

# FPS Crosswalk Table for King's Site Index Curves

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Dan Opalach, PhD  
President & Senior Forest Biometrician  
Forest Biometrics Research Institute  
Portland, Oregon



# 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

- ▶ 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

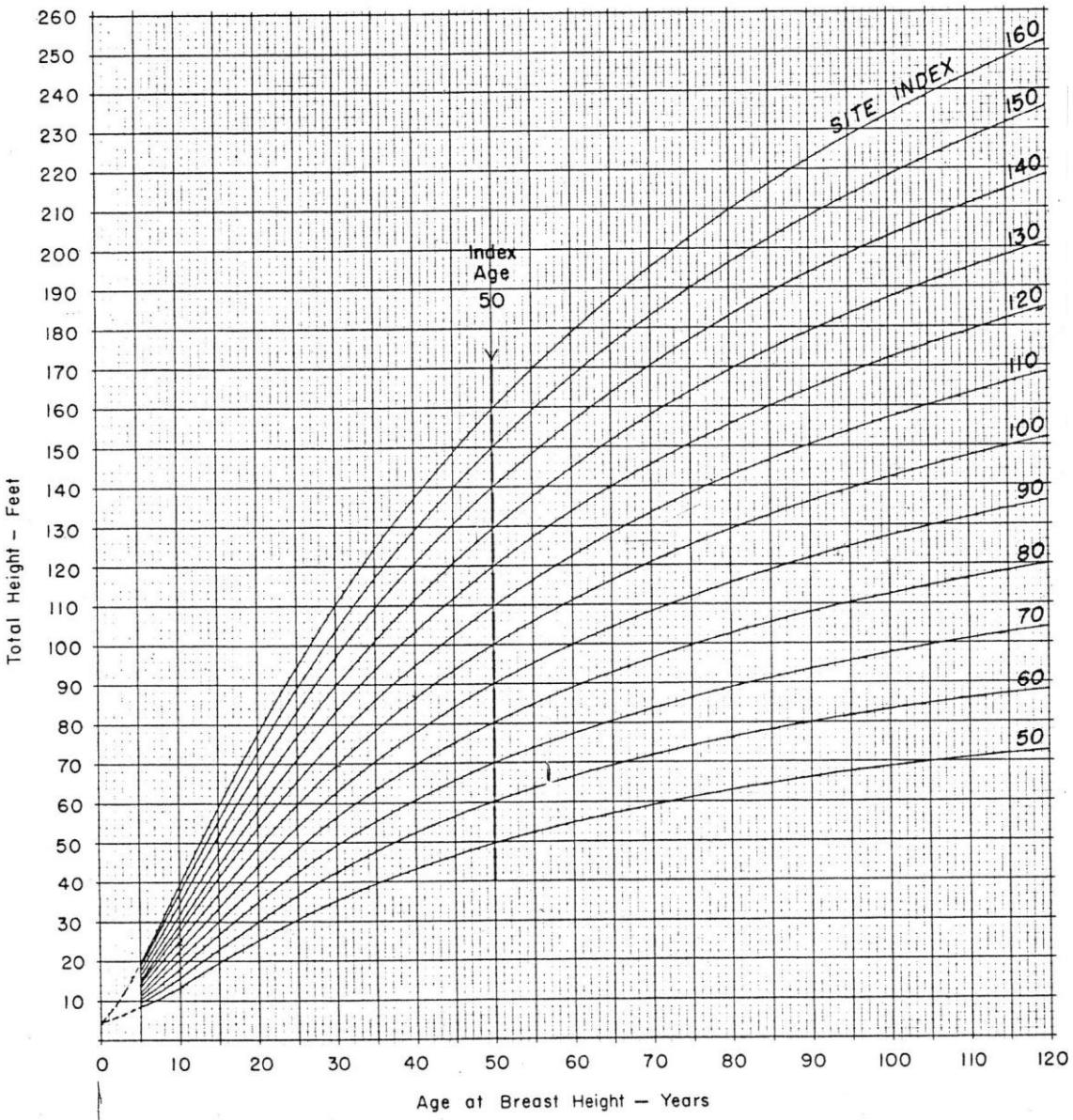
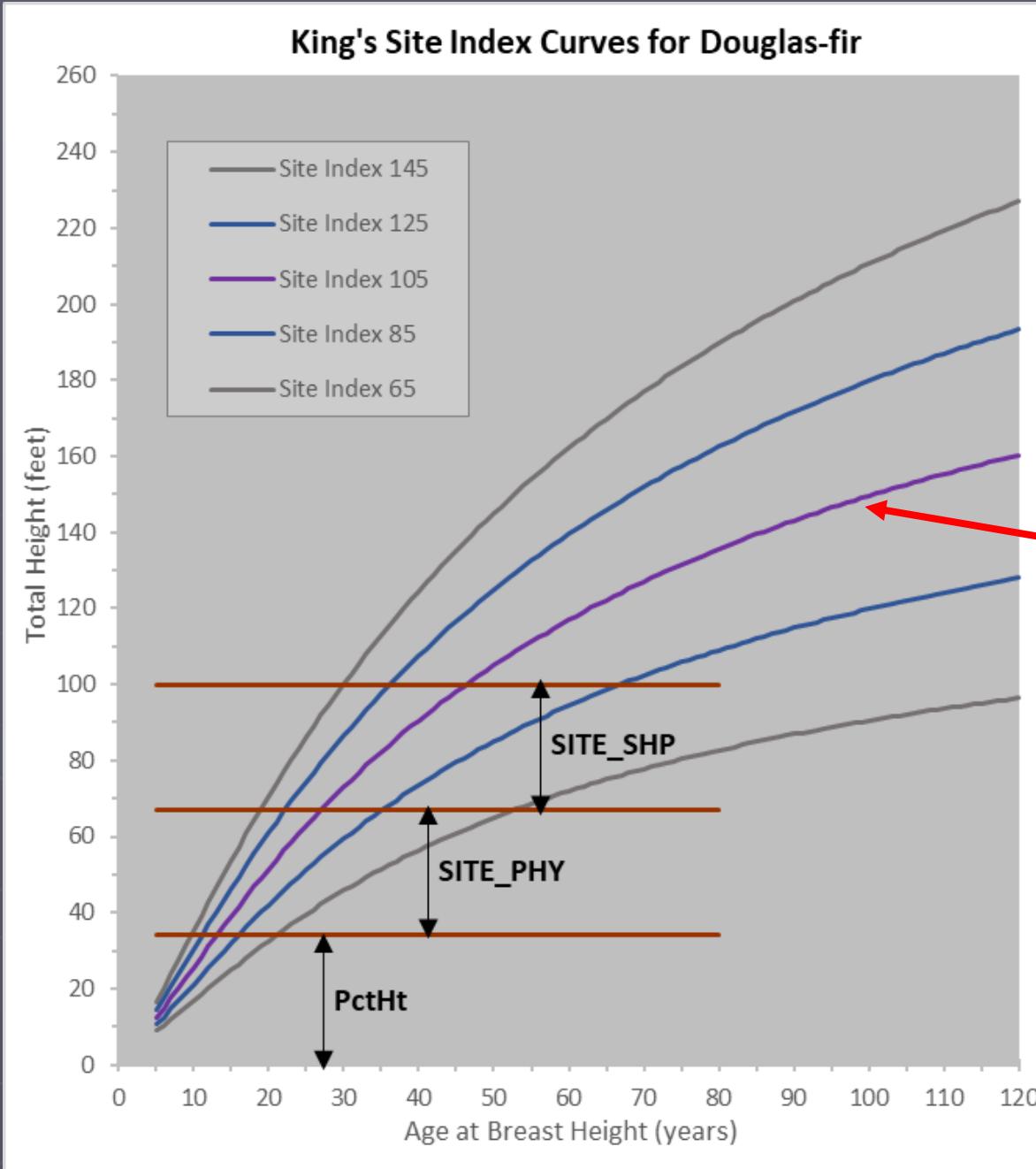


FIGURE 5. Site index curves for Douglas-fir.

