Eight Years of Grapevine Cultivar Evaluation In Nebraska

University Of Nebraska Viticulture Program

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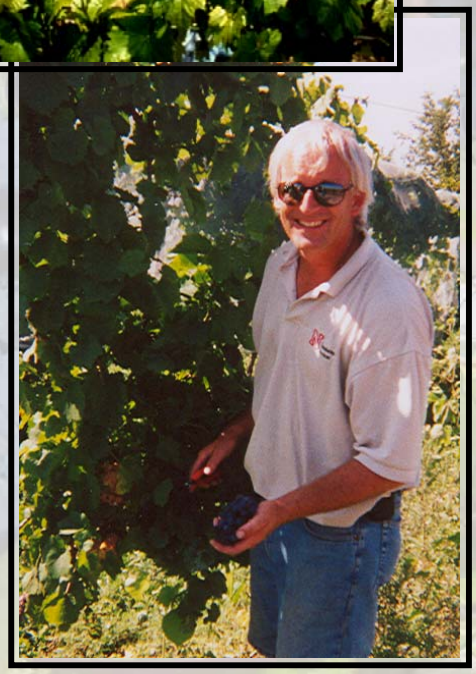


UNIVERSITY OF Nebraska Lincoln

University Of Nebraska Viticulture Program

Project Initiation

The project was stimulated in 1997 by a generous grant from the Richard P. and Laurine Kimmel Charitable Foundation, together with support from the University of Nebraska's Institute of Agriculture and Natural Resources. Land at three southeast Nebraska sites was selected in 1997 and planting began in May of 1998. Installation of experiments and additional plantings continued in 1998, 1999, 2000, 2001 and 2002 at these sites, with "on-vineyard" projects begun at three other locations in 1999, 2000 and 2001. Useful data on hardiness and tolerance of our stressful climate are being accumulated.

A Geography of Viticulture

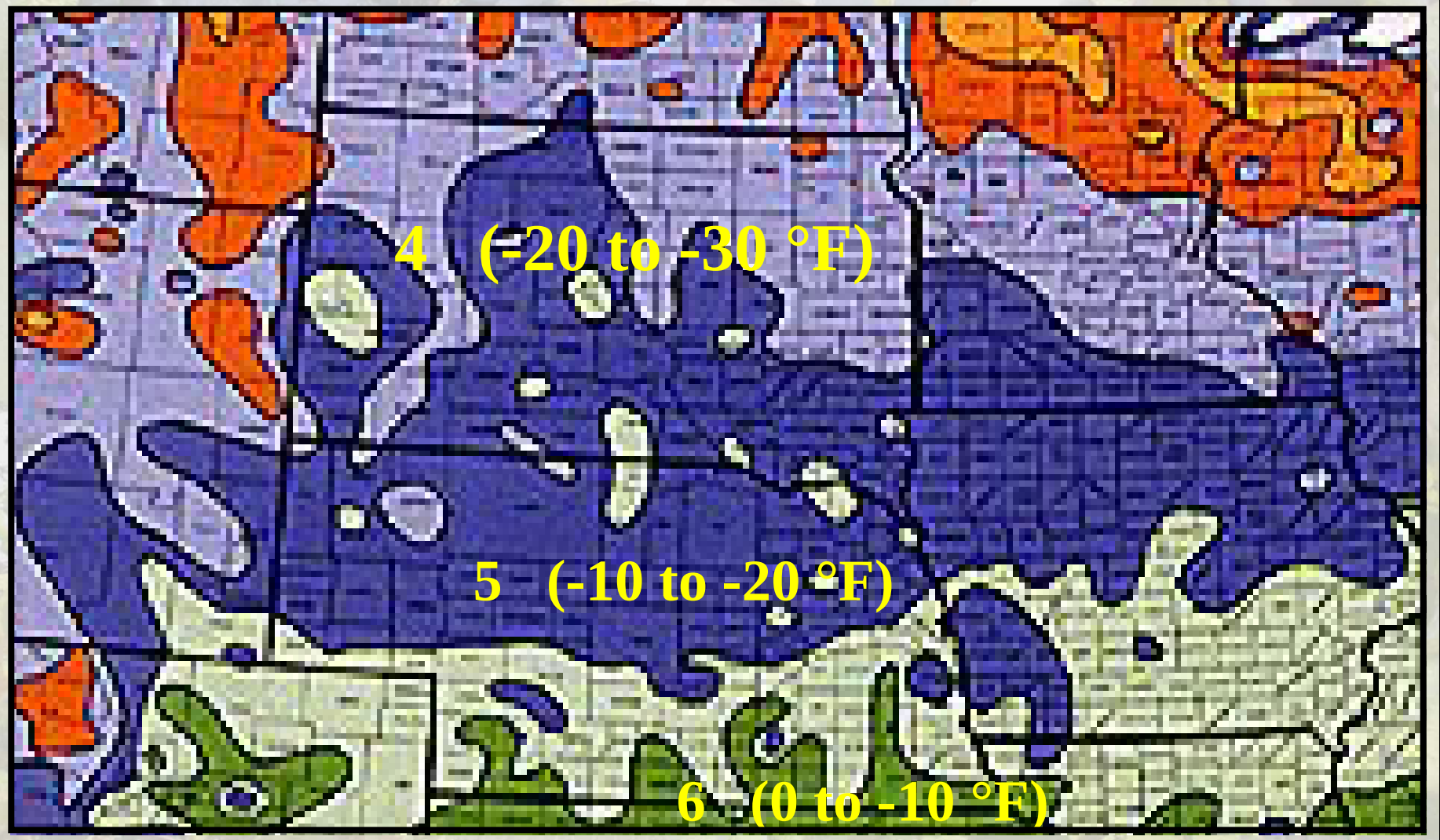
Climate Parameters for Variety & Vineyard Site Selection

