

## INSECTS AND WILDLIFE

ENY 4210 (UNDERGRADUATE LEVEL) OR  
ENY 5212 (GRADUATE LEVEL)  
3 CREDIT HOURS  
OFFERED SPRING, SUMMER, AND FALL SEMESTERS  
OFFERED ON-LINE ONLY

### INSTRUCTOR:

John Capinera  
Office location: ENY 1019  
Entomology and Nematology (Steinmetz Hall)  
1881 Natural Area Drive, UF Campus

### OFFICE HOURS:

Daily Monday-Friday at:  
Email: [Capinera@ufl.edu](mailto:Capinera@ufl.edu)  
Telephone: 352-273-3905  
Or by arrangement

COURSE WEBSITE: <http://lss.at.ufl.edu>

## LECTURE OUTLINE:

### Lecture 1

Course introduction  
PowerPoint notes, B&W  
PowerPoint notes, color

### Lectures 2-5

#### Section 1. Insects and their relatives

- Naming of taxa
- Arthropoda
- Insecta
- Classification of insects
- Characteristics of the major groups of insects
- Evolution of insects
- Insect biogeography

PowerPoint notes, B&W  
PowerPoint notes, color

### Lectures 6-10

## Section 2. Structure and function of insects

Integument and molting

Body regions: head, thorax, abdomen

Internal anatomy: Muscular system, Fat body, Digestive system, Circulatory system, Ventilatory system, Nervous system, Vision, Glandular systems

Polyphenism or polymorphism

Communication

Sociality: Ants, Social bees and wasps, Termites

Metamorphosis

Reproductive system and Eggs

Excretory system

Thermal biology

Feeding ecology

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## Lectures 11-12

### Section 3. Food resources for wildlife

Assessment of insectivory

Methods for determining the abundance of insects

Methods for determining wildlife diets

Nutritional value of insects

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PowerPoint notes, color

## Lectures 13-15

### Section 4. Wildlife diets

Analysis of amphibian and reptile diets

Analysis of mammal diets

Analysis of bird diets

Analysis of fish diets

The benefits of insects for wildlife survival and reproduction

How insects avoid becoming food for wildlife

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PowerPoint notes, color

## Lectures 16-18

### Section 5. Insects important as food for wildlife

Aquatic insects important as food for wildlife

Mayflies (order Ephemeroptera)

Stoneflies (order Plecoptera)

- Dragonflies and damselflies (order Odonata)
- Bugs (order Hemiptera)
- Alderflies, dobsonflies, and fishflies (order Megaloptera)
- Beetles (order Coleoptera)
- Flies (order Diptera)
- Caddisflies (order Trichoptera)
- Terrestrial insects important as food for wildlife
  - Termites (order Isoptera)
  - Cockroaches (order Blattodea)
  - Grasshoppers, katydids, and crickets (order Orthoptera)
  - Earwigs (order Dermaptera)
  - Bark lice or psocids (order Psocoptera)
  - Bugs (order Hemiptera)
  - Lacewings, antlions and mantidflies (order Neuroptera)
  - Beetles (order Coleoptera)
  - Moths and butterflies (order Lepidoptera)
  - Flies (order Diptera)
  - Wasps, ants, bees, and sawflies (order Hymenoptera)

PowerPoint notes, B&W

PowerPoint notes, color

Lectures 19-22

Section 6. Insects and ecosystems

- Insects and decomposition
- Nutrient cycling
- Herbivory by insects
- Plant diseases and insects
- Pollination and seed dispersal by insects
- Invasiveness of insects

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Lectures 23-24

Section 7. Transmission of disease agents to wildlife by arthropods

- Arthropod feeding behavior
- Disease in wildlife
- Virulence
- Disease hosts
- Disease transmission
- The causes of disease
- The nature of parasitism
- Parasite-induced changes in host behavior

