

Automated Grading, Upgrading, and Cuttings Prediction of Surfaced Dry Hardwood Lumber



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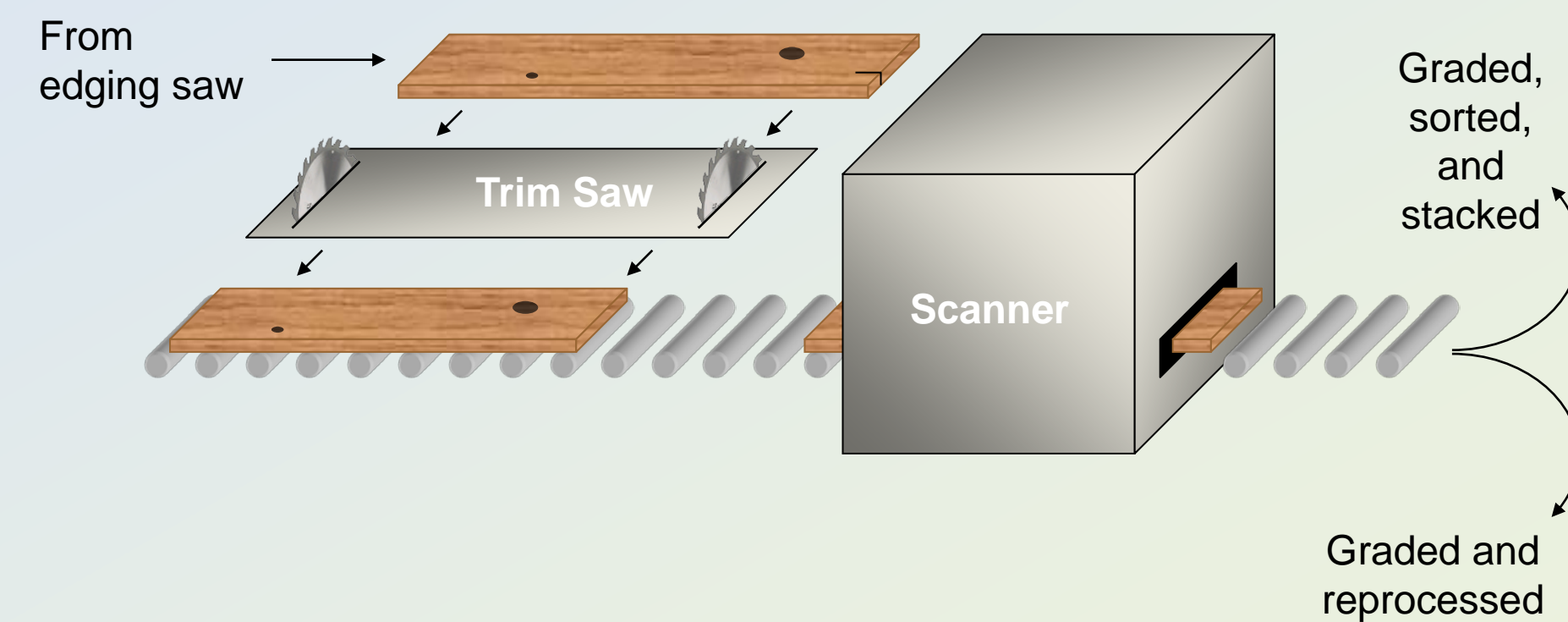


Why conduct the hardwood lumber scanning R&D?

