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Raspberry Renovations and Soil Quality Determinations: Lower Fraser Valley, British Columbia, Canada

2011 National Cooperative Soil Survey Conference

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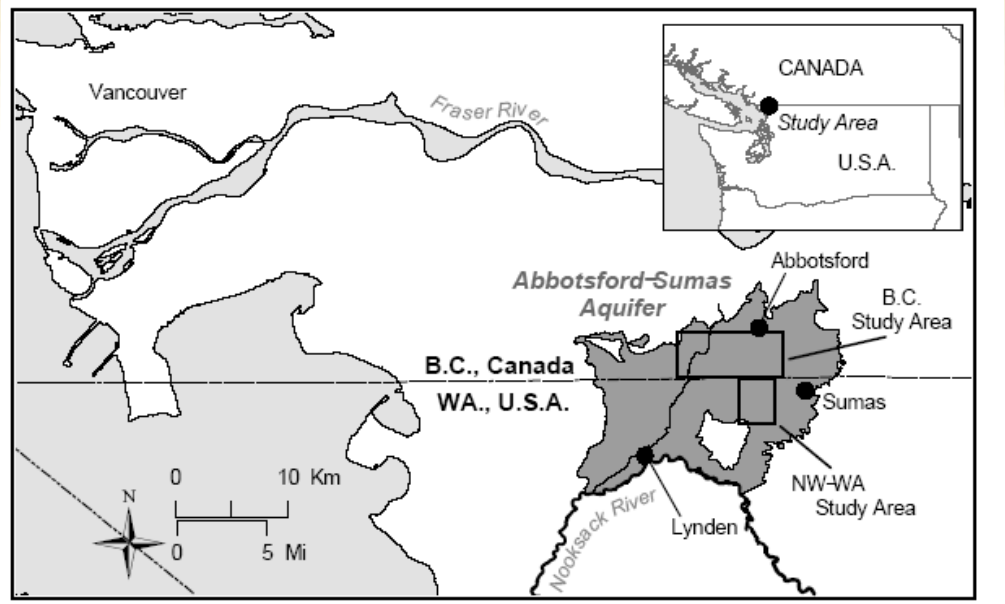
Canada

Outline

- Raspberry Renovation Overview
  - Describe & Define area
  - What is the Problem
  - Need for Renovation
  - Identify Soil Quality Parameters
  - Examples of Soil Quality Data
  - Conclusions
  - Acknowledgements

