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Need Quality? Try Canopy and Fruit Zone Management Vermont and New Hampshire

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Who I Am...



- First experience with vineyards in Germany
- Training at University of California at Davis
- First job at Pindar Vineyards, Long Island, NY
- Temperance Hill Vineyard in Oregon
- Penn State Cooperative Extension since 1999





Variable vine vigor at Lincoln Peak



Veraison in Marquette

Viticulture Goals

- Fully maturity fruit for wine making
- Fully mature wood for over wintering
- Get the fruit ripe as soon as possible so the vine can get the wood ripe for winter!



How to get there? Kees van Leeuwen has the answer...

- Small berries with size set after fruit set
- Shoot growth cessation just before veraison

How to achieve these goals?

- Control soil moisture
- Limit exchangeable nitrogen in the soil

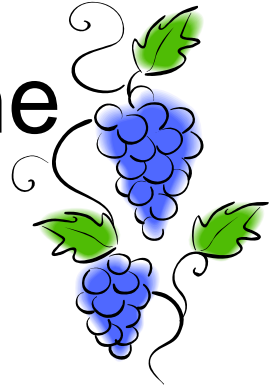
Good canopy management works in ALL vineyard applications!

Concept of Terroir: You have it..but can it make good wine?

- Soil properties: physical, chemical and biological
- Climate at the macro, meso and micro levels
- Plant materials including species, varieties, clones and rootstocks
- Viticulture is our input into the terroir equation and includes canopy and fruit zone management as vital components
- Understand your terroir
- Identify a regional NH terroir



Uniformity and the Utopian Vine



- Just imagine...
 - A vine you prune and then walk away from it
- We want everything to be the same and the right size:
 - Leaves – small to medium size
 - Shoot length – 1 – 1.5m
 - Internode length – 60-80mm
 - Berry size - small
 - Cluster size – small for the variety, ideally loose
- Strive for uniformity between vines and vineyard blocks
- The enemies of uniformity:
 - Winter injury, diseases, tractor blight, poor viticulture, row direction, soil and mesoclimate variability, etc.

What does a good canopy look like?

- ... you know it when you see it. It is the most visually striking part of the vineyard so do it well.
- It will enhance your reputation and the price of your grapes
 - The canopy includes:
 - Shoots
 - Fruit
 - Permanent vine parts
 - The trellis system



Why are canopy and fruit zone management strategies important?

- In any given year, no viticultural practices can impact the final outcome of fruit quality more: you can do it!
- Enhancing the microclimate of the vine: entry of light and air into the canopy environment offers...
 - Lower incidence of almost all diseases by reducing humidity levels and allowing wind to dry out leaves and fruit
 - Allows sunlight to penetrate into the canopy interior for more efficient photosynthesis
 - Affects fruit zone temperature range allowing more efficient biosynthesis of essential compounds
 - Helps to reduce levels of methoxypyrazines in clusters

Vine Size



- **Big vine**
- Medium vine
- Small vine



Vine Size and Balance

- Balancing the vegetative and reproductive needs of a vine...
 - Getting the vine to do what WE want it to do, not what it wants to do
- Water is the key. It affects everything
- ...then everything else
- Size matters: Big vines and small vines and quantity and quality
- Example: 1m X 1m in Bordeaux vs. 3m x 1.7m in NJ
 - 9 sq ft vs 45 sq ft of soil



Canopy management starts before you plant the first vine...

- Soil analysis for vine vigor potential: low to moderate vigor soils are the best!
 - Low pH, low nutrition, well-excessively well drained, lots of rock
- Climate: how much rain and what is the distribution
- Vine density: between rows for quantity, between vines for quality
- Type of trellis system: single or divided
- Selection of variety, clone and especially rootstock
- Row orientation



Canopies come in all shapes and sizes: each has specific requirements to make it work

Single canopies:

- Vertical shoot position
 - Head trained, cane pruned
 - Cordon trained, spur pruned
- Goblet – head trained, cane pruned
- High wire cane or cordon

Divided systems:

- Scott Henry or Smart-Dyson
- Geneva Double Curtain
- Lyre



Successful Canopy Management...

Begins with pruning to a balanced vine

- Correct early training and superstructure development
- Evenly spaced spurs or well-placed canes
- No more than 2-3 buds per spur
- Canes < 2 ft in length for most varieties
- Short to medium internode length
- Keeping the head area open
- Keeping the area between cordons or canes open
- Elimination of renewal spurs in cane pruning



Into the growing season...

