An Analysis of Processing Head Measurements in Merchandizing Southern Yellow Pine

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Tree Merchandizing

Loggers motivation:

1. Market demand
2. Higher economic value (total stem value)

Merchandizing with Knuckleboom Loader

- Visual estimation
- Subjective
- Potential measurement error

Merchandizing with Processing Head

- Eliminate operator subjectivity
- Measure the actual length and diameter of tree

https://waratah.com/

Processing Head

HTH622B Harvester Head

Length measuring wheel

Diameter measuring arms

Saws

Feeding wheels

2280 kg / 5,027 lb.
Net Weight

32 MPa / 4,641 psi
Max Hydraulic Pressure

650 mm / 26 in.
Max Delimb Opening

730 mm / 29 in.
Max Feed Roller Opening

750 mm / 29.5 in.
Max Sawing Capacity

24-30 metric ton
Carrier Size

https://waratah.com/

Processing Head

https://www.tigercat.com/product/h250d-processor/

Processing Head

Previous study: Total Stem Value Comparisons Between Tracked Processor & Knuckle-boom Loader

- 2154G John Deere Swing Machine
  - 622B Waratah processing attachment head
- 234B Tigercat knuckleboom loader
  - Pull-through de-limber
  - Slasher saw
- Same tree was “merchandized” by each machine

Previous study: Total Stem Value Comparisons Between Tracked Processor & Knuckle-boom Loader

- Using a processing head did not increase logger's total merchantability on a per/stem basis.
- Visual estimation may result in inaccurate measurements.
- If calibrated correctly, utilizing a processing head could ensure accuracy.
- If mills pursue accuracy requirements, processors will need to be reconsidered in the Southeast US

Merchandizing with Processing Head

- Problem: confirmation of its measurement accuracy
- Potential error sources:
  - multiple passes due to limb removal
  - The head does not return to the butt after grabbing the stem
  - Measuring wheel skips over the knots and limbs

