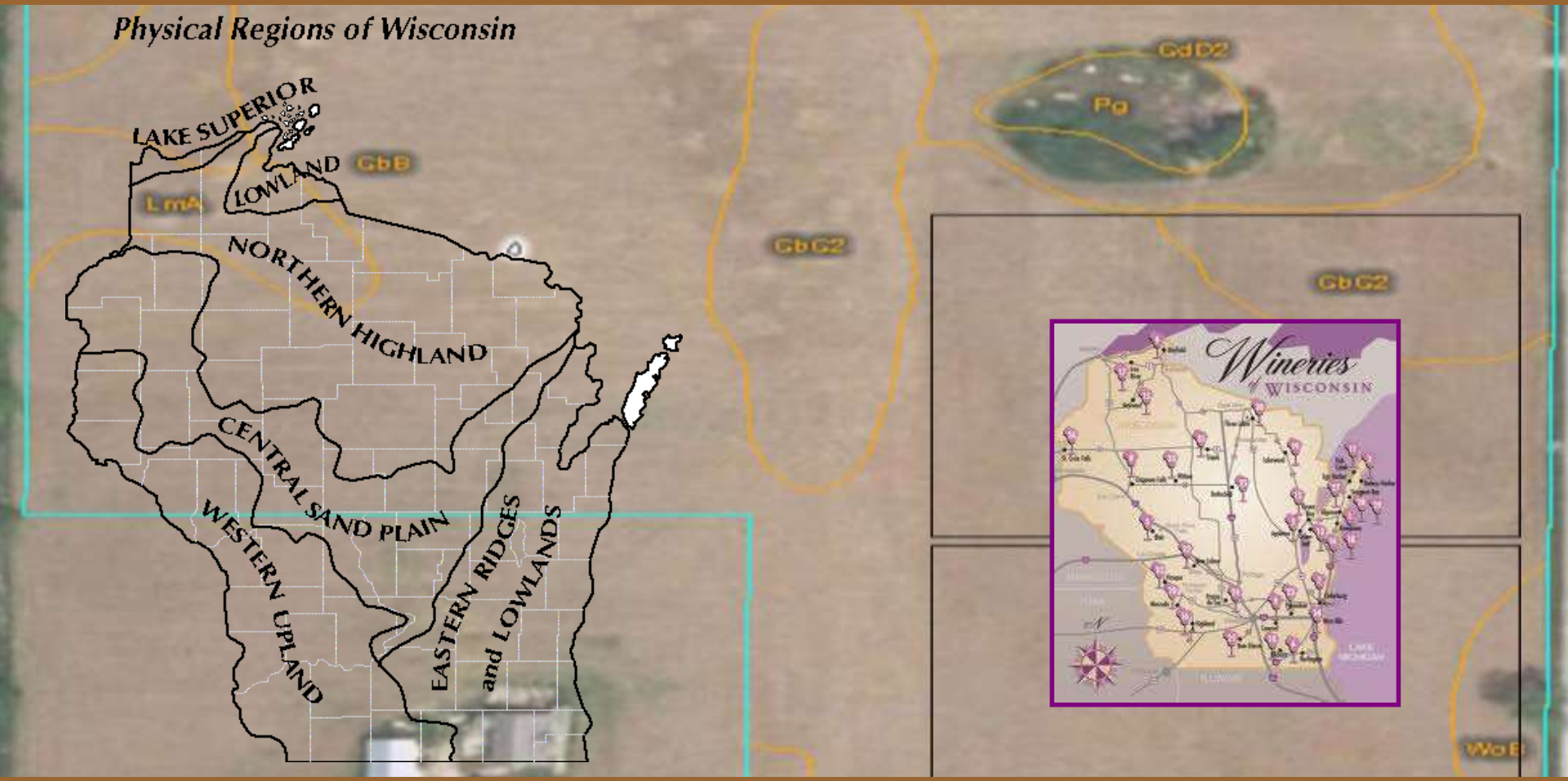
# Vineyard Site Selection and Layout




Dean Volenberg

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# Vineyard Site Selection

## Climate & Geographic Location

French American hybrid wine grape plants are a phenologically distinct crop with the most important developmental stages being débourement (budburst), floraison (flowering), full bloom, veraison (color change and maturation), and harvest (grape maturity). The time between these phenological stages varies greatly with grape cultivar, climate, and geographic location. Understanding the phenology of a given plant system is important in determining the ability of a region to produce a crop within the confine of its climatic regime.

# Vineyard Site Selection

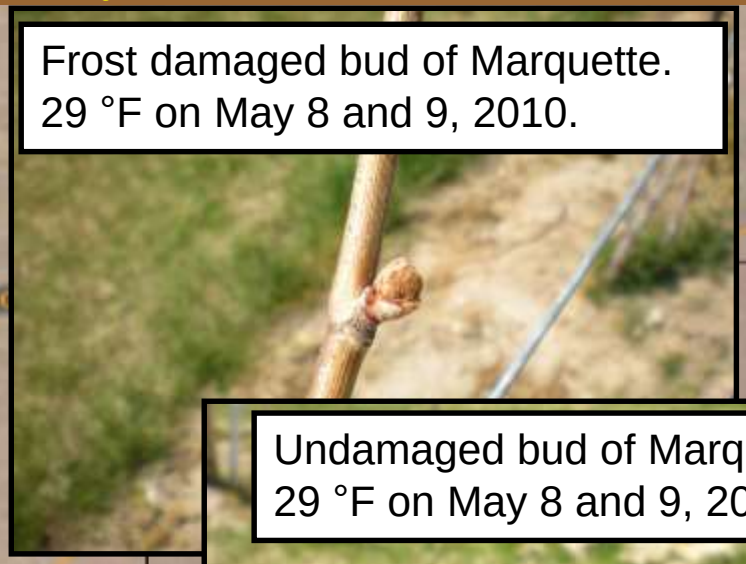
## Climate & Geographic Location

French American hybrid wine grape plants are a phenologically distinct crop with the most important developmental stages being débourement (budburst), floraison (flowering), full bloom, veraison (color change and maturation), and harvest (grape maturity). The time between these phenological stages varies greatly with grape cultivar, climate, and geographic location. Understanding the phenology of a given plant system is important in determining **the ability of a region to produce a crop within the confine of its climatic regime.**

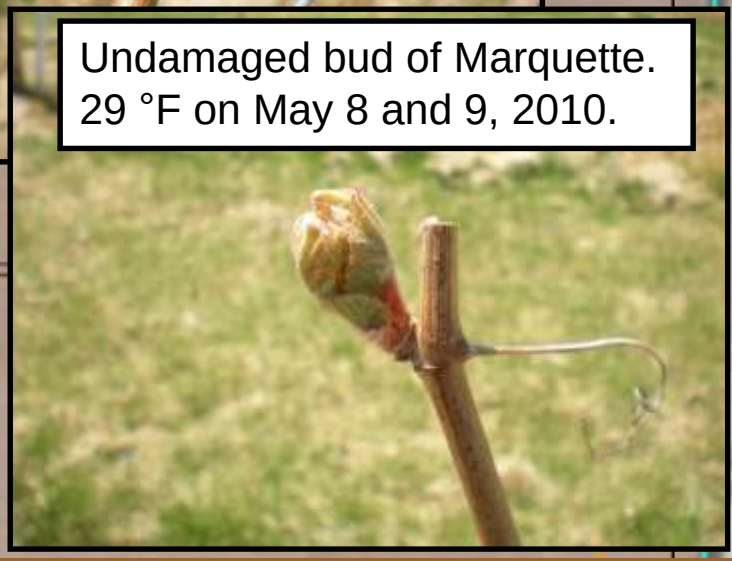
# Vineyard Site Selection

## Climate & Geographic Location

- Considerations
  - Winter low temperatures
  - Spring frosts
  - Frost free days
  - GDD base 50



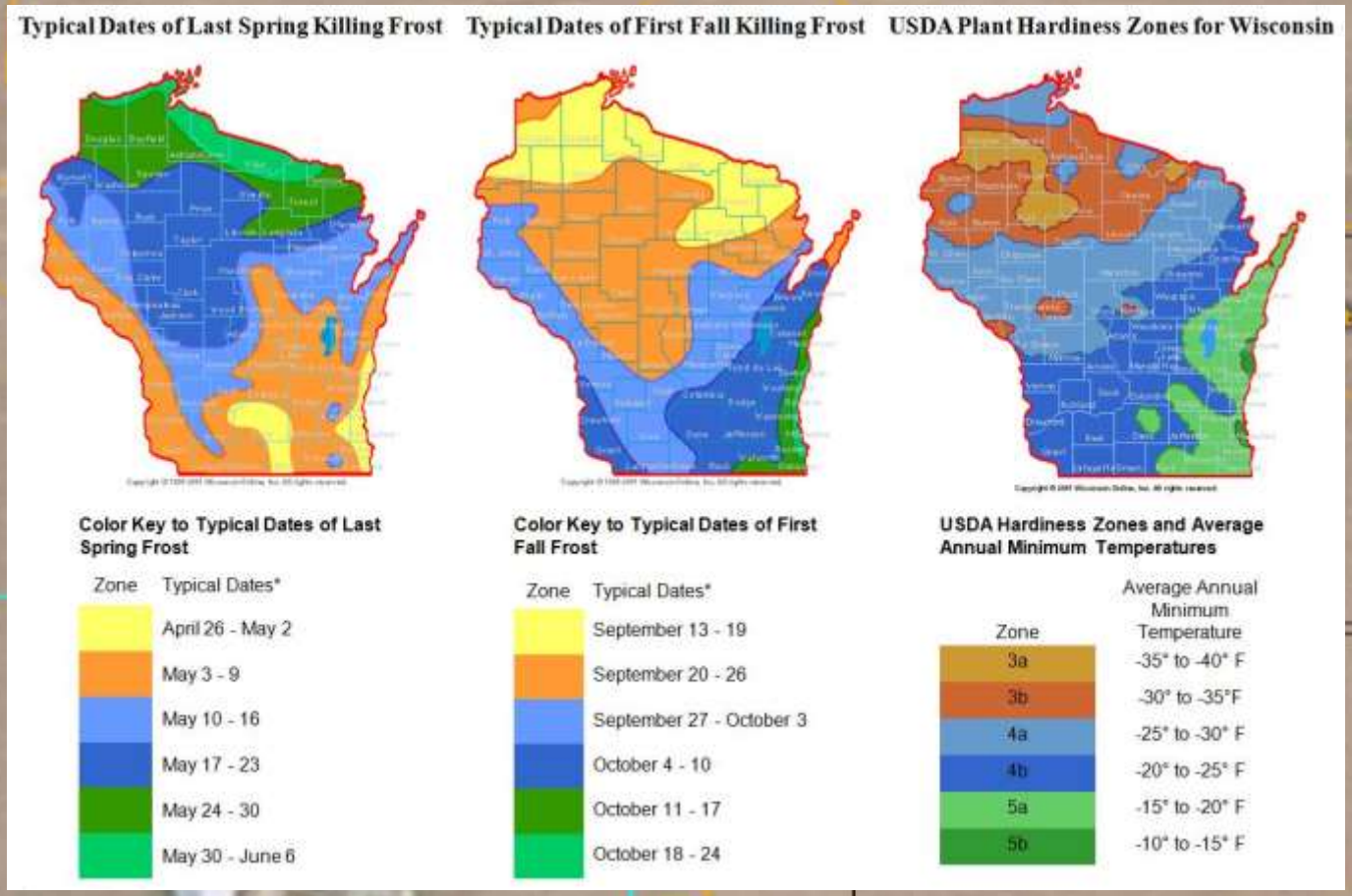
Frost damaged bud of Marquette.
29 °F on May 8 and 9, 2010.



Undamaged bud of Marquette.
29 °F on May 8 and 9, 2010.