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

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

- ▶ Long-term growth adjusted for limiting environmental factors

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

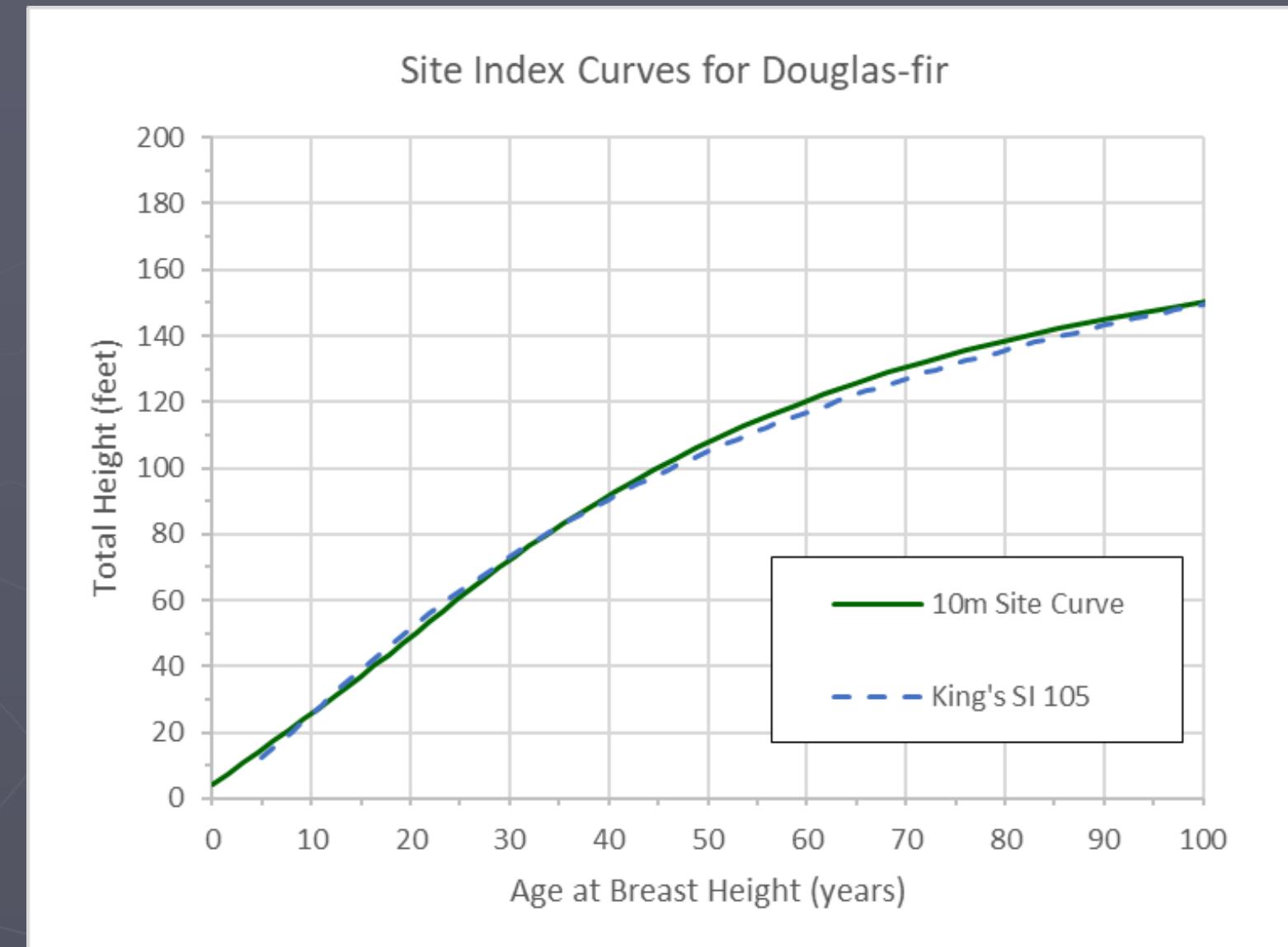
- ▶ Growth due to early silviculture

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

10m Site Curves can exhibit a wide variety of patterns

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

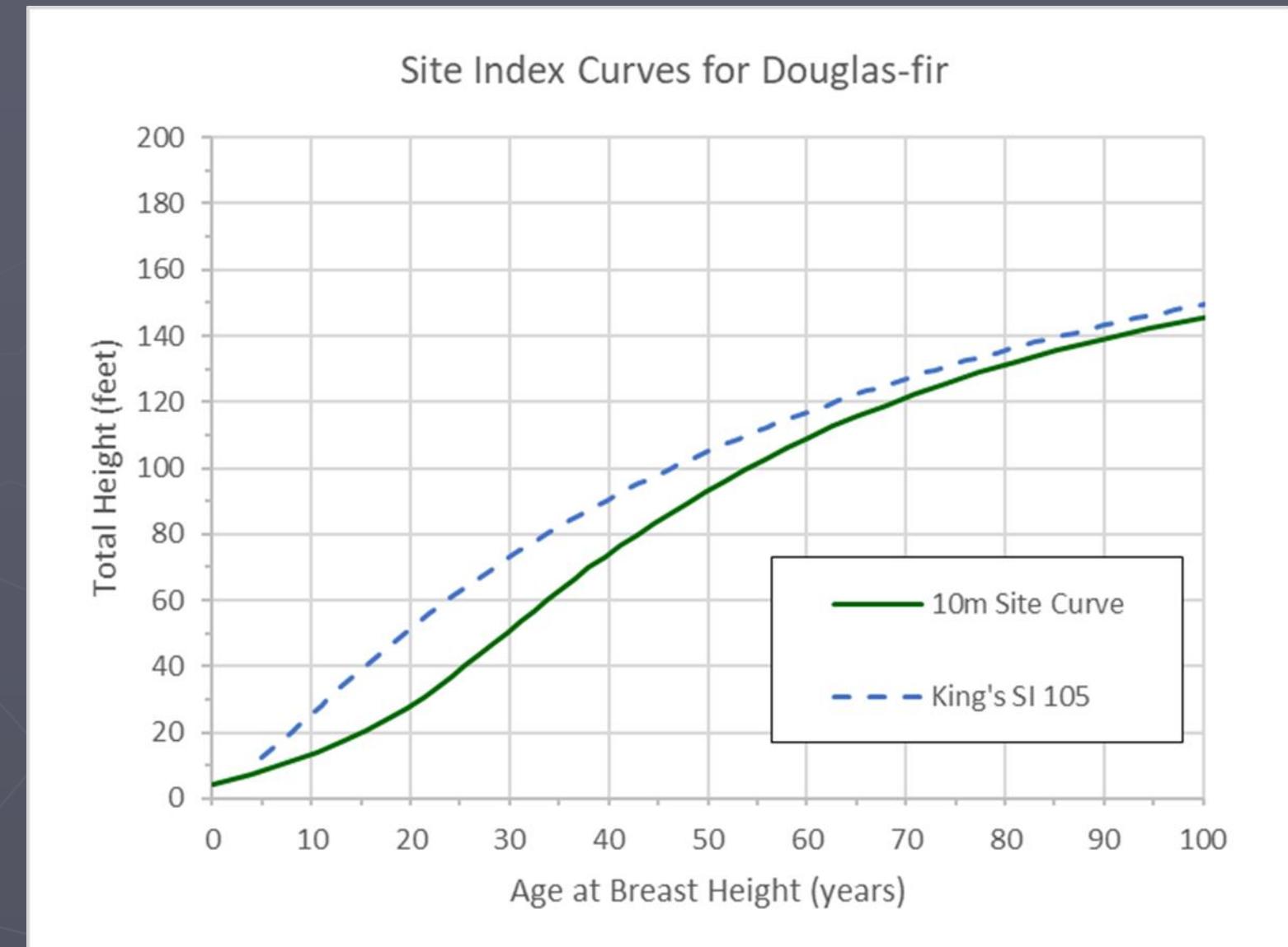
- SITE\_PHY = 7.243
- SITE\_SHP = 71.98%
- PctHt = 81.16%



10m Site Curves can exhibit a wide variety of patterns

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

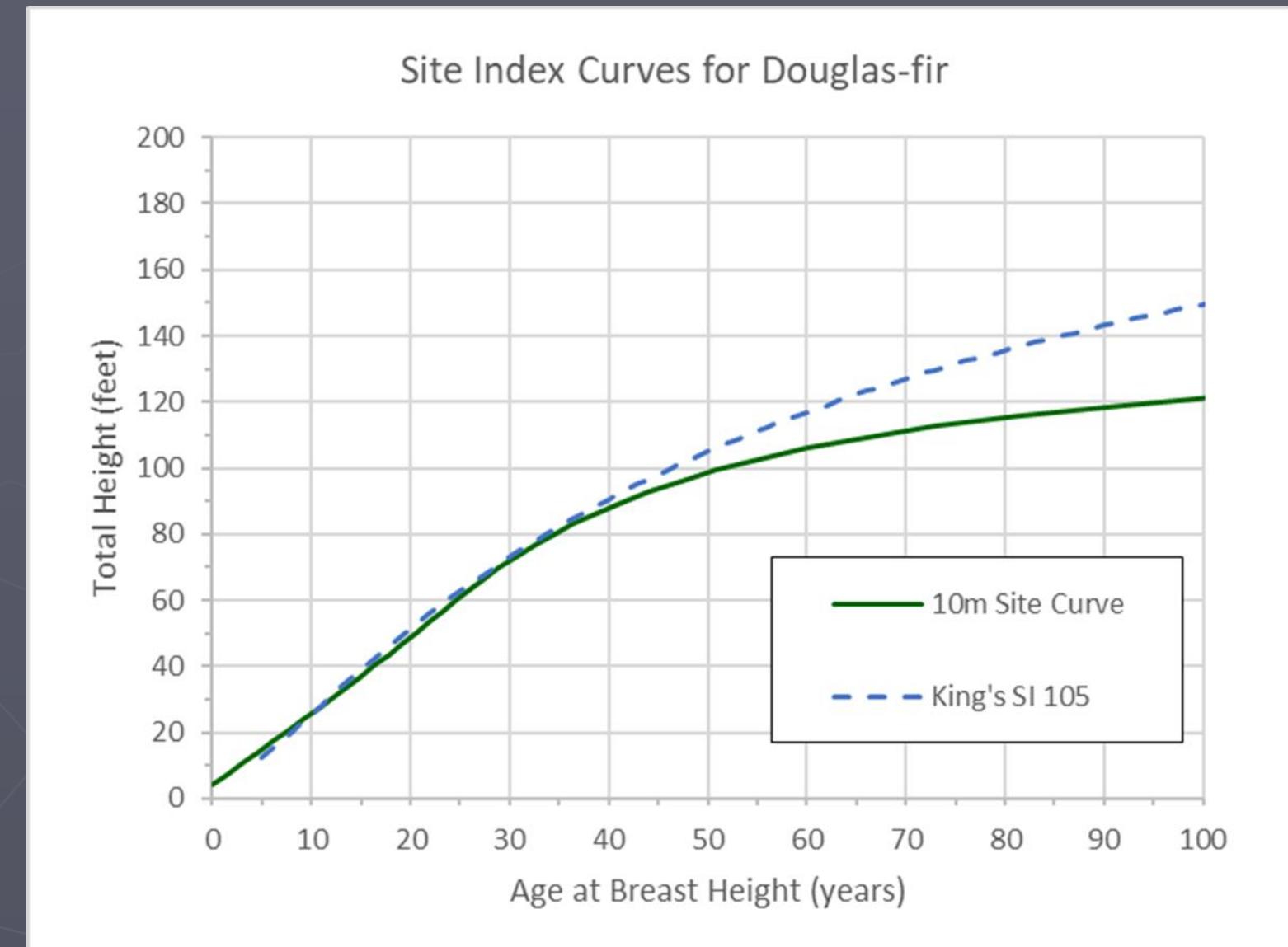
- SITE\_PHY = 7.243
- SITE\_SHP = 71.98%
- PctHt = 40.00%



10m Site Curves can exhibit a wide variety of patterns

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

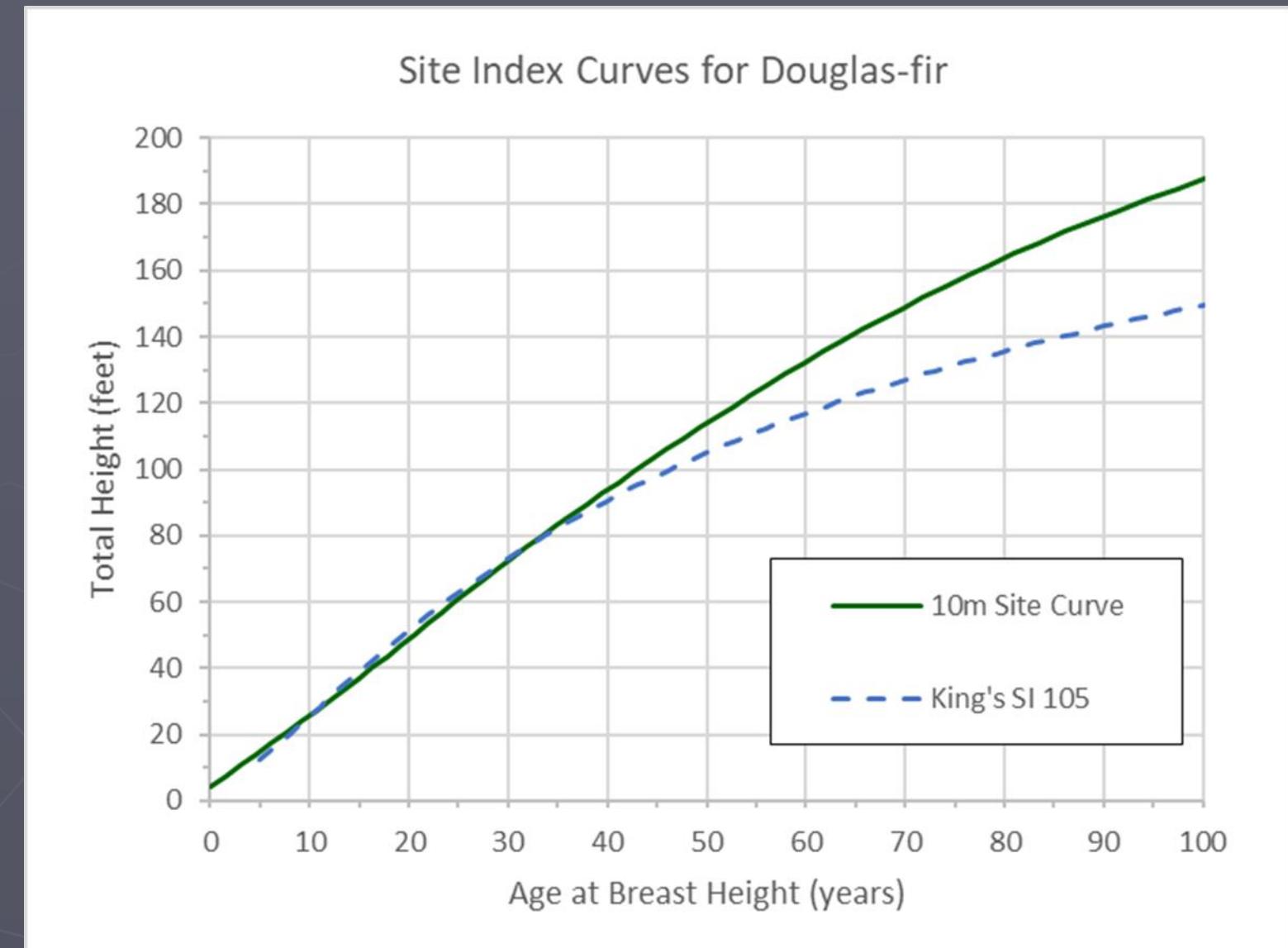
- SITE\_PHY = 7.243
- SITE\_SHP = 50.00%
- PctHt = 81.16%



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%



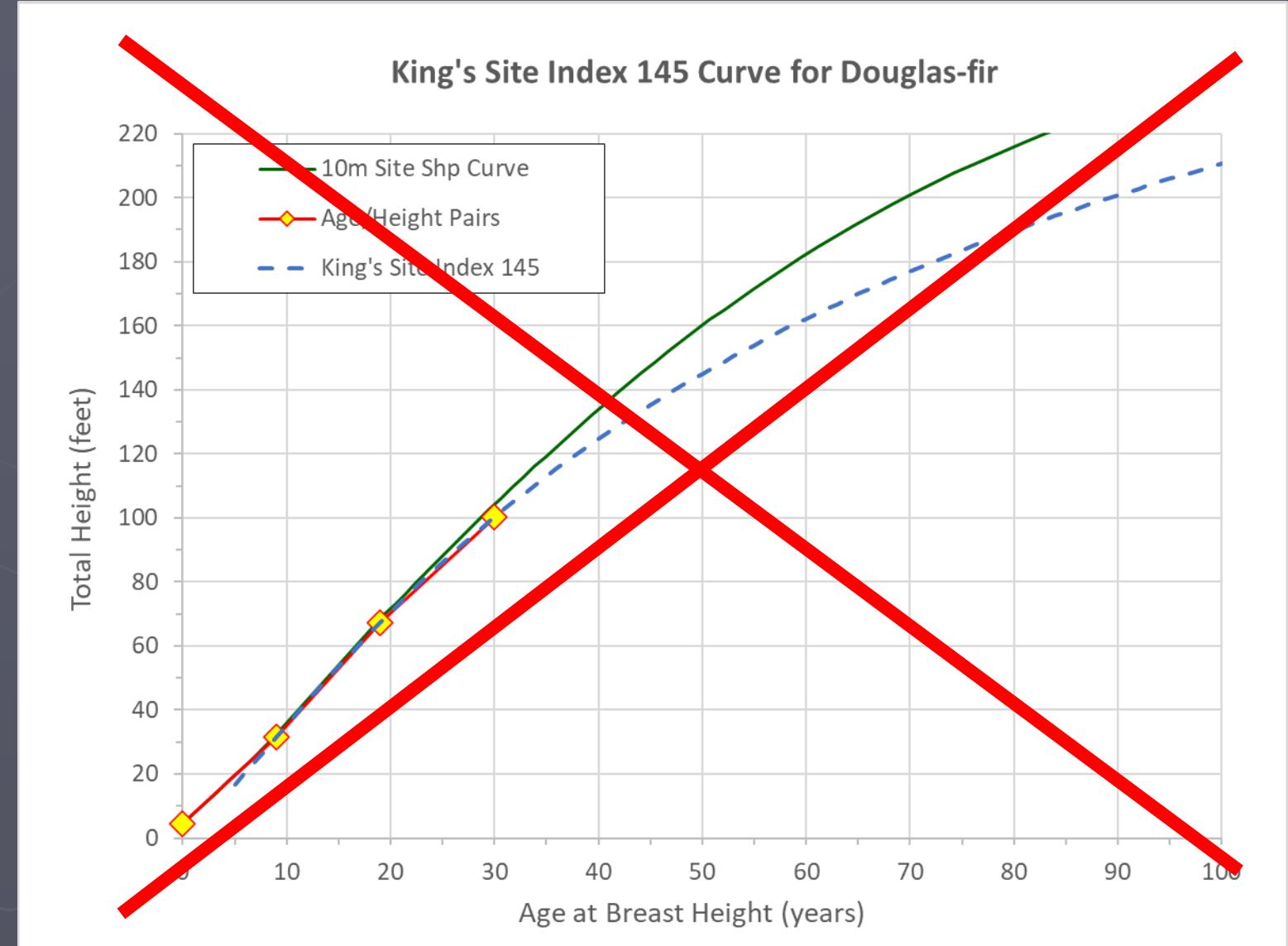
# Calculation of the three 10m site metrics for King's site index 95

