recommendations for lime (such as UGAs AESL reports) provide recommendations for <u>6 inches of soil</u> depth.
- AKA, you'll need to probably at least triple the recommendation to get to the depth needed in vineyards

Organic Matter

- Why less than 3.5 % O.M?
  - 30 to 60 pounds of actual nitrogen are released per 1% organic matter per year due to mineralization
  - At 3.5% O.M., between 105 and 210# actual N may be released
  - ~ ½ of this is available to vines
  - This exceeds the per acre recommended rate of N for bunch grapes resulting in excess vegetative growth delayed fruit ripening & poor fruit quality

Soil physical properties influence root development

- Vertical root distribution determined by:
  - Soil texture
  - Stoniness
  - Depth of water table
  - Depth of restrictive barrier
  - Genetics

- Fine textured soils (silt, clay) have
  - Higher water-holding capacities
  - Lower infiltration rates
    - Therefore, roots tend to be small & fine textured

Root System of Grapevines

- Depth
  - 60% of roots in the top 2 ft. of soil
  - Roots may extend down over 18 ft. in some soils
- Lateral spread
  - Possibly up to 30 ft.
    - ~ 15% of total biomass between 4 and 5 ft. from the trunk

Grapevine rooting patterns: A comprehensive analysis and review. D. Smart, E. Schwass, A. Lakso & L. Morano.Am. J. Enol. Vitic. 57(1): 89 – 104. 2006

Photo (Mike Trought; Wines & Vines): Grapevine root system

Water Drainage

- Vines will not tolerate "wet feet" during the growing season

- Eliminate wet areas in fields
  - Ditching
  - Tile drainage
  - Find another site

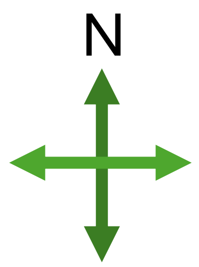
Soil Features Summary

Soil Feature	Importance	Desirable Value	Undesirable Value	Ability to Modify
Internal water drainage	**XXXXX**	> 2”/hour	< 2”/hour	Ditching, tile drainage
Water holding capacity	**XXXX**	> 0.15inch/inch of soil	< 0.1 inch/inch of soil	Increase organic matter level
Fertility	**XXX**	Low to medium	High fertility	Vine/rootstocks, spacing, ground cover competition
Effective rooting depth	**XXX**	> 3 feet	< 1 ft.	Deep ripping, irrigation
Texture (sand/silt/clay)	**XXX**	Loam, sandy loam, sandy clay loam	> 50% silt	
Soil pH	**XXX**	6.0 – 6.5 (6.5 for *vinifera*)	< 5.0 (Al toxicity)	Preplant liming to raise pH or acidification to lower pH
Organic matter content	**XX**	1.0 – 3.0 %	> 3.5%	Vine spacing, ground covers

Adjacent Agricultural Operations

- Need for buffer zones
  - An area separating a certified production area from an adjacent land area not maintained under organic management
- Potential for herbicide drift

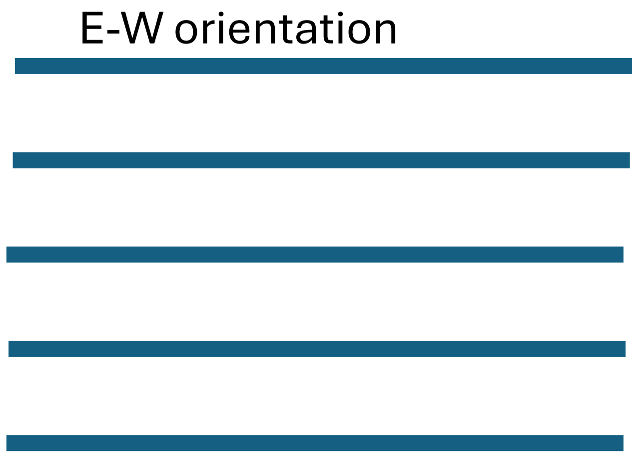
Row Orientation



- Orientation = Cardinal Direction
- Less impactful in wider spacing and open canopies (non-VSP)

Practical considerations:

- Contour to prevent erosion
- Wind control
- Reduce risk of frost damage
- Safe operation of tractors and equipment
    - Terracing (running rows across the landscape) for slopes >30%



