

SFF grant 407602 - Milestone M-3461: Woodville harvest (Summer 2016/17)

Clemens Altaner

Background

In February 2015 (as part of the SFF grant 407602), 81 families of *E. bosistoana* and a total of 4032 seedlings were planted at Murrays Nursery, Woodville (see milestone M-3377). The trial was planted in blocks of 8 (2x4) consisting of single families repeated 2 – 8 times depending on plant availability.

The plants were ~1-4 m tall and have been pruned to obtain a clear stem section 500 mm long at the base (see milestone M-3377). Figure 1 gives an indication of the current tree size. The 500 mm clear-wood section was used for assessing wood properties (milestones M-3461 and M-3462) and the stump left to coppice. Proseed will propagate selected individuals with superior wood properties from the coppice (upcoming milestone M-3489). Due to mortality (~7%) and other growth defects (~15%) some individuals were not available for testing. Survival was exceeding the envisaged 50%, so a further selection was made.

The February 2015 plantings also included 13 families of *E. argophloia*. *E. argophloia*'s growth was slower than that of *E. bosistoana* and not all families were of the required size for testing. Therefore it was decided to postpone the harvest of these *E. argophloia* trees and include them with the November 2015 plantings.



Figure 1: February 2015 Eucalypts bosistoana plantings (right) on the 30th of May 2016. Trial harvested in November/December 2016

Pre-harvest

Each tree was been labelled with pre-printed tags using a staple gun at the stump (to facilitate tree identification when taking coppice for propagation) and at the clear stem section (to be able to track the sample back to the tree). All 4032 trees have been assessed for height and form in October 2016. It was also recorded if the trees had been staked when young. No significant ($P = 0.05$) difference in growth-strain between the staked and unstaked trees of good form was found. No obvious systematic variation in tree height or form through was observed throughout the site (Figure 2). More trees were staked on the southern end of the site.

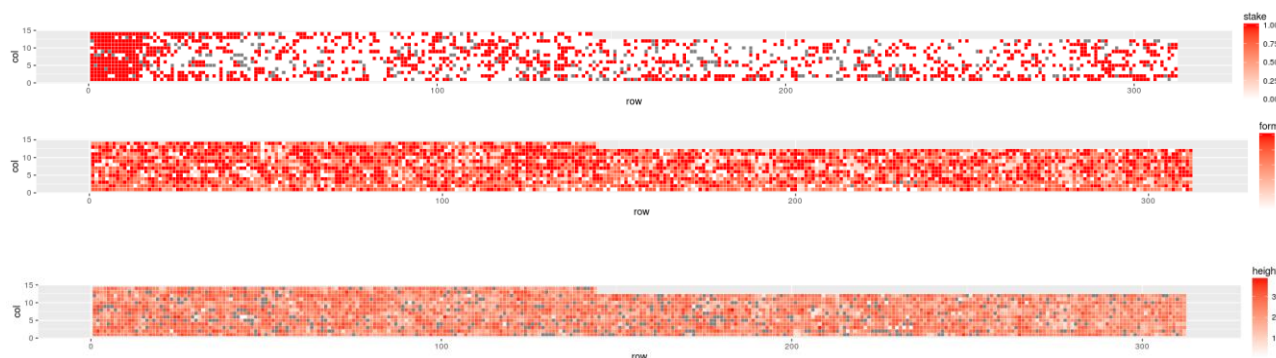


Figure 2: Heat maps of the February 2015 *E. bosistoana* plantings for staking (top – red: staked, white not staked, grey no data), form (middle – 1 (bad) to 6 (good)) and height (bottom – height in dm; grey: no data)

A Health and Safety plan for the harvest as well as the sample processing was developed (attached). The harvesting and processing team (~15 persons) was inducted and trained using ~150 spare samples coming from the surround plantings. This opportunity was used to streamline the processes.

Harvest

The February 2015 planting was harvested in 2 batches to ensure that the samples were as fresh as possible for the assessment of growth-strain. Trees were harvested on the 7-9th of November and the 5-7th of December 2016. A forestry contractor was in charge of cutting trees. University of Canterbury staff (3-4 persons) supported the operation with selecting trees to be discarded, moving tops, labelling and packing samples. Harvest proceeded along blocks according to the following steps:

- 1) Top trees by forestry contractor (safe distance to be kept). Figure 3
- 2) Move tops to the side (care to be taken not to damage coppice). Figure 4
- 3) Mark height for additional topping or if tree is to be discarded.
- 4) Check labels and colour coding individuals in a block to ensure that samples can be traced back to the tree if all but one of the labels for a block are lost. Figure 5
- 5) Cut stems at the base by forestry contractor (safe distance to be kept). Samples left next to their stump. Figure 6
- 6) Check labels and collect samples from each block of 8. Bundle with zip-ties. Figure 7
- 7) Pack samples into the bins vertically. Figure 8

The area around the stumps was hoed for weed control. This should ensure good growth of the coppice (Figure 9).



Figure 3: Topping trees (step 1)



Figure 4: Removing tops (step 2)



Figure 5: Colour coding samples (step 4).



Figure 6: Cutting samples (step 5)



Figure 7: Bundling samples by blocks (step 6)



Figure 8: Samples packed in a transport bin (step 7)



Figure 9: Weed control around stumps to ensure good coppicing. Note: November 2015 (trees in front of the poplars) and February 2016 plantings (trees with stakes) in the back.

