Lifter Study

Where are my roots?

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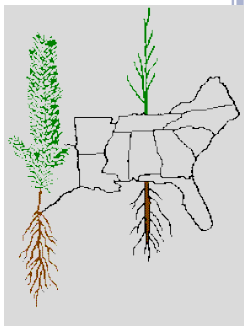

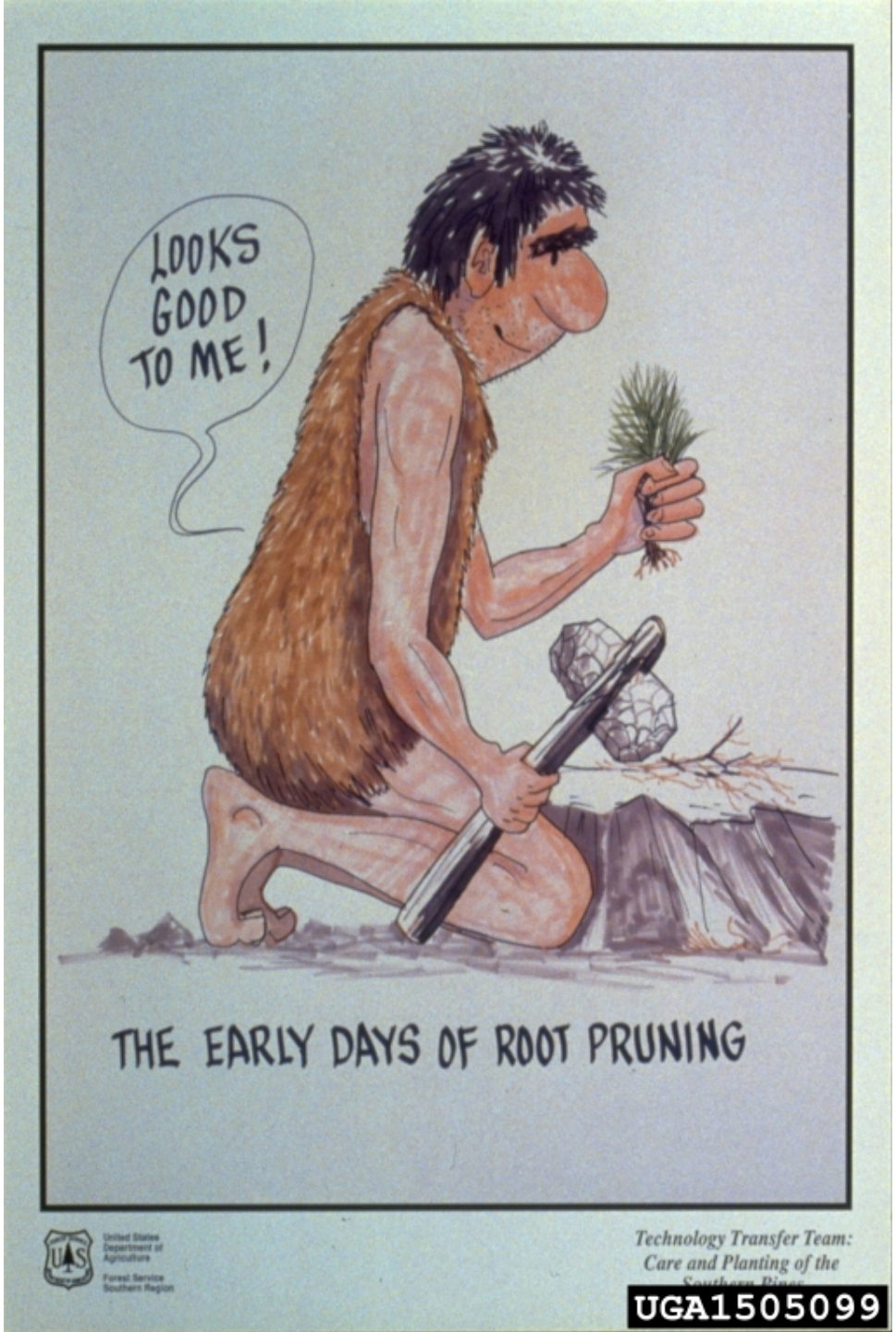
LOOKS GOOD TO ME!
THE EARLY DAYS OF ROOT PRUNING
United States Department of Agriculture
Forest Service Southern Region
Technology Transfer Team:
Care and Planting of the

OPERATE SEEDLING LIFTERS CAREFULLY!

