Grande Prairie Regional College

SEP 2 7 2000

Department of Science and Technology

Bachelor of Applied Forest Resource Management

Forest Soils and Hydrology: FO 2130

Pre-requisite: FO1220

Calendar Description:
Explore the chemical and biological processes occurring in forest floors and forest soils. Advance the understanding of nutrient cycles in forest ecological systems. Tree nutrition and its relationship with fertilization. Examine in detail the water cycles in forest systems. Introduce systematically the concept and system of land capability classification and site description. Emphasize soil management for silviculture, nursery and problem soils. Investigate the impacts of forest fire and harvest on soil and water quality.

Instructor: Jennifer Hacking
Office: J221
Office hours: Mon & Wed 9:30 – 11:30
Mon, Wed, Thurs, & Fri 1:30 – 3:30
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Lectures: Tuesdays and Thursdays 11:30 – 12:50 A209
Lab: Fridays 8:30 – 11:20 J116

Texts:

Required

Prichett, William L., and Richard F. Fisher. 1987. **Properties and Management of Forest Soils, 2nd Edition.** John Wiley & Sons, New York.

Hewlett, J.D. 1982. **Principles of Forest Hydrology.** The University of Georgia Press, Athens, Ga.

Recommended

Beckingham, J.D. and J.H. Archibald. 1996. **Field Guide to Ecosites of Northern Alberta.** Canadian Forest Service, Northwest Region.

Perry, David A. 1994. **Forest Ecosystems.** The John Hopkins University Press, Baltimore, Maryland.

Websites: http://res.agr.ca/CANSIS/
http://www.soils.rr.ualberta.ca/soils330/class.html

COURSE OUTLINE

PART 1. Formation of Forest Soils and Ecological Classification

1. Forest floor and forest soils — Sept 12/14

   1.1 Forest floor classification
   1.2 Formation of forest floor (litter fall and decomposition)
   1.3 Overview on organic matter study methods
   1.4 Podzolization and Podzolic soils
   1.5 Forest soils in Alberta

2. Ecological classification and land capacity — Sept 19/21

   2.1 Land capacity classification
   2.2 Site description
   2.3 Ecological classification of forest soils

PART 2. Chemical and Biological Processes

3. Chemical process — Sept 26/28

   3.1 Acidity and acidification in forest soils
   3.2 Diffuse-double-layer (DDL) theory and cation retention
   3.3 Anion sorption, phosphate fixation and the fate of phosphate fertilizers

4. Ecology of organisms in forest soils — Oct 3/5

   4.1 Overview on organism world in forests
   4.2 Biochemical pathways of forest litter decomposition
   4.3 Microbial-plant interactions

PART 3. Tree Nutrition and Soil Fertility

5. Tree nutrition and nutrient cycling — Oct 10/12

   5.1 Root systems
   5.2 Movement of nutrients to plant roots
   5.3 Nutrient uptake by trees
   5.4 Geochemical nutrient cycling
   5.5 Biological nutrient cycling

6. Fertilization — Oct 17

   6.1 Forest nutrition assessment
   6.2 Principles of fertilization
   6.3 Fertilizers and fertilizer application
   6.4 Effects of fertilizers
   6.5 Use of wastewater and sludge as fertilizers
   6.6 Economics analyses

PART 4. Forest Soil Management

7.	Soils and Silviculture	Oct 24/26
	7.1 Harvesting and nutrient cycling 7.2 Effects of land cleaning and site preparation 7.3 Soils and species selection 7.4 Nutrition management (including symbiotic N-fixation)	
8.	Management of nursery soils	Oct 31
	8.1 Site selection 8.2 Soil management for nursery 8.3 Christmas trees and seed orchards	
9.	Fire-affected soils and management	Nov 2
	9.1 Effects of fire on soil properties 9.2 Effects of fire on water quality 9.3 Management implications	
10.	Management of problem soils and land reclamation	Nov 7
	10.1 Aforestation and reforestation sites 10.2 Reclamation of land to forest (reforestation)	
11.	Soil erosion and control	Nov 9
	11.1 Definitions 11.2 Factors affecting soil erosion 11.3 Prediction (USLE) and measurement of soil erosion 11.4 Control and prevention	
12.	Environmental problems in forest ecosystems	Nov 14
	12.1 Water quality (definition and parameters) 12.2 Soil quality 12.3 Effects of land management practices on soil and water quality	

PART 5. Forest Hydrology

13.	Engineering properties of soils	Nov 16
14.	Introduction to hydrology	Nov 21/23
	14.1 Definitions 14.2 Water and energy balance 14.3 Drainage basin morphology	
15.	Water budget	Nov 28/30
	15.1 Atmospheric water and precipitation 15.2 Subsurface water 15.3 Evaporation and evapotranspiration 15.4 Surface water and water yield	

COURSE EVALUATION

Throughout the course students will be asked to: complete three assignments, prepare and give a presentation on one of the course topics, complete lab reports, write a lab exam, mid-term lecture exam, and final lecture exam. These requirements will be evaluated, and weighted as listed below.

Assignments (3)	20%
Project	25%
Labs (including lab exam)	20%
Mid-term exam	15%
Final exam	20%

Evaluation of skills, knowledge, understanding

Skills:	Assignments Labs	40%
Knowledge/ Understanding:	Exams	35%
	Project	25%

Study Schedule Guidelines

Sept 12/14	Section 1
Sept 19/21	Section 2
Sept 26/28	Section 3
Oct 3/5	Section 4
Oct 10/12	Section 5
Oct 17	Section 6
Oct 19	Midterm Exam
Oct 24/26	Section 7
Oct 31/Nov2	Section 8 & 9
Nov 7/9	Section 10 & 11
Nov 14/16	Section 12 &13
Nov 21/23	Section 14
Nov 28/30	Section 15
Dec 5/7	Review