Assessment of green samples

Due to logistical constraints it was decided to carry out all assessments at the School of Forestry (University of Canterbury, Christchurch). Samples were shipped in insulated bins (INDAC) containing ~15 cm of water and some ice on top. Samples arrived in good condition within 4-7 days (Figure 10) and were kept refrigerated in water to avoid drying until processed.



Figure 10: Condition of samples when arriving at the School of Forestry for assessments

All samples were processed with 1 week from arrival, i.e. 2 weeks after harvest. Previous work had shown no effect of cold storage of more than 4 weeks on growth-strain assessments. Stems were processed in blocks (random order). The following procedure was followed:

- 1) A bundle was taken from the bins and the labels were checked. Stapled labels were removed and reattached with rubber bands. Figure 11
- 2) The clear section of the stems were debarked from the large end diameter using knives, chisels, and scrapers. Figure 12
- 3) The samples were docked to create a flat end and a defect free stem section. Figure 13
- 4) The length of the split was marked on the sample and recorded. Figure 14
- 5) The diameter was measured with callipers and recorded. Figure 14
- 6) The sample was split with a band saw to the previously marked position. Figure 15
- 7) The opening between the 2 half prongs was measured with a calliper and recorded. Figure 16
- 8) Two ~150 mm long samples were cut from the large end and relabelled (augmented with A or B) using an indelible pencil. Figure 17
- 9) The mass of each sample was recorded. Figure 18
- 10) The volume of each sample was measured by immersion weighing and recorded. Figure 18
- 11) The samples were dried at 103 °C (~48 h). The severe drying conditions were chosen to amplify drying defects like collapse.



Figure 11: Checking and re-attaching labels (step 1)



Figure 12: De-barking samples (step 2)



Figure 13: Docking debarked sample (step 3)



Figure 14: Measuring diameter and marking split length (steps 4 and 5)



Figure 15: Splitting a sample (step 6)



Figure 16: Measuring the opening (i.e. growth-strain) for 2 trees (step 7)



Figure 17: Docking samples for density, volumetric shrinkage and stiffness measurements (step 8)



Figure 18: Measuring green mass and volume (steps 9 and 10)

Sneak preview

A total of 2683 trees have been harvested and assessed for diameter, growth-strain and green mass/volume (in duplicate). Figure 16 indicates some of the variability in the growth-strain in the *E. bosistoana* samples. A good range in growth-strain was found between the families (Figure 19). The median value for the best families was less than half of that of the worst families. A considerable within family variation was also present, which further helps selection of low growth-strain individuals. Figure 20 shows the height of the 81 *E. bosistoana* families ranked for growth-strain. Similar results are expected for the other assessed traits.

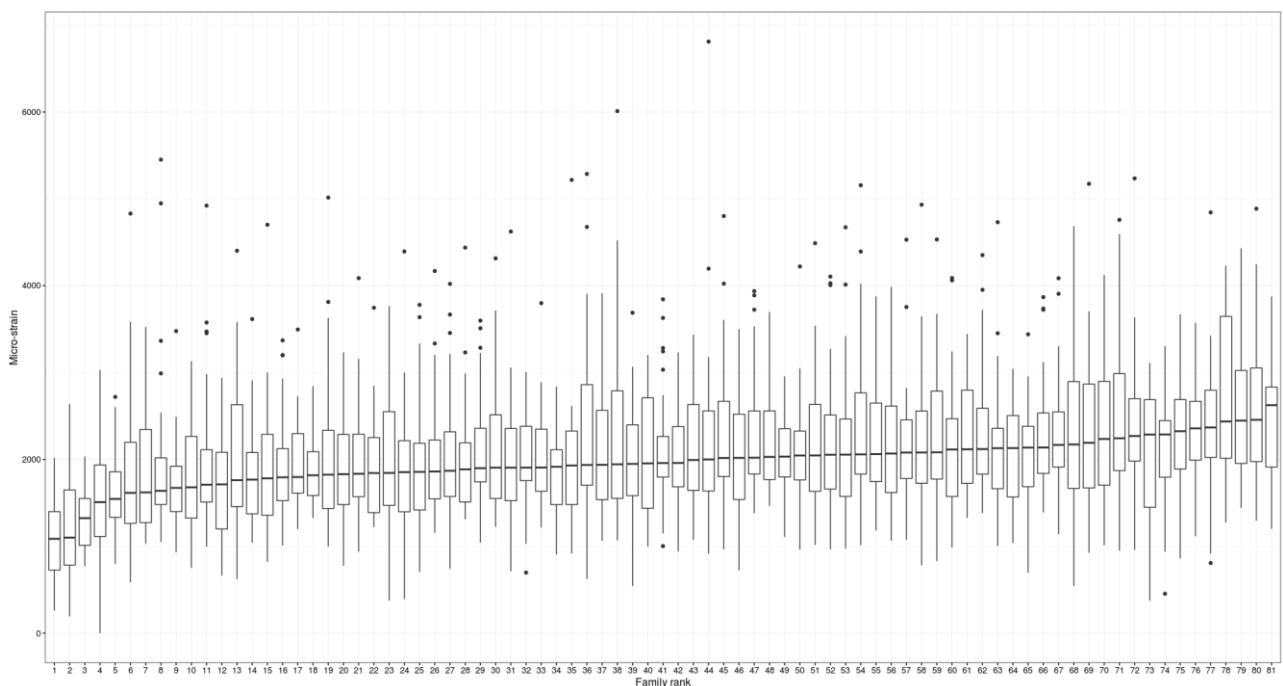


Figure 19: 81 *E. bosistoana* families ranked for growth-strain at age 22 months.