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RUNNING TOO FAST TEARS THE ROOTS.

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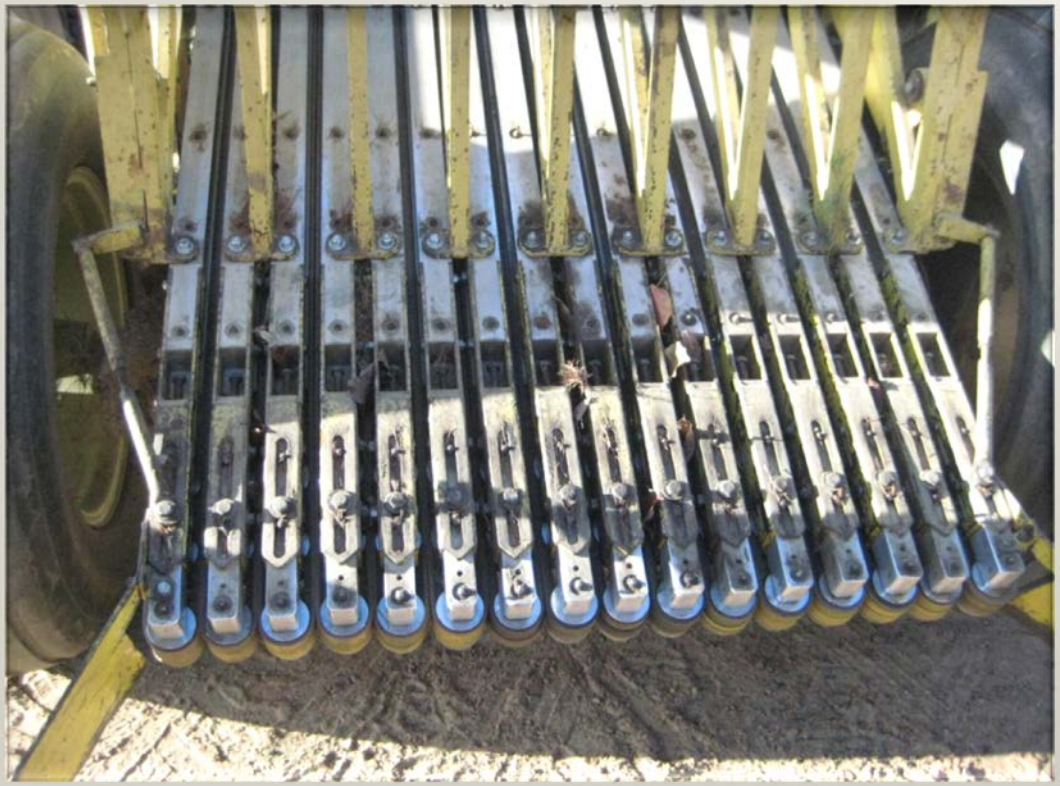


Root facts

- Larger root systems often exhibit greater root growth potential.
- For bareroot culture – root injury is inherent and impossible to totally eliminate.
- Jim Rowan (1987) operational lifting can remove 35 -77% of small roots.
- This can lead to 5 to 50% mortality at outplanting.
- **Root stripping** can occur at outplanting by planters physically removing “excess” roots, **or** during lifting by leaving roots in the soil.

Study Objectives and observation collected

- To compare a 2-row or full bed lifter - each at 2 operating speeds.
- At each nursery, 80' of bed row was flagged for each lifter (normal and fast). This was repeated 4 times.
- Hand lifted seedlings were lifted from drill 3 using a shovel in each 80' plot at each nursery.
- Seedling parameters measured – RCD, height, seedling biomass, root weight ratio, root morphology criteria and root growth potential.

