

ENY 6215
Biological Control of Weeds

Course Syllabus
Fall 2004

Instructor

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Course Description (FAMU General Catalog 2004-2006)

Principles of biological control. Examples of invertebrates and vertebrates, and terrestrial and aquatic weeds currently being treated or under study for treatment with biological control agents will be discussed. Invertebrate agents will be emphasized, but vertebrates and pathogens also will be included.

Prerequisites

General Entomology (ENY 3004) or consent of instructor. Students are encouraged to have taken insect ecology and insect classification.

Course Overview

This course (3 credit hours) is designed to train students in the basic principles of biological control, using examples from select groups of pests. It will be taught to include the importance of biological control in the ever expanding use of integrated pest management (IPM) in modern agriculture as well as in the environment. The course will include lectures, a term paper will be assigned for completion during the semester, and a one hour seminar will be required on the same topic. There will be one or more field trips to biological control facilities in Florida. Students must participate fully in all class activities.

Course Goals

The primary goal of the course is to develop knowledge concerning biological control practices to enable students to evaluate ongoing programs and to be able to work in the field of biological control. In addition, students will be taught to understand the significance of biological control in

IPM. Course should also provide an overview of biological control in nature and the use of this strategy to control insect pests and weeds.

Student Objectives

At the conclusion of this course, students should be able to:

1. Discuss and understand application of the basic principles of biological control.
2. Understand how such applied ecology fits into the modern IPM approach to the management of agricultural and environmental systems.
3. Perform techniques used in various fields of biological control.
4. Express abilities in evaluating and presenting seminars.
5. Demonstrate ability to produce a scientifically researched term paper.

Course Requirements

- a. Students are expected to attend class and participate fully in all class activities. Refer to Class Attendance Regulations described in the Florida A&M University 2004-2006 General Catalog, page 34, column 1 and reproduced below.
- b. Attendance may be taken at either the beginning or the end of the class. Failure to be present for either or both will be noted as an unexcused absence. If for some reason, you are not able to attend, please notify the instructor.
- c. Some field classes may be held at the project sites. Transportation for field trips will be provided.
- d. Students are expected to comply with all university, college and division policies and codes, not limited to but including those set forth in the current university catalog.
- e. Pagers, radios, telephones and other disruptive devices are generally not permitted in class; exceptions to this rule are made on a case-by-case basis.

Class Attendance Regulations (Source: Florida A&M University 2004-2006 General Catalog, page 34, column 1)

Students are responsible for all assignments, quizzes, and examinations at the time they are due and may not use their absence from class as a plea for extensions of time to complete assignments or for permission to take make-up examinations or quizzes.

Class attendance is very important. It is expected that the students will attend class on a regular basis and that the assigned reading material will be read prior to coming to class. The class attendance regulations will apply to all students as follows.

Class attendance is compulsory for all students. A student will be permitted one unexcused absence per credit hour of the course he or she is attending. A student exceeding the number of unexcused absences will be dropped from the course and assigned the grade of “F”. Students may be readmitted to the class with the dean’s and the instructor’s permission.

Student Instruction Interaction

One of the best tools of learning process is effective in-class and out-of-the-class interaction between the student and the instructor. This is your course, my major interest is to make this course useful to you. I welcome questions, suggestions and discussions. Ask questions and clarify concepts before it is too late (i.e. before exams). Do not miss classes and attend review sessions, if any.

Outside Project

Each student will complete an individual project (based on discussions with the instructor) and will write a 10-15 pages term paper on a selected topic. This paper will be of publishable quality. Each student will present a 40 minute long seminar with 10 minutes of questions and discussions on the topic of the term paper. Students will participate in questions and discussions in each session.

Exams

One quiz will be given to prepare students for the exams to be given later. Three (3) exams will be given. Exam questions will be essay type and short answer. Multiple choice and filling the blank exams will also be included. All exams will be cumulative. Tentative exam dates are shown in this syllabus. Each student is required to take the final exam on the date scheduled by the University.