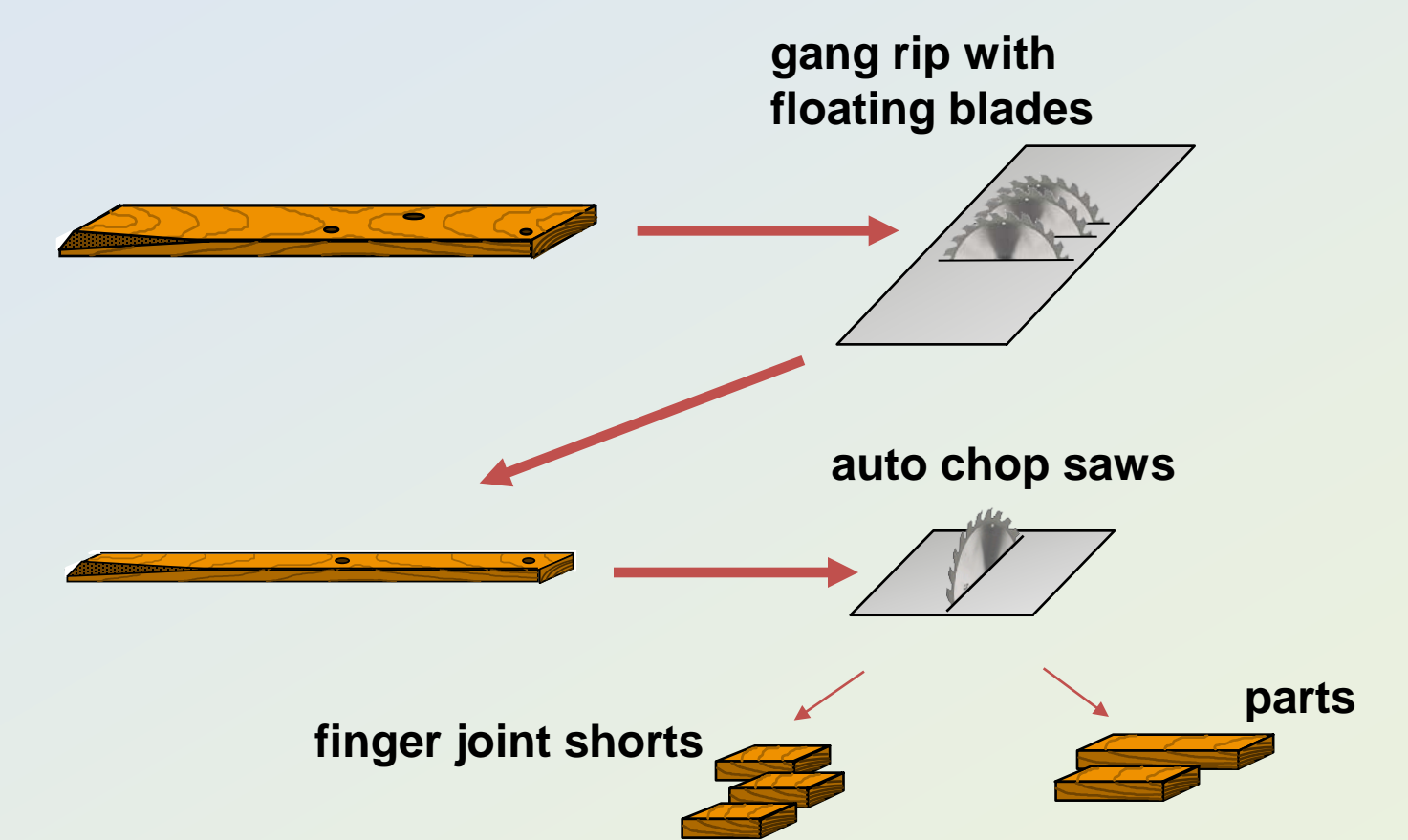
• A major sawmill owner said on scanning and grading lumber ... things will change the minute we can have a machine to accurately grade the product (lumber) and bar code it and designate a best application ... molding, furniture, flooring or whatever ...



Our most recent efforts deal with testing of a system to Automate Hardwood Lumber Grading and Predict Cuttings or Uses



