

Department of City and Regional Planning  
University of North Carolina

PLAN 641  
ECOLOGY AND LAND USE PLANNING  
Lecture time/location: M, W 9:30-10:45, Hamilton 150

Fall 2007  
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Course Description

Land use planning and ecology focuses on understanding the functions of ecosystems, how land development activities impact such functions, and how land use management tools can be used to create impact mitigation and restoration strategies. The functions, threats, and protection strategies of watersheds, and wetlands will be examined.

A key theme throughout the course will be to explore how the scientific knowledge of ecological relationships can be integrated within a land use 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:

- 1) To identify important functions of different types of urban ecosystems;
- 2) To evaluate how urban development impacts urban ecosystem functions; and
- 3) To create environmental plans for mitigating the impact of land development, and protecting and restoring urban ecosystems..

Class Format

This course will meet for two sessions per week. Class sessions will be lectures with extensive class discussion and oral presentations by students. Field trips will also be taken to observe the functions of ecosystems and how such functions are influenced by urban development.

Course Requirements

Requirements include five cumulative plan documents:

- state of watershed report (20% of grade);
- watershed management plan policy framework (20% of grade);
- sub-watershed management plans (20% of grade);
- wetland management plan (20% of grade);
- completed watershed management plan (20% of grade).

Readings

Course readings (required) are on Blackboard.unc.edu; reserved readings are available in the Chapin Library, New East, 2nd floor.

\*Indicates required reading

Session 1: Introduction and Overview of Course Aug. 22

### **Part I: Environmental Plans and Implementation Tools**

*Objectives:*

- 1) To identify and evaluate land use management tools that can be used for impact mitigation and restoration; and*
- 2) To evaluate how land use management tools are used to formulate comprehensive ecosystem protection strategies.*

Session 2: The Environmental Plan Aug. 27

\*Baer, William, 1997, "General Plan Evaluation Criteria: An Approach to Making Better Plans," Journal of the American Planning Association, vol. 63, no. 3, pp. 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, 5<sup>th</sup> Edition, Chicago: University of Illinois Press.

\*Daniels, Tom 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, Chicago: APA Planners Press, pp. 11-36.

Session 3: Plan Implementation Tools

Aug. 29

\*Randolph, John. 2003. "Ch. 5: Land Conservation for Working Landscapes, Open Space, and Ecological Protection," "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. 83-87, 106-140, 141-168.

### **Part II: State of Watershed Report**

*Objectives:*

- 1) To map a watershed, identify drainage networks, and compute watershed slopes and area.*
- 2) To evaluate land development impacts on upland and riparian zones of watersheds.*
- 3) To create a state of the watershed report and vision for the future.*

Session 4: Physical Attributes of Watersheds: Boundary, Slope, Stream Order Sept. 5

\*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.

\*Cassells, David and others, 1983, "ch. 2: Understanding the Role of Forests in Watershed Protection," in Carpenter, Richard, ed., in Natural Systems for Development: What Planners Need to Know, New York: MacMillan Publishing Co., pp. 53-69.

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

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

\*files on Y-drive under PL641 course:

Y:\PLAN 641.07\water\_GIS\_originals\water-manual (print the manual)

TBA: (GIS data files, no need to print)

ASSIGNMENT 1: State of Watershed Report for Booker Creek Watershed Due: Oct. 1

Session 5: Watershed and Sub-watershed Planning Sept. 10

\*Center for Watershed Protection, 1998, "Ch. 3: Crafting a Watershed Plan," Ch. 4: Customizing Subwatershed Plans," Rapid Watershed Planning Handbook: A Comprehensive Guide for Managing Urbanizing Watersheds, Ellicott City, MD: same as author, pp. 3.1-3.36, 4.1-4. 18.

Session 6: Impervious Cover Sept. 12

\*Arnold, Chester and C. James Gibbons, 1996 (Spring), "Impervious Surface Coverage: The Emergence of a Key Indicator," Journal of the American Planning Association, pp. 243-258.

\*Ryznar, Rhonda and Philip R. Berke, 2001, "Testing the Applicability of Impervious Surface Estimates Based on Zoning Categories in Watersheds," Chapel Hill: Department of City and Regional Planning, UNC, pp. 17.

\*Case Study: Powhatan Creek Watershed Management Report, 2001, 5 pp.

Orange County Soil Survey

ON RESERVE

Note: In class assignment on developing and development policies based on imperviousness of Powhatan Creek Watershed.

Session 7: Land Suitability Analysis

Sept 17

\*Hutchinson, Scott and Larry Daniel. 2000, Inside ArcView GIS. On Word Press [skim]. ON RESERVE

\*Ormsby, Tim and Jonell Alvi. 1999. Extending ArcView GIS, ESRI Press, chapter "How Model Builder Works.