# Vineyard Site Selection

## Macro Scale



# Vineyard Site Selection

# Frost Free Days

**Growing Season Summary**
**Derived from 1971-2000 Averages**

**Sturgeon Bay Experimental Farm**

| | Date of Last Spring Occurrence | | | | | Date of First Fall Occurrence | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Base Temp °F | Median | Early | 90% | 10% | Late | Median | Early | 90% | 10% | Late |
| **32** | 5/10 | 4/21 | 4/27 | 5/25 | 6/04 | 10/08 | 9/23 | 9/24 | 11/02 | 11/13 |
| **30** | 5/03 | 4/17 | 4/23 | 5/17 | 5/22 | 10/14 | 9/23 | 9/25 | 11/12 | 11/16 |
| **28** | 4/24 | 4/06 | 4/09 | 5/09 | 5/13 | 10/24 | 9/24 | 9/30 | 11/12 | 11/19 |
| **24** | 4/12 | 3/23 | 3/27 | 4/21 | 4/26 | 11/09 | 10/09 | 10/17 | 11/17 | 11/23 |
| **20** | 4/02 | 3/12 | 3/18 | 4/10 | 4/13 | 11/20 | 10/24 | 11/03 | 12/03 | 12/22 |
| **16** | 3/27 | 3/06 | 3/15 | 4/09 | 4/11 | 11/25 | 11/03 | 11/12 | 12/19 | 12/22 |

http://mrcc.sws.uiuc.edu/climate_midwest/historical/grow/wi/478267_gsum.html

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# Vineyard Site Selection

## Frost Free Days

**Growing Season Summary**
**Derived from 1971-2000 Averages**

**Sturgeon Bay Experimental Farm**

| | Date of Last Spring Occurrence | | | | | Date of First Fall Occurrence | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Base Temp °F | Median | Early | 90% | 10% | Late | Median | Early | 90% | 10% | Late |
| 32 | 5/10 | 4/21 | 4/27 | 5/25 | 6/04 | 10/08 | 9/23 | 9/24 | 11/02 | 11/13 |
| 30 | 5/03 | 4/17 | 4/23 | 5/17 | 5/22 | 10/14 | 9/23 | 9/25 | 11/12 | 11/16 |
| 28 | 4/24 | 4/06 | 4/09 | 5/09 | 5/13 | 10/24 | 9/24 | 9/30 | 11/12 | 11/19 |
| 24 | 4/12 | 3/23 | 3/27 | 4/21 | 4/26 | 11/09 | 10/09 | 10/17 | 11/17 | 11/23 |
| 20 | 4/02 | 3/12 | 3/18 | 4/10 | 4/13 | 11/20 | 10/24 | 11/03 | 12/03 | 12/22 |
| 16 | 3/27 | 3/06 | 3/15 | 4/09 | 4/11 | 11/25 | 11/03 | 11/12 | 12/19 | 12/22 |

150 Frost Free Days

http://mrcc.sws.uiuc.edu/climate_midwest/historical/grow/wi/478267_gsum.html

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# Vineyard Site Selection

# Frost Free Days

**Growing Season Summary**
**Derived from 1971-2000 Averages**

**UW-Marinette**

148 Frost Free Days

| Base Temp °F | Date of Last Spring Occurrence | | | | | Date of First Fall Occurrence | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Median | Early | 90% | 10% | Late | Median | Early | 90% | 10% | Late |
| **32** | 5/08 | 4/20 | 4/26 | 5/18 | 5/27 | 10/03 | 9/14 | 9/23 | 10/17 | 11/01 |
| **30** | 4/30 | 4/06 | 4/17 | 5/14 | 5/27 | 10/10 | 9/22 | 9/24 | 10/31 | 11/11 |
| **28** | 4/23 | 3/26 | 4/07 | 5/08 | 5/11 | 10/18 | 9/22 | 10/02 | 11/06 | 11/15 |
| **24** | 4/13 | 3/14 | 3/30 | 4/26 | 5/07 | 11/04 | 9/23 | 10/12 | 11/16 | 11/28 |
| **20** | 4/05 | 3/14 | 3/20 | 4/17 | 4/19 | 11/12 | 10/14 | 10/24 | 11/26 | 12/20 |
| **16** | 3/25 | 2/27 | 3/16 | 4/09 | 4/18 | 11/20 | 10/31 | 11/03 | 12/07 | 12/22 |

http://mcc.sws.uiuc.edu/climate_midwest/historical/grow/wi/475091_gsum.html

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# Vineyard Site Selection

## Growing Degree Days

**Growing Season Summary**
**Derived from 1971-2000 Averages**
**Sturgeon Bay Experimental Farm**

| Element | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDD Base 40 | 0 | 0 | 23 | 136 | 442 | 709 | 899 | 859 | 597 | 276 | 52 | 3 | 4001 |
| GDD Base 45 | 0 | 0 | 8 | 61 | 296 | 559 | 744 | 705 | 449 | 156 | 19 | 1 | 3000 |
| GDD Base 50 | 0 | 0 | 1 | 22 | 172 | 410 | 589 | 550 | 306 | 70 | 6 | 0 | 2130 |
| GDD Base 55 | 0 | 0 | 0 | 6 | 85 | 268 | 434 | 396 | 181 | 24 | 1 | 0 | 1398 |
| GDD Base 60 | 0 | 0 | 0 | 1 | 35 | 148 | 282 | 247 | 87 | 5 | 0 | 0 | 807 |
| MGDD* Base 50 | 0 | 0 | 12 | 76 | 251 | 431 | 586 | 554 | 345 | 129 | 17 | 1 | 2406 |

*Modified Growing Degree Days: Base 50 Ceiling 86.

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# Vineyard Site Selection

## Growing Degree Days

**Growing Season Summary**
**Derived from 1971-2000 Averages**
**UW Marinette**

| Element | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDD Base 40 | 0 | 1 | 26 | 168 | 501 | 771 | 951 | 895 | 606 | 287 | 52 | 3 | 4204 |
| GDD Base 45 | 0 | 0 | 9 | 86 | 354 | 621 | 797 | 740 | 458 | 169 | 20 | 0 | 3206 |
| GDD Base 50 | 0 | 0 | 2 | 38 | 225 | 471 | 642 | 585 | 317 | 83 | 6 | 0 | 2332 |
| GDD Base 55 | 0 | 0 | 0 | 15 | 126 | 327 | 488 | 430 | 193 | 31 | 1 | 0 | 1584 |
| GDD Base 60 | 0 | 0 | 0 | 5 | 63 | 199 | 335 | 280 | 99 | 8 | 0 | 0 | 970 |
| MGDD* Base 50 | 0 | 0 | 17 | 106 | 298 | 485 | 627 | 584 | 361 | 149 | 23 | 1 | 2614 |

*Modified Growing Degree Days: Base 50 Ceiling 86.

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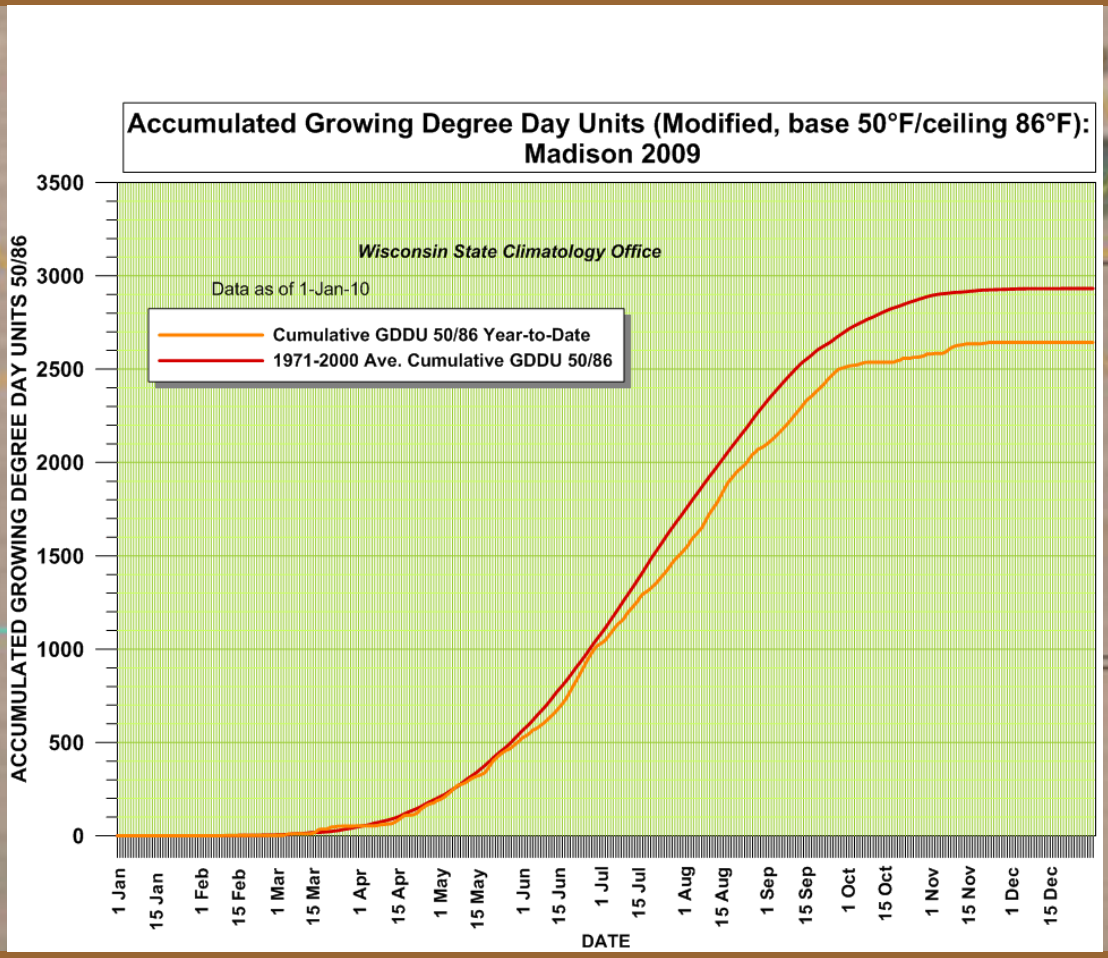
# Vineyard Site Selection

## Growing Degree Days



# Vineyard Site Selection

## Length of Growing Season

**Length of Growing Season (Days)**
**Derived from 1971-2000 Averages**
**Peninsular Agricultural Research Station**

| Base Temp °F | Median | Shortest | 10% | 90% | Longest |
|---|---|---|---|---|---|
| **32** | 150 | 128 | 136 | 163 | 199 |
| **30** | 166 | 135 | 138 | 199 | 205 |
| **28** | 178 | 135 | 158 | 210 | 221 |
| **24** | 211 | 176 | 190 | 228 | 238 |
| **20** | 230 | 207 | 215 | 259 | 274 |
| **16** | 245 | 218 | 221 | 267 | 285 |

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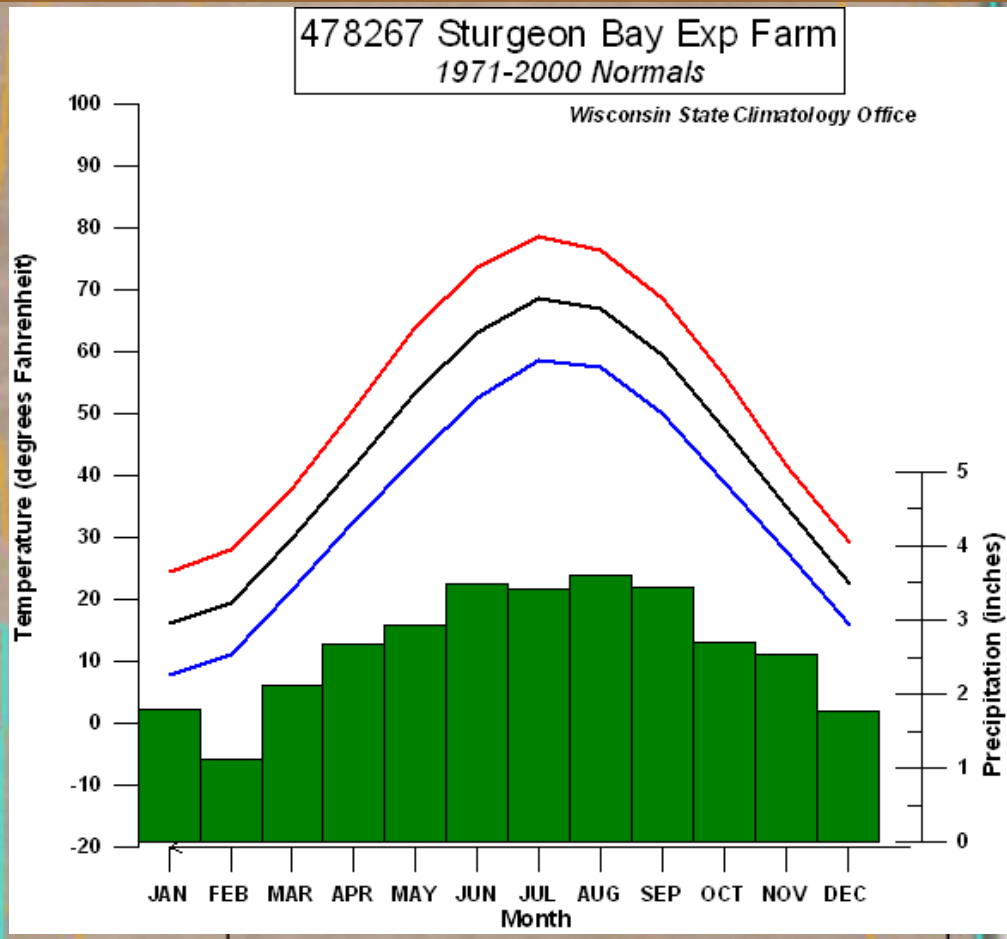
# Vineyard Site Selection

