

# FPS Crosswalk Table for King's Site Index Curves

2023 Growth Model Users Group Meeting  
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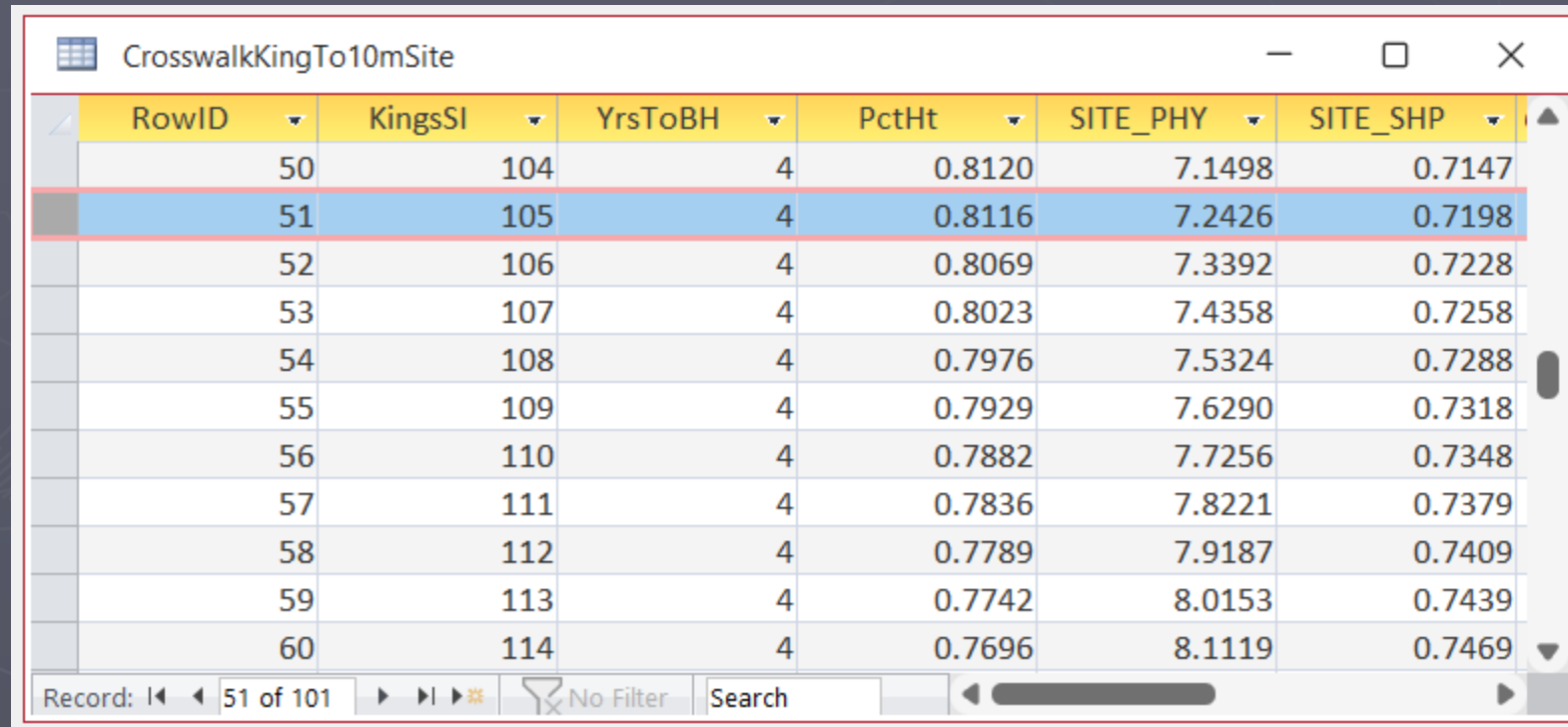


# Quick FBRI Update

- ▶ FPS Version 7.60 released March 23, 2023
  - Several bugs fixed
  - Implemented regional rules for scaling butt logs
  - Includes crosswalk tables for **King's site index curves** and Monserud's site index system
  - Additional documentation is in the C:\Fp7\Doc folder
- ▶ Going forward
  - Two in-person workshops have been scheduled
    - ▶ FPS Basics—April 11 & 12
    - ▶ Harvest Scheduling—October 17 & 18
  - Fix more bugs
  - Research new methods for producing forest inventories
  - Establish an eastern FBRI office
  - Begin planning a major upgrade to the FPS software (the 5<sup>th</sup> generation of the program)
    - ▶ Process census-level inventories
    - ▶ Move away from Microsoft Access
    - ▶ GIS integration

# FPS Crosswalk Table for King's Site Index Curves

- ▶ The crosswalk table below is used to determine the PctHt, SITE\_PHY, and SITE\_SHP for any given King's site index



RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
50	104	4	0.8120	7.1498	0.7147
51	105	4	0.8116	7.2426	0.7198
52	106	4	0.8069	7.3392	0.7228
53	107	4	0.8023	7.4358	0.7258
54	108	4	0.7976	7.5324	0.7288
55	109	4	0.7929	7.6290	0.7318
56	110	4	0.7882	7.7256	0.7348
57	111	4	0.7836	7.8221	0.7379
58	112	4	0.7789	7.9187	0.7409
59	113	4	0.7742	8.0153	0.7439
60	114	4	0.7696	8.1119	0.7469

Record: 51 of 101 | No Filter | Search

- ▶ This presentation describes how the crosswalk table was developed from King's site index curves

# King's site index curves for Douglas-fir

Published in 1966

Widely used in Washington, Oregon,  
and California

Only requires total height and age at  
breast height on a sample of trees to  
estimate a site's productivity

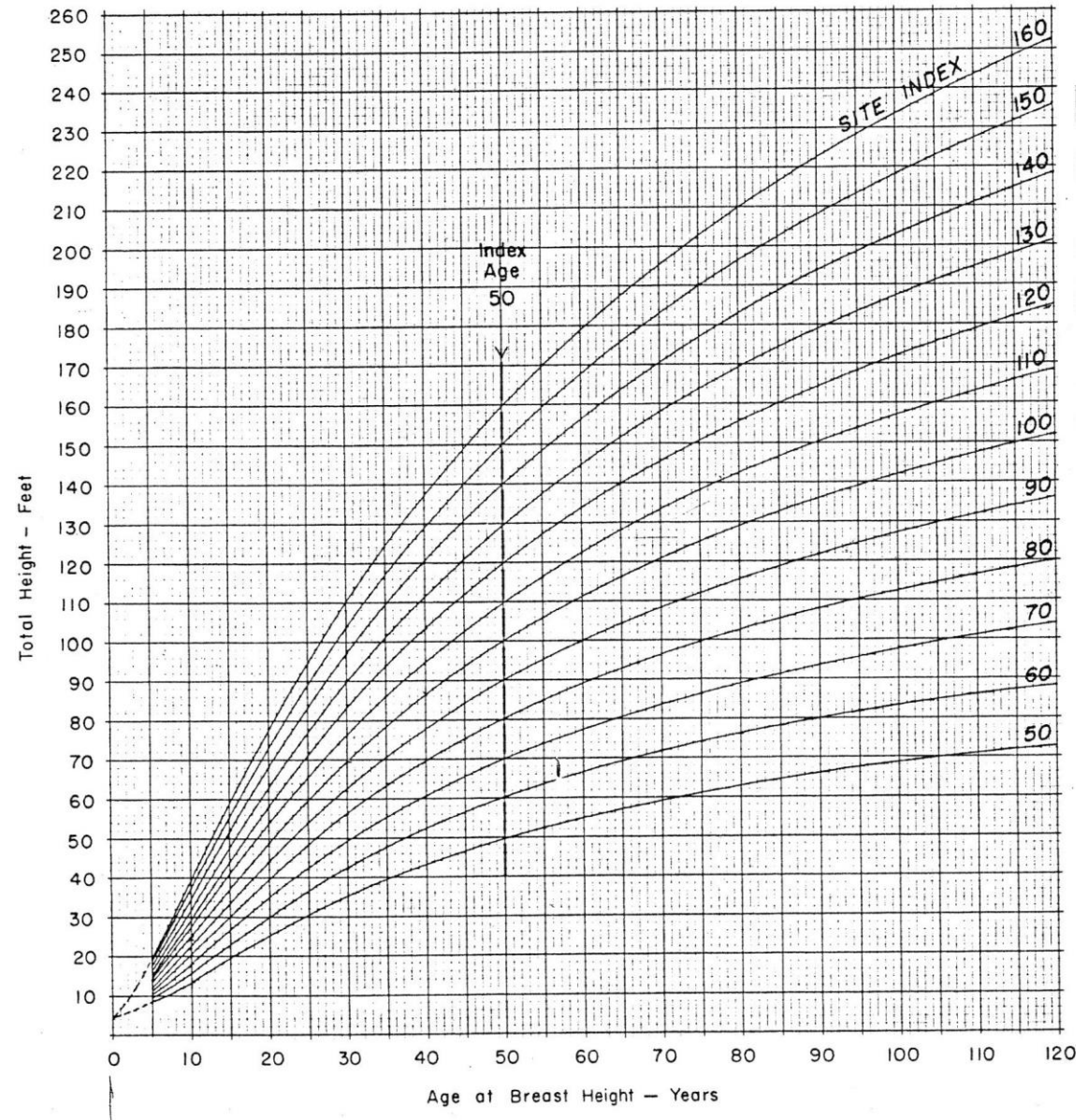
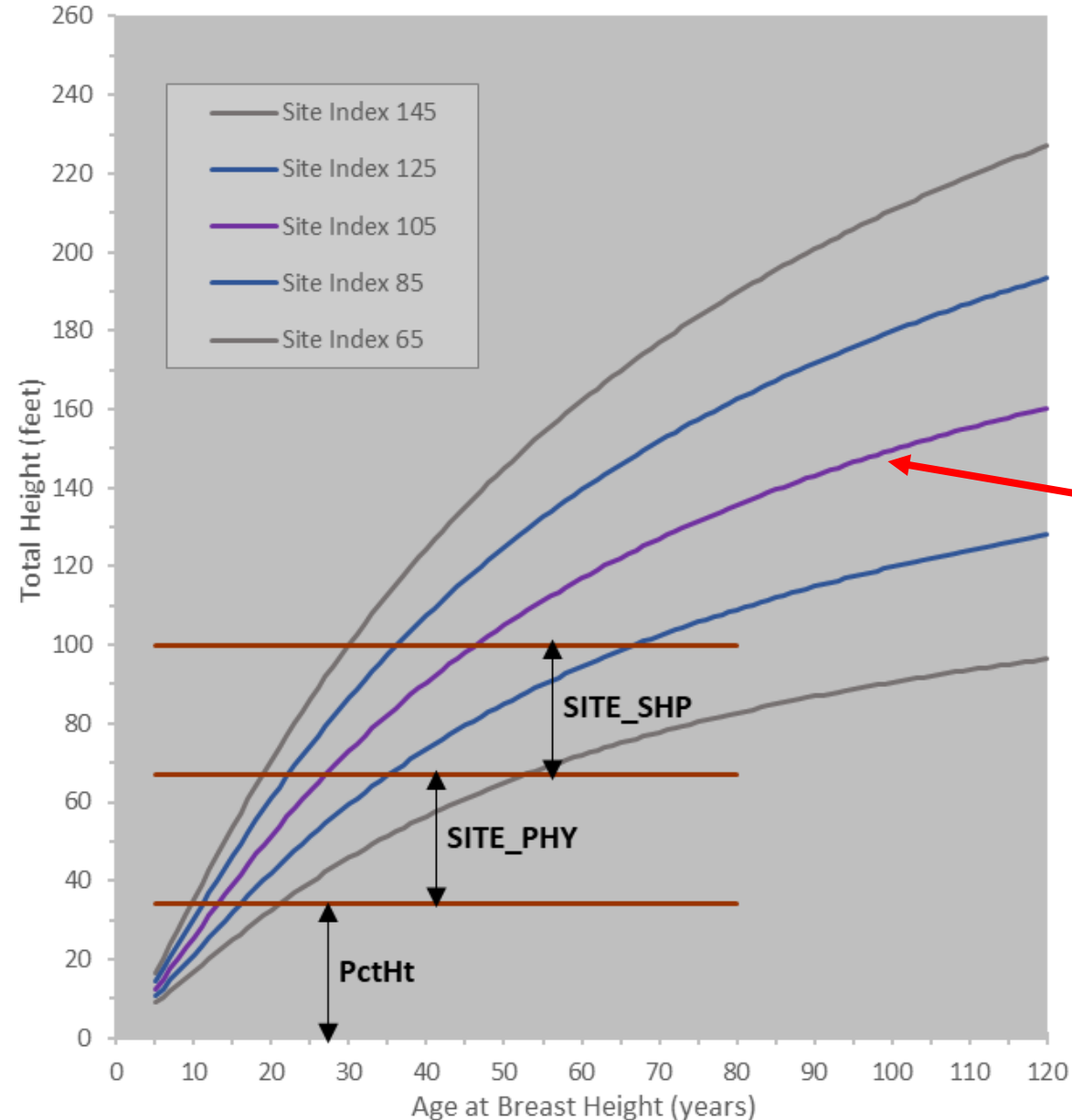


FIGURE 5. Site index curves for Douglas-fir.



King's Site Index Curves for Douglas-fir



To model King's curves within FPS, we need to find the SITE\_PHY, SITE\_SHP, and PctHt values for each site index

For example, what values of SITE\_PHY, SITE\_SHP, and PctHt produce a curve that is a good approximation to King's site index 105 curve?

