Development of a Geographic Information System for Sustainable Viticulture Tailored to Terroir

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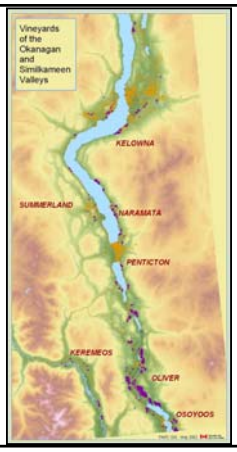
Sub-activities:

1. **Update the GIS for new and renovated vineyards**
2. **Add <u>plant community ecology</u> as a terroir component**
   - **explore its impacts on vineyard performance**
3. **Explore the interactive effects of climate and canopy management on fruit development and quality**



Update the GIS

- **GPS coordinates for variety-blocks**
  - **new vineyards**
  - **renovated vineyard**
- **Collect information on planting systems (variety, clone, rootstock, trellis/training, row direction, irrigation technique etc.)**
- **Determine slope/aspects**
- **Characterize the soils in each block (classify to series, texture, stoniness etc.)**
- **Create maps: variety-blocks, soils**

Malbec

Vineyards prior to update: 262
New Vineyards added: 281
Total = 543
Coastal vineyards are pending

Varieties on the rise:
- **Viognier**
- **Syrah**
- **Roussanne**
- **Marsanne**
- **Malbec**
- **Sauvignon blanc**

Syrah

Roussanne

Marsanne

Viognier

Sauvignon blanc

GIS Model - Terroir

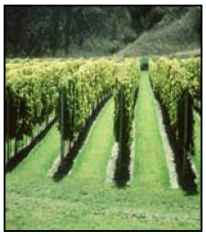
Site/Terroir
- **Vineyard location**
- **Topography**
- **Surrounding topography**
- **Soil**
- **Climate**
- **Biodiversity and ecology**

Management
- **Varieties, rootstocks**
- **Planting systems**
- **Canopy management**
- **Crop load adjustment**
- **Pest and disease management**
- **Floor management**
- **Inputs (water, pesticides, fertilizer, labour)**

Commercial Performance
- **Vine and fruit development**
- **Yield**
- **Fruit quality**
- **Vine health**

Environmental Performance
- **Resource conservation**
- **Ecosystem stability**
- **Soil health**
- **Pollution**
- **Community relations**

<u>Natural and native ecosystem</u>
- **resource poor soil**
- **moderate diversity**
- **plant species well adapted**
  - **climate**
  - **soil**
  - **ecosystem**
- **stable – maintenance free**



<u>Wine grape production system</u>
- **resource enriched soil**
- **soil species diversity may be higher**
- **low plant species diversity**
- **plants poorly adapted to natural**
  - **climate**
  - **soil**
  - **ecosystem**
- **unstable – requires maintenance**


Organic systems

- use “natural” (not necessarily native) inputs (cover crops, amendments, etc.)
- increase biological diversity: soil and plant communities
- promote productivity and plant health (growth and yield) – pro-life
- ecological pest control – predators keep pests in check
- mostly unnatural (unlike native), requiring inputs and maintenance
- less stable than natural native ecosystems

Given that:

- Wine grapes perform well on
  - lean soils
  - little water
  - frugal fertility
  - similar to conditions of their native habitat and BC’s southern interior
- Native ecosystems are stable under natural conditions

Hypothesis:

- Vineyards will perform well if they incorporate near-natural conditions. These will welcome-in stable native biological communities (plants and soil microbials)


Studies:

- Characterize vineyard plant communities
  - relate vineyard vegetation with
    - predator populations
    - pest impacts
- Characterize plant communities in native ecosystems
  - relate native to managed ecosystems

Set future research parameters

Plant communities

- 98 vineyards
  - planted rows
  - drive rows
  - surrounding area
- 14 natural sites