## Temperature

Red line is normal monthly high temperature

Black line is normal average monthly temperature

Blue line is normal monthly low temperature

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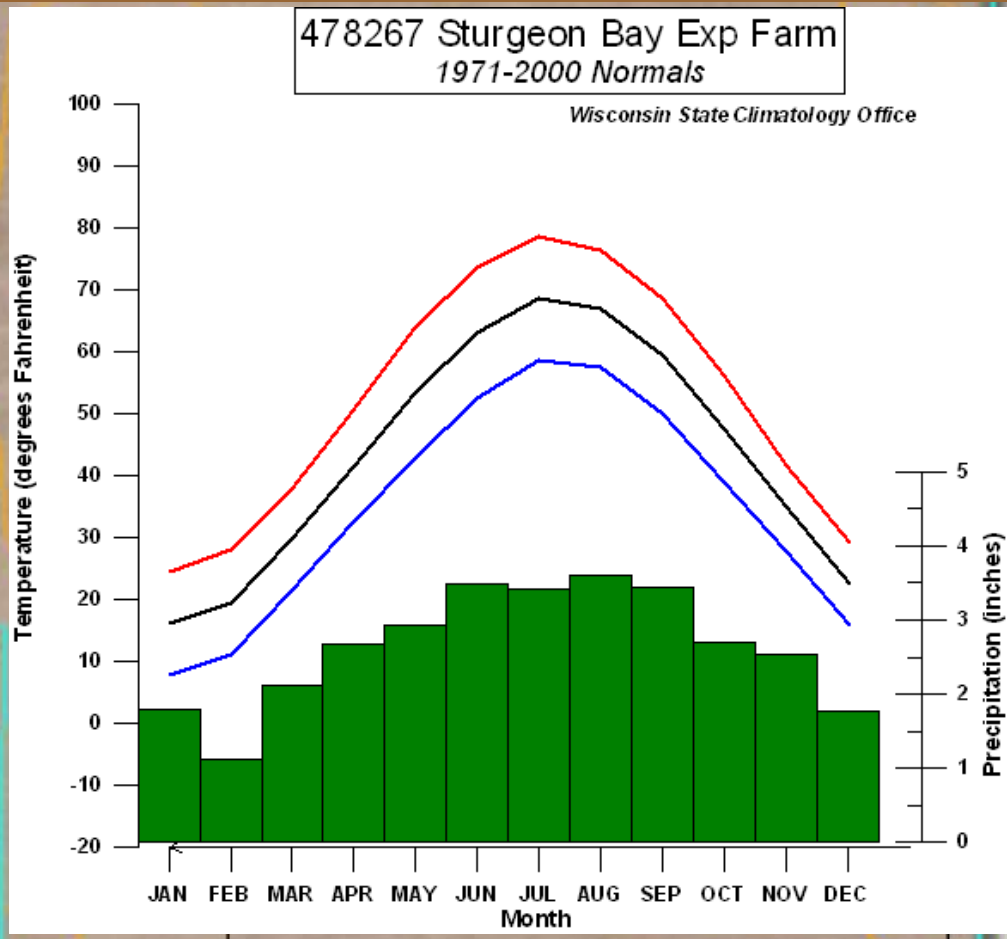
# Vineyard Site Selection

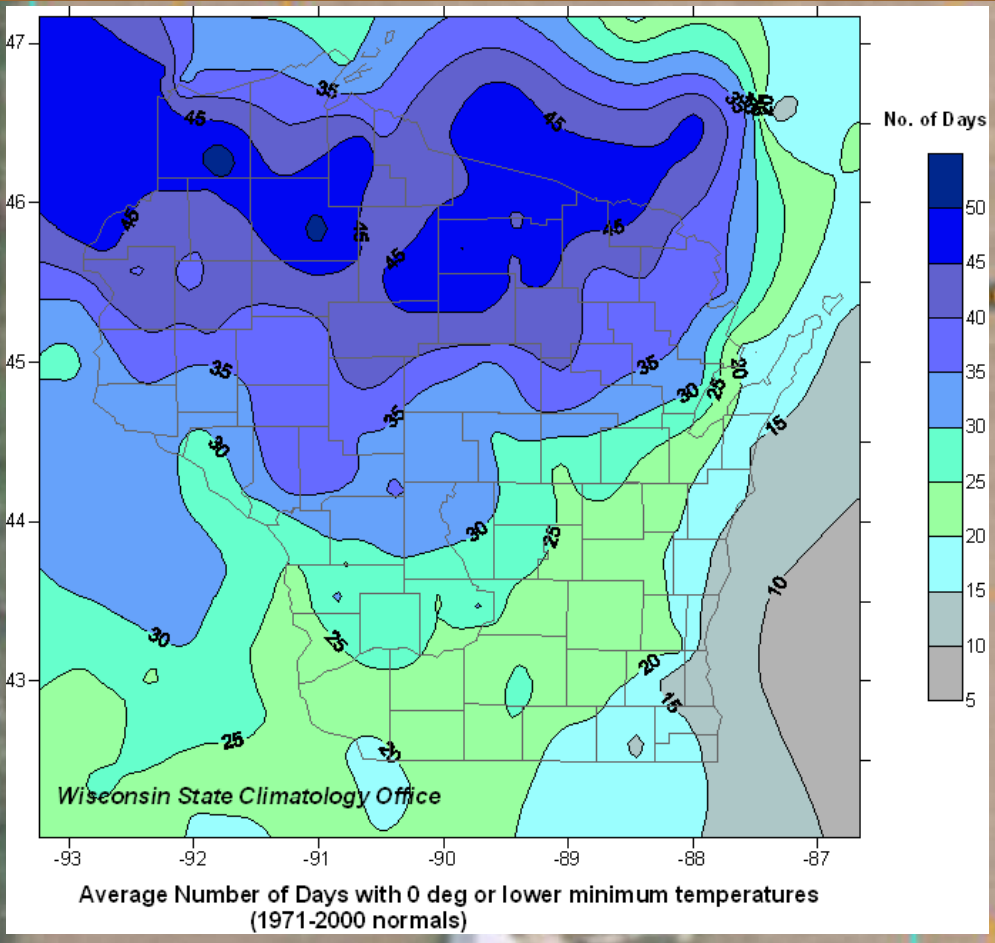
## Temperature and Fruit Chemistry

- Daytime Optimum
  - 68-77 °F
- Nightime Optimum
  - 59-68 °F

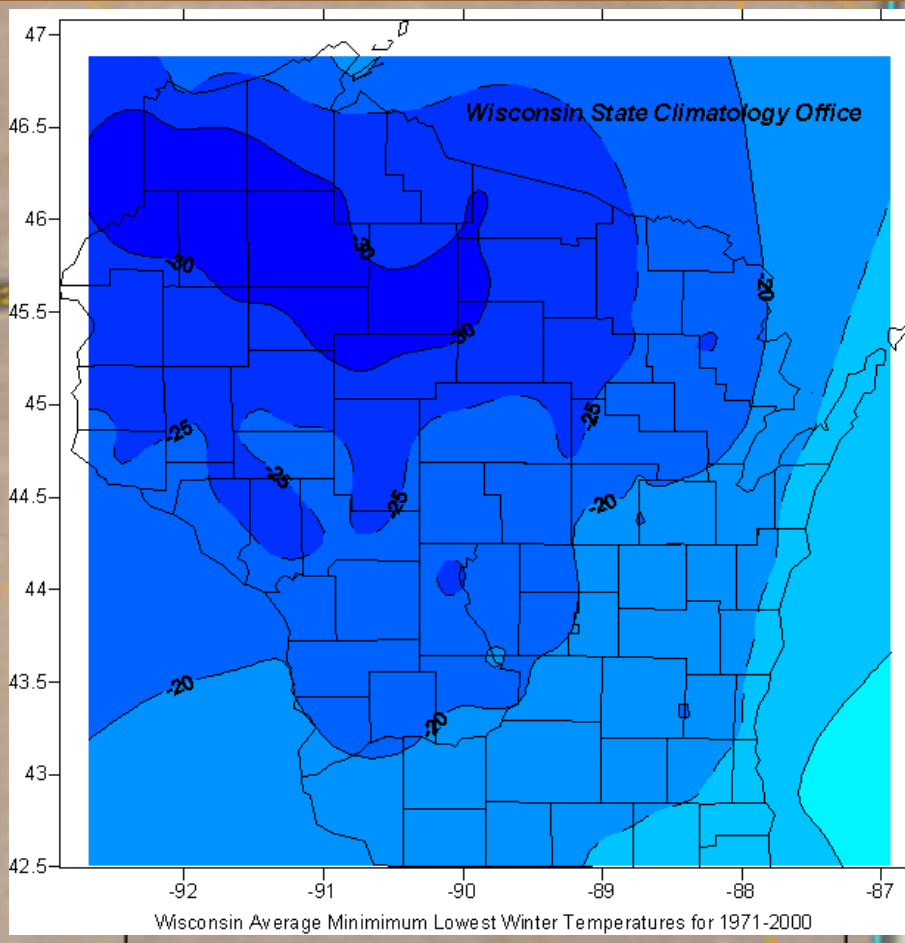


# Vineyard Site Selection

## Cold Thresholds



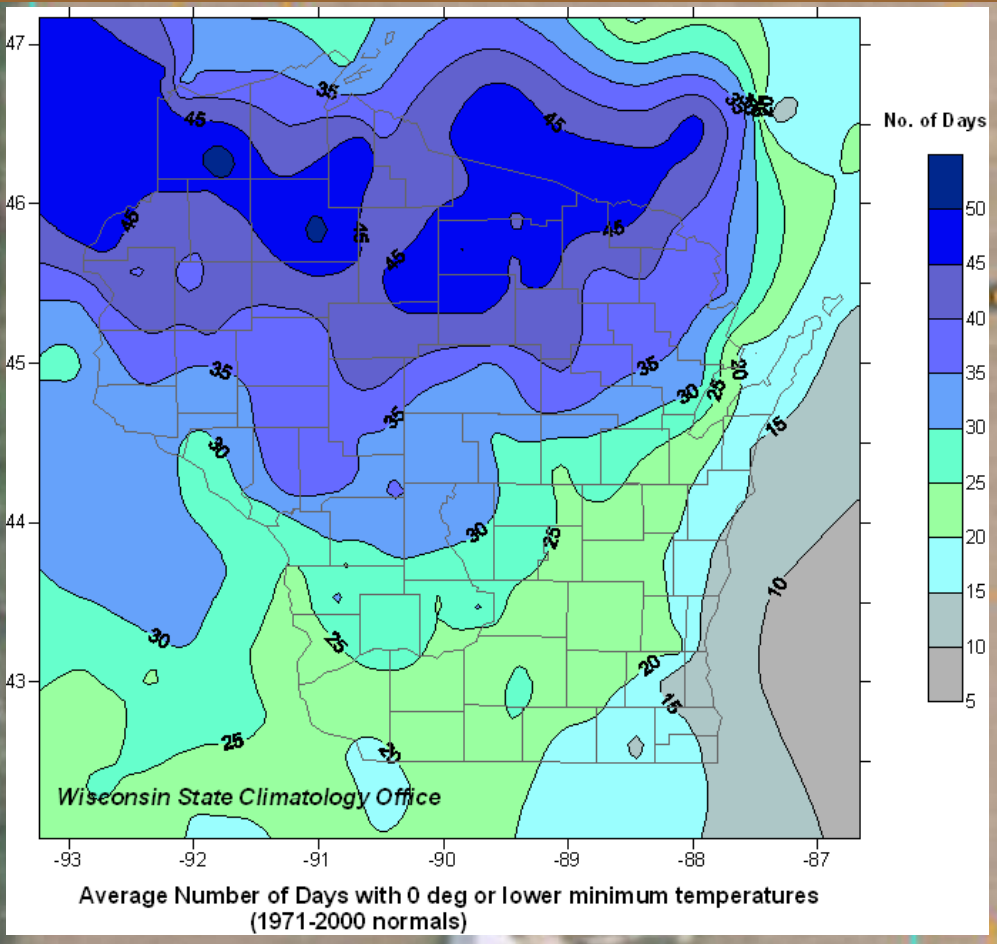

Average Number of Days with 0 deg or lower minimum temperatures
(1971-2000 normals)

