

**Course Subject, Number and Title**

Zoology 955

LIMNOLOGY SEMINAR: A limnologist's introduction to spatial analysis and GIS in R  
Spring Semester 2018

**Credits**

1 credit

**Canvas Course URL****Course Designations and Attributes****Meeting Time and Location**

Time: Tuesday 13:30-14:30

Location: Hasler Lab 210

**Instructional Mode**

Face-to-face. This seminar will be tutorial based and focused on developing a skillset that can be applied in graduate student research.

**How Credit Hours are met by the Course**

Traditional Carnegie Definition – One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks.

**INSTRUCTORS AND TEACHING ASSISTANTS****Instructor Title and Name**

Dr. Hilary Dugan, Assistant Professor, Center for Limnology  
Department of Integrative Biology

**Instructor Availability**

Office hours by appointment.

**Instructor Email/Preferred Contact**

[hdugan@wisc.edu](mailto:hdugan@wisc.edu)

**OFFICIAL COURSE DESCRIPTION****Course Description**

If you have never used GIS in your research, you may think of it as a great way of creating maps (and it is!). But more importantly, GIS is a good foundation for applying spatial analyses. As ecologists, much of our research has an inherent spatial component (sampling locations, species distributions, site heterogeneity). The objective of this course is to provide an

introduction to handling and manipulation spatial data so that students can have the skillset and resources to apply spatial analyses in their own research.

This course will cover topics such as: handling spatial data, coordinates and projections, raster data sets (like climate or land cover data), data interrogation, modifying spatial data, maps, and the basics of satellite imagery. Even if you do not currently use spatial data in your research, it is advantageous to know how to complete simple GIS tasks. Both for your own research and your future career.

### Requisites

Graduate or professional standing. Students should be familiar (beginner level) with the R programming language.

If you have never used R and would like to take this course, it does not take long to get acquainted. There are plenty of online courses (ex. <https://www.coursera.org/learn/r-programming>), and meaty text documents (<https://cran.r-project.org/doc/manuals/R-intro.pdf>). I highly recommend using RStudio as a code editor. RStudio provides a wealth of learning resources (<https://www.rstudio.com/online-learning/#R>), and handy desk cheatsheets (<https://www.rstudio.com/resources/cheatsheets/>).

### LEARNING OUTCOMES

#### Course Learning Outcomes

Develop the knowledge and skills to use and analyze spatial data in graduate student research.

### GRADING

Assessment will be based on a handful of short assignments, and a final project based on individual research topics.

### TIMETABLE (as of 1/8/2018)

Date	Topic	Useful R Packages
Jan 23	Introduction to Spatial Data	
Jan 30	Coordinate Reference Systems Projections	Packages: - rgdal
Feb 6	Vector Data - Types - Reading/Writing	Packages: - sp - raster - rgeos
Feb 13	Guest Lecture	
Feb 20	Raster Data - Types Reading/Writing	
Feb 27	Vector Data Manipulation - Aggregating - Overlays - Spatial Queries - Ex) National Hydrography Dataset	
Mar 6	Raster Data Manipulation - Raster Stacks/Bricks - Ex) Global Climate Model Data	

Mar 13	Spatial Data Analysis - Autocorrelation	
Mar 20	Spatial Data Analysis - Interpolation	
Mar 27	SPRING BREAK	
Apr 3	Case Study – FLAME with Luke Loken	
Apr 10	Maps	
Apr 17	QGIS introduction	
Apr 24	Satellite Imagery - Thresholding - Classification	Remote sensing R packages: - RStoolbox - landsat - MODISTools - hsdar - Visualization: rasterVis
Apr 30	Final Reports	
May 1	Final Reports	

## OTHER COURSE INFORMATION

Resources:

Applied Spatial Data Analysis with R

(<http://gis.humboldt.edu/OLM/r/Spatial%20Analysis%20With%20R.pdf>)

## RULES, RIGHTS & RESPONSIBILITIES

- See the Guide's to [Rules, Rights and Responsibilities](#)

## ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to [studentconduct.wiscweb.wisc.edu/academic-integrity/](http://studentconduct.wiscweb.wisc.edu/academic-integrity/).

## ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

**McBurney Disability Resource Center syllabus statement:** "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." <http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php>

## **DIVERSITY & INCLUSION**

**Institutional statement on diversity:** “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” <https://diversity.wisc.edu/>