Scaling Juniper Markets: *Sustainable Solutions for Rangelands and Rural Communities*

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Outline

- Background
- Material sources
- Particleboard
- Strandboard
- Future steps

MADE IN OREGON
WESTERN JUNIPER
TM

Background - Dramatic Expansion of Juniper Woodlands

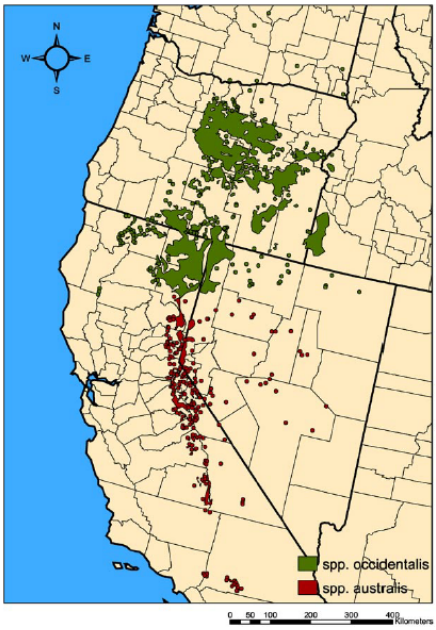


Photo taken near Prineville, Oregon circa 1890

Same location in 1989

In Oregon:
1930 – 1.5 million acres
2005 – 6.5 million acres

Background - Dramatic Expansion of Juniper Woodlands

As juniper trees dominate a site:

- Erosion increases
- Forage production declines
- Streamflows are reduced
- Wildlife habitat is altered

Thinning woodlands is expensive – especially without markets for juniper

Markets for juniper (both solid wood products and **byproducts**) will help offset thinning costs.

Material sources

Explored in this project	Residue	Description	Current Market(s)
Yes	Slabs (Figure 1)	From outer diameter of tree, predominantly sapwood with bark	Firewood
Yes	Edgings (Figure 2)	Generated as boards with rough edges are trimmed to width; heartwood and sapwood, some bark	Often burned as fuel at sawmills
Yes	Peeler shavings – with bark (Figure 3)	Sapwood, bark	Garden mulch
?	Peeler shavings – without bark (Figure 4)	Produced by pole peeler, primarily sapwood	Can be sold to particleboard mills
Yes	Sawdust (Figure 5)	Includes sapwood, heartwood, and some bark Note: the geometry of these particles varies with the type of saw used	None
Yes	Planer shavings	Sapwood, heartwood	Very limited production (from secondary manufacturers using juniper)
No	Limbs	Generally left in the forest when the trees are harvested	Firewood
No	Foliage	Generally left in the forest when the trees are harvested	Essential oil

Slabs & Edgings

- Production of 2,000-2,500 MBF of lumber =>

2000-5000 tons of slabs

Figure 1. Juniper slabs

Figure 2. Juniper edgings

Peeler shavings

Figure 3. Juniper peeler shavings (with bark)

Figure 4. Juniper peeler shavings (without bark)

