BASIC FIELD MEASUREMENTS

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CLASS OBJECTIVES

- Review basic forestry measurements and tools
- Review plot procedures
  - Fixed radius plot
  - Variable radius plot
  - Combination plot
- Complete field exercise

DISTANCE AND AREA MEASUREMENT

Common Field Techniques:

- **Pacing**
- **Measurement Aids**
  - Chain
  - Measurement Tape
- **Electronic distance Measurements**
  - Rangefinder

PACING

To set your pace:

Accurately measure a pacing course on level ground. Put stakes at each end

Repeatedly pace off the course, counting off the number of paces it takes to complete the distance.

Keep a natural comfortable pace that can be held all day. Don’t try to adjust to even standard, but try to count your pace to the course distance

It is usually easier to adopt the number of paces per distance, say 13 paces per 1 chain (66 feet) or 20 paces per 100 feet, than it is to calculate the number of feet per pace

GUNTER CHAIN MEASUREMENTS

1 Chain = 66 feet

1 Chain = 100 links

1 Furlong = 10 chains

1 Mile = 5,280 feet

1 Mile = 80 chains

1 Acre = 43,560 ft^2

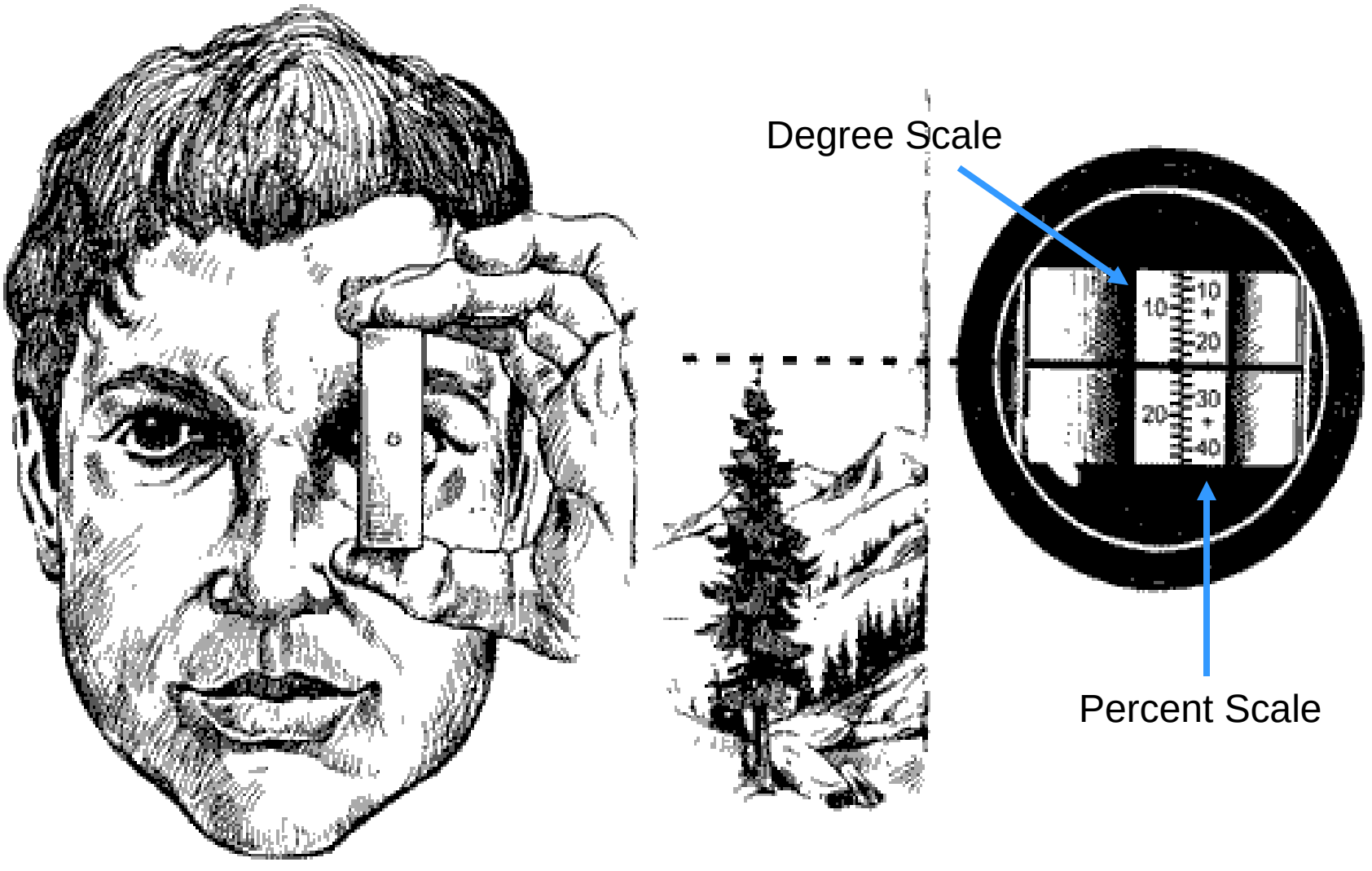
1 Acre = 160 $rods^2$

1 Acre = 10 $chains^2$

MEASUREMENT TAPES

- Tapes are available in various lengths up to 1,000 feet and can be made of various materials
- Hip chains can be considered a form of measurement tape

ANGLE MEASUREMENT



CORRECTION FOR SLOPE

Matter of trigonometry:

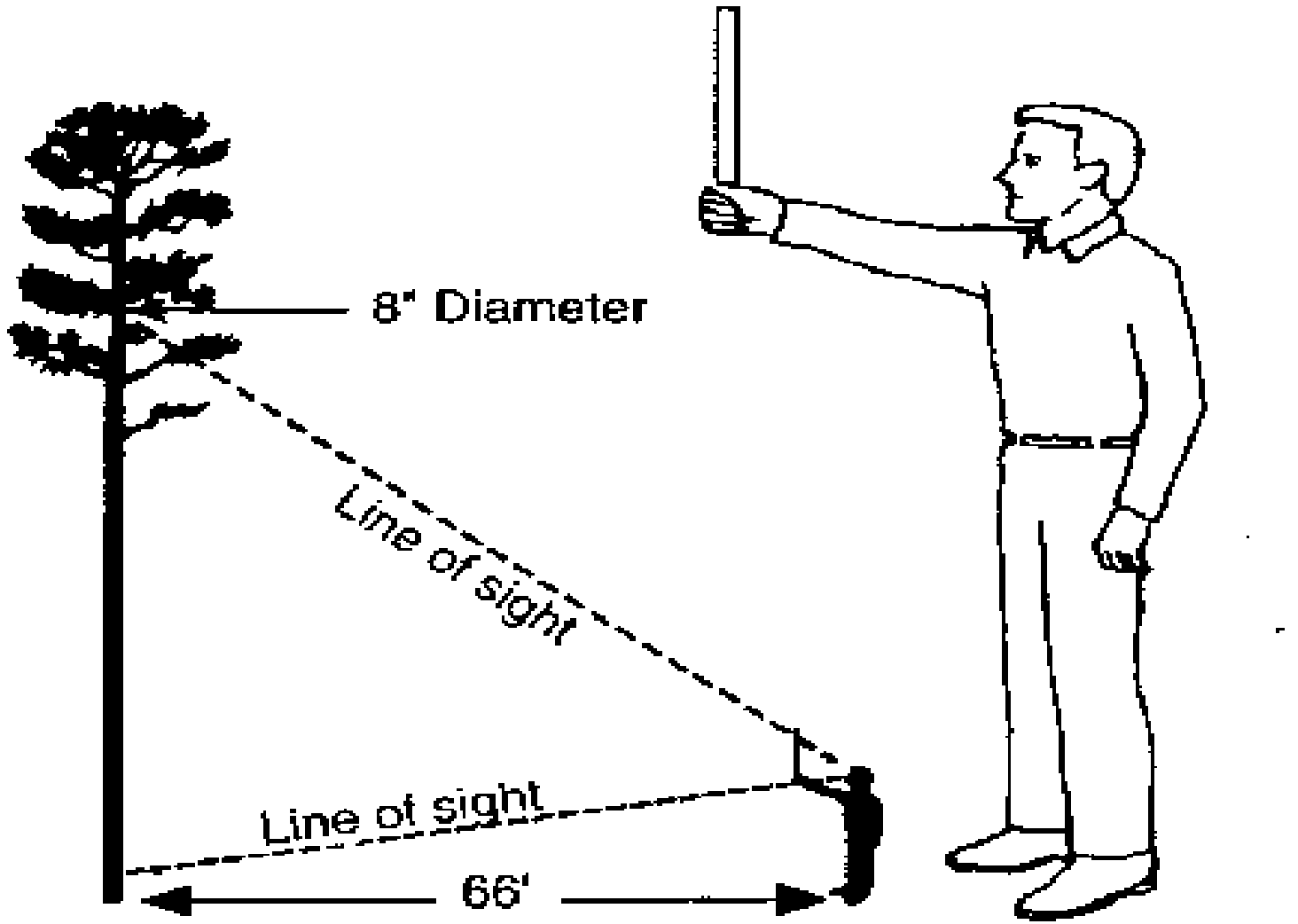
- **HD = SD * *cos* A**
  where A = angle in degrees
  Look of conversion on back of clinometer

