

Soil fertility, plant nutrition and environmental research- Grape DIAP era, 2010-2013



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INDUSTRY SEMINAR - BROCK UNIVERSITY, APRIL 27TH, 2011

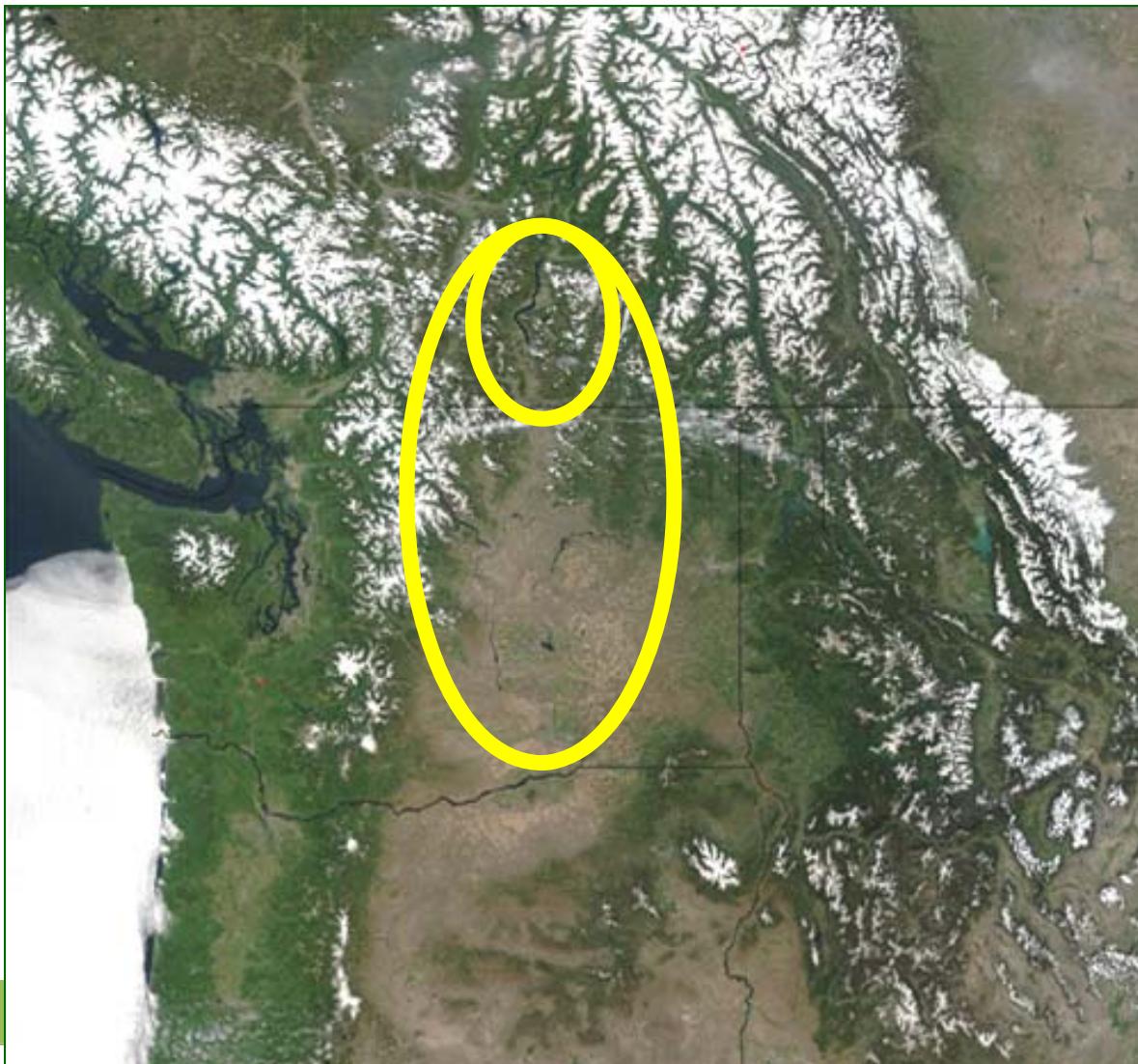


Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada

Irrigated tree fruit and grape production area Washington and British Columbia



Precipitation

Precipitation data from Environment Canada's climate network. (1961-90 Normals)

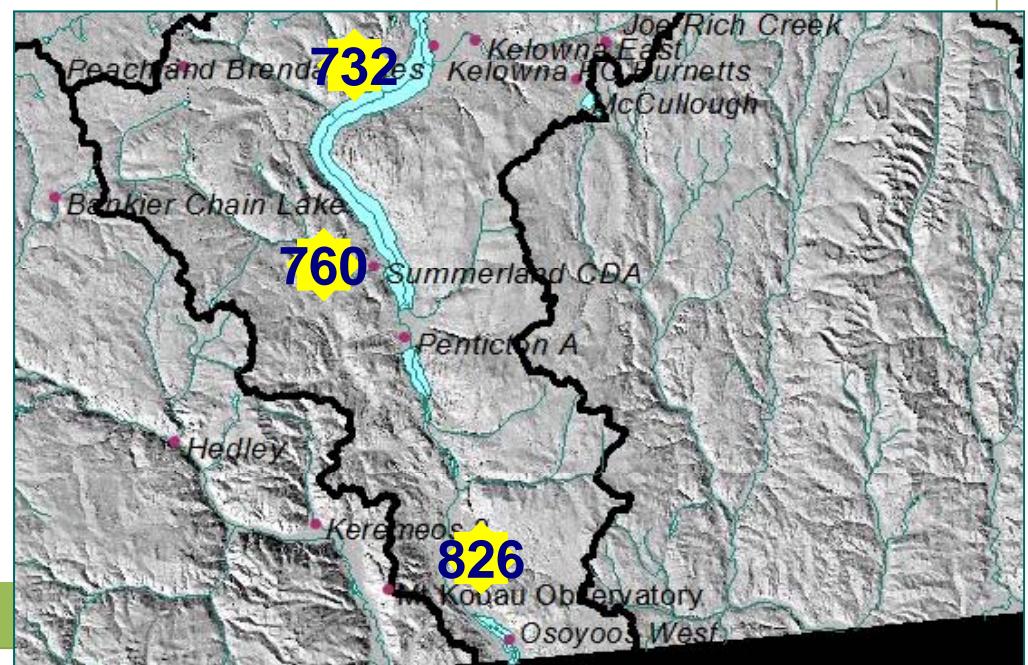
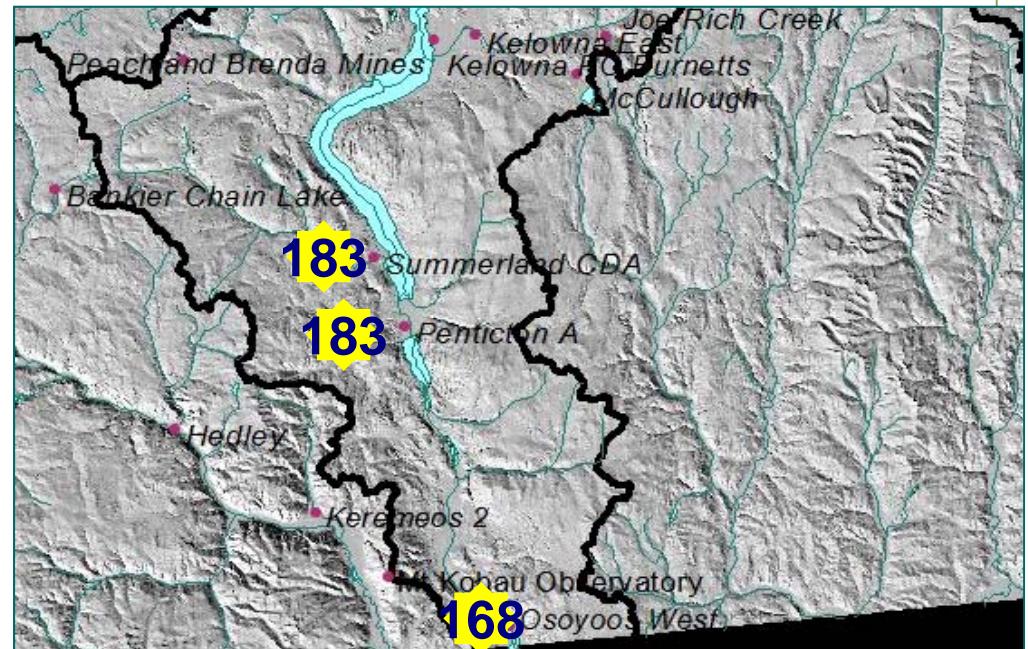
Mean Apr-Oct precipitation (mm)