PowerPoint notes, B&W

PowerPoint notes, color

Lectures 25-26

Section 8. Infectious disease agents transmitted to wildlife by arthropods

Viruses

Myxomatosis

Avian pox

West Nile virus

Yellow fever

St. Louis encephalitis

Hemorrhagic disease

Bacteria

Tularemia

Anaplasmosis

Lyme disease

Plague

Avian botulism

Fungi

Aflatoxin poisoning

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PowerPoint notes, color

Lectures 27-28

Section 9. Parasitic disease agents transmitted to wildlife by arthropods

Protozoa

American trypanosomiasis

African trypanosomiasis

Avian malaria

Toxoplasmosis

Helminths

Spirocercosis

Dirofilariasis

Elaeophorosis

Lancet fluke

Dog tapeworm

Giant thorny-headed worm

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Lectures 29-33

Section 10. Arthropods as parasites of wildlife

Mites and ticks (Arachnida: Acari or Acarina: several orders) affecting wildlife

Insects (Insecta) affecting wildlife

- Lice (Insecta: Phthiraptera)
- Bugs (Insecta: Hemiptera: Reduviidae, Cimicidae, and Polyctenidae)
  - Assassin bugs, subfamily Triatominae – kissing bugs (Hemiptera: Reduviidae)
  - Bed bugs, swallow bugs, and bat bugs (Insecta: Cimicidae and Polyctenidae)
- Flies (Insecta: Diptera: several families)
  - Mosquitoes (Insecta: Diptera: Culicidae)
  - Black flies (Insecta: Diptera: Simuliidae)
  - Biting midges (Insecta: Diptera: Ceratopogonidae)
  - Phlebotomine sand flies (Insecta: Diptera: Psychodidae: Phlebotominae)
  - Horse flies and deer flies (Insecta: Diptera: Tabanidae)
  - Tsetse flies (Insecta: Diptera: Glossinidae)
  - Muscid flies (Insecta: Diptera: Muscidae)
  - Blow flies (Insecta: Diptera: Calliphoridae)
  - Flesh flies (Insecta: Diptera: Sarcophagidae)
  - Bot and warble flies (Insecta: Diptera: Oestridae)
  - Louse flies (Insecta: Diptera: Hippoboscidae)
- Fleas (Insecta: Siphonaptera)
- Other taxa of occasional importance to wildlife
  - Eye gnats (Insecta: Diptera: Chloropidae)
  - Snipe flies (Insecta: Diptera: Rhagionidae)
  - Bees and wasps (Insecta: Hymenoptera: various families)
  - Ants (Insecta: Hymenoptera: Formicidae)
  - Dermestids (Insecta: Coleoptera: Dermestidae)

PowerPoint notes, B&W

PowerPoint notes, color

Lectures 34-36

Section 11. Pesticides and their effects on wildlife

- Insecticide mode of action
- Persistence of insecticides
- Acute effects of insecticides
- Sublethal effects of insecticides
- Other pesticides
- Indirect effects of pesticides on wildlife
- Insecticides in the food chain
- Risks of insecticides
- Resistance to insecticides

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Lectures 37-38

Section 12. Alternatives to insecticides

- Environmental management or cultural control
- Physical and mechanical control
- Host resistance
- Semiochemicals
- Biological control
- Area-wide insect management
- Integrated pest management (IPM)
- Preventing versus correcting problems

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PowerPoint notes, color

Lectures 39-40

Section 13. Insect-wildlife relationships

- How wildlife affect insect survival
  - Naturally occurring predation by wildlife on insects
  - Introduction of vertebrates for biological suppression of insects
- How insects affect wildlife survival
  - Predation by insects on wildlife
    - Effects on terrestrial wildlife
    - Effects on aquatic wildlife
  - Symbiotic relationships between insects and wildlife
  - The benefits of insects for habitat conservation
  - The benefits of insects for wildlife-based recreation

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PowerPoint notes, color

Lectures 41-42

Section 14. Insect and wildlife conservation

- Other economic benefits of insects
- Conservation of insects, the smallest 'wildlife'
- Managing insect resources for the benefit of wildlife
  - Principles
  - Practices

PowerPoint notes, B&W

PowerPoint notes, color

**Note:** the lecture designations above are designed to equate the on-line course to traditional residential lecture courses. For example, the last two lectures (# 41, 42) represent the material that would be presented in in the last two 50 minute lectures of a standard course. You will not find that these are separate lectures, however, in the narrated Powerpoint. For the purpose of distance delivery there

is simply one lecture, labeled Section 14, and you can divide it up as you wish. The section designation also corresponds to the chapter designation in the textbook. So 'insect and wildlife conservation' is Chapter 14 in the text.

