

Poplar Root developing and Tree Spacing

Poplars are commonly planted on moist, unstable pastoral hill country to prevent or reduce soil erosion, thereby maintaining hillslope integrity and pasture production. Mechanical reinforcement by poplar root systems aids slope stabilisation. Root mass and distribution were determined for three *Populus deltoides* × *nigra* ‘Veronese’ trees aged 5, 7 and 9.5 yr planted as 3 m poles at 8 m x 8 m spacing on a hillslope near Palmerston North in the southern North Island. Most of the structural roots (≥ 2 mm diameter) were distributed in the top 40 cm of soil. Vertical roots penetrated to about 1.0 m, being the depth of the soil above a fragipan. Total structural root dry masses (excluding root crown) were 0.57 kg, 7.8 kg and 17.90 kg for the trees aged 5, 7 and 9.5 yr respectively. Total structural root length was 79.4 m for the 5 yr tree and 663.5 m for the 9.5 yr tree. Surrounding trees increased root mass density to 3 times and root length density to 4-5 times the contribution of the single tree at 9.5 yr. The study indicated that root development of wide-spaced poplar trees on hillslopes was minimal in the first five years but then increased rapidly. It is concluded that the minimum structural root network required for poplar trees to effectively bind soil does not develop until at least five years

Table 1. Dimensions of excavated ‘Veronese’ poplars together with relationships between trunk dimensions and mass (excluding root crown) and length of structural roots (>2 mm diameter), for trees of three ages growing on hill country near Palmerston North, New Zealand.

Tree age (yr)	Height (m)	DBH (cm)	Trunk cross- sectional area (cm ²)	Root length (m)	Root mass (kg DM)	Root mass: trunk area	Root length: trunk area
5	7.3	8.4	55.4	79.4	0.57	0.010	1.43
7	9.0	14.0	153.9	349.3	7.80	0.051	2.26
9.5	13.3	21.3	356.1	663.5	17.90	0.050	1.87

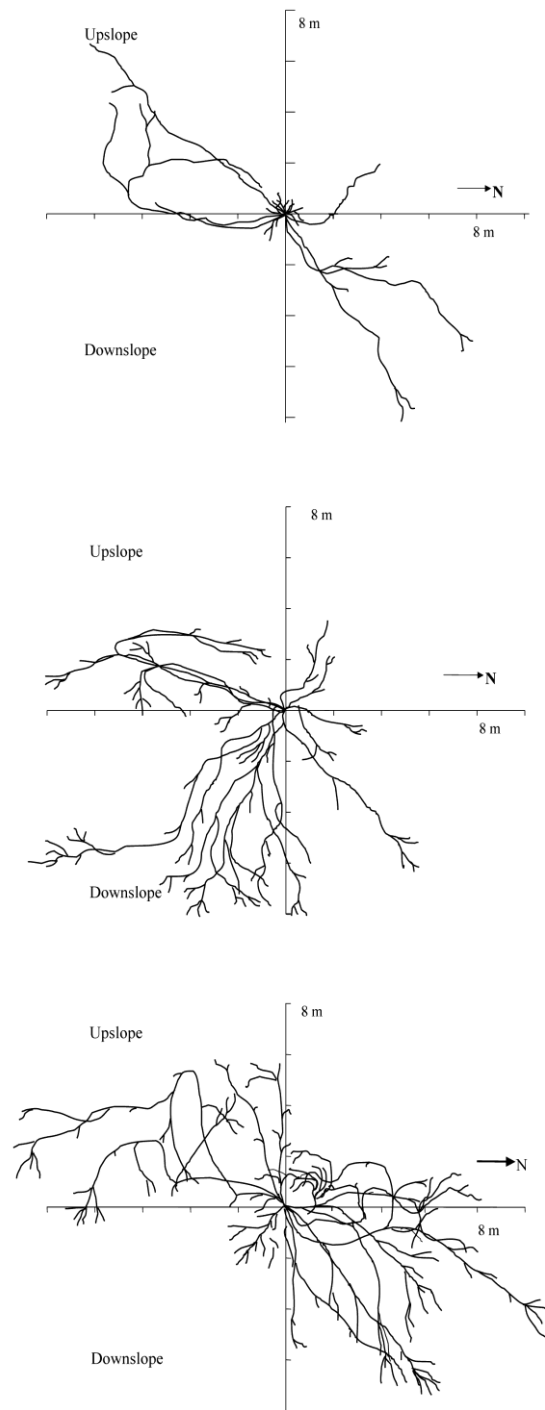
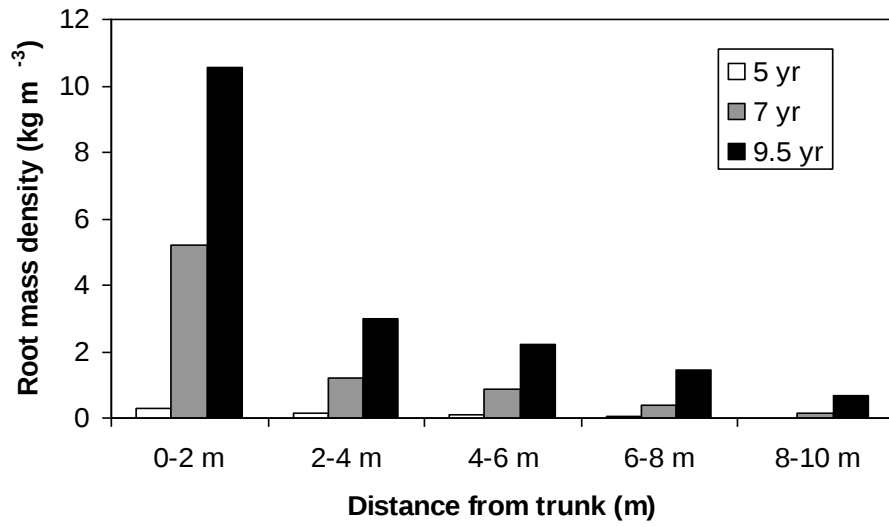
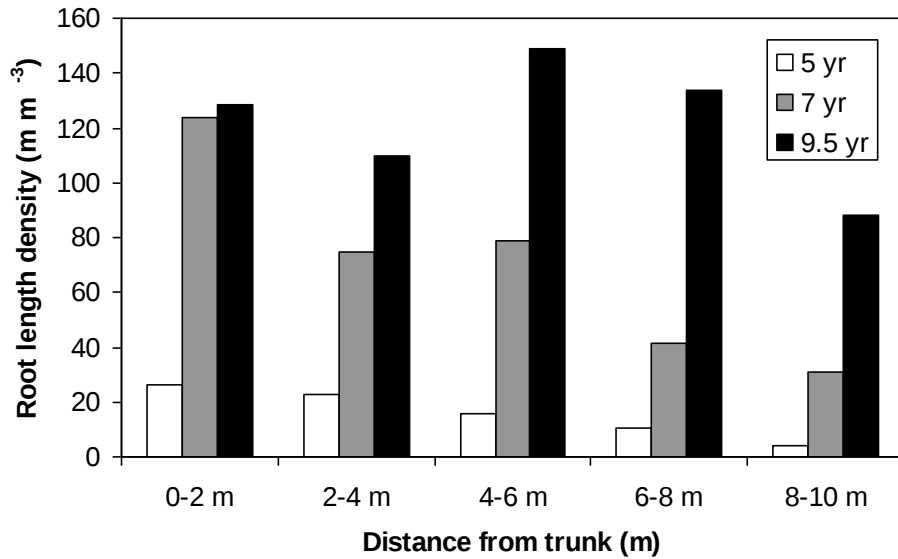


