DEPARTMENT OF CITY AND REGIONAL PLANNING
University of North Carolina at Chapel Hill

PLAN 641: ECOLOGY AND LAND USE PLANNING

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Office: New East 307

Fall 2017
12:30 – 1:45 M + W (New East 102)

http://sakai.unc.edu

Course Description

Ecology and Land Use Planning focuses on understanding the functions of ecosystems, the land development activities that impact such functions, and the land use management tools that can be used to create strategies for mitigating and restoring environmental damage. While urban land use change and environmental planning have many implications for ecological systems, water is increasingly becoming a key link between ecological health and quality and urban development. This course is a semester-long introduction to watershed planning, where we examine the functions of, threats to, and strategies for protecting watersheds and wetlands.

The impacts of urbanization on watershed health can be dramatic and potentially harmful to human interests, and include flooding and declining water quality. As development continues and low-density urban growth converts open space into impervious surfaces, it is imperative that decision makers, planners and citizens assess, monitor, and mitigate these effects. A key theme throughout the course will be to explore how the scientific knowledge of ecological relationships can be integrated into an environmental planning framework. The fundamental goal is to assure natural ecosystem integrity is sustained over the long-term, while accommodating human use and occupancy within natural ecological limits.

Course Objectives

Our mission in this course is to understand the ecological context of planning and how ecological principles – primarily concerning water – may inform planning decisions. By the end of the course, students should (1) understand key concepts in watershed planning and science relevant to planners, and (2) be able to apply watershed principles to real planning problems. Insightful solutions to ecological planning problems require that planners be able to synthesize in-depth ecological knowledge with a strong understanding of planning procedures, economic and infrastructural constraints, and social priorities. This course seeks to prepare planners to engage effectively with biologists, natural resource managers, park managers, and other professionals from the natural sciences. Students with a natural science background will benefit from reflecting on the potential and limitations of drawing on ecological knowledge to address real planning problems. This course also places an emphasis on written, visual, and oral communication, with the aim of preparing students to collaborate with other specialists such as hydrologists, civil engineers, ecologists or other relevant professionals. By the end of the course, students will have:

1) Developed a firm grasp of the quantitative, spatial, and qualitative techniques relevant to urban watershed planning;
2) Applied watershed assessment techniques to evaluate existing conditions and estimate the impacts of future development;
3) Evaluated how urban development impacts urban ecosystem functions;
4) Developed an understanding of, and appreciation for, the role that planners have in constructing technologically appropriate and environmentally sensitive solutions to water related problems;
5) Identified the important role of watershed planning and undertook specific tasks in preparing watershed plans;
6) Created environmental plans for mitigating the impacts of land development while protecting and restoring urban ecosystems; and
7) Formulated watershed management policies and actions that protect the natural system functions of watersheds, while mitigating the impacts of future development on watershed health.

What is this syllabus?

This document is many things: it is a planning document, so you can plan your time commitment for reading and assignments; it is a roadmap through the class that aims to give you bearings for each class; it is also a contract of sorts, telling you the level of effort I intend to put into course as a teacher semester, as well as the level of effort I expect from you as a student.

Class Format and Readings

This course will meet twice per week. Class sessions will involve lectures, guest speakers, and extensive class discussion. Field trips will also aid our observation of ecosystem functions and how these functions are influenced by urban development.

A special effort has been made to select relevant, timely and well-written readings. The source and style of each reading varies considerably. While some are academic articles, we will also look at policy documents, case studies, practical handbooks, and articles from the popular press. The readings will expose us to viewpoints from a wide and diverse community of professionals involved in managing watersheds and water systems, including sanitation engineers, planners, journalists, historians, climate scientists, geographers, and economists, among others. All course readings and assignment details are on Sakai and should be completed before the class for which they are listed.

How can you do well in this class?

To do well in this course, I expect you to 1) spend significant time and effort working with your group on the semester-long planning project, 2) spend time working through the reading material in advance of class, 2) attend class and participate.

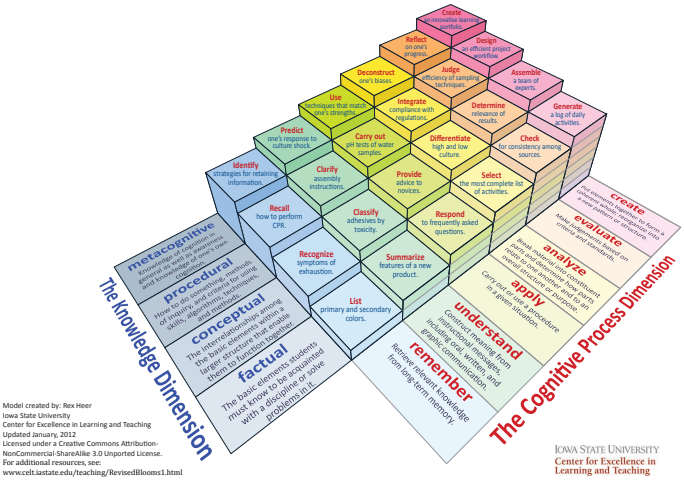
Time Commitment: In this course, you should expect to spend at least 3 hours outside of class for each hour you spend in class. This amounts to at least 7-8 hours per week outside of class.