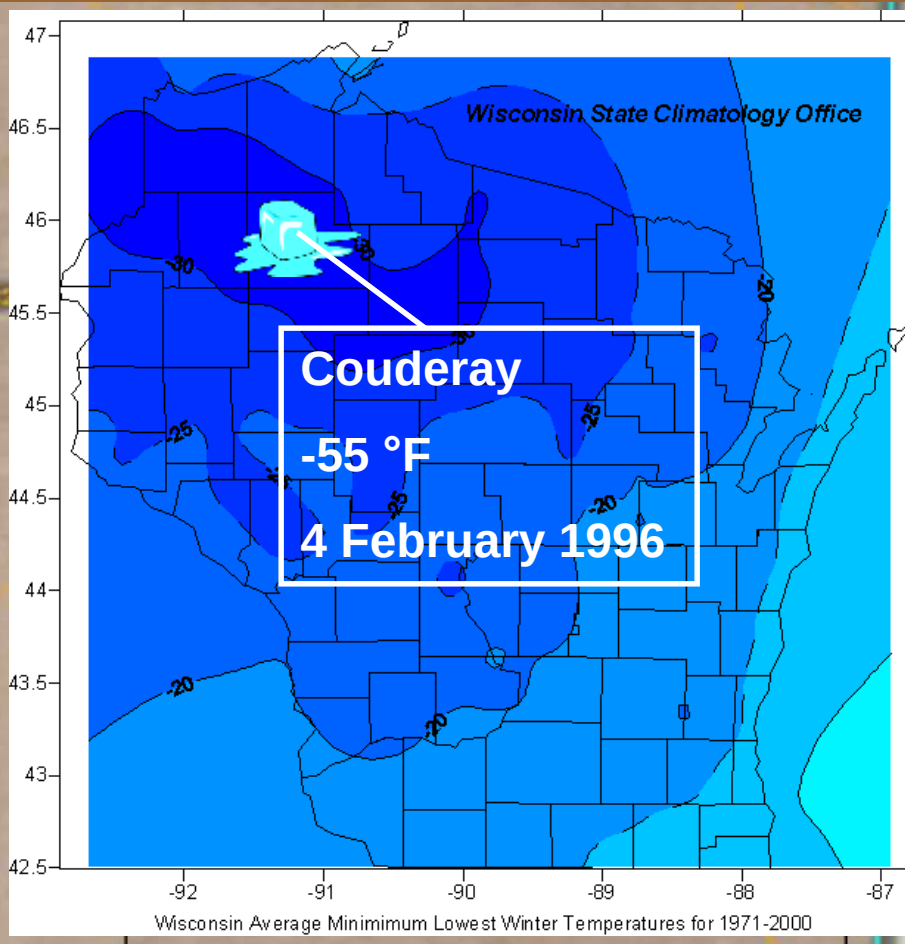



Wisconsin Average Minimum Lowest Winter Temperatures for 1971-2000

# Vineyard Site Selection

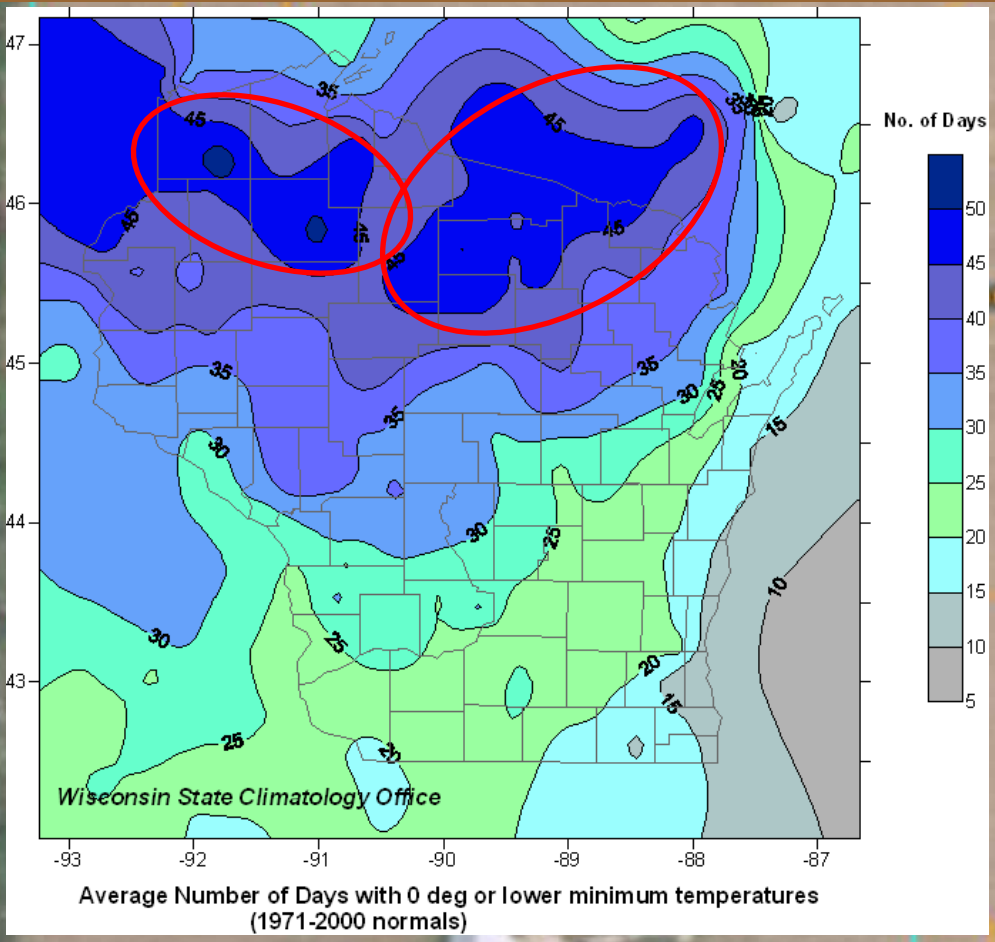
## Cold Thresholds



# Vineyard Site Selection

## Cold Thresholds

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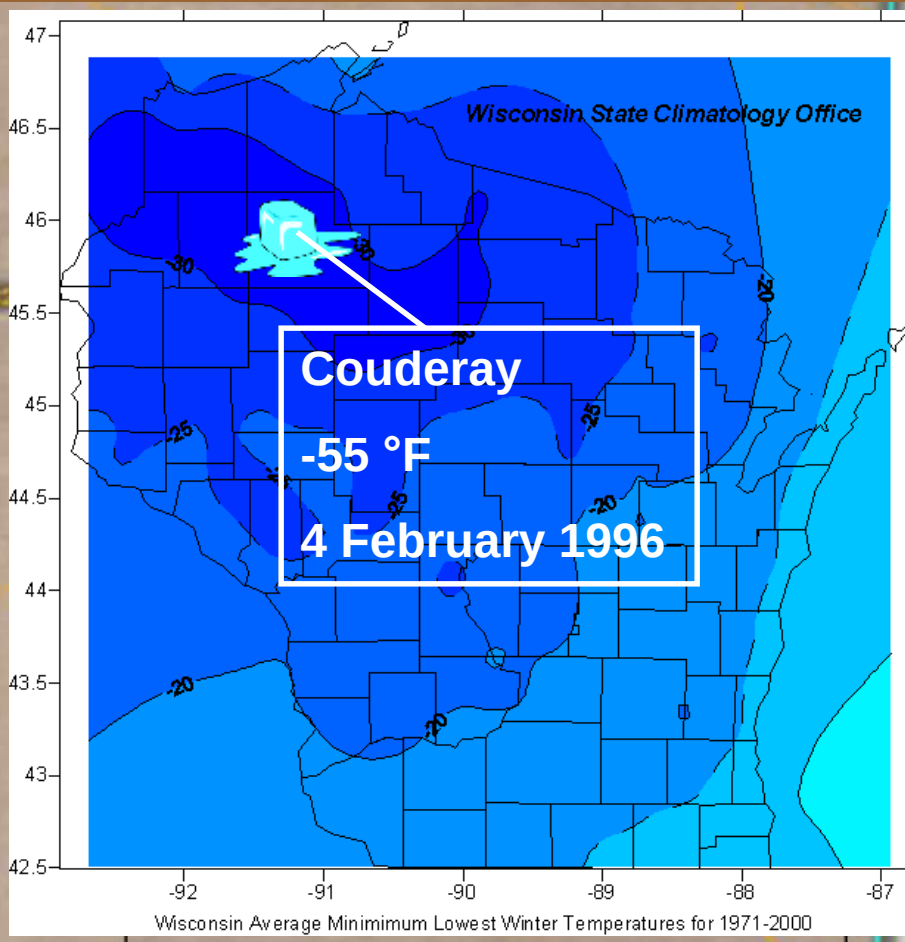
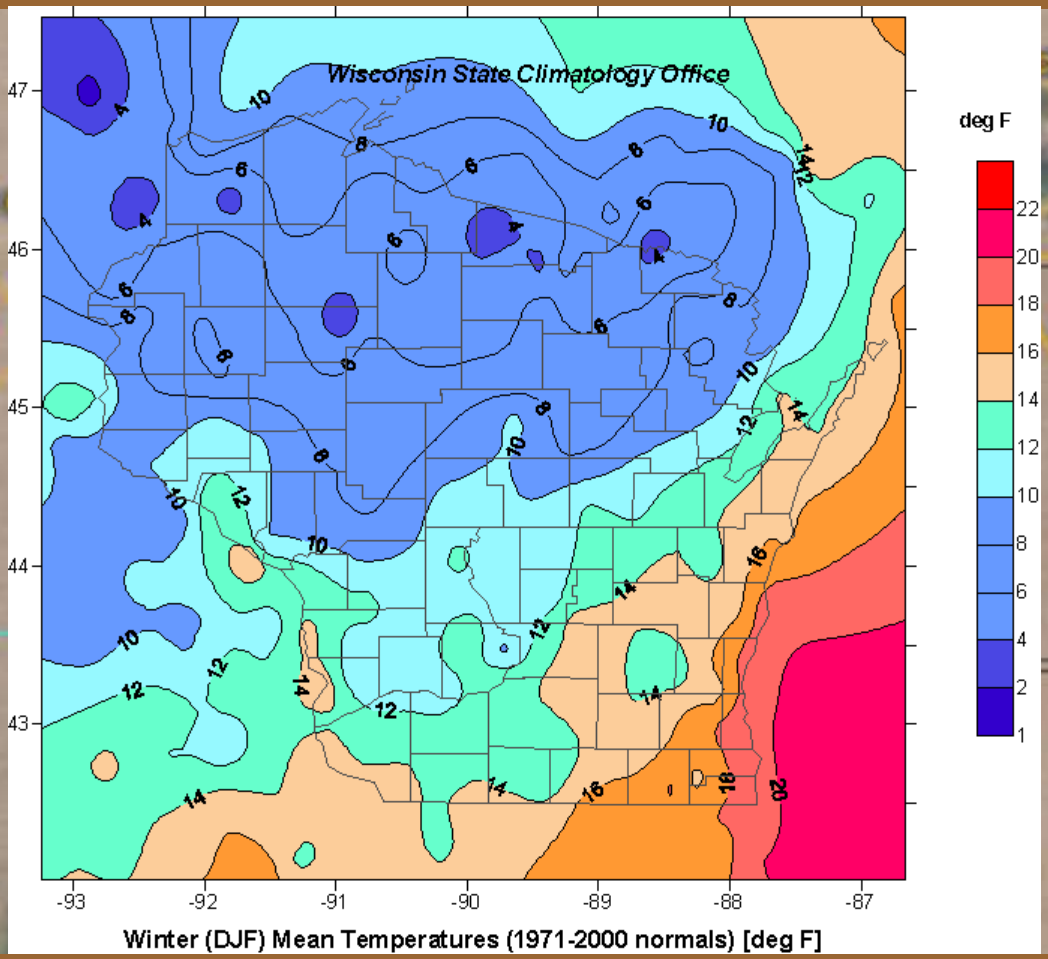
(1971-2000 normals)




