# GRANDE PRAIRIE REGIONAL COLLEGE

## DEPARTMENT OF SCIENCE AND TECHNOLOGY



### Bachelor of Applied Forest Resource Management

**SILVICULTURE I: FO3130**

**Pre-requisite:** Forest Ecology (FO2020)

**Calender Description:**
Harvesting systems for reforestation; nursery practices; forest regeneration principles and techniques; stand tending including spacing, release, thinning, fertilization, pruning and drainage; silvicultural surveys; tree improvement – theory and practice.

**Instructor:** Albert Sproule
Office: E310/C203
Phone: 539-2061
Email: albertsproule@yahoo.ca

| | | | |
|---|---|---|---|
| Lectures: | Monday, Wednesday | 10:00 - 11:20 | C316 |
| Lab: | Tuesday | 14:30 - 17.30 | B305 |

**Course Description:**
Silviculture is defined as the establishment, development, care and reproduction of stands of timber. Since trees do grow and reproduce naturally, there is the implicit suggestion that the application of silvicultural techniques by foresters will improve on nature. In other words, by the application of silvicultural techniques we can make trees grow better and more quickly than they would in natural, unmanaged stands.
The two logical divisions of silviculture are:

1. The scientific basis of silviculture, i.e. forest ecology, which we studied in FO2020.
2. The practice of silviculture, i.e. the application of the principles of forest ecology. This is the focus of the present course.

While the decisions and actions of the silviculture forester can, to some extent, affect the growth of a stand at any time during its life, there are occasions when he/she is particularly able to influence its future development. These occasions are sometimes described as "windows of opportunity". In our course we will identify these windows of opportunity and the various ways in which the silviculture forester can influence stand development at these times. In brief, the "windows of opportunity" and the major variables we will consider at each, are:

**(i) Harvesting**

- importance of the pre-harvest assessment in site classification
- harvesting techniques to influence regeneration
- management of pest problems through choice of harvesting method

**(ii) Regeneration**

- regeneration method, artificial or natural
- methods of site preparation
- species selection
- stock type
-

**(iii) Stand tending**

- weeding and cleaning
- release
- thinning
- pruning
- fertilizing

In each situation we will consider the silvicultural options available and their biological, economic and ecosystematic consequences.
Other concepts that we will refer to during the course include:

(a) Silvicultural systems, i.e., the choice, prior to harvest, of a program of silvicultural treatments (the silviculture prescription) which will extend throughout the life of the succeeding stand.
(b) Enhanced Forest Management (EFM), formerly known (and referred to in some texts) as Intensive Forest Management (IFM).

This is a logical and fairly traditional way of looking at silviculture. However, we need to keep in mind that todays silviculture forester is not only concerned with growing trees for fibre, but management plans must often take into account the many other values of the forest. These other values include such things as hydrology, aesthetics, recreational and spiritual values, and maintenance of the forest as a habitat for wildlife, fish and soil microorganisms. In a very real sense, the silviculture forester is the person who has to implement the plans to maintain some, or all, of these different forest values.
We will consider the silviculture forester's job from this aspect and we will see that it need not make his/her job that much more difficult, since the principles of silviculture themselves do not change. It is only their application which, depending on the objective, may be varied.

## TEXTS AND REFERENCES

### RECOMMENDED FOR PURCHASE

Smith, D.M., Larson, B.C., Kelty, M.J. and P.M.S. Ashton. (1997). The Practice of Silviculture - Applied Forest Ecology. John Wiley & Sons, Inc. Toronto. 537 pp.

### TEXTS AVAILABLE IN THE LIBRARY

Compendium of Canadian Forestry Statistics. (1996). Canadian Council of Forest Ministers.
Field Guide to Ecosites of Alberta. (Series of four publications).
Forest Site Interpretation and Silvicultural Guideline for Alberta. (1996). Alberta Environmental Protection.
Matthews, J.D. (1989). Silvicultural Systems. Oxford University Press, Oxford. 284 pp.
Lavender, D. (1994). Regenerating British Columbia's Forests.UBC Press, Vancouver. 372 pp.

