Frost Recovery in Vineyards

2008

General History of Spring Frost

- 2008: Statewide
  - Scattered outside of Lodi
- 2007: Winter injury
- 2006: Minor Frost (Just before budbreak)
- 2001: Frost
  - April 1-3: East SJ Co. & North Delta
- 1999: Frost
  - April 10: East SJ Co.
- 1997: Frost
  - April 6: Scattered East
- 1996: Minor Frost
  - March 26: Scattered
- 1991: Winter Kill
- 1984: Minor Frost
  - (on right)
- 1983: Slight Frost
  - South County
- 1972: Major Frost
- 1968: Frost

Frost Damage

- What
- When
  - Spring Frost vs. Cold Damage
- Where
  - Low Areas
  - Obstructions
- Why

Cold Damage to Vines

- Winter kill
  - -10°F (-12°C)
- Spring frost
  - -31°F - ½ hour
  - -26° - 28°F

Budbreak and Frost

- March 15 – average
- May 1 – frost possibility until
- Prune late
- Double prune
- Variety & Site selection

Contributing Factors Frost

- Soil texture
- Slope & Aspect (drainage)
- Stage of Vine Growth
- Carbohydrate Status
- Variety
- Relative Humidity & Dew Point
- Weather Pattern up to Frost
Dew Point & Relative Humidity

Frost Damage
- Ice Nucleation
- Ice nucleating bacteria
- Ice Crystals
- Cell Rupture
- Cold Temperatures

Topography and Drainage

Pre-Frost Irrigation

Limitation of Drip Irrigation

Soil & Ground Cover
- Soil’s Capacity & Conductivity
- Dry & Cultivated
- Uncultivated & Bare
- Dry & Mowed
- Wet & Mowed
Cover Crop Benefits vs Costs

Spring Frosts

- 1933: Late April
- 1961: April 19 and 20
- 1964: April 24
- 1972: March 26, 27, and 28
- 1983: April 13
- 1984: April 20
- 1997: April 5
- 1999: April 9
- 2001: April 8
- 2006: April 15, 20 and 24

Weather Records and Monitoring

- History of Site
- Area temperature and weather data
- Thermometer Stations placed
- Weather Stations or Data loggers (low cost)
- Frost alarms
- NOAA web site [www.wrh.noaa.gov](http://www.wrh.noaa.gov)

Lodi District Weather Stations 2008

<table>
<thead>
<tr>
<th>April 7</th>
<th>15</th>
<th>26</th>
<th>30</th>
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<tbody>
<tr>
<td>Lodi</td>
<td>30.7</td>
<td>36.9</td>
<td>34.0</td>
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<td>Acampo</td>
<td>35.0</td>
<td>36.1</td>
<td>33.9</td>
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<td>Lockeford</td>
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<td>36.4</td>
<td>34.1</td>
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<td>Live Oak</td>
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<td>Wheatbridge</td>
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<td>Thornton</td>
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<td>Lodi West</td>
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<tr>
<td>Walnut Grove</td>
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<td>36.8</td>
<td>38.0</td>
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<td>Clay Station</td>
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<td>34.9</td>
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<td>Sheldon</td>
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Frost Damage Mitigation

- Trimming Damaged Tissue
- Shoot Thinning
- Cluster Thinning
- Removing All Shoots or Repruning
  Benefits < Costs  1933, 1967, 1972
- Adjust Management for Lower Crop

Doing Something vs Nothing

- Shoot Removal
- Repruning vs Thinning
- Self Recovery
- Shoot Removal

Winkler, 1933
Artcliff, 1957
Lider, 1965
Kasimatis & Kissler, 1972

Kasimatis & Kissler Trials

- Tokay, Carignane, Zinfandel, Chenin blanc, and Grenache
- Seven Sites
- Shoot Removal of all shoots, damaged shoots only, and a control with no adjustment
- Shoot removal done 3 days after frost

*1972 Frost March 28, 27, & 29

Harvest Yield 1972

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Total</th>
<th>Primary</th>
<th>Secondary</th>
<th>Basal</th>
<th>Latest</th>
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<tr>
<td>Remove All Shoots</td>
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<td>4.6</td>
<td>0.9</td>
<td>12.9</td>
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<td>Damaged Removed</td>
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<td>12.9</td>
<td>1.5</td>
<td>7.2</td>
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<td>Control</td>
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<td>14.6</td>
<td>0.9</td>
<td>4.8</td>
<td>1.3</td>
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</table>

Brix  NDB  (6.2-6.6 ‘Beat’)
T.A. NDB  (6.6-7 g/l.)
pH  NDB  -

Canopy/Crop Load Strategies

- Cluster Thinning  No
- Shoot Thin Damaged shoots if half or more of shoots killed to clusters and beyond  Maybe
- Shoot Thin if only shoot tips damaged  No
- Remove all shoots and start again  No
- Cut back to long spurs if cane pruned  Maybe
- Do nothing, but irrigate*  Yes (9/10)

*and normal pest control

Summary

- Irrigation normal or slightly more initially
- No extra nitrogen; less depending on crop
- Continue Pest Management, especially powdery mildew
- No cluster thinning
- No shoot thinning for most varieties and sites
- Cane pruned vines may benefit from re-pruning
- Some fruit buds developing for 2009 may be damaged, but many factors determine ultimate fruitfulness for next year.