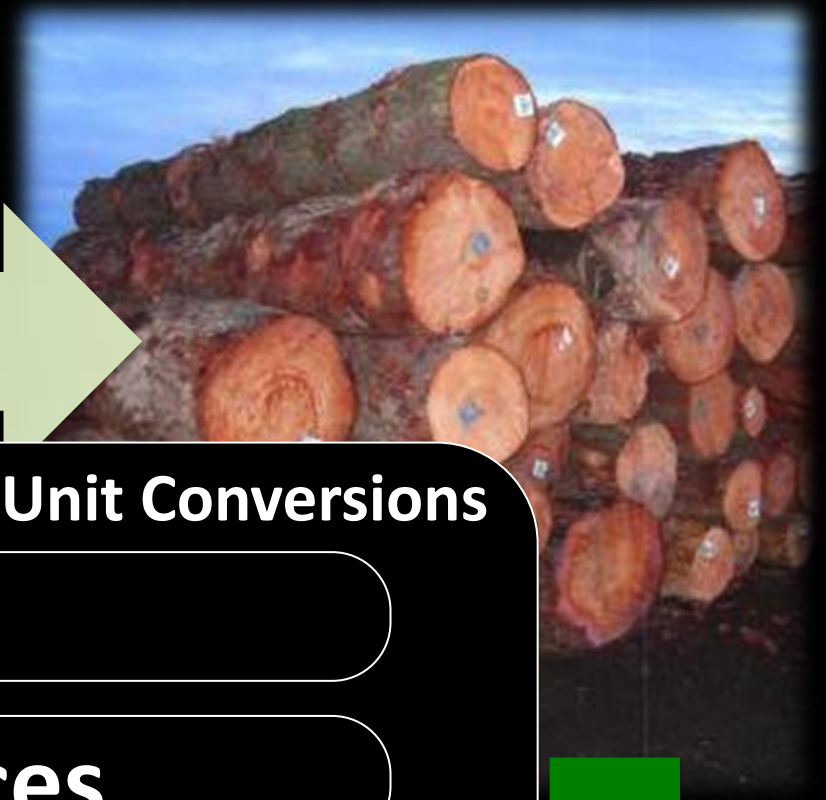
Lost In Translation

Consequences of mistaken timber volume unit conversions & how to minimize them

Neal Hart, Jendro & Hart, LLC

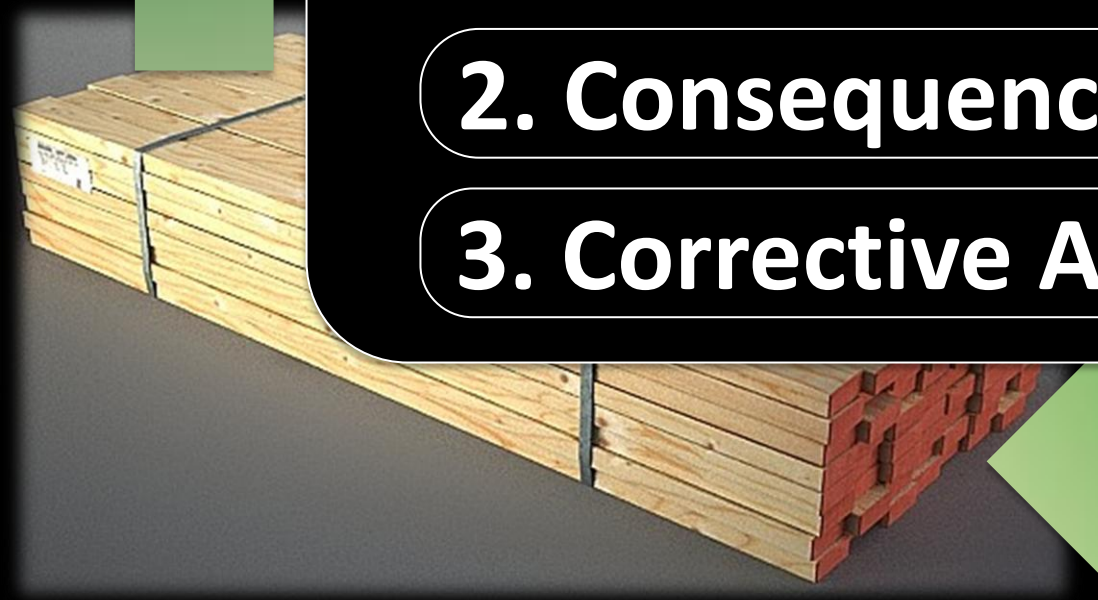
Western Forest Economists Meeting, May 2016

Lost In Translation



Mistaken Timber Volume Unit Conversions

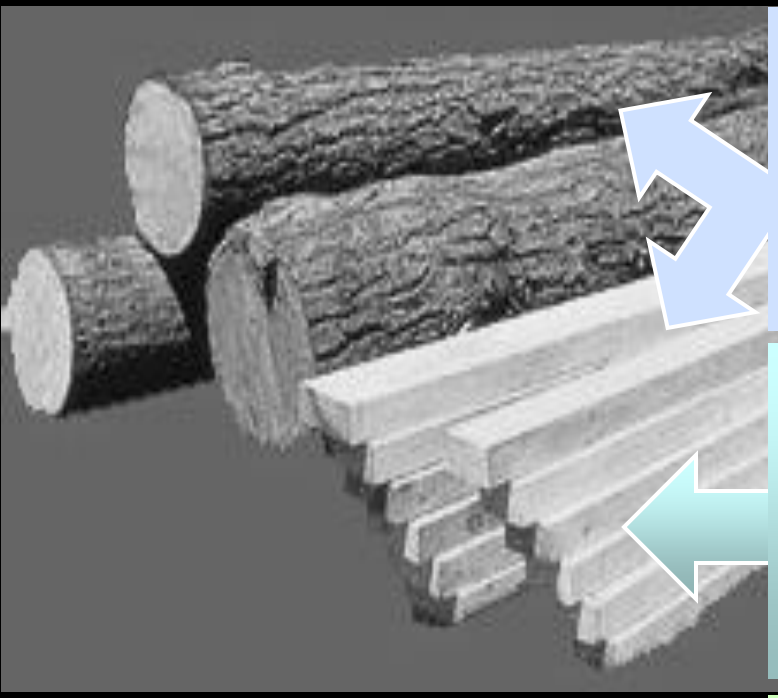
1. Causes
2. Consequences
3. Corrective Actions



Neal Hart, Jendro & Hart, LLC

Western Mensurationists Meeting, June 2015

Three common, *but false*, presumptions about Board Foot measurements:

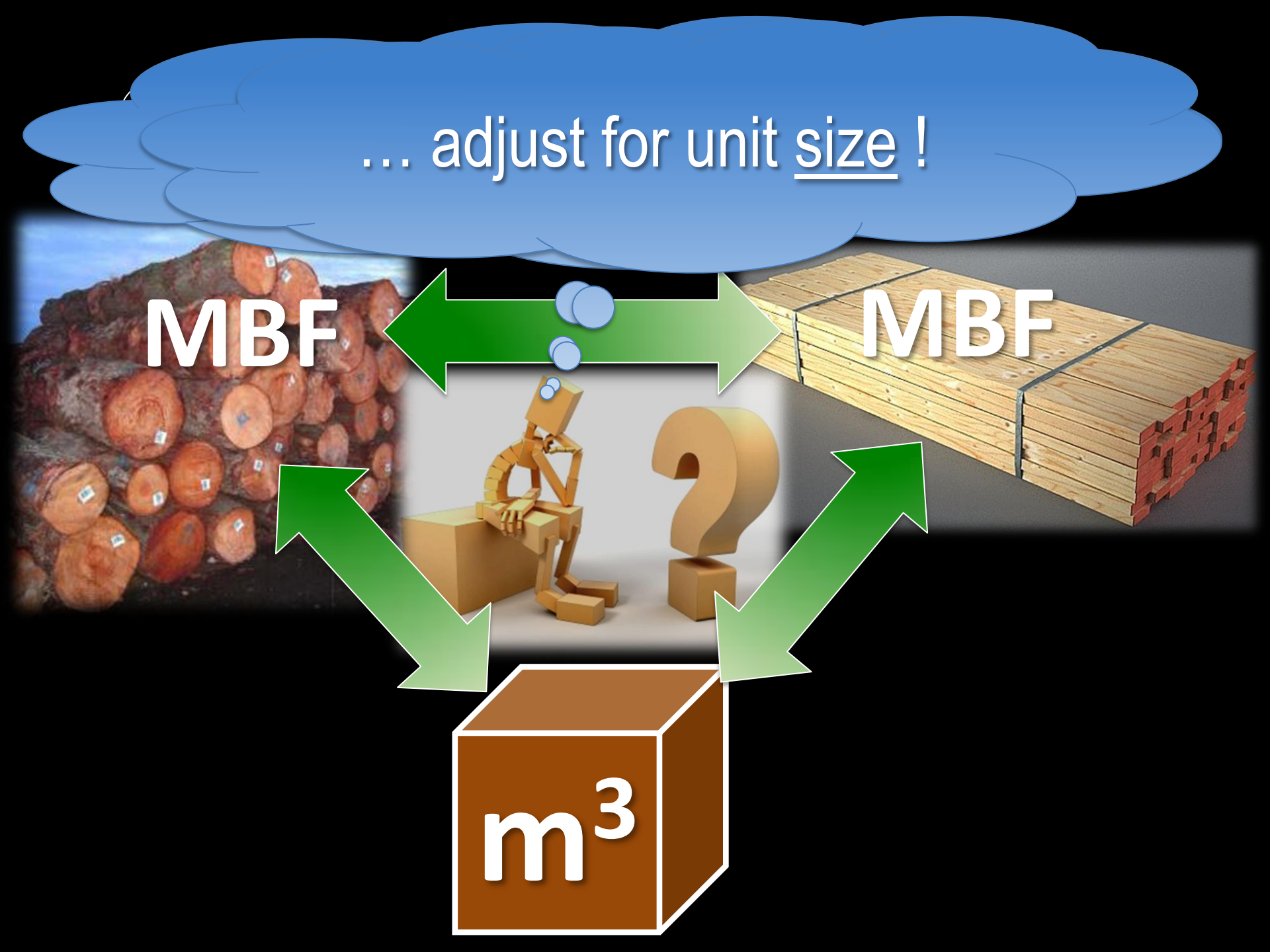


1. A "board foot" is the same in log and lumber measurement

2. Board foot log scales accurately predict lumber volume

3. The ratio of board feet to other scales is a single precise factor

Like:
Feet x 0.3048
= Meters


… adjust for unit size !
MBF
MBF
m3

$83.333 \text{ cf} \div 35.315 \text{ cf} = 2.36 \text{ m}^3 / \text{MBF}$

$2.36 \text{ m}^3 = 1 \text{ MBF}$

m^3

35.315 cf

83.333 cf

… unit conversion should be the same for both!

MBF

MBF

2.36

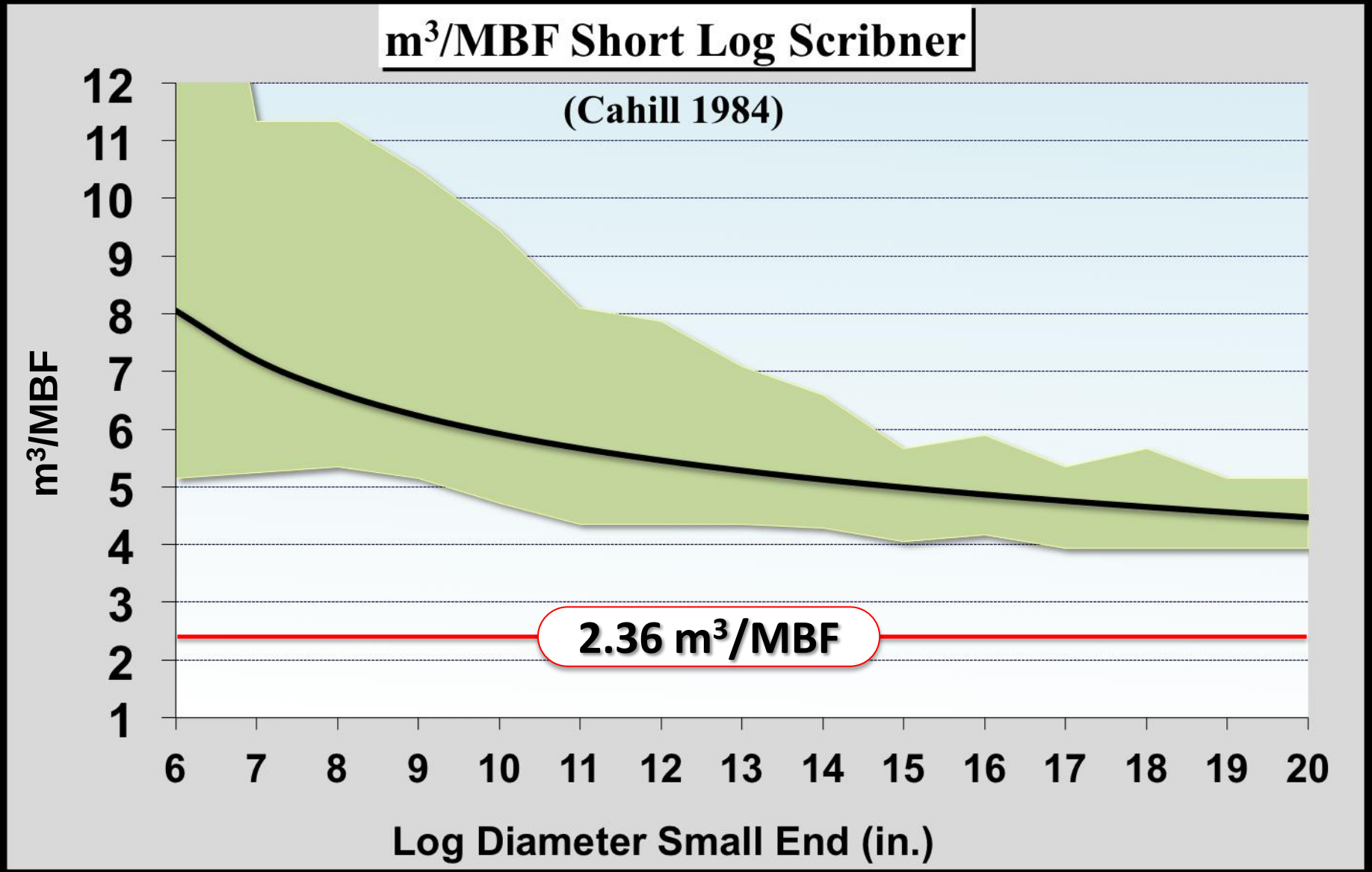
2.36

Never True for Logs

True *only* in special cases for Lumber

m^3

2.36 factor vs. reality for logs



2.36 factor vs. reality for softwood lumber

Product (nom. dim.)	GTS m^3/MBF	Finished m^3/MBF	
1 or 2 x 2	1.81	1.33	
1 or 2 x 3	1.93	1.47	1.50
1 or 2 x 4	1.96	1.55	1.57
1 or 2 x 6	2.02	1.62	
1 or 2 x 10	2.04	1.64	
1 or 2 x 12	2.04	1.66	
4 x 4	2.13	1.81	
4 x 6	2.20	1.89	
6 x 6	2.27	1.98	

