Timber Measurements Society
Coeur d'Alene Idaho April, 2018
Logging Utilization in Arizona and New Mexico 2012-2017

Eric Simmons

Research Associate, Forest Industry Research Program,
Bureau of Business and Economic research, at University of Montana.

UNIVERSITY OF MONTANA

BUREAU OF BUSINESS AND ECONOMIC RESEARCH
UNIVERSITY OF MONTANA

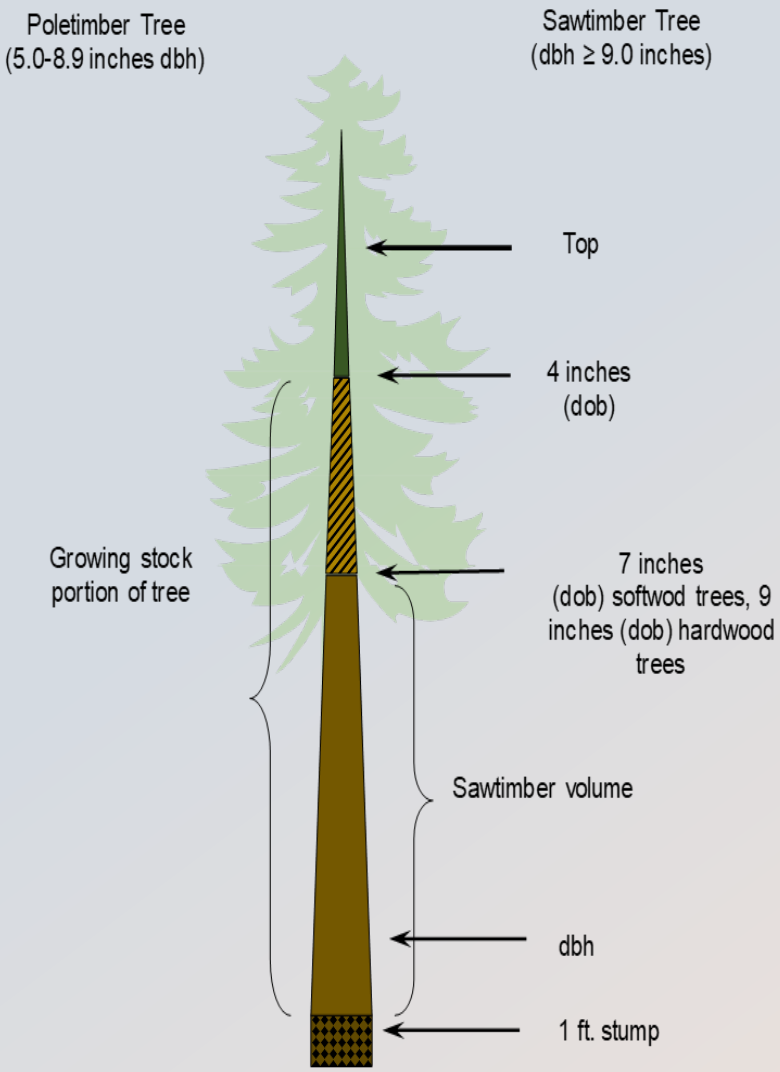
State Level Logging Utilization Objectives

The goal was to update logging residue data for Arizona and New Mexico. The study was designed to provide factors that are scalable to commercial timber harvesting operations at the state level. For this research, the logging residue factors were used to aid in quantifying feedstock supplies.

Objectives:

- Characterize harvest operations.
- Profile harvest by tree dbh.
- Develop residue ratios for calculating residue quantities based on harvest volume.