- Growing Degree-Days (Base 50 °F); April 1 to October 31; No upper threshold (Winkler et al., 1975); Total heat units and cumulative days
- Average Tminimum Extreme--Isoline of -8 °F is an ecological boundary for V*itis vinifera*; days/decade
- USDA Winter Hardiness Zones--4a to 6b
- Mean Frost-Free Period (Base 28 °F)--Need a 165 day window
- Mean January Air Temperature--Isoline of 30 °F is related to Pierce's Disease
- Mean Annual Tmaximum <32 °F as Cumulative Days
- Mean Annual Number of Days of Tmaximum >90 °F
- Probability of 5-Consecutive Days >60 °F in January, February, or March
- Accumulation of GDDs (Base 32 °F) Consecutively for 1000 hrs (Bud Break)
- The parameters define the variety and sustainability of place, not necessarily the resulting quality and character of the wine.

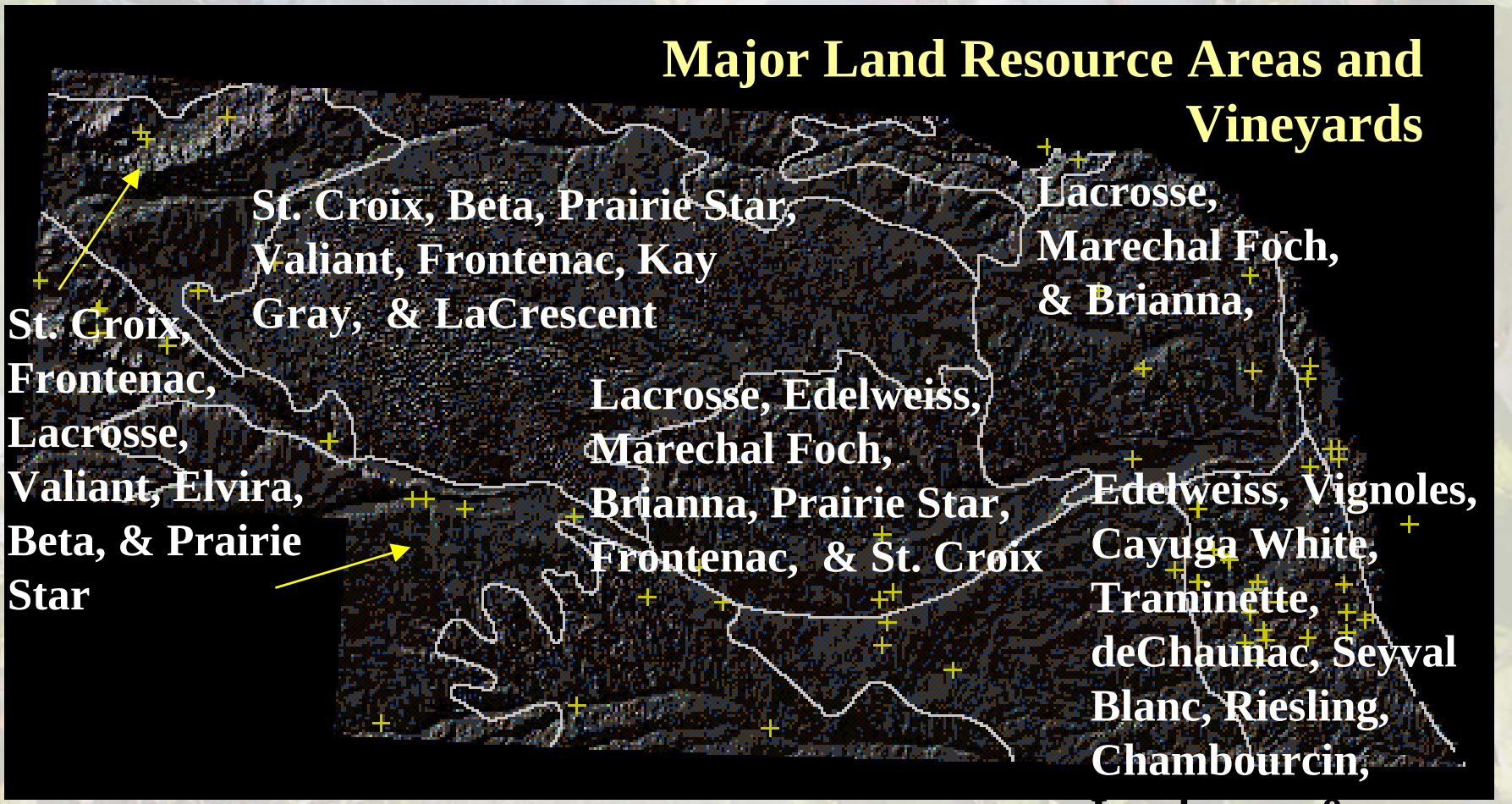
Challenges to Successful Winegrape Producton