- Shoot thinning at 1-3”
- Shoot positioning on VSP and hanging systems at 16-24” and again when needed
- Moving wires vs. tucking shoots
- Lateral removal
- Leaf removal after fruit set and again at veraison if necessary
- Hedging the canopy on sides and top X times per year
- **Timing: It all hinges on timing and availability of adequate and skilled labor. Be prepared! Understand the weather.**





Suckering the head for
uniform shoot density



The end game: when it really counts

- Veraison to harvest: water matters
 - Just enough stress to get the vine's attention
 - Too much stress is bad!
- Shoot growth cessation
- Small leaves
- Yellowish-green color
- Small berries and clusters
- Uniformly ripe berries





Challenging late season, cool climate viticulture at Newport Vineyards in Rhode Island. They cannot afford not to be perfect every year!



Visual Indicators



Growing
Dead Tip

Slowing

Stopped

Getting in the ballpark: Smart rules

- 12-16 buds per pound of pruning weights
- 3-5 shoots per linear foot of trellis
- 0.2-0.4 lbs of pruning weight per linear foot of trellis. If over 0.45 consider dividing the ca
- 2-3 inch internode length
- 15-20 leaves or 36-40" shoot length
- 1-1.5 leaf layers
- 80-100% exterior leaf exposure
- 50-100% fruit exposure
- Leaves: small basal and mid shoot, slightly dull and pale green



Taming the rambunctious vine

- Taking away water and nutrients: Site selection – soils
- Rootstock choice
- Drain tile
- Cover crops
- Kicker or vigor-diversion canes
- Hedge multiple times
- Divide the canopy – VSP to Scott Henry



Fruit Zone Management: creating a microenvironment for fruit to ripen

Cold climate
viticulture on the
Niagara Peninsula



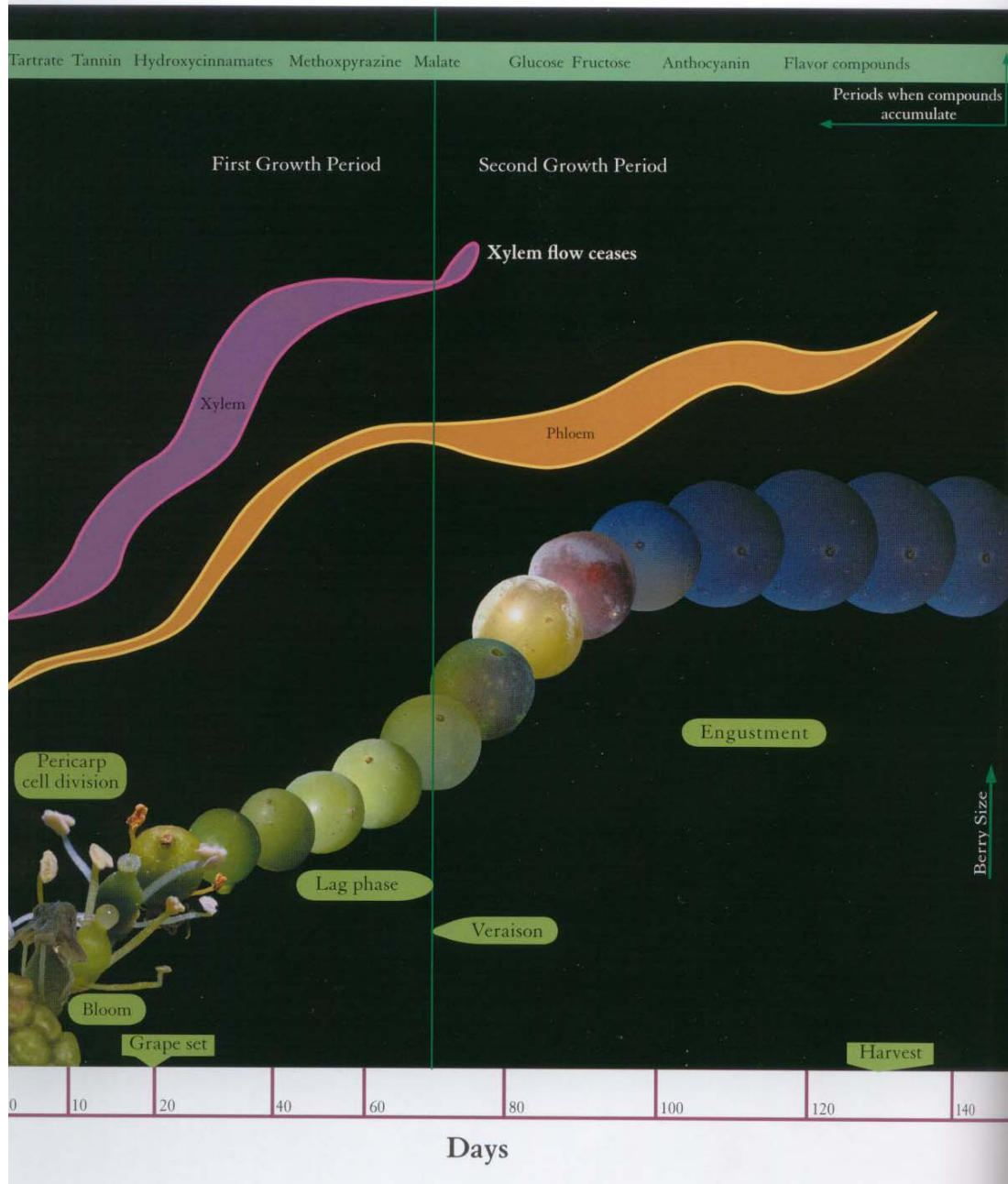
It begins before the first vine is planted...

