



# Viticulture, enology and marketing for cold-hardy grapes



## *Viticulture:*

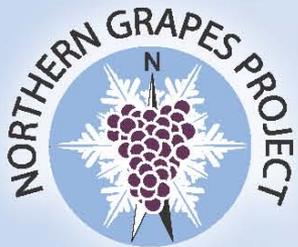
Addressing climate, soils, nutrition,  
pest management to achieve  
consistent quality.

**Paul Domoto**

Iowa State University

*The Northern Grapes Project is funded by the USDA's Specialty Crops Research Initiative Program of the National Institute for Food and Agriculture, Project #2011-51181-30850*



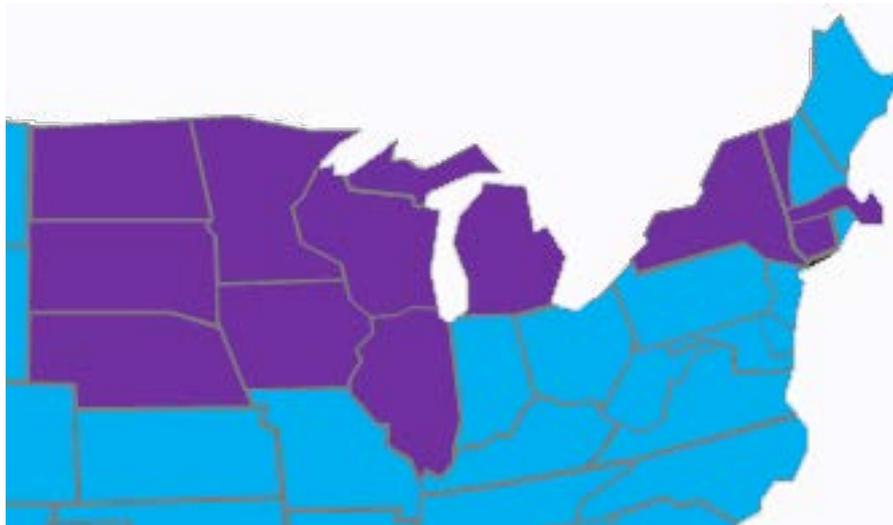


# History of Wine Making in the Eastern US



## Early *V. riparia* hybrids

Beta  
Bluebell  
Chontay  
King of the North



## *V. labrusca*

Concord  
Catawba  
Delaware  
Niagara

## French interspecific hybrids introduced 1920's - 1960's

Aurore	Chelois	Ravat 34
Baco noir	de Chaunac	Rosette
Cascade	Landot noir	Seyval blanc
Chambourcin	<b>Léon Millot</b>	Vignoles
<b>Chancellor</b>	<b>Maréchal Foch</b>	Villard blanc



# Northern Hybrids with *Vitis riparia* parentage



**Univ. of Minnesota**

Frontenac  
Frontenac gris  
La Crescent  
Marquette

Dr. Ron Peterson

**S. Dakota St. Univ.**

Valiant

**Ed Swanson**

Brianna (7-4-76)

