Using Willow Riparian Buffer Strips for Biomass Production and Riparian Protection

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Willow Buffers for Riparian Protection and biomassProduction

Runoff from agricultural fields: can transport nutrients, sediment, and agro-chemicals to streams

Willow Buffers for Riparian Protection and Biomass Production

Willow biomass production system

Decades of worldwide knowledge and experience

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Tailor biomass production system for riparian buffers

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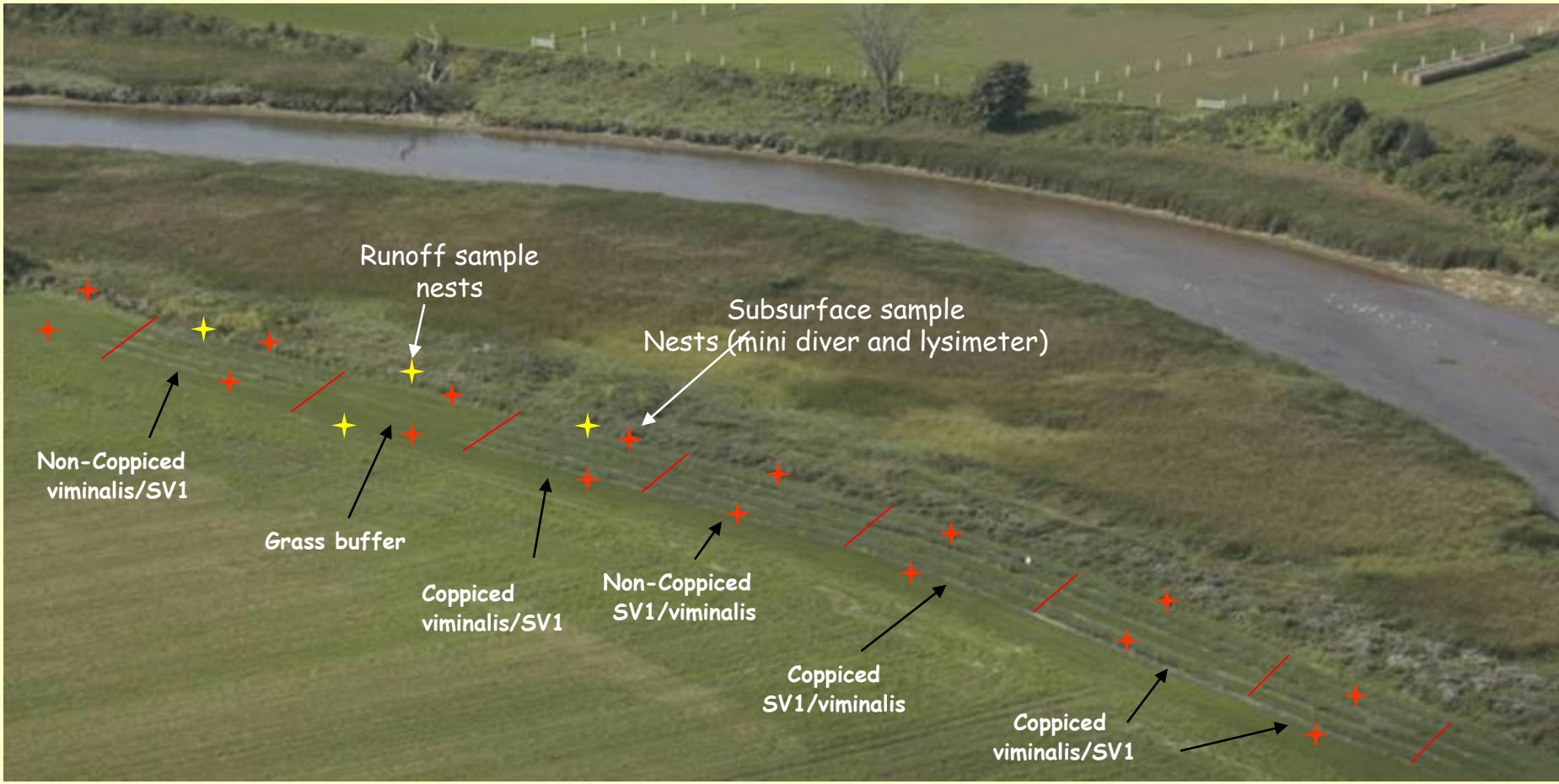
Riparian Buffer

Willow buffers for biomass production and riparian protection

Research questions

- What is the potential biomass production from willow riparian buffers?
- How effective are willow riparian buffers in nutrient and carbon sequestration?
- What is the impact of first year coppicing on buffer performance?
- What are the long term impacts of biomass harvest on nutrient and carbon sequestration?

