

# CENTRE FOR ENHANCED FOREST MANAGEMENT

## ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 00/0000 (DRAFT)



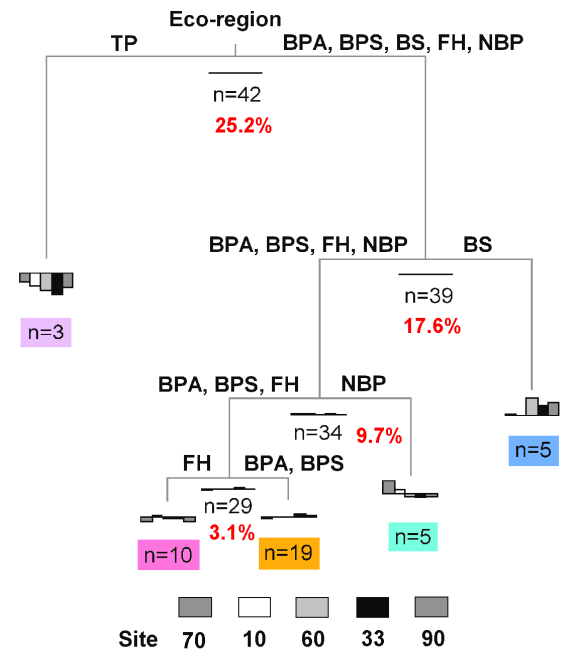
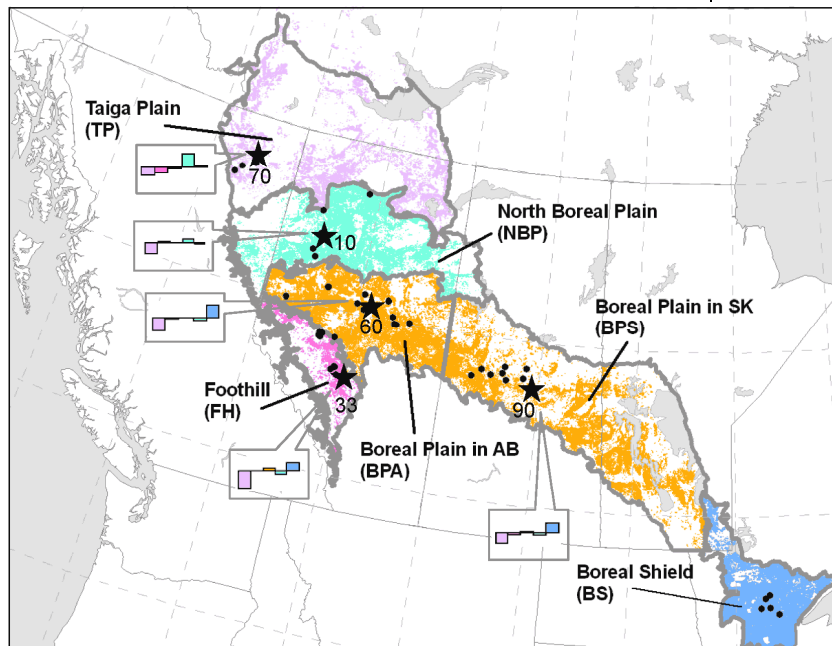
### A novel method to develop seed zones from reciprocal transplant experiments.

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Seed zones are essential tools in reforestation to ensure that seedlings are well adapted to the growing conditions of the planting site. Using only planting stock that originates within a zones ensures that no loss of productivity or forest health occurs due to maladaptation. We developed a new approach to analyze geographic patterns of genetic variation in forest trees, and to develop seed zones that reflect genetic similarity of tree populations.

growth of Minnesota sources at sites 33, 60, and 90 (blue bars in map insets), poor growth of northern sources at all sites, and above average performance of NBP sources at site 70 (turquoise bar in map inset)

2) Partitioning of genetic variance observed across all test sites first separates northern and Minnesota sources, explaining 25.2% and 17.6% of the total variation, respectively. Only small amounts of variation can be explained by partitioning the boreal plains and foothills.

3) The bar charts at the end of the tree branches can be interpreted as an average genetic reaction norm of similar genotypes over multiple test environments.



**Methods:** We apply multivariate regression tree analysis to partitioning genetic variation in data from provenance trial series (growth, adaptive, or neutral marker traits). The partitioning is based on a set predictor variables that serve as criteria in a series of dichotomous splits of the genetic data set. The predictor variables can be categorical (e.g. ecosystem of seed source), continuous (e.g. geographic or climate variables), or a combination of both. The method can be applied to various types of genetic data and multiple traits observed over several environments.

**Results:** In a case study for aspen, we analyze growth performance of seed sources from western Canada (black dots in map), grown at five test locations (stars).

1) Notable effects of seed transfers are above-average

**Implications:** For Alberta, aspen seed zones that reflect genetic similarity (although not optimal growth) should be delineated along a latitudinal cline where 58° and 56° degrees could serve as approximate boundaries.

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