We simulate cutting yields and best lumber uses with ROMI software



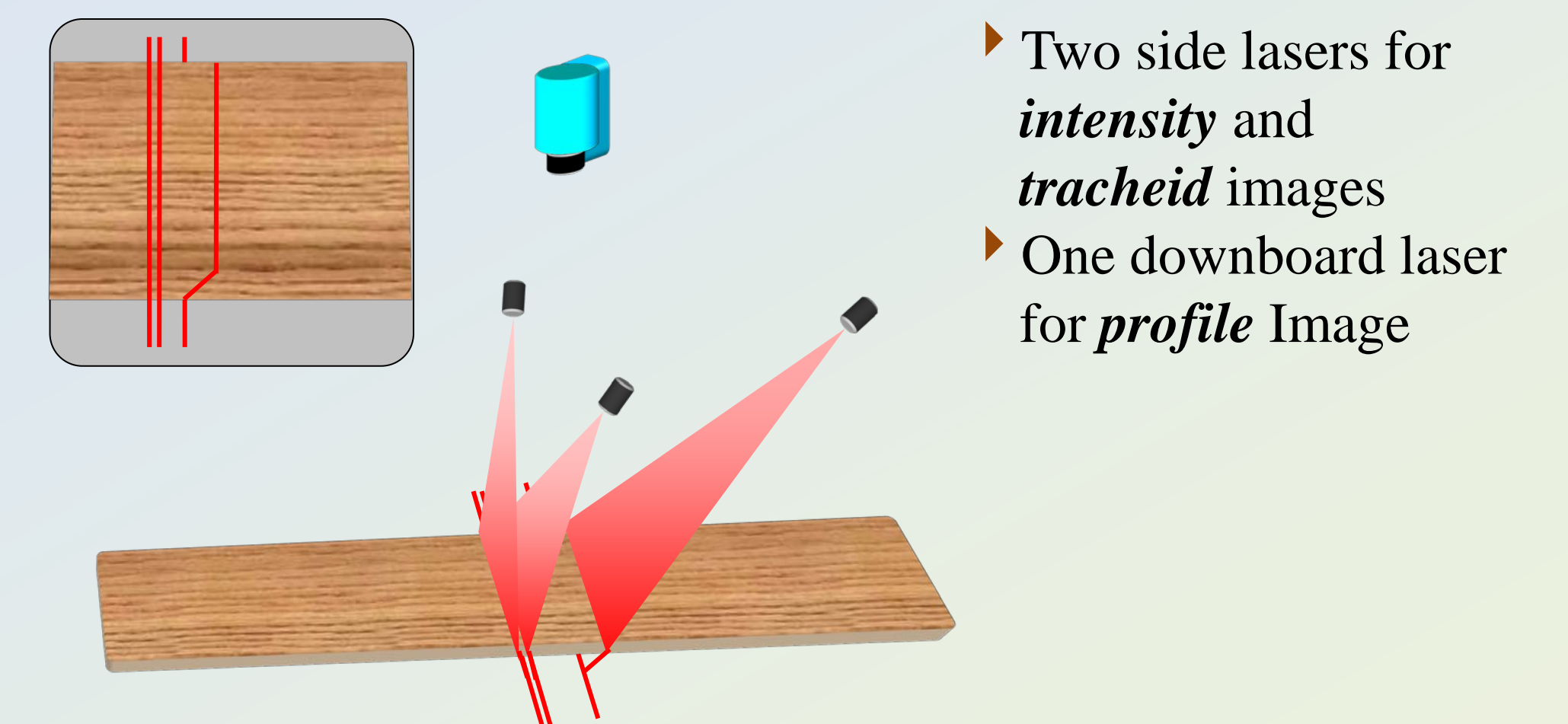
Motivation

- Hardwood sawmills:
 - They have limited NHLA graders and need to reduce costs and improve marketing
- Lumber purchasers:
 - Need to grade lumber to validate purchases
 - Need to best utilize lumber
 - Need to reduce costs

