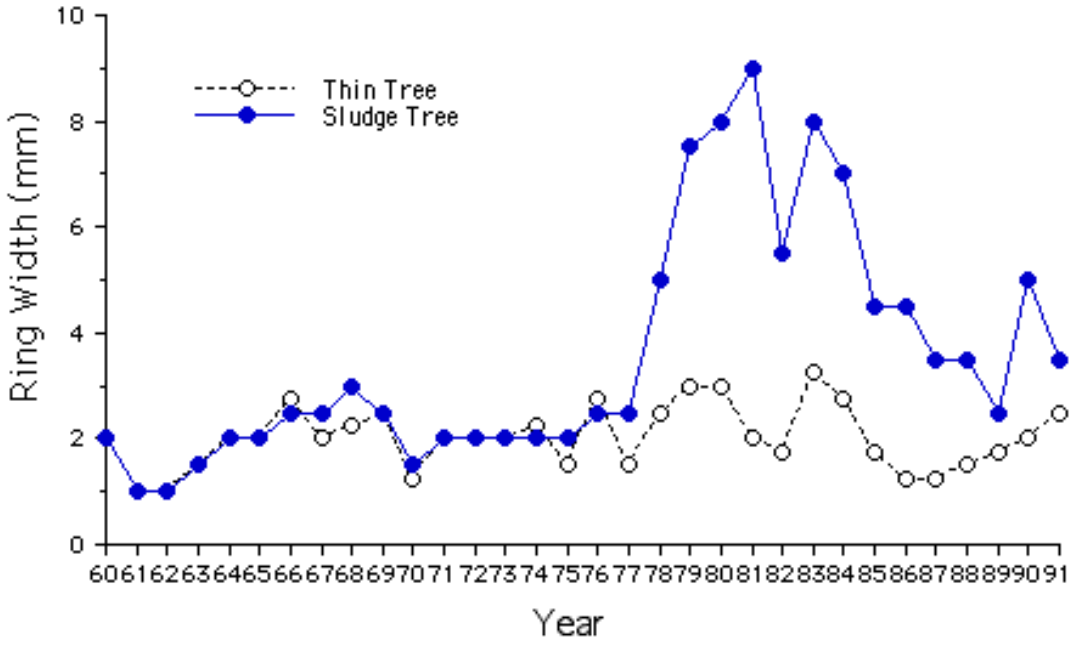
Study Questions for December 2001 ESC 221

1. From the St. Helens example, provide illustrations of how compensation, variation and feedback worked in the response of trees to ashfall.



2. Type II sequence for two 40 plus year old Douglas-fir trees harvested in 1991 from Pack Forest (by an earlier ESC 221 class). Both trees were thinned in the summer of 1977 (August) and then fertilized (PC term for sludged) in March 1978. Interpret this Type II sequence. Tell me something about the trees before treatment. How did they respond to treatment (why?)? What other tree information would you like to make you feel really comfortable about your answers?

3. Nitrogen is an interesting essential element or nutrient. It is mobile and it is typically present in low to very low concentrations in the soil.

    A. What is nitrogen used for in a plant or tree?
    B. What specialized morphological feature does the plant root have for nitrogen uptake? How might this "structure" work (hint: remember concentrations outside [soil] is very low and inside plant relatively high)?
    C. How might a plant conserve nitrogen? Spatially ?Temporally?
    D. Why might nitrogen availability decrease as a stand ages?
    E. How do plants respond to nitrogen deficiencies?

4. Leaves translocate more carbon to the stem than sylleptic branches and sylleptic branches more than proleptic in black cottonwood trees. And this pattern is especially noticeable after buds have set. Where does the carbon come from for translocation? Why does it all get translocated? Why the observed differences?

5. Select one of the following structure-function relationships and explain how structure influences function and the advantages and disadvantages of such structural-functional relationships (if there are no apparent advantages and disadvantages, discuss the tradeoffs in having versus not having such a relationship).
    A. Endodermis and water/nutrient uptake
    B. Sun-shade shoot structure
    C. Sun-shade foliage structure
    D. The large earlywood (springwood) vessels found in Oregon white oak (vs. tracheids or smaller vessels)
6. Are all structural-functional relationships optimal? If yes, how? If no, why not?
7. How are roots and shoots different? List as many differences as you can think of.
8. What evidence have you seen of compartmentalization?
9. If the advantage of having a stem is foliar display (i.e., competitive stature), what are some of the disadvantages? How might a tree compensate for these?
10. Short answers. What does the X do or what is X?
    A. Cuticle
    B. Stress
    C. Stomata
    D. Ray parenchyma
    E. Chlorophyll a, chlorophyll b
    F. Imposed dormancy
    G. Maintenance respiration
    H. Xylem, phloem
    I. Sylleptic branches
    J. Boundary layer resistance
    K. Guard cells
    L. Root cap
    M. Meristems
    N. Epicormic branches
    O. Lammas
    P. Fixed or free growth
    Q. Apical dominance
    R. Apical control
11. How might the quantity of foliage (or foliage function) be balanced with the quantity of roots (or root function)? Are there ways of expressing this relationship? Can quantity or function be partitioned spatially and/or temporally?
12. Tree development has been modeled as modular growth. What is a module? How are modules controlled? Give at least one process and one structural example.
13. How are the light and dark reactions of photosynthesis distributed within a leaf, within a canopy? How is nitrogen and chlorophyll connected to this?
14. How is leaf longevity and photosynthesis related? What are the tradeoffs between having a leaf for a very short time (2 months) or a very long time (20 years)?
15. Describe some of the characteristics of a leaf and a plant of species A when that leaf is grown in the sun or shade or that plant is grown in the sun or shade (contrast and compare structure and function).
16. What factors might be responsible for what we see in trees at or near treeline – detail at least one pathway for control?
17. Describe the path of water transport in a tree. Where are the control points? Where are possible places of either resistance or failure (which would then result in increased resistance)?