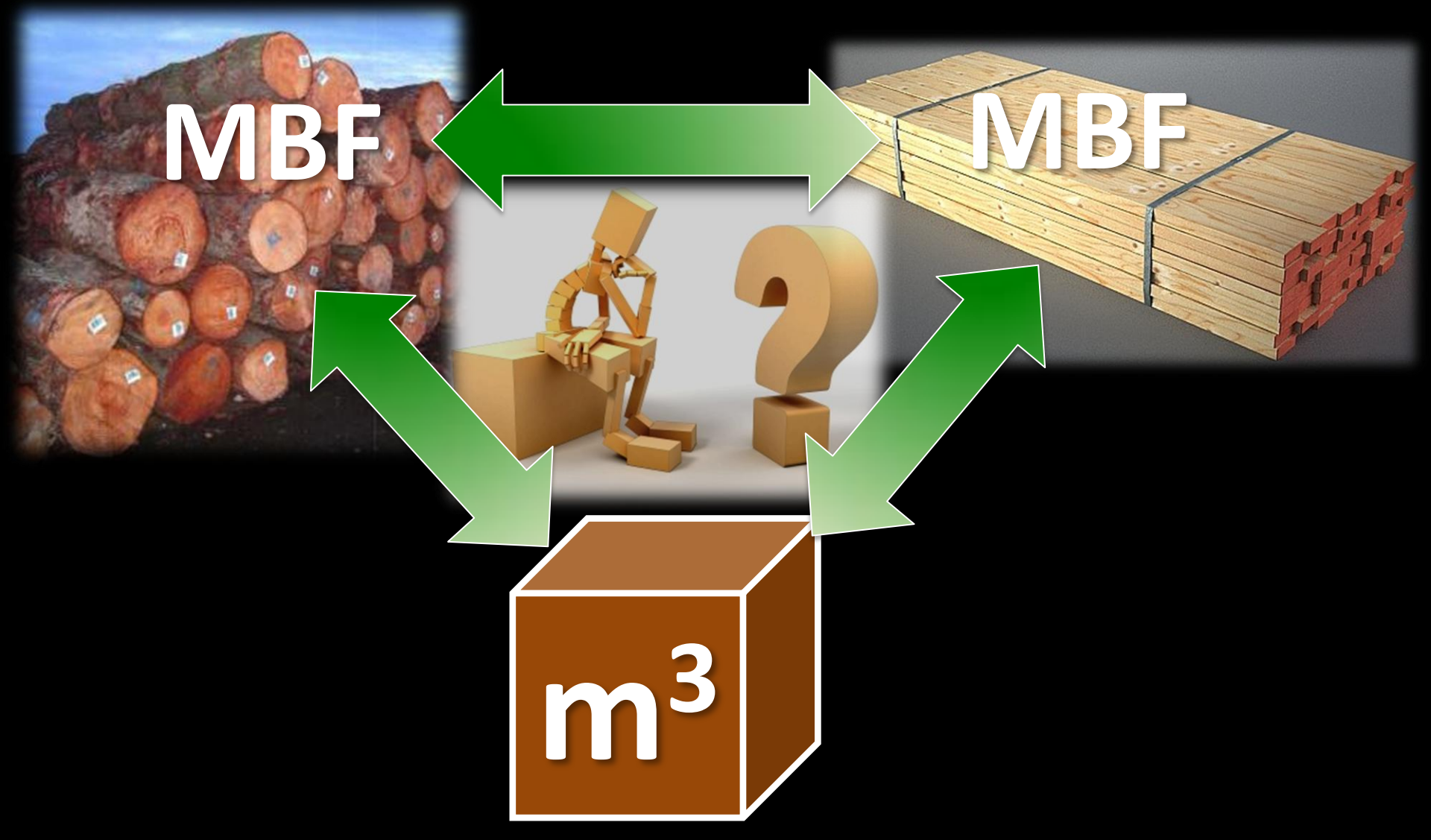
If PET studs

2.36 factor vs. reality for hardwood lumber

Product (nom. dim.)	GTS m^3/MBF	Finished m^3/MBF
2/4	1.43	0.74
3/4	2.06	1.33
12/4	2.54	2.16
16/4	2.54	2.21

Pallet lumber accounts for 44% of US hardwood lumber production with ave. conversion ratio of approx. 1.55 m^3/MBF

Misleading or incorrect conversion tables



2.36 factor is being used for logs & lumber

The conversions in this table are only suitable for converting volume units of harvested roundwood or processed sawtimber to approximate alternative units, but not for estimating standing volume of biomass.

Section: Appendix A
olume to Volume Conversion Factors

…suitable for converting volume units of harvested roundwood or processed sawtimber…

2.3598 m^3/MBF

FROM	cord	cord	cunit	foot	board feet	average	average
standard cord						128	3.6246
solid cord						80	2.2653
cunit	0.7813					100	2.832
board foot	0.00065	0.00104	0.00083	1	0.001	0.0833	0.0024
1,000 board feet	0.651	1.0416	0.8333	1,000	1	83.33	2.3598
cubic foot	0.0078	0.0125	0.01	12	0.012	1	0.0283
						35.3146	1

(Verified with several other sources.)

Source:
http://www.[illegible]conversion.org/
(Verified with several other sources.)

Ex. of misleading sources for 2.36 factor

PORT OF PORTL

Metric Conversion Table*

To Find	Given	Multiply	X
Kilograms	Pounds	Pounds	0.4536
Pounds	Kilograms	Kilograms	2.2046
Metric Tons	Short Tons	Short Tons	0.9072
Metric Tons	Long Tons	Long Tons	1.0160
Short Tons	Kiloton/Metric Tons	Metric Tons	1.1023
Long Tons	Metric Tons	Metric Tons	0.9842
Cubic Mete			1.1327
Measurem			0.8828
Square Fe			10.76
Square Mete			0.0929
Cubic Feet	ubic Meters	Cubic Meters	35.3147
Cubic Meters	Cubic Feet	Cubic Feet	0.0283
Cubic Meters	MBF (Thousand Board Feet)	MBF	2.3597
MBF (Thousand Board Feet)	Cubic Meters	Cubic Meters	0.4238
Acres	Hectares	Hectare	2.47
Hectares	A		0.405
Miles			0.62
Kilometers			1.609
Square Feet			43,560

* The equivalents and metric conversion tables page for information only. Not on file with the FMC.

Product is not identified

2.3597 m^3/MBF

Ex. of misleading sources for 2.36 factor

CONVERSION TABLE

Factors to Convert Reported Units of Quantity to Harmonized System Units of Quantity

Product is not identified

Reported Uni… Name/Abbrev.	…ne/Abbrev.	…tiplication Factor to Convert
…	…	…
Board foot (BFT)	Cubic meter (CBM)	0.00236
…	…	…
Thousand board feet (MBF)	Cubic meters (CBM)	2.360

Misleading conversions in gov't publications

USDA
United States Department of Agriculture

Factors for converting between metric and in-lb units of measure[a]

Unit	Conversi	
square foot		
cubic foot (	17	ubic meter
short ton (chips)	0.0185	,000 cubic feet
board foot (hardwood lumber)	0.00236	cubic meter
board foot (softwood lumber)	0.00170	cubic meter
board foot (lumber export and imports)	0.00236	cubic meter
board foot (logs)	0.00453	cubic meter

4.53 m³/MBF

2.36 m³/MBF

1.70 m³/MBF

Misleading conversions in gov't publications

USDA
United States Department of Agriculture

Production, Prices, Employment and Trade in Northwest Forest Industries, All Quarters 2013

4.53 m^3/MBF

Conversion Factors Used in This Report

For logs: 4.53 cubic meters equals 1 thousand board feet

For lumber: 2.36 cubic meters equals 1 thousand board feet

For veneer: 92.9 square meters equals 1 thousand square feet

For plywood: .885 cubic meters equals 1 thousand

2.36 m^3/MBF

For chips, paper, and pulpwood: .907 metric tons equals 1 short ton

Forest Service | Pacific Northwest Research Station | Resource Bulletin PNW-RB-266 | September 2015

Misleading conversions on the internet

Global Wood

Serving The Lumber & Wood Products Industry

Welcome !

Home | News | Market | Showroom | Classified Ads | Trade Center | Products | Companies | Technology | User Services

Timber Technology & Knowledge Center

Wood Products Weights & Measures

1 FBM = 1 board foot 12" x 12" x 1"
1 MFBM = 1,000 fbm
1 M[illegible] board)
1 [illegible]
1 cord [illegible] wood, 1[illegible]
1 tonne - 1000 kil[illegible] = 1.1023 tons
1 ton = 200 lbs - [illegible] tonnes
# of imperial un[illegible] conversion factor = metric units/conversion factor = i[illegible]al units

5.1282 m³/MBF

2.3598 m³/MBF

Round Wood	Lumber
1MFBM = 5.1282 m3	1 MFBM = 2.3598 m3
1 Cord = 2.4070 m3	1 Cord = 1.1075 m3
1 Cunit = 2.8317 m3	1 Cunit = 1.3029 m3

Misleading conversions on the internet

About.com
Forestry

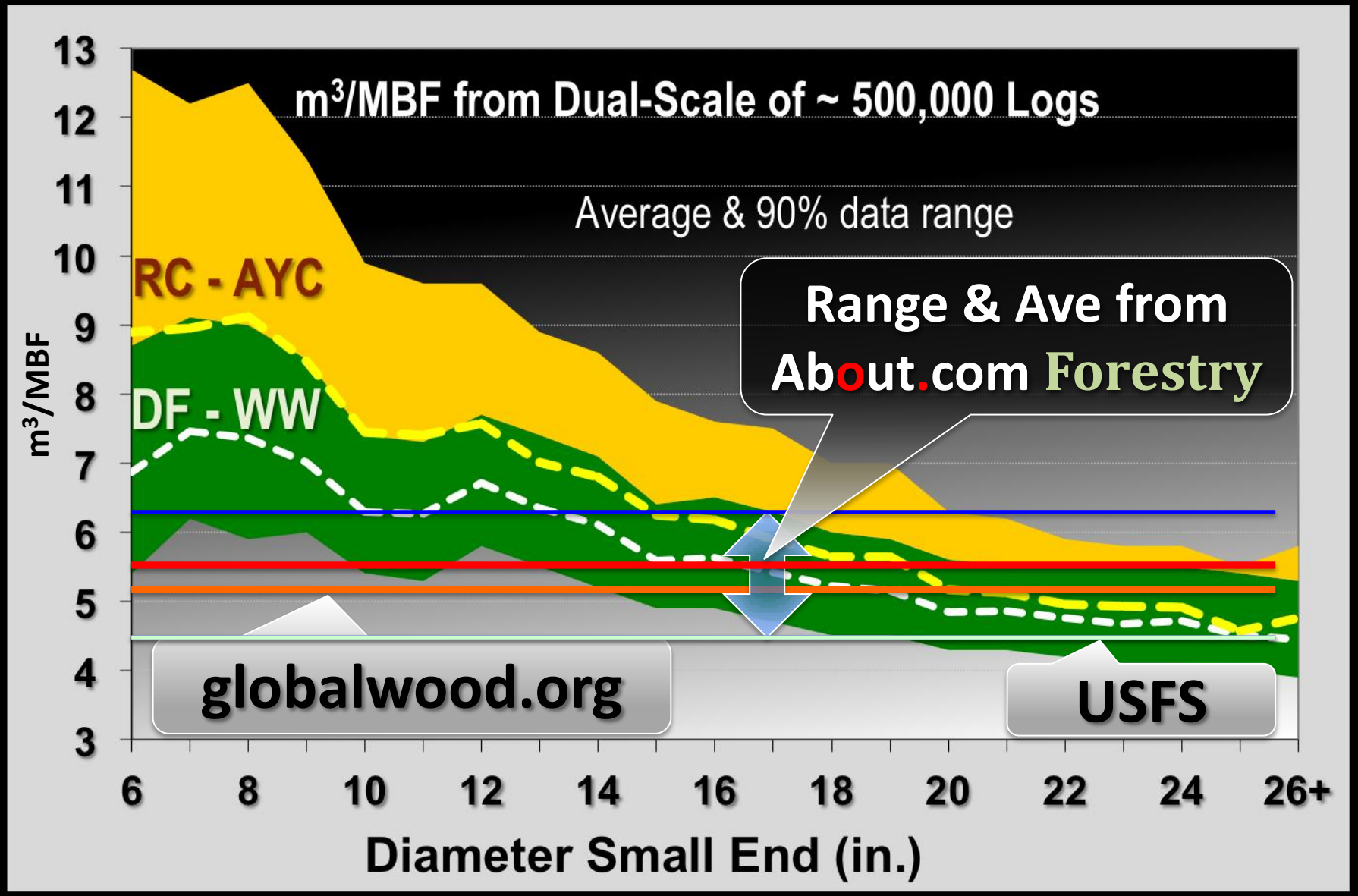
Question: How do y… board feet to cubic fee…

Answer: One thousand board feet (mbf) equals approximately 183 cubic feet. Depending on the kind and condition of wood actual conversion can range from 160 to 220 cubic feet per mbf.

