

FSTY 405 — Silviculture II

Final Exam, 14th December 2004

Name:

Student number:

- Ensure that your name and student number are correctly entered above.
- Answer in the spaces provided after each question, writing down clearly the intermediate steps. Use the reverse as scratch pad. Writing just the final numerical answer is *not* acceptable.
- Write clearly, and use ink, not pencil.
- Pages: 5. Questions: 5 out of 6, worth 5 marks each, total 25. Cross-out clearly the number of the question that you want excluded. Otherwise I will drop the one with the highest marks!
- Answer clearly and to the point. Nonsense is penalized.
- Info (you may or may not need this): $\ln xy = \ln x + \ln y$, $\ln x^y = y \ln x$, $y = \ln x \Leftrightarrow x = e^y$, $e^{x+y} = e^x e^y$. Circle area = πr^2 .

1. Which of the BC growth models would be the most appropriate in the following situations, and why?
 - (a) Projecting the development of an uneven-aged stand in the Southern Interior.

 - (b) Comparing planting patterns, e. g., square, triangular, or rectangular grids.

 - (c) Predicting growth of an aspen stand near Fort Nelson.

2. A stand has 700 stems per hectare, 22 m top height, and a (quadratic) mean dbh of 30 cm. We have a height growth function

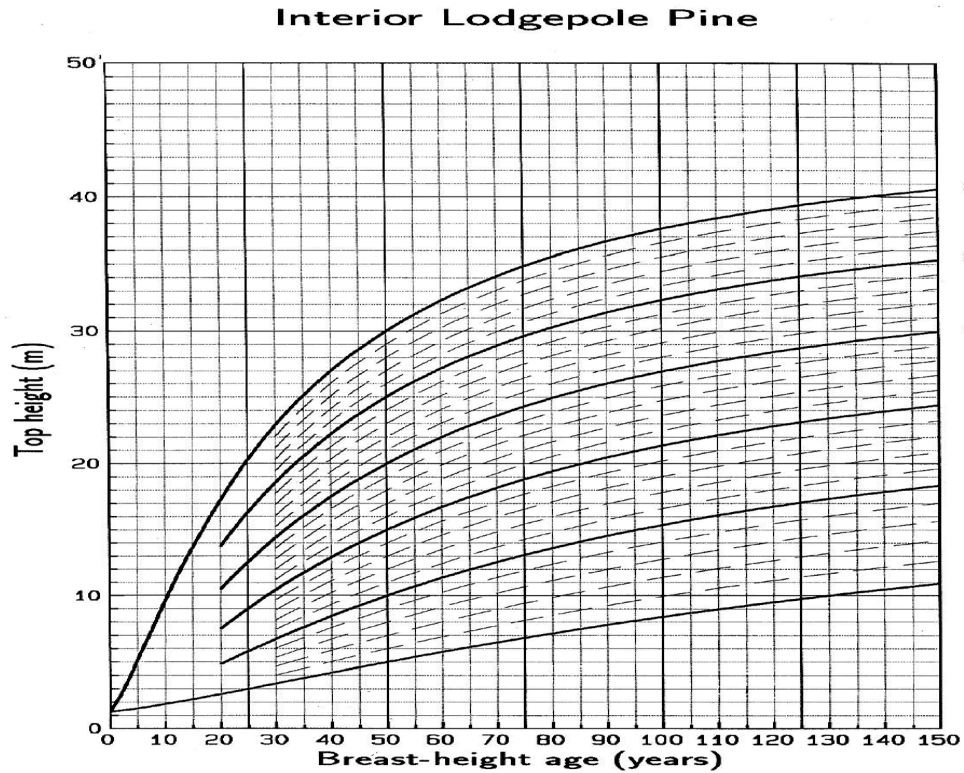
$$\ln H = 3.6 - 32/t ,$$

and a stand volume function:

$$\ln V = 0.9 \ln B + 1.1 \ln H - 0.9 ,$$

where H is top height in m, t is age in years, V is volume in m^3/ha , and B is basal area in m^2/ha . Calculate the mean annual increment.

3. With the following graph,



- (a) Label the continuous curves with the corresponding site index on the right edge of the graph. Index age is 50 years (breast-height age).
- (b) Find the age at which top height is 25 m in site 21. Mark the relevant point(s) on the graph.

4. We have the following model,

$$\Delta H = 0.10(32 - H)$$

$$\Delta N = -0.028N$$

$$\Delta B = 0.08B + (41 + 0.018N - 3.2B)/H$$

$$V = 0.3BH - 4.2$$

where H is top height (m), N is trees per hectare, B is basal area (m^2/ha), and V is volume (m^3/ha). Increments are for 5-year periods. A 30 year-old stand has $H = 14$, $N = 1000$, $B = 18$. At age 35, 50% of the trees and 40% of the basal area are removed in a thinning. Estimate the volume at age 40.

5. What is, explain:
 - (a) Tree competition index?

 - (b) Growth intercept?

(c) Pressler's law/hypothesis (pipe model theory)?

(d) Expansion factor?

6. Draw a System Dynamics (rate-level, Vensim) diagram for the model of question 4.