- **HD = SD * *cos* (arc tan A)**
  where A = angle in decimal percent

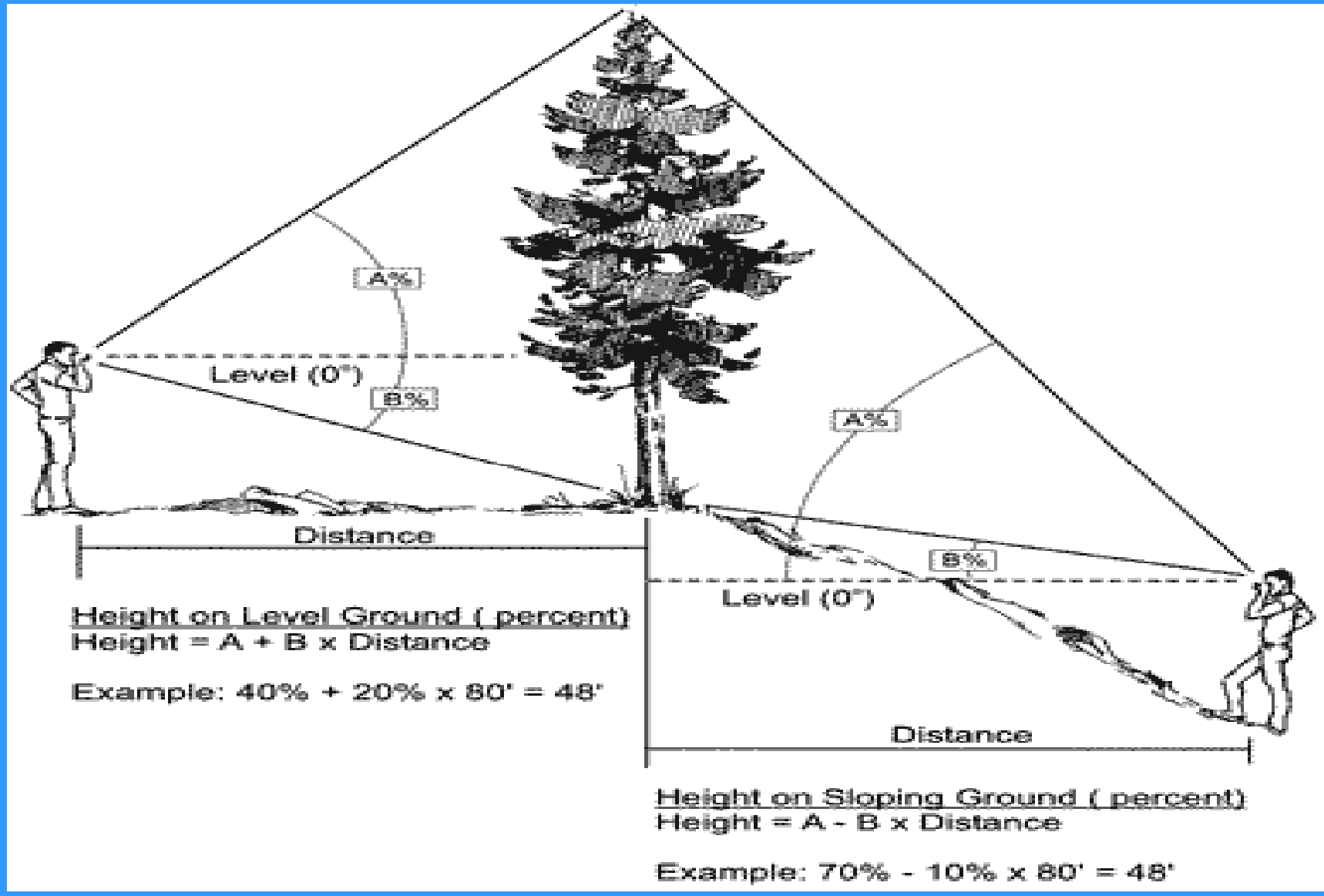
SLOPE CORRECTION TABLE

Slop e percent	Conversion factor	Slope percent	Conversion factor
5	0.999	58	0.865
10	0.995	60	0.857
15	0.989	62	0.850
20	0.981	64	0.842
22	0.977	66	0.835
24	0.972	68	0.827
26	0.968	70	0.819
28	0.963	72	0.812
30	0.958	74	0.804
32	0.952	76	0.796
34	0.947	78	0.788
36	0.941	80	0.781
38	0.935	82	0.773
40	0.928	84	0.766
42	0.922	86	0.758
44	0.915	88	0.751
46	0.908	90	0.743
48	0.902	92	0.736
50	0.894	94	0.729
52	0.887	96	0.721
54	0.880	98	0.714
56	0.872	100	0.707

