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WILD 562.01: Wildlife Habitat Modeling

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Syllabus

WILD 562 - Wildlife Habitat Modeling

Dr. Mark Hebblewhite, Forestry 304, Phone: 243-6675,

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Lectures: 10:10 – 11:00 AM Tuesday and Thursday
CHCB 452

Computer labs: 1:00 – 4:00 pm Tuesdays JOUR 107

Course objectives: To complete a comprehensive survey of recent advances and approaches in the study of wildlife-habitat relationships. Students will learn the importance of definitions of habitat, and learn the pivotal 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 newer methods such as climatic niche envelope models, GARP models, and Mahalanoibis distance-methods. 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:

- 1) 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.

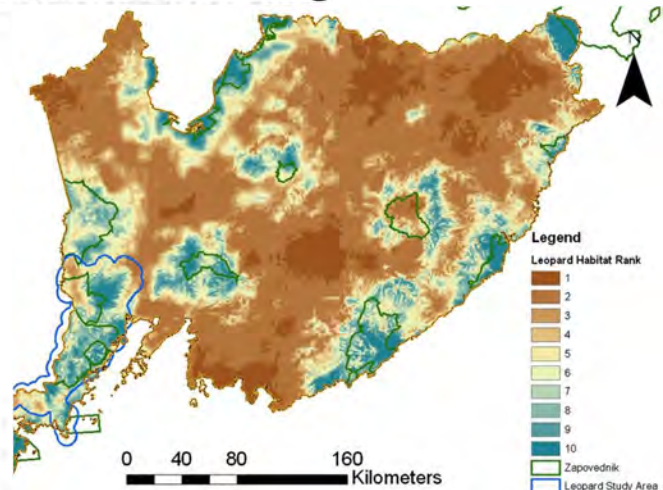
Software:

The computer laboratory portion of the class will depend on use ARCGIS as the GIS platform, and the open-source statistical program R. Both of these two software packages will be made available in the JOUR computer labs.

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 Tinn-R available for download here: <http://cran.r-project.org/web/packages/TinnR/>. Through the semester we will download and install other R-packages. STATA 10.0 will be also available in JOUR 106 or JOUR 107. Other advanced stats packages (STATA, S-Plus, SAS) are compatible with the analyses in this course, but this course will be based on statistical analyses with R. This is the first time this class has been offered in R, and students new to R are encouraged to consider taking FOR 595 *Introduction to Ecological Analysis* in R offered by Solomon Dobrowski and David Affleck, and/or working through some of these excellent introductory R books.

- 2) Dalgaard, P. 2008. *Introductory statistics with R*. Springer.
- 3) Zurr, A.F., et al. 2009. *A beginners guide to R*. Springer.
- 4) Crawley, M.J. 2005. *Statistics: an introduction using R*. Wiley.



ARCGIS 10.0 see www.esri.com/

We will be using ARCGIS 10.0 despite the fact that ARCGIS 10.0 has some backwards compatibility issues with ARCGIS 9.3.1 and earlier editions, and Hawthtools and other extensions (Home Range Tools) no longer work with 10. The university has a site license for ARCGIS for the entire campus, therefore, your advisors can install ARCGIS on university desktop computers free of charge within your own labs. I will also be providing free 1-year student license versions of ARCGIS 10.0. In addition to ARCGIS 10.0, you also need to make sure the extension Spatial Analyst is installed, and Geospatial Modeling Environment (GME, <http://www.spatial ecology.com/gme/>) some other tools I will cover in lab. Note that GME replaces Hawthtools.

Course Website:

Students will need active CFC login accounts to access the computer lab and UM NetID to access the Moodle class webpage. Students will need to become familiar with MOODLE, the new online course software. See <http://umonline.umd.edu/> for details and UM Online 101.

WBIO 595 Grades

| | |
|---------------------------------|-----------|
| Lab Assignments | 40 |
| Class Participation | 10 |
| <u>Student Research Project</u> | <u>50</u> |
| Annotated Bibliography | 5 |
| Research Proposal | 10 |
| Proposal Presentation | 15 |
| Final Research Paper | 20 |
| | 100 |

Lab Assignments: Students will have a **choice of 5 of 7 lab assignments** to choose from to prepare and submit by the next lab (next week) during the first 2/3 of the course. Lab assignments will build on lecture materials and labs and thus will be comprehensive in scope.