What is participation? Participation means that you are actively listening and engaging in classroom discussions, as well as engaging the class with your own questions, whether you bring them in class or through the question website that I have created for PLAN 641: http://plan641.web.unc.edu.

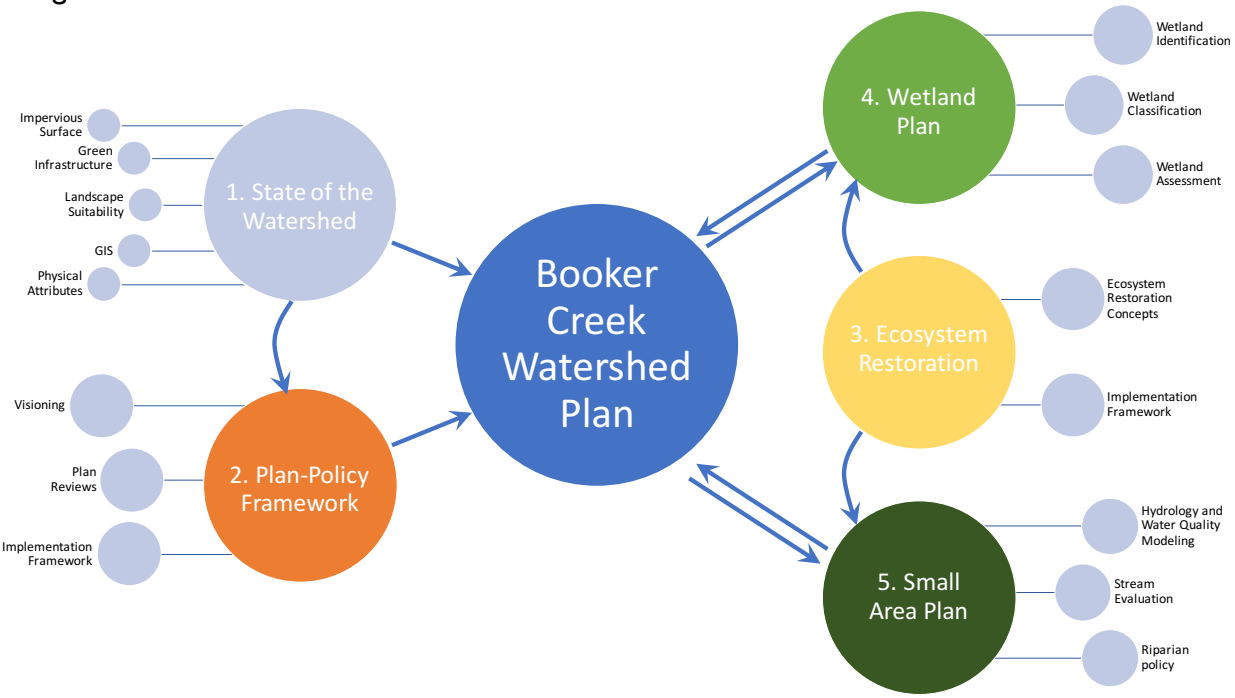
There is a lot of reading. How do I get through it all? The most important thing to do is planning your time. Some tips:

- If you don't have one, get a calendar! Put all due dates and special class activities (e.g. field trips) on your calendar. Probably the easiest and most flexible is Google Calendar, but you may prefer others. You can embed other calendars into your own, such as the UNC City and Regional Planning's, which lists all department events and important academic dates: *https://calendar.google.com/calendar/ical/dcrp%40unc.edu/public/basic.ics.*
- There are lots of resources for time management available, here are a couple:
  http://www.time-management-guide.com
  https://students.dartmouth.edu/academic-skills/learning-resources/time-management
- Everyone reads articles differently, you need to figure out how you can effectively read a large volume of material and come away with the main ideas and key points. *"Some books should be tasted, some devoured, but only a few should be chewed and digested thoroughly." – Sir Francis Bacon*. Skimming is your friend and an important strategy to keep up with the readings, but when you see important points, slow down and digest thoroughly.
- Write down questions as you read! If you are having trouble understanding something from the readings or from class, you can submit your questions here: http://plan641.web.unc.edu/. Asking questions is an important part of participating in your own learning process.

Why will we spend the semester creating a new plan? Bloom's Taxonomy considers educational learning based on different levels of complexity and specificity. Our goal is to climb this mountain, where the peak involves creating new knowledge, while synthesizing lots of concepts and information that you have acquired in this class. Creation is the goal.