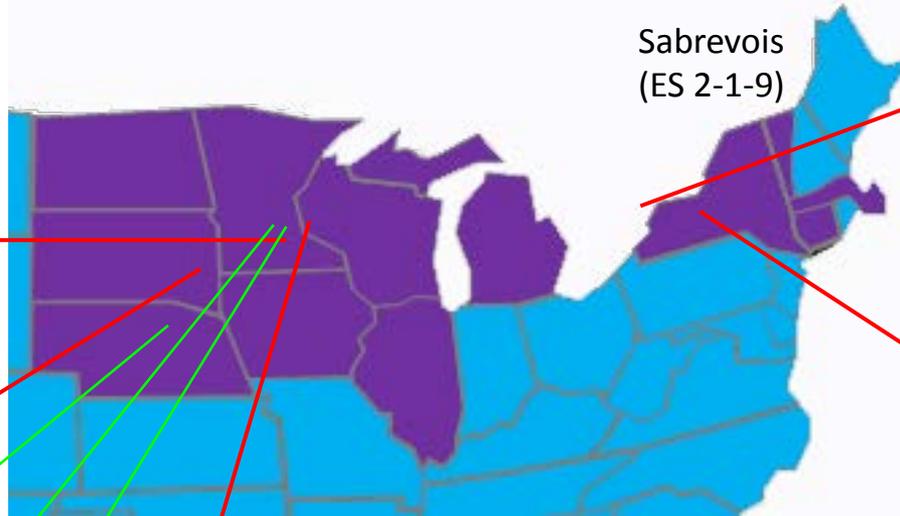
**David MacGregor**

Petit Ami™

**Tom Plocher**

Prairie Star (ES 3-24-7)

Petite Pearl™



Sabrevois  
(ES 2-1-9)

**Ontario Min. of Ag.**

Ventura



Dr. Bruce Reisch

**NY St. Ag. Expt. Sta.**

Corot noir™

GR 7

Noiret™

Traminette



**Elmer Swenson, Osceola, WI**

Alpenglow

Edelweiss

Esprit

Kay Gray

La Crosse

Louise Swenson

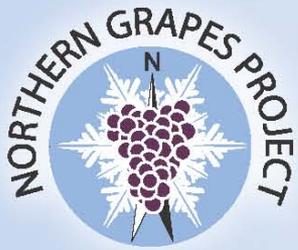
Petite Jewel

St. Croix

St. Pepin

Swenson Red

Swenson White



# Diversity of Climates & Soils



## Climate:

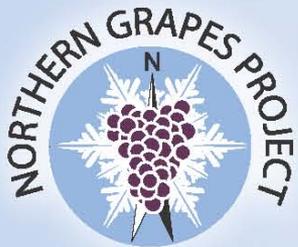
- Average minimum winter temperature: 0 to -35 F
- Frost-free days: less than 130 to over 180.
- Growing Degree Days: less than 2,500 to over 3,500.
- Annual precipitation: less than 15 to over 50 inches.

## Soils:

- Different origins: marine, terrestrial; glaciated, non-glaciated
- Soil pH: less than 5.5 to over 8.0
- Fertility: Organic matter less than 1% to well over 5%

***What range of fruit chemistry and maturity can be produced across the climatically and soil variable Upper Midwest and Northeast?***

***What viticultural practices can positively influence fruit maturity and chemistry?***



# Objective 1

**Document cold climate varietal performance in variable climates and understanding the resulting sensory characteristics of the fruit and wines.**

**Obj. 1a. Evaluate cold climate cultivar performance under a wide range of climates throughout the Upper Midwest and Northeast to match cultivar with site.**

- A collaboration with the NE-1020 project “Multi-state evaluation of winegrape cultivars and clones”.
- **Viticulture Team:**
  - Field performance of northern hybrid cultivars (Frontenac, Marquette, St. Croix, Frontenac gris, La Crescent)
  - Collect climatic data at the sites.
- **Enology Team:**
  - Fruit chemistry
  - Winemaking
  - Sensory profile analysis



