



FIA Data Updates and Changes

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ANNUAL SOFAC MEETING

AUGUST 9-10, 2022

- ▶ Overview of latest SRTS data set—v36a
- ▶ Changes in FIA data availability and tools
- ▶ Upcoming changes in volume/biomass estimates –new equations
 - ▶ National Scale Volume and Biomass (NSVB)

SRTS Data Sets and FIA Compilation Dates

State	SRTSv35b				SRTS v36a			
	2017	2018	2019	2020	2018	2019	2020	2021
Alabama				❖				❖
Arkansas			❖					❖
Florida	❖					❖		
Georgia			❖				❖	
Kentucky	❖				❖			
Louisiana		❖			❖			
Mississippi			❖				❖	
North Carolina			❖					❖
Oklahoma		❖				❖		
South Carolina			❖				❖	
Tennessee	❖				❖			
Texas			❖				❖	
Virginia			❖				❖	

Compiled data represent a range of years

Compilation year and average measurement dates by state, SRTS v36a						
Basin_Name	Other_ID	Compilation_year	Avg Plot Measurement Date	Avg Previous Measurement Date	Avg Date for Remeasurement	
Alabama	Growing stock	2021	2017.92	2011.06	2014.49	
Arkansas	Growing stock	2021	2019.55	2014.5	2017.03	
Florida	Growing stock	2019	2018.16	2012.42	2015.3	
Georgia	Growing stock	2020	2019	2013.39	2016.2	
Kentucky	Growing stock	2018	2016.66	2010.72	2013.69	
Louisiana	Growing stock	2018	2015.73	2007.45	2011.6	
Mississippi	Growing stock	2020	2018.71	2012.22	2015.47	
North Carolina	Growing stock	2021	2018.82	2012.21	2015.52	
Oklahoma (east)	Growing stock	2019	2018.21	2012.43	2015.33	
South Carolina	Growing stock	2020	2018.73	2013.51	2016.12	
Tennessee	Growing stock	2018	2016.81	2010.39	2013.6	
Texas (east)	Growing stock	2020	2018.54	2013.31	2015.93	
Virginia	Growing stock	2020	2019.14	2013.78	2016.47	

FIA Updates—DataMart Issues

- ▶ Many users of FIA data download CSV formatted files for creating custom datasets and subsequent analysis.
- ▶ Latest FIA data updates for SRTS have relied on CSV downloads but CSV file downloads on FIA's DataMart have not been available for several months.
- ▶ A new CSV file creation process is needed and a new server to house the data—will take time
- ▶ Alternative CSV download site on Box but files had formatting inconsistencies and not all the latest data were available
- ▶ Solution was to download SQLITE database files from DataMart

FIA DataMart









FIA DataMart

FIADB_1.9.0 Last updated
July 22, 2022

Alert: EVALIDator is experience stability issues. We are currently working on an update that we hope to have available soon.

- ▶ Download **SQLITE** state files
- ▶ Use **SQLITE Studio** app to select and export desired data tables to CSV format
 - ▶ R package also available to create CSVs

FIA DataMart files

File type	Description	Level of difficulty
 PDF	Portable Document Format files of FIA State reports	Low
 HTML	HTML Format - Most recent FIA data by State	Low
 XLS	Microsoft® Excel 2013 workbooks containing many reports for the most recent State inventories. Workbooks also includes VBA Macros that issue POST and/or GET API commands to generate EVALIDator reports based on parameters passed in INPUTS worksheet.	Medium
 SQLITE	SQLite3 State databases. SQLite home page . The SQLite State databases contain FIADB data and FVS-ready data (see Field note: A new conversion of Forest Inventory and Analysis data for use in the Forest Vegetation Simulator for information about FVS-ready data).	High
 CSV	Forest Inventory and Analysis Database (FIADB) comma-delimited files in FIADB version 1.9.0 format.	High
 API	Application Programming Interface for EVALIDator web-application	High

FIA Updates—New Evaluator Tool

- ▶ Evaluator 2.0 has been developed, tested, and now replaces version 1.8
- ▶ Functionality is much like the old version but has newer technology, more secure, and easier to maintain.
- ▶ If you encounter errors or unexpected results, report the issue to the email referenced on the Evaluator page.
- ▶ Some changes in functionality include:
 - ▶ Any available classification variable can now be selected as a Page-Row-Column variable
 - ▶ Options for results output have expanded--
 - ▶ Standard tabular estimates
 - ▶ Normalized tabular estimates
 - ▶ Normalized estimates as CSV download

FIADB-API v1.0.0 - View Report

Estimate Parameters

Numerator attribute number and description: 0003 Area of timberland, in acres
 FIADEF as the forest land definition

State/EVAL_GRP(s):
 North Carolina 372021

Row variable: Forest type group (based on values from the Current inventory).

Column variable: Ownership group (based on values from the Current inventory).

Filtering clause(s) applied to numerator and demoninator: None

Estimate:

Forest type group	Ownership group				
	Total	National Forest	Other federal	State and local	Private
Total	18,009,230	1,131,471	311,484	1,126,690	15,439,585
White / red / jack pine group	130,185	10,430	-	7,697	112,058
Spruce / fir group	12,310	6,153	-	6,157	-
Longleaf / slash pine group	431,925	13,032	87,210	63,506	268,177
Loblolly / shortleaf pine group	5,932,133	102,976	100,006	353,551	5,375,601
Other eastern softwoods group	16,488	-	-	-	16,488
Oak / pine group	2,086,341	99,691	39,236	123,073	1,824,341
Oak / hickory group	6,833,345	811,712	42,067	323,093	5,656,473
Oak / gum / cypress group	1,654,884	29,042	30,643	177,316	1,417,883
Elm / ash / cottonwood group	533,707	-	12,322	55,085	466,301
Maple / beech / birch group	63,875	22,662	-	-	41,213
Other hardwoods group	135,519	35,773	-	12,315	87,431
Exotic hardwoods group	20,519	-	-	-	20,519
Nonstocked	157,998	-	-	4,899	153,100

- ▶ Standard tabular output works well for limited numbers of rows/columns



Forest Service
U.S. DEPARTMENT OF AGRICULTURE

FIADB-API v1.0.0 - View Report

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Filtering clause(s) applied to numerator and demoninator: None

- ▶ Normalized tabular output—each non-Null cell of table listed as a row with row/column labels, estimate and error statistics

FOREST TYPE GROUP	OWNERSHIP GROUP	ESTIMATE	SE PERCENT	PLOT COUNT
Total	Total	18,009,230	0.683	3,519
White / red / jack pine group	Total	130,185	19.220	34
Spruce / fir group	Total	12,310	69.469	2
Longleaf / slash pine group	Total	431,925	10.543	95
Loblolly / shortleaf pine group	Total	5,932,133	2.357	1,316
Other eastern softwoods group	Total	16,488	50.597	5
Oak / pine group	Total	2,086,341	4.589	510
Oak / hickory group	Total	6,833,345	1.884	1,576
Oak / gum / cypress group	Total	1,654,884	5.083	379
Elm / ash / cottonwood group	Total	533,707	9.264	139
Maple / beech / birch group	Total	63,875	28.480	14
Other hardwoods group	Total	135,519	19.679	29
Exotic hardwoods group	Total	20,519	39.158	8

- ▶ Normalized CSV download—each cell of table listed as a row with row/column labels, estimate and error statistics in CSV file (shown here opened in Excel).
- ▶ This table has detailed forest type as rows and 5-year age class as columns
- ▶ >750 records but easy to summarize and create error statistics