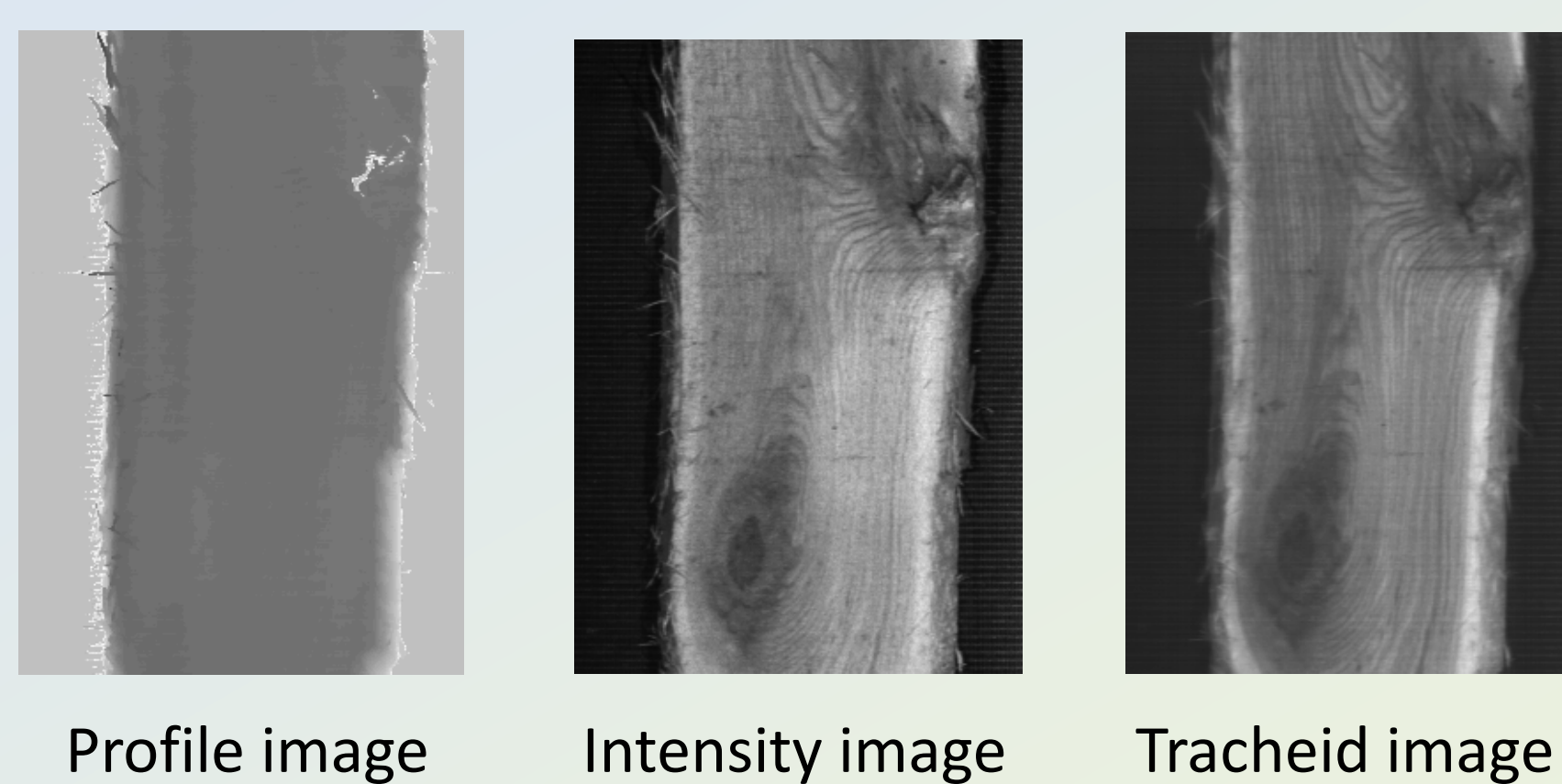
Current study

- Our **prototype scanning system**
 - Designed for rough or surfaced lumber
 - Scans boards using lasers, video camera, PC
 - Detects wane, clear wood, defects
 - Interfaces with E/T and grading software
 - ROMI software used to predict cuttings
 - Focus on hardwood
 - Defect types: wane, holes, decay, knots, voids/splits

