

Fall 2004

**UNIVERSITY OF ALASKA FAIRBANKS
SCHOOL OF AGRICULTURE AND LAND RESOURCES MANAGEMENT
COLLEGE OF NATURAL RESOURCES DEVELOPMENT AND MANAGEMENT**

**NRM 452
FOREST HEALTH AND PROTECTION**

OFFERED FALL OF EVEN YEARS

Forest Health and Protection looks at biotic and abiotic agents that cause forest disturbance. Importance of these agents, in terms of forest health, is considered from an ecological perspective. There are four units in the course: 1) Forest Health—concept, importance of organisms and non-living factors to ecosystem process, role of disturbance in ecosystems, use of pesticides in forest ecosystems, and integrated pest management; 2) vertebrates, dwarf mistletoes, micro-organisms, and fungi—role in forest ecosystems, life cycles, identification, impacts, and control; 3) insects—role in forest ecosystems, anatomy, life cycles, identification, impacts, and control; 4) fire and abiotic factors—role in the forest ecosystem, basic fire concepts, fire behavior, control, prevention, and prescribed fire. With respect to living organisms, major groups (guilds) and key species or examples from across North America will be discussed. Emphasis will be on contemporary forests and their interactions and problems with specific agents of change.

Class meets in Room 183 Arctic Health Research Building on the University of Alaska Fairbanks campus (West Ridge) on Monday and Wednesday from 1900 to 2030 hours. There is the possibility of one or two field trips, no cost, to be arranged so as to not interfere with student schedules.

INSTRUCTOR: Edmond C. Packee, Ph.D.
Associate Professor of Forest Management
Office: 161 Arctic Health Research Building
Office Hours: 1000 to 1300 hours Monday or by appointment
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UNIVERSITY OF ALASKA FAIRBANKS
SCHOOL OF NATURAL RESOURCES AND AGRICULTURAL SCIENCES
FALL 2004

**FOREST HEALTH AND PROTECTION
NRM 452**

COURSE OUTLINE/SYLLABUS

INTRODUCTORY COMMENTS

NOTE: FOR FALL 2004, CLASS TYPICALLY WILL MEET ONCE A WEEK

Forest Health and Protection addresses three major areas of forest management: Disease, insects, and fire. Elsewhere, these three areas are commonly taught as three separate courses. In addition, Forest Health and Protection also addresses wildlife damage, environmental damage, and negative human impacts.

There are four required texts: the basic text, disease, insects, and a text (provided) that covers diseases and insects as well as some of the other problems in Alaska.

There are major exams in this class; basically, one for each section; thus there is no final. Thus, there is no option to not taking the final exam.

This course requires four "professional reports" with the topic to be assigned.

- Rust pathogen
- Fungal or green plant parasite
- Insect
- Fire issue

These are not term papers. They are mini-papers, if you like. They consist of a title page, executive summary, problem statement, literature review, alternate solutions (listing advantages and disadvantages of each alternate), recommendation and why the recommendation was selected, and literature cited. I expect a separate title page, a separate page for the executive summary which can be no longer than 300 words, 3 to 6 pages of content, and a separate page(s) for literature cited. An example of the desired format will be provided; think of it as a report to your supervisor. Instructor will provide the titles/subjects; the students will randomly draw the titles/subject! Remember, you are to write this as if you worked in the private sector and I will grade the papers; think of me as your immediate supervisor.

DISABILITIES

IF YOU HAVE ANY KIND OF A DISABILITY (physical, mental, language) THAT MIGHT AFFECT YOUR PERFORMANCE IN THIS CLASS, PLEASE ADVISE ME IN WRITING WITH THE DOCUMENTATION BEFORE THE THIRD CLASS!

GRADING POLICY

The instructor reserves the right to grade on a curve and to select the curving procedure/method! Cheating on tests or plagiarism is grounds for an outright "F" and if sufficiently severe,

recommendation for dismissal from the University of Alaska Fairbanks. If you do not know what constitutes plagiarism, we can have a short workshop after class. The "A" Book is in force. I have no respect for persons who deliberately cheat. The profession has no place for people who cheat and lie! Because Society is full of people who cheat or lie, there is still no excuse for anyone in this class to do so! Spring of 1994 was the last semester that I was somewhat lenient—no more. Cheating or plagiarism is an outright "F."

