Michigan’s Fruit/Grape Growing Regions

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Topics to be covered

• The history of fruit growing in Michigan.
• What is the relationship between traditional growing and production of tree fruit and wine grape production?
• Wine grape variety selection determines the impact of tree fruit and grapes

The Michigan fruit industry continues to be a leader among fruit crops in the United States. Our climate, soils, and established marketing and processing businesses lead the way for the Midwest and Eastern United States in producing abundant amounts of high quality products.
In the last 25 years, numbers of Michigan fruit farms and farmers has been significantly reduced due to challenges in profitability and competition. The 106,000 acres of fruit produced at the end of 2012 represents a comparative loss of 20,000 acres over 9 years (www.nass.usda.gov/Statistics_by_State/Michigan).

Development and history of grape industry parallels the fruit industry

- 1679 French Explorers 1679 made wine from Vitis riparia wild grapes.
- Mid-1800s Viable wine industry is established with vineyards and eight wineries in Monroe County. None survived prohibition.
- 1880 Southwest Michigan’s wine industry begins with Concord grapes as backbone.
- The earliest apple trees planted in Michigan were probably at the French settlement of Detroit in the 18th century.
- French culture has a long tradition of apples and cider.
- The first official Michigan apple statistics were compiled in 1889. Production that year was 13.16 million bushels.

Fruit Growing History in Michigan

- First settlers, many recent immigrants from Europe established farms with fruit.
- In southwest Michigan, peaches were planted by William Burnett, who established a trading post on the west bank of the St. Joseph River a mile upstream from Lake Michigan in the 1780s. Early settlers found his orchard still surviving and producing in the 1820s*
- The earliest apple trees planted in Michigan were probably at the French settlement of Detroit in the 18th century.
- The first official Michigan apple statistics were compiled in 1889; 13.16 million bushels vs 2011; 25 million bushels.

Early Apple Orchards
- Low Density Systems
  * Return on Investment was Low
  * Labor and land available and cheap

Transition to High Density Orchard Sites
- Vineyard Sites
  - Lemon Creek Farms, Berrien Co.
  - Brengman Bros., Crain Hill Vineyard, Suttons Bay

Peaches
Vinifera wine grapes

What has had the most impact on geography of fruit growing in Michigan?

1. Climate
2. Topography
3. Soil characteristics
4. Markets
Climate has had the greatest impact on fruit growing regions

- Determines fruit species and varieties we can grow.
- Fruit quality (summer temperatures)
- Consistency in fruit production (frosts and freezes and winter low temperatures)

Majority of Michigan fruit produced within 50 miles of Lake Michigan shoreline.
Lake Michigan moderates our climate to allow Michigan to Grow 106,000 acres of fruit crops. Lots of energy released in the process of freezing large bodies of water. Water helps neutralize effects of low temperatures > microclimates.
Low Temperatures; midwinter and beyond

Average Number of Days with Temps Below -4F

Data and maps prepared by Aaron Pollyea, Peter Kurtz, and Tracy Aichele, Michigan Climatological Resources Program, Michigan State University Department of Geography, based on data from the NOAA, 1952-2001.

www.grapes.msu.edu/climate.htm

Bud hardness of Montmorency Tart Cherry

Adapted from J. Flore, MSU

Winter Hardiness

- Hardiness holds as long as temperatures remain fairly cold.
- LT_{50} = the temperature at which 50% of buds are killed (controlled test studies).
- Fluctuations in hardiness occur with warm spells during winter = de-acclimation. (CURRENT SITUATION) re-acclimation possible when followed by normal cold winter temperatures.
- Once chilling requirement is satisfied (NOW), trees can't re-acclimate to hardness levels obtained earlier in the winter = vulnerable to injury.
- Chilling requirement/satisfaction most efficient at around 42-48 degrees F. Temperatures above and below do not contribute as much.
Low Temperature Episodes and Effects on Fruit Growing

Three Crucial Periods

- Spring
- Fall Harvest
- Winter = Dormancy

Snow provides insulation

Low temperatures recorded winter 2014

Extreme minimum temperatures during winter 2014 @ 240 Environweather & NOAA sites

Jeff Andresen, March, 2014 Fruit AOE CAT Alerts
Spring Frosts are especially harmful to bloom in tree fruit

Late Winter and Spring Frost

Grapes

Concord grapes – primary bud killed, forcing secondary bud
Elevation/Topography Important

- With respect to surrounding area
- **Cold air drainage**
- Aspect; important for heat units and sugar accumulation in fruit
- Helps avoid crop loss due to spring frost and severe low temperatures in winter.

Elevation – Slope – Frost Pockets

Slope: Aspect (compass direction)  
Grade (steepness)
3/4/2019

Southwestern slope/aspect

Verterra Winery

Classification system; Appellations in France best sites in France are identified based on “terroir” which includes south to southwest exposure

South exposure slope, Mosel River

Trittenheim, Mosel River, Germany
Topography of the State

Near Freesoil, MI: peaches on a site, Some 30 feet above surrounding field Crop land

Even slight elevation differences can make a huge difference in microclimate

Frost injury (brown vines) from June freeze, Lawton, MI
Mid / Late Winter - Inciting Damage

Damaged French hybrids
Low section of a site
Winter 2008/09
Leelanau Peninsula

Select crops to fit site:
Soybeans growing in the flat and Concord grapes up an adjoining hill, SW, MI

Tart cherries
Sweet cherries
V. Vinifera grapes (Riesling)
Impact of frosts During harvest

Low Temp Event Oct 2009
Leelanau Peninsula, Northern Michigan
Images taken Oct 15, 2009

Frost in fall = shutdown of functioning leaves

- Grapes are a non climacteric (respiration) fruit

**Non Climacteric Fruit** (strawberry, grapes, citrus) – sugar content does not improve post harvest.

- Non climacteric fruits tend to maintain what ever quality they had at harvest without many beneficial changes (grapes, pineapple, citrus).

