Aotearoa Chardonnay Terroir

Aotearoa Chardonnay Symposium
September 26, 2024
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MSc Geology, Terroir Specialist

CHARDONNAY SYMPOSIUM

Agenda

- Introduction
- Understanding terroir
  - Terroir theory
  - Chardonnay and terroir
- Terroir in Action
  - Case studies in the Napa Valley
  - Terroir in the Côte d'Or
- A (brief) tour of Aotearoa's Geologic History
- Questions?

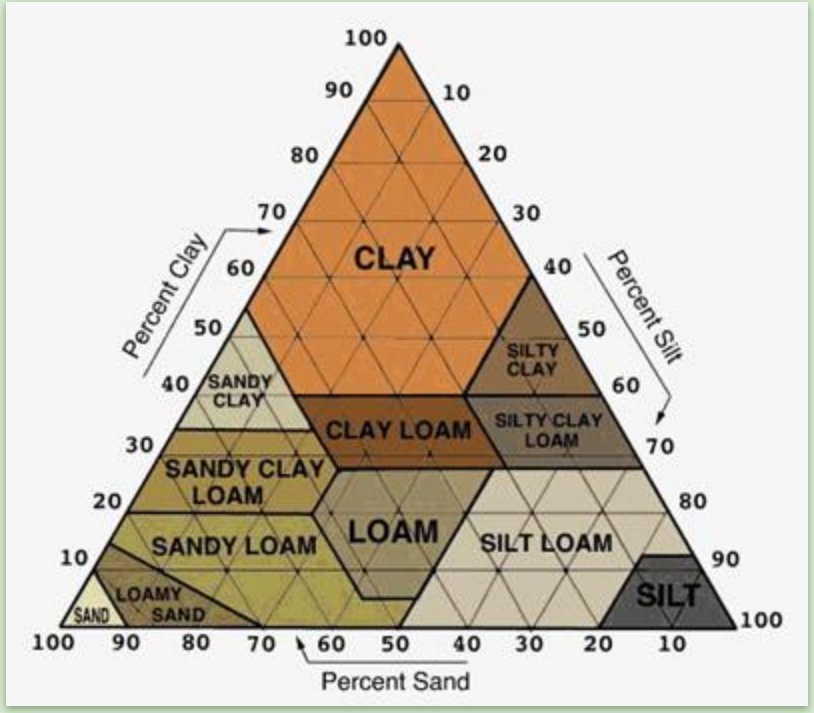
Understanding Terroir


“The complete natural environment
in which a particular wine is
produced, including factors such as
the soil, topography, and climate”

Understanding terroir

Components of Terroir

- Bedrock
  - Formation of Residual and Transported Soils
- Soil
  - Chemistry
  - Texture
  - Clay Composition
- Topography
- Aspect
- Climate and Weather
- Human Tradition

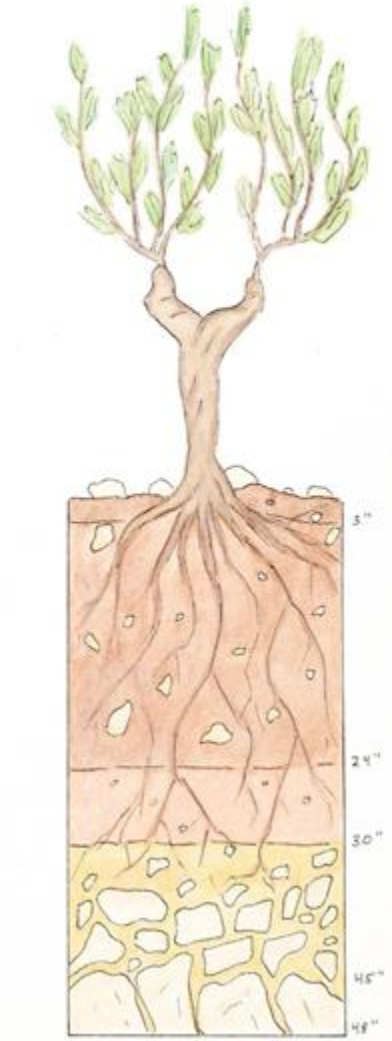


Understanding terroir

Geology and Terroir

What is geology’s role in terroir?

Why do we care?



Benefits of Understanding Terroir

- Make better wine

Understanding Terroir

Benefits of understanding terroir

- Make better wine
- Be better stewards to the land

Understanding Terroir

Benefits of understanding terroir

- Make better wine
- Be better stewards to the land
- Gain tools to help us communicate what is special about a place.

Understanding Terroir

Chardonnay and Terroir

The noblest white grape: Chardonnay, Riesling, or Chenin Blanc?

“Minerality” and Tasting for Texture

Illustration by The Wall Street Journal

Terroir in Action

Terroir in Action

Case Studies

Diversity in Napa Valley

Details in the Côte d’Or

Terroir in Action

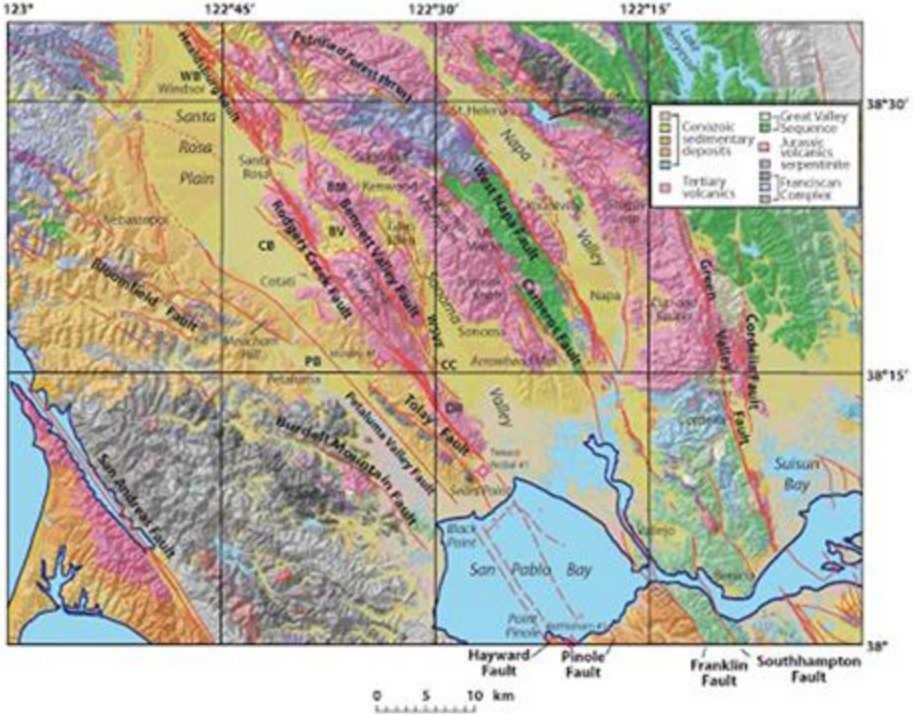
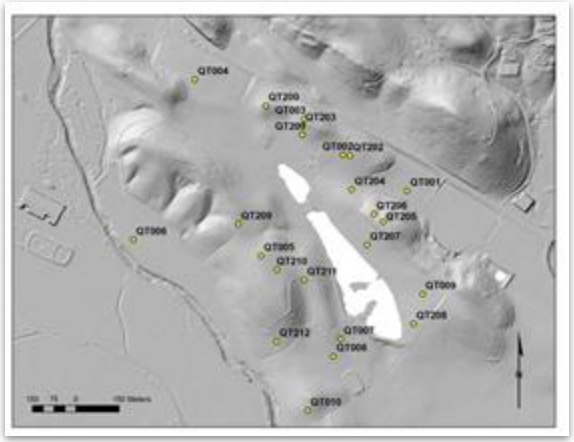


Figure 2. Simplified geologic map of the northern San Francisco Bay region modified from Langenheim et al. (2010). Locations of wells discussed in the text: Bethlehem #1 near Point Pinole; Murphy #1 east of Petaluma; Texaco Nobel #1 near Sears Point. Faults in San Pablo Bay are from Wright and Smith (1992) and Parsons et al. (2003). Abbreviations: BM—Bennett Mountain; BV—Bennett Valley; CB—Cotati basin; CC—Carriger Creek; CV—Carneros Valley; DR—Donnell Ranch; JL—Jack London State Park; L—Lakeville; LV—Lovall Valley; MP—Mount Pisgah; NV—Nunns Valley; PB—Petaluma basin; SR—Steinbeck Ranch; WB—Windsor basin; WSVF—West Sonoma Valley fault.

