



**Environmental Biology Master's Thesis  
ENV 580/ENV 580G**

Thesis research in the Environmental Biology program is by invitation only. After you have received an invitation from the ENV Program Director to conduct thesis research, you need to determine a topic and find an adviser to help you. If you are considering conducting the thesis work at Hood, you need to find a research adviser among the faculty. This need not necessarily be the same person as your academic adviser. You could also do a thesis at an off-campus site, which is sometimes the student's work site, if that is a better match for you.

In choosing a project you need to consider the following:

1. What topics are of interest to you? A project is way too much work to do if you do not have a sincere interest in the topic and the outcome of your study.
2. What skills do you know or will you need to develop to be able to study the topic(s) you have chosen? A good strategy is to have your project be a training ground that you can use to develop the skills and practical knowledge to make you more employable at your current job or open doors to new types of jobs now or in the future.
3. What are the time constraints? Can you work in the evenings and on weekends to finish your project or will it require larger blocks of time? Can you work on a project full time for a short period of time (e.g. a month in the summer)? Projects rarely fit into the neat 3-hour, 1-day-a-week schedules like your classes did, so you will need to make some adjustments for this.

Once you have given these questions some thought and arrived at less tentative answers, contact potential advisers and make appointments with them to talk about where your interests and theirs may overlap. You probably have some ideas about what topics most faculty study from having them as instructors in classes or talking with them informally. You can also do a literature search to see what they have published recently. Once you and an adviser have mutually agreed to work together, your next step is to write a proposal for the work you will do. An approved proposal is needed to allow you to enroll in ENV 580/ENV 580G.

## **ADMINISTRATIVE PROCEDURES**

### ***Thesis Adviser***

The student is responsible for submitting a thesis proposal approved by the reading committee and for securing a thesis adviser to oversee the project. Proposed advisers who are not Hood College faculty or adjunct instructors must be approved. It is expected that the adviser will be a Ph.D., M.D., or D.V.M. experienced in the topic of the proposed research. In this case, the student should forward the adviser's curriculum vitae to the ENV Program Director. The Program Director reviews the thesis adviser qualifications and gives final approval.

Potential thesis advisers who do not hold the Ph.D., M.D. or D.V.M degree must be additionally approved by the Graduate Council of Hood College. In such a case, the Program Director is asked to submit the adviser's curriculum vitae and two supporting letters of recommendation to the Dean of the Graduate School. The Graduate Council will review the adviser's credentials and submit a recommendation to the Dean. Final approval of the thesis adviser is made by the Dean of the Graduate School.

### ***Reading Committee***

The approved thesis adviser serves as chair of the reading committee. The adviser and the student, in consultation, will identify at least two additional persons to serve on the reading committee. At least one member of the committee must be a full-time equivalency (AC) faculty member in the sponsoring department. Additional members of the committee may be an AC faculty member in the degree program, another faculty member from the department, or another professional working on the research topic. For non-members of the faculty, a curriculum vitae and one letter of recommendation must be submitted to the ENV Program Director for approval.

The reading committee should be kept informed of progress on the thesis project and should meet as required to help guide the research. At least one committee meeting should occur for a proposal-defense presentation by the student prior to the onset of research. The committee should meet at least once again before the thesis defense.

### ***Registering for Thesis Credits***

Students writing a thesis must register for ENV 580/580G (6 credits) during the regular graduate school registration period. Registration for thesis research occurs after a student's proposal defense and the approval of a written proposal by all members of the reading committee, the Program Director, and the Dean of the Graduate School. The Program Director will confirm the proposal's approval by all committee members and he/she will submit the completed proposal to the Dean of the Graduate School and the Graduate School Office to complete the registration process. Registration for ENV 580/580G should occur prior to beginning the proposed thesis research.

If the thesis is not completed within the same semester for which it was originally registered, a grade of IP (In Progress) will be assigned until the thesis has been completed, defended, and finalized. The fee for the six credits is only paid once at the original registration date. If "IP" status occurs for this course in any given semester, the student only pays Hood's comprehensive fee.