Terminology



Growing stock vs. non-growing stock

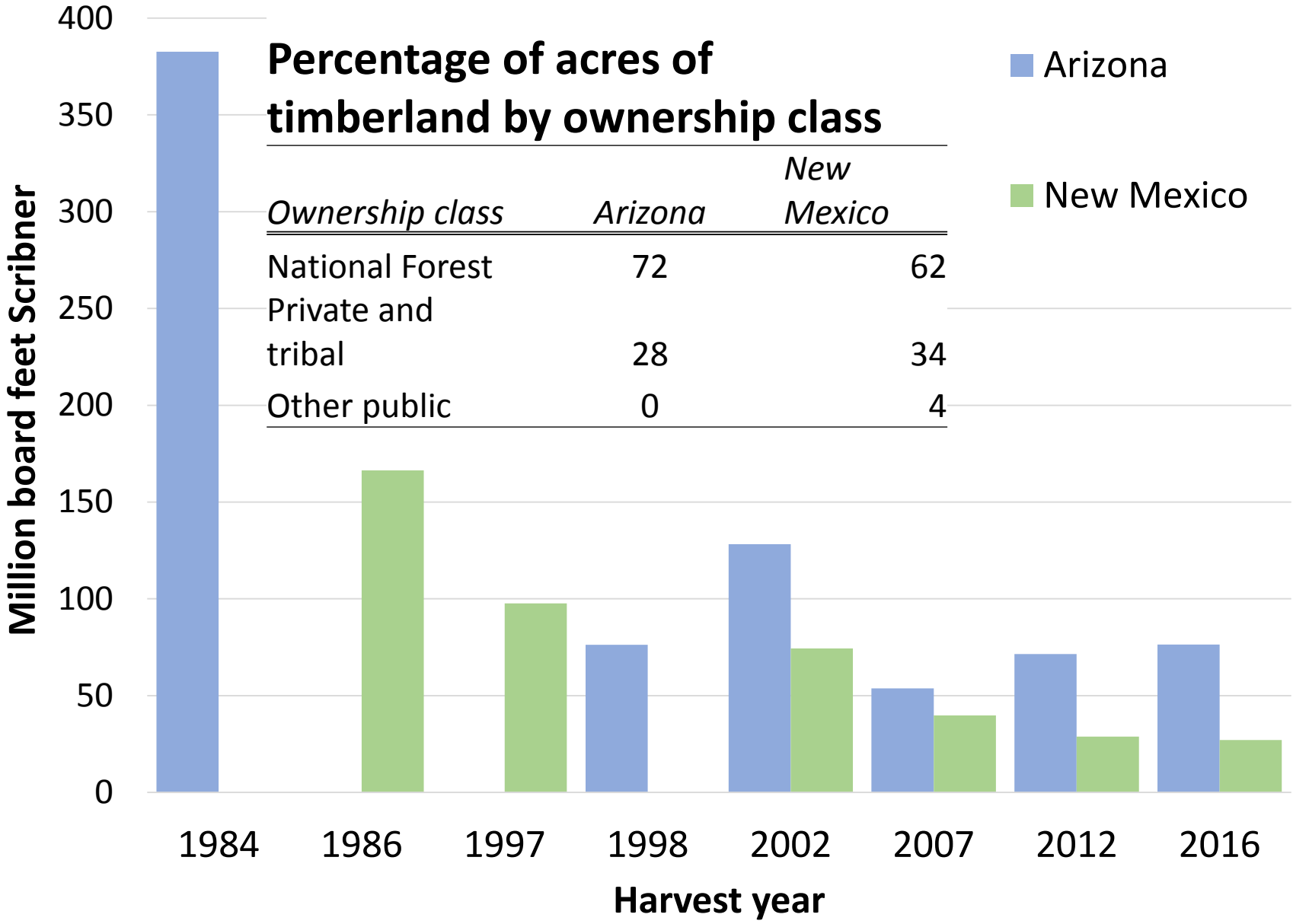
Removals = volume cut

- **Timber products** = logs to mills
- **Logging residue** = left in woods, component of "slash"

Growing stock logging residue is from the bole portion of trees from the 1 ft. stump to the 4" dob and does not include tops and limbs.

