PLAN 641: WATERSHED PLANNING

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Spring 2021  
9:05 – 10:20 M + W  
Course website: http://sakai.unc.edu  
Course Zoom access:  
https://go.unc.edu/plan641  
(or https://unc.zoom.us/j/92414266761; password: 641zoons)  
Course question site: https://pollev.com/bendor

Course description. 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. We will focus 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 becoming the key link between ecological health and quality and urban development.

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, 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. “Virtual field trips” – in the form of guest lectures and videos – will also aid our observation of ecosystem functions and how these functions are influenced by urban development.

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, 3) attend class and participate. Remotely working with a group during the pandemic requires careful scheduling, planning, and division of work and responsibilities.

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. It is likely, however, that during some weeks, this course will require much more time, and in other weeks, it will require much less time.

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 weekly poll for PLAN 641: https://pollev.com/bendor/. Please contact the instructor if you have any questions, problems with the readings or the course, or any other issues that you wish to discuss. Students in this class are encouraged to speak up and participate during class meetings. Because the class will represent a diversity of individual beliefs, backgrounds, and experiences, every member of this class needs to show respect for every other member.

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.
- There are lots of resources for time management available, here is a good one: 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! Submit those questions to the course’s poll: https://pollev.com/bendor. 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.
Assignments + course grading

0) (Individual) Linked-In Learning QGIS Module (submitted via Sakai) 5%
1) Vision statement and plan evaluation 10%
2) State of the watershed (part I) 15%
3) Sub-watershed management plan 15%
4) State of the watershed (part II) + GI plan-policy component 10%
5) Wetland management plan 15%
6) Complete (corrected) Booker Creek Watershed Management Plan (with restoration components + presentation) 20%

Course Participation 10%

Total: 100%

Grading notes: As a matter of departmental policy, and in order to be fair to your fellow students, late assignments will be docked 20% per day. Generally, an H (or A) is given for exceptional work that demonstrates a real mastery of course material. L or F (D/F) work substantially fails to meet minimum requirements, either due to incomplete coverage of required information, incorrect results, or sloppy, unprofessional reporting of results. All grades for group work will be weighted by your teammates’ evaluations of your contributions and your class participation.

Summary of due dates (Homework submitted via Sakai Assignments (one per group) by 5 pm on due date)
- Feb. 10: Completion of Linked-In Learning QGIS Module (individual assignment)
- Feb. 22: Assignment 1: Booker Creek vision statement and plan review report
- Mar. 17: Assignment 2: State of the watershed report (part I)
- Mar. 24: Assignment 3: Sub-watershed field evaluations, modeling, and local area plan-policy framework
- Apr. 12: Assignment 4: State of the Watershed report (part II) + GI plan-policy component
- Apr. 21: Assignment 5: Wetland policies and actions component
- May. 5: Student presentations of Booker Creek Watershed Management Plan
- May. 7: Assignment 6: Full Booker Creek Watershed Management Plan, including ecosystem restoration actions

Virtual field trips and guest speakers
- Jan. 27: Virtual field trip to Booker Creek watershed, Led by Allison Weakley (Chapel Hill Stormwater Analyst)
- Feb. 24, Mar. 1: Geographic information systems with QGIS, Led by Philip McDaniel (UNC GIS Librarian).
- Mar. 29: UNC green infrastructure virtual field trip, Led by Sally Hoyt (UNC stormwater engineer)
- Mar. 31: Riparian zones and urbanization, Led by Prof. Danielle Spurlock (UNC City and Regional Planning)
- Apr. 14: Wetland virtual field trip, More Info TBA.
- Apr. 26: Ecosystem restoration virtual field trip – Battle Grove Restoration Site, Led by Sally Hoyt
- Apr. 28: Ecosystem restoration practice and policy. Led by Adam Riggsbee (Co-Founder/CEO, RiverBank Conservation)
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: My purpose as a professor 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): https://learningcenter.unc.edu/services/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://ars.unc.edu/) to coordinate reasonable accommodations.
Course outline

For each course topic, required readings are provided. A special effort has been made to select relevant, timely and well-written readings. Additional resources are listed that can be examined in detail, depending upon your interest in the subject. The source and style of each reading varies considerably. I recommend downloading all of the materials as they may serve you as useful references during future classes or in your career.

*** Reading comprehension and time management are skills. PLEASE READ ASSIGNED MATERIAL BEFORE EACH CLASS***

The professor reserves to right to make changes to the syllabus, including project due dates, when unforeseen circumstances occur. These changes will be announced as early as possible so that students can adjust their schedules.

***Please arrive on time, activate your video on Zoom and remember to mute yourself if you are not speaking. Fun and/or hilarious (tasteful) virtual backgrounds are encouraged***

I will start our Zoom 15 minutes before class and keep it going for 10 minutes after class to build in some informal time.

Recommended reference readings:


Assignment 0: On your own, please complete the Linked-In Learning course, “Learning QGIS” (Gordon Luckett; dated October 2019) at http://linkedin.unc.edu/. This course augments the GIS overview sessions of PLAN 641 and consists of 12 modules scheduled to take approximately 3 hours. At the end of the course, you will receive a PDF certificate, which you can submit via Sakai Assignments feature (due: Feb 10th). Please come to class with any questions you have about GIS or QGIS. If you have already completed this certificate, then you are not required to re-do it (although it may help to refresh).