	A	B	C	D	E	F	G
1	FOREST_TYPE	STAND_AGE_5_YR_CLASSES	ESTIMATE	VARIANCE	PLOT_COUNT	SE	SE_PERCENT
2	Total	Total	18009229.8	15129148720	3519	123000.6046	0.682986479
3	Eastern white pine	Total	119864.765	584015812.2	31	24166.4191	20.16140365
4	Eastern white pine / eastern hemlock	Total	8093.45156	40972142.73	2	6400.94858	79.08799519
5	Eastern hemlock	Total	2226.53174	4804065.959	1	2191.817957	98.44090351
6	Red spruce	Total	12310.0725	73130317.33	2	8551.62659	69.46853147
7	Longleaf pine	Total	383165.454	1837531339	86	42866.43604	11.18744804
8	Slash pine	Total	48759.3785	261044036.6	10	16156.85726	33.13589665
9	Loblolly pine	Total	5168914.07	17836321226	1125	133552.6908	2.5837669
10	Shortleaf pine	Total	94082.2846	379203996.7	30	19473.16093	20.69801027
11	Virginia pine	Total	355280.013	1505602982	100	38802.10022	10.92155448
12	Table Mountain pine	Total	7699.30319	25785515.48	3	5077.944021	65.95329336
13	Pond pine	Total	281865.224	1452413898	60	38110.54839	13.52084086
14	Pitch pine	Total	24292.4796	100001094	7	10000.0547	41.16522841
15	Eastern redcedar	Total	16488.0713	69597821.77	5	8342.530897	50.59737285
16	Eastern white pine / northern red oak / white oak	Total	221379.895	1120758538	46	33477.73197	15.12230004
17	Eastern redcedar / hardwood	Total	40117.9051	158865756.1	13	12604.19597	31.41788171
18	Longleaf pine / oak	Total	18992.6964	100138669.6	4	10006.93108	52.68831155
19	Shortleaf pine / oak	Total	141833.08	662002288.1	36	25729.40513	18.14062358
20	Virginia pine / southern red oak	Total	351540.472	1640567141	83	40503.91513	11.52183558
21	Loblolly pine / hardwood	Total	1165392.9	5250588723	291	72460.94619	6.217726772
22	Slash pine / hardwood	Total	11629.6794	64436363.34	2	8027.226379	69.02362598
23	Other pine / hardwood	Total	135453.881	661937274	38	25728.14167	18.99402331
24	Post oak / blackjack oak	Total	82867.324	381851184	22	19541.01287	23.58108352
25	Chestnut oak	Total	456398.734	2240932746	97	47338.49117	10.37217847
26	White oak / red oak / hickory	Total	1114352.04	5016624573	266	70828.13405	6.355992667

FIA Updates—New Volume/Biomass Equations

- ▶ **National Scale Volume and Biomass (NSVB)** equations
- ▶ When implemented in coming weeks, all current inventory volume, biomass, and carbon estimates will be impacted
- ▶ Change estimates (net growth, removals, and mortality estimates will also be recalculated using the new equations
- ▶ Previously released datasets back to the beginning of annual inventories will be updated (generally around the year 2000)

New Volume/Biomass Equations--Background

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- ▶ FIA program evolved through regional work units in the early decades which resulted in a wide range of statistical models used to predict tree volumes and biomass attributes.
- ▶ In 2009, FIA developed the component ratio method (CRM) that would standardize calculations of tree biomass attributes. However, regional volume models were still used to predict tree merchantable volume which served as the primary component feeding the CRM method.
- ▶ A large-scale effort was needed to develop a nationally consistent modeling framework

New Volume/Biomass Equations--Background

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- ▶ FIA began a decade long research project to collect new tree volume, biomass and carbon data followed by development of a national modeling system.
- ▶ Personnel and cooperators included:
 - ▶ FIA staff from regional FIA units
 - ▶ Seven university researchers
 - ▶ Numerous forest industries
 - ▶ USFS Forest Management Service Center
 - ▶ Southern Research Station Wood Properties RWU-4704

New Volume/Biomass Equations--Data

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- ▶ More than 3000 trees across the U.S. were felled to obtain the needed measures of volume, biomass, etc.
- ▶ These data augmented legacy data that were located from other studies and put into a common format.
 - ▶ More than 250,00 tree records
 - ▶ Available at legacytreedata.org
 - ▶ Other non-public data from forest industry and Canada.

Modeling Approach

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- ▶ Data were compiled by several university collaborators and the Legacy Tree Data website.
- ▶ The fitting dataset consisted of 234,823 destructively sampled trees from 339 species across 23 ecological divisions.
- ▶ Four candidate allometric models were selected for evaluation:

1. $Y = a * D^b * H^c$ (Schumacher-Hall)

2. $Y = \begin{cases} a_0 * D^{b_0} * H^c; D < k \\ a_0 * k^{(b_0-b_1)} * D_1^b * H^c; D \geq k \end{cases}$ (Segmented) | where $k = 9$ for softwood trees and $k = 11$ for hardwoods

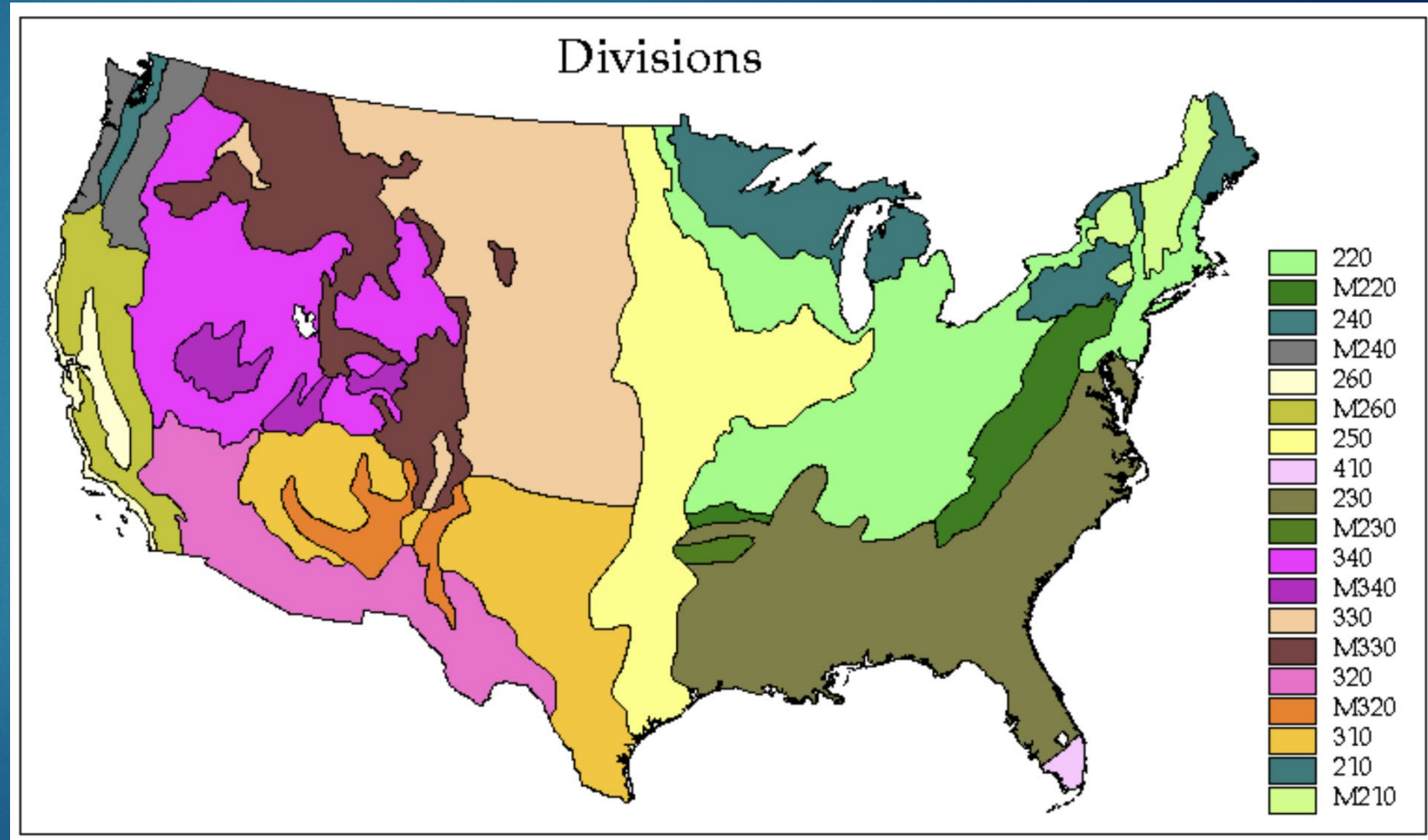
3. $Y = a * D^{(a_1 * (1 - e^{-(b_1 * D)})^{c_1})} * H^c$ (Continuously Variable)