Semester Big Picture



Course Grading/Requirements

Five cumulative plan documents:

1) State of the watershed report	15%
(Individual) Completed Lynda GIS Training*	5%
2) Watershed plan-policy framework	20%
3) Wetland management plan	20%
4) Sub-watershed management plan	20%
5) Complete Booker Creek watershed management plan + presentation	20%
Total:	100%

All group work will be weighted by your teammates' evaluations of your contributions and your class participation.
*Exempt if completed PLAN/GEOG 491/591 or another GIS course

Grading Notes: Generally, an **H** grade is given for exceptional work that demonstrates a real mastery of course material. **L** or **F** work substantially fails to meet minimum requirements either due to incomplete coverage of required information, incorrect results, or sloppy, unprofessional reporting of results.

Summary of Due Dates (Homework must be submitted via Sakai Dropbox by 5 pm on due date. No Exceptions)

- Sept 18: Completed Lynda GIS Module (individual student, submitted via Sakai Dropbox)
- Oct. 9: Assignment 1: State of the watershed report and poster.
- Nov. 6: Assignment 2: Vision and plan-policy framework.
- Nov. 15: Assignment 3: Wetland evaluation and plan-policy frameworks.
- Nov. 29: Assignment 4: Watershed field evaluations, modeling, and plan-policy frameworks
- Dec. 6: Student presentations of Booker Creek Watershed Management Plan
- Dec. 8: Assignment 5: Final Booker Creek Watershed Management Plan Presentation/Report

Field Trips

- Sept. 25: *UNC Green Infrastructure Field Trip (On Campus),* Led by Sally Hoyt (UNC stormwater engineer)
- Sept. 27: *Field Trip to Booker Creek Watershed (Off Campus)*
- Oct. 30: *Wetland Field Trip to Carolina North (Off Campus),* Led by Sally Hoyt
- Nov. 29: *Ecosystem Restoration Field Trip – Forest Grove Restoration Site (On Campus),* Led by Sally Hoyt

Policy on Late or Incomplete Work: As a matter of departmental policy, and in order to be fair to your fellow students (particularly in light of the extensive time requirements of this course), **late assignments will not ordinarily be accepted**.

- **No extensions will be given.**
- **Zero points will be assigned to work not turned in on time.**

IF YOU HAVE A MEDICAL EMERGENCY, PLEASE INFORM THE INSTRUCTOR AS SOON AS POSSIBLE. Grades of incomplete may be given in the event of a medical or another emergency. In these cases, a written application for an incomplete on any assignment must state the reasons for the request and propose a new deadline.

Resources: Our purpose as professors is to help you to excel in this learning environment. Should you need further assistance beyond the help of the professor, please consult the following on-campus resources:

- The Writing Center: http://writingcenter.unc.edu
- The Learning Center: http://learningcenter.unc.edu
- The Learning Center resources for students with learning disabilities (LD) and/or attention-deficit/hyperactivity disorder (ADHD): http://learningcenter.unc.edu/ldadhd-services
- The Center for Student Success and Academic Counseling: http://cssac.unc.edu
- Counseling and Wellness Services: http://campushealth.unc.edu

The University's Honor Code is in effect. The University of North Carolina at Chapel Hill has had a student-administered honor systems and judicial system for over 100 years. The Honor Code represents UNC-Chapel Hill students' commitment to maintain an environment in which all students respect one another and are able to attain their educational goals. As a student at Carolina, you are entering a community in which integrity matters – integrity in the work you submit, and integrity in the manner in which you treat your fellow Carolina community members. Because academic honesty and trustworthiness are important to professional planning, this is a significant University and Departmental tradition. Your attention is called to the Instrument of Student Judicial Governance for policies and procedures pertaining to the honor system. We are committed to treating Honor Code violations seriously and urge all students to become familiar with its terms set out at https://studentconduct.unc.edu/. If you have questions it is your responsibility to ask the professor about the Code's application. Please consult with the instructor if you are uncertain about your responsibilities under that code with respect to this course.

The University of North Carolina – Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in difficulties with accessing learning opportunities. All accommodations are coordinated through the Accessibility Resources and Service Office. Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately early in the semester to discuss your specific needs. Students with documented disabilities should contact the Department of Disability Services at 919-962-8300 (SASB North, Suite 2126; https://accessibility.unc.edu) to coordinate reasonable accommodations.

Readings, course content, and schedule may change over the course of the semester. Therefore, this syllabus could be subject to change!

Recommended reference readings:

Isobel W. Heathcote, John Richard Edwards, Hugh Greener, and Hugh M. Coombs. 1998. Integrated watershed management: principles and practice. Taylor & Francis: New York, NY

John Randolph. 2004. Environmental land use planning and management. Island Press: Washington, D.C.

Please complete required readings before scheduled class period.

Aug. 23: *Course Overview*

Required:

USEPA. 1996. Why Watersheds? (EPA800-F-96-001). US Environmental Protection Agency: Washington, D.C.