# Calculation of the three 10m Site Metrics

## *SITE\_PHY*, *SITE\_SHP*, and *PctHt*

- ▶ Macro-site growth capacity

$$\textit{SITE\_PHY} = \frac{10 \text{ meters} \times 10 \text{ years/decade}}{\text{ring count at 34 ft} - \text{ring count at 67 ft}}$$

- ▶ Long-term growth adjusted for limiting environmental factors

$$\textit{SITE\_SHP} = \frac{\text{ring count at 34 ft} - \text{ring count at 67 ft}}{\text{ring count at 67 ft} - \text{ring count at 100 ft}}$$

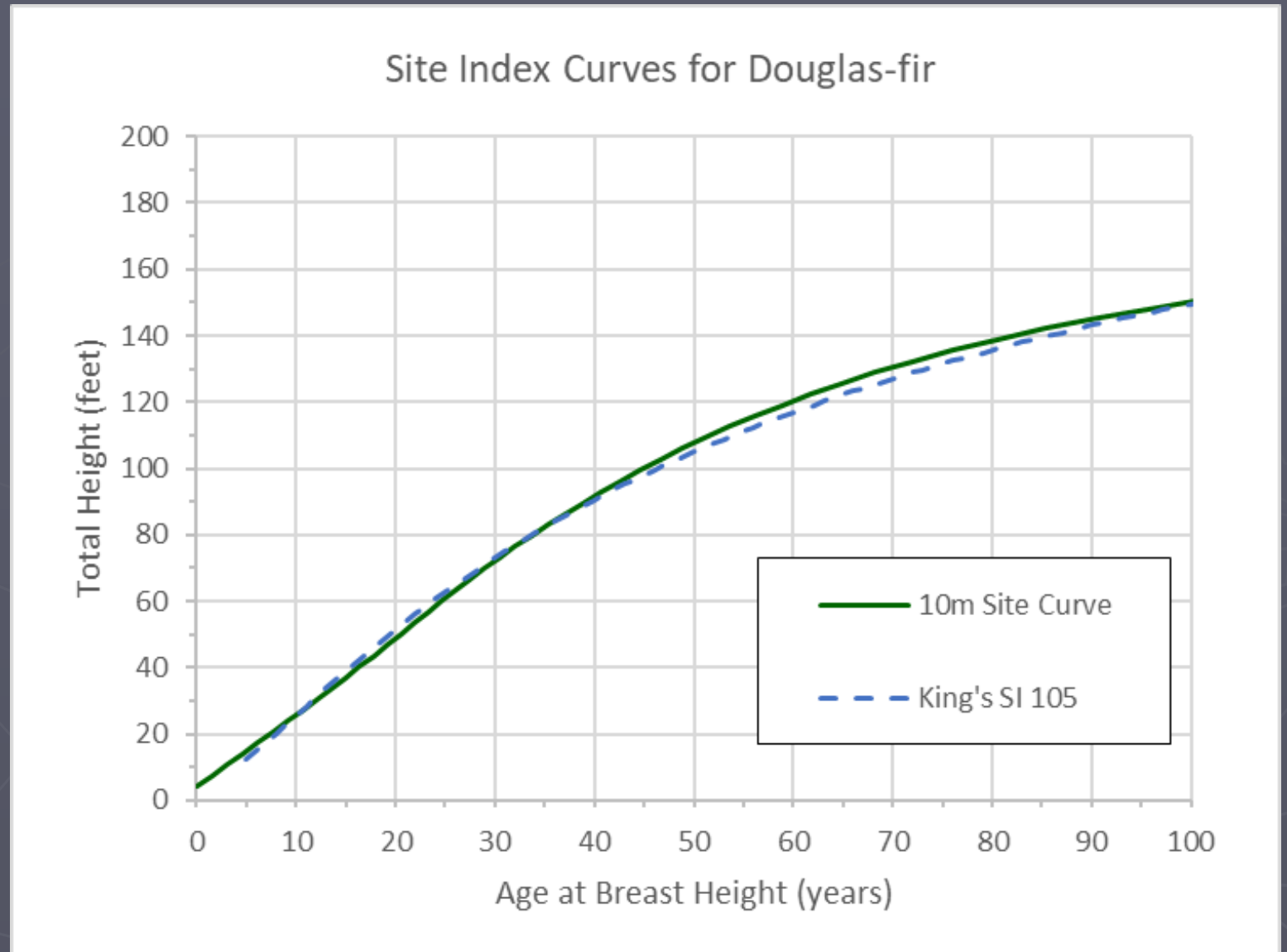
- ▶ Growth due to early silviculture

$$\textit{PctHt} = \frac{\text{ring count at 34 ft} - \text{ring count at 67 ft}}{\text{ring count at 1 ft} - \text{ring count at 34 ft}}$$

## 10m Site Curves can exhibit a wide variety of patterns

Metrics for the 10m Site Curve shown in the chart (green curve)

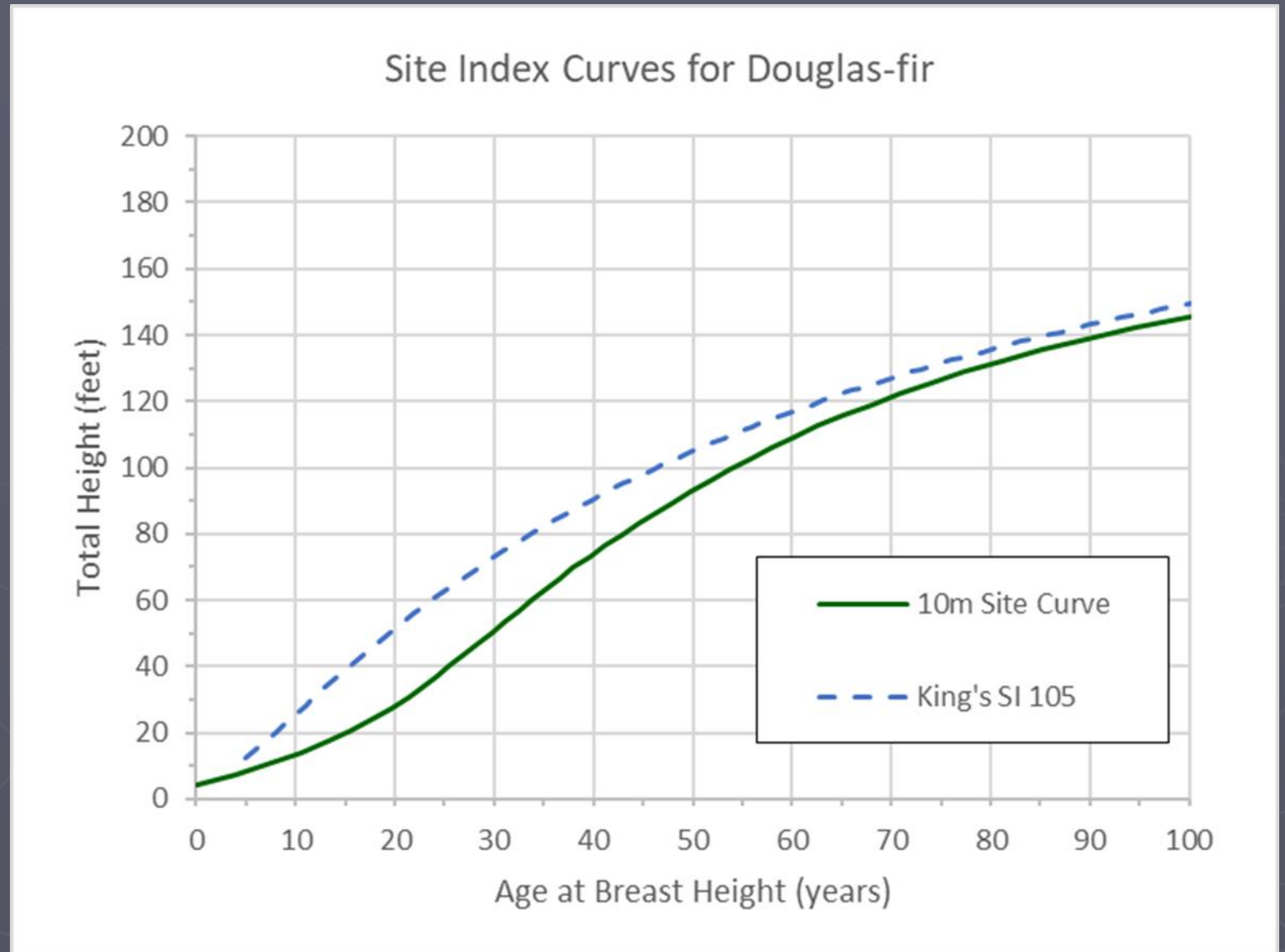
- SITE\_PHY = 7.243
- SITE\_SHP = 71.98%
- PctHt = 81.16%



## 10m Site Curves can exhibit a wide variety of patterns

Metrics for the 10m Site Curve shown in the chart (green curve)

- SITE\_PHY = 7.243
- SITE\_SHP = 71.98%
- PctHt = 40.00%

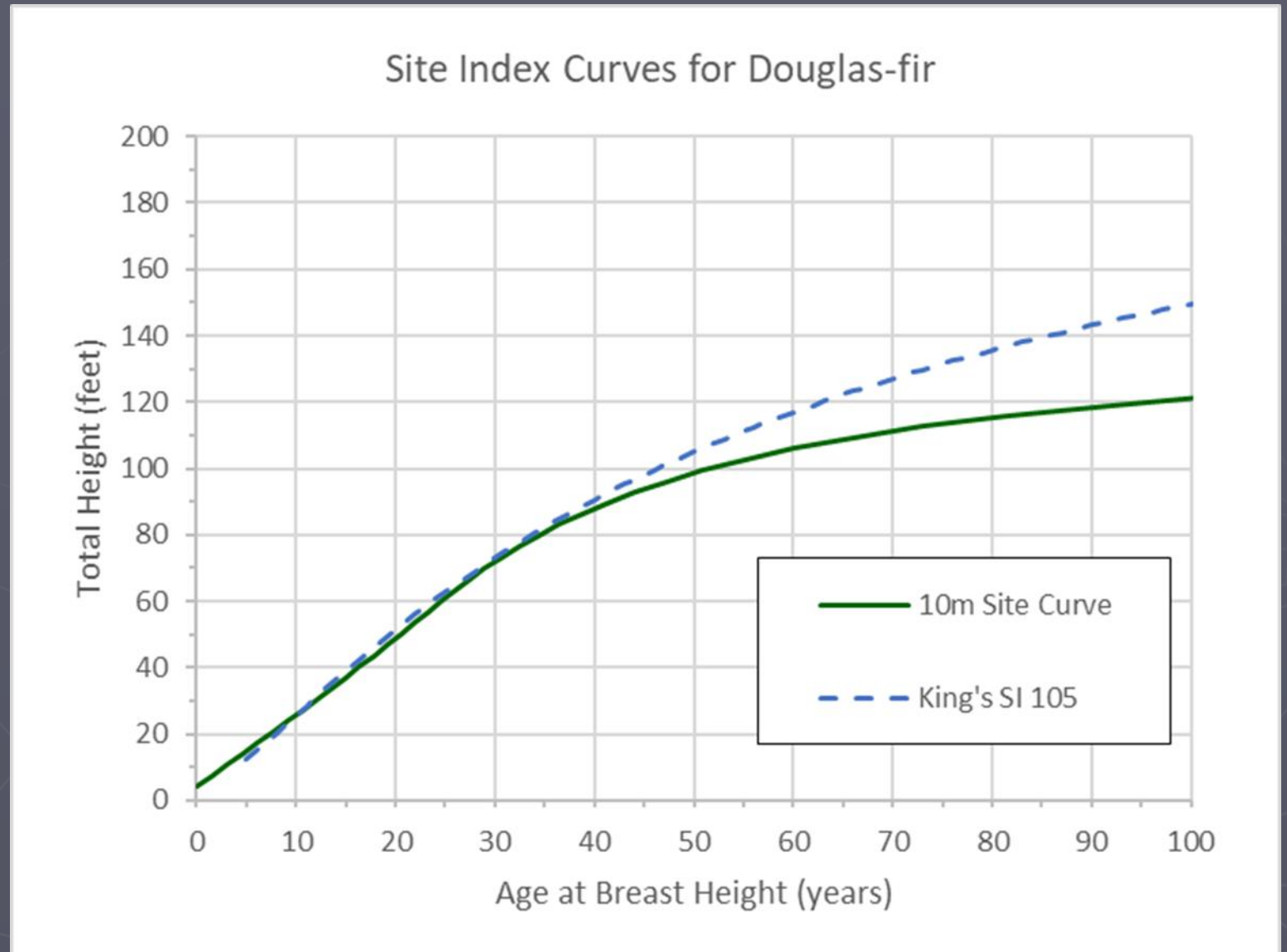




## 10m Site Curves can exhibit a wide variety of patterns

Metrics for the 10m Site Curve shown in the chart (green curve)

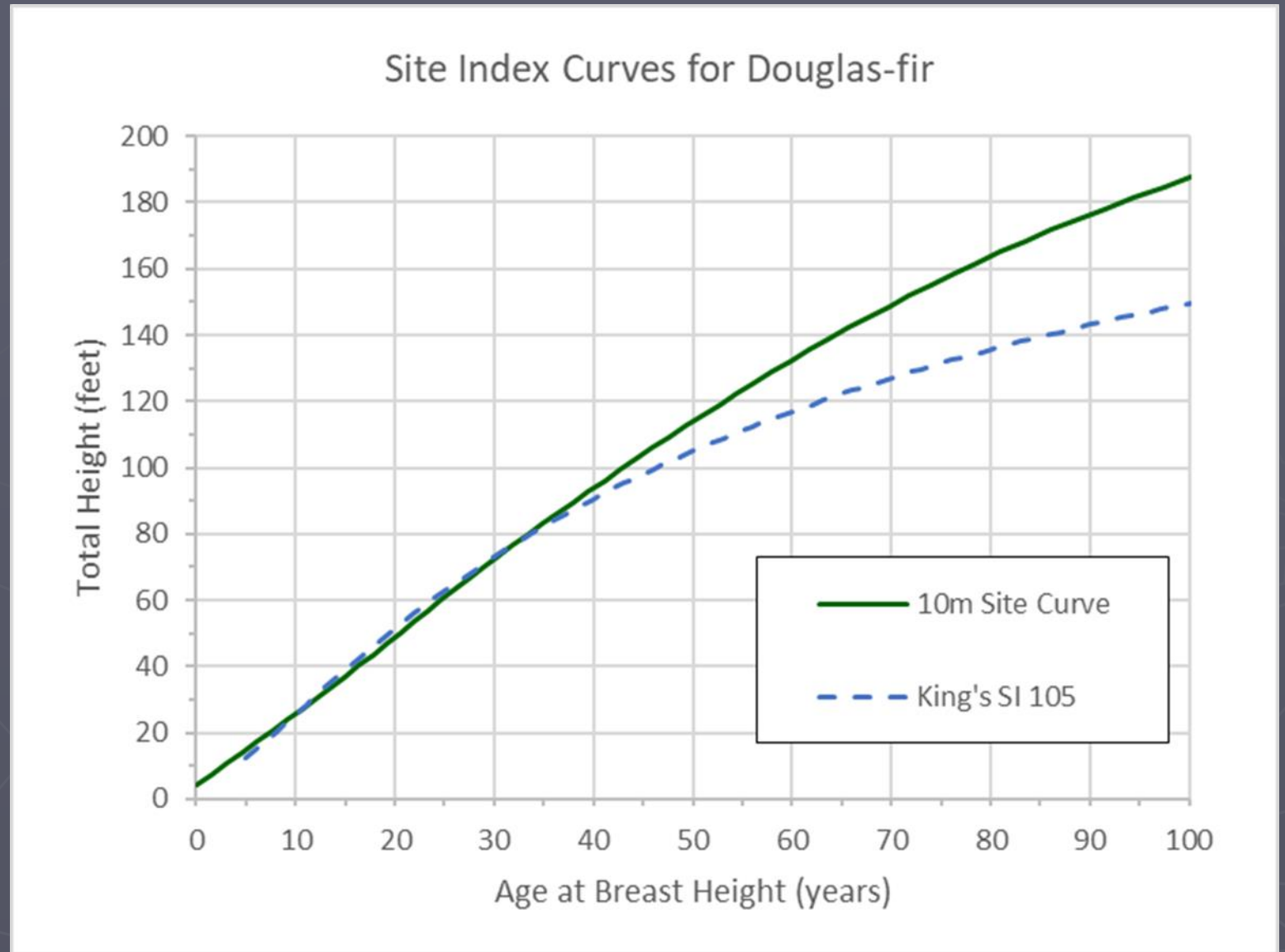
- SITE\_PHY = 7.243
- SITE\_SHP = 50.00%
- PctHt = 81.16%