\*Berke, Philip, David Godschalk, and Edward Kaiser, "Analyzing Environmental Information," in Urban Land Use Planning, 5<sup>th</sup> edition, Chicago: University of Illinois Press (forthcoming), pp. 33-41.

Session 8: Computer lab for suitability analysis

Sept. 19

Session 9: Best Management Practices Sept. 24

\*Schuler, Thomas, 1987, "ch. 2: Choosing the Best BMP Option for a Site," in Controlling Urban Runoff, Washington, D.C.: Washington Metro Regional Council, pp. 2.1-2.17.

\*Department of Environmental Resources, 1999, "ch. 2: Low-Impact Development Site Planning," Ch. 4: Low-Impact Development Integrated Management," pp. 2-1 – 2-20, 4-1 – 4-25, Low Impact Design Strategies: An Integrated Approach, Prince George's County, MD: same as author.

\*Center for Watershed Protection, 1998, Nutrient Loading from Conventional and Innovative Site Development, Ellicott City, MD: same as author (*skim*) ON RESERVE

Note: In class assignment on selecting BMPs for development sites.

Session 10: Open Session Sept. 26

Session 11: Presentation of State of the Watershed Report for Booker Creek Watershed Oct. 1

ASSIGNMENT 1: Student presentations of assignment 1. Posters and reports are due in class

### **PART III. 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*

Session 12: Visioning and scenario building; formulating a policy framework Oct. 3

\*Berke, Philip, 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," Urban Land Use Planning, Chicago: University of Illinois Press.

Assignment of teams and watershed management plans to be reviewed for next class.

ASSIGNMENT 2: Vision Statement and Policy Framework for Protection of Booker Creek Watershed  
Due: Oct. 17

Session 13: Student reviews and discussion of illustrative vision statements, goals and objectives, policies, and other components of policy frameworks in a sample of environmental plans. Oct. 8

Session 14: Simulated visioning exercise on "What Do We Want for the Future of Our Watershed?"  
Instructions will be given ahead of time. Oct. 10

Session 15: Open session for teams; be prepared to discuss draft vision statement/policy frameworks with instructor. Oct. 15

\*Environmental Protection Agency. 2004. Protecting Water Resources with Smart Growth. EPA 231-R-04-002. Washington, D.C. (*skim*) ON RESERVE

\*Environmental Protection Agency. 2005. Using Smart Growth Techniques as Stormwater Best Management Practices. EPA 231-B-05-002. Washington, D.C. (*skim*) ON RESERVE

### **Part IV: Watershed Field Evaluation and Modeling**

Session 16: Land Development Impacts on Watersheds Oct. 17

\*Cassells, David and others, 1983, "ch. 2: Understanding the Role of Forests in Watershed Protection," in Carpenter, Richard, ed., Natural Systems for Development: What Planners Need to Know, New York: MacMillan Publishing Co., pp. 69-93 (see Cassells reading, session 4).

\*Riley, Ann L., 1998, "ch. 4: River Scientists," in Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens, Washington, D.C.: Island Press, pp. 129-141.

\*Tsihrintzis, V. and R. Hamid. 1997. Modeling and Management of Urban Stormwater Runoff Quality: A Review, Water Resources Management, 11: 137-164.

ASSIGNMENT 2: Vision and policy framework due.

ASSIGNMENT 3: Watershed Field Evaluation and Modeling Due: Nov. 7

Session 17: Application of Water Quality Models to Land Use Planning Oct. 22

\*Donigan, A. 1991. Modeling on Nonpoint Source Water Quality in Urban and Non-Urban Areas. Washington, D.C.: EPA: read pp. 1-30

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

Session 18: Field Trip to Booker Creek Watershed Oct. 24

Session 19: Land Development Impacts on Riparian Zones of Watersheds Oct. 29

\*TJCOG, 1999, An Introduction to Riparian Buffers, Technical Memo: Riparian Buffer Series, No. 1, pp. 1-8.

\*TJCOG, 1999, Local Ordinances for Protecting Riparian Buffers, Technical Memo: Riparian Buffer Series, No. 4, pp. 1-13.

\*Town of Chapel Hill. 2004. "Resource Conservation District (RCD)," Land Use Management Ordinance, Town of Chapel Hill, NC.

\*Riley, Ann L., 1998, "ch. 3, 5, 7," in Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens, Washington, D.C.: Island Press, pp. 253-260 (*skim*).