- Asks the question, "Why manage watersheds?"
- Answers with benefits of management

Robert B. Jackson, Stephen R. Carpenter, Clifford N. Dahm, Diane M. McKnight, Robert J. Naiman, Sandra L. Postel, and Steven W. Running. 2001. Water in a Changing World. Issues in Ecology, Issue 9. Ecological Society of America: Washington, D.C. [Online]: http://cfpub.epa.gov/watertrain/pdf/issue9.pdf

- Global overview of water problems
- Justifications for urban water management

Part I: State of Watershed Report

Objectives:

1) To map a watershed, identify drainage networks, and compute watershed slopes and area.
2) To identify and evaluate land use management tools for impact mitigation and restoration and to formulate comprehensive ecosystem protection strategies.
3) To evaluate land development impacts on upland and riparian zones of watersheds.
4) To create a state of the watershed report and vision for the future.

Aug. 28, 30: *Introduction to GIS techniques: Part I and II* (Led by Philip McDaniel, GIS Librarian; NE 102, please bring laptops)

*** If you have not had previous GIS training (e.g. PLAN 491/591), you are required to enroll in the free Lynda.com course "ArcGis Essential Training," which can be accessed from http://lynda.unc.edu/. This course will augment the GIS overview section of this course and consists of 13 modules scheduled to take approximately 5.5 hours. This course is well laid out and can be completed on your own. If you need even more basic training, you can complete the course, "Learning ArcGIS" (3.25 hours) prior to the "ArcGis Essential Training" course. At the end of the course, you will receive a PDF certificate, which you can send to the instructor via the Sakai Dropbox.

Required:

Larz Anderson. 2000. Chapter 2: Maps and Chapter 3: The Constraints of Slope on Land Development, in Planning for the Built Environment. APA Planners Press: Chicago, pp. 9-32, 239-240, 245-246.

Recommended:

QuantumGIS (QGIS) Tutorials: [Online]: http://www.qgistutorials.com/en/docs/introduction.html

- This is a tutorial created for QGIS, a free and open-source alternative to ESRI's ArcGIS hegemony.
- Great worksheets and information on GIS concepts

Harvard Map Collection. 2009. GIS Tutorials and Exercises: Introduction to Geographic Information Systems (GIS) Tutorial. Harvard University: Cambridge, MA. [Online]: http://www.gis.harvard.edu/training/non-credit-training/virtual-training/tutorials

- This is a tutorial created by Harvard based in the ESRI ArcGIS environment.

Many books exist on this topic – I recommend review of: Michael Law and Amy Collins. 2015. Getting to Know ArcGIS Desktop [Fourth Edition]: ESRI Press: Redlands, CA.

Sept. 4: *Labor Day (NO CLASS MEETING)*

Sept. 6: *Introduction to Environmental Planning*

Required:

Tom Daniels and Katherine Daniels. 2003. "Ch. 1: Taking Stock of the Local Environment and Creating an Environmental Action Plan," in The Environmental Planning Handbook for Sustainable Communities and Regions. APA Planners Press: Chicago: pp. 11-36.

Town of Chapel Hill. 2012. Snapshot of the Town of Chapel Hill. Town of Chapel Hill: Chapel Hill, NC. [Online]: http://www.townofchapelhill.org/home/showdocument?id=12177

- This booklet is a snapshot in time about the Town of Chapel Hill and provides data projections for the future.
- This will give you a better understanding of Town's capabilities, planning, data, etc. (not updated since 2012)

Costanza, Robert, et al. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387 (6630): 253-260.

Tetra Tech, Inc. 2004. Morgan Creek Local Watershed Plan: Targeting of Management Report. North Carolina Ecosystem Enhancement Program: Raleigh, NC

Recommended:

USEPA. 2017. Catalog of Federal Funding Sources for Watershed Protection. US Environmental Protection Agency: Washington, D.C. [Online]: https://ofmpub.epa.gov/apex/watershedfunding/f?p=fedfund:1

- Skim to get a sense of funding sources for watershed plans

Carl Zimmer. 2014. Putting a Price Tag on Nature's Defenses. NY Times Article.

Sept. 11, 13: *Physical Attributes of Watersheds*

Required:

Riley, Ann L., 1998, "Ch. 1: The Basics," in Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens, Washington, D.C.: Island Press, pp. 1-13, 27-33.

Christopher J. Walsh, Allison H. Roy, Jack W. Feminella, Peter D. Cottingham, And Peter M. Groffman. 2005. The Urban Stream Syndrome: Current Knowledge and the Search for a Cure. Journal of the North American Benthological Society 24(3): 706–723

Christopher A. Frissell, William J. Liss, Charles E. Warren, and Michael D. Hurley. 1986. A Hierarchical Framework for Stream Habitat Classification: Viewing Streams in a Watershed Context. Environmental Management 10(2): 199-214

William Marsh. 1991. Chapter 4: Topography, Slopes and Land Use Planning, Chapter 9: Watersheds, Drainage Nets, and Land Use, in Landscape Planning: Environmental Applications, John Wiley and Sons: New York. pp. 54-59, 132-135.