Study Location & Soils



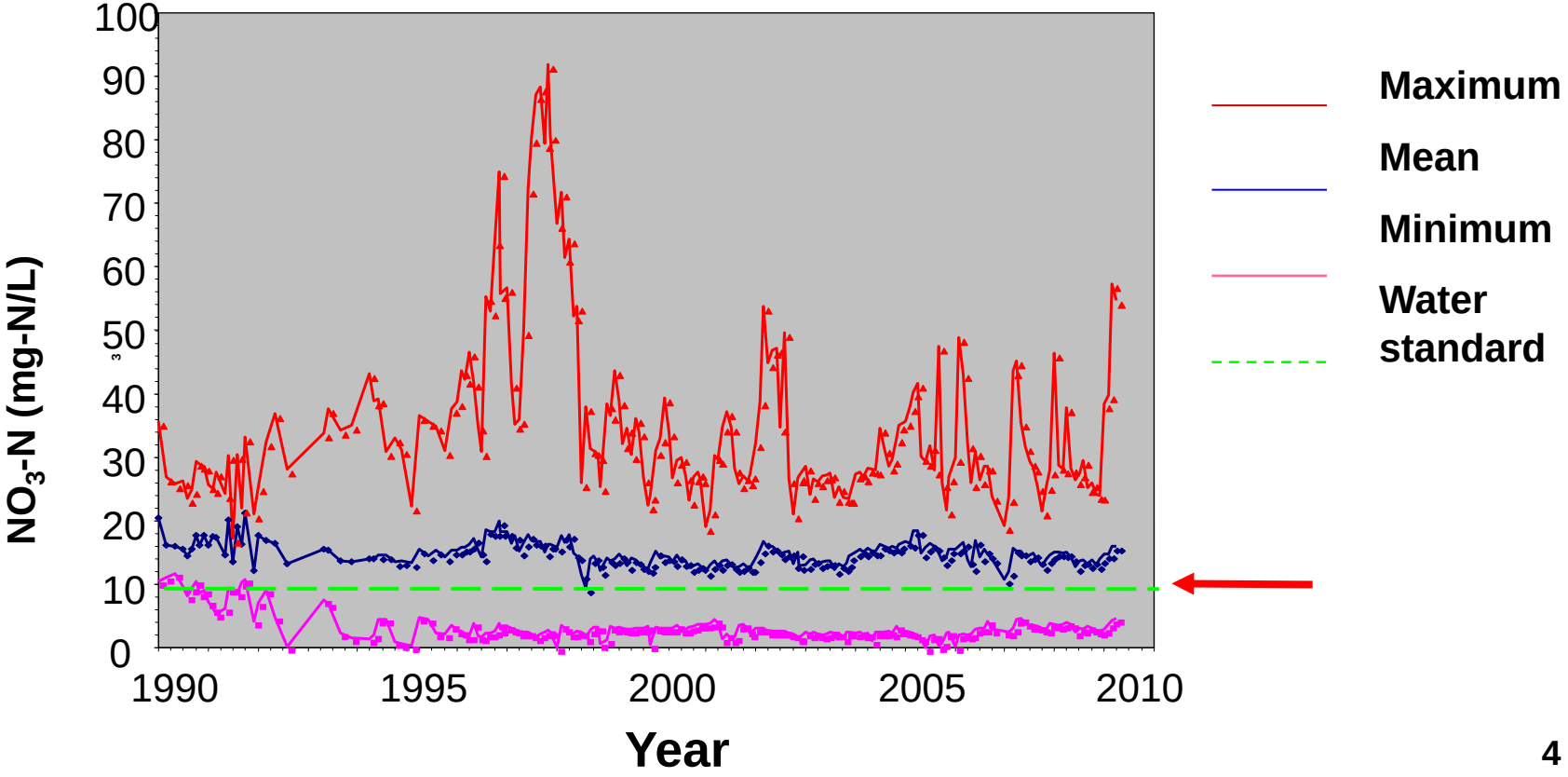
Location:
Abbotsford Sumas Aquifer

Eolian veneers over Glacial Fluvial

Problem: Nitrate Leaching Abbotsford - Sumas Aquifer

Nitrate-N Trend in Abbotsford Aquifer Piezometers

(Environment Canada Pacific and Yukon Region)



Management practices contributing to leaching risk

Previously Recognized:

- Historical use of manure as an amendment – in excess of crop N requirements
- N fertilizer inputs
- Clean tillage between rows

Additional possibilities:

- Over-irrigation
- Bare land over winter during renovation
  - Effects of fumigation?
- Ammonium deposition from Intensive Livestock Operations

Raspberry Renovation - background

- Renovate raspberry stands after 5 – 8 years
  - Buildup of root pathogens
  - Viruses

- Renovation involves in the fall:
  - Fall removal of canes
  - Fall tillage
  - Fall fumigation for nematodes
  - Spring manure application
  - Spring formation of hills & planting

Renovation experiment setup

North	260'			195'			130'			65'			South
Row 2	t5	t2	t4	t5	t6	t2	t2	t6	t5	t3	t5	t4	
	p24	p23	p22	p21	p20	p19	p18	p17	p16	p15	p14	p13	
Row 1	t3	t6	t1	t3	t1	t4	t4	t1	t3	t6	t2	t1	
	p12	p11	p10	p9	p8	p7	p6	p5	p4	p3	p2	p1	

t6 = compost
t5 = high manure
t4 = low manure
t3 = cover crop
t2 = fumigate
t1 = control

21'8" long plots (=6.67 m)
each plot = 6.67 m x 10 m = 66.7 m2 = 0.00667 ha
Barley seeded at 200 kg/ha = 1.33 kg/plot
Basamid applied at 65 g/m2 = 4.34 kg/plot