Evaporation

Measured evaporation data (atmometer - estimates ET_0)

Total Apr-Oct 2002 – est. ET (mm)



Strategies for managing water well



- Applying water to meet plant requirements (irrigation scheduling)
- More conservative systems (micro-irrigation/mulching)



- Deficit or partial irrigation techniques

Changes in production systems



Response- Organic Production Systems



Summerland Sweet Cherry Varieties



Santina



Skeena



Cristalina

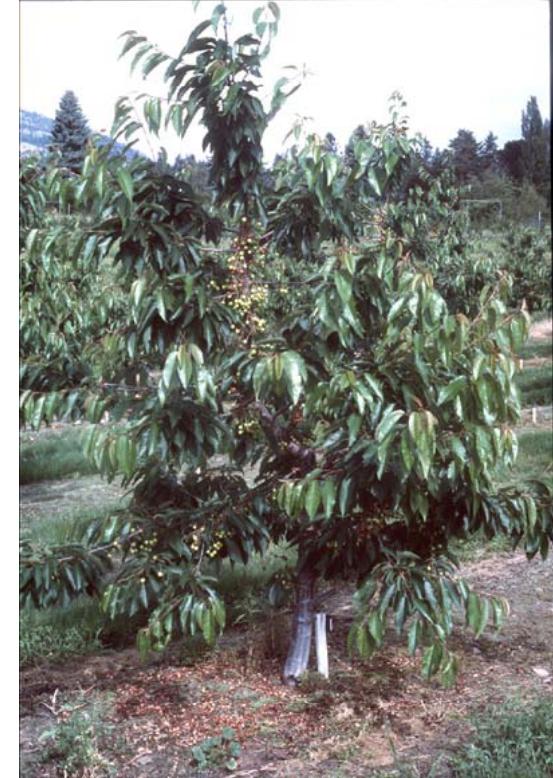


Staccato

Higher Density Production Systems



Mazzard, F12/1 rootstock,
6m x 6m

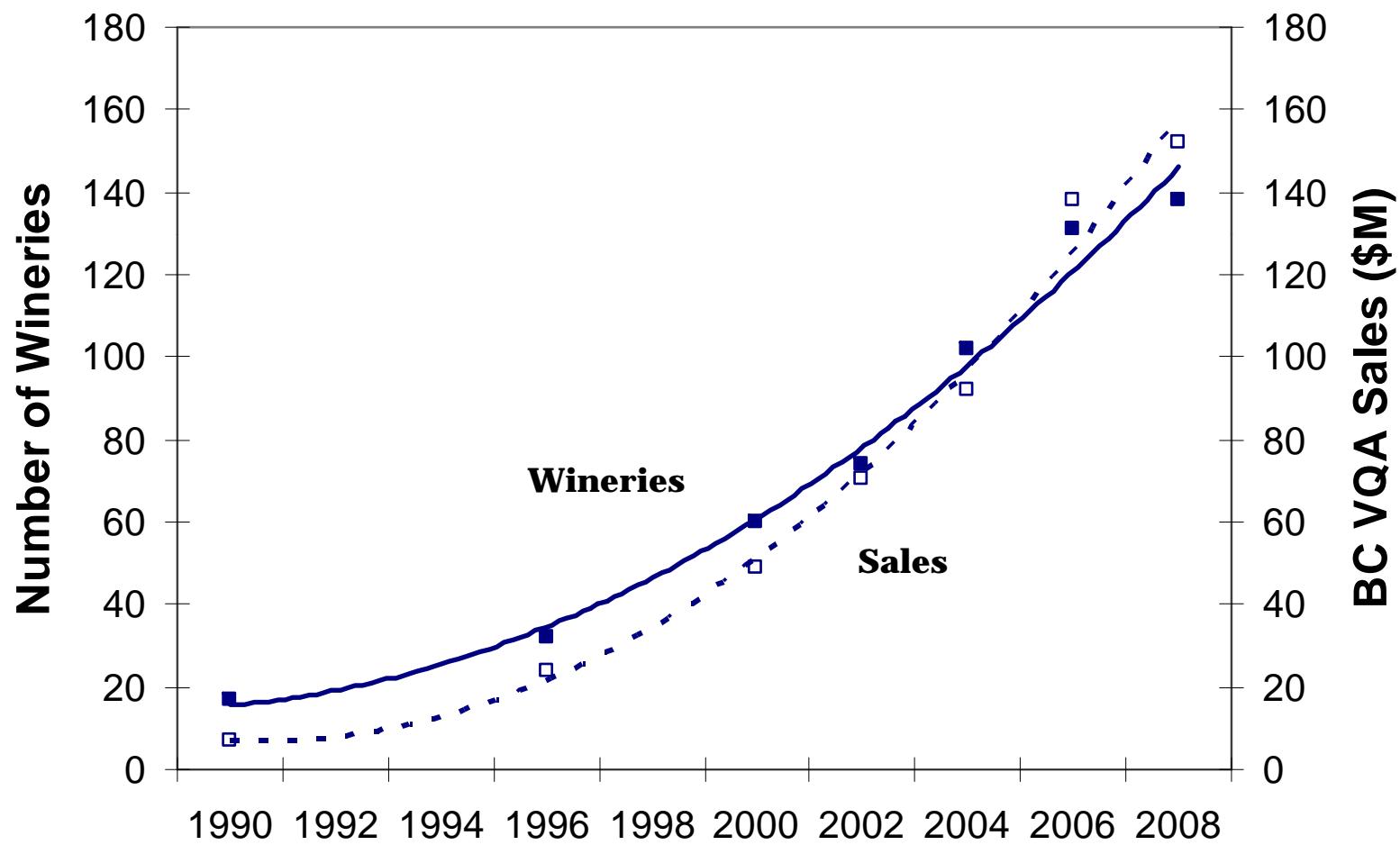


Gisela 5,6 rootstock,
1.2-2.5m x 4-5m

Grape production systems

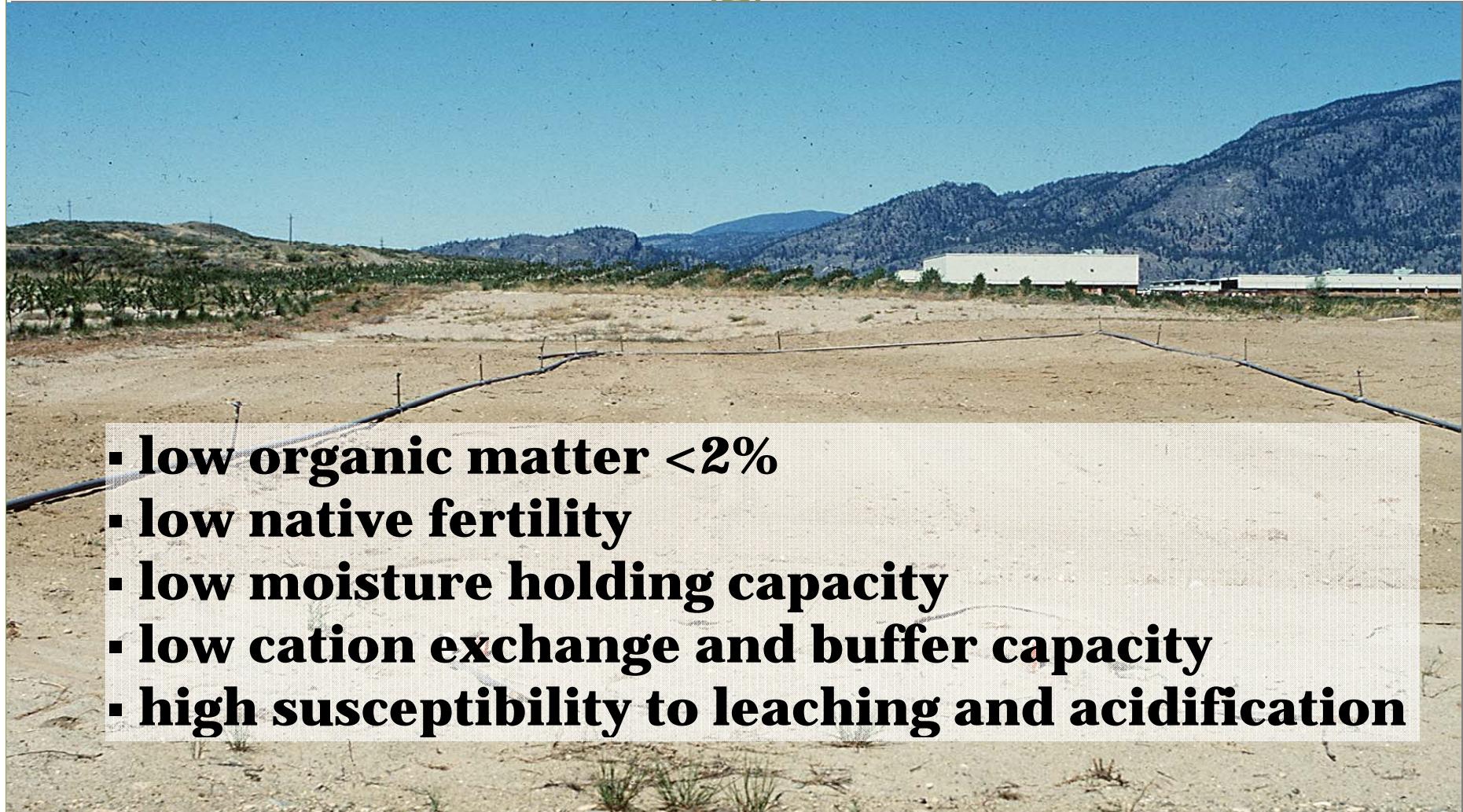


Growth in the BC wine industry



Source: BC Wine Institute from data from the BCLDB

Typical site—Osoyoos loamy sand



