ENVS 163 Plant disease ecology – Spring 2013
Environmental Studies, UC Santa Cruz

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office hours: Wed 2:00-3:30, Fri 9:00-10:30

Class meetings: Lecture MWF 11:00-12:10 in 221 ISB
ENVS 163-01A, Wednesday 08:00-09:10 a.m. in Physical Sciences 136
ENVS 163-01B, Wednesday 09:30-10:40 a.m. in Physical Sciences 136

Class website: The course website will be hosted on eCommons. Course syllabus, quizzes, assignments, and important links will all be available there.

Required course recources (available at Bay Tree Bookstore):
2. i>clicker

Course goals and philosophy
I want you to take several things away from this course. You should be comfortable thinking about (1) life histories of the various taxa of plant pathogens, (2) how pathogen life history shapes the impact of disease on plants, plant populations, and plant communities, (3) how thinking about plants and their pathogens in an evolutionary ecology framework provides a basis for creating more effective means of managing diseases, (4) how mathematical models can help us understand spatial and temporal dynamics of plant diseases, and (5) how scientists learn about disease systems through the combined use natural history/observational studies, experiments, and models/theory. I also want you to have the analytical tools you need to continue learning about and acting on plant diseases and other environmental issues of importance to you.

Specifically, by the end of the course:
1. You should be able to place plant diseases into the context of modern ecological and evolutionary theory, and connect that theory to disease management. For example, when would we expect natural selection to lead to an increase in virulence and when to a decrease? How can we manage agroecosystems to minimize the probability of disease outbreaks? How do physiological and behavioral adaptations in plants and pathogens shape interactions between them? How might climate change affect impacts of plant disease?
2. You should be able to critically evaluate scientific literature and put it to use in making arguments. This means being comfortable reading primary scientific literature that provides empirical tests of specific systems, and connecting them to larger theory and practices. Students often find this very challenging, but this is an important skill for you to be able to keep up to date about plant diseases (or just about any other aspect of environmental studies you could name) throughout your careers.
**General expectations**

1. Come to class prepared, on time, with your i>clicker, and ready to participate actively.
2. Attend and participate in discussion sections.
3. Do the readings before class. Be able to answer the “Questions” and have a clear idea of the meaning of “Words to Know” at the end of each chapter of *Essential Plant Pathology*. Please use the CD than accompanies the book.
4. Ask questions. It is the best way to get me to slow down in lecture.
5. Go to office hours – get clarification, explore ideas, offer suggestions,
6. Follow up on what interests you, and use all available resources.
7. No cell phones or internet-connected computers allowed during class.
8. I have a zero tolerance policy for plagiarism and cheating. See the Academic Integrity section below, and the handout available on the eCommons site and at http://people.ucsc.edu/~ggilbert/Documents/Avoiding Plagiarism.pdf
9. Work together (except on quizzes and exams). This is not a competition. I don’t curve grades (unless poor performance is clearly linked to my own incompetence). I strongly encourage you to form peer-review groups to help each other improve your written work.
10. i>clickers register who responded to in-class questions, and the proportion of possible in-class clicker responses made will be used as the primary measure of attendance and participation (6% of final grade). For in-class quizzes (at the end of many lectures on the material for that day), correct answers will count 2X an incorrect answer (2%). An additional 2% is based on vocal participation in class and attendance at office hours. Using an i>clicker not registered to you, or allowing someone to use your i>clicker, will be considered cheating.

**Course evaluation**

10% Lecture attendance and participation (i>clicker)
10% Section attendance and participation
10% Online quizzes on readings
2% Online pre-post testing
15% Section assignments: Life history poster and 4 critical reviews/arguments, presentation
10% Epidemiology homework
15% Midterm exam 1
15% Midterm exam 2
3% Final paper outline
10% Final paper

*Lecture attendance and participation (10%).* I expect you to attend and participate in lectures. Class begins promptly at 11:00. The lectures are designed to expand on the readings, so it is up to you to do the readings before class. Bring specific questions about the readings to the lectures, and ask them. Attendance and participation are recorded based on i>clicker use and vocal participation.