## 10m Site Curves can exhibit a wide variety of patterns

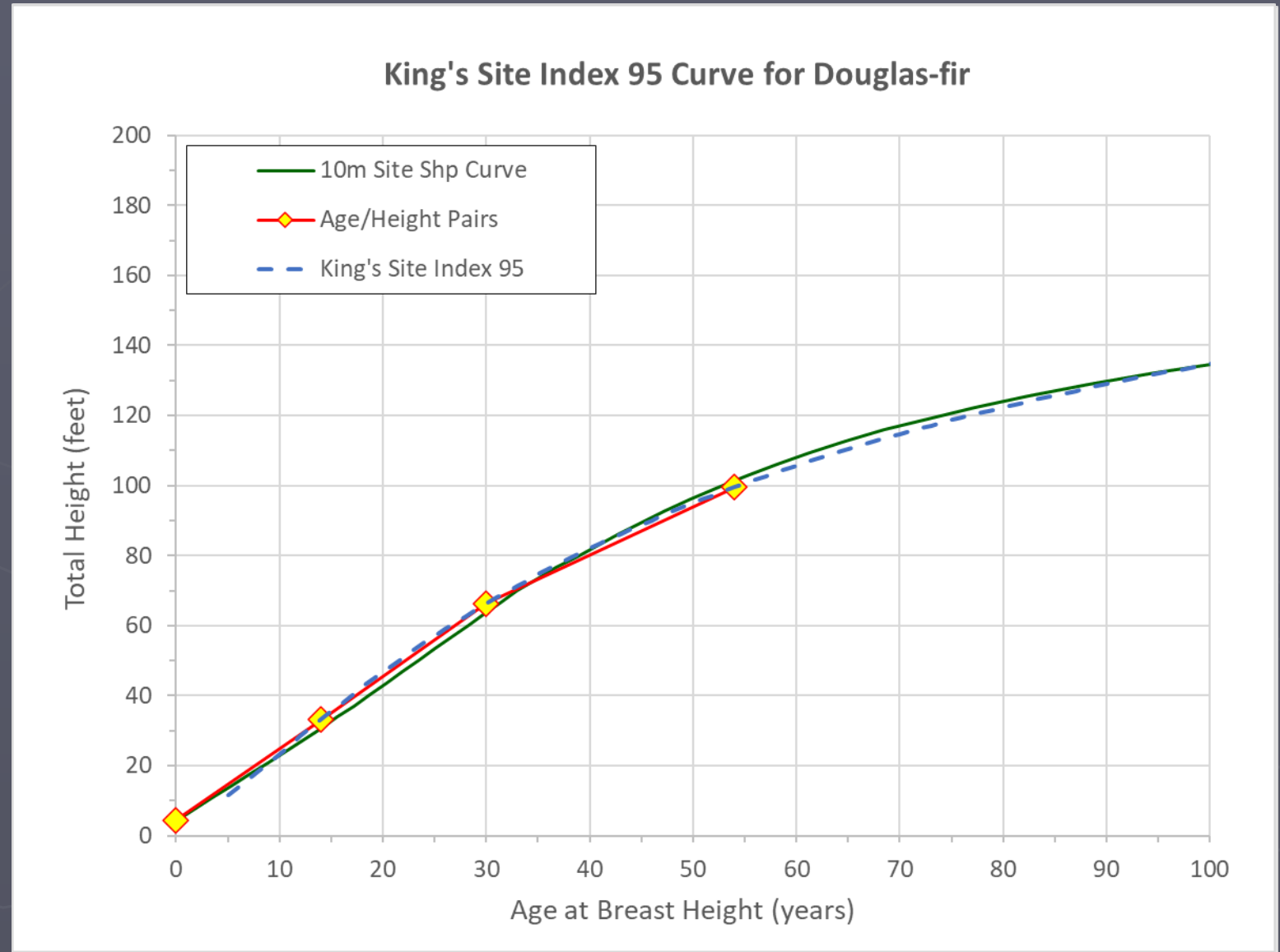
Metrics for the 10m Site Curve shown in the chart (green curve)

- SITE\_PHY = 7.243
- SITE\_SHP = 80.00%
- PctHt = 81.16%



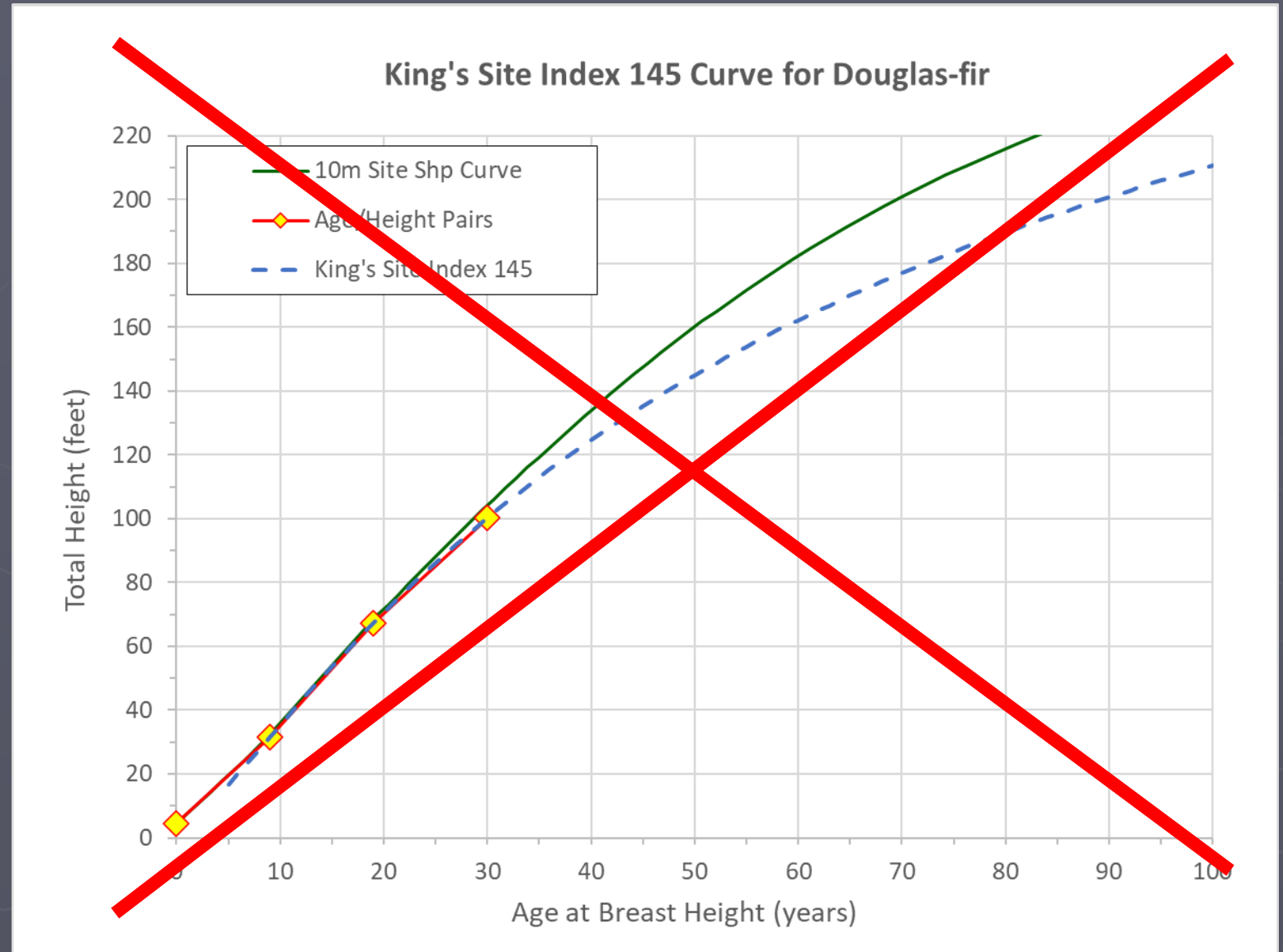
# Calculation of the three 10m site metrics for King's site index 95

- ▶ Start with King's curve
- ▶ Calculate SITE\_PHY  
= 6.314 meters/decade
- ▶ Calculate SITE\_SHP  
= 66.85%
- ▶ Calculate PctHt  
= 81.59%
- ▶ **PRETTY GOOD FIT!**



## Calculation of the three 10m site metrics for King's site index 145

- ▶ Start with King's curve
- ▶ Calculate SITE\_PHY  
= 10.918 meters/decade
- ▶ Calculate PctHt  
= 77.51%
- ▶ Calculate SITE\_SHP  
= 83.25%
- ▶ **CRAPPY FIT!!!**
- ▶ To fix the problem reduce SITE\_SHP



## Calculation of the three 10m site metrics for King's site index 145

- ▶ Start with King's curve
- ▶ Calculate SITE\_PHY  
= 10.918 meters/decade
- ▶ Calculate PctHt  
= 77.51%
- ▶ Re-define SITE\_SHP based on height at 100 years old:  
SITE\_SHP = 80.46%
- ▶ **MUCH BETTER FIT!**





E32

The crosswalk table below shows the three Site10 metrics (**PctHt**, **SITE\_PHY**, and **SITE\_SHP**) for selected King's site index curves

RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
1	55	9	1.4105	2.0840	0.4310
11	65	8	1.1012	3.1577	0.4207
21	75	7	0.9478	4.2279	0.5094
31	85	6	0.8689	5.2673	0.6013
41	95	5	0.8159	6.3143	0.6685
51	105	4	0.8116	7.2426	0.7198
61	115	4	0.7649	8.2085	0.7499
71	125	3	0.7786	9.1263	0.7778
81	135	3	0.7419	10.0595	0.7894
91	145	2	0.7751	10.9181	0.8046
101	155	2	0.7704	11.8050	0.8167

The crosswalk table below is derived from the table at the left using "interpolation" to calculate the Site10 metrics (**PctHt**, **SITE\_PHY**, and **SITE\_SHP**) by 1 foot height increments

RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
1	55	9	1.4105	2.0840	0.4310
2	56	9	1.3796	2.1914	0.4300
3	57	9	1.3487	2.2987	0.4290
4	58	9	1.3177	2.4061	0.4279
5	59	9	1.2868	2.5135	0.4269
6	60	9	1.2558	2.6208	0.4259
7	61	8	1.2249	2.7282	0.4248
8	62	8	1.1940	2.8356	0.4238
9	63	8	1.1630	2.9429	0.4228
10	64	8	1.1321	3.0503	0.4217
11	65	8	1.1012	3.1577	0.4207
12	66	8	1.0858	3.2647	0.4296
13	67	8	1.0705	3.3717	0.4384
14	68	8	1.0551	3.4787	0.4473
15	69	8	1.0398	3.5858	0.4562
16	70	8	1.0245	3.6928	0.4650
17	71	7	1.0091	3.7998	0.4739
18	72	7	0.9938	3.9068	0.4828
19	73	7	0.9784	4.0139	0.4917
20	74	7	0.9631	4.1209	0.5005
21	75	7	0.9478	4.2279	0.5094