Wagner et. al, 2011

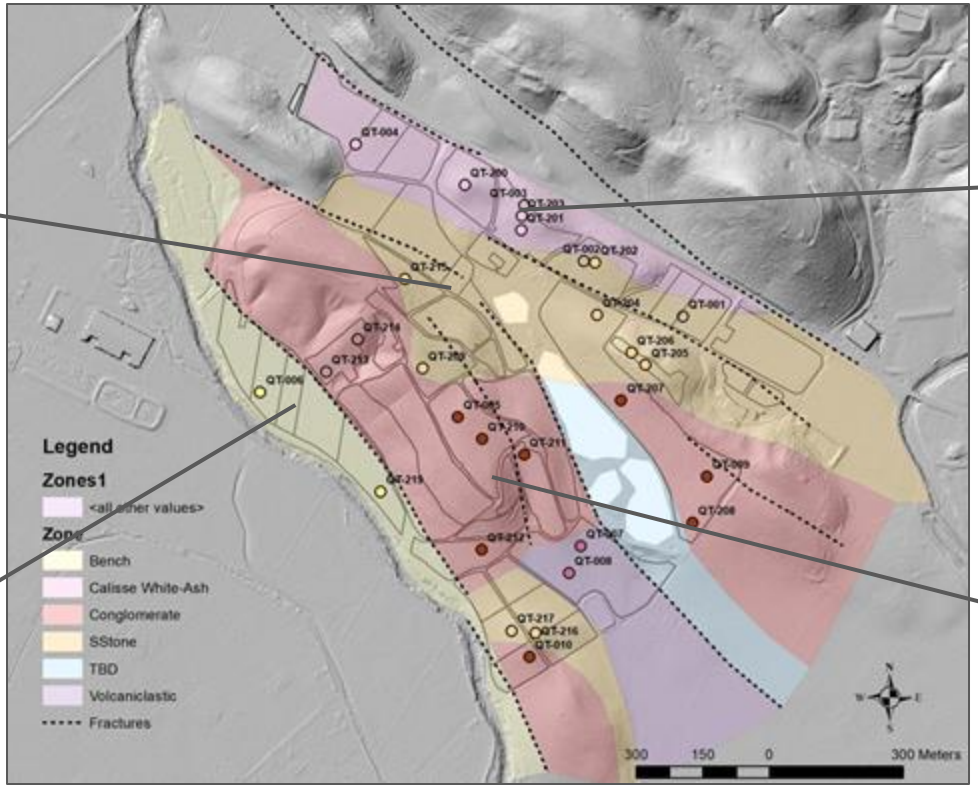
Terroir in Action

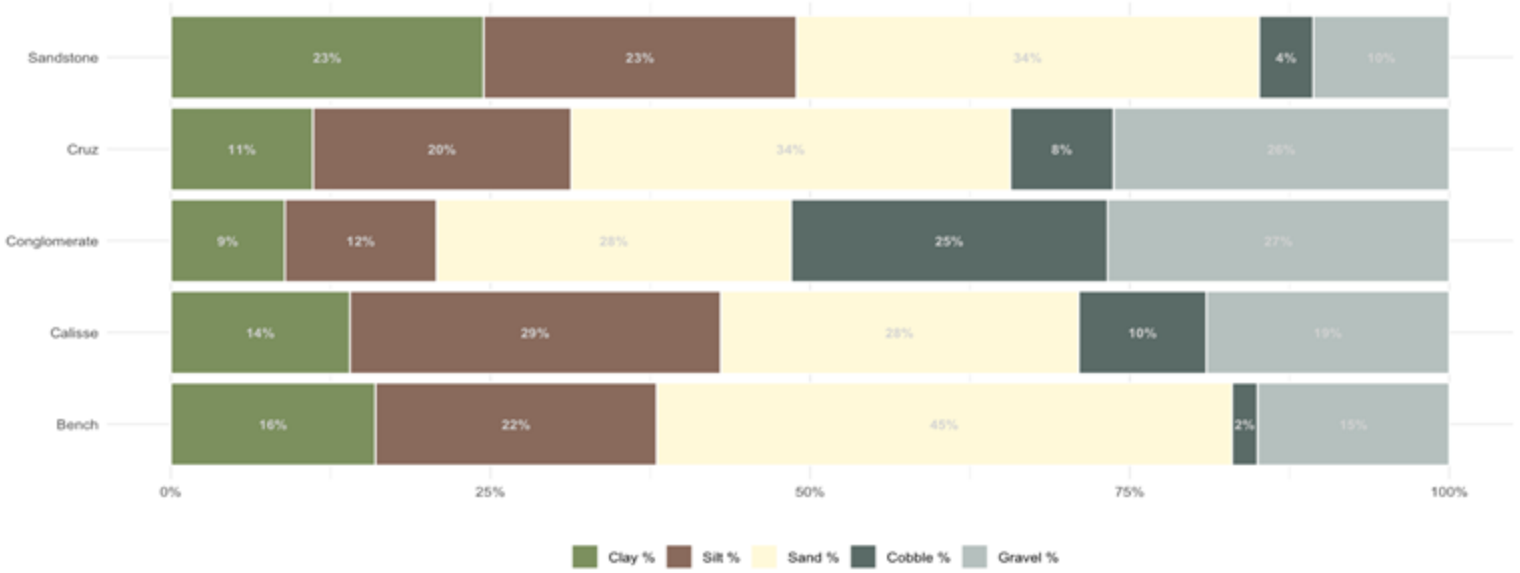
Geologic Diversity at Quintessa



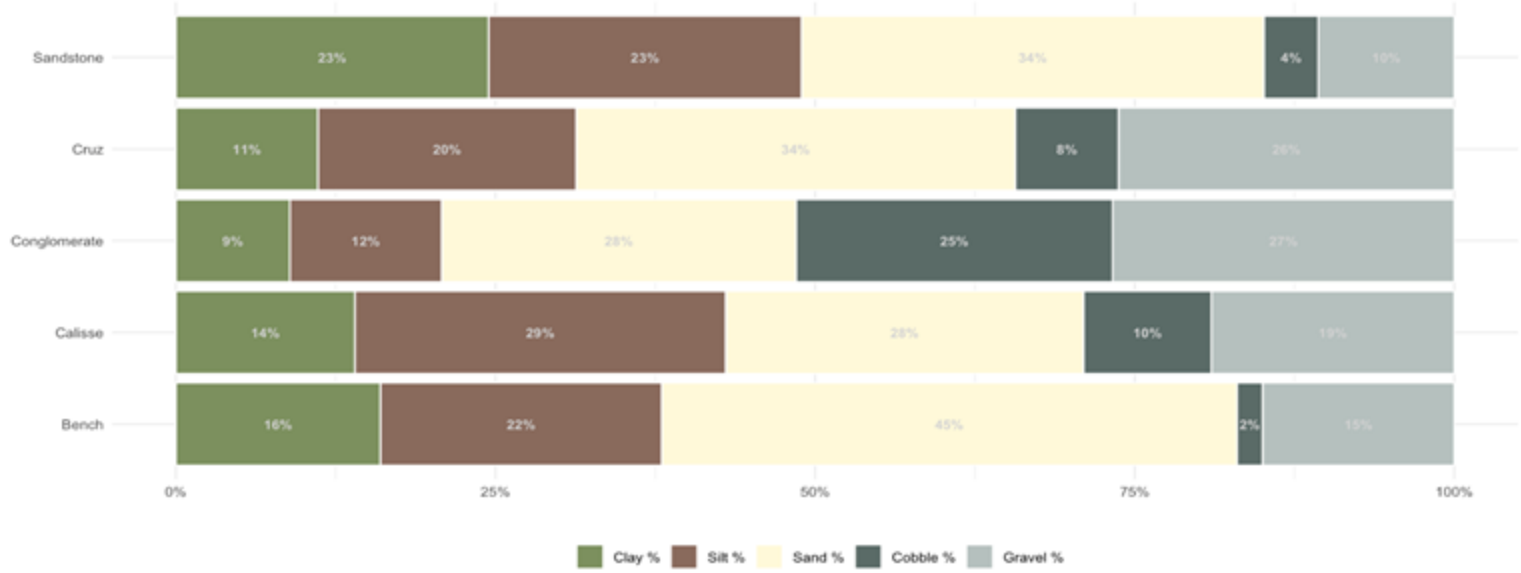
Terroir in Action

Geologic Diversity at Quintessa





TERROIR UNIT CLASS	ROCK %	GRAVEL %	COBBLES %	SCALED SAND %	SCALED SILT %	SCALED CLAY %
Bench	17.33	15.33	2.00	44.80	22.27	15.60
Calisse	36.20	19.00	10.11	28.09	28.68	14.12
Conglomerate	52.35	27.47	24.82	27.58	11.50	8.57
Cruz	34.17	25.83	8.33	34.43	20.33	11.08
Sandstone	19.64	9.60	4.00	34.34	22.78	23.24

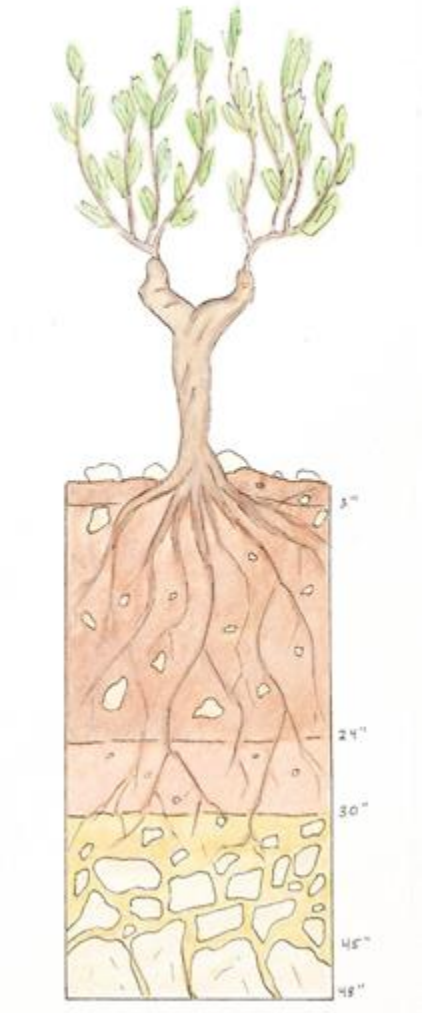

Sandstone
23%
23%
34%
4%
10%
Cruz
11%
20%
34%
8%
26%
Conglomerate
9%
12%
28%
25%
27%
Calisse
14%
29%
28%
10%
19%
Bench
16%
22%
45%
2%
15%
0%
25%
50%
75%
100%
Clay %
Silt %
Sand %
Cobble %
Gravel %