*Section attendance and participation (10%).* Active, prepared participation in the discussion section groups is essential. Showing up at all the sections give you half the points. Active, constructive participation in discussions, presentations, and projects in section is the key to the remaining half.
Regular attendance at Professor or TA office hours can add up to 2% to your score, up to the maximum 10%.

Section assignments (15%) Life history poster, four critical reviews / arguments, paper presentation

On-line quizzes on assigned readings (10%) I expect you to have read and thought about the assigned readings before coming to class. To help you along, there are timed on-line quizzes about major points from the readings on eCommons that must be completed before the class for which the readings are assigned. There are no make-ups on missed quizzes, but you can get full points for this dimension of the class by correctly answering 90% of the questions throughout the quarter (that means if you miss a quiz or two, you can still get full points for the class). You cannot get more than 10% total for this section, however, even if you correctly answer more than 90% of the quiz questions.

Online pre-post testing (2%) I am very interested in understanding the background that students bring to this class, and how the class helps develop additional skills and understanding for working with complex, dynamic scientific information. I place of the first Discussion Section, I ask you to take an on-line pre-test on material relevant to this course that I would expect an upper-division student to be familiar with (most of it is actually from high-school science standards). You will take a very similar post-test near the end of the course. Your score will be an average of the pre-test and post-test, augmented by proportion of potential improvement accomplished over the course, or the highest score obtained, whichever is greater.

Midterm exams. There will be two midterm exams (15% each) and no final exam. Materials in lectures, handouts, section assignments, the textbook, and required readings are all fair game for the exams. Exams will be blends of multiple choice, short answer, and illustrative graph-type questions.

Final paper (3% for outline and 10% for final product). The brevity of the final written product (2 pages) is not a reflection of how much work this assignment takes. The Secretaries of Agriculture and Interior have decided to fund five research institutes to address critical areas in plant disease ecology. The institutes can focus on a particular disease or on a particular topic that crosses many diseases. The institutes can focus on either applied problem solving or basic understanding that may later contribute to problem solving. You are asked to identify one topic that you are passionate about, and write a 2-page (single-spaced, 12-point font, 1-inch margins) brief that synthesizes relevant published scientific literature to help the Secretaries understand the current state of research in the area and to make an evidence-based case that this is a topic of critical need. You need to use a minimum of four articles from the primary peer-reviewed literature in a significant way, and go beyond just reporting the results of those studies to present a clear, coherent, synthetic statement based on your analysis of the research. The challenge here is to take a body of work, understand it well, and tell a coherent story about the topic informed by and supported by the best available scientific literature. The complete citation for each article (in the format used in the journal Ecology) MUST be included for all citations in a Literature Cited section. Similarly, the in-text citations of the references must follow the style used in Ecology. See below for more details on assignment and grading.

Late policy and makeups. Quizzes and assignments are due before class begins (11:00 a.m.) on the day they are due. There are no make-ups for online quizzes. All other late assignments will be docked 1 point off your total course grade (of 100%) per calendar day late (to max 5 points), unless arrangements to turn it in late were made in advance. Assignments will not be accepted more than one week after they are due. In addition to the course-grade penalty, 5% will be deducted from the score of the final paper for each calendar day late. Makeups on the midterm exams are by oral exam only. Please attend the section in which you are registered; in exceptional circumstances you can arrange with the TA to join a different section if you are unable to attend your assigned section in a particular week. This should be a rare event, however.
**Regrading of papers or exams.** We strongly encourage you to come to office hours at any point to talk about things you don't understand, including about graded papers, quizzes, and exams. Requests for regrading, however, (of papers or particular questions on exams) will ONLY be considered when accompanied by a written request that explains clearly why you think the grade was incorrect. Written requests will be accepted no sooner than 6 hours after receiving the graded work, and no later than 1 week after receiving it. Only Greg will handle regrades. If there are simple problems with the tally of the scores, you can check with Greg or your TA.