Study Locations

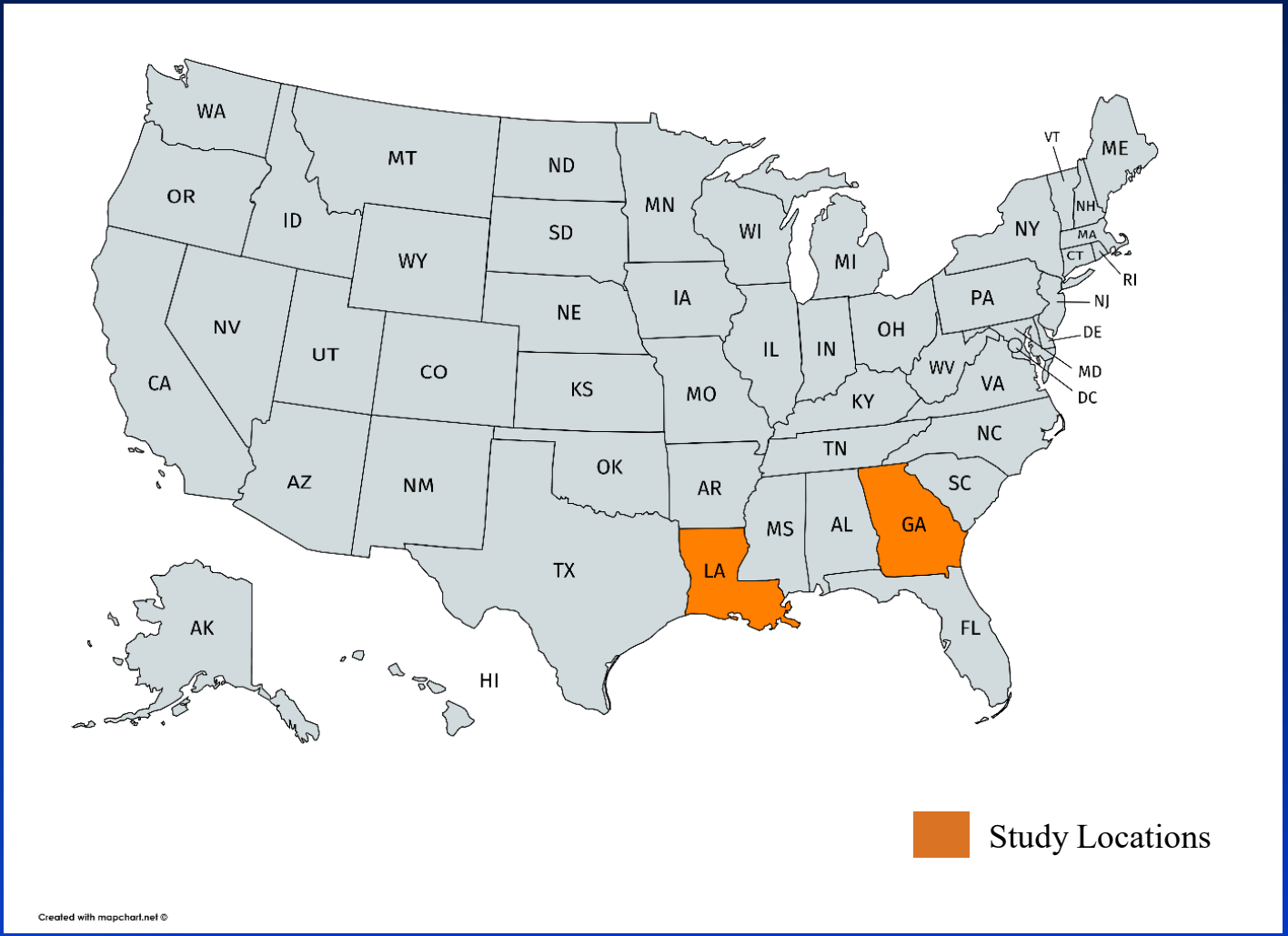


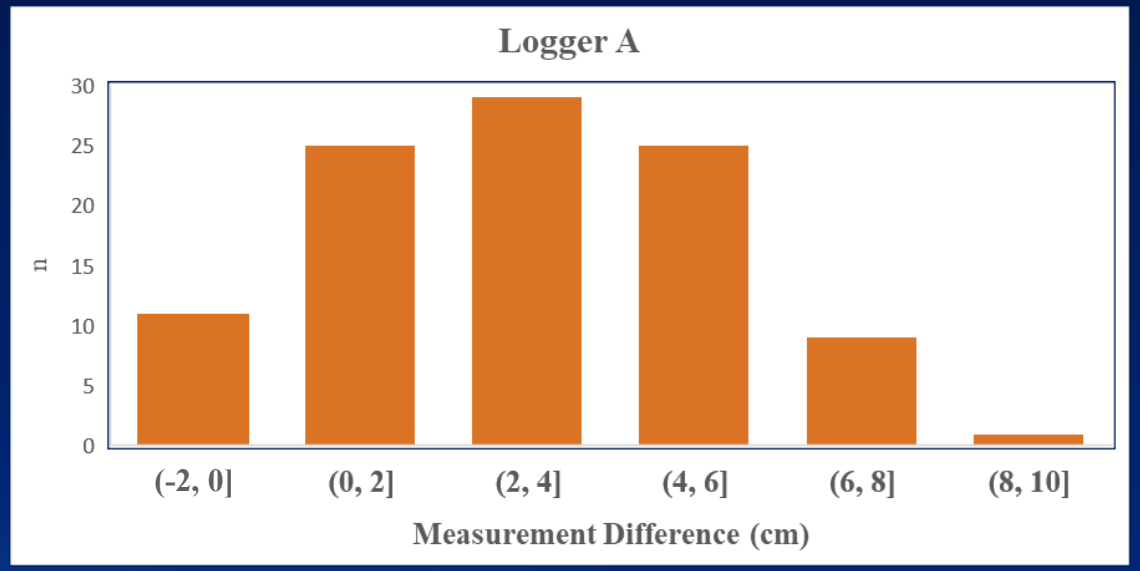
Figure 1. Study Locations

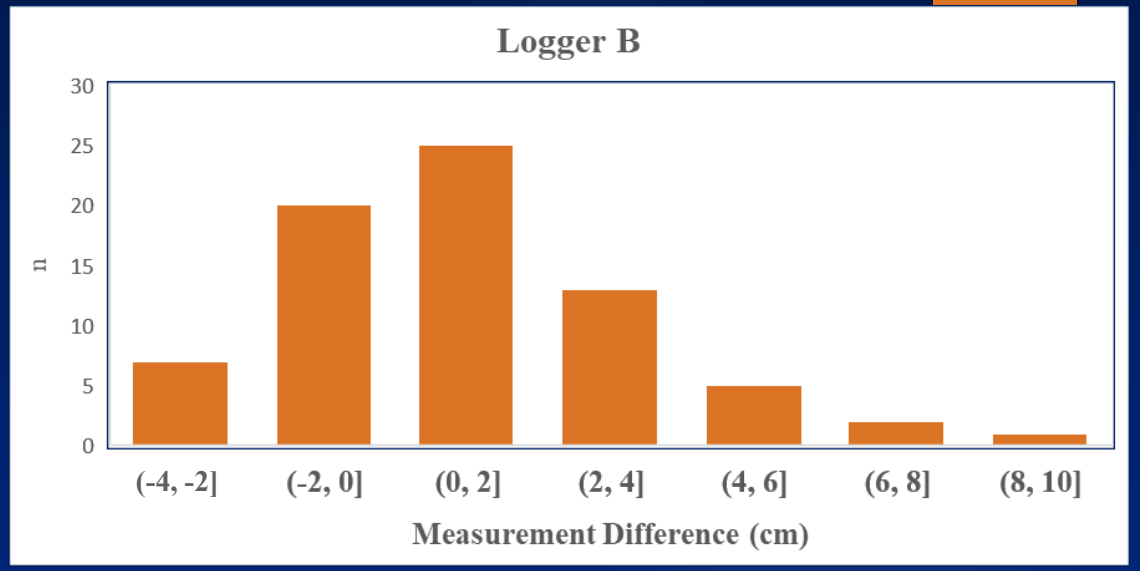
Methods

- 4 sets, each 25 logs (100 logs in an operation)
- Record the log measurements by the processing head (length and diameter)
- Measure the processed log (length and diameter inside-bark)
- Analyze the measurement differences