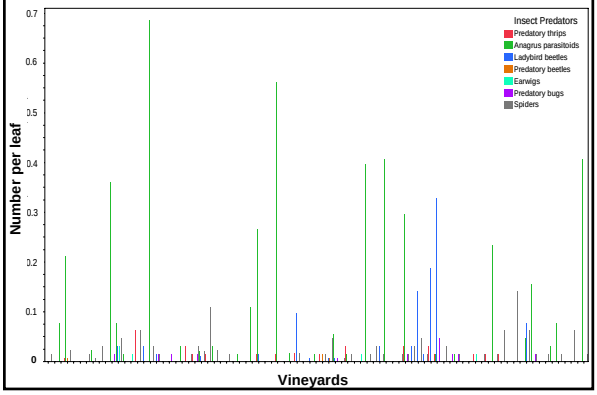


Pest & Predator Monitoring

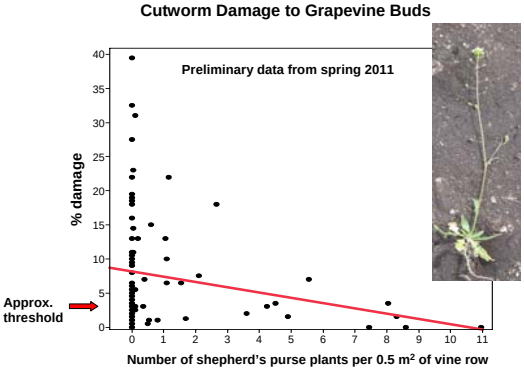
- each vineyard sampled 3 times
- spray programs determined



Insect Predators in 98 Commercial Vineyards (excluding predatory mites)



Cutworm Damage to Grapevine Buds



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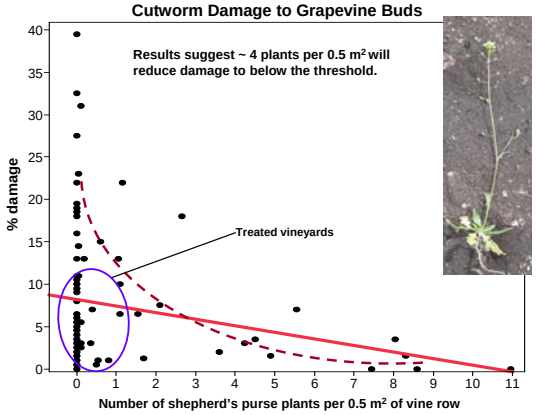


Vaseaux-Oliver Region Natural Sites

Species	Percent cover
Snowberry	30
Wild rose	25
Saskatoon	20
Wild currant	10
Yarrow	5
Cinquefoil	5
Mustard	1
Silverleaf phacelia	1
Grass 1*	1
Grass 2*	1
Grass 3*	1
Grass 4*	1

* To be identified

Interactive Effects of Climate and Canopy Management Impacts of Fruit Exposure on Fruit & Wine Quality

Two experiments (different blocks):
- N/S rows
- E/W rows

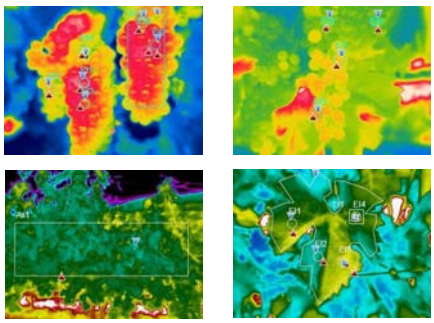
Bilateral-cordon trained vines

Thinned to 16 shoots and 10 clusters per cordon

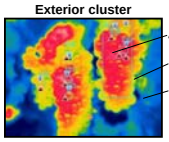
Treatments - applied on different cordons, 6 reps:
- fully exposed clusters
- clusters shaded using adjacent shoots

Measurements and sampling:
- cluster exposure and temperature
  - IR gun, IR camera, fisheye camera
  - percent exposure/coverage, canopy gaps
- leaf gas exchange
- fruit composition: early Sep and at harvest, samples from exposed and shaded clusters
- small-lot wines made for compositional and sensory analysis

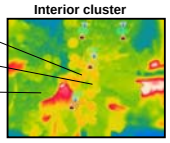
Infrared Photographs



Exterior cluster



Interior cluster



ambient: 34 °C

Basic Composition of Berries

		E-W Rows			N-S Rows		
Clusters	Berries	SS (Brix)	pH	TA	SS (Brix)	pH	TA
Exposed	Exterior	23.3 a	3.7 b	5.6 a	22.6	3.5	7.4
	Interior	24.7 b	3.5 a	7.4 b	23.3	3.5	7.6 b
Shaded	Exterior	25.0 b	3.5 a	7.3 b	23.3	3.5	7.1
	Interior	25.2 b	3.5 a	7.2 b	23.1	3.5	6.9 a

Interactive Effects of Climate and Canopy Management Impacts of Fruit Exposure on Fruit & Wine Quality

Planned for 2012

Two experiments (different blocks):
- **N/S rows**
- **E/W rows**

Treatments - applied on whole vines
- **fully exposed clusters**
- **fully shaded clusters**
- **Dapple-lit clusters**

Measurements and sampling:
- **cluster exposure and temperature**
- **leaf gas exchange**
- **fruit composition: sampled by position**
- **small-lot wines: compositional and sensory analysis**

Acknowledgements:
- **Cooperating vineyards & wineries**
- **BC Wine Grape Council**
- **AAFC DIAP Program**

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