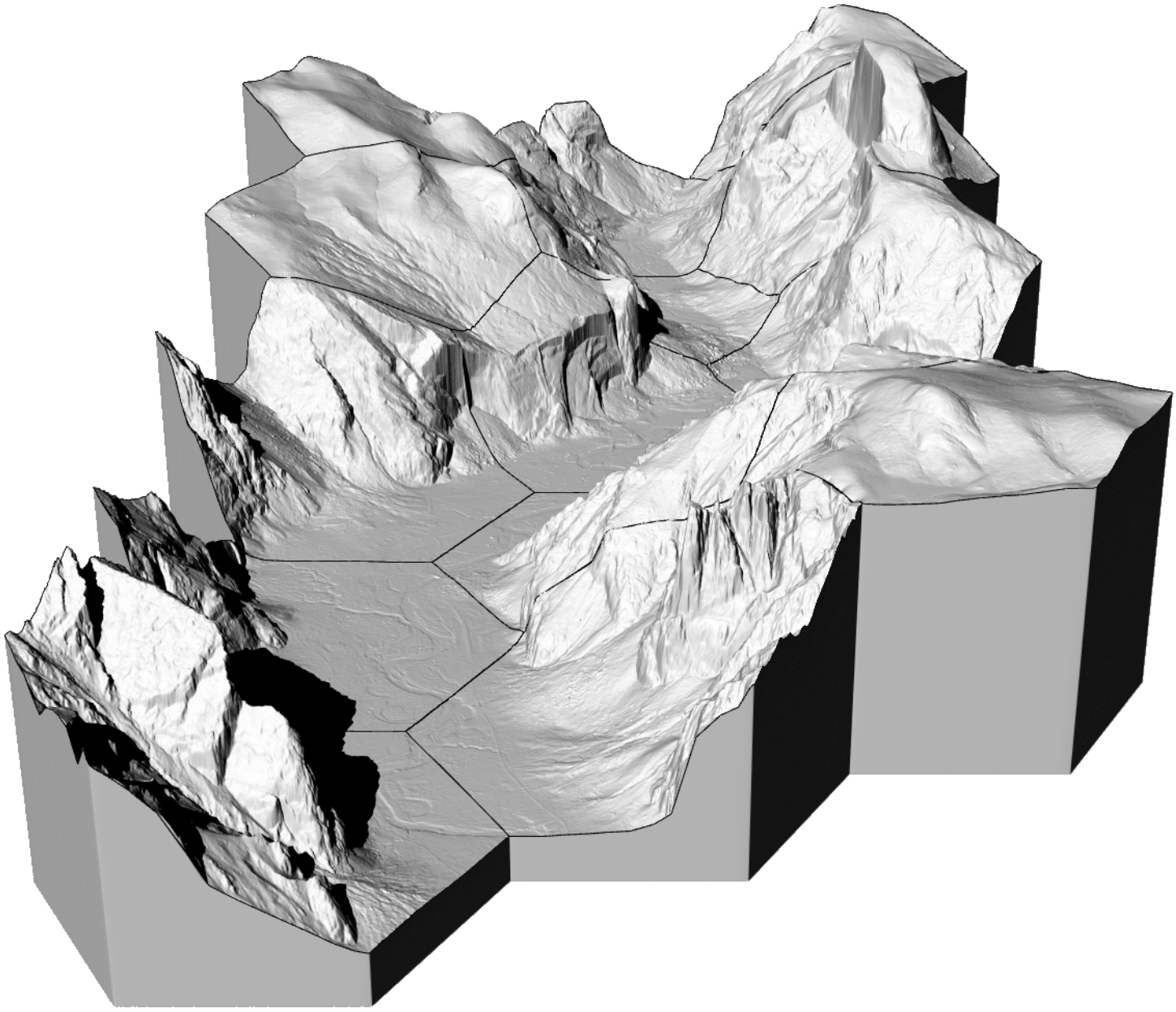
LA 7051 | Advanced Topics Studio

Computational Ecology

Yosemite National Park

Brendan Harmon
baharmon@lsu.edu

Fall 2018. Design 217.
Monday, Wednesday, & Friday
1:30pm–5:30pm.



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Course description

In this studio you will learn computational methods for ecological modeling and use them to plan for the future of Yosemite national park. This studio will introduce advanced topics in landscape ecology and biodiversity conservation such as shifting ecological baselines, process-form interaction, systematic conservation planning, and climate change adaptation. You will learn how to model ecological patterns and simulate ecological processes using Geographic Information Systems (GIS). You will learn visual programming, geospatial programming in Python, digital fabrication methods, and advanced 3D rendering. You will apply these methods to develop a long-term landscape plan for the national park. Each week you will spend a day in a seminar discussing ecological theory and its applications, a day in a workshop learning new computational methods, and a day developing your projects.

Optional fieldtrip

There will be an optional fieldtrip to Yosemite National Park the week before the semester starts.

Course schedule

1. Landscape ecology
2. Programming
3. Form & process
4. Baselines
5. Suitability
6. Viewsheds
7. Corridors
8. Land change
9. Fire simulation
10. Flood simulation
11. Digital fabrication
12. Planning I
13. Planning II
14. 3D rendering
15. Final review

Projects

At the final review you will present your work from all three projects – mapping and analysis, landscape planning, and reserve design – in an engaging narrative that explains the challenges faced by the park, your landscape planning methodology, and your design.

Mapping & analysis You will develop a series of maps and other media that describe the national park, its physical environment, and ecological patterns and processes. Your work should introduce the biodiversity conservation issues faced by the park. Deliverables may include maps, renderings, animations, video, and text. **Due:** week 5.