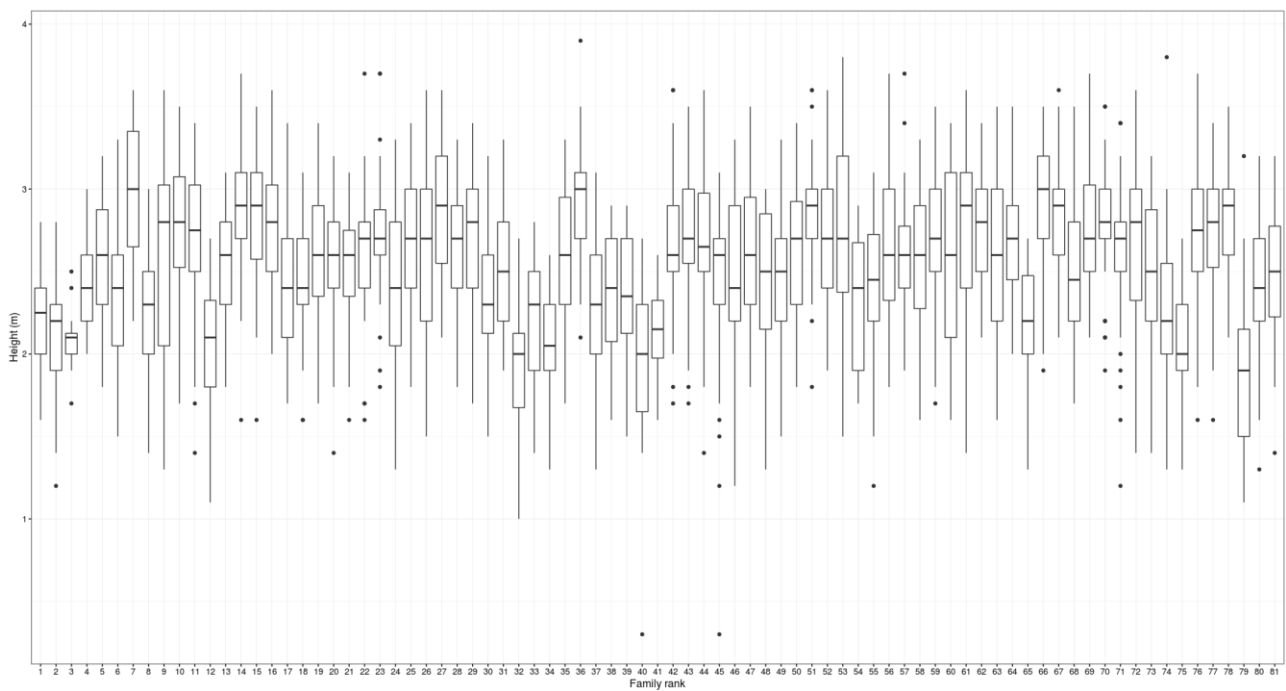


Figure 20: Tree height for 81 *E. bosistoana* families ranked for growth-strain at age 22 months.

Future work

The dry measurements of the retrieved samples are carried out in early January. Then the data will be analysed (milestone M-3462) and superior trees selected for propagation (milestone M-3489).

The 2nd and 3rd plantings of *E. bosistoana* (89 families) and *E. argophloia* (31 families) will be harvested and assessed later this year once they have reached the required size following the procedure described here.

Appendix - Health and Safety plan

Background:

The School of Forestry (SoF) has signed a contract with MPI (SFF 407602), which includes the testing of 2 year old eucalypt trees for growth-strain (and other wood properties). This includes up to 10,000 trees in 2 years. The growth-strain assessment procedure has been developed at SoF (Chauhan, S. and K. Entwistle (2010). "Measurement of surface growth stress in Eucalyptus nitens Maiden by splitting a log along its axis." *Holzforschung* 64: 267-272). To be able to measure the necessary number of samples in a timely manner, the team needs to be able to work in the WoodTechLab from Mon-Fri between 9-5. This is only possible if work can be conducted without the presence workshop staff (who, however, will be there most of the time).

The experimental procedure is as follows:

1. Stems arrive in bins as groups of ~8
2. Debarking crew remove zip-ties and labels
3. Debark using knives, chisels, and scrapers
4. Mark the point to which the split is to be made, and record the split length
5. Measure diameter with callipers and record with the label code
6. Move sample to buffer for splitter with label (a table in a convenient place for the splitter to access the next sample).
7. The sample is split with the band saw and passed off to the opening measurer
8. Opening is measured with callipers and recorded
9. The sample is moved to the buffer table for the docker (with the label)
10. The docker using the cut-off saw, docks the sample ~150 mm from the big end and moves the resulting two samples (and original label) to the labellers buffer table. In the cases of a wound wood sample the stem remainder is kept with label otherwise the stem remainder is discarded.
11. The labeller, labels the two samples with the original label code, augmented with A or B to distinguish the two sides with indelible wood pencil
12. The samples are moved to the mass and volume measurement buffer table
13. Mass is measured with scales and volume with scales + lab-stand, results are recorded
14. Samples are placed in ovens or the kiln for drying at 60 degree C