4. $Y = a * D^b * H^c * e^{-(b_2 * D)}$ (Modified Wiley)

- ▶ All candidate models were evaluated for each species. The Schumacher-Hall model was considered the 'default' equation form.

Modeling Approach

- ▶ Preliminary work showed that the relationship between tree size and volume/biomass of a species frequently varied across ecological divisions. Therefore, models were fit by species within ecological division

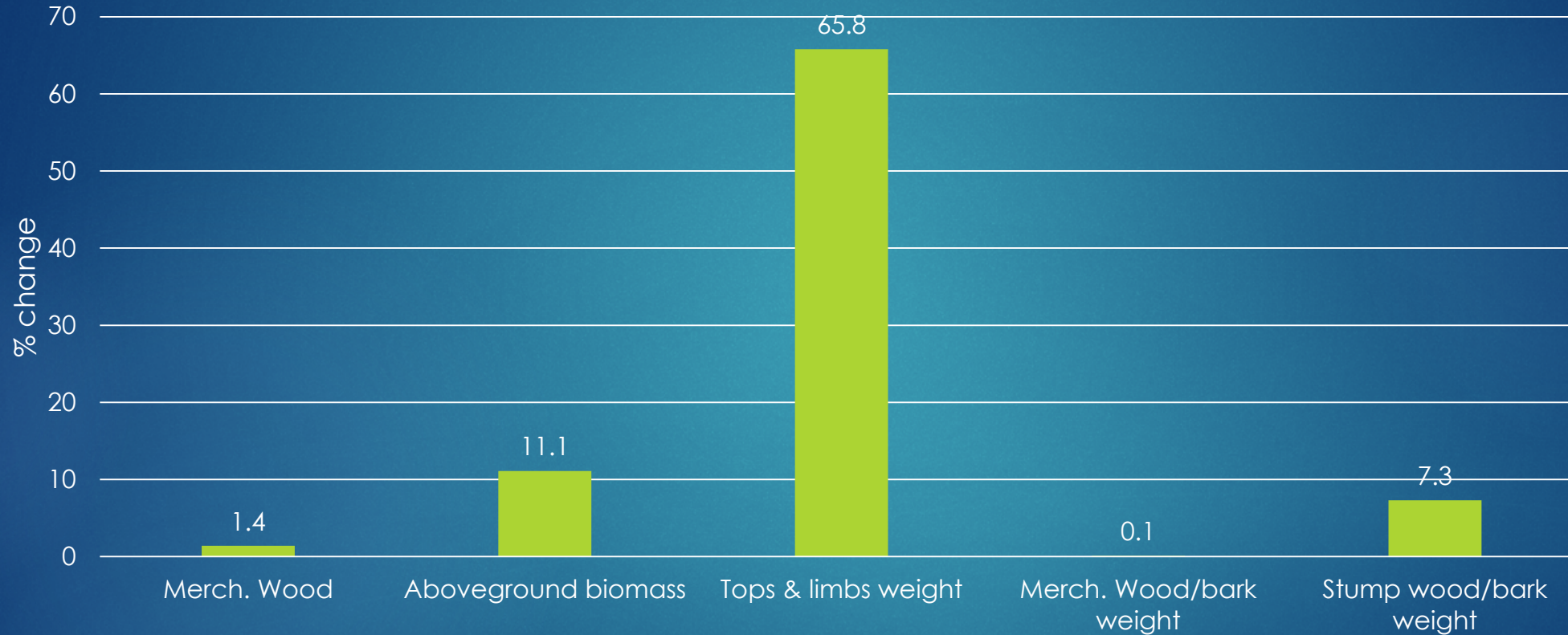


Modeling Approach

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- ▶ Predict total stem wood and bark volumes as function of d.b.h. and total height.
- ▶ Volume ratio approach divides stem into any sections needed, such as the merchantable portion, stump, stem top, etc.
- ▶ Convert stem wood volume to biomass using specific gravity.
- ▶ Predict total stem bark weight as a function of d.b.h. and total height.
- ▶ Predict total branch biomass as a function of d.b.h. and total height.
- ▶ Predict total aboveground biomass as a function of d.b.h. and total height.
- ▶ See more details at:
https://charcoal2.cnre.vt.edu/nsvb_factsheets/index.html

Nationwide Results-Current FIADB to NSVB



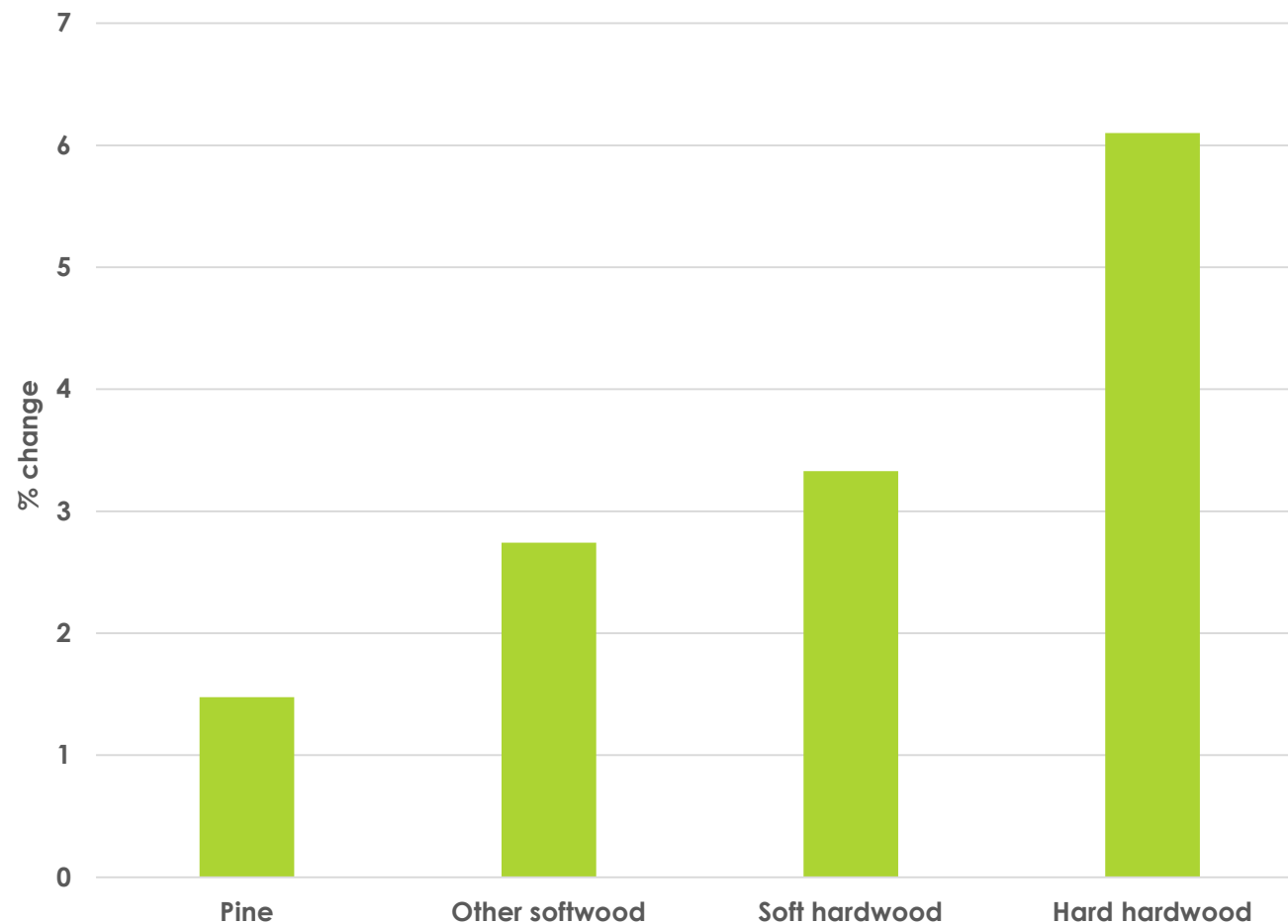
Ray Sheffield, SOFAC Meeting, August 9-10, 2021