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



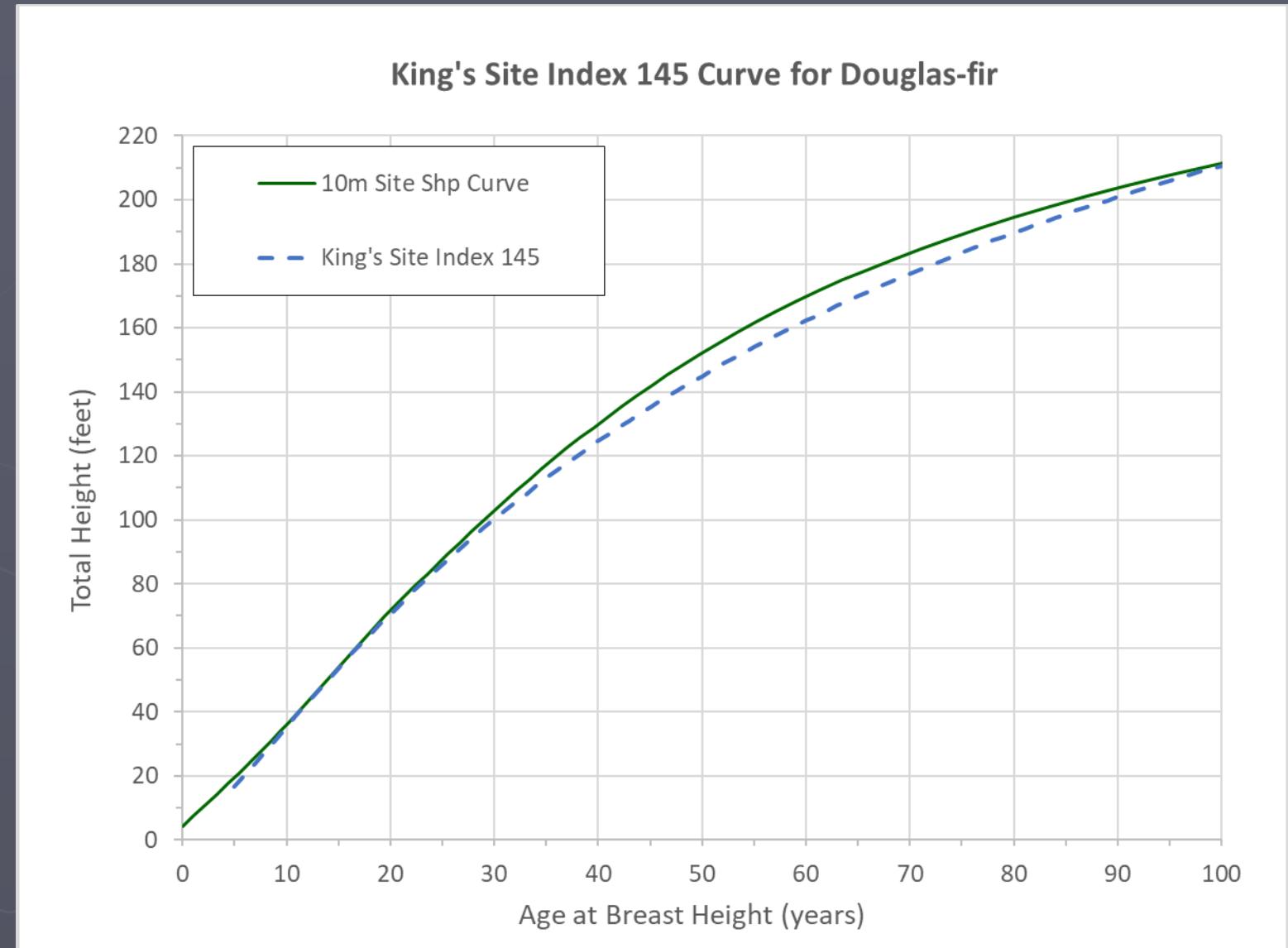
# Calculation of the three 10m site metrics for King's site index 145

- ▶ 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

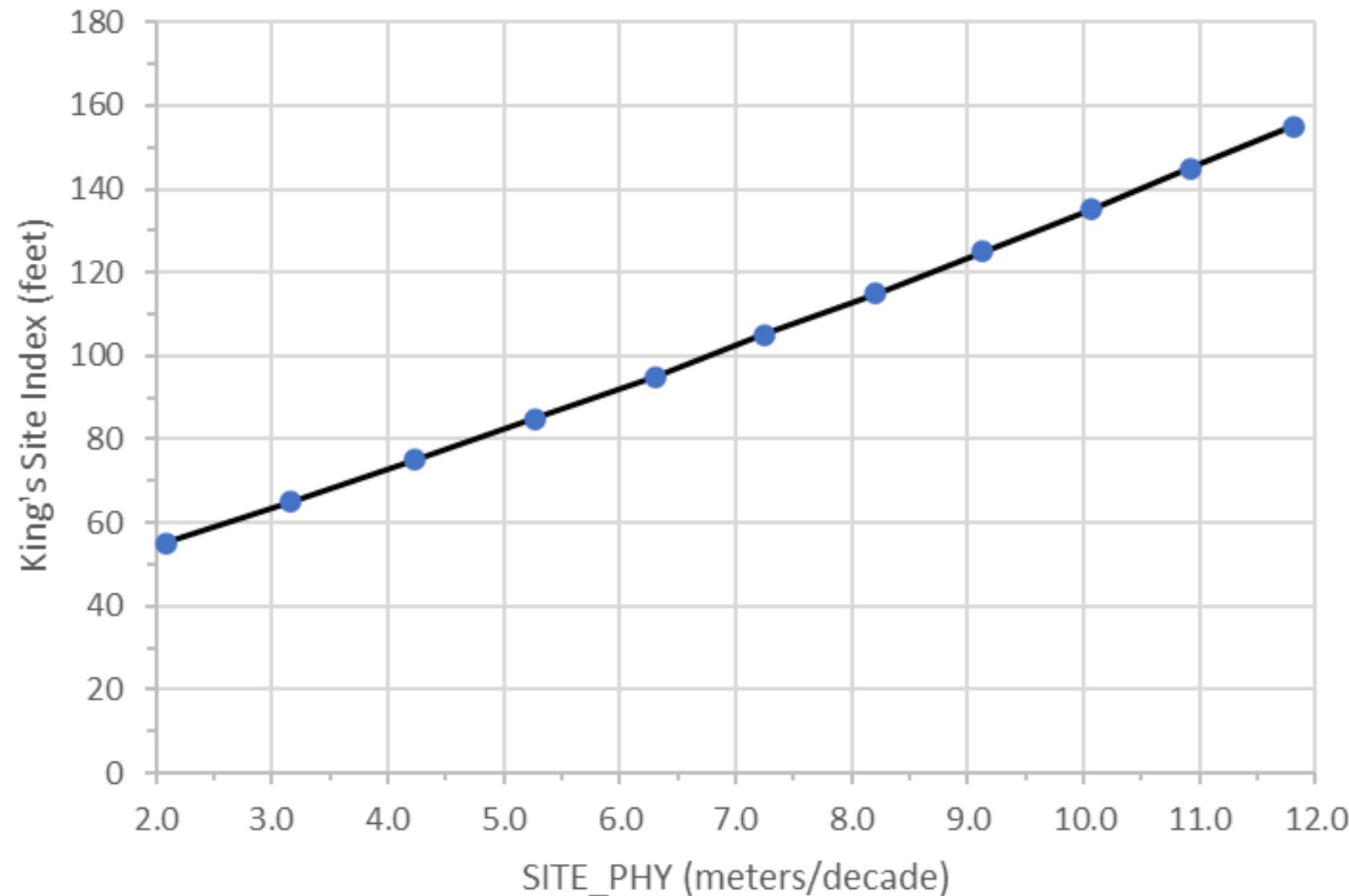
The crosswalk table below is derived from the table at the left using "interpolation" to calculate the Site10 metrics (**PctHt**, **SITE\_PHY**, and **SITE\_SHP**) by 1 foot height increments

RowID	KingsSI	YrsToBH	PctHt	SITE_PHY	SITE_SHP
1	55	9	1.4105	2.0840	0.4310
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

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

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

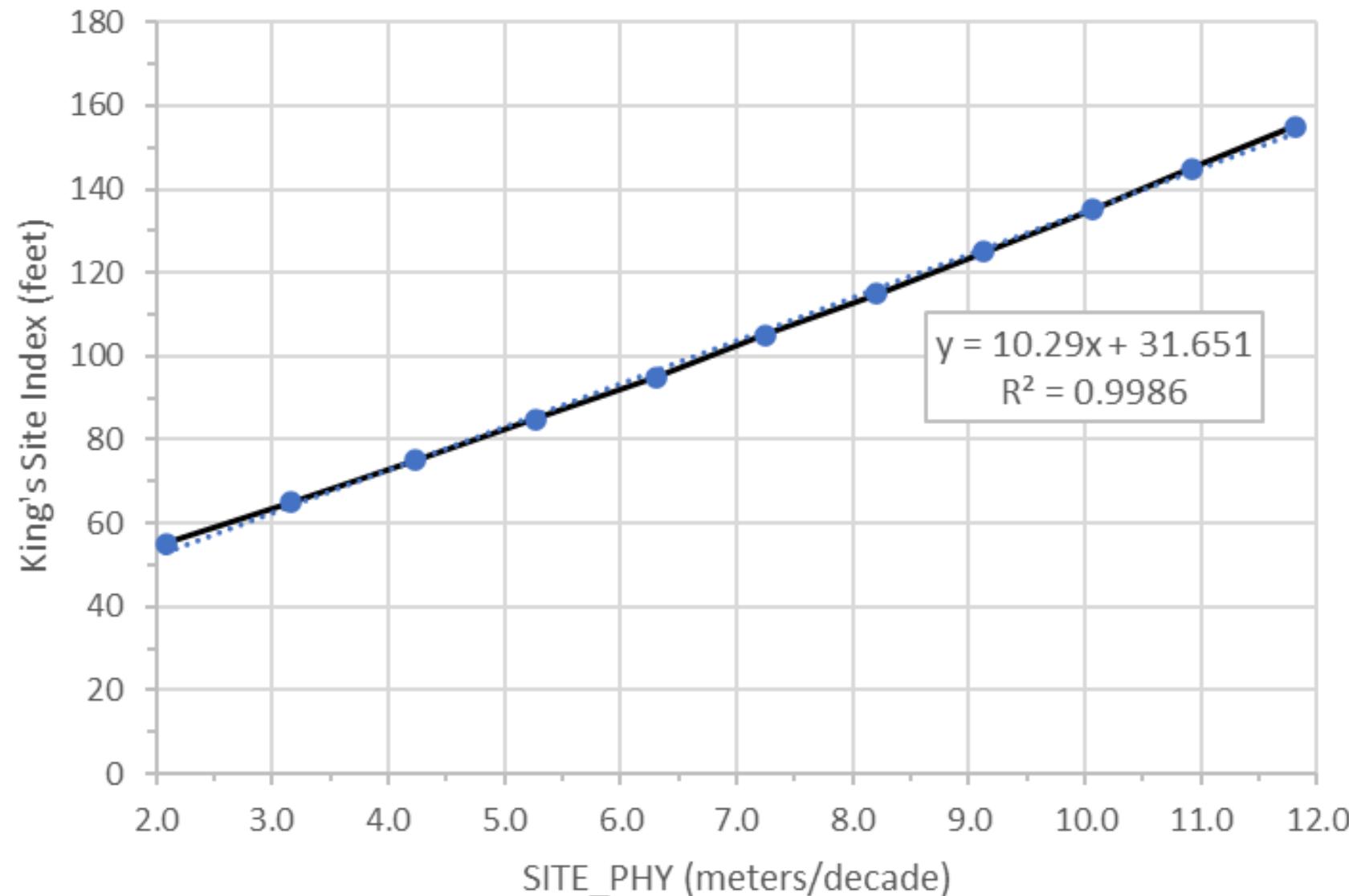
### King's SI vs. SITE\_PHY



- ▶ 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:

$$y = 10x + 30$$

### King's SI vs. SITE\_PHY



# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

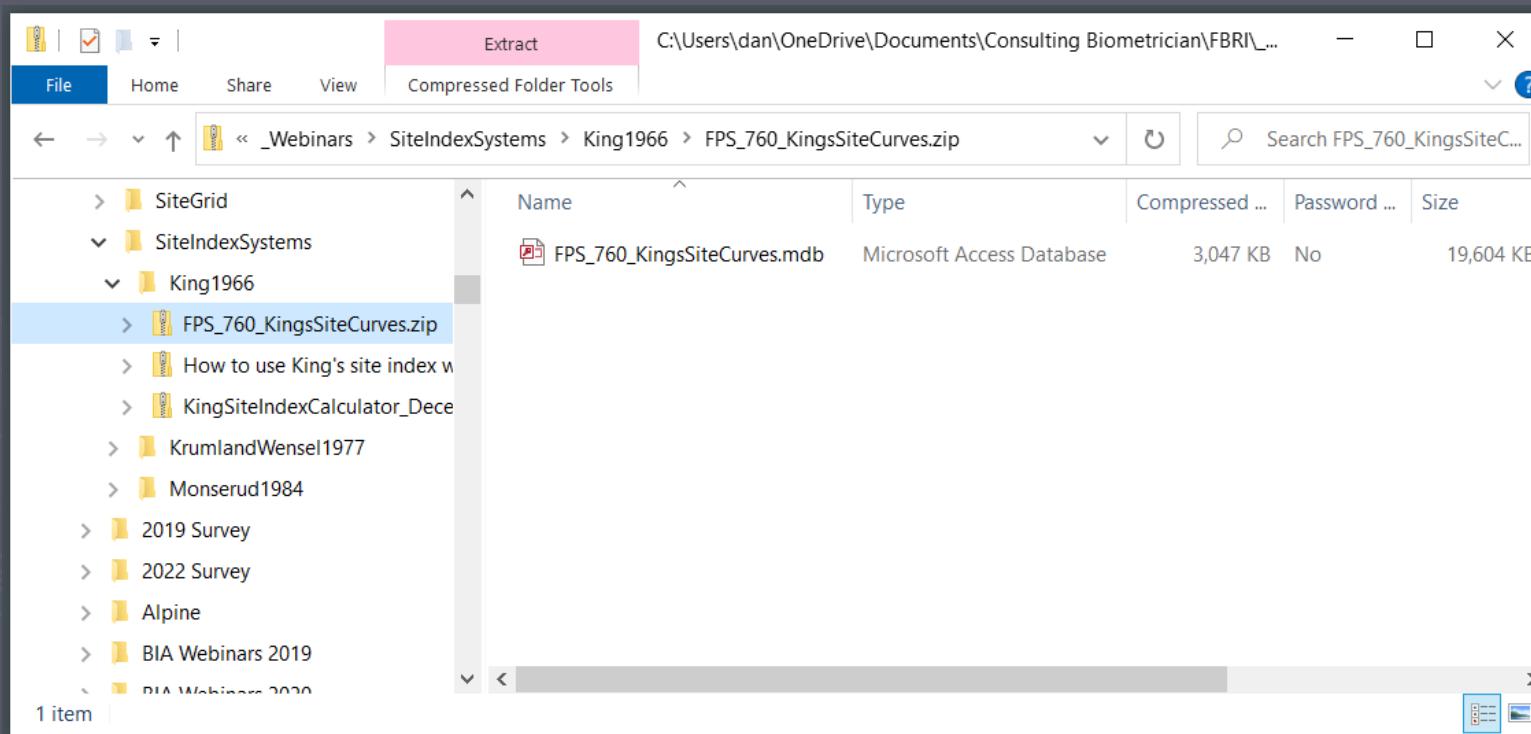
CrosswalkKingTo10mSite

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
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Record: 1 4 51 of 101 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 10100 10101 10102 10103 10104 10105 10106 10107 10108 10109 10110 10111 10112 10113 10114 10115 10116 10117 10118 10119 101100 101101 101102 101103 101104 101105 101106 101107 101108 101109 101110 101111 101112 101113 101114 101115 101116 101117 101118 101119 1011100 1011101 1011102 1011103 1011104 1011105 1011106 1011107 1011108 1011109 1011110 1011111 1011112 1011113 1011114 1011115 1011116 1011117 1011118 1011119 10111100 10111101 10111102 10111103 10111104 10111105 10111106 10111107 10111108 10111109 10111110 10111111 10111112 10111113 10111114 10111115 10111116 10111117 10111118 10111119 101111100 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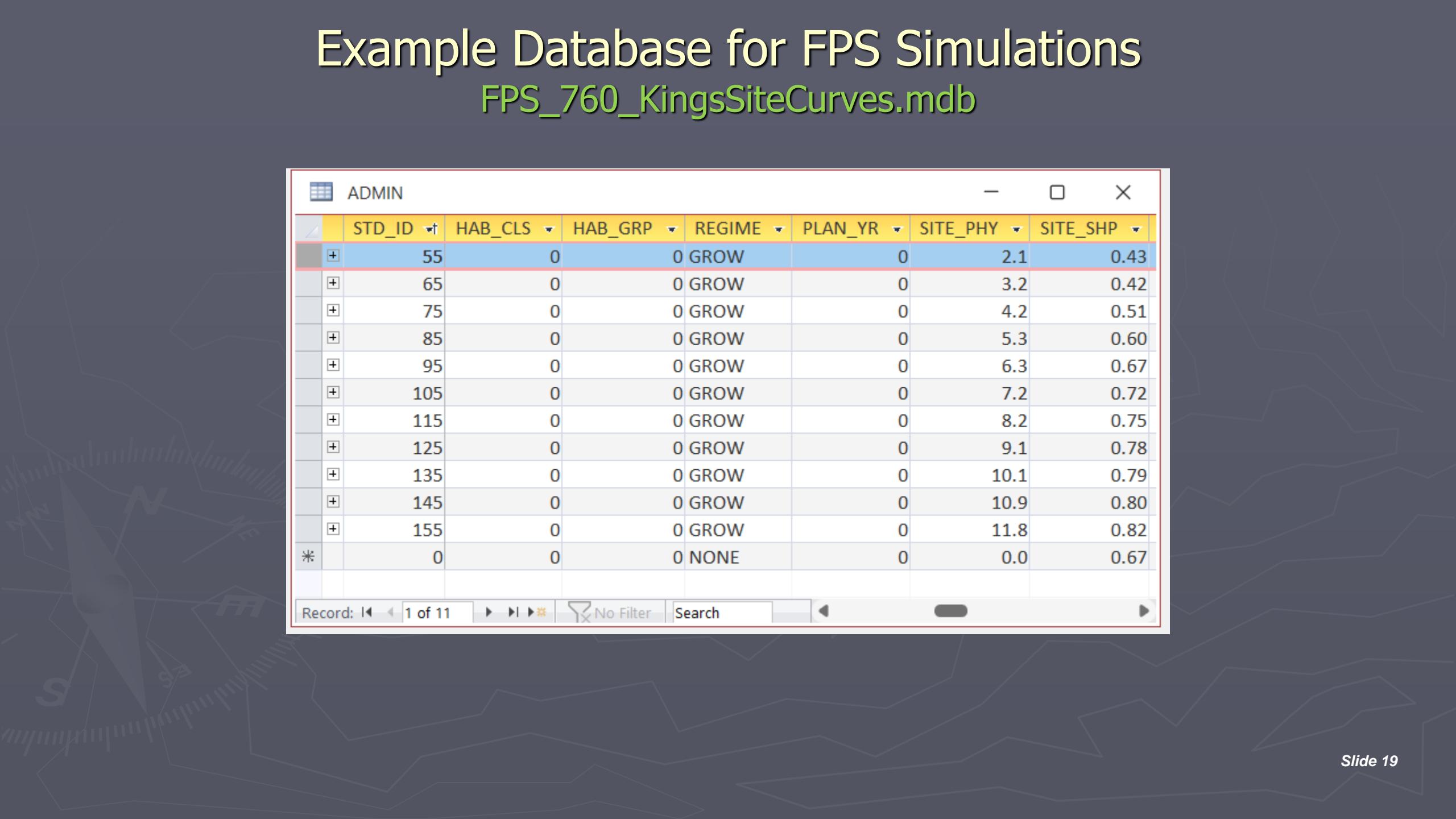
# Example Database for FPS Simulations

## 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	55	0	0	GROW	0	2.1	0.43
65	65	0	0	GROW	0	3.2	0.42
75	75	0	0	GROW	0	4.2	0.51
85	85	0	0	GROW	0	5.3	0.60
95	95	0	0	GROW	0	6.3	0.67
105	105	0	0	GROW	0	7.2	0.72
115	115	0	0	GROW	0	8.2	0.75
125	125	0	0	GROW	0	9.1	0.78
135	135	0	0	GROW	0	10.1	0.79
145	145	0	0	GROW	0	10.9	0.80
155	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_ME	THIN_N	T
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

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

PLOTS

STD_ID	PLOT	TREE	SPEC	GRP	X_C	Y_C	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	

# Example Database for FPS Simulations

## FPS\_760\_KingsSiteCurves.mdb

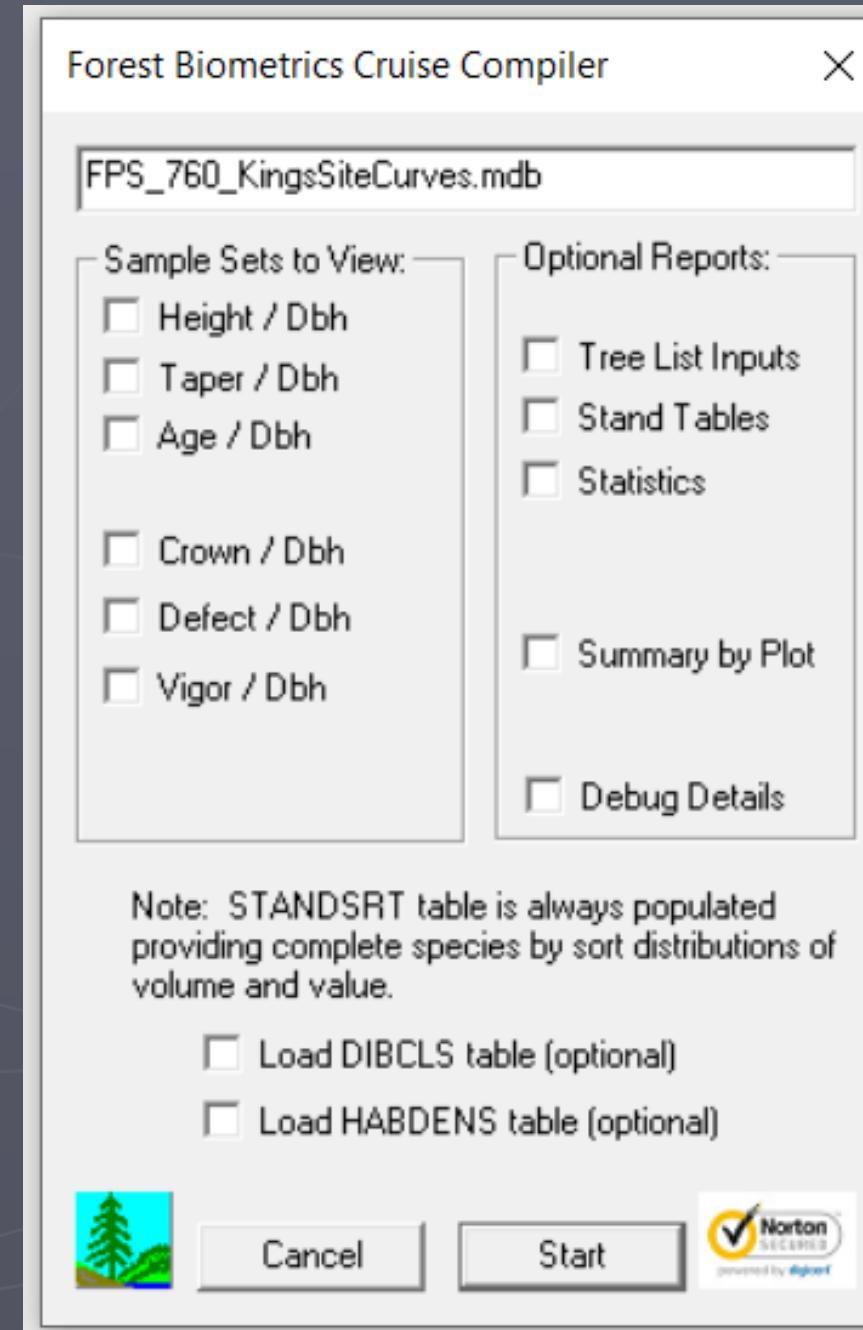
SCHEDULE

Bas	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	7,000,000
0	2026	1000	500	-5000	0	120	12	900	7,000,000
0	2029	1000	500	-5000	0	120	12	900	7,000,000
0	2032	1000	500	-5000	0	120	12	900	7,000,000
0	2035	1000	500	-5000	0	120	12	900	7,000,000
0	2038	1000	500	-5000	0	120	12	900	7,000,000
0	2041	1000	500	-5000	0	120	12	900	7,000,000
0	2044	1000	500	-5000	0	120	12	900	7,000,000
0	2047	1000	500	-5000	0	120	12	900	7,000,000
0	2050	1000	500	-5000	0	120	12	900	7,000,000
0	2053	1000	500	-5000	0	120	12	900	7,000,000
0	2056	1000	500	-5000	0	120	12	900	7,000,000
0	2059	1000	500	-5000	0	120	12	900	7,000,000
0	2062	1000	500	-5000	0	120	12	900	7,000,000
0	2065	1000	500	-5000	0	120	12	900	7,000,000
0	2068	1000	500	-5000	0	120	12	900	7,000,000

# Example Database for FPS Simulations

FPS\_760\_KingsSiteCurves.mdb

► Compile

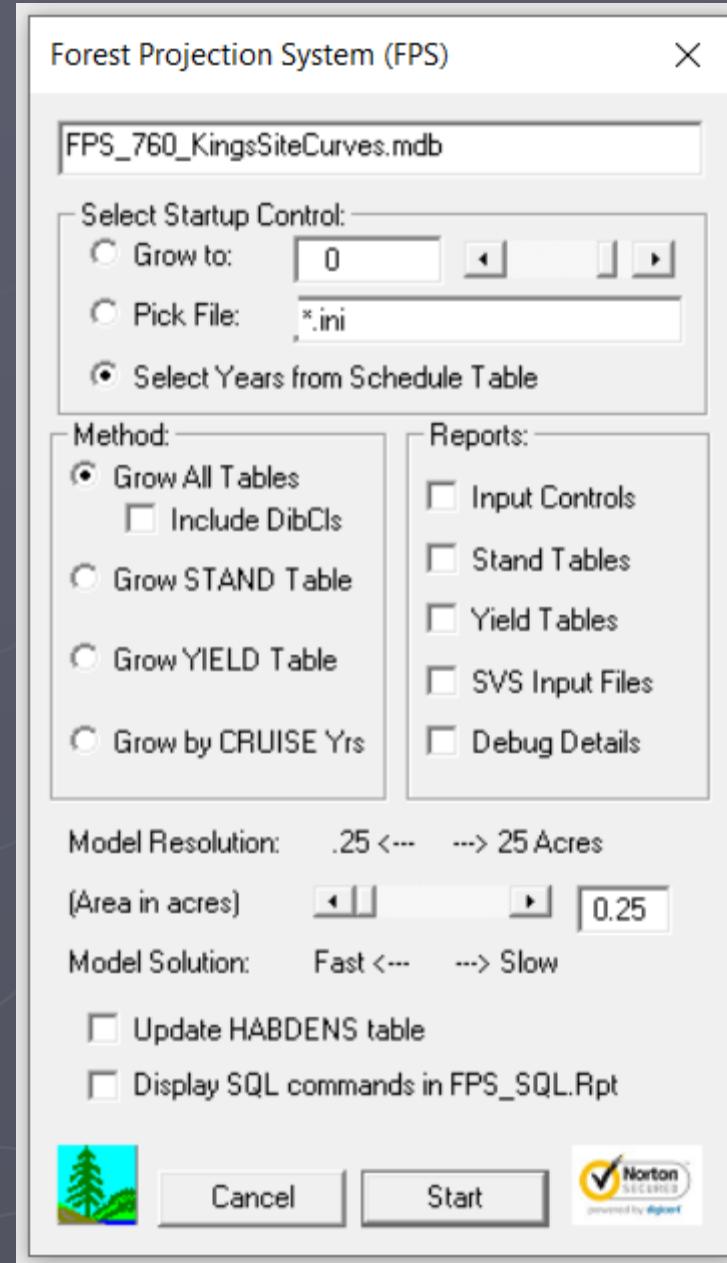


# Example Database for FPS Simulations

FPS\_760\_KingsSiteCurves.mdb

## ► Grow the stands

- Select Years from Schedule Table
- Grow All Tables



# Example Database for FPS Simulations

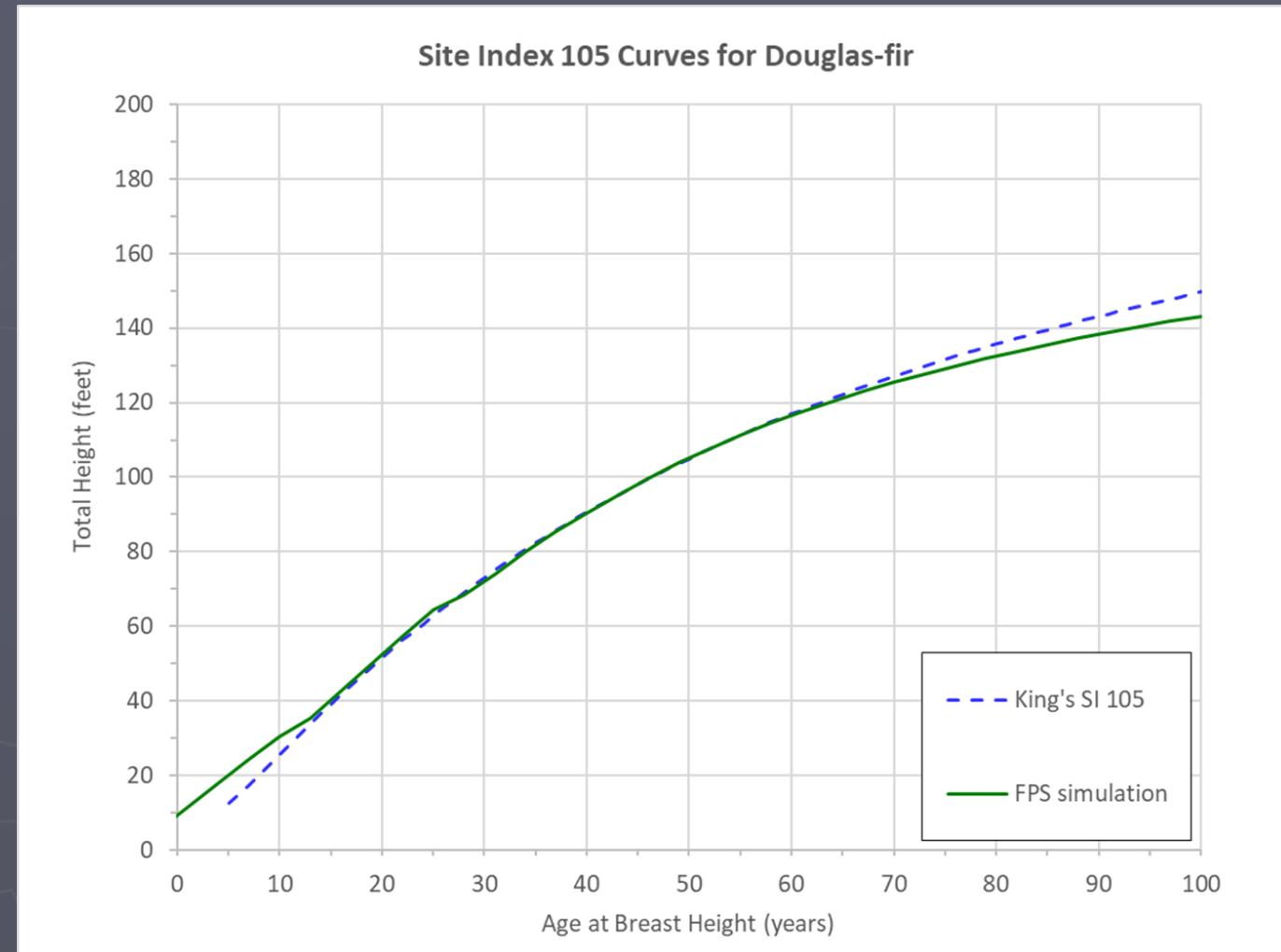
## FPS\_760\_KingsSiteCurves.mdb

STAND

STD_ID	RPT_YR	REGIME	Status	TBR_L	Flag_Y	Tot_Age	Trees	QDBH	BASAL	TOPHT	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	

