Grape Growing 102

Thank you to the following for contributing to this presentation:
• Rebecca Harbut - University of Wisconsin Madison, Extension Fruit Specialist
• Kevin Schoessow – Agriculture Agent NW Wisc – Spooner
• Tim Rehbein - Agricultural Agent Vernon County
• Dean Volenberg - Agricultural Agent Door County
• Wisconsin Grape Growers Association

Answers To Questions
• Site Selection and Soil Science
  • Wine or Table Grapes
    – Which Varieties to Plant
  • Planting, Trellis, etc…..
  • Vine Anatomy and How To Prune and Train
  • Pest Problems
  • Harvest

Site Selection
Location - Cold
• SE-S-SW facing slope
  • Air drainage down slope to open area
  • Avoid cold air traps at bottom of slope
  • Avoid sheltered areas with little air movement
  • Frost free season of 140-150 days
• 2000 Heat Units 50 °F
• Lowest temps. -10 to (-15) °F is ideal, -20 °F tolerable

For More Information on Wisconsin Climate.
State Climatology Office
http://www.aos.wisc.edu/~sco/seasons/winter.html#Temperature

Site Selection
Location - Heat Accumulation

Heat Accumulation is the other half of the story

Site Selection
Soil and Soil Test
• Soil
  – Well-drained loam
  – pH 6.0 to 7.2
  – 125-150 ppm K₂O
  – 30-50 ppm P₂O₅
  – 1 to 2 oz nitrogen/plant
  – Split application during first year

• Soil Sampling
  – Sampling Soils for Testing A2100
  http://learningstore.uwex.edu/Assets/pdfs/A2100.pdf
  – Sampling garden soils and turf areas for testing A2166
  http://learningstore.uwex.edu/Assets/pdfs/A2166.pdf
Vine Balance

• DO NOT OVER-FERTILIZE
• 1 cup of a 9-23-30 is sufficient

Wine or Dine

• Wine Grapes (15 pounds per plant)
  – Numerous hardy varieties to choose from
  – White or red wine
  – Quality dependent on
    • Growing conditions
    • Crop load management
    • Training system

• Table Grapes (Can get to 20 pounds per plant)
  – Seedless varieties both blue, red, and green/white
  – Somewhat reduced hardiness
  – Easy to grow
  – Unique flavors and qualities
  – Juice options for some seeded varieties
  – Some folks will eat seeded grapes

Wine or Dine or Sublime

Some uses of the grape vine in the backyard or horticultural setting are for mainly visual purposes
For example on an arbor
NOT for fruit production
Don’t over fertilize
Don’t have to worry about critters
Don’t have to worry about colored bird poop!

The University of Minnesota is breeding a vine just for this purpose

Table Grape Varieties

• Red Seedless Varieties
  – Reliance (Arkansas)
  – Einset (New York)
  – Vanessa (Ontario)
  – Canadice (New York)
  – Petite Jewel (Wisconsin, Swenson)
  – Somerset seedless (Minnesota)

Reliance

• Vines hardy for zone 5 (T.R.)
• Early ripening
• High production potential
• Medium sized cling skin berries
• Mild flavor and good quality
• Variable fruit color if shaded
• Consistent performance

Einset

• Vines are hardy with moderate vigor zone 5 (T.R.)
• Early ripening after Reliance
• Medium sized berries, slightly thick cling-slip skin
• Mild flavor, strawberry after taste
• Production level variable
• Good storage potential
• Hardy -15 to -25 °F
<table>
<thead>
<tr>
<th>Table Grape Varieties</th>
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<tbody>
<tr>
<td><strong>Vanessa</strong></td>
<td></td>
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<tr>
<td>• Moderately hardy, vigorous vines</td>
<td></td>
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<tr>
<td>• Zone 5 (T.R.)</td>
<td></td>
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<tr>
<td>• Prefers well-drained fertile soils</td>
<td></td>
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<tr>
<td>• Early ripening with Einset</td>
<td></td>
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<tr>
<td>• Medium sized berries, thin skinned cling skin with very firm crisp flesh</td>
<td></td>
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<tr>
<td>• Production and vigor site dependent</td>
<td></td>
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<tr>
<td>• Very high quality and storage life</td>
<td></td>
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<tr>
<td>• Hardy -15 to -25°F</td>
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</tbody>
</table>

