

Biology 262/Env 274, Fall 2014 M/W 3:05--4:20, BioSci 130
Cities and Trees/People, Plants, and Pollution/Constructed Climates
Prof. Will Wilson, wgw@duke.edu, BioSci 250
Office Hours: M 10-1/W 11-1
TA: Erin McKenney, eam50@duke.edu, BioSci 311

With most Americans living in cities or suburbia, an understanding of urban environments becomes more important for making good decisions concerning our future needs. My service on a few of Durham's city and county commissions led to the realization that I needed more information to make a more compelling argument for greater public spending on trees and urban nature. What are the unique features of urban environments? What role does "nature" play in cities? What financial arguments underpin allocating public funds to parks and greenspace versus schools and security? What good are urban trees? Do urban trees capture much carbon while considering their costs? Do urban trees help cool the city? Does urban nature improve citizens' lives? Do all socioeconomic groups have equal access to "urban open space"?

As a result of seeking answers to those questions, I developed this course and the accompanying book. In this course we will learn about the environmental properties of cities, including urban heating and cooling, pollution and health, energy and carbon, air and water quality, economic value, and health and welfare socioeconomic inequities. Sadly, we won't solve issues like global warming or preserving clean water and air, but we will learn about the essential environmental science underpinning the choices we face.

I expect students to prepare for class by finishing the required readings as outlined in the syllabus below. These readings come from the book I wrote, *Constructed Climates* (available at Duke Bookstore and freely available on the web at constructedclimates.org), and a primary publication (or two) relevant to the daily lecture topics.

Each class meeting begins with an eight-minute timed writing based on a prompt from the assigned readings. Your advance preparation will reduce our reliance on the specifics of lectures and allow for more discussions and clarifications of that material, as well as discussion of related topics.

Your course grade involves exams, quizzes, and reading summaries:

3 Exams	25% each
Timed Writings	25%

Timed Writings can not be made up, but the lowest **two** scores will be dropped. With a prior Dean's excuse for missing class, an alternative timed writing prompt may be taken **during office hours (and with prior notice) within one week after missing the quiz**.

Bio262/Env274, Fall 2014 Course Schedule: (vers. 8/21/2014)

Meeting #:Date Reading (Ch:Fig)	Topics
1: M 8/25	Introductions; Outline; Grading; Cheating Policy; Overview
2: W 8/27 A:1-6; 1:1-7 Pozzi & Small 2005	People and Land Use Human densities; Regulation and Limitation; Demographic transition; Land use change
3: M 9/1 1:1-7 Godfray et al. 2010	Food Factors Harvesting vs. Farming; Modern agriculture; Net primary productivity; evapotranspiration; yield; nitrogen; watersheds
4: W 9/3 1:8-12 Arnold & Gibbons 1996	Pavement and Precipitation Imperviousness; stormwater; precipitation; peak discharge/baseflow, water cycle, runoff; erosion/sedimentation
5: M 9/8 Booth 1991 Sweeny et al. 2004	Pollution and Streams causes of impairment, emissions, pollutants, cars, nutrients, pharmaceuticals, bioaccumulation, thermal pollution, groundwater
6: W 9/10 2:1-3,7-9 Imhoff et al. 2010	Urban Heat Islands Impervious surfaces; thermal mass; albedo/shading; solar/light energy; blackbody radiation
7: M 9/15 2:4-6,11 Dixon & Mote 2003	Urban Storms atmosphere; UHI-induced storms; lightning; urban rain; absorption, scattering, and greenhouse effect
8: W 9/17 1:8,10 Faeth et al. 2011	Animals and Cities populations vs urbanization; lyme disease; stream organisms; mercury; PAHs; SE agriculture; thermal pollution
9: M 9/22 2:10,12-18 Kleerekoper et al. 2012	Reducing Urban Heat tradeoffs; physiology:crowns/DBH; scaling; transpiration; permeable paving
10: W 9/24 Meyer et al. 2003 Collins et al. 2010	Stormwater Control Measures Headwater streams, riparian buffers, infiltration, low impact development; green roofs; street sweeping
11: M 9/29	EXAM I

<p>12: W 10/1 3:1-4 Trenberth et al. 2009</p>	<p>US Energy Use energy sources and uses; units; urban E use; air conditioning; energy and economy</p>
<p>13: M 10/6 3:5-9 Bonan 2008</p>	<p>Carbon Cycle and Climate Change carbon cycle; pools/fluxes; CO₂ levels; soils; climate change; Milankovitch cycles; sea level rise; phenology; urban/rural differences</p>
<p>14: W 10/8 3:10-13 Jenerette et al. 2011</p>	<p>Trees, Energy, and Carbon air conditioning; stored/sequestered carbon; wood equivalents; photosynthesis; light and Ch-<i>a</i>; NPP; nutrients and trophic cascades; footprints/carbon budget</p>
<p>M: 10/13</p>	<p><i>FALL BREAK</i></p>
<p>15: W 10/15 3:14-17 Shashua-Bar et al. 2011</p>	<p>Conserving Energy landscaping C budget; wood heat; energy budget; urban E use; white roofs; trees/energy reduction; solar equivalents</p>
<p>16: M 10/20 4:1-7 Hyslop 2009</p>	<p>Emissions and Ozone NO_x; VOCs; ozone formation; troposphere/stratosphere; temperature effects; emissions; biogenic/anthropogenic</p>
<p>17: W 10/22 4:7-12 Kuttler & Strassburger 1999</p>	<p>Pollution and Temperature downwind ozone; coal-burning plants; NO_x and VOCs; emissions and weather; pollution and temperature; 1hr/8hr measures</p>
<p>18: M 10/27 4:2,10-14 McDonald et al. 2007</p>	<p>Urban Air and Regulations urban vs. rural levels; ozone damage to plants; traffic issues; smog</p>
<p>19: W 10/29</p>	<p>EXAM II</p>

<p>20: M 11/3 5:1,2 Luck et al. 2011</p>	<p>Behavior and Public Goods tragedy of the commons; over-harvesting; public goods model; ecosystem services</p>
<p>21: W 11/5 5:1-7 Lee et al. 2008</p>	<p>Ecosystem Valuation value; property values; ecosystem services; biodiversity; lyme disease example; WTP/WTA; air quality; stated/revealed values</p>
<p>22: M 11/10 5:3,4,8-12 Wolfe & Mennis 2012</p>	<p>Preferences and Social Value neighborhood trees; park preferences; public housing; vegetation and violence; child development; stress; obesity</p>
<p>23: W 11/12 6:1-4 Byrd & Joad 2006</p>	<p>Health Consequences of Heat and Air Pollution heat, air quality, and mortality; asthma and ozone; MI/pneumonia; PM2.5</p>
<p>24: M 11/17 6:5-7 Barreca et al. 2012</p>	<p>Comparing Populations demographic changes; standard mortality</p>
<p>25: W 11/19 6:8-11 Boone et al. 2009</p>	<p>Provisioning People with Parks socioeconomic distributions; environmental inequities: heat, vegetation, parks; Gini coefficient</p>
<p>26: M 11/24 6:12-14 Ezzati et al. 2008</p>	<p>Poverty, Pollution, and Pavement environmental inequities: pollution, health, life expectancy; SAT scores; New York; Durham</p>
<p>W 11/26</p>	<p><i>THANKSGIVING BREAK</i></p>
<p>27: M 12/1</p>	<p>Review</p>
<p>28: W 12/3</p>	<p>Exam III</p>
	<p><i>NO FINAL EXAM</i></p>