

RESEARCH BRIEF 07

Poplar trees and soil properties



Summary

This study investigated the effects of poplar tree spacing on soil properties (infiltration rate, bulk density, soil moisture content and soil organic matter content) in two Nelder tree plots, with different soil types. Nelder plantings (see the planting pattern in Figure 1) are a forestry tool used to assess how tree wood production at different spacings (different planting densities) changes with time. Soil cores were collected in the field to a depth of 5 cm and the soil properties were investigated and analysed in the laboratory.



- Infiltration rates were faster with closer tree spacing. Infiltration rates were lowest in open pasture.
- Soil bulk density was lower at closer tree spacings. At the widest tree spacings soil bulk density was comparable with that in open pasture.
- Soil moisture content did not vary significantly between treed areas and open pasture in sandy loam.
- In silt loam there was a decline in soil moisture content as tree spacing increased and to open pasture, although the decline was not significant.
- Soil organic matter generally decreased as tree spacing increased, although not significantly so.

Poplars were shown to improve soil properties. The improvements were most noticeable for trees that were close together.

It is expected that improvements to soil properties contributed by wide-spaced poplars will be greatest close to the trees.

Field sites for the research

The field studies were done at two sites (Table 1), both with 19-year-old 'Tasman' poplars planted in a fan nelder arrangement (Figure 1). Spacings between trees increase as the fan spreads out. Grazing stock were able to move in and out of both nelders. Ongaonga is a flat site and Woodville is a gently sloping site.

Trial area	Road	Poplar clone	Latitude	Longitude	Elevation (m)	Soil type
Ongaonga	Lookout Road	'Tasman'	39°50'15.60"S	176°18'29.34"E	353	Sandy loam
Woodville	Saddle Road	'Tasman'	40°18'56.60"S	175°50'23.94"E	126	Silt loam

Table 1. Locations of the nelder trials

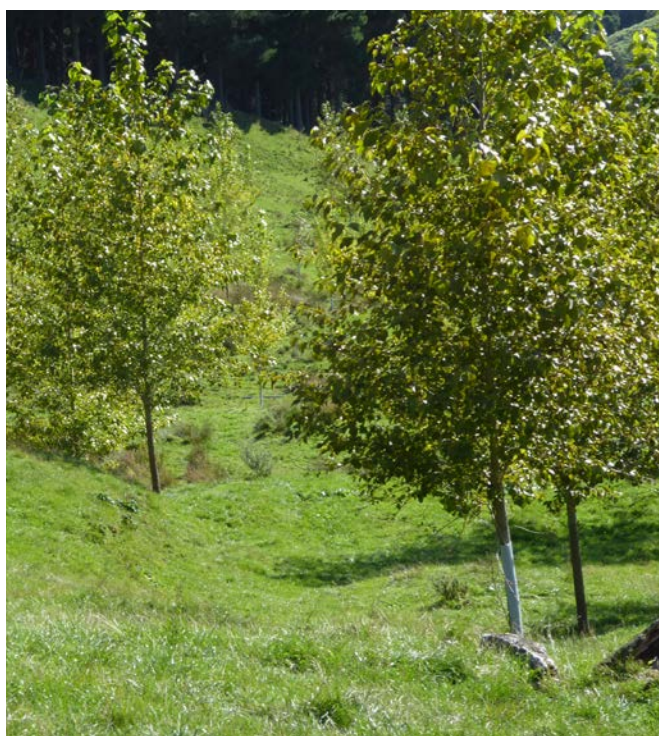


Figure 1. Nelder poplar trials at Ongaonga (left) and Woodville (right).

The soil samples were collected from within in the nelder plots at close (trees were 3.5 and 3.8 m apart), mid, and wide tree spacings (Table 2), from open pasture, and to a depth of 5 cm.

Spacing	Ongaonga		Woodville	
	Distance (m)	Stocking (s/ha)	Distance (m)	Stocking (s/ha)
Close	3.5	819	3.8	694
Mid	5.7	304	7.0	201
Wide	11.5	76	13.0	59

Table 2. Poplar tree spacing and stocking in the close, mid and wide spaced trees in the nelder trials.



Soil properties

Infiltration rates were faster with closer tree spacing. Infiltration rates were lowest in open pasture. Soil bulk density, moisture content and organic matter (Table 3) were influenced by tree spacing and also by soil type. Trends were more apparent in the silt loam soil.

Spacing	Ongaonga	Woodville
Soil bulk density (g/cm³)		
Close	0.71 a	1.02 a
Mid	0.72 ab	1.13 b
Wide	0.77 b	1.29 c
Pasture	0.78 b	1.21 d
Soil moisture content (%)		
Close	58.7 a	28.7 a
Mid	62.0 a	24.4 a
Wide	56.3 a	23.1 a
Pasture	59.8 a	21.5 a
Soil organic matter (%)		
Close	10.7 ab	4.5 a
Mid	10.7 ab	3.9 a
Wide	11.1 b	3.0 b
Pasture	9.7 a	3.6 ab
Tree DBH (cm)		
Close	30.3 a	28.2 a
Mid	39.5 b	39.9 b
Wide	52.4 c	40.3 b
Tree height (m)		
Close	24.9 a	17.4 a
Mid	24.7 a	19.7 a
Wide	21.1 b	14.8 b

DBH = diameter at breast height (1.4 m)

For more information

This is one in a series of research briefs about Poplars and Willows that can be found at poplarandwillow.org.nz
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