## WRITING A THESIS PROPOSAL

Your thesis proposal will be a truncated version of your final thesis with some modifications. Aim for a length of 6-12 pages; there is no official minimum or maximum requirement. Follow the formatting guidelines for the final thesis (p. 5) to allow you to build more easily your final thesis document later on. You should have some of the main sections of a scientific paper: Introduction, Methods, and References Cited. There is no need to compose an abstract, since this is a proposal. After you have outlined the problem and presented supporting background information in your Introduction, provide a detailed explanation of your study site(s), focal organism(s), experimental design, appropriate statistics planned (draw on your knowledge from ENV 505 and 515 here) and/or tools/techniques to be applied to your problem. As you do not yet have “Results” nor a “Discussion”, include a section entitled “Proposed Results and Discussion” in which you outline what you expect to find upon completion of your research—no one will hold you to these predictions for the final thesis.

Your References section should be extensive and follow a format like that of p. 14. Any information in your proposal that is used/learned from a source should be cited in the text. Follow a consistent format from one particular journal that is chosen by your adviser and is appropriate to the sub-discipline of your research. A [Name-Year](#) format works well, or you could use the [numbered format](#) if that corresponds to the format of the journal that you have chosen; the numbered format is also useful if many of your sources are government/public documents with unclear or organizational authorship. The Hood College library website gives information on [citing sources](#), including instructions on how to use a reference manager like [Zotero](#). Using a reference manager is highly recommended, especially if you have a lot of sources, to ensure consistency in formatting and correspondence between all of your in-text citations and the references listed in this section of your proposal.

A ENV 580/580G proposal should be submitted to the committee chair 4-6 weeks prior to the proposed thesis defense and to the committee members at least 2 weeks before the proposal defense to allow committee comments and multiple iterations of the document prior to the defense meeting.

### ***Thesis Proposal Defense***

The proposal defense is very similar in format to a thesis defense. Unlike the thesis defense, only the reading committee and student are in attendance. There is no formal invitation to the wider Hood community to attend this step in the thesis process. The student will prepare a 35-45 minute presentation that is based on the proposal document. After his/her talk, the reading committee may ask the student questions on the efficacy of design, proposed outcomes, etc. Once their questions have been exhausted, the student is asked to step out of the room for a brief conference among members of the reading committee. If the committee agrees that the proposed work is viable with no major design flaws, the student’s proposal is approved on the spot. In rare occurrences, the student may be requested to fix some major design issues and re-submit the proposal for the reading committee’s review and approval. In most cases, those issues have been addressed during review of the proposal document.

### ***Laboratory Facilities***

Hood College may not be able to provide laboratory facilities for all of the students engaged in thesis research. In cases where the student elects to do a thesis that requires the use of laboratory facilities outside of Hood College, locating and receiving approval to use a laboratory research facility is the responsibility of the student.

### ***Oral Defense***

An oral defense of the thesis is required and will be conducted by the reading committee at an agreed upon date and at a specified location. To schedule a location on campus, contact the Biology Department's Administrative Assistant. Defense dates should not be set until the thesis adviser and the reading committee approve the thesis draft. Defense dates are not permitted in the two weeks period prior to the final thesis submission date set by the Graduate School. At least two weeks before the oral defense, the student should submit the thesis, in final form, to the adviser, reading committee members, Program Director and Dean of the Graduate School. The Dean of the Graduate School and the Program Director should be invited to attend the defense, whether or not they are members of the reading committee.

The candidate should expect to present the thesis research and findings in a professional manner, similar to presentations at a professional meeting. The use of well-prepared graphs, tables, and other explanatory aids is encouraged. The candidate will be expected to explain the research and to answer questions relating to the thesis topic. The oral defense may be attended by members of the sponsoring department, the Dean of the Graduate School, and others in the research group interested in the topic, subject to the approval of the reading committee. Normally, the presentation of the thesis data by the student is an open event to faculty, students and other invitees. However, the question and answer session is closed and attended only by the student, the reading committee members, Program Director, Dean of the Graduate School, and (at their request) members of the departmental graduate faculty.

### ***Approval of Master's Thesis***

The thesis is approved after the oral defense and after corrections recommended by the thesis adviser, reading committee, Program Director, and Dean of the Graduate School have been completed. Approval by all committee members should be communicated in writing (by email) via the committee chair to the Program Director. The Program Director will submit an approved thesis to the Dean of the Graduate School for final approval.