5.46 m^3/MBF

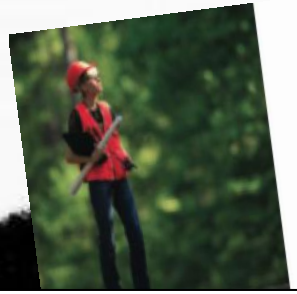
4.54 to 6.25 m^3/MBF

Empirical conversion data - Scribner LL



Empirical conversion data - Scribner LL

WEYERHAEUSER 2013 ANNUAL REPORT AND FORM 10-K



Weyerhaeuser

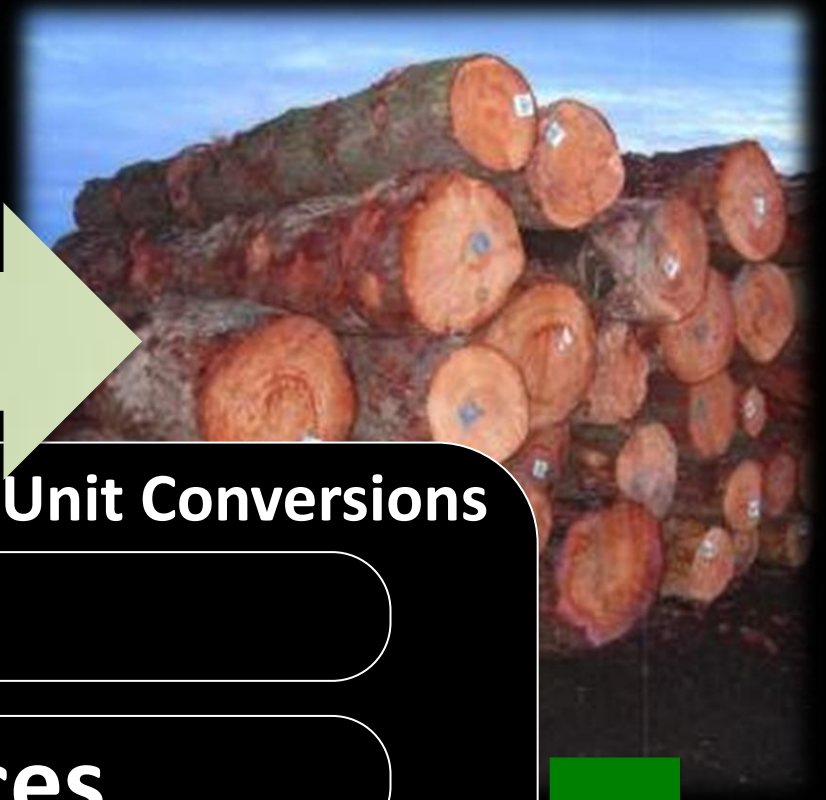
HOW WE MEASURE OUR PRODUCT

We report Timberlands data in cubic meters. … Cubic meter volume … provides a more consistent and comparative measure of timber and log volume … than other units of measure…

The average conversion rate for MBF to cubic meters is approximately 6.7 cubic meters per MBF.

6.7 m^3/MBF

Lost In Translation



Mistaken Timber Volume Unit Conversions

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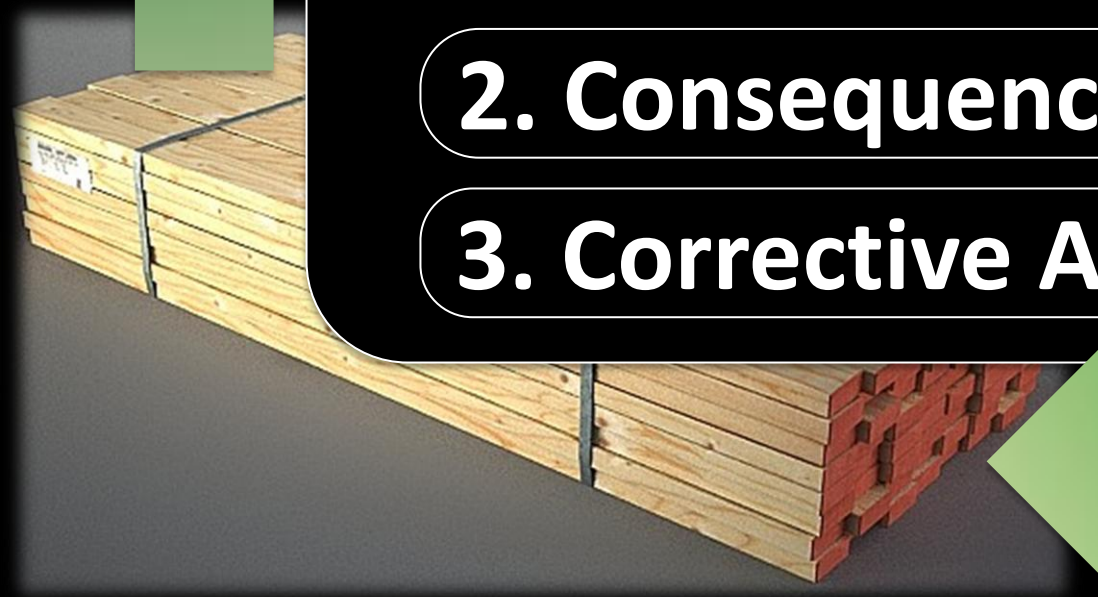
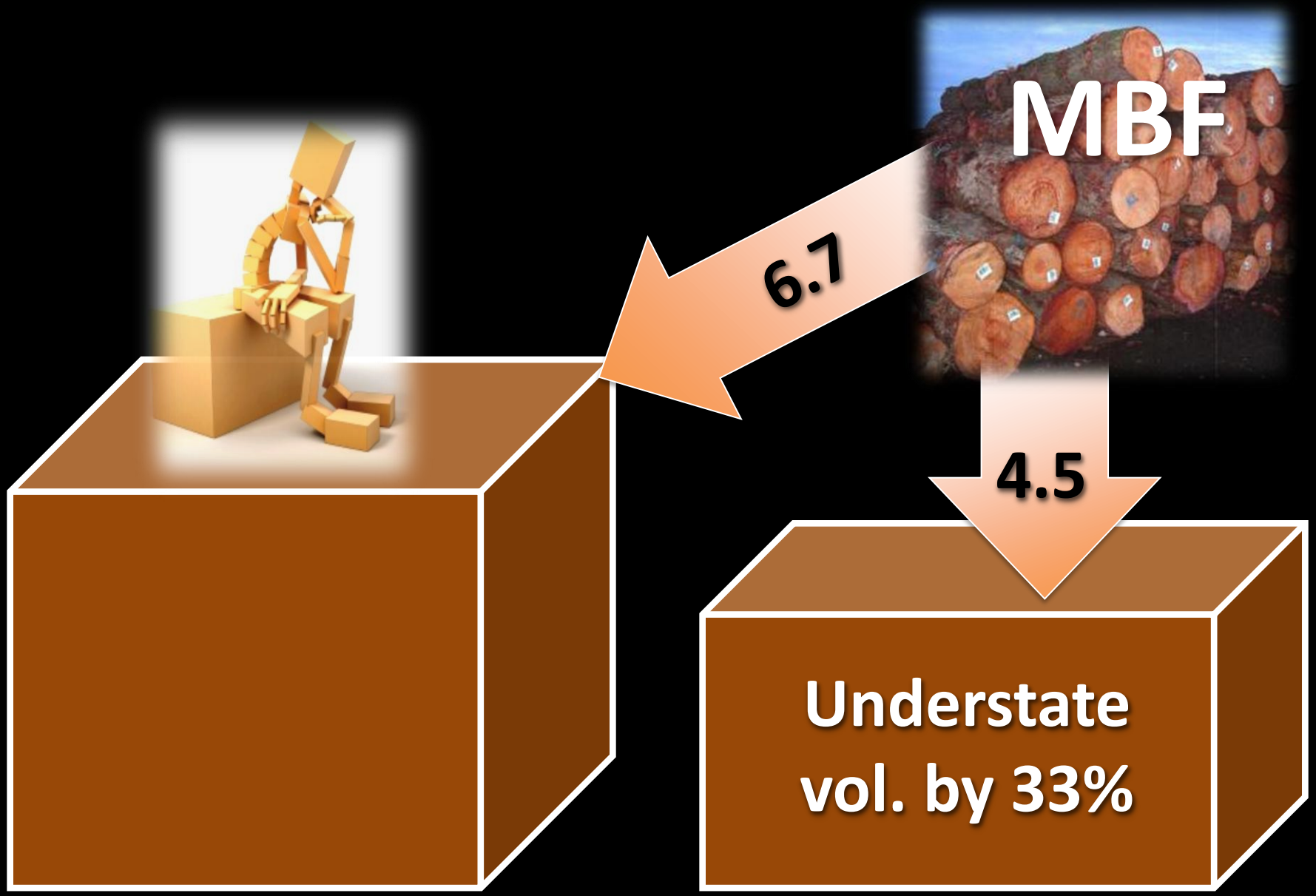


Neal Hart, Jendro & Hart, LLC

Western Mensurationists Meeting, June 2015

Conversion errors are often large



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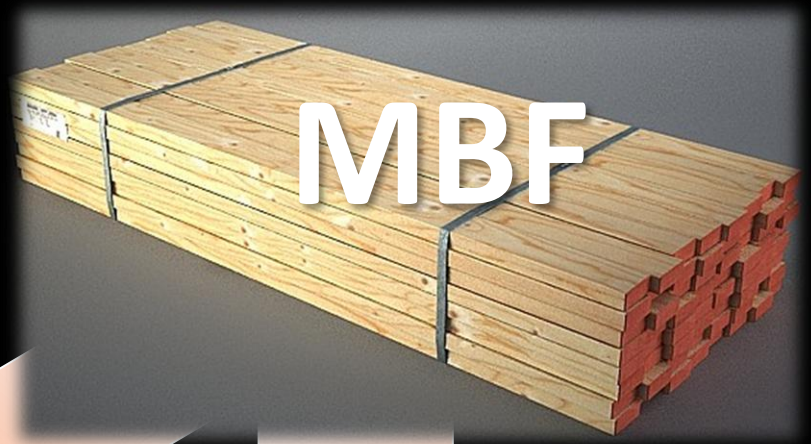

1.60

2.36

Overstate vol. by 48%

Consequences in economic research

Forest Products Export Trends Update for the Pacific Northwest Region

October 24, 2005

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Published N

This paper is part of a series of discussion papers w
salient issues identified as important by participants at the
Land Base forum in November 2004.

II. Key Supply and Demand Factors Impacting Trade

Placing log harvest levels in perspective, Washington harvest levels have declined substantially from their peak in 1987 to about half. Much if not all of this decline was brought about by harvest restrictions put in place to protect forest habitat. Significant amounts of forested lands were withdrawn from timber production.

At the same time as Washington's harvest levels declined, other countries increased their levels. Harvest levels in Chile and New Zealand have grown substantially and now exceed Washington. Levels in Finland expanded following the 1991 recession and are 2.5 times Washington's total. This global shift in timber harvests has had important implications for Washington's primary and secondary product exports.