# Viticulture Team

## Objective 1a



Harlene  
Hatterman-Valenti



Rebecca  
Harbut



Paolo Sabbatini



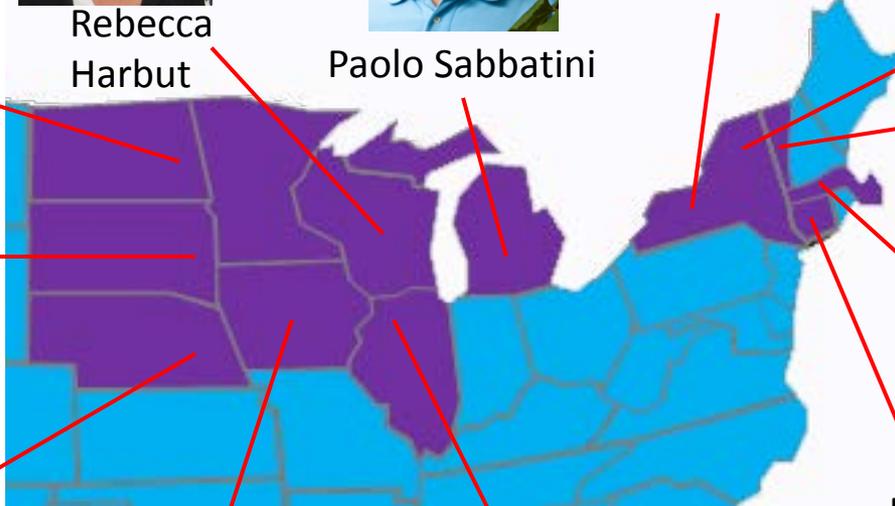
Tim Martinson\*



Kevin  
Lungerman



Anne  
Fennell

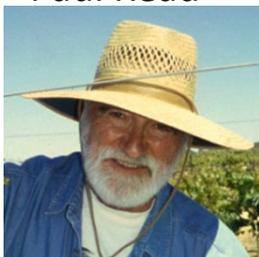


Lorraine Berkett



Sonia  
Schloemann

Paul Read



Paul Domoto



Bill Shoemaker



Bill Nail





# What we know about Northern Hybrids



- 1. Many can withstand winter temperatures as low as -40 F.**
- 2. On fertile soils, many exhibit very vigorous vegetative growth.**
- 3. Juice from the grapes can be:**
  - a. Very high in % soluble solids (Brix).**
  - b. Very high in titratable acids (TA)**
  - c. Juice pH tends to rise rapidly during berry maturation.**
  - d. Juice has a different profile of malic to tartaric acid than other grapes.**
  - e. Juice can be high in potassium (K) which precipitates tartaric acid out of the wine as potassium bitartrate crystals.**
  - f. Red wine cultivars are often very high in anthocyanin pigments.**
- 4. Wines made from these grapes can often have an “herbaceous” or “grassy” character.**



# What we know about Grapevine Physiology



**Symptoms associated with grapes grown in overly shaded canopies:**

- Levels of titratable acids remain high.
- Juice pH rises rapidly during berry maturation.
- Juice can be high in potassium (K).
- Juice has a different profile of malic to tartaric acid.
- Wines made from the grapes have an “herbaceous” or “grassy” character.

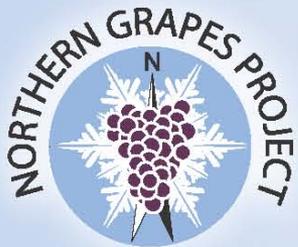
***Can vineyard management practices improve the quality of fruit from cold climate cultivars?***



## Objective 2

**Develop and extend research-based vineyard management practices that allow sustained production of high quality fruit from cold climate cultivars.**

- **Obj. 2a.** Evaluate crop and canopy management strategies to minimize fruit acid content and improve fruit composition in high-acid, high-sugar cold climate grape cultivars.



# Objective 2a

## Approaches

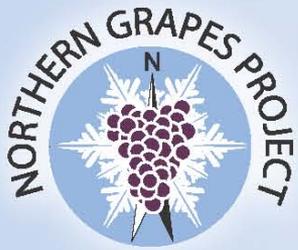


### i. Identify training systems suited to cold climate grape cultivars.

- Will compare vine performance, yield, light interception, disease incidence, and fruit composition in replicated trials.

