GRANDE PRAIRIE REGIONAL COLLEGE

DEPARTMENT OF SCIENCE AND TECHNOLOGY

Bachelor of Applied Forest Resource Management

FOREST HEALTH: FO3080

Transfer status: Under discussion

Pre-requisite: FO1200 (Dendrology); BT2400 (Plant Physiology)

Calender Description:

Increasing importance of forest health in the 1990's. Identification of major insect and disease pests and their symptoms. Life histories of selected insects and pathogens. The pest in relation to its forest environment. Pest management through an understanding of pest biology. Long-term management strategies versus temporary short-term programs. Fibre management strategies and their effects on forest health. Elements of a forest health program.

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Lectures:	Monday and Wednesday	10:00 - 11:20	B305
Labs:	Monday	2:30 - 5:30	Field and B305

Recommended textbook:

Hiratsuka, Y., Langor, D.W. and P.E. Crane. (1995). A Field Guide to the Forest Insects and Diseases of the Prairie Provinces. UBC Press, Vancouver.

Textbooks Available in the Library

Allen, E., Morrison, D and G. Wallis. (1996). Common Tree Diseases of British Columbia. Canadian Forest Service, Pacific Forestry Centre, Victoria, B.C.

Blanchard, R. O. and T.A. Tattar. (1997). Field and Laboratory Guide to Tree Pathology. 2nd Ed. Academic Press, Toronto.

Canadian Council of Forest Ministers. Compendium of Canadian Forestry Statistics. (1996).

Coulsen, R.N. and J.A. Witter. (1984). Forest Entomology: Ecology and Management. John Wiley & Sons, Toronto.

Knight, F.B. and H.J. Heikkenen. (1980). Principles of Forest Entomology, 5th Ed. McGraw-Hill, Toronto.

Scientific Journals and Periodicals available in the library

Bugs and Diseases. Alberta Forest Service, Edmonton.
Canadian Journal of Forest Research
Forestry Chronicle
Northern Journal of Applied Forestry
Silviculture

Course Objectives

The major objectives which I expect students to achieve, are:

- An appreciation of insects and diseases as a part of the natural forest and why, although they have always been present in the natural forest, insects and diseases are particularly important in the 1990's.
- The ability to recognize important forest pests, and/or their symptoms, in the field and the ability to relate particular environmental conditions to the presence, or absence, of specific pests.
- An understanding of the basic concepts of insect and disease management and an appreciation of why good management requires not only a knowledge of the biology of the pest organism, but also involves all aspects of forest science.
- An appreciation of the changing face of forestry in Alberta and its implications for insect and disease management.

Course Description

General introduction, what is forest health?

- Factors contributing to the current high profile of forest health:
    - Forest industry expansion of the 1980's and 1990's has led to:
        - lack of a timber reserve
        - an increasing area of young regenerating stands
    - Imposition of new regeneration standards.
    - Widespread use of Enhanced Forest Management (EFM) practices.
    - Annual Allowable Cut (AAC) implications.
    - Reduced impact of fire.
    - Acceptance by the forest industry of the Forest Care 'Codes of Practice'.
    - Higher profile of forest health in Alta Govt LFS revised 'ground rules'.

Agents which can adversely affect forest health (damage agents)

- Insects
- Fungi
- Flowering plants
- Mammals
- Birds
- Bacteria
- Viruses
- Abiotic

Study of insects as damage agents

- General biology of insects
    - anatomy
    - physiology
    - life cycle, growth
    - ecology, population dynamics

Economically important insects causing damage to forests

- Species affecting:
  - roots
  - stems
  - foliage
  - reproductive biology

- How to recognize insects and how to identify by symptom.
- Impact:
  - mortality (especially in regeneration)
  - loss of height growth
  - volume loss
  - loss of stem and wood quality
  - effect on reproductive biology