Additionally, if you have not had previous GIS training (e.g. PLAN 491/591), you are required to enroll in the Linked-In Learning course “ArcGis Essential Training,” which consists of 13 modules scheduled to take approximately 5.5 hours. If you need more basic training (i.e., you have never been exposed to GIS at all), you should also complete the course, “Learning ArcGIS” (3.25 hours) prior to the “ArcGis Essential Training” course.

PART I: Creating a vision and evaluating plans

Objectives: 1) Learn about the structure and requirements of the course 2) Elicit and formulate watershed issues and opportunities 3) Formulate a comprehensive watershed vision 4) Evaluate watershed plans to understand their content, structure, and quality

Jan. 20: Course introduction


- Asks the question, “Why manage watersheds?” and answers with discussion of the benefits of management
- Global overview of water problems
- Justifications for urban water management

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Jan. 25: Introduction to environmental planning

Required:


Recommended:

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


Jan. 27: Booker Creek watershed virtual field trip (please view video before class, with questions during class), led by Allison Weakley, Chapel Hill Stormwater Analyst

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

Required:

- Gives a better understanding of Town’s capabilities, planning, data, etc.


- Offers lots of information on local watershed management and planning activities.


- Lots of details on Town’s demographics.


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

*Required for plan review and discussion (next time):


Feb. 1: Visioning and scenario building; formulating a policy framework

Required:


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:

Feb. 3: Plan implementation tools
Required:
• 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:

• 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.

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

Feb. 8: 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

Feb. 10: Simulated visioning exercise: “What do we want for the future of our watershed?”
Recommended:

DUE: Completion of Linked-In Learning QGIS Module (as individual; turn in completion certificate (or approved exemption note) by 5 PM via Sakai Assignments
Part II: Understanding the state of the watershed

Objectives:
1) Learn about Geographic Information Systems (GIS) and mapping techniques with QGIS
2) Map a watershed, identify drainage networks, and compute watershed slopes and area.
3) Identify and evaluate land use management tools for impact mitigation and restoration and to formulate comprehensive ecosystem protection strategies.
4) Evaluate land development impacts on upland and riparian zones of watersheds.
5) Create a state of the watershed report and vision for the future.

Feb. 15: UNC Wellness Day (NO CLASS MEETING)

Feb. 17, 22: Physical attributes of watersheds

 ASSIGNMENT I DUE: A) Booker Creek vision statement + B) plan review write-up (February 22, 5 PM via Sakai Assignments)

Required:
  • 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

Feb. 24, Mar. 1, 3: Geographic Information Systems with QGIS (Sessions 1-2 led by Philip McDaniel, UNC GIS Librarian). Session 3: how to make better maps


Additional resources:
  o 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
• Many books exist on GIS – including ArcGIS and ArcGIS Pro – I recommend a review (in the library):


Mar. 8, 10: Impervious cover

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

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

Recommended:
- Skim, lots of interesting information.
- Washington Post magazine article describing how impervious cover associated with sprawl is threatening streams nationwide


Part III: Watershed field evaluation and modeling

Objectives:
1) Apply quantitative modeling to watershed hydrology and water quality
2) Perform field evaluations of stream health and understand alternative methods
3) Create a small area (sub-watershed) plan-policy framework

Mar. 15: Modeling watershed dynamics

Required:
ASSIGNMENT 3 DUE: Sub-watershed field evaluations, modeling, and local area plan-policy framework (5 PM via Sakai Assignments)

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

Recommended:
- 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

P. Hamel, 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.


Mar. 29: [VIRTUAL FIELD TRIP] UNC green infrastructure field trip (Guest speaker: Sally Hoyt, UNC Stormwater Engineer)

*Required:*


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

Mar. 31: Riparian zones and urbanization. (Guest Speaker: Prof. Danielle Spurlock, UNC City and Regional Planning)

*Required:*


Apr. 5: UNC Wellness Day (NO CLASS MEETING)

**Part V: 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.

Apr. 7: Identification and classification of wetlands and impacts of urbanization

*Required:*


- See Pages 13-56.

Recommended:
- Interesting popular writing piece on wetlands and climate mediation.
- Skim, goes into more detail than in-class PowerPoint.

Assignment 4 DUE: State of the Watershed report (part II) + GI plan-policy component (5 PM via Sakai Assignments)

Recommended:
- See Pages 1-12

Apr. 14: [VIRTUAL FIELD TRIP] Wetland field trip (Guest speaker: TBA, UNC Stormwater Engineer)

Required:

Recommended:
- Useful for preparing your wetland plans.
Part VI: Ecosystem restoration and restoration planning

Objectives:
1) Understand the mitigation and restoration process;
2) To understand the legal frameworks supporting restoration;
3) To create an ecological restoration strategy.

Apr. 19, 21: Watershed mitigation and restoration

ASSIGNMENT 5 DUE: Wetland policies and actions component (April 8; 5 PM via Sakai Assignments)

Required:


Recommended:


Apr. 26: [VIRTUAL FIELD TRIP] Ecosystem restoration – Battle Grove restoration site (Guest Speaker: Sally Hoyt, UNC Stormwater Engineer)

Required:

Recommended:

Apr. 28: Ecosystem restoration practice and policy. (Guest Speaker: Adam Riggsbee, Co-Founder/CEO, RiverBank Conservation)

Required (skim):

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

May 3: Student work day

May 5: Student presentations of Booker Creek Watershed Management Plan

ASSIGNMENT 6 DUE: Full Booker Creek Watershed Management Plan, including ecosystem restoration actions (Friday, May 7th, 5 PM via Sakai Assignments)