Three (3) procedures involving a health and safety risk have been identified. These are:

1. **Debarking stems (using knives and chisels)**
2. **Splitting stems with a band saw**
3. **Docking stems with a drop saw**

Responsibilities (team):

- Working only after appropriate inductions/training
- Nobody to work alone, 2nd person in shouting distance
- Working hours 9-5 Mon-Fri. No saws to be used /debarking with chisels etc outside this time
- Keep work area tidy

- Report accidents, near misses or identified hazards (to Nigel Pink, Clemens Altaner (ext 6807 mobile 02102969873), David Norton (ext 6116 or 027-201-7794))
- Process samples

Responsibilities (Nigel) ext 6108 – mobile 0274512452 :

- Prepare/clear lab prior to arrival of samples
- Training of team
- Regular maintenance of machinery (saws)

Required inductions

1. Induction to the WoodTechLab – all team also if inducted previously as this training will allow for work without the presence of WoodTechLab staff
2. Induction to work with hand tool to aid debarking
3. Induction to the band saw for sample splitting
4. Induction to the drop saw for sample docking
5. Induction to the overall experiment objective/layout to ensure correct data

Attachments

Safe operating procedures (SOPs)

1. Hand tool
2. Band saw
3. Drop saw

Risk assessments

1. Chisels
2. Band saw
3. Drop saw

Workshop training forms









1. Splitting 'logs' (with a band saw)
2. Docking samples from a 'log'

WoodTechLab induction form (for this project)

Standard Operating Procedure: Hand Tools

Issue Date:	27 th November 2016	Last Reviewed:	27 th November 2016
Approved By:	Nigel Pink	Next Review Date:	4 th December 2016

DON'T use this machine/equipment unless you are authorized in its safe operation

	Hazards:  Laceration  Flying Debris
	PPE Required:  Safety Glasses  Foot Protection  Protective Clothing  Ear Protection  Dust Mask (for certain toxic timbers)
	DO: <ul style="list-style-type: none"> ✓ Tie-back long or loose hair, and contain loose clothing ✓ Move cutting edges away from hands ✓ Use in well-lit area ✓ Keep operating area clean of debris to see cutting edge clearly ✓ Wear leather gloves that fit well
	DON'T: <ul style="list-style-type: none"> ✗ Cut towards body ✗ Be distracted when using tools ✗ Use blunt tools ✗ Use fingers as guiding edge with sharp tools

Standard Operating Procedure Checklist:

Hand Tools

Hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some examples of misuse include the following:

- Using a screwdriver as a chisel may cause the tip of the screwdriver to break and fly, hitting the user or other employees;
- Using a tool with a wooden handle (e.g., hammer) if the handle is loose, splintered, or cracked, the head of the tool may fly off and strike the user or another worker;
- Using a wrench if its jaws are sprung, because it might slip; and
- Using impact tools (e.g., chisels, wedges) if they have mushroomed heads, the heads might shatter on impact, sending sharp fragments flying.

Hand tool precautions including the following:

- Employers shall caution employees that saw blades, knives or other tools be directed away from aisle areas and other employees working in close proximity. Knives and scissors shall be sharp. Dull tools can be more hazardous than sharp ones;
- Floors shall be kept as clean and dry as possible to prevent slips with or around dangerous hand tools; and
- Around flammable substances, sparks produced by iron and steel hand tools can be a dangerous ignition source. Where this hazard exists, spark-resistant tools made from brass, plastic, aluminium or wood shall be used.

Authorized Persons: (The following persons are authorised to operate, supervise and test students on the equipment/process)

Name:	Title:	Contact Details:

Standard Operating Procedure: **BANDSAW**

Issue Date: 31/10/16

Last Reviewed: 31/10/16

Approved By: Nigel Pink

Next Review Date: 4/12/16

DON'T use this machine/equipment unless you are authorized in its safe operation



HAZARDS:



Rotating Parts



Laceration

PPE Required:



Safety Glasses



Foot Protection



Protective Clothing

DO:

- ✓ Tie-back long or loose hair, and contain loose clothing
- ✓ Turn on any suction hooked to the machine for dust extraction
- ✓ Switch off and bring the machine to a complete standstill before making adjustments or measurements or before cleaning swarf accumulations with the swarf brush
- ✓ Keep fingers off the line of the cut at all times
- ✓ Wear ear protection when needed

DON'T:

- ✗ Cut metal or anything with embedded nails or screws on this machine
- ✗ Wear rings, watches or jewellery, or anything on fingers or wrists
- ✗ Wear gloves when using this machine
- ✗ Attempt to cut very small items
- ✗ Cross cut cylindrical or irregular stock
- ✗ Adjust guides unless authorized

Standard Operating Procedure Checklist:

PRE-Operation:

1. Ensure no slip/trip hazards are present in workspaces and walkways.
2. Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).
3. Check that all guards are in position.
4. Ensure push stick is available.
5. Lower the blade guide and guard to full effect.
6. Faulty equipment must not be used. Immediately report suspect machinery.

Operation:

1. Never leave the machine running unattended.
2. The work piece should be fed forward evenly and held firmly on the table to ensure effective control during cutting whilst keeping hands in a safe position
3. Use a push stick when feeding material past the blade.
4. Do not force a wide blade on a cut of small radius. Use relief cuts when cutting sharp curves.
5. Stop the machine before attempting to back the work away from the blade.
6. Stop the saw immediately if the blade develops a 'click'. Report it!