- **low organic matter <2%**
- **low native fertility**
- **low moisture holding capacity**
- **low cation exchange and buffer capacity**
- **high susceptibility to leaching and acidification**

Fertigation techniques



Increased importance
mineral x water interaction
eg. Fertigation



Potential advantages:

- flexibility of timing
- match plant demand and fertilizer application

By improving technology



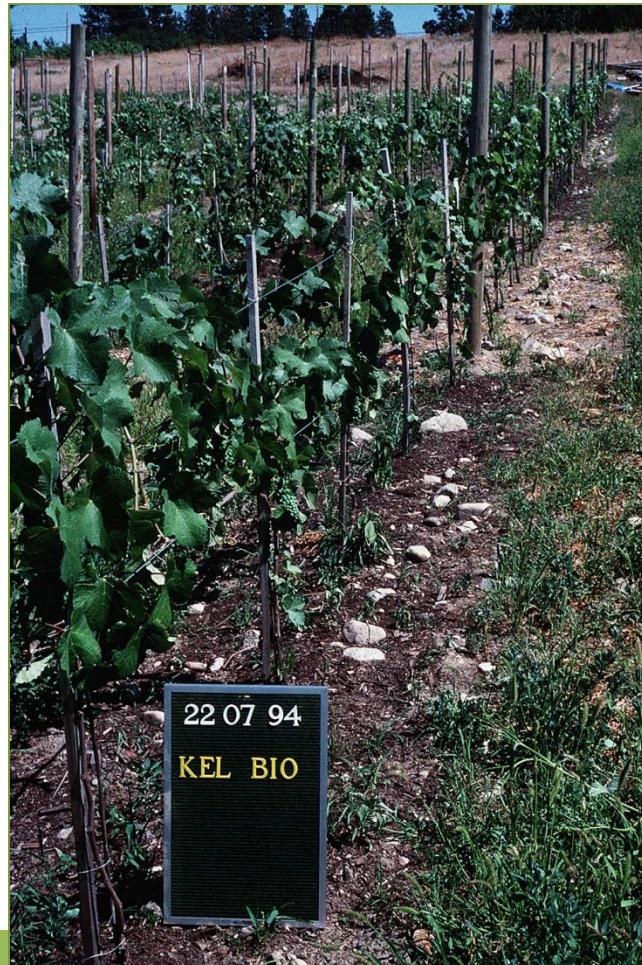
Individually controlled
microsprinklers and
drippers

- **Controlled by sensors**
- **Individual tree water management**
- **Under development**

controller

Issues

Nitrogen form





Biosolids



Agassiz compost



- vegetation/poultry manure/straw
- aerated, turned
- 65°C (weed, disease control)



Site 1



- Merlot/SO4 rootstock
- 1.25mx2.5m (3200 v ha-1)
- planted 1999
- harvest Oct 6, Oct 2, Sep 26 (2005-2007)