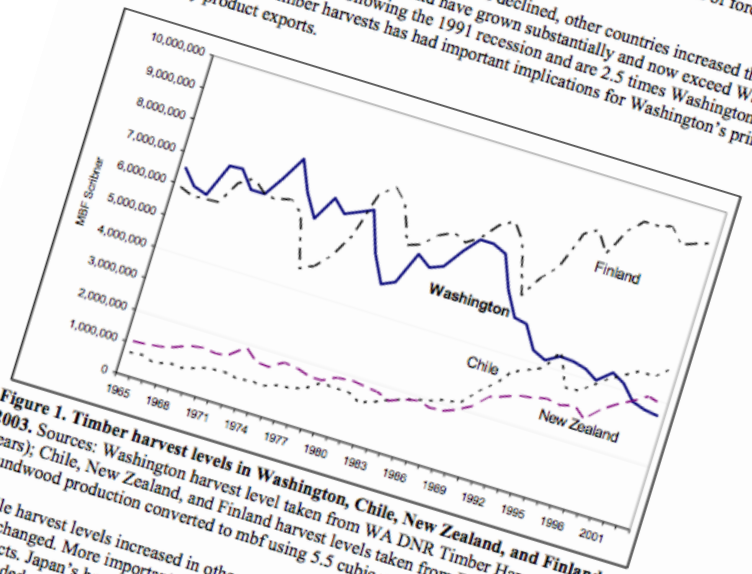
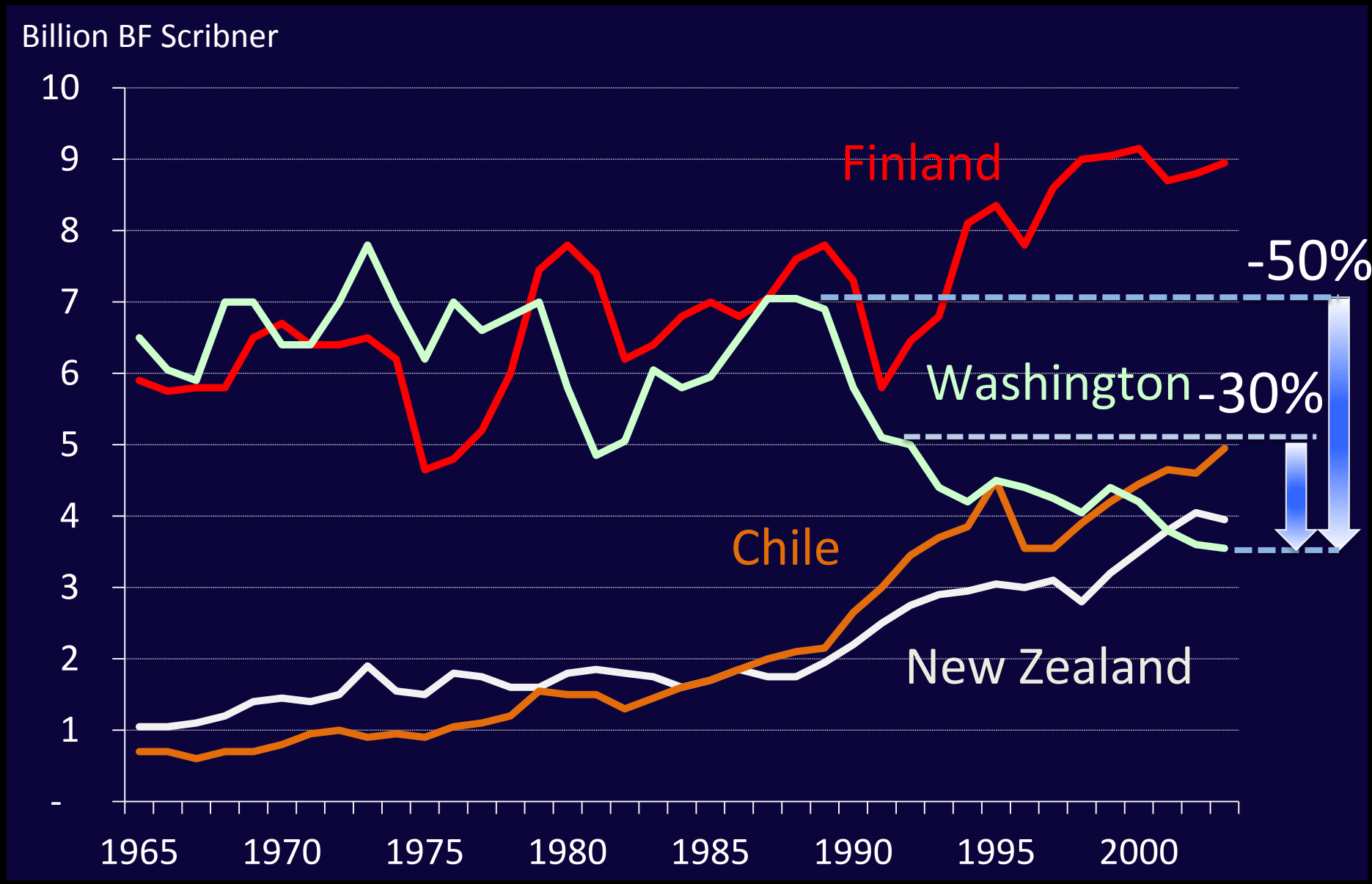


Figure 1. Timber harvest levels in Washington, Chile, New Zealand, and Finland: 1965-2003. Sources: Washington harvest level taken from WA DNR Timber Harvest Reports (various years); Chile, New Zealand, and Finland harvest levels taken from FAOSTAT industrial roundwood production converted to mbf using 5.5 cubic meters per mbf.

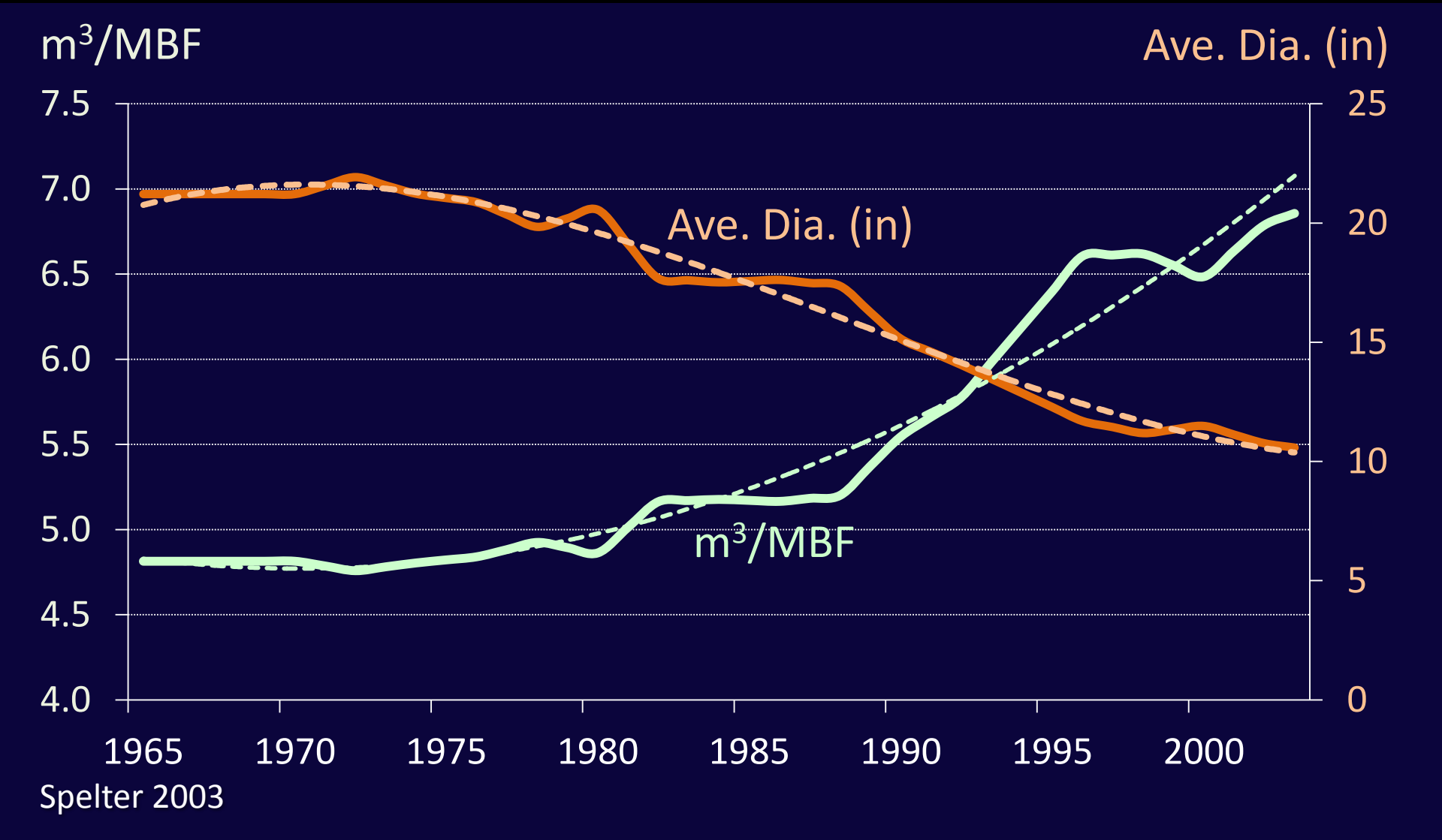
While harvest levels increased in other regions of the world, demand for solid wood products also changed. More important, the U.S. became the global center of demand for solid wood products. Japan's housing sector faltered after the financial crisis in Asia, and it has not rebounded over the past five years. Meanwhile the U.S. housing sector has climbed steadily since the 1991 recession (Figure 2).