Preliminary Results

Butt Diameter Measurement Differences Distribution





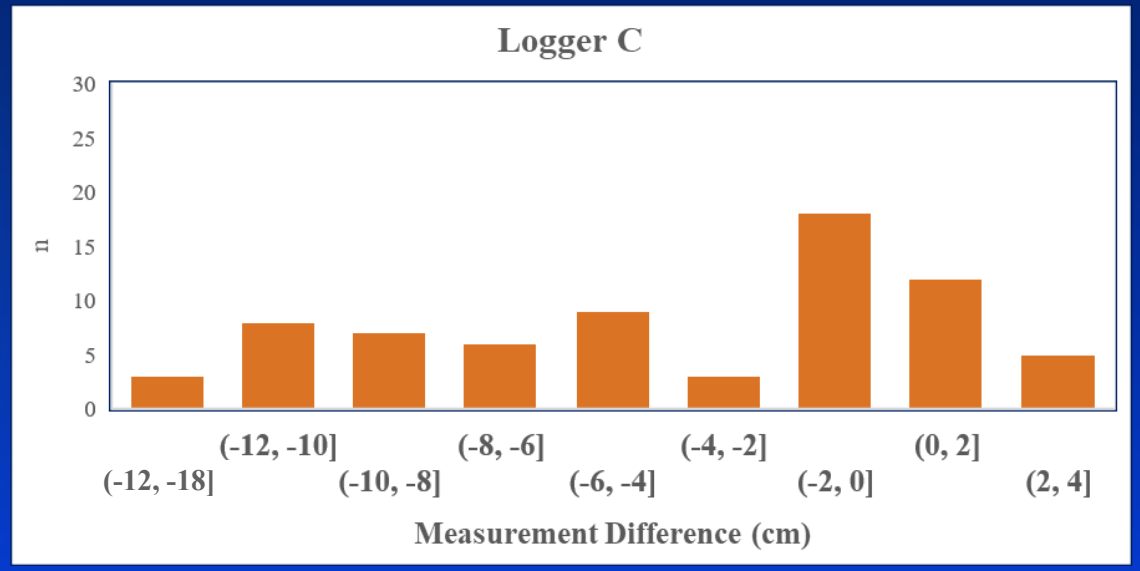
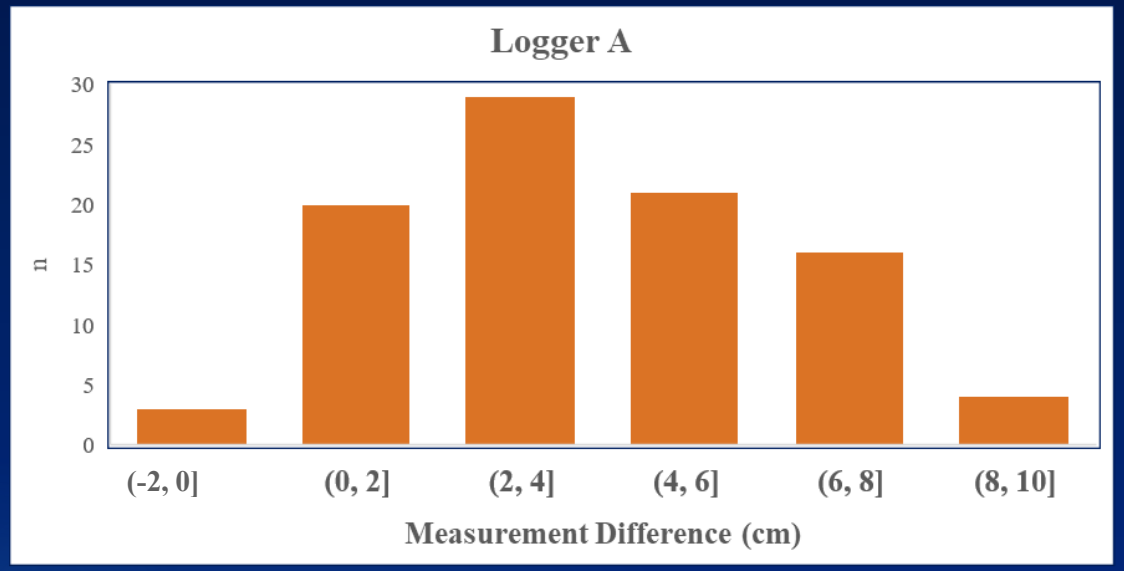
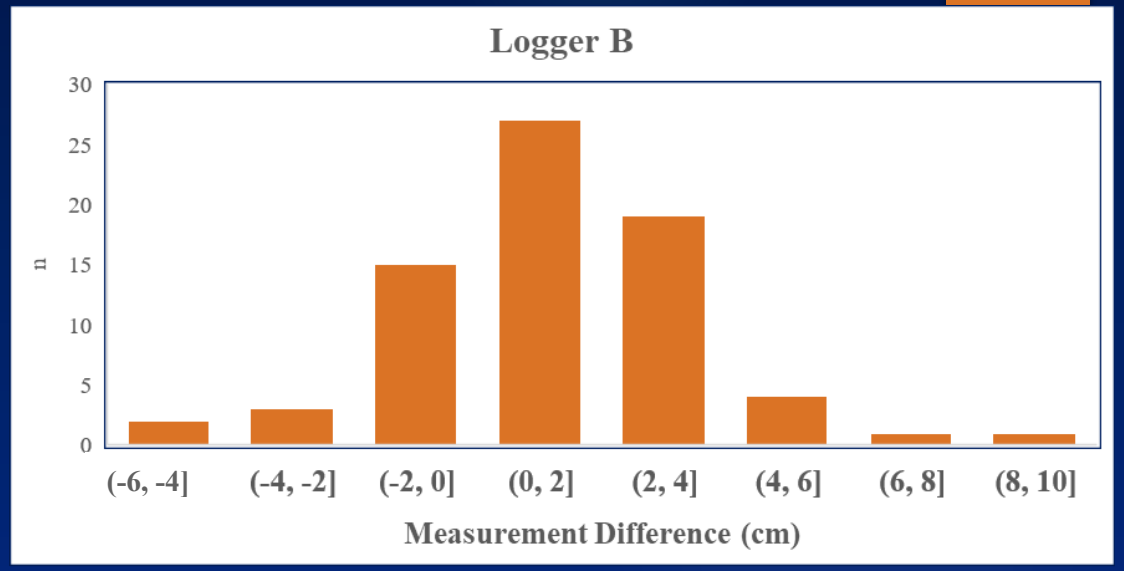