Source: Presentation by James Westfall, 2022 FIA User Group Meeting, May 23, 2022

What will be the impact of NSVB equation to SRTS data?

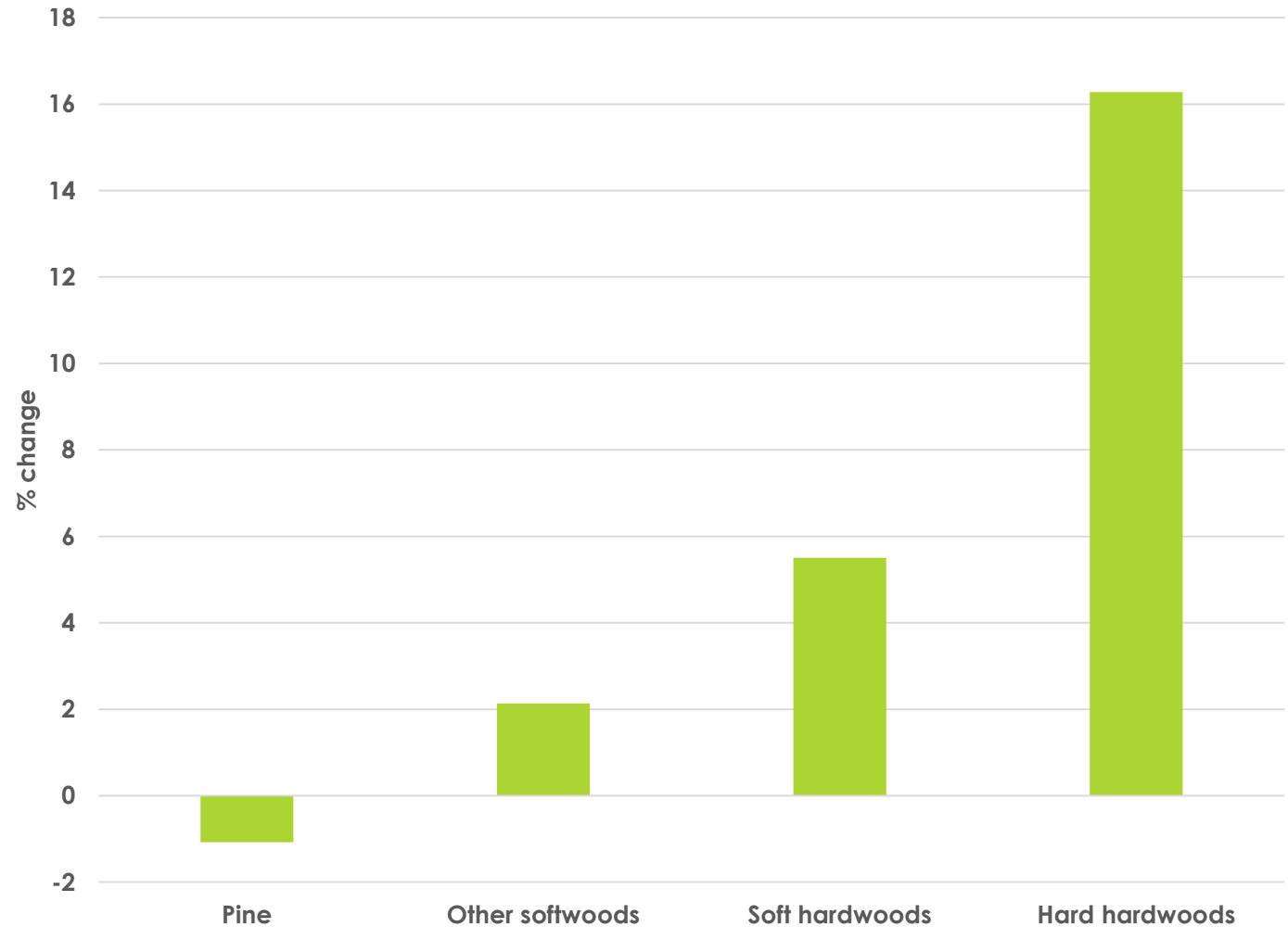
- FIA provided access to TREE records for 13 Southern states containing the standard FIADB volume/biomass variables and the new NSVB estimates
- I assigned the detailed species to the 4 SRTS species groups—Pine, Other softwoods, Soft hardwoods, and Hard hardwoods