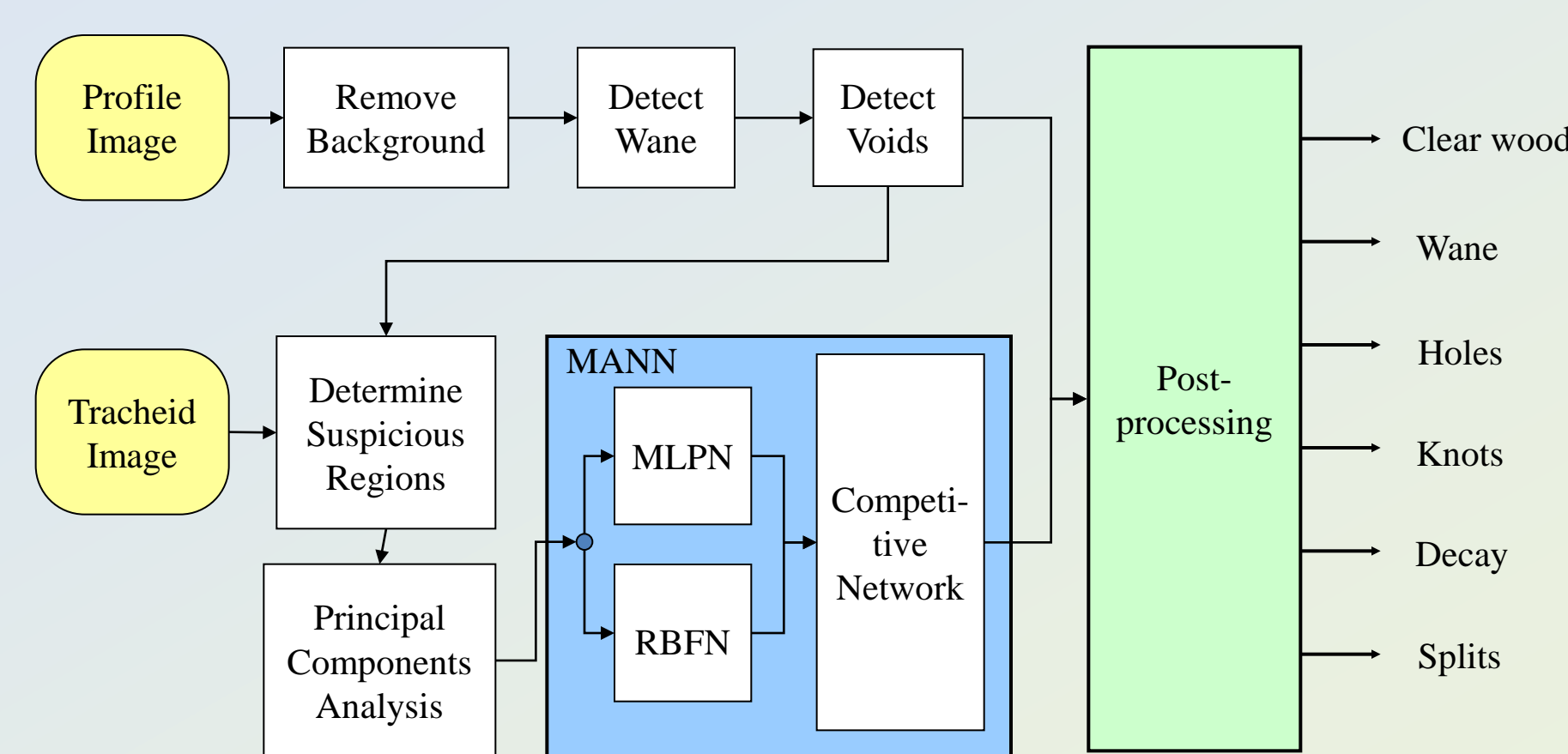
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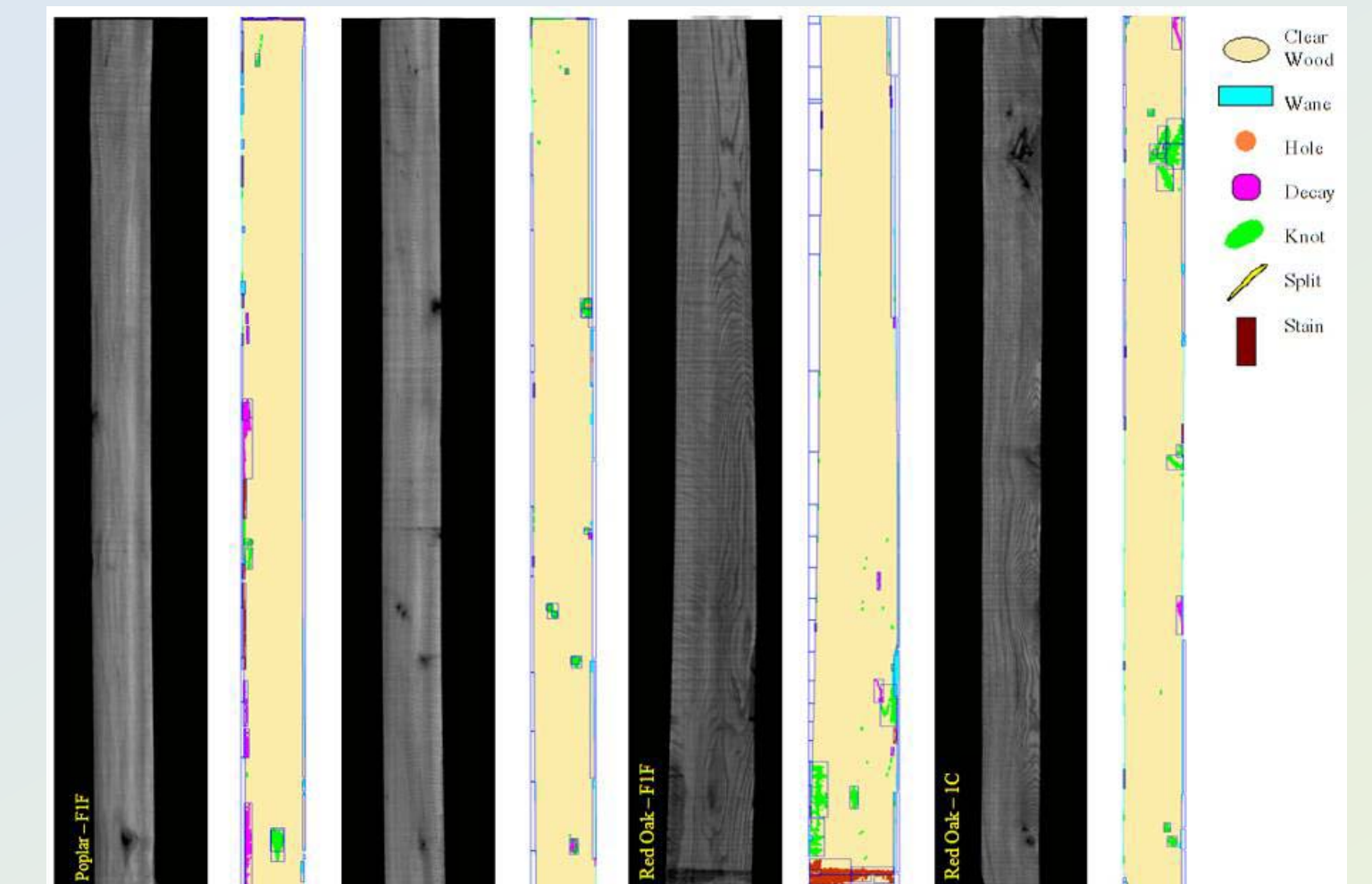
Example images