### ***Grade for Thesis***

The thesis is graded "S" (satisfactory) or "U" (unsatisfactory). The Thesis Adviser awards an interim grade of "IP" for any semester of thesis research after registration before completion; he/she also awards the final grade. The grade of "S" has no effect upon the student's grade point average. The grade of "U" has the same effect as a grade of "F" (failure). A final grade of "U" on the thesis usually results in the student's dismissal from the Master's Degree program. An unsatisfactory performance at the oral defense of thesis may result in the student's dismissal from the Master's Degree program. The Program Director, in consultation with the adviser, the reading committee and the Dean of the Graduate School, may allow the student one additional opportunity to defend the thesis. Unsatisfactory performance at the retake will result in dismissal with no additional opportunities to complete the degree.

## **THESIS REQUIREMENTS FOR ALL STUDENTS**

### ***Headings, Spacing, and Margins***

Section headings should contain all uppercase letters, be boldface, and centered at the top of a new page. All text should be **double-spaced** with 1 inch margins all around. The recommended font is 12 pt Times New Roman.

### ***Copyright***

Under the Copyright Act of 1976, the "copyright in the work of authorship" becomes the property of the author who created it. Students completing a ENV 580/580G document must take care to obtain permission before using copyrighted materials within their thesis. Permission to use copyrighted materials, for example, tables and figures, must be obtained from the holder of the [copyright](#). The student needs to search carefully for the source of the copyright and obtain permission to use the copyrighted materials in the thesis document. See p. 15 for a sample letter that you could use to request permission to use copyrighted material. This permission should be referenced in the paper at the point where such materials are presented. The student must retain copies of the copyright permissions and supply them to Hood College upon request. Students are able to facilitate the use of their research and findings by including a copyright waiver (p. 10) as part of the final report.

### ***Acknowledgment of Hood College in Publications of Thesis Work***

The Graduate School of Hood College should be acknowledged in publications that result from the thesis research. A simple statement of acknowledgment is sufficient. An appropriate example would be "Research reported in this document was originally published in a Master's degree thesis sponsored by the Department of \_\_\_\_\_ and submitted to The Graduate School of Hood College in Frederick, Maryland."

### ***Deadlines***

The importance of observing deadlines for final submission of the completed and approved thesis cannot be overemphasized. Students are urged to follow closely and carefully the published dates for thesis submission. Arrangements for the oral defense of the thesis should be made early enough to allow time for completion of required corrections. This will enable the candidate to earn the Master's Degree at the earliest possible date. Past experience has shown that the most common reason for thesis candidates to receive their diplomas later than anticipated is because of poor planning with respect to the deadlines.

As a general guideline, all theses are due in approved final form to the Graduate School two weeks prior to the last day of classes in the fall or spring semester. However, be sure to check the Catalog or contact the Graduate School to confirm the assigned date each term.

## THESIS GUIDELINES FOR MASTER'S DEGREE STUDENTS AT HOOD COLLEGE

### ***Preliminary Pages***

All of the below-named sections should begin on separate pages and must be double-spaced. The preliminary pages should be numbered in lower case Roman numerals located at the bottom center of each page. The title page is counted as page “i” but is not numbered. The preliminary pages should appear in the order specified below.

- a. **Title page** (see sample on p. 9)
- b. **Statement of Use and Copyright Waiver** (see example on p. 10)
- c. **Abstract** – this should be a short, concise summary of the thesis outlining the purpose of the work, the rationale and method, and highlighting the most significant findings. The maximum length of the abstract is 150 words.
- d. **Dedication** (optional)
- e. **Acknowledgements and Sponsorship** – thank and/or give credit to individuals and funding sources that made your project possible. If you received Graduate Research Funds to support your work, this should include the Graduate School of Hood College.
- f. **Table of Contents** – include the beginning page for each section (see example on p. 11)
- g. **List of Tables** – include the page location of each table, and short titles (see example on p. 13)
- h. **List of Figures** – include the page location of each Figure, and short legends (follow example for above)
- i. **List of Abbreviations** (optional)

### ***Main body of the text***

The main body of the text should be numbered in Arabic numerals located at the bottom center of each page. The first page is counted as page “1” but is not numbered. If you use chapters, each chapter should begin on a new page, but the numbering is continuous from pages 1-XX for the entire thesis.

