

URBAN ECOLOGY 11:216:487 – SPRING 20XX

Dr. Myla Aronson

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Tuesdays: 10:55am-1:55pm, Hickman 205

Required Text and Readings

- Gaston, K.J. 2010. *Urban Ecology*. Cambridge University Press, New York. ISBN: 978-0-521-743479-5
- Various papers throughout the semester. TBA

Course Description

Urban landscapes are rapidly expanding globally and over 50% of the human population now lives in urban areas. Because the majority of human settlements are in areas of high biodiversity, the rapid urbanization of the world has profound effects on global biodiversity. Urban Ecology is a seminar course, with a mix of lecture and discussion, where we will focus on the processes determining patterns of abundance and distribution of organisms in urban ecosystems, the interactions among organisms in the urban environment, the interactions between humans (and societies) and nature in urban environments, and some aspects of urban planning as it relates to ecology and the environment. This course will meet once a week for three hours and will be offered for 3 credits. There will be some field trips.

Pre-requisites: Principles of Ecology (11:704:351), or Plant Ecology (11:704:332), or equivalent. No pre-requisites for graduate students.

Course Objectives and Learning Goals:

By the end of the course the successful student will be able to:

1. *Understand and discuss how humans are components of urban ecosystems.*
2. *Understand and discuss how urban ecosystems function, the response of plants and animal to urban environments, the ecology of community interactions in urban systems, and how urban areas affect local, regional, and global biodiversity patterns.*
3. *Read, interpret, and synthesize primary literature on urban ecology.*
4. *Effectively communicate scientific knowledge*
5. *Make scientifically informed decisions about societal issues related to urban areas.*

Assignments/Responsibilities and Assessment:

In order to assess completion of the above learning goals, students will be expected to:

- Lead Discussion (20% undergraduates/ 20% of graduate students final grade): Two times (10% each) during the semester each student will lead discussion on a primary literature paper. This assignment will assess students' ability to *read, interpret, and synthesize primary literature on urban ecology* and *their ability to effectively communicate scientific knowledge*.
- Discussion Summaries (10% undergraduates/ 10% graduate students final grade).
- Exams (20% of undergraduates/ 10% of graduate students final grade): There will be two exams in this course (15% each). A mid-term exam and a final exam. Exams will be in

essay format. These exams will assess students' understanding of *humans as components of urban ecosystems, how urban ecosystems function, the response of plants and animal to urban environments, the ecology of community interactions in urban systems, and how urban areas affect local, regional, and global biodiversity patterns.*

- In-Class Presentation (30% of undergraduates/ 20% of graduate students final grade): At the end of the semester students will present on a topic of their choice within urban ecology to the class in PowerPoint format. We will develop and discuss that topic during the first half of the semester. This presentation not simply regurgitation of the literature, but a critical review of the subject. Students will be required to submit 10 references for their presentation by April 1. This assignment will assess students' ability to *read, interpret, and synthesize primary literature on urban ecology, effectively communicate scientific knowledge, and make scientifically informed decisions about societal issues related to urban areas.*
- Participation (20% of undergraduates/ 20% of graduate students final grade): Students are expected to be prepared for each class meeting and participate in each discussion. Participation will assess their ability to *understand and discuss humans as components of urban ecosystems, how urban ecosystems function, the response of plants and animal to urban environments, the ecology of community interactions in urban systems, and how urban areas affect local, regional, and global biodiversity patterns.* Participation will also assess students' ability *effectively communicate scientific knowledge.*
- Grant Proposal (20% of final grade, graduate students only): Graduate students will write a grant proposal on a topic in urban ecology. More information on this later. This assignment will assess students' ability to *read, interpret, and synthesize primary literature on urban ecology and effectively communicate scientific knowledge*

Assessment Scale

All assignments are due at the beginning of class. 5% will be deducted for each day that the assignment is late. No extra credit will be awarded, but students are encouraged to submit work early for initial comments. To be fair, I ask that any requests for a grade change must be in writing. Grade scale: 100-90%= A, 87-89%= B+, 80-87%= B, 77-79%= C+, 70-75%= C, 66-69%= D+, 60-65%= D, <60%= F.

Attendance and Participation

As this course is largely a discussion based course, students are required to attend all course meetings and be prepared so that they can effectively participate in each class meeting. If a student is going to miss a meeting, they must to let me know BEFORE the class meets. We will arrange an assignment to make-up for missing class. If a student misses more than three course meetings (for whatever reason), they will automatically drop one letter grade.

Academic Honesty

Plagiarism is the most common form of cheating (intentionally or not). Students are expected to understand what constitutes plagiarism and are expected to avoid it. If a student is caught plagiarizing, they will be penalized. All sources must be provided. If a student is caught plagiarizing from another student – both students will be penalized.