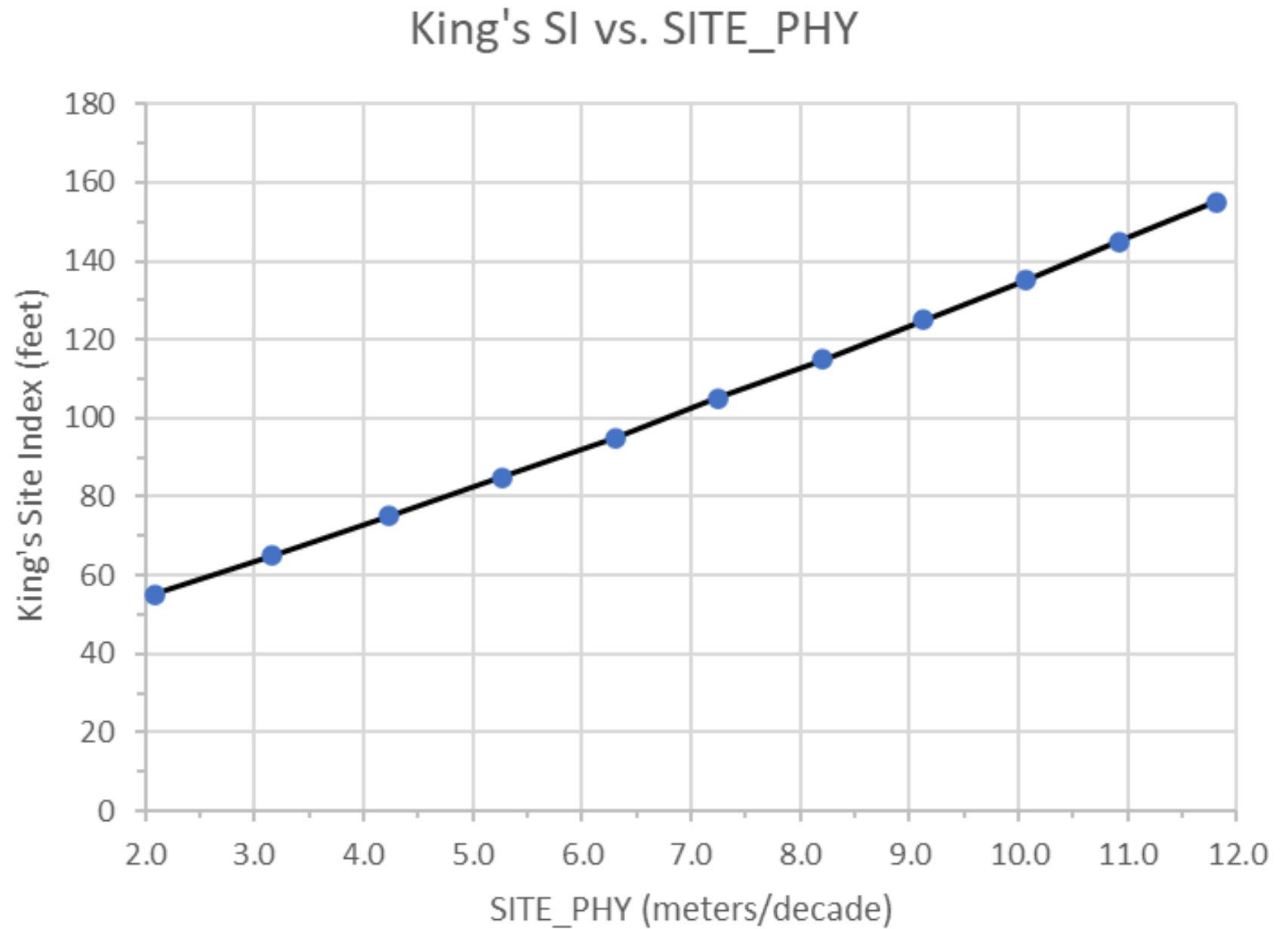
INSTRUCTIONS

PLOTS table

RESULTS

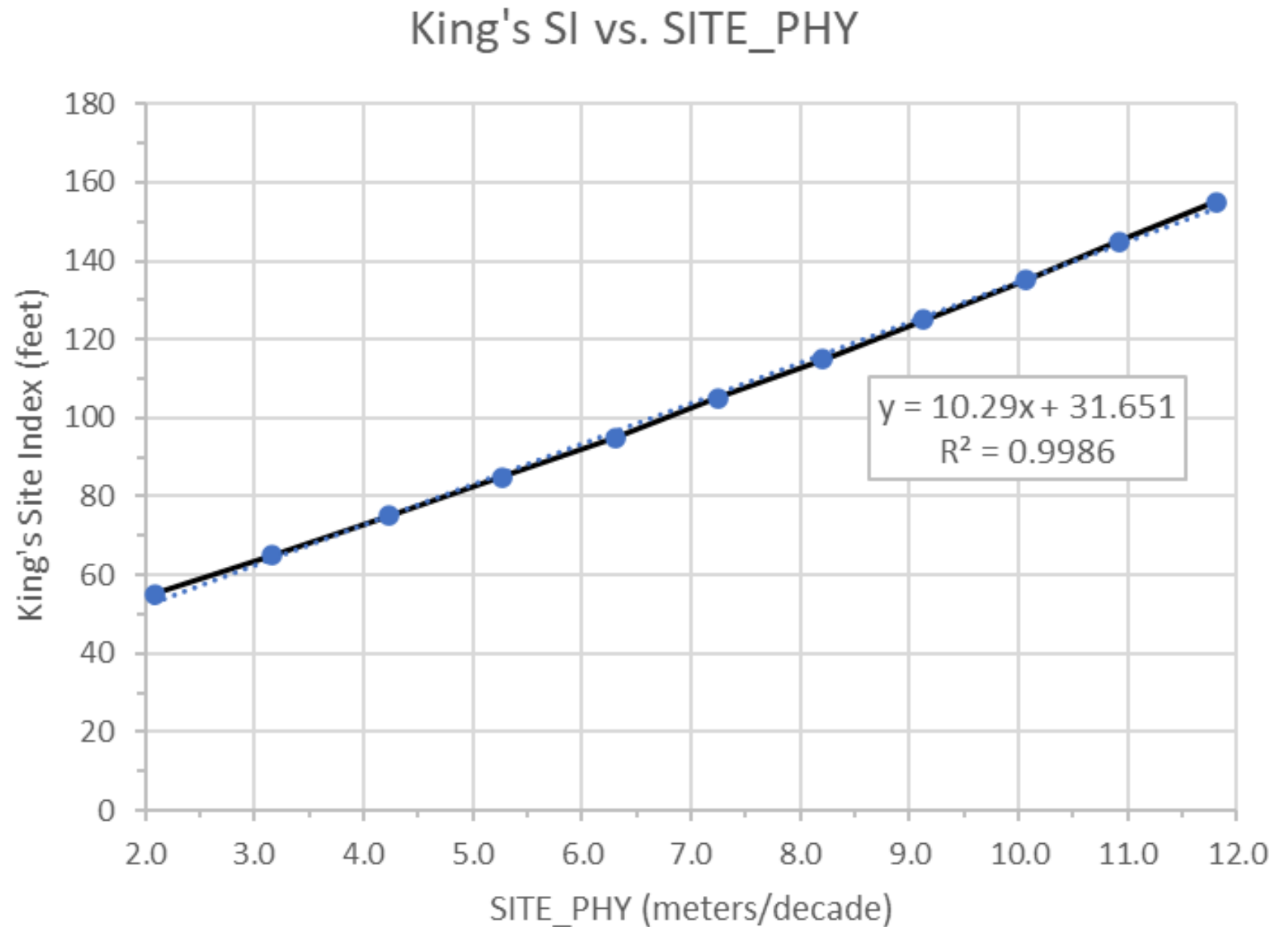
CrosswalkKings

- There is a linear relationship between King's site index and SITE\_PHY



- ▶ There is a linear relationship between King's site index and SITE\_PHY
- ▶ Run a trendline through the data
- ▶ Dr. Jim Arney reported a simplified version of this relationship in his SiteGrid papers and other places:

$$y = 10x + 30$$



# Example Database for FPS Simulations

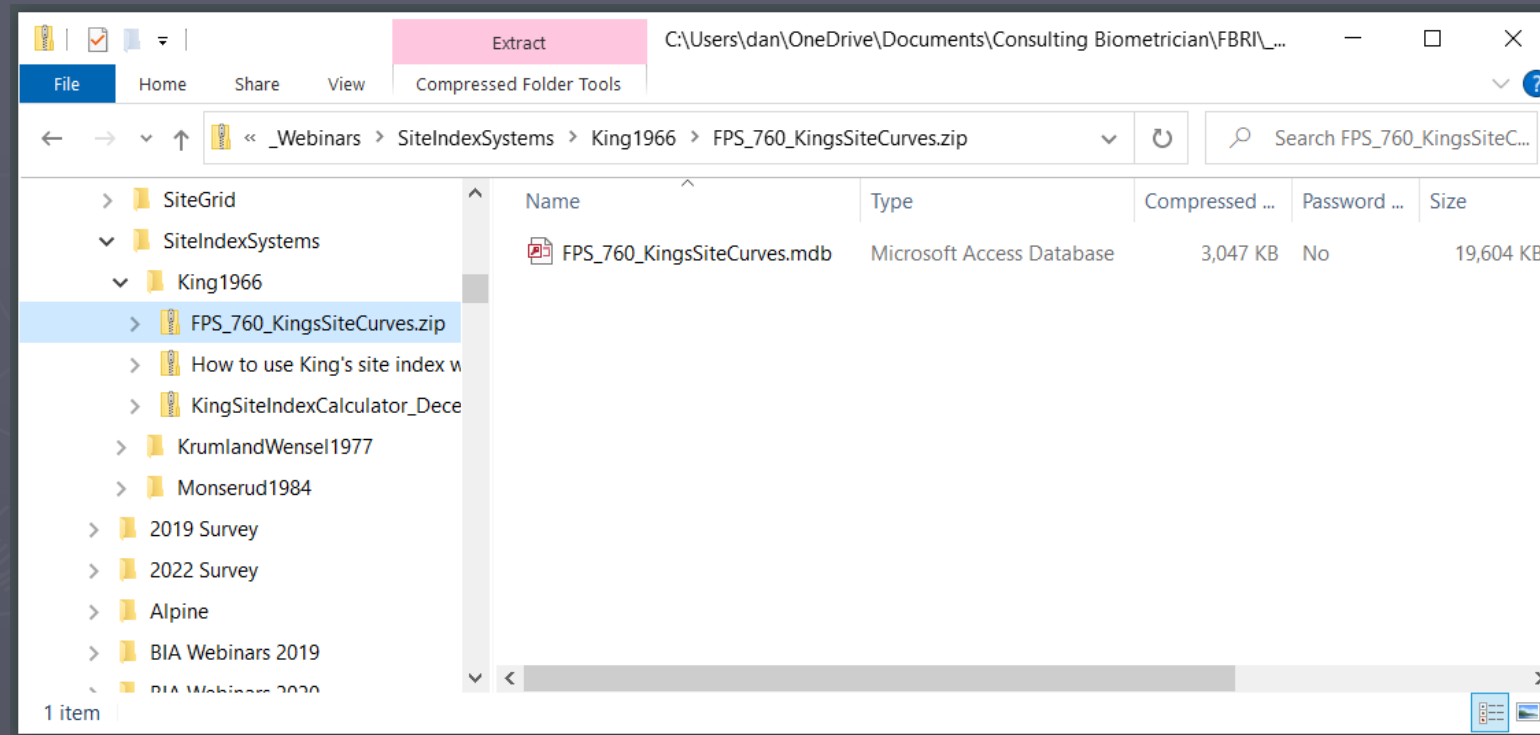
## FPS\_760\_KingsSiteCurves.mdb

CrosswalkKingTo10mSite							
RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP		
50	104	4	0.8120	7.1498	0.7147		
51	105	4	0.8116	7.2426	0.7198		
52	106	4	0.8069	7.3392	0.7228		
53	107	4	0.8023	7.4358	0.7258		
54	108	4	0.7976	7.5324	0.7288		
55	109	4	0.7929	7.6290	0.7318		
56	110	4	0.7882	7.7256	0.7348		
57	111	4	0.7836	7.8221	0.7379		
58	112	4	0.7789	7.9187	0.7409		
59	113	4	0.7742	8.0153	0.7439		
60	114	4	0.7696	8.1119	0.7469		

Record: 14 51 of 101 No Filter Search

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb





# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

ADMIN							
	STD_ID	HAB_CLS	HAB_GRP	REGIME	PLAN_YR	SITE_PHY	SITE_SHP
+	55	0	0	GROW	0	2.1	0.43
+	65	0	0	GROW	0	3.2	0.42
+	75	0	0	GROW	0	4.2	0.51
+	85	0	0	GROW	0	5.3	0.60
+	95	0	0	GROW	0	6.3	0.67
+	105	0	0	GROW	0	7.2	0.72
+	115	0	0	GROW	0	8.2	0.75
+	125	0	0	GROW	0	9.1	0.78
+	135	0	0	GROW	0	10.1	0.79
+	145	0	0	GROW	0	10.9	0.80
+	155	0	0	GROW	0	11.8	0.82
*	0	0	0	NONE	0	0.0	0.67

Record: 1 of 11 No Filter Search

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

SILVICS										
Bas	REGIM	GRP	TRT_NB	Rege	PctHt	PctSu	TRT_Ke	TRT_V	THIN_ME1	THIN_N
0	P055	..	1	P	141%	55%	1	1	0	0
0	P065	..	1	P	110%	65%	1	1	0	0
0	P075	..	1	P	95%	75%	1	1	0	0
0	P085	..	1	P	87%	85%	1	1	0	0
0	P095	..	1	P	82%	90%	1	1	0	0
0	P105	..	1	P	81%	90%	1	1	0	0
0	P115	..	1	P	76%	90%	1	1	0	0
0	P125	..	1	P	78%	90%	1	1	0	0
0	P135	..	1	P	74%	90%	1	1	0	0
0	P145	..	1	P	78%	90%	1	1	0	0
0	P155	..	1	P	77%	90%	1	1	0	0
*	0 NONE	..	0	N	50%	35%	1	1	0	0

Record: 1 of 11 Filtered Search

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

CRUISE										
STD_ID	M_DATE	MSMT_YR	CRUISER	BAF	BAF_DBH	PLOT_AREA	VEG_AREA	TRANSECT	PLOTS	T
55	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
65	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
75	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
85	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
95	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
105	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
115	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
125	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
135	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
145	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
155	5 /12/2022	2021	DANO	10.00	999.0	1.00	20.00	66.00	1	
*			0 Crew	10.00	5.0	100.00	20.00	66.00	0	

Record: 1 of 11 | Unfiltered | Search

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

PLOTS														
STD_ID	PLOT	TREE	SPEC	GRP	X_L	Y_L	MSMT	DBH	TREES	HEIGHT	HT_CODE	TAP_DIA	TAP	
55	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
55	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
55	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
65	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
65	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
65	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
75	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
75	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
75	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
85	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
85	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
85	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
95	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
95	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
95	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
105	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
105	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
105	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		
115	1	1	DF	..	0	0	2021	0.0	100.0	0.9	1	0.0		
115	1	2	DF	..	0	0	2021	0.0	100.0	1.1	1	0.0		
115	1	3	DF	..	0	0	2021	0.0	100.0	1.3	1	0.0		

Record: 10 of 33

No Filter

Search

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

SCHEDULE										
Basi	PLAN_Y	BRD_M	CUB_M	VAL_MIN	AREA_M	AREA_MA	AGE_M	AGE_MA	BRD_GOAL	
0	2023	1000	500	-5000	0	120	12	900	7,000,0	
0	2026	1000	500	-5000	0	120	12	900	7,000,0	
0	2029	1000	500	-5000	0	120	12	900	7,000,0	
0	2032	1000	500	-5000	0	120	12	900	7,000,0	
0	2035	1000	500	-5000	0	120	12	900	7,000,0	
0	2038	1000	500	-5000	0	120	12	900	7,000,0	
0	2041	1000	500	-5000	0	120	12	900	7,000,0	
0	2044	1000	500	-5000	0	120	12	900	7,000,0	
0	2047	1000	500	-5000	0	120	12	900	7,000,0	
0	2050	1000	500	-5000	0	120	12	900	7,000,0	
0	2053	1000	500	-5000	0	120	12	900	7,000,0	
0	2056	1000	500	-5000	0	120	12	900	7,000,0	
0	2059	1000	500	-5000	0	120	12	900	7,000,0	
0	2062	1000	500	-5000	0	120	12	900	7,000,0	
0	2065	1000	500	-5000	0	120	12	900	7,000,0	
0	2068	1000	500	-5000	0	120	12	900	7,000,0	

Record: 1 of 35 No Filter Search



# Example Database for FPS Simulations

FPS\_760\_KingsSiteCurves.mdb

► Compile

Forest Biometrics Cruise Compiler

FPS\_760\_KingsSiteCurves.mdb

Sample Sets to View:



- ☐ Height / Dbh
- ☐ Taper / Dbh
- ☐ Age / Dbh
- ☐ Crown / Dbh
- ☐ Defect / Dbh
- ☐ Vigor / Dbh

Optional Reports:

- ☐ Tree List Inputs
- ☐ Stand Tables
- ☐ Statistics
- ☐ Summary by Plot
- ☐ Debug Details

Note: STANDSRT table is always populated providing complete species by sort distributions of volume and value.

