



The Mother Tree PROJECT

SITE SELECTION CRITERIA

The research sites are in mature forests (age 82-123 years) across a 900 km climate gradient in interior British Columbia, Canada, from near the southern distribution of Interior Douglas-fir in BC near Cranbrook (49.21° N, 115.37°W), to its northernmost extent near Fort St James (54.65°N, 124.43°W). Each location along the gradient represents a unique set of climatic conditions where Interior Douglas-fir grows. As a comparison to the interior location, one coastal location was chosen in the Malcolm Knapp Research Forest near Maple Ridge (49.32°N, 122.54°W).

Site selection criteria included: mature stands with at least one-third of the basal area in Douglas-fir; medium moisture regime; and similar topography, species mix, stand structure and tree age distribution across a 20-ha block. We established agreements with the licensees operating in the chosen locations to apply our five experimental logging treatments and maintain the area as long-term (decades) research sites.

The interior study locations are in various biogeoclimatic (BEC) subzones of the Interior Douglas-fir (IDF), Sub-Boreal Spruce (SBS), and Interior Cedar-Hemlock (ICH) zones and occur in the Thompson-Okanagan, Kootenay-Boundary, Cariboo, and Omineca Forest Regions. The coastal site is in the Coastal Western Hemlock (CWH) zone on the south coast of BC. At each location the three replicate sites are within the same BEC zone except at the Alex Fraser Research Forest where one replicate is in the IDF and the other one in the ICH zone. Four sites occur in the IDF zone which dominates low-mid elevation valleys and rolling terrain in southern interior BC and is characterized by warm, dry summers, a fairly long growing season and cool winters (Meidinger and Pojar 1991). The IDF_{xh} (Interior Douglas-fir very dry hot subzone), where one Peterhope replicate occurs, is the driest IDF subzone in the province. The SBS zone, where our highest latitude site (John Prince) occurs, dominates the landscape of BC's central interior. The SBS climate is continental with relatively warm, moist, short summers, moderate annual precipitation and cold, snowy winters. The ICH zone, where the remaining interior sites are located, occurs at mid to low elevations and the climate is continental with warm, dry summers and cool, wet winters. The ICH is the most productive zone in interior BC and has the highest tree diversity of any zone in the province. The

CWH zone occurs at low to mid elevations along the entire BC coast, mostly west of the coastal mountains. It receives the most rainfall of any BEC zone in BC. Summers are cool but hot spells can occur, and winters are mild.

Climatic data for our 23 sites was extrapolated from ClimateNA, by inputting latitude, longitude and elevation, and choosing the 1980-2010 dataset (Wang et al. 2016). Of our interior sites, the two mid-elevation locations in the interior wet belt of the Kootenay-Boundary region receive the most precipitation (868-1059 mm yr⁻¹), with about one-third falling during the growing season. The coastal site receives an average of 2701 mm of precipitation annually. At the other extreme, our two driest locations receive about 390 mm of precipitation annually. Precipitation falling as snow ranges from 140 mm yr⁻¹ at our climatically driest sites to 420 mm yr⁻¹ at the wettest. Mean annual temperature of the interior locations ranges from 2.3°C to 7.7°C, and is 8.0°C for the coastal site. Drought during the growing season is an important climatic growth limiting factor throughout the interior locations, especially in the IDF zone. Frost constrains growth and survival of susceptible seedling species in all of the interior subzones where our sites occur (Braumandl and Curran 1992; Lloyd et al. 1992; Steen and Coupe 1997; DeLong et al. 1993). The average frost-free-period on the interior sites ranges from 84 days at the highest latitude site to 152 days at the lowest elevation, southern site, and is 172 days at the coastal site. Summer heat: moisture index (SHM), (mean warmest month temperature/(mean summer precipitation/1000) is highest for the Thompson-Okanagan and low elevation West Kootenay site (81-88). Sites at higher elevations and further north have a lower SHM (51-68), and the SHM of the coastal site is 25.

The 23 replicate sites have a medium (mesic-submesic) moisture regime, are south or west facing, and are in a mid-slope position. Slope gradient is relatively gentle ($\leq 30\%$) except at one Redfish Creek replicate where slopes are 40-60%. Soil textures vary but in general the texture of the dominant B horizon is coarser in the ICH zone (sandy loam) than the IDF (silt loam, sandy clay loam or loam), and finest in the SBS (clay loam or loam). Soil texture at the coastal location varies from sandy loam, silt loam to loam. Coarse fragment content of the dominant B horizon ranges from about 25 to 50 percent. The predominant soil orders are Luvisols and Brunisols in the IDF zone, Podzols and Luvisols in the SBS, and Podzols in the ICH and CWH.