Percentage of acres of timberland by ownership class

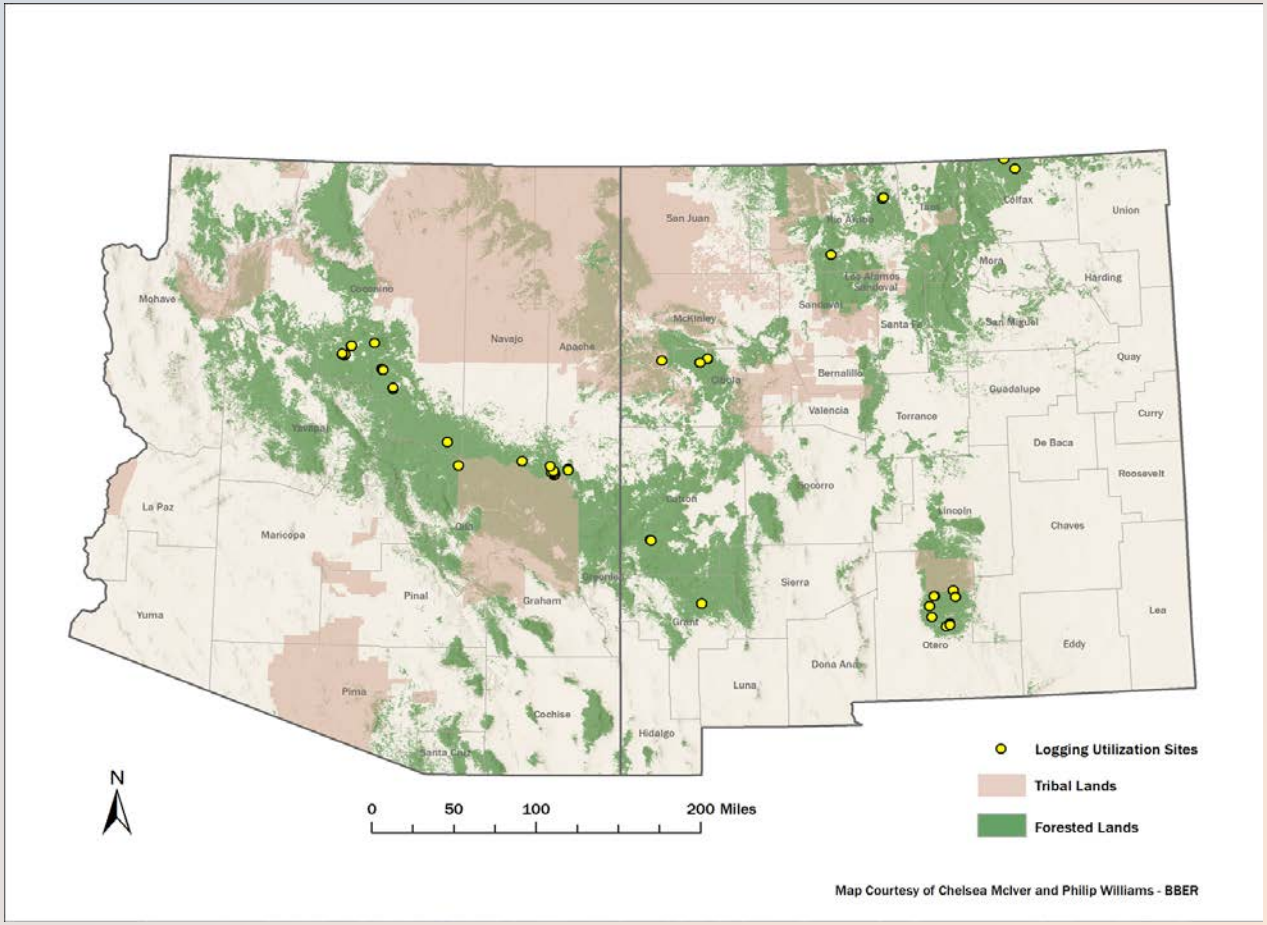
Ownership class	*Arizona*	*New Mexico*
National Forest	72	62
Private and tribal	28	34
Other public	0	4



Site selection

- Based on recent county level harvest volumes.
- Measurable felled trees & stumps.
- Commercial products
- Not salvage.
- Safe!

State	Sites	Trees
Arizona	30	750
New Mexico	24	608



Map courtesy of Philip Williams, Graduate Assistant in our program

Logging Utilization Methods

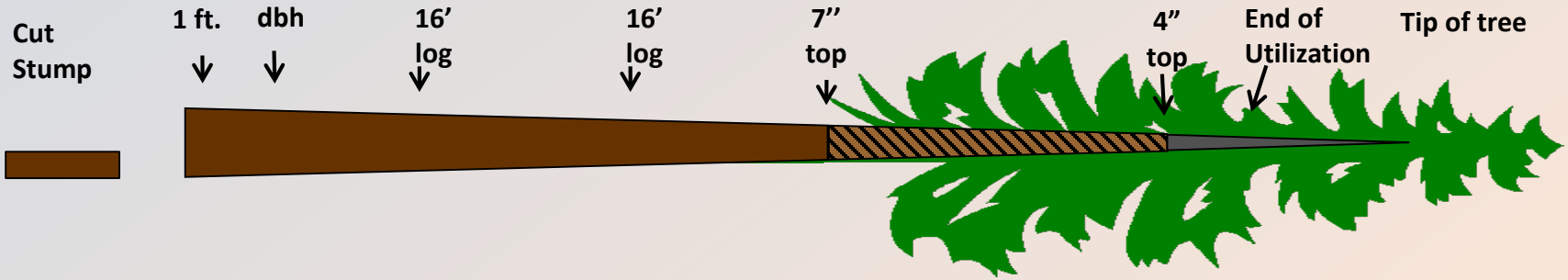
Site information from loggers & foresters

- Equipment & methods used.
- Products & receiving mill(s).
- Log lengths & small-end diameters.
- Cutting card was a utilization guide!
- Checked log decks and residue piles for top diameters.

Logging Utilization Methods

Felled-tree measurements:

- **Species & cut stump height.**
- **Diameters along bole at key points & sections ≤ 16’ from ground to tip of main stem.**
- **Identify each bole section as used (product) or not (residue).**