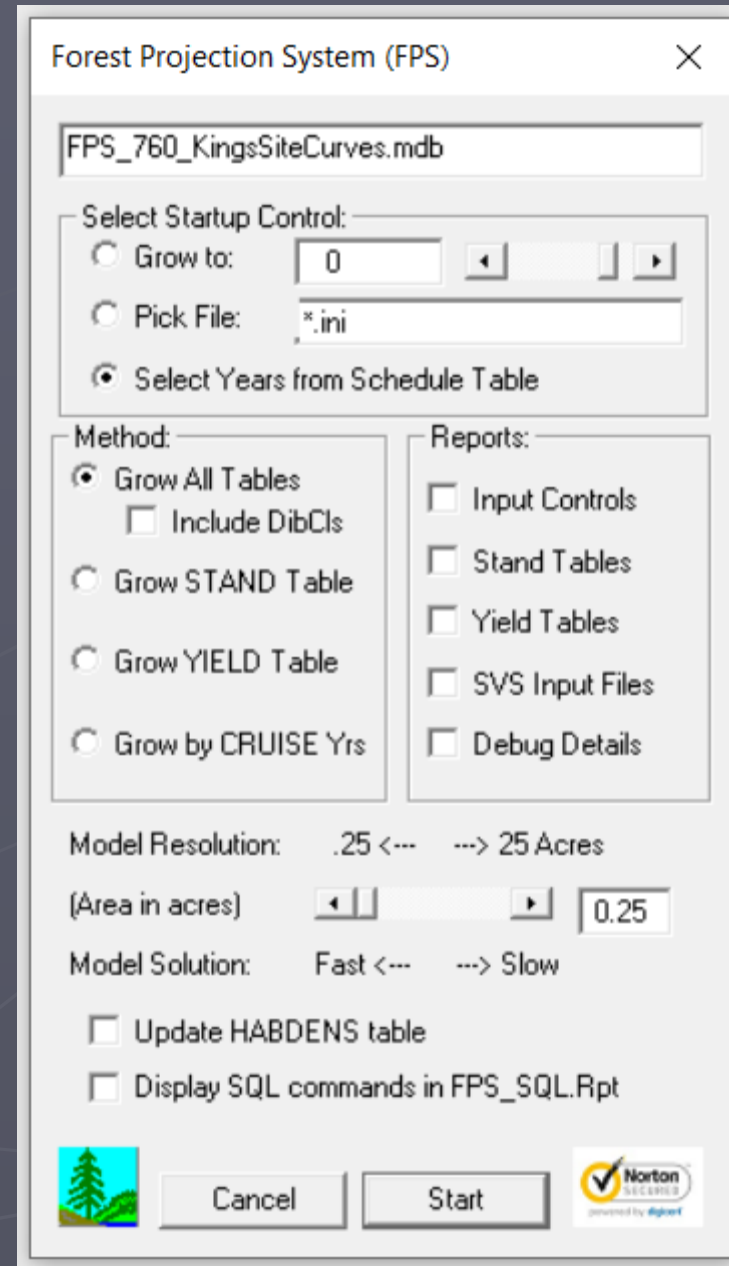
- ☐ Load DIBCLS table (optional)
- ☐ Load HABDENS table (optional)

# Example Database for FPS Simulations

FPS\_760\_KingsSiteCurves.mdb

- Grow the stands
  - Select Years from Schedule Table
  - Grow All Tables



The image shows a screenshot of the 'Forest Projection System (FPS)' dialog box. The title bar reads 'Forest Projection System (FPS)' with a close button. The main area contains several sections: a file path 'FPS\_760\_KingsSiteCurves.mdb' in a text box; a 'Select Startup Control:' section with three radio buttons: 'Grow to:' (set to 0), 'Pick File:' (set to \*.ini), and 'Select Years from Schedule Table' (which is selected); a 'Method:' section with five radio buttons: 'Grow All Tables' (selected), 'Grow STAND Table', 'Grow YIELD Table', and 'Grow by CRUISE Yrs', plus an unchecked 'Include DIBCLs' checkbox; a 'Reports:' section with five unchecked checkboxes: 'Input Controls', 'Stand Tables', 'Yield Tables', 'SVS Input Files', and 'Debug Details'; 'Model Resolution:' set to '.25 <--- ---> 25 Acres' with '(Area in acres)' below it and a slider set to '0.25'; 'Model Solution:' set to 'Fast <--- ---> Slow'; and two unchecked checkboxes: 'Update HABDENS table' and 'Display SQL commands in FPS\_SQL.Rpt'. At the bottom, there is a tree icon, 'Cancel' and 'Start' buttons, and a Norton Secured logo.

Forest Projection System (FPS)

FPS\_760\_KingsSiteCurves.mdb

Select Startup Control:

- ☐ Grow to: 0
- ☐ Pick File: \*.ini
- ☒ Select Years from Schedule Table

Method:

- ☒ Grow All Tables
  - ☐ Include DIBCLs
- ☐ Grow STAND Table
- ☐ Grow YIELD Table
- ☐ Grow by CRUISE Yrs

Reports:

- ☐ Input Controls
- ☐ Stand Tables
- ☐ Yield Tables
- ☐ SVS Input Files
- ☐ Debug Details

Model Resolution: .25 <--- ---> 25 Acres  
(Area in acres) 0.25

Model Solution: Fast <--- ---> Slow

- ☐ Update HABDENS table
- ☐ Display SQL commands in FPS\_SQL.Rpt

Cancel Start

Norton Secured  
powered by Symantec

# Example Database for FPS Simulations

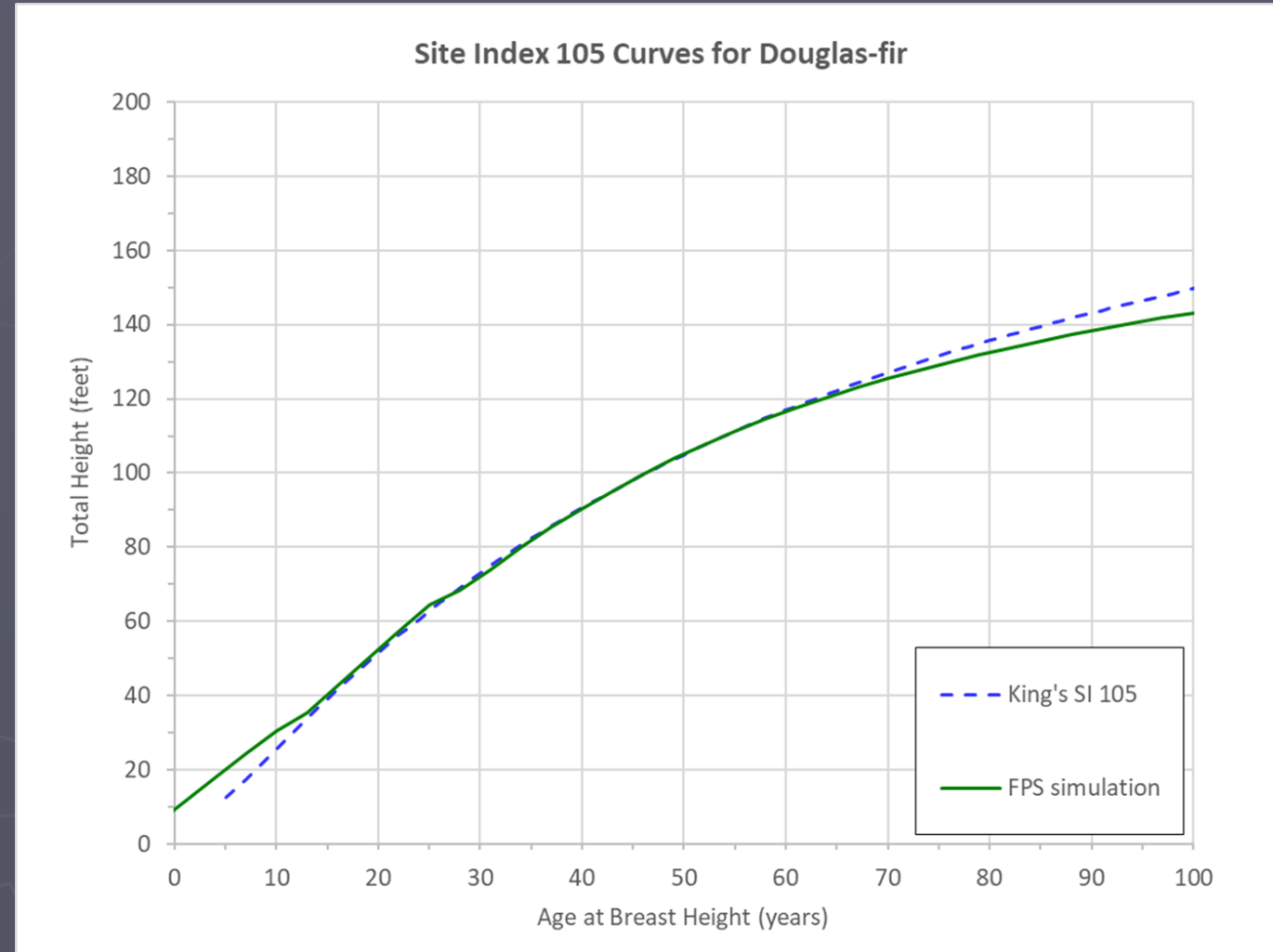
## FPS\_760\_KingsSiteCurves.mdb

STD_ID	RPT_YR	REGIME	Status	TBR_L	Flag_1	Tot_Age	Trees	QDBH	BASAL	TOP_HT	CCF	RI
105	2021	GROW	0 DF..	1	0	300.00	0.0	0.0	1.1	8		
105	2023	GROW	0 DF..	3	2	294.34	1.2	2.4	5.4	19		
105	2026	GROW	0 DF..	3	5	285.69	3.1	14.8	11.9	45		
105	2029	GROW	0 DF..	3	8	276.86	5.0	37.4	18.6	80		
105	2032	GROW	0 DF..	3	11	272.33	6.7	66.7	25.0	120		
105	2035	GROW	0 DF..	3	14	272.32	8.2	99.4	31.0	162		
105	2038	GROW	0 DF..	3	17	272.32	9.5	133.0	36.2	204		
105	2041	GROW	0 DF..	3	20	272.32	11.2	187.8	43.7	270		
105	2044	GROW	0 DF..	3	23	272.31	12.4	228.8	51.1	315		
105	2047	GROW	0 DF..	3	26	272.30	13.6	273.7	58.6	359		
105	2050	GROW	0 DF..	3	29	272.25	14.6	316.0	65.8	399		
105	2053	GROW	0 DF..	3	32	272.19	15.0	332.7	69.3	415		
105	2056	GROW	0 DF..	3	35	272.09	15.6	362.5	75.4	442		
105	2059	GROW	0 DF..	3	38	271.99	16.3	392.3	81.3	469		
105	2062	GROW	0 DF..	3	41	271.57	16.8	415.6	86.7	490		
105	2065	GROW	0 DF..	3	44	271.01	17.2	435.1	91.8	506		
105	2068	GROW	0 DF..	3	47	270.49	17.5	453.7	96.6	521		
105	2071	GROW	0 DF..	3	50	269.99	17.9	471.6	101.1	535		
105	2074	GROW	0 DF..	3	53	268.99	18.2	484.7	105.2	545		
105	2077	GROW	0 DF..	3	56	267.83	18.4	495.5	108.9	552		
105	2080	GROW	0 DF..	3	59	266.75	18.6	505.5	112.5	559		

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# King's Site Index Curves vs. FPS Simulations

- ▶ In the following 11 slides I will be comparing King's site index curves with FPS simulations
- ▶ King's curves are shown with a **dashed blue line**
- ▶ FPS simulations are shown with a **solid green line**