**Academic integrity.** I expect you to adhere to the highest standards of academic integrity in this class. When a student enrolls at UCSC he or she automatically agrees to abide by University policies. The student policy and regulations handbook is available at [http://www2.ucsc.edu/judicial/handbook.shtml](http://www2.ucsc.edu/judicial/handbook.shtml). Academic integrity and scholarship are core values of the UCSC community; plagiarism and cheating contradict these values, and so are very serious academic offenses. I have a zero tolerance policy for plagiarism and cheating. No credit will be given for an assignment where a breach of academic integrity is established, and we will follow the established UCSC process for violations of academic integrity ([http://www.ucsc.edu/academics/academic_integrity/undergraduate_students/](http://www.ucsc.edu/academics/academic_integrity/undergraduate_students/)). Please review the handout on Avoiding Plagiarism (also available on the course web page) that summarizes what is considered violation of academic integrity – this handout will be included in your quizzes and exams. If you have any questions about UCSC policy please consult your professors and the course reader. In addition, UCSC has an excellent Information Literacy Tutorial at [http://nettrail.ucsc.edu](http://nettrail.ucsc.edu) that includes a clear discussion of plagiarism and the ethics of information use and citing.

For additional clear descriptions and discussion of what constitutes plagiarism, please see the following web pages from the Learning Center.

- [http://www.plagiarism.org/learning_center/what_is_plagiarism.html](http://www.plagiarism.org/learning_center/what_is_plagiarism.html)
- [http://www.plagiarism.org/learning_center/plagiarism_faq.html](http://www.plagiarism.org/learning_center/plagiarism_faq.html)

Greg Gilbert and Ingrid Parker prepared a handout on avoiding plagiarism (required reading for this class) and available at [http://people.ucsc.edu/~ggilbert/Documents/Avoiding_Plagiarism.pdf](http://people.ucsc.edu/~ggilbert/Documents/Avoiding_Plagiarism.pdf)

Obviously, because i>clicker use in lecture constitutes part of the grade, using someone else's i>clicker, or having someone else use yours, are both cheating. If we catch someone doing this, i>clickers will be confiscated and BOTH students will be prosecuted in accordance with UCSC academic integrity rules.

**Peer-review of analytical brief for extra credit.** You can receive up to 2 points extra credit toward your final course grade by participating in significant peer-review of the final paper. Full credit requires (1) providing substantive review comments to a peer in the class, (2) receiving and incorporating comments from a peer in the class, (3) turning in the original (hardcopy) reviewed drafts of both reviewers together as a bundle in class on the day the paper is due, along with a brief joint cover letter noting who the reviewers were, and an assessment of the value of doing the reviews.

**Course evaluation extra credit.** Course evaluations are now done through eCommons. They are extremely important to me as a professor that you complete them. I won't be able to see what you put on the evals until after the course grades are in, and I will never know what you wrote (they are anonymous), but I will know if you completed a course eval. You will get 0.5% added to your course grade for completing the course eval no later that 24h after the end of the final exam.