Willow buffers for biomass production and riparian protection
PEI Project Site



RCBD design with three blocks (replicates) and two management practices (coppicing and harvest treatments) and two Salix clones (sub-treatments)

Willow buffers for biomass production and riparian protection

Data collected

- Plant data
  - Biomass yield (allometric & sampling) 8 trees per plot/species (48 trees/species)
  - Root growth (pit excavation & soil cores)
  - Nutrient (N & P) and carbon (leaf, root & wood)
  - Transpiration (stem flow gauge)
- Soil Data
  - Baseline and annual data
  - Nutrient supply rate (PRS probes)
- Shallow groundwater data
  - Levels (Mini-divers)
  - lysimeters
- Sedimentation data
  - Overland flow (sediment traps)

Soil core sampling

Lysimeter shallow groundwater sampling

Sap flow measurement in 2009 Coppice plot

Harvested Plot

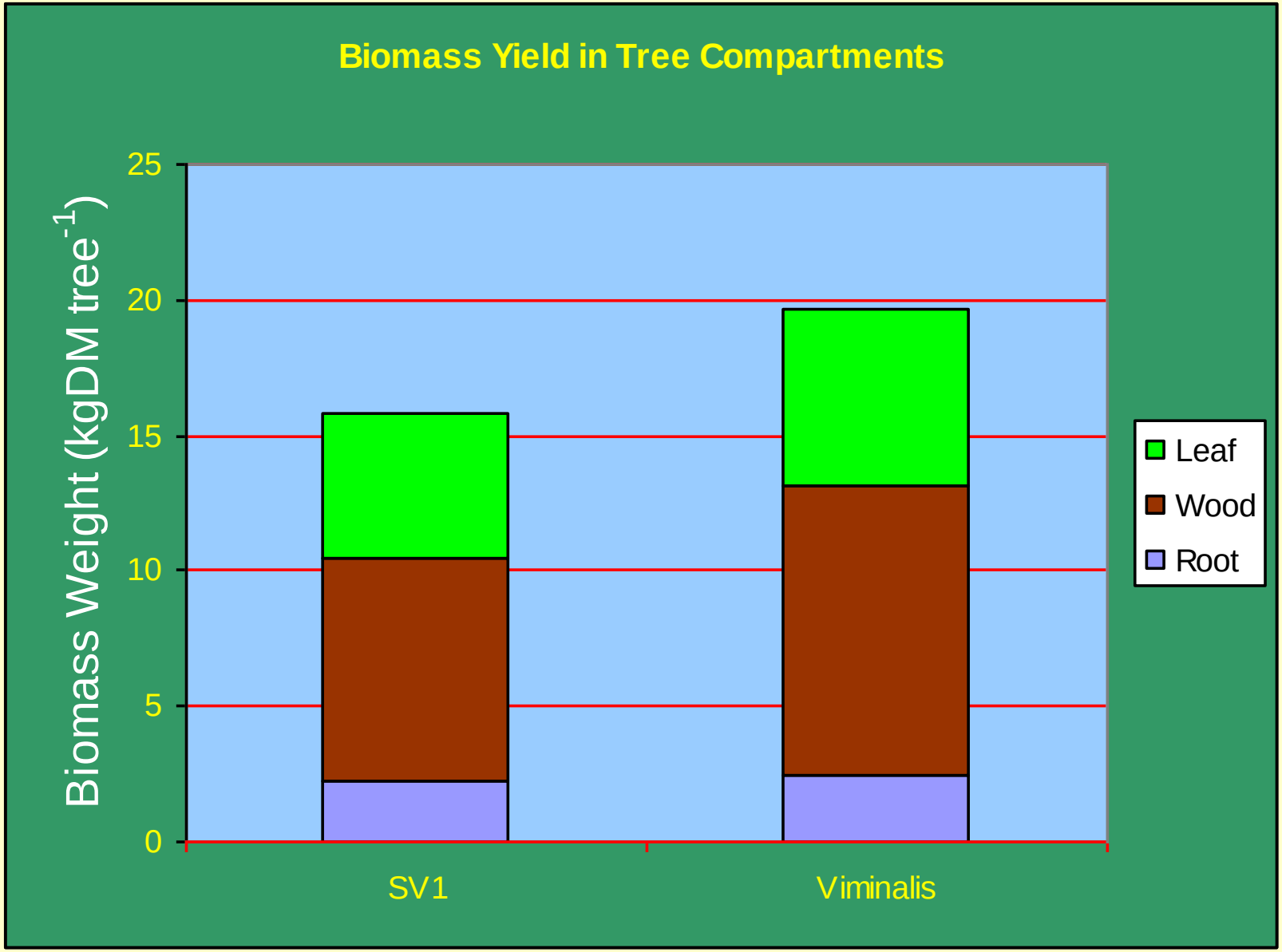
December 2009

Non-Harvested and Harvested Plots
July 2010

Site Soil Characteristics

	Hovingh 2		Hovingh 3		Waugh	
	SV1	**Viminalis**	**SV1**	**Viminalis**	**Not harvested**	**Coppiced**
Soil Texture	fine sandy loam		fine sandy loam		fine sandy loam	
pH	5.9		5.5		6.4	
Organic matter	3.95		4.08		3.16	
Nutrient Supply Rate (µg/10cm²)						
NO_3-N	48.6	22.8	46.7	10.4	41.6	38.1
Ca	422.6	638.0	467.8	288.0	539.7	623.5
Mg	69.2	115.0	104.8	43.0	129.1	151.1
K	208.1	460.8	423.2	258.6	231.7	255.9
P	13.4	16.0	9.4	11.1	8.2	6.8
Mn	1.4	1.2	1.4	2.2	4.5	6.5

Question 1: Biomass production



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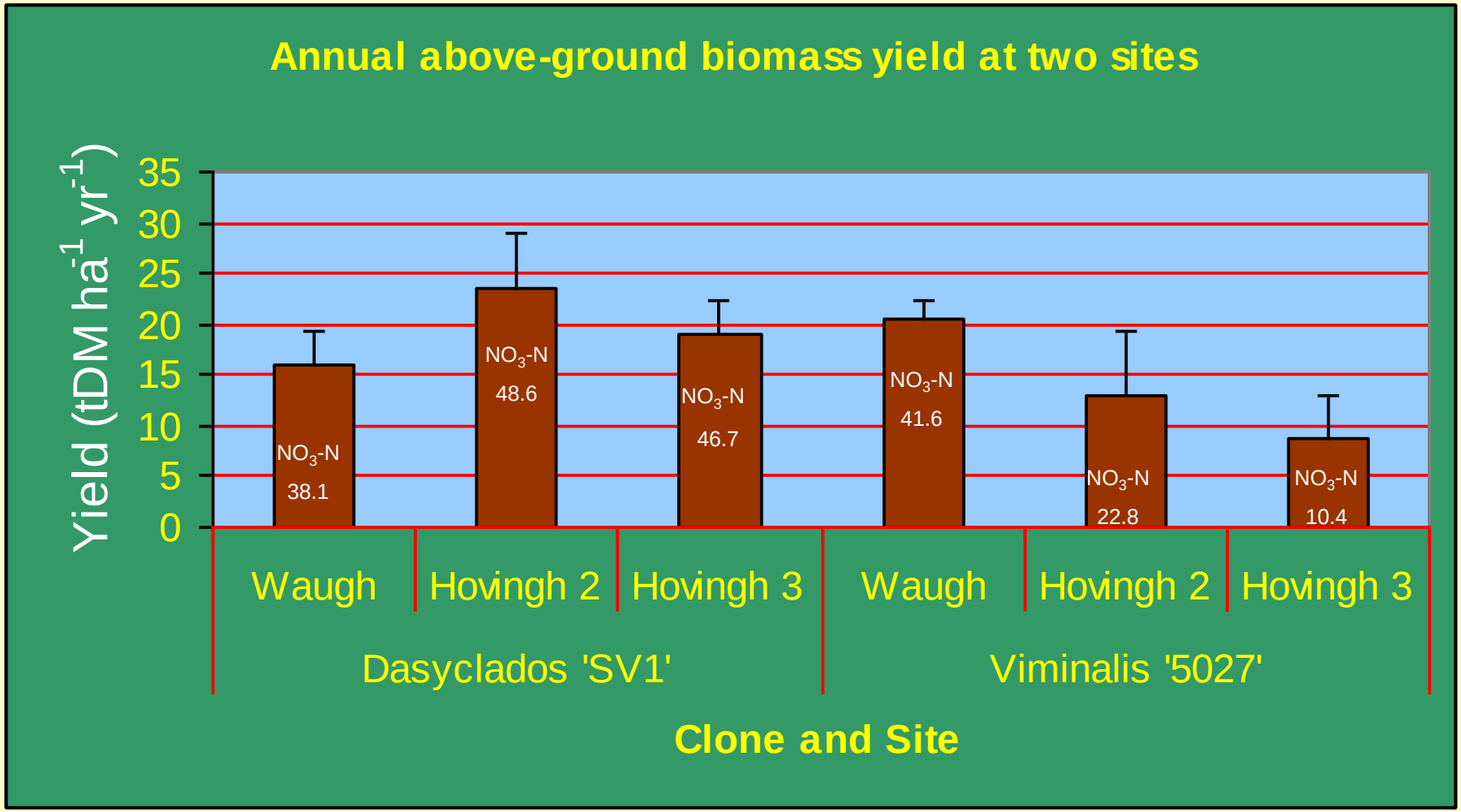