## SCIENTIFIC JOURNALS AND PERIODICALS AVAILABLE IN THE LIBRARY

Canadian Journal of Forest Research
Forestry Chronicle
Northern Journal of Applied Forestry
Silviculture

## EXAMINATIONS AND MARK ALLOCATION

| | |
|---|---|
| Mid-term examination | 30% |
| Lab XII | 15% |
| End-of-term lab report | 15% |
| Final examination | 40% |

# LECTURE SCHEDULE

**Silvicultural systems** — **6 lectures**
- pre harvest surveys
- harvesting systems

**Disposal of logging slash** — **1 lecture**

**Seedling production** — **6 lectures**
- cone and seed collection
- seed zones/breeding regions
- nursery operations
  - production of planting stock

**Reforestation** — **2 lectures**
- natural vs atificial regeneration

**Site prep** — **6 lectures**
- no treatment
- chemical treatment
- prescribed fire
- scalping
- elevated microsites
- mixing
- grazing

**Site prep surveys** — **1 lecture**

**Planting and seeding** — **3 lectures**
- direct seeding
- seedling stock types
- survival surveys

**Stand tending** — **8 lectures**
- weeding
- cleaning
- spacing (silvicultural thinning)
- release
- drainage
- thinning
  - silvicultural (pre-commercial)
  - commercial
- fertilizing
- pruning

**Regeneration surveys** — **2 lectures**

# LAB SCHEDULE (Fall, 2002)

**Lab I** — **Field lab**

**Pre-harvest assessment**

- Conduct pre-harvest survey
- Development of silviculture prescription
- Management Options Survey (MOS)
  - ► outline of student term-project

**Lab II** — **Indoor lab**

**Nursery procedures**

- Extraction of seed from pine cones
- De-winging and separating empty seeds from filled
- Stratification – used in some species
- Germination tests
  - ► germination capacity and germinative energy
  - ► seeding into styrofoam blocks

**Lab III** — **Field lab**

**Site prep**

- Addressing the constraints
- Maximising the positives
- Required number of planting spots

**Lab IV** — **Field lab**

**Surveys in regenerating blocks**

- Planting checks
- Survival surveys
- Regen surveys
  - ► establishment survey
  - ► free-to-grow (performance) survey

**Lab V** — **Field lab**

**Stand tending in regenerating blocks**

- Mechanics of doing it
  - ► thinning
  - ► cleaning
  - ► spacing
  - ► release from over-storey

**Lab VI** — **Field lab**

**Stand tending in older stands (stand density management)**

- Mechanics of doing it
  - ► basal area (or number of stems) to remove or retain
  - ► identifying trees to remove or retain
  - ► visit to a previously-thinned stand
  - ► collect data, height, DBH, increment cores from a previously-thinned stand and from an unthinned part of the same stand.

**Lab VII** — **Indoor lab**

**Analysis of data collected in lab VI**

- Statistical comparison of growth parameters in thinned versus unthinned stand
  - ► height
  - ► diameter
  - ► volume per hectare
  - ► comparison of annual ring growth since stand tending

**Lab VIII** **Indoor lab** **Genetic improvement**

- Logistics involved in setting up a program
  - choosing the species
  - identifying the breeding region
  - how big should the seed orchard be?
  - design of the progeny test
  - establishing the seed orchard

**Lab IX** **Field lab** **Selecting superior trees**

- Identifying the candidate stands
- Selecting the tree
  - recording growth parameters on the "superior tree selection form"
  - superior tree and comparison trees

**Lab X** **Indoor lab** **Assessing the progeny test**

- First measurement of test material grown in the greenhouse
  - ranking the families
  - first roguing of the seed orchard
  - is there a genotype/environment (GE) interaction?

**Lab XI** **Field lab** **Visit to Huallen Seed Orchard complex**

- Led by Weyerhaueser genetic specialist, John Edwards

**Lab XII** **Indoor lab:** **Student presentation of term papers (see lab I)**

**Lab XIII** **Indoor lab** **Silviculture Records Management Systems**

- Presentations on
  - ARIS
  - GENUS

**Note:** During field labs students are expected to observe the particular forestry operation and also to understand the biological principles underlying the particular methodology.
It is essential to keep good, up-to-date, notes of all field labs. Lab reports/notes will be graded at the end of term.

**Note:** Depending on the availability of particular field operations, field trips may be re-sequenced, or different trips may be combined into one full-day lab.