

## ENV 341 – Urban Forests as Social-Ecological Systems

### Autumn 2017: SYLLABUS

**Professor:** Jess Vogt – Please call me “Jess”! ☺

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Office: McGowan South 203 G

Class: Tues/Thurs 11:20 am – 12:50 pm McGowan South, Room 401

Lab: Thurs 8 am\* – 11 am

\*Note that on select Thursdays, we may leave campus as early as 7:30. See Calendar for details.

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### ABOUT THE PROFESSOR

#### Biography:

I am a sustainability scientist and teacher-scholar passionate about creating spaces in which everyone can find their place to contribute to creating a world where all can thrive and flourish. As an Assistant Professor in the Department of Environmental Science and Studies in the College of Science and Health at DePaul University, I teach sustainability science, urban forestry, and mixed methods courses on social-environmental systems, and collaborate with students to do research in the Lab for Urban Forestry in the Anthropocene (LUFA; [www.lufa-depaul.org](http://www.lufa-depaul.org)). My research seeks to answer the question, **How can we create more resilient communities of humans and nature?** I consider myself a social-ecological systems and sustainability scientist and my research is anchored in the idea that we cannot study systems of nature without also studying the concentric social, economic, and institutional systems of people. For the past several years, my research has examined the social and ecological impact of the coproduction of the urban forest by nonprofit organizations and neighborhood groups in 5 U.S. cities (Atlanta, Detroit, Indianapolis, Philadelphia, and St. Louis), funded by a grant I managed from the U.S. Forest Service. Most recently, I have been investigating the connections between urban forestry research, practice, and education, and broader sustainability initiatives. I received my Ph.D. in Environmental Science (concentration in urban forestry and urban ecology), Master of Public Affairs (concentration in sustainable development), and Master of Science in Environmental Science (concentration in applied ecology) from the School of Public and Environmental Affairs (SPEA) at Indiana University (Bloomington Indiana USA). I attended Lawrence University (Appleton Wisconsin USA) for undergrad, majoring in Environmental Studies and Biology. In addition to my academic appointment at DePaul, I maintain an affiliation as a Researcher with the Bloomington Urban Forestry Research Group (BUFRG; [www.indiana.edu/~cipec/research/bufrg\\_about.php](http://www.indiana.edu/~cipec/research/bufrg_about.php)) at Indiana University, I am an Associate Editor for the journals *Urban Forestry and Urban Greening* and *Forestry*, Vice Chair of the Science and Research Committee of the International Society of Arboriculture, and a Returning Fellow/Mentor for the Byron Fellowship transformational sustainability leadership program.

#### Communication Philosophy:

In order to make this a successful a learning experience for all of us, I am available to meet with students outside of class as much as possible. Therefore:

- I am in my office (203 G) or lab (217) on most weekdays between 9am and 5pm and my door is always open. Please feel free to stop by anytime with questions, comments or concerns about the class, or even just to chat!
- Email me or talk to me before or after class if you want to schedule an appointment.
- Feel free to call or text me on my cell phone (920-850-2016) during reasonable hours with questions or concerns. If you leave a voicemail, I'll get back to you.

## BASIC COURSE INFORMATION

### Course Description:

Urban forests include all the trees, forests, and greenspaces in cities and towns. Urban forest management, or urban forestry, is the discipline/profession that seeks to plan and manage this green infrastructure in order to provide ecological, economic, and social benefits to all residents. Trees and vegetation have long been protected and planted in cities and towns for a variety of reasons. Recently, urban forestry has expanded to be a lead focus in the broader arena of urban ecology and urban ecosystem management, with a clear goal of creating sustainable ecosystems. This course will look at urban forests through the lens of social-ecological systems (SESs) of linked human and natural components, with a focus on teaching students the basic skills of urban forest management. The course will utilize the talents of a number of guest speakers and field exercise facilitators who are professionals in urban forestry to give students a practical, real world introduction to the subject. The DePaul University campus and the City of Chicago and surrounding region will serve as our field laboratory to view an actively managed urban forest.