Michael J. Paul and Judy L. Meyer. 2001. Streams in the Urban Landscape. Annual Review of Ecological Systems 32: 333–65

- Overview of chemical and geomorphic characteristics of urban streams

Recommended:

Karen Cappiella and Lisa Fraley-McNeal. 2007. The Importance of Protecting Vulnerable Streams and Wetlands at the Local Level. Center for Watershed Protection and US Environmental Protection Agency: Ellicott City, MD and Washington, D.C.

- Great information source on headwater streams and definitions of intermittent streams

Natural Resources Conservation Service. 2007. National Engineering Handbook: Part 630 Hydrology. Hydrologic Soil Groups (Chapter 7) (10–VI–NEH). USDA: Washington, D.C.

Sept. 18: *Impervious Cover*

DUE: Completion of Lynda Module "Getting Started with ArcGIS." Turn in completion certificate via Sakai Dropbox by the end of class on Sept. 13 (unless you are exempt; see page 2 of the syllabus).

Required:

Thomas Schueler. 2003. Chapter 2: Hydrologic Impacts of Increased Impervious Cover. In: Impacts of Impervious Cover on Aquatic Systems: Watershed Protection Research Monograph No. 1. Center for Watershed Protection: Ellicott City, MD.

- An authoritative volume on urban hydrology
- Focus on Chapter 2.

Chester Arnold and C. James Gibbons. 1996. Impervious Surface Coverage: The Emergence of a Key Indicator. Journal of the American Planning Association 62: 243-258.

- Lends a historical perspective to the emergence of impervious surface as a driver of environmentally-related planning thought

Ryznar, Rhonda and Philip R. Berke. 2001. "Testing the Applicability of Impervious Surface Estimates Based on Zoning Categories in Watersheds," UNC Department of City and Regional Planning: Chapel Hill.

Recommended:

Carol R. Jacobson. 2011. Identification and quantification of the hydrological impacts of imperviousness in urban catchments: A review. Journal of Environmental Management 92: 1438-1448.

Linda R. Exum, Sandra L. Bird, James Harrison, and Christine A. Perkins. 2005. Estimating and Projecting Impervious Cover in the Southeastern United States (EPA/600/R-05/061).

- Skim, lots of interesting information.

Mary Battiata. 2005. Silent Streams. Washington Post: Sunday, November 27, 2005. [Online]: http://www.washingtonpost.com/wp-dyn/content/article/2005/11/22/AR2005112202165.html

- Washington Post magazine article describing how impervious cover associated with sprawl is threatening streams nationwide)

David N. Lerner and Bob Harris. 2009. The relationship between land use and groundwater resources and quality. Land Use Policy 26S: S265–S273

Sept. 20: *Urban Green Infrastructure and Best Management Practices*

Required:

Michael E. Dietz. 2007. Low Impact Development Practices: A Review of Current Research and Recommendations for Future Directions. Water Air and Soil Pollution 186:351–363

Stacey Berahzer. 2015. Crosswalking between Gray and Green Infrastructure – Considerations for Budget Officers. Center for Watershed Protection: Baltimore, MD

Girling, C. and R. Kellert. 2002. Comparing Stormwater Impacts and Costs on Three Neighborhood Plan Types. Landscape Journal, 21: 100-109.

Recommended:

Line, D. E., Brown, R. A., Hunt, W. F., & Lord, W. G. 2011. Effectiveness of LID for commercial development in North Carolina. Journal of Environmental Engineering 138(6), 680-688.

Thomas E. Low. 2010. Light Imprint Handbook: Integrating Sustainability and Community Design. New Urban Press: Charlotte. [Online]: http://lightimprint.org/

- Snippets of the book are available online – copied onto Sakai.
- Light Imprint is the New Urbanism push for new stormwater techniques
- Contains matrix of stormwater BMPs, with information on which transect they're suitable for, their cost, and their maintenance requirements

Hamel, P., Daly, E., & Fletcher, T. D. 2013. Source-control stormwater management for mitigating the impacts of urbanisation on baseflow: A review. Journal of Hydrology 485: 201-211.

City of Portland. 2010. Portland's Green Infrastructure: Quantifying the Health, Energy and Community Livability Benefits [Specifically Sections 1 & 2]. City of Portland Environmental Services: Portland, OR. [Online]: https://www.portlandoregon.gov/bes/article/298042

Sept. 25: [FIELD TRIP] *UNC On-Campus Green Infrastructure Field Trip*. Led by Sally Hoyt, UNC Stormwater Engineer

Required:

Zielinski, Jennifer. 2001. The Benefits of Better Site Design in Residential Subdivisions, Watershed Protection Techniques 3(2), pp. 633-646.

Peter T. Weiss, John S. Gulliver, and Andrew J. Erickson. 2007. Cost and Pollutant Removal of Storm-Water Treatment Practices. Journal of Water Resources Planning and Management 133(3): 218-229.