Canes removed & roundup applied mid-August 2009
Barley planted September 11 2009
Fumigation September 18 2009
Manure and compost applied & rototilled March 31/10
Planted with 'Saanich' April 16/10
Soil sampled periodically

Renovation experiment setup: spring 2010

Soil (Health) Quality Definitions

- **Acton & Gregorich (1995) definition for agriculture**
  - **soil's fitness to support crop growth without resulting in soil degradation or otherwise harming the environment**

- **The USDA National Soil Survey Handbook definition 2011**
  - **Capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.**
  - **2 aspects: inherent & dynamic**

Role of Existing Soil Survey

- **Data for inherent soil properties**
  - **Texture**
  - **Parent Material**
  - **Spatial Distribution**
  - **Soil Series**
  - **Taxonomy**

- **Initial data for dynamic soil properties**
  - **pH**
  - **Organic Carbon**

Dynamic Soil Quality Properties Sampled

Chemical Soil Function: Support Life

- pH
- Organic Carbon

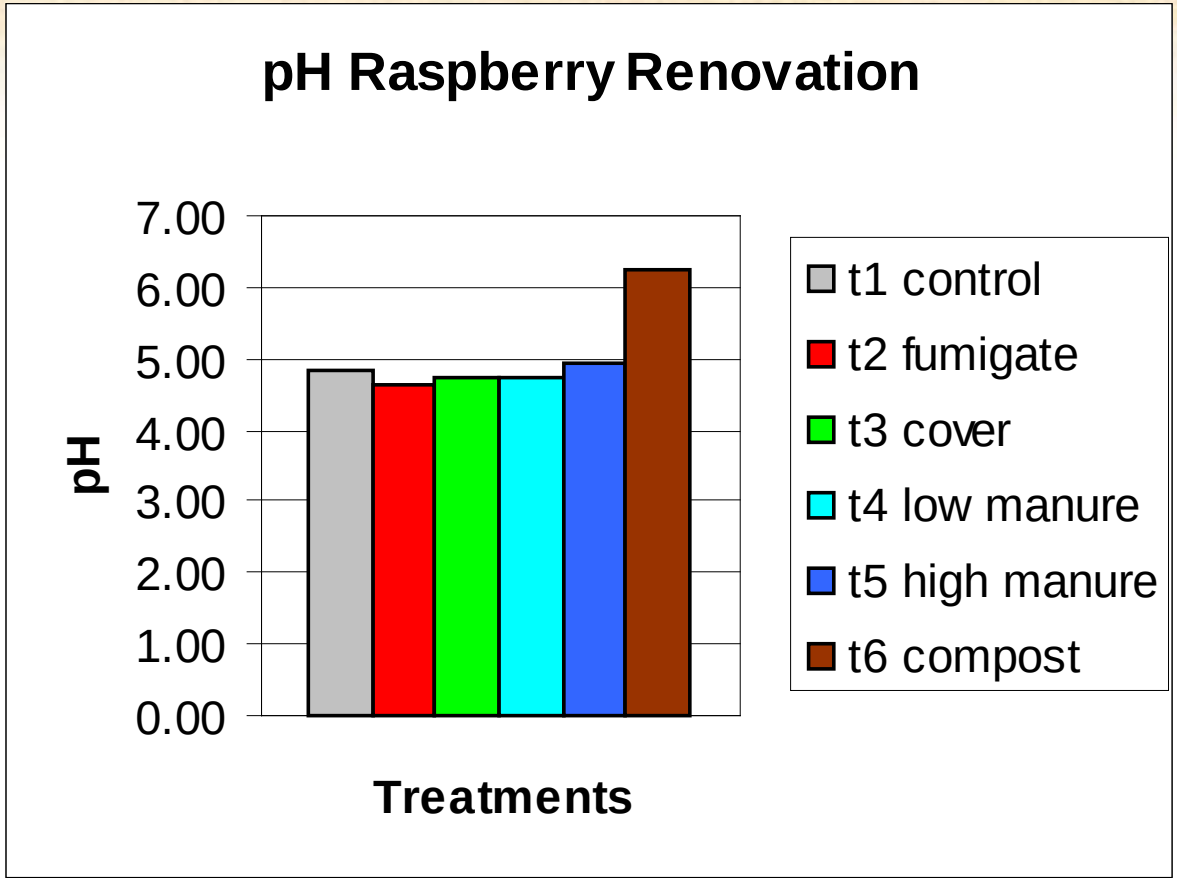
Biological Soil Function: Water Movement

