FSTY 405: Silviculture II

Syllabus – Fall 2001

Course information

Calendar description

FSTY 405-3 Silviculture II. Factors influencing forest yields, traditional prediction methods, growth and yield simulations. Exploration of stand dynamics, quantitative implications of management treatments and environmental limitations to tree and stand growth.

Prerequisites: NREM 203-3, MATH 152-4, 342-3 and FSTY 305-4.

Approach and objectives

From the description above, the course deals with "quantitative silviculture", essentially forest growth modelling, or *growth and yield* (G&Y). It aims at developing a quantitative understanding of stand growth and development in response to silvicultural treatments and environmental factors, including a basic knowledge of G&Y prediction models and methods.

The approach involves an interweaving of several parallel themes:

- Tree physiological and ecological principles.
- Systems theory, dynamical systems and applied mathematics.
- Computer experimentation with simplified systems.
- Available G&Y models and methods.
- Practical issues of needs, application, and data collection.

Most students will become growth model users rather than developers. Therefore, we focus more in understanding the basis and limitations of the various techniques than in specialized methodologies for model building and estimation. Considering also the rapid advances in this field, we emphasize foundations and concepts over the mechanics of running current computer implementations.

Experience shows that it is quicker and more productive in the long run to introduce the appropriate mathematical tools as needed, than trying to circumvent them through obscure elementary arguments. Defining and explaining the mathematics when required means that, in principle, there would be few prerequisites, although obviously it is easier to recall previously acquired knowledge. As a byproduct, it is expected that the students will develop skills relevant to the application of mathematical modelling concepts and techniques to real-life problems and new situations.

Times and Locations

Lectures: Tuesday and Thursday, 13:30 to 14:20, room LIB 5-136.

Section C1, CRN 65168 lab: Thursday, 14:30 to 17:20, room LIB 5-116.

Section C2, CRN 65169 lab: Friday, 11:30 to 14:20, room LIB 5-116.

Section C3, CRN 65170 lab: Thursday, 10:30 to 13:20, room LIB 5-116.

Lectures start on 4th September, labs 13–14 September.

Instructors, communications

Instructor

Oscar García, room ADM 3012, phone 960-5004.

Office hours: Monday, Wednesday 14:00 to 17:00, or by appointment. Do NOT expect replies to email.

Guest lecturers TBA.

Teaching assistant

Doug Thompson, room 3062, phone 960-6659, `thompsor@unbc.ca`

Office hours: Tuesday, Thursday 10:30 to 11:30.

Web site

`http://web.unbc.ca/~garcia/FSTY405/` will be used for assignments, notes, announcements, etc. Students are expected to check the site at least once a week.

`http://webct.unbc.ca:443/` might be used to post grades or for other information needing controlled access. Select `myWEBCT`, and log-in using your student ID and same password as on your email account.

Readings and materials

Textbook (required reading)

VANCLAY, J. K. "Modelling Forest Growth and Yield — Applications to Mixed Tropical Forests", CAB International, 1994. Somewhat expensive, but currently there are no other good alternatives. Not at all restricted to tropical forests, despite its title; covers well the growth modelling literature, although with more emphasis on mixed species and/or uneven-aged stands than usual. Three copies on reserve in the library.

Supplementary reading

The following two texts cover growth & yield modelling, along somewhat more traditional lines (some chapter copies in the library):

CLUTTER, J. L., FORTSON, J. C., PIENAAR, L. V., BRISTER, G. H. and BAILEY, R. L. "Timber Management: A Quantitative Approach", Wiley, New York, 1983. Chapters 2, 3 and 4 (required reading).

DAVIS, L. S. and JOHNSON, K. N. "Forest Management", 3rd ed., McGraw-Hill, 1987. Chapters 3, 4 and 5.

SPURR, S. H. "Forest Inventory", Ronald, 1952. Even older, but still worth reading.