### ***Content Sections***

Section headings should be centered, capitalized, and should begin on a new page. Content sections are presented according to the following guidelines:

*Introduction* -- This section is used to describe the rationale for the project and to provide an overview of previously published relevant work that serves as a foundation and prelude to the thesis. Thus, it encompasses the introduction, rationale, and review of the primary literature often used in grant proposals and publications. If a hypothesis is being tested, it is often stated explicitly in the introduction. The introduction should make clear the significance of the research in the context of the wider body of scientific knowledge, and it should have a clear statement of purpose. The review of the literature should be current and thorough, encompassing all pertinent references. Subheadings may be used and are helpful for organizing

the information. In general, it is better to err in favor of excess length than to abbreviate this section. Tables and figures may be used in the introduction; if they are not your own, be sure to include the citation for a table/figure's source. You will also have to acquire [copyright permissions](#) (p. 5) if the material is copyrighted and not in the public domain.

*Materials and Methods* -- This section should describe in detail all of the methods, protocols, reagents, etc. used to conduct the research. In a thesis, as contrasted to a journal article, the purpose of this section is to provide enough information so that another scientifically knowledgeable person could duplicate your data with only the thesis available as an information source. Tables and figures may be included in this section (see below). This section should make clear all of the procedures performed by the candidate, as well as sources of reagents not prepared by the candidate. This section should describe data collection and analysis methods (e.g. description of statistical analyses). Use of abbreviations is acceptable, but they must be used consistently. Abbreviations should be tabulated in the preliminary pages (see p. 6). Numbers should be spelled out only if they begin a sentence.

*Results* -- This section presents a comprehensive picture of all the research results and data. More data are included in a thesis than in a scientific paper. The supporting data, e.g., toxicity curves with neomycin-resistance, are included -- whereas in a paper the results would be described briefly. Preliminary standardization of an assay, e.g., ELISA, would be incorporated so that someone reading the thesis would be instructed and fully informed. This section usually contains tables and figures, **which should be on the page immediately following their first mention in the text.** It is also permissible to incorporate tables and figures into the text at the point where they are mentioned. Tables and figures are numbered consecutively (Arabic numerals) throughout the thesis. Numbering for tables and figures is independent (start at Table 1 and Figure 1, etc.). Each table should have a descriptive title above, and each figure should have a descriptive legend below; each will be listed by page number in the contents pages. If space for the legend is a problem, the facing page method can be used. In this case, the figure and its legend *share one page number*. Each figure or table is interpreted and explained in the text. Do not expect the reader to look at numbers in a table and extrapolate. Write out descriptions of all the tabular and figure data as part of the text, along with appropriate comments and observations relating to collection of the data.

*Discussion* -- Having presented the actual data in the results section, this section is for critique and interpretation. Describe conclusions, determine how/if they support or do not support your hypothesis/hypotheses, and compare findings with other reported data. Where there is agreement, use it for validation. Where there is disagreement, suggest reasons and explanations. Suggest future directions for research.

*References cited* – All sources cited in your text should be listed here, and all sources listed here should be cited in your text. Cross check carefully; refer back to p. 3 for more information on in text citations and using a reference manager. The list of references in this section should be single spaced and arranged alphabetically by first author. No numbering should be used. Include the names of all authors and editors, as well as full titles, and starting and ending page numbers. See p. 14 for an example reference list.

*Internet references* -- References to pages on the World Wide Web should not normally be used, since such references often change or become unavailable. In certain cases, e.g., GenBank references, where it is likely that the cited material will be continuously available, such references are permitted.

*Appendices* -- Some data may be included in appendices if the data are (a) not original work of the candidate, but required to understand the project, (b) useful, but not results of research (tables of common data), or (c) so extensive it may interrupt the flow of the thesis (e.g., many photographs or specialized graphics). It is unusual to include an appendix in a thesis.

### ***Chalk and Wire Assessment of ENV 580/580G Documents***

To help the ENV program assess that we are meeting the outcomes we have set for our students, it is requested that you upload the first draft of your proposal and the first draft of your final thesis to Blackboard; your advisor will set up separate links for each of these submissions via the “ENV 580” site that you see in your Blackboard home page. This will be very much like submitting an assignment for one of your courses, except that this will in no way impact you, your grades, or your outcome in the program. Just a few clicks on your part to upload these documents will be of immense help to the ENV program as we continuously aim to configure our courses and curriculum in ways to be most beneficial to students in environmental biology.

### ***Electronic Archiving and Distribution of ENV 580/580G Documents***

After your thesis has been completed and approved by the Graduate Dean, you should submit it to [ProQuest](#) and to MD-SOAR, a Shared Open Access Repository. This will require registration and approval from the Library before you can submit your project so please allow for that time. The student is responsible for all fees associated with the archiving and electronic publishing of a thesis. Directions for submission to MD-SOAR are below:

1. Go to <https://mdsoar.org/>
2. Under the **Submit** heading, click on “Submit Item to MD-SOAR”
3. Log in to the system.
4. Insert metadata, upload file, choose a Creative Commons License, agree to the MD-SOAR license.