Timber Harvest Volume 1965 - 2003

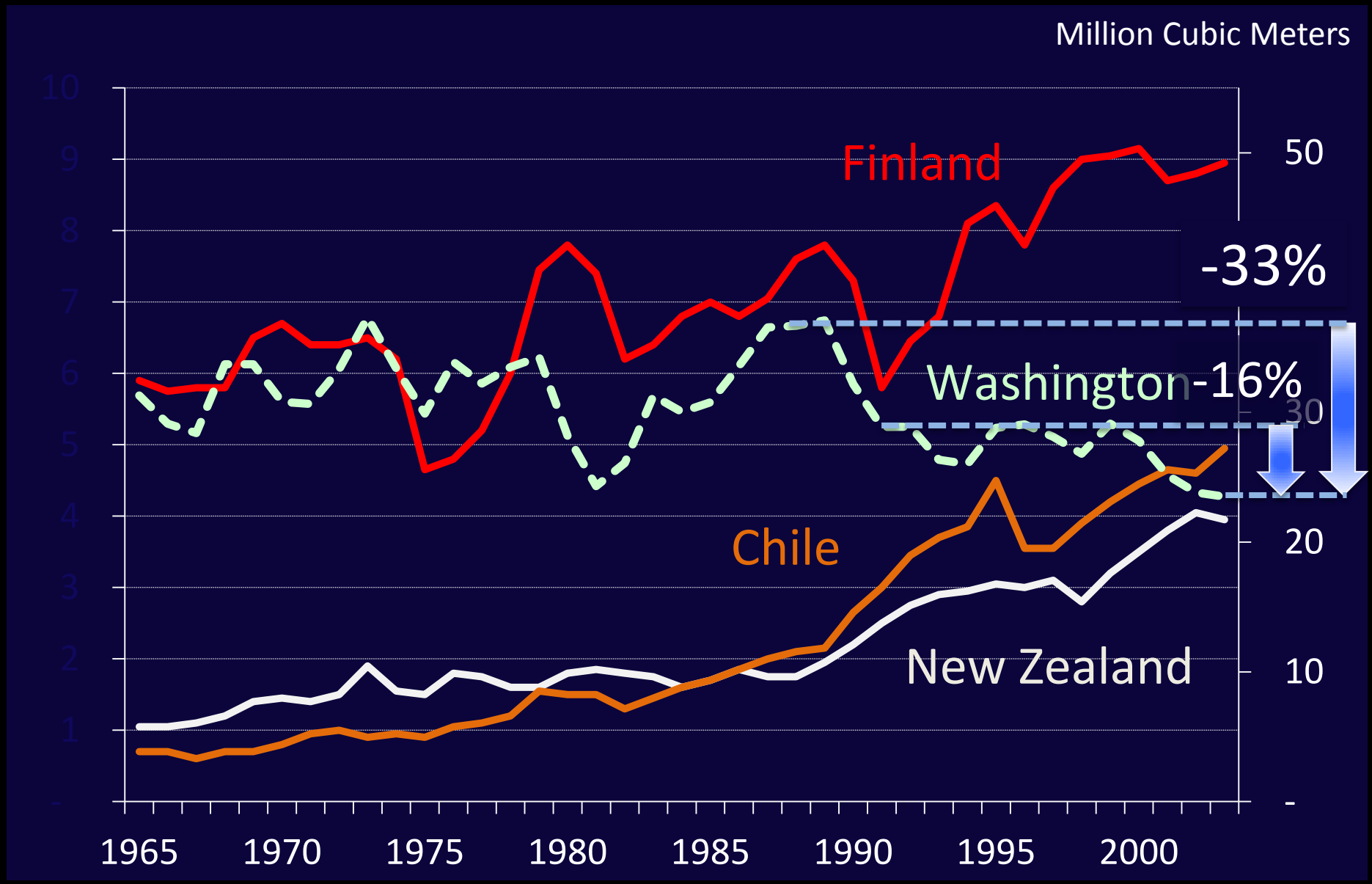


Washington Timber Harvest

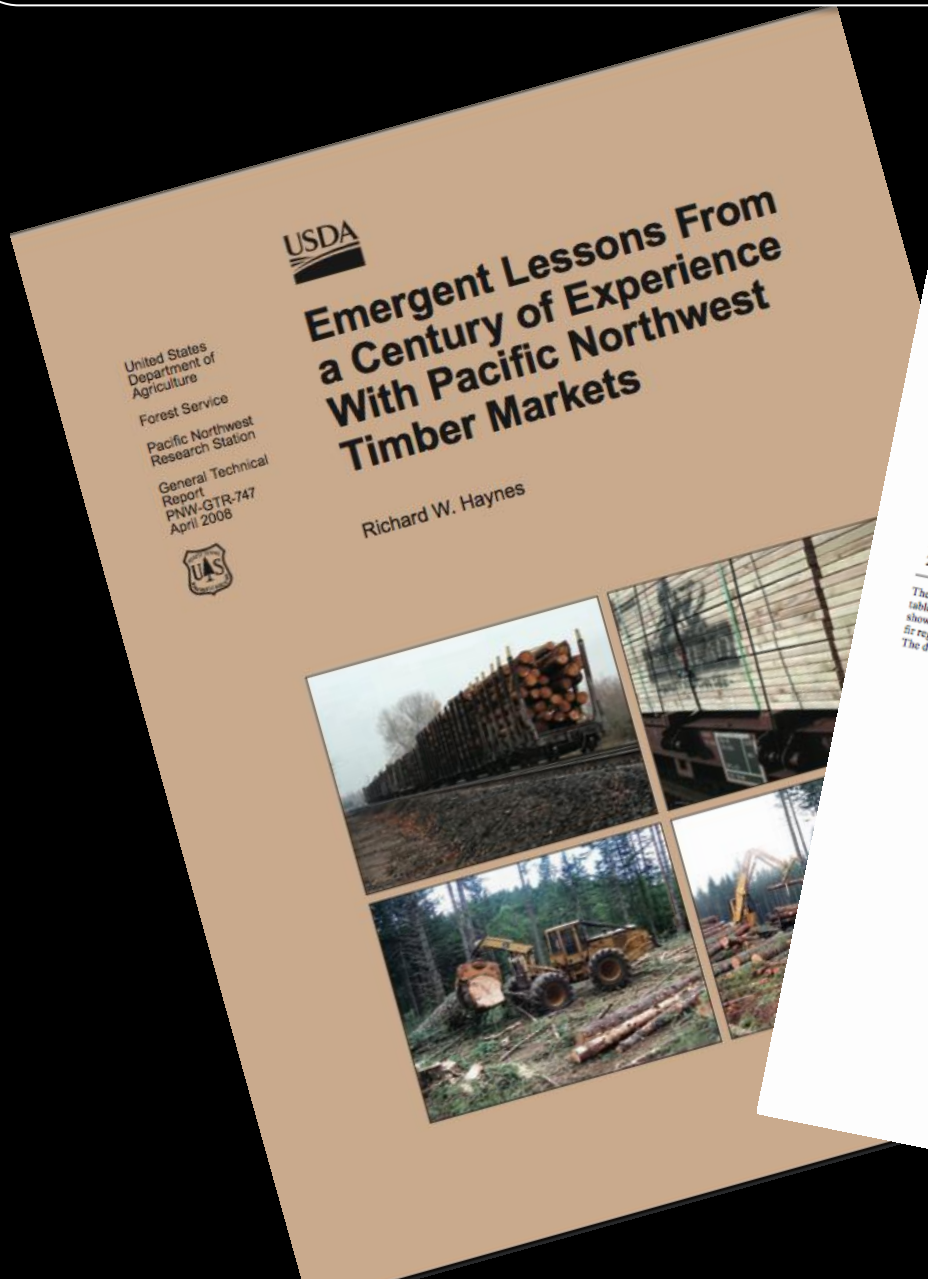
Average Log Diameter & m^3/MBF Scribner Conversion



Timber Harvest Volume 1965 - 2003



Consequences in economic research



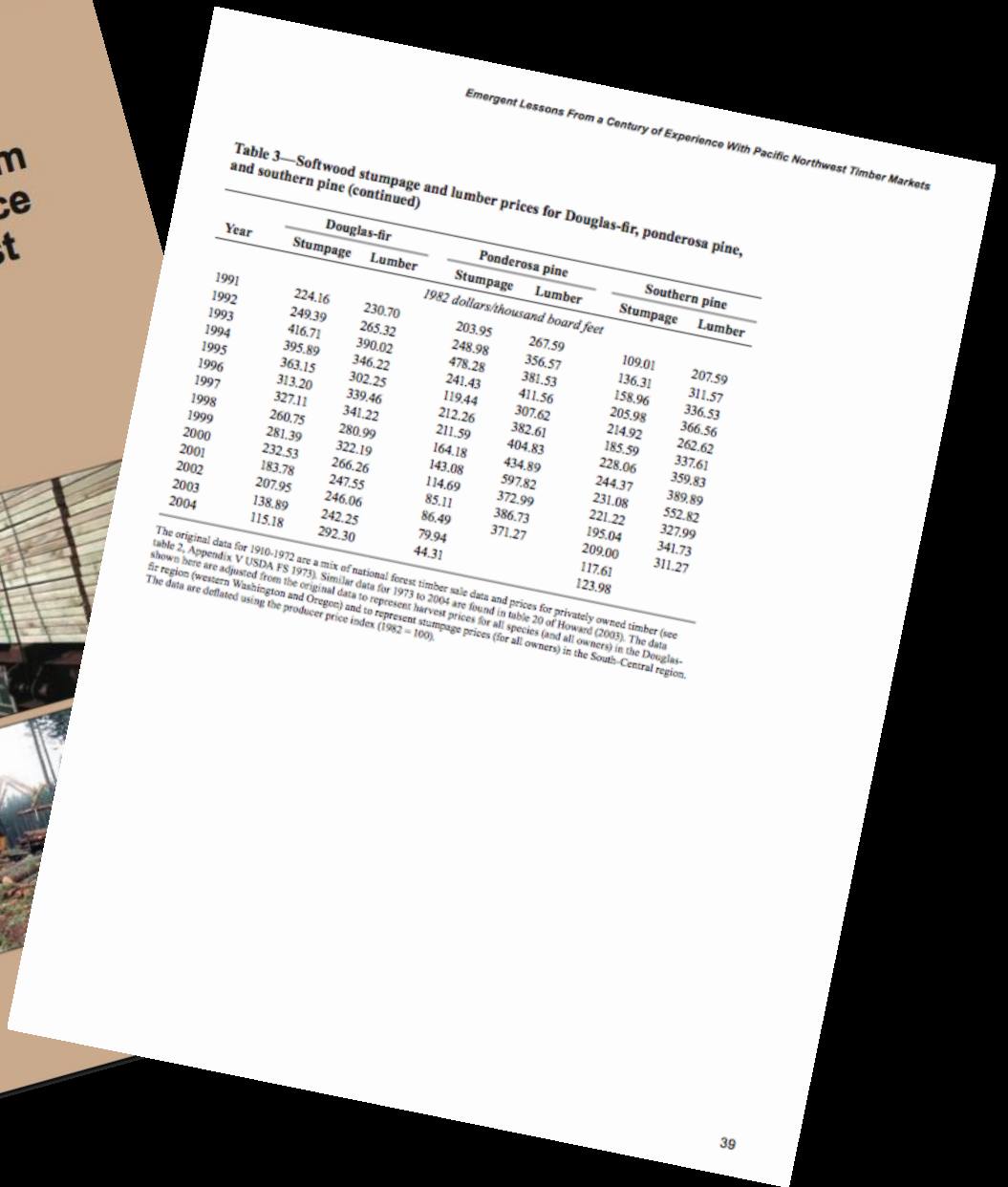
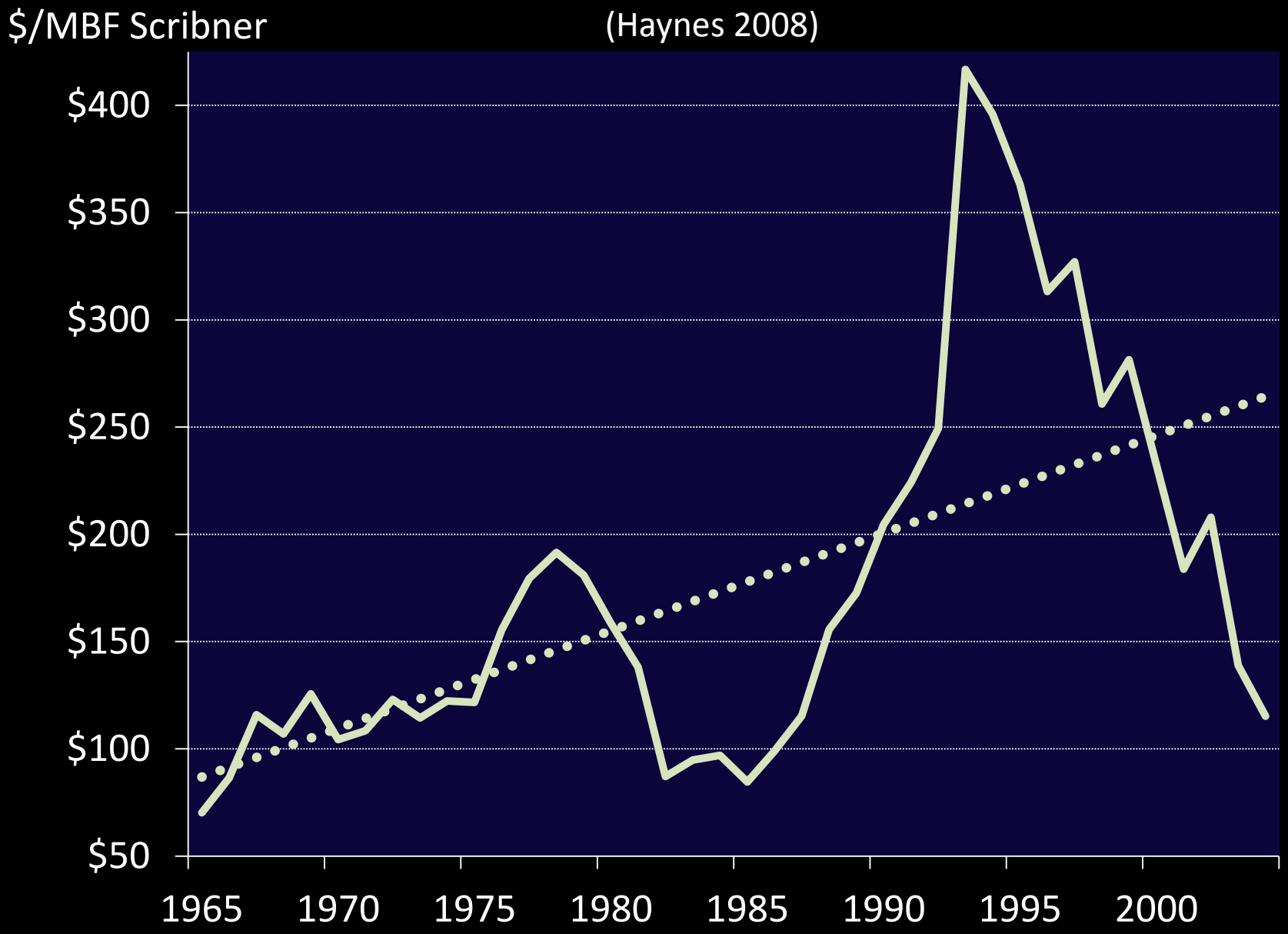


Table 3—Softwood stumpage and lumber prices for Douglas-fir, ponderosa pine, and southern pine (continued)

Year	Douglas-fir		Ponderosa pine		Southern pine	
	Stumpage	Lumber	Stumpage	Lumber	Stumpage	Lumber
	1982 dollars/thousand board feet					
1991	224.16	230.70	203.95	267.59	109.01	207.59
1992	249.39	265.32	248.98	356.57	136.31	311.57
1993	416.71	390.02	478.28	381.53	158.96	336.53
1994	395.89	346.22	241.43	411.56	205.98	366.56
1995	363.15	302.25	119.44	307.62	214.92	262.62
1996	313.20	339.46	212.26	382.61	185.59	337.61
1997	327.11	341.22	211.59	404.83	228.06	359.83
1998	260.75	280.99	164.18	434.89	244.37	389.89
1999	281.39	322.19	143.08	597.82	231.08	552.82
2000	232.53	266.26	114.69	372.99	221.22	327.99
2001	183.78	247.55	85.11	386.73	195.04	341.73
2002	207.95	246.06	86.49	371.27	209.00	311.27
2003	138.89	242.25	79.94		117.61	
2004	115.18	292.30	44.31		123.98	

The original data for 1910-1972 are a mix of national forest timber sale data and prices for privately owned timber (see table 2, Appendix V USDA FS 1973). Similar data for 1973 to 2004 are found in table 20 of Howard (2003). The data shown here are adjusted from the original data to represent harvest prices for all species (and all owners) in the Douglas-fir region (western Washington and Oregon) and to represent stumpage prices (for all owners) in the South-Central region. The data are deflated using the producer price index (1982 = 100).

