Syllabus – Spring 2023
WILD 562 – 01 – Wildlife Habitat Modeling – 4 Credits

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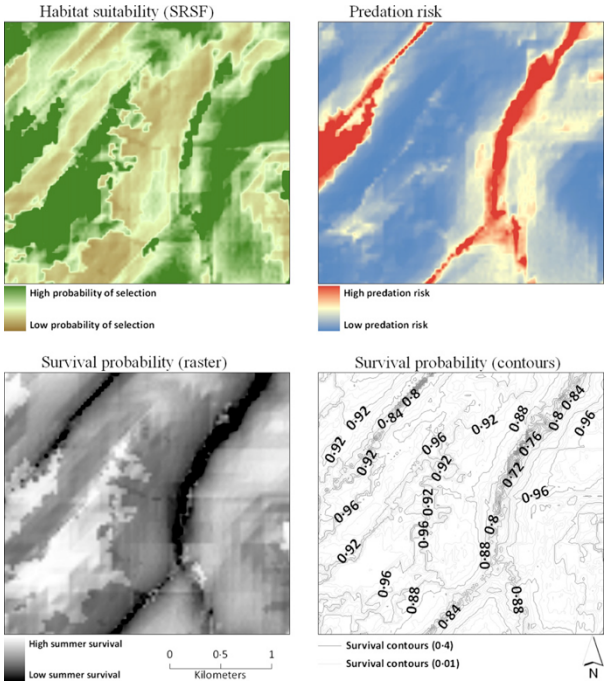

Lectures**:** 11:00 – 12:20 PM Tues; Room - Health Sciences (HS) 411

Computer labs: 11:00 – 3:00 pm in Stone Hall 106*

- *Note different than listed in Cyberbear*

Course Website: Students will need active UM NetID to access the Moodle class webpage – **WILD562.01-34082-Spring2023** - through UM Online. If required, students who need to use a computer lab will need CFC login accounts to access the computer labs in Stone Hall. Students will need to become familiar with MOODLE. See http://umonline.umt.edu/ for details and UM Online 101.

Course objectives: To expose students to a comprehensive survey of recent advances and approaches in the study of wildlife-habitat relationships, with a focus on analysis of GPS location data. Students will learn the importance of definitions of habitat and learn the classic theories of habitat selection. Building on these definitions and theories, students will be exposed in class and computer laboratories to: 1) approaches to measure habitat including field, classification/ordination methods, GIS, and remote sensing techniques; 2) approaches to measure wildlife use of habitat including telemetry (VHF, GPS), surveys, Mark-Recapture, etc.; 3) approaches to the analysis of wildlife-habitat data including common designs such as habitat suitability index (HSI) models, resource selection functions (RSF), occupancy modeling, and Species Distribution Modeling methods such as Random Forest models or MAXENT. We will focus on the use of RSF models but evaluate them with respect to these other methods. A large part of the class will involve student-lead analysis projects and presentations.

Required Readings: Will be assigned from current scientific literature and made available on the course website. Readings assigned will often form the basis of discussion in class and especially for the laboratories – it's expected they will have been read before class! However, for those interested especially in RSF methods, I recommend this in your bookshelf, which I will provide in PDF.

- Manly, B. F. J., McDonald, L. L., Thomas, D. L., McDonald, T. L. & Erickson, W. P. 2002. Resource selection by animals: statistical analysis and design for field studies. Kluwer, Boston, USA.

Software: The computer lab will depend 100% on the open-source statistical program R. Students may have occasion to need to use an actual GIS program such as ArcGIS or QGis (which I recommend instead), but I will not be teaching with ArcGIS in Labs. This class is NOT a GIS class per se. Through the semester we will also use other R-packages, WinBUGS/JAGS, and the Tidyverse.

R-project http://www.r-project.org/
R is free and available for download from the website above. We will be using an open-source GUI (graphical user interface) called R-Studio available for download here: http://www.rstudio.com Through the semester we will

download and install other R-packages. Students new to R are encouraged to consider taking WILD 540 Wildlife Study Design in R and the associated WILD 541 – R Lab, and/or working through some of these excellent introductory R books.

