GIS and Sustainability Project Exchange

Want to make a difference? Help out by taking on a project, or suggest one.

If you want to do a thesis project or independent study that makes a difference, then start by finding out what is needed on campus. It's always nice to have an eager audience interested in your work, and your products are better when that audience holds you accountable for doing it well. Questions and ideas below are examples of projects that individuals or classes could take on. Larger group projects are listed below.

This list is just a start, and it is always evolving. Any idea may be useful. Any idea can have a theoretical angle that makes it suitable for a thesis topic. Ideas can also be found in other locations, such as Princeton's sustainability ideas list.

You can add to this list (faculty/staff: add your name if you want to help students develop it). Or you can peruse the list for projects that need doing. Questions? see Mary Ann Cunningham or Neil Curri.

GIS and Mapping projects

Help with climate smart communities: Conduct a climate change vulnerability assessment for Dutchess County (or other communities)

Health impacts: map fossil fuel production/processing and vulnerable/front line populations– fossil fuels and environmental features of interest

Assess extractive areas and environmental factors following this recent Distilled post on resource extraction

Sea level rise: new article in Washington Post says it's accelerating and people are moving into vulnerable areas.

Distribution of eGRID fossil fuel and renewable energy sites: are there tendencies for FF sites to occur in communities with socioeconomic disadvantages?

Conservation landscapes on campus: The new Climate Action Plan includes plans for conservation landscape planning on campus. What would this look like? What habitat areas do we already have? What management needs?

Map air quality, carbon emissions, other pollutants, for example starting with EPA Castnet data here, or EPA envirofacts, and/or EPA data we used in lab, or GapMinder data, or UNEP data. Perhaps connect these ideas to carbon reduction plans in Paris. How has the decline in coal power affected emissions distributions? Where have impacts of this change been greatest?

What are threshold effects of climate change? Using climate data for 2030s or 2050s, where will temperature change pass a threshold for ice, permafrost, key crops, human heat stress, or other factors?

Vulnerability in developing areas what measures of poverty and climate vulnerability put which regions of the world at special risk? (CIESIN data layers may be a good place to start)

Update and develop campus planting maps and data on campus - Point locations of all campus plantings have been mapped and associated with maintenance scheduling information. The web map used to display this information could be further developed to include maintenance activity (accessed via web app and/or mobile app). The polygon areas of the plantings need to be mapped.

What impact has Vassar College had on its own landscape? - (project idea from April Biesaw)
Use historical air photos to map the Vassar landscape through time, showing the creation and destruction of waterways, buildings, roads, parking lots, etc. Figure out what the land was used for before main campus and the farm were created.

Environmental gradients mapping: The EMMA network (http://www.emmahv.org) is currently is made up of 9 sites in the Hudson Valley and we are in need of site characterizations. The sites are meant to create a north/south and urban/rural gradient. In particular we are looking for help mapping the land cover, soils, streams, wetlands, waterbodies, and fragmentation. We are also looking for gaps in our gradient. This information would be incredibly valuable as we undergo our strategic planning and develop future directions. Contact Keri VanCamp for additional information.

Map Human Development Index data Neil has cleaned up a very extensive HDI data set, and there are many topics that could be mapped to display HDI and related data. He has posted a report on the dataset and the HDI report here. This data set is available on the lab computers.

Map changes in impervious surface cover for different years (1936-recent) in Dutchess County: to show extent of suburban expansion, road network, with implications for habitat, water quality, and other impacts.

Tree cover change and suburban sprawl in Dutchess county: we have digitized tree cover for 1936 and 2001, and we have partially digitized tree cover for 1955. How much change happened in those two intervals? Where? How did suburban expansion change in extent and density?

Calculate road network and carbon impacts of suburbs vs. urban areas. Which areas have the greater social cost and impacts? Which receive more subsidies?

What is the magnitude of ecosystem services of tree cover on the Vassar Campus? Use iTree programs to calculate them.

Where does our energy come from? map the sources of oil, gas, hydro, and other energy we use. Or map land use, topography, settlement, poverty, vulnerable water bodies, or other factors in some major producing regions (easiest in US and Canada, but possible elsewhere)

Energy sources to start with might include the EIA (for example this link, including state-to-state data; NREL,

Projects that have received attention already:
[Eilif Ronning did this for Keri in Cartography class; might want a revisit after a few years]
Map the flowering plant diversity in the old fields on the Vassar Farm and Ecological Preserve (VFEP) over time. This summer we conducted weekly surveys of the plants in flower in the old fields on the ecological preserve. We are interested in examining the nectar availability for pollinators throughout the season. The dataset is extensive and there are many ways the data could be used to create a map that informs land management on the VFEP. Contact Keri VanCamp for additional information. I would love to do this! (Eilif)

[Stephanie Ingraldi and Norris Meigs and Addison Tate have worked on this]
Pollinator pathways for the Town of Poughkeepsie: in support of a new initiative to establish a pollinator pathway, we need to map areas that could be suitable for pollinators.