Coastal Washington & Oregon
DF Stumpage Price Trend - 1982 Dollars



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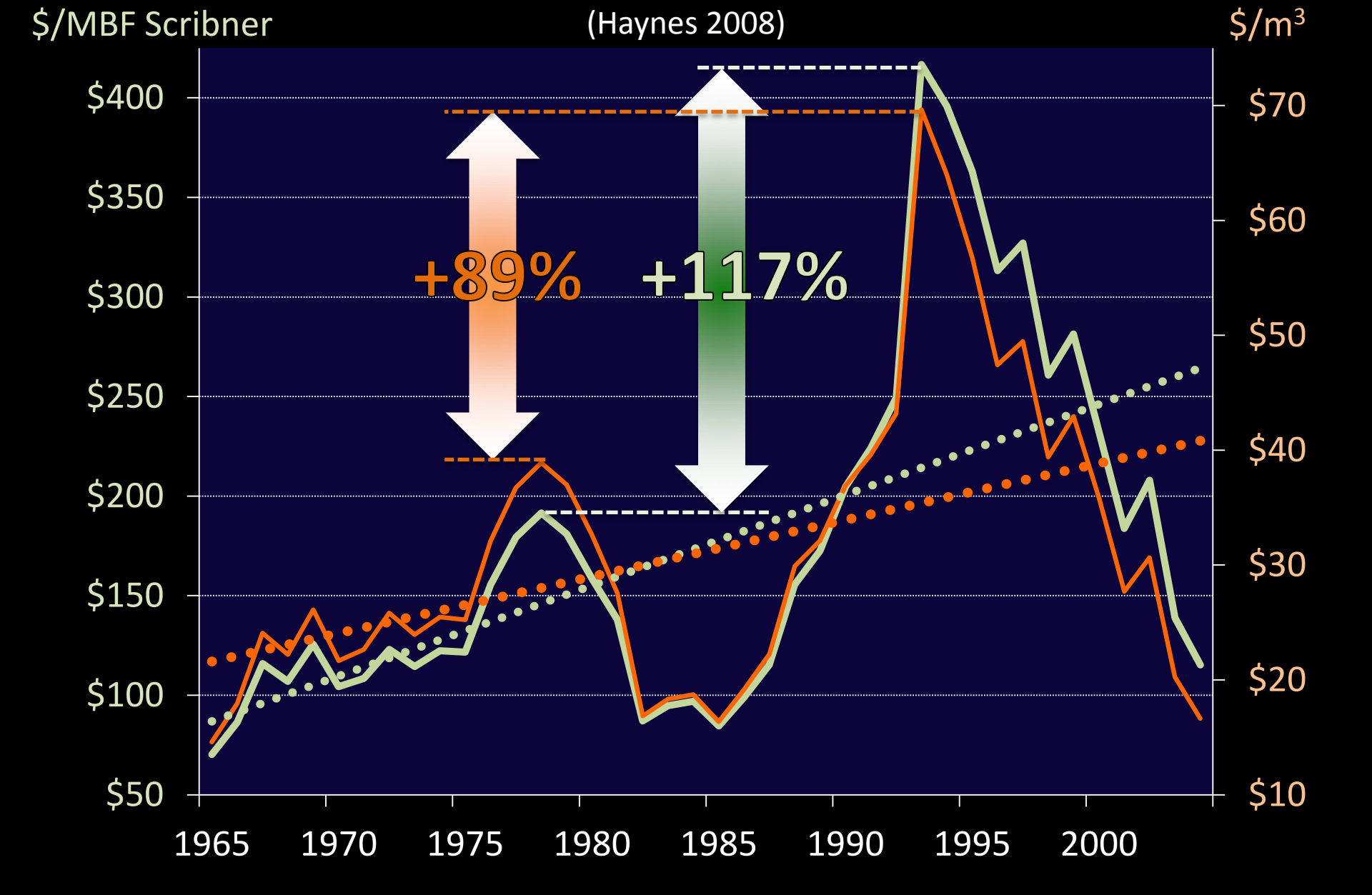
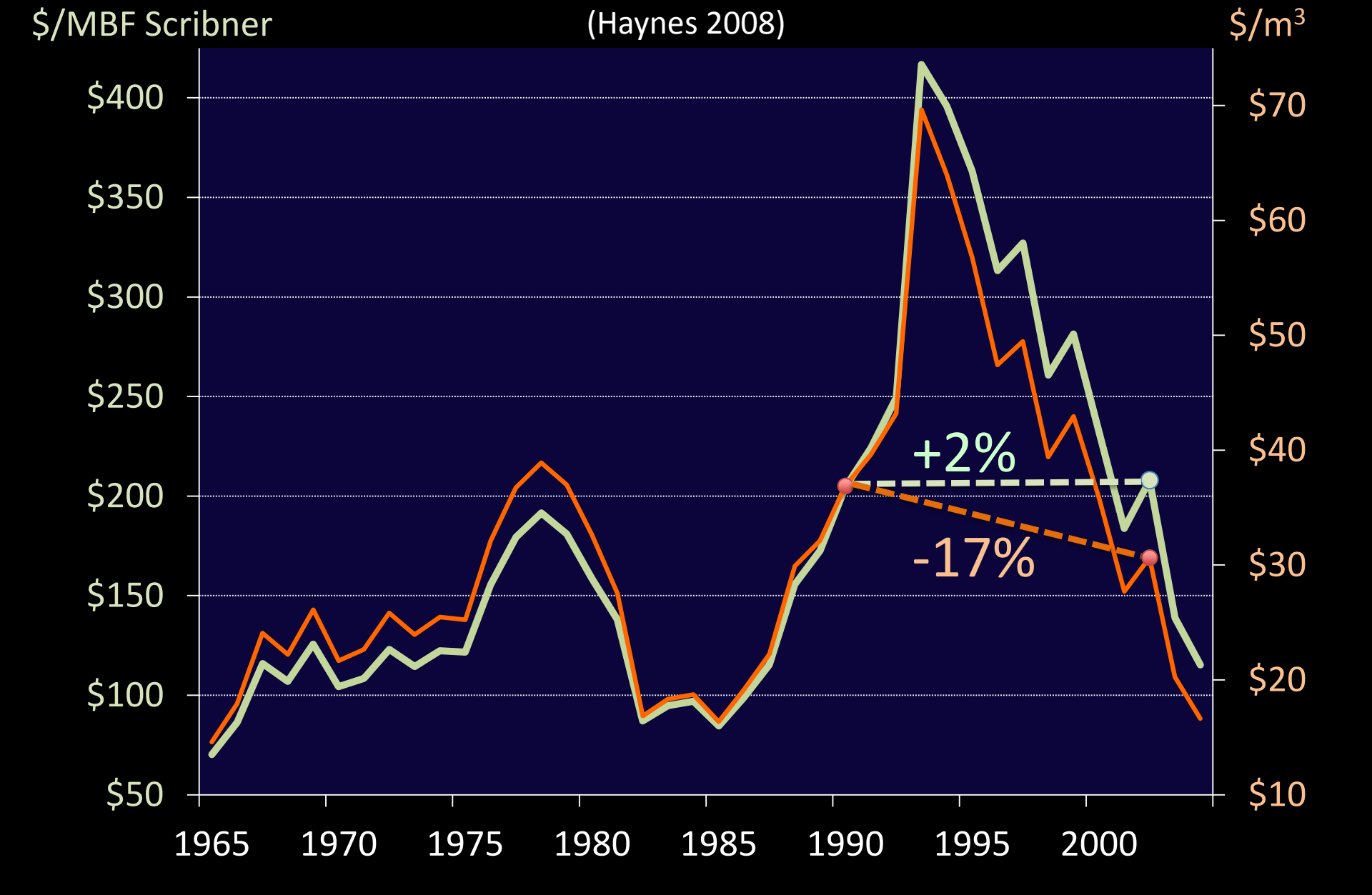
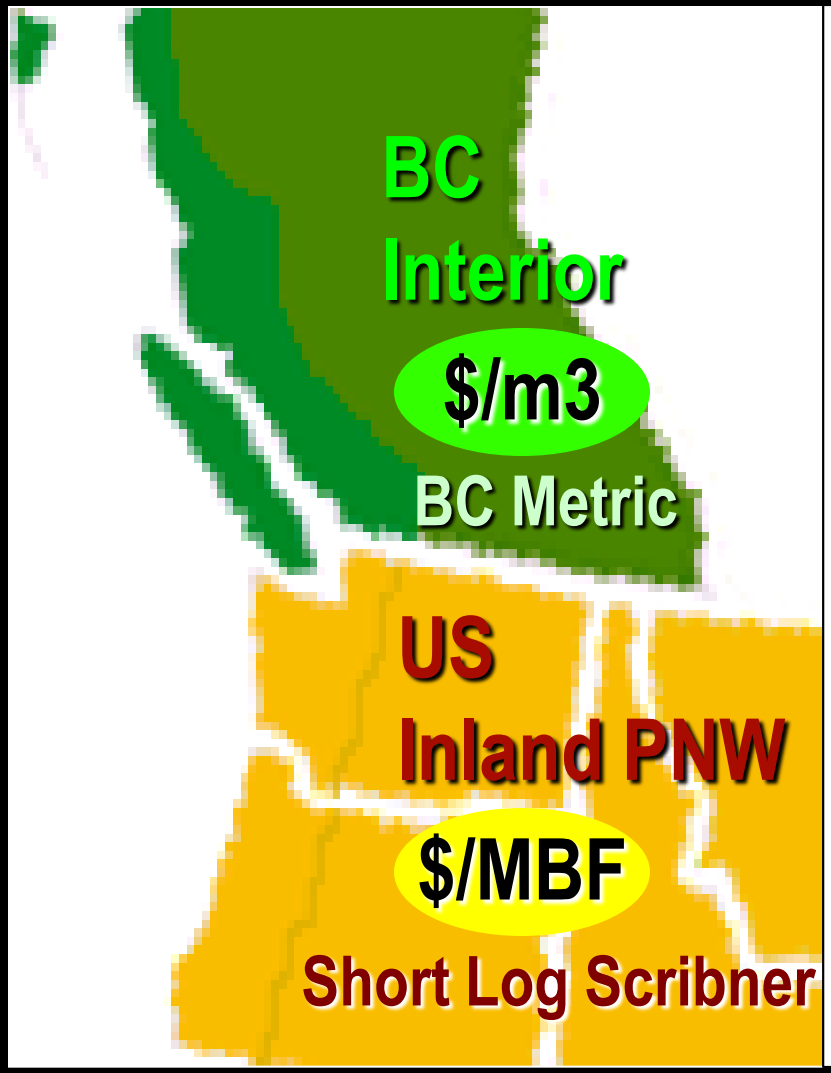
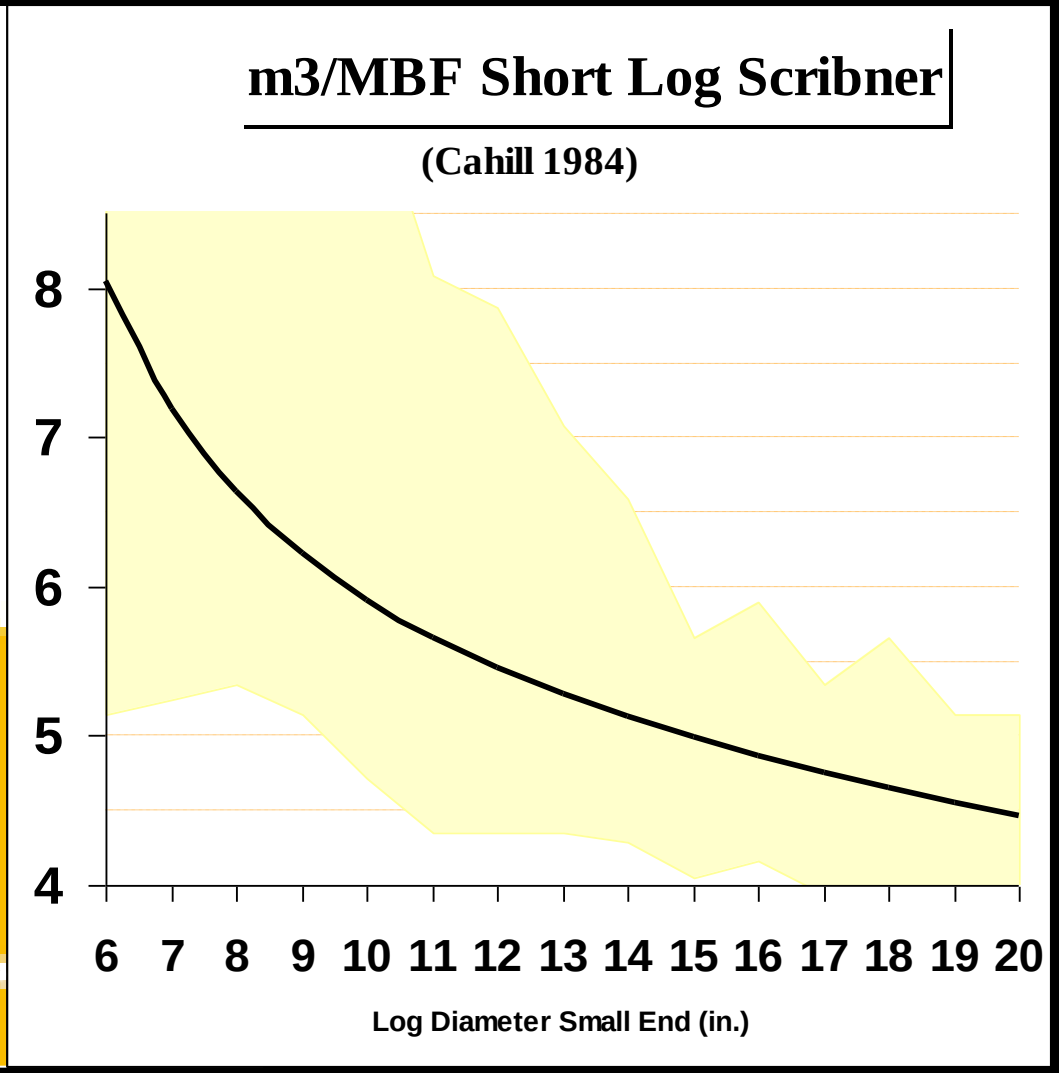


