

# Preliminary Results of Tree Ring Analyses in Acadia National Park



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## Introduction

In 2013, the Northeast Temperate Network (NETN) began coring trees adjacent to forest plots in Acadia National Park (ACAD) to better understand age dynamics of forest stands, and to see how age correlates with indicators of forest structure, composition and function. The objectives of this work are to estimate the stand age for each forest plot, to determine the relationship between diameter at breast height (DBH) and tree age at DBH, to compare stand ages with date of land acquisition, and forest metrics that are expected to differ between mature and late-successional forests, including structural stage, snag abundance and coarse woody debris (CWD).

## Methods

We have collected cores for 32 plots on western Mount Desert Island (MDI), four plots on Isle au Haut (IAH), and two plots on eastern MDI (Fig. 1). At each forest plot, four trees were cored within a 10 m buffer of the plot boundary. Two co-dominant and two intermediate trees were selected for coring that were representative (e.g., same species and similar size) of trees on the plot. At each tree, we recorded the tree species, crown class (co-dominant or intermediate), and measured DBH where the cores were taken with an increment borer.



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## Results

Results supported our assumption that larger DBH trees tend to be older than smaller trees, but there was a lot of variability in the data, indicating that DBH is not the best predictor of tree age (Fig. 2). Comparisons between co-dominant and intermediate tree ages within the same plot revealed that plots with co-dominant trees less than 80 years old at DBH also had similar ages (<20 yrs difference) for intermediate trees. This follows patterns expected for mature forests, which are generally composed of a single-aged cohort of trees. Average stand ages within all structural stages (Pole, Mature & Late-Successional) were close in range (Table 1). The number of snags per plot did not correlate well with stand age (Fig. 3). Volume of CWD was low for Pole, as expected, but was also lower than predicted for late-successional stages (Fig. 4). There are likely many factors influencing these results, including the fact that large CWD and snags tend to be relatively rare across the landscape. On average, forest stands originated 19 yrs prior to National Park Service ownership. However, this varied between 100 yrs before to 36 yrs after land acquisition (Table 2).

## Conclusion

Overall, results from the first two years of coring revealed valuable information about forest stands in Acadia, and we expect to improve our understanding as more plots are cored. Tree core data will help us more accurately categorize structural stages that have previously been classified using relative basal area only. We will continue to collect cores from western MDI and IAH until all plots have been sampled, and will expand this project to other units in ACAD and other NETN parks as resources allow.

**Table 1.** Average age and DBH (cm) of co-dominant trees separated by structural stage. The structural stage metric uses relative basal area of trees in pole (DBH: 10-19.9 cm), mature (DBH: 20-34.9cm) and large (DBH >35cm) size categories.

| Average Age and Size by structural stage |      |      |
|------------------------------------------|------|------|
|                                          | Age  | DBH  |
| Pole (n=2)                               | 78.8 | 20.5 |
| Mature (n=26)                            | 90.9 | 26.6 |
| Late-Succession (n=5)                    | 92.7 | 29.5 |

Northern red oak (*Quercus rubra*) on plot 137 with old basal scar, likely from 1947 fire.



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**Figure 1.** Location of forest health plots where trees were selected for coring to determine stand age during 2013-2014.