What has had the most impact on geography of fruit growing in Michigan?

1. Climate
2. Topography
3. Soil characteristics
4. Markets
Soils are not as limiting as Climate and Topography to fruit/grape growing

- Retaining moisture and nutrients
  - Grapes: Can be slightly infertile
- Prefer good internal drainage
- Provide enough depth in tilth to host roots and anchorage
- Source of moisture and nutrient supply

Vineyard Sites in the Old World:

- Elevation (topography)
- R.Perry, Hort Dept, MSU

Wine Grape Varieties
Varietal Discrimination

Dominating 8-9 Retail
Cabernet Sauvignon
Merlot
Chardonnay
Pinot Noir
Riesling
Sauvignon Blanc
Pinot Gris/Grigio
Zinfandel

Determine your wine business model!!

- How important is it to produce and sell wine made from Vinifera varieties?
- The primary varieties that make up the wholesale/retail industry?
- Answers to these questions helps determine site selection.
- Do you want to grow local fruit > wine?
  - Cold hardy varieties not as popular in wholesale markets, but fit tasting-room-needs.
  - Provide volume for proprietary blends.

Variety Selection

Following list of cultivar groups are ranked in order of market/consumer interest and are in inverse order of cold tolerance:

1. **Vinifera Cultivars**: Chardonnay, Riesling, etc. (Limited to areas above -4 degrees F. mean low temp – Best Sites).
2. **French Hybrids**: Older cultivars developed in France using species native to America which were crossed with Vinifera cultivars to increase cold tolerance and resistance to pests (Vidal, Seyval, Chambourcin, Foch, etc). Contemporary breeding programs exist in America (NYAES, Geneva) and in Europe, with this goal in mind (Cayuga White, Caro Noir, etc). (Limited to Fruit production areas)
3. **American Hybrids**: beginning with the breeder T.V. Munson, there were many varieties developed such as Cynthiana, Norton, Delaware, Niagara and Concord used for wine and juice production. (Limited to Fruit production areas).
4. **Super Hardy Hybrids**: Minnesota varieties such as Frontenac, LaCrescent, etc. (Many areas in Michigan).
### Relative comparison of grape and fruit and winter cold tolerance levels

<table>
<thead>
<tr>
<th>Cold Hardiness Class</th>
<th>Range of Critical Low Temperature</th>
<th>Species Category</th>
<th>Varieties**</th>
<th>Tree Fruit Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Tender</td>
<td>5°F to 10°F</td>
<td>Wild V. R.</td>
<td>V. Rotundifolia, Cowart, Scuppernong, etc.</td>
<td>Fig, Satsuma Tangerine</td>
</tr>
<tr>
<td>Very Tender</td>
<td>10°F to 0°F</td>
<td>V. Vinifera</td>
<td>Chenin Blanc, Rhone varieties, Semillon, Sauvignon Blanc, Zinfandel, Cabernet Sauvignon, Sangiovese, Merlot, etc.</td>
<td>Walnut, Almond</td>
</tr>
<tr>
<td>Tender</td>
<td>0°F to 15°F</td>
<td>V. Vinifera</td>
<td>Gewurztraminer, Pinot noir, Pinot gris, Chardonnay</td>
<td>Apricot, Japanese Plum (ex. Santa Rosa)</td>
</tr>
<tr>
<td>Moderately Tender</td>
<td>15°F to 20°F</td>
<td>V. Vinifera &amp; hybrids</td>
<td>Riesling, Cabernet Franc, Lemberger, Gamay noir, Chambourcin, Zinfandel, Blaufränkisch (Lemberger), Dornfelder, Cрюг, etc.</td>
<td>Peach (variety dependent)</td>
</tr>
<tr>
<td>Moderately Hardy</td>
<td>20°F to 25°F</td>
<td>Hybrid hybrids (French and American)</td>
<td>Château De Chamant, Seyve-Villard, Norton, Seyval blanc, Vidal blanc, etc.</td>
<td>Peach and Tart Cherry, Thompson seedless, Marquette, Frontenac, Pinot blanc, etc.</td>
</tr>
<tr>
<td>Hardy</td>
<td>25°F to 30°F</td>
<td>Hybrid hybrids, V. x labruscana</td>
<td>V. Lentil, Seyve-Villard, Constance, Chambourcin, Vignoles, Vignoles, etc.</td>
<td>Tart and Sweet Cherry, UNIQUE Prexel, Unique 189, Science, Indian Laurel, etc.</td>
</tr>
<tr>
<td>Very Hardy</td>
<td>30°F to 35°F</td>
<td>Hybrid hybrids, V. x labruscana</td>
<td>V. Lentil, Seyve-Villard, Constance, Chambourcin, Vignoles, Vignoles, etc.</td>
<td>Tart and Sweet Cherry, UNIQUE Prexel, Unique 189, Science, Indian Laurel, etc.</td>
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*Midwinter temperatures subject to variation according to plant phenology (early or late activity)

**Subject to variation according to clone

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### Grapes and Fruit

- **Vinifera Varieties (site dependent)**
- **French Hybrids**
- **American grapes (Concord, Niagara)**
- **Super Cold Hardy**
- **Peach, tart and sweet cherry**
- **Apple and Pear**
- **Cold Hardy Apple**
- **Saskat. Tart Cherries**