POST-Operation:

1. Switch off the saw and reset all guards to a fully closed position.
2. Leave the machine and work area in a safe, clean and tidy state.

Authorized Persons: *(The following persons are authorised to operate, supervise and test students on the equipment/process)*

Name:	Title:	Contact Details:

Standard Operating Procedure: **Crosscut bandsaw**

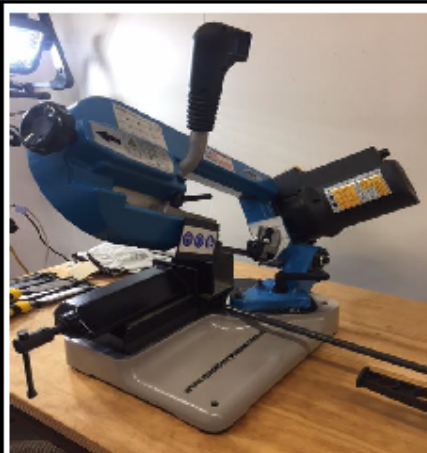
Issue Date: 01/11/2016

Last Reviewed: 31/10/16

Approved By: Nigel Pink

Next Review Date: 4/12/16

DON'T use this machine/equipment unless you are authorized in its safe operation



HAZARDS:



Rotating Parts



Laceration

PPE Required:



Safety Glasses



Foot Protection



Protective Clothing

DO:

- ✓ Tie-back long or loose hair, and contain loose clothing
- ✓ Turn on any suction hooked to the machine for dust extraction
- ✓ Switch off and bring the machine to a complete standstill before making adjustments or measurements or before cleaning
- ✓ Clamp the job securely with the vice. Let the blade cut and apply a small amount of force so that cutting is continuous but not laboured and not slowing the band down
- ✓ Keep fingers off the line of the cut at all times
- ✓ Wear ear protection when needed

DON'T:

- ✗ Wear rings, watches or jewellery, or anything on fingers or wrists
- ✗ Wear gloves when using this machine
- ✗ Attempt to cut very small items
- ✗ Cut anything with embedded nails or screws
- ✗ Apply excessive force or cut without clamping the job
- ✗ Adjust guides unless authorized

Standard Operating Procedure Checklist:

PRE-Operation:

1. Ensure no slip/trip hazards are present in workspaces and walkways.
2. Locate and ensure you are familiar with the operation of the ON/OFF starter and E-Stop (if fitted).
3. Check that all guards are in position.
4. Clamp the job in the vice.
5. Faulty equipment must not be used. Immediately report suspect machinery.

Operation:

1. Never leave the machine running unattended.
2. Use a steady easy amount of force to feed the cut.
5. Stop the machine before attempting to back the work away from the blade
6. Stop the saw immediately if the blade develops a 'click'. Report it!

POST-Operation:

1. Switch off the saw and reset all guards to a fully closed position.
2. Leave the machine and work area in a safe, clean and tidy state.

Authorized Persons: *(The following persons are authorised to operate, supervise and test students on the equipment/process)*

Name:	Title:	Contact Details:

Hazard Assessment & Control Form Hand Tools

Human Resources

Section A – Hazard Details						
Event number (if applicable)		Date	1 st November 2016			
BEIMS number (if applicable)		Raised by	Nigel Pink			
Physical Conditions Check (if applicable)	Check condition of hand tools weekly	Date				
Department where hazard is located	Forestry	Specific location	Wood Technology Laboratory			
Describe the hazard	Debarking small tree samples with sharp hand tools					
How can the hazard occur? (i.e. what circumstances must be present for it to happen)	Project requires removal of bark from tree samples					
What will happen if it occurs? (i.e. what will the consequence be e.g. notifiable event, death?)	Contact with blades, chisel points, or any sharp tools can result in severe cuts					
Is this a Significant Hazard? (Can it cause Serious Harm?)	Yes					
Who is exposed to the hazard?	Students and Staff assigned to the project					
How frequently does it occur?	No data available					
How likely is/could the hazard occur?	Possible					
How will it be fixed/controlled?	Training will be conducted on safe use of chisels for this exact procedure. As a group we will decide the best way to remove the bark with minimal cutting and use of sharp tools. Use of Leather gloves, cutting away from the body. Use methods to minimise slipping with sharp tools resulting in cuts. Samples have been deliberately harvested when debarking is easy due to tree growth (spring – rather than winter) ie does not stick strongly to the wood.					
Will this eliminate, or minimise the hazard?	Minimise current hazard					
What time, resources and or costs will be needed?	Induction training, SOP and workshop training forms, PPE					
Section B – Risk Category Assessment						
Determine the risk category using the Risk Matrix below. Please circle.						
Risk Matrix						
	Result	Minor (1)	Moderate (2) (first aid only)	Severe (3) (notifiable event)	Major (4) (permanent disabling injury)	Catastrophic (5) (Loss of life, ≥ \$1 million costs)
Likelihood						
Almost never/rare (1)	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)	
Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)	
Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)	
Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Critical (20)	
Almost certain (5)	Medium (5)	High (10)	High (15)	Critical (20)	Critical (25)	
Risk Categories						
Critical	For consideration, consult immediately with your Supervisor/Manager to stop activity/process – action immediately					