See the NC Department of Environmental Quality Stormwater Control Measures (SCM) Design Manual: https://deq.nc.gov/sw-bmp-manual

- Review Sections A-1 (Runoff Treatment and Volume Match), A-7 (Guidance on SCM Selection), and C-0 (Minimum Design Criteria for all SCM)

Sept. 27: [FIELD TRIP] *Booker Creek Watershed Field Trip (Off Campus)*

Required:

Alsharif, K. (2010). Construction and stormwater pollution: Policy, violations, and penalties. *Land Use Policy* 27(2): 612-616.

Letunic, Niko. 2007. Beyond Plain English: Ten Best Practices for Creating Citizen Friendly Planning Documents. Planning Magazine, October, pp. 40-43.

- A good guide for making group reports easily read by a diverse group

Recommended (poster design suggestions):
Creating Effective Poster Presentations: http://www.ncsu.edu/project/posters
Steven M. Block. 1996. Do's and Don'ts of Poster Presentation. Biophysical Journal 71: 3527-3529

Oct. 2: *Land Suitability Analysis*

Required:
Malczewski, J. (2004). GIS-based land-use suitability analysis: A critical overview. Progress in Planning 62(1): 3-65.
Berke, Philip, David Godschalk, and Edward Kaiser, 2006, "Analyzing Environmental Information," in Urban Land Use Planning, 5th edition, Chicago: University of Illinois Press, pp. 33-41.
Collins, M. G., Steiner, F. R., & Rushman, M. J. (2001). Land-use suitability analysis in the United States: Historical development and promising technological achievements. Environmental Management 28(5): 611-621.

PART II: Creating a Vision and Policy Framework

Objectives: *1) To elicit and formulate watershed issues and opportunities.*
2) To formulate a watershed visioning.
3) To set goals and policies linked to the goals, and then integrate them into a "vision statement" and policy framework

Oct. 4: *Visioning and scenario building; formulating a policy framework*

Note: Today you will be assigned to a group to review the plan-policy framework of an example plan for the following week.

Required:
USEPA. 2013. A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters (EPA 841-R-13-003). US Environmental Protection Agency: Washington, D.C.
Philip Berke, David Godschalk, Ed Kaiser and Daniel Rodriguez. 2006. Ch. 9: State of Community Report: Scenarios and Visions, pp. 1-26; Ch. 10: Direction Setting, pp. 1-10," In Urban Land Use Planning (5th Edition), University of Illinois Press: Chicago.
NC Division of Water Resources and Triangle J Council of Governments. 2014. A simplified guide to writing watershed restoration plans in North Carolina. TJCOG: Durham, NC

Recommended:
Berit Junker, Mattias Buchecker, and Ulrike Mueller-Boker. 2007. Objectives of public participation: Which actors should be involved in the decision making for river restorations? Water Resources Research 43: W10438.

Oct. 9: *Plan Implementation Tools*

ASSIGNMENT 1 DUE: Posters and reports are due in class.

Required:
John Randolph. 2003. "Ch. 6: Design with Nature for People: Sustainable, Livable, and Smart Land Use Development," "Ch. 7: Local Government Smart Growth Management," in Environmental Land Use Planning and Management. Washington, D.C.: Island Press, pp. 106-140, 141-168.

- Great reference text on development tools.
- See compilation of plan implementation tools from PLAN 744: Development and Environmental Management in Assignments directory on Sakai.
- USEPA. 2014. 8 Tools of Watershed Protection in Developing Areas. US Environmental Protection Agency: Washington, D.C.

Recommended:
Tom Schueler. 2000. The Economics of Watershed Protection. Watershed Protection Techniques. 2(4): 469-481. [Center for Watershed Protection]
USEPA. 2004. Protecting Water Resources with Smart Growth (EPA 231-R-04-002). US Environmental Protection Agency: Washington, D.C.

- Longer document, but very valuable to skim.
- Review headings to get a good sense of diverse tools available to planners and policy-makers at different levels of government.

Oct. 11: *Student plan reviews and discussion.* Reviews of illustrative vision statements, goals and objectives, policies, and other components of policy frameworks in a sample of environmental plans

Required:

William Baer. 1997. General Plan Evaluation Criteria: An Approach to Making Better Plans. Journal of the American Planning Association 63(3): 329-344.

Berke, Philip, David Godschalk, and Edward Kaiser with Daniel Rodriguez. 2006. *Plan Quality Protocol* in Ch. 3: Making a Good Plan, in Urban Land Use Planning (5th Edition). University of Illinois Press: Chicago.

Recommended:

See APA Efforts to certify comprehensive plans: https://www.planning.org/sustainingplaces/compplanstandards/

Oct. 16-18: *Fall Break (NO CLASS MEETING)*

Oct. 23: *Simulated visioning exercise: "What do we want for the future of our watershed?"*

Required:

Charlie MacPherson and Barry Tonning. Getting in Step: A Guide to Effective Outreach in your Watershed. US Environmental Protection Agency: Washington, D.C.

Part III: Wetland Evaluation and Mitigation

Objectives:
1) To identify the scientific and political issues involving wetland delineation;
2) To identify how land development threatens wetland functions;
3) To apply a field method to evaluate the functions of wetlands and rate their value;
4) To create a wetland protection strategy.