Change in merchantable bole volume, Southwide

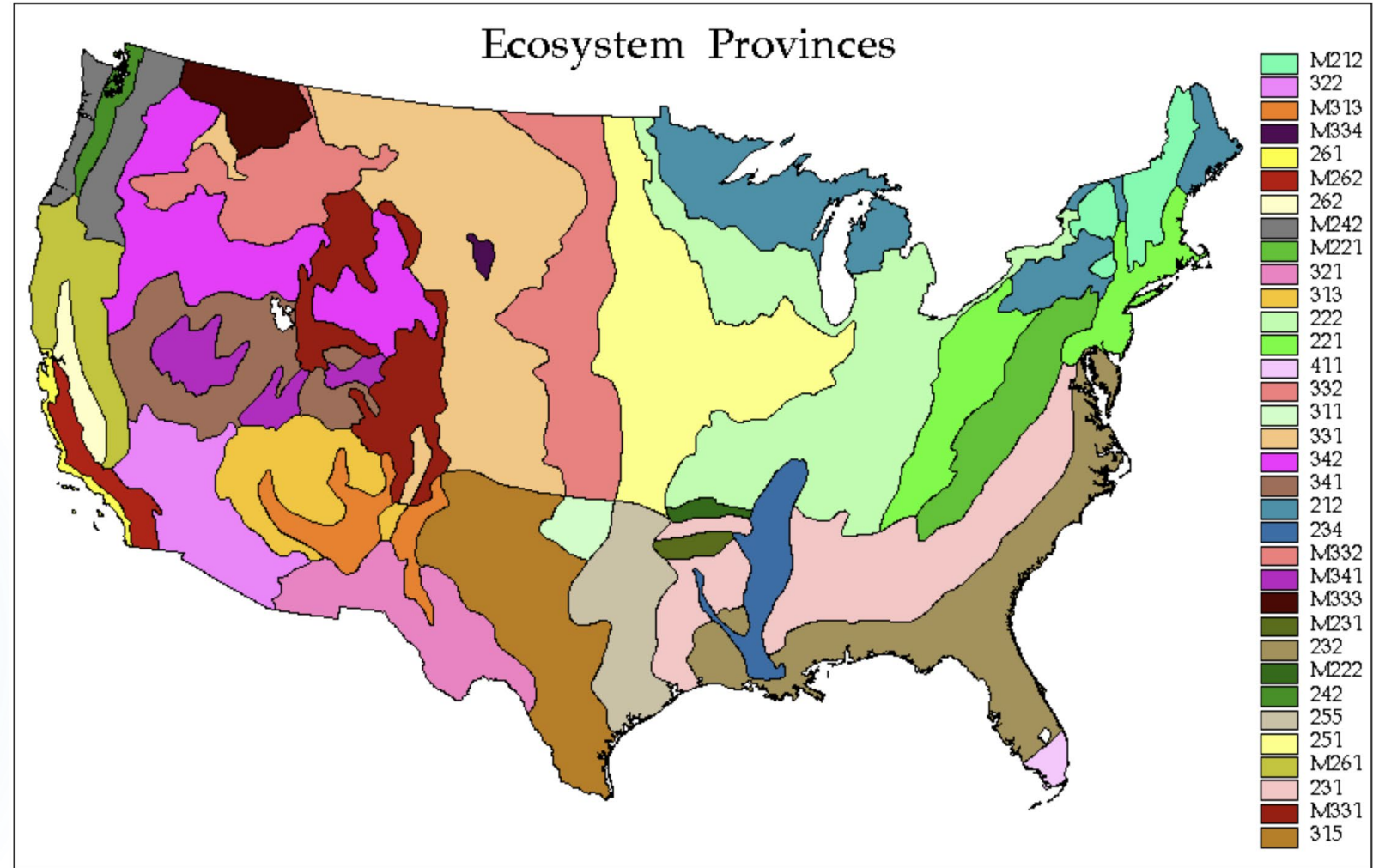


Change in aboveground carbon in live trees 1.0 inch d.b.h. and larger, Southwide

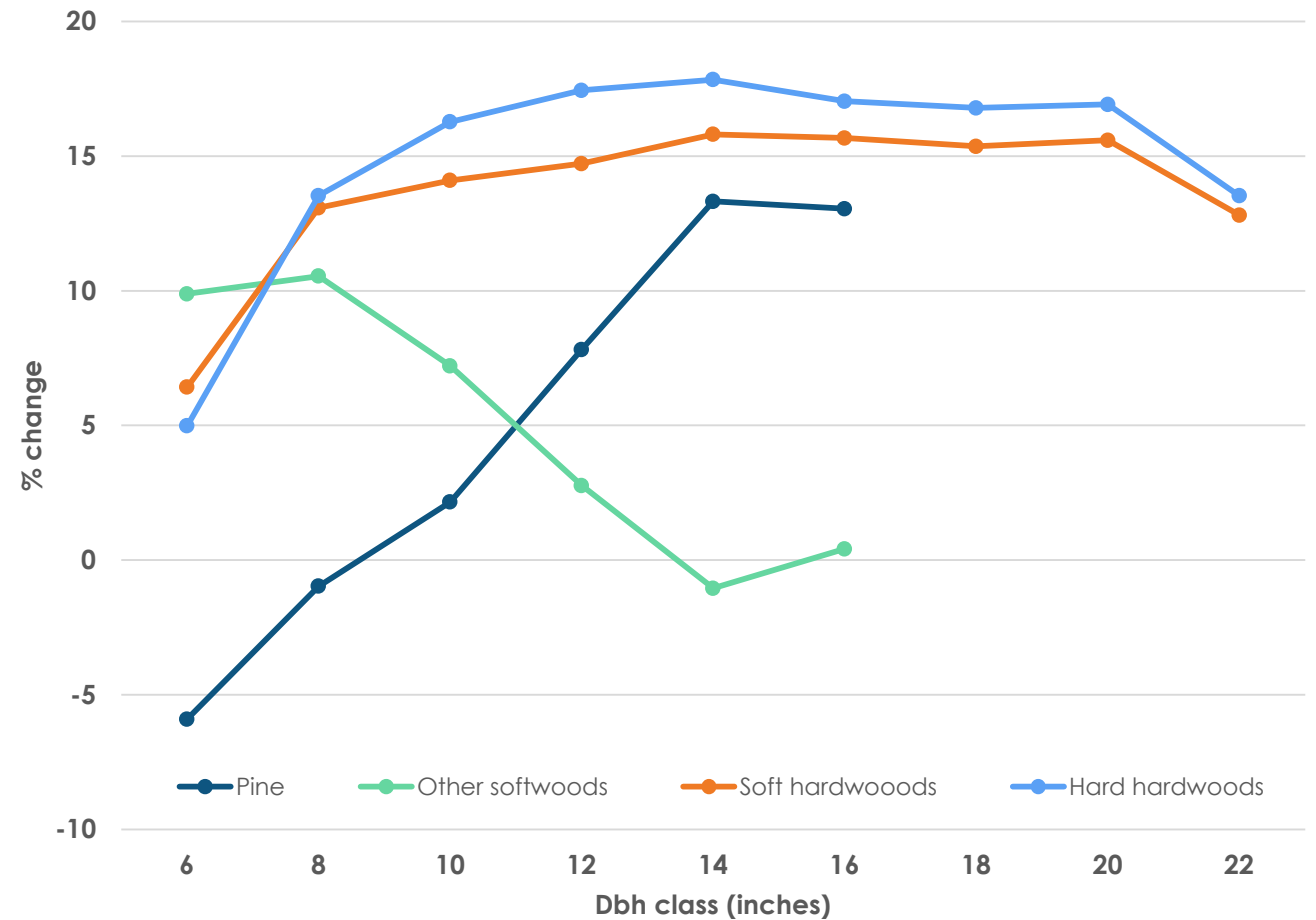
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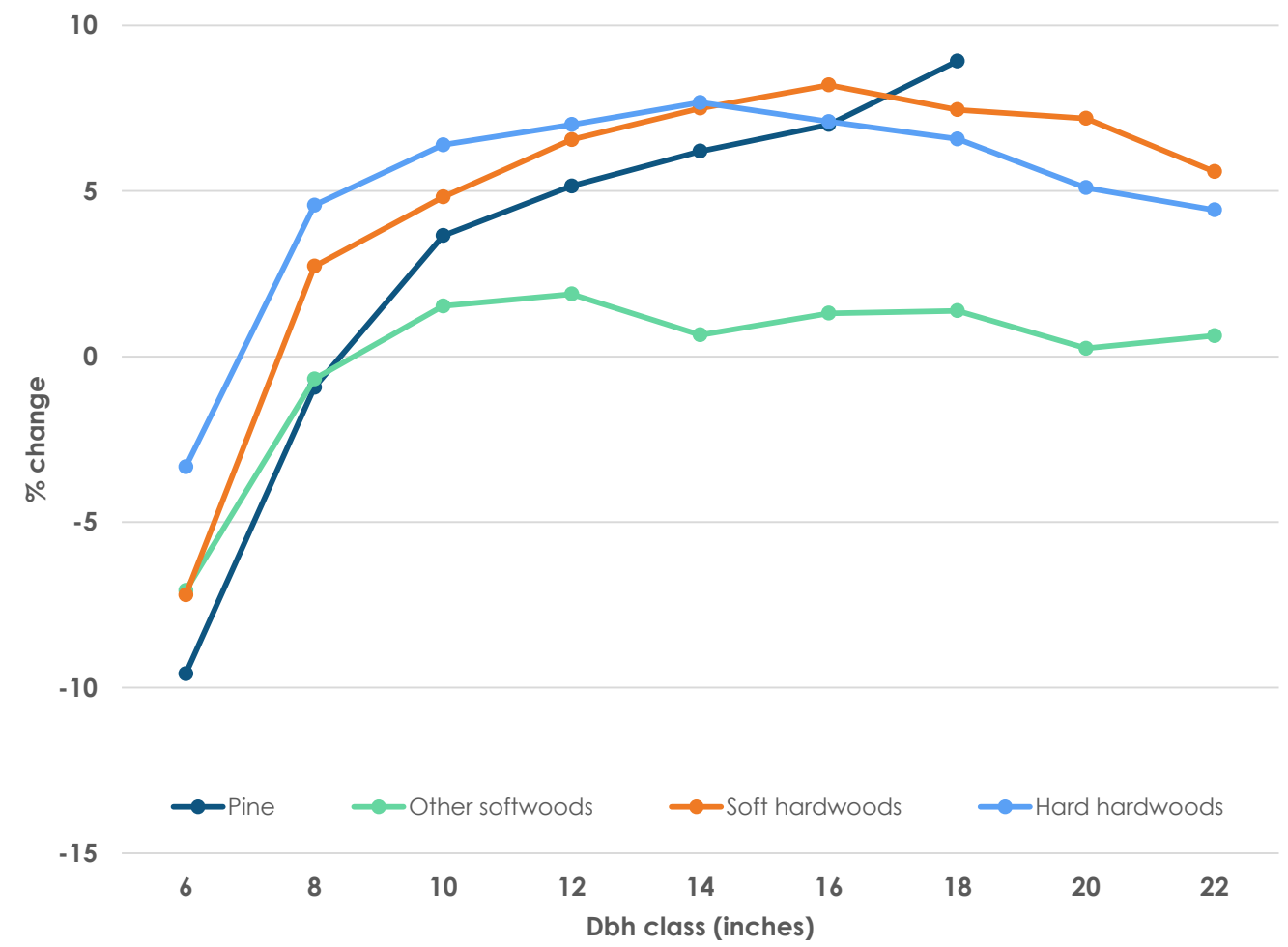
- **Merchantable volume change by tree size and groups of ecosystem provinces provides important insight**
- **Eastern-Central Broadleaf**
- **Central Appalachians**
- **Lower Mississippi Riverine**
- **Southeastern Mixed**
- **Outer Coastal Plain**