- Earthworm Counts

Physical Soil Function: Water Movement

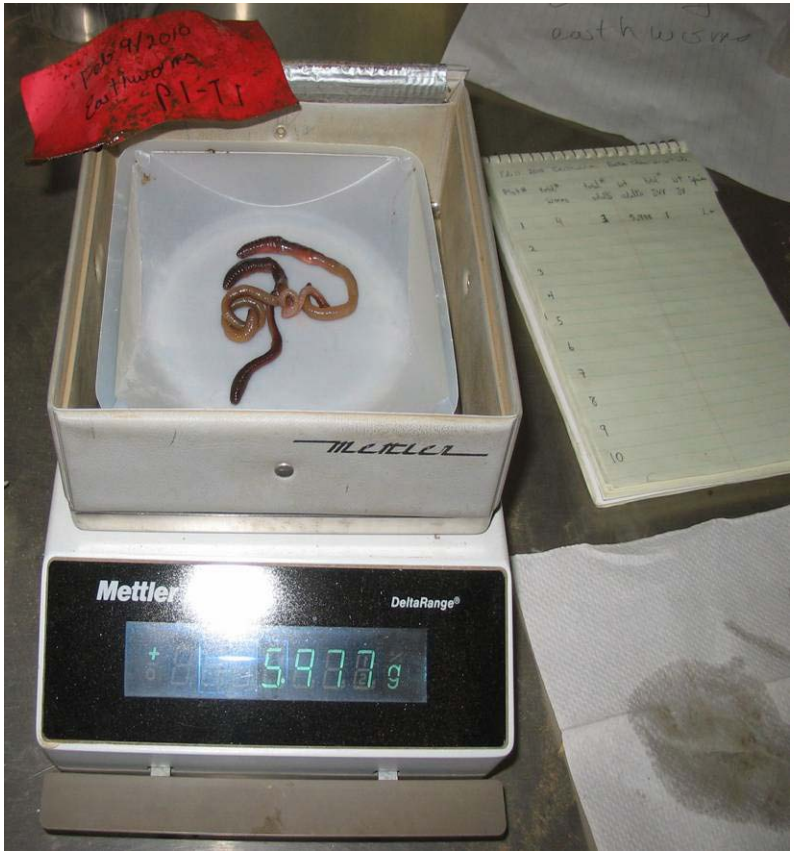
- Bulk Density
- Available Water Storage Capacity
- Wet Aggregate Stability
- Saturated Hydraulic Conductivity