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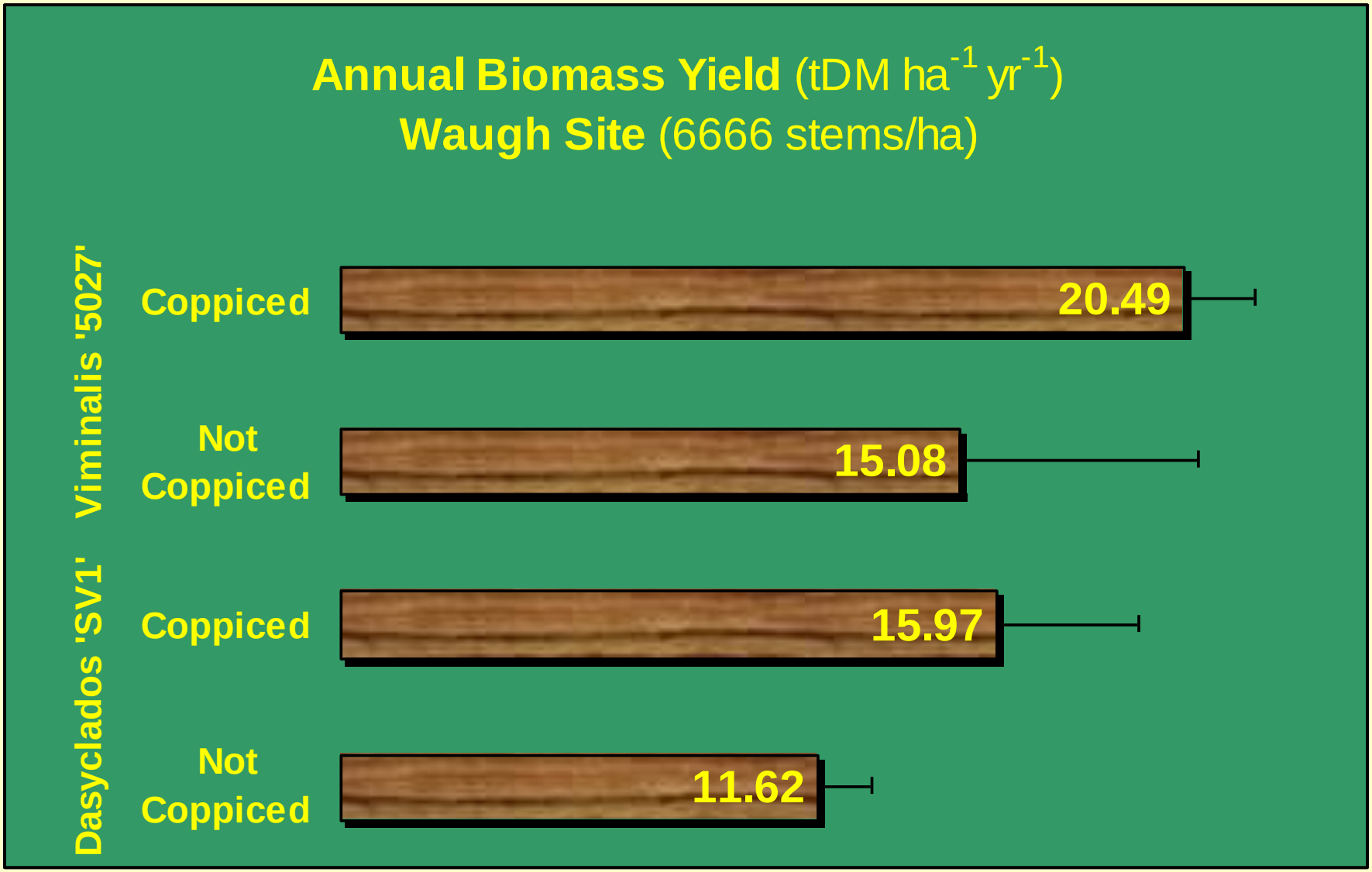
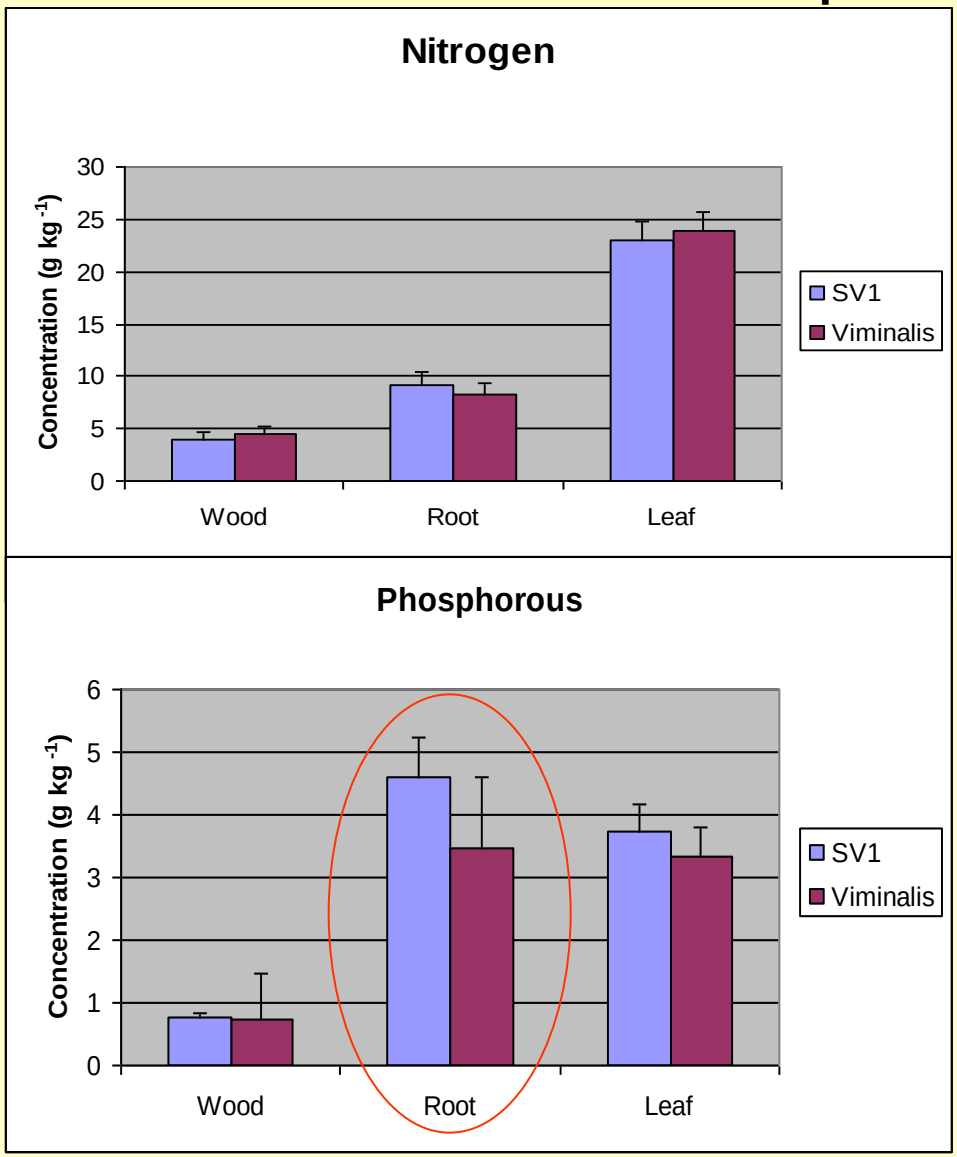