**Registering your i>clicker** To get credit for your i>clicker responses, you MUST register your i>clicker on line at [http://www.iclicker.com/](http://www.iclicker.com/).
<table>
<thead>
<tr>
<th>Date</th>
<th>Topics</th>
<th>Required readings</th>
<th>Due</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1 Apr</td>
<td>Intro to course &amp; diseases</td>
<td></td>
<td></td>
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<tr>
<td>W 3 Apr</td>
<td>Plants</td>
<td>EPP Ch. 1</td>
<td>On-line Pre-test</td>
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<tr>
<td>F 5 Apr</td>
<td>Fungi</td>
<td>EPP Ch. 2; syllabus; Avoid plagiarism</td>
<td>Quiz1</td>
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<tr>
<td>M 8 Apr</td>
<td>Fungi &amp; Oomycetes</td>
<td>EPP Ch. 2</td>
<td>Quiz2</td>
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<td>W 10 Apr</td>
<td>Bacteria</td>
<td>EPP Ch. 3</td>
<td>Quiz3</td>
<td>Microbial life history</td>
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<td>F 12 Apr</td>
<td>Nematodes</td>
<td>EPP Ch. 4</td>
<td>Quiz4</td>
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<td>M 15 Apr</td>
<td>Viruses</td>
<td>EPP Ch. 5</td>
<td>Quiz5</td>
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<td>W 17 Apr</td>
<td>Parasitic plants</td>
<td>EPP Ch. 6</td>
<td>Quiz6</td>
<td>Life history posters</td>
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<td>F 19 Apr</td>
<td>Abiotic diseases</td>
<td>EPP Ch. 7</td>
<td>Quiz7</td>
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<td>M 22 Apr</td>
<td>Midterm 1: life histories</td>
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<td>W 24 Apr</td>
<td>Types of diseases</td>
<td>EPP Ch. 8</td>
<td>Quiz8</td>
<td>Critique / arguments</td>
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<td>F 26 Apr</td>
<td>Types of diseases</td>
<td>EPP Ch. 8</td>
<td></td>
<td></td>
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<td>M 29 Apr</td>
<td>Other Symbioses (Saunders)</td>
<td>Kennedy '03; Rollinger '93; Clay '99</td>
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<td>W 1 May</td>
<td>Ecological interactions</td>
<td>EPP Ch. 9A, Bradley et al. 2003</td>
<td>Quiz9A; Critique 1</td>
<td>Environment</td>
</tr>
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<td>F 3 May</td>
<td>Physiological interactions</td>
<td>EPP Ch. 9B</td>
<td>Quiz9B</td>
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<td>M 6 May</td>
<td>Genetic Interactions</td>
<td>EPP Ch. 9C</td>
<td>Quiz9C</td>
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<tr>
<td>W 8 May</td>
<td>Genetic Interactions</td>
<td>EPP Ch. 9C; Bruns et al. 2012</td>
<td>Critique 2</td>
<td>Genetic Interactions</td>
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<td>F 10 May</td>
<td>Evolutionary ecology Saunders</td>
<td>Gilbert &amp; Webb 2007; Springer 2008</td>
<td>Final Paper topics/outlines</td>
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<td>EPP Ch. 10</td>
<td>Midterm 1</td>
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<td>W 15 May</td>
<td>Epidemiology 2</td>
<td>EPP Ch. 10</td>
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<td>F 17 May</td>
<td>Epidemiology 3</td>
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<td>M 20 May</td>
<td>Disease management</td>
<td>EPP Ch. 11</td>
<td>Quiz11</td>
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<td>W 22 May</td>
<td>Novel interactions</td>
<td>Parker &amp; Gilbert 2004</td>
<td>Critique 3</td>
<td>Management plans</td>
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<td>F 24 May</td>
<td>Natural ecosystems-epidemics</td>
<td>Grünwald et al. 2012;</td>
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<td>Epidemiology Homework</td>
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<tr>
<td>M 27 May</td>
<td>Memorial Day Holiday</td>
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<tr>
<td>W 29 May</td>
<td>Natural ecosystems-feedback</td>
<td>Bever 1997; Vanderputten 1993</td>
<td>Critique 4</td>
<td>Climate change</td>
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<td>F 31 May</td>
<td>Natural ecosystems - diversity</td>
<td>Gilbert 2002;</td>
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<tr>
<td>M 3 Jun</td>
<td>Biological control</td>
<td>Kuchment 2013; Arnold et al. 2003</td>
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<td>Final Paper 11: 00 a.m.</td>
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<td>W 5 Jun</td>
<td>Disease into the future</td>
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<td>Paper presentations</td>
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<td>F 7 Jun</td>
<td>Midterm Exam 2: All else</td>
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These readings are available in Resources in the ENVS 163 eCommons site.

**Required readings**


Bruns, E., M. Carson, and G. May. 2012. Pathogen and host genotype differently affect pathogen fitness through their effects on different life-history stages. BMC Evolutionary Biology 12:135 DOI: 10.1186/1471-2148-12-135


**Suggested readings – some additional papers drawn from in lectures**


Section assignments and activities

3 April: No formal meeting. Use this time to take the on-line pre-test on eCommons.

10 April: Organization; review of academic integrity; review and discussion of microbial life histories. No pre-section assignment due.