Site 2



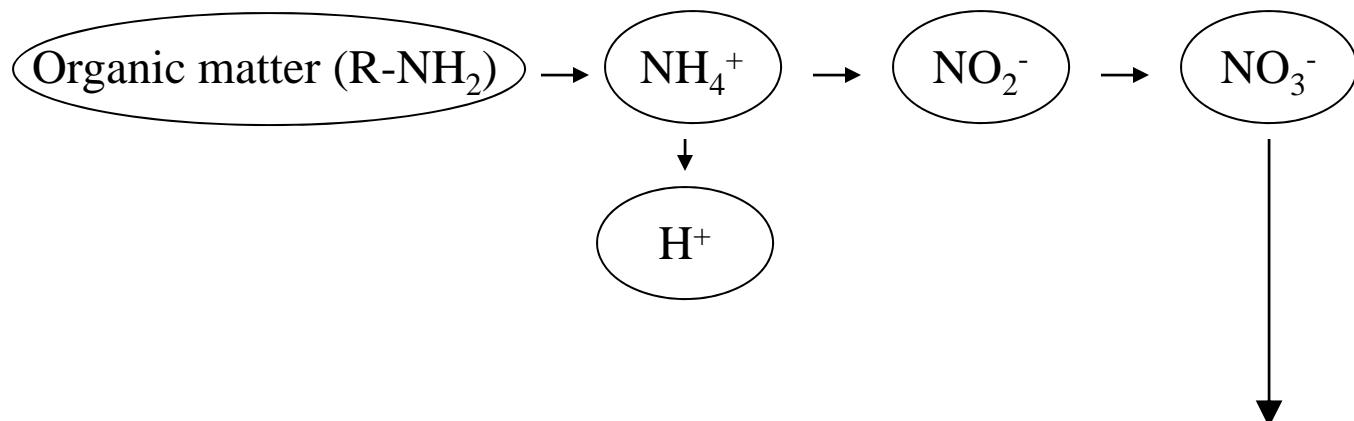
- Cabernet Sauvignon
- 1.17mx2.5m (~3400 v ha-1)
- planted 1998
- harvest Oct 27, Oct 24, Oct 22 (2005-2007)

Issues

Linkage of N and water supply

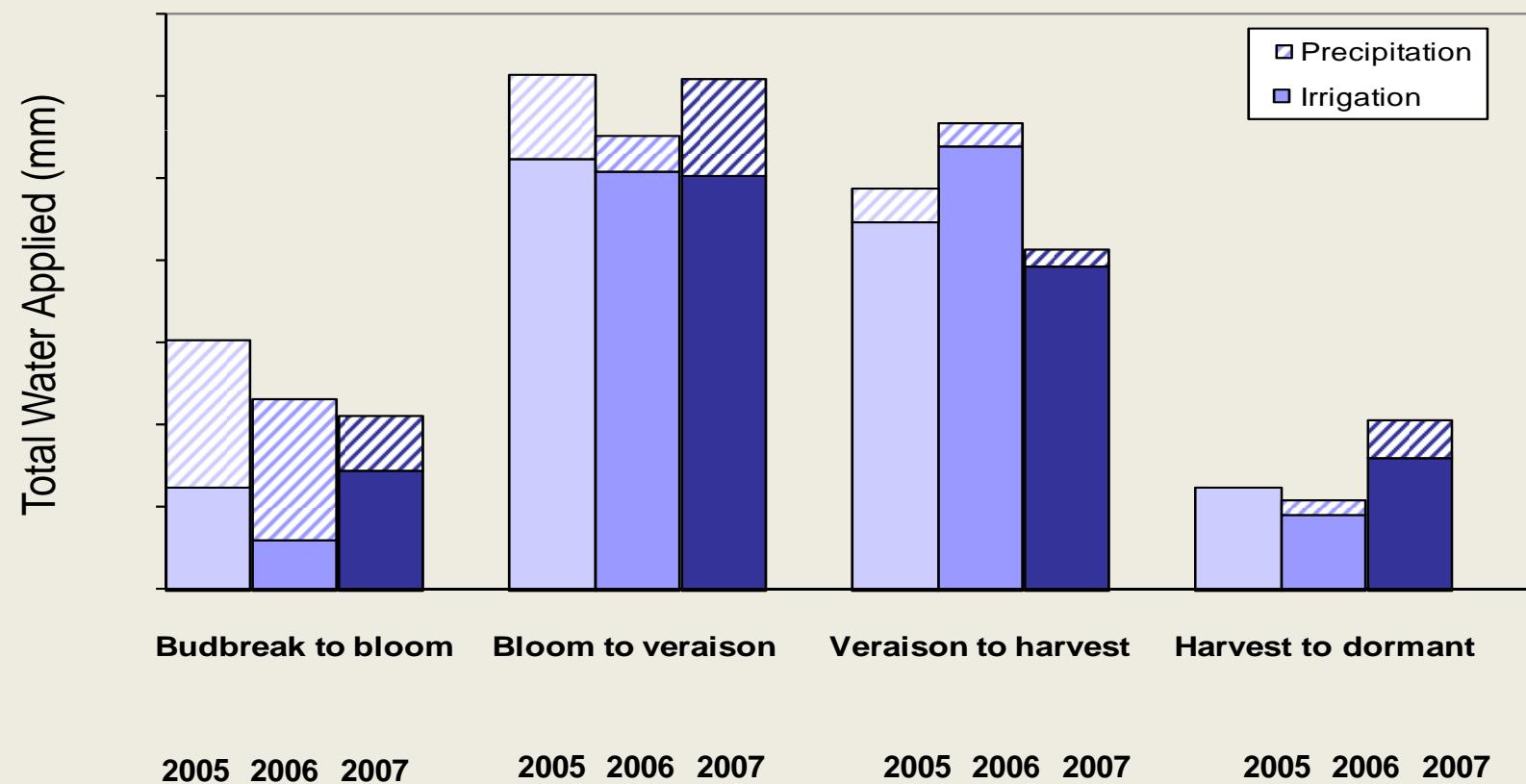
Linked because

- **NO_3^- (nitrate) is highly mobile in soils**
- **N availability is affected by water movement through soils**
- **irrigation management key to N retention in root zone**



Total Annual Water Applied by Growth Stage

Site 1, 2005-2007 (Irrigation + Precipitation)



Issues Nitrogen timing



Dormant pruning



Bloom and set



Veraison



Post-harvest

Issues

Nitrogen balance



- **Vigor/quality (N for yeast fermentation), long term vine health, winter hardiness**



Merlot Experiment - treatments (2005-2007)

- 40kg N/ha, Early (E) – late dormant (early May)
- 80kg N/ha, E
- 40kg N/ha, Late (L) – bloom (mid Jun)
- 80kg N/ha, L
- Trt 3 + 40kg N/ha, post harvest (early/late Oct)
- Compost (40kg N/ha), Agassiz, Nm – 30% (yr1)
– 20% (yr2,3)
- RCB, 8 reps, 10 vines/plot – 480 vines