Sawdust

- Production of 2000-2500 MBF of lumber =>

500-600 tons of sawdust

Juniper from bandsaw

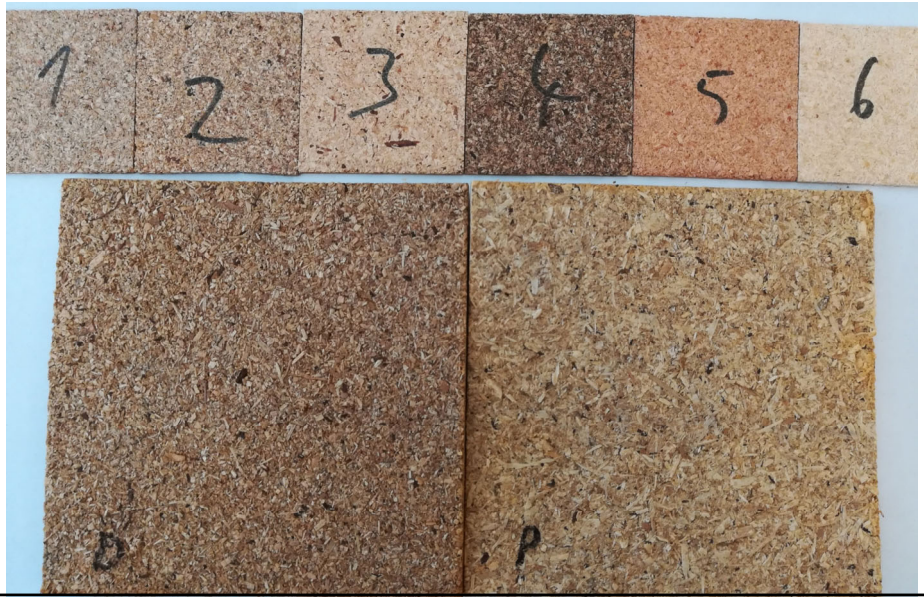
Juniper from edger circular saw

Juniper from circular saw

Planer shavings

- Negligible amount

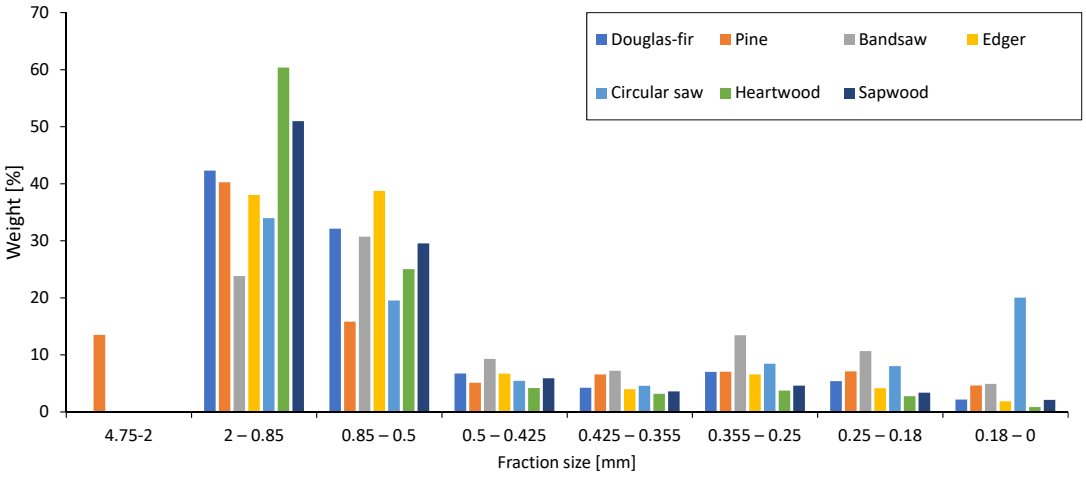
Particleboard



Particleboard

- Juniper sawdust **with bark**
- Particleboard made from particles thinner than 5 mm (thickness swelling, water absorption, linear expansion, moisture content)

Fraction analysis



Particleboard with varying quantities of wax

- Thickness Swelling after 7 days

	Wax Content			
	1%	0.5%	0%	Custom 1%
Douglas-fir	35.0 (7.0)	37.6 (8.8)	36.6 (10.2)	36.4 (8.8)
	A	A, B, C	A, B	A, B
Bandsaw	44.3 (8.5)	42.2 (10.2)	50.6 (10.2)	41.7 (9.7)
	A, B, C, D, E, F, G	A, B, C, D, E, F	E, F, G, H	A, B, C, D, E, F
Edger	48.0 (6.4)	46.5 (5.9)	44.9 (4.6)	43.2 (6.2)
	C, D, E, F, G, H	B, C, D, E, F, G, H	A, B, C, D, E, F, G	A, B, C, D, E, F
Circular saw	38.4 (4.8)	39.5 (6.7)	40.7 (7.8)	40.2 (5.5)
	A, B, C, D	A, B, C, D	A, B, C, D, E	A, B, C, D, E
Heartwood	48.2 (8.9)	44.3 (9.8)	52.3 (12.7)	48.3 (9.9)
	D, E, F, G, H	A, B, C, D, E, F, G	F, G, H	D, E, F, G, H
Sapwood	54.0 (7.9)	55.7 (7.6)	55.6 (5.2)	54.5 (8.3)
	G, H	H	H	G, H

Means with the same letter do not differ statistically by the Tukey´s test (α = 0.05). Numbers in parentheses represent standard deviation

Particleboard with addition of juniper (TS)

- 5, 10, 20% of juniper added to Douglas-fir or Pine particles

Douglas-fir

	24 hours	48 hours	7 days
Control	24.8 (2.8) A	26.5 (3.5) A	28.4 (3.5) A
5% Bandsaw	26.6 (3.1) A	29.3 (2.7) A, B	32.4 (2.9) A, B
10% Bandsaw	25.4 (2.6) A	27.8 (2.2) A, B	31.5 (3) A, B
20% Bandsaw	26.5 (1.9) A	29.4 (1.3) A, B	33.1 (2.1) A, B
5% Edger	25.9 (2.8) A	28.8 (2.3) A, B	32.5 (2.4) A, B
10% Edger	26.2 (2.7) A	28.9 (3.1) A, B	32.3 (3.6) A, B
20% Edger	27.5 (2.7) A	30.1 (3.3) A, B	33.6 (4.2) A, B
5% Circular saw	25.2 (3.3) A	28.8 (3.6) A, B	32.4 (3.5) A, B
10% Circular saw	27.2 (3.1) A	31.4 (3.4) B	35.2 (3.8) B
20% Circular saw	27.7 (2.9) A	31.4 (3.7) B	35.6 (5.1) B