Question 2 – Nutrient and carbon accumulation

Concentration of N & P in Willow Compartments



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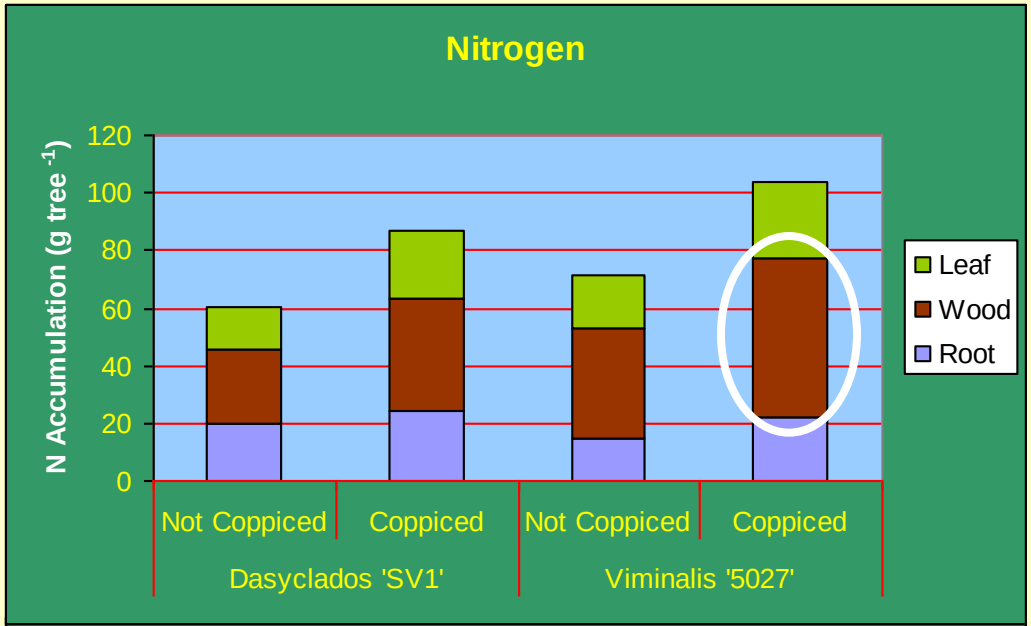