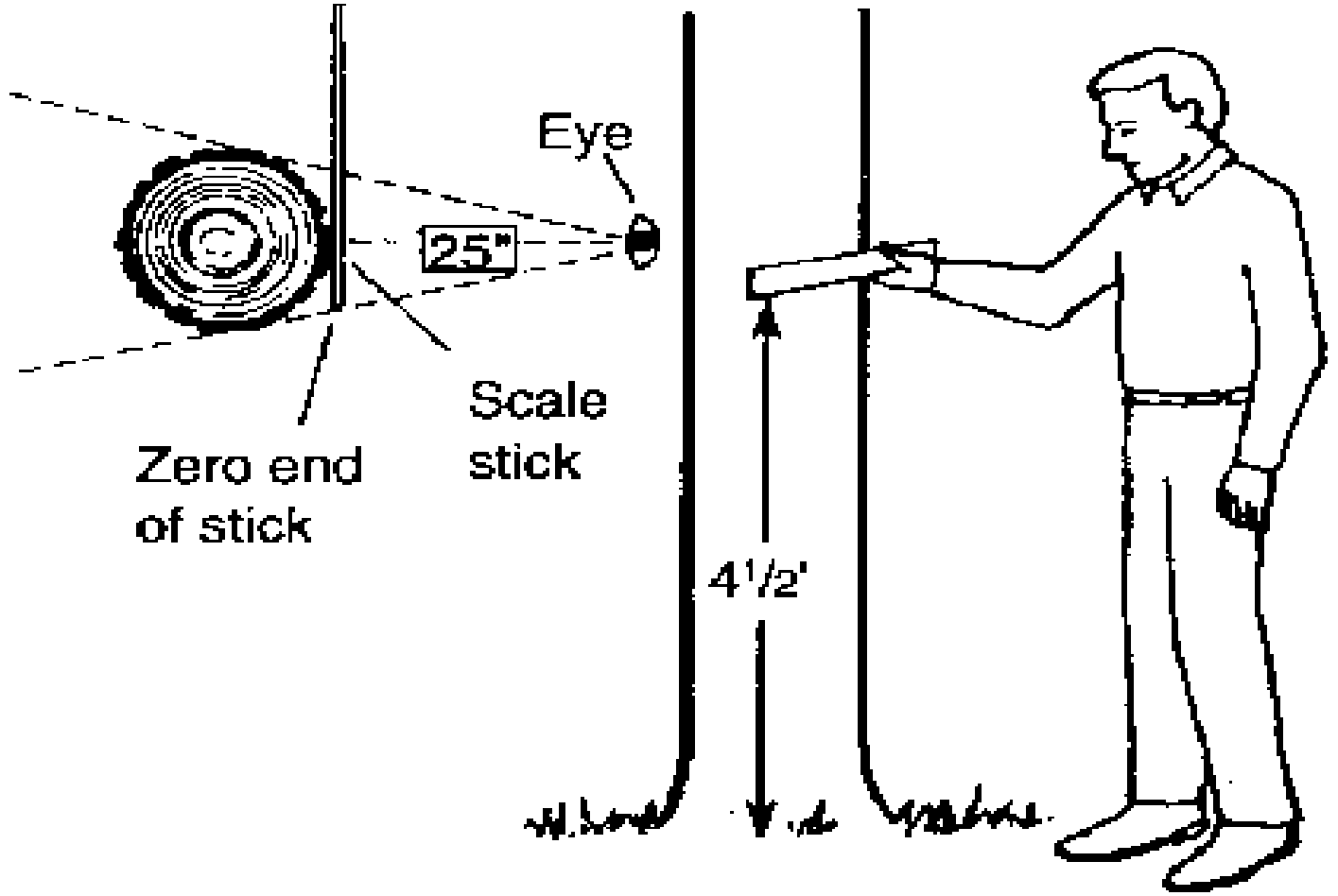
TREE HEIGHT



TREE HEIGHT

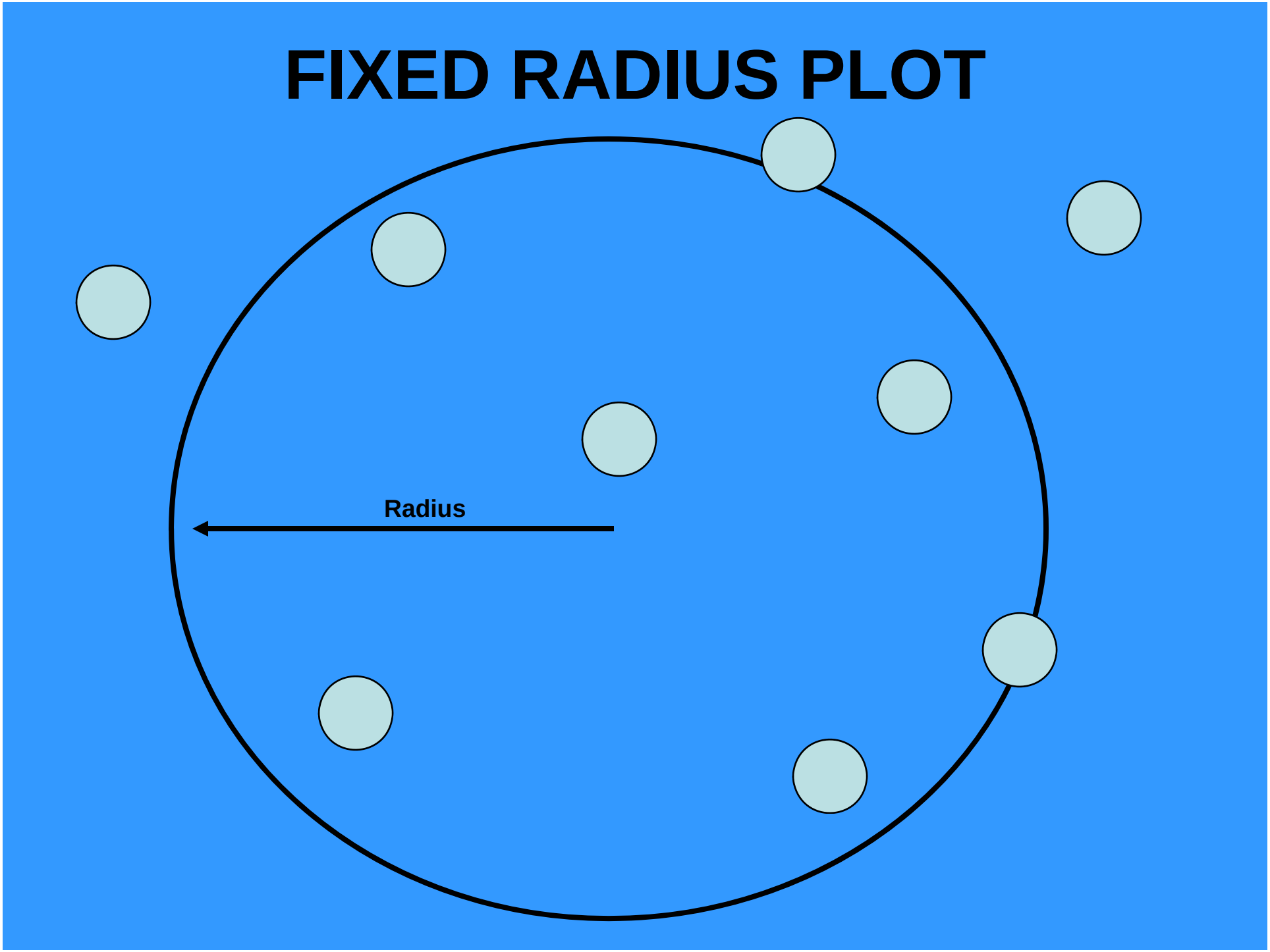

A%
Level (0°)
B%
Distance
Height on Level Ground (percent)
Height = A + B x Distance
Example: 40% + 20% x 80' = 48'
A%
B%
Level (0°)
Distance
Height on Sloping Ground (percent)
Height = A - B x Distance
Example: 70% - 10% x 80' = 48'

TREE DIAMETER

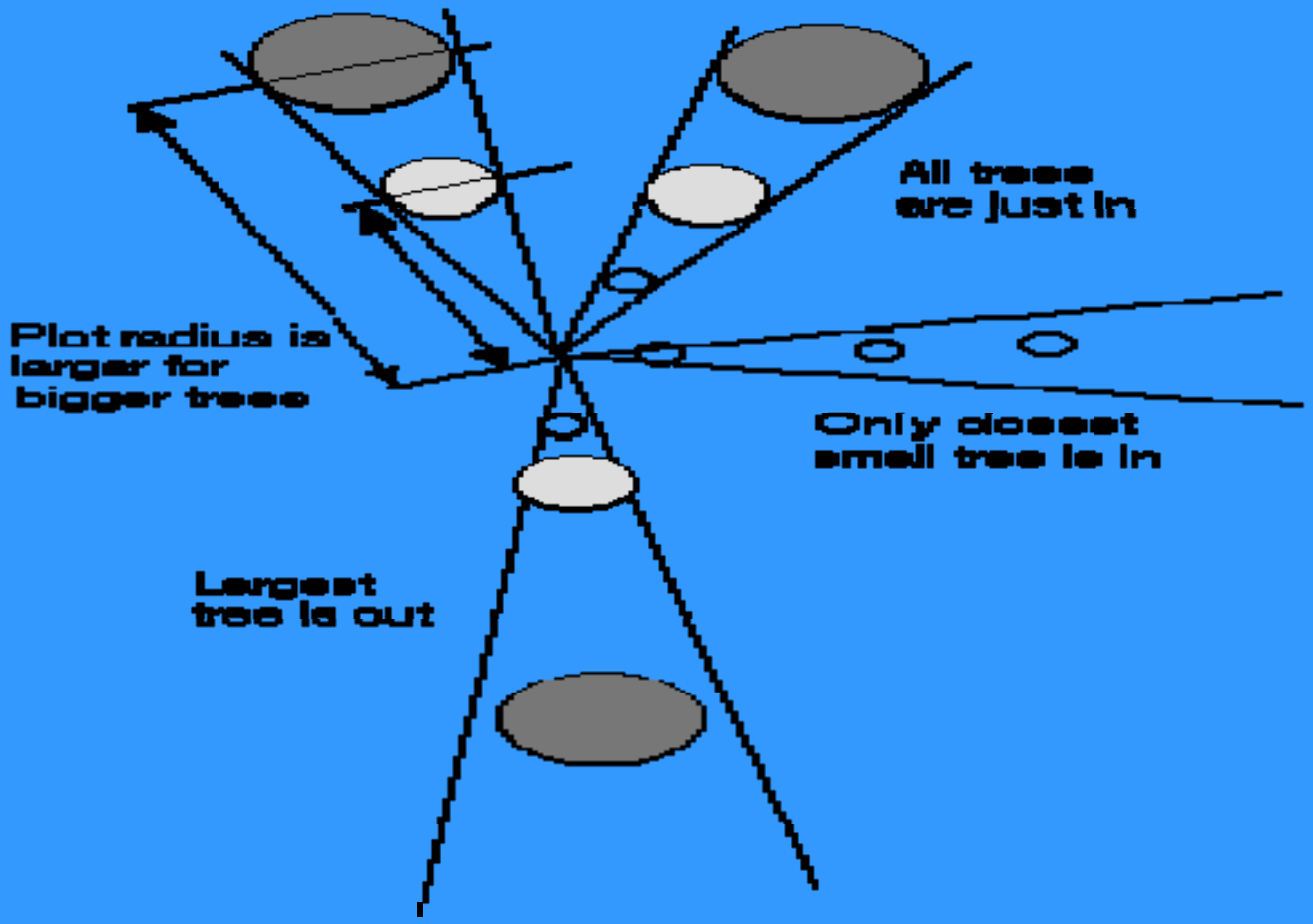


TREE DIAMETER

FIXED RADIUS PLOT



VARIABLE RADIUS PLOT

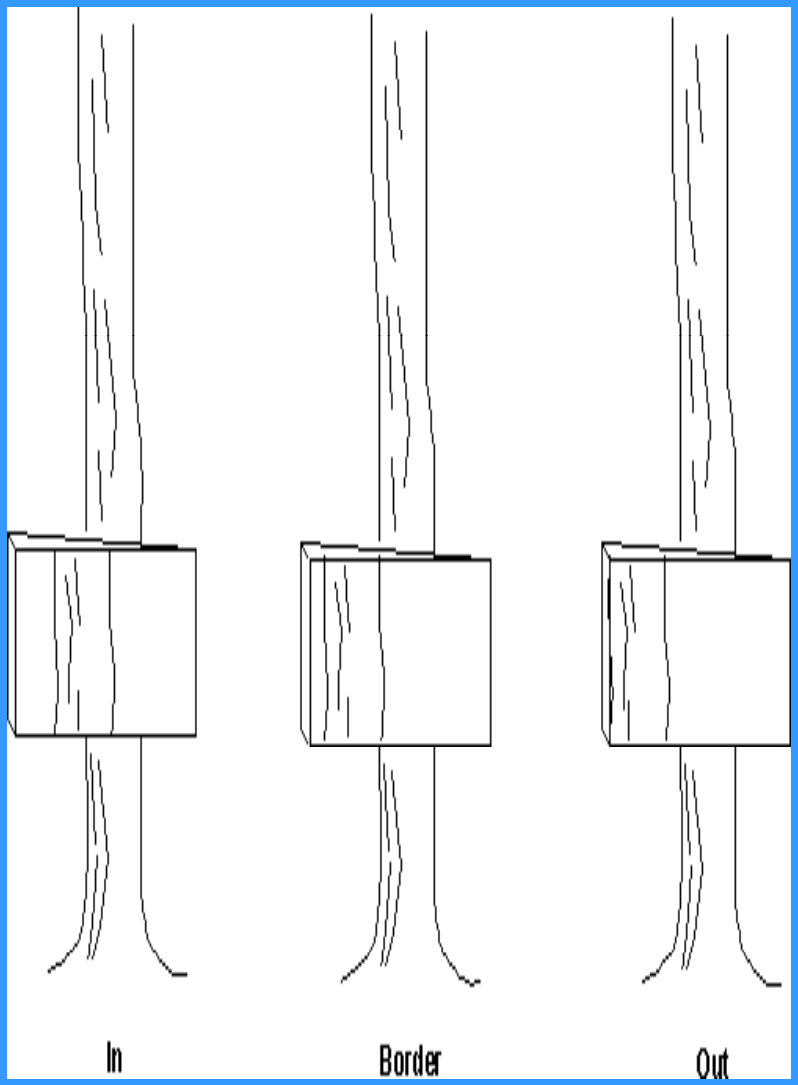


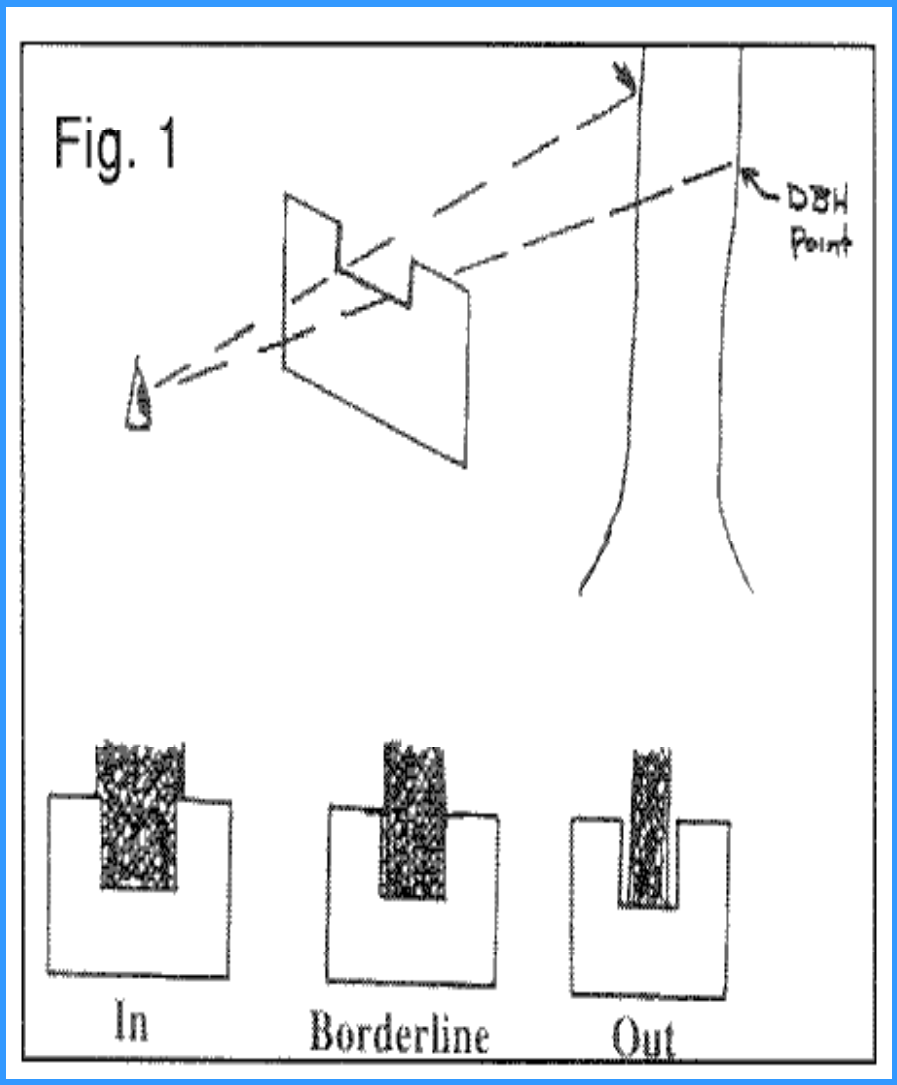
Plot Radius Factor = Square Root of 75.6218/BAF