17 April: **Life history poster.** Prepare a one-page, original (that means your words and drawings) life history poster (8.5"x11" or larger) of the plant disease of your choosing. It should (1) clearly identify the pathogen and host(s) of interest, (2) depict the most important aspects of the plant / pathogen life cycles as they relate to disease development, (3) describe how the pathogen causes disease on the plant, (4) impacts on the host, and (5) specific approaches to management of this disease. See p 56 in the Kuchment 2013 *The end of orange juice* reading for an excellent example. Do your best work on the drawings - you won't be graded on how life-like the drawing is, but how effectively it conveys the information. On a separate sheet, include the full citations of references you used to design the poster. Turn in both as hardcopies at the beginning of section. Be prepared to make a 2-minute presentation to the class about your disease.

24 April: Finding, reading, and critiquing scientific literature; supporting your arguments. In-section activities. Bring your laptop, if you have one.


Being able to read the primary scientific literature is a professional skill that will allow you to stay on top of the latest information throughout your career, without having to simply take the work of interpreters at face value. Reading scientific papers efficiently, effectively, and critically is a learned skill – there are tricks to help, but it really just requires practice. By far, however, the best way to read scientific literature is with friends. Scholarly nerds (like professors and grad students) form journal clubs and reading groups not just because it is part of the educational and research process, but because (1) it make understanding the literature much easier, and (2) it is fun. Really. Fun! Get with it – everyone is doing it!

Each student must turn in an individual draft of a critical review of Bradley et al. 2003. on eCommons before section. You are encouraged to talk to other about the paper, but each student should write his/her own draft. Bring a hard-copy version of your draft to section, where we will have group discussions about the paper and your reviews. You then work in groups in section, to create a consensus critique to upload to eCommons. 70% of the grade will be for the individual draft and 30% on the group critique.

8 May: Genetic and physiological interactions. **Critical review 2:** Bruns, E., M. Carson, and G. May. 2012. Pathogen and host genotype differently affect pathogen fitness through their effects on different life-history stages. BMC Evolutionary Biology 12:135 DOI:
15 May: Epidemiology homework Excel tools. Be sure to bring laptops and the Excel homework assignment to section. Section will review the assignment and tips on using Excel effectively to complete it.

22 May: Critical Argument 3: cultural disease management.
You may choose any peer-reviewed, empirical paper (not a review paper) related to crop rotation or intercropping and plant disease management. Each student prepares a critical review before section that (1) summarized the article read and (2) uses the findings from that article to support or refute the statement "Crop diversification, through rotation or multicropping, is an effective means of controlling plant disease". Note that it is not at all important whether your article supports or refutes the statement, but rather that you clearly argue how the particular article you read supports or refutes the statement. Individual drafts must be posted before the start of section. Bring a copy with you to section. In section, you will then be divided into groups to come up with a consensus statement based on the collective knowledge obtained from all the papers you read. 70% of the grade will be for the individual draft and 30% on the group consensus statement.

29 May: Critical Argument 4: about the impacts of climate change on plant disease. Do a Web of Science search with the following Topic boolean search terms: (plant SAME (disease* OR pathogen*)) AND (climate SAME change). Pick an article of interest to you, and prepare a critical review before section that (1) summarizes the article read, and then (2) makes an argument, based on that finding of that article, that either (a) argues for federal funding for a research program (you need to define what that program should be) or (b) argues that climate change impacts on plant disease are unlikely to be of major concern. What is important is that you support your argument clearly, not what position you take. Individual drafts must be posted before the start of section. Bring a copy with you to section. Be prepared to make your argument in 1 minute to the section.

5 June: Final Paper presentations. Your final paper must be posted on eCommons by Monday 3 June. In section on 5 June, be prepared to make a clear, 2-min presentation about your disease to the class. You are encouraged to pre-record it to play back as an .mp3 recording (e.g., a "radio spot") or make a video to show. No more than 2 minutes each.
Critical Review / Argument Requirements

**Length:** The reviews should be **300-500 words for the summary and 300-500 words for the critique or argument.**

**Document type:** Paste the text of the review directly into the eCommons assignment, rather than uploading a document. This facilitates grading. Be sure to keep a copy for yourself.