CCT209
Corona -1

Terroir in Action

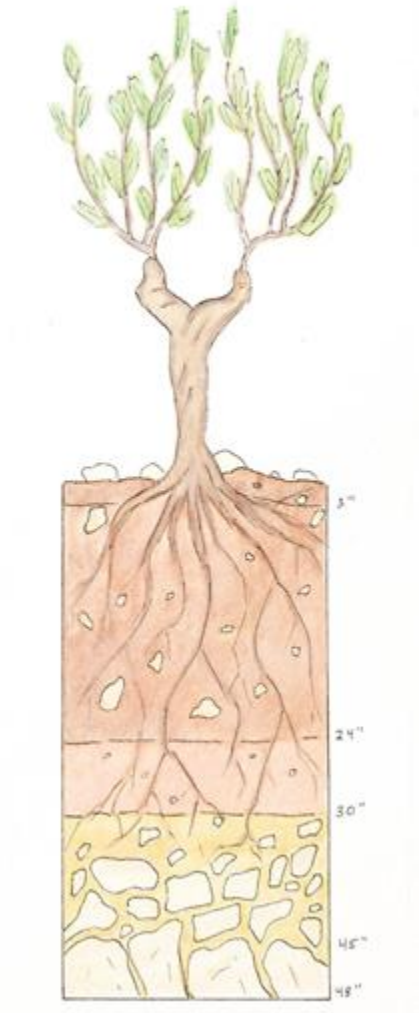
Factors that Influence Soil Temperature

- Composition
- Structure
- Texture
- Moisture
- Color
- Vegetation
- Irrigation and Drainage
- Topography
- Compactness
- Climate
- Season



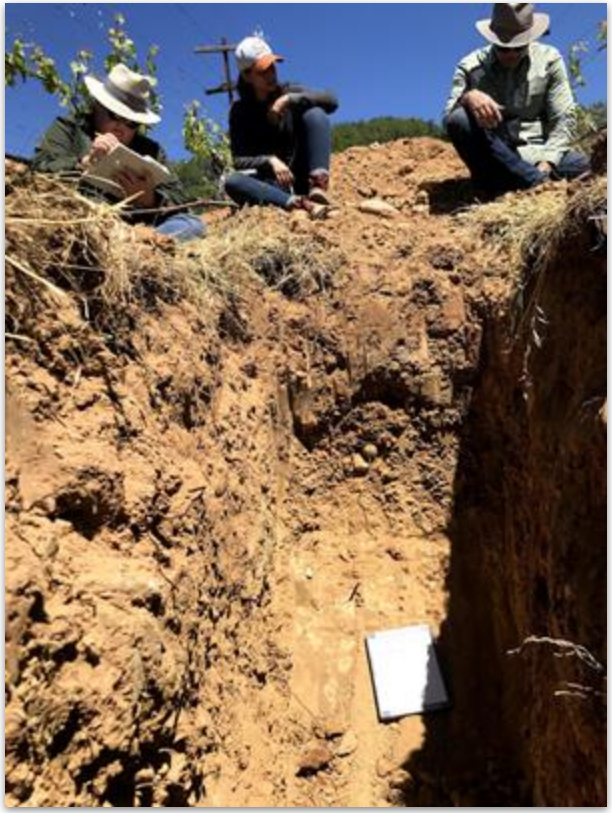
Factors that Influence Soil Temperature

- **Composition** – Mineral matter has lower specific heat than organic matter
- **Structure** – Pore space and drainage
- **Texture** – Heavy soils hold water, warm up very slowly
- **Moisture** – Moist soils are cooler, heat up more slowly
- **Color** – Dark soils absorb heat, light soils reflect
- **Vegetation** – Vegetation intercepts heat, increases humus, moisture
- **Irrigation and Drainage** – Irrigation cools when hot (summer), drainage warms when cold (spring)
- **Topography** – Slopes are warmer
- **Compactness** –compacted soils have better heat conductivity, but tilling reduces heat flux



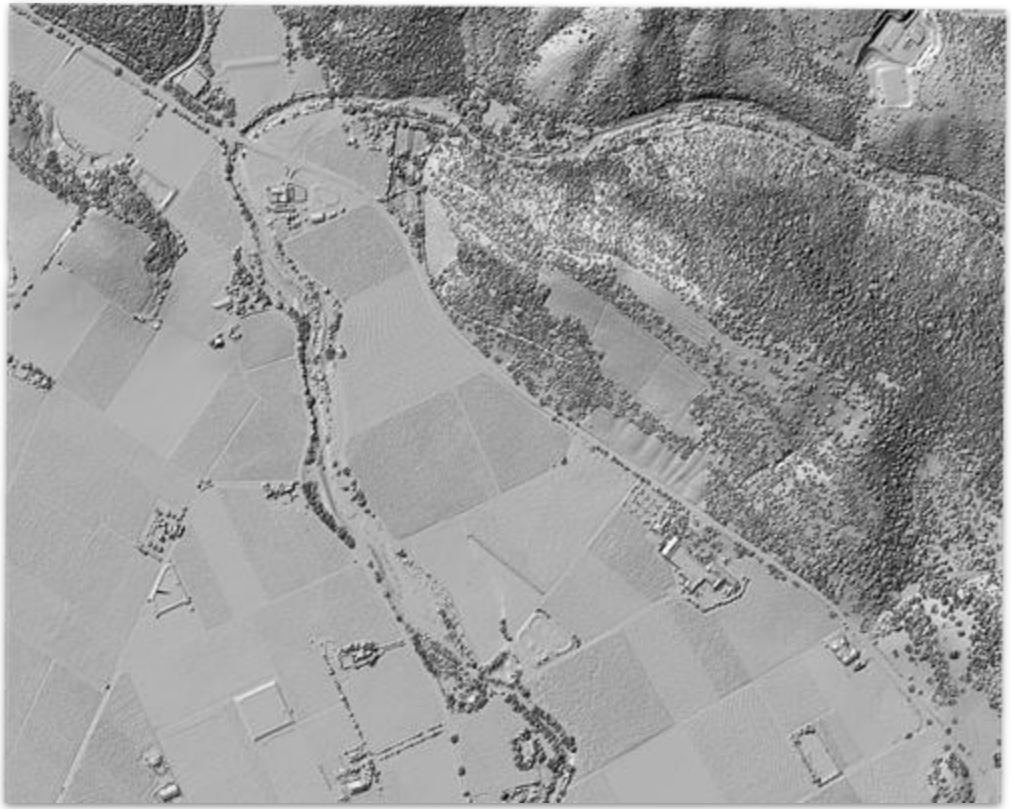
Terroir Zones and Climate Change Interactions

- **Draught**
  - What is the water holding capacity of each terroir zone? Which zones struggle the most in draught, and which respond to irrigation?
- **Sustained Higher Temperatures**
  - Which zones will see the highest temperatures? Which will cool the most at night? Have we taken slope, aspect, location, into account in defining the zones?
- **Extreme Heat Waves**
  - How can this information help to prioritize parts of the property?
  - Are there different mitigation methods more relevant/impactful to specific zones?
- **Biodiversity**
  - What is the natural balance of different zones?
- **Intense Winter Storms**
  - Erosion, winter runoff
- **Frost (Spring Precocity?)**