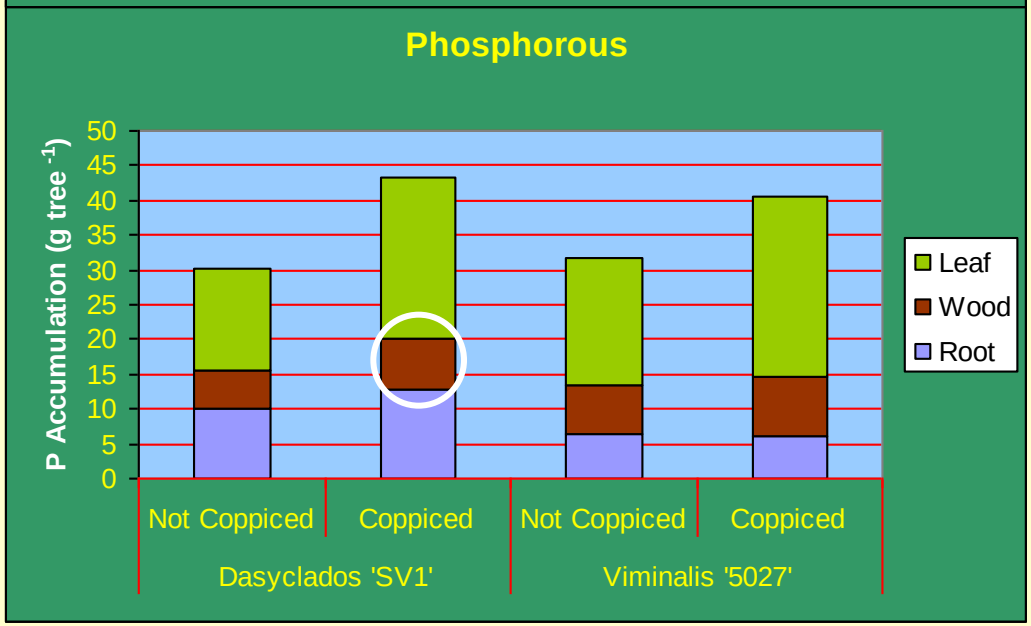

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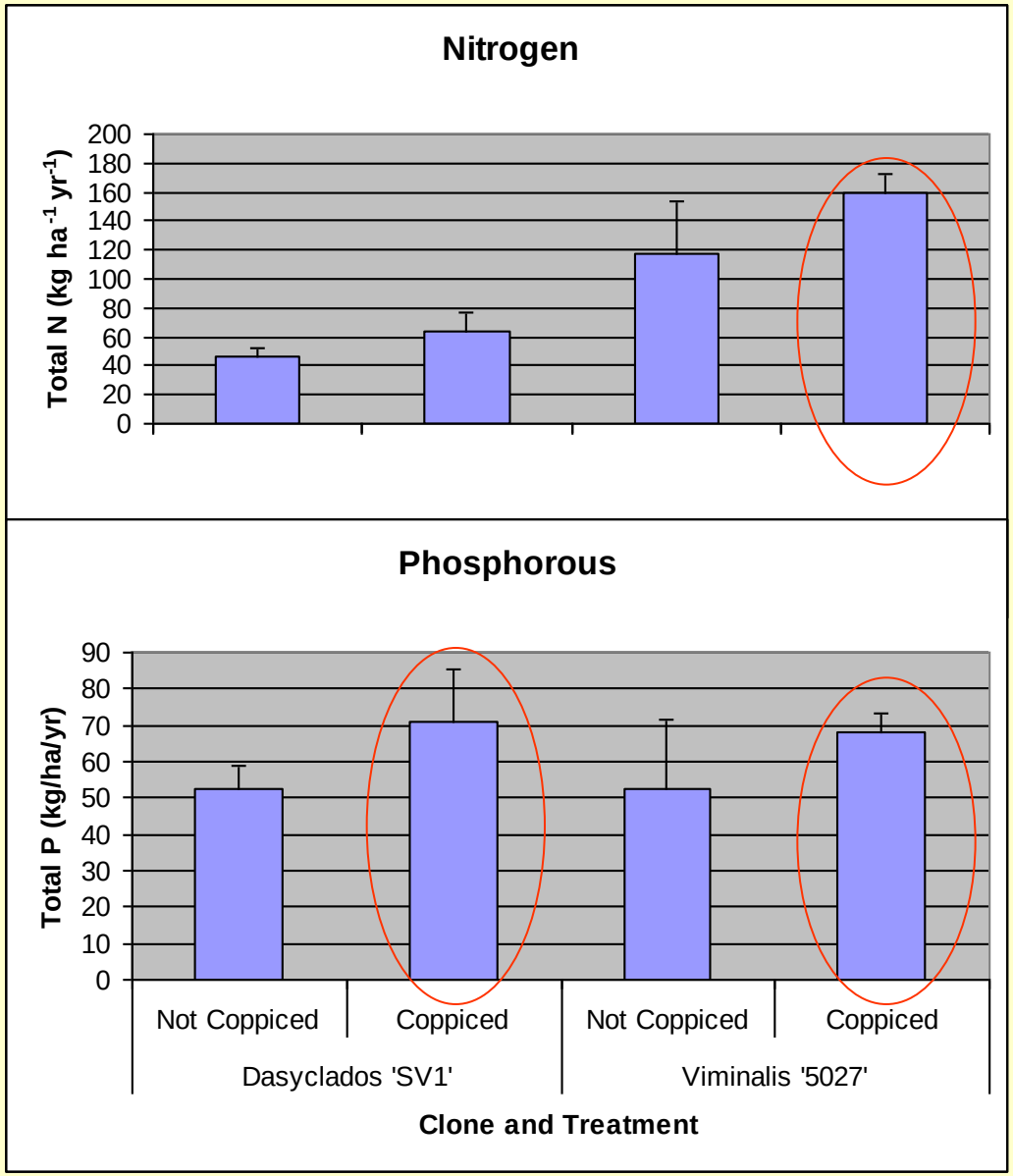
Annual above and below-ground N & P Accumulation