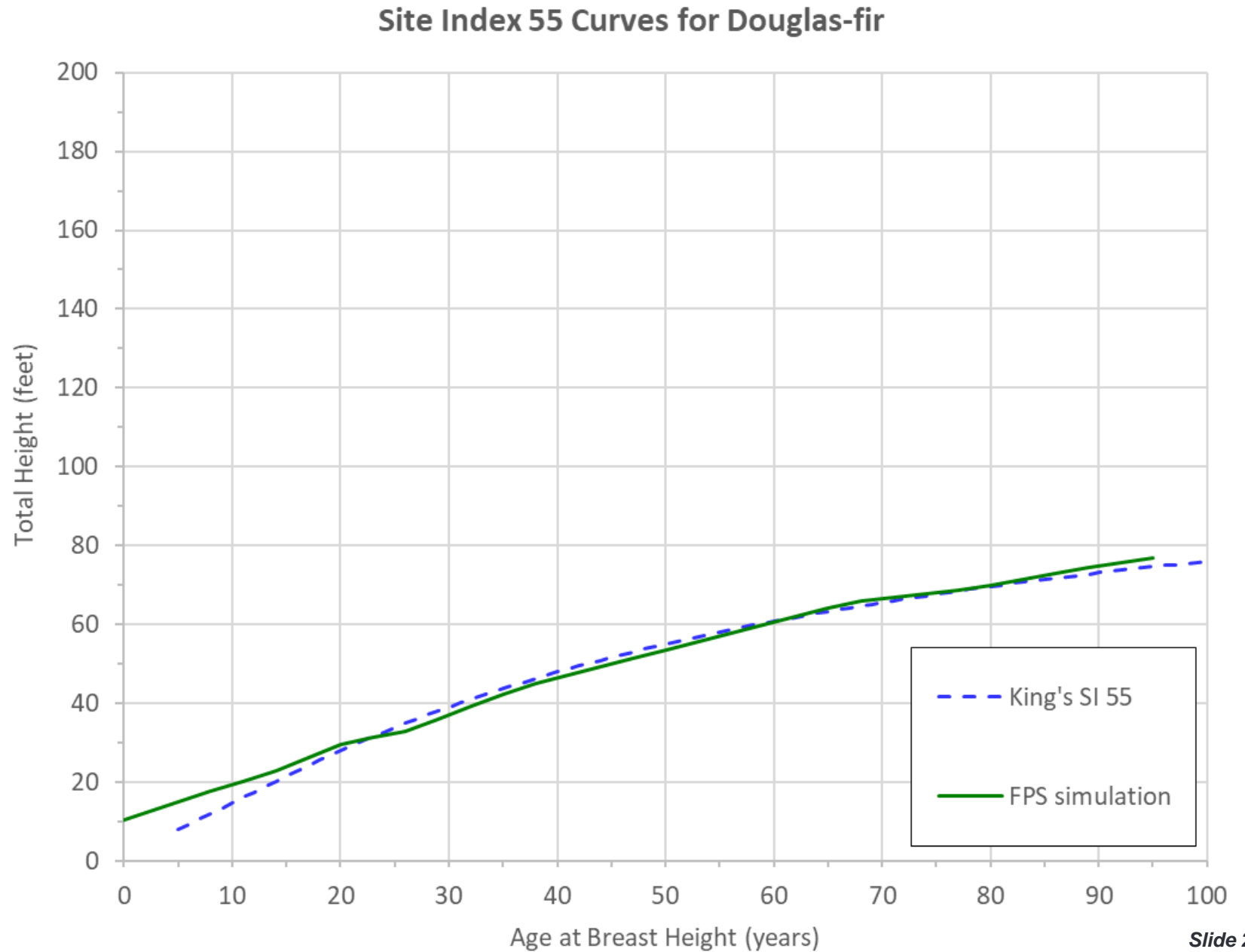


## FPS Simulation for Site Index 55

PctHt = 141.05%

SITE\_PHY = 2.084

SITE\_SHP = 43.10%



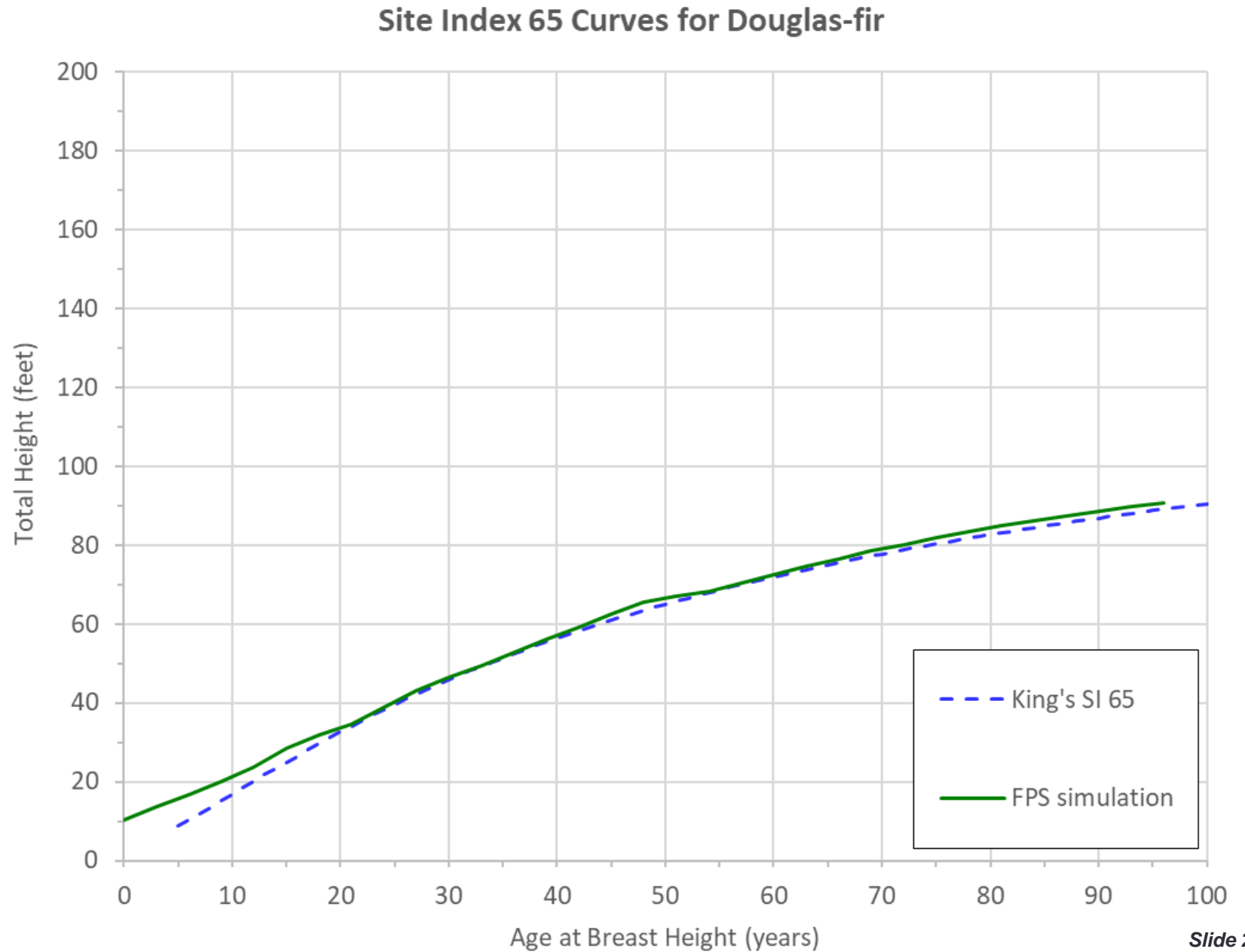


## FPS Simulation for Site Index 65

PctHt = 110.12%

SITE\_PHY = 3.158

SITE\_SHP = 42.07%

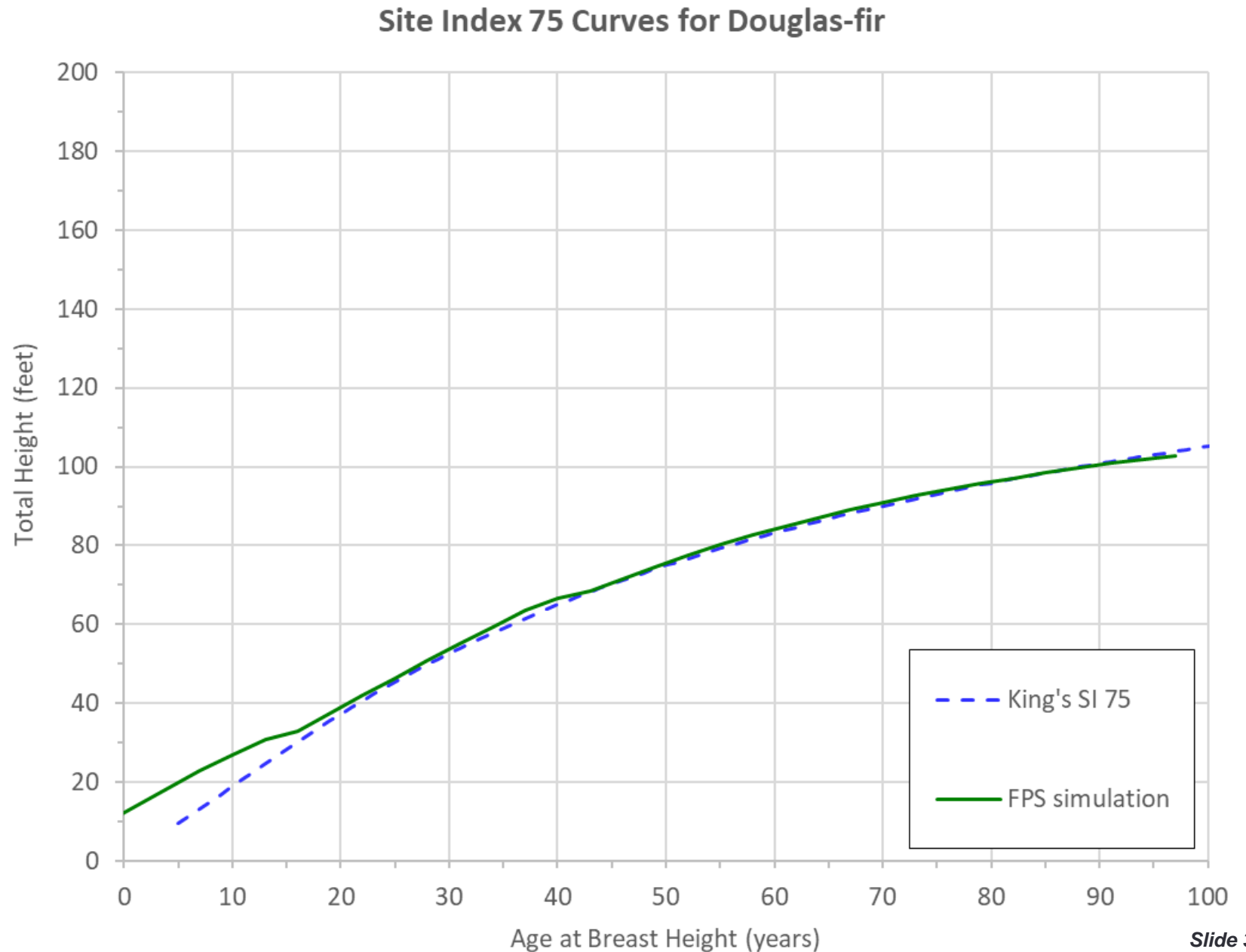


## FPS Simulation for Site Index 75

PctHt = 94.78%

SITE\_PHY = 4.228

SITE\_SHP = 50.94%

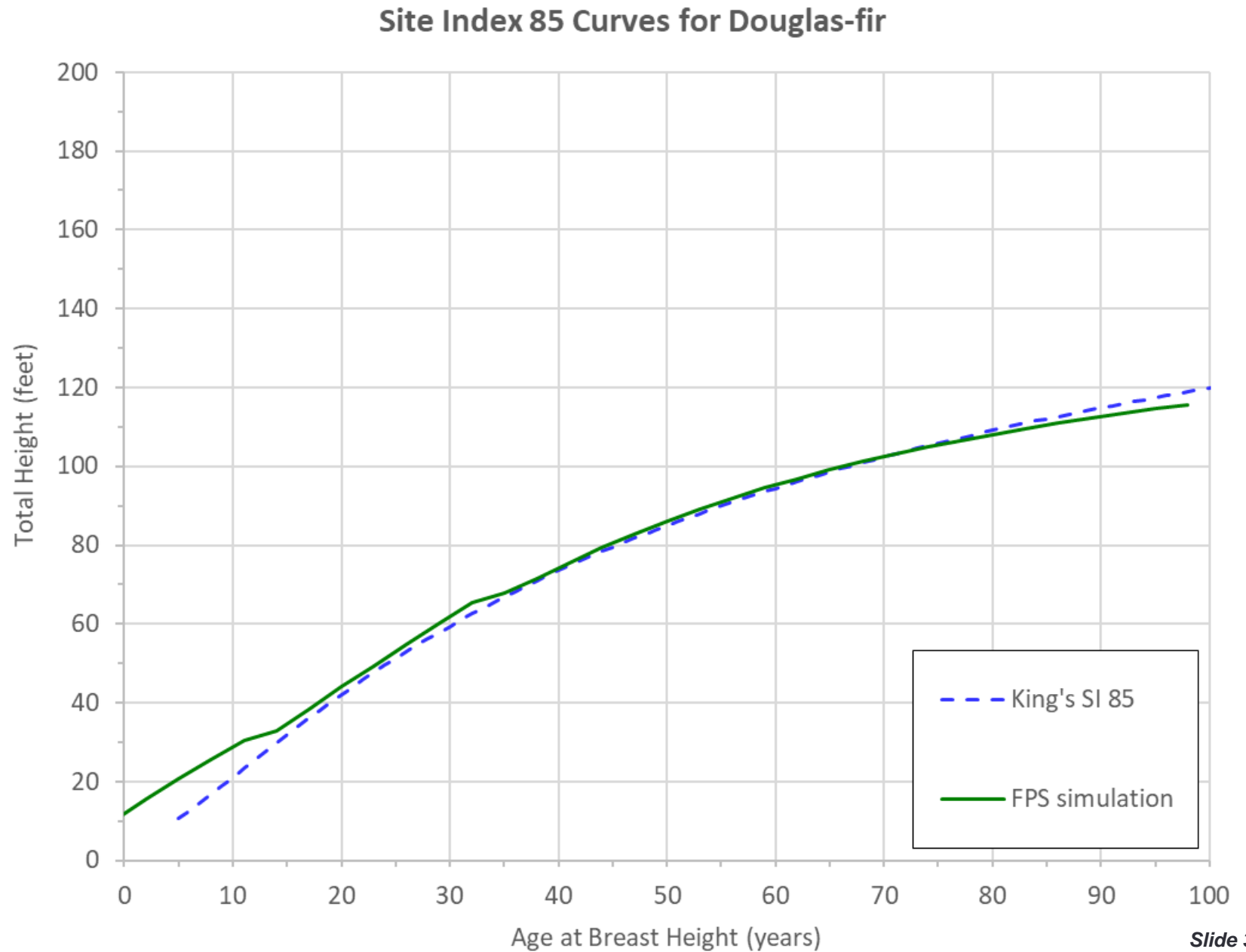


## FPS Simulation for Site Index 85

PctHt = 86.89%

SITE\_PHY = 5.267

SITE\_SHP = 60.13%

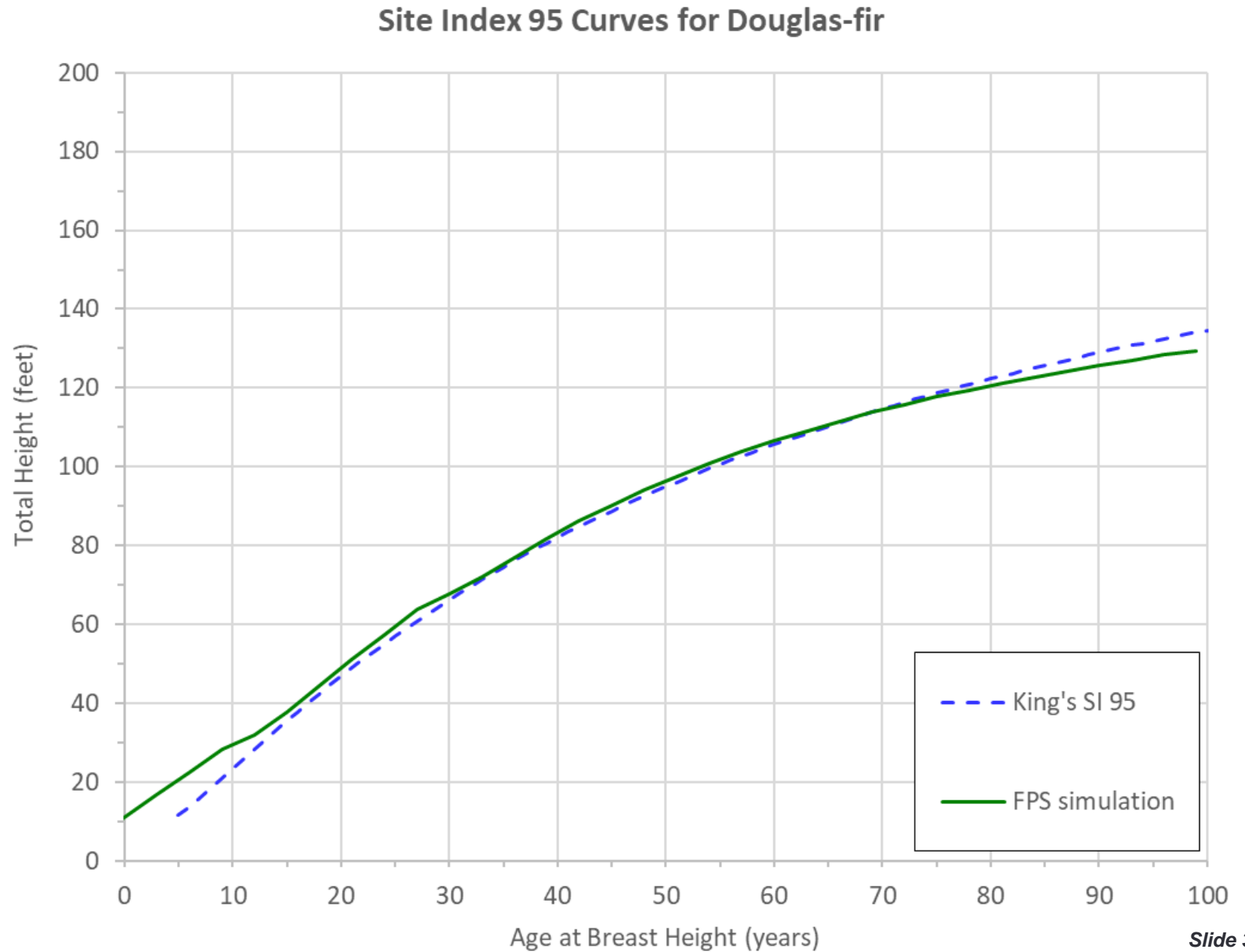


## FPS Simulation for Site Index 95

PctHt = 81.59%

SITE\_PHY = 6.314

SITE\_SHP = 66.85%

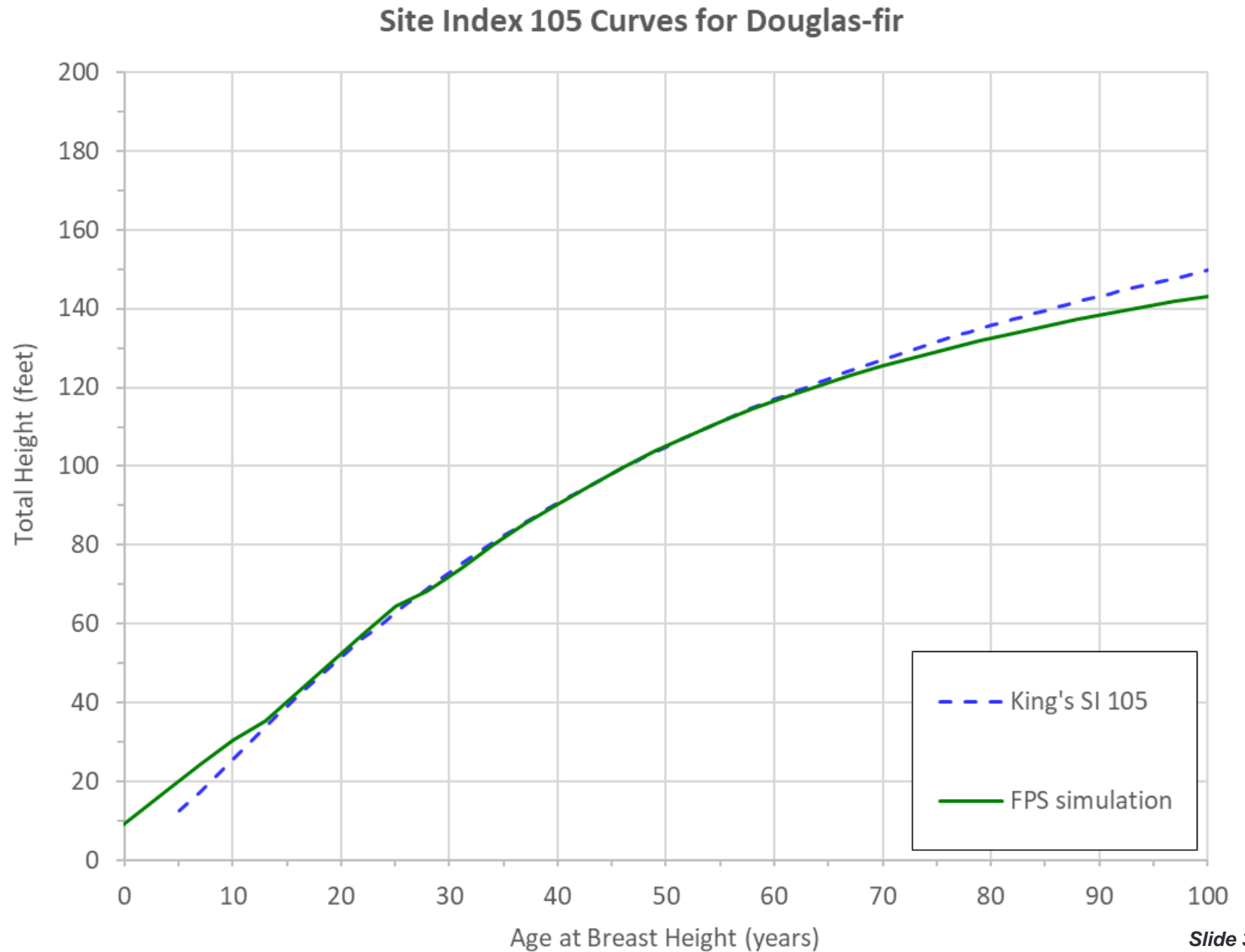


## FPS Simulation for Site Index 105

PctHt = 81.16%

SITE\_PHY = 7.243

SITE\_SHP = 71.98%



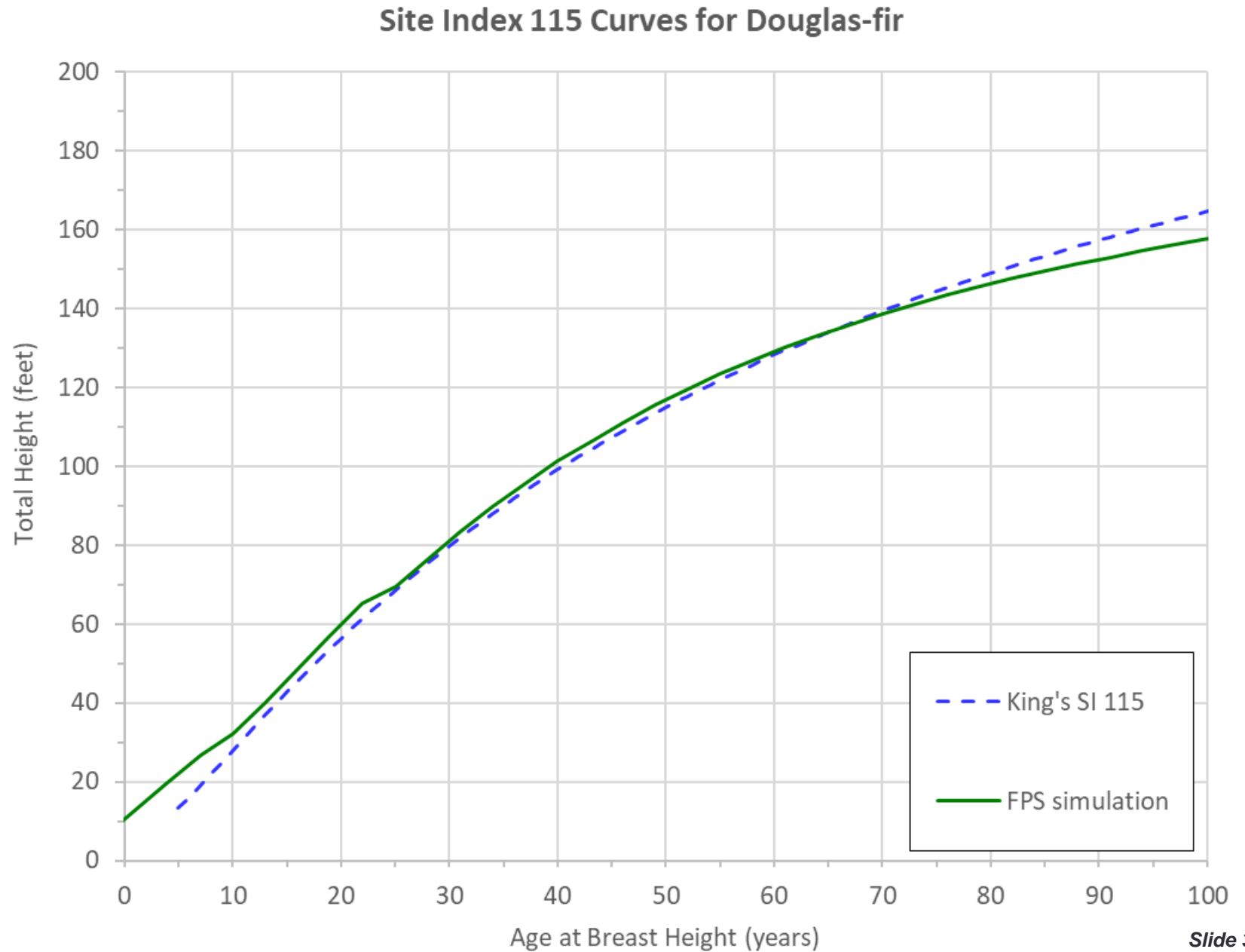


## FPS Simulation for Site Index 115

PctHt = 76.49%

SITE\_PHY = 8.208

SITE\_SHP = 74.99%

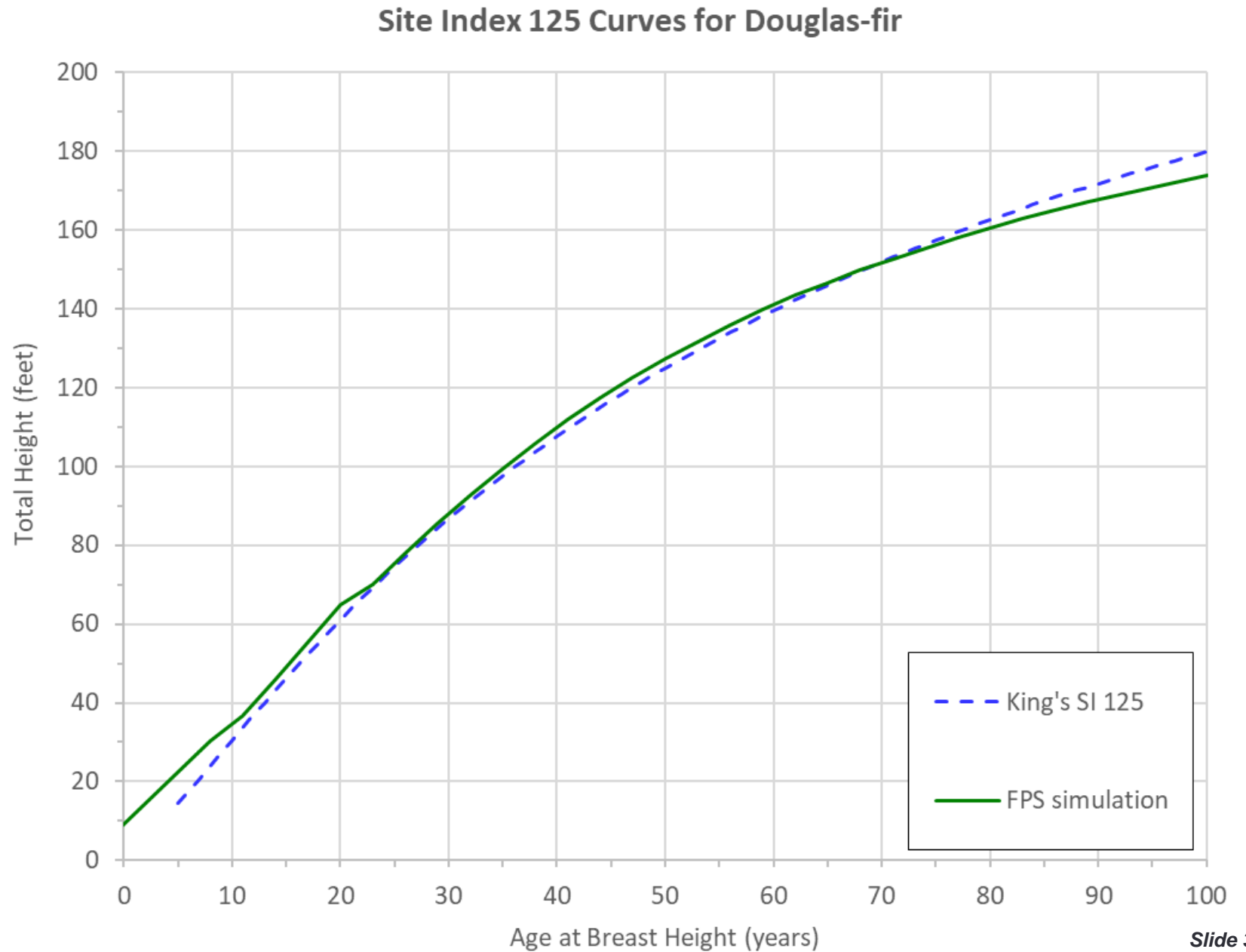