GRADE ALLOCATION

MAJOR TESTS (3 or 4)	each worth	16 or 12 percent of final grade	= 48%
REPORTS	each worth	10 percent of final grade	= 40%
CLASS PARTICIPATION		10 percent of final grade	= 10 %
INSTRUCTOR'S DISCRETION		02 percent of final grade	= 02 %

THERE IS NO FINAL AS SUCH! THERE WILL BE THREE OR FOUR TESTS—ONE FOR EACH SECTION (CONCEPTS, WILDLIFE DAMAGE, ENVIRONMENTAL DAMAGE, HUMAN IMPACTS; FUNGI; INSECTS; FIRE) OF THE COURSE. EACH TEST IS SUBJECT SPECIFIC AND INCLUDES GENERAL PRINCIPLES AND CONCEPTS. At least one test will be take home; any take home test will be graded on content and in relation to other results—in short, they are competitive.

GRADES:

A = >90.00 percent

B = 80.00 to 89.99 percent

C = 70.00 to 79.99 percent

D = 60.00 to 69.99 percent

F = <60.00 percent

I = rare event; it is not an available option for late work. All work is to be submitted by the end of the semester and PREFERABLY ON TIME. There is no excuse for not meeting deadlines. You do not have that luxury in the private sector except in the case of emergencies (health or death in the family). Your work load is set out for you and you have a schedule. Changes to the schedule will generally benefit the student—essentially we all agree to a change. Similarly, I am prepared to address report deadlines—I recognize you have schedules and other courses.

INSTRUCTOR'S DISCRETION

This allows me to increase or decrease your letter grade when you are on the borderline. Class attendance, effort, neatness of assignments, meeting deadlines—all work in your favor. I encourage good questions. In some cases we will defer the question to another time—after class or an office meeting. Use of technical words in this course is essential. You are not only required to know definitions but also to understand the concepts. Thus if you don't understand a concept, it is your responsibility to advise me.

Guest instructors will provide lectures on a regular basis.

TEXT BOOKS

REQUIRED:

Edmonds, R.L.; Agee, J.K.; Gara, R.I. 2000. Forest health and protection. Boston, MA: McGraw-Hill Companies, Inc. 630 p.

Sinclair, Wayne A.; Lyon, Howard H. Johnson, Warren.T. 1987. Diseases of trees and shrubs. Ithaca, NY: Cornell University Press. 574 p.

Johnson, Warren T.; Lyon, Howard H. 1987. Insects that feed on trees and shrubs. (2nd ed.) Ithaca, NY: Cornell University Press. 556 p.

Holsten, Edward H.; Hennon, Paul E.; Werener, R.A. 1985. Insects and diseases of Alaskan forests. (rev.) Juneau, AK: USDA Forest Service, State and Private Forestry, Forest Pest Management, Alaska Region Report No. 181. 217 p.

SUPPLEMENTAL:

Manion, Paul D. 1991. Tree disease concepts (2nd ed.). Englewood Cliffs, NJ: Prentice Hall, Inc. 402 p.

Tainter, F.H.; Baker, F.A. 1996. Principles of forest pathology. New York, NY: John Wiley & Sons, Inc. 805 p.

Tattar, Terry A. 1989. Diseases of shade trees. (rev. ed.). San Diego, CA: Academic Press, Inc. 391 p.

Coulson, Robert N.; Winter, John A. 1984. Forest entomology: Ecology and management. New York, NY: John Wiley and Sons, Inc. 669 p.

Speight, Martin R.; Wainhouse, David. 1989. Ecology and management of forest insects. Oxford, UK: Oxford University Press. 374 p.

Pyne, Stephen J. 1984. Introduction to wildland fire. New York, NY: John Wiley & Sons, Inc. 455 p.

RESERVE ITEMS:

Will be on reserve in the Biosciences Library in the Arctic Health Research Building; most are on 2 hour and overnight. Some are my personal copies; I ask that you take care of them. My lecture notes will be on reserve in a separate notebook—you may copy these. A second notebook/file folder will contain some of the additional reading assignments.