Row Orientation

Willamette Valley,
Oregon site

Steep slopes – don't contour up and down the hill

(ideally <15%, definitely <30%)

Row Spacing

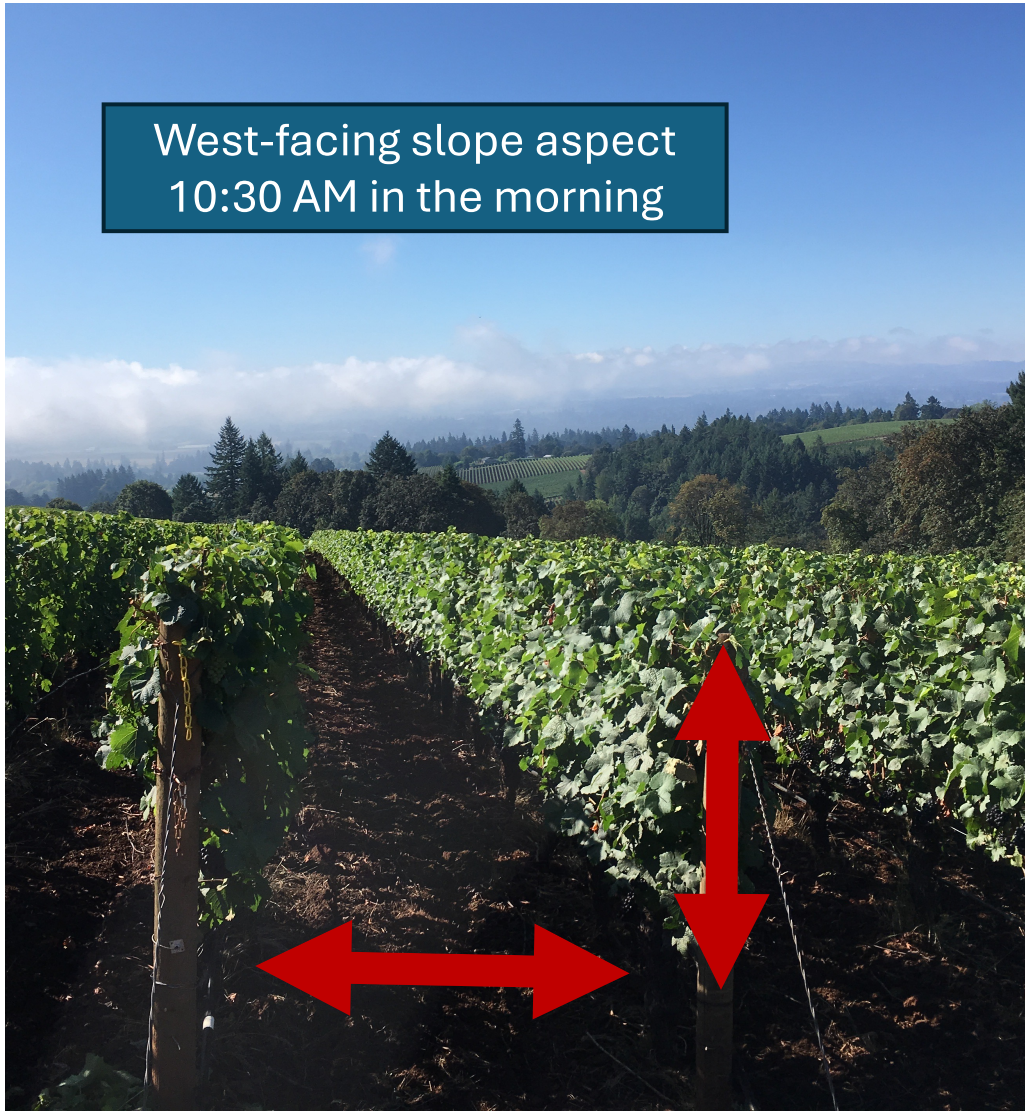
Narrow row spacing = more linear feet of vines per acre

Calculation of linear ft/acre:
43,560 ft^2/row spacing in ft

Row Spacing

Keep full-sun vine requirement in mind!

