Conservation Biology

BIOC63H3

Course Manual, 2013

Course syllabus

Course description and objectives

BIOC63H3 provides an introduction to the scientific foundation and practice of conservation biology. It reviews ecological and genetic concepts and facts constituting the basis for conservation including patterns and causes of global biodiversity, the intrinsic and extrinsic value of biodiversity, the main causes of the worldwide decline of biodiversity and the approaches to save it. The course showcases the interdisciplinary nature of conservation biology, demonstrating the social, political and economic factors that affect the discipline. The main course approach is to rely on a case study approach.

The overall goal of the course is to provide students with an introduction to both the scientific basis of modern conservation biology and the application of these principles to conservation applications and problems around the world. After completing the course, the students should exhibit familiarity with the relevant primary and secondary scientific literature and be able to locate, summarize and synthesize information from these sources.

Instructor

Ivana Stehlik

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Email: ivana.stehlik@utoronto.ca

Office hours: if my office door is open, please feel free to drop by anytime (open door policy)! My best times to talk to you are Mon 3 - 4, Tue 10 - 12 and Thu 10 - 12, however, I appreciate if you let me know that you want to come. If these times don't work for you, fire off an email to schedule a meeting, I will do my best to accommodate your schedule!

Prerequisites

BGYB50 and BGYB51. These are non-negotiable.

Marks breakdown

Written paper on the lab project	28%
Quizzes about field trips (Rouge Park, Tommy Thompson Park, zoo; 2% each)	6%
Midterm exam	33%
Final exam	33%

Times and location

Course lecture time: Tue and Thu, 4 pm – 5 pm
Tutorial time: Thu, 9 am - 12 pm, MW226
Note: Alternate weeks for the two tutorial groups (TG1 and TG2)