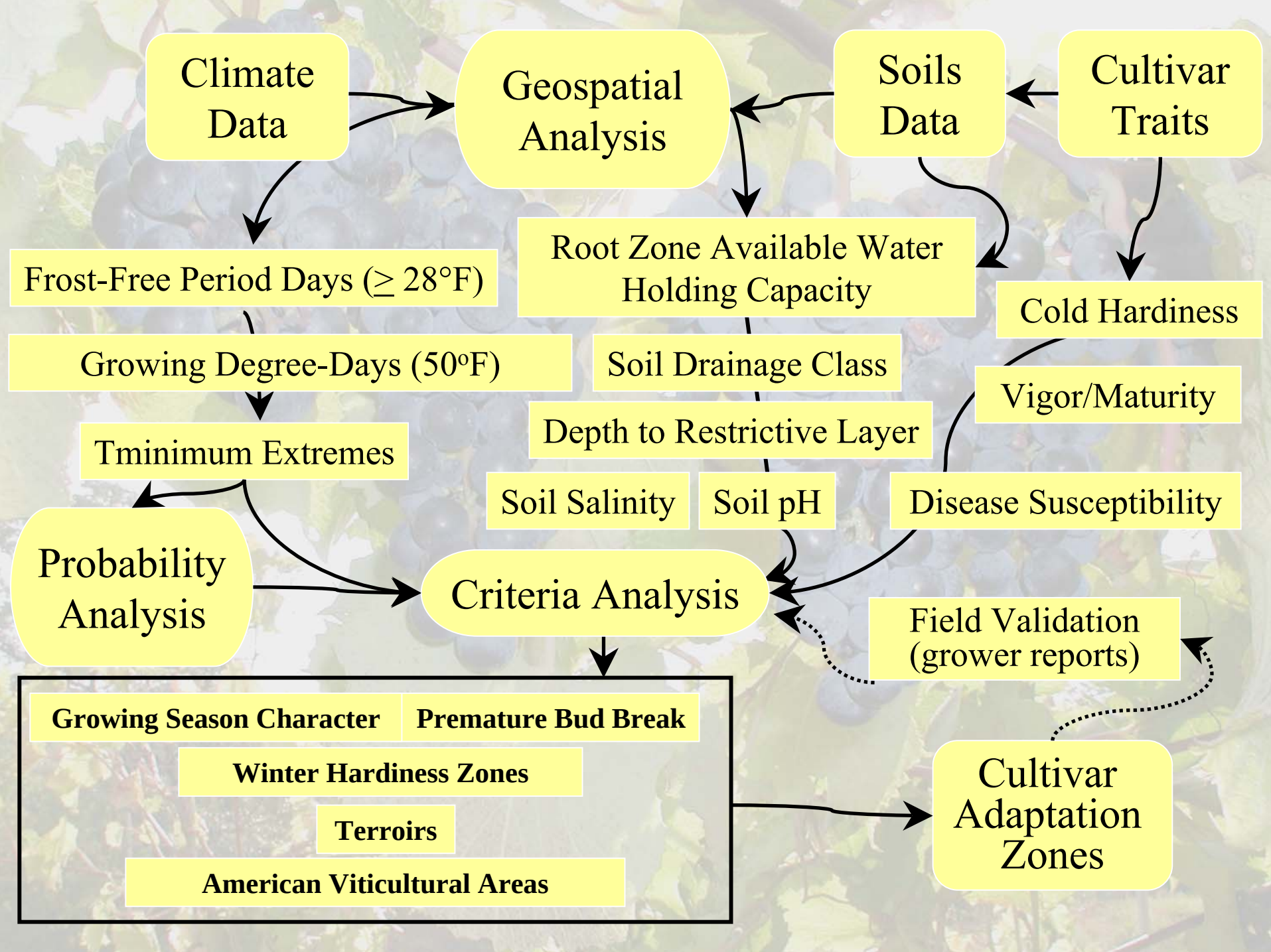
Spring Cold Weather Events (Frost/Freeze)
Diseases
Phenoxy Herbicide Volatilization/Drift
Abrupt Early Fall Temperature Drop
Winter Temperature Minima