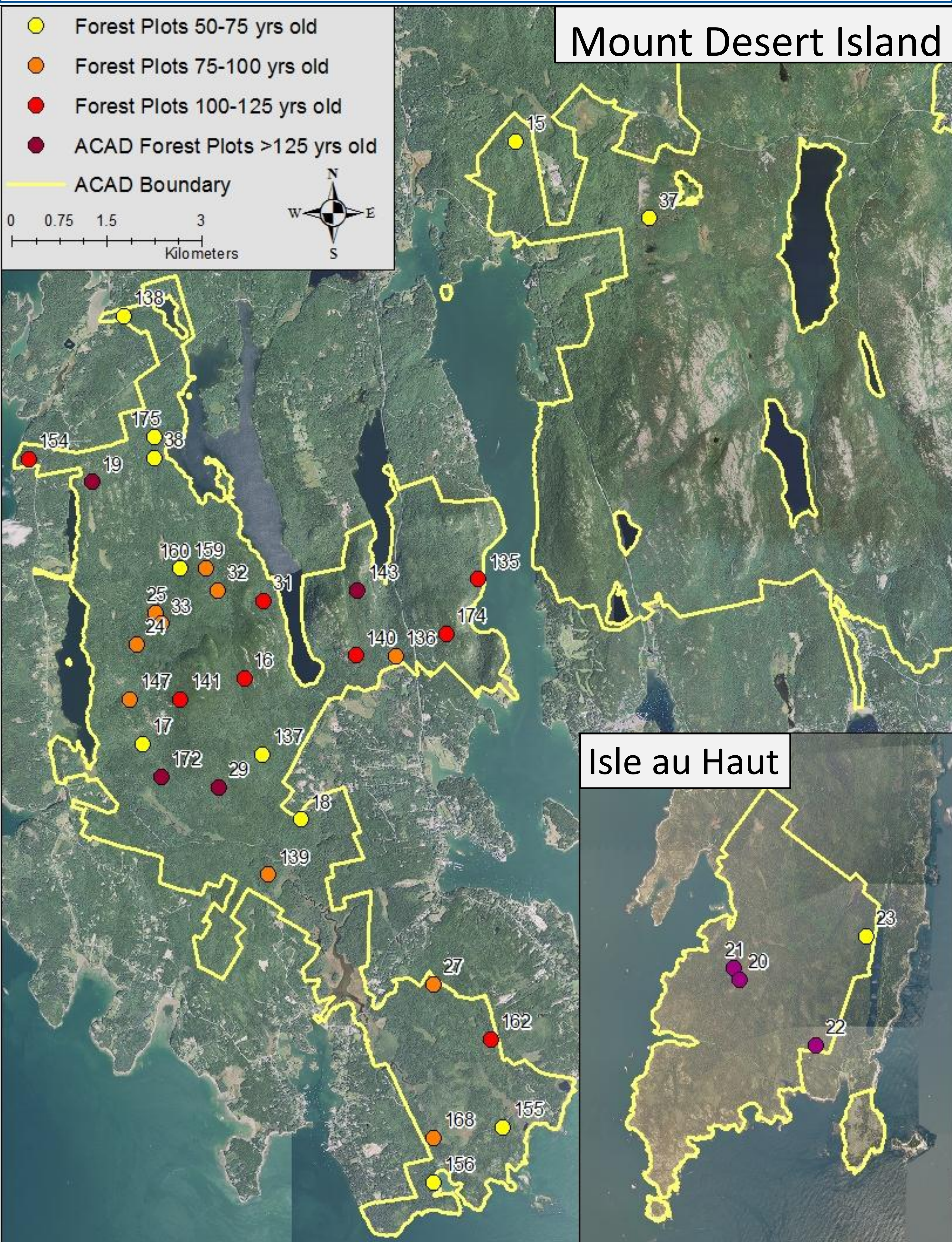


**Figure 2.** Estimated stand age versus tree size at DBH for trees of Co-dominant and Intermediate crown classes at ACAD forest plots during 2013-14.