Preliminary Schedule (Primary literature readings will be added)

Week	Date	Topics	Readings	Assignments
1	January 21	Introduction to urban ecology	Gaston Chapter 1 McKinney 2002	
2	January 28	Urbanization patterns	Gaston Chapter 2 Seto et al. 2012 Cadenasso et al. 2007	
3	February 4	Urban environments and ecosystem functions	Gaston Chapter 3 McDonnell et al. 1997 Manes et al. 2012	
4	February 11	Responses of organisms to urban habitats	Gaston Chapter 4 Parker & Nilon 2008 Duncan et al. 2011	Online Discussions
5	February 18	Urban Biodiversity – Patterns and drivers, Plants	Gaston Chapter 5, 6 Aronson et al. 2014 Hahs et al. 2009 Williams et al. 2009	
6	February 25	No Class		Online Discussions
7	March 4	Urban Biodiversity – Patterns and drivers, Animals	Gaston Chapter 5, 6 Niemela & Klotze 2009 Davies et al. 2012 Hedblom & Soderstrom 2010	
8	March 11	Urban socio-ecological linkages	Gaston Chapter 8 McHale et al. 2013 Kinzig et al. 2005	Online Discussions
9	March 25	Parks, natural areas and conservation in urban areas	Gaston Chapters 7, 10 Goddard et al. 2010 Shackleton & Blair 2013	Mid-term exam
10	April 1	Monitoring, management and restoration of biodiversity	Gaston Chapter 11 (pages 263-269) Chapter 7, pages 144-146 Nilon 2011 Handel et al. 2013	Mid-term due
11	April 8	Urban planning and design – Guest Speaker – Steven Handel	Gaston Chapter 11 Ignatieva et al. 2011 McIvor & Lundholm 2011	References due Online Discussions
12	April 15	Urban Futures Climate Change and	Gaston Chapter 12 Solecki & Marcotullio	

		Urbanization	2013 Mantyka-Pringle et al. 2014	
13	April 22	Field Trip – Duke Farms		
14	April 29	Presentations		Final Exam - TBA

Reading List

- Aronson, M.F.J. *et al.* in press. A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Academy B*.
- Cadenasso, M.L., S.T.A. Pickett, and K. Schwarz. 2007. Spatial heterogeneity in urban ecosystems: reconceptualizing land cover and a framework for classification. *Front. Ecol. Environ.* 5: 80-88.
- Davies, T.W., J. Bennie, and K.J. Gaston. 2012. Street lighting changes the composition of invertebrate communities. *Biology Letters* 8:764-767.
- Goddard, M. A., A. J. Dougill, and T. G. Benton. 2010. Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology & Evolution* 25: 90-98.
- Groffman *et al.* 2004. Nitrogen fluxes and retention in urban watershed ecosystems. *Ecosystems* 7: 393-403.
- Hahs, A.K. *et al.* 2009. A global synthesis of plant extinction rates in urban areas. *Ecology Letters* 12: 1165-1173.
- Duncan, R.P. *et al.* 2011. Plant traits and extinction in urban areas: a meta-analysis of 11 cities. *Global Ecology and Biogeography* 20: 509-519.
- McDonnell *et al.* 1997. Ecosystem processes along an urban-to-rural gradient. *Urban Ecosystems* 1: 21-36.
- McHale, M.R., D.N. Bunn, S.T.A. Pickett, and W. Twine. 2013. Urban ecology in a developing world: why advances socioecological theory needs Africa. *Frontiers in Ecology and the Environment* 11: 556-564.
- McKinney M.L. 2002. Urbanization, biodiversity, and conservation. *BioScience* 52:883-890.
- Niemelä, J., and D.J. Klotze. 2009. Carabid beetle assemblages along urban to rural gradients: A review. *Landscape and Urban Planning* 92:65-71.
- Nilon, C.H. 2011. Urban biodiversity and the importance of management and conservation. *Landscape and Ecological Engineering* 7:45–52.
- Parker, T.S. and C. Nilon. 2008. Gray squirrel (*Sciurus carolinensis*) density, habitat suitability, and behavior in urban parks. *Urban Ecosystems* 11(3):243-255.
- Seto, K.C. B. Guneralp, and L.R. Hutyrá. 2012. Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *PNAS* 109: 16083–16088.
- Williams, N.S.G. *et al.* 2009. A conceptual framework for predicting the effects of urban environments on floras. *Journal of Ecology* 97: 4-9.

Optional Readings

- Grimm, N.B. *et al.* 2000. Integrated approaches to long-term studies of urban ecological systems. *BioScience* 50: 571-584.
- Niemelä, J. 1999. Ecology and urban planning. *Biodiversity and Conservation* 8:119–131.

- Pickett, S.T.A. *et al.* 2001. Urban ecological systems: linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. *Annu. Rev. Ecol. Syst.* 32: 127-157.
- Pickett, S.T.A. *et al.* 2008. Beyond urban legends: an emerging framework of urban ecology, as illustrated by the Baltimore ecosystem study. *Bioscience* 58: 139-150.
- Pickett, S.T.A. *et al.* 2011. Urban ecological systems: Scientific foundations and a decade of progress. *Journal of Environmental Management* 92:331-362.
- McDonnell, M.J., and A.K. Hahs. 2008. The use of gradient analysis studies in advancing our understanding of the ecology of urbanizing landscapes: current status and future directions. *Landscape Ecology* 23: 1143-1155.
- Tzoulas, K., and P. James. 2010. Making biodiversity measures accessible to non-specialists: an innovative method for rapid assessment of urban biodiversity. *Urban Ecosystems* 13:113–127.