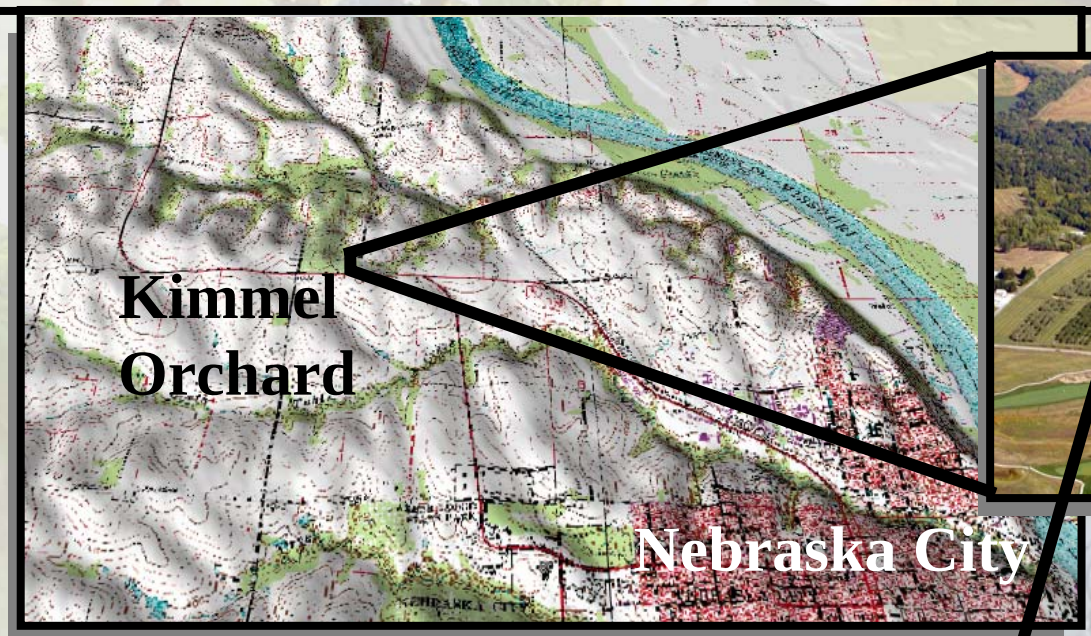
USDA Plant Hardiness Zone Map (2003)



The Working Hypothesis




Climate Data
Geospatial Analysis
Soils Data
Cultivar Traits
Frost-Free Period Days (≥ 28°F)
Root Zone Available Water Holding Capacity
Cold Hardiness
Growing Degree-Days (50°F)
Soil Drainage Class
Vigor/Maturity
Tminimum Extremes
Depth to Restrictive Layer
Soil Salinity
Soil pH
Disease Susceptibility
Probability Analysis
Criteria Analysis
Field Validation (grower reports)
Growing Season Character
Premature Bud Break
Winter Hardiness Zones
Terroirs
American Viticultural Areas
Cultivar Adaptation Zones



Climatic Characteristics of Southeast Nebraska

- Nebraska City (1971-2000)
  - FFP (28°F) = 202
  - GDD (50°F) = 3455
  - Tmin Extreme = -12.5
- Auburn 5 ESE (1971-2000)
  - FFP (28°F) = 189
  - GDD (50°F) = 3836
  - Tmin Extreme = -15.3

Characteristics of three
University of Nebraska Viticulture Program
Research sites

Site Location	Elevation (m)	Soil Type	Annual Precipitation (mm)	Winter Minimum (°c)
Nemaha (South East)	300	Silt Loam	750	-24
Peru (South East)	365	Clay Loam	680	-27
Scottsbluff (Western)	1300	Sandy Loam	380	-35