State	CT	NY	IA	NE
Cooperator	Bill Nail	Tim Martinson	Gail Nonnecke Paul Domoto	Paul Read
Training systems	HWC MWC/VSP GDC Smart-Dyson	HWC MWC/VSP Umbrella Kniffin	HWC MWC/VSP GDC Scott Henry	HWC MWC/VSP GDC Smart-Dyson Scott Henry
Cultivars	St. Croix	Frontenac Marquette La Crescent	Frontenac Marquette La Crescent	Frontenac St. Croix

Abbreviations: HWC= high wire cordon; MWC=mid-wire cordon; GDC= Geneva double curtain



# Objective 2a

## Approaches



### **ii. Canopy management.**

*Will modifying the light environment through canopy management practices improve fruit and wine making characteristics?*

- Shoot thinning
- Shoot positioning
- Summer hedging
- Leaf removal

**Team:** Gail Nonnecke & Paul Domoto (IA)  
Tim Martinson (NY)  
Rebecca Harbut (WI)



# Objective 2a

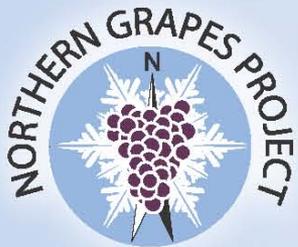
## Approaches



### **iii. Cropping level management.**

*Under what conditions will crop thinning moderate acidity and assist growers in avoid delays in ripening?*

- a. Crop load adjustment (Gail Nonnecke & Paul Domoto, IA)
- b. Timing and severity of crop reduction. (Tim Martinson, NY)
- c. Grower extension demonstration plots. (Year 3-4?)
  - Kevin Iungerman (NY)
  - Rebacca Harbut (WI)
  - Mike White & Paul Domoto (IA)
  - Bill Nail (CT)

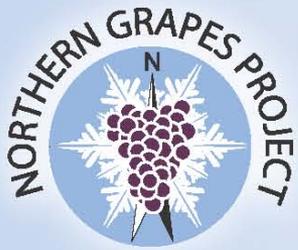


# Objective 2b

**Determine optimal mineral nutrition and soil management practices for cold climate cultivars.**

## ***Issues:***

- Unbalanced mineral nutrition due to lack of or excessive nutrient inputs (N, K) can lead to undesirable grape juice properties (H/L acidity, H/L sugars, L yeast assimilable N).
- Mineral nutrient petiole analysis sufficiency ranges are based on other grapes species (*V. labrusca* & *V. vinifera*).
- The best tissue type to assess nutritional status (petiole vs leaf blade) for all grapes species has recently come under debate.



# Objective 2b

## Approach

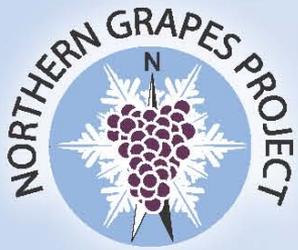


**Study will be conducted in grower vineyards representing different soil types.**

**Sites: MN (4), IA (4), SD (3), ND (2), NY (1)**

- i. Annual soil sampling.
- ii. Nutritional profiling of cold climate cultivars.
  - Petiole and leaf blade samples will be collected 3 times during the growing season (Full bloom, Pre-veraison, Veraison)
- iii. Correlation with yield, vine and fruit parameters.
  - Pruning weights
  - Yield
  - Fruit composition (SS, pH, TA, yeast assimilable N)

**Team:** Carl Rosen\* (MN), Paul Domoto & Gail Nonnecke (IA), Rhoda Burrows (SD), Harlene Hatterman-Valenti (ND), Tim Martinson (NY)



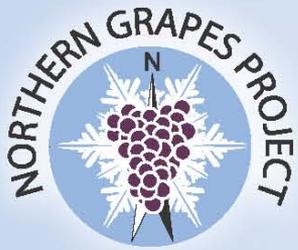
# Objective 2c



**Develop sustainable pest management recommendations based on cold climate cultivar copper and sulfur sensitivity and disease resistance.**

## *Issues:*

- Host resistance is the cornerstone of sustainable disease management, but information on cold climate grape cultivars is largely based on incomplete, anecdotal reports.
- Minnesota cultivars are at least moderately resistant to some diseases, but the range of resistance to the important diseases has not been tested.



