
Description: Mechanisms and hypotheses to explain non-native plant invasions. Impacts of invasions on communities and ecosystems, including natural and agricultural areas, management approaches, and design and analysis of experiments. Offered spring term in even-numbered years.

Biological invasions are second only to habitat destruction in causing declines in native species and are currently cited as one of the primary drivers of global environmental change. However, non-native species invasions also provide unique opportunities for testing basic theories in ecology and evolution. In this course we will review the process and underlying mechanisms of plant invasions, effects of invasions on communities and ecosystems, and management techniques. The focus will be on conceptual frameworks, research approaches, and the overall process of 'doing' science.

Time and Location: Tuesdays 9:35-10:25 (period 3)
Thursdays 9:35-11:30 (periods 3-4)
McCarty B 3108

Instructor: S. Luke Flory
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Required Text: There is no required text for this class.

Suggested Texts: Lockwood, J.L., M.F. Hoopes, and M.P. Marchetti (2007). *Invasion Ecology*. Malden, MA: Blackwell Publishing. ISBN: 1405114185
(on reserve) Davis, M.A. (2009). *Invasion Biology*. Oxford, UK: Oxford. ISBN: 0199218757
Fifty Years of Invasion Ecology: The Legacy of Charles Elton. (2011). Edited by D.M. Richardson. Oxford, UK: Wiley-Blackwell. ISBN: 1444335863
Conceptual ecology and invasion biology: reciprocal approaches to nature. (2006). Edited by M.W. Cadotte, S.M. McMahon, and T. Fukami. ISBN: 1402041586

Reading List: The readings for this course will vary depending on the interests and experience of the students but will focus on primary literature in invasion ecology such as:

Bradley, B.A., D.M. Blumenthal, et al. (2010). "Predicting plant invasions in an era of global change." *Trends in Ecology and Evolution*. 25:310-318.

- Colautti, R.I. and H.J. MacIsaac. (2004). "A neutral terminology to define 'invasive' species." Diversity and Distributions. 10:135-141.
- Davies, K.W. and R.L. Sheley. (2007). "A conceptual framework for preventing the spatial dispersal of invasive plants." Weed Science. 55:178-184.
- Diez, J.M., H.L. Buckley, et al. (2009). "Interacting effects of management and environmental variability at multiple scales on invasive species distributions." Journal of Applied Ecology. 46:1210-1218.
- Funk, J.L. and P.M. Vitousek. (2007). "Resource-use efficiency and plant invasion in low-resource systems." Nature. 446:1079-1081.
- Gaskin, J.F. and B.A. Schaal. (2002). "Hybrid *Tamarix* widespread in the U.S. invasion and undetected in native Asian range." Proceedings of the National Academy of Sciences. 99:11256-11259.
- Hawkes, C.V., I.F. Wren, et al. (2005). "Plant invasion alters nitrogen cycling by modifying the soil nitrifying community" Ecology Letters 8:976-985.
- Leger, E.A. and K.J. Rice. (2003). "Invasive California poppies (*Eschscholzia californica* Cham.) grow larger than native individuals under reduced competition." Ecology Letters. 6:257-264.
- Moles, A.T., H. Flores-Moreno, et al. (2012). "Invasions: the trail behind, the path ahead, and a test of a disturbing idea." Journal of Ecology. 100:116-127.
- Orrock, J. L., M. S. Witter, et al. (2008). "Apparent competition with an exotic plant reduces native plant establishment." Ecology **89**(4): 1168-1174.
- Parker, I.M., S. Simberloff, et al. (1999). "Impact: toward a framework for understanding the ecological effects of invaders." Biological Invasions. 1:3-19.
- Santos, M.J., L.W. Anderson, and S.L. Ustin. (2011). "Effects of invasive species on plant communities: an example using submersed aquatic plants at the regional scale." Biological Invasions. 13:443-457.
- Sax, D.F., J.J. Stachowicz, et al. (2007). "Ecological and Evolutionary insights from species invasions." Trends in Ecology and Evolution. 22:465-471.
- Thomsen, M.S., J.D. Olden, et al. (2011). "A broad framework to organize and compare ecological invasion impacts." Environmental Research. 111:899-908.

