

Ecology and Restoration of Invaded Ecosystems

FOR 6934 (3 credits) Fall, 2011

Course Description

This advanced course will explore the ecological basis of biological invasions, with emphasis on plant invasions in managed forests and natural ecosystems. Management tools and techniques will be discussed, along with the restoration of formerly invaded systems. Plant invasions from Florida and around the world will be used as case studies. It will be based on an online discussion format, with recorded lectures and relevant assigned readings from a textbook and primary literature. The course is designed for graduate students in the online program in Ecological Restoration and those with a strong background in ecology and plant science.

Instructor(s)

Primary Instructor:
Donald Hagan, PhD Candidate SFRC
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Co-instructor:
Kimberly Bohn, Asst. Professor SFRC
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Learning Outcomes

At the end of this course, each student will:

- Demonstrate an understanding of the biology and ecology of plant invasions
- Be able to critically assess theories related to invasion mechanisms, competition and ecological succession
- Identify major invasive plant species of concern and their ecological impacts in managed forests and natural, terrestrial ecosystems
- Understand how to use modern tools and techniques to predict/combat plant invasions and restore invaded ecosystems

Readings

Texts

1. Invasion Ecology. JL Lockwood, MF Hoopes and MP Marchetti. 2007. Blackwell Publishing, 303 p. (**Required**).

2. Conceptual Ecology and Invasion Biology: Reciprocal Approaches to Nature. MW Cadotte, SM McMahon and T Fukami. 2006. Springer, 507 p. (**Required**).

Readings (available in Sakai, under “Lessons”)

1. Callaway RM, Bedmar EJ, Reinhart KO, Gomez-Silvan C, and Klironomos J. 2011. Effects of soil biota from different ranges on *Robina* invasion: acquiring mutualists and escaping pathogens. *Ecology* 92(5): 1027-1035.
2. Catford JA, Vesk PA, White MD and Wintle BA. 2011. Hotspots of plant invasion predicted by propagule pressure and ecosystem characteristics. *Diversity and Distributions*
3. Collins AR, Jose S, Daneshgar P and Ramsey CL. 2007. Elton’s hypothesis revisited: an experimental test using cogongrass. *Biological Invasions* 9:433-443.
4. Davis et al. 2011. Don’t judge species on their origins. *Nature* 474: 153-154.
5. Ewel JJ and Putz FE. 2004. A place for alien species in ecosystem restoration. *Frontiers in Ecology and the Environment* 2(7):354-360.
6. Gosper CR, Stansbury CD and Vivian-Smith G. 2005. Seed dispersal of fleshy-fruited invasive plants by birds: contributing factors and management options. *Diversity and Distributions* 11, 549-558.
7. Hobbs RJ, Arico S, Aronson J, Baron JS, Bridgewater P, Cramer VA, Epstein PR, Ewel JJ, Klink CA, Lugo AE, Norton D, Ojima D, Richardson DM, Sanderson EW, Valladares F, Vila M, Zamora R and Zobel M. 2006. Novel ecosystems: theoretical and management aspects of the new ecological world order. *Global Ecology and Biogeography* 15:1-7.
8. Kettenring KM and Reinhardt-Adams C. 2011. Lessons learned from invasive plant control experiments: a systematic review and meta-analysis. *Journal of Applied Ecology* 48:970-979.
9. Lonsdale WM. 1999. Global patterns of plant invasions and the concept of invasibility. *Ecology* 80:1522-1536.
10. McGlone CM, Sieg CH and Kolb TE. 2011. Invasion resistance and persistence: established plants win, even with disturbance and high propagule pressure. *Biological Invasions* 13: 291-304.
11. Peterson AT, Papes M and Kluza DA. 2003. Predicting the potential invasive distributions of four alien plant species in North America. *Weed Science* 51:863-868.
12. Seastedt TR, Hobbs RJ and Suding KN. 2008. Management of novel ecosystems: are novel approaches required. *Frontiers in Ecology and the Environment* 6: 547-553.
13. Simberloff D. 2011. How common are invasion-induced ecosystem impacts? *Biological Invasions* 13:1255-1268.

Class Format and Policies

You have signed up for an on-line course. In that regard, the method of delivery will be quite different from your normal lecture-based classroom experience. Most weeks, **students will be assigned 2 readings**: usually a chapter from one of the required texts, and a relevant peer-reviewed journal article of the instructors' choosing. A short (approximately 20 minute) "primer" lecture to introduce the topic will be provided, and the instructors will lead a weeklong discussion on it. **The lecture will be posted each Monday afternoon. Discussion questions will also be posted on Mondays, with follow-up questions and comments posted throughout the week. To facilitate participation, discussions will be asynchronous, that is, they will use a message board format (as opposed to a live "chat room").**

A separate discussion, focusing on the journal article, will be led by a different graduate student, with assistance from the instructors, each week. Typically these additional readings will build on topics introduced in the lectures and/or present a case study of relevant invasive plant research.

NOTE: Discussion questions are intended to stimulate conversation and debate and encourage you to explore more deeply into the topics covered in the week's readings. In many cases, there will not be a clear "right" or "wrong" answer.

Throughout the semester, lectures and readings will be supplemented with brief (~10 minute) video podcasts or narrated powerpoint slides on invasion topics relevant to the state of Florida. These will be led by Dr. Kimberly Bohn and other invasion ecology experts.

Assignment and attendance policy: Since this is an online course, "attendance", in the traditional sense, is not required. However, a major portion of the grade for this course will be based on participation in the discussion forum, and all students are expected to contribute each week. In the event of an illness or other emergency, students will be excused from one week of participation contingent upon arrangement with the instructors. Written assignments are due electronically by noon (Eastern time) on the due date and will lose 10% of the grade for each day they are late (weekends count too). In cases of extended illness or emergencies, arrangements to turn in late exams or other written assignments must be made with the instructor prior to the due date.