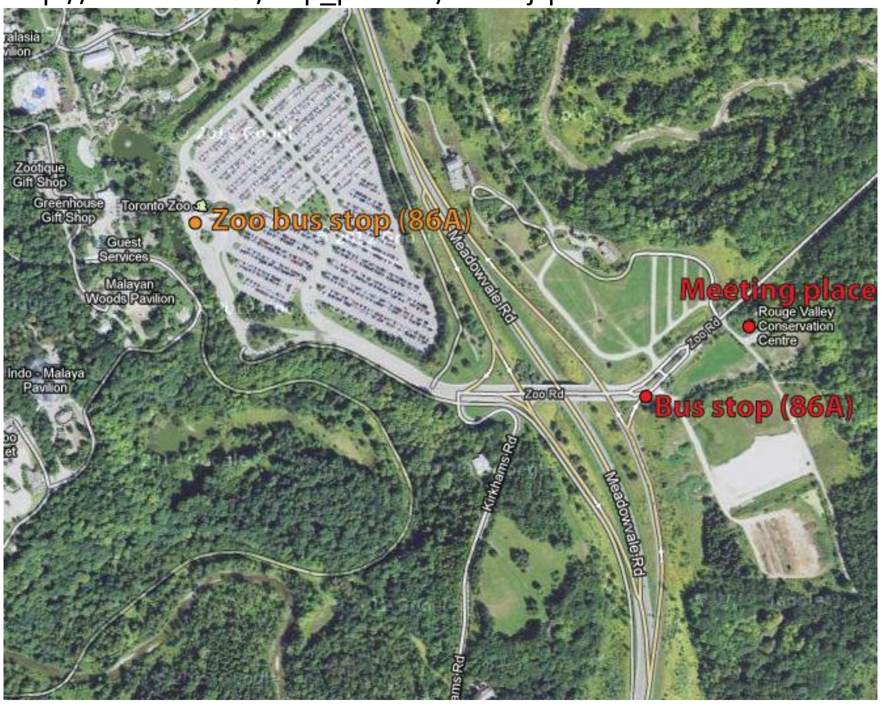
Course schedule/Important dates

Date	Lecture or Tutorial group	Activity
Sep. 3/5	1/2	Course introduction; Global biodiversity pattern and processes
Sep. 10/12	3/4	Value of biodiversity
Sep. 12	TG1	Data collection herbivore damage lab project
Sep. 17/19	5/6	Threats to biodiversity I: Overexploitation; habitat degradation, habitat fragmentation and habitat destruction
Sep. 19	TG2	Data collection herbivore damage lab project
Sep. 24/26	7/8	Threats to biodiversity II: Invasive species
Oct. 1/3	9/10	Threats to biodiversity III: Global change
Oct. 8/10	11/12	Threats to biodiversity IV: Case study of tropical forests and oceans
Oct. 10	TG1	Field trip to the Rouge Park
Oct. 10	**TG1**	**Quiz about the Rouge Park: hand in to IS in SW563C by 6:00 PM**
Oct. 15-18	**Reading week**	
Oct. 22/24	13/14	Conservation genetics
Oct. 24	TG2	Field trip to the Rouge Park
Oct. 24	**TG2**	**Quiz about the Rouge Park: hand in to IS in SW563C by 6:00 PM**
Oct. 29/31	15/16	Approaches to conservation I: Species and populations
Oct. 31	**Midterm exam (lectures 1-12), both TG1 and TG2, during tutorial, 9 - 12 am**	
Nov. 5/7	17/18	Approaches to conservation II: Species and landscapes
Nov. 7	TG1	Field trip to the Tommy Thompson Park
Nov. 7	**TG1**	**Quiz about the TTP: hand in to IS in SW563C by 6:00 PM**
Nov. 12/14	19/20	Approaches to conservation III: Design of reserves
Nov. 14	TG2	Field trip to the Tommy Thompson Park
Nov. 14	**TG2**	**Quiz about the TTP: hand in to IS in SW563C by 6:00 PM**
Nov. 14	**TG1 and TG2**	**Submission of the paper on the lab project to turnitin.com, deadline 11.59 pm**
Nov. 19/21	21/22	Approaches to conservation IV: Ex situ conservation Reintroduction, managed relocation
Nov. 21	TG1	Field trip to the Zoo
Nov. 21	**TG1**	**Quiz about the Zoo: hand in to IS in SW563C by 6:00 PM**
Nov. 26/28	23/24	Environmental economics; Agenda for the future
Nov. 28	TG2	Field trip to the Zoo
Nov. 28	**TG2**	**Quiz about the Zoo: hand in to IS in SW563C by 6:00 PM**
Dec TBA (exam period)		**Final exam (lectures 13-24)**

Field trips

There are three mandatory field trips, to (1) Rouge Park, (2) Tommy Thompson Park, and to (3) the zoo.

(1) Rouge Park: You are expected to travel independently to Rouge Park. If you travel by TTC, thus with bus 86A direction to the zoo, get off at the penultimate station before the zoo (request a stop, because normally nobody gets off there; see map below), as the bus leaves Meadowvale Rd. Because busses tend to run late, you need to accommodate for late bus arrivals! I strongly suggest to take a bus which is scheduled to arrive by 9:00 AM, while the field hike starts at 9:15 AM from the Rouge Valley Conservation Centre (meeting place on the map). It is your responsibility to be on time, the group will not wait for you if you are late! In order to plan your bus travel times, use TTC's trip planner at http://www3.ttc.ca/Trip_planner/index.jsp.



(2) Tommy Thompson Park:

A yellow school bus will be organized to get you to and from Tommy Thompson Park. The bus will leave at TBA (the exact time will be announced in class and on Blackboard) from the UTSC campus and will get you back in time for classes at 12:10 PM. You will be expected to bring exact change to cover the cost for the bus, and I will announce the amount in class (expect something btw 10 and 15$). Please note that you cannot drive your own car to the park, as no private cars are allowed there, hence you will have to take the bus from UTSC to participate on this field trip.

(3) Zoo: You are expected to travel independently to the zoo. Again, you need to accommodate for late bus arrivals! Use TTC's trip planner and be at the zoo by TBA (exact time will be announced in class and on BB). You will need to pay the normal entrance fee plus a fee to get behind the scenes (exact amount will be announced in class, but expect something no higher than $20), for which you need to bring exact change. If you have a zoo membership, bring it, so that you will only need to pay the behind-the-scenes fee.

Attendance policy in labs and lab quizzes

In contrast to lectures, attendance will be taken in all lab sessions. Only students who attend the outdoor data collection on the herbivore damage lab project (and hence contributing to the class data set) will be able to write up the paper (and earn a maximum of 25% of the final course grade). Similarly, only students who participate in the field trips (to the Tommy Thompson and Rouge Parks and the Zoo) will be able to take the quiz about these field trips (and earn a maximum of 9% of the final course grade).