Limiting Distance = Factor for BAF * Diameter

If tree is closer than Limiting Distance it is in plot

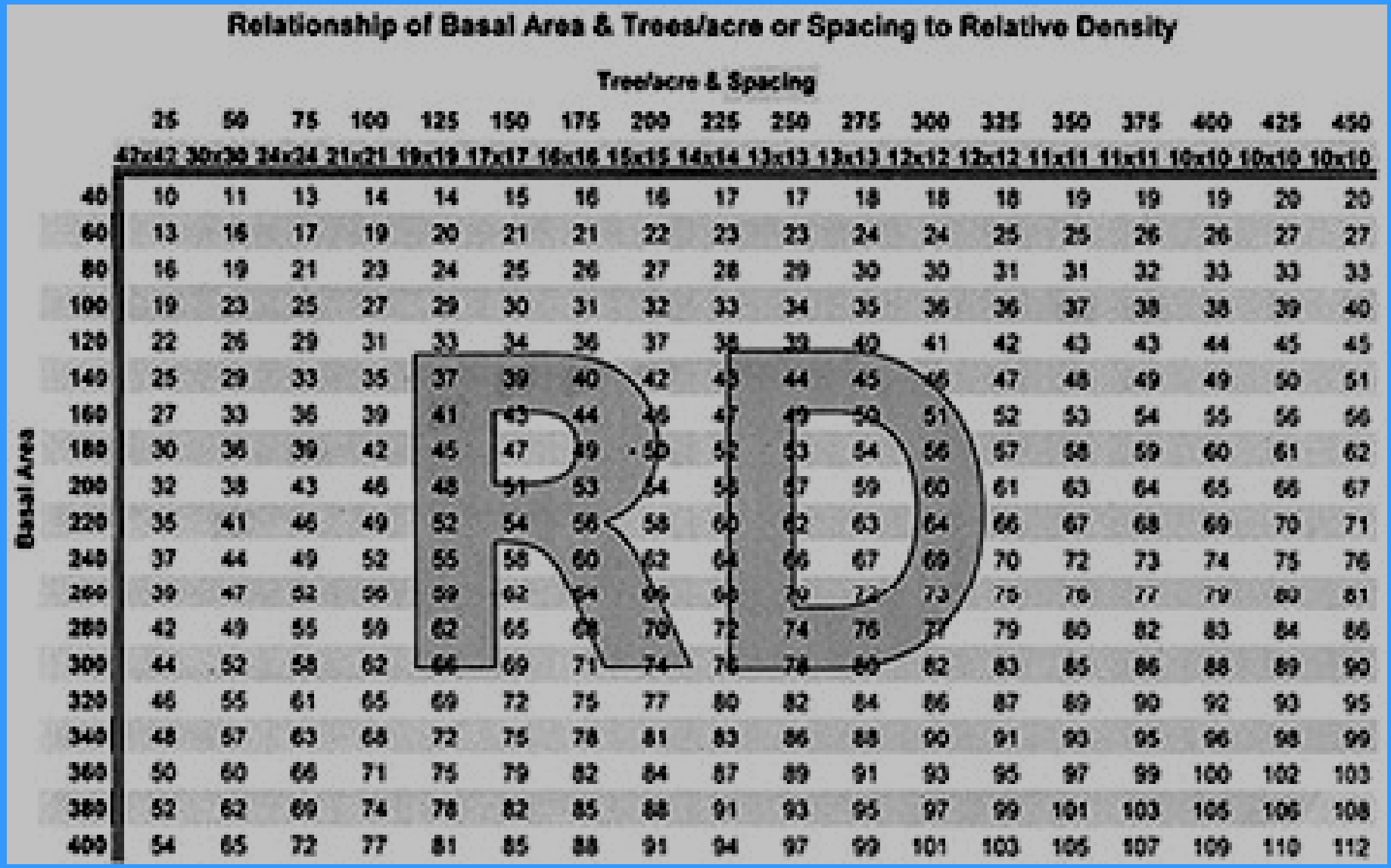
VARIABLE RADIUS PLOT





VARIABLE RADIUS PLOT

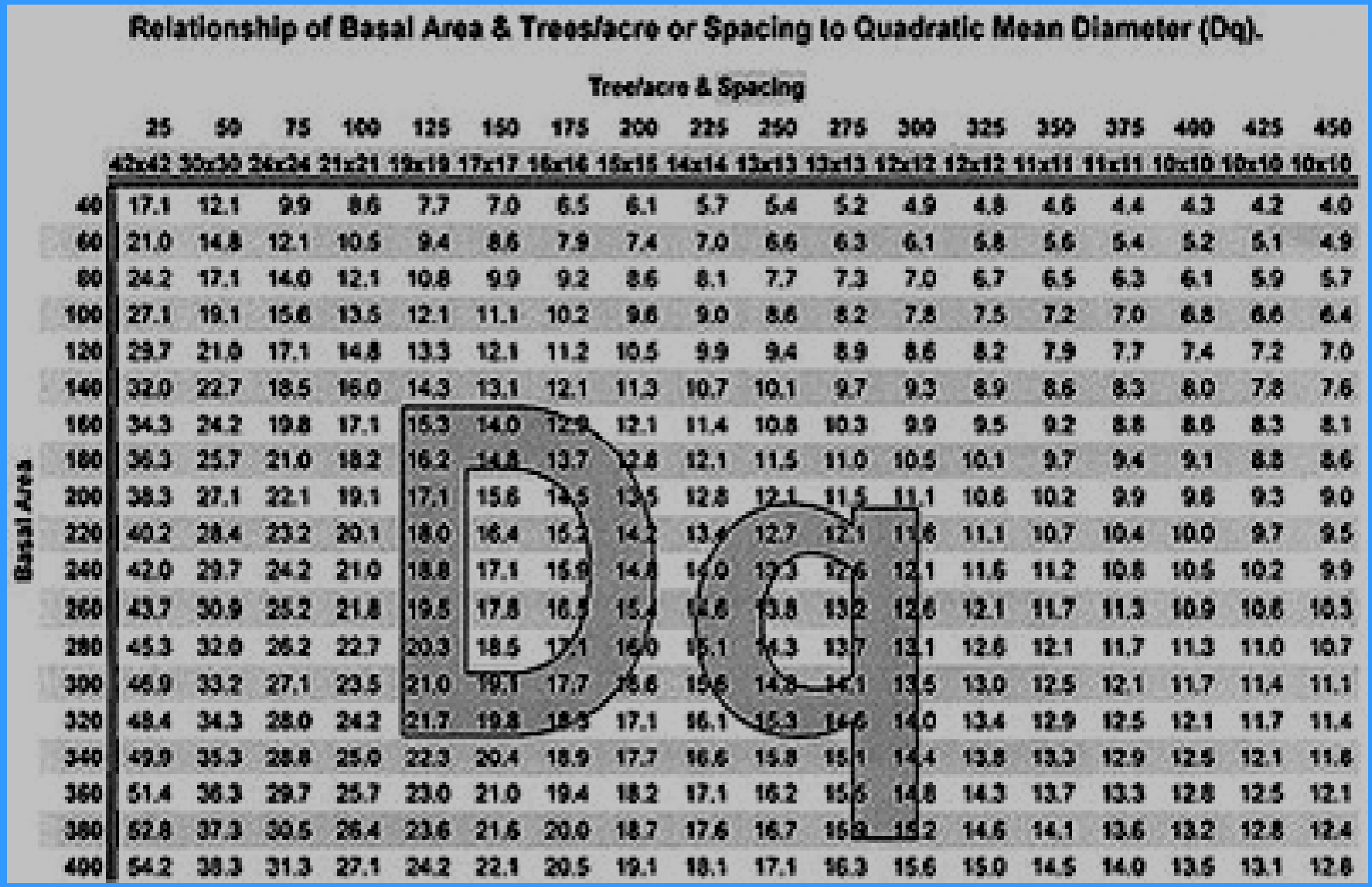
FIELD ESTIMATE OF RD



Relationship of Basal Area & Trees/acre or Spacing to Relative Density

Basal Area	Tree/acre & Spacing																	
	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450
	47x47	30x30	34x24	21x21	19x19	17x17	16x16	15x15	14x14	13x13	13x13	12x12	12x12	11x11	11x11	10x10	10x10	10x10
40	10	11	13	14	14	15	16	16	17	17	18	18	18	19	19	19	20	20
60	13	16	17	19	20	21	21	22	23	23	24	24	25	25	26	26	27	27
80	16	19	21	23	24	25	26	27	28	29	30	30	31	31	32	33	33	33
100	19	23	25	27	29	30	31	32	33	34	35	36	36	37	38	38	39	40
120	22	26	29	31	33	34	36	37	38	39	40	41	42	43	43	44	45	45
140	25	29	33	35	37	39	40	42	43	44	45	46	47	48	49	49	50	51
160	27	33	36	39	41	43	44	46	47	49	50	51	52	53	54	55	56	56
180	30	36	39	42	45	47	49	50	52	53	54	56	57	58	59	60	61	62
200	32	38	43	46	48	51	53	54	56	57	59	60	61	63	64	65	66	67
220	35	41	46	49	52	54	56	58	60	62	63	64	66	67	68	69	70	71
240	37	44	49	52	55	58	60	62	64	66	67	69	70	72	73	74	75	76
260	39	47	52	56	59	62	64	66	68	70	72	73	75	76	77	79	80	81
280	42	49	55	59	62	65	68	70	72	74	76	77	79	80	82	83	84	86
300	44	52	58	62	66	69	71	74	76	78	80	82	83	85	86	88	89	90
320	46	55	61	65	69	72	75	77	80	82	84	86	87	89	90	92	93	95
340	48	57	63	68	72	75	78	81	83	86	88	90	91	93	95	96	98	99
360	50	60	66	71	75	79	82	84	87	89	91	93	95	97	99	100	102	103
380	52	62	69	74	78	82	85	88	91	93	95	97	99	101	103	105	106	108
400	54	65	72	77	81	85	88	91	94	97	99	101	103	105	107	109	110	112

FIELD ESTIMATE OF QMD



Relationship of Basal Area & Trees/acre or Spacing to Quadratic Mean Diameter (Dq).

Basal Area	Tree/acre & Spacing																	