Coastal Washington & Oregon
DF Stumpage Price Trend - 1982 Dollars

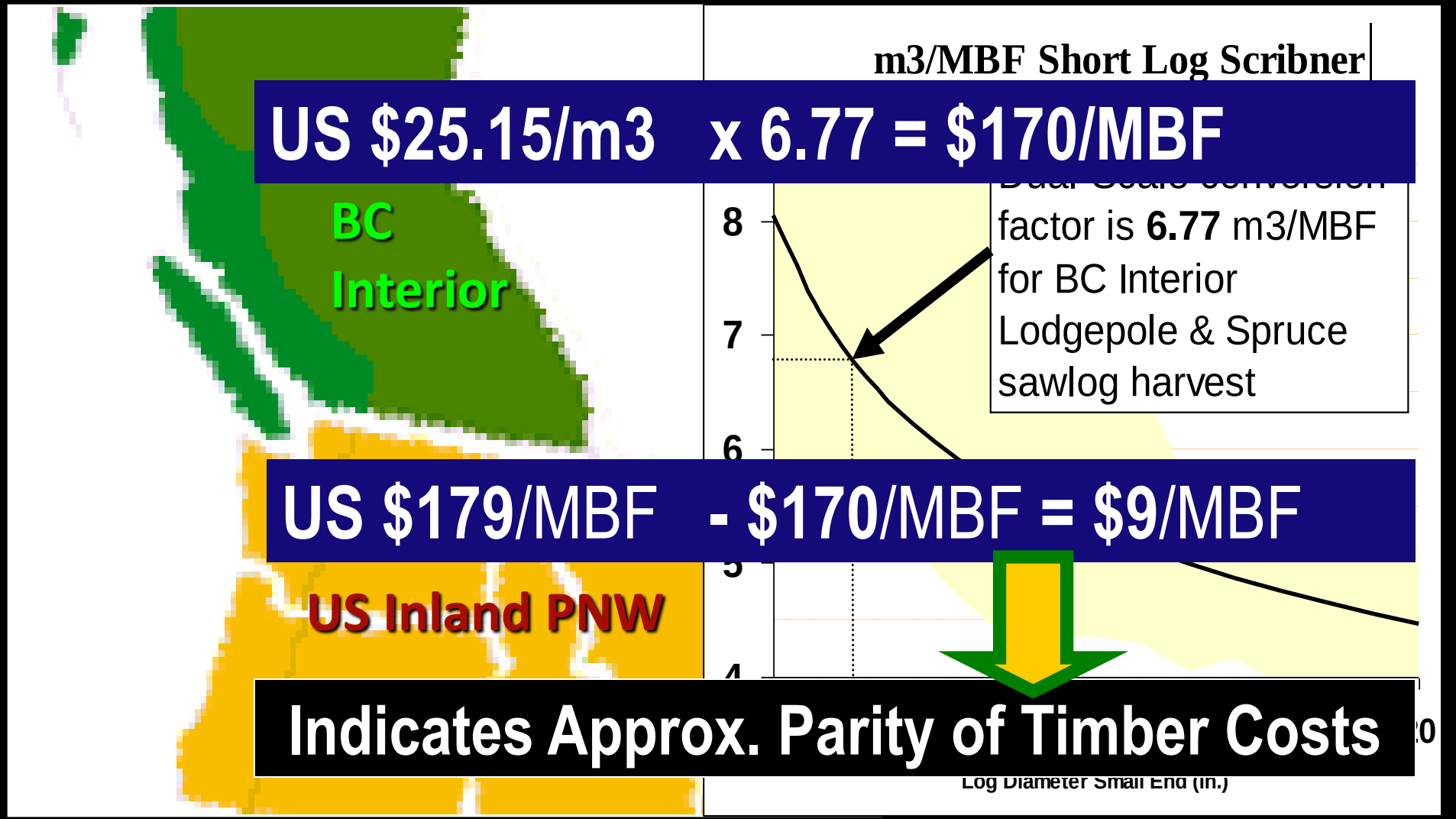


Consequences in international trade





Consequences in international trade



Consequences in international trade

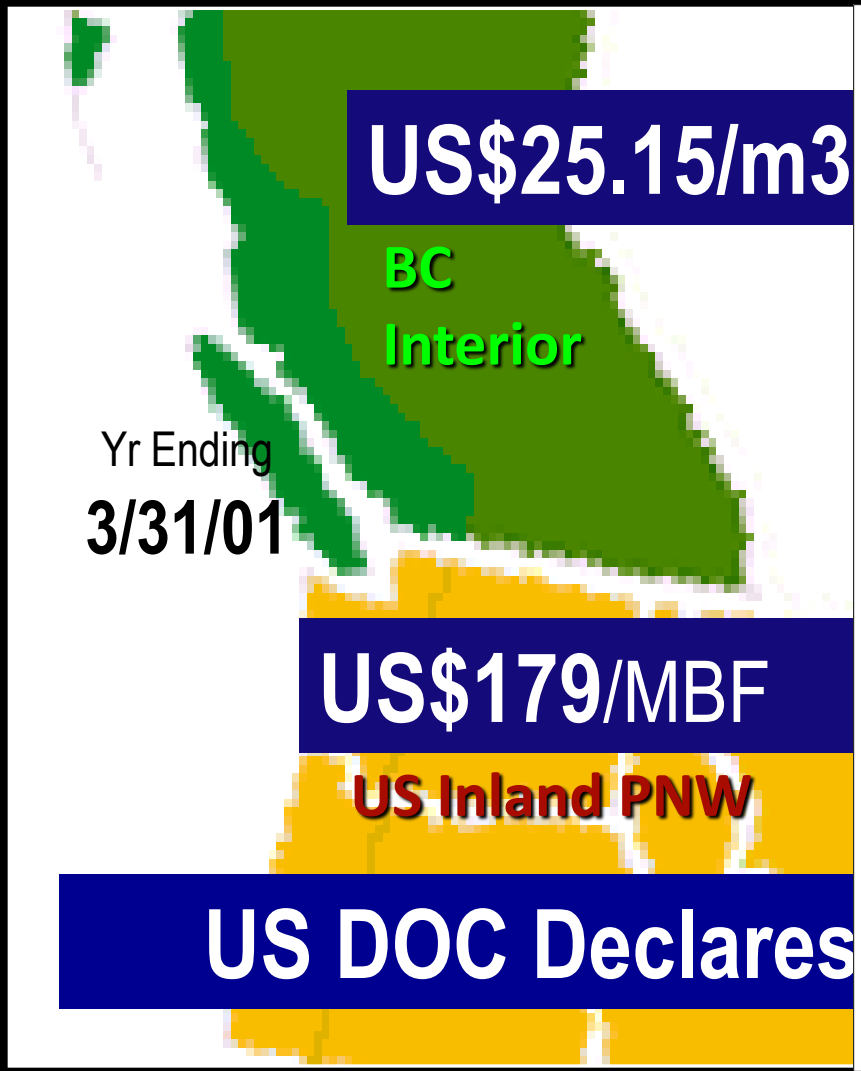
"The most appropriate approach to m^3/MBF conversions would be for Commerce to use a standard, published, average factor…

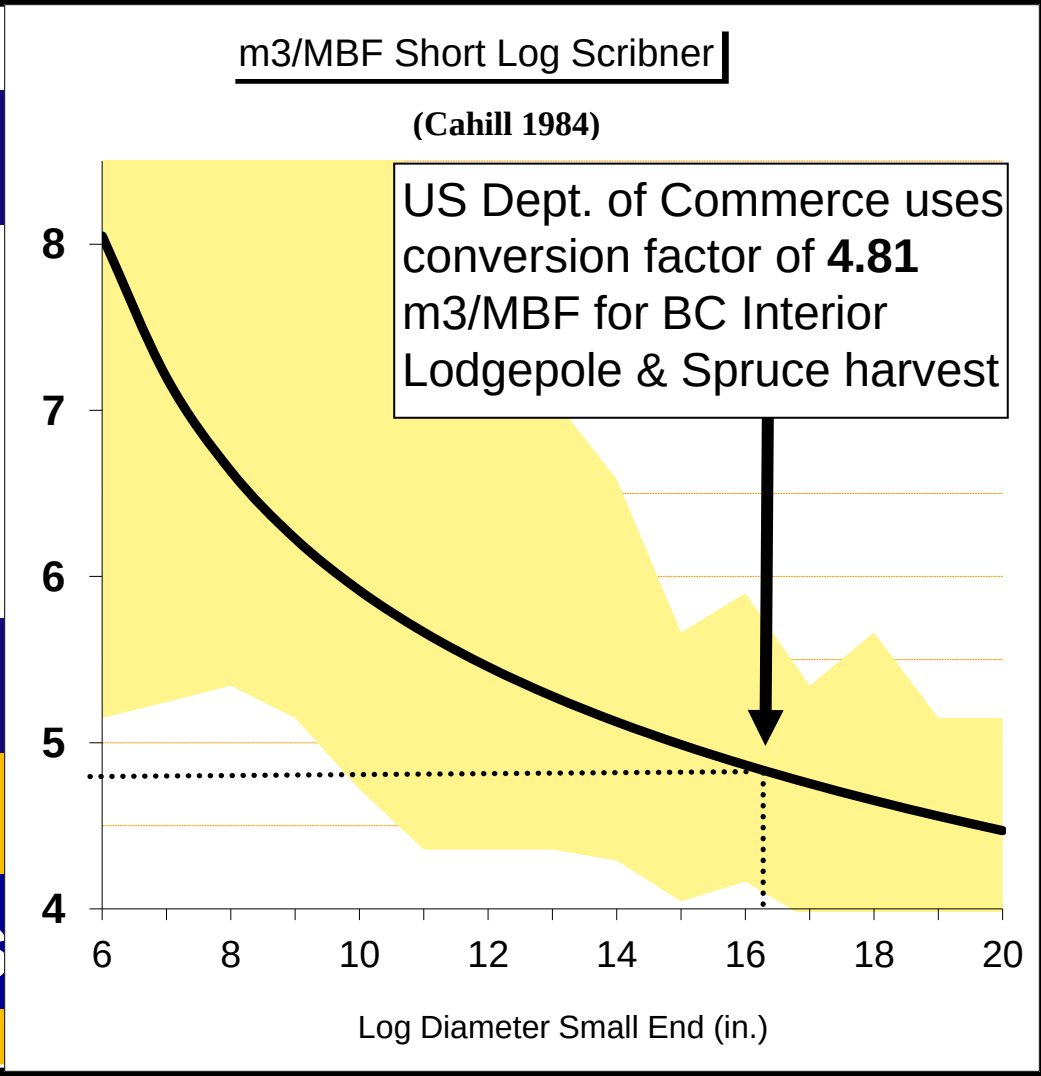
The most widely accepted such factor is 4.53 m^3/MBF."

"In fact, alone, its very longevity and stability suggest that, as a general approximation, it is reasonably accurate."

Expert for "Coalition for Fair Lumber Imports" January 2002

Consequences in international trade





Consequences in international trade

During 2002 - 2006 the US Government charged approx. **$1.5 Billion** in tariffs on BC Interior manufacturers of Lodgepole & Spruce lumber

Virtually all those tariffs resulted from incorrect conversion between US Scribner & BC Metric scale

Consequences in international trade

BC Interior C$56.65/m³

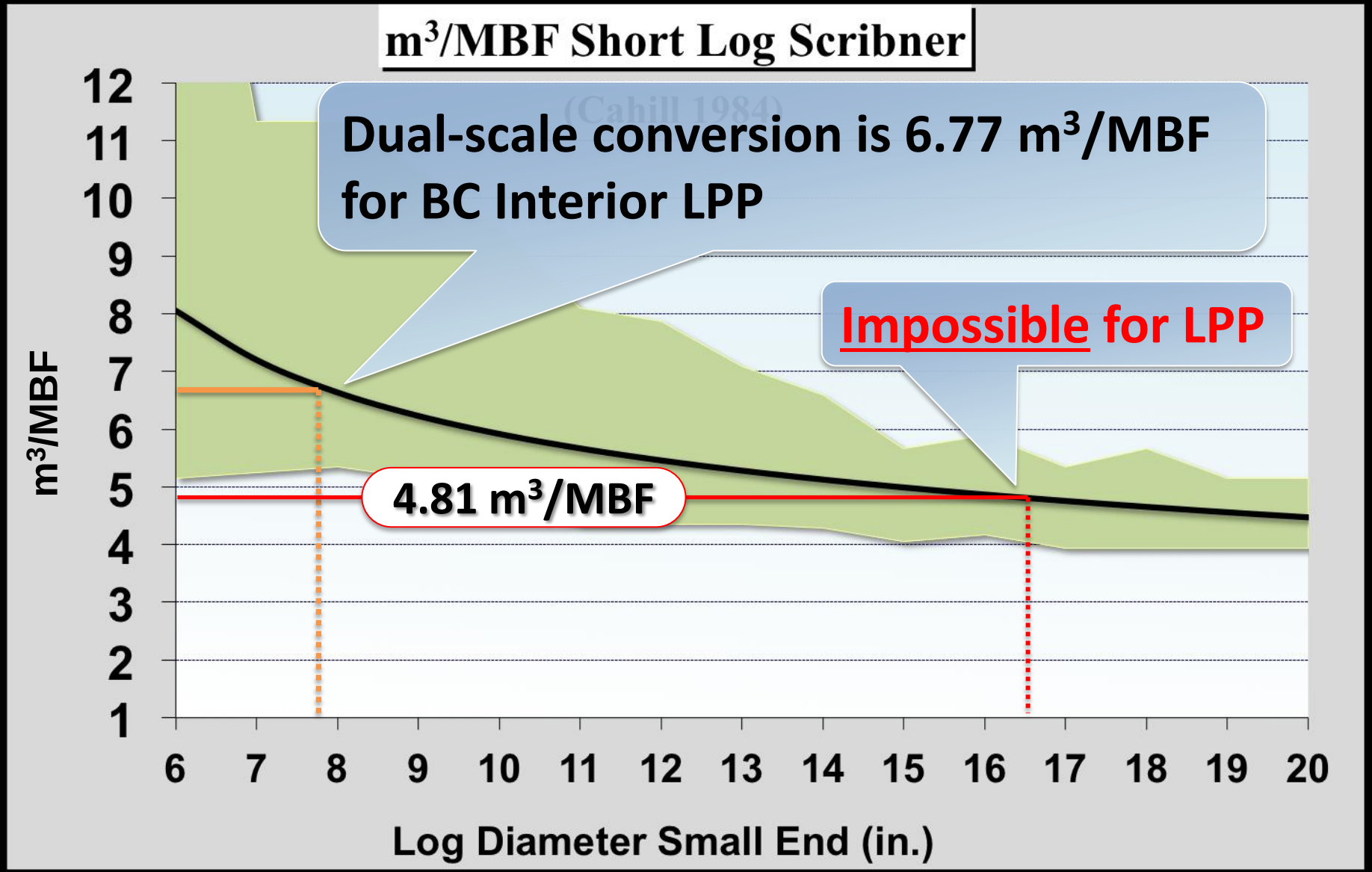
US inland C$76.20/m³ → 35% more than BC

(($353/MBF ÷ 4.81 m³/MBF) x 1.03837)

[5] According to *Log Lines*, U.S. sawmills paid, on average, $353/MBF for lodgepole pine (and $354/MBF for Engelmann spruce) during the third quarter of 2013. *Log Lines*, Nov. 2013, at 6. The $353/MBF price was converted using a conversion factor of 4.81 m³/MBF and an exchange rate of US$1 = C$1.038367.