Terroir in Action

Alluvial Diversity at Trailside

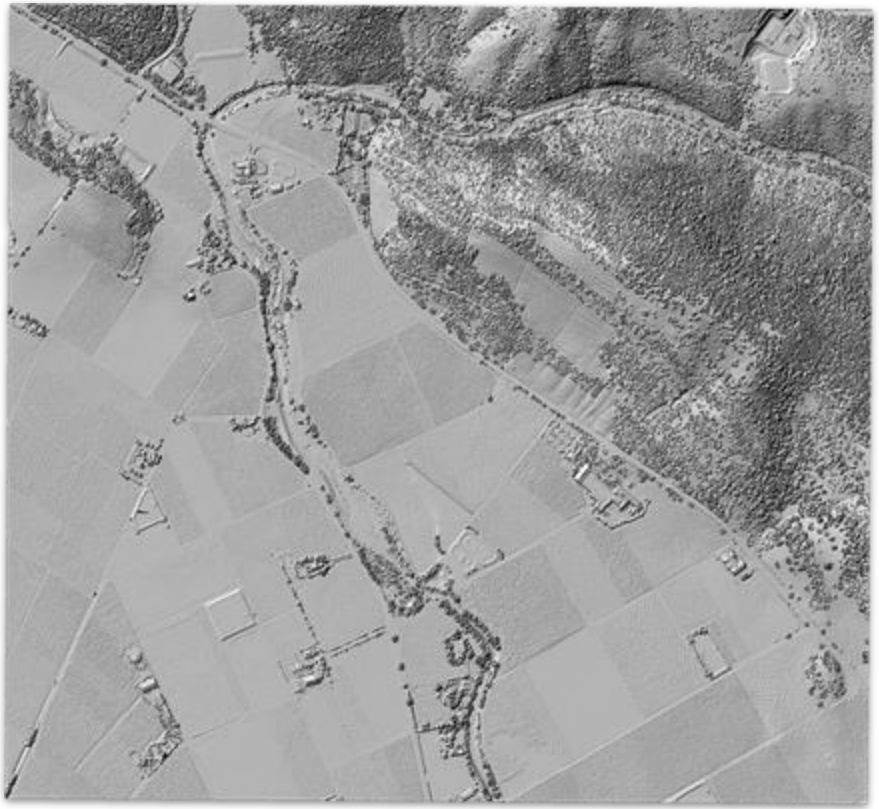


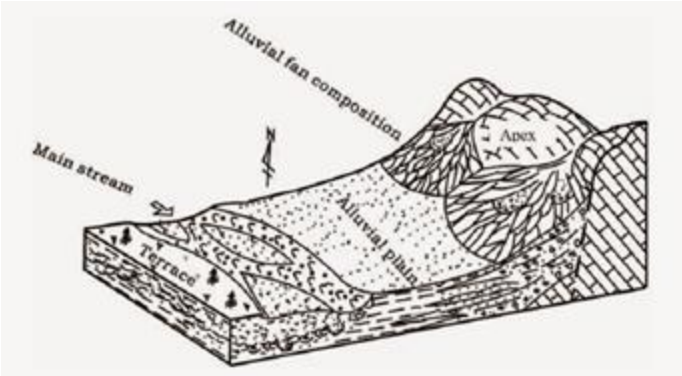
Terroir in Action

Alluvial Diversity at Trailside

Terroir in Action

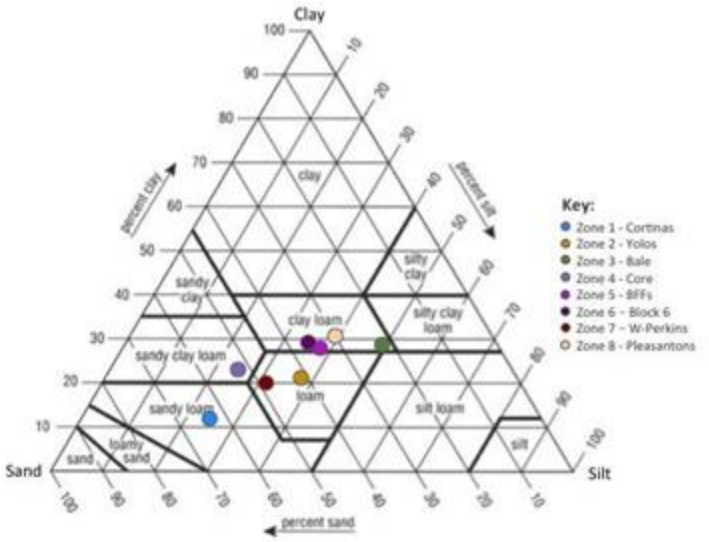
Alluvial Diversity at Trailside

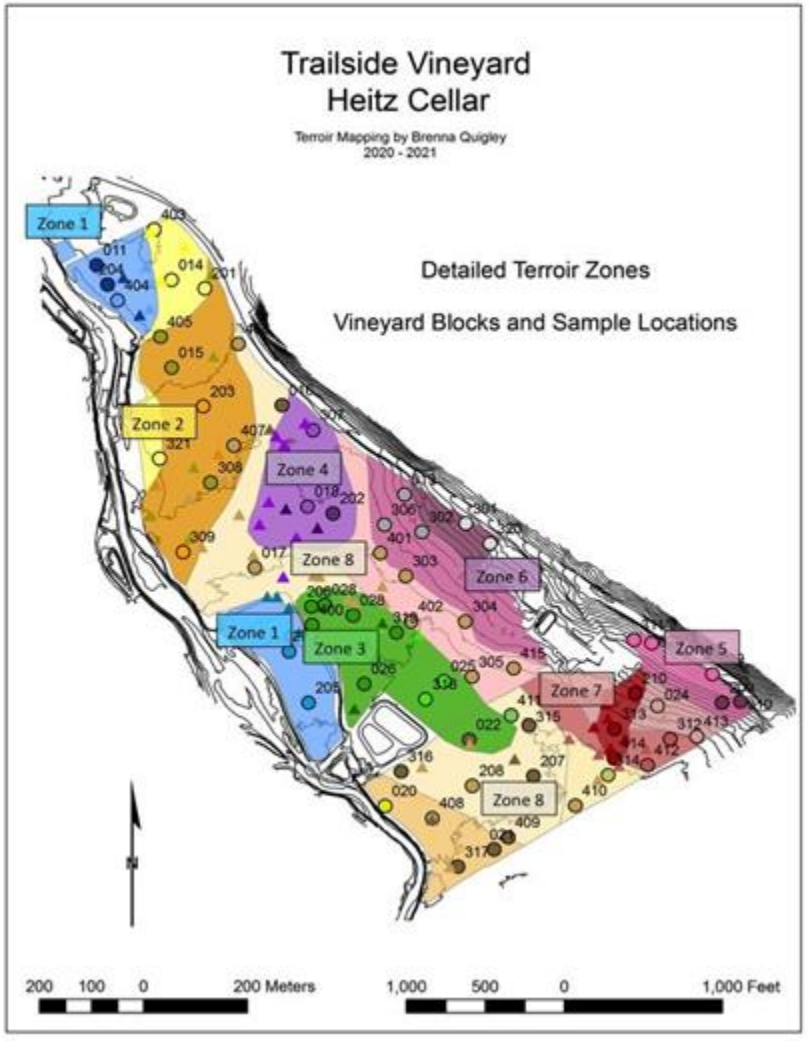




Terroir in Action

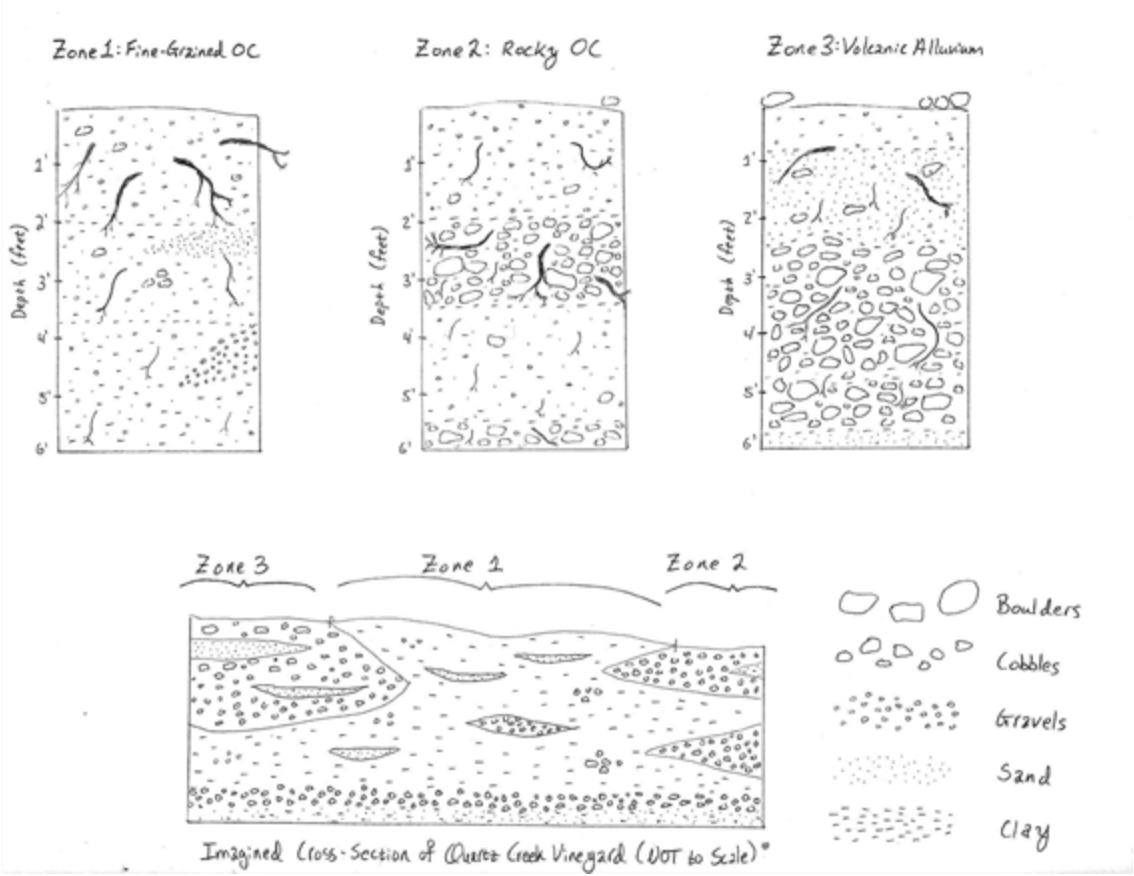
Alluvial Diversity at Trailside





Terroir in Action

Digging Deeper



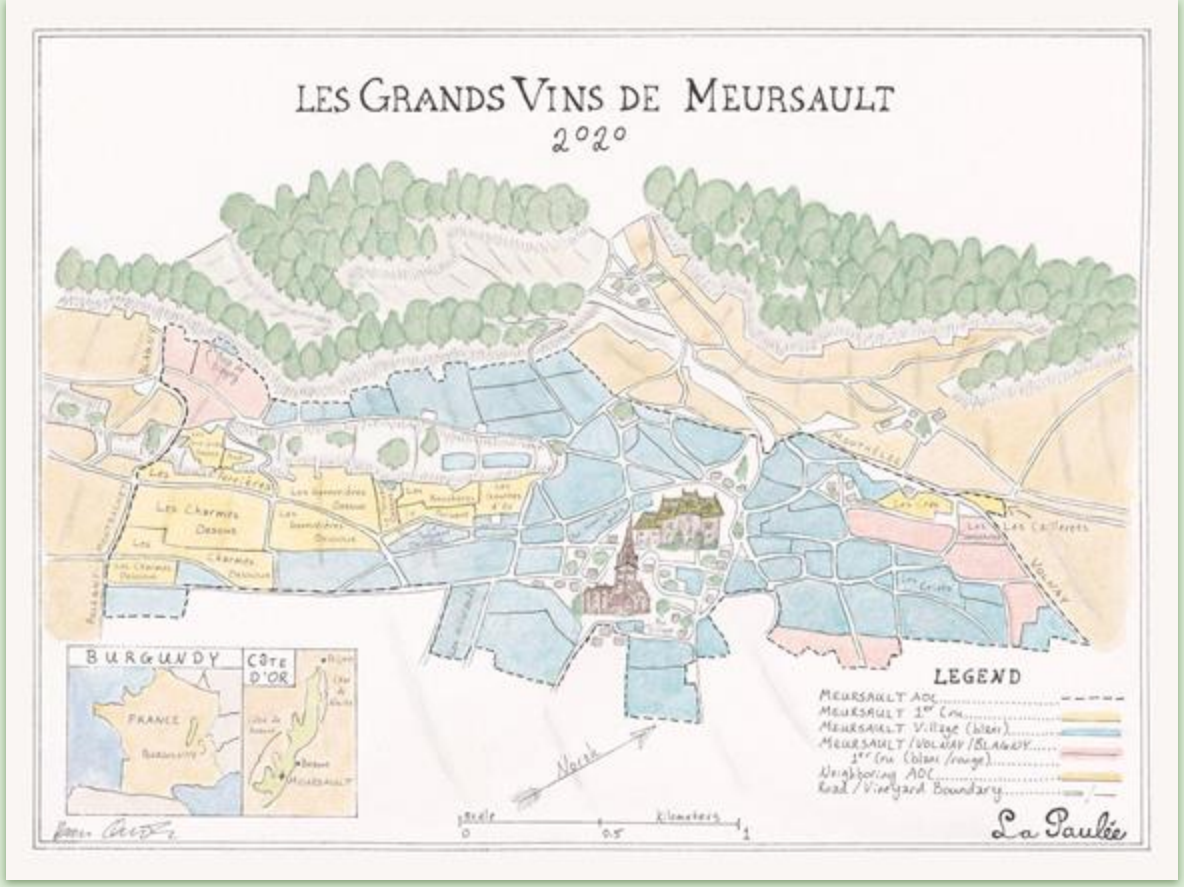
Terroir in the Côte d’Or

Terroir in Action

The Côte d’Or

Terroir in Action

Nuance in the Côte d'Or



Simplified Geologic Map of Blagny and Surrounding Areas

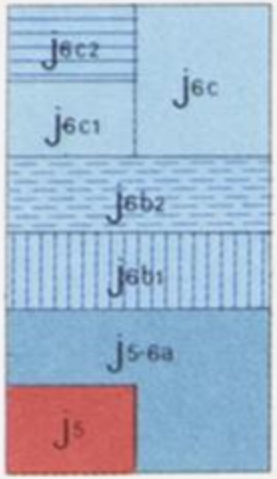
From BRGM Regional Maps

Upper Ox, lst

Mid Ox, marl

Upper Bath, with dig

Massive, dolomitic



Oxfordien *s.l.*

j6c - Oxfordien supérieur :

j6c2 - Calcaires de Germolles, dolomie

j6c1 - Calcaires oolithiques rouges de Givry

j6b2 - Marnes de Mercurey ou calcaires à oncolites

j6b1 - Calcaires de Nantoux :

calcaires lithographiques puis oolithiques

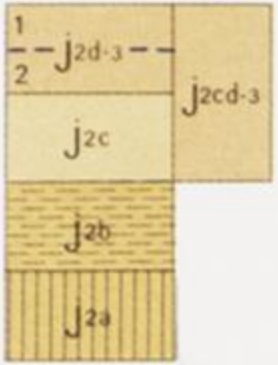
j5-6a - Oxfordien moyen et supérieur (?) :