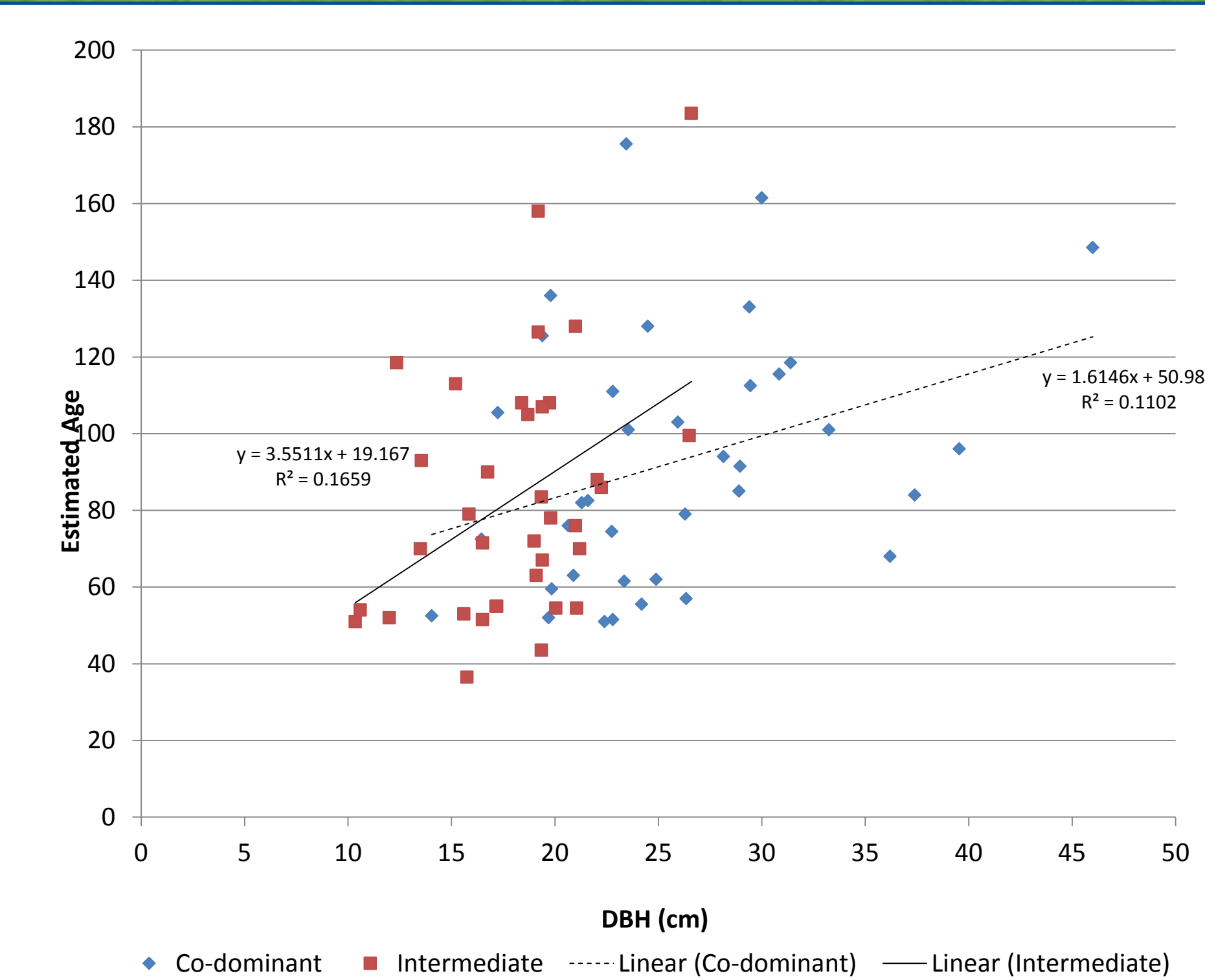


**Figure 3.** Estimated stand age versus snags / plot found in ACAD forest plots during 2013-14.

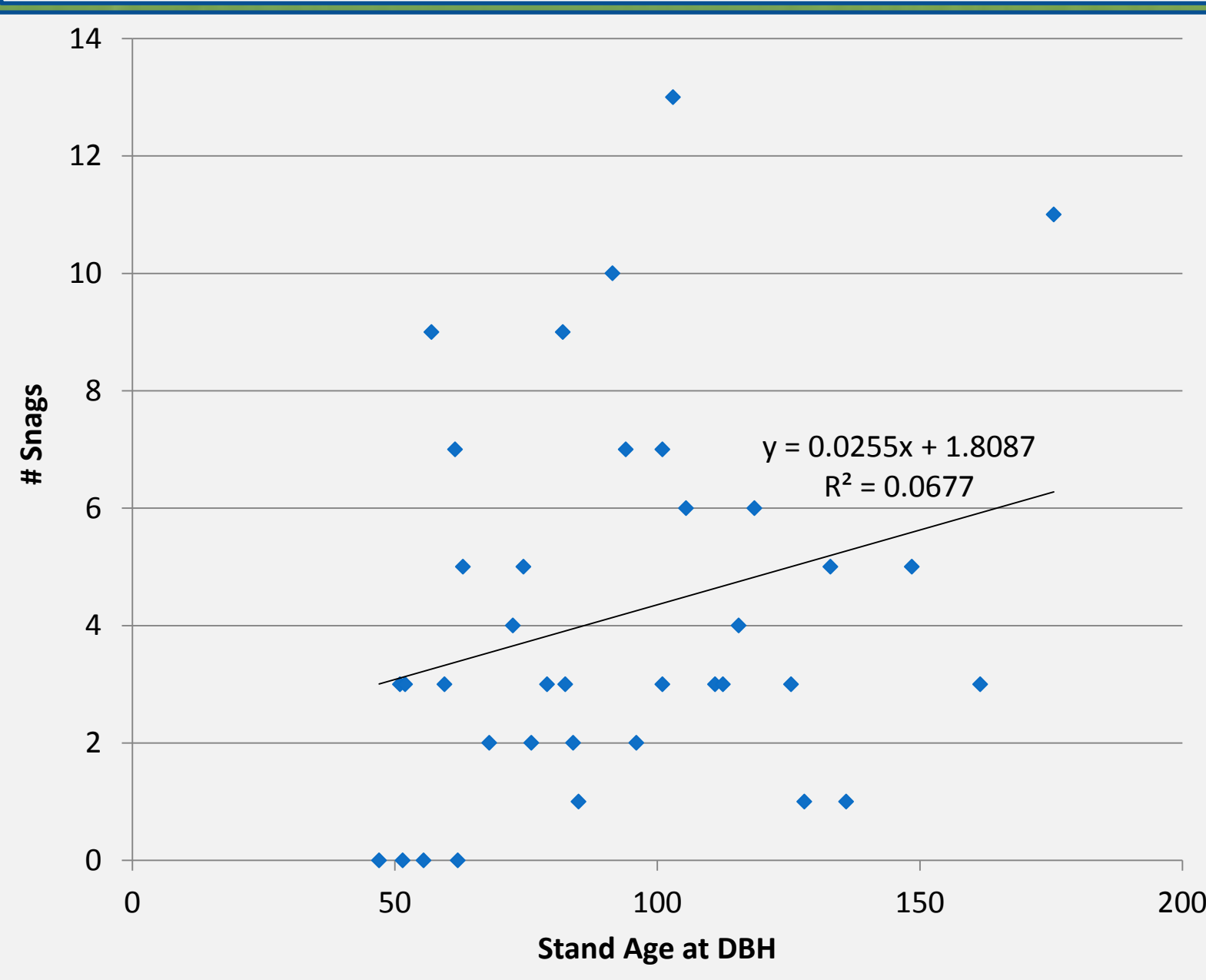
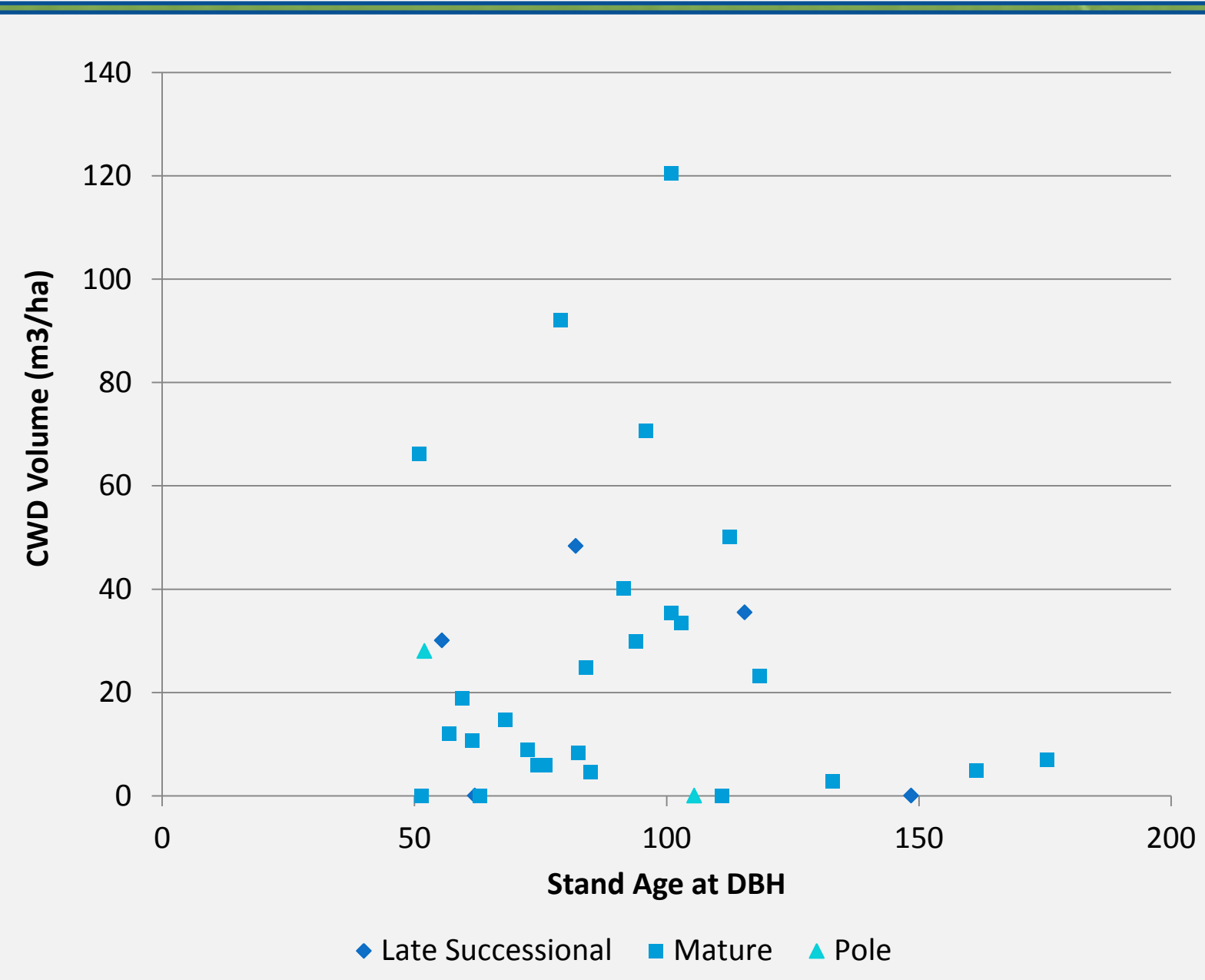


**Figure 4.** Estimated stand age versus CWD volume found in ACAD forest plots during 2013-14.



Red spruce (*Picea rubens*) core taken near plot 175 - 10cm DBH and 53 years old.



Eastern white cedar (*Thuja occidentalis*) core taken in a cedar swamp near plot 019 – 28.8cm DBH and 150 years old.



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Background image of Saint Sauvuer Mountain overlooking Beech cliffs. Jesse Wheeler photo