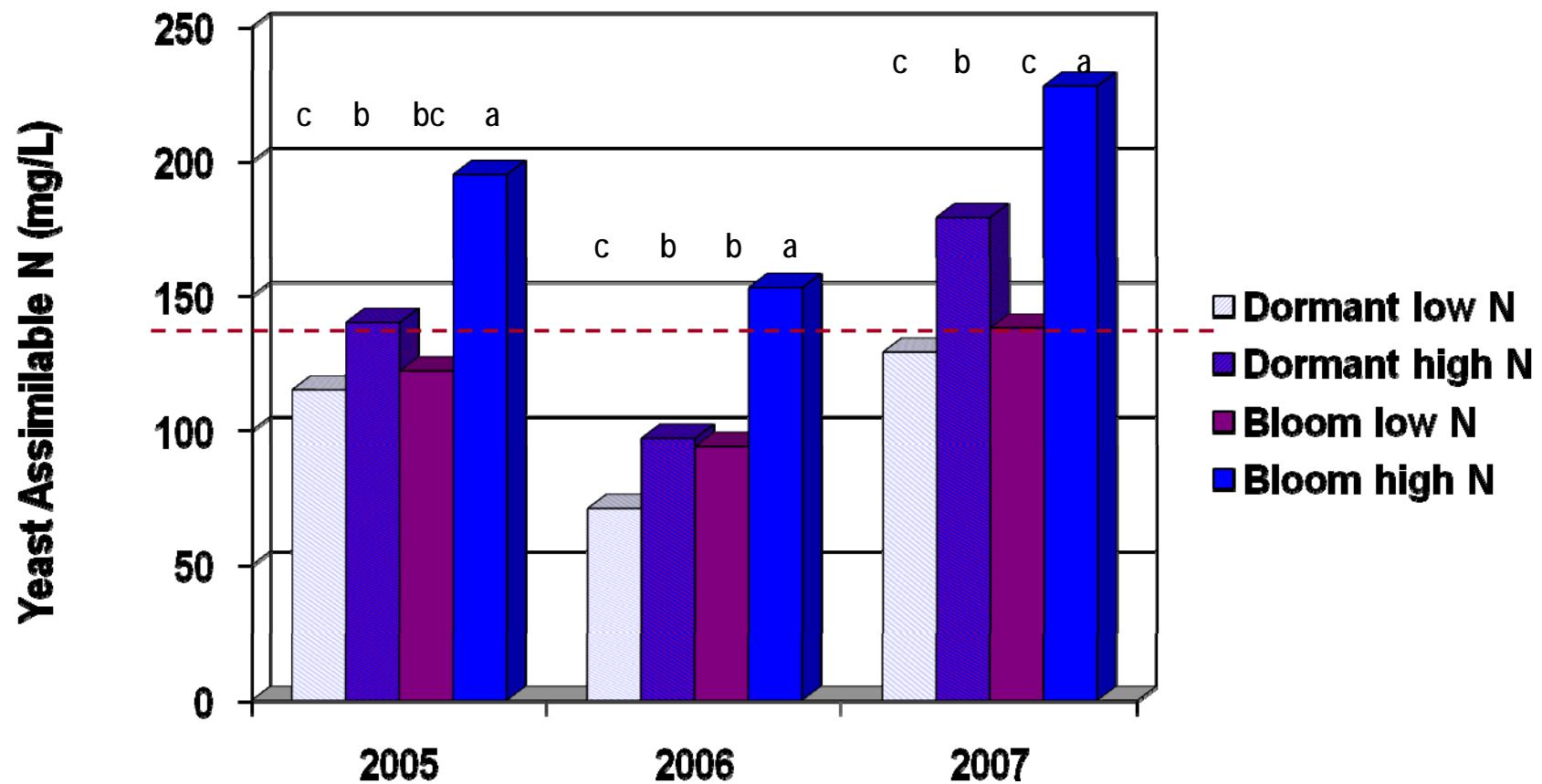
Grape quality



- 2-6 berries (U, M, L) x 8 clusters
- Analysis:
Juice SS, pH, titratable acidity
Yeast assimilable N conc.
(YANC) – formol titration

Formol method adapted from Zoecklein BW, Fuselang KC, Gump BH and Nury, F. 1999. Wine Analysis and Production. Chapman & Hall, New York, NY. 621p.

Yeast Assimilable N (mg/L)



Canopy Vigor (Veraison)



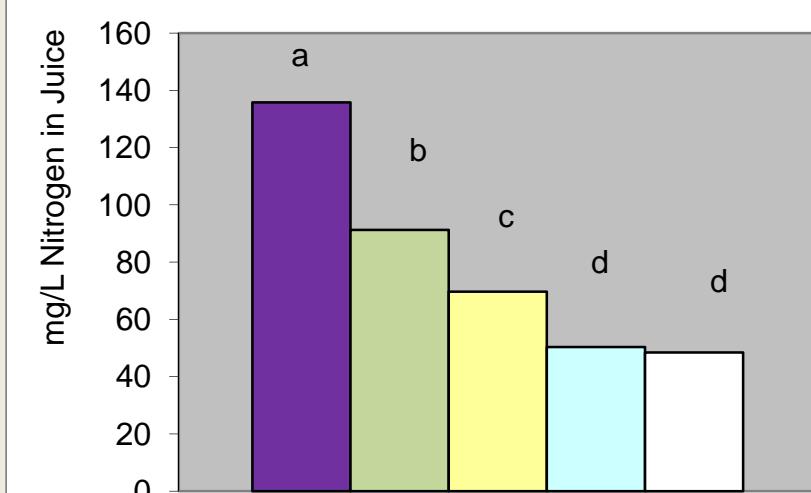
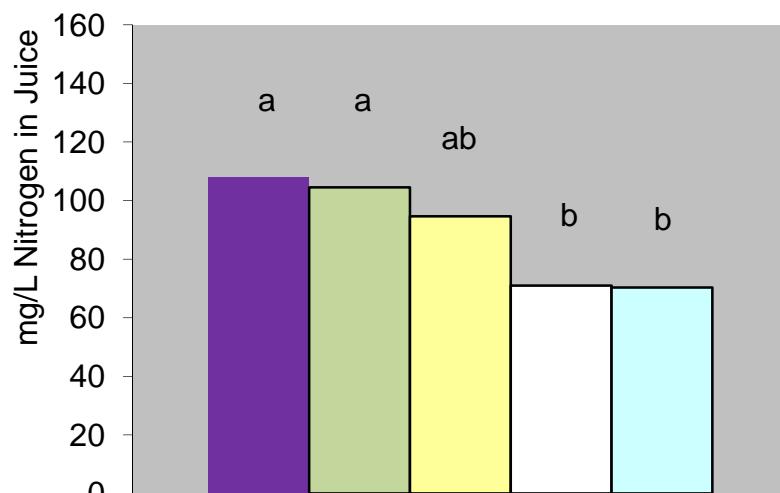
% sky

YANC as affected by various treatments at veraison (new project)