## COURSE FOREMAT AND REQUIREMENTS:

Students who enroll in 'insects and Wildlife' will receive a 'Welcome letter' from me at the beginning of the semester. This letter contains important information about testing and grading, especially when the tests are scheduled to occur. This is the only place where test dates are posted, so save this correspondence.

This course is offered as narrated Powerpoints, delivered by the eLearning course management system Sakai. Notes in Powerpoint format are available to in both color and black and white should you care to print them.

There are 3 graded exams for this course, plus an optional extra point quiz.

These all are multiple choice tests and taken via Sakai unless other arrangements are made in advance. There will be 50 questions and 50 minutes to answer them, for each test.

Also, there are three ungraded 'quizzes' built into the Powerpoint presentations. The first is built into Section 1 and is self-grading. Note that the grade is not reported, it is for your use only as a study aid. If you can answer these questions successfully you are acquiring adequate knowledge about the relationship of insects and their relatives.

There also are two supplemental units on identification associated with Sections 1 and 5. The former identification 'quiz' provides study aids for identification of insect orders and insect relatives. The latter 'quiz' stresses identification of arthropods of particular importance to wildlife. These 'quizzes' are not graded, but I suggest that you study the explanations as to how identification of the images is determined.

You have opportunity to earn up to 5 additional points on your final course average by scoring well on the optional extra point quiz. The extra points are earned by identifying images and diagnostic characters properly. If you study the supplemental identification units mentioned earlier, and review the images shown in the section on insects as parasites of wildlife (Section 10) you should be able to earn some points. You must properly identify at least 50% of the images to earn 1 extra point, 60% to earn 2 points, etc.

Graduate students only (enrolled in ENY 5212) are responsible for the material in the journal articles included with this course, and questions about the journal articles are included on your tests (but not the undergraduate tests). They should be read in conjunction with certain units, namely:

<u>Chapter</u>	<u>Journal article</u>
6 - Insect herbivory and nutrients	
6 - Salmon flies and nutrients	
6 - Termites and elephants	
6 - Ticks and global warming	
8 - Plague and mountain plover	
8 - Plague and prairie dogs	
8 - Scavenging and plague	
8 - Trout disease and stoneflies	
9 - Chagas disease in Brazil	
10 - Fire ants and wildlife	
11 - Pesticides and intoxication	
13 - Bats limit arthropods	
13 - Bats limit insects	
13 - Beehive-elephants	
14 - Plague and vector control	
14 - Tick control	

Graduate students also must conduct an independent research project. The independent research project is to develop a wildlife management plan that favors the survival and/or reproduction of one species of vertebrate wildlife via manipulation of arthropods. For example, the plan could be based on habitat manipulation that enhances the insect-based food supply, reduces the mortality of wildlife due to pesticides, or reduces the impacts of blood feeding arthropods or the disease causing agents they transmit. Prior approval of the research topic from the instructor is required. This project should be limited to about 5 typewritten pages. The paper is due on the last day of classes, immediately preceding the start of the final exam period.

**COURSE COMMUNICATIONS:** Please contact me at my email address ([Capinera@ufl.edu](mailto:Capinera@ufl.edu)) rather than through the Sakai course management system.

**REQUIRED TEXT:** Capinera, J.L. 2010. Insects and Wildlife. Arthropods and their Relationships with Wild Vertebrate Animals. Wiley-Blackwell, Oxford, UK.

**ADDITIONAL RESOURCES:** All other materials are provided via the eLearning site.

**COURSE DESCRIPTION:** Insects and other arthropods and their relationships with wild vertebrate animals.

**PREREQUISITE KNOWLEDGE AND SKILLS:** This is an introduction to entomology that focuses on the interrelationships of insects and vertebrate animals. Some background in biology is useful, but there are no prerequisites. If you have not taken an entomology course, you should enroll in ENY 3002L or

ENY5006L, the introductory entomology laboratory, while enrolled in 'Insects & Wildlife'. This will give you hands-on experience with insects, and will enhance your diagnostic abilities.

**PURPOSE OF COURSE:** This course has several purposes: (1) to introduce students who are mostly interested in vertebrate animals (wildlife) to the importance of smaller, oft overlooked, but ecologically important invertebrates, mostly insects; (2) to introduce students to vertebrate animals that interact with arthropods (mostly insects); (3) to learn how insects are managed, and how vertebrate animals can be positively or negatively affected by the various practices.