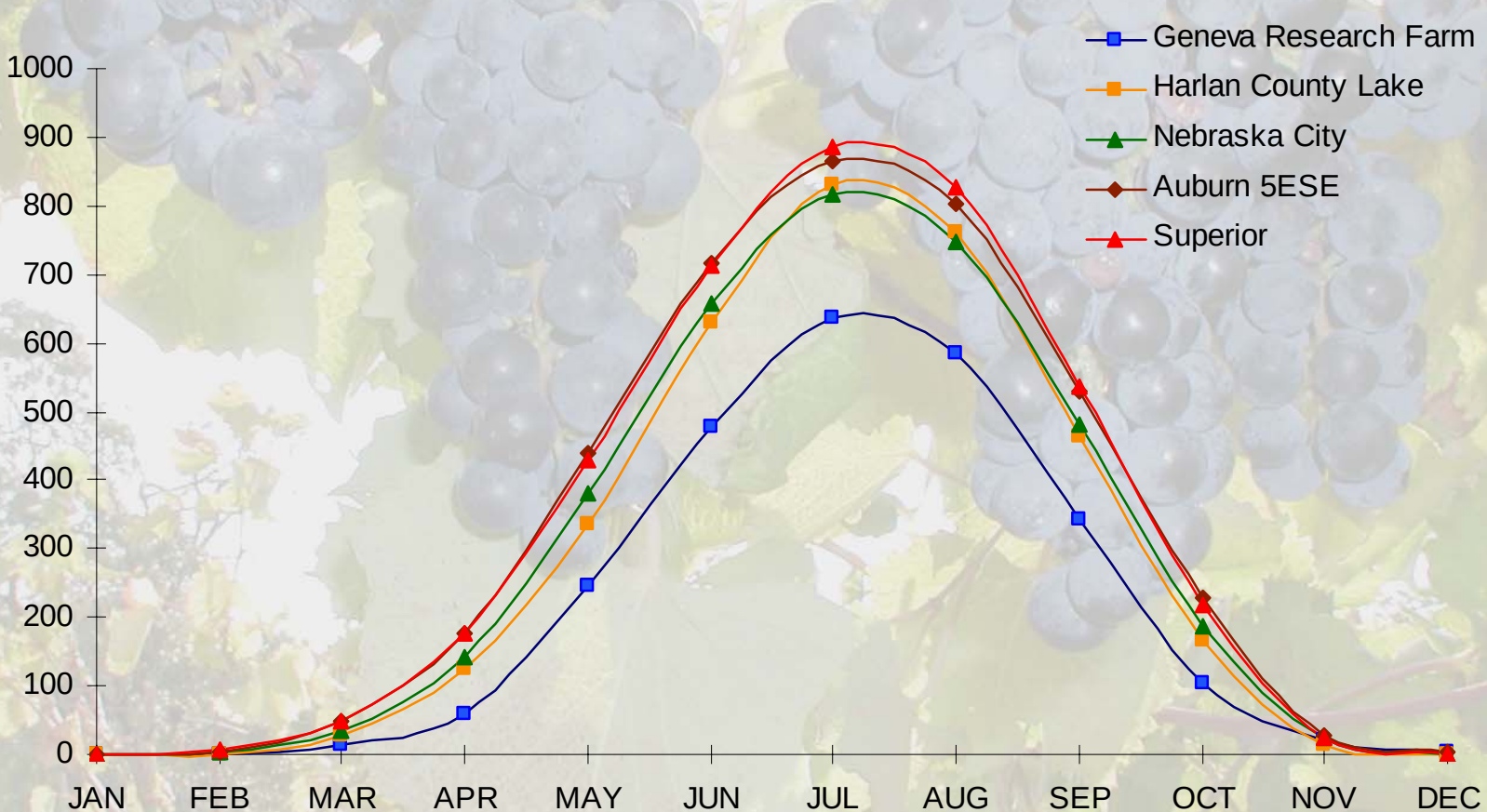
In loess-derived (the deep windblown silts of Nebraska) soils, grape vines can extend their roots to depths of 20 to 40 feet without restriction. So, these soils can readily store large amounts of water to buffer drought events.

Climate Comparison of Major Vineyards in Nebraska

1971 to 2000 Normals

Weather Station	FFP (28°F)	Days <-10°F	Tmin Extreme	Abs Tmin	GDD (50°F)
Cuthills Vineyard Osmond	166	8.4	-21.0	-28	3249
Geo. Spencer Kearney 4 NE	177	3.8	-14.4	-30	3325
James Arthur Vineyard Lincoln AP	183	4.0	-15.2	-22	3605
Blue Valley Vineyard Crete	190	2.8	-14.5	-25	3714
Lovers Leap Vineyard Crawford	153	4.3	-17.5	-33	2742
Whiskey Run Creek Auburn 5 ESE	189	3.1	-15.3	-27	3836
Geneva Research Farm Geneva, NY	198	0.5	-7.2	-16	2485