High	Inform people – immediate action to be taken and applied
Medium	Correction required
Low	Risk perhaps acceptable – attention indicated
Result (Critical/High, Medium or Low)	Medium 9

Section C - Hazard Action/Control Plan					
Action #	Activity/action to be completed	Responsibility	Due date	Progress status update	Date completed and verified as successful
1	Workshop training form details exact methods used	Nigel Pink	October 2016		
2	SOP standard operating practises available in area on walls or machines	Nigel Pink	October 2016		
3	Use only by trained and competent operators	Nigel Pink			
4	Weekly check of equipment and visual inspection while working to see that agreed procedures are being used	Nigel Pink	H&S Calendar	November	
5	Always cut away from people, fingers and body. Use of leather gloves supplied	Nigel Pink	October 2016		
6	Review this form 4 th December	Nigel Pink			
<p>Hazard Register: Where a hazard is not eliminated, but the controls have been successfully implemented and verified, then you must enter the details onto your Hazard Register for ongoing management, i.e. review and monitoring.</p> <p>Significant Hazard: these hazards may require a separate implementation plan depending on the scale of the required controls. Refer to the Protocol: Risk Management.</p>					

Section D – Residual Risk Assessment	
Use the Risk Rating Matrix in Section B to recalculate the risk and determine whether the selected control has reduced the risk.	
Result (Critical/High, Medium or Low)	<p>Low 4</p> <p>Enter result into the "Risk Category Rating" column of the Hazard Register.</p>

Section E - Approval (Manager/Head to complete)			
I declare that the information detailed above is a true and correct record.			
Name		Date	
Position Title			
Signature		Hazard entered into Hazard Register	Y / N

Hazard Assessment & Control Form

Human Resources

Section A – Hazard Details

Event number (if applicable)		Date	27 th November 2016
BEIMS number (if applicable)		Raised by	Nigel Pink
Department where hazard is located	Forestry	Specific location	Wood Technology Laboratory
Describe the hazard	Dyco bandsaw		
How can the hazard occur? (i.e. what circumstances must be present for it to happen)	Normal Operation of the machine.		
What will happen if it occurs? (i.e. what will the consequence be e.g. serious harm, death?)	Contact with blade or band causing severe cuts and may cause amputation of fingers or hands. Dust from toxic wood may cause asthma or long term respiratory damage . Kickback of parts from the blade can cause impact damage to the body or impalement of hands and body.		
Is this a Significant Hazard? (Can it cause Serious Harm?)	yes		
Who is exposed to the hazard?	Technicians and other authorised users		
How frequently does it occur?	No data available NZ but UK HSE historical documentation records these hazards		
How likely is/could the hazard occur?	Likely		
How will it be fixed/controlled?	Operator training covers the SOP forms for the machine and the Workshop training forms specific to the exact process. Eliminate any process which is not documented on the training forms.		
Will this <u>eliminate</u> , <u>isolate</u> or <u>minimise</u> the hazard?	Minimise current hazard		
What time, resources and or costs will be needed?	Induction training, machine training with SOP and workshop training forms		

Section B – Risk Category Assessment

Determine the risk category using the Risk Matrix below. Please circle.

Risk Matrix

Result Likelihood	Minor (1)	Moderate (2) (first aid only)	Severe (3) (serious harm)	Major (4) (permanent disabling injury)	Catastrophic (5) (Loss of life, ≥ \$1 million costs)
Almost never/rare (1)	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)
Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)
Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)
Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Critical (20)
Almost certain (5)	Medium (5)	High (10)	High (15)	Critical (20)	Critical (25)

Risk Categories

Critical	For consideration, consult immediately with your Supervisor/Manager to stop activity/process – action immediately
----------	---

High	Inform people – immediate action to be taken and applied
Medium	Correction required
Low	Risk perhaps acceptable – attention indicated
Result (Critical/High, Medium or Low)	High 16

Section C - Hazard Action/Control Plan					
Action #	Activity/action to be completed	Responsibility	Due date	Progress status update	Date completed and verified as successful
1	Safeguards are in place on the machines. Register of users held by Nigel Pink	Nigel Pink	October 2016		
2	SOP standard operating practises available in area on walls or machines	Nigel Pink	October 2016		
3	Use only by trained and competent operators	Nigel Pink			
4	Monthly check of equipment	Nigel Pink	H&S Calendar	November	
5	Always use maximum guarding job will permit and use push sticks for everything to keep fingers away	Nigel Pink			
6	Independent dust suction system	Nigel Pink	October 2016		
7	Clean working area with brushes rather than compressed air	Nigel Pink			
8	Review this form 4 th December	Nigel Pink			

Hazard Register: Where a hazard is not eliminated, but the controls have been successfully implemented and verified, then you must enter the details onto your Hazard Register for ongoing management, i.e. review and monitoring.

Significant Hazard: these hazards may require a separate implementation plan depending on the scale of the required controls. Refer to the Protocol: Hazard Management.

Section D – Residual Risk Assessment	
Use the Risk Rating Matrix in Section B to recalculate the risk and determine whether the selected control has reduced the risk.	
Result (Critical/High, Medium or Low)	Low 4
Enter result into the "Risk Category Rating" column of the Hazard Register.	

