Student trajectories toward GIS competence at Bucknell

Ben Marsh
Geography/Environmental studies
Duane Griffin
Geography
Janine Glathar
Library and Information Technology
David Del Testa
History
Carl Kirby
Geology
• ‘Critical mass’ as an impediment .. not just seniors on the way out the door.
• Upper-level students with interest & competence are needed.
• Students follow many paths toward GIS competence.
• Students have different learning goals.
• Different courses are attractive in different ways.
Student trajectories toward GIS competence at Bucknell

1. A first taste
2. Intensive intro for non-technical students
3. The beginning of expertise
   • Geography & Geology GIS courses
     ... the different niches
   • Possibility of a ‘mechanics’ self-directed mini-course
4. Routine involvement in upper-level course work
5. Independent studies / thesis / etc.
6. Integration with LIT / Janine
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Most students are unable to know that they would be interested in GIS because they’ve never encountered it.

- Just a taste – FOUN
- First courses – meeting it in passing
- Stepping in – easy access in a ‘methods’ course
First-year seminars Field data linked

Goal – brief exposure to mapping
Upper-level lab science
Field data linked to cook-book GIS
Goal – see an analytic success
Lab XII—Enst/Geog 345: Streams and landuse: Analyzing nutrient loading

Goals: Three goals for this lab: 1) understand the relation between stream health and how the land in the watershed is used, 2) encounter modern geo-spatial tools, GIS, 3) as usual, write a concise report.

Today we’ll work up the data from 2 weeks ago.

1. calculate the percent of land area in the watershed We will be using a computer mapping system called GIS; we will put together. First open the ArcMap program.
   a. Open the project called geog_345_nutrient_loadings called R:\geography\public\GEOG_345\Nutrient_loadings.
   b. Turn on the layers in the table of contents one by one starting at the bottom, to see what we’ve mapped. Landuse is from satellite imagery; watersheds are determined from the streams & topography. All layers are from free public sources.
   c. Open the attribute tables (right click in TOC) of the watershed and landuse layers to see the data associated with the map units — understand the columns?
   d. Open the Toolbox (it’s a red button) & locate the Union tool (use ‘search’ in Index). ‘Union’ the watershed and the landuse layers – careful where you write the output file. This will double up the information from both layers – each part of the map will be re-sliced according to both what watershed it’s in and what landuse it’s in.
   e. Open the attribute table of the resulting map, right-click on the heading of the subarea column, choose calculate geometry, choose area, choose the hectares unit, and say ‘okay’. We now know the area of the watersheds, and of all the subareas by landuse.
   f. We need to make a column with a unique value for each shed+use pair, so we can sum the areas by landuse and basin. I made a little routine called joiner_cal that will do this … use it in [right-click on the text header, then …] calculate values to write the unique value into the join_fields column, by loading the routine from the GIS folder.
   g. Use the Dissolve tool to combine all of the shed+use pairs using the join-fields column as Dissolve_field, carrying the subarea value through as a sum and the hectares value as first or max or anything else (since they’re all the same number).
   h. Export the attribute table as dbf to some folder that you can ‘write’ to — your personal space, e.g. Save all your important data like this … you can export map images, etc., too.

Upper-level lab science
Field data linked to cook-book GIS
Goal – see an analytic success
Introduction
This lab outlines the minority groups that live within 1 mile, 2 mile, and 3 mile radii of the proposed site of a landfill in Brunswick County Pennsylvania. The minority group that is being measured is black non-Hispanics.

Methods
To create this data, we loaded census 2010 data for percent minority into an ArcGIS map, as well as the proposed site for the landfill. Then I drew a circle of 1 mile radius around the landfill, as well as a circle with a 2 mile radius, and a circle with a 3 mile radius. Next, I selected the block groups from the census that had their centers located within the 1 mile radius circle, as well as those located within the 2 and 3 mile radius circles. Then I looked at the attribute table to gather information on how many black non-Hispanic people lived in each of these radii and how many total people lived within each of these radii. I calculated the percent of black non-Hispanics in the radius to the total number of people living in the radius for all three radii.

Followed is a picture of these radii on a map with percentages of black non-Hispanic residents from the 2010 census.

<table>
<thead>
<tr>
<th></th>
<th>BHH</th>
<th>total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mile</td>
<td>119</td>
<td>227</td>
<td>52.42291</td>
</tr>
<tr>
<td>2 mile</td>
<td>346</td>
<td>1101</td>
<td>31.42598</td>
</tr>
<tr>
<td>3 mile</td>
<td>643</td>
<td>2140</td>
<td>30.04673</td>
</tr>
<tr>
<td>county</td>
<td>12120</td>
<td>107431</td>
<td>11.28166</td>
</tr>
</tbody>
</table>

Results
Put into a graph, it becomes clear that there are a high percentage of black non-hispanic minorities living close to the proposed site of the landfill compared to non-minorities.