- Select the coolest possible site for a given variety to consistently fully ripen
 - Riesling in the Mosel
 - Pinot noir in Burgundy
 - Cabernet Sauvignon in the Medoc
 - ??? in southern New Jersey
- All of the attributes of a good canopy will benefit the fruit zone

Crop Estimation: Just Do It

- Growers universally hate to do it
- You need a statistically accurate sampling
- You need to develop data over time
- Eventually, if you are smart and good, you can wing it
- Pick a system and stick to it. Same time, same person, same vines, same method, each year
- Try for +/- 5% accuracy

Berry Development



What is the right crop level?

- First... ask yourself, “why am I doing this?” What is out of balance.
- What is the target style of wine? What is the correct crop level to achieve it?
- Consider the economics of thinning – loss of fruit vs. loss of wine quality and price
- General guidelines for varieties:
 - Cabernet Sauvignon 3-6 t/a
 - Pinot Noir < 2.5 t/a
 - Chardonnay 3-6 t/a
 - Riesling 2.5-4 t/a



Crop Level

- Experiment with cropping trials on your vineyard, each block, within blocks
- Thinning to one cluster per shoot as a starting point on red hybrids and vinifera
- Crop estimate at lag phase
- Thin aggressively prior to veraison, each subsequent pass has less impact on fruit ripening
- Continue to thin unripe (wings, berries, clusters) and diseased fruit
- Sort grapes all the way to the fermenter – sort pre/post crush



Vine Density and Yield per Vine

- Getting closer and closer
- What is the relationship between yield and quality?
- What is the fastest way to the bank?
- How much is quality of site a factor?



The Economics of Vine Density and Wine

1m x 1m

- 9 sq ft / vine
- 4840 vines per acre
- Assume 2 lb/vine
- 4.85 t/a
- @ 150 g/t > 3630 btls
- \$20/btl (Ausone is 200 euro)
- \$72,600 wine value/ac
- 14,520 linear feet
- \$25,200 for vines (@ \$5/plant)

8' x 5' (average in PA or NJ)

- 40 sq ft/vine
- 1089 vines per acre
- @ 4 t/a > 7.5 lb/vine
- 600 gal/3000 btls of wine
- @ \$15/btl (good quality)
- \$45,000 wine value/ac
- 5445 linear feet
- \$5445 for vines (@ \$5/plant)

Rubber Hits the Road: Post veraison vine physiology

Temperature

- enzymatic processes
 - flavor compounds
 - phenolic compounds
 - color
 - tannins
- finding the temperature sweet spot in the fruit zone