### Course Objective:

By the end of this course, you will be a knowledgeable resident of the urban forest social-ecological system. Through a combination of close reading of the urban forestry literature, discussion with experts in the field, and selected field exercises, we will learn to apply the principles of urban forest management to real world cases.

### Learning Outcomes:

To achieve the above course objective, we will work our way through seven learning outcomes:

1. Become familiar with the concept of cities as social-ecological systems (SESs), and the roles of trees and urban forests in urban SESs
2. Acquire an understanding of sustainability as it pertains to urban forests and urban forestry programs in modern cities, towns, communities and neighborhoods
3. Become and advocate for the urban forest by acquiring an understanding of the benefits and costs of street trees and urban forests to cities and towns
4. Develop a familiarity with urban governance and planning systems (including local, state and national) and their impact on the urban forest and how it is managed
5. Acquire a working knowledge of tree biology and street tree planting and maintenance strategies
6. Develop skills in street tree and urban forest inventory and analysis
7. Engage in a practical urban forest case study project with a benefit to a community partner

## COURSE MATERIALS

### Required Reading:

Reading List: There is no textbook required for this course. Throughout the term, ***required reading for class will be posted to D2L under the Content modules by topic*** and identified by author's names and years and title (e.g., Konijnendijk et al, 2006, Defining urban forestry). Full citations are listed in the Reading List at the end of this Syllabus.

What's in the News: In addition to assigned readings, we will also keep ourselves aware of what's going on in the news related to urban forestry. Most Mondays at the beginning of class, I will ask, "What's in the News" and students will have an opportunity to report about what they've read in the news. There are two additional assigned "texts" to this end:

- *The Nature of Cities* (<http://www.thenatureofcities.com>) is an excellent collective blog that has posts by researchers and practitioners on the subject of greening in cities, environmental justice, urban planning and development for nature, and more.
- Alliance for Community Trees (ACTrees; website: <http://actrees.org>)—a nonprofit organization of urban forestry and greening organizations under the banner of the Arbor Day Foundation—sends out a weekly email blast of urban forestry-related news, entitled, “Treebune News” (<http://actrees.org/news/newsletter-archive/>).

**Please subscribe to both of these websites' email newsletters** and scan them weekly to keep abreast of the urban forestry news. You might also have your own favorite sources for “green” news in cities. I encourage you to search further and bring anything interesting you discover to class.

#### **Recommended Tree ID Books:**

If you don't currently have a tree identification book that you like, the following guides are recommended: (The Williams book is my personal favorite; Harlow is a favorite of Chicago DOT Forester Jeff Brink.)

Williams MD (2007) **Identifying Trees: An All-Season Guide to Eastern North America.** Stackpole Books: Mechanicsburg, PA. 416pp. <http://www.amazon.com/Identifying-Trees-All-Season-Eastern-America/dp/0811733602>

Harlow WM (1959) **Fruit Key & Twig Key to Trees & Shrubs.** Dover Publications: New York. 56pp. <https://www.amazon.com/Fruit-Key-Twig-Trees-Shrubs/dp/0486205118>

#### **Course Technology:**

- **Desire2Learn (D2L, aka, Daylight) site** for ENV 341.
  - **Content:** Inside Content, there is a Module for each course Topic (see Calendar) that contains all readings for this topic, as well as a Module for each major type of assignment (Discussion Papers, Field Write-Ups, Class Project – see “Course Evaluation” below), that contains all assignment details, rubrics, Submissions links, and other helpful documents.
  - **Submissions:** where all assignment instructions will be posted and assignments will be submitted.
  - I will send class-related emails via D2L, so make sure your preferred email address is in the D2L system. See me if you're unsure how to make sure.
- **Microsoft Excel: You should be comfortable using equations and creating charts in Microsoft Excel. If you are not comfortable with these features of Excel, see the resources posted to D2L in Content >> Microsoft Excel.**

## **COURSE EVALUATION**

#### **Final Grade:**

Your final grade in the course will be based on a combination of participation in class (5%), discussion papers (40%), field exercise write-ups (30%), and a class project (25%). *Note that there are no exams or quizzes.* Your comprehension of readings, class lectures, and field exercises will be evaluated in the way you bring these materials and skills to bear in discussion papers and in the class project. **No extra credit is available.**

#### **Point Scale:**

The following point scale will be used to assign letter grades **with no exceptions:** A (92%-100%), A- (90%-91.9%), B+ (88%-89.9%), B (82%-87.9%), B- (80%-81.9%), C+ (78%-79.9%), C (72%-77.9%), C- (70%-71.9%), D (60%-69.9%), and F (0%-59.9%).