Section E - Approval (Manager/Head to complete)			
I declare that the information detailed above is a true and correct record.			
Name	Nigel Pink	Date	
Position Title			
Signature		Hazard entered into Hazard Register	Y / N

Hazard Assessment & Control Form Crosscut Bandsaw

Human Resources

Section A – Hazard Details			
Event number (if applicable)		Date	27 th November 2016
BEIMS number (if applicable)		Raised by	Nigel Pink
Department where hazard is located	Forestry	Specific location	Wood Technology Laboratory
Describe the hazard	Crosscut bandsaw.		
How can the hazard occur? (i.e. what circumstances must be present for it to happen)	Normal operation of the machine.		
What will happen if it occurs? (i.e. what will the consequence be e.g. serious harm, death?)	Contact with blade or band causing severe cuts and may cause amputation of fingers or hands. Dust from wood may cause allergies or long term respiratory damage .		
Is this a Significant Hazard? (Can it cause Serious Harm?)	yes		
Who is exposed to the hazard?	Technicians and other authorised users		
How frequently does it occur?	No data available NZ but UK HSE historical documentation records these hazards		
How likely is/could the hazard occur?	Likely		
How will it be fixed/controlled?	Operator training covers the SOP forms for the machine and the Workshop training forms specific to the exact process. Eliminate any process which is not documented on the training forms.		
Will this eliminate, isolate or minimise the hazard?	Minimise current hazard		
What time, resources and or costs will be needed?	Induction training, machine training with SOP and workshop training forms, PPE		

Section B – Risk Category Assessment							
Determine the risk category using the Risk Matrix below. Please circle.							
Risk Matrix							
Result Likelihood	Minor (1)	Moderate (2) (first aid only)	Severe (3) (serious harm)	Major (4) (permanent disabling injury)	Catastrophic (5) (Loss of life, ≥ \$1 million costs)		
Almost never/rare (1)	Low (1)	Low (2)	Low (3)	Low (4)	Medium (5)		
Unlikely (2)	Low (2)	Low (4)	Medium (6)	Medium (8)	High (10)		
Possible (3)	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)		
Likely (4)	Low (4)	Medium (8)	High (12)	High (16)	Critical (20)		
Almost certain (5)	Medium (5)	High (10)	High (15)	Critical (20)	Critical (25)		
Risk Categories							
Critical	For consideration, consult immediately with your Supervisor/Manager to stop activity/process – action immediately						

High	Inform people – immediate action to be taken and applied
Medium	Correction required
Low	Risk perhaps acceptable – attention indicated
Result (Critical/High, Medium or Low)	High 16

Section C - Hazard Action/Control Plan					
Action #	Activity/action to be completed	Responsibility	Due date	Progress status update	Date completed and verified as successful
1	Safeguards are in place on the machines. Register of users held by Nigel Pink	Nigel Pink	October 2016		
2	SOP standard operating practises available in area on walls or machines	Nigel Pink	October 2016		
3	Use only by trained and competent operators	Nigel Pink			
4	Monthly check of equipment	Nigel Pink	H&S Calendar	November	
5	Always use maximum guarding job will permit and use push sticks for everything to keep fingers away	Nigel Pink			
6	Independent dust suction system	Nigel Pink	October 2016		
7	Clean working area with brushes rather than compressed air	Nigel Pink			
8	Review this form 4 th December	Nigel Pink			

Hazard Register: Where a hazard is not eliminated, but the controls have been successfully implemented and verified, then you must enter the details onto your Hazard Register for ongoing management, i.e. review and monitoring.

Significant Hazard: these hazards may require a separate implementation plan depending on the scale of the required controls. Refer to the Protocol: Hazard Management.

Section D – Residual Risk Assessment	
Use the Risk Rating Matrix in Section B to recalculate the risk and determine whether the selected control has reduced the risk.	
Result (Critical/High, Medium or Low)	Low 4
Enter result into the "Risk Category Rating" column of the Hazard Register.	

Section E - Approval (Manager/Head to complete)			
I declare that the information detailed above is a true and correct record.			
Name	Nigel Pink	Date	
Position Title			
Signature		Hazard entered into Hazard Register	Y / N

School of Forestry Workshop Training Forms

Name: WOODVILLE Bandsaw	Staff/Student ID Number:
Department: Forestry	
Project training required for: Growth-strain assessments (Woodville trial) SFF407602	
<p>Procedure (in words):</p> <p>Longitudinal cut using bandsaw. Carry out the following workshop checks;</p> <ol style="list-style-type: none">1/ Ensure adequate lighting.2/ Clear working area: hands free of obstructions on and no tripping obstacles.3/ Do not operate if the machine covers are not in place or is being serviced4/ Wear PPE - safety glasses, sturdy footwear, earmuffs and overalls or lab coat.5/ Make sure the area is not crowded with people and there is room to work safely and move around the machine.6/ Ensure extraction system is working. <p>Read and follow all instructions for operation of the machine according to the SOP for Dyco Bandsaw. Start machine without the job near the blade let it come to full speed. Try to place the stick grounded on the table when presented to the blade. Hold the stick firmly with hands not near the table (the stick needs to be long enough, if it is too short do not attempt to cut it) and apply a small amount of force to start the cut. This part of the cut is the most unstable and the blade will bite into the wood. The point of which the blade starts cutting the job needs to be supported right to the surface of the table or it may try to grab. When ripping (cutting along the grain) irregular shaped objects care is needed when starting the cut. The operator can raise and lower the end of the stick they are holding to make sure the job is flat on the table. Once the cut is started proceed cutting at a rate that the band is cutting to capacity but not overly exceeded. DO NOT wear gloves when operating the machine. Take care when withdrawing the piece from the band so that we do not apply too much side force causing the saw blade to derail. Take the stick out of the cut slowly and carefully. Turn off the machine and lower the guards when you are finished. Leave the entire area in a clean state.</p>	

School of Forestry Workshop Training Forms

Diagram:

good and bad practice for starting the longitudinal cut;



Stick presented flat. Front edge off table, may bite when blade hits the wood

Stick end lifted up so the front edge is supported underneath the cut. Lower stick end with the curve of the wood as the cut proceeds.