| Canadice               |              |
|• Vines are hardy, moderate vigor |
|• Zone 5 (T.R.)         |              |
|• Sets heavy crops limiting vigor |
|• Ripens with Einset    |              |
|• Medium sized berries slip skin tendency, somewhat soft flesh |
|• Good quality, similar flavor to Delaware, *Labrusca* (foxy) flavor |
|• Cluster thin to maintain vigor |
|• Hardy -10 to -20°F    |

| Petite Jewel           |              |
|• Very hardy, moderate vigor vine |
|• Zone 4                |              |
|• Ripens with or before Reliance |
|• Berries small-medium size |
|• Firm flesh, fruity-spicy flavor |
|• Small loose clusters |
|• Very consistent performer for harsh winter conditions |

| Somerset Seedless      |              |
|• Very vigorous vine    |              |
|• Zone 4                |              |
|• First to ripen at WMARS trial – end of August |
|• Berries small-medium size |
|• Clusters ~ ¼ lb       |              |
|• Loose clusters        |              |
|• Very consistent performer for harsh winter conditions |

<table>
<thead>
<tr>
<th>Table Grape Varieties</th>
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<tbody>
<tr>
<td><strong>White/Green Seedless</strong></td>
<td></td>
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<tr>
<td>– Marquis (New York)</td>
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<tr>
<td>– Himrod (New York)</td>
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</tbody>
</table>
Himrod

- Moderately hardy and vigorous
- Zone 5 (T.R.)
- Medium sized cling skin berries
- Ripens with Einset
- High quality fruit and flavor
- Excellent storage potential
- Hardiness is still questionable for reliable production in northern areas of WI

Table Grape Varieties

- Blue seedless
  - Trollhaugen
  - Mars

Mars

- Hardy vigorous vines
- Zone 4 if protected (T.R.)
- Midseason maturity
- Medium-large, slip skin berries, somewhat thick skinned
- Concord type flavor, good quality and storage potential
- Very productive and reliable

Trollhaugen

- Very hardy vines of moderate vigor
- Zone 4 and possibly zone 3?
- Early maturity before Mars
- Small, thin skinned slip skin berries
- Excellent mild Concord flavor for fresh market sales
- Very productive and reliable with good storage potential
- Excellent for harsh winter conditions

Seeded Varieties

- Buffalo
  - Concord type, hardy, vigorous, early maturity
  - Large fruit of excellent quality
- Swenson Red
  - Red variety, very hardy, late maturity
  - Large fruit, firm, excellent quality, needs heat
- Bluebell
  - Concord type, early maturity
  - Very hardy
  - Reported as best juice variety
- Concord
  - Old favorite
  - Very hardy, very vigorous
  - Needs heat and long season

Wine Varieties

- Red Wine
  - Foch
  - St. Croix
  - Frontenac
  - Leon Millot
  - Marquette
  - Baltic
  - Petite Pearl
- White Wine
  - La Crescent
  - La Crosse
  - St. Pepin
  - Frontenac gris
  - Brianna
  - Edelweiss
Marechal Foch
- Very hardy vines zone 4b
- Low to moderate vigor
- Early maturity
- High sugar and high acid
- Making some nice wines

St. Croix
- Very hardy vines 4a & b
- Moderate vigor
- Matures early
- Harvested at low sugar
- Very productive
- Popular wine variety in MN

Frontenac
- Very hardy MN introduction
- Vigorous and very productive
- Good disease resistance
- Except for black rot
- Susceptible to Grape Phylloxera
- High sugar 24-28%
- Very high acid
- Matures early October
- Deep red color for ports

Leon Millot
- Hardy, vigorous vines zone 4a
- Ripens before Foch, early season
- Produces good quality Burgundy
- Very productive
- Relatively disease free
- Good choice in short season area
- Relative of Foch

Marquette
- Very hardy MN introduction
- Moderate vigor
- Production levels of 10#/plant
- Matures mid-late September
- High sugar relatively low acid
- Good disease resistance

Baltica
- Introduction from Estonia
- Parentage: V. amurensis, V. labrusca, V. riparia, and V. vinifera
- Long loose clusters
- Small sized berries (2 g)
- Disease resistant except P. mildew
- Makes a light red to full complex red wine, climate dependant
- Excellent variety for short growing season
### Petite Pearl
- Introduction from MN Breeder Tom Plocher
- Matures mid-September to early October in MN
- Compact cluster with small berries
- Breaks bud late (frost protection)
- Disease resistant to P. mildew, D. mildew, and black rot
- High tannin levels and low TA

### La Crescent
- Very hardy
- Vigorous and productive
- Resembles Vignoles in flavor
- High acid/High sugar
- Low disease susceptibility except for downy mildew
- Matures late September

### La Crosse
- Hardy vines, moderate vigor
- Early midseason maturity
- Produces fruity non-labrusca wine
- Very productive
- Unique flavor even as a table grape
- Consistent producer
- Can get bunch rot

### St. Pepin
- Very hardy, vigorous vines
- Midseason maturity
- Pistillate type needs pollinator which is usually La Crosse
- Produces fruity Riesling type wine
- Moderate production
- Blends well like La Crosse is a good table grape
- Out of all the whites, most in demand by winemakers

### Frontenac Gris
- Bud sport of Frontenac
- Same viticultural characteristics as Frontenac
- Late midseason 24 to 25° Brix (MN)
- Peach, apricot, and tropical aromas
- Very winter hardy

### Brianna
- Bred by Elmer Swenson and named by Ed Swanson
- Medium to large berries
- Medium to small tight clusters
- Vigorous growth
- Very cold hardy
- Grapefruit, tropical, floral characteristics
- Often harvested at low brix 16 to 18, as ripening progresses foxy notes become apparent
Edelweiss

- Bred by Elmer Swenson in the 1970's
- Medium to large berries
- Fairly loose clusters
- Vigorous growth
- Very cold hardy
- German style sweet/semi sweet wine
- Often harvested at low brix 16 to 18, as ripening progresses foxy notes become apparent
- This photo has hail damage

Planting

- Select North-South row orientation
- Most of the plants are bare root stock
- 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

Trellis Construction

- Trellis responsible for vine + crop weight
  - 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
  - Keep shoots off of ground
- Training systems for trellis
  - Cane pruning
  - Spur (2-3 bud cane) pruning

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
**Vine Anatomy**

**CANES, CORDONS AND SHOOTS... OH MY!**

- **Cordon** - permanent stem
  - Trained horizontally
  - Not all systems have cordons
- **Cane**
  - One year old shoot
  - **SPUR** - Canes pruned to 2-3 buds
- **Shoot**
  - Current season's growth
  - Bear fruit clusters

**Pruning and Training**

[Link](http://ohioline.osu.edu/b919/)
Pruning and Training

Initial Pruning from planting to fruiting

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

Training Methods

High Cordon
Use for trailing grape cultivars

Low Cordon
Use for upright grape cultivars

Training Methods

Low-Cordon Vertical Shoot Positioning

Pruning Rules

40 buds per plant for medium to larger cluster grapes
Up to 60 buds per plant for smaller cluster grapes
The 2013 growing season is developing the 2014 crop
For a mature vine, you will remove 80-90% of last year's growth

Pruning Rules

Year one is for developing the root
Year two is for developing the trunk
Year three is for developing the cordon and maybe a little fruit, 5-10 fruiting buds
Year four is for more fruit, 20 fruiting buds
Year five should be a mature vine

Pruning Rules

When you start to prune, you have to be able to tell what was last year's growth which is usually a nice light brown color
Grape Pests

- Weed management critical during establishment years
  - Start weed free
  - Maintain weed free zone in rows
  - Weeds impede air flow resulting in potential higher incidence of grape diseases

Diseases Problems

- Powdery Mildew
- Downy Mildew
- Black Rot
- Phomopsis Cane and Leaf spot
- Copper and Sulfur Sensitivities