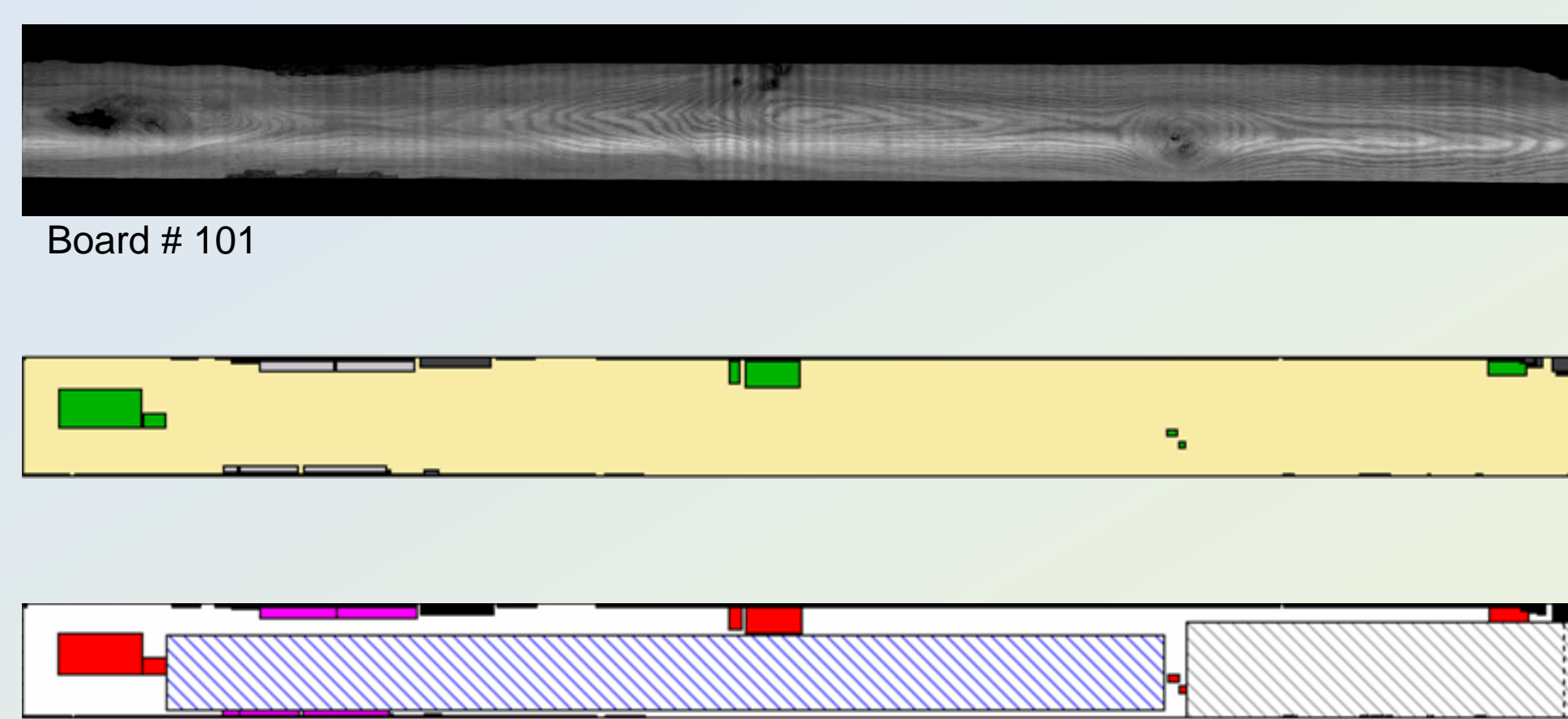
Detecting wane and defects



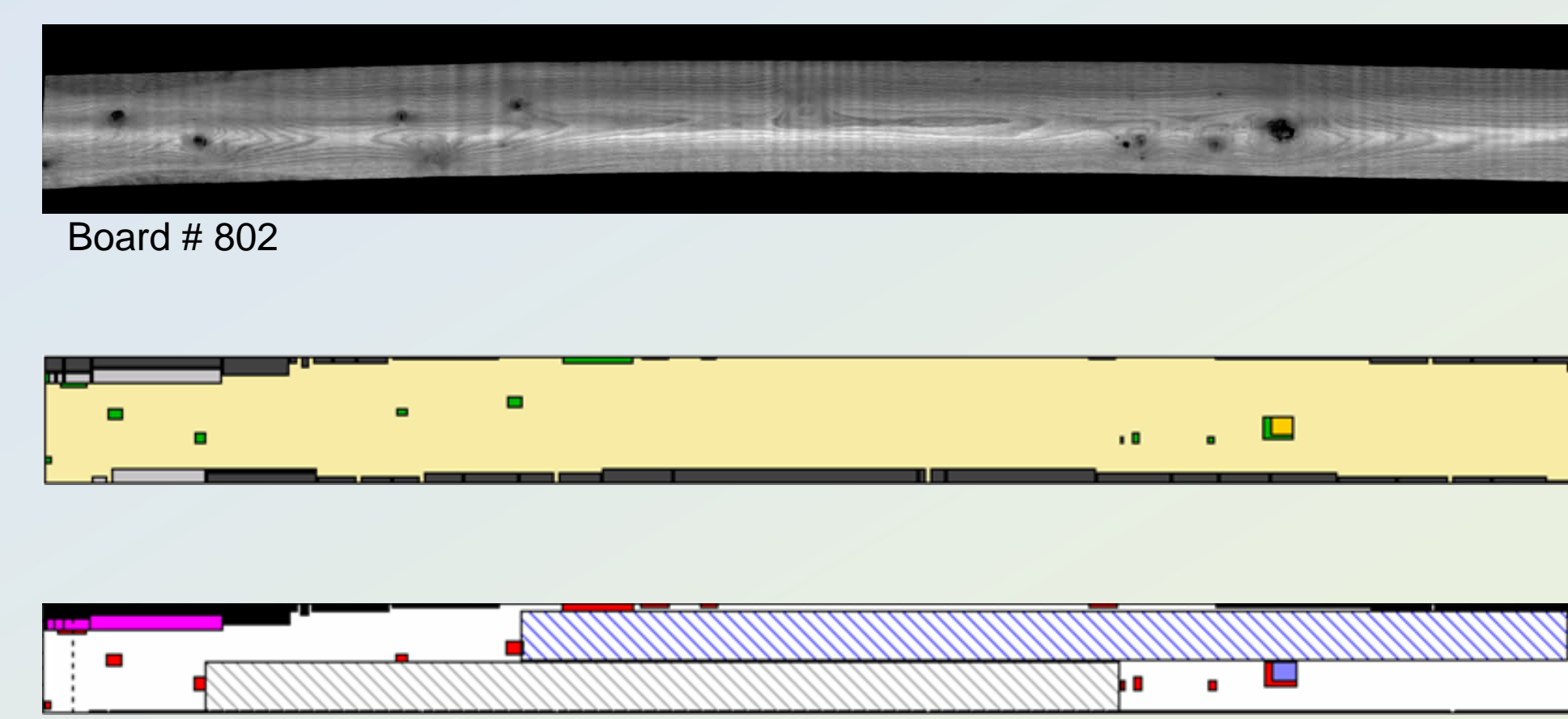
Experimental results from poplar and red oak boards