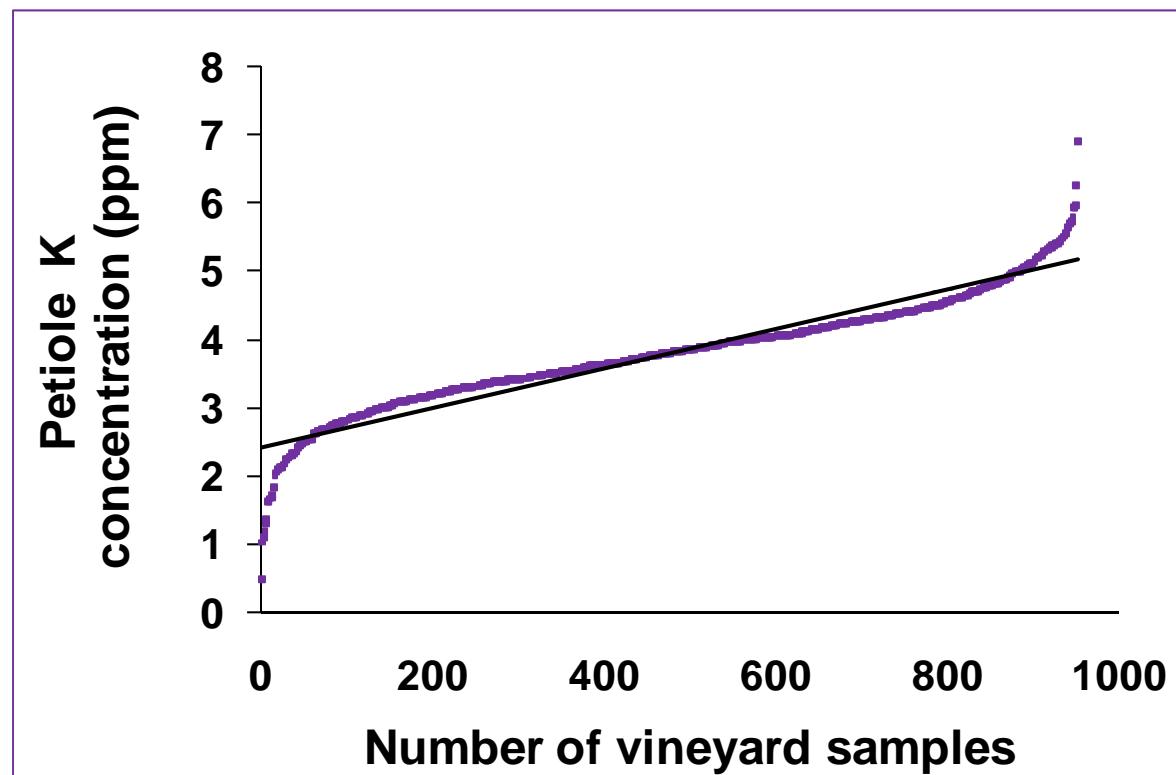
Average Juice Nitrogen mg/L
Cabernet Sauvignon

Average Juice Nitrogen mg/L
Merlot

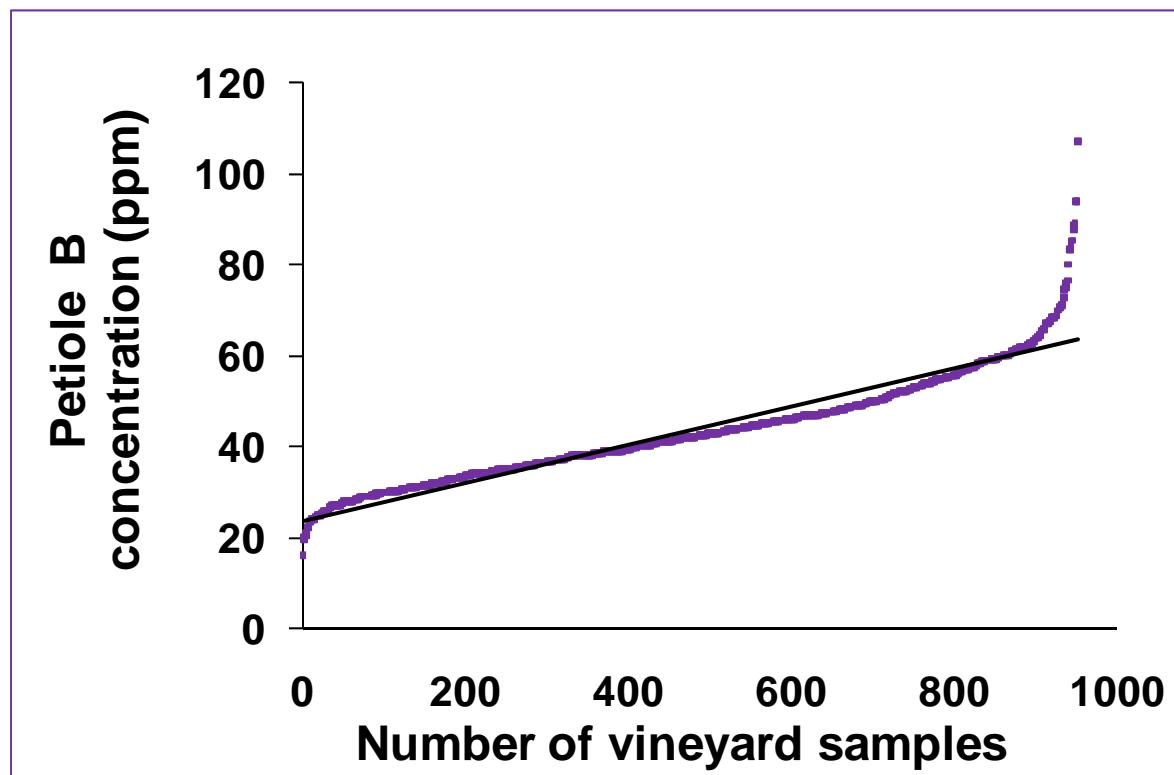
Legend	
	Control
	Foliar Rate 1
	Foliar Rate 2
	Ground Only
	Ground + Foliar



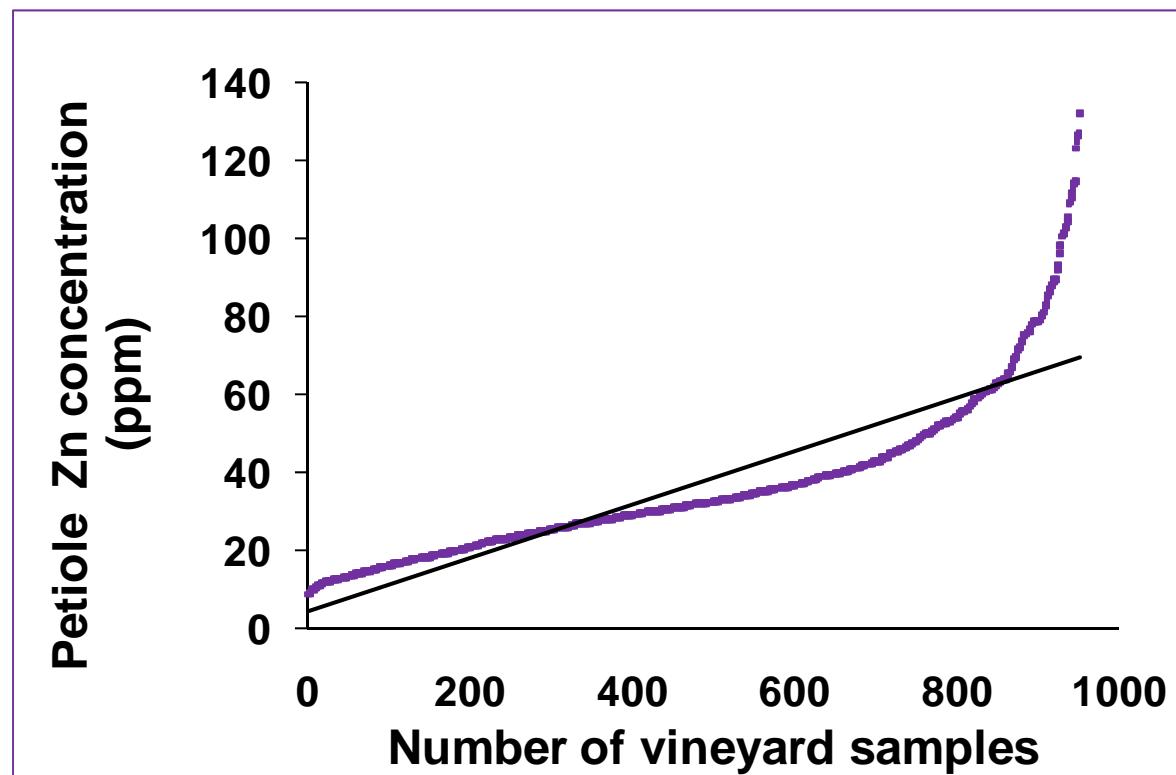
Petiole K at bloom (BC)