Diseases Problems

- Producing organically or naturally does NOT mean “do nothing”
- If you want fruit and you want to do it organically, as a rule of thumb, you will be using twice as much product and spraying twice as often
- A dormant application of lime sulfur will help
- At minimum, apply the dormant lime sulfur and then spray fungicides just before bloom, at bloom and just after bloom
- Midwest Fruit and Grape Spray Guide

Powdery Mildew

- Fungal Disease
- Can infect all green tissue
- Cluster petioles and stems
  - Susceptible all season
- Berries susceptibility
  - Based on sugar content
  - <10% high, >10% none
- Overwinters in buds & canes
- Dependent on environment
  - Temps. 68-80F
  - Cloudy and High Humidity
## Powdery Mildew Management

**Early Control is Critical**
- Heavy rains will disrupt development
- Dry, warm, am/pm dews favor development
- Fungicide applications; 8-10" shoot-pre-bloom
  - 2-3 Applications, repeat Sept-Oct.; Weather dependent
- **Commercial**
  - Nova
  - Rally, Elite, Procure
  - Strobilurins; Sovran, Flint
    - Broader spectrum; Control other diseases
    - Protective qualities
- **Home vineyards**
  - Immunox (Myclobutanil)

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## Downy Mildew

- **Fungal disease**
- **Overwinters in infected leaves**
- Early leaf infection moves to blossoms
- Favored by rapid growth + wet conditions
- Ideal temperature for infection 65° F

## Downy Mildew Management

- Susceptibility Dependent on Variety
  - Vinifera hybrids most- American least
- **Control Starts Early**
  - Initial shoot growth to pre-Bloom
  - Critical before bloom to prevent fruit infection
  - Fungicide applications very effective
  - Continue 10-14 d interval dependent on weather
- **Commercial**
  - Sovran, Flint, Dithane, Mancozeb or Captan
- **Home**
  - Captan, Dithane

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## Black Rot

- **Fungal disease infecting leaves- fruit**
  - Overwinters in mummified fruit
- **Infests early leaves**
  - Requires a wetting period
    - Temperature + rainfall(1".) + Hrs. leaf wetness
    - Sporulates on leaves and infects fruit
    - Susceptibility lessen as leaves, fruit mature
  - Control with Captan, Dithane
    - Begin at Pre-bloom – Verasion (fruit coloring)
    - Intervals of 14 days, 21 days dry weather

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## Phomopsis

- **Fungus Overwinters In Canes and Buds**
- **Spores Released in Spring**
  - Needs Free Water
  - Optimum Temps. Of 65-70F
  - Susceptibility
    - Very Young Tissue of Stems and Fruit
    - Bud Break – Early Fruit Set
    - Varies Among Varieties

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## Phomopsis Management

- **Sanitation**
  - Remove all dead and infected canes
  - Use only clean healthy propagation wood
- **Fungicide Program**
  - Start early shoot development
  - Continue through fruit set-pea sized fruit
  - Early protection
    - Captan, Dithane
Grape Insects

- Grape Berry Moth
- Grape Leafhopper
- Grape Flea Beetle
- Rose Chafer
- Sporadic Pests

Grape Berry Moth

- Overwinters in cocoon on ground
- Adults emerge May 15-June 15
- Eggs laid near/on grape clusters
- Look for webs on clusters
- 1st Generation pupate in leaf
- 2nd Generation larva enter fruit
- Larvae leave fruit to pupate in leaves and debris on ground
- Control with Sevin if detected

Leafhoppers

- Grape and Potato
- Overwinter or migrate
- Feeding speckles leaves
- Examine leaf undersides
- High populations
  - Can Stunt Vines
  - Fruit Quality Affected
- Treatment
  - Imidacloprid, Imidan, Sevin

Grape Flea Beetle

- Emerge in Spring
  - Feed on swelling buds
- Lay eggs on emerging leaves
- Hatching larvae feed on lvs.
- Monitor on warm spring days
  - Apply Danitol or Sevin to active adults
  - Can cause significant damage

Rose Chafer

- Larvae overwinter in soil
- Adults emerge at bloom
- Adults feed on blossoms developing, fruit, and leaves
- Common pest in light sandy soils
- Control with Sevin, Danitol, and Assail