marnes blanches et marno-calcaires

j5 - Oxfordien moyen :

marnes à oolithes ferrugineuses et

calcaires à *Balanocrinus subteres*



Bathonien inférieur et Callovien :

j2cd-3 - calcaires du Bathonien supérieur

et Callovien indifférenciés

j2d-3 - Bathonien supérieur et Callovien :

1 - calcaires oolithiques, chailles (Callovien)

— - niveau marneux à *Digonella divionensis*

2 - calcaires oolithiques (Bathonien supérieur)

Bathonien supérieur :

j2c - calcaires massifs, dolomitiques au sommet

Bathonien moyen et supérieur :

j2b - marnes à *Pholadomya bellona*

Bathonien inférieur :

j2a - calcaires oolithiques et calcaires sublithographiques

Terroir in Action

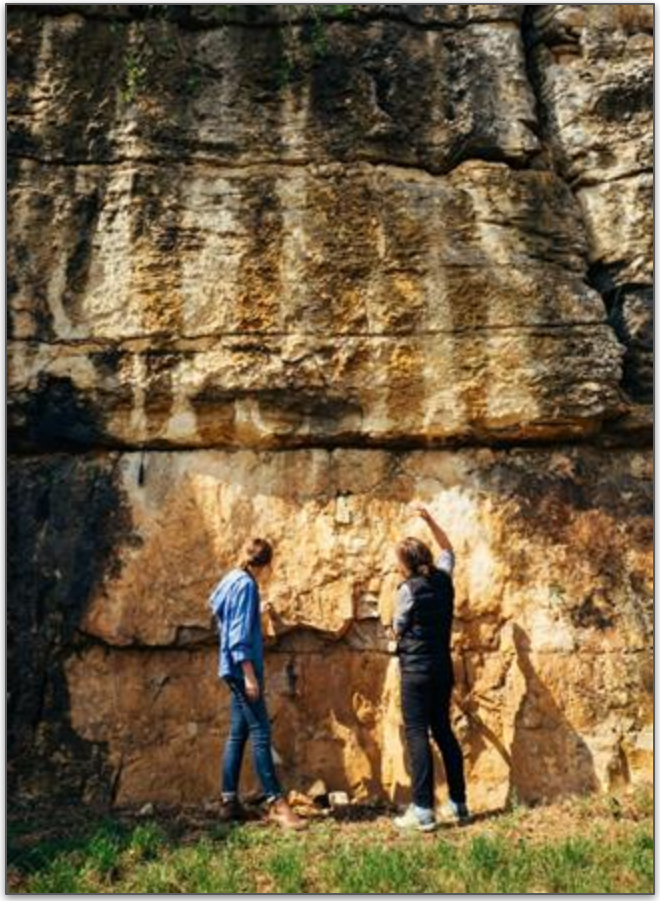
The Côte d’Or

Terroir in Action

The Côte d'Or

Terroir in Action

Limestone and Marl



Terroir in Action

Blagny

Some numbers for context:

- Depth to Parent Material:
  - 22 - 50 inches (55 - 130 cm)
- Texture
  - Rock % from 15% - 80%, most from 30% - 50%
  - Clay: % from 34 - 58%
  - Silt: 14% - 40%
  - Sand: 5% - 58%
- Chemistry
  - pH: 7.9 - 8.4
  - Active Lime: 6.1-9.4 %
  - Fe 5-15 ppm