OLIVER, C. D. and LARSON, B. C. "Forest stand dynamics", Update Edition, Wiley, 1996. Not growth modelling, but good treatment of fundamental ideas and principles of tree and stand development.

ASSMANN, E. "The principles of forest yield study", Pergamon Press, 1970. A classic, with much historical background and review of Central European work, in English. Unfortunately out of print, and not in the UNBC library.

FRANC, A., GOURLET-FLEURY, S. and PICARD, N. "Une Introduction à la Modélisation des Forêts Hétérogènes", ENGREF, 2000. An advanced monograph, just appeared (in French).

Various articles and reports, TBA.

Software

The following software, all available free, may be used in the labs and/or for assignments:

Gnuplot. A flexible and easy to use plotting program. `http://www.gnuplot.org`

APLSE. Free interpreter for the APL computer language. `ftp://watserv1.uwaterloo.ca/languages/apl/apl-plus/index.html` (also get *plusdemo* for a tutorial and documentation)

J is a newer dialect of APL. More powerful and better supported (in non-commercial versions), but with a steeper learning curve. Free: `http://www.jsoftware.com`

Vensim. System Dynamics simulation package, free version available. `http://www.vensim.com/freedownload.html`

AME/Simile. Another one, only discrete time but with multiple-instances feature. `http://www.ierm.ed.ac.uk/simile/`. See online tutorials.

BC MOF growth and yield packages VDYP, SiteTools, Tipsy, MGM, Prognosis BC, and tutorial "Introduction to Growth & Yield CBT": `http://www.for.gov.bc.ca/research/software/download.htm`

Students might find useful a symbolic algebra package, not just for this course. Derive (http://www.derive.com) is relatively easy to use and moderately priced (a version is built-in in the TI-89 and TI-92 calculators). Other alternatives have a steeper learning curve: Maple (http://www.maplesoft.com, network licenses at UNBC), its free look-alike muPad (http://www.sciface.com), or Mathematica (http://www.wolfram.com).

URLs

The MOF growth and yield websites contain much useful material and pointers: http://www.for.gov.bc.ca/research/gymodels/, http://www.for.gov.bc.ca/resinv/g\&y/. Students should be thoroughly familiar with their contents.

AME modelling tutorials: http://helios.bto.ed.ac.uk/ierm/ame/tutorial/main.htm

John T. Finn's Systems Ecology Notes: http://bandersnatch.fnr.umass.edu/pub/mod577/sysnotes.html

Ecological modelling server: http://dino.wiz.uni-kassel.de/ecobas.html

IUFRO: http://iufro.boku.ac.at/iufro/iufronet/d4list.htm

Systems links: http://www.uni-klu.ac.at/users/gossimit/links/bookmksd.htm, http://pespmc1.vub.ac.be/CYBSYSLI.html

O. García's downloadable articles (see reference [8] for a suggested reading sequence on growth modelling): http://web.unbc.ca/~garcia/publ/publs.htm

UNBC Growth & Yield Chair website (TBA).

Grading, etc.

Exams:
Midterm - 23rd October
Final - 6th December.

Lab exercises, quizzes:	15%
Assignments/projects:	20%
Midterm:	30%
Final (cumulative):	35%

Attendance and class participation may be taken into account for borderline decisions.

Questions about grading should be brought to the attention of the instructor or TA in writing within one week. After that time there will be no reconsideration.

Academic honesty: Refer to the Academic Offenses section of the UNBC Undergraduate Calendar.

Tentative course outline

(Required readings from the textbook in parenthesis)

- Introduction (p. 1–5)
- Overview (p. 5–13)
- Site quality (p. 134–155)
- Yield tables/functions (p. 14–18)
- Distance-dependent models (p. 58–68)
- Distance-independent and size class models (p. 68–78, 156–191, 34–56)
- Whole stand models (p. 18–33)
- Regeneration and recruitment (p. 192-203)
- Data, estimation, "validation" (p. 79–102, 204–241)
- Review and discussion (p. 223–251)