

Background

Douglas-firs are a dominant species in tree farms in the northwest and knowing the rates of decomposition of their stumps after tree harvest may have implications on carbon/ nutrient cycling models and management. By assessing decomposition rates in Douglas-fir, this study will be able to create a model of decay for tree farms in this region. This model could also contribute to the study of carbon sequestration in tree farming practices.

Objectives

- Create a model of decay for Douglas-fir stumps
- Compare that model to others for Douglas-fir coarse woody debris
- Determine the potential for decay of stumps at age “x”

Methods

- Choose stumps with a specific age
- Assess stumps for decay class
- Record stump height, diameter, bark thickness assessed in field
- Determine density using a resistograph
- Plot/Site information recorded
- Collect material for carbon and nitrogen
- Repeat for above and below ground

Classification System

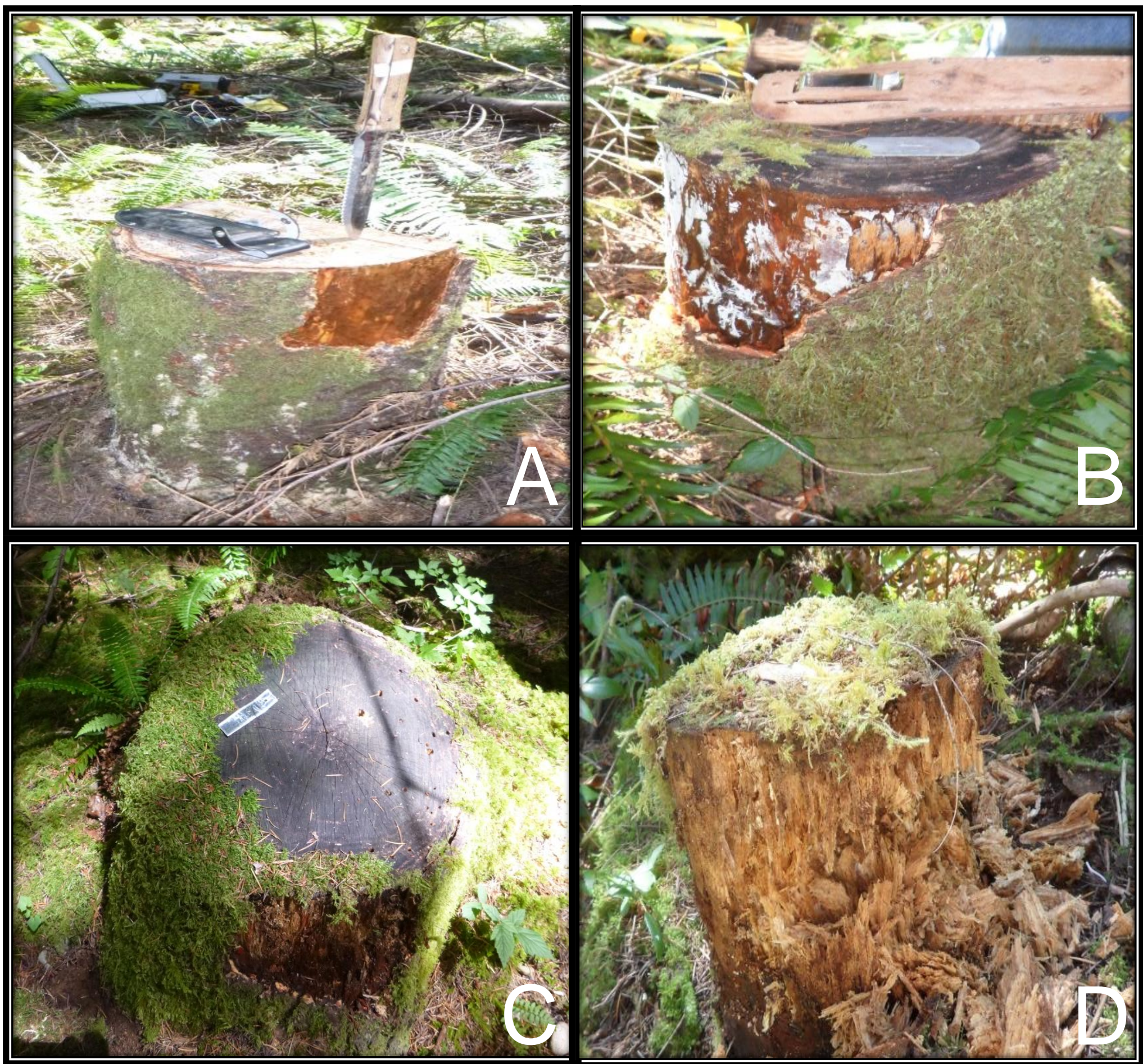


Figure 1: Examples of Stump Classification: A: Class 1; B: Class 2; C: Class 3; D: Class 5

