Grande Prairie Regional College
Department of Science and Technology

FOREST SOILS & HODROLOGY FO 2130
(Winter 1998)

Instructor:	C. Shang, Office C410; Tel: 539-2011
Prerequisite:	Introduction to Soil Science and Geomorphology (FO 1220)
Transfer credits:	N/A
Lecture:	Monday, Wednesday & Friday 12:00 P.M. - 12:50 P.M., Room B307
Laboratory:	Friday, 15:00 - 17:50 P..M.
Textbooks:	Pritchett, W.L. and R. F. Fisher. 1996. Properties and Management of Forest Soils. 1986. 2nd ed. John Wiley & Sons, New York. Hewlett, J.D. 1982. Principles of Forest Hydrology. The University of Georgia Press, Athens, GA
Lab manual:	GPRC. 1998. F2130 Lab Manual.

COURSE OUTLINE

PART I. Formation of Forest Soils and Ecological Classification

1. Forest soil formation
    - 1.1 Forest floor
    - 1.1 Podzolization
    - 1.2 Forest soils in Alberta

2. Ecological classification and land capability
    - 2.1 Land inventory
    - 2.2 Capability classification
    - 2.3 Site description and evaluation

PART II. FOREST HYDROLOGY

3. Engineering properties of forest soils

4. Introduction to hydrology
    - 4.1 Definitions
    - 4.2 Water and energy balance
    - 4.3 Drainage basin morphology

5. Water budget
    - 5.1 Atmospheric water and precipitation
    - 5.2 Subsurface water
    - 5.3 Evaporation and evapotranspiration
    - 5.4 Surface water and water yield

PART III. Chemical and Biological Processes

6. Chemical processes
    - 6.1 Acidity and acidification in forest soils
    - 6.2 Diffuse-double-layer (DDL) theory and cation retention
    - 6.3 Anion sorption and phosphate fixation

7. Ecology of organisms in forest soils
    - 8.1 Transformation of organic matter in forest floor
    - 8.2 Microbial-plant interactions

PART IV. Tree Nutrition and Soil Fertility

8. Tree nutrition and nutrient cycling
    - 9.1 Root systems
    - 9.2 Movement of nutrients to plant roots

9.3 Nutrient uptake by trees
9.4 Geochemical nutrient cycling
9.5 Biological nutrient cycling

10. Fertilization
    10.1 Forest nutrition assessment
    10.2 Principles of fertilization
    10.3 Fertilizers and fertilizer application
    10.4 Effects of fertilization
    10.5 Use of wastewater and sludge as fertilizers
    10.6 Economics analyses

PART V. Forest Soil Management

12. Soils and Silviculture
    12.1 Harvesting and nutrient cycling
    12.2 Effects of land clearing and site preparation
    12.3 Soils and species selection
    12.4 Nutrition management (including symbiotic N-fixation)

13. Management of nursery soils
    13.1 Site selection
    13.2 Soil management for nursery
    13.3 Christmas trees and seed orchards

14. Fire-affected soils and management
    13.1 Effects of fire on soil properties
    13.2 Effects of fire on water quality
    13.3 Management implications

15. Management of problem soils
    15.1 Dry sands, wetland and permafrost
    15.2 Low fertility soils
    15.3 Soil erosion and control (including harvesting effect)
    15.4 Land reclamation (mine, oilfield and other industry uses)

16. Environmental problems in forest ecosystems
    16.1 Air pollution and acid deposition
    16.2 Effects of fertilizers
    16.3 Effects of pesticides
    16.4 Harvesting and water quality

COURSE EVALUATION

	Number	% of total
Assignments	3	5
Soil report	1	10
Lab and field exercises	6	20
Presentation	1	5
Mid term exam	1	20
Final exam	1	40

REFERENCES

1. Soil fertility and fertilizers. 1993. 5th edition. S.L. Tisdale, W.L. Nelson, J.D. Beaton and J. Havlin. Macmillan, NY.

2. Soil sampling and methods of analysis. 1993. Carter, M.R. (ed). Canadian Society of Soil Science. Lewis Publishers.

3. Method of soil analysis. Part 2—microbiological and biochemical properties. 1994. R.W. Weaver, S. Angle, P. Bottomley, D. Bezdicek, S. Smith, A. Tabatabai, and A. Wollum, edit. Comm. SSSA book series no. 5. Soil Science Society of America, Madison, WI.

4. Method of soil analysis. Part 3—chemical properties. 1994. D.L. Sparks, A.L. Page, P.A. Helmke, R.H. Loeppert, P.N. Soltanpour, M.A. Tabatabai, C.T. Johnson, and M.E. Sumner, edit. Comm. SSSA book series no. 5. Soil Science Society of America, Madison, WI.

5. Forest site interpretation and silviculatural prescription guide for Alberta. 1996. Version 2.0. Environment Training Centre, Alberta Environment Protection.

6. Field guide to ecosites of northern Alberta. 1996. J.B. Beckingham and J.H. Archibald. Canadian Forest Service, Northwest Region, Northern Forestry Centre.

LAB EXERCISE & RESEARCH PROJECT

Week	Date	Exercise
1	Jan 9	The soils in the training forest area (report)/writing CEC lab
2	Jan 16	Determination of soil available N
3	Jan 23	Determination of soil available P
4	Jan 30	Determination of soil available K
5	Feb 6	Soil consistency and penetrability
6	Feb 13	Precipitation measurement
7	Feb 20	Saturated flow of water through porous medium
8	Feb 27	**Winter break**
9	March 6	Fertilizer calculation
10	March 13	Presentation on soil properties
11	March 20	Presentation on forest soils
12	March 27	Field trip on forest floor
13	April 3	Field trip on site evaluation
14	April 10	**Good Friday**