December 4, 2013

Conversion factor for LPP



Consequences in international trade

BC Interior C$56.65/m³

US inland C$54.14/m³ → ~~35%~~ **Lower than BC**

(($353/MBF ÷ 6.77 m³/MBF) x 1.03837)

[5] According to *Log Lines*, U.S. sawmills paid, on average, $353/MBF for lodgepole pine (and $354/MBF for Engelmann spruce) during the third quarter of 2013. *Log Lines*, Nov. 2013, at 6. The $353/MBF price was converted using a conversion factor of 4.81 m³/MBF and an exchange rate of US$1 = C$1.038367.

December 4, 2013

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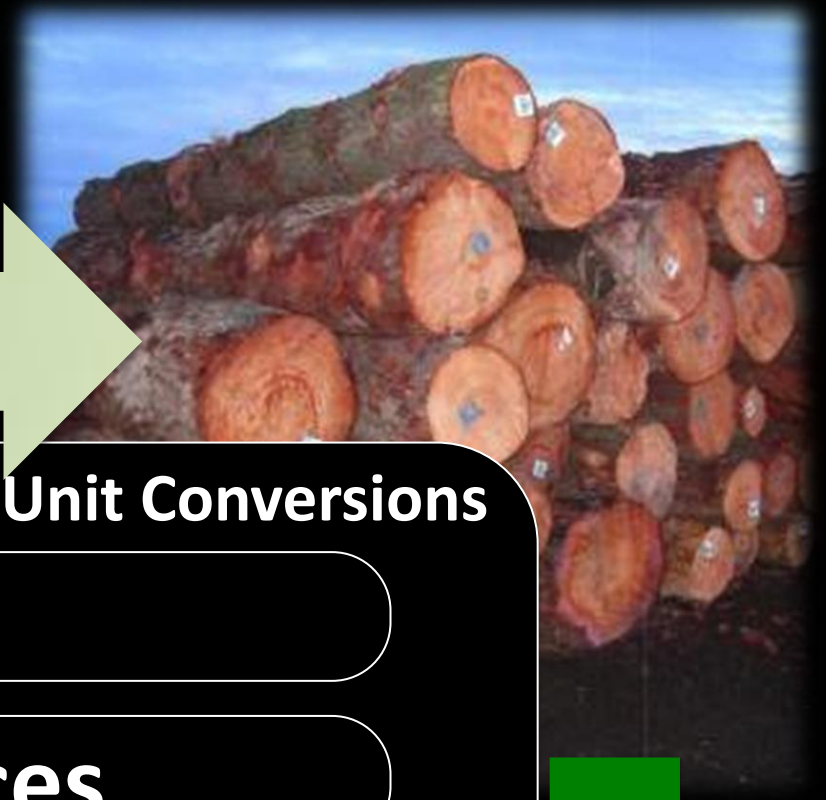

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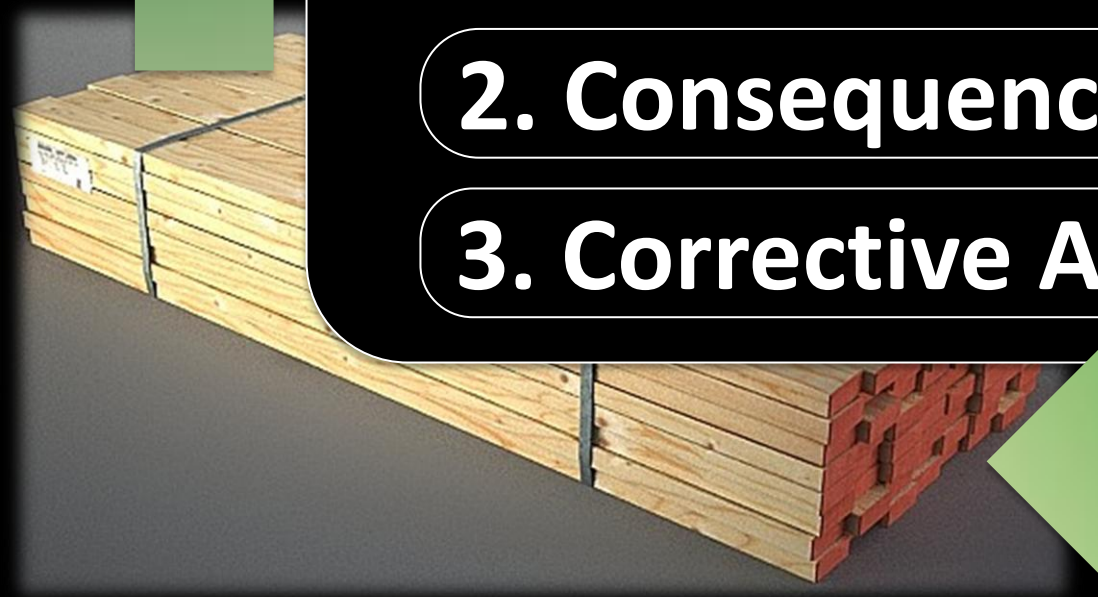
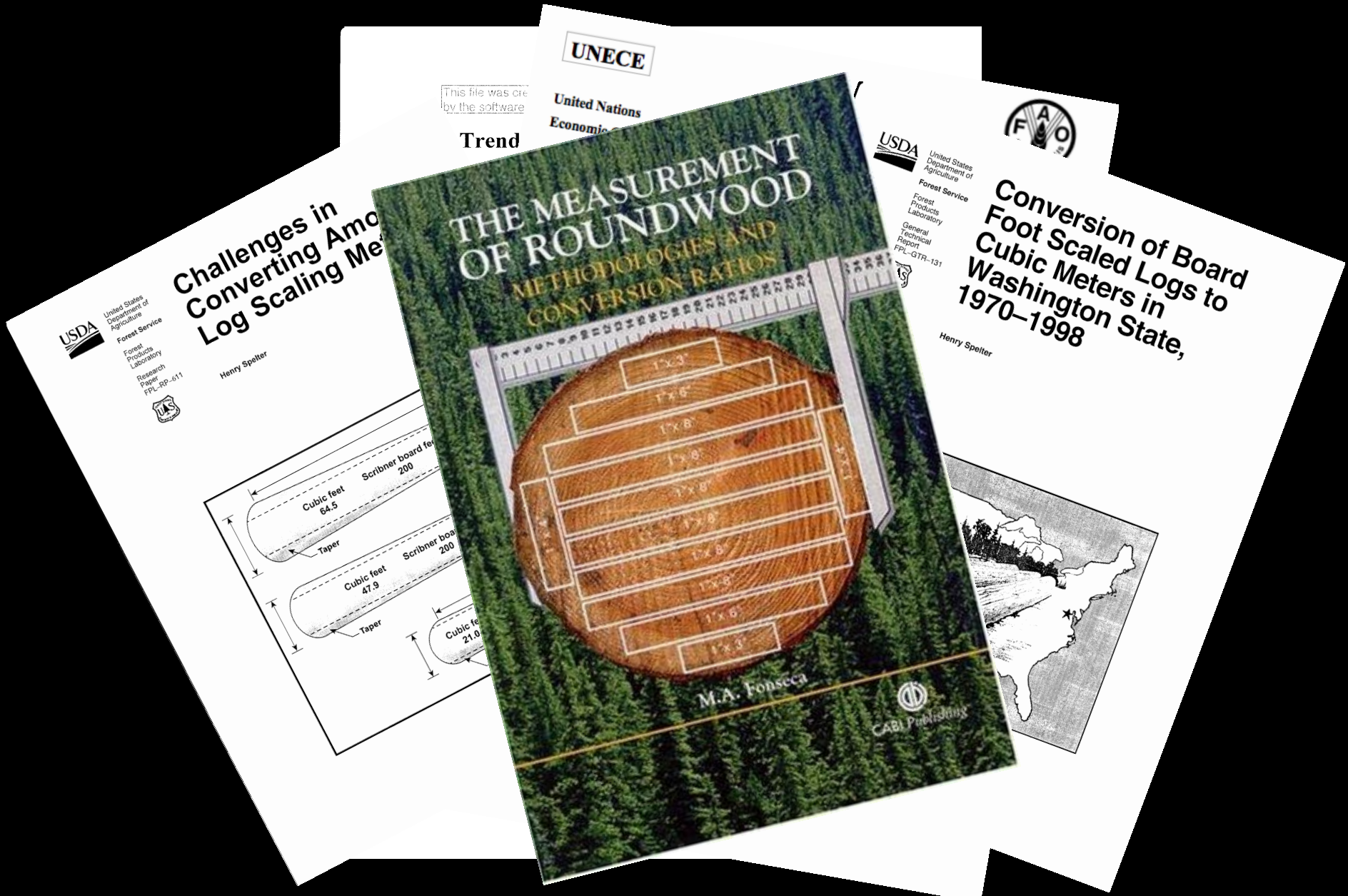


Neal Hart, Jendro & Hart, LLC

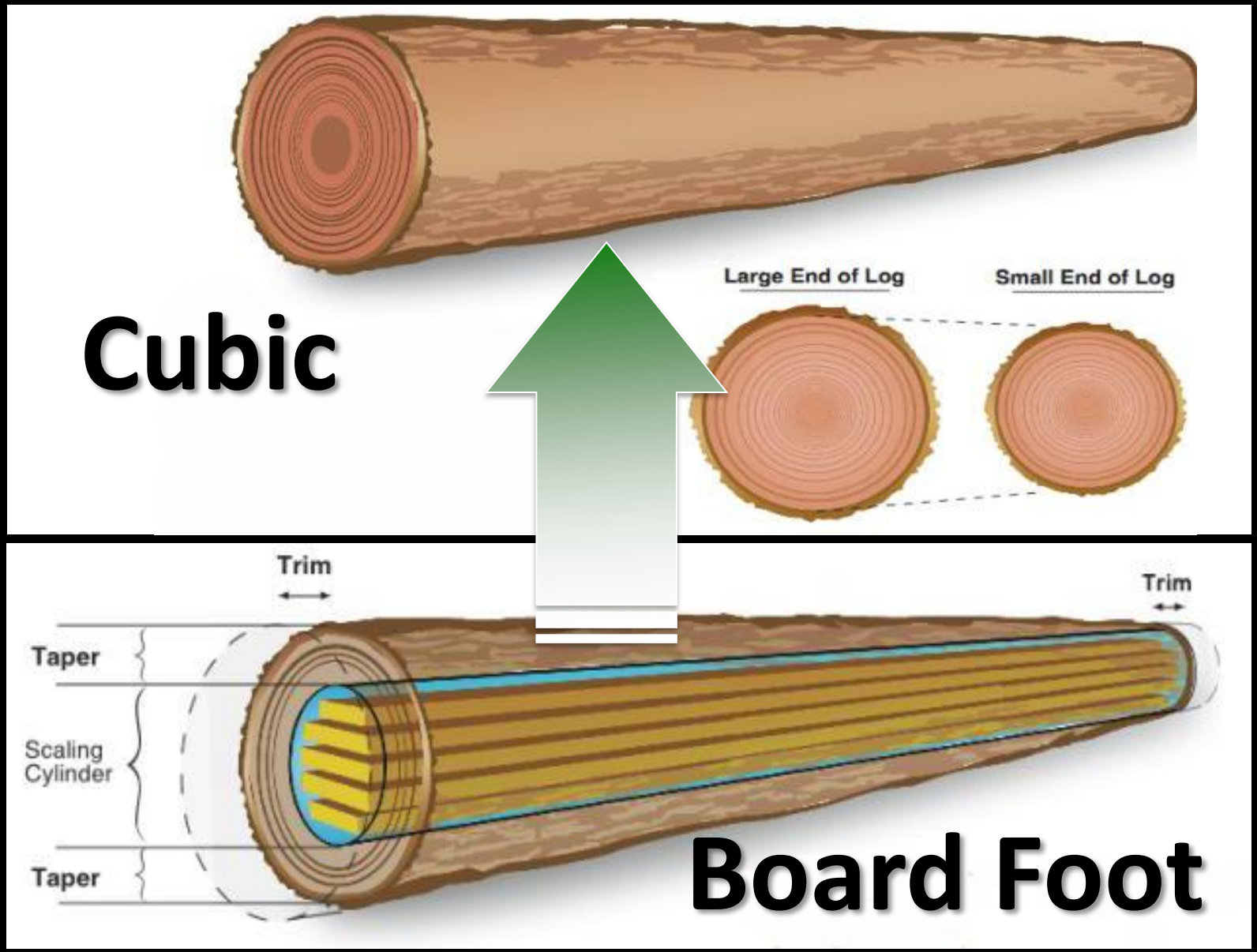
Western Mensurationists Meeting, June 2015

Corrective Action - Communication

Corrective Action - Education



Corrective Action – Transition to Cubic



Lost In Translation

Questions or Comments?

Neal Hart, Jendro & Hart, LLC