Figure 1. Radial distribution of structural roots (>2 mm diameter) of 'Veronese' poplar trees aged 5 yr (top), 7 yr (middle) and 9.5 yr (bottom) growing on hill country near Palmerston North, New Zealand.

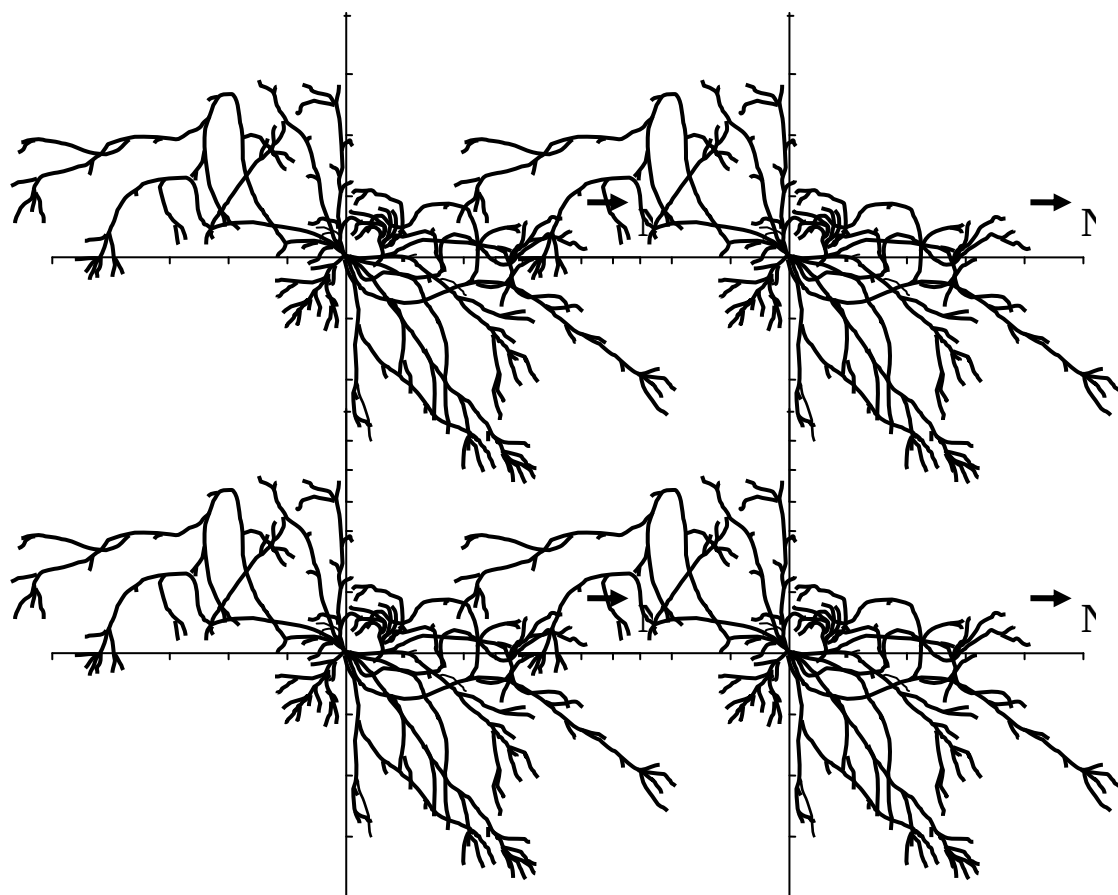
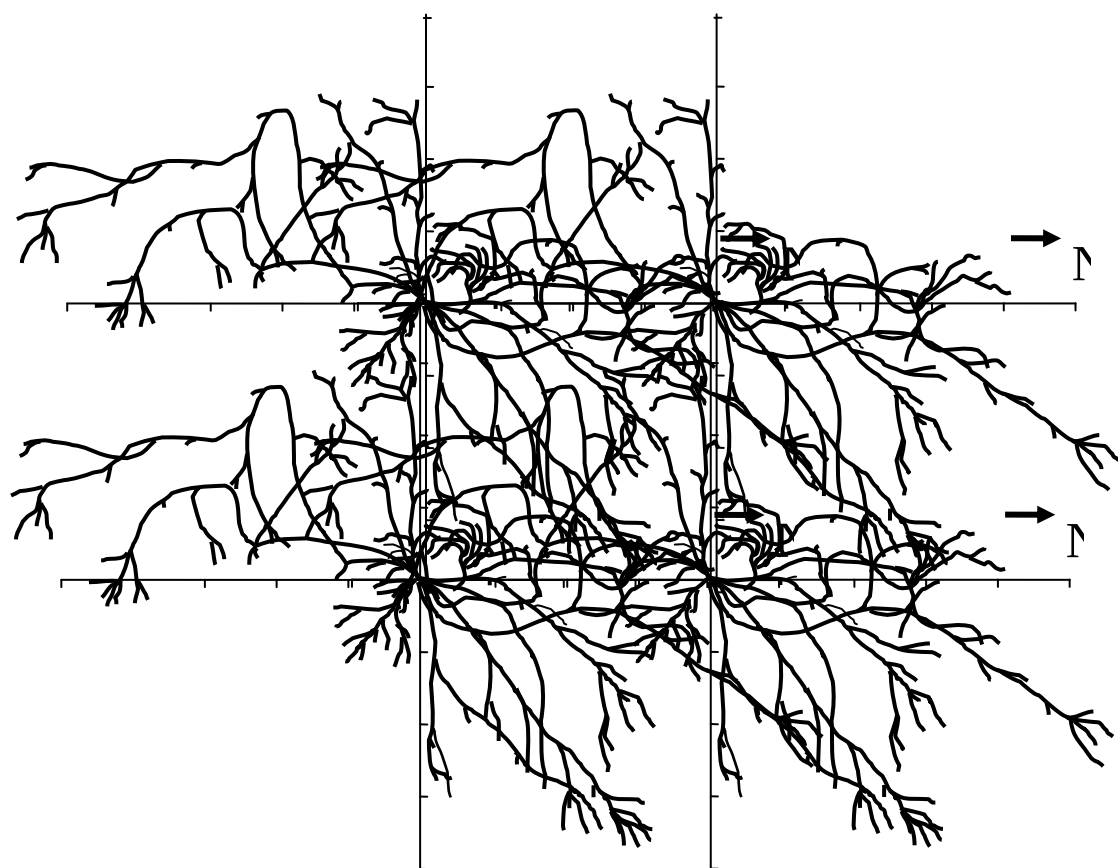


(a)



(b)

Figure 2. Total root mass density (a) and total root length density (b) at different distances from the trunk of ‘Veronese’ poplar trees aged 5 yr, 7 yr and 9.5 yr growing at 8 m x 8 m spacing on hill country near Palmerston North, New Zealand.



The upper illustration shows the horizontal distribution of roots across the slope for 9.5 yr trees spaced at 8 m x 8 m. This compares with the bottom illustration where the spacing is at 15 m x 15 m. Both illustrations are based on the data gathered from the tree aged 9.5 yrs in the study.

While tree growth and root development are climate and soil dependent the findings presented here are likely to be representative of Veronese poplar performance in North Island hill country. An indication of root development can be obtained from trunk dbh since there is a direct relationship between the two measures. The data given in this article could be used as a rough guide. Significant protection can not be expected until after five years or more of growth. Initial tree spacing for early protection of slopes needs to be a lot closer than final spacing and landowners should consider denser planting and later thinning of initial plantings as part of their tree management and soil stabilisation programme.

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