Oct. 25: *Identification and Classification of Wetlands and Impacts of Urbanization*

Required:

Richard Whisnant. 1999. Wetlands in North Carolina. Environmental and Conservation Law, Issue 6: 1-9. The University of North Carolina at Chapel Hill, Institute of Government: Chapel Hill, NC.

Wright, Tiffany, Jennifer Tomlinson, Tom Schueler, Karen Cappiella, Anne Kitchell, and Dave Hirschman. 2006. Direct and Indirect Impacts of Urbanization on Wetland Quality, U.S. Environmental Protection Agency: Washington, D.C.

- See Pages 13-56.

Meiyin Wu, Dennis Kalma, and Carol Treadwell-Steitz. 2014. Differential Assessment of Designations of Wetland Status Using Two Delineation Methods. Environmental Management 54: 23–29.

Recommended:

Stacy Small-Lorenz. 2014. Wetlands Do Triple Duty in a Changing Climate. Water Currents: Blog of the National Geographic Society.

- Interesting popular writing piece on wetlands and climate mediation.

ACOE. 1987. Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1). US Army Corp of Engineers: Washington, D.C.

- Skim, goes into more detail than in-class PowerPoint.

ACOE. 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0) ERDC/EL TR-12-9. U.S. Army Corps of Engineers: Washington, D.C.

D. Dvorett, Bidwell, J., Davis, C., and DuBois, C. 2012. Developing a hydrogeomorphic wetland inventory: reclassifying national wetlands inventory polygons in geographic information systems. Wetlands 32(1): 83-93.

Oct. 30: [FIELD TRIP] *Wetland Field Trip to Carolina North (Off Campus).* Led by Sally Hoyt, UNC Stormwater Engineer

Required:

Center for Watershed Protection. 2000. Crafting Better Watershed Protection Plans. [Watershed Protection Techniques. 2(2): 329-337]

Kate A. Brauman, Gretchen C. Daily, T. Ka'eo Duarte, and Harold A. Mooney. 2007. The Nature and Value of Ecosystem Services: An Overview Highlighting Hydrologic Services Annual Review of Environmental Resources 32:67–98

Recommended:

Government of Western Australia. 2007. Guidelines checklist for preparing a wetland management plan. Western Australia Department of Environment and Conservation: Perth, Australia.

- Useful for preparing your wetland plans.

Becky Ward. 2008. Mason Farm Wetland/Floodplain Restoration & Stream/buffer Enhancement Chapel Hill, Orange & Durham Counties, North Carolina: Restoration Plan. NC Ecosystem Enhancement Program: Raleigh, NC

Nov. 1: *NO CLASS MEETING.*

Nov. 6: *Assessment of Wetland Functions*

ASSIGNMENT 2 DUE: Vision and plan-policy framework (5 PM via Sakai Dropbox)

Required:

NC Wetland Assessment Method (NCWAM): https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-quality-program-development/ncwam-manual

USEPA. 2013. Wetlands Supplement: Incorporating Wetlands into Watershed Planning. US Environmental Protection Agency (Region 5): Chicago, IL.

- Focus on Pages 1-40

M. Acreman & J. Holden. 2013. How Wetlands Affect Floods. Wetlands 33:773–786.

Recommended:

Fennessy, M. Siobhan, Amy D. Jacobs, and Mary E. Kentula. 2004. Review of rapid methods for assessing wetland condition (EPA/620/R-04/009). US Environmental Protection Agency: Washington, DC.

Sutula, Martha A., Eric D. Stein, Joshua N. Collins, A. Elizabeth Fetscher, and Ross Clark. 2006. A practical guide for the development of a wetland assessment method: the California experience. JAWRA Journal of the American Water Resources Association 42(1): 157-175.

Wright, Tiffany, Jennifer Tomlinson, Tom Schueler, Karen Cappiella, Anne Kitchell, and Dave Hirschman. 2006. Direct and Indirect Impacts of Urbanization on Wetland Quality, U.S. Environmental Protection Agency: Washington, D.C.

- See Pages 1-12

Part IV: Watershed Field Evaluation and Modeling

Nov. 8: *Application of Water Quantity and Quality Models to Land Use Planning*

Required:

V. M. Jayasooriya, A. W. M. Ng. 2014. Tools for Modeling of Stormwater Management and Economics of Green Infrastructure Practices: a Review. Water, Air, & Soil Pollution. 225:2055

A.H. Elliott and S.A. Trowsdale. 2007. A review of models for low impact urban stormwater drainage. Environmental Modelling & Software 22:394-405

Recommended:

Keith E. Schilling and Calvin F. Wolter. 2009. Modeling Nitrate-Nitrogen Load Reduction Strategies for the Des Moines River, Iowa Using SWAT. Environmental Management 44:671–682

Nov. 13: *Riparian Zones and Urbanization*. [Guest Speaker]: Prof. Danielle Spurlock, UNC City and Regional Planning