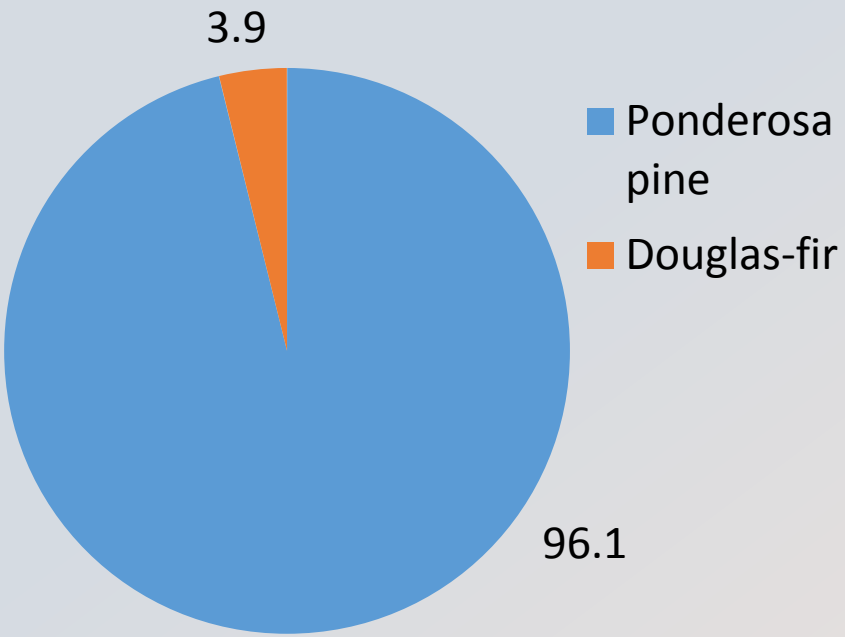
Results:

Logging systems

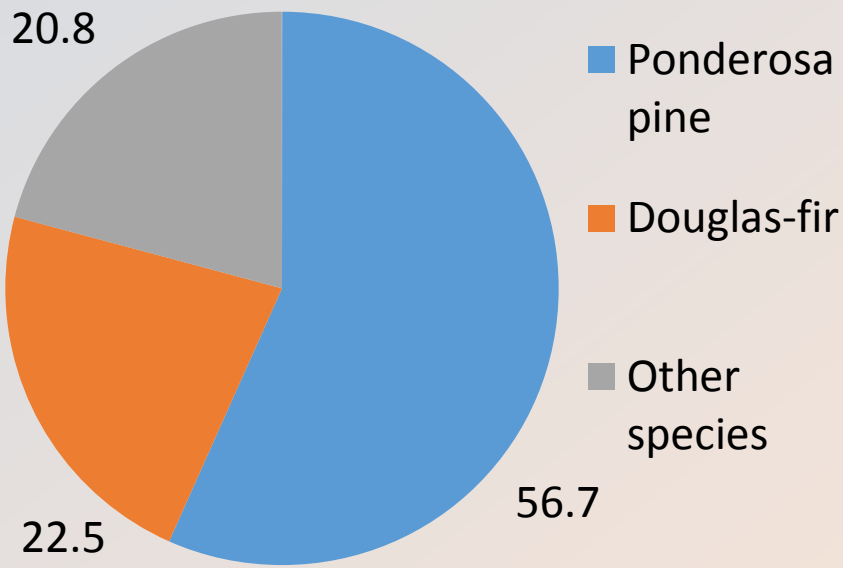
- More than 93% of Arizona sites were mechanically felled, skidded tree length, and mechanically merchandised at landings.
- 42% of New Mexico sites were hand felled, and merchandised with chainsaws in the unit. The majority used systems similar to Arizona.
- Ground based yarding was employed on all of the sites in both states.
- About 50% of the sites in Arizona had in woods grinding operations.

Trees by species

Percent of mill delivered volume by species Arizona



Percent of mill delivered volume by species New Mexico



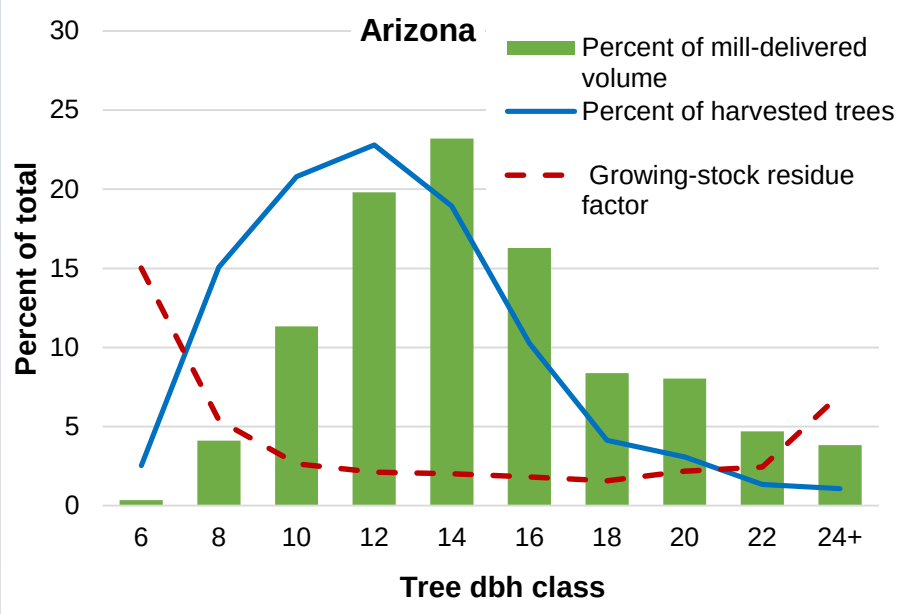
- **Ponderosa pine was the majority of the harvest in both states comprising 96% in Arizona and nearly 57% in New Mexico.**
- **Arizona treatments favored removing the ponderosa pine for fuels reduction and leaving other species.**
- **Engelman spruce comprised the majority of other species in New Mexico with some southwestern white fir and southwestern white pine.**