SERIALS:

Will not be placed on reserve; they cannot be checked out of the library. You are expected to find these on the shelf. They can be found in either Rasmusson or Biosciences. Something will be worked out for the Tok students.

HOMEWORK: WRITTEN AND READING ASSIGNMENTS

Written: All written assignments are expected to be completed by the agreed upon deadline (this is the reality of the business world and the reality of governmental agency deadlines; I am willing to adjust deadlines if there is just cause. Make diskette copies of all efforts—the excuse, “my hard drive locked-up is no longer valid”! I still do all-nighters. If you have a problem with your assignment, let me know in advance. I expect good quality reports: content, organization, grammar, spelling, and neatness count.

Reading: Maintaining currency in the reading assignments is essential. I am more after concepts and general patterns than I am after great details; this is not Silvics and Dendro. I expect you to know life cycles, scientific names, definitions, and control options. I will let you know where I expect other detail.

OFFICE HOURS

Monday: 1000 to 1300 hrs

After class (not before class)

By appointment except on Thursdays and Fridays

Never on afternoons after 1500 hrs or **before** any evening class!

2000 OUTLINE AND SCHEDULE

(NOTE: THIS SCHEDULE IS SOMEWHAT TENTATIVE & SUBJECT TO [MINOR] ADJUSTMENT)

(READING & WRITTEN ASSIGNMENTS ARE IN SEPARATE SECTION)

Ideally, I would like to see this class be once a week on Monday nights from 1900 to 2200 hours instead of twice a week from 1900 to 2030 hours since there is another required NRM course. However, there will be several evenings where this may not be possible. In addition, I must be out of town for the weeks of September 5 and 27 and October 4. Also, guest presenters must be accommodated—schedule wise and time wise. Hence the schedule below must be recognized as flexible.

First Class Meets on Thursday 2 September 2004 for approximately 3 hours; thereafter all classes meet on Monday evening with some possible on Wednesdays. Class begins at 1900 hours. Depending on weather conditions, a field class (one-day is possible in mid October.

Week/Date

30 Aug 3.0

INTRODUCTION

Course content and structure

The Syllabus/Schedule

Biodiversity

Sustainability

Ecosystem approach

Healthy forest

 Concept

 Condition of the North American Forest today

Management approach (integration of management and protection)

Major abiotic agents

Wildlife agents

Human activity

Examples of major North American Forest Insect and Disease Problems

 Insects

 Native

 Exotic

 Diseases

 Native

 Exotic

FOREST HEALTH

The concepts:

 Forest health

 Ecosystem health

 Sustainability

Historical perspective of forest/ecosystem health

Forest health and forest resources and use

Forest health monitoring

Silviculture and forest health

13 Sep 3.0
FOREST HEALTH CONCEPTS (conclusion)
INTEGRATED PEST MANAGEMENT
Integrated Pest Management

Definition

Components

Pesticides

Insecticides

Fungicides

Soaps

Adjuvants

Inert ingredients

Biological Agents

Parasites

Predators

Diseases

Botanicals

Pheromones

Fire

Mechanical

Site manipulation (Site preparation, slash abatement)

Cutting

Removal of host material

Trapping

20 Sep 3.0
SAFETY CONSIDERATIONS
PESTICIDES

Pesticides characteristics

Toxicity

Lethal

LD50

LC50

Sublethal

Dermal

Abortagenicity

Carcinogenicity

Embryotoxicity

Mutagenicity

Testing procedures

Safety Equipment

The Label

Liability

Where to find more information

Pesticide Families and Characteristics

Pesticide Application Techniques

BIOLOGICAL AGENTS

Associated risks

PHEROMONES

Associated risks

Specificity

PRESCRIBED FIRE SAFETY

MECHANICAL SAFETY CONSIDERATIONS

PUBLIC RELATIONS

27 Sep 3.0 guest lecturer
ABIOTIC AGENTS, HERBIVORY, AND GREEN PLANTS

Climate

Wind

Snow and ice

Red belt

Sunscald

Frost

Heat stress

Soil

Flooding/Drought

Compaction

Soil fill

Mechanical

Mammals

Moose

Elk

Deer

Livestock (cattle, sheep, goats, pigs)