Growing Degree-Days



Climate Comparison of Major Vineyards in Nebraska

1971 to 2000 Normals

Weather Station	Days <-10°F	Tmin Extreme	Abs Tmin	Cultivars
Cuthills Vineyard Osmond	8.4	-21.0	-28	Lacrosse, deChaunac, Marechal Foch, Brianna
Geo. Spencer Kearney 4 NE	3.8	-14.4	-30	Traminette, Seyval Blanc, Edelweiss, Brianna
James Arthur Vineyard Lincoln AP	4.0	-15.2	-22	Lacrosse, Edelweiss deChaunac, St. Croix
Blue Valley Vineyard Crete	2.8	-14.5	-25	Edelweiss, Melody Seyval Blanc, Aurore
Lovers Leap Vineyard Crawford	4.3	-17.5	-33	Edelweiss, Lacrosse St. Croix, Valiant, Beta

Environmental Measurement Instrumentation

2005 COOPERATORS

UNL Research Site - Scottsbluff

Cuthills Vineyards - Pierce

Nissen Brothers Vineyard - Hartington

Echo Hills Vineyards - Arlington

James Arthur Vineyards - Raymond

17 Ranch – Lewellen

Ida's Vidas – Ogallala

Millenium Wines - Lexington

Mac's Creek Vineyards -- Lexington

George Spencer Vineyards - Gibbon

Myers Vineyards - Superior

Czechland Vineyards - Wilber

UNL Research Site – Neb. City

Table 1. Mean Hardiness Rating and Spring Bud Break for Cultivars Exhibiting Reliability

Cultivar	Mean Hardiness Rating[z]	Mean Bud Break Rating[y]	Remarks
Chambourcin, O.R.	6.47	2.15	
Chambourcin/3309C	6.19	1.65	
deChaunac	8.28	5.80	Late frost susceptible but fruits well on secondaries
Delaware	8.30	3.70	
Edelweiss	8.43	4.10	Sometimes hurt by late frost
Frontenac	8.66	2.80	
Lacrosse	8.33	3.60	
Marechal Foch	6.98	5.90	Late frost susceptible
Saint Croix	8.71	3.95	
Vignoles	8.11	3.70	

[Z] Ratings: 1 to 9, with 1`= dead and 9 = all buds alive and breaking. Averaged over four locations and three years.

[Y] Ratings: 1 to 6, with 1 = tight buds, 6 = buds opened and shoots elongating.

Table 2. Mean Hardiness Rating and Spring Bud break for Cultivars to Consider on a Trial Basis in Nebraska

Cultivar	Mean Hardiness Rating[z]	Remarks
Bianca/3309C	5.18	Variable vigor
Catawba	5.30	Not good on heavy soils
Cayuga White	5.85	Very productive once established
Chardonel	6.20	Slow starter
Cynthiana/Norton	7.30	Small bunches, productive
Esprit	6.65	
Lemberger/3309C	6.34	Must be grafted, large clusters
Leon Millot	7.30	Similar to M. Foch, early bud break
Niagara	5.82	
Riesling/3309C	6.68	Must be grafted
Seyval Blanc	7.05	Attractive large clusters, overcropping may be a problem
Traminette	6.50	Beautiful clusters, lovely spicy wine
Trollhaugen	6.80	
Vidal Blanc	5.16	Slow starter

[z] Ratings: 1 to 9, with 1 = dead and 9 = all buds alive and breaking. Averaged over four locations and three years.

Table 3. Mean Hardiness Rating for Experimental Grape Genotypes in Nebraska

Genotype (Code #)	Mean Hardiness Rating[z]	Remarks
ES 2-1-9	5.20	Named 'Sabrevois' in Quebec; lacks vigor in Nebraska
ES 3-24-7	6.70	'Prairie Star'; fruity white wines
ES 5-4-29	6.55	
ES 6-1-43	4.95	'Swenson White'
ES 10-18-30	6.45	
ES 7-4-76	9.00	'Brianna'; white wines bursting with tropical fruit
MN 1131	6.95	
MN 1166	7.95	'LaCrescent'; excellent fruity white wines
MN 1197	7.50	
MN 1200	7.60	
MN 1211	7.60	
NY GR7	7.45	good vigor on lean soils
NY 70.809.1	7.05	
NY 62.122.1	5.25	
NY 73.0136.17	6.60	

[z] Ratings: 1 to 9, with 1 = dead and 9 = all buds alive and breaking.

