

BIO 455/555 BIOLOGICAL INVASIONS

Instructor

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Course Objectives

Biological Invasions is listed within Area V (Ecology) of the School of Biology and Ecology curriculum. Joining this class is expected to contribute to student understanding of the interactions of organisms and their environments and the consequences of these interactions for population, community, and ecosystem dynamics. Specific objectives to be met by taking this course include being able to describe biotic and abiotic factors that influence the dynamics of populations and to use ecological principles to explain the consequences of human activity (current economic and social issues). Students completing Biological Invasions will also improve the array of the tools for life-long learning and should be able to demonstrate the ability to use resources at hand to gather information, clearly articulate questions and answers to others, and assess the accuracy of science reports presented in the media.

The students completing this course are expected to

- Know theoretical bases of invasion biology
- Understand mechanisms behind species establishment in non-native areas
- Understand the impacts of exotic organisms at the population and ecosystem levels
- Appreciate economic and sociopolitical issues surrounding exotic species
- Know alternative approaches to managing invasive species

Assigned readings

Additional reading will be assigned when a given topic is presented. Reading materials will be placed on reserve in the library. Students are expected to read **all** assigned materials. I do not intend to talk at length about material that is presented clearly in the assigned readings. If something remains unclear after reading a particular publication, please ask me for clarification.

General Course Description

In an increasingly global society, virtually no areas remain sheltered from invasion by alien species. Currently, invasion by alien species is recognized as one of the major environmental problems worldwide. Failure to address this issue may have dire consequences, including disruption of vital ecological processes, loss of agricultural, forestry, and fishery resources, and epidemics of serious diseases within human populations.

This course is designed to serve as an introduction to invasion biology, a rapidly growing area of applied biology. It is assumed that the students have already taken a course in introductory ecology and are familiar with basic ecological concepts. In this course, students will learn about the mechanisms of natural and human-mediated biological invasions, their consequences from ecological, economic, political, and ethical perspectives, and review management options available for prevention and/or mitigation of the negative impacts of invasive species. The intent is that a strong foundation in ecological principles will lead to an

understanding of what causes biological invasions and what are the possible ways of dealing with them.

Attendance

Students are expected to attend **all** class sessions. Unexcused absence from tests will result in a **zero grade**. Make-up examinations will be allowed only by previous arrangement. If you are too ill to take a test, please contact instructor by phone or e-mail before the test and arrange to have a doctor's note confirming your illness. Lecture sessions will start on time. Late entry into the classroom is distracting to other students and the instructor. If you have a disability for which you may be requesting an accommodation, please contact Ann Smith, Director of Disabilities Services, 121 East Annex, 581-2319, as early as possible in the term.

If you have a question during the lecture, ask it. It is highly likely that other students may have the same question or a similar question. If something remains unclear after I have lectured on a topic, please ask me for clarification.

Grant proposal

Students taking this course for graduate credit are expected to write a short (no more than 8 double-spaced pages) grant proposal on a topic of their choice related to biological invasions. The whole class will be then divided into two grant panels. Each panel will review the submitted proposals, rank them, and decide which ones are worth being funded.

Course Requirements for Undergraduate Credit (BIO455)

Hour examinations (three @ 25 points ea.).....	75
Invasive species fact sheet.....	15
Grant panel participation.....	10
Total points.....	100

Course Requirements for Graduate Credit (BIO555)

Hour examinations (three @ 22 points ea.).....	66
Graduate project.....	10
Grant proposal.....	20
Grant panel participation.....	4
Total points.....	100

Fact sheets will be graded based on their factual accuracy, completeness of coverage, clarity, and design. Grant panel participation will be graded based on thoroughness of review, as well as on logic and quality of reviewer's comments. Graduate project will be graded based on creativity, relevance, knowledge of the subject, and ability to engage audience in a meaningful exchange of opinions.

(100-90=A, 89-80=B, 79-70=C, 69-60=D, 59-0=F)

Please remember that examinations are based on material given **both in lectures and assigned readings**.

Date **Topic**

Module I. Nature on the move and nature out of place.

14-Jan	Introduction to the course.
16-Jan	Natural invasions.
18-Jan	Accidental introductions by humans.
21-Jan	No class -- Martin Luther King Day
23-Jan	Deliberate introductions by humans.

Module II. Biology and ecology of invaders.

25-Jan	Characteristics of successful invasive species. Part I.
28-Jan	Characteristics of successful invasive species. Part II.
30-Jan	Genetic processes in biological invasions. Guest lecture by Dr. Rhymer.
1-Feb	Temporal dynamics of invasions.
4-Feb	Patterns and dynamics of spatial spread of exotics.
6-Feb	Exam I.

Module III. Ecosystem impacts of exotic species.

8-Feb	Community and ecosystem - structure and function. Part I.
11-Feb	Community and ecosystem - structure and function. Part II.
13-Feb	Biodiversity and biological invasions.
15-Feb	Ecosystem invasibility.
18-Feb	Biotic resistance and biotic facilitation.
20-Feb	Changes caused by invaders. Part I.
22-Feb	Changes caused by invaders. Part II.

Module IV. Current state of affairs.

25-Feb	Pathogen invasions. General aspects of epidemics and epizootics.
27-Feb	Human invasions.
29-Feb	Tsetse fly movie.
	Spring break
17-Mar	Plant invasions. Guest lecture by Dr. Campbell.
19-Mar	Fungal invasions. Guest lecture by Dr. Annis.
21-Mar	Impacts of an invasive fish at multiple levels of ecological organization. Guest lecture by Dr. Simon.
24-Mar	Deep Sea Invasion movie.
26-Mar	Managing invasive species on Midway Atoll. Guest lecture by Christy Finlayson.
28-Mar	Exam II.

Module V. Managing biological invasions.

31-Mar	Predicting invasions.
2-Apr	Biological control. Part I.

- 4-Apr Biological control. Part II.
- 7-Apr Cane Toads movie.
- 9-Apr Other control methods.
- 11-Apr Prevention of undesirable introductions and regulatory control.
- 14-Apr Purging Spurge movie and discussion.
- 16-Apr Graduate student project.

Module VI. Biological invasions and human society.

- 18-Apr Economic impacts of invasions.
- 21-Apr Public perception of alien species.
- 23-Apr Ethical issues in dealing with biological invasions.
- 25-Apr Grant panel meeting I.
- 28-Apr Grant panel meeting II.
- 30-Apr **No class -- Maine Day**
- 2-May General discussion. What's wrong with exotic species, anyway? And who are we to decide?

Finals
week

Exam III