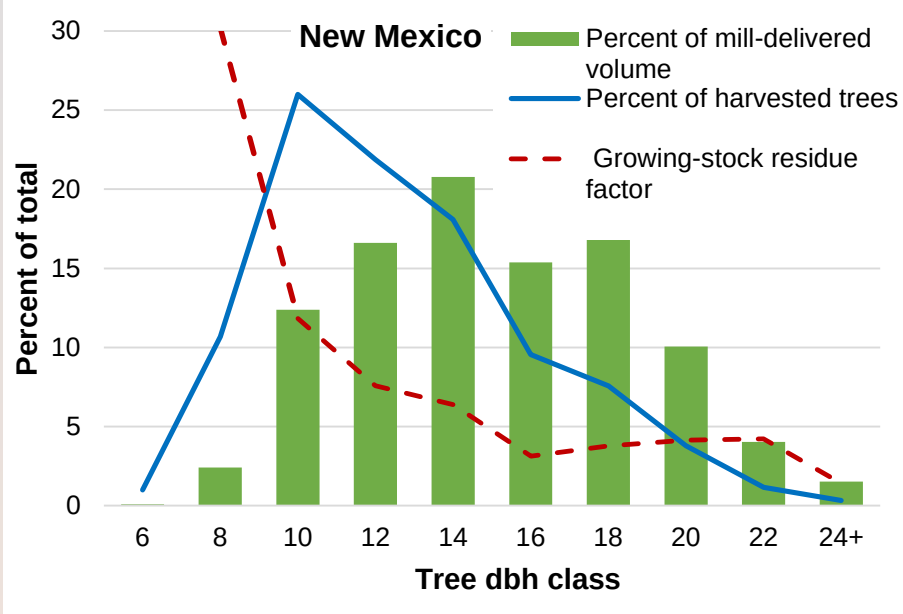
Trees by diameter

50% of trees in both states were ≤ 12.4 inches dbh.

- Arizona trees in this range produced 25% of the utilized volume and 31% of the logging residue
- New Mexico trees in this range produced 24% of the utilized volume and 44% of the logging residue.
- The lower proportion of residue in Arizona was due to the grinding of smaller trees and top material for biomass uses.

Proportions of mill delivered volume, harvested trees, and residue per mill delivered volume by tree dbh.





Arizona and New Mexico removals factors

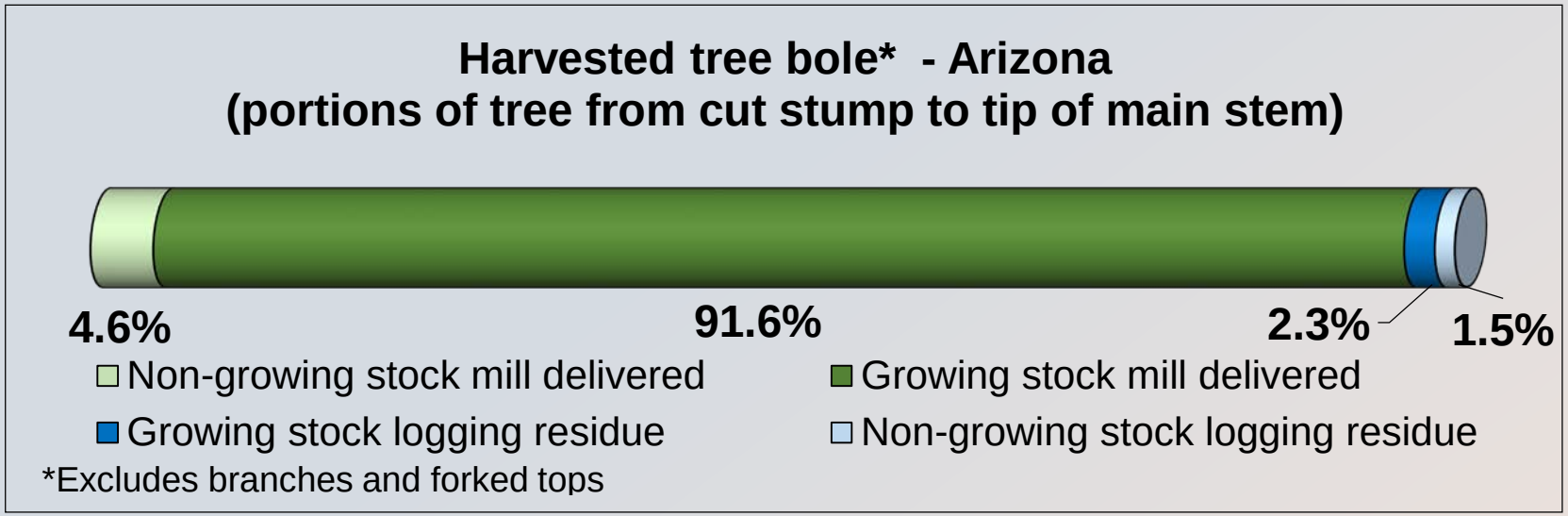
For every 1,000 cubic ft. (cf) of volume delivered to the mill in Arizona:

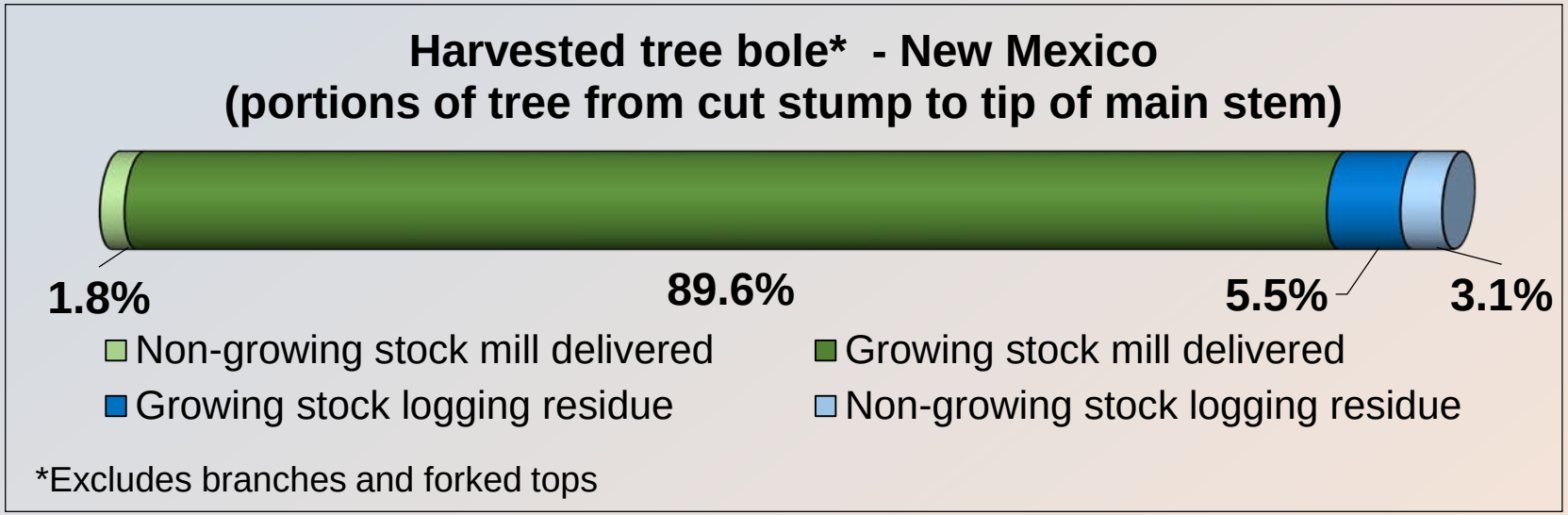
- 986 cf of growing stock (GS) is removed.
- 962 cf of GS is delivered to the mill.
- **24 cf of GS logging residue is created.**
- An additional 38 cf of non-GS (stumps and tops) is delivered to the mill.

New Mexico:

- 1,045 cf of growing stock (GS) is removed.
- 980 cf of GS is delivered to the mill.
- **65 cf of GS logging residue is created.**
- An additional 20 cf of non-GS (stumps and tops) is delivered to the mill.

