

Syllabus:**Independent Study in Community Ecology**

BIO497/697 (1 credit)

BIO498/698 (2 credits)

BIO499/699 (3 credits)

Dr. Emily Grman

office: 401V Mark Jefferson

lab: 462 Mark Jefferson

office phone: 734-487-3139

email: egrman@emich.edu

Course description:

For undergraduate students (BIO497, 498, 499): Independent, original research in biology involving extensive library, computation, field, and/or laboratory study, under the guidance of a biology faculty member.

For graduate students (BIO697, 698, 699): An intensive study of a problem or group of problems under the direction of a University faculty member.

Learning objectives: After completing independent research in my lab, you will be able to:

- Find and evaluate primary and secondary scientific ecological literature
- Identify and describe gaps in current ecological understanding
- Design and carry out experimental or observational research in the lab, greenhouse, and/or field
- Maintain a quality laboratory notebook
- Interpret the results of ecological research and explain how they fit into the larger field of ecology
- Disseminate study results to the broader scientific and/or university community

Course requirements:

Attendance. You are required to show up for several different types of events. In total, plan to spend **5 hours** (for BIO 497 or 697), **10-12 hours** (for BIO 498, 698), or **15 hours** (for BIO 499, 699) **per week** present on campus or in the field (if appropriate) participating in these different types of events.

- Lab meetings or individual meetings with me (usually **1-1.5 hours per week**). In these meetings, we will discuss your progress, steps you should take next, ecological concepts in the literature, and other topics that will help you make concrete progress towards completion of your research project. These meetings are not intended to be scary, but you should plan to show up prepared to discuss your progress and future plans. These meetings will be much more beneficial for you if you think carefully ahead of time about what I can help you with and how you would like to make use of my time with you.
- Research hours in the lab, greenhouse, or field (usually **9-10 hours per week**). Please choose a regular weekly work schedule and add it to the Grman Lab Google calendar (a calendar I maintain through my emich account; I will add you and give you permission to edit). Please stick to this schedule as much as possible. If you need to move your hours for a particular week, that's usually fine, but please text or email me ahead of time to be sure. Please keep the lab Google calendar updated so everyone knows when people will be around.

Contribute to the lab team. The lab is a cooperative environment, and all members benefit from being part of the lab community. To keep things running smoothly, please contribute to the team effort.

- Add your contact information (cell phone number and email address) to the lab contact list in our shared Google Drive folder so that you can be easily contacted if a team member needs to get in touch.
- Keep a safe work environment.
- Clean and put away tools after you use them.
- Send me an email if supplies are getting low or if equipment breaks.
- Help out with lab tasks. For example, you may be assigned rotating greenhouse watering tasks, dishwashing, or other routine maintenance such as making solutions or putting away shipments of supplies.

- You may also be expected to participate in other research projects besides your own, for example if a labmate has time-sensitive work such as collecting data or processing samples. Be confident that helping out a labmate now will mean that people are available to help you when you need it.

Lab notebook. The lab notebook is a critical tool in quality research. You will depend on your lab notebook for accurate records of how you set up studies, how you collected and handled samples, how you developed protocols, where you found essential tools or resources, and how you solved problems. Future lab members will depend on it to build their research projects. Your methods and results may also contribute to future publications or grant proposals. Therefore it is essential to thoroughly and accurately document all the parts of the research you conduct. When in doubt, write it down! In each journal entry, indicate:

- the date and your start and end times
- the larger context/problem/area of work you are dealing with
- which samples or experiment you are working with (if any)
- which protocol you are using (if any)
- the names of anyone working with you
- the conclusion or take-home message from what you achieved or learned from the activity.

You may also want to jot down any random research-related ideas that occur to you, even if it isn't clear how they relate to what you are working on at the moment. If you are processing large numbers of samples, it is also very useful if you record the approximate amount of time it took per sample. This will make future planning and scheduling much easier.

You are required to keep your notebook up-to-date and bring it with you to all research-related activities (such as field excursions, lab meetings, etc). I may ask to examine it at any time. I will evaluate your lab notebook as part of your grade for the course. **When you leave the lab, you must leave your lab notebook with me** (you can keep a copy if you wish).

Disseminating your results. Presenting the results of scientific work is essential for allowing other scientists to learn from and build on what you have done. You are required to present your results in some format. You and I will discuss the details of which format makes the most sense for your project and your situation. Options include a brief written report, a presentation at the EMU Undergraduate Symposium, the EMU Graduate Research Conference, or others.

Annotated bibliography If you are in the planning or writing stages of your research, you may be required to contribute regularly to an annotated bibliography. Keep a single Google Doc in your folder in our shared Google Drive and add *at least two* article summaries to it each week (dating each entry). The purpose of this assignment is to encourage you to read the scientific literature. I will provide a couple of papers to start you off, and you are expected to find additional papers that are relevant to your specific project or to the larger, more general ecological topic. Web of Science, available through the EMU library (<http://www.emich.edu/library/databases/iadFullList.php?firstCh=W>), is a great search tool with basic and advanced capability including forwards and backwards searches. Google Scholar is also useful for locating references if you already know their titles.