# Objective 2c

## Approach



- 1. Characterize the disease and insect susceptibility of cold climate grape cultivars.**
- 2. Determine the sensitivities of cold climate grape cultivars to copper- and sulfur-based fungicides.**

**Procedure:** Replicated cultivar trials in

- VT (Lorraine Berkett)
- WI (Patty McManus\* & Rebecca Harbut).



# Objective 2c Procedure



## I. Cultivars:

**VT:** Frontenac, La Crescent, St. Croix, Marquette, Prairie Star, Corot noir, Vignoles, Traminette

**WI:** Frontenac, La Crescent, St. Croix, Marquette, Frontenac gris, La Crosse, Brianna, Valiant (*disease susceptible control*)

## II. Pest will be managed using standard cultural and chemical controls.

I. **WI:** Disease control in one rep will be based on copper and sulfur fungicides acceptable in an organic vineyard.

II. **WI:** (Years 4 & 5) no controls will be applied for insects or diseases.

## III. Disease and insect incidence and severity will be monitored and assessed, and correlated with weather station data.

– **Key diseases:** powdery mildew, downy mildew, black rot, Phomopsis leaf & cane spot, anthracnose

– **Key insects:** grape berry moth, eastern grape leafhopper, phylloxera



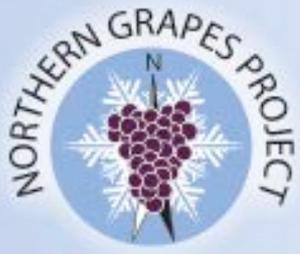
# Viticulture Team

## Summary of Objectives



- 1a. Field performance of cold climate cultivars.
- 2a. Evaluate crop and canopy management strategies.
  - I. Training systems
  - II. Canopy management
  - III. Cropping level
- 2b. Determine optimal mineral nutrition & soil management practices.
- 2c. Develop sustainable pest management practices.

**GOAL:** Improve the quality of wine produced from cold climate grape cultivars grown in sustainable vineyards located across the Upper Midwest and Northeast.



# Viticulture, enology and marketing for cold-hardy grapes

## The Viticulture Team



Harlene  
Hatterman-Valenti



Carl Rosen



Patty  
McManus



Rebecca  
Harbut



Poalo  
Sabbatini



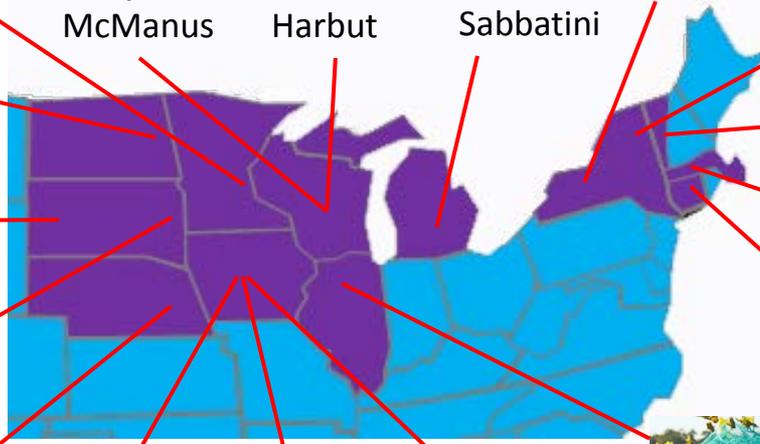
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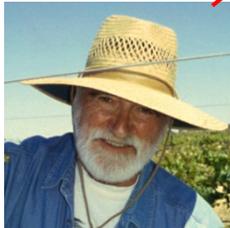
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Lorraine  
Berkett



Anne Fennell



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Sonia  
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