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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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:


SUPPLEMENTAL:


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
  - LD$_{50}$
  - LC$_{50}$
- Sublethal
- Dermal
Abortagencity
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 Macrohopia
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)
    Ephemerida (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
*Ipse* 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


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.