**Writing:** Clear, concise, unambiguous writing with correct spelling and good grammar.

**Structure:** Header, Summary, Critique (see details below and example)

**EVALUATION**

**10 points: Structure.** Please follow the header format shown in the example (student name, class and assignment, date, full citation of article reviewed). Should meet the expected length, have a clear structure, and clear, grammatically correct, stylistically appropriate writing.

**30 points: Summary of the article.** The first section (300-500 words) should be a concise summary of (a) the objective of the study, (b) what was done, and (c) what was found. Only include enough of the methods to know what kind of study was done (e.g., “… used fungicide application experiments in the field to…”, “… through isolations of fungi from 30 species of symptomatic plant species, they examined …”, “… collected rust spore samples from wheat fields across North America and testing their race structure using …”). You should **not** include detailed methods like " in a completely randomized block design in southern Mississippi, they added zero or 15 larvae to each of 20 replicate plots, 2x2-m each, on 4 April 2001 to …."

Provide what is needed to get the picture of what was done, but the focus should be on the objectives and the results.

**30 points: Critique or Argument.** Critique is not criticizing. It is a thoughtful evaluation. In the second section describe something positive about the scientific value of the study (note: “well written” does not count – look at the science), and describe why it is important. All papers have strong points, or they would not have been published. Sometime it is hard not to fall into the trap of just focusing on all the problems. Then you should briefly discuss either (a) any important problems with the paper (e.g., “the author’s interpretation of the data may be flawed because they did not consider …”), or (b) a specific suggestion for where to go next with this line of study (note: “repeat this again in another year or species or place”, or “increase the sample size” is generally not enough unless you provide very specific reasons for why this might provide significantly different results. What is the next logical step to **build** on these findings?)

Alternatively, you may be asked to use the second section to make a particular argument about a larger point. How do the results of this study support (or refute) a particular claim or hypothesis (e.g., "crop rotation is useful to control plant disease"). Be specific about how the particular paper provides support (or refutes) the claim.

**30 points: Group consensus critique/argument.** Must be posted by 5:00 p.m. on the day due in appropriate discussion forum (one posting per group, with all student's full names).

**Thus there is a total of 100 points per critical review.**
Summary. The focus of this study was to determine potential effects of vector behavior on disease transmission in the *Silene-Ustilago* system. Behavior included preferences for healthy vs. infected hosts, rates of spore deposition and changes in vector movement associated with plant spacing. In the study they 1) identified insect species that were the most abundant visitors to local populations of *Silene alba*, and 2) determined whether insect vectors discriminated between healthy and diseased flowers. Because vectors must visit both healthy and diseased flowers to spread infection, any biases with respect to host disease status may influence the rate at which disease spreads. Knowledge of dispersal mechanisms and the distance spores are dispersed is important to modeling disease spread. The number of spores deposited on healthy hosts is likely to influence how infection probabilities vary with distance from diseased plants and a "threshold" number of spores may be required to achieve infection. In natural populations, spore dispersal also depends on vector foraging patterns that may vary with plant spacing: densely spaced patches of plants should attract higher numbers of vectors whereas individual vectors may visit more flowers if plant in widely spaced patches. They found many insects visited the plants, but the most common were bees, syrphid flies, nocturnal moths and sphingid moths. Bees tended to prefer healthy flowers unless they had been previously exposed to diseased flowers. In the context of disease spread, vectors that discriminate had a lower probability of encountering disease, but were more likely to spread spores to healthy plants. Moths made more visits to plants with more flowers and there was no preference for healthy vs. infected plants in terms of the number of flowers visited per unit time. But when visitation rates were divided by the number of flowers, moths discriminated in favor of healthy flowers over infected flowers. Even in close plant spacing spore dispersal over long distances may occur. With bees, even after visits to the 15th consecutive flower, significant amount of spores were deposited. More spores were deposited per visit if the bee visited more than one infected flower before encounters with healthy flowers.