Study of fungi as damage agents

- Fungal biology, including
  - structure
  - classification
  - life history

Important fungal damage agents

- Species affecting
  - roots
  - stems
  - foliage
  - reproductive biology
- How to identify by symptom and by fungal characteristics
- Impact:
  - mortality (especially in regeneration)
  - loss of height growth
  - volume loss
  - loss of stem and wood quality
  - effect on reproductive biology

Other pathogens:

- Flowering plants
- Bacteria
- Viruses
- Birds
- Mammals
- Abiotic
  - climate
  - pollution

Surveys to detect and evaluate endemic and epidemic levels of damage agents

- Aerial survey
  - helicopter vs fixed-wing
  - use of Global Positioning System (GPS)
- Ground surveys
  - one-dimensional, two-dimensional, pixel, etc.
- Pheromone traps
- Temporary sample plots and permanent sample plots
- Timing of surveys
- Combining damage agent surveys with other silvicultural surveys
- Aids to surveying
- Efficiencies in surveying

Control of damage agents

- Silvicultural - building control plans into the silvicultural prescription
- Mechanical - of limited use in operational forestry
- Biological - undertake with caution
- Chemical - last resort
- Genetic
- Integrated

Enhanced Forest Management (EFM)

- How various EFM techniques interact with the biology and population dynamics of damage agents
  - thinning, spacing, release from overstorey
  - planting vs seeding
  - fertilizing
  - use of genetically improved stock
  - use of exotics

Ecosystem management

- Forest health vs individual tree health

LECTURE SCHEDULE

Overview of the course — 1 lecture
- operational vs ecosystem perspective

Forest health in the 1990's — 1 lecture
- reasons for increasing importance of forest health

Development of a forest health program — 1 lecture
- distribution, impact and management

Damage agents — 1 lecture
- overview of major types

Forest entomology
- general biology and taxonomy of insects — 3 lectures
- detailed discussion of major pests in : — 5 lectures
  - Canada
  - Alberta
    - young stands
    - mature stands
    - nurseries
    - seed orchards
- the important relationship between insect biology and management

Pathology
- dwarf mistletoe, an angiosperm pest — 2 lectures
- fungal biology and taxonomy — 4 lectures
  - fungal pests of:
    - young stands
    - mature stands
    - nurseries
    - seed orchards
- bacterial pests — 1 lecture

Mammal and bird pests — 2 lectures

Abiotic damage agents — 2 lectures
- climate
- pollution

Damage agent surveys — 2 lectures
- ground surveys, aerial surveys, pheromone traps
- statistical valididty of different surveys
- GPS, digital mapping, satellite surveys

Population dynamics
- 'k' and 'r' strategists — 3 lectures
- relationship between predator and prey
- population fluctuations, stable, cyclic, eruptive

Principles of pest management — 2 lectures
- silvicultural, mechanical, biological, genetic, chemical, integrated

Enhanced forest management — 2 lecture
- interaction of EFM techniques with the biology and population dynamics of damage agents
  - site prep
  - stand tending
  - planting vs seeding
  - genetically improved stock
  - use of exotics

Lab Schedule

Lab I	Field lab	Walk-through mature stands, naturally regenerated stands and artificially regenerated stands, noting different environments of each.
Lab II	Field lab	Pests of deciduous stands
Lab III	Field lab	Insect pests of conifer stands
Lab IV	Field lab	Fungal pests of conifer stands
Lab V	Field lab	Pests of log yards
Lab VI	Field lab	Lodgepole pine dwarf mistletoe
Lab VII	Field lab	Damage agent surveys
Lab VIII	Mid-term lab exam	Test on damage agent identification
Lab IX	Indoor lab	Analysis of data collected in Lab VII
Lab X	Indoor lab	Alberta's spruce budworm program
Lab XI	Indoor lab	Students prepare written and verbal presentations on forest health topics
Lab XII	Indoor lab	Presentation of lab XI papers
Lab XIII and	Indoor lab	Revision lab; videos, slides review of important damage agents

Examinations

Mid-term examination	.....	30% of term marks
Mid-term lab exam	.....	20% of term marks
Papers from lab XII	.....	10% of term marks
Final exam	.....	40% of term marks