

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 5 Scattered East |
| ▪ 1996 | Minor Frost | March 26 Scattered |
| ▪ 1991 | Winter Kill | |
| ▪ 1984 | Minor Frost | (one night) |
| ▪ 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

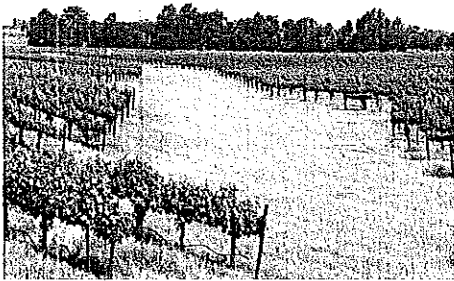
Dew Point & Relative Humidity

Frost Damage

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



Topography and Drainage



Pre-Frost Irrigation



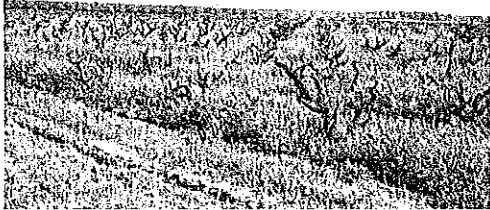
Limitation of Drip Irrigation



Soil & Ground Cover

- Soil's Capacity & Conductivity
- Dry & Cultivated
- Uncultivated & Bare
- Dry & Mowed
- Wet & Mowed

Cover Crop Benefits vs Costs



GROUND PREPARATION FOR FROST CONTROL

Warmest	WET, FIRM, BARE GROUND	+2 degrees F
	DRY, FIRM, BARE GROUND	-----
	SHREDED COVER CROP	-0.5
	FRESH DISCED	-2
	LOW COVER CROP	-1 to 3
	HIGH COVER CROP	-3 to 8
Coldest		

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
- 2008 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

Lodi District Weather Stations 2008

	April 7	15	20	24
Lodi	32.7	36.9	34.0	30.2
Acampo	35.0	39.1	33.9	32.1
Lockeford	34.3	35.4	34.1	33.8
Live Oak	32.7	39.5	35.6	33.3
Woodbridge	32.8	37.9	34.0	33.0
Thornton	33.4	38.5	35.8	32.3
Lodi West	35.0	40.0	36.0	35.0
Walnut Grove	33.6	36.8	30.6	32.1
Clay Station	35.5	34.0	31.6	31.3
Sheldon	34.7	33.6	33.3	32.6

Avg April Minimum 48° F

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 Winkler, 1933
- Repruning vs Trimming Antcliff, 1957
- Self Recovery Lider, 1965
- Shoot Removal 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 26, 27, & 28

Harvest Yield 1972

Strategy	Yield lbs per vine				
	Total	Primary	Secondary	Basal	Latent
Remove All Shoots	32.8	4.6	0.9	13.9	0.8
Damaged Removed	37.5	13.0	1.6	7.2	1.6
Control	38.1	14.6	0.9	6.8	1.3

Brix NSD (0.2-0.6 °Brix)
T.A. NSD (0.3-0.7 g/L)
pH NSD -

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.