For general background reading on the larger ecological topic, try to focus on papers in high-impact journals:

American Naturalist, Annual Reviews in Ecology Evolution and Systematics, BioScience, Ecological Applications, Ecological Monographs, Ecology, Ecology Letters, Frontiers in Ecology and the Environment, Global Change Biology, Journal of Applied Ecology, Journal of Ecology, Nature, New Phytologist, PLoS Biology, Philosophical Transactions of the Royal Society Series B, Proceedings of the National Academy of Sciences, Science, Trends in Ecology and Evolution.

Other journals are also acceptable:

American Journal of Botany, Biological Conservation, Canadian Journal of Botany, Conservation Biology, Ecography, Ecosystems, Functional Ecology, Oecologia, Oikos, Restoration Ecology, and many others.

For specific information about your question and study organism/system, you will have to broaden your search to also include papers in specialized or regional journals:

American Midland Naturalist, Basic and Applied Ecology, Ecological Restoration, Journal of Plant Ecology, Journal of Vegetation Science, Mycorrhiza, Natural Areas Journal, Plant Ecology, and many others.

If you are in doubt about whether a paper is appropriate for your bibliography, ask me.

For each paper that you include in your bibliography, first give the citation of the paper using the style of the journal *Ecology*. Consult any article in that journal for examples on correct formatting. Here is one example:

Flinn, K. M., and M. Vellend. 2005. Recovery of forest plant communities in post-agricultural landscapes. *Frontiers in Ecology and the Environment* 3:243–250.

Next, write your answers to each of questions 1-8 below in complete sentences as concisely as you can (1-3 sentences max). Use good scientific writing style, including clear, concise sentences and good grammar.

Specifically, include these three points.

- 1) What is the Big Ecological Question or Issue that this article addresses? This should be presented in the first paragraph of the introduction.
- 2) What is the specific research question and/or hypothesis of the study? These should be presented in the last paragraph of the introduction.
- 3) Describe the approach or methods the authors used to address the question.
- 4) Describe the most important findings or results of the paper. Which figure(s) or table(s) shows these results?
- 5) Was the hypothesis supported?
- 6) Do the authors use their findings to make an argument or draw a conclusion about the Big Ecological Question or Issue? What is the connection between their results and the Big Issue?
- 7) Do you believe their conclusions are justified and correct? Why or why not?
- 8) How or why is this paper relevant to your project? What question does it answer for you? There are many ways a paper can be useful for a project, including providing general background on the big question or issue, providing specific background on the study system or species, explaining useful methods or study design, producing specific results that can be compared with yours, presenting main conclusions that fit in with an argument you are trying to make, and many others.

Grading: You will be assigned a grade based on the following criteria:

- Time spent participating in research in lab meetings, lab, greenhouse, and/or field
- Quality, consistency, and completeness of laboratory notebook
- Contributions to the lab team and lab meetings
- Dissemination of research results
- Quality of annotated bibliography (if required)

To receive an **A (Excellent Performance)**, you will:

- Engage in persistent, hard work
- Exhibit an ability to work independently
- Deliver reliable and properly carried-out work
- Keep a lab notebook that is excellent, with up-to-date recording, all necessary details of procedures performed, helpful anecdotes or observations
- Display critical thinking in lab meetings
- Give clear presentations of research progress/obstacles, papers for discussion, or other topics when leading lab meetings
- Consistently demonstrates a full, comprehensive understanding of the project and its significance
- If required, produce an annotated bibliography that includes highly relevant, current literature, displays a solid understanding of each paper and how it relates to the current study and the field as a whole, and is written in clear, concise, accurate, and professional scientific language.

To receive a **B (Good Performance)**, you will:

- Engage in persistent, hard work
- Exhibit an ability to work with limited supervision
- Deliver reliable and properly carried-out work
- Keep a lab notebook that is organized and up-to-date, including most necessary details of procedures performed
- Give clear presentations of research progress/obstacles, papers for discussion, or other topics when leading lab meetings
- If required, produce an annotated bibliography that includes mostly relevant, current literature, displays a solid understanding of each paper, and is written in professional scientific language.

To receive a **C (Average Performance)**, you will:

- Engage in persistent, hard work
- Deliver work that is mostly reliable, with a few small or one major flaw or error
- Keep a lab notebook that shows evidence of confusion and inaccurate or incomplete recording of procedures performed
- Give confusing or misleading presentations of research progress/obstacles, papers for discussion, or other topics when leading lab meetings
- Demonstrates an inadequate grasp of project goals or significance
- If required, produce an annotated bibliography that displays a weak understanding of each paper.

To receive a **D (Poor Performance)**, you will:

- Perform inadequate or sloppy work
- Display an inability to work without direct supervision
- Fail to keep an organized lab notebook
- Demonstrates an inadequate grasp of project goals or significance
- If required, fails to regularly turn in an annotated bibliography.

Last updated: July 23, 2018