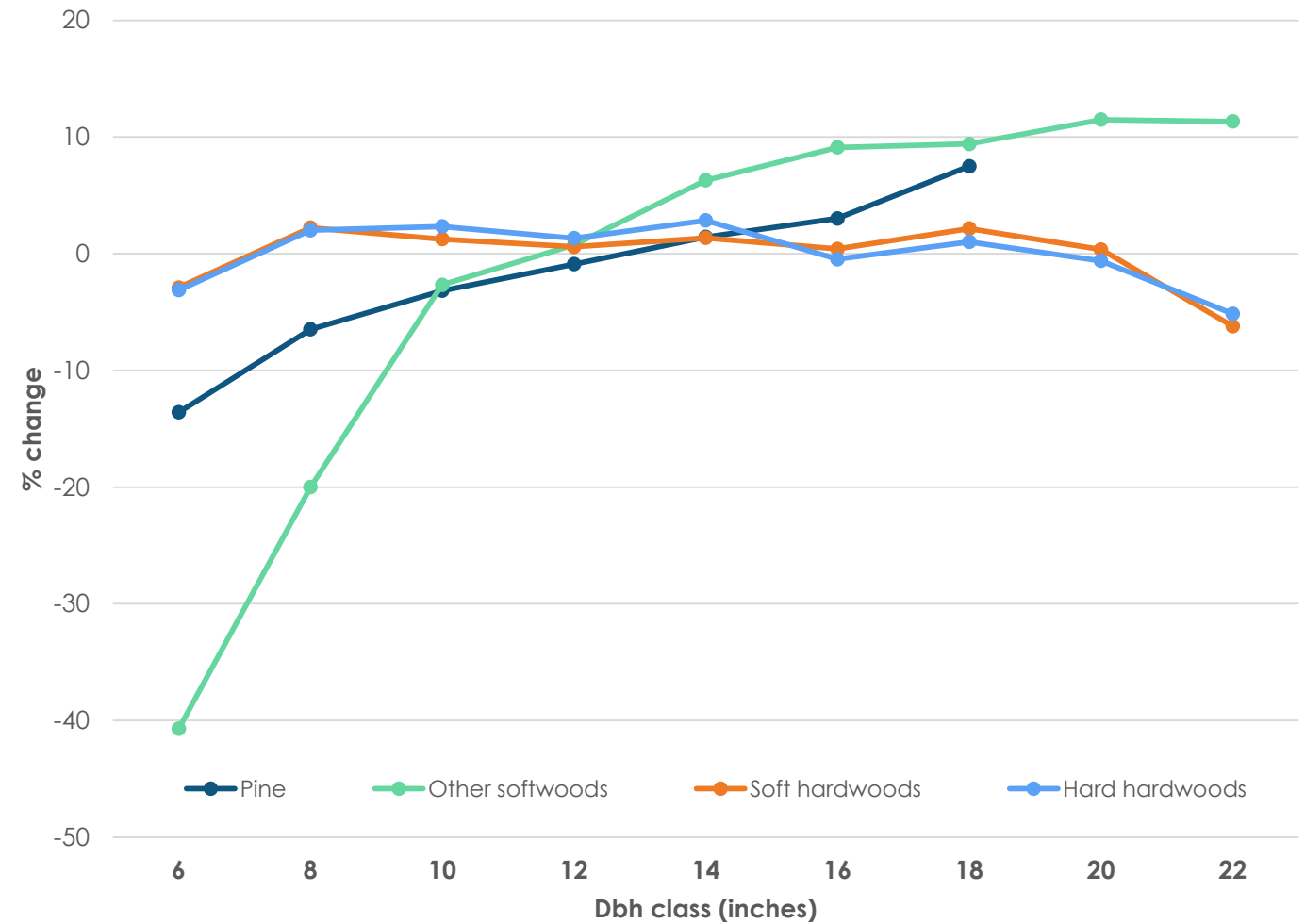
Change in merchantable volume in the Eastern-Central Broadleaf Provinces