**Participation in (and Preparedness for) Class:**

You are expected to keep up with assigned readings and participate in class activities and discussion. Thus, your regular attendance and preparedness for class is expected.

**Discussion Papers:**

Four (4), 500-700-word discussion papers will be required of each student during the semester. The prompt for each will be introduced in class and posted to the D2L Submissions for each paper. Papers will be turned in via Submissions before class at 11:20 am on the day they are due. Discussion papers will ask you to think critically about the materials we've read for class, class lecture and discussion, and field exercises. A rubric for discussion papers is available in the Submissions tab for the papers.

Late discussion papers ***may*** be accepted if you ***notify me in writing in advance of the due date***. Extensions will be negotiated on a case-by-case basis as appropriate. ***Late discussion papers will not be accepted without advance notice in writing.***

**Field Exercises & Write-Ups:**

There will be several field exercises (some on campus, some to which we will travel using the ENV vans) during the scheduled lab time for this class (Thursday mornings 8-11 am). See the Calendar at the end of this syllabus for details and dates. Following each field exercise, you'll complete a set of questions (i.e., Field Write-Up) on the experience. These will be submitted via D2L before class on the Thursday following the field exercise.

***If you have a conflict with a scheduled field exercise date, please talk to me as soon as possible so we can work this out. You can make up a missed field exercise by attending one of the fall tree plantings put on by Openlands. See the Openlands website (and sign up for their CERVIS volunteer management software through which you can register to attend one of their public community tree planting events) for a list of planting dates and talk to me about this opportunity ASAP:***

<https://openlands.org/trees/forestry-events/>

A note about the ‘nature’ – pun intended! ☺ – of field exercises: Our field exercises will be excursions into the out of doors where we will measure trees, dig in the soil, use sharp tools to prune trees, pull invasive species, and other such activities normally undertaken by the professional urban forester – we will even climb<sup>1</sup> trees! ***So please come prepared:*** this means well-fueled and/or armed with snacks, bring a filled water bottle, dress in layers and for being outside according to the day's weather report, sunscreen, hats, raingear, and whatever else you need to be comfortable outside for several hours on fall mornings – *including being prepared for rain or shine* – and other such field work preparedness. You are all ENV folks so I assume you know the field trip drill, ***but if you have any questions or concerns, please talk to me ASAP!***

Finally, since this is a lab class, all students must complete a lab safety training. This will be available on D2L.

**Class Project:**

A significant portion of your final grade (and the time you invest in this course) will consist of the Class Project. This project will be your opportunity to work with a few of your peers to conduct a consultancy-style project with real benefits for local urban forest stakeholders. Details will be presented during week 2, but ***plan now for this taking a significant amount of out of class time during weeks 3-10.*** I will give you some time off of class and readings will be lighter during the second half of the course to accommodate for the extra time required of you.

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<sup>1</sup> Under supervision of professional arborists from Davey Tree, while wearing proper protective equipment.

## ADDITIONAL CLASSROOM POLICIES

### Email Etiquette:

I would prefer that you use email communication for all class business. This way, we all have a record of communications (and so I will remember when I agreed to meet with you, etc.! ☺). Please practice the following email etiquette, which you might find useful not just in this class, but in all your email communications.

- Use a short but descriptive subject line. ***Something more than just “ENV 341” is crucial.***
- Continue conversations about the same topic or question in the same email thread by *replying* to the email rather than creating a new message.
- Emails should be as brief as possible but also include sufficient information for me to know what you’re asking.
- See <http://emailcharter.org> for more suggestions on email etiquette to help keep our inboxes manageable.

### Minimum Technology Policy:

Because participation and engagement with one another is so important, I prefer not to have any technology – laptops, tablets, phones, etc. - in the classroom (unless I specifically ask you in advance to bring an internet-enabled device to class).