WHITE WINEGRAPE CULTIVARS (“varieties”)

Edelweiss
Delaware
Lacrosse
Seyval Blanc (“Seyval”)
LaCrescent
Vignoles
Prairie Star

For trial consideration

Cayuga White
Brianna
Chardonel
Esprit
Riesling (grafted)
Vidal Blanc
Saint Pepin
Traminette

RED WINEGRAPE CULTIVARS (“varieties”)

deChaunac

Frontenac

Marechal Foch (“Foch”)

Saint Croix

St. Vincent

Valiant

For trial consideration

Cabernet Franc (grafted)

Chambourcin

Norton/Cynthiana

Lemberger (grafted)

GRAPES FOR JUICE, JELLY, TABLE AND OTHER USES

- Bluebell – juice (red)
- Canadice – seedless, table (pink)
- Concord & Concord Seedless – table, juice, jelly (wine, red)
- Catawba – table, juice (wine, pink)
- Delaware – table, juice (wine, pink)
- Himrod – seedless, table (white)
- Niagara – juice, jelly (wine, white)
- Reliance – seedless, table (red)
- Swenson Red – table, (wine)

Are Nebraska Wines Good For You ?

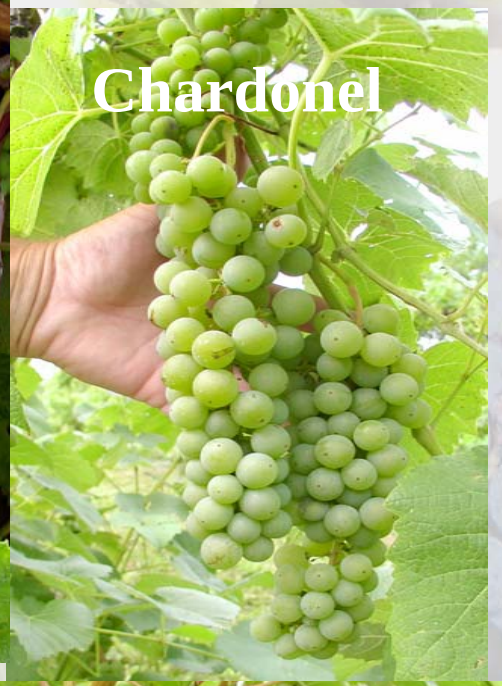
Polyphenolic Classes

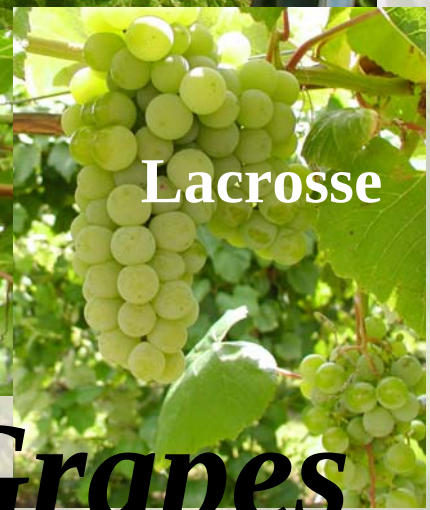
- **Flavonoids**
  - Insect deterrent or attractant, feeding stimulant, signal to soil mycorrhiza, UV protection
- A. **Anthocyanidins** --delphinidin, cyanidin
  - Pigmentation
- B. **Flavonols**—Quercetin, catechin, epicatechin
  - Allelopathic functions
- C. **Stilbenes**—Resveratrol, picead
  - phytoalexin

Nebraska Grapes

- St. Croix> Frontenac> deChaunac ~4900 -1400 mg/kg whole grapes

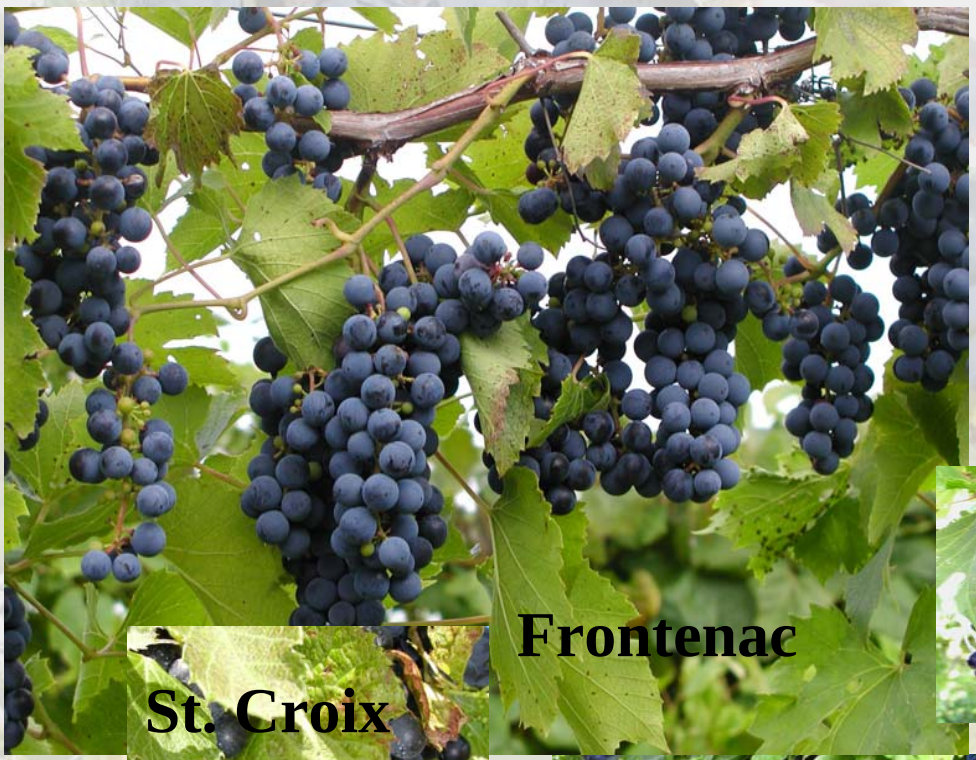
- Vignoles & LaCrosse ~ 1400mg/kg whole grapes