A 5-class system of decay for stumps of Douglas Fir trees*

Characteristics of Cut Stumps	Decay Class				
	I	II	III	IV	V
Bark	Intact	Intact	Intact - Broken, some pieces missing	Crumpling, larger pieces missing.	Mostly Deformed, to completely absent.
Inner Wood	Hard	Sapwood softening	Sapwood Soft	Sapwood Soft, Heartwood softening.	Both Sapwood and Heartwood soft.
Texture	Intact - Knife does not Penetrate	Intact to Partly Soft Knife will Penetrate some of sapwood.	Hollow Areas; Knife Penetrates to inner wood.	Small, soft blocky pieces	Soft and Powdery
Shape/Size	Round - No change	Round - No change	Round, may have minor shape loss	Stump Reduced in Size, loss of shape	Stump Slumping, Not holding Shape
Color of wood	Original color	Original color	Original color to faded	Light brown to reddish brown	Red-brown to dark brown
Stump Structure	Fully Structured	Mostly Structured	Minor Slump	Reduced Size, loss of shape, noticeable slump	Minimally Discernable as a Stump
Signs of Wood Borer (Insect Galleries) **	Absent	Minor to No Boring	Minor to Moderate Boring	Moderate to Advanced Boring	Signs of Advanced Boring, borers absent.
Root Invasion	None	None	Root Invasion Starting - Sapwood	Root Invasion into Heartwood	Roots from other plants bringing soil upward around stump base.

* Adapted from From Maser and Trappe, The Seen and Unseen World of the Fallen Tree - 1984 and from Tobin, Brian, Kevin Black, Luke McGurdy, and Maarten Nieuwenhuis. 2007. "Estimates of decay rates of components of coarse woody debris in thinned Sitka spruce forests". Forestry. 80 (4): 455-469.

Resistograph

- Specialized portable drill that converts torque to a density reading (see figure 2)

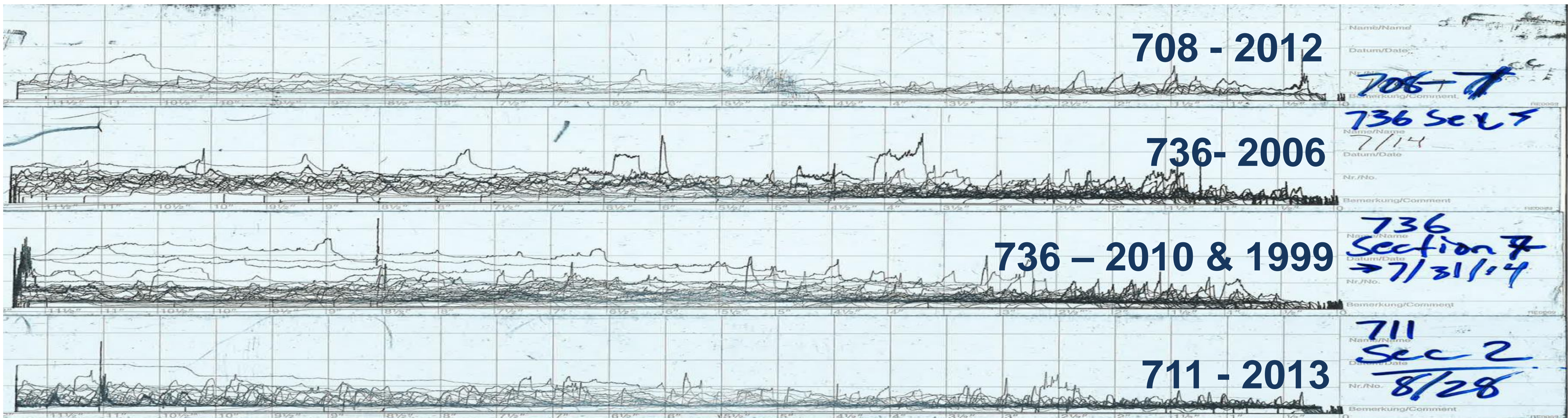


Carbon and Nitrogen

- Drill with a 5” bit to a 4” depth
- Level of carbon:nitrogen taken from stump to soil level



Figure 2: Example resistograph readings for harvested plots



Below Ground

- Steps completed for above ground analysis are repeated every 4th stump (density, and carbon to nitrogen ratio) at 6” below soil surface

Analysis

- Determine significant factors of decay, including differences: 1) between ages, 2) among ages at different locations, and 3) between above and below ground measurements
- Carbon:Nitrogen ratios
- Event History “Death” Modeling
- **work in progress**

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References

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