Means with the same letter do not differ statistically by the Tukey´s test (α = 0.05). Numbers in parentheses represent standard deviation

Pine

	24 hours	48 hours	7 days
Control	30.9 (4.3) A	32.2 (4.1) A	34.8 (4.5) A
5% Bandsaw	32.4 (4.7) A	34.6 (3.7) A	38.8 (5) A
10% Bandsaw	31.5 (2.4) A	34 (4.5) A	38.8 (5.3) A
20% Bandsaw	32.7 (3.5) A	35.5 (2.8) A	40.6 (3) A
5% Edger	33 (4) A	35.7 (3.1) A	40 (3.9) A
10% Edger	32.7 (5.7) A	35.4 (5.2) A	40.1 (6.1) A
20% Edger	33.8 (2.5) A	37.4 (3.4) A	41.2 (3.2) A
5% Circular saw	32 (5.8) A	34.5 (4.2) A	39 (4.3) A
10% Circular saw	32.4 (2.5) A	35.2 (1.7) A	40.6 (2.6) A
20% Circular saw	30.5 (5) A	32.8 (3.7) A	39.2 (4.8) A

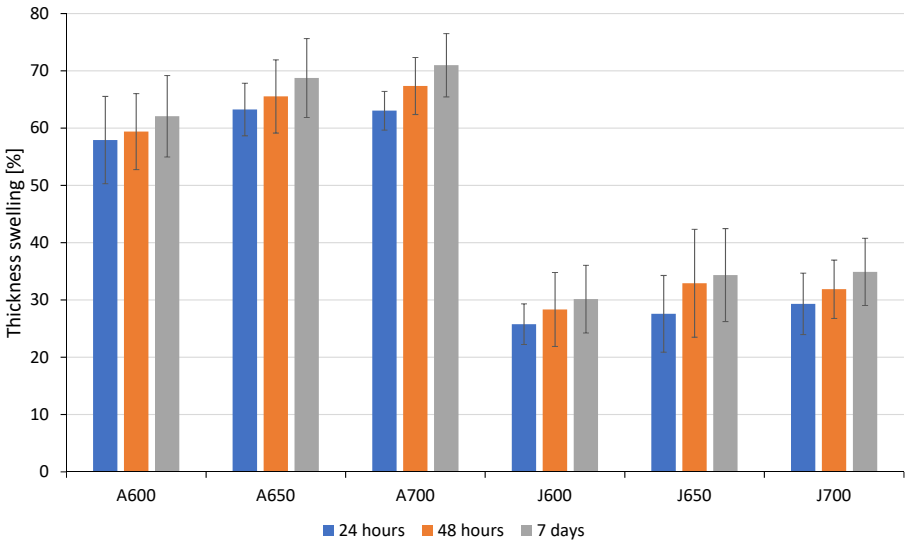
Means with the same letter do not differ statistically by the Tukey´s test (α = 0.05). Numbers in parentheses represent standard deviation

Conclusion - Particleboard

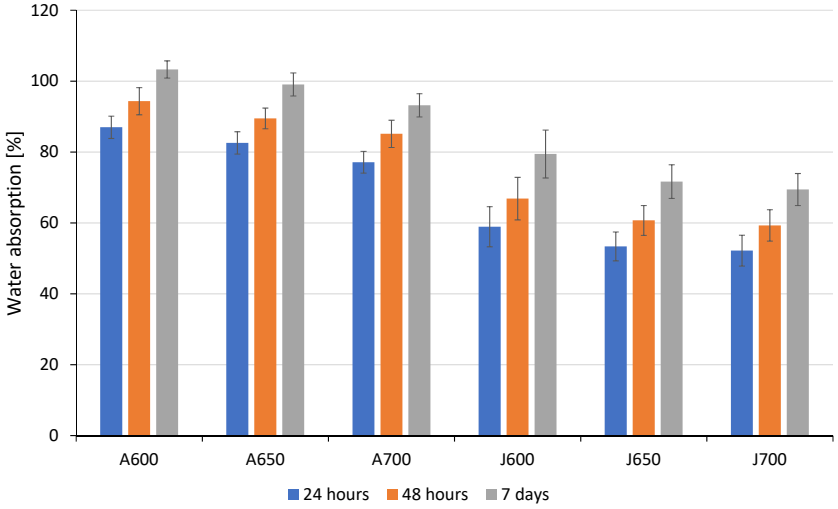
- Ability to make PB from 100% juniper sawdust **with bark** with comparable properties to Douglas-fir and Pine particleboard
- Absolutely the same properties of Douglas-fir and Pine PB with addition of juniper less than 20% for thickness swelling, water absorption, linear expansion
- The lower moisture content of PB with juniper addition or 100% juniper