Course Objectives:	<p>Upon completion of this course, students should be able to:</p> <ol style="list-style-type: none"> 1. Explain the history of invasion ecology. 2. Outline the stages of the invasion process. 3. Describe and critically evaluate the hypotheses to explain biological invasions. 4. Summarize the effects of invasions on communities and ecosystems. 5. List the possible management strategies for invasions and their pros and cons. 6. Design experiments to test mechanisms and impacts of invasions. 7. Synthesize, critique, and write about primary literature. 8. Discuss literature with fellow scientists and orally present to a group. 9. Prepare a paper for publication in a peer-reviewed journal.
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Attendance: You are expected to attend all classes and arrive on time. Your participation is part of your grade. Please discuss planned absences with me ahead of time.

Grades: Your grade will be based on presentation of a lecture, literature discussions and written synopses, and a semester- long experiment. There will be no exams. Discuss with me ahead of time any anticipated problems with meeting deadlines.

Task	Description	Points	Total
Lecture	Outline and meeting with instructor Presentation of lecture	5 20	25
Literature discussions	Lead discussion Synopses Participation	5 4 x 5 pts 10 pts	35
Experiment	Prospectus Analysis plan Presentation	10 10 20	40
Class total: 100			

Grades will be assigned using the following scale:

94-100 = A; 90-93 = A-; 87-89 B+; 83-86 = B; 80-82 = B-; 77-79 = C+; 73-76 = C;
70-72 = C-; 67-69 = D+; 63-66 = D; 60-62 = D-; < 60 = E.

Tentative Schedule *potential student-lecture topics

Wk	Date	Topic	Assignment due
1	1/7	Introduction of class, instructor, and participants; form groups	
	1/9	Experimental design, discussion of projects	
2	1/14	History of invasion ecology, terminology, definitions	
	1/16	Stages of the invasion process, literature discussion	
3	1/21	Presentation & discussion of ideas for projects	Project proposals (oral, 15 min)
	1/23	No class – group project work day	
4	1/28	*Dispersal – vectors, pathways	
	1/30	Literature discussion	Prospectus (written, 2-3 pgs)
5	2/4	*Establishment, abiotic factors – disturbance, heterogeneity	
	2/6	Literature discussion	
6	2/11	*Establishment, biotic factors – diversity, enemies	
	2/13	Literature discussion	
7	2/18	*Spread of invasions	
	2/20	No class – group project work day	
8	2/25	*Evolution	
	2/27	Literature discussion	
9	3/11	*Impacts of invasions - communities	
	3/13	Literature discussion	
10	3/18	*Impacts of invasions – ecosystem processes	
	3/20	Literature discussion	
11	3/25	*Predicting invasions – early detection, rapid response, modeling	
	3/27	Literature discussion	
12	4/1		
	4/3		
13	4/8		Analysis plan (written)
	4/10		
14	4/15		
	4/17		
15	4/22	Project presentations	Presentation (oral)

Assignments:

Lectures & discussions: Each class member will lead one lecture and discussion and write synopses for 4 of the discussion articles for the course. Lecture and discussion leaders will need to select 1-3 articles from the recent literature on their topic for the whole class to read. Send me a pdf file or url link to the article at least one week in advance for posting on Sakai. Leaders will also want to select additional readings on their topic as background for preparing the lecture and leading discussion. Feel free to see me for lecture and article ideas and/or use the ISI Web of Science database or Google Scholar. Further instructions will be provided in class.

Experiment: Instead of exams, group experiments are included in this course as an opportunity for exploration of special areas of interest, reinforcement of principles in invasion ecology, and honing of skills in experimental design, data collection, analysis and interpretation, working collaboratively, and presentation of results. These experiments have the potential to produce publishable work and may result in presentations at scientific meetings. Together we will decide on groups of 2-4 students with mutual interests. Working in groups will keep everyone's time investment down and is great training in working collaboratively, an increasing trend in ecological science. Further details will be provided in class.

Missed Assignments: Please contact me as soon as possible if you do not expect to complete assignments on time so that we can agree on a revised due date or schedule make-up work.

Grading policy: Information on current UF grading policies for assigning grade points can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Academic Honesty: In 1995 the UF student body enacted an 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.

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."**

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office.

(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: Resources are available on-campus for students having personal problems or Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides 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.

1. *University Counseling & Wellness Center*, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwcl, Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library, Training Programs, Community Provider Database
2. *Career Resource Center*, First Floor JWRU, 392-1601, www.crc.ufl.edu/

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, 352-392-8565, www.dso.ufl.edu/drc/