Porcupines

Hares/rabbits

Squirrels/Rodents

Birds

Nematodes

Vines and Lianas

Alleopathy

Mistletoe & Dwarf Mistletoe

Plant description

Basic life cycle

Host/Species

Impacts/benefits

Control

FOLIAGE DISEASES

Types of Foliage Diseases

Conifer Diseases

Lophodermium needle cast
 Brown spot
Dothistroma
Elytroderma
 Rhabdocline
 Tip blight
 Snow molds
 Brown felt blight
 Hardwood Diseases
 Powdery mildews
 Leaf blister
 Tar spot of maple
 Anthracnose

04 OCT 3.0 guest lecturer

TEST #1 (IN CLASS) FROM 20:30; Class starts at 1900 hours

STEM DISEASES

Rusts

Cronartium species and alternate hosts
Cronartium ribicola
 Fusiform rust
 Commandra rust

11 Oct STEM DISEASES (continued)

Rusts

Spruce broom rust

Cankers

Nectria on aspen
Nectria canker on beech
 Larch canker
Ceratocystis on aspen
Eutypella canker on maple
Hypoxylon canker
Scleroderris canker
 Pitch canker
Fusarium canker

VASCULAR WILT DISEASE

Types of wilts

Wilt disease characteristics

Wilt diseases

Dutch elm disease

Oak wilt

Verticillium wilt

ROOT AND SEEDLING DISEASES

Root Diseases

Importance

Mode of action

Major pathogens

Phytophthora

Armillaria

Heterobasidion

Phellinus

Leptographium

SEEDLING DISEASES (especially those of the nursery)

Types of diseases

Damping-Off

Symptoms

Pathogens

Pythium

Phytophthora

Rhizoctonia

Fusarium

Sclerotium

Control

Root Diseases

Symptoms

Pathogens

Fusarium

Cylindrocladium

Sclerotium or *Macrophomia*

Control

Nematodes

- 18 Oct** 3.0 guest lecturer
 STEM DISEASES AND WOOD DECAY FUNGI
 Stem Diseases (non-basidiomycetes)
 Red heart of birch
 Wetwood
 Wood decays
 Heart Rot
 Butt Rot
 Top Rot
 The Rot Fungi
 Wood decay process
 Wood disease cycle
 Effects of decay on wood
 Wood properties
 Product quality
 Important Decay Fungi of Conifers
 Important Decay Fungi of Hardwoods
 Wood Decay in Building Products

25 Oct 3.0 (guest lecturer)

TEST #2 (IN CLASS) FROM 20:30; Class starts at 1900 hours

FOREST INSECTS

Insect Anatomy

Insect Classification

The Orders

APTERYGOTA (=AMETABOLA)

Thysanura (silver-fish)

Diplura (two-pronged bristle-tails)

Protura

Collembola (springtails)

EXOPTERYGOTA (HEMIMETABOLA)

Ephemoptera (mayflies)

Odonata (dragonflies)

Plecoptera (stoneflies)

Orthoptera (grasshoppers & crickets)

Phasmida (stick insects)

Dictyoptera (cockroaches)

Dermaptera (earwigs)

Psocoptera (booklice)

Mallophaga (biting & bird lice)

Anoplura (sucking lice)

Thysanoptera (thrips)

Hemiptera (bugs, aphids, adelgids, leaf hoppers, cicadas, & plant hoppers)

ENDOPTERYGOTA (HOLOMETABOLA)

Neuroptera (lacewings & snake flies)

Mecoptera (scorpion flies)

Lepidoptera (butterflies & moths)

Trichoptera (caddis flies)

Diptera (flies)

Siphonoptera (fleas)

Hymenoptera (bees, wasps, ants, sawflies, & ichneumon flies)

Coleoptera (beetles & weevils)