Lumber Grading -- Red Oak -- Grade 2C



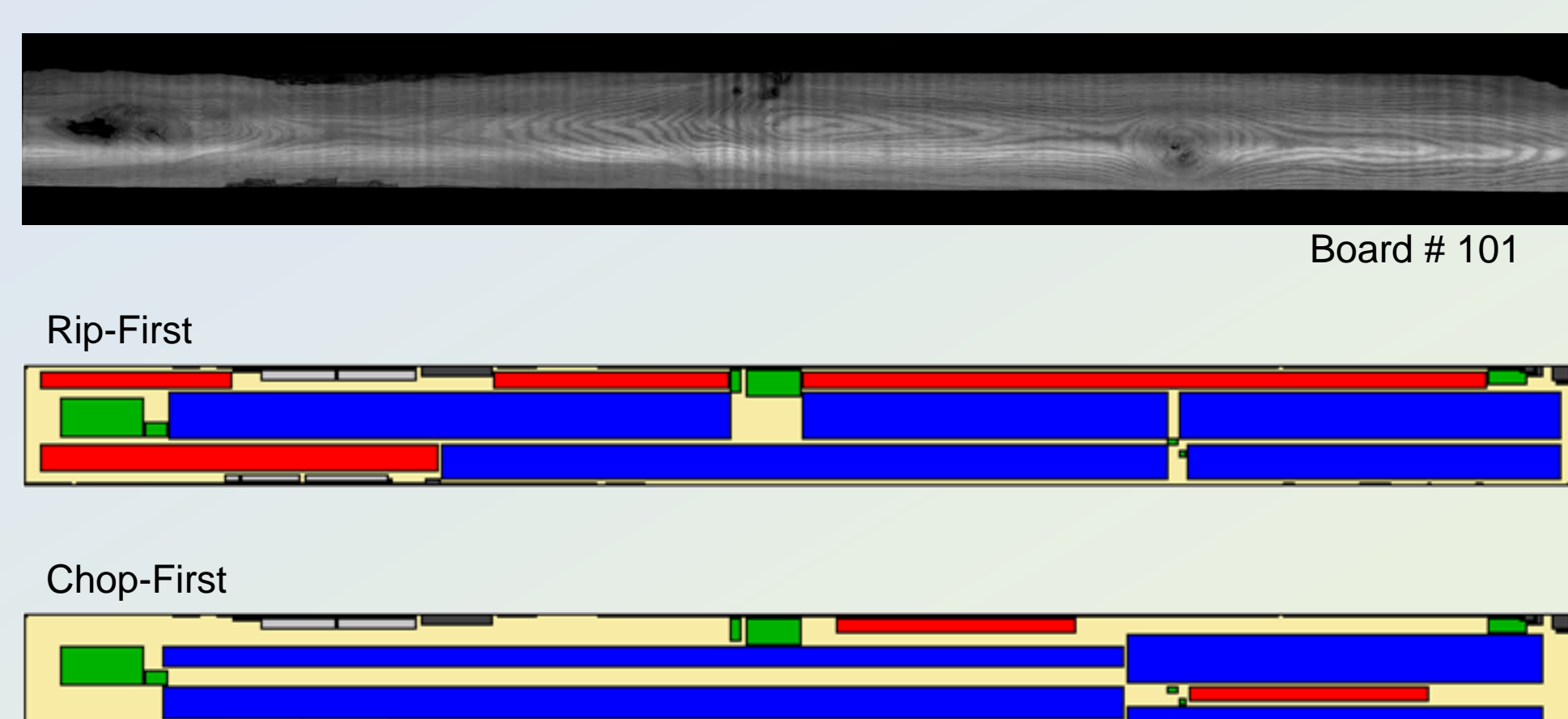
Lumber Grading ... Red Oak -- Grade 2C



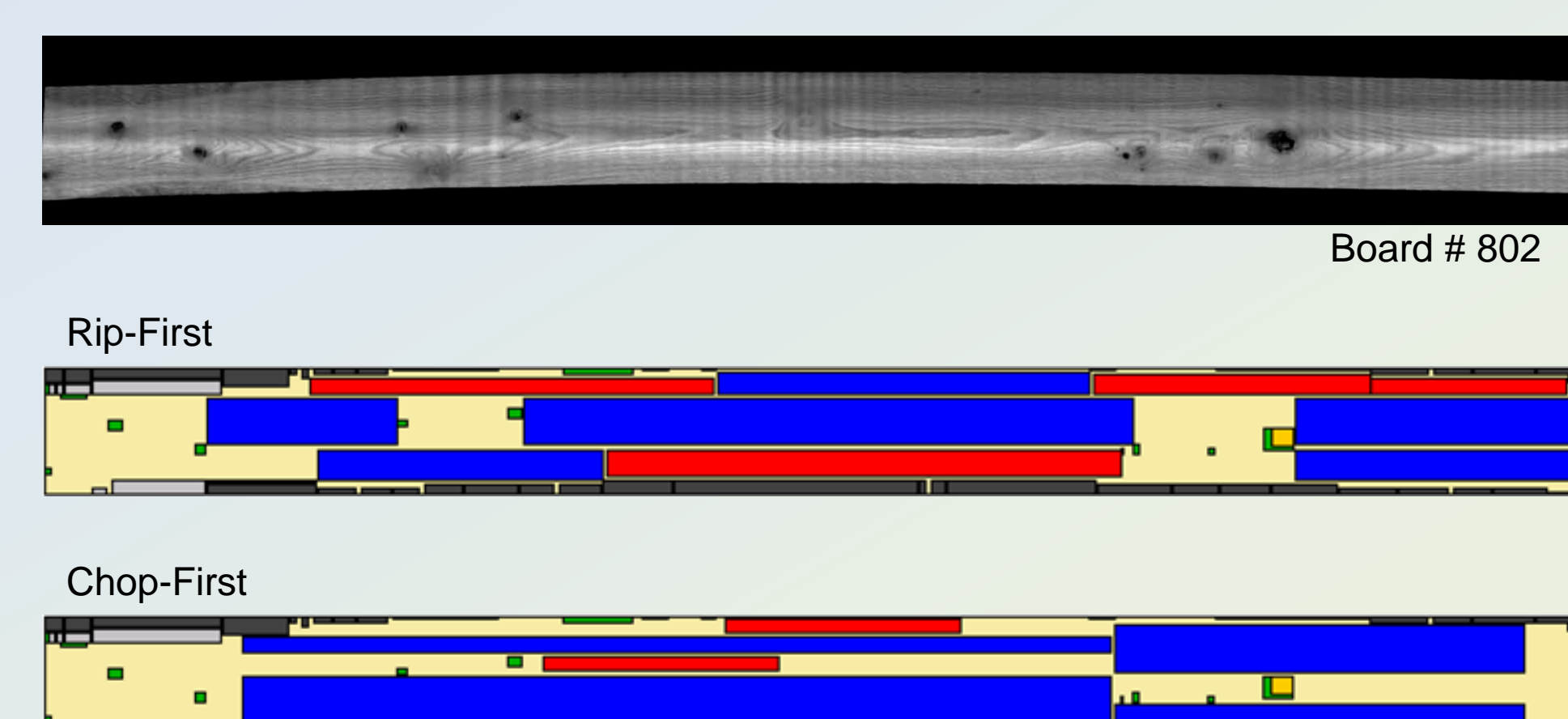
Lumber grading results from the company grading and our automated system

Species	Company Graded Board	No. of Boards	Scan & Grade vs. Company Grade			
			Same Grade	Higher Grade	Lower Grade	Upgrade Possible
Yellow Poplar	FAS	36	17	0	19	15
	1C	29	1	8	20	15
	2C	21	14	2	5	7
Total		86	32	10	44	37
Red Oak	FAS	27	22	0	5	3
	1C	39	1	14	24	21
	2C	24	16	5	3	13
Total		90	39	19	32	37

ROMI simulations --Red Oak -- Grade 2C



ROMI simulations --Red Oak -- Grade 2C



Summary

- Our scanning does a nice job on KD surfaced lumber
- NHLA hardwood lumber grading has been demonstrated
- (We are rechecking the grades and adding more scanned boards)
- ROMI simulated cuttings can be determined
- Best lumber use determination is possible