#### **Here's why:**

Studies have shown that allowing technology in the classroom is distracting and results in decreased student learning. Although we may think we are effectively “multitasking” when you’re simultaneously using multiple applications on our computers (or when you’re listening to class discussion and checking your email), you cannot truly do more than one thing at once. At best, “multitasking” results in what is called “fast switching,” or rapidly moving between separate activities, where at any instant all of your brain is only focused on one of the activities. Take it from Adam Gazzaley, MD, Ph.D., a professor of neuroscience at University of California, San Francisco (from his TED talk, <https://www.youtube.com/watch?v=tiANn5PZ4BI>):

*“With each switch, there is a time delay, and this leads to a cost and an impact on performance. You do not do two things as well as you do one thing, if you switch back and forth between them.”*

Technology is a type of distraction and interference that impairs long-term and short-term memory, and, ultimately, learning. ***For these reasons and others, technology – computers/laptops, tablets, cell phones, etc. – are discouraged in the classroom*** when not specifically asked for. With these distractions at a minimum, we will be able to more fully engage in the class, with each other and with the readings in class discussions and activities.

### Online Teaching Evaluations:

Instructor and course evaluations provide valuable feedback that can improve teaching and learning. The greater the level of participation, the more useful the results. As students, you are in the unique position to view the instructor over time. Your comments about what works and what doesn't can help faculty build on the elements of the course that are strong and improve those that are weak. Isolated comments from students and instructors' peers may also be helpful, but evaluation results based on high response rates may be statistically reliable. As you experience this course and material, think about how your learning is impacted.

Your honest opinions about your experience in and commitment to the course and your learning may help improve some components of the course for the next group of students. Positive comments also show the department chairs and college deans the commitment of instructors to the university and teaching evaluation results are one component used in annual performance reviews (including salary raises and promotion/tenure). The evaluation of the instructor and course provides you an opportunity to make your voice heard on an important issue – the quality of teaching at DePaul. ***Don't miss this opportunity to provide feedback.***

**Academic Integrity:**

DePaul University is a learning community that fosters the pursuit of knowledge and the transmission of ideas within a context that emphasizes a sense of responsibility for oneself, for others and for society at large. Violations of academic integrity, in any of their forms, are, therefore, detrimental to the values of DePaul, to the students' own development as responsible members of society, and to the pursuit of knowledge and the transmission of ideas. Violations include but are not limited to the following categories: cheating; plagiarism; fabrication; falsification or sabotage of research data; destruction or misuse of the university's academic resources; alteration or falsification of academic records; and academic misconduct. Conduct that is punishable under the Academic Integrity Policy could result in additional disciplinary actions by other university officials and possible civil or criminal prosecution. Please refer to your Student Handbook or visit Academic Integrity at DePaul University (<http://academicintegrity.depaul.edu>) for further details.

**Students with Disabilities:**

Students seeking disability-related accommodations are required to register with DePaul's Center for Students with Disabilities (CSD) enabling you to access accommodations and support services to assist your success. There are two office locations:

- Loop Campus – Lewis Center #1420 – (312) 362-8002
- Lincoln Park Campus – Student Center #370 – (773) 325-1677

Students are also invited to contact me privately to discuss your challenges and how I may assist in facilitating the accommodations you will use in this course. This is best done early in the quarter and our conversation will remain confidential.

**Writing Center:**

I strongly recommend you make use of the Writing Center throughout your time at DePaul. The Writing Center provides free peer writing tutoring for DePaul students, faculty, staff, and alumni. Writing Center tutors work with writers at all stages of the writing process, from invention to revision, and they are trained to identify recurring issues in your writing as well as address any specific questions or areas that you want to talk about. Visit [www.depaul.edu/writing](http://www.depaul.edu/writing) for more information.

**Dean of Students Office:**

The Dean of Students Office (DOS) helps students in navigating the university, particularly during difficult situations, such as personal, financial, medical, and/or family crises. Absence Notifications to faculty, Late Withdrawals, and Community Resource Referrals, support students both in and outside of the classroom. Additionally, they have resources and programs to support health and wellness, violence prevention, substance abuse and drug prevention, and LGBTQ student services. The Office is committed to your success as a DePaul student. Please feel free to contact them at <http://studentaffairs.depaul.edu/dos>.