Map/analyze layers in the Scenic Hudson solar mapping tool

The Underground Railroad in the Hudson Valley - Vassar Prof. Rebecca Edwards co-authored a 2008 report on various people and places in the Mid-Hudson Valley associated with the underground railroad. Map their businesses, homes, and other places that may have served some function in helping to hide escaped slaves. This may involve georeferencing historic maps to use as basemaps and/or identify relevant locations. This project could be well-suited to "story map" using ArcGIS Online, something like this but structured more like a tour. Could be part of an effort to getting some places in the mid-Hudson Valley listed on the National Historic Register's list of property associated with the Underground Railroad.
More info here: https://ford.vassar.edu/projects/2007/edwards.html
http://www.hudsonrivervalley.org/links/antislavery.html

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Group projects, easy-entry
map historical wetlands for our area? https://www.fws.gov/wetlands/Data/Historic-Wetlands-Data.html
(only done in portions of three states IL, WI, IA, in this map, zoom out to IL, WI, IA; see also web services)

map wetland features and other features new pipeline corridors (e.g. Line 3 or Bayou Bridge)

Survey123 mapping of habitat features on campus, or of vine issues on campus

Survey123 inventory of window AC, of energy inefficiency issues

HOT mapping with Hudson Valley Mappers

What is the magnitude of ecosystem services of tree cover on the Vassar Campus? Map by species and DBH, use equations from ENST 124 process to calculate carbon storage; use iTree programs to calculate pollutant benefits for larger area, or for an area like Newburgh.

Where does our energy come from? map the sources of oil, gas, hydro, and other energy we use. Or map land use, topography, settlement, poverty, vulnerable water bodies, or other factors in some major producing regions (easiest in US and Canada, but possible elsewhere)

Digitize historic change on campus over decades; impervious surface cover, also plantings, paved areas, buildings, and so on--as seen in air photos over the decades? What does this mean for impacts on local watersheds or biodiversity? (This is related to the one above but is more preliminary)

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Sustainability projects
Create films of sustainability practices or needs or leadership on campus: a project for film students or English or others. Question is, what conditions facilitate these examples? How can we promote those conditions? (practice documentary film design and production)

Climate impacts: Examine faculty/staff travel impacts: document license plates in parking lots; continue to work on residential zip codes and other info sources. (Alistair and Dzifa have JYA location data MAC has faculty zip codes).

Greenhouse gas accounting: Faculty and staff travel all the time, but accounting for this travel has been hard to pin down. Can we improve systems for accounting for fac/staff travel locations/distances? Student + Accounts Payable could work on a form online to enter travel info (and print for reimbursement)

Greenhouse gas accounting: Assess the current state of knowledge about fugitive emissions of natural gas, model uncertainty in the estimates of our GHG budget (see for example http://grist.org/climate-energy/bad-news-for-obama-fracking-may-be-worse-than-burning-coal/)

Accounting for sustainability: how do you design an accounting process that is inclusive and more complete than what we currently have? How do we understand the problem of externalities?

Sustainable transportation: Study options and costs for secure bike storage. What are the options, obstacles, opportunites? (URBS, economics,…)

Sustainable transportation: Outline a proposal for an annual bike exchange, to build on the abandoned bike sales B&G currently does (STS, ENST)

Energy use: do a historical search and assessment of energy use in say 1970, 1960, and compare practices and consumption to current practices and consumption. How much fac/staff travel? What

appliances recommended to incoming students? Provided? Purchasing records? Energy expenditure records? Can we construct part of a STARS report for a historical time point?

Greenhouse gas accounting: Assess the current state of knowledge about fugitive emissions of natural gas, model uncertainty in the estimates of our GHG budget (see for example
http://grist.org/climate-energy/bad-news-for-obama-fracking-may-be-worse-than-burning-coal/

Climate impacts: Map oil distribution network in US and Canada. It is not possible to do this completely, but any progress would help us understand geopolitical, environmental, and social impacts better than we do. (Geog/ESCI)

Food security: Food culture project with Middle Main project, interview Poughkeepsie residents with traditional food knowledge (anthropology, LALS, ENST)

Sustainability planning: Outline and justify aspects of a plan for a Sustainability Summer Institute (combination of URSI and EDF fellows, with EDF fellows for leadership)

Energy use and climate impacts: Study cost and benefits of electric golf carts and other options for our vehicle fleet.

Stormwater impacts and environmental quality: study runoff variations from different surfaces , for stormwater planning

Natural landscaping: study conditions that promote growth of vines; identify further opportunities for mowing reduction; examine obstacles to mowing reduction;

Solar thermal energy: what would it take to heat Walker Pool with solar hot water? Explore technology, budgets, and barriers to kick start this discussion of low-C energy.

EMMA
Members are mostly land managers, so they want to learn better land management ideas
Only a few sites have veg maps, not necessarily that detailed
Northeast Terrestrial Habitat map, predictive, classes tied to TNC Naturesev classification systems. Would like to do field verification of the map.

Soil types, geology on sites
Maybe stream work, watersheds

Soil conditions, soil chemistry in watersheds; clayey soils, etc.
Urbanization

First just doing inventory would be valuable.

Some maps to show how the areas occur in the same areas

Big drivers = (big 4 questions)
Deer management
Invasive species
Climate change
Habitat loss/fragmentation

TNC forest regeneration capacity study based on FIA, which Neil was interested in when he was at Cornell

 Peter Smalledge Cornell Cooperative master forester program