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Excavator Mounding in the Bulkley and Kispiox Forest Districts

Figure 1. Cross-section of mound showing buried organic layer and mineral cap

The creation of mounded planting spots with excavators was first used operationally in the Prince Rupert Region in the late 1980's. Research and operational trials have shown that mounding can significantly improve the growth of planted spruce in the ICHmc and SBSmc subzones. This note summarizes the results from one experiment and lists some recommendations for the best use of excavator mounding.

In 1987, a site along Highway 37 in the Kispiox District was chosen to test Sitka spruce and western redcedar response to excavator mounding. This site had only partial success in regenerating Sitka spruce because of frost and heavy competition from shrubs and forbs. Two different areas were mounded: one with poorly drained soil (hygric moisture regime) and one with moderately-well to imperfectly drained soil (subhygric moisture regime). The mounds created by the excavator were approximately 100 x 80 cm across, and 20-30 cm high. Capping materials on the mound were 15-20 cm deep.

Forest Sciences, Prince Rupert Forest Region
Bag 5000, Smithers, BC V0J 2N0 847-7500 (FAX 847-7217)

Table 1. Condition of planted Sitka spruce after 5 growing seasons, Hwy 37.

Site	Treatment	good (%)	fair (%)	poor (%)	dead (%)
Subhygric	control	57	33	0	0
Subhygric	mounded	90	7	3	0
Hygric	control	10	50	20	20
Hygric	mounded	40	50	3	7

Table 2. Height and diameter of planted Sitka spruce after 5 growing seasons, Hwy 37.

Site	Treatment	Height (cm)	Diameter (mm)
Subhygric	control	58c*	10.1b
Subhygric	mounded	74b	14.2a
Hygric	control	53c	10.0b
Hygric	mounded	89a	16.8a

**values significantly different within a column are distinguished by a different letter ($p<0.05$)*

The hygric site had mostly organic capping while the subhygric site had predominantly mineral capping.

Both redcedar and Sitka spruce seedlings had better growth on mounded spots in the first couple of years. However, severe frost decimated the cedar seedlings in the third or fourth growing season. The mounding treatment did not offer any protection from frost damage in this case. The Sitka spruce suffered less damage from the frost, and both the condition of the seedlings and their growth was significantly better at year five with the excavator mounding treatment (Table 1 and 2).

Based on the results of this trial, as well as assessments of six other mounded sites, I can make several recommendations.

1) Always inspect the soils for soil texture and moisture regime before deciding to mound. Seedling establishment can be improved on many **but not all** wet sites. Avoid mounding where the uppermost 15 to 20 cm layer of mineral soil is fine-textured with a dense, massive structure. Such soil results in mounds that tend not to settle sufficiently, but instead can maintain a 'pyramid' shape. It is important to have a large enough area on the top surface of the mound capable of intercepting and absorbing rainfall, with edges that slope gradually into the surrounding ground, so that a stable root system can develop. Capping materials that are very dense severely limit root development, resulting in impaired access to moisture and nutrients.

2) Good candidate sites for mounding should have at least 20 to 30 cm or more of well-decomposed organic material and/or friable mineral soils below the "F" horizon in the forest floor. Friable soils suitable for mounding generally include those mineral materials that are coarse loamy to loamy in texture, or fine loamy soils (clay loams, silty clay loams) that have high organic matter contents (dark brown in colour) and/or well-developed structure.

3) Increased rates of growth during seedling establishment have been observed following mounding on wetter and mesic sites in the SBSmc. However, the relatively high cost of mounding is best justified where poor soil drainage and/or very aggressive vegetation make successful regeneration unlikely without treatment.

4) Mounding may provide some degree of protection to seedlings from occasional moderate frost events during the growing season, however it cannot be counted on to save trees from severe frosts on very frost-prone sites.

5) On sites where there are some naturally raised microsites, it makes sense to take advantage of them and plant them directly. This can help to bring stocking up to target levels while reducing costs and minimizing the extent of soil disturbance caused by mounding.

Further information on the operationally mounded sites is contained in the report *Excavator mounding in the Bulkley and Kispiox forest districts: observations five to six years after planting at operationally treated sites*, available from Marty Kranabetter, Forest Sciences, Smithers Regional office.

This note prepared by **Anne Macadam**, Boreal Research and Development.

Contact:
Marty Kranabetter, Soil Scientist
847-7435