**Sample Title Page**

**IMPACT OF HOOD COLLEGE ON THE FREDERICK COUNTY ECONOMY**

by

Marjorie Smith

B.A. (University of Maryland) 1983

THESIS

Submitted in partial satisfaction of the requirements

for the degree of

MASTER OF SCIENCE

in

ENVIRONMENTAL BIOLOGY

in the

GRADUATE SCHOOL

of

HOOD COLLEGE

May 2010

Accepted:

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Committee Member

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Director, Environmental Biology Program

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Committee Member

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April M. Boulton, Ph.D.  
Dean of the Graduate School

\_\_\_\_\_  
(Type Name)  
Committee Member

***Sample Copyright Waiver Page***

**STATEMENT OF USE AND COPYRIGHT WAIVER**

I authorize Hood College to lend this project report, or reproductions of it, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

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- ASAP: systematic annotation package for community analysis of genomes [Internet]. 2013. Madison (WI): University of Wisconsin-Madison; [cited 2013 Sep 12]. Available from <http://www.genome.wisc.edu/tools/asap.htm> Internet resource
- Bechinher C, Sciortino F, Zihlerl P. 2013. Physics of complex colloids. Washington (DC): IOS Press; [accessed 2015 Aug 27]. <https://ebookcentral.proquest.com/lib/hood-ebooks/reader.action?ppg=3&docID=1441803&tm=1496853977000>. E-book
- Boyd A, Glaser R. 1987. Mapping EBV early antigens in human cells after microinjection of subgenomic DNA clones. In: Levine P, Glaser R, editors. Epstein-Barr and Human Diseases. Clifton, NJ: Humana Press. p 145-149. Section of a Print Book
- Chiuchiolo AL, Dickhut RM, Cochran MA, Ducklow HW. 2004. Persistent organic pollutants at the base of the Antarctic marine food web. Environ Sci Technol [accessed 2006 Sep 5]; 38(13):3551-3557. <http://pubs.acs.org/doi/full/10.1021/es0351793>. Journal Article - online
- O'Brien SJ, Joslin P, Smith GL, Wolfe R, Shaffer N, Heath E, Ott-Joslin J, Rawal PP, Bhatlachajee KK, Martenson JS. 1987a. Evidence for African origins of founders of the Asiatic lion species survival plan. Zoo Biol 6:99-116. Journal Articles - print
- O'Brien SJ, Martenson JS, Packer C, Herbst L, Devos L, Joslin P, Ott-Joslin J, Wildt D, Bush M. 1987b. Biochemical genetic variation in geographic isolates of African and Asian lions. Natl. Geog Res 3:114-124.
- Rossi AMK, Hirschhorn RR. 1991. Expression of growth-regulated genes in normal and SV40-transformed hamster fibroblasts. J Cell Biochem 47:165-173.
- Vessey SH, Meikle DB. 1984. Free-living rhesus monkeys: Adult male interactions with infants and juveniles. In: Taub D, editor. Primate Paternalism. New York: Van Nostrand Reinhold Company, Inc. p 113-126.
- White J, Boyd AL, Carter S, Ozer H. 1992. Cooperativity of SV40 T antigen and RAS in progressive stages of transformation of human fibroblasts. Exp Cell Res 203:157-163
- Working Group on Diversity in the Biomedical Research Workforce (US). 2012. Draft report diversity in the biomedical research workforce [Internet]. Bethesda (MD): National Institutes of Health (US); [cited 2013 Sep 12]. Available from <http://acd.od.nih.gov/Diversity%20in%20the%20Biomedical%20Research%20Workforce%20Report.pdf> Government document

*Copyright Letter Example*

Date

Holder of Copyright  
Street Address  
City, State Zip

Dear Holder of Copyright:

I am a graduate student in the Environmental Biology Master's degree program at Hood College in Frederick Maryland. My project is \_\_\_\_\_. I am requesting permission to include in my Independent Project the following material:

*(Include all relevant information about your request: title, page numbers, year of publication, etc.)*

If permission is granted, proper acknowledgement and credit will be incorporated in the final report.

Sincerely,

Your Name  
Contact Information