Critique. This study is a significant advance in our understanding of the spread of vector-borne plant pathogenic fungi, and has implications for managing such diseases in agricultural systems. The design of the study allowed them to clearly distinguish between …

This study suggest that xxxxx might also be an important regulator in the spread of vector-borne diseases. An important followup study would be to… OR Although there were many strong components to this study, we were concerned that interactions between pollinator species of different sizes might have been confounded by…
Final Paper Assignment, Structure, and Grading Rubric
ENVS 163 Plant Disease Ecology

The Secretaries of Agriculture and Interior have decided to fund five research institutes to address critical areas in plant disease ecology. The institutes can focus on a particular disease or on a particular topic that crosses many diseases. The institutes can focus on either applied problem solving or basic understanding that may later contribute to problem solving. You are asked to identify one topic that you are passionate about, and write a 2-page (single-spaced, 12-point font, 1-inch margins) brief that synthesizes published scientific literature in disease ecology to help the Secretaries understand the current state of relevant research in the area and to make an evidence-based case that this is a topic of critical need. You need to use a minimum of four articles from the primary peer-reviewed literature in a significant way, and go beyond just reporting the results of those studies to present a clear, coherent, synthetic statement based on your analysis of the research. The challenge here is to take a body of work, understand it well, and tell a coherent story about the topic informed by and supported by the best available scientific literature. The complete citation for each article (in the format used in the journal *Ecology*) MUST be included for all citations in a Literature Cited section. Similarly, the in-text citations of the references must follow the style used in *Ecology*.

1. The final paper outline (due 10 May) must include (1) a title, (2) a 1-paragraph overview of the argument to be made, (3) full citations for 4 relevant articles from the literature, (4) one or two sentences for each of the citations specifying what that article contributes to your argument.

2. The final paper (due 3 June) should be an analytical review and synthesis of the literature on a critical plant disease or topic in plant disease ecology, and make a clear evidence-based argument about why this topic is critical for significant research attention. It should include:
   • Your full name, course number and name, date.
   • Informative descriptive title
   • The goal is to pick a signal important issue or disease, take a body of scientific work, understand it well, and tell a coherent story about the topic informed by and supported by the best available scientific literature.
   • Appropriate structure and clear writing. Be sure that you present the big picture and the specific questions or issues you will address, in the order you will address them, in introducing your paper. Use signposts (section headings, strong topic sentences, etc.) to make it easy to see at a glance how your paper is structured, and how you are making your arguments. Be sure to include a strong, clear conclusion that synthesizes your argument that your topic is one of the critical areas to merit research.
   • Minimum (that means no fewer than, but likely to include more) of four peer-reviewed scholarly articles that you engage in a substantive way in your paper. You should be analyzing and summarizing the literature, not just reporting it.
   • Appropriate citation of all sources from which you derive information and ideas in the text and in the literature cited section at the end of the paper. Citation style MUST follow the style used in the journal *Ecology*. Look at a recent issue of *Ecology*, or the Instructions to Authors page of the Ecological Society of America for appropriate citation style. You can also refer to the *Avoiding Plagiarism* handout provided at the beginning of the quarter.
   • Two pages, single spaced, 12-point font, 1 inch margins
3. The **final paper** must be submitted on eCommons as a Microsoft Word .doc or .docx file. The file names must include your last name (e.g., Gilbert_finalpaper163.docx). I cannot accept papers written in the Pages format.

4. **Peer-review of final paper for extra credit.** You can receive up to 2 points extra credit toward your final course grade by participating in significant peer-review of the final paper. Full credit requires (1) providing substantive review comments to a peer in the class, (2) receiving and incorporating comments from a peer in the class, (3) turning in the original reviewed drafts of both reviewers together as a bundle at the same time as turning in the papers, along with a brief joint cover letter noting who the reviewers were, and an assessment of the value of doing the reviews. This could be a Word document with track-changes and comments inserted, or as hardcopy printouts with the comments you exchanged on them given directly to Greg. Credit will be given according to the depth and constructiveness of the feedback given, and how peer-review comments were addressed in the final version. Note: Minimal, non-specific feedback like “Hey, this looks great, maybe see if you can cut a bit from the intro” would not get any credit.
Grading rubric for ENVS163 Plant Disease Ecology Final Paper Proposal

Name:                                              Final score: ______/100

_/10: Paper title:

_/30: 1-paragraph overview of the argument to be made. Must clearly state an delimit a
topic, and outline the argument that this is an important topic for research.