Terroir in Action

Blagny

Not a lack of diversity

Embracing the impact of smaller details, and mastering them

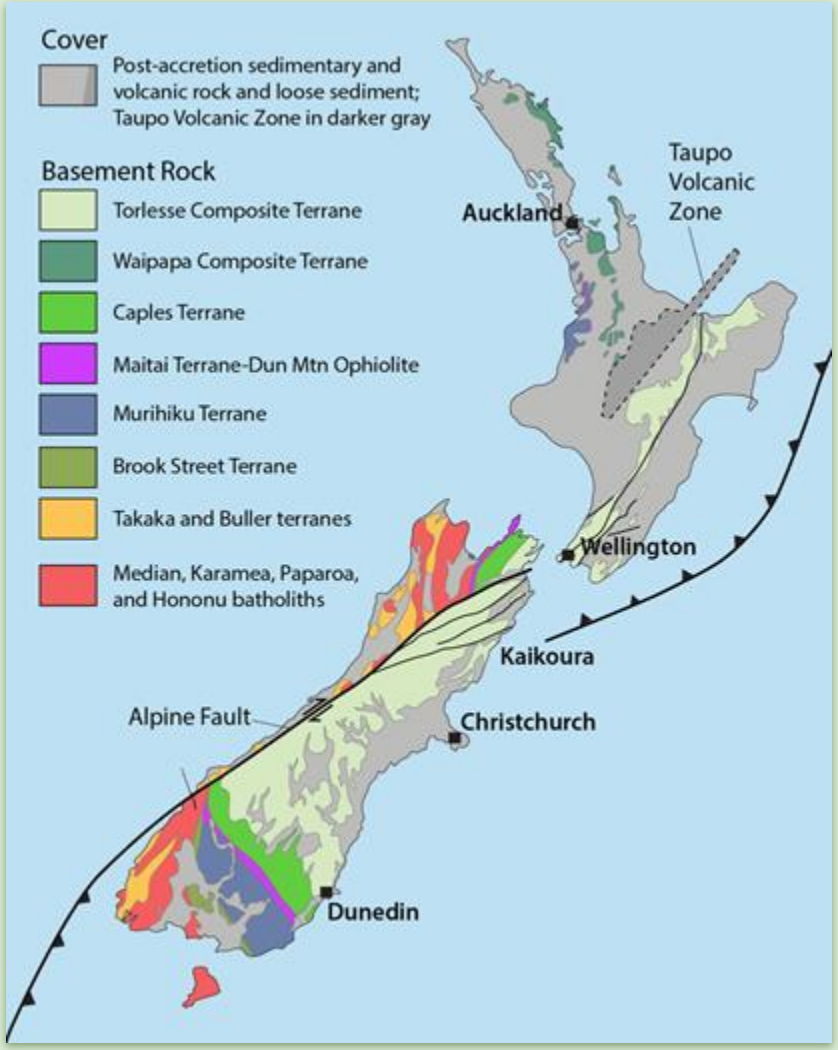
Terroir in Action

Embracing Nuance and Mastering the Details

A (Brief) Tour of Aotearoa's Geologic History

Aotearoa's Geologic History

Geologic Map of New Zealand



Aotearoa's Geologic History

Terroirs of New Zealand

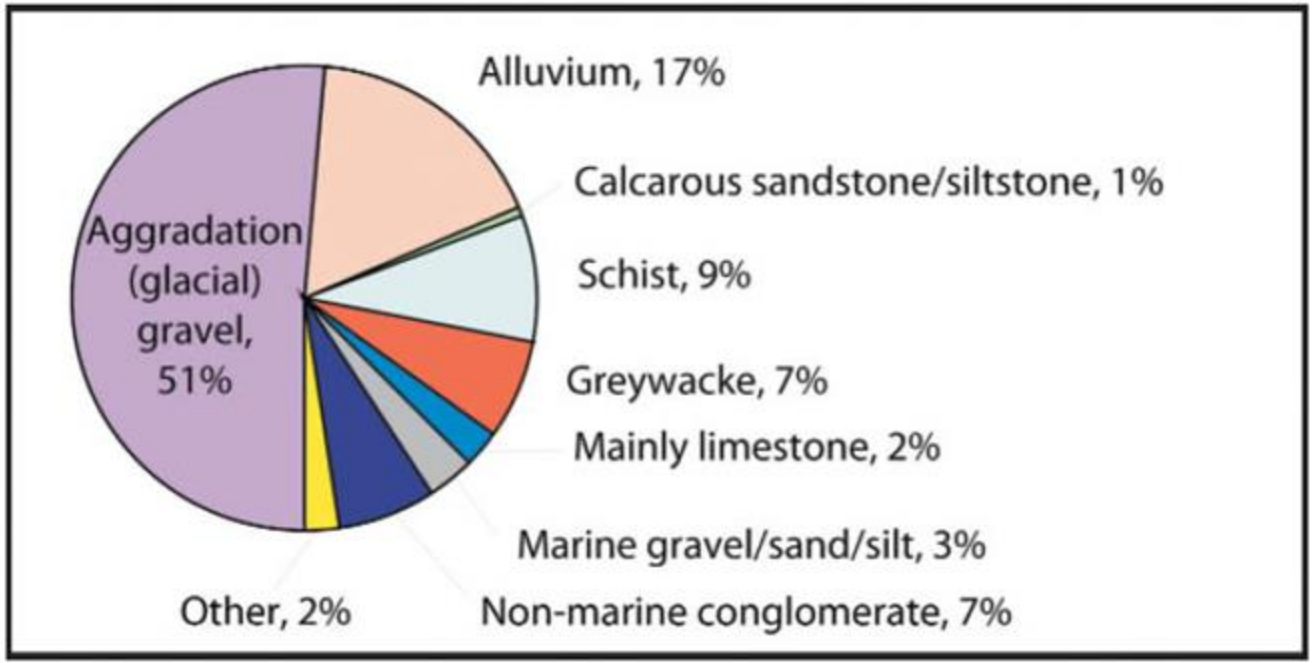
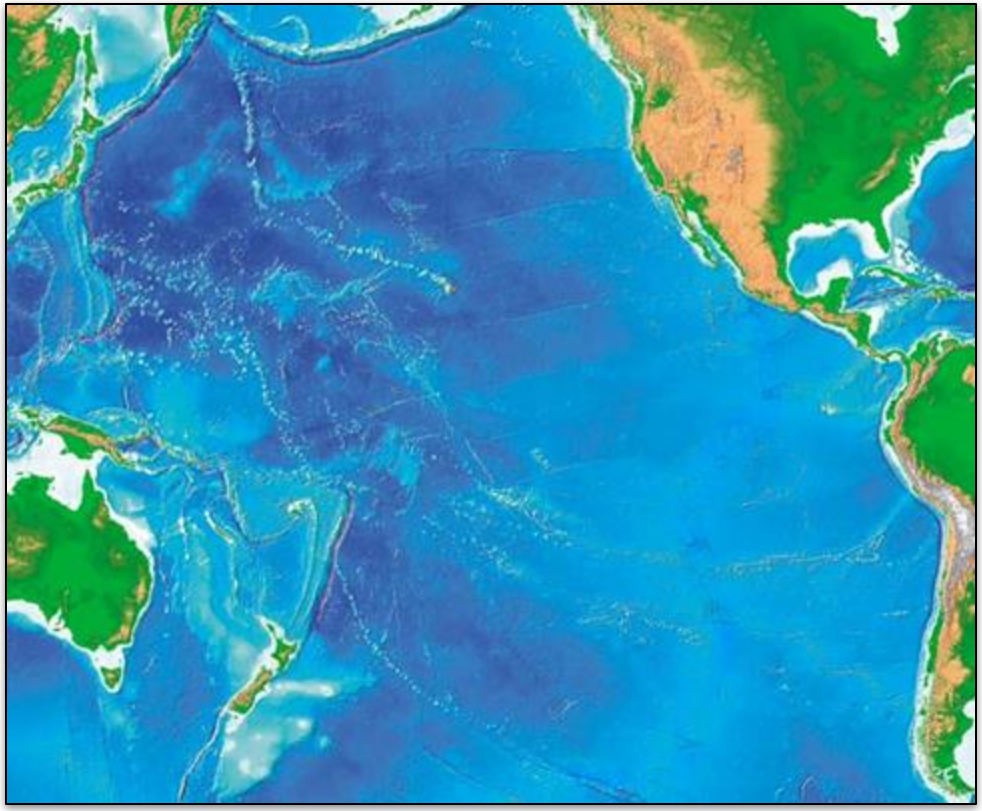


Figure 3. Main geological units that underlie New Zealand vineyards, expressed as percentage of total vineyard area (geological data of New Zealand was sourced from GNS Science; this study).

Imre, S.P. and Mauk, J.L.. Geology and Wine 12. New Zealand Terroir. May 2009.

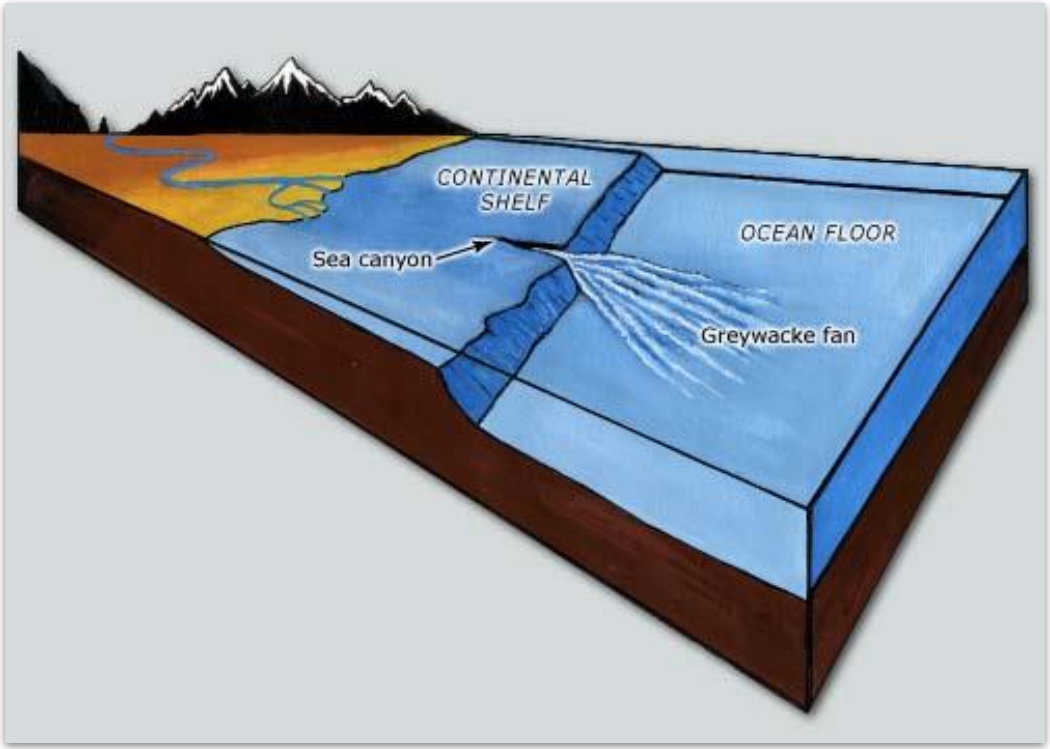
Aotearoa's Geologic History

Zealandia



Aotearoa's Geologic History

New Zealand 200 Million Years Ago

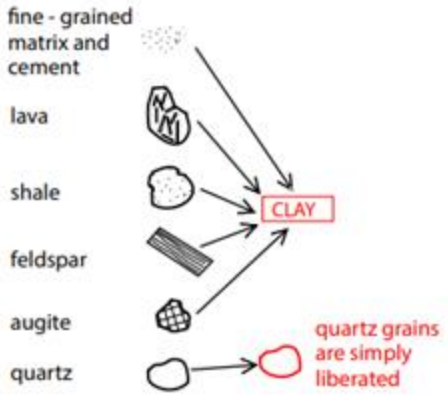


Source: Glen Coates, *The rise and fall of the Southern Alps*. Christchurch: Canterbury University Press, 2002. Te Ara - The Encyclopedia of New Zealand. Artwork by Bruce Mahalski

Aotearoa's Geologic History

Greywacke

Torlesse Greywacke -
Mt. Cooke International Park

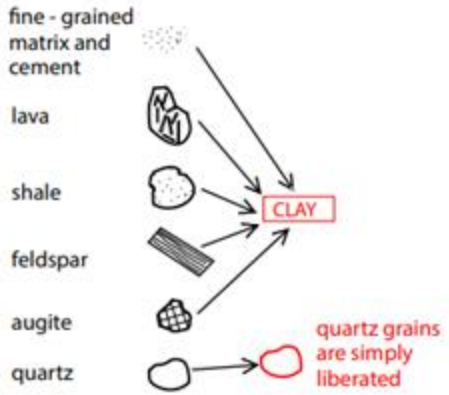


Microscope view of greywacke.
The white grains are quartz.

Fig. 6.7. Typical greywacke (indurated sandstone) of the Waipapa Terrane that outcrops along much of the east coast of Northland and Auckland. The rock is cut by numerous quartz and zeolite veinlets. Rakino Island, Hauraki Gulf.
Photographer Bruce Hayward.

Aotearoa's Geologic History

Greywacke Terroirs



Microscope view of greywacke. The white grains are quartz.

Terroir Insights/Questions:

- Consistent rock throughout NZ with drastically different climates
- Variation in rockiness and/or soil depth between sites?
- How rich are the clays produced from greywacke?
- Fracture orientation?