Wisconsin Average Minimum Lowest Winter Temperatures for 1971-2000

# Vineyard Site Selection

## Cold Thresholds



# Vineyard Site Selection

## Topography effects on air temperatures

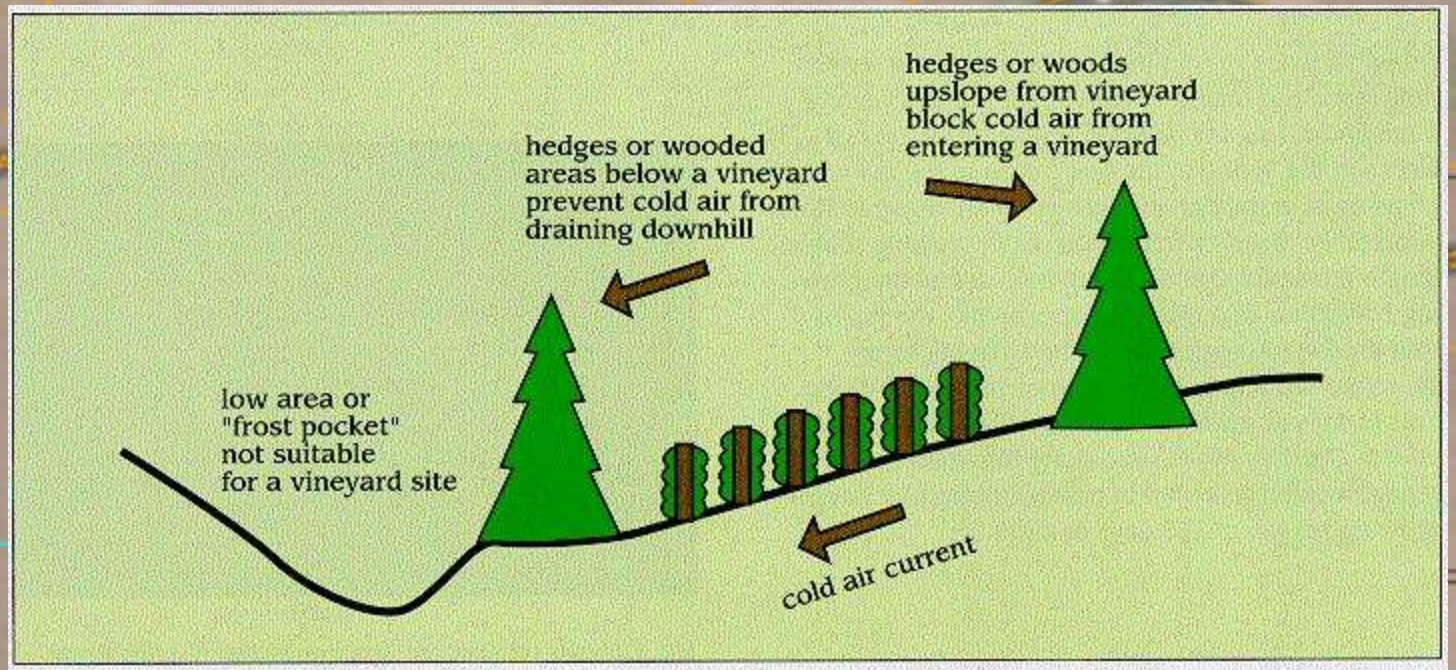
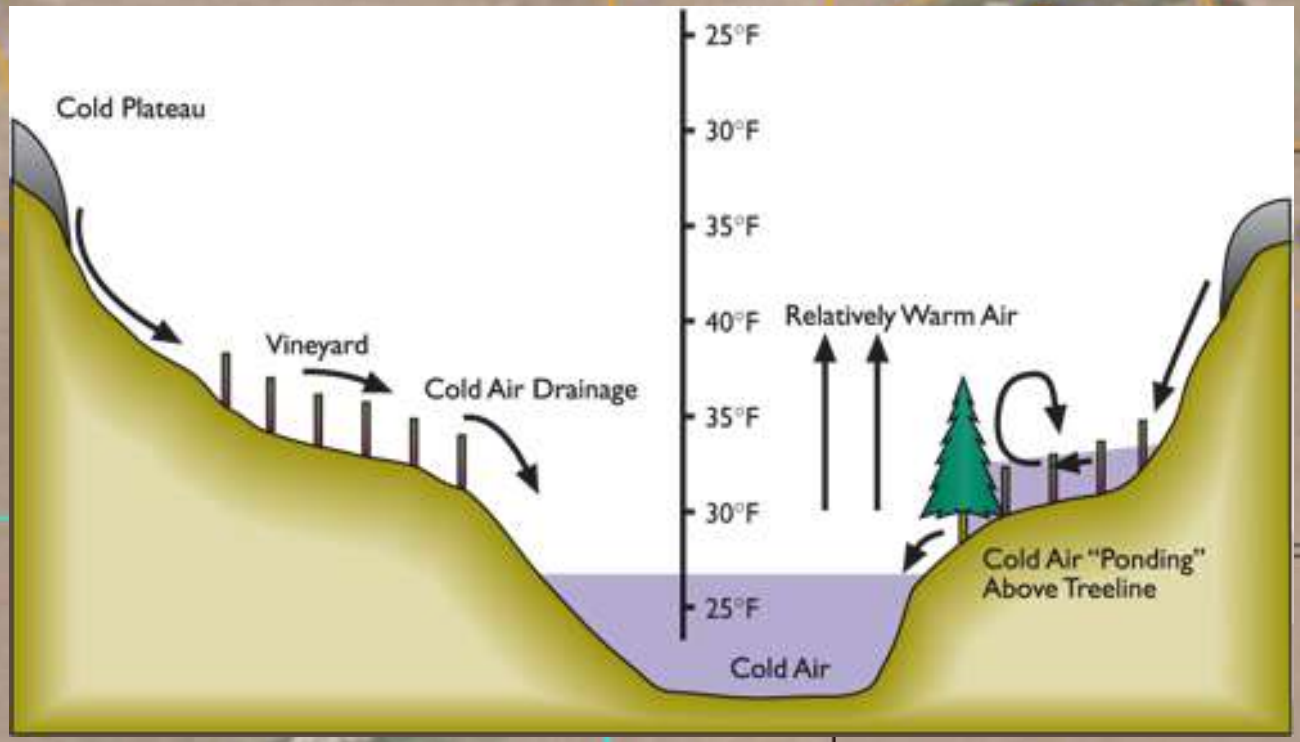



Fig. 4. Topography and adjacent vegetation influence the susceptibility of a vineyard site to spring and fall freeze damage.