Petiole B at bloom (BC)



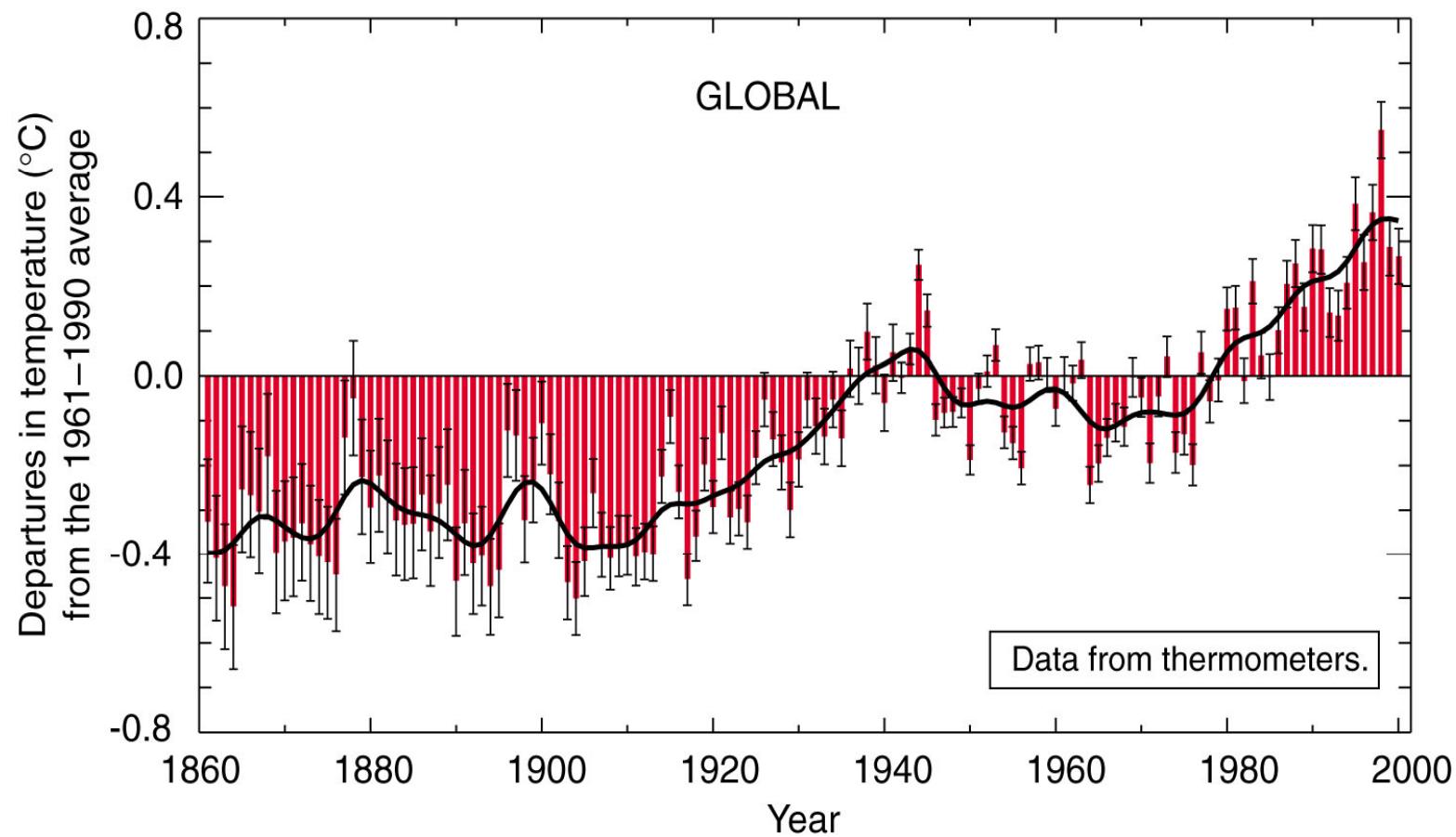
Petiole Zn at bloom (BC)