**CALENDAR***Last updated: 9/8/17*

*Also listed in this Calendar are optional Saturday tree planting events led by Openlands at which Jess will be present as an Openlands TreeKeeper. More urban forestry events led by Openlands are listed at: <https://openlands.org/trees/forestry-events/>.*

<b>Topic*</b>	<b>Week</b>	<b>Day</b>	<b>Date</b>	<b>Assignment(s) due before class</b>	<b>Field exercise/Guest speaker and other special notes</b>
<i>*See D2L Content for PDFs assigned readings for each Topic. See Reading List (follows) for citations.</i>					
<b>Intro to Urban Forests (UF)</b>	<b>WEEK 1</b>	Thurs-class <i>(no full lab Week 1)</i>	Sept 7, <i>class from 8 am - 12:50 pm</i>		<i>Please look at D2L and get started on readings right away. In particular, take a look at the following (in suggested reading order) Konijnendijk et al. (2006) – read closely; Nowak &amp; Greenfield (2012) – great background on tree canopy trends; Clark et al. (1997) – skim this one; and Kenney et al. (2011) – print, read closely, and bring to class.</i>
		<i>Optional Saturday</i>	Sept 9		<i>Openlands Community Tree Planting: Hermosa (N Kilpatrick Ave &amp; W Parker Ave) – meet at 9 am – sign up at <a href="https://openlands.org/trees/forestry-events/">https://openlands.org/trees/forestry-events/</a> if interested</i>
<b>Tree Biology &amp; Identification</b>	<b>WEEK 2</b>	Tues	Sept 12		
		Thurs-lab	Sept 14, <i>meet in Loop by 8:30 am</i>		<i>Tree ID &amp; management tour with Jeff Brink (Chicago DOT) – Maggie Daley and Millennium Park: Meet downtown, at Columbus bridge at the upper level of Upper Randolph (coordinates: 41.884221, -87.620630) <b>by 8:30 am</b></i>
			Thurs-class		<i>Class will meet in a Loop campus classroom after the tree tour.</i>
<b>UF Benefits &amp; Costs</b>	<b>WEEK 3</b>	Tues	Sept 19		
		Thurs-lab	Sept 21	Tree Tour Write-Up	<b>Inventory with Jess around DePaul/Lincoln Park</b>
			Thurs-class		
		<i>Optional Saturday</i>	Sept 23		<i>Openlands Community Tree Planting: Ravenswood (2926 W Leland Ave) – meet at 9 am – sign up at <a href="https://openlands.org/trees/forestry-events/">https://openlands.org/trees/forestry-events/</a> if interested</i>
<b>Measuring the UF</b>	<b>WEEK 4</b>	Tues	Sept 26	Discussion Paper # 1	
		Thurs-lab	Sept 28	Tree Inventory Write-Up	<b>DePaul Campus Tree Inventory</b> ( <i>time to collect the data we need for the class project</i> ) <i>[Rain date for Tree ID walk with Jeff Brink]</i>
		Thurs-class			
	<b>WEEK 5</b>	Tues	Oct 3		<i>[No class – Jess is in Toronto for research]</i>
		Thurs-lab	Oct 5		<b>DePaul Campus Tree Inventory</b> ( <i>time to collect the data we need for the class project</i> )