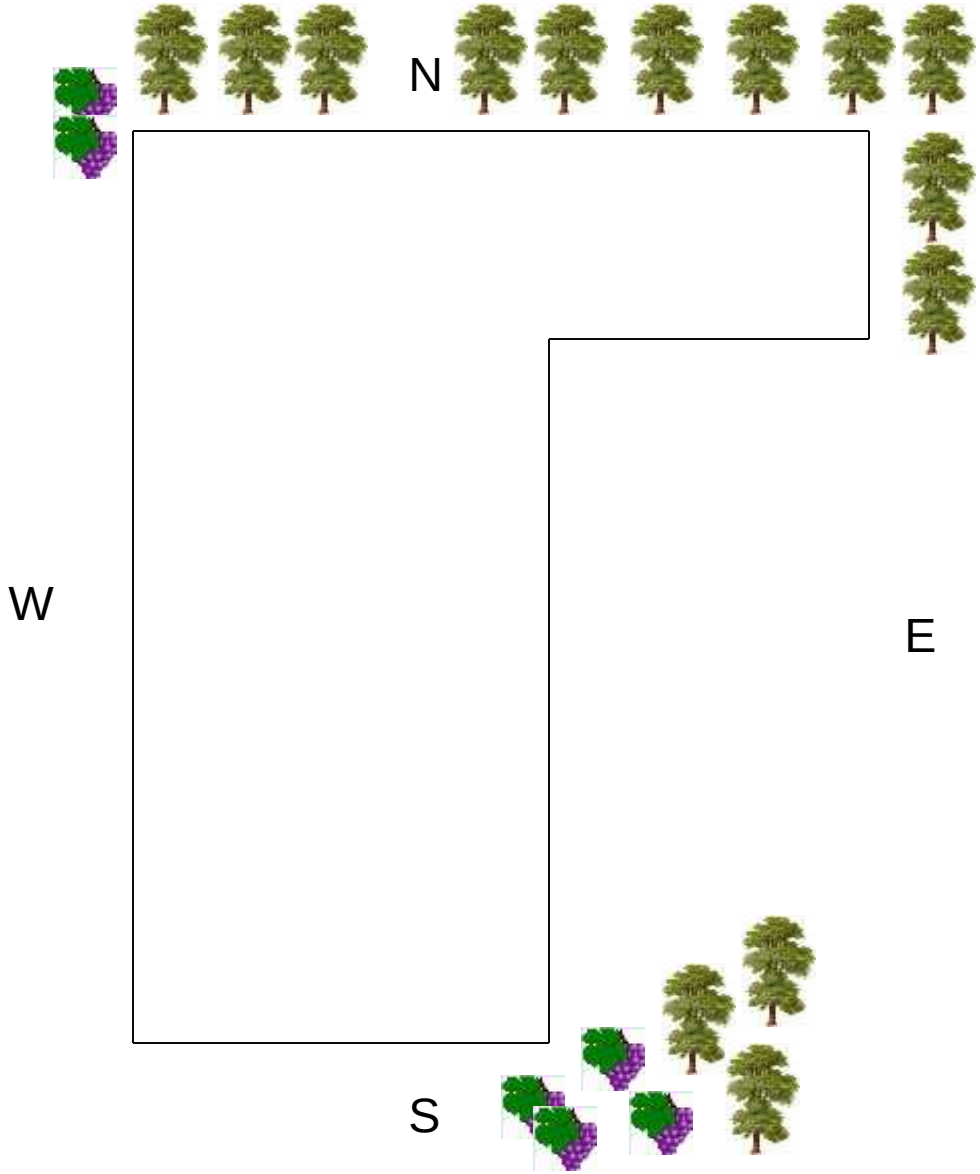
# Vineyard Site Selection

## Topography effects on air temperatures



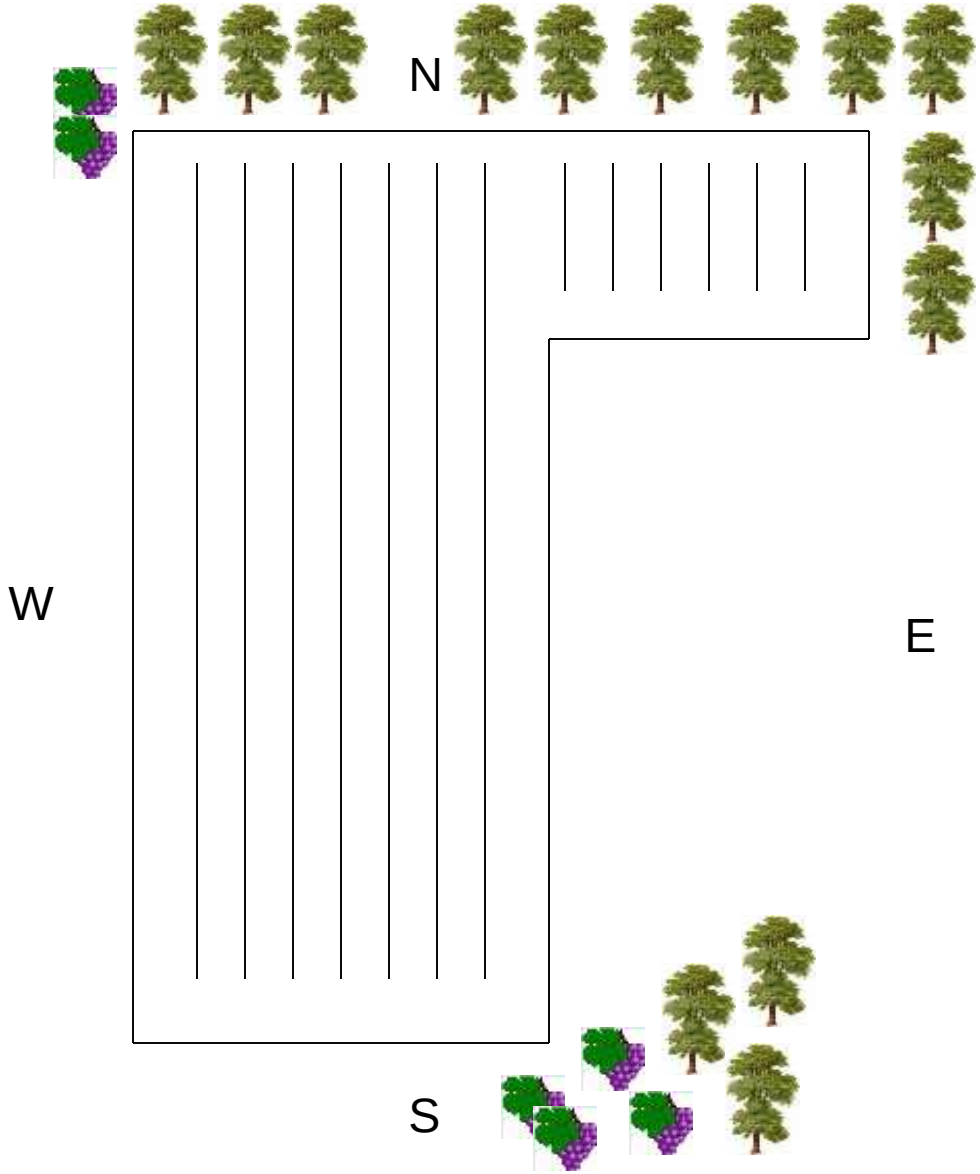
# IPM & Vineyard Site Selection

- Map your site and surroundings



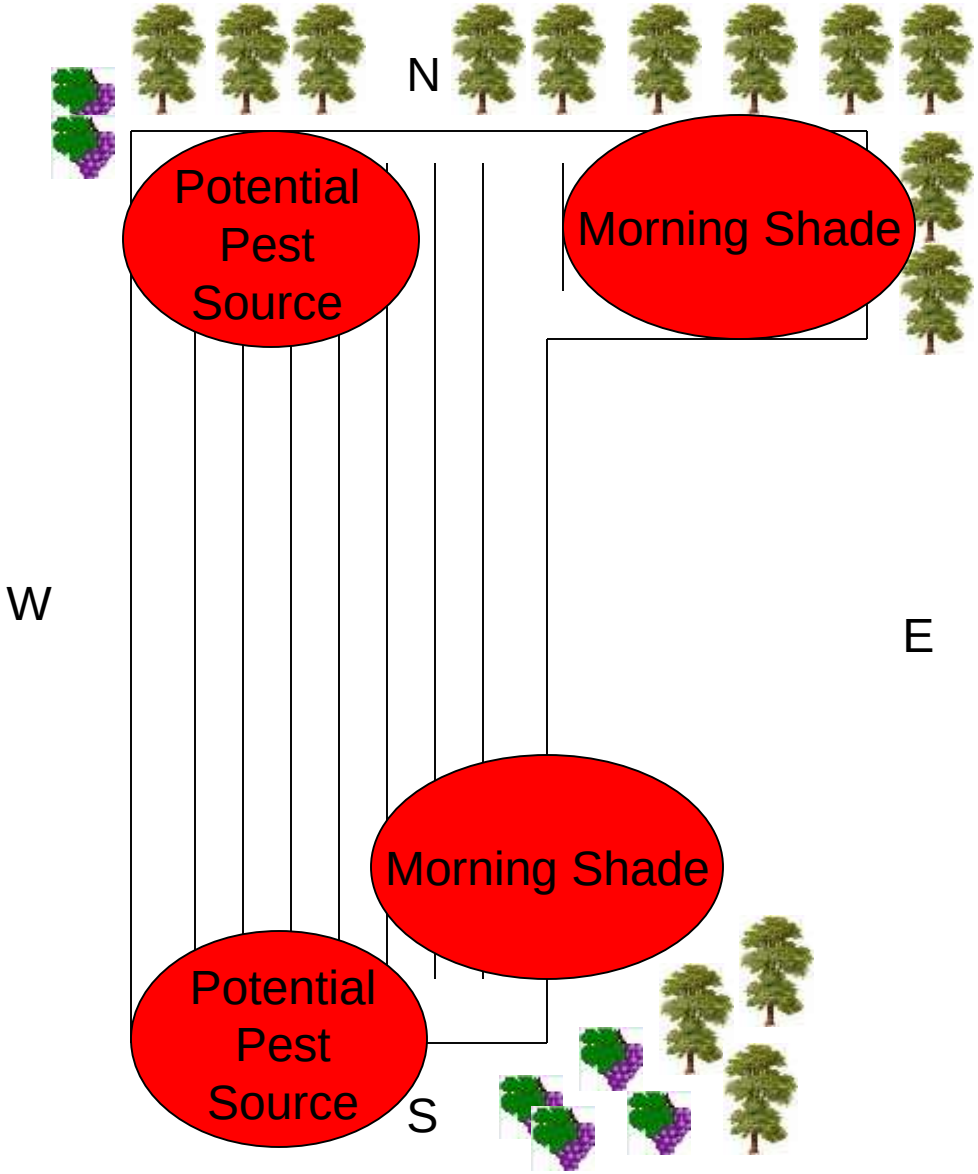
# IPM & Vineyard Site Selection

- Map your site and surroundings
- Lay out rows



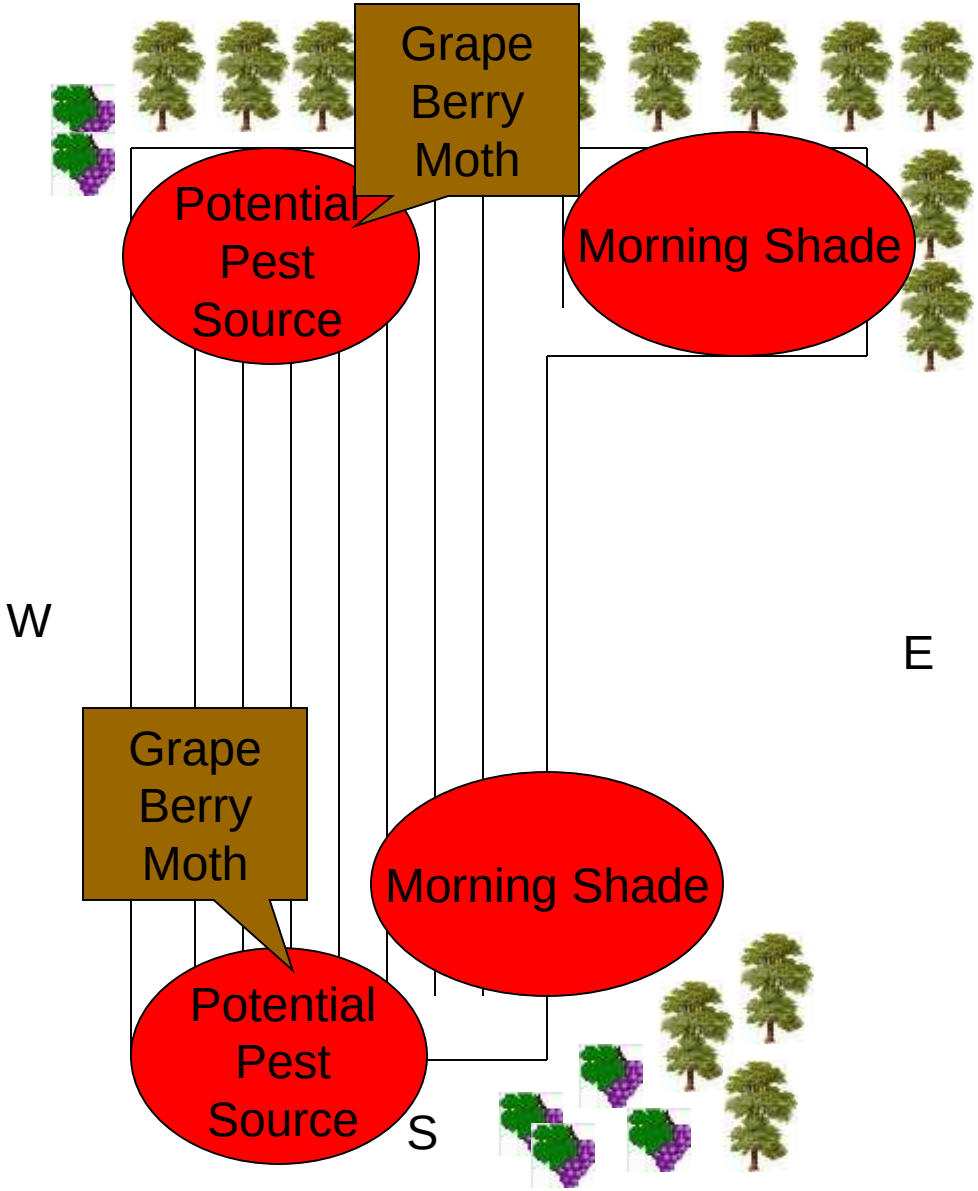
# IPM & Vineyard Site Selection

- Map your site and surroundings
- Lay out rows
- Identify potential problem pest areas



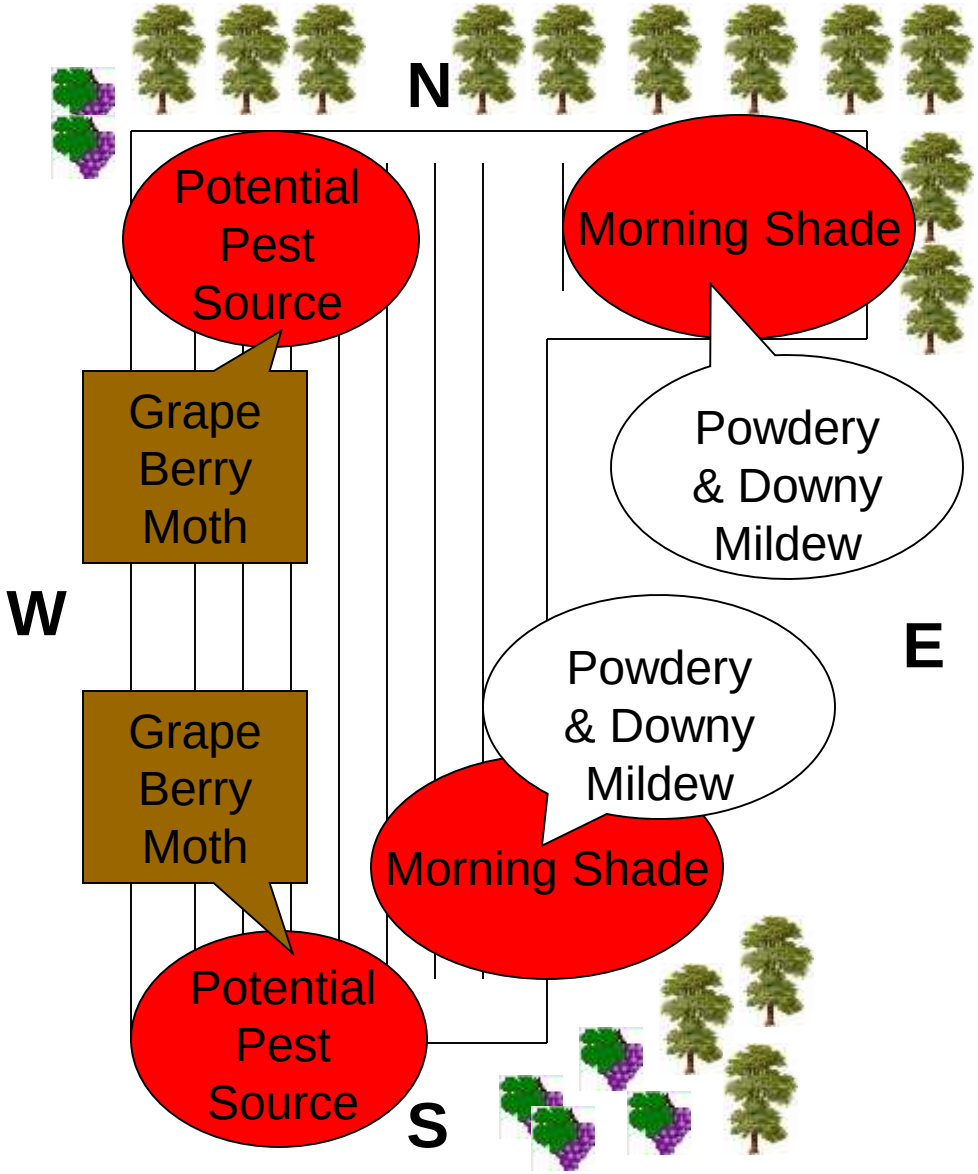
# IPM & Vineyard Site Selection

- Map your site and surroundings
- Lay out rows
- Identify potential problem pest areas



# IPM & Vineyard Site Selection

- Map your site and surroundings
- Lay out rows
- Identify potential problem pest areas
- Identify pests that may persist in problem pest areas



Infestation of grape clusters by grape berry moth at borders and interiors of commercial vineyards with various habitat borders.

| | Mean cluster infestation (%) in vineyards | | | | | |
|---|---|---|---|---|---|---|
| | July | | August | | September | |
| | Border | Interior | Border | Interior | Border | Interior |
| Deciduous woods | 72.4a[1] | 39.5a | 79.4a | 62.7a | 99.2a | 78.6a |
| Coniferous woods | 30.5b | 13.0b | 86.8a | 55.2a | 92.3ab | 65.1a |
| Tree row | 34.6b | 20.6ab | 75.3a | 56.9a | 93.9ab | 71.9a |
| Grasses | 29.2b | 21.8ab | 61.3a | 40.1a | 78.3b | 56.2a |

[1]Means within a column followed by the same letter are not significantly different (Tukey α = 0.05)

Botero-Garcés, N. and R. Isaacs. 2004. Environmental Entomology 33:310-319.