Global warming and climate change



Variations of the Earth's Surface Temperature* since 1860



*relative to 1961-1990 average

IPCC third assessment report, 2001

Temperature effects on production

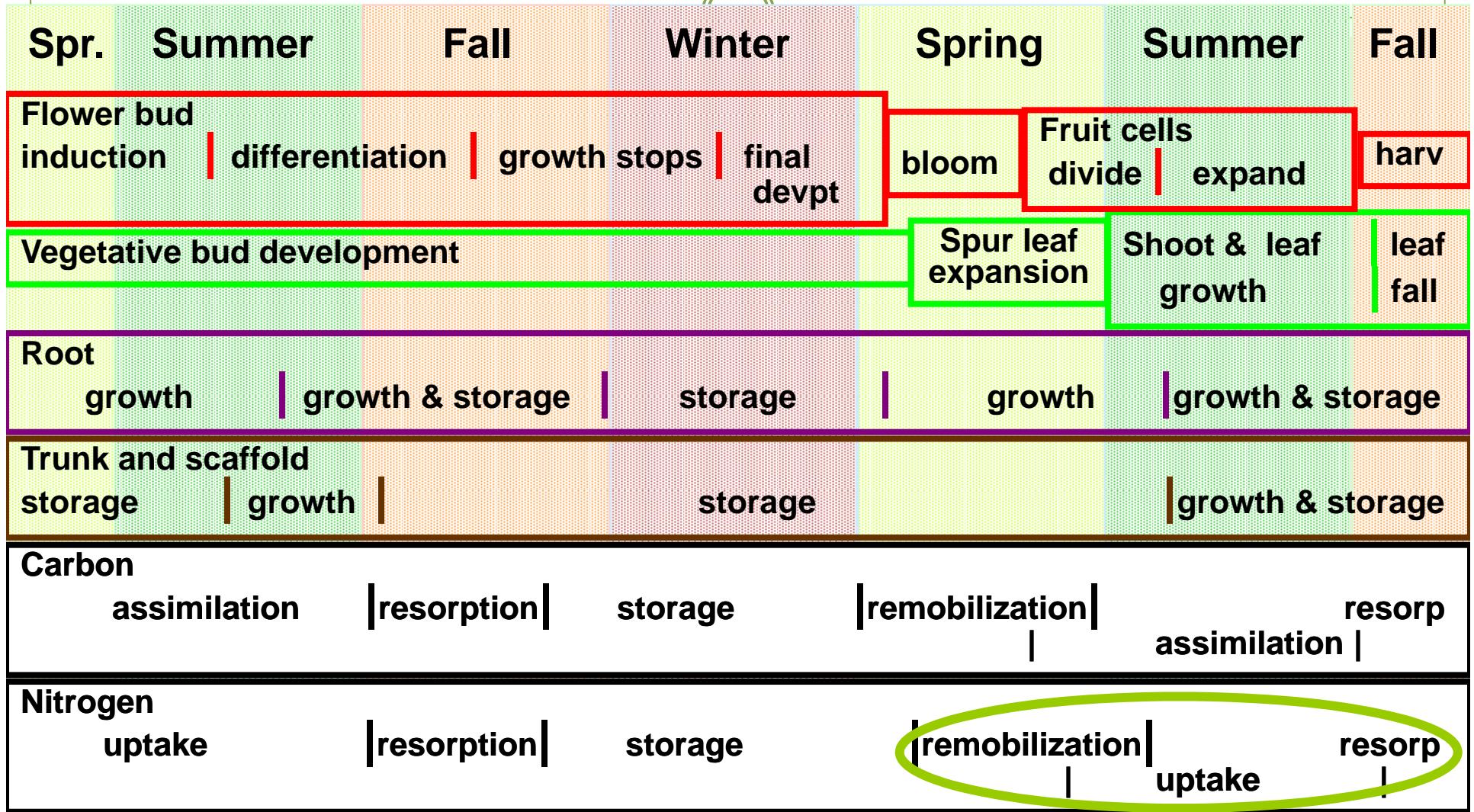


Grape – Historical production records
Okanagan, BC (1930-1989)

Yield ↓

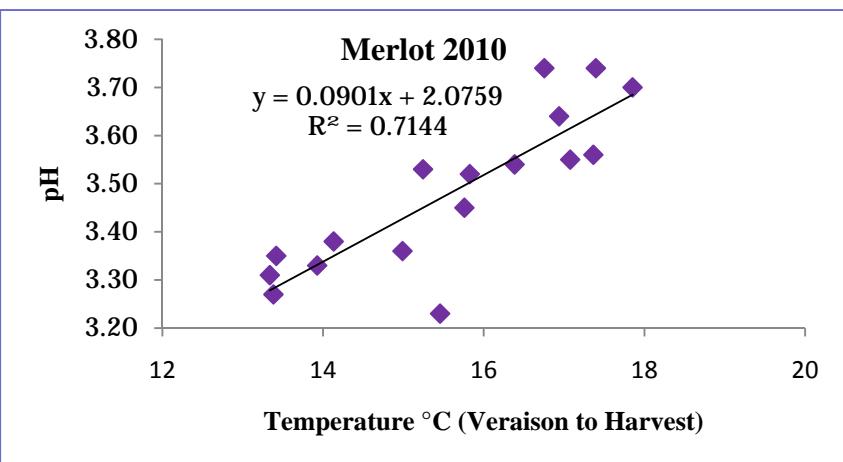
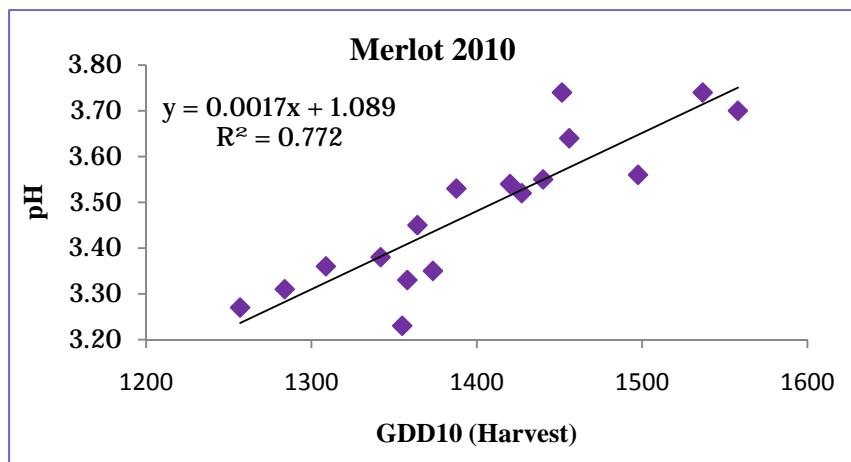
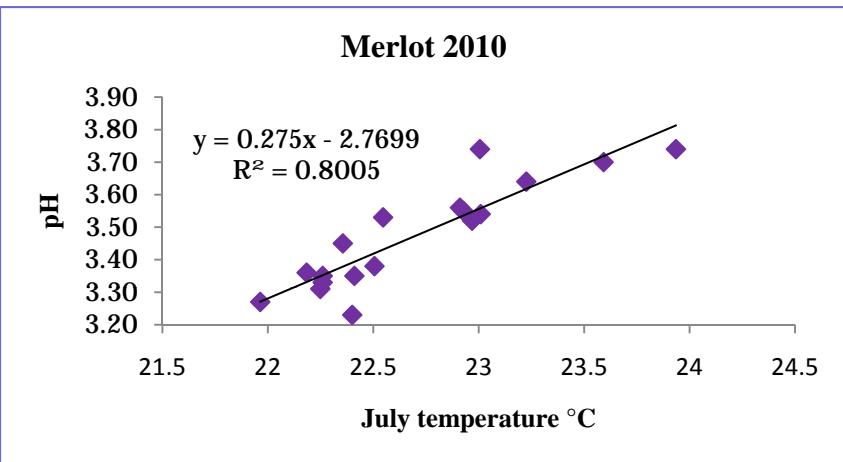
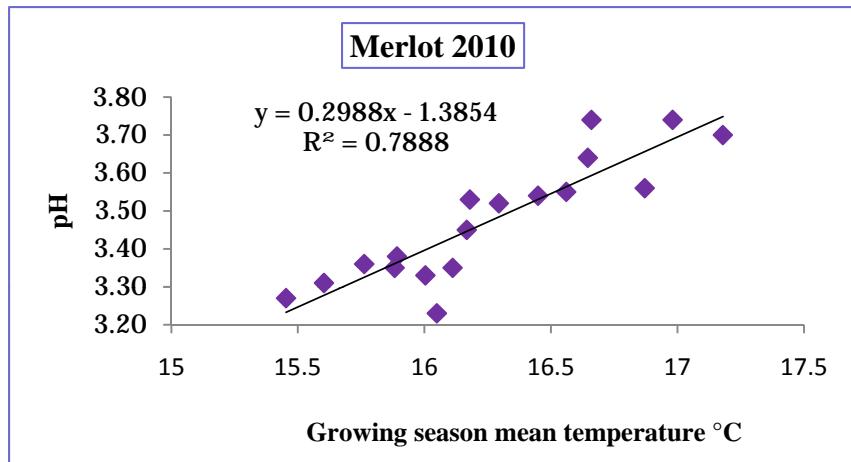
- $\geq 32^\circ\text{C}$ (Jul.harv. yr)
- $\geq 26^\circ\text{C}$ (Jul. preharv. yr)
- $\geq 28^\circ\text{C}$ (Aug,harv. yr)
- 6 to -23°C (late Oct, Nov, Feb)

Increased temperature likely to influence fruit growth and development stage



...and mineral nutrition?

Temperature effects on juice pH



Thank you



Questions?