_/40: Full citations for 4 relevant articles form the literature, in the format used in the journal
Ecology

_/20: one or two sentences for each of the citations specifying what that article contributes to
your argument.
Grading rubric for ENVS163 Plant Disease Ecology Final Paper

Name:

Paper title:

Final score: ______/100 Extra Credit for Peer-review: ______/2

____/10: Structure and guidelines: File name and format; Following requirements for name, title, date as given. Length 2 pages, single spaced, 12 pt font. (Note: papers on topics clearly outside the theme of this assignment will not receive any credit)


____/10: Appropriate citation of the literature. Inclusion of at least four appropriate peer-reviewed publications from the scientific literature, with appropriate in-text citations and literature cited section. MUST USE THE FORMAT USED IN THE JOURNAL Ecology (see Avoiding Plagiarism handout).

____/30: Effective use of peer-reviewed primary scholarly literature. Cited literature is accurately and substantively used to support your arguments. Descriptions of work and findings of others are clearly explained to be understandable by others in this class without having to read the original work.

____/40: Coherent, synthetic, analytical review of research to make a clear argument. Clearly establish the goals of the paper, including specific questions or controversies, or particular issues that will be addressed. Effectively integrate and synthesize ideas and findings from multiple sources to address those goals, including a clear synthetic conclusion. Should tell a story.

General comments:
**Required format for final paper:** Please follow this overall structure including this format for citations. Please number all pages.

**Title of paper**

**Your Name**

ENVS163 Plant Disease Ecology

**Date**

Then follows the body of the text – use sections and subsections as appropriate to help with the flow of the paper.

*In the text use citations as follows:*

Single author (Janzen 1971)

Two authors (Burdon & Chilvers 1984)

Three or more authors (Bradley *et al.* 2002)

Multiple citations (Janzen 1971, Burdon & Chilvers 1984)

**Literature Cited:** (Use the format exactly as given below).

*For journal articles:*


*For a book:*


*For a book chapter:*


*For a website:*

Suggested exercise to help select a topic for the Final Paper
And maximize your effective use of Web of Science

Purposes:
(1) Develop skills for effectively using the Web of Science to find scientific literature,
(2) Finding and evaluating literature to be used for your final paper, and
(3) Proposing the topic for your final paper.

What to do:
1. Pick a particular pathogen, disease, or concept that you think might be a good topic for your final paper. For example:
   - A disease
     - Sudden Oak Death
   - A pathogen
     - Phytophthora ramorum
   - A concept
     - induced resistance

2. Go to the University Library web page at http://library.ucsc.edu. Click More databases in the FIND ARTICLES box at left, then choose Web of Science.

3. Click in the top search box (above "Example: oil spill* mediterranean") and type the name of your pathogen or disease or concept in the Topic box and click “Search”. Record the number of “results found” you got for your search terms. Read through the titles and abstracts of the articles (click on the title to see the abstract), check and make a record of those that seem interesting and useful. If the UC library has an electronic subscription to the journal, clicking on “UC-eLinks” will take you to the online text. Others are available only in the library. Note which ones are readily available to you.

5. From the results page, use the “Sort by” tool on the right to sort by Times cited - highest to lowest. This will show which papers are the “classics” on the topic (although by default newer papers, even if exceptional, haven’t had the same opportunity to be cited).

6. Click on the title of a paper you are interested in. Click on the number after “Cited Reference”. This shows you all the articles that were cited in that paper, allowing you to follow back into history and find the papers that informed that work.

7. Now click on the number after “Times cited” for that citations. This shows you all the papers that have cited that publication – allowing you to follow the paper’s impact forward in time. For instance, today a search on “sudden oak death” produced 276 results. The top-cited article in that collection cited 30 previous publications and was in turn cited 336 times. Often you’ll find the most useful papers in following up who cited papers you are really interested in.

8. Peruse the references you find in while exploring the citations. Gather and examine at least five articles that you can access either electronically or in the Science & Engineering library.

9. Use this process to explore pathogens, diseases, or topics for your final paper. Be sure that there are adequate publications for you to be able to write a paper!