- Dalgaard, P. 2008. Introductory statistics with R. Springer.
- Zurr, A.F., et al. 2009. A beginner's guide to R. Springer.
- Crawley, M.J. 2005. Statistics: an introduction using R. Wiley.

We will be using **R version 4.2.2** ("Innocent and Trusting") and the latest version of R studio this semester in class. Please try to STICK to these versions to make our lives easier.

Grading

WILD 562 Grades	Grades	
Lab Assignments	40	
Class Participation	10	
Student Research Project	50	
Research and Analysis Proposal		10
Analysis Presentation & Discussion		20
Final Research Paper		20
	100	

Late Assignments: Late assignments will be adjusted – 10%/calendar day late unless an extension is agreed-upon in advance with Dr. Hebblewhite.

Lab Assignments: Students will have 3 main **sets** of assignments in addition to the student projects. Lab assignments will build on lecture materials and labs and thus will be comprehensive in scope. They are designed to train you to write and think about habitat modeling precisely, and I will pass along specific instructions for writing successful lab assignments before the first lab is due.

Student Project: The student project will form the bulk of the course grade and will be comprehensive in scope covering materials from class and lecture. It is expected that students will use their own spatial data to develop a student project. Steps in the student project are as follows:

Class discussion of topics & scheduling presentations – We will discuss and finalize student projects by ~ February 16 in class, discussing potential student projects.

Research proposal (10) - students will be expected to submit a brief research proposal including literature review, research question, study area, data collection, and data analysis methodology to be used. Proposal due **March 16, 2023** before spring break.

Proposal presentation (20) – Students will lead the class (during lecture times) through a Powerpoint presentation of their research question and proposal for ~15, with 5 minutes of discussion. Students will assign 1 relevant paper for the class to read before the presentation related to either the biology or preferably the methods detailed in the paper. Presentation slots will include lecture on **May 2 and 4, 2023**.

Final research paper (20) – Students will prepare a ~20-page scientific manuscript reporting the results of analyses focusing on methodological and habitat related issues relevant to the class objectives. Details of the research paper will be given later. The Final paper will be due by the second day of **Exam week, when our final exam was scheduled, Tuesday May 5pm.**

General Course Policies

Email Policy: Next to cell phone use, email is perhaps the world's most banal form of communication. I require emails to myself and the teaching assistant from students to be composed professionally with proper sentence and English writing style with no spelling mistakes, a CLEAR subject line that CLEARLY identifies the COURSE CODE [i.e., Subject: WILD 562 question from student X], and a clear, concise question. Because of email proliferation, professors often get >200 ill-formed and unnecessary emails a day, wasting everyone's precious time. Finally, I do not reply to emails sent after normal working business hours, 8 – 5, Monday to Friday. In general, I also do not answer my office phone because I am usually in another meeting.

Furthermore, while I may be able to answer procedural and simple questions on email, the main use of email in this class should be to request a meeting outside of the normal office hours of myself and teaching assistant. **IF you have general questions about course material, the encouraged vehicle for class discussion will be via the MOODLE discussion forum on our class website.** Students emailing me with a general question will be directed to repost their general course question to MOODLE so that we can provide an answer for all students. Chances are – if you have a question about an assignment, material in class, or a class-related topic – someone else does. Answering your question for everyone will help the entire class.

Mobile Phone Policy: Mobile phone use is disruptive to both your own, your fellow students learning, and teaching. No use of mobile phones will be permitted in class.

Students with Disabilities Statement

If you are a student with a disability and wish to request reasonable accommodations for this course, contact me privately to discuss the specific modifications. Please be advised, I may request that you provide a verification letter from Disability Services for Students. If you have not yet registered with Disability Services, located in Lommasson Center 154, please do so to coordinate your reasonable modifications. For more information, visit the Disability Services website at www.umt.edu/disability.

Student Conduct Code Statement

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code.

Academic misconduct, such as Cheating or Plagiarism [see §V(A)(1) & (B)(1) of the Student Conduct Code] will be addressed on a case-by-case basis but can most often results in an automatic failing grade in the class as determined by the sole prerogative of the instructor. Moreover, University sanctions can include warnings, probation, suspension, expulsion, and denial of a degree.