# 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**



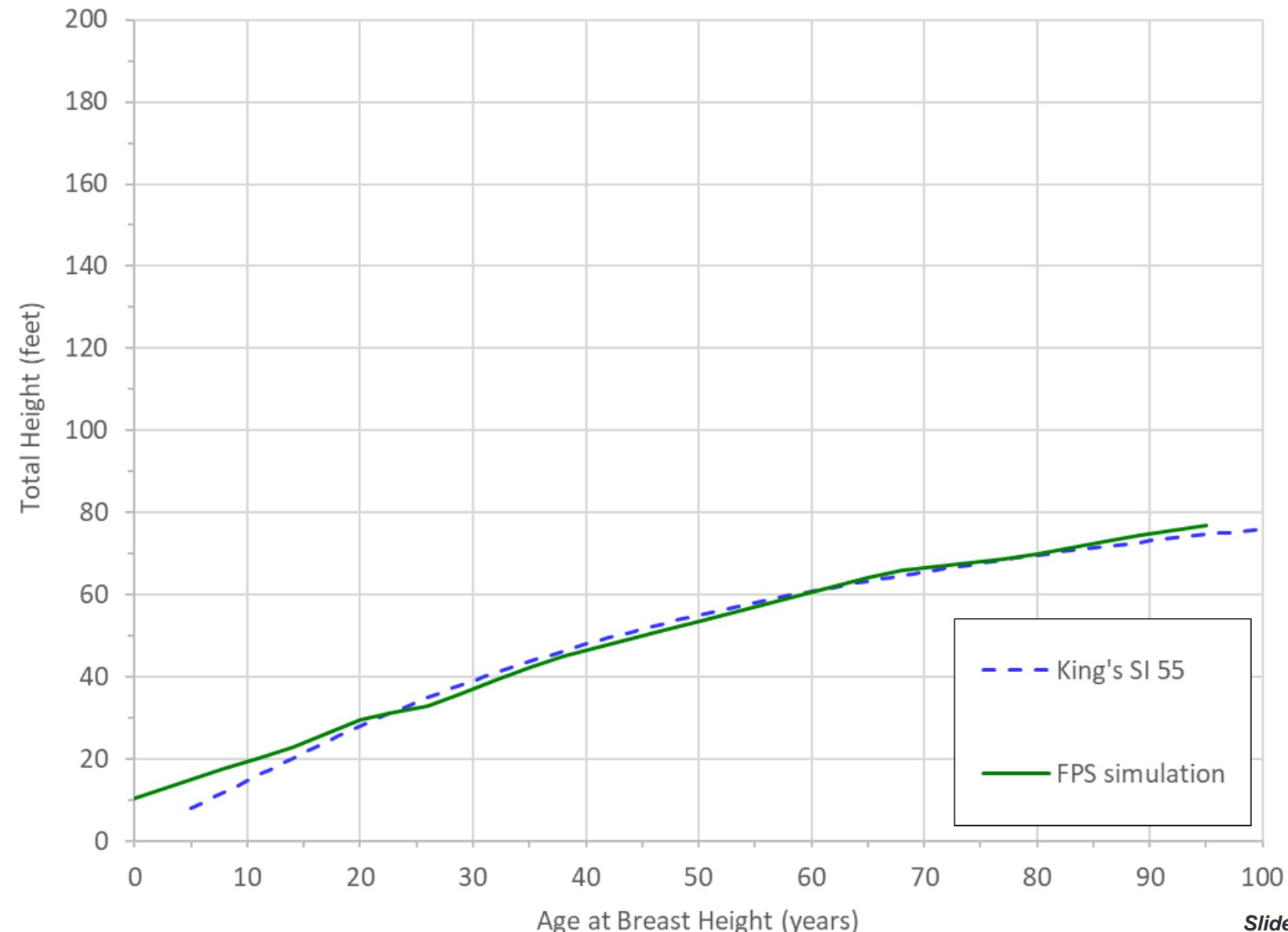
## FPS Simulation for Site Index 55

PctHt = 141.05%

SITE\_PHY = 2.084

SITE\_SHP = 43.10%

Site Index 55 Curves for Douglas-fir



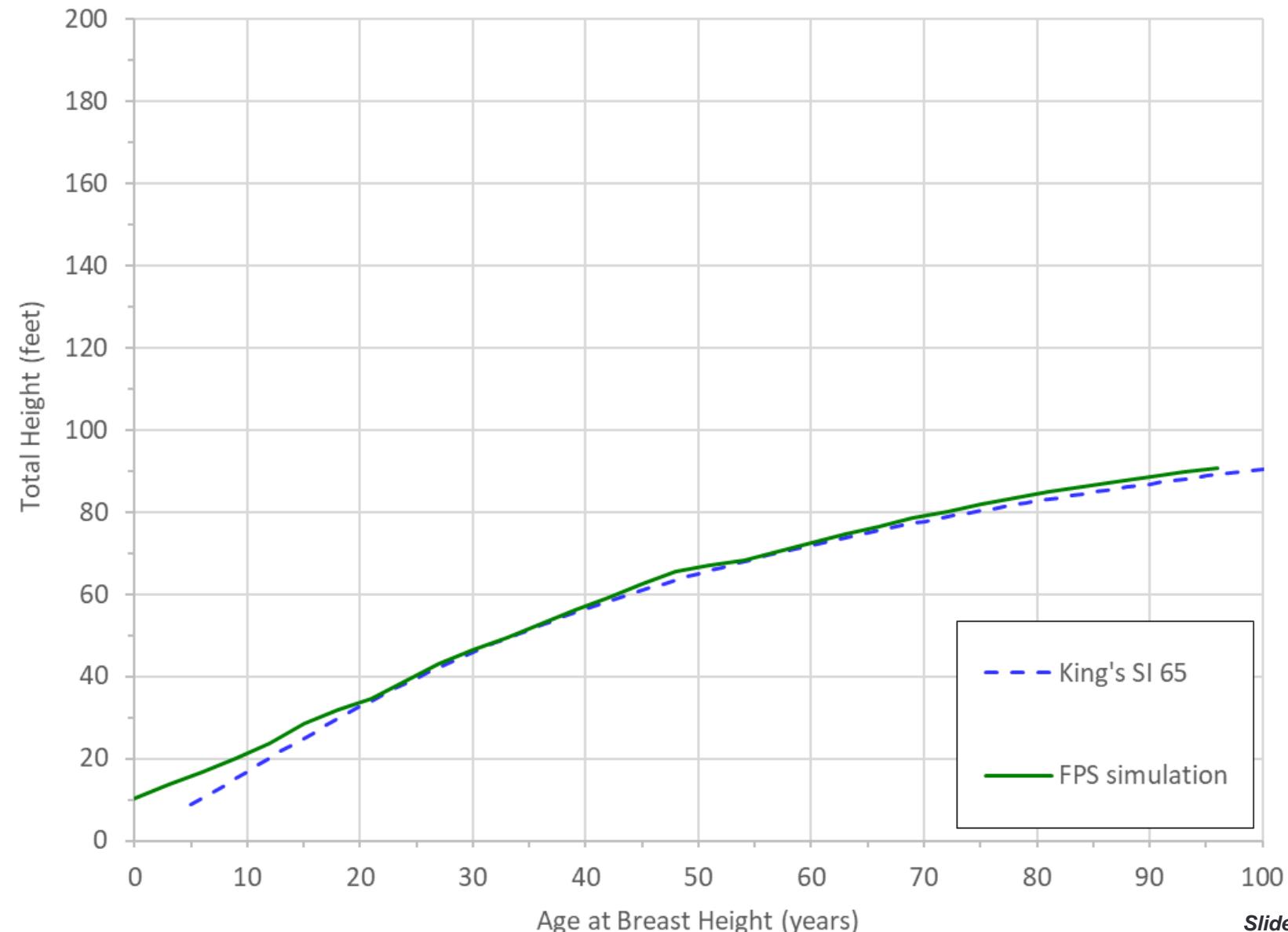
## FPS Simulation for Site Index 65

PctHt = 110.12%

SITE\_PHY = 3.158

SITE\_SHP = 42.07%

Site Index 65 Curves for Douglas-fir



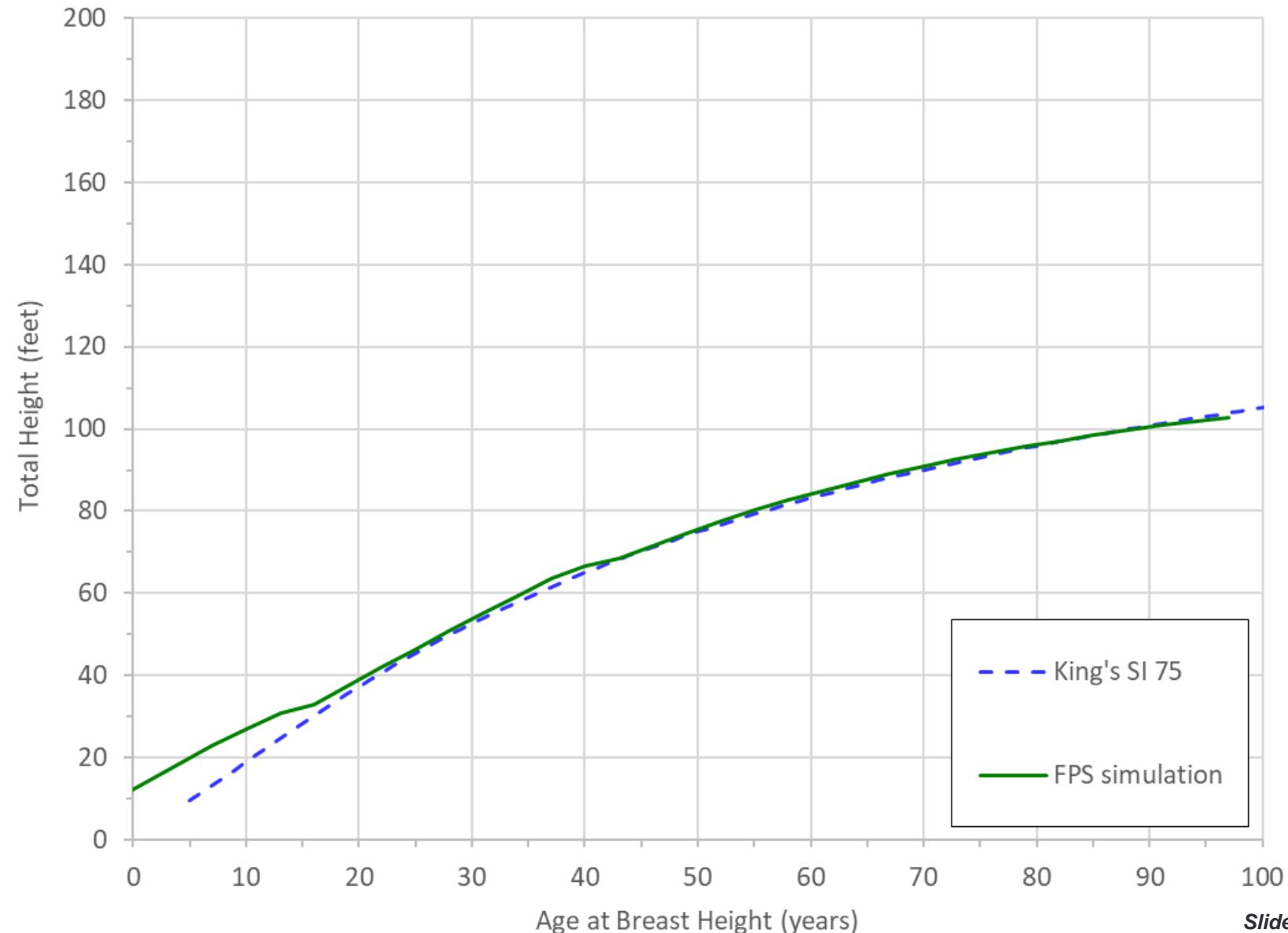
## FPS Simulation for Site Index 75

PctHt = 94.78%

SITE\_PHY = 4.228

SITE\_SHP = 50.94%

Site Index 75 Curves for Douglas-fir



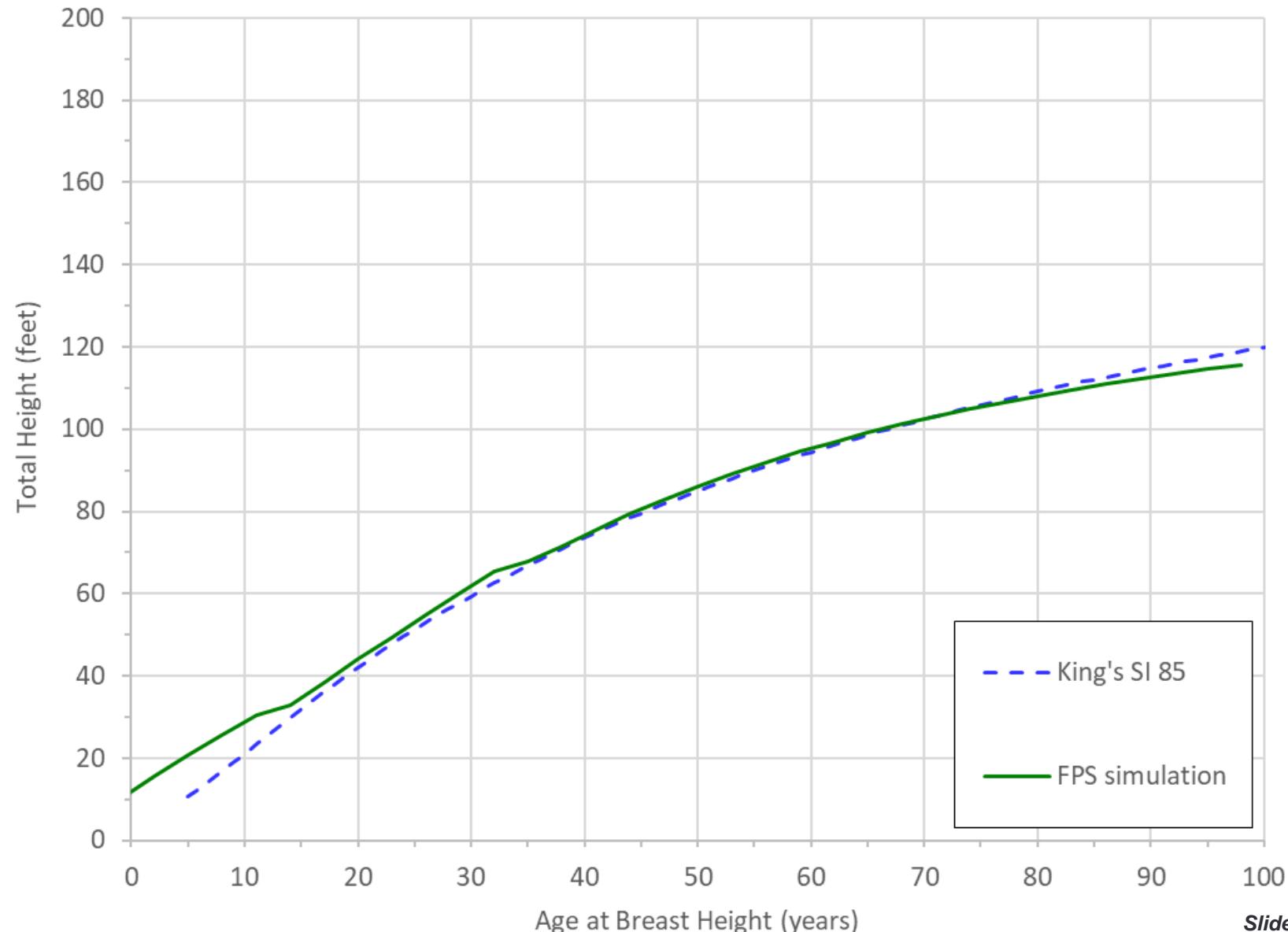
## FPS Simulation for Site Index 85

PctHt = 86.89%

SITE\_PHY = 5.267

SITE\_SHP = 60.13%

Site Index 85 Curves for Douglas-fir



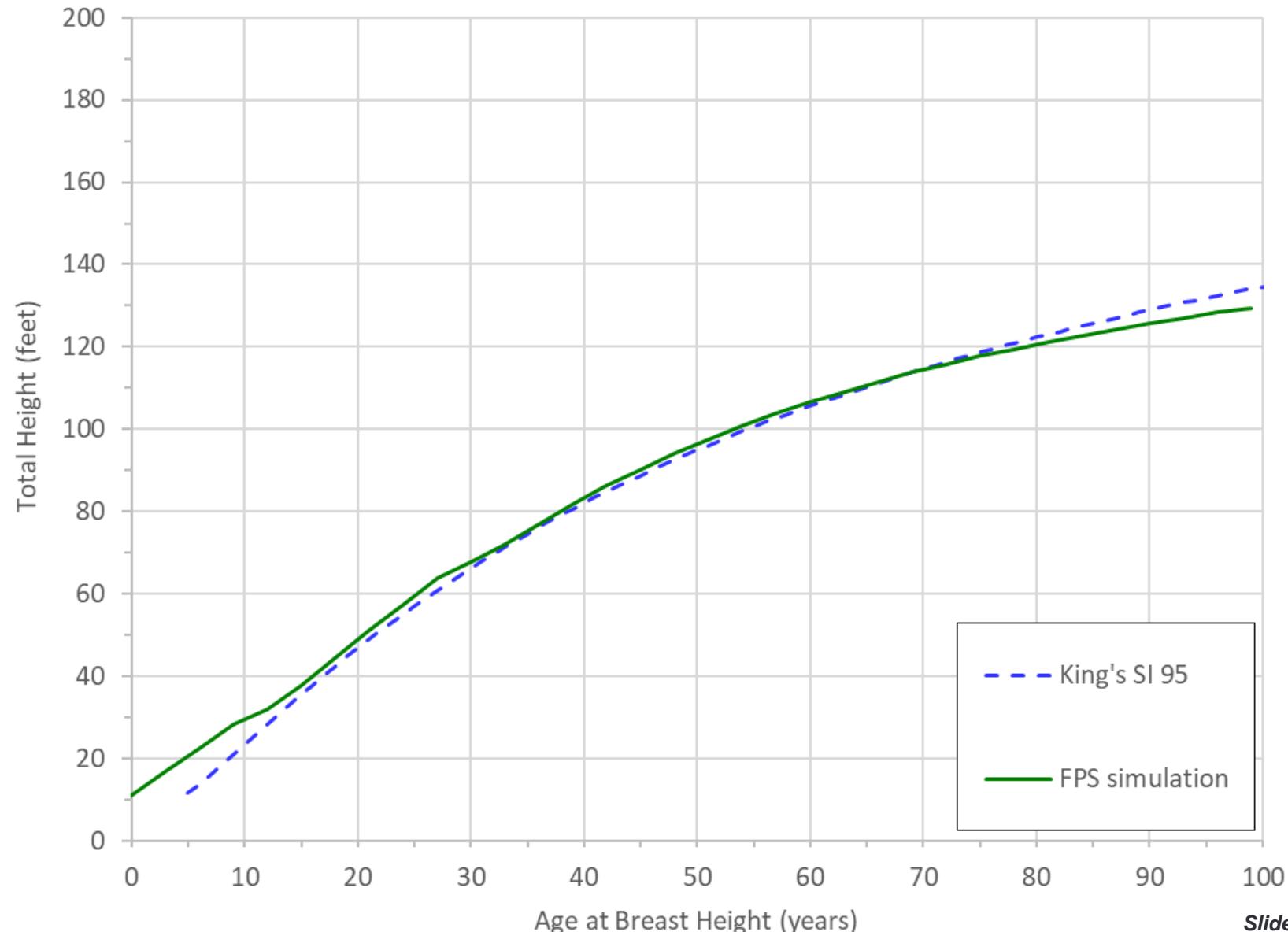