01 Nov 3.0 guest lecturer

ECOLOGY OF FOREST INSECTS

Insects in the Forest Ecosystem

Insects as part of the forest community

Insects and the individual tree

Nutritional requirements of insects

Trees as a source of food (nutrition) for insects

Tree defenses against insects

Host stress favoring insects

Insects and forest stability

- Insects and forest succession
- Insects and forest productivity
- Population Dynamics of Forest Insects
 - Concept of population dynamics
 - Patterns of population changes
 - Characteristics of outbreaks
- Enemies of Forest Insects
 - Prey-enemy relationships (Population dynamics II)
 - Predators
 - Vertebrate
 - Invertebrates
 - Parasites
 - Pathogens

INSECT CONTROL CONSIDERATIONS

- Monitoring
- Forecasting Outbreaks and Damage
- Insects and Forest Values
- Risk Assessment

Public

INSECT GUILDS AFFECTING FOREST TREES I

The Concept

Fruit and Seed Insects

- Seed weevils
- Seed chalcids
- Cone borers

Nursery Insects

- Collembola

Root and Root Collar Insects

- Weevils
- Borers

08 Nov 3.0 guest lecturer

INSECT GUILDS AFFECTING FOREST TREES II

Bud and Shoot/Twig Insects

- Bud moth
- Terminal weevils
- Adelges/Pineus*

Defoliators

- Budworms
- Sawflies
- Pine butterfly
- Larch casebearer

- tussock moths (European and Douglas-fir)

INSECT GUILDS AFFECTING FOREST TREES III

Stem and Bole Insects

Horntails
 Pitch moth
 Bark beetles
 Dendroctonus rufipennis
 Dendroctonus monticolae
 Southern pine beetle
 Elm beetle
Ips spp.
 Flat-headed borers
 Rounded-headed borers
 Horntails
 Pitch moth

15 Nov 3.0 guest lecturer
MANAGEMENT OF INSECT PESTS
 Basic considerations/concerns
 IPM realities
 Concept of Damage
 Forest Practices
 Sanitation
 Trapping
 Species Composition
 Breeding/Selection of Trees for Resistance
 Biological Control
 Predator Encouragement
 Parasites
 Microbial Chemicals

22 Nov 3.0
TEST #2 (IN CLASS) FROM 20:30; Class starts at 1900 hours
FIRE IN THE FOREST ECOSYSTEM
 Wildfire
 History of Fire Suppression
 Changing Policies
 Prescribed Fire
 Use in Rocky Mountains
 Use in the Northern Forest
 Removal of Fire from the Ecosystem
 Impacts on ecosystem structure and functions
 Impacts on fuel build-ups
 Impacts on wildlife
 Broad picture of fire and the landscape
FIRE IN THE FOREST & FIRE TRIANGLE
 Fire: What is it?
 The process
 Causes
 Phases of combustion
 Chemistry and physics of ignition and combustion

29 Nov 3.0 guest lecturer

Forest fuels

Types

Chemistry

Moisture

Fuel beds

Classification

Fire weather

Fire behavior

Kinds of fires

Surface

Ground

Spot (includes snags)

Crown

Fire storm

Fire Behavior forecasts

Season of fire occurrence

Rules of thumb

Fire behavior (what you can expect)

Surface fires

Ground fires

Spot fires

Crown fires

Fire storm

Transition to convection situations

Large fires

Fire Prediction/Behavior Models

06 Dec 3.0 guest lecturer

FIRE SUPPRESSION TACTICS Safety

Clothing

Protective devices

Hazards off the fire line

Fireline hazards

ESCAPE ROUTE(S)

Heat

Carbon Monoxide

Smoke

Burns

Aircraft

Motorized Equipment

Back-firing

Suppression Principles and Methods

Fire danger rating

Systems and Procedures

Value/Importance

- Presuppression
- Fire control
- Suppression Methods
- Initial Attack principles
- Crew Organization
- Line Construction
- Backfiring
- Forest Fire Equipment
 - Hand tools
 - Mechanized Ground Equipment
 - Water Handling Equipment
 - Explosives
 - Fire retardant chemicals (water and chemicals)
 - Aircraft/Operations
 - Paracargo
 - Smokejumpers
 - Airtankers
 - Helicopters
 - Fire monitoring
 - Fire suppression planning
 - Transport
 - Monsoon-buckets
 - Ignition Devices
 - Fire Mapping
- Presuppression
 - Planning
 - Maps and records
 - Pre-attack planning
- Detection
 - Methods
 - Public
 - Look-outs
 - Aerial
 - Visual
 - Infrared
 - Computerized Technology
 - GIS
- Communications
 - Dispatch
- FIRE PREVENTION, PRESUPPRESSION, & PREPAREDNESS
- Strategy of Fire Prevention
 - Education and Public Relations
 - Fire Laws
 - Fire Hazard reduction
 - Urban Forests