Arizona and New Mexico harvested tree bole utilization





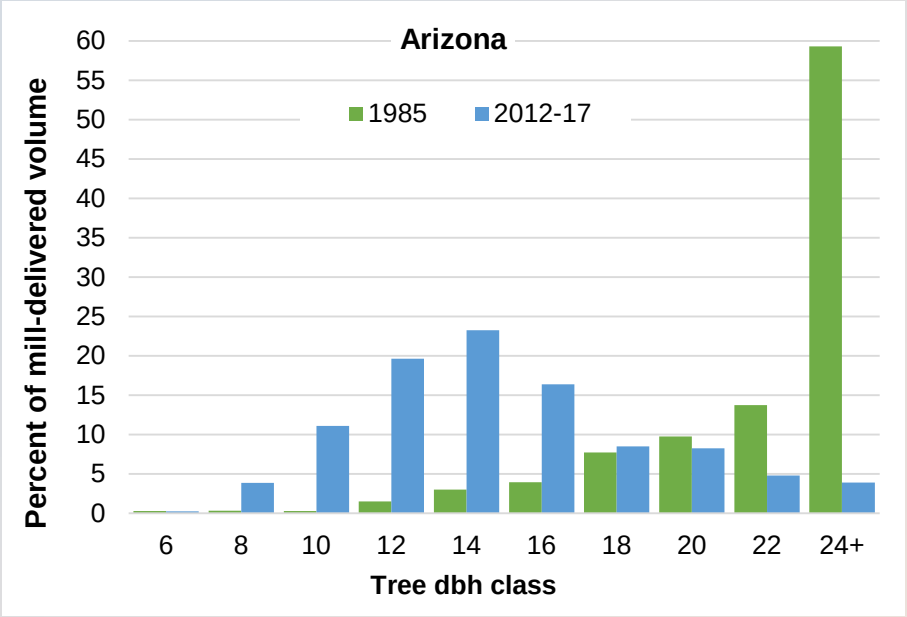
In Arizona 3.8% and in New Mexico 8.6% of the harvested bole volume (plus limbs & tops) remains in the woods as logging residue.

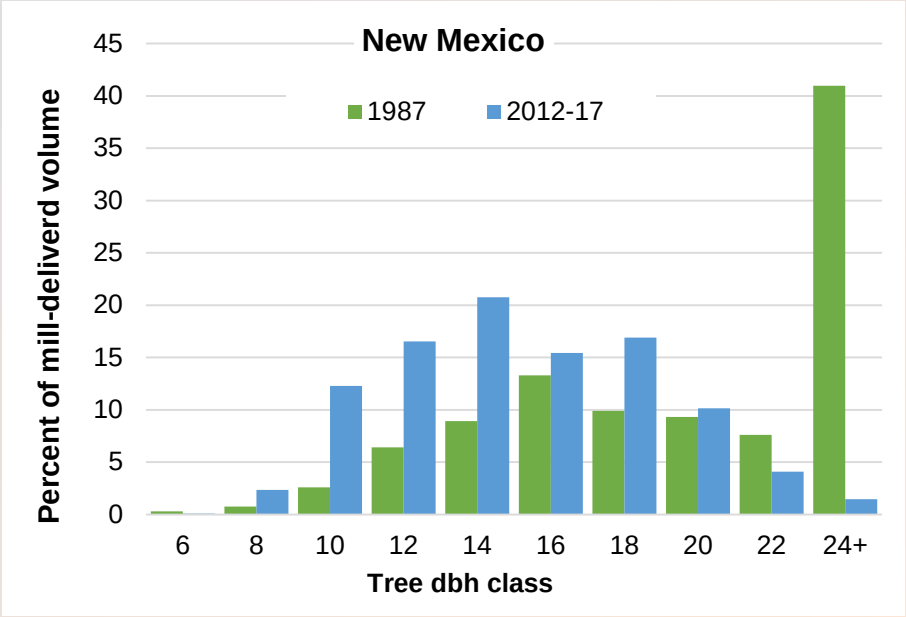
Changes through time

Tree dbh

- In the late 1980s, trees ≥ 24 inches dbh provided between 40 and 60 percent of the mill-delivered volume.
- Currently trees ≥ 24 provide less than 5% most comes from trees 10 – 16 inches dbh in Arizona and 12-18 inches dbh in New Mexico.
- Due to:
  - Perceived reduction of large tree inventory.
  - Restoration prescriptions focused on small trees.
  - Diameter caps.