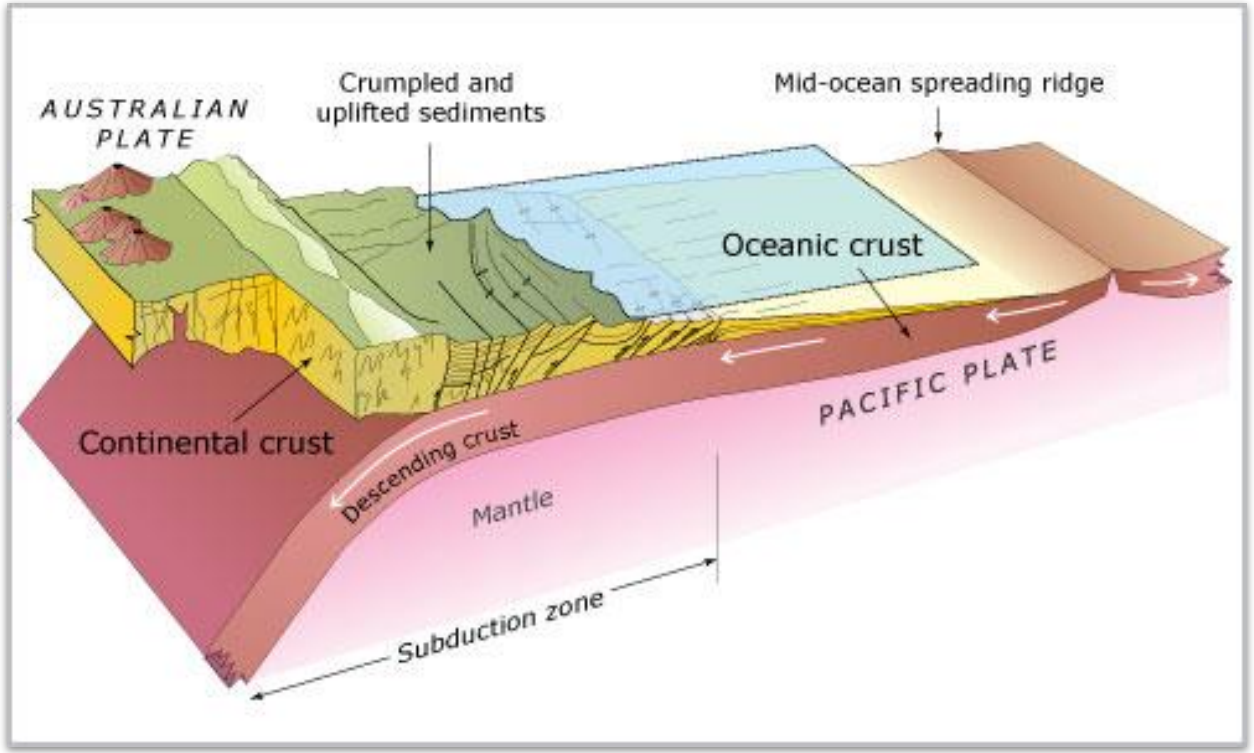
Regions:

- Auckland
- Northland
- Marlborough

*Note: Residual greywacke terroirs are different than transported terroirs consisting of greywacke cobbles

Aotearoa's Geologic History

Convergence – Greywacke and Schist



Aotearoa's Geologic History

Schist Terroirs

Regions:

Central Otago

Terroir Insights/Questions:

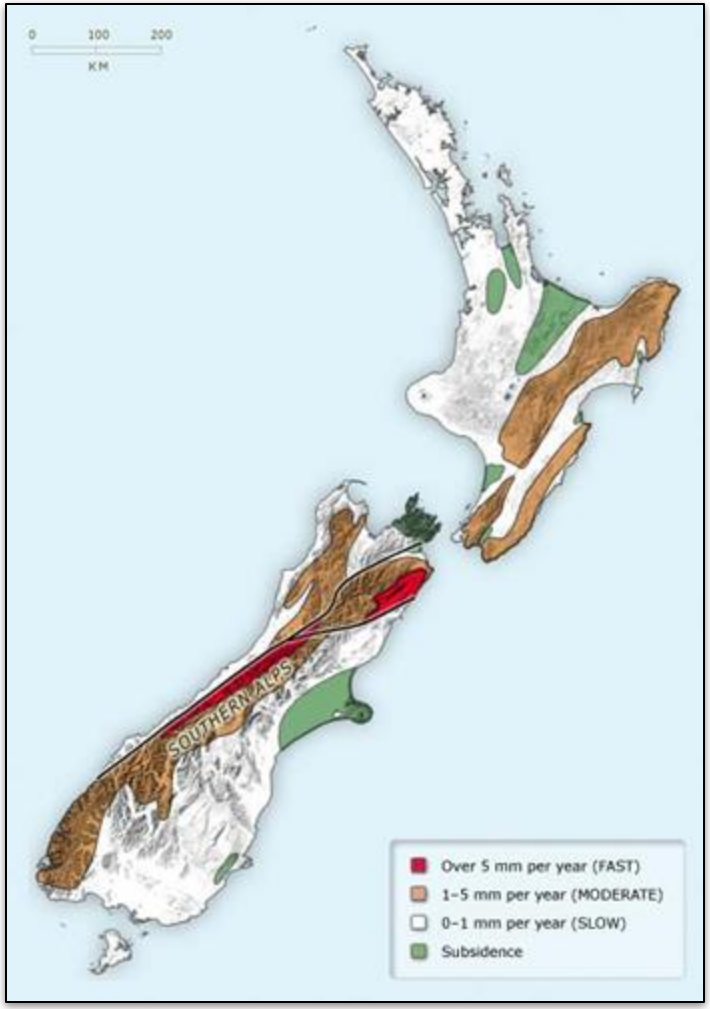
- "Schist" in NZ may correspond to gneiss elsewhere
- Typically produces steep slopes
- Variations in metamorphic grade that are unaccounted for?
- Slate - schist - gneiss typically produce wines with increasingly muscular structure
- Fracture/foliation orientation compatible with root growth?

Aotearoa's Geologic History

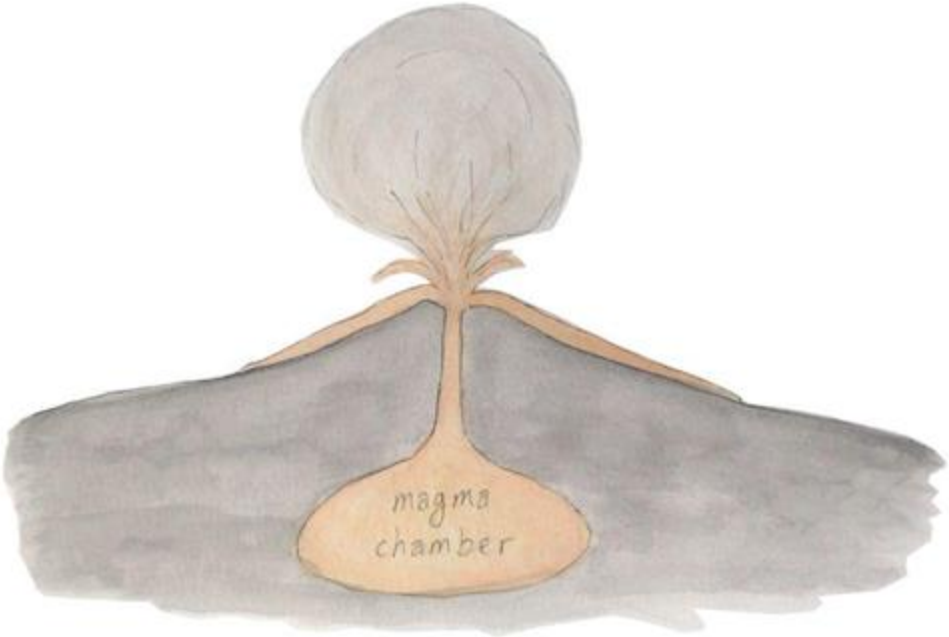
The Formation of Zealandia

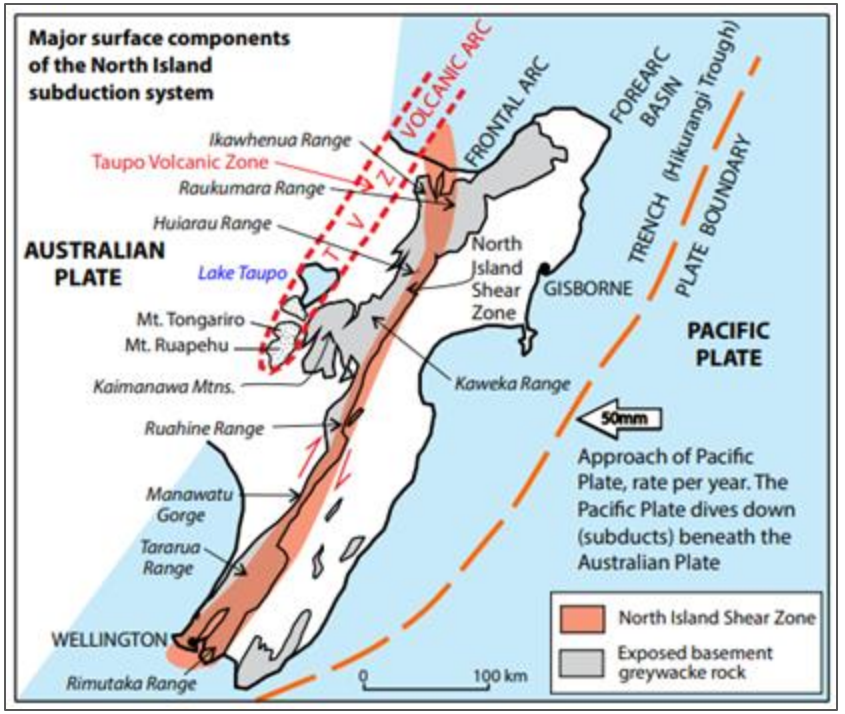
Aotearoa's Geologic History

Mountain Building



Recent Volcanism and Marine Sediments





Regions: Waikato, Northland/Auckland (?)