- Goal: to maximize area
- With enough space for equipment (at least 1.5 ft on each side of equipment) but also not too much space (so you can spray in both directions)
- Rule of thumb: No less than 1:1 – trellis height: row spacing
- In east coast US, generally 9-12 ft depending on trellis/training system, slope, vine vigor, soils, equipment



Vine Spacing in eastern US

- *Often* high vigor sites/varieties
- General vine spacing recommendations:
  - *Vinifera* –4-6 ft
  - Hybrids - 6-10 ft
  - Muscadines – 12-20 ft
    - Higher vigor vines can be spaced further apart, but bigger vines can be more stressed, lose productivity on ends
- Trellis System will change interrow spacing requirements
- Site water availability is important here!
  - More water = bigger vines = lower vine density
  - Less water = smaller vines = higher vine density
- Allow at least 24 - 35 ft. turning room at ends of rows

Vertical Shoot Positioned Trellis (**VSP**)

Vertical Shoot Positioned Trellis (**VSP**)

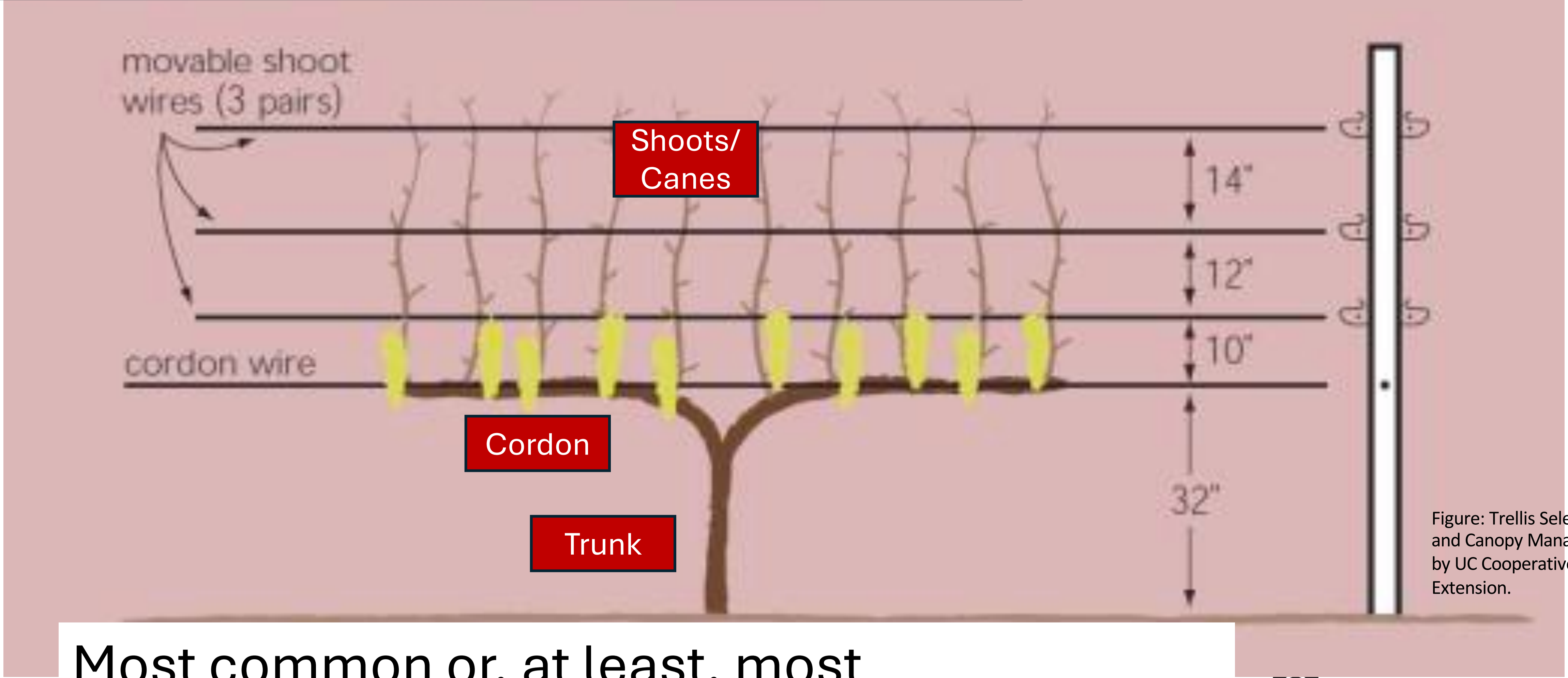
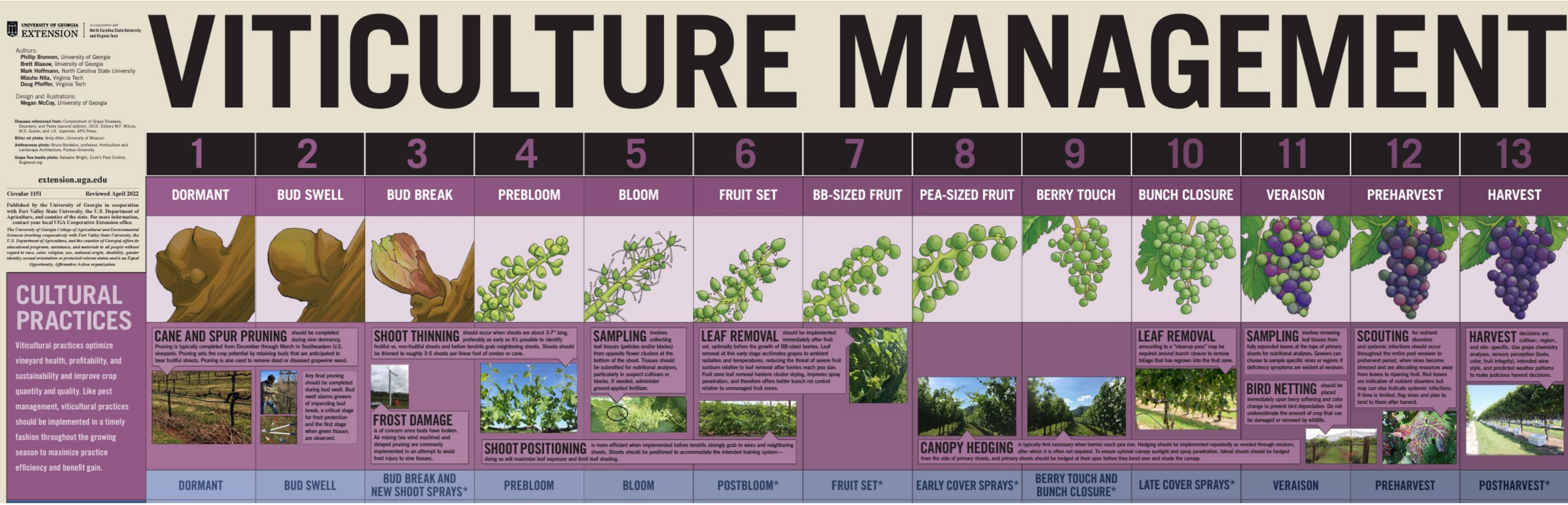