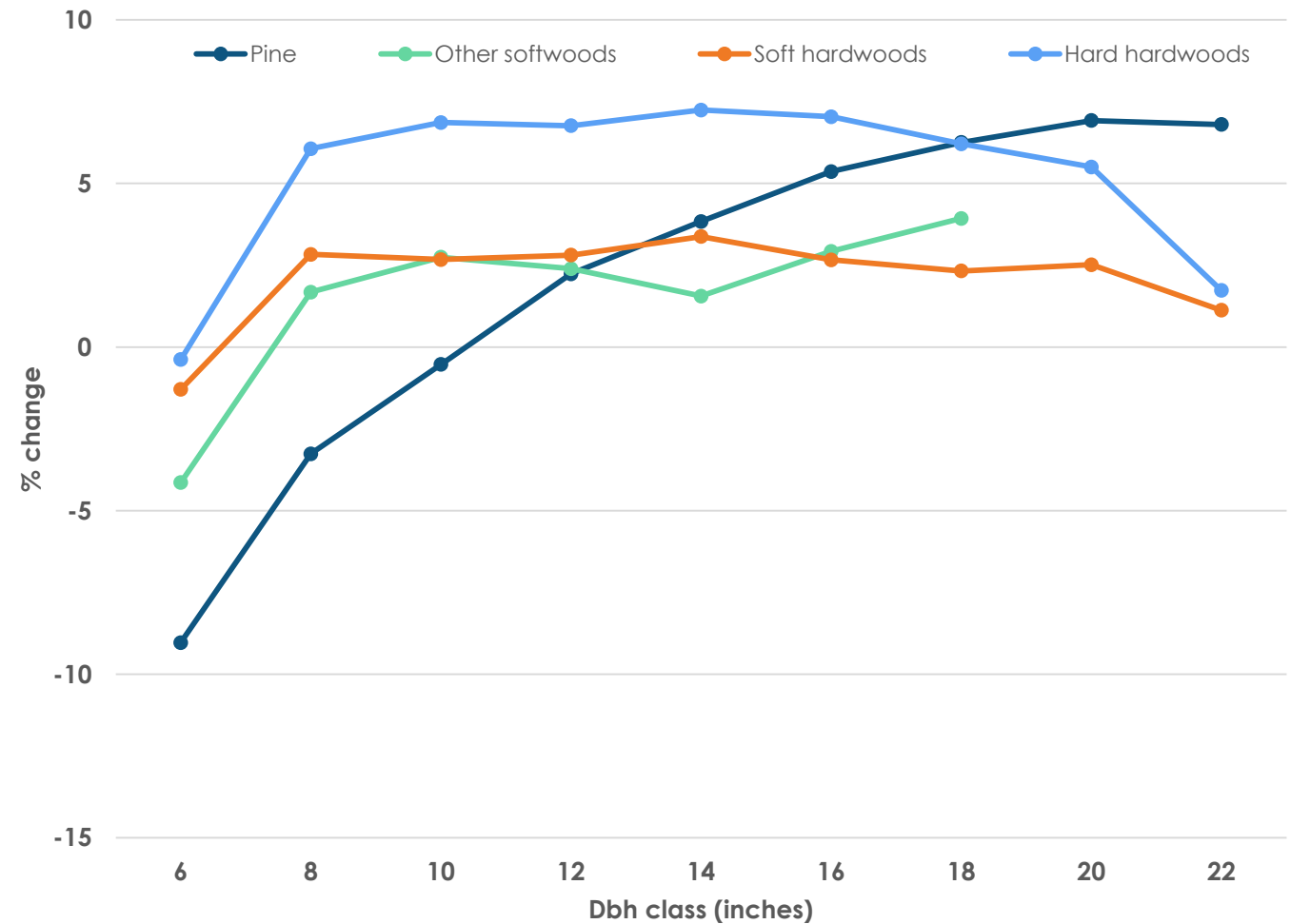
Change in merchantable volume in the Central Appalachian Broadleaf Forest-Coniferous Forest Meadow Province



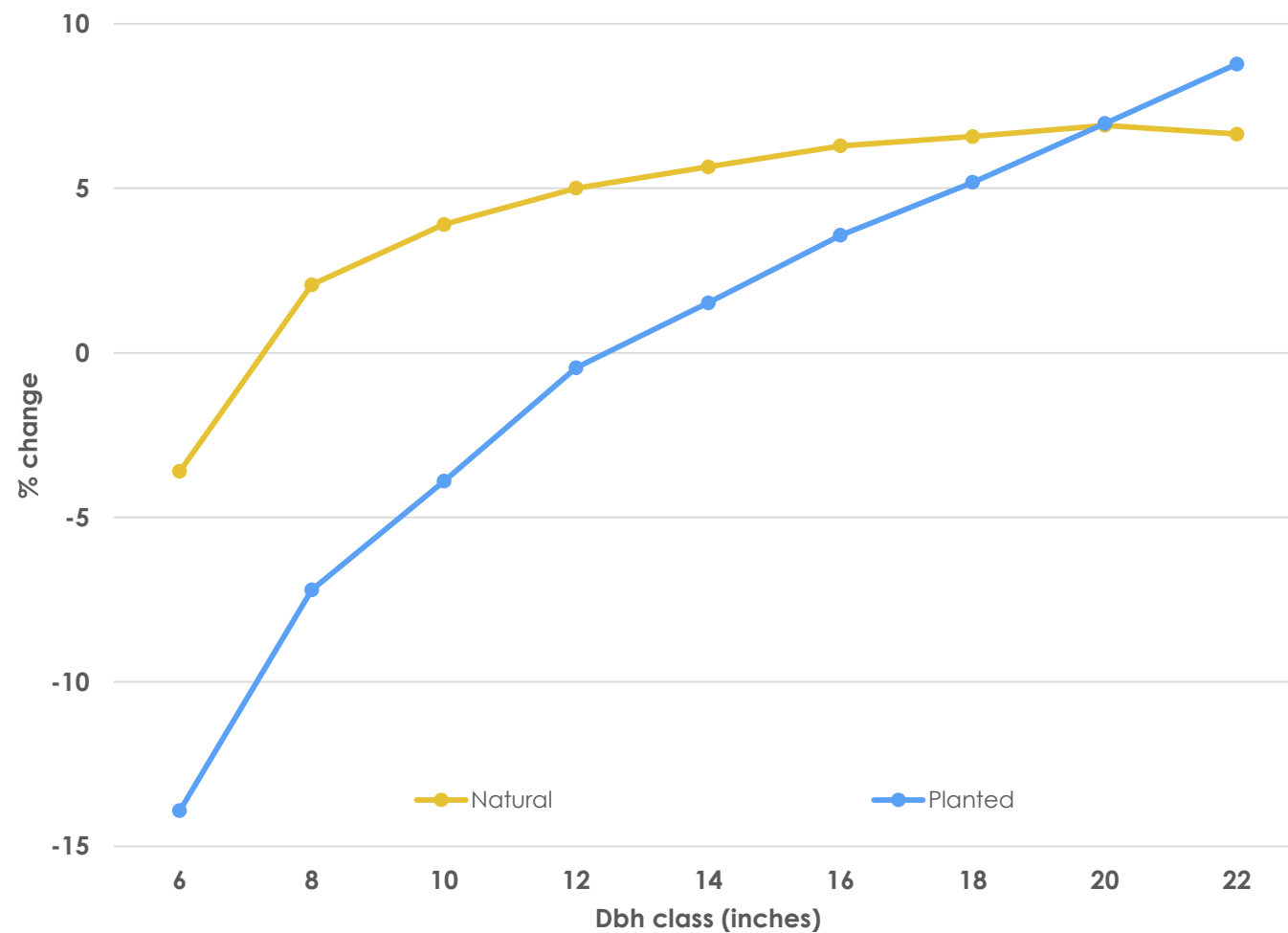
Change in merchantable volume in the Lower Mississippi Riverine Province



