1. Course Objectives
This course focuses on the uses of GIS techniques in solving practical environmental problems. The students’ objectives of this class are:

- Obtaining ideas of how GIS can be applied to various environmental studies and applications.
- Grasping fundamental GIS knowledge and techniques required in solving real-world environmental problems.
- Developing personal experience in using GIS to solve environmental problems.

The course is made of three components: the lectures, the lab exercises, and the term project. In the lectures, the ideas, techniques, and procedures in some real-world environmental GIS projects are analyzed and discussed. In the lab part, the students gain hands-on experience in using those GIS tools that are very likely to be useful in an environmental project. The students complete a term project to acquire the experience of solving a real-world environmental problem with GIS.

In this term, the students will be working on a real project from Wildlands Project, [http://www.twp.org/](http://www.twp.org/). The project is about investigating the status of the remaining old growth forests in the Northeastern United States and Southeastern Canada (an area called the Northern Appalachians and Southern Canadian Shield or NASCS). There are two major components in this project:

- building a GIS database of the remaining old growth forests in the NASCS area for inventory, mapping, and analysis purposes; and
• performing spatial analyses on the spatial structures and distributions of the forests for planning and decision making purposes.

2. Prerequisites
Geography 58 or Geography/Earth Science 55, or permission of the instructor.

3. Computing Environment and Software
ArcGIS is the main software package used in this class. ArcGIS runs in Microsoft Windows environment on IBM compatible PCs.

4. Grading
There are five exercises, one exam and one term project in this course.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Lab Exercises</td>
<td>30%</td>
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<tr>
<td>Class Presentation</td>
<td>15%</td>
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<tr>
<td>Term Project</td>
<td>35%</td>
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<tr>
<td>Exam</td>
<td>20%</td>
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5. Readings

Books:


Goodchild, M. F. et al. (eds), 1993, Environmental modeling with GIS. New York: Oxford University Press.


Research articles will be assigned through the term.

6. Intended Schedule

Week 1:
Lecture 1. Introduction to Environmental Application of GIS (I) (January 5)
Reading:
• Lang, L., 1998, Managing Natural Resources with GIS, Redlands, CA:ESRI

Lecture 2. Introduction to Environmental Applications of GIS (II) (January 7)

Lecture 3. Introduction to Environmental Data (January 9)
Reading:
• USGS Digital Elevation Model Data (http://edcwww.cr.usgs.gov/glis/hyper/guide/usgs_dem)
• USGS Digital Raster Graphic (DRG) Program (http://mcmcweb.er.usgs.gov/drg/)
• USGS Digital Line Graph Data (http://edc.usgs.gov/glis/hyper/guide/usgs_dlg)

Lecture 4. Introduction to the “Old Growth” Project (January 10)

Lab 0. Reviewing ArcGIS: ESRI Virtual Campus Exercises
Lab 1. Downloading USGS DEM and Creating a 3D Color Terrain Map.

Week 2:
Lecture 5. Using GIS to extract landform information from digital elevation models (I): Primary terrain attributes (January 12)
Reading:
• Burrough and McDonnell, 1998, Chapter 8
• DeMers, 2002, Chapter 4

Lecture 6. Using GIS to extract landform information from digital elevation models (II): Watershed information (January 14)

Lecture 7. Discussion of the “Old Growth” Project

Lab 0. Reviewing ArcGIS: ESRI Virtual Campus Exercises (cont.)
Lab 1. Downloading USGS DEM and Creating a 3D Color Terrain Map (cont.).

Week 3:
Lecture 8. Using GIS to perform classification analysis (I) (January 21)
Reading:

Lecture 9. Using GIS to perform classification analysis (II) (January 22)

Lecture 10. Knowledge-based techniques in natural resource mapping (January 23)

Lab 2. Extracting Landform Information from DEM

Lab 0 and Lab 1 are due on Thursday.

Week 4:
Lecture 11. Using GIS to perform spatial interpolation (I) (January 26)
Reading:
• Burrough and McDonnell, 1998, Chapter 5
• Burrough and McDonnell, 1998, Chapter 6

Lecture 12. Using GIS to perform spatial interpolation (II) (January 28)

Lecture 13. Discussion of the “Old Growth” Project (January 30)

Lab 3. Supervised and unsupervised classifications of landforms

Lab 2 is due on Thursday.

Week 5
Lecture 14. Using GIS to study spatial patterns (I) (February 2)
Reading:
• Gatrell, A.C., Bailey, TC., Diggle, P.J., Rowlingson, B.S., 1996, Spatial point pattern analysis and its application in geographical epidemiology, Transactions of the Institute of British Geographers, 21, 256-274.

Lecture 15. Using GIS to study spatial patterns (II) (February 4)

Lecture 16. GIS in landscape ecological studies (I) (February 6)
Reading:
• TBA

Lab 4. Spatial Interpolation
Lab 3 is due on Thursday.

Week 6:
  Lecture 17. GIS in landscape ecological studies (II) (February 9)
  Lecture 18. Discussion of the “Old Growth” Project (February 11)

Week 7:
  Lecture 19. Using GIS to study spatial correlation (February 16)
    Reading:
    • TBA
  Lecture 20. Cartographic issues in environmental GIS projects (February 18)
    Reading:
    • TBA
  Lecture 21. Course summary (February 20)

Week 8:
  Exam (February 23)

  Individual advisory on the “Old Growth” project

Week 9:
  Student final presentation (March 3)
  Student final Presentation (cont.) (March 5)

POSTERS AND REPORTS ARE DUE ON MARCH 11 (THURSDAY).