## FPS Simulation for Site Index 95

PctHt = 81.59%

SITE\_PHY = 6.314

SITE\_SHP = 66.85%

Site Index 95 Curves for Douglas-fir



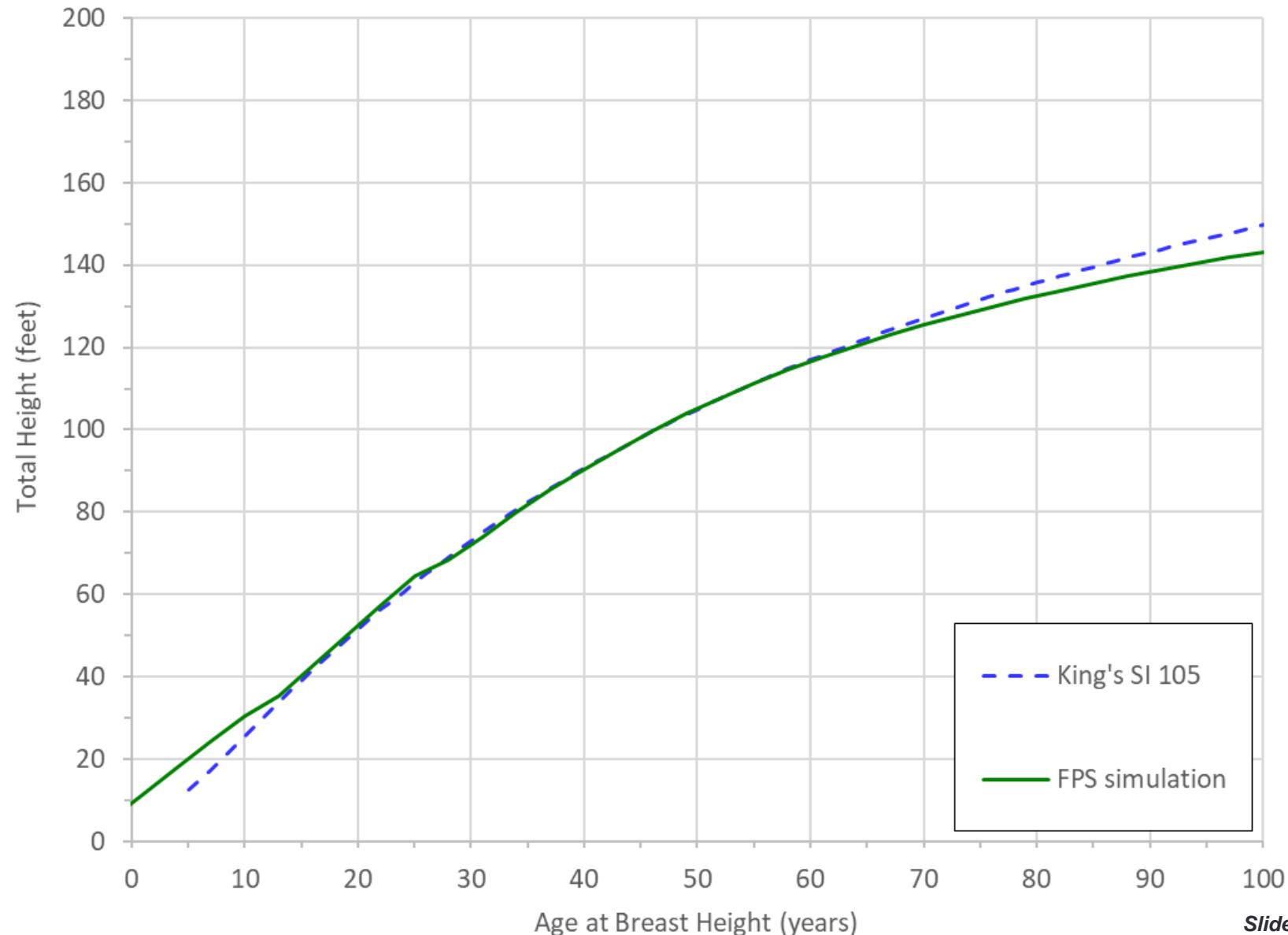
## FPS Simulation for Site Index 105

PctHt = 81.16%

SITE\_PHY = 7.243

SITE\_SHP = 71.98%

Site Index 105 Curves for Douglas-fir



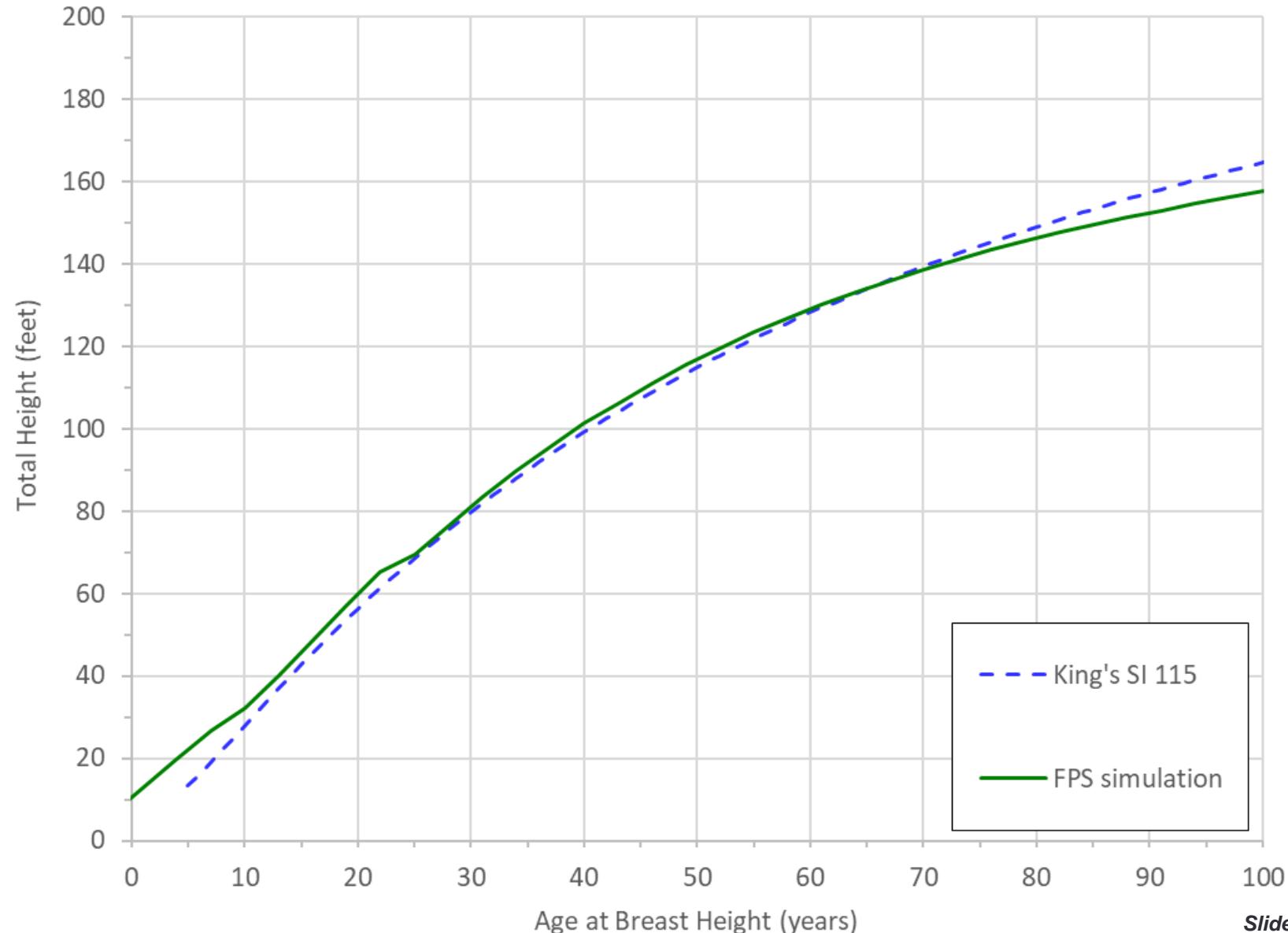
## FPS Simulation for Site Index 115

PctHt = 76.49%

SITE\_PHY = 8.208

SITE\_SHP = 74.99%

Site Index 115 Curves for Douglas-fir



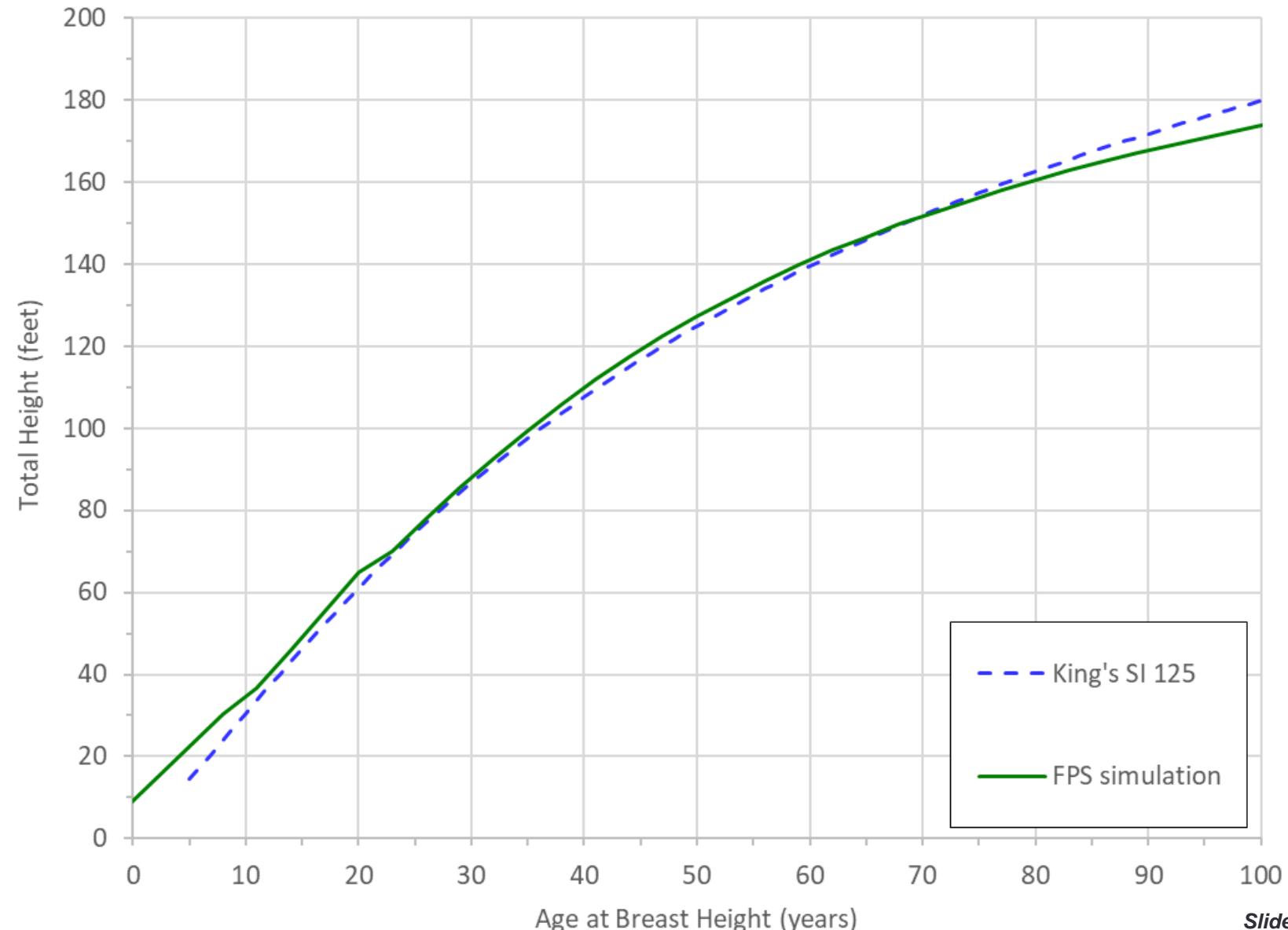
## FPS Simulation for Site Index 125

PctHt = 77.86%

SITE\_PHY = 9.126

SITE\_SHP = 77.78%

Site Index 125 Curves for Douglas-fir



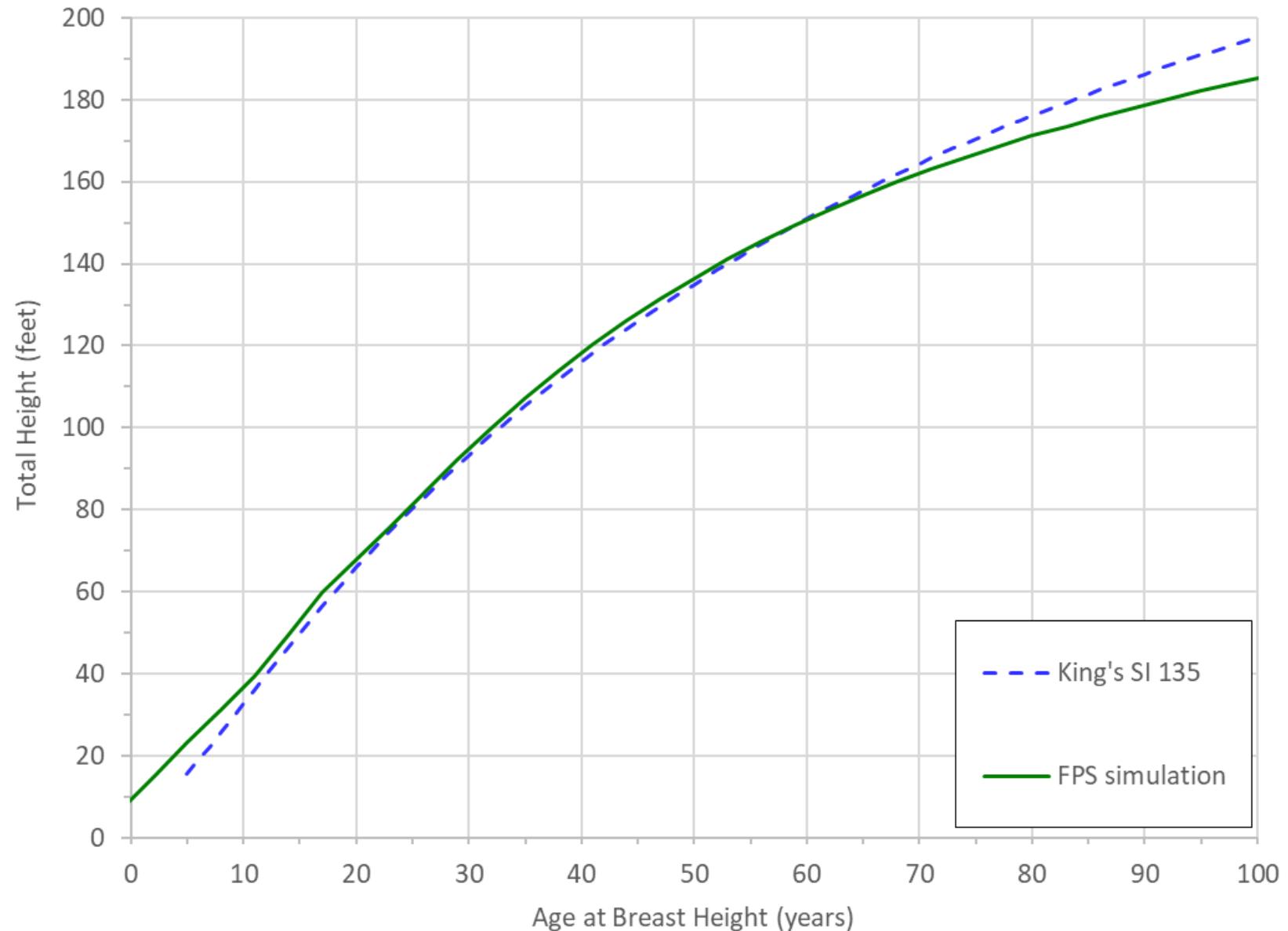
## FPS Simulation for Site Index 135

PctHt = 74.19%

SITE\_PHY = 10.059