Infestation of grape clusters by grape berry moth at borders and interiors of commercial vineyards with various habitat borders.

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| Deciduous woods | 72.4a[1] | 39.5a | 79.4a | 62.7a | 99.2a | 78.6a |
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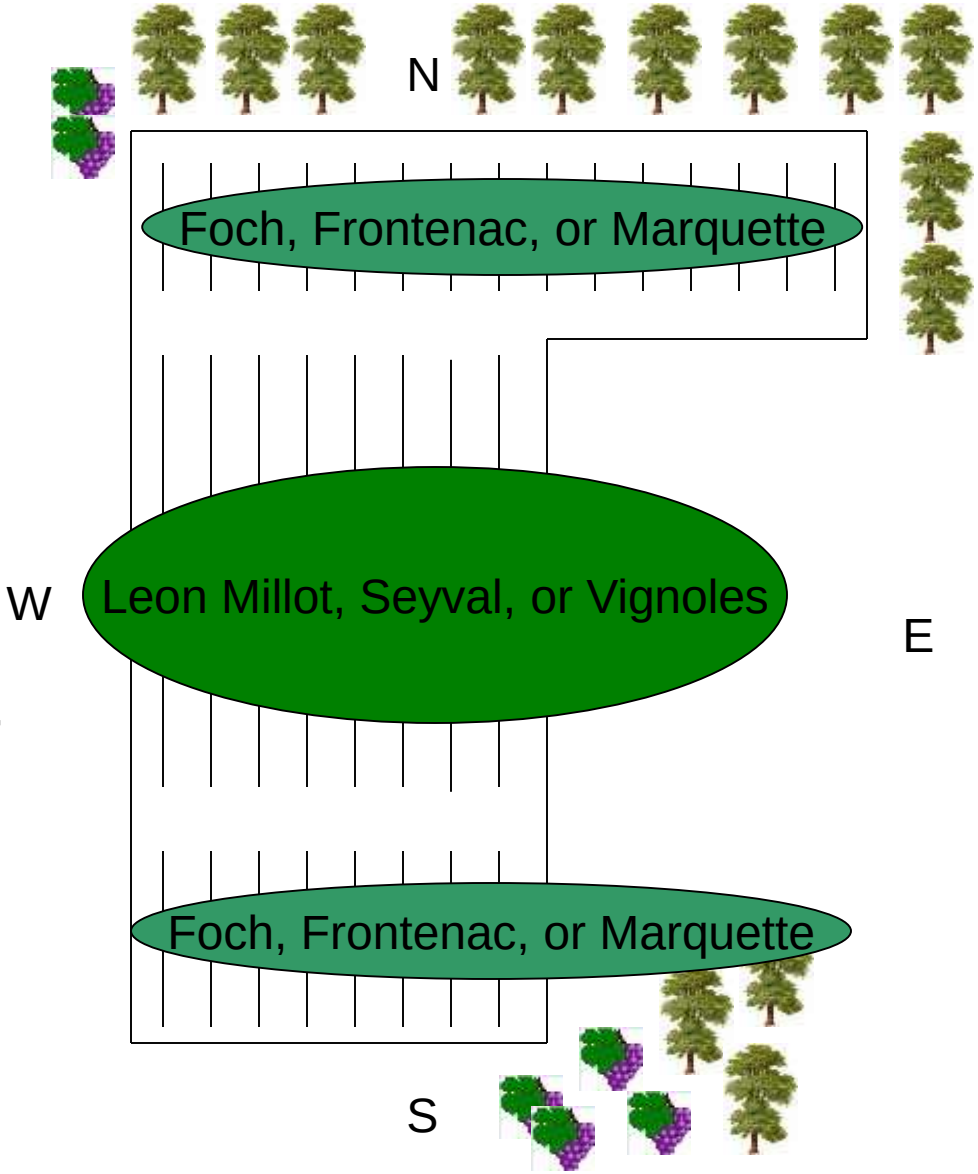
| Grasses | 29.2b | 21.8ab | 61.3a | 40.1a | 78.3b | 56.2a |

[1]Means within a column followed by the same letter are not significantly different (Tukey α = 0.05)

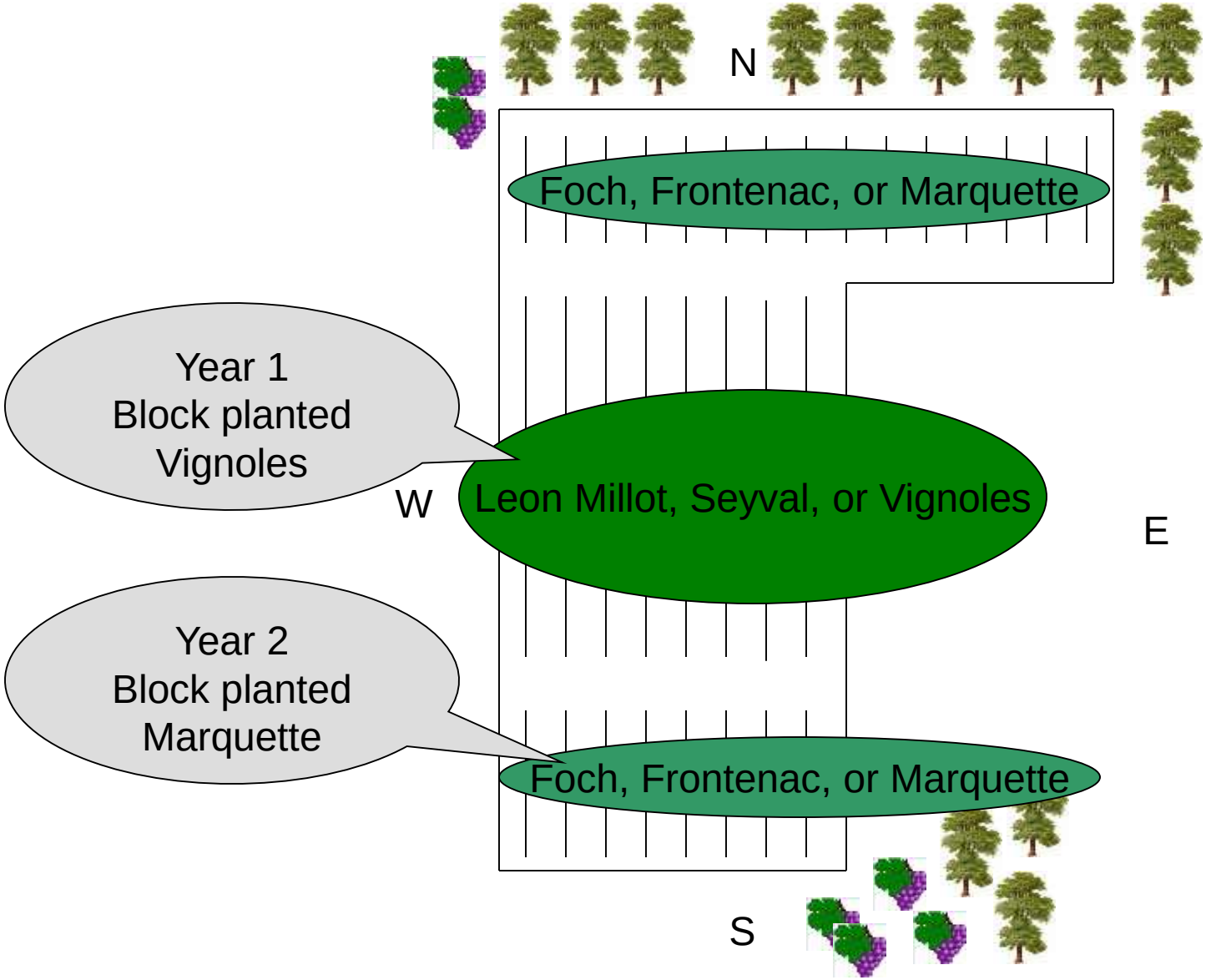
Botero-Garcés, N. and R. Isaacs. 2004. Environmental Entomology 33:310-319.

# IPM & Vineyard Site Selection

- Lay out vineyard based on potential pest threats
- Match grape varieties to potential pest problems as dictated by vineyard
- Also consider market for grape varieties



# IPM & Vineyard Site Selection



# IPM & Vineyard Site Selection


N

Foch, Frontenac, or Marquette

Year 1
Block planted
Vignoles

W

Leon Millot, Seyval, or Vignoles

E

Year 2
Block planted
Marquette

Foch, Frontenac, or Marquette

S

# IPM & Vineyard Site Selection

- St. Pepin for Ice Wine in the remaining block

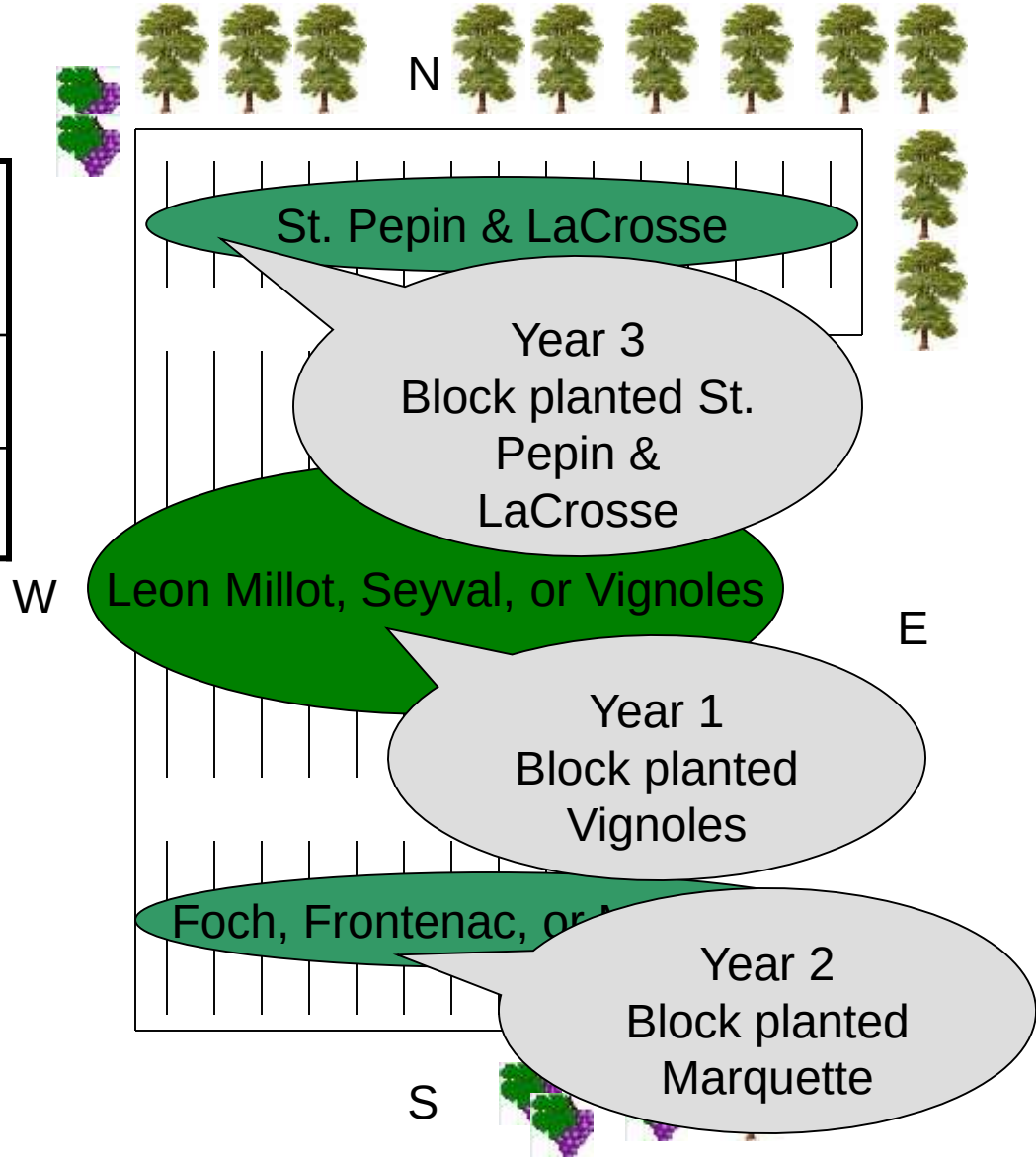
  Is St. Pepin a good fit for this location and its associated pollinator Lacrosse?