Water and Nutrients

- essential for all processes
- the right amount at the right time

Light

- photosynthesis
 - sugars
 - brix
 - fuel for metabolism

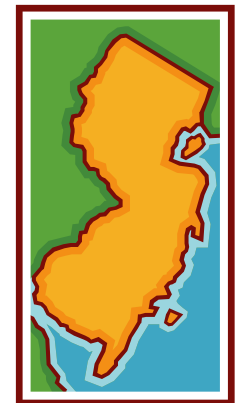
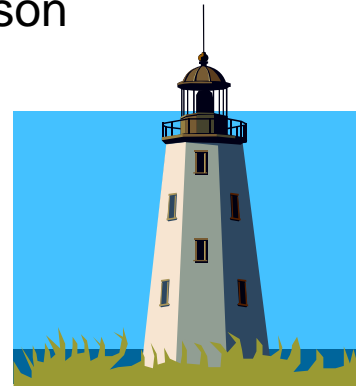
The challenge for all viticulturists:

How to get the tannin, color, alcohol and flavor curves to intersect at optimal degrees for each component before the weather runs out or other conditions force the harvest (MPs can also be considered)

Examples:

- California – too much heat, alcohol is out of balance, flavors deficient
- Long Island - very cool, Cabernet Sauvignon often lacks full flavor profile, tannins can be harsh
- Oregon – climate change has pushed ripeness until PN character is upset
- Germany - cool evening temperatures retain acidity for aromatic white varieties
- New Hampshire – cool and short ripening season
 - Cold winters
 - variety choice is critical – what grows vs what sells

Finding the warm spots



Fruit Uniformity

- Uniformity and synchrony are the keys to quality. Strive for them.
 - Uniformity of composition/quality
 - Uniformity of ripeness
 - Uniformity in space:
 - Areas of the vineyard (soil and topography)
 - Sides of the trellis (divided canopies, especially)
 - Within the vine (“big vines”, especially)
 - Uniformity in time: Synchrony
 - Ripeness simultaneous throughout vineyard
 - Flavor and mouthfeel ripeness simultaneous with sugar and acid ripeness

Leaf pulling strategies

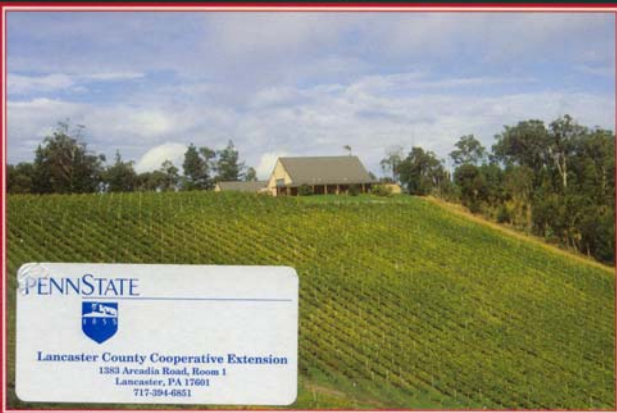
- Sunlight/warmth pushes ripening, manipulate shade/exposure to create optimal environment
- Morning side early season
- Afternoon side prior to veraison if sunburn is not a threat (leaf removal will lower MPs)
- Post veraison: more aggressive removal if rain and temperature affect ripening



Too much!

VITICULTURE *and* ENVIRONMENT

JOHN GLADSTONES



W I N E T I T L E S

Sunlight into Wine

A HANDBOOK FOR WINEGRAPE CANOPY MANAGEMENT



Richard Smart & Mike Robinson



O.I.V. AWARD WINNER
1992



Thank you!

Great Wine in the Movies



Great Vintages: Michael Broadbent
1947 Ch. Cheval-Blanc, St.-Emilion



*For those who were unaware of its success in the 1921 and 1929, 1947 was the first really eye-opening vintage of Cheval-Blanc. It did for this chateau what the '31 vintage did for Quinta Noval; set it on a pedestal. I have been privileged to taste Cheval-Blanc '47 on ten occasions from 1959, when it was impressive but seemed unready, though the 1960s, when it was consistently rich and lovely. Three bottled by Harvey's were excellent; two Belgian bottlings, rich but showing some end acidity in 1977. Last tasted from a chateau-bottled magnum: colour still very deep and fine; a complacent, abundantly confident bouquet, calm, rich, distinguished – but it did not open up and blossom in the glass like a great Medoc; slightly sweet, plump, almost fat, ripe, incredibly rich, high in alcohol. A magnificent wine, almost port-like. Last tasted at Sainsbury Club dinner, April 1980 ***** Drink now – ad infinitum?*

<http://www.slate.com/id/2184371/nav/tap3/>

**Lots of Questions?
Few Answers.**



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