SITE\_SHP = 78.94%

Site Index 135 Curves for Douglas-fir



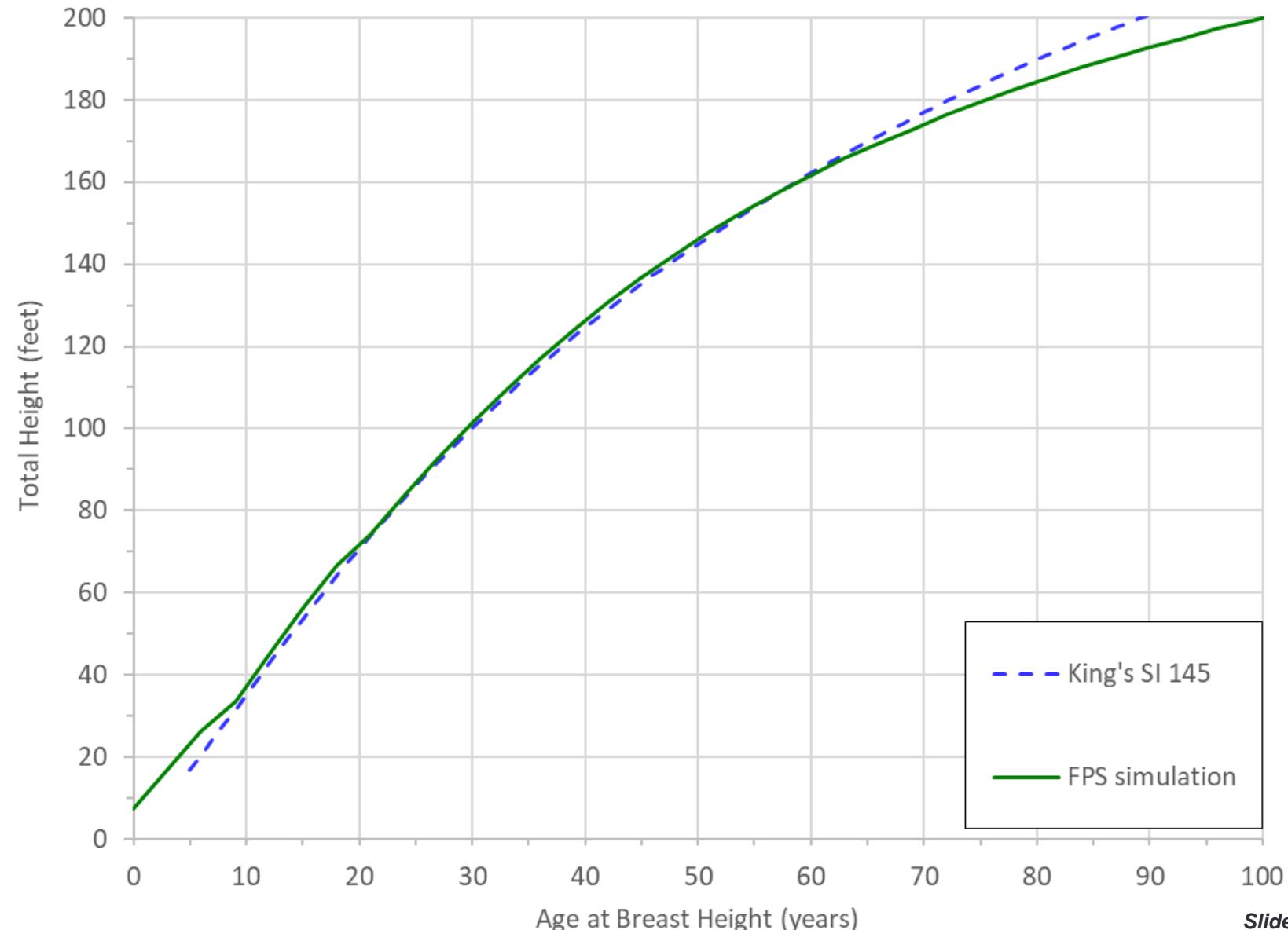
## FPS Simulation for Site Index 145

PctHt = 77.51%

SITE\_PHY = 10.918

SITE\_SHP = 80.46%

Site Index 145 Curves for Douglas-fir



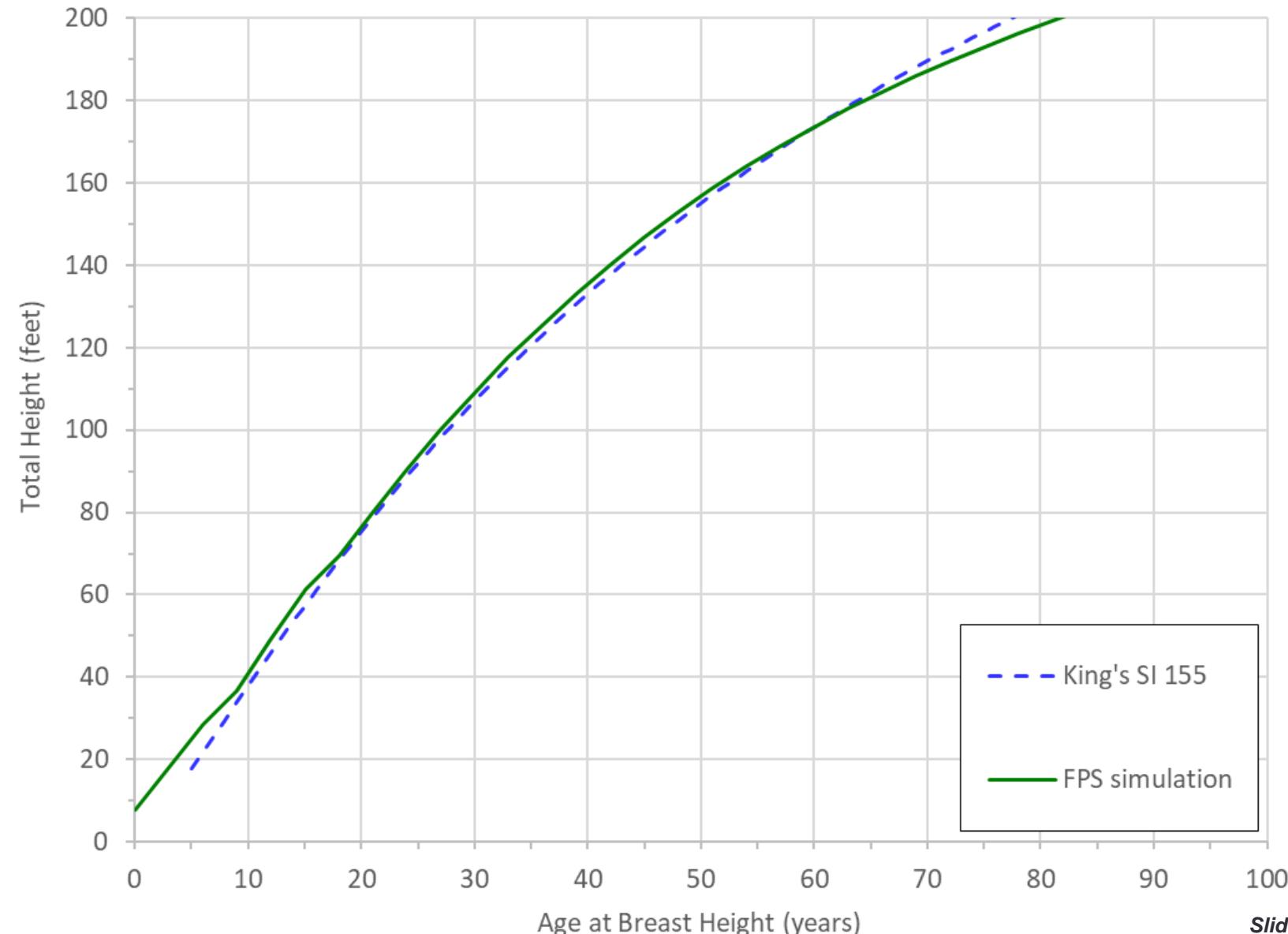
## FPS Simulation for Site Index 155

PctHt = 77.04%

SITE\_PHY = 11.805

SITE\_SHP = 81.67%

Site Index 155 Curves for Douglas-fir



Breast Height Age	King's Site Index Curve (height at BH age 50)	FPS Simulation (TOP_HT at BH age 50)
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	

*King'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

*Monserud's crosswalk table*

# Questions?

Contact Dan Opalach at:

[dan@forestbiometrics.org](mailto:dan@forestbiometrics.org)

(971) 940-2409