We can see that the area within 1 mile of the proposed landfill is about 50% black non-hispanic, whereas the county is only about 10% black non-hispanic. As the distance from the landfill gets larger, the percent of minorities decreases.

Discussion
It is fairly clear that the disparate impact of black non-hispanic is high in regards to this proposed landfill. The landfill is being pushed to be built near a community with a high percentage of black non-Hispanics, indicating that the proposed site may be attempting to take advantage of the fewer resources of the black non-Hispanic people which prohibit them from fighting against the landfill. A new site should be proposed that contains only about 10% black non-Hispanic people (because that is the county average) so that the likelihood of disparate impact is lessened.
GIS in teaching across the curriculum

BIOL 353 (Ecosystem Ecology)
BIOL 415 (Conservation Biology)
BOTS (Bucknell Semester on the Susquehanna)
CENG 305 (GIS Applications for Engineering)
CENG 320 (Water Resources Engineering)
CENG 330 (Introduction to Transportation Planning)
CENG 421 (Hydrology)
CENG 42x (Groundwater Hydrology)
CENG 422 (River Mechanics)
CENG 432 (Urban & Regional Planning)
CENG 490 (Senior Design)
CSCI 361 (Software Engineering)
ECON 102 (Methods)
ECON 312 (Health Economics)
ENGL 224 (Visions of the Susquehanna)
ENGR 101 (Engineering Graphics)
ENST 200 (Acquiring Environmental Knowledge)
ENST 211 (Environmental Pollution & Control)
ENST 302 (Environmental Research Methods)
ENST 255 (Environmental Justice)
FOUN “Families in History and History in Families”
FOUN “Blue Highways” foundation seminar

GEOG 101 (Introduction to Human Geography)
GEOG 175 (Landforms of the World)
GEOG 204 (Applied GIS)
GEOG 257 (Global Environmental Change)
GEOG 332 (Evolution, Ecology & Human Impact)
GEOG 345 (Food & the Environment)
GEOL 103 (Physical Environmental Geology)
GEOL 230 (Environmental GIS)
GEOL 310 (Applied Environmental Geomorphology)
GEOL 320 (Flood Analysis)
HIST 275 (Mills, Milling and Local History)
HUMN 128 (Myth, Reason, Faith)
HUMN 272: (Nature and Enlightenment)
HUMN 290 (Susquehanna Country)
HUMN 301 (Brain, Mind, and Culture)
PHYS 147 (Energy & Sustainability)
PSCI 140 (American Politics)
RELI 233 (Global Feminism & Religion)
UNIV 266 (Sustainable Building Design)
WMST 233 (Global Feminism & Religion)
Susquehanna Summer Writer’s Institute
Environmental Residential College
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GIS courses – Geog 204 and Geol 230
Standard intro to use of ArcGIS
Goal – medium-level expertise
GEOG 204: Applied GIS

- Goal: Be Able to Use GIS for a Project of Your Own.
- Diverse majors
- 3 Phase Semester
  1. Brutal Boot Camp
  2. Midterm Group Project
  3. Individual Project
- Managing enrollment
- Managing expectations
- Analytical or Cartographic Option
Hi Duane,

...current job, and how glad I am to have taken your class. I'm working for the Bureau of Land Management in the Lander, WY Field Office. I'm working with another recent grad doing a lot of field work data collection. ... I can tell that your GIS class was much better than my work partner's from how much we each know. I put together a map that has...]

Cheers,
Andrew
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‘Capstone’ - Original data & analysis
Goal – students see others using methods

Food access inventory

This is a project from the 2012 Environmental Studies 411 senior clinic course. See all 8 projects at the main Community Projects 2012.

Food access inventory

Food access is a health issue – Is healthy food available to all? -- issue -- Are disadvantaged population more likely to have poor food examined how available food is in Sunbury. Sunbury turns out to have access compared to other towns in central Pennsylvania, as a large hospital headquartered in the town and supporting two grocery stores in the

- Andrew Kilough, Devon Lindsley, Geneva Hesner, Margaret Turrentine.

Download the Food Access Policy Report
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A VEGETATION RECONSTRUCTION OF UNION COUNTY, PENNSYLVANIA DURING THE EARLY HISTORICAL PERIOD (1755-1865)

By

Nicholas P. Goncalves

A Thesis Submitted to the Honors Council
For Honors in Geography
May, 9 2011
Advanced research -
Community assets inventory for a healthcare inventory
Goal – near-professional support for higher-level research teams
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Who is Janine?

- GIS Specialist
- New position at Bucknell
- Work out of Library & IT Division
- Integrate GIS & spatial thinking across the curriculum in teaching and research
  - Serve as a resource for faculty and students
Successes:

- Students quickly learn what GIS can do.
- The threshold for learning GIS seems lower.
- Students can support each other & faculty work.
- A range of kinds of GIS are available.