Sporadic Pests

- Phylloxera
  - Aphid-like insect
  - Foliar most important to Midwest
  - Root feeding important to Vinifera hybrids
  - Produces galls on leaves
  - Sevin or Danitol at pre-bloom if galls present
- Japanese Beetle
  - Biggest problem in southern WI
  - Monitor and spray
  - Do not use Japanese beetle traps
Grape Pests and Phenology

<table>
<thead>
<tr>
<th>Growth stage</th>
<th>Visual</th>
<th>Modified Eichhorn-Lorenz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bud swell</td>
<td>1-5&quot;</td>
<td>2-3 7-13 14-18 19-22 23</td>
</tr>
<tr>
<td>Shoot 8-12&quot;</td>
<td>14-18</td>
<td>23 31 32 33-34 35 36-37</td>
</tr>
<tr>
<td>Pre-bloom</td>
<td>19-22</td>
<td>38 39-47</td>
</tr>
<tr>
<td>Bloom</td>
<td>Pea-sized</td>
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<tr>
<td>Berry touch</td>
<td>Berry</td>
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<tr>
<td>Bunch closing</td>
<td>Bunch</td>
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<tr>
<td>Verais</td>
<td>Verais</td>
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<tr>
<td>Harvest</td>
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<tr>
<td>Post-harvest</td>
<td>Post-harvest</td>
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</tbody>
</table>

Insects
- Cutworm: ++
- Grape Flea Beetle: +
- Rose Chafer: +++++
- Grape Berry Moth: +++++++ +
- Grape Leafhopper: +++ ++
- Potato Leafhopper: +++ +
- Japanese Beetle: +++

Diseases
- Phomopsis: ++++++++ +
- Black Rot: ++++++++ 
- Downy Mildew: ++++++ +
- Powdery Mildew: ++
- Botrytis Bunch Rot: + + + +

Other Grape Pests
- Robin
- Starling
- Pileated Woodpecker
- The smaller and redder the berry the more they like them - Netting

Mid-Summer
- Leaf removal around clusters at veraison
  - Remove from east side/north side first
  - Helps with color and sugar development
- Cluster Thin if needed
  - Usually 2 clusters per shoot for large berry
  - 3 clusters per shoot for smaller berry
- Shoot Thinning
  - Remove secondary shoots that develop
  - Keep shoots growing up or down and NOT sideways

Pre-Harvest
- More leaf removal around clusters at veraison
  - From the south/west side if it is cooler than normal growing season
  - Can get sunscald
- Deer
  - Delightful to see but can eat a cluster at a time
  - Fence, repellants (non-bearing years)
- Raccoon
  - Peels the grapes first
  - Electric fence, they will rip plastic bird netting
  - Trap out
Harvest

- Harvest – Use a Refractometer to test
  - Table grape harvest
    - Multiple harvests for color and flavor
    - Grapes do not develop more flavor after harvest
    - Store at 35°F for up to 7 days
  - Wine grapes
    - Sugar development and acid reduction
    - Should be 20%+ (variety dependent)
    - Can store in refrigeration for several days before processing

- Double check all the Pre-Harvest Intervals (PHI) of all the products that you used on the grapes.

Advanced Pruning – The Challenge

Advanced Pruning – The Options

- Cut them all off at the base of the trunk in spring and hope for suckers to grow this year...50/50 chance
- Prune back into balance...80/20 chance
- Take dormant 4 bud count cuttings during February or March and propagate them first, then go with one of the options above

Advanced Pruning – Let’s Prune

- Cut out all the known dead material
- Follow dead vines to trunks and cut them out if dead
- If buds are tight, it is easier to pull out prunings
- Keep track of good shoots
- You WILL make cutting errors – just don’t make it a finger or hand!

Advanced Pruning – ID the good

Advanced Pruning – Count buds
Advanced Pruning—What a difference

Information

• Wisconsin Grape Growers Association
  http://wigrapes.org/
• Weekly Grape IPM Scouting Reports
  http://www.uwex.edu/ces/cly/door/
• Grape Cultivar Trials @
  – West Madison ARS
  – Peninsular ARS
  – Spooner ARS

Upcoming Events

For the commercial growers ......
All grape production events are always posted on the Wisconsin Grape Grower’s Website
http://wigrapes.org/