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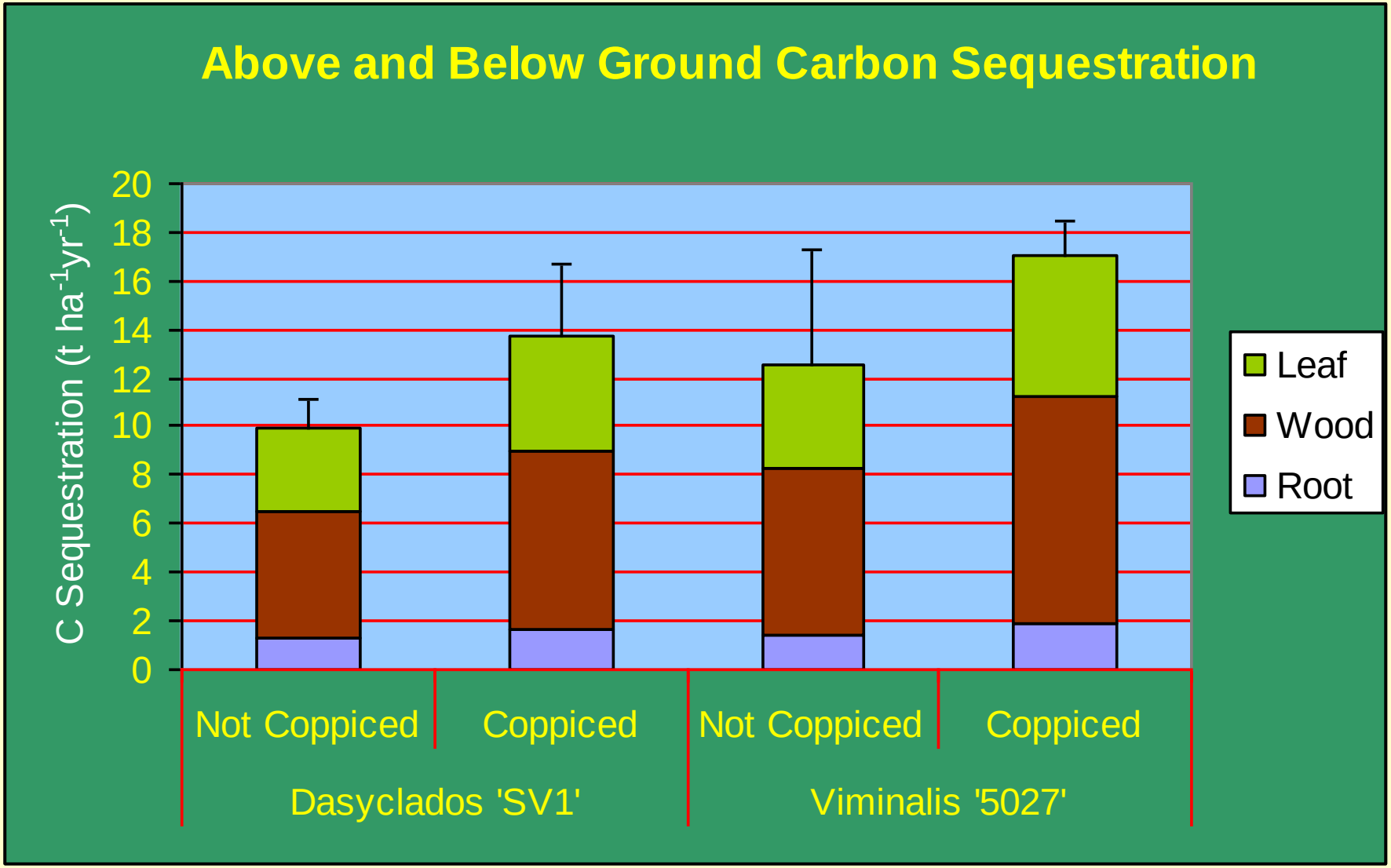

Conclusions

- Very high biomass productivity in riparian areas
- NO_3 supply rate is important factor
- Substantial amounts of carbon and nutrients can be accumulated in willow riparian buffers
- Overall, clone viminalis '5027' superior to dasyclados 'SV1' in PEI
- Coppicing increased productivity which leads to increased carbon and nutrient sequestration
- Need better understanding of below ground role

Thank You

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