Figure 2. Data Distribution of Differences in Butt Diameter Measurement

Top Diameter Measurement Differences Distribution





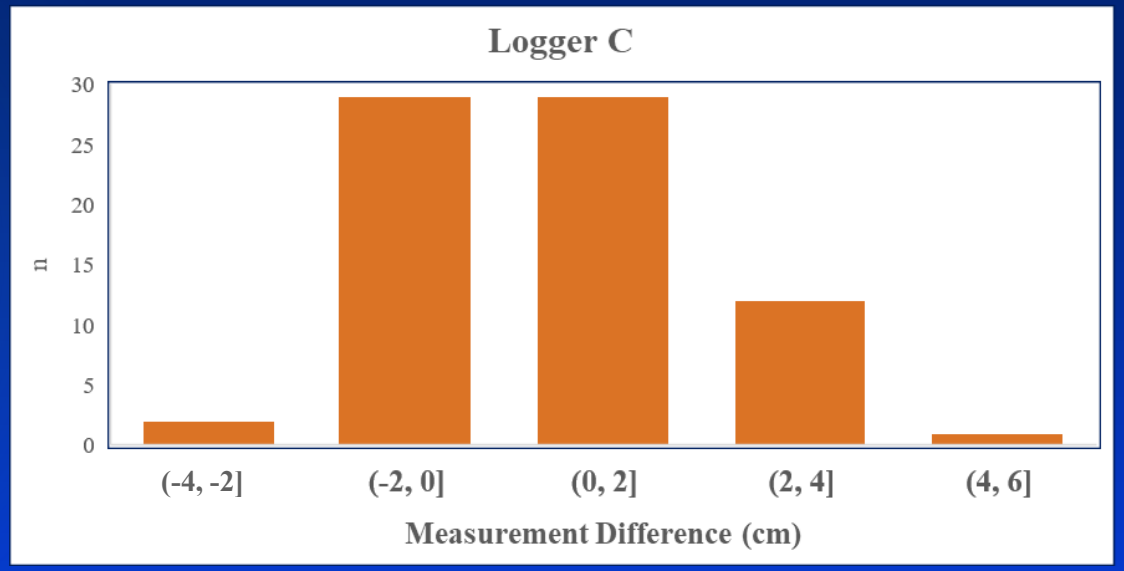
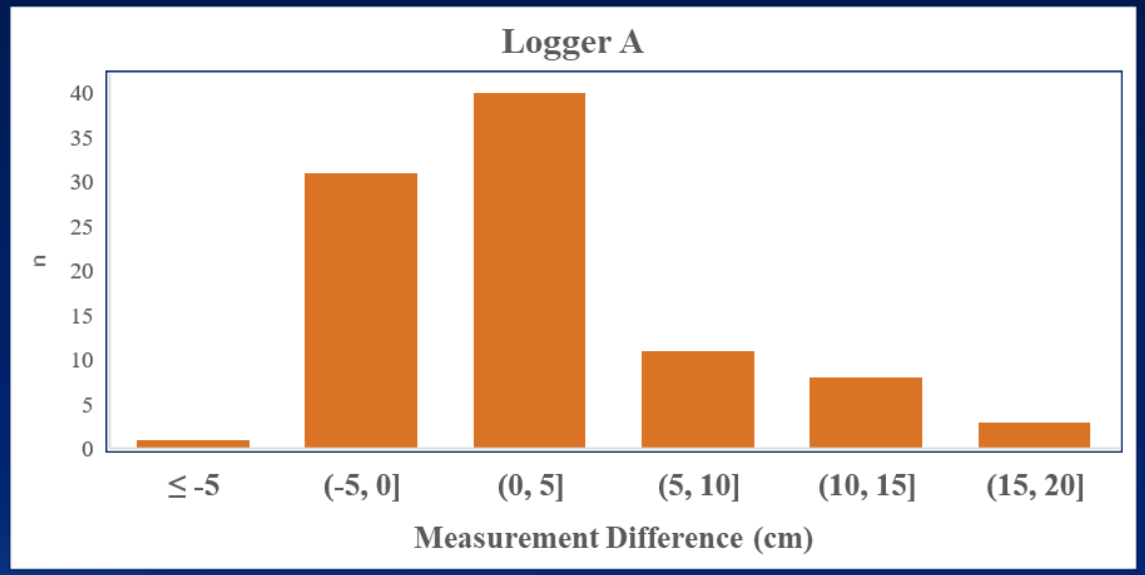
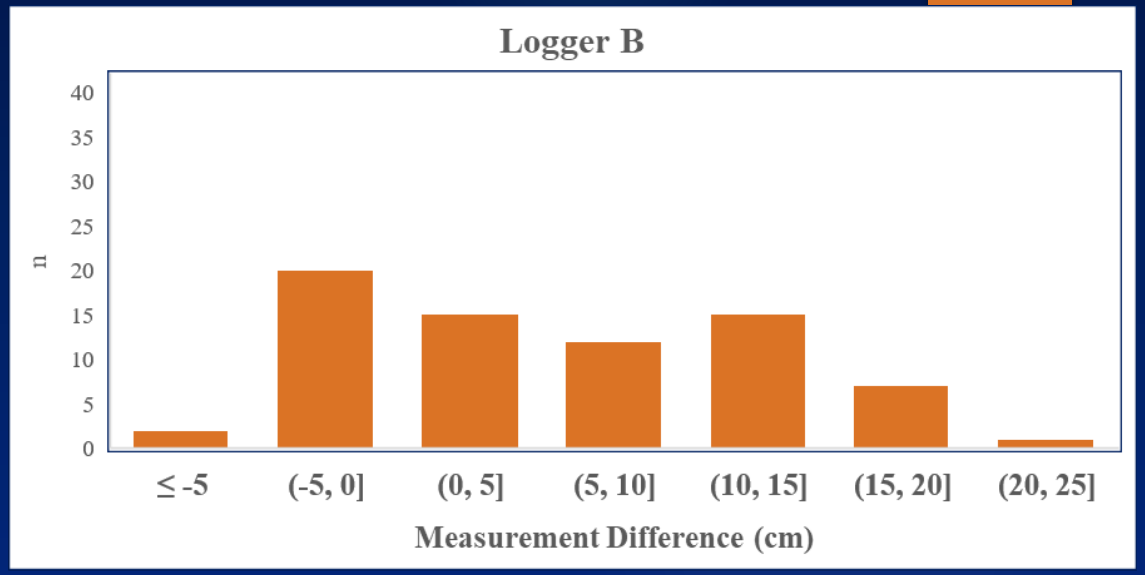