Wildland
Methods

- Fuel isolation
 - Firebreaks
 - Fuelbreaks
 - Greenbelts
- Fuel removal
 - Prescribed burning
 - Intensive utilization
 - Vegetation removal
- Species manipulation

13 Dec 3.0 guest lecturer

FIRE CONTROL POLICY AND ORGANIZATION

Fire Management Policy

Policy determination

- People
- Market values
- Non-market values
- Ecosystem maintenance/biodiversity/and forest health considerations

Fire Management Goals

- Area burned: how much acceptable? where acceptable?
- Considerations used in formulating goals

Policy formulation

- Protection forests
- Watershed
- Wildlife
- Parks, recreation areas, wilderness
- Plantations and intensively managed forests
- Extensively managed multiple use forests
- Urban-forest interface
- Public and professional concerns

Alaska Forest Fire Policy

Fire Management Agencies

- Federal agencies
- State agencies
- Private agencies
- International agencies
- Alaska model

1.5

PRESCRIBED FIRE

Role of prescribed fire

- Fuels Management: Slash/hazard reduction
- Type conversion
- Site preparation
- Wildlife habitat improvement

Insect control
Disease control
Prescribed fire in a historical context
Prescribed fire prescriptions
Prescribed Burning
Techniques
Planning
THE PRESCRIPTION
Preparation of Area
Execution
Follow-up
Public Relations

15 Dec Starts at 1900 hrs
TEST #4

Final

All papers due at 1900 hrs or grade on paper is an F.

BIBLIOGRAPHIC FORMAT
FOR COURSES TAUGHT BY
Edmond C. Packee, Ph.D.
Associate Professor of Forest Management

In the past, I have allowed just about any format accepted by scientific professional organization, scientific journal, or science style manual for the courses that I teach. I have requested the style manual or journal or organization whose style was used to be reported. Rarely was that provided. The results ranged from excellent to unacceptable. In the latter case, the excuses were often more pathetic than the results. Hence, I have no choice but to tighten up. The format for citing to be followed is given below. I will allow exceptions, but only if cleared in writing by me well (weeks) in advance by me. The clearance then becomes part of the paper and is to be inserted immediately after the title page.

Except for initials of authors and the two letter abbreviations for the state in that part of the citation referring to where published, no other abbreviations are acceptable. The term "et al." is used only in the text (including tables) for three or more authors; it is never used in the "Cited Literature."

Citations in the text are to be author and date:

In 1987 Sinclair et al. stated that sulfur was an essential component of some amino acids. Sinclair et al. (1987) said "Sulfur is a constituent of certain amino acids."
"Sulfur is a constituent of certain amino acids" (Sinclair et al. 1987)

Davis (1954) said
(Davis 1954)

Alt and Hyndman (1986)
(Alt and Hyndman 1986)

There is no relationship among the three books (Davis 1954; Alt and Hyndman 1986; Sinclair et al. 1987).

In the report (Anonymous 1974)

The undated file report (Slick n.d.)

CITED LITERATURE

Alt, D.; Hyndman, D.W. 1986. Roadside geology of Montana. Missoula, MT: Mountain Press Publishing Company. 427 p.

Anonymous. 1974. A student's impression of Ed Packee or why I got an incomplete. University of Alaska Fairbanks Student Confidential Report Series 22:1-5.

Davis, K.P. 1954. American forest management. New York, NY: Mc-Graw-Hill Book Company, Inc. 482 p.

Sinclair, W.A.; Lyon, H.H.; Johnson, W.T. 1987. Diseases of trees and shrubs. Ithaca, NY: Cornell University Press. 575 p.

Slick, I.M. no date. How to cheat in Ed Packee's class and get an F. University of Alaska Fairbanks Student Complaint, File Report. 10 p.