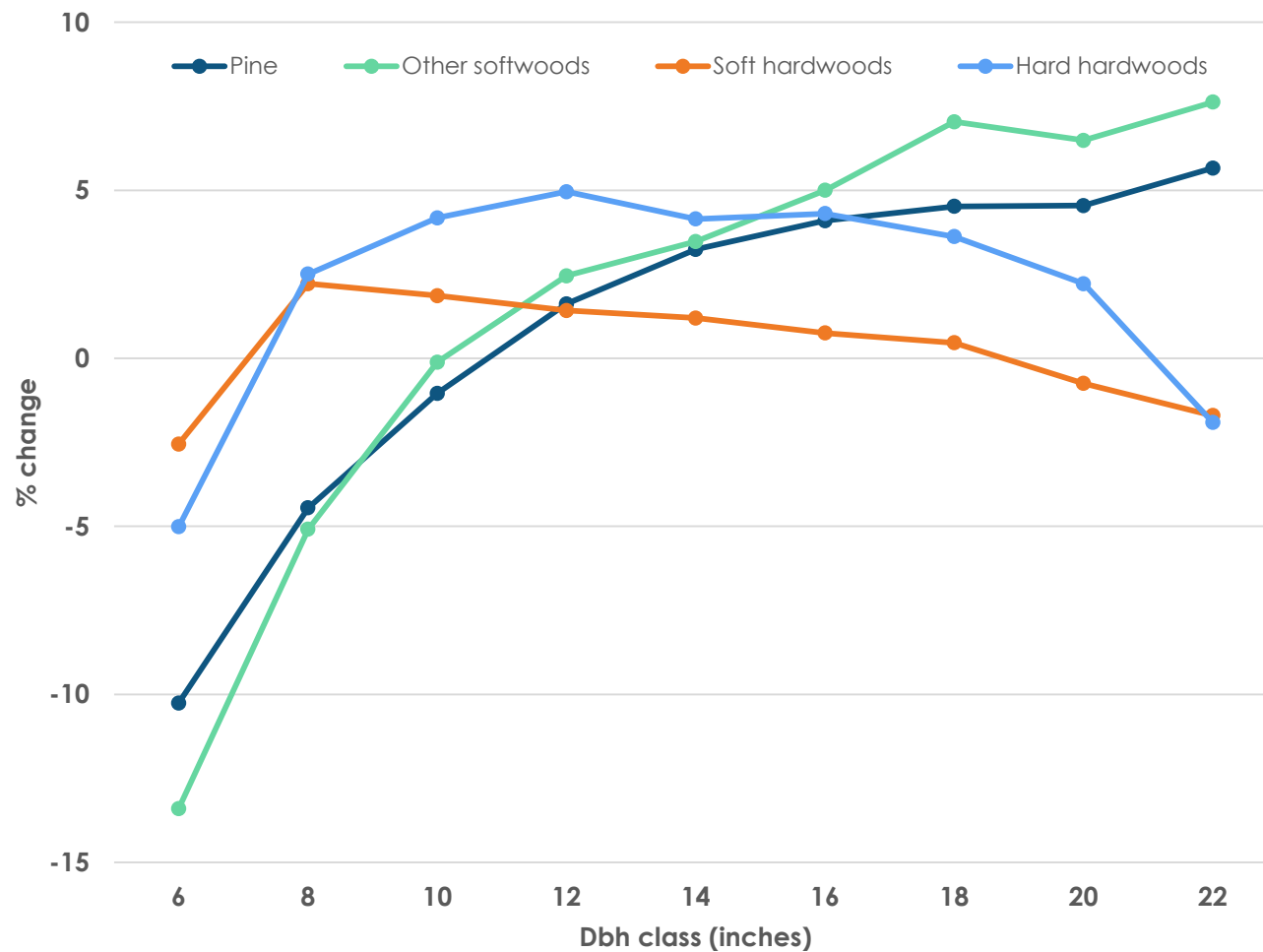
Change in merchantable volume in the Southeastern Mixed Forest Province



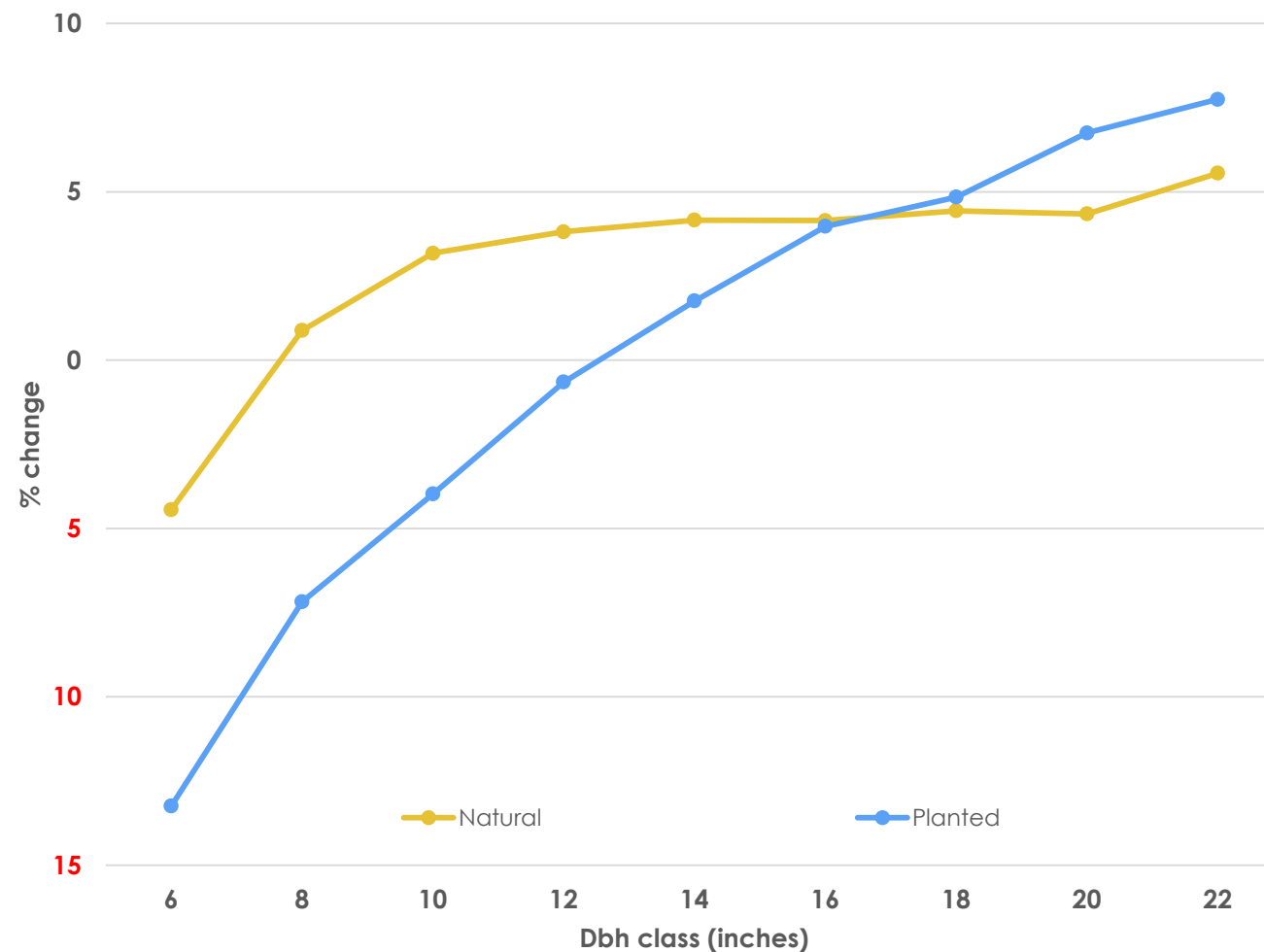
Change in pine merchantable volume in the Southeastern Mixed Forest Province—planted and natural stands



Change in merchantable volume in the Outer Coastal Plain Mixed Forest Province



Change in pine merchantable volume in the Outer Coastal Plain Mixed Forest Province—planted and natural stands



Take Home Messages

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- ▶ Hardwood volume will increase the most, especially in the central hardwoods region
- ▶ Pine volume, overall, will not see large changes overall, but diameter distributions will shift from smaller to larger diameters.
- ▶ Revised volumes will be implemented into the latest SRTS data set
- ▶ County trends database can be updated back to around 2000. Back through periodic inventory years...??