Forbidden. Do not present stick to the saw off the ground like this. Band will bite hard possibly break and cause injury

Date Training Completed:

Workshop Manager Signature:

I understand that I am required to wear appropriate PPE at all times, and that I am subject to the instructions issued by the Workshop Manager. I will follow the training instructions on this form and have read the appropriate (Safe Operating Procedures) SOP for any machines I will use. I have also read the hazard register and had the workshop induction.

Trainee Signature:

School of Forestry Workshop Training Forms

Name: WOODVILLE

Cross cut machine

Staff/Student ID Number:

Department:

Forestry

Project training required for:

Growth-strain assessments (Woodville trial) SFF407602

Procedure (in words):

Crosscut using Crosscut Bandsaw. Carry out the following workshop checks.

- 1/ Ensure adequate lighting.
- 2/ Clear working area: hands free of obstructions on and no tripping obstacles.
- 3/ Do not operate if the machine covers are not in place or is being serviced
- 4/ Wear PPE - safety glasses, sturdy footwear, earmuffs and overalls or lab coat.
- 5/ Make sure the area is not crowded with people and there is room to work safely and move around the machine
- 6/ Ensure extraction system is working.

Read and follow all instructions for operation of the machine according to the SOP for Crosscut bandsaw. Clamp irregular green stick in vice. Try to place the stick grounded on the vice for stability. Use supplied end stop to set the length of the cut. Start machine (check motor speed is set to fastest) and pull down onto stick until cutting and apply a small amount of force to proceed with cutting at a rate that the band is cutting to capacity but not overly exceeded. DO NOT wear gloves when operating the machine. Wait until the band is at a complete stop before releasing the vice and manipulating the sample.

Diagram:



School of Forestry Workshop Training Forms

Date Training Completed:

Workshop Manager Signature:

I understand that I am required to wear appropriate PPE at all times, and that I am subject to the instructions issued by the Workshop Manager. I will follow the training instructions on this form and have read the appropriate (Safe Operating Procedures) SOP for any machines I will use. I have also read the hazard register and had the workshop induction.

Trainee Signature:

Workshop Induction Form

Rules

- No use of machinery without approval and specific training from Workshop Manager.
- Any machinery requires training and signed SOP (safe operating procedures).
- Inform workshop manager when you plan to be in the workshop.
- Do not work alone.
- Use PPE (eye protection, earmuffs and safety glasses) at all times when appropriate.
- Keep to designated safe walkway areas.
- Do not enter Wood Technology Laboratory outside normal hours without prior approval from Workshop Manager
- Do not work on weekends
- Clean your designated area and arrange the flow of materials and storage within your designated area. Keep a clutter free area around the people who will be working.
- Sweep up bark and bag the used wood cuttings for removal daily.

Training

Three levels of Health and safety training will be covered. Firstly we will go over the general workshop induction for the building. Then we will move to the safe operating procedures for each machine and tool you will be using. Then we will conduct specific training for these machines and tools that describes exactly how the machines and tools will be used to carry out your specific task. The training does not cover the use of these machines outside of the tasks that are detailed on the training form.

General

No eating\ drinking

Enclosed footwear

Follow instructions of Workshop Manager

First Aid Cabinet area and contents

Eye wash stations and hand wash area

Emergency machine shutdown system

Fire

Location of fire extinguishers and alarm buttons. On hearing the fire alarm leave the building by the nearest Fire Exit and report to the designated meeting area (front of main forestry building). If the workshop manager is not around and you think you are the last person then take the fire warden band located next to the Workshop Managers office and check areas are evacuated if safe to do so.

Evacuation

Induction to cover location of evacuation procedure chart on workshop wall. Discuss the use of the chart regarding where to evacuate and when to leave workshop in events (e.g. earthquake)

Hazards Specific to area

Go through main current hazards in specific buildings with The Workshop Manager

Refer to specific hazards on School of Forestry Hazard Register. Point out the hazards White Board at entrance area

Main Hazards of Workshop

Dust: Instruct on use of dust extraction system

Slips, trips and falls: Point out taped walking areas to be kept free of obstacles

Noise and flying particles: Point out PPE station with safety glasses and earmuffs

Events and Near-misses

In the unfortunate case that there is either an incident or near miss incident where there has been a close call or potential for harm stop work and report it to either Nigel Pink, Lachlan Kirk, Clemens Altaner or David Norton.

Nigel Pink	ext6108	0274512452
Lachlan Kirk	ext6304	0274719604
David Norton	ext6116	0277017794
Clemens Altaner	ext6807	02102969873

Induction completed by: Nigel Pink, in his absence Lachlan Kirk

Inductee Name:

Date and Sign :

Inducted by: Name:

Date and Sign: