Tree Biomass; Growth & Yield

Problem Set 4 – Due Tu 15 Mar 2016

1. Compute (ie., estimate) the total above ground biomass and biomass of roots for the following set of trees. Use the process outlined in class, which starts with a volume equation, converts it to biomass of stem, then employs Jenkins' system to derive biomass of components. Trees are immature, growing in the coastal region.
   a) Western hemlock tree with DBH = 21.9 in., Total Height = 115.0 ft.
   b) Western red cedar tree w/ DBH = 18.2 in., Total Height = 123.0 ft.

2. Suppose a tree with DBH equal to 12.2 in. grows with a constant basal area increment of 0.10966 sq. ft every 4 years over the next 16 years.
   a) Compute the *diameter* increment for this tree for each 4-year periods.
   b) With a constant basal area increment, is the diameter increment constant, increasing, or decreasing?

3. The following excerpted data were collected from a complete stem analysis on a loblolly pine tree that was 50-ft tall at time of felling. The tree was bucked into 10-ft sections (except of course for the tip.

Section Ht. above ground (ft)	Average Diameter (in.)	Section Ht. above ground 8-yr previous (ft)	Avg. diameter 8 years previous (in.)
1	14.6	1	12.1
11	12.8	11	10.7
21	10.5	21	9.0
31	8.7	31	7.5
41	5.2	41	4.3
50	0.0	43	0.0

   a) Compute growth percent for height over the 8-yr period.
   b) Compute growth percent for DBH over the period (you will need to linearly interpolate from adjacent section heights).
   c) Calculate growth percent in volume (assuming a cylinder for the stump, paraboloid frusta for middle sections, and a cone for the tip).
   d) Comment on how the previous three growth percent figures compare – hypothesize why they may be different.

4. Consider a stand that is 65 years old yielding 52,300 BF per acre.
   a) What is the Mean Annual Increment (MAI)?
   b) The stand is measured 10 years later. It yields 55,700 BF per acre. What is Periodic Annual Increment (PAI) for the ten-year period?
   c) What is Growth Percent for the ten-year period?
   d) Do you think Culmination Point has been reached in this stand?

5. Use the Total Stand Projection method to predict per acre volume 10 years from now in a stand of Douglas-fir that now carries 200 sq. ft basal area / acre, 8280 cu.ft / acre, and has a dominant height of 110 ft. Site Index for this stand is 130 ft @ 50 yr breast height age (according to King). (HINT: You will need to consult a normal yield table for purposes of computing N%, i.e., percent normality.)