	Thurs-class			
<b>Planning &amp; Policy</b>	<b>WEEK 6</b>	Tues	Oct 10	Discussion Paper #2  <b>Guest speaker: Daniella Perriera (Openlands)</b>
		Thurs-lab	Oct 12	<b>i-Tree Landscape with Margaret Abood (research assistant to Dr. Christie Klimas on a U.S. Forest Service subcontract):</b> Meet in TBD computer lab
		Thurs-class		[No class; lab will end at 11 am, so Jess can go to a Chicago Region Trees Initiative event to inventory trees in the Historic Pullman neighborhood in the afternoon. Let Jess know if you'd like to come along.]
	<i>Optional</i>	Saturday	Oct 14	<i>Openlands Community Tree Planting: Lakewood Balmoral (5526 N Magnolia Ave) – meet at 9 am – sign up at <a href="https://openlands.org/trees/forestry-events/">https://openlands.org/trees/forestry-events/</a> if interested</i>
<b>Maintenance</b>	<b>WEEK 7</b>	Tues	Oct 17	<b>Guest speaker re: pruning: Jerome Scott (Chicago Parks District)</b>
		Thurs-lab	Oct 19	<b>i-Tree Landscape Write-Up</b> <b>Pruning practical with Jerome Scott:</b> Meet at South Field in Lincoln Park (the area around the southern tip of the Zoo's pay parking lot) by 8:00 am
		Thurs-class		
	<b>WEEK 8</b>	Tues	Oct 24	Discussion Paper #3
<b>Threats to UF</b>		Thurs-lab	Oct 26, <i>leave at 7:30 am</i>	<b>Pruning Write-Up</b> <b>Arboriculture research with Dr. Jake Miesbauer (Morton Arboretum):</b> Meet by ENV vans at 7:30 am to drive to the Morton Arboretum and arrive by ~9:00 am; we'll return to campus by 12:50 pm.
		Thurs-class		
	<b>WEEK 9</b>	Tues	Oct 31	
		Thurs-lab	Nov 2, <i>leave at 7:30 am</i>	<b>Morton Arboretum Write-Up</b> <b>Construction on private property &amp; tree protection ordinances with Dr. Keith O'Herrin (Village of Highland Park):</b> Meet by ENV vans at 7:30 am to drive to Highland Park and arrive by ~8:30 am; we'll return to campus by 12:50 pm.
<b>UF Industry &amp; Profession</b>	<b>WEEK 10</b>	Tues	Nov 7	Discussion Paper #4  <b>Guest speaker: Dr. Keith O'Herrin</b> (Keith's dissertation research examined urban forestry as a profession)
		Thurs-lab	Nov 9, <i>9 am – 12:50 pm</i>	<b>Highland Park Write-Up</b> <b>Visit with industry employers &amp; climbing demonstration with Mark Noark &amp; local recruiters from Davey Tree Company:</b> Meet in DePaul Quad at 9 am – you will have the opportunity to climb trees so please dress appropriately and warmly since we will be outside for the duration
		Thurs-class		
<b>Class Projects</b>	<b>WEEK 11</b>	Tues	Nov 14	
	<b>FINALS WEEK</b>	Tues	<b>Nov 21, 11:30 am – 1:45 pm</b>	All Class Project materials due in class Presentation of Class Project to stakeholders

## COURSE READING LIST

**Draft – subject to change; last updated: 9/4/17**

All readings are posted on D2L in the content modules by **Topic**. Note that some of these readings are **required** and some are **optional** – see D2L for which articles to definitely read for each topic, what to pay close attention to in certain readings, and what to print and bring to class for class discussion.

Complete citations below. Number of pages in length for each reading is noted for convenience (e.g., **2pp.**).

### Intro to Urban Forestry

#### Defining the urban forest

Konijnendijk, C. C., Ricard, R. M., Kenney, A., & Randrup, T. B. (2006). Defining urban forestry – A comparative perspective of North America and Europe. *Urban Forestry & Urban Greening*, 4, 93–103. <http://doi.org/10.1016/j.ufug.2005.11.003>. **11pp.**

#### Urban ecosystems

Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X., & Briggs, J. M. (2008). Global change and the ecology of cities. *Science*, 319(5864), 756–60. <http://doi.org/10.1126/science.1150195>. **5pp.**

Nowak, D. J., & Greenfield, E. J. (2012). Tree and impervious cover change in U.S. cities. *Urban Forestry & Urban Greening*, 11(1), 21–30. <http://doi.org/10.1016/j.ufug.2011.11.005>. **10pp.**

Breen, J. (2016). See how Chicago has grown since 1830 – And what it could look like in 2030. *DNAinfo: Chicago*. Retrieved from <https://www.dnainfo.com/chicago/20160317/downtown/see-how-chicago-has-grown-since-1830-what-it-could-look-like-2030>. **1p.**