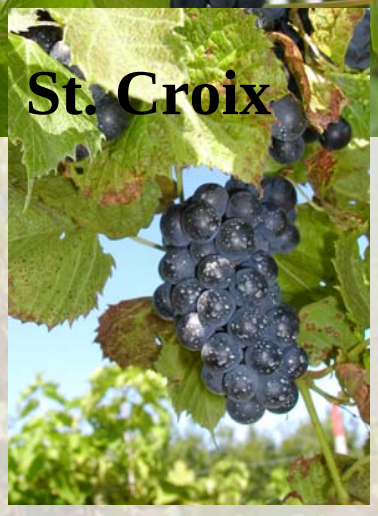


White Wine Grapes

Red Wine Grapes



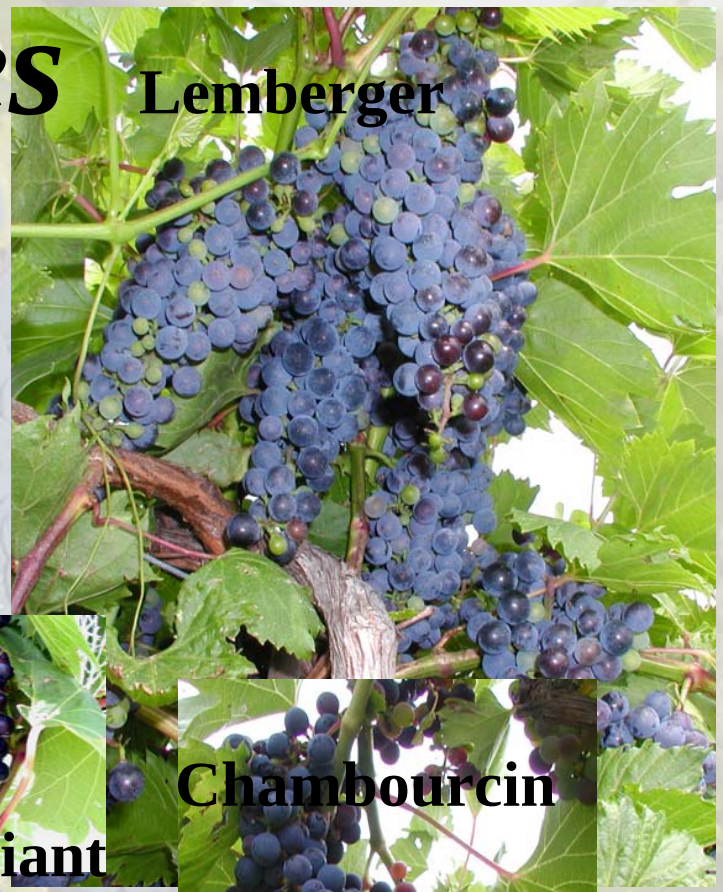
Frontenac



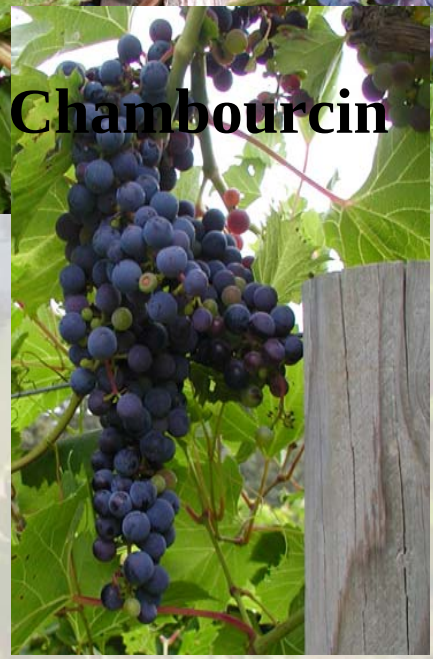
St. Croix

Norton

Valiant



Lemberger



Chambourcin