Figure 3. Data Distribution of Differences in Top Diameter Measurement

Length Measurement Differences Distribution





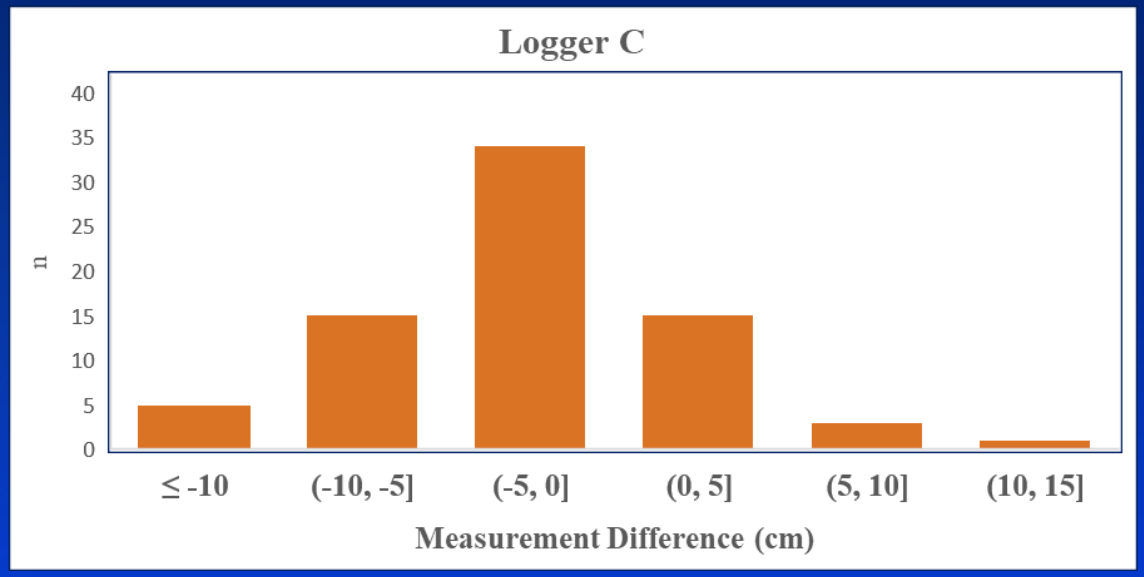


Figure 4. Data Distribution of Differences in Length Measurement

Table 1. Summary of Measurement Differences between Processing Head Measurement and Post-measurements

Logger	Measurement Difference					
	Butt Diameter (cm)		Top Diameter (cm)		Length (cm)	
	Mean	SD	Mean	SD	Mean	SD
A	2.87	2.19	3.79	2.43	3.15	29.14
B	1.04	2.35	1.19	2.18	5.45	26.11
C	-3.87	4.81	0.56	1.45	-2.57	17.41

