

# Determining Site Productivity

## *Alternatives to Current Methods*

James D. Arney, Ph.D.

**Forest Biometrics Research Institute**

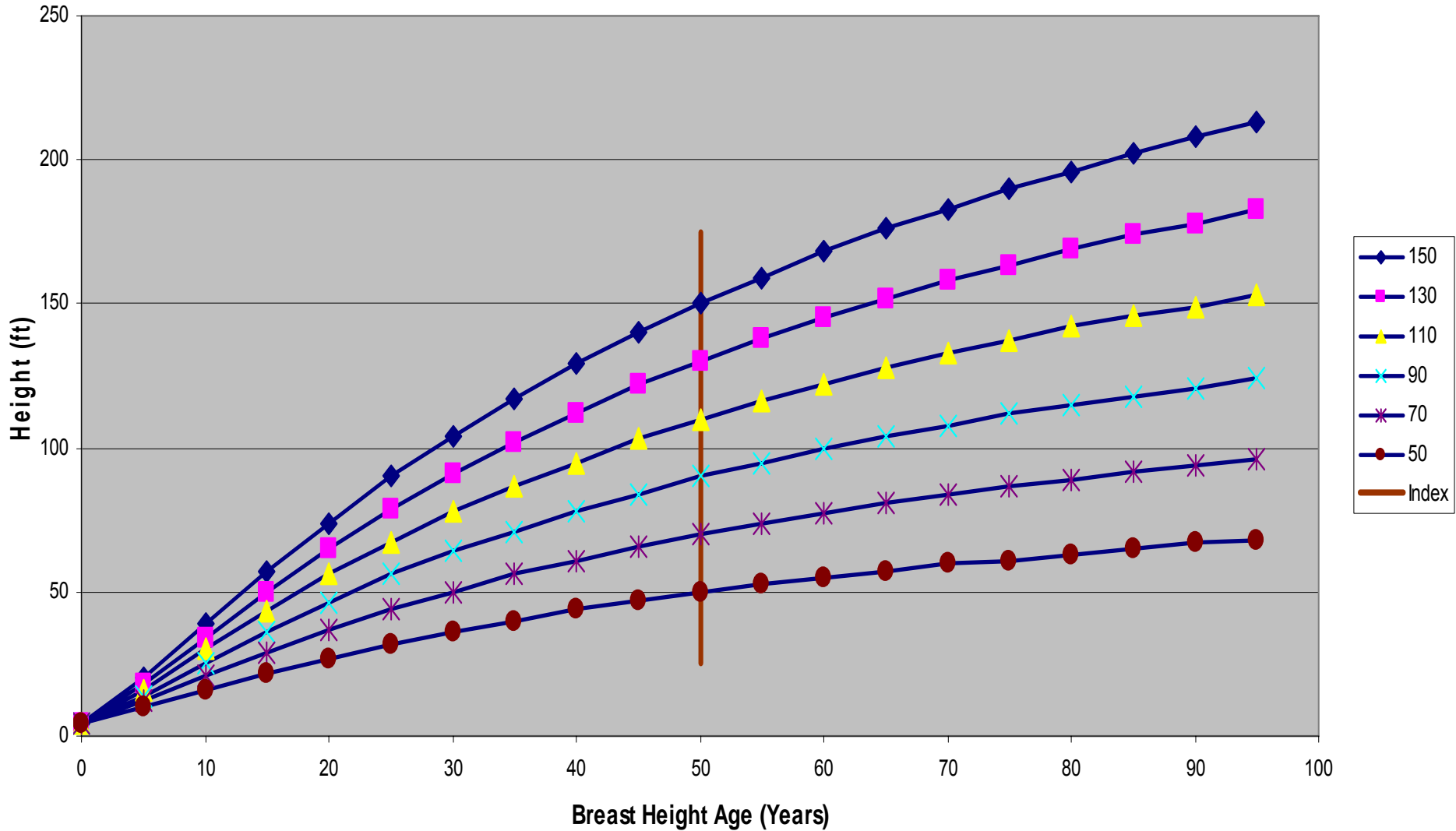
Corvallis, Oregon

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# Traditional Site Classification

- ▶ Height Growth / Age Indexed at Fixed Age
- ▶ Macro-Site Capacity Defined by Ht / Age
- ▶ Assumed to be Independent of Silviculture
- ▶ Traditional Methods:
  - Historically Height at 100 years (Total Age)
  - West Coast – Height at 50 years (Breast Height)
  - Southeast – Height at 25 years (Total Age)

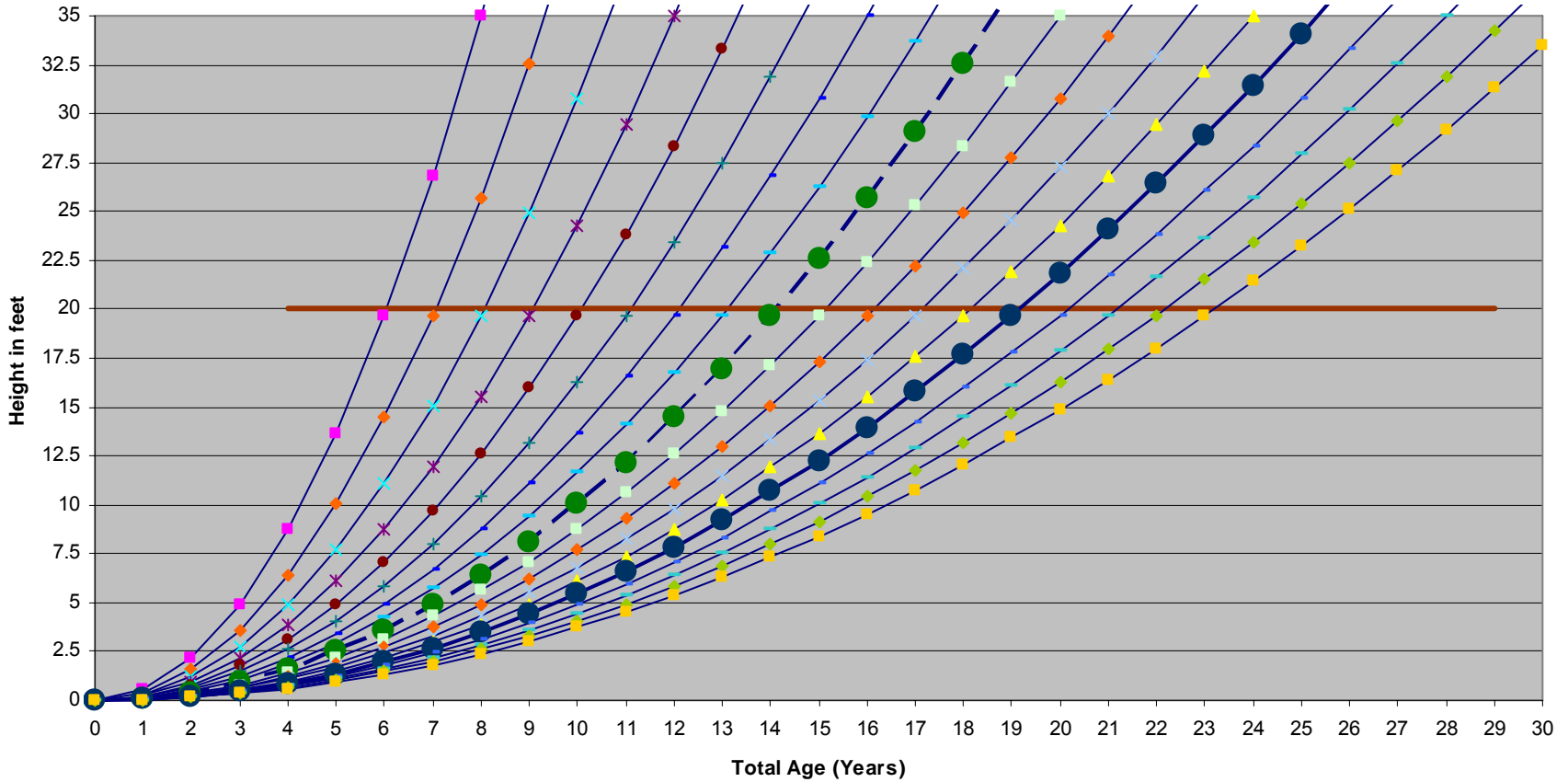
# Standard West Coast Site Index Curves Douglas-fir (King, 1966)



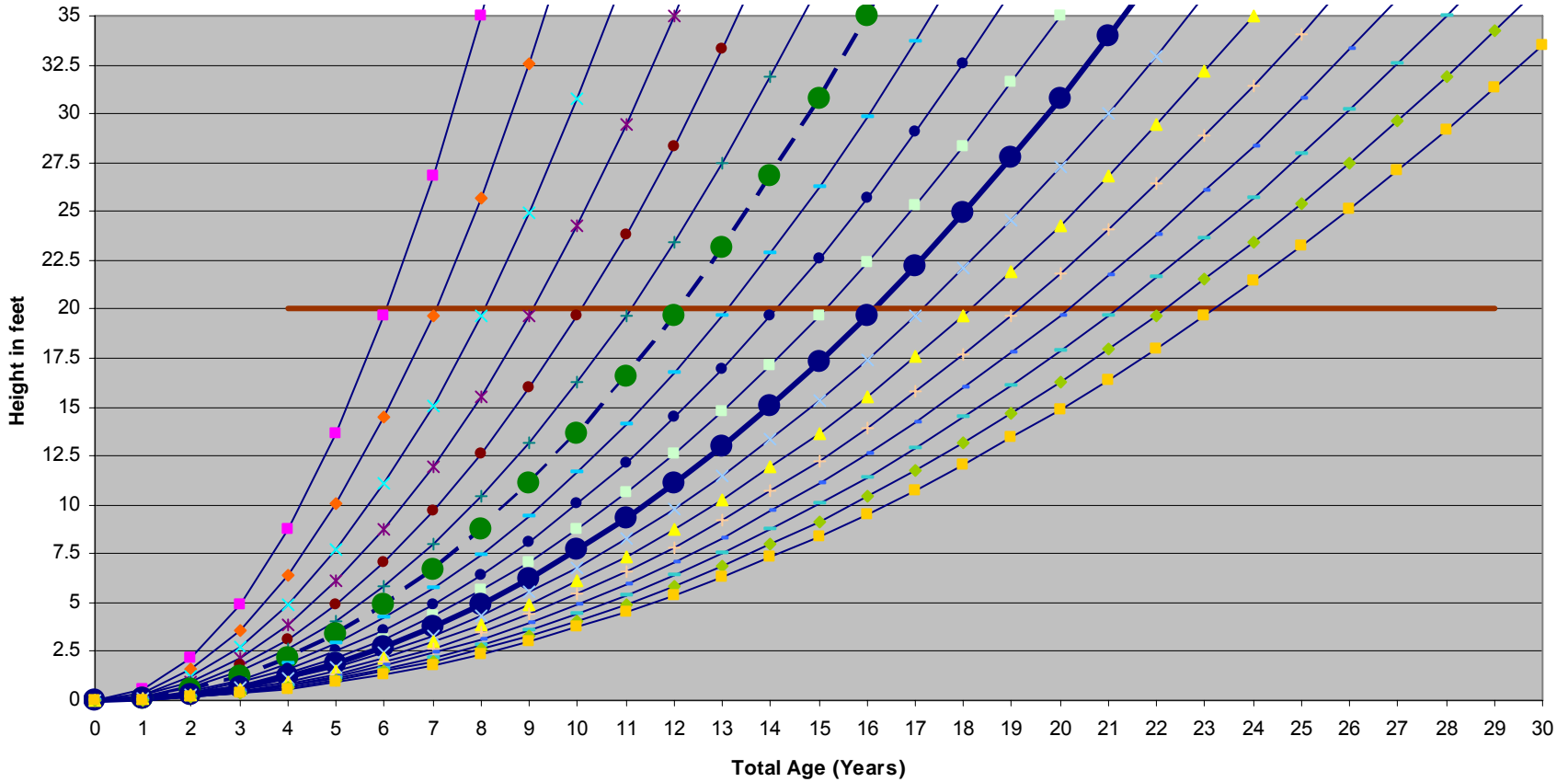
# Shortcomings of Traditional Methods

- ▶ Early Growth highly sensitive to Silviculture
  - Height Growth delayed by Competition
  - Effective Site Preparation enhances Growth
  - Vigorous Planting Stock enhances Growth
  - Effective Brush Control enhances Growth
  - Effective Browsing Control enhances Growth
- ▶ Early Silviculture confounds BH Site Method
- ▶ **Plantation** Ht/Age rates exceed **Site Curves**

### Managed vs Natural Stand - Total Yrs to 20-ft Ref Height Douglas-fir Site 80ft @50yrsBH



# Managed vs Natural Stand - Total Yrs to 20-ft Ref Height Douglas-fir Site 100ft @50yrsBH



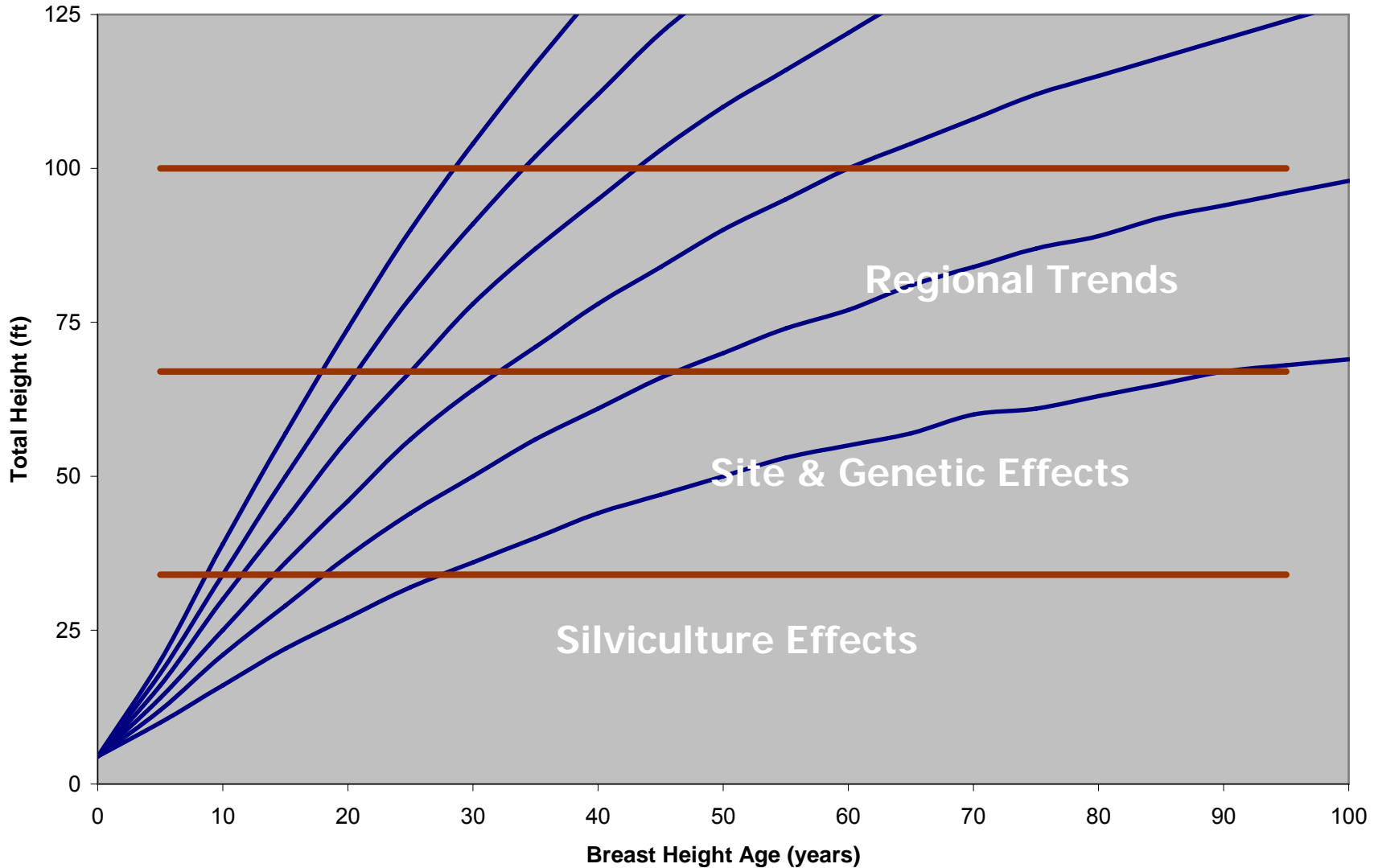
# Alternative Site Classification

- ▶ Separate the Impact and Influence of Silvicultural Treatments and Genetic Gain
- ▶ Establish and Apply a Robust Method of Site Classification from Direct Tree Measurement
- ▶ Develop an Ownership-wide Classification of Native Site Productivity Capacity
- ▶ Establish a Permanent Classification based on Soils, Climate and Topographic Variables

# 10m Site Classification Method

- ▶ Use Boris Zeide's (1978) Two-Point Principal
  - Measure Two Heights on the Same Tree
  - Record the Number of Years between Msmts
  - Site Index based on Two Upper-Stem Msmts
- ▶ Move the Base Age from BH to 10-meter Ht
- ▶ Site Capacity equals #Years from 10 to 20 meters
- ▶ Site Shape equals #Years from 20 to 30 meters
- ▶ Site Index = Height Growth in Meters / Decade
- ▶ Site Index =  $100 / (\# \text{Years from 10m to 20m Ht})$
- ▶ 10m Site Method may be Applied Anywhere

# Conventional Coastal Douglas-fir Site Curves Height Growth Intercepts (10, 20, 30 meters)



**Traditional Published Site Curves (King, 1966) converted to 10m Site  
(Traditional Display)**

FOREST BIOMETRICS RESEARCH INSTITUTE						10m-SITE CURVES				
Region:	11	Species:	DF	Site Index - 50yr BH Basis						
34ft\	30	45	60	75	90	105	120	135	150	165
Age \	-----			Total	Height (feet)			-----		
1	34	35	35	36	36	37	37	38	39	40
2	35	36	36	37	38	39	40	41	42	44
3	35	37	38	39	40	42	43	44	46	48
4	36	37	39	40	43	44	46	48	50	52
5	36	38	40	42	45	47	49	51	53	56
6	36	39	41	43	47	49	52	54	57	60
7	37	40	42	45	48	52	54	58	61	64
8	37	40	43	47	50	54	57	61	64	68
9	38	41	45	48	52	56	60	64	68	72
10	38	42	46	50	54	58	63	67	72	76
11	38	43	47	51	56	60	65	71	76	81
12	39	43	48	52	57	62	68	73	79	85
13	39	44	49	54	59	65	70	76	82	88
14	39	45	50	55	61	67	73	79	85	92
15	40	45	51	56	63	69	75	81	88	95
16	40	46	52	58	64	71	77	84	91	98
17	40	47	53	59	66	73	80	87	94	102
18	41	47	54	60	67	75	82	90	97	105
19	41	48	55	61	69	77	85	92	100	108
20	41	49	56	63	70	78	87	95	103	111
22	42	50	57	65	73	82	91	100	109	118
24	42	51	59	67	76	85	94	104	114	124
26	43	52	61	69	79	89	98	108	118	129
28	43	53	62	71	81	92	102	112	123	134
30	44	54	64	74	84	95	106	117	128	139
32	45	55	65	76	86	97	109	120	132	144
34	45	56	67	77	89	100	112	124	136	148
36	45	57	68	79	91	103	115	127	139	152
38	46	58	70	81	93	105	118	130	143	156
40	46	59	71	83	95	108	121	134	147	160
42	47	60	72	84	97	110	123	137	150	164
44	47	61	73	86	99	112	125	139	153	167
46	48	62	75	87	101	114	128	142	156	170
48	48	62	76	88	102	116	130	144	159	173
50	48	63	77	90	104	118	132	147	161	176
55	49	65	79	93	108	122	137	152	167	182
60	50	66	81	96	111	126	141	157	172	188
65	51	68	84	98	114	130	145	161	177	193
70	51	69	85	101	117	133	148	165	181	197
75	52	70	87	103	119	135	151	168	184	201
80	52	72	89	105	121	138	154	171	188	204
85	53	73	90	106	123	140	156	173	190	207
90	53	73	91	108	125	142	158	176	193	209
95	54	74	92	109	127	144	160	177	195	211
100	54	75	93	111	128	145	162	179	196	213

Age = Ring count at 34-foot height on the tree (not BH)  
 Ref: Forest Biometrics Research Institute. 2005. Calibration  
 Workshop - Site Index Procedures for felled trees.

**Traditional Published Site Curves (King, 1966) converted to 10m Site  
(10m Site Display)**

FOREST BIOMETRICS RESEARCH INSTITUTE		10m-SITE CURVES			
Region: 11 Species: DF		Site Index Conversions			
-Total Height Steps-		10m Site		Standard	
34- 67ft	67-100ft	-----	10m Site	-----	BH Site
Years	Years	Class	(Index)	Shape	Index
48	150	2	( 2.1)	32%	50
40	144	3	( 2.5)	28%	55
34	121	3	( 3.0)	28%	60
30	78	3	( 3.4)	38%	65
26	63	4	( 3.8)	42%	70
24	44	4	( 4.2)	54%	75
21	37	5	( 4.7)	58%	80
19	31	5	( 5.2)	62%	85
18	27	6	( 5.7)	65%	90
16	24	6	( 6.2)	66%	95
15	21	7	( 6.7)	70%	100
14	20	7	( 7.1)	72%	105
13	18	8	( 7.6)	74%	110
12	16	8	( 8.1)	76%	115
12	15	9	( 8.6)	77%	120
11	14	9	( 9.2)	77%	125
10	13	10	( 9.8)	78%	130
10	12	10	(10.2)	80%	135
9	11	11	(10.7)	83%	140
9	11	11	(11.1)	84%	145
9	10	12	(11.6)	85%	150
8	10	12	(12.1)	85%	155
8	9	13	(12.6)	86%	160
8	9	13	(13.1)	88%	165
7	8	14	(13.5)	89%	170
7	8	14	(14.0)	90%	175
7	8	14	(14.5)	91%	180

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 Silvics = Capacity in Years to achieve height of 10m  
 = **Micro**-Site effects (vegetation & pest mgmt)  
 10m Site = Meters of Growth per Decade (from 10m height)  
 = **Macro**-Site effects (soil, climate capacity)  
 = 100 / (#Years from 10 to 20 meters)  
 Shape = Decline in Site Growth Capacity  
 = (Yrs 10-20m)/(Yrs 20-30m) (region, genetics)  
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Ref: Forest Biometrics Research Institute. March 2007.  
 Calibration Workshop - Site Classification Methods

**Note:**

- 10 meter height = 34-ft height (32.8 ft + 1 ft stump)
- 20 meter height = 67-ft height (65.6 ft + 1 ft stump)
- 30 meter height = 100-ft height (98.4 ft + 1 ft stump)