Assignments and Evaluation of Student Learning

Since this course will be based largely on a discussion format, participation in weekly discussion sessions will constitute a major portion of the final grade. **Students will be expected to contribute at least two thoughtful, well-researched questions or comments in each discussion (i.e. 2 for the instructor-led discussion and 2 for the graduate student-led discussion, for a total of 4/week). Failure to do so will result in a loss of up to 3.3 points from the participation grade, each week (see grading breakdown, below).** For the student-led discussions, the discussion leader will be expected to read the article (and supporting literature, as necessary) and lead a discussion on the most important topics covered in it. This will involve providing a brief summary, asking and answering questions, and generally facilitating a productive online dialogue between students. All students are

required to read the article. The discussion leader should initiate the discussion no later than Wednesday at noon (Eastern time).

The remainder of the grade will come from the midterm and final exams. For the exams, students will be held responsible for all material covered in lectures, assigned readings and video podcasts/narrated powerpoints. They will be short answer and essay format and require an advanced-level understanding of invasion ecology, with particular emphasis on theory. Exams will be take home/open book and students will be given 5 days to complete them. Prior to each exam, we will hold an online, synchronous review session using the “Chat Room” tool in Sakai.

The grading breakdown will be as follows:

40 points	Participation in weekly discussion sessions (3.3 points/week x 12 weeks w/discussions)
10 points	Journal article discussion (each student required to lead 1 discussion)
20 points	Midterm exam (open book, take home)
30 points	Final exam (comprehensive, open book, take home)

Total: 100 points

Grading Scale (<http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html>)

Points	Grade
90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
<60	F

Schedule of Class Topics (with required readings)

Introduction

Week 1: Introduction (no required readings)

- A. Overview of course, brief lecture, and introduction to e-learning
- B. Assign readings for semester.

Recommended reading:

Davis et al. (2011)

Theories and Mechanisms

Week 2: Invasibility and Invasiveness

- A. Chapter 4, Cadotte et al.
 - B. Lonsdale (1999)
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Week 3: Vectors and Pathways

- A. Chapter 2, Lockwood et al.
 - B. Gosper et al. (2005)
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Week 4: Propagules and propagule pressure

- A. Chapter 4, Lockwood et al.
 - B. Catford et al. (2011)
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Week 5: Disturbance

- A. Chapter 5, Lockwood et al.
 - B. McGlone (2011)
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Week 6: Biotic interactions

- A. Chapter 6, Lockwood et al.
 - B. Collins et al. (2007)
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Week 7:

MIDTERM EXAM

Week 8: Ecological processes

- A. Chapter 15, Cadotte et al.
 - B. Callaway et al. (2011)
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Week 9: Ecological interactions involving invasive species

- A. Chapter 10, Cadotte et al.
 - B. Chinese privet (*Lygodium* spp.) case study podcast – Dr. Bohn
 - C. Simberloff et al. (2011)
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Week 10: Novel ecosystems

- A. Chapter 20, Cadotte et al.
 - B. Hobbs et al. (2006)
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Management and Restoration of Invaded Systems

Week 11: Prediction and Risk Assessment

- A. Chapter 12, Lockwood et al.
 - B. Peterson et al. (2003)
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Week 12: Management Tools and Techniques

- A. Japanese climbing fern (*Lygodium japonicum*) case study podcast and lecture – Dr. Bohn
- B. Seastedt et al. (2008)

Week 13: Restoration of Invaded Systems

- A. Coral ardisia (*Ardisia crenata*) case study podcast and lecture – G. Celis
- B. Ewel and Putz (2004)

Week 14: Restoration of Invaded Systems (cont.)

- A. Cogongrass (*Imperata cylindrica*) case study podcast & lecture – D. Hagan
- B. Kettenring and Reinhart-Adams (2011)

Week 15: Synthesis and Review

Week 16:

FINAL EXAM

Additional References

Atlas of Florida Vascular Plants: <http://florida.plantatlas.usf.edu>

Florida Exotic Pest Plant Council (FLEPPC): <http://fleppc.org>

UF Center for Aquatic and Invasive Plants: <http://plants.ifas.ufl.edu>

Other Information**Academic Honesty, Software Use, UF Counseling Services, Services for Students with Disabilities**

In 1995 the UF student body enacted a new honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

In adopting this honor code, the students of the University of Florida recognize that academic honesty and integrity are fundamental values of the university community. Students who enroll at the university commit to holding themselves and their peers to the high standard of honor required by the honor code. Any individual who becomes aware of a violation of the honor code is bound by honor to take corrective action. The quality of a University of Florida education is dependent upon community acceptance and enforcement of the honor code.

The Honor Pledge: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied: **“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior.

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

(Source: 2011-2012 Undergraduate Catalog)

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. Both the Counseling Center and Student Mental Health Services provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health Services is located on the second floor of the Student Health Care Center in the Infirmary.

- *University Counseling Center*, 301 Peabody Hall, 392-1575, www.counsel.ufl.edu
- *Career Resource Center*, CR-100 JWRU, 392-1601 ext: 0, www.crc.ufl.edu/

- *Student Mental Health Services*, Rm. 245 Student Health Care Center, 392-1171, www.shcc.ufl.edu/smhs/

Alcohol and Substance Abuse Program (ASAP)

Attention Deficit Hyperactivity Disorder (ADHD)

Center for Sexual Assault / Abuse Recovery & Education (CARE)

Eating Disorders Program

Employee Assistance Program

Suicide Prevention Program

Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

0001 Reid Hall, 392-8565, www.dso.ufl.edu/drc/