Source of measurement differences

- The operators' experience
- Calibration
- Post measurements error (difficulties to measure the log's diameter)

Figure 5. Field Documentation

Next …

- Data collection in 5-7 operations in the Southeast US
- Re-visit the previous operations (Software update by Waratah)

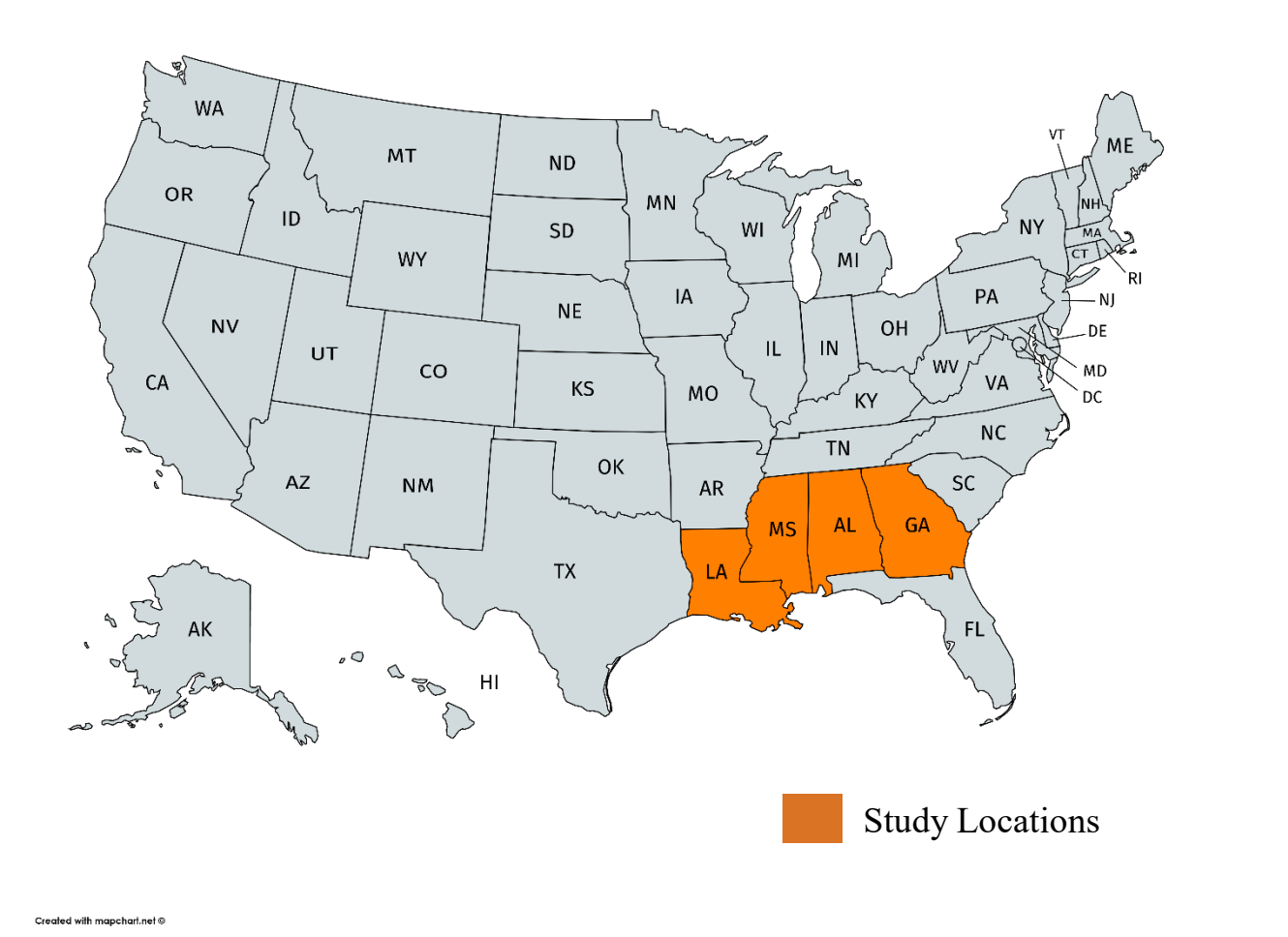


Figure 6. Study Locations

Questions?