Environmental conditions, species and seedling densities for the 3 nurseries

Nursery	Species	Seedling Density	Date Lifted	Soil Moisture	% Sand	% Silt	% Clay
A	Slash	21/sqft	12/15/10	7.1%	84	9	7
B	Loblolly	23/sqft	2/9/11	10.1%	83	9	8
C	Loblolly	21/sqft	2/23/11	6.4%	74	15	11

The average seedling RCD between nurseries ranged from 4.3 mm to 4.5mm

The average seedling height between nurseries ranged from 11.3” to 11.7”

Seedling lifter speed and use of seedling lifter bar

Nursery	Lifter	Lifter Blade Used?	Normal Speed	Fast Speed
A	Mathis 2-row	-	1.50 mph	2.00 mph
	Love Full Bed	No	0.25 mph	0.50 mph
B	Love Full Bed	No	0.33 mph	0.39 mph
C	Love Full Bed	Yes	0.50 mph	0.70 mph

A root weight ratio of 27% (0.27) approximates a shoot:root ratio of 2.5:1

Root Weight Ratio

Table 3: Statistical contrasts for root biomass and root weight ratio

		Root biomass (g)	Root Wt. Ratio	# White Root Tips
		Contrast	Contrast	Contrast
Nursery	**Contrast**	**Means**	**Means**	**Means**
A	2-row lifter vs handlifted	0.75 vs 0.91	0.15 vs 0.16	52.4 vs 78.1
	2-row normal vs 2-row fast	0.75 vs 0.76	0.14 vs 0.15	51.0 vs 53.8
	Full bed vs handlifted	0.86 vs 0.91	0.15 vs 0.16	67.8 vs 78.1
	Full-bed normal vs Full-bed fast	0.87 vs 0.86	0.15 vs 0.15	47.5 vs 88.0

Significant at the 5% or 1% level of probabili

Table 3: Statistical contrasts for root biomass and root weight ratio

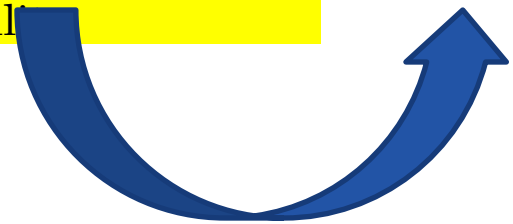
		Root biomass (g)	Root Wt. Ratio	# White Root Tips
Nursery		**Contrast**	**Contrast**	**Contrast**
B	Full bed vs handlifted	1.08 vs 1.11	0.23 vs 0.24	67.5 vs 63.5
	Full-bed normal vs Full-bed fast	0.96 vs 1.22	0.23 vs 0.23	61.1 vs 74.0

Significant at the 5% or 1% level of probability

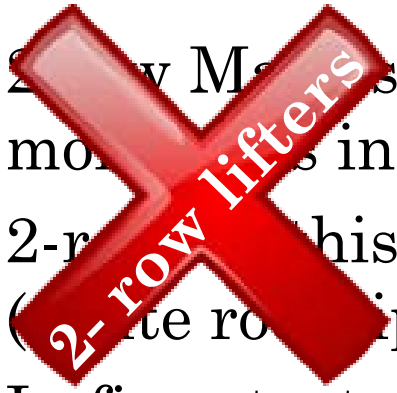
Table 3: Statistical contrasts for root biomass and root weight ratio

		Root biomass (g)	Root Wt. Ratio	# White Root Tips
		Contrast	Contrast	Contrast
Nursery	**Contrast**	**Means**	**Means**	**Means**
C	Full bed vs handlifted	1.34 vs 1.03	0.25 vs 0.23	35.8 vs 34.2
	Full-bed normal vs Full-bed fast	1.39 vs 1.29	0.25 vs 0.24	45.2 vs 26.5

Significant at the 5% or 1% level of probabil



Results and observations



- 2-row Mas lifter (either speed) left significantly more roots in the soil than hand lifting.
- 2-row this lifter gave significantly less RGP (white roots) than hand lifting.
- In finer texture soils the use of a lifter blade helps recover more roots.
- The use of the lifter blade may also be beneficial of other soils/fields when lifting conditions are not optimum.

Results and observations

- Caution should be used when increasing tractor speed without adjusting belt and or beater bar speed.
  - More forgiving on coarse textured soils than on fine textured soils.
  - Nursery modifications of the lifter may allow speed changes without sacrificing seedling quality
- Separation of the seedlings coming up the belt is very important. At Nursery "C", on fine textured soils, the faster speed did not allow for this separation, forcing us to "tear" the seedlings apart, possibly injuring the roots which may explain the reduced RGP.

And finally …..

- Thought to ponder… When planters pull seedlings out of their bag and try to separate the seedlings are they causing damage to the roots (a form of stripping?).
  - The impact of this will not be seen in years where planting conditions are favorable.
  - In years where planting conditions are not favorable or with late plating, the impact may be seen.