Testing and Grading:

The evaluation of the student performance will be based on a combination of class participation, three exams, a comprehensive final exam, a class term project (which includes a written report and paper presentation). The term project will require both team and individual work.

Exam I	20%
Exam II	20%
Exam III	20%
Term Paper	10%
Seminar	5%
Quiz	5%

Final Exam	<u>20%</u>
	100%

Your final grade will be determined by matching your final average with the following scale: 90 and above is A, 80-89 = B, 70-79 = C, 60-69 = D and below 60 is F.

Make up Work

You must make arrangements, in advance, for any exam for which you know you will not be present. If, in my judgment, the reason for such absence is genuine, I may allow you to take an essay type exam PRIOR TO scheduled exam. However, I must point out to you that equivalent exams are difficult to make. An exam missed for unexpected cause may be made up, at my discretion, provided (i) the reason is sound and (ii) you notify me or the departmental secretary at least the morning of the exam (limit ONE exam).

Enhancement Activities

The research project which will result in a term paper should benefit the student in preparation for writing a thesis or future publications. Participation in a seminar will assist students in developing abilities to speak before an audience, and to evaluate and critique other presentations. The field trips to selected facilities will give students first-hand experience in ongoing biological control research.

Teaching Methodology

Lectures and supplemental materials will be provided by the instructor as well as guest lecturers from other institutions. Lectures will consist of verbal and visual media presentations. Field trips to project sites may be a necessary part of this course. Teaching methodology will include lectures, class discussions, PowerPoint presentations, demonstration materials, and problem solving. A variety of resources will be used throughout the course. At the end of the course, during the last week of classes, each student will make an in-class report on his or her research and turn in a written report. Classroom time for discussion and review of course content is included at the end of the semester, prior to the final exam.

Required Textbook

Paul Debach, 1964. Biological Control of Insect Pests and Weeds. Chapman & Hall, 1th ed., 844 pp.

Varley, Grawell & Hassell. 1973. Insect population Ecology. An analytical approach. University California Press, 212 pp.

Van Driesche, R. G., and T. S. Bellows, Jr. 1996. *Biological Control*. Chapman & Hall, New York, NY &, Xii + 539 pp. 1st ed. ISBN 0-412-02861

Reading List

Scientific articles supplied to the class, textbook references on reserve.

Additional Resources: A huge amount of information on biological control is available on the Internet

at: <http://www.bio-control.com/>;

http://www.elsevier.com/wps/find/journaldescription.cws_home/622791/description;

<http://www.pestanimal.crc.org.au>;

<http://nematode.unl.edu/wormepns.htm>

Bibliography

Barbosa, P. (ed.). *Conservation Biological Control*. Academic Press, San Diego, California, 424 pp.

Bellows, T. S, T. W. Fisher (eds.). 1999. *Handbook of Biological Control: Principles and Applications of Control*. Academic Press, San Diego, California. 1046 pp.

Delfosse, E. S., and R. R. Scott (eds.). 1992. *Biological Control of Weeds: Proceedings of the VIII International Symposium on Biological Control of Weeds*, Lincoln University, Canterbury, New Zealand, 2-7 February 1992. CSIRO Publishing, Melbourne, Australia. 735 pp.

Deloach, J. C. 1997 *Biological Control of Weeds in the United States and Canada*. Chap. 13, pp. 173-204. *In* Luken, J. O. and J. W. Thieret (eds.). *Assessment and Management of Plant Invasions*. Springer-Verlag, New York, New York, 456 pp.

Harris, P. 1991. *Classical Biocontrol of Weeds: Its Definition, Selection of Effective Agents, and Administrative-Political Problems*. *Can. Entomol.* 123: 827-849.

Julien, M., and G. White. 1997. *Biological Control of Weeds: theory and practical application*. Australian Centre for International Agricultural Research, Canberra, Australia. 192 pp.

Lawton, J. H. 1990. *Biological Control of Plants: A Review of Generalizations, Rules, and Principles Using Insects as Agents*. FRI Bulletin, Forest Research Institute, New Zealand Forest Service 155, pp. 3-17.