Credit for Work from Another Class

Submission of papers that were written for credit in another class is not permitted, regardless of whether the subject matter is appropriate (as per the University of Montana Student Conduct Code). In other words, you are expected to turn in original work for this course. If you have any questions, whatsoever, it is better to speak with the professor or teaching assistant before you get a zero for an assignment.

Course Withdrawal Deadlines Statement

Important Dates Restricting Opportunities to Drop a Course Spring 2023

https://www.umt.edu/registrar/calendar/spring.php

Deadline	Description	Date
To 15th instructional day	Students can drop classes on CyberBear with refund & no "W" on Transcript	February 6, @5 PM
16th to 45th instructional day	A class drop requires a form with instructor and advisor signature, a $10 fee from registrar's office, student will receive a 'W' on transcript, no refund.	February 15 - March 29 @5 PM
Beginning 46th instructional day	Students are only allowed to drop a class under very limited and unusual circumstances. Not doing well in the class, deciding you are concerned about how the class grade might affect your GPA, deciding you did not want to take the class after all, switching majors, and similar reasons are not among those limited and unusual circumstances. If you want to drop the class for these sorts of reasons, make sure you do so by the end of the 45th instructional day of the semester. Requests to drop must be signed by the instructor, advisor, and Associate Dean (in that order) so if you pursue this request, leave sufficient time to schedule meetings with each of these individuals (generally this will take at least 3-5 working days). A $10 fee applies if approved. Instructor must indicate whether the individual is Passing or Failing the class at the time of request.	March 29 May 5 @5 PM

DRAFT WILD 562 Schedule (subject to change)

WILD 562 Wildlife Habitat Modeling

Lec#	Day	Date	Lecture Topic	Lab Topic & Readings	Assignments Due
1	Tues	17-Jan	**Introduction, Syllabus, Overview**		
2	Thur	19-Jan	What is Habitat	Lab 1: Introduction to R and Spatial data	
3	Tues	24-Jan	Niche Theory		
4	Thur	26-Jan	Niche & Habitat	Lab 2: Habitat use & home ranges	
5	Tues	31-Jan	Density-dependent habitat selection		
6	Thur	2-Feb	Habitat & Scale	Lab 3: Habitat use - RSF models I	1. Habitat definitions
7	Tues	7-Feb	Critical Habitat		
8	Thur	9-Feb	Remote Sensing in Ecology	Lab 4 : Categorical RSF's	
9	Tues	14-Feb	Island Biogeography		
10	Thur	16-Feb	Model Selection	Lab 5: Model Selection	
11	Tues	21-Feb	Habitat Fragmentation		
12	Thur	23-Feb	Evaluating RSF models	Lab 6: Evaluating RSFs	
13	Tues	28-Feb	RSF Theory		
14	Thur	2-Mar	Mixed-effects models	Lab 7: Mixed-effects models	
15	Tues	7-Mar	Movement and Resource Selection		
16	Thur	9-Mar	Step Selection Functions	Lab 8: Conditional logistic RSF models	2. Wolf RSF modeling
17	Tues	14-Mar	Guest Lecture		
18	Thur	16-Mar	SSF's II	Lab 9: SSFs II: dynamic habitat covariates	3. Research Proposal Due
19	Tues	21-Mar	**Spring Break**		
20	Thur	23-Mar	**Spring Break**	**No Lab**	
21	Tues	28-Mar	Connectivity models		
22	Thur	30-Mar	Connectivity models II	Lab 10: Connectivity Modeling	
23	Tues	4-Apr	Identifying behavioral states		4. SSF Models
24	Thur	6-Apr	Identifying behavioral states	Lab 11: Movement state modeling	
25	Tues	11-Apr	Occupancy Modeling		
26	Thur	13-Apr	Occupancy models II	Lab 11: Occupancy modeling	
27	Tues	18-Apr	Species Distribution Models		

28	Thur	20-Apr	Niche Modeling	Lab 12: Species Distribution Models
29	Tues	25-Apr	Linking habitats to populations	
30	Thur	27-Apr	Climate Change Modeling	Lab 13: Troubleshooting Lab
31	Tues	2-May	Student Presentations	
32	Thur	4-May	Student Presentations	Student Presentations in Lab

NO FINAL EXAM - Final paper due by 5pm May 9, Exam week.