Figure: Trellis Selection and Canopy Management by UC Cooperative Extension.

Most common or, at least, most quintessential vineyard trellis system

High-wire/ Hanging

- Low cost for establishment
- Mechanizable
- Accommodates vines with low, moderate, and high vigor
- Requires hedging to prevent shoots touching the ground
- Heavy (fruit laden) shoots can break



https://extension.uga.edu/publications/detail.html?number=C1151

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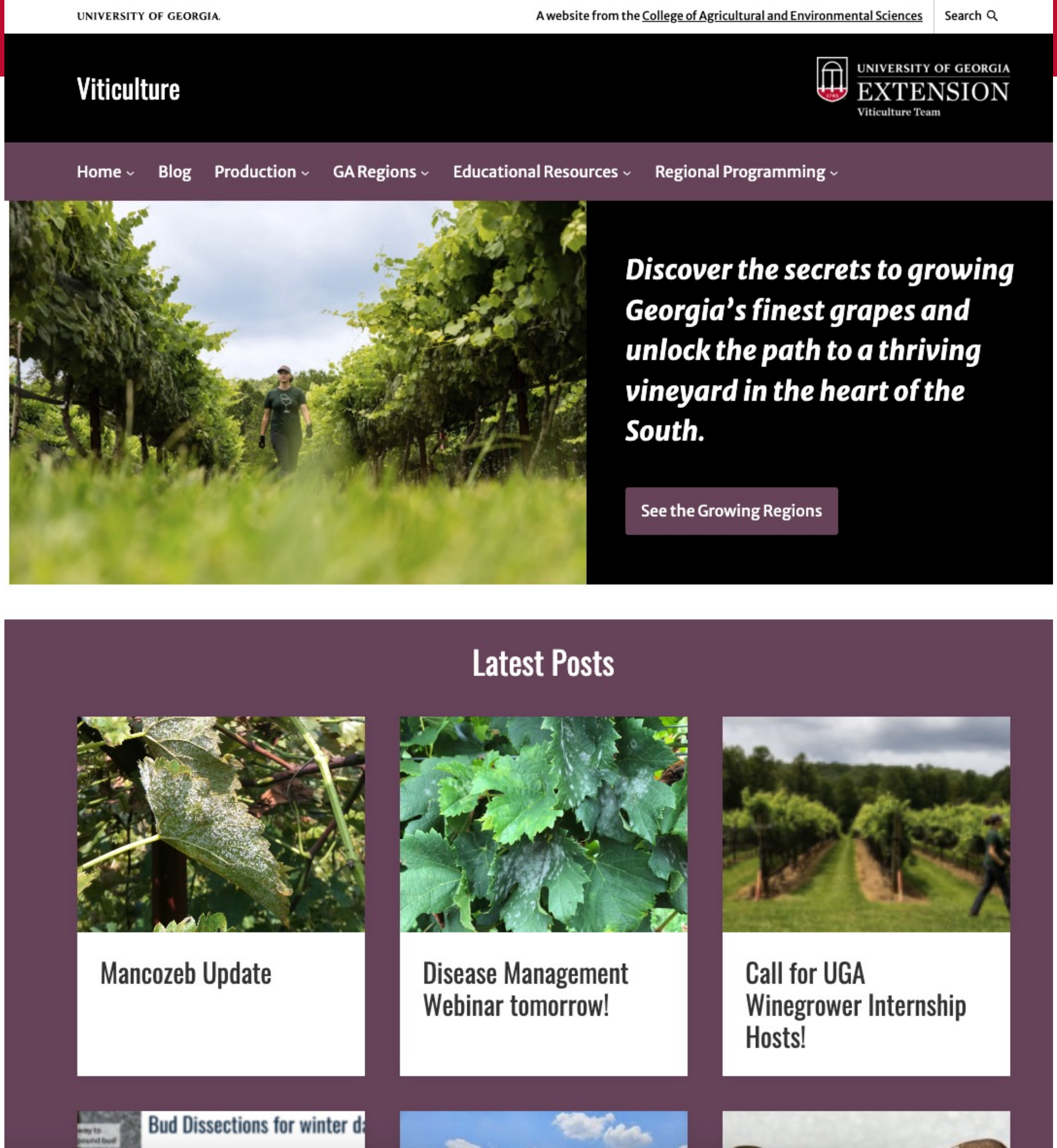

https://viticulture.uga.edu/

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Conversions Cheat Sheet:

- 1 acre = 43,560 square feet
  - ~0.4 hectares
- 1 hectare = 2.47 acres
- 1 foot = 0.3048 meters
- 1 meter = 39.37 inches (3.28 feet)

$$\frac{43{,}560 \text{ sq ft/acre}}{\text{row spacing (ft)} \times \text{vine spacing (ft)}} = \text{vines/acre}$$

Vines per Acre/Hectare

Row spacing in feet/meters

Vine spacing in feet/meters

	6 1.83	7 2.13	8 2.44	9 2.74	10 3.02	11 3.35	12 3.66
3 0.91	2420 5977	2074 5122	1815 4483	1613 3984	1452 3586	1320 3260	1210 2988
4 1.22	1815 4483	1556 3843	1361 3361	1212 2993	1089 2689	990 2445	908 2242
5 1.52	1452 3586	1245 3075	1089 2689	968 2390	871 2151	792 1956	726 1793
6 1.83	1210 2988	1037 2656	908 2242	807 1993	726 1793	660 1630	605 1494
7 2.13	1037 2561	889 2195	778 1921	691 1706	622 1536	566 1398	519 1281
8 2.44	908 2242	778 1921	681 1682	605 1494	545 1346	495 1222	454 1121