pH $CaCl_2$

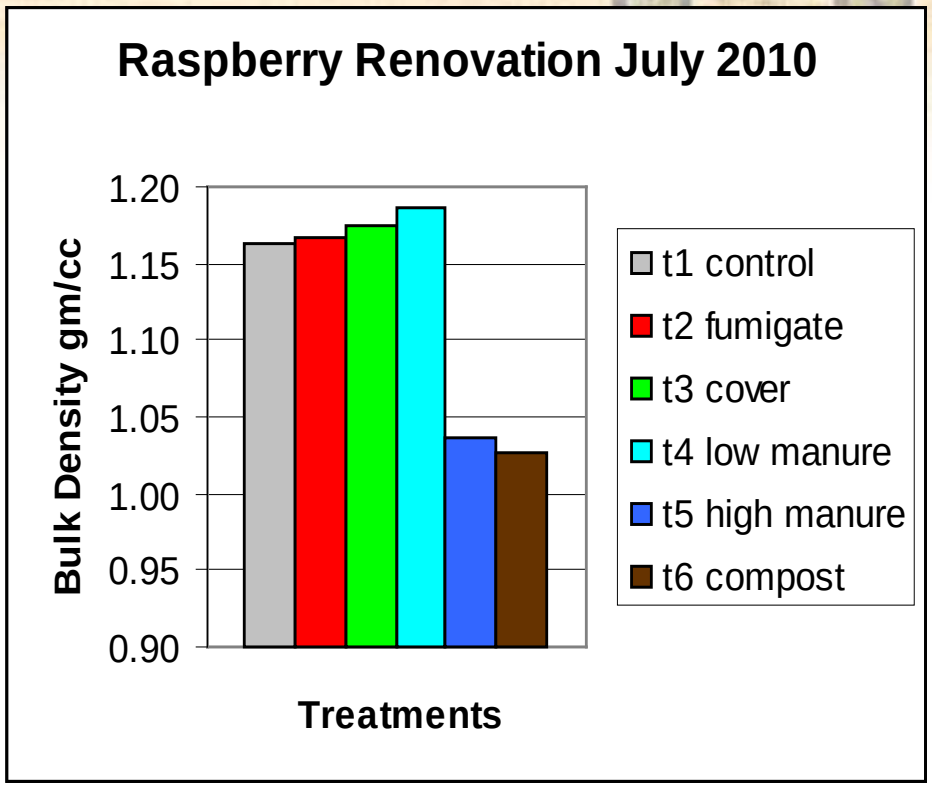


Significant treatment differences

Earthworms

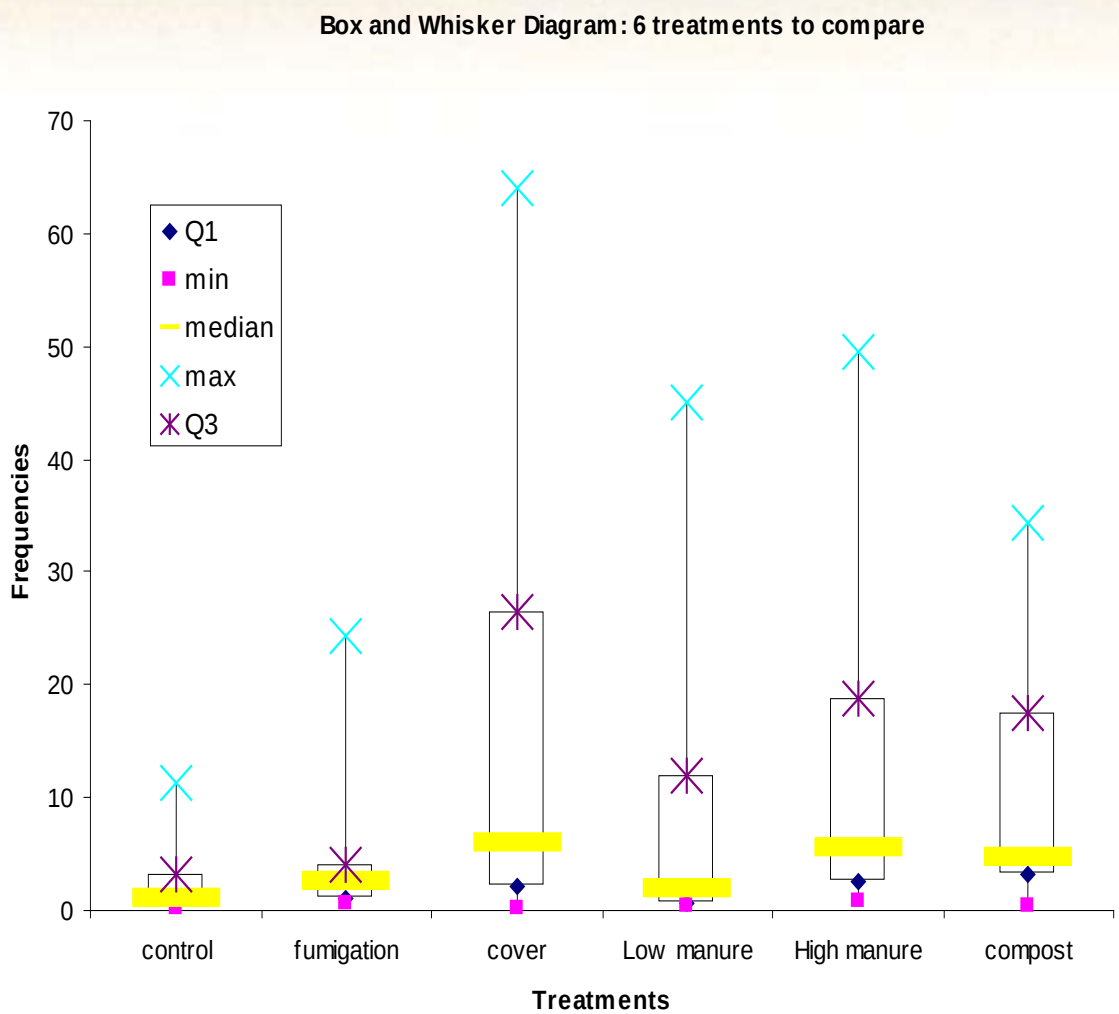


Bulk Density

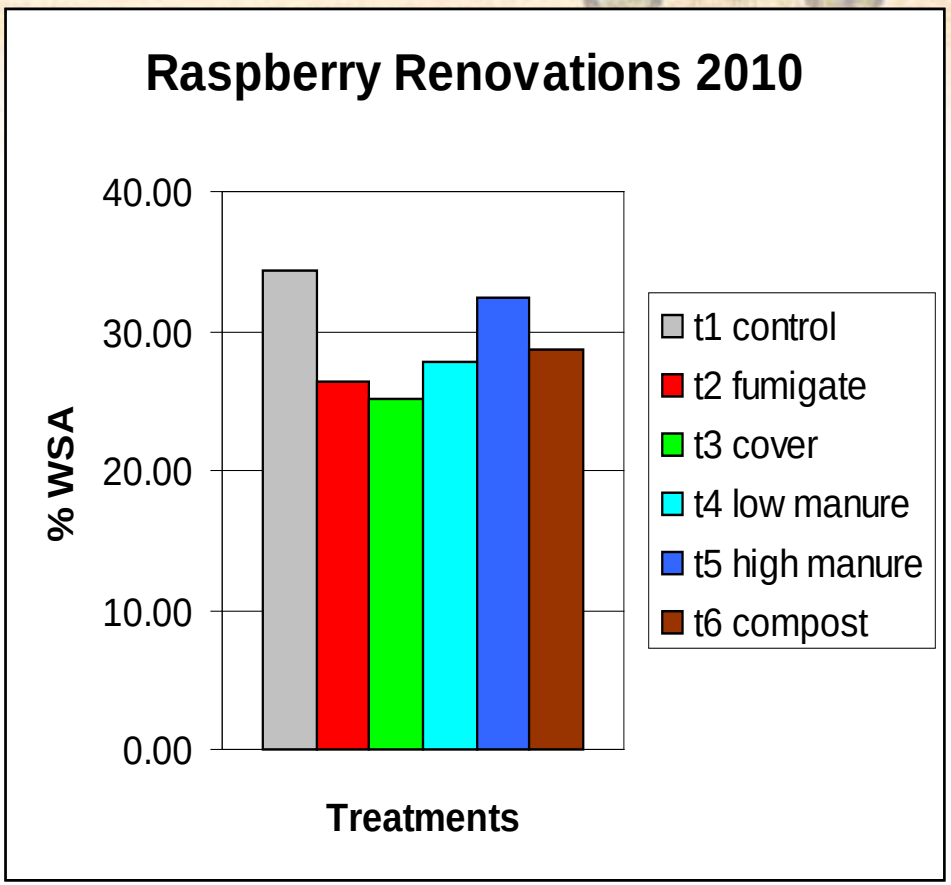


Significant treatment differences

Guelph Permeameter



Water Stable Aggregates



No significant treatment differences

Conclusions

- **Focused on water movement soil function**
- **Only 1 season data**
- **Treatment effects may take longer to determine differences for some properties**
- **Soil Quality requires long term studies**

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