#### History of urban forestry

Ricard, R. (2005). Shade trees and tree wardens: revising the history of urban forestry. *Journal of Forestry*, 103(5), 230–233. **4pp.**

Gerhold, H. D. (2007). Origins of urban forestry. In J. E. Kuser (Ed.), *Urban and Community Forestry in the Northeast* (2nd ed., pp. 1–23). New York, NY: Springer. **23pp.**

#### Urban forest sustainability

Clark, J. R., Matheny, N. P., Cross, G., & Wake, V. (1997). A model of urban forest sustainability. *Journal of Arboriculture*, 23(1), 17–30. **14pp.**

Kenney, W. A., van Wassenaer, P. J. E., & Satel, A. L. (2011). Criteria and indicators for strategic urban forest planning and management. *Arboriculture & Urban Forestry*, 37(3), 108–117. **10pp.**

### Tree Biology

#### General tree biology & growth

Lilly, S. J. (2010). Chapter 1: Tree Biology. In *Arborists' Certification Study Guide* (pp. 1–19). Champaign, IL: International Society of Arboriculture. **19pp.**

USDA Forest Service. (2006). *How a Tree Grows* (No. FS-32, 2nd ed.). U.S. Department of Agriculture, Forest Service. **8pp.**

Struve, D. K. (2009). Tree establishment: A review of some of the factors affecting transplant survival and establishment. *Arboriculture & Urban Forestry*, 35(1), 10–13. **4pp.**

### Species accounts

- Culley, T. M., & Hardiman, N. A. (2007). The beginning of a new invasive plant: A history of the ornamental callery pear in the United States. *BioScience*, 57(11), 956–964.
- Chaney, W. R. (1993). *Acer saccharinum*: Silver maple: The “coyote of trees.” *Arbor Age*, 13(4), 31. **1pp.**

### **Urban Forest Benefits & Costs**

#### General benefits readings

- Willis, K.J., Petrokofsky, G. (2017). The natural capital of city trees. *Science*, 356(6336), 374–376.  
doi:10.1126/science.aam9724. **3pp.**
- Alliance for Community Trees. (2011). *Benefits of Trees and Urban Forests: A Research List*. College Park, MD. **19pp.** (including references)
- McPherson, G., Simpson, J. R., Peper, P. J., Maco, S. E., & Xiao, Q. (2005). Municipal Forest Benefits and Costs in Five US Cities. *Journal of Forestry*, 103(8), 411–416. **7pp.**
- McPherson, E. G., Simpson, J. R., Peper, P. J., Gardner, S. L., Vargas, K. E., Maco, S. E., & Xiao, Q. (2005). *Midwest Community Tree Guide: Benefits, Costs, and Strategic Planning* (NA-TP-05-05). Newtown Square, PA: USDA Forest Service Northeastern Area State and Private Forestry. Retrieved from [http://www.na.fs.fed.us/urban/treespayusback/vol1/Midwest Community Tree Guide final.pdf](http://www.na.fs.fed.us/urban/treespayusback/vol1/Midwest%20Community%20Tree%20Guide%20final.pdf). **90pp.** Read the Executive Summary and Chapter 2 in detail. Pay attention to the figures on p.22 & 27-28; skim the rest.

#### Ecological benefits

- Nowak, D. J., Hoehn, R., & Crane, D. E. (2007). Oxygen Production by Urban Trees in the United States. *Arboriculture & Urban Forestry*, 33(3), 220–226. **7pp.**
- Bowler, D. E., Buyung-Ali, L., Knight, T. M., & Pullin, A. S. (2010). Urban greening to cool towns and cities: A systematic review of the empirical evidence. *Landscape & Urban Planning*, 97(3), 147–155. <http://doi.org/10.1016/j.landurbplan.2010.05.006>. **9pp.**

#### Social benefits

- Kuo, F. E. (2003). The role of arboriculture in a healthy social ecology. *Journal of Arboriculture*, 29(3), 148–155. **8pp.**
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## **Urban Forest Planning & Policy**

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