	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450
	42x42	30x30	24x24	21x21	19x19	17x17	16x16	15x15	14x14	13x13	13x13	12x12	12x12	11x11	11x11	10x10	10x10	10x10
40	17.1	12.1	9.9	8.6	7.7	7.0	6.5	6.1	5.7	5.4	5.2	4.9	4.8	4.6	4.4	4.3	4.2	4.0
60	21.0	14.8	12.1	10.5	9.4	8.6	7.9	7.4	7.0	6.6	6.3	6.1	5.8	5.6	5.4	5.2	5.1	4.9
80	24.2	17.1	14.0	12.1	10.8	9.9	9.2	8.6	8.1	7.7	7.3	7.0	6.7	6.5	6.3	6.1	5.9	5.7
100	27.1	19.1	15.6	13.5	12.1	11.1	10.2	9.6	9.0	8.6	8.2	7.8	7.5	7.2	7.0	6.8	6.6	6.4
120	29.7	21.0	17.1	14.8	13.3	12.1	11.2	10.5	9.9	9.4	8.9	8.6	8.2	7.9	7.7	7.4	7.2	7.0
140	32.0	22.7	18.5	16.0	14.3	13.1	12.1	11.3	10.7	10.1	9.7	9.3	8.9	8.6	8.3	8.0	7.8	7.6
160	34.3	24.2	19.8	17.1	15.3	14.0	12.9	12.1	11.4	10.8	10.3	9.9	9.5	9.2	8.8	8.6	8.3	8.1
180	36.3	25.7	21.0	18.2	16.2	14.8	13.7	12.8	12.1	11.5	11.0	10.5	10.1	9.7	9.4	9.1	8.8	8.6
200	38.3	27.1	22.1	19.1	17.1	15.6	14.5	13.5	12.8	12.1	11.5	11.1	10.6	10.2	9.9	9.6	9.3	9.0
220	40.2	28.4	23.2	20.1	18.0	16.4	15.2	14.2	13.4	12.7	12.1	11.6	11.1	10.7	10.4	10.0	9.7	9.5
240	42.0	29.7	24.2	21.0	18.8	17.1	15.9	14.8	14.0	13.3	12.6	12.1	11.6	11.2	10.8	10.5	10.2	9.9
260	43.7	30.9	25.2	21.8	19.5	17.8	16.5	15.4	14.6	13.8	13.2	12.6	12.1	11.7	11.3	10.9	10.6	10.3
280	45.3	32.0	26.2	22.7	20.3	18.5	17.1	16.0	15.1	14.3	13.7	13.1	12.6	12.1	11.7	11.3	11.0	10.7
300	46.9	33.2	27.1	23.5	21.0	19.1	17.7	16.6	15.6	14.8	14.1	13.5	13.0	12.5	12.1	11.7	11.4	11.1
320	48.4	34.3	28.0	24.2	21.7	19.8	18.3	17.1	16.1	15.3	14.6	14.0	13.4	12.9	12.5	12.1	11.7	11.4
340	49.9	35.3	28.8	25.0	22.3	20.4	18.9	17.7	16.6	15.8	15.1	14.4	13.8	13.3	12.9	12.5	12.1	11.8
360	51.4	36.3	29.7	25.7	23.0	21.0	19.4	18.2	17.1	16.2	15.5	14.8	14.3	13.7	13.3	12.8	12.5	12.1
380	52.8	37.3	30.5	26.4	23.6	21.6	20.0	18.7	17.6	16.7	15.9	15.2	14.6	14.1	13.6	13.2	12.8	12.4
400	54.2	38.3	31.3	27.1	24.2	22.1	20.5	19.1	18.1	17.1	16.3	15.6	15.0	14.5	14.0	13.5	13.1	12.8