Aotearoa's Geologic History

Limestone Terroirs

Terroir Insights/Questions:

- Hard limestone that produces rich clay soils? Or soft marls?
- Clay content is always important, as is iron
- How calcareous? pH?
- Restrictive to root growth?
- Soil depth, rockiness, and clay must all be in balance to produce exceptional wines

Regions:

North Canterbury

Central Otago

Marlborough

Waipara

(Hawke's Bay - calcareous sandstone and siltstone)

Fig. 15.9. View west over Weka Pass limestone escarpments in north Canterbury. Photographer Lloyd Homer, GNS Science.

Aotearoa's Geologic History

Sedimentary Marine Terroirs

Regions:

Northland

Auckland

Gisborne

North Canterbury

Hawke's Bay

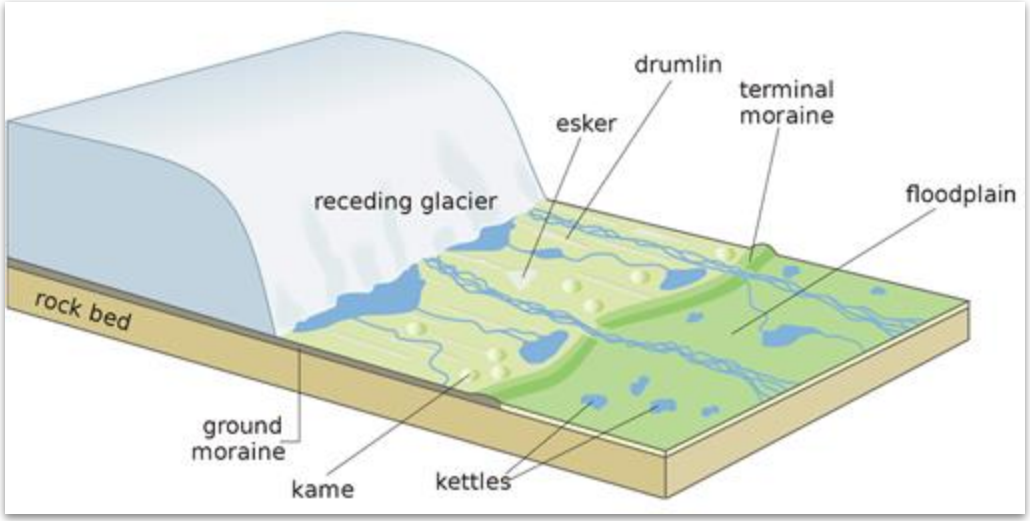
Marlborough

Terroir Insights/Questions:

- Santa Barbara County is excellent region for comparison
- How lithified is the bedrock?
- Depth to restrictive material?
- Soil texture is important

Aotearoa's Geologic History

Glaciation



Aotearoa's Geologic History

Glacial / Alluvial Terroirs

Regions:

- Everywhere

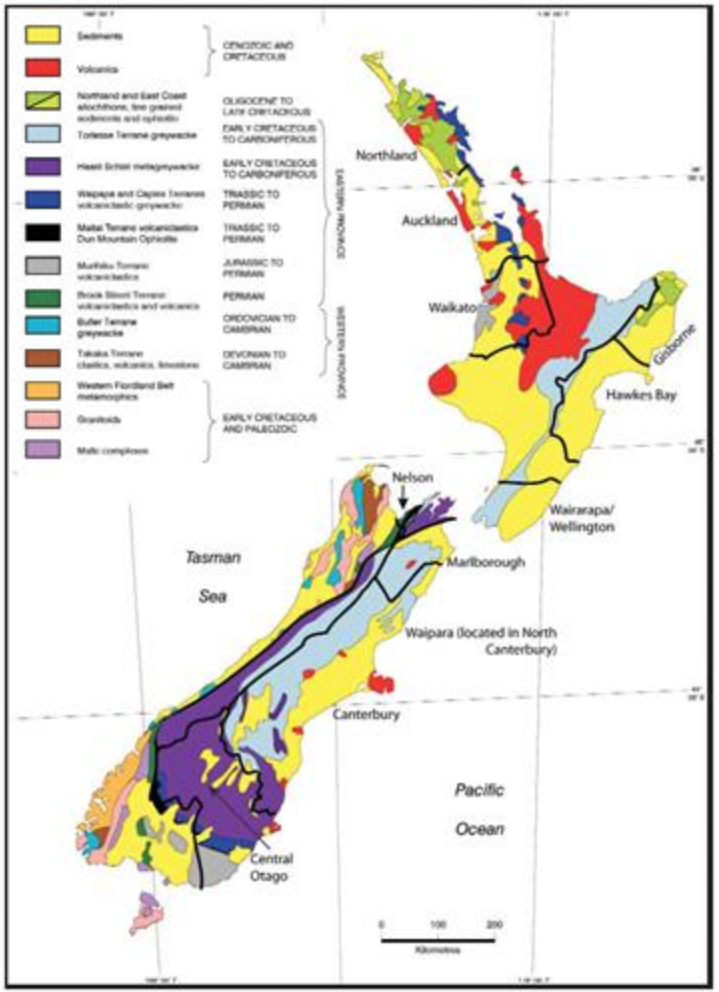
Terroir Insights/Questions:

- Glacial/Alluvial/or both?
- How well sorted is the transported material? Rounded?
- How consistent are the soils? Lenses? Vertical variability?
- Balance in soil texture?

Aotearoa's Geologic History

Aotearoa Chardonnay Regions –

- Northland
- Auckland
- Gisborne
- Hawke's Bay
- Wairarapa
- Nelson
- Marlborough
- North Canterbury / Waipara
- Waitaki
- Central Otago



Imre, S.P. and Mauk, J.L.. Geology and Wine 12. New Zealand Terroir. May 2009.

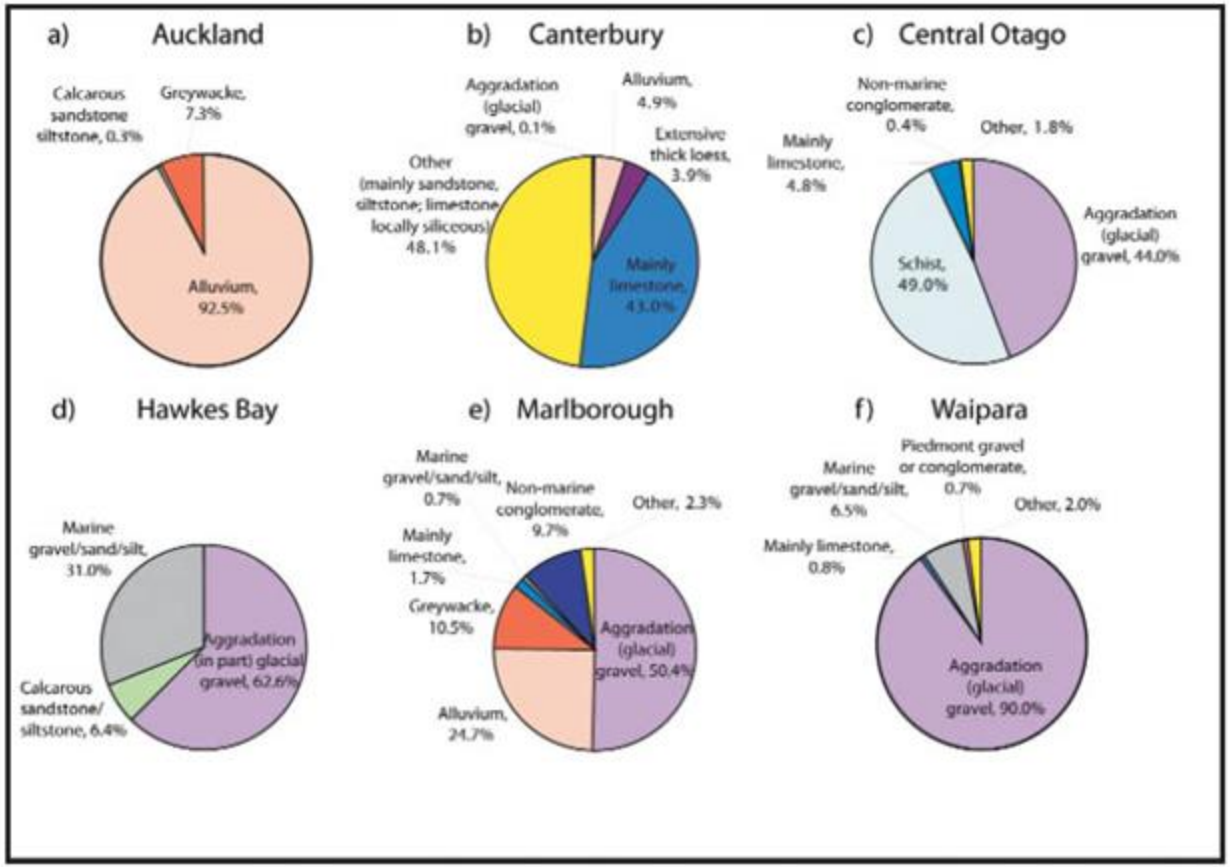


Figure 9. Geological units that underlie vineyards in New Zealand winegrowing regions, expressed as percentage of total vineyard area in each region (geological data of New Zealand was sourced from GNS Science; this study).

Imre, S.P. and Mauk, J.L.. Geology and Wine 12. New Zealand Terroir. May 2009.

Questions?

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Now for Steve Smith MW

Tasting for Chardonnay Terroir in New Zealand

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