Estimation of Standard Growth

- Four Methods:

1. Stand table projection
2. Total stand projection
3. Yield tables
4. Derived growth and yield functions.

Stand Table Projection

a) For Uneven Aged forest,

following data is needed:

- Diameter growth information
- Present stand table
- Local volume table
- Information to calculate ingrowth
- Estimates of mortality
- Diameter growth information- obtained from increment boring or (repeated measurement in permanent sample plots)

- 3 ways that repeated measurements can be used

1. Assume that all trees in each dia class are located at the class midpoint & all tree will grow at the avg. rate.

Table 16-2
Calculation of 10-Year Predicted Volume Growth Per Acre, Assuming That All Trees in Each Diameter Class Are Located at the Class Midpoint, and That All Trees Will Grow at the Average Rate

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Present dbh Class (inches)	10-Year dbh Increment (inches)	Future dbh (inches)	Future Volume per Tree (cubic feet)	Present Stand Table (number)	Present Volume per Tree (cubic feet)	Future Stock Table (cubic feet)	Present Stock Table (cubic feet)	Volume Production (cubic feet)
6	2.02	8.02		41.73				
8	1.88	9.88		28.73				
10	1.74	11.74	17.0	21.73	12.5	369.4	271.6	97.8
12	1.60	13.60	24.2	17.33	18.4	419.4	318.9	100.5
14	1.46	15.46	31.9	12.87	25.6	410.6	329.5	81.1
16	1.32	17.32	40.7	9.47	34.2	385.4	323.9	61.5
18	1.18	19.18	50.1	8.27	44.1	414.3	364.7	49.6
20	1.04	21.04	62.3	5.00	55.6	311.5	278.0	33.5
22	0.90	22.90	75.3	3.47	68.5	261.3	237.7	23.6
24	0.76	24.76	89.8	2.87	83.5	257.7	239.6	18.1
26					100.1			
Total				151.47		2829.6	2363.9	465.7

Cont..

- Column 5

  - obtained from inventory data of field

- Column 6

  - similar to C-4, use C-3 data

- C7

  C4 x C5

- C8

  C6 x C5

- C9

  C7-C8

C9 = Periodic gross growth & initial vol.

Cont..

2) Assume trees in each dia class are evenly distributed through the class, and each tree will grow at the average rate.

a) In this case first calculate the movement ratio M.

$$M = I / C$$

I= Periodic dia increment

C= dia class interval

Table 16-3

Calculation of 10-Year Predicted Volume Growth Per Acre, Assuming Trees in Each Diameter Class Are Evenly Distributed Through the Class, and Each Tree Will Grow at the Average Rate

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dbh Class (inches)	10-Year dbh Increment (inches)	Movement Ratio (*M*)	Present Stand Table (number)	Volume per Tree (cubic feet)	Future Stand Table (number)	Number of Trees Moving			Future Stock Table (cubic feet)	Present Stock Table (cubic feet)	Volume Production (cubic feet)
						0 Classes	1 Class	2 Classes			
6	2.02	1.01	41.73				41.31	0.42 = (.01 × 41.73)			
8	1.88	0.94	28.73		43.03	1.72	27.01	= (41.73 − .42)	378.1	271.6	106.5
10	1.74	0.87	21.73	12.5	30.25	2.82	18.91		411.8	318.9	92.9
12	1.60	0.80	17.33	18.4	22.38	3.47	13.86		443.6	329.5	114.1
14	1.46	0.73	12.87	25.6	17.33	3.47	9.40		431.6	323.9	107.7
16	1.32	0.66	9.47	34.2	12.62	3.22	6.25		425.1	364.7	60.4
18	1.18	0.59	8.27	44.1	9.64	3.39	4.88		404.8	278.0	126.8
20	1.04	0.52	5.00	55.6	7.28	2.40	2.60		308.9	237.7	71.2
22	0.90	0.45	3.47	68.5	4.51	1.91	1.56		278.9	239.6	39.3
24	0.76	0.38	2.87	83.5	3.34	1.78	1.09		109.1		109.1
26				100.1	1.09						
Total			151.47		151.47				3191.9	2363.9	828.0

Cont...

b) Using M predict future stand table

c) Using M get col. 7,8,9

d) Get col.6 from 7,8,9

e) Get $C_{10} – C_{11}$ using LVT or Col. 5

f) $C_{12} = C_{10} – C_{11}$ = gross periodic growth

Cont…

3) Recognize the actual position of trees in each diameter class & apply the diameter growth for individual trees in the class.

- so we can get future stand table.

- if periodic interval is not very high ingrowth may be estimated by including trees of lower dia classes in initial stand table

Mortality was not considered in the Example: How to account ??

- for middle aged stands mortality is less

- Mortality estimates should be done in permanent S.P. or

- by stand inspection in a cruise. Collect data dia class wise

Table 16-4
Determination of Tree Movement
Percentages from Raw Data for 8-Inch Diameter Class

Raw Data					Summary		
dbh Class (inches)	Present dbh (inches)	10-Year dbh Increment (inches)	Future dbh (inches)	Classes Move (number)	Classes Move (number)	Trees Moving (number)	Trees Moving (percent)
8	7.1	1.5	8.6	0	0	3	30
	7.3	1.6	8.9	0	1	5	50
	7.4	1.5	8.9	0	2	2	20
	7.5	1.8	9.3	1	Total	10	100
	7.9	2.5	10.4	1			
	8.1	1.6	9.7	1			
	8.3	1.8	10.1	1			
	8.5	2.6	11.1	2			
	8.7	1.7	10.4	1			
	8.9	2.2	11.1	2			

Short Comings:

- Vol. depends on dia, ht. form if dia & ht relationship changes over periodic interval results may not be very accurate.

  - this change is not much for uneven aged stands compared to even aged stands

  - diameter growth predictions are quite accurate but height and mortality accounting is crude.

  - therefore, don’t use the method for even aged forests and where dia-ht. relation changes very fast.