Moran, V. C., and J. H. Hoffmann (eds.). 1996. *Proceedings IX International Symposium on biological control of weeds: 19-26 January 1996, Stellenbosch, South Africa*. University of Cape Town, Rondebosch, South Africa. 563 pp.

Newman, R. M., D. C. Thompson, and D. B. Richman. 1998. Conservation strategies for the biological control of weeds. Chap. 20. pp 371-396. *In* Barbosa, P. (ed.). *Conservation Biological Control*. Academic Press, San Diego, California, 424 pp.

Rees, N. E., P. C. Quimby, G. L. Piper, E. M. Coombs, C. E. Turner, N. R. Spencer, and L. V. Knutson (eds.) 1996 *Biological Control of Weeds in the West*. Western Society of Weed Science, Bozeman, Montana.

Rosen, D., F. D. Bennett, and J. L. Capinera, (eds.). 1994. *Pest Management in the Subtropics, Biological Control - a Florida Perspective*. Intercept Limited, Andover, UK. 737 pp.

Simberloff, D., D. C. Schmitz, and T. C. Brown. 1997. *Strangers in Paradise, Impact and Management of Nonindigenous Species in Florida*. Island Press, Washington. 467 pp.

Seminar Topics

1 - Using both positive and negative cases of biological control defend the continued use of biological control and discuss methods to avoid calamity or failure in the future.

2 - Pros and cons of multiple introductions of agents against pests (all at the same time) or (in succession).

3 - What advantages and disadvantages do users of biological control in foreign countries have, compared with U.S. biological control professionals. Cite at least two or three examples in each category (i. e. advantages and disadvantages)

4 - Citing at least three examples of problems in recent biological control projects, discuss how you would modify the protocols to address these problems and/or to eliminate them.

5 - Controversy over use of biological control at all - defend the use of biological control in sensitive areas (for example Hawaii).

Tentative lecture schedule

Date	Topics
August 25	Scope and Significance of Biological Control
27	History of Biological Control
29	Fundamental Steps in Biological Control
September 01	Labor Day
03	Fundamental Steps in Biological Control
05	Fundamental Steps in Biological Control
08	Fundamental Steps in Biological Control
10	Quiz 1
12	Theories and Mechanisms of Natural Population Regulation
15	Theories and Mechanisms of Natural Population Regulation
17	Biotic vs Abiotic Factors in Biological Control
19	Biological Characteristics of Natural Enemies
22	Exam 1
24	Developmental Stages of Natural Enemies
26	Nutrition of Entomophagous Insects and Their Hosts
29	Natural Enemy Collection, Culture, and Colonization

- October 01 Exploration for Natural Enemies
- 03 Quarantine Theory and Practice
- 06 Quarantine Theory and Practice
- 08 Manipulation of Entomophagous Insect
- 10 Manipulation of Entomophagous Insect
- 13 Use of Insect Pathogens in Biological Control
- 15 Natural Enemies Behavior and Ecology
- 17 Natural Enemies Behavior and Ecology
- 20 **Exam 2**
- 22 Importation, Augmentation, and Conservation in Biological Control
(*Dr. Susie Legaspi*)
- 24 Importation, Augmentation, and Conservation in Biological Control
(*Dr. Susie Legaspi*)
- 27 **No- Class ESA Meeting**
- 29 **No- Class ESA Meeting**
- 31 Biological Control of Weeds (*Dr. Stephen Hight*)
- November 03 Biological control of Weeds (*Dr. Stephen Hight*)
- 05 Biological control of Weeds
- 07 The Role of Taxonomy in Biological Control
- 10 Culturing Entomophagous Insects
- 12 Risk Assessment (*Dr. Kenneth Bloem*)
- 14 Evaluation of Biological Control with Experimental Methods
- 17 Current Issues in Biological Control
- 19 Studies in Global Case Histories (Field project)
- 21 Studies in Global Case Histories (Field project)
- 24 Special Topics - Transgenic Crops/Natural Enemies

26	Seminar Preparation
28	Thanksgiving
December 01	Student Presentation
03	Student Presentation
05	Review (Last Day of Class)
8-12	Final Exams