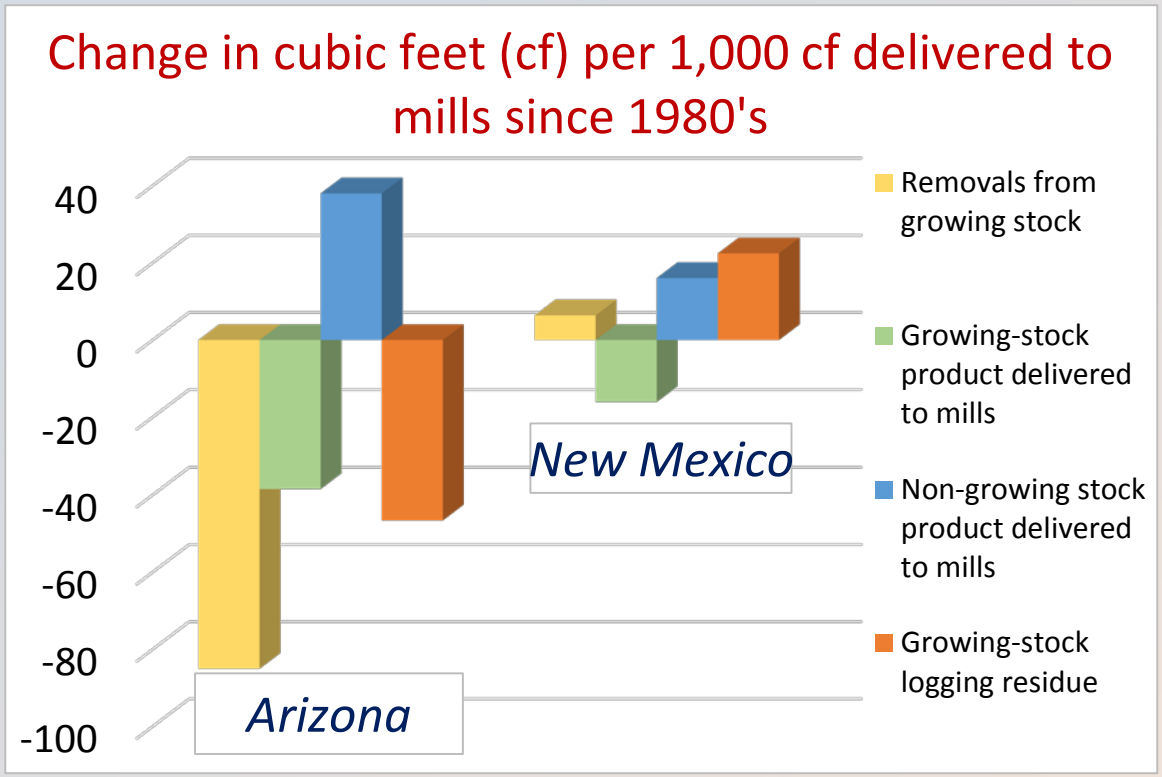
Percent of mill delivered volume by tree dbh previous study to current





Removals factors

- Since the late 1960's removals factors have improved in both states.
- Since the late 1980's the trend continued in Arizona.
- Since the late 1980's growing stock removals and logging residue factors have increased in New Mexico.



Why?

- End of utilization in Arizona, 2.6 inches diameter outside bark (dob).
- End of utilization in New Mexico, 6.1 inches dob.
- New Mexico has less demand for small tree product mainly biomass.
- Lack of capacity or capability of using smaller diameter trees for product.

Some takeaways

- Smaller trees produce proportionally more logging residue compared to their mill delivered volume.
- Logging residue factors increase exponentially as small end diameter utilization increases.
- Generally, resource utilization has improved over time.
- Milling infrastructure, product diversity, and treatment objectives can have a direct effect on harvested tree utilization.

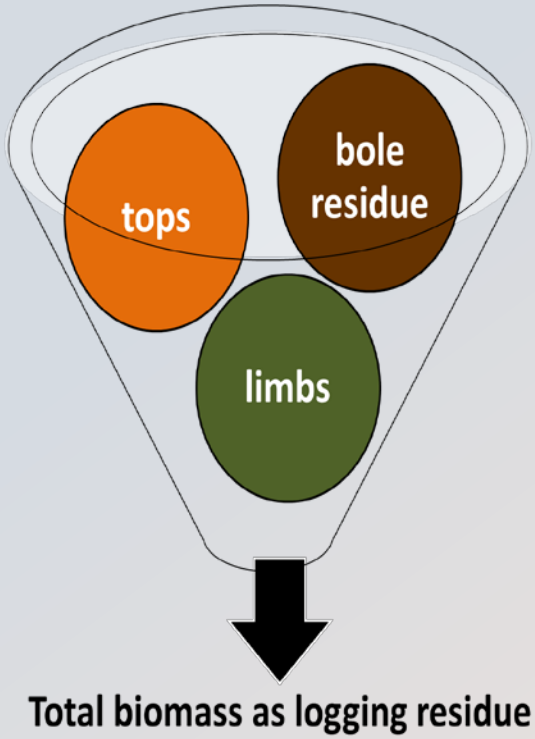
Thank you and see you in the woods!

Eric Simmons:
eric.simmons@business.umt.edu
Steve Hayes:
steve.hayes@business.umt.edu
Erik Berg:
erik.berg@business.umt.edu

On the web at:
http://www.bber.umt.edu/fir/

BUREAU OF BUSINESS AND ECONOMIC RESEARCH
UNIVERSITY OF MONTANA

Uses for this information



- Removals factors.
- Whole tree volume equations for tops and limbs.
- Mill study data.
- Scalable to harvest.

2.07 green tons of residue per MBF of commercial harvest Oregon (2013 TPO data) and 1.89 Washington (2014 TPO data).

Northwest Advanced Renewables Alliance (NARA)

Washington State University, Oregon State University, Idaho State University, University of Washington and The University of Montana

- The answers will not be the same for
- Methodologies may be useful
- Supply chain
- Logistics
- Life cycle analysis (carbon accounting)
- Socio-economic analysis
- Quantifying residues (already partially done with this study)

http://nararenewables.org/