Note: In class assignment: Be prepared to analyze Chapel Hill's RCD ordinance based on the degree to which the RCD incorporates the "model components" (see TJCOG Technical Memo 4) and "width requirements" (see TJCOG's Technical Memo No. 1). Questions to consider:

1. Apply the following criteria for assessing the effectiveness of a buffer ordinance:
  - a. does the RCD contain a clear definition of purpose?
  - b. is the definition of a buffer clear?
  - c. does the RCD include comprehensive rules/standards for protecting buffers?
  - d. does the RCD contain a clear explanation of the administration of an approval?
  - e. does the RCD specify how buffer protection will be enforced?
2. How does Chapel Hill's RCD compare with other buffer ordinances in the Triangle region (see matrix)?

Session 20: Watershed Impact Mitigation and Restoration Measures I Oct. 31

\*Riley, Ann L., 1998, "ch. 7, ch. 9," in Restoring Streams in Cities: A Guide for Planners, Policymakers, and Citizens, Washington, D.C.: Island Press, pp. 273--282, 335-348 (con't of Riley, session 19)

Session 21: Open session Nov. 5

Session 22: Presentation Nov. 7

ASSIGNMENT 3: In class presentation of watershed field evaluations, modeling, and recommendations. Reports are due.

## 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.

Session 23: Identification and Delineation of Wetlands      Nov. 12

\*Tiner, Ralph. 1999. "Ch. 1: Wetland Definitions" in Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification and Mapping, New York: Lewis Publishers, pp. 1-16.

\*Marsh, William, 1991, ch. 18: Wetlands, Habitat and Land Use Planning," Landscape Planning: Environmental Applications, New York: John Wiley & Sons, Inc., pp. 280-284 [skim 284-288]..

\*Richardson, Curtis, 1994, "Ecological Functions and Human Values in Wetlands: A Framework for Assessing Forestry Impacts," Wetlands, Vol. 14, No. 1, pp. 1-9.

ASSIGNMENT 4: Wetland Evaluation      Due: Dec. 3

Session 24: open session      Nov. 14

Session 25: Wetland Field Trip in Chapel Hill      Nov. 19

Session 26: Wetland Classification      Nov. 26

\*North Carolina State University Wetland Website, 2001, Types of Wetlands and Their Roles in the Watershed, pp. 1-7 (see <http://h2osparc.wq.ncsu.edu/info/wetlands/>)

\*Tiner, Ralph. 1999. Ch. 8: Wetland Classification" in Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification and Mapping, New York: Lewis Publishers, pp. 257-290 [skim].

\*Tiner, Ralph. 1999. Ch. 10: Wetland Mapping..." in Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification and Mapping, New York: Lewis Publishers, pp. 347-365.

Session 27: Assessment of Wetland Functions      Nov. 28

\*Water Resources Management Program, 1993, "Guidelines for Using the Urban Wetland Evaluation Checklist," Urban Wetlands in the Yahara Monona Watershed: Functional Classification and Management Alternatives, Institute of Environmental Studies, University of Wisconsin, Madison, Wisconsin, pp. 19-41.

\*Urban Wetland Evaluation Checklist, pp. 161-167.

\*Salvesson, David, 1994, "Regional Wetlands Planning," Wetlands: Mitigating and Regulating Development Impacts, Washington, D.C.: The Urban Land Institute, pp. 15-21, 48-52.

\*North Carolina State University Wetland Website, 2001, Wetland Restoration and Creation, Mitigation Banking & Successful Mitigation . Skim website: <http://h2osparc.wq.ncsu.edu/info/wetlands/>

\*DeLaney, Taylor. 1995, Benefits to Downstream Flood Attenuation and Water Quality as a Result of Constructed Wetlands in Agricultural Landscapes, Journal of Soil and Water Science, Nov.-Dec., pp. 620-626.

Wetland Evaluation Case Study

\* Case study: Starkweather Creek Wetland: Madison, Wisconsin (to be read prior to class)

Note: In class evaluation of case study wetland

**Part VI: Presenting the Watershed Plan to the Community**

*Objectives:*

*1) To present a plan coherently.*

*2) To engage elected officials, citizens, and planners in a discussion of the strengths and weaknesses of a plan.*

*3) To represent and respond to interests of specific stakeholders as well as general public interests.*

Session 28: Open Session                      Dec. 3

ASSIGNMENT 4: Reports on wetland evaluation and recommendation are due.

ASSIGNMENT 5: Plan for Booker Creek Watershed.                      Due: Oral presentation, Dec. 5  
Written plan, Dec. 7

Session 29: Student presentations    Dec. 5

ASSIGNMENT 5: Student presentations of plan for Booker Creek Watershed.

ASSIGNMENT 5: Final written plan is due Dec. 7