Required:

Peter M. Groffman, Daniel J. Bain, Lawrence E. Band, Kenneth T. Belt, Grace S. Brush, J. Morgan Grove, Richard V. Pouyat, Ian C. Yesilonis, and Wayne C. Zipperer. 2003. Down by the Riverside: Urban Riparian Ecology. Frontiers in Ecology and the Environment 1(6): 315-321

Leslie L. Orzetti, R. Christian Jones, and Robert F. Murphy. 2010. Stream Condition in Piedmont Streams with Restored Riparian Buffers in the Chesapeake Bay Watershed. Journal of the American Water Resources Association 46(3):473-485

Nov. 15: *Sub-watershed and Stream Evaluation*

ASSIGNMENT 3 DUE: Wetland evaluations and plan-policy frameworks (5 PM via Sakai Dropbox)

Required:

Schueler, T., A. Kitchell. 2005. Desktop Analysis: Comparative Sub-watershed Analysis. In: Urban Subwatershed Restoration Manual No. 2: Methods to Develop Restoration Plans for Small Urban Watersheds (Version 2.0). Center for Watershed Protection.: Ellicott City, MD.

Eric A. Davidson, Mark B. David, James N. Galloway, Christine L. Goodale, Richard Haeuber, John A. Harrison, Robert W. Howarth, Dan B. Jaynes, R. Richard Lowrance, B. Thomas Nolan, Jennifer L. Peel, Robert W. Pinder, Ellen Porter, Clifford S. Snyder, Alan R. Townsend, and Mary H. Ward. 2012. Excess Nitrogen in the U.S. Issues in Ecology: Report 15. Ecological Society of America: Washington, D.C.

Recommended:

WV DEP. 2006. West Virginia Nonpoint Source Program: Natural Stream Channel Design & Riparian Improvement Project Monitoring Protocol. WV Dept. of Environmental Protection Nonpoint Source Program: Charleston, WV

Kitchell, A., Schueler,T. 2005. Manual 10: Unified Stream Assessment: A User's Manual. Urban Subwatershed Restoration Manual Series. Center for Watershed Protection, Ellicott City, MD.

Ronald Bjorkland, Catherine M. Pringle And Bruce Newton. 2001. A Stream Visual Assessment Protocol (SVAP) For Riparian Landowners Environmental Monitoring and Assessment 68: 99–125.

Nov. 20, 22: *Thanksgiving Break – Class does not meet.*

Part V: Ecosystem Restoration and Restoration Planning

Nov. 27: *Watershed Impact Mitigation and Restoration Measures*

Required:

BenDor, Todd, and M.W. Doyle. 2010. Planning for Ecosystem Service Markets. Journal of the American Planning Association 76 (1): 59–72.

Palmer Hough and Morgan Robertson. 2009. Mitigation under Section 404 of the Clean Water Act: where it comes from, what it means. Wetlands Ecology and Management 17:15–33.

Recommended:

Erwin, Kevin L. 2009. Wetlands and global climate change: the role of wetland restoration in a changing world. Wetlands Ecology and management 17(1): 71-84.

Young D. Choi. 2004. Theories for ecological restoration in changing environment: Toward 'futuristic' restoration. Ecological Research 19: 75–81.

Rubec, C. D., & Hanson, A. R. 2009. Wetland mitigation and compensation: Canadian experience. Wetlands Ecology and Management 17(1), 3-14.

Nov. 29: [FIELD TRIP] *Ecosystem Restoration – Forest Grove Restoration Site* (On Campus), Led by Sally Hoyt, UNC Stormwater Engineer

ASSIGNMENT 4 DUE: Watershed field evaluations, modeling, and plan-policy frameworks (5 PM via Sakai Dropbox)

Required:

Egan, D., Hjerpe, E. E., & Abrams, J. 2011. Why people matter in ecological restoration. In: Human Dimensions of Ecological Restoration (pp. 1-19). Island Press/Center for Resource Economics.

Recommended:

M. Scholz. 2011. Wetland Systems: (Chapter 2: Wetland Case Studies) Pgs. 19-126. Springer: New York.

Dec. 4: *Ecosystem Restoration Practice and Policy.* [Guest Speaker]: George Howard, Co-Founder/CEO, Restoration Systems

Required (skim):

Interagency Workgroup on Wetland Restoration. 2003. An Introduction and User's Guide to Wetland Restoration, Creation, and Enhancement. National Oceanic and Atmospheric Administration, US Environmental Protection Agency, US Army Corps of Engineers, US Fish and Wildlife Service, and Natural Resources Conservation Service: Washington, D.C. [Online]: http://www.habitat.noaa.gov/pdf/pub_wetlands_restore_guide.pdf

- Focus specifically on Pages 4-34, although the entire document is useful.

Dec. 6: *Student presentations of Booker Creek Watershed Management Plan*

ASSIGNMENT 5: Booker Creek Watershed Management Plan, DUE (Friday, December 8th, 5 PM via Sakai Dropbox)