Planning methodology You will develop a landscape planning methodology for developing a long-term master plan for the national park. Begin with a suitability analysis using map overlays You should should also develop graphics that explain your planning methodology. **Due:** week 10.

Landscape planning You will design a long-term masterplan for the national park that addresses contemporary and emerging ecological issues. Your masterplan should evolve over time, address multiple spatial and temporal scales, engage visitors in the park's ecological processes, and aesthetically express the uniqueness and dynamism of the landscape. Deliverables include an illustrative masterplan, a CNC milled terrain model, phasing diagrams, diagrams illustrating management regimes, and 3D renderings. **Due:** week 15.

Grading

Mapping	25%	**Methodology**	25%	**Planning**	50%

Software

GRASS GIS | `https://grass.osgeo.org/`
Blender | `https://www.blender.org/`
Rhinoceros | `https://www.rhino3d.com/`
RhinoTerrain | `http://www.rhinoterrain.com/`
RhinoCAM | `https://mecsoft.com/rhinocam-software/`

Topics

Landscape ecology An introduction to landscape ecology and biodiversity conservation. The methods workshop will cover ecological census techniques, interpolation methods, and hotspot analysis.

Sutherland, William J. 2006. *Ecological Census Techniques*. 2nd ed. Cambridge, UK: Cambridge University Press.

Myers, Norman, Russell A Mittermeier, Cristina G Mittermeier, Gustavo A B da Fonseca, and Jennifer Kent. 2000. "Biodiversity hotspots for conservation priorities." *Nature* 403:853–858.

Forman, Richard T T. 1995. *Land Mosaics: The ecology of landscapes and regions*. New York: Cambridge University Press.

Geospatial programming A series of methods workshop will introduce visual programming, python programming, and python scripting in GIS. You will also learn how to use Git, a version control system, to maintain your code.

Hetland, Magnus Lie. *Instant Hacking*. http://hetland.org/writing/instant-hacking.html.

GitHub. 2016. *GitHub Guides: Hello World*. https://guides.github.com/activities/hello-world/.

Harmon, Brendan A, Anna Petrasova, Vaclav Petras, Helena Mitasova, Jelena Vukomanovic, and Ross K Meentemeyer. 2016. *Introduction to GRASS GIS: Python Scripting*. http://ncsu-geoforall-lab.github.io/grass-intro-workshop/python.html.

Form & process

Ecological baselines ...

Suitability analysis ...

Viewsheds ...

Corridors ...

Land change ...

Petrasova, Anna, Vaclav Petras, Derek Van Berkel, Brendan A Harmon, Helena Mitasova, and Ross K Meentemeyer. 2016. "Open source approach to urban growth simulation." *ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*: 953–959. doi:10.5194/isprs-archives-XLI-B7-953-2016. http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLI-B7/953/2016/.

Fire simulation ...

Flood simulation ...

Digital fabrication ...

Landscape planning ...

3D rendering ...

Petrasova, Anna, Vaclav Petras, Brendan A Harmon, and Helena Mitasova. 2016. *Using GRASS GIS through Python and tangible interfaces*. https://grasswiki.osgeo.org/wiki/Using_GRASS_GIS_through_Python_and_tangible_interfaces_(workshop_at_FOSS4G_NA_2016).

Petrasova, Anna, Brendan Harmon, Vaclav Petras, and Helena Mitasova. 2015. *Tangible Modeling with Open Source GIS*. Springer International Publishing. doi:10.1007/978-3-319-25775-4. https://www.researchgate.net/publication/291973077_Tangible_Modeling_with_Open_Source_GIS.

Readings

Hetland, Magnus Lie. *Instant Hacking*. http://hetland.org/writing/instant-hacking.html.

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Policies

Time Commitment Expectations LSU's general policy states that for each credit hour, you (the student) should plan to spend at least two hours working on course related activities outside of class. Since this course is for six credit hours, you should expect to spend a minimum of twelve hours outside of class each week working on assignments for this course. For more information see: http://catalog.lsu.edu/content.php?catoid=12&navoid=822.

LSU student code of conduct The LSU student code of conduct explains student rights, excused absences, and what is expected of student behavior. Students are expected to understand this code: http://students.lsu.edu/saa/students/code.

Disability Code The University is committed to making reasonable efforts to assist individuals with disabilities in their efforts to avail themselves of services and programs offered by the University. To this end, Louisiana State University will provide reasonable accommodations for persons with documented qualifying disabilities. If you have a disability and feel you need accommodations in this course, you must present a letter to me from Disability Services in 115 Johnston Hall, indicating the existence of a disability and the suggested accommodations.

Academic Integrity According to section 10.1 of the LSU Code of Student Conduct, "A student may be charged with Academic Misconduct" for a variety of offenses, including the following: unauthorized copying, collusion, or collaboration; "falsifying" data or citations; "assisting someone in the commission or attempted commission of an offense"; and plagiarism, which is defined in section 10.1.H as a "lack of appropriate citation, or the unacknowledged inclusion of someone else's words, structure, ideas, or data; failure to identify a source, or the submission of essentially the same work for two assignments without permission of the instructor(s)."

Plagiarism and Citation Method Plagiarism is the "lack of appropriate citation, or the unacknowledged inclusion of someone else's words, structure, ideas, or data; failure to identify a source, or the submission of essentially the same work for two assignments without permission of the instructor(s)" (Sec. 10.1.H of the LSU Code of Student Conduct). As a student at LSU, it is your responsibility to refrain from plagiarizing the academic property of another and to utilize appropriate citation method for all coursework. In this class, it is recommended that you use Chicago Style author-date citations. Ignorance of the citation method is not an excuse for academic misconduct.