**COURSE GOALS AND/OR OBJECTIVES:** By the end of this course, students will develop an understanding of the ecological relationships of arthropods and pesticides with natural resources, particularly the roles of arthropods as food, nuisance pests, vectors of animal disease, and in natural resource and wildlife conservation. Students will be able to identify the groups of insects (and other arthropods) that are most important as food, nuisance pests, and vectors of animal disease. They will learn methods of arthropod diet assessment and know how different methodologies affect the outcomes of research. They will learn how arthropod populations can be manipulated to favor wildlife, and will create a wildlife management plan that applies the principals and practices provided in the course.

#### **HOW THIS COURSE RELATES TO THE STUDENT LEARNING OUTCOMES:**

Biology students – will develop competence in the basic terminology, concepts, methodologies and theories used within the biological sciences; and will develop ability to analyze biological information and develop reasoned solutions to problems.

Wildlife biology students – will develop knowledge of scientific, social and ethical arenas of wildlife ecology and conservation; skills for critical reasoning in conservation management; knowledge of Florida wildlife species and their biology, ecology, natural history and behavior; principles and applications of wildlife management practices, population dynamics and habitat management; and application of biological principles to solve problems in wildlife conservation and preserve biological diversity.

Entomology students - will allow students to demonstrate knowledge of insects, other arthropods and/or nematodes, including their relationship with the environment and humans

**TEACHING PHILOSOPHY:** Students learn best when they are interested in the subject. Although this is an introductory entomology course, it has as its focus the elements of entomology that are most important to students who are interested in wildlife biology and management, ecology, and conservation. Thus, students will be presented with why certain insects are important, and how human actions can enhance or diminish vertebrate animal populations via insect manipulation.

**INSTRUCTIONAL METHODS:** The class is entirely on-line, but you also are responsible for the material in the textbook. You should view the lectures and read the text in the order shown in the class outline. You should also view the video clips, which serve to illustrate the items discussed. Each test will be available for at least 3 days, so you have some latitude as to when you take the test. There are 3 required tests, plus an optional insect identification test. On-line tutorials are provided to allow you to gain extra credit via the optional identification test. Graduate students have additional requirements (readings and a term paper), as shown below.

#### **COURSE POLICIES:**

**ATTENDANCE POLICY:** There is no attendance policy, but it will be difficult to pass the course unless you read the book carefully, and listen to the lectures.

**QUIZ/EXAM POLICY:** You have only one chance to take each test, so prepare in advance. Please take tests using a reliable computer and connections. Contact me in advance if there will be a problem with the dates of the scheduled tests.

**COURSE TECHNOLOGY:** You will need computer access to the UF Sakai eLearning site to see the course contents and take the tests.

#### **UF POLICIES:**

**UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:** Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at

<http://www.dso.ufl.edu/students.php>.

NETIQUETTE: COMMUNICATION COURTESY: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. [Describe what is expected and what will occur as a result of improper behavior]

<http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf>

## GETTING HELP:

For issues with technical difficulties for E-learning in Sakai, please contact the UF Help Desk at:

- [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu)
- (352) 392-HELP - select option 2
- <https://lss.at.ufl.edu/help.shtml>

Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS when the problem was reported to them. The ticket number will document the time and date of the problem. You MUST e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Other resources are available at <http://www.distance.ufl.edu/getting-help> for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints
- Library Help Desk support

Should you have any complaints with your experience in this course please visit <http://www.distance.ufl.edu/student-complaints> to submit a complaint.

## GRADING POLICIES:

Students are responsible for the content of the lectures and textbook. Graduate students also must submit a research project and read assigned journal articles. The course grade is based on performance on the 3 exams (and the project, if graduate level). Note that the material in the journal articles assigned to graduate students will be included in the tests taken by graduate students, but not by undergraduates). The exams and project are weighted equally (33.3% each for

undergrads, or 25% each for grads). The final grade, based on accumulation of points, will be assigned as:

A=>93%

A-=90-92.9

B+=87-89.9

B=83-86.9

B-=80-82.9

C+=77-79.9

C=73-76.9

C-=70-72.9

D+=67-69.9

D=63-66.9

D-=60-62.9

E=<60

Grade point equivalencies for grades are found at:

<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>