## FPS Simulation for Site Index 125

PctHt = 77.86%

SITE\_PHY = 9.126

SITE\_SHP = 77.78%

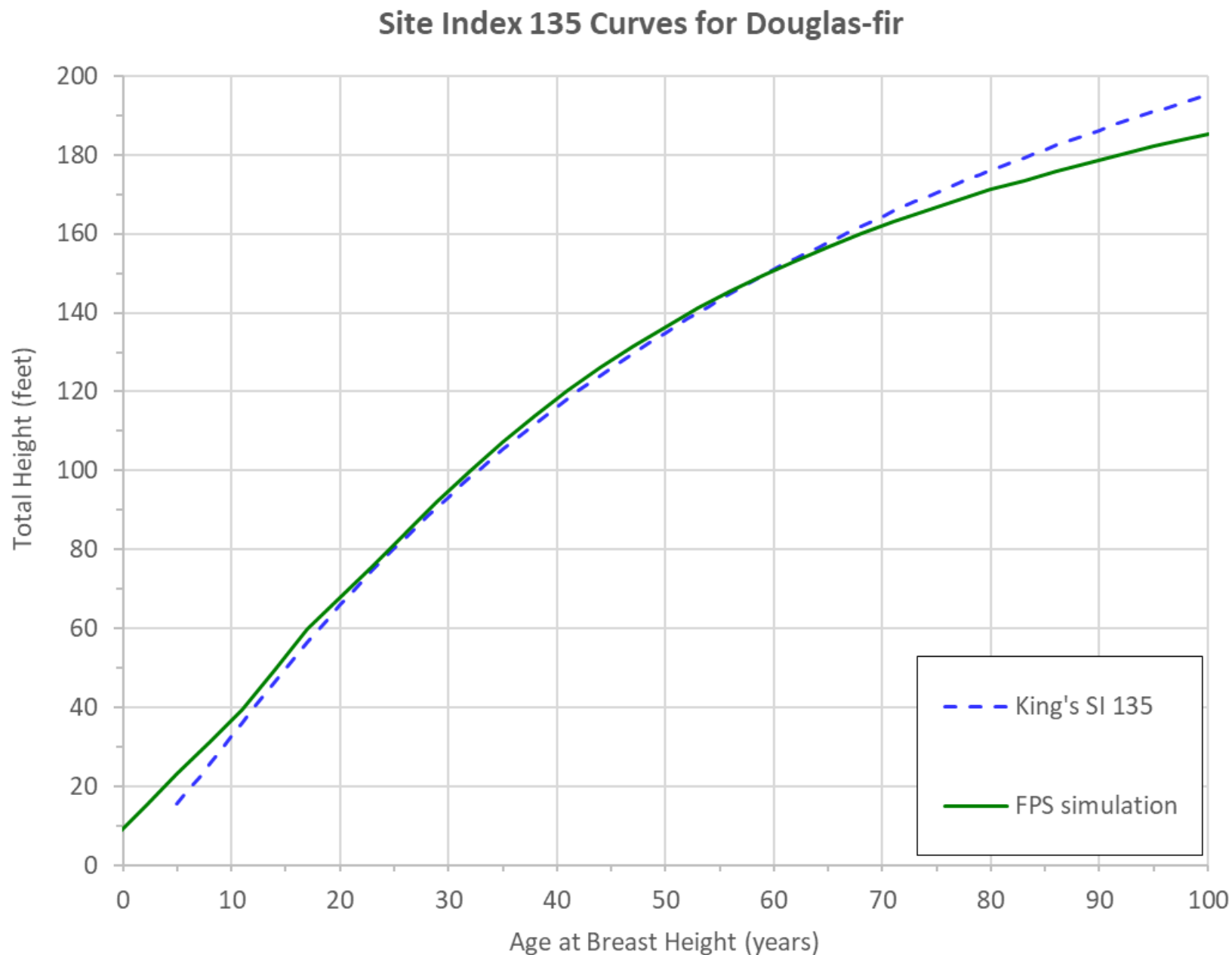


## FPS Simulation for Site Index 135

PctHt = 74.19%

SITE\_PHY = 10.059

SITE\_SHP = 78.94%

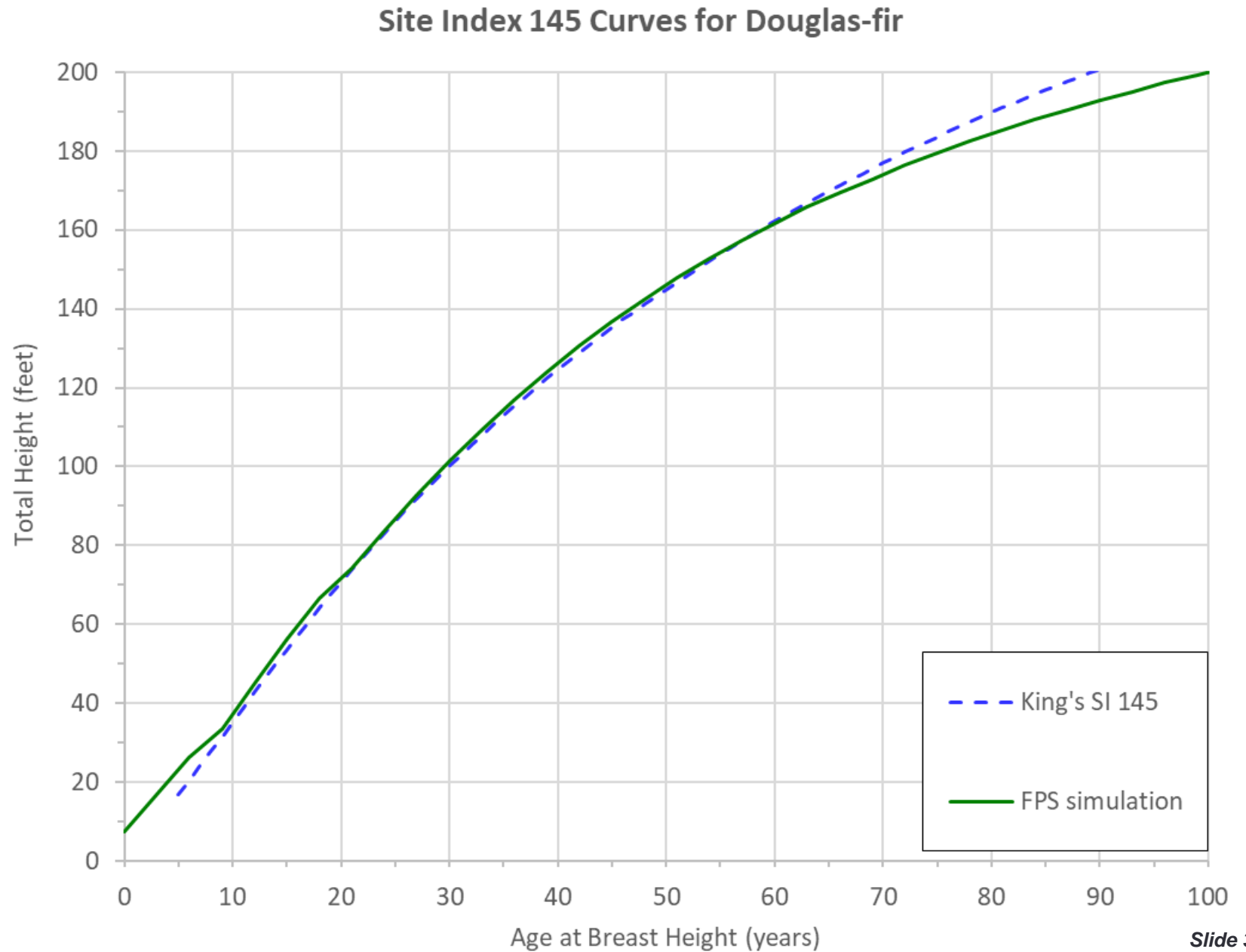


## FPS Simulation for Site Index 145

PctHt = 77.51%

SITE\_PHY = 10.918

SITE\_SHP = 80.46%

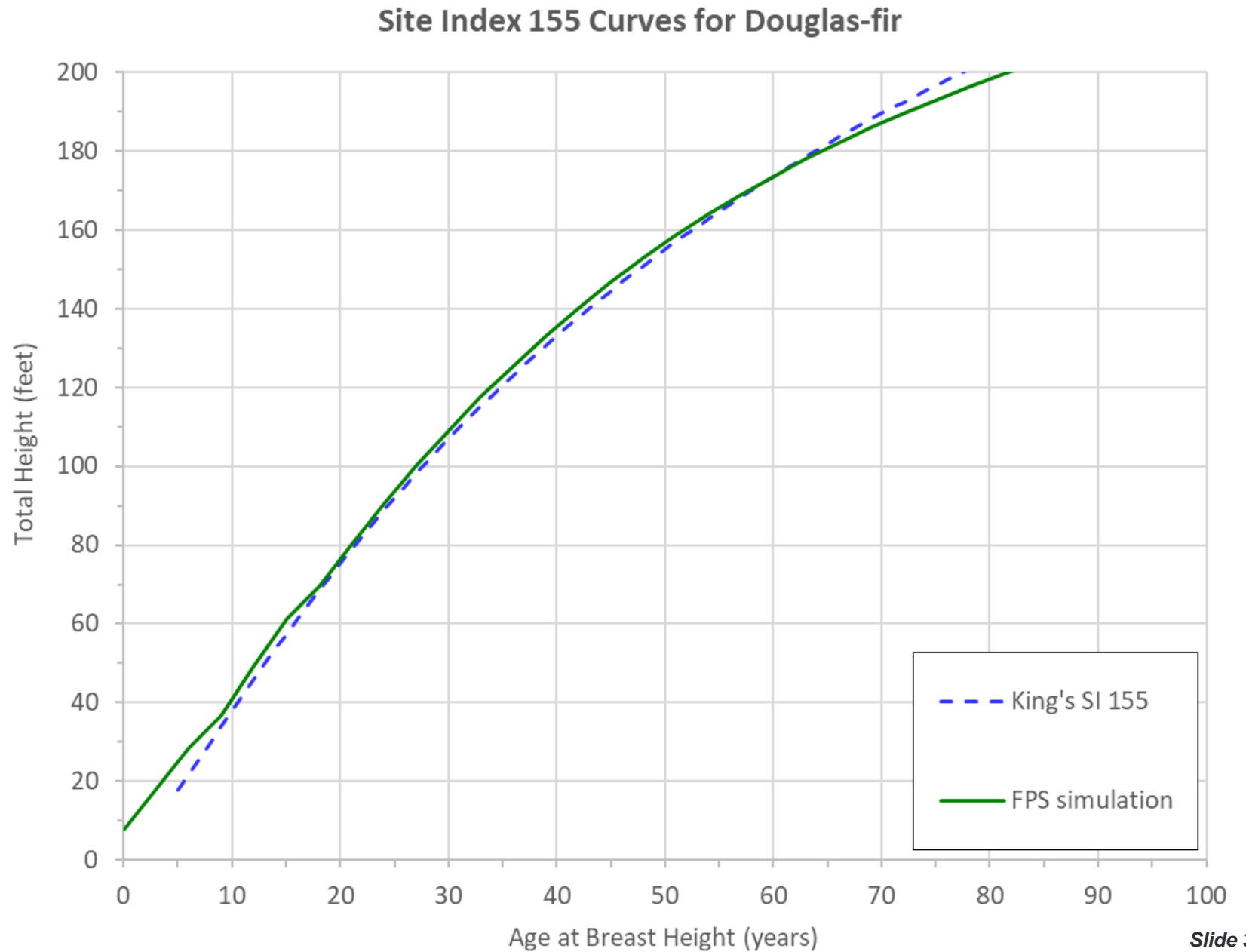


## FPS Simulation for Site Index 155

PctHt = 77.04%

SITE\_PHY = 11.805

SITE\_SHP = 81.67%



<b>Breast Height Age</b>	<b>King's Site Index Curve (height at BH age 50)</b>	<b>FPS Simulation (TOP_HT at BH age 50)</b>
50	55	53
50	65	66
50	75	75
50	85	86
50	95	96
50	105	106
50	115	117
50	125	127
50	135	136
50	145	146
50	155	156



# FPS 7.60 Crosswalk Tables

- ▶ Two crosswalk tables for Douglas-fir have been developed to date
  - FPS Crosswalk Table for King's Site Index Curves
  - FPS Crosswalk Table for Monserud's Site Index Curves

RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
50	104	4	0.8120	7.1498	0.7147
51	105	4	0.8116	7.2426	0.7198
52	106	4	0.8069	7.3392	0.7228
53	107	4	0.8023	7.4358	0.7258
54	108	4	0.7976	7.5324	0.7288
55	109	4	0.7929	7.6290	
56	110	4	0.7882	7.7256	
57	111	4	0.7836	7.8221	
58	112	4	0.7789	7.9187	
59	113	4	0.7742	8.0153	
60	114	4	0.7696	8.1119	

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*King's crosswalk table*

*Monserud's crosswalk table*

RowID	MonserudsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
47	63.0	8	0.8263	3.4466	0.6625
48	63.5	8	0.8263	3.4822	0.6644
49	64.0	8	0.8263	3.5177	0.6664
50	64.5	8	0.8263	3.5532	0.6683
51	65.0	8	0.8263	3.5887	0.6703
52	65.5	8	0.8263	3.6270	0.6721
53	66.0	8	0.8263	3.6653	0.6739
54	66.5	8	0.8263	3.7036	0.6757
55	67.0	8	0.8263	3.7418	0.6775
56	67.5	8	0.8263	3.7801	0.6794
57	68.0	8	0.8263	3.8184	0.6812

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# Questions?

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