# IPM & Vineyard Site Selection

| Variety | Powdery Mildew | Downy Mildew |
|---|---|---|
| St. Pepin | +++ | ++ |
| La Crosse | ++ | +++ |

++ Moderately susceptible

+++ Highly susceptible



# IPM & Vineyard Site Selection

| Variety | Powdery Mildew | Downy Mildew |
|---|---|---|
| St. Pepin | +++ | ++ |
| La Crosse | ++ | +++ |

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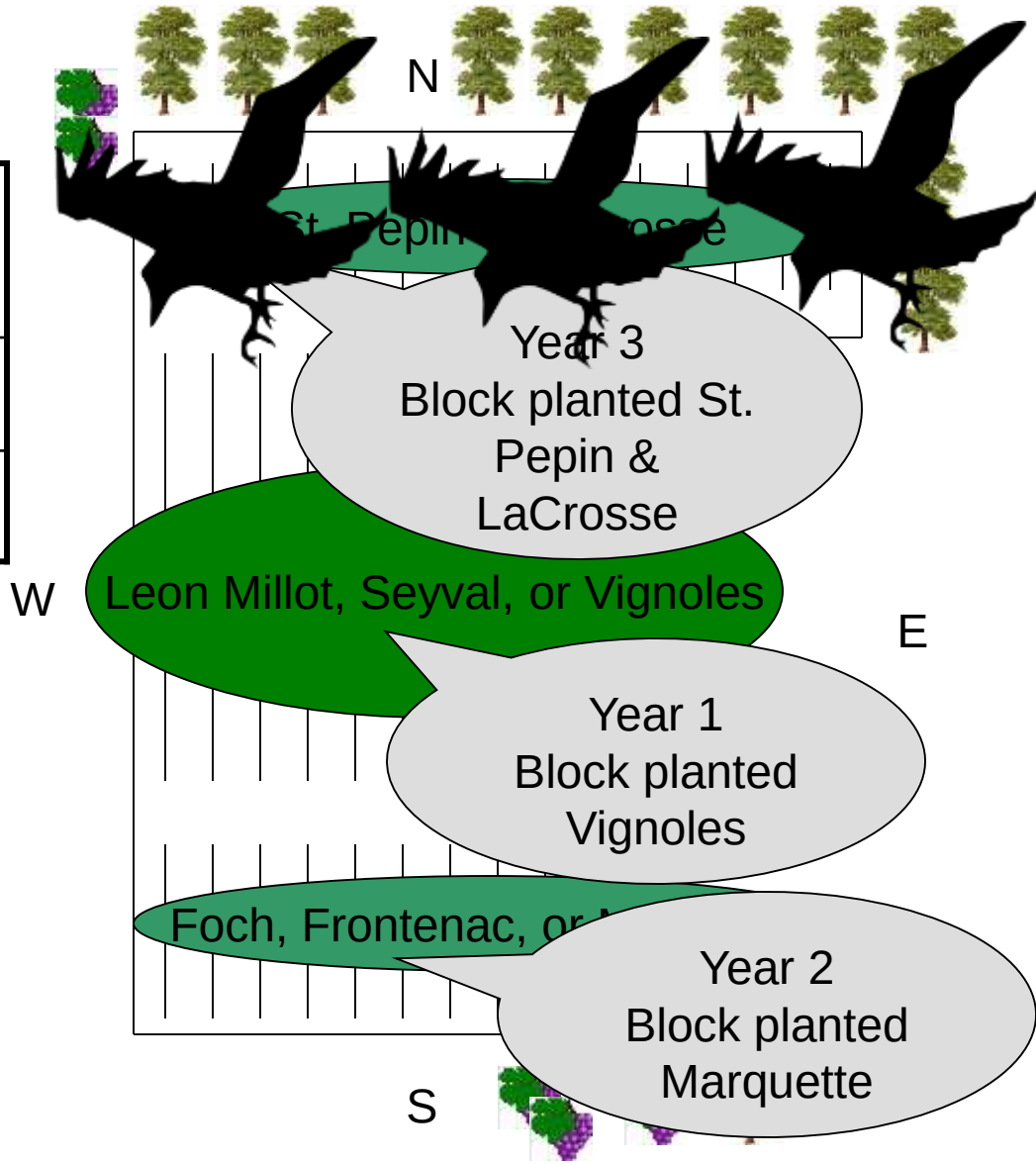
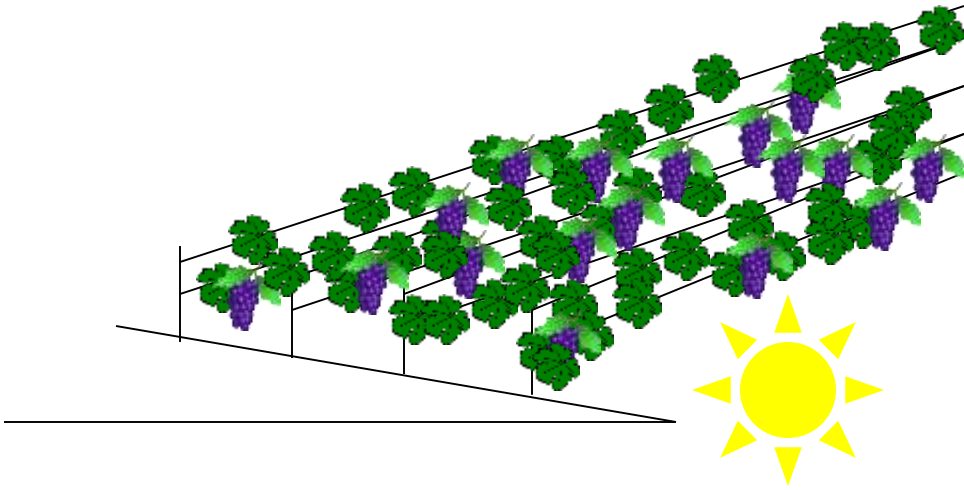
+++ Highly susceptible



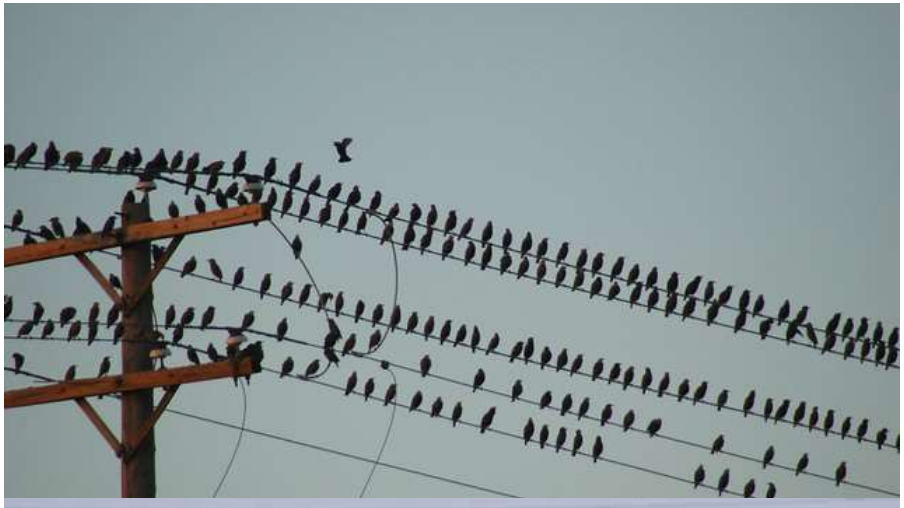
# IPM & Vineyard Site Selection

- Row Orientation
  North/South
- Aspect - East results in rapid drying
- Soil - low to moderate fertility
  - O. M. < 5%



# IPM & Vineyard Site Selection

- Look Up
  - Birds
  - Trees
- Look Around
  - Know your neighbor
  - Know their crops



# IPM & Vineyard Site Selection

- Phenoxy herbicide injury
  - 2,4-D
  - Dicamba
  - Clopyralid
  - Triclopyr

# Other Herbicide Off-Target Sources

- Homeowners lawns
- Golf courses
- Highway Right-of-way
- Invasive plant management

# IPM & Vineyard Site Selection

- Vine Spacing
  - Vigor of vine
- Vine Spacing Impacts
  - Air circulation
  - Pesticide coverage

# IPM & Vineyard Site Selection

## Weed management

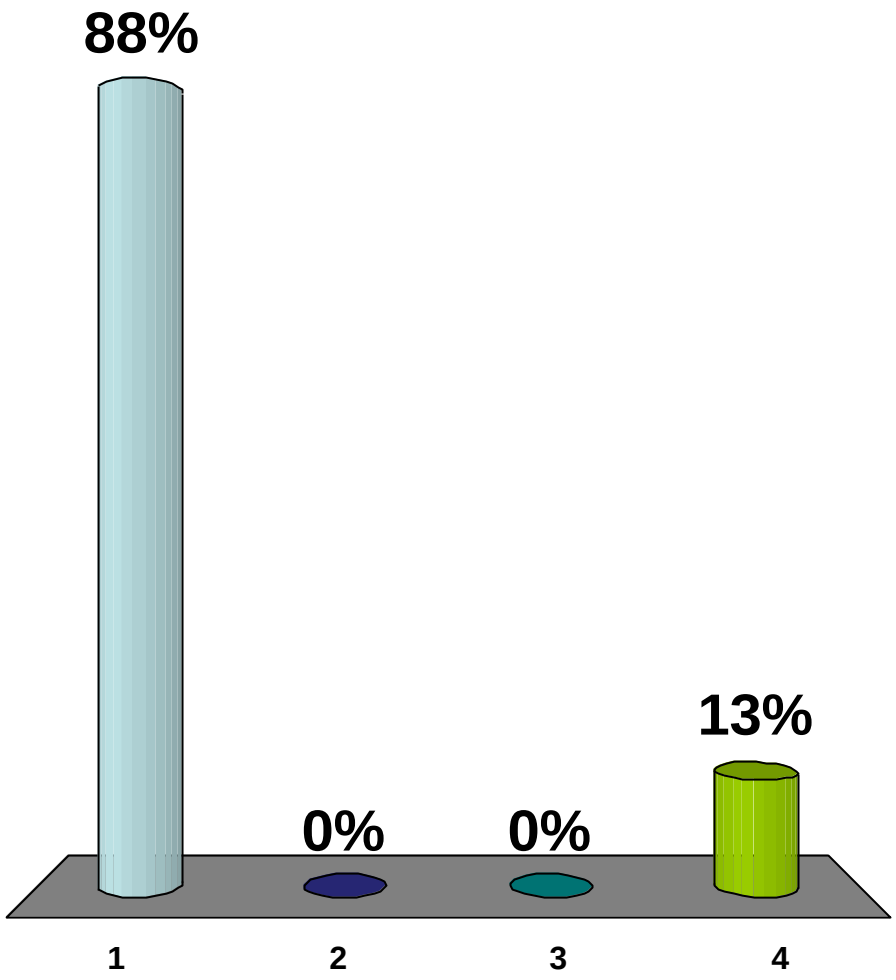
- Before establishment (2 year process)
  - Plan, prepare, polish-off weeds, plant
- After establishment
  - Weed management in row
    - Increases air flow
    - Removes sites for potential pests
    - Preserves water and nutrients

# What is the most important year to manage weeds in the vineyard?

1. Establishment (year 1)
2. Year 2
3. Year 3
4. First crop (Year 4)

# What is the most important year to manage weeds in the vineyard?

1. Establishment (year 1)
2. Year 2
3. Year 3
4. First crop (Year 4)



# New Grape Growers/Expanding

- IPM-when does it begin?
  - Before grapes are ordered
- Intentions for grapes
  - Sell grapes to market/wineries-Backward marketing
    - What do wineries/consumers want
  - Use grapes at your winery
    - What do consumers want
    - What management practices to employ

# Vineyard Layout

- Grape Variety Selection
  - Cold hardiness
  - Dictates potential pest problems
  - Assessment of disease susceptibility
  - Assessment of insect susceptibility
  - May impact pest management options



# Vineyard Site Selection and Layout

For More Information on Vineyard Site Selection and Layout.

Wolf, T. K. (editor). 2008. **Wine Grape Production Guide**. Natural Resource, Agriculture, and Engineering Service. Cooperative Extension. NRAES-145. Ithaca, N.Y. 336 p.

For More Information on Wisconsin Climate.

State Climatology Office

http://www.aos.wisc.edu/~sco/seasons/winter.html#Temperature

Midwest Regional Climate Center

http://mcc.sws.uiuc.edu/climate_midwest/mwclimate_data_summaries.htm

Dean Volenberg

UW-Extension Door County