Strandboard

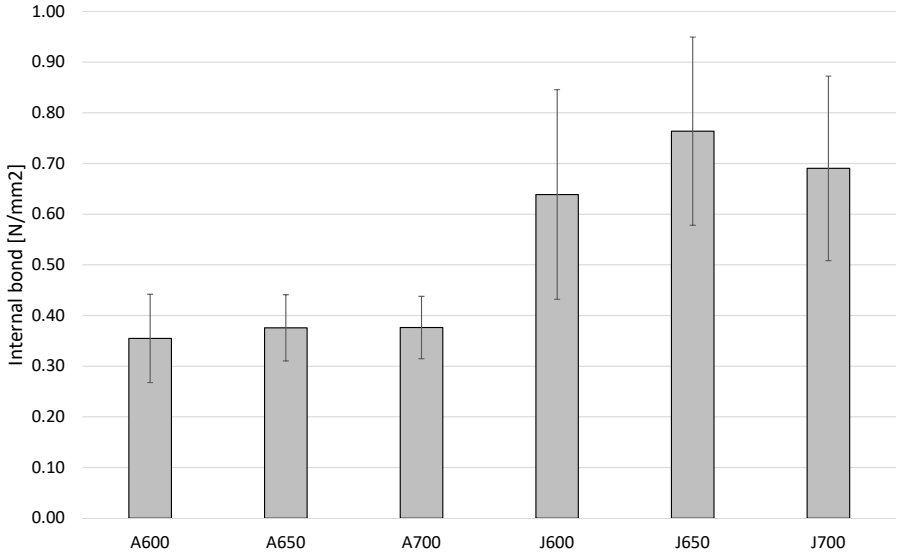
Strandboard – thickness swelling



Strandboard – water absorption



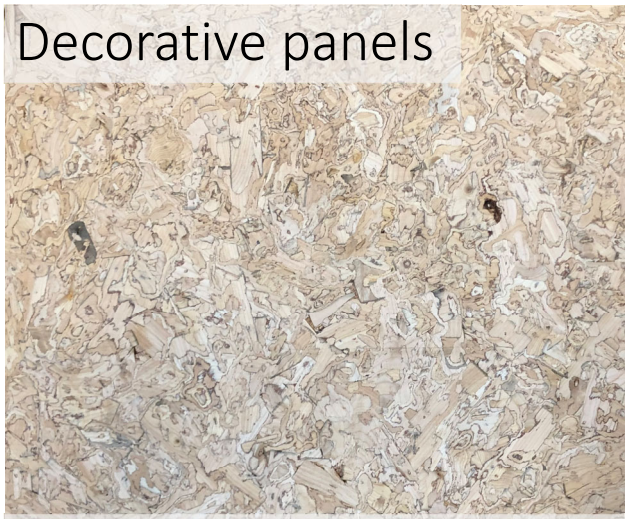
Strandboard – internal bond



Conclusion - Strandboard (OSB)

- Ability to make strands from juniper slabs
- Thickness swelling and water absorption lower for juniper
- Internal bond higher for juniper
- OSB with better or equal properties like other species

Decorative panels



- Core and surface with regular strands

- Core with regular strands
- Surface cross-section strands

Next steps for Particleboard

- **Manufacturing of 3 layer panel ¾”-** testing Bending properties (MOE, MOR), Internal Bond, Density profile, Moisture content, Thickness swelling,

- **What are other important properties for particleboard?**

(Water absorption, Linear expansion, Screw withdrawal, Hardness)

Next steps for OSB/decorative panel

- **Manufacturing of ½"-** testing Bending properties (MOE, MOR), Internal Bond, Density profile, Moisture content, Thickness swelling,
- Impregnation of strandboard with juniper essential oil

- **What are other important properties for decorative panels?**

(Water absorption, Linear expansion, Screw withdrawal, Hardness, Decay resistance)

Thank you for your attention

Questions?