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:

1. **Meeting & scheduling presentations** - Students will schedule a brief meeting with Dr. Hebblewhite no later than October 1st to discuss the potential project and to schedule presentations.
2. **Annotated bibliography (5)** – this will include a review of no less than 10 habitat-related papers relevant to each student’s particular research topic. Students will provide a brief 1-paragraph review of the salient points of each paper with respect to their question. An example annotated bibliography will be provided. Due October 11th.
3. **Research proposal (10)** - students will be expected to submit a brief research proposal including literature review, research question, study area, data collection, and methodology to be used. Proposal due Nov 1st.
4. **Proposal presentation (15)** – Students will lead the class (during lecture times) through a powerpoint presentation of their particular research question and proposal for ~20-30 minutes. 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. Students will lead a class discussion of the methodological and scientific issues encountered in each student’s project. Starts 29 November.
5. **Final research paper (20)** – Students will prepare a 10-20 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 December 12th.**

WILD 562 Wildlife Habitat Modeling – Draft Schedule

| Lec# | Date | Lecture Topic | Lab Topic & Readings | Assignments |
|------|--------|--|---|-----------------------------------|
| 1 | 30-Aug | Introduction, Syllabus, Overview | Lab 1; Computer Lab Orientation, Vector & Raster Data | |
| 2 | 1-Sep | What is Habitat | | |
| 3 | 6-Sep | What is Habitat II: The Niche | Lab 2: Introduction to R | |
| 4 | 8-Sep | Niche Theory Continued | | |
| 5 | 13-Sep | Density Dependent Habitat Selection | Lab 3: H.S.I. Models | |
| 6 | 15-Sep | Habitat Selection Theory | | |
| 7 | 20-Sep | Introduction to Selection | Lab 4: Habitat use - RSF models I | <i>Lab assignment 4</i> |
| 8 | 22-Sep | Scale | | |
| 9 | 27-Sep | RSF Designs | Lab 5: Habitat selection - RSF's II | <i>Lab 5</i> |
| 10 | 29-Sep | RSF Theory | | |
| 11 | 4-Oct | <u>Guest Lecture</u> | Open R Lab | <i>Lab 6</i> |
| 12 | 6-Oct | <u>Guest Lecture</u> | | |
| 13 | 11-Oct | RSF Theory | Lab 6: RSF III and Model Selection | <i>Annotated Bibliography Due</i> |
| 14 | 13-Oct | Model Selection | | |
| 15 | 18-Oct | Categorical RSF models | Lab 7: Categorical RSF models | <i>Lab 7</i> |
| 16 | 20-Oct | Interactions in GLM | | |
| 17 | 25-Oct | Evaluating RSF models | Lab 8: Evaluating RSFs | <i>Lab 8 - Proposals due</i> |
| 18 | 27-Oct | Evaluating RSF models | | |
| 19 | 1-Nov | Matched-case control designs | Lab 9: Conditional logistic RSF models | Lab 9 |
| 20 | 3-Nov | Poisson models: Modeling amount of use | | |
| 21 | 8-Nov | Mixed-effects models | Lab 10: Mixed-effects RSF models | Lab 10 |
| 22 | 10-Nov | Functional responses in resource selection | | |
| 23 | 15-Nov | Occupancy Models | Lab 11: Occupancy Modeling | Open Night Lab Session |
| 24 | 17-Nov | Occupancy Models | | |
| 25 | 22-Nov | Applications: Critical Habitat | Open Lab | |
| 26 | 24-Nov | Thanksgiving Holiday: No Class | | |
| 27 | 29-Nov | Linking habitat to populations | Lab 12: Occupancy Modeling | |
| 28 | 1-Dec | Habitat and climate change | | |
| 29 | 6-Dec | Student presentations | <u><i>Student presentations in Lab</i></u> | |
| 30 | 8-Dec | Student presentations | | |
| 31 | 12-Dec | NO FINAL EXAM | | Student papers due |