If you miss any of these events due to illness or other causes beyond your control, submit, within one week of the missed lab, a written request for special consideration to the instructor explaining the reason for missing the event, and attaching appropriate documentation, such as the official University of Toronto medical certificate (www.utoronto.ca/health/form/medcert.pdf).

Website

Class information will be provided on the course website on the U of T Portal: portal.utoronto.ca. You will need your UTORid and your password to access the site. Please refer to instructions on how to access the course website on blackboard using the information in http://www.portalinfo.utoronto.ca.

Lectures and other course material

Lectures and other course material (e.g. the class data set forming the basis of the lab report) will be posted in a dedicated BIOC63H class folder on dropbox, so you will either need to create a new (and free) dropbox account or you can use your pre-existing dropbox. In order to create your personal 2 GB dropbox account, please follow instructions online found under

https://www.dropbox.com/pricing

by choosing the FREE option. Once you own a dropbox account, you will be able to follow the invitation sent to you by the instructor through email to join the dropbox class folder in the first week of classes. This invitation will be sent to your official university email account, so it is vital that you check your email inbox as soon as the course starts (no lecture material will be posted on Blackboard or intranet, so it is in your own interest to get access to all course materials through dropbox ASAP). Lectures will be posted typically the evening before class.

Penalty for late submission

There will be a penalty of 10% per day for assignments received late. Weekend days count as individual days. Unless there are extenuating circumstances (e.g. medical reasons with a medical certificate), a mark of zero will be applied to assignments submitted one week late or more. Heavy workloads or malfunctioning computer equipment are not legitimate reasons for late submission. If you know ahead of time that you have a legitimate reason why you cannot hand in the assignment, let the course instructor know before the due date.

Missed exams

Students who miss an exam for reasons entirely beyond their control may, within one week of the missed test, submit a written request for special consideration to the instructor explaining the reason for missing the test, and attaching appropriate documentation, such as the official University of Toronto medical certificate (www.utoronto.ca/health/form/medcert.pdf).

Academic integrity policy

According to Section B of the University of Toronto's *Code of Behaviour on Academic Matters*, it is an offence for students to:

• use someone else's ideas or words in their own work without acknowledging that those ideas/words are not their own with a citation and quotation marks, i.e. to commit plagiarism.

• include false, misleading or concocted citations in their work.

• obtain unauthorized assistance on any assignment.

• provide unauthorized assistance to another student. This includes showing another student completed work.

• submit their own work for credit in more than one course without the permission of the instructor

• falsify or alter any documentation required by the University. This includes, but is not limited to, doctor's notes.

• use or possess an unauthorized aid in any test or exam.

Violation of the Code of Behaviour on Academic Matters will force the instructor to provide a written report of the matter to the Chair/DeanProvost's and a penalty according to the U of T's guidelines on sanctions will be put into place.

Submission of reports to Turnitin

Students will be asked to submit their reports to **Turnitin.com** for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site:
(http://www.utoronto.ca/ota/turnitin/ConditionsofUse.html)
Turnitin.com is most effective when it is used by all students; however, if and when students object to its use on principle, the course offers a reasonable offline alternative. The student will then be asked to meet with the course instructor to outline and discuss the report before its final submission to demonstrate the process of creating the report according to the academic integrity policy.

Communication policy

Students are required to regularly and often check their UTOR email to receive announcements relating to the course. To inquire about course-related issues, students are strongly encouraged to solely use their UTOR email, as hotmail or other email providers are spam-filtered on a regular basis. It is the responsibility of the student to make sure his or her email reaches the instructor.

The instructor will not answer any questions related to material discussed in class or during the tutorials by email (unless it is a clear yes-no answer), but the student is encouraged to ask these questions during official office hours or to schedule a meeting outside office hours by email.

Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach the course instructor and/or the AccessAbility Services Office as soon as possible. Enquiries are confidential. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

Readings

There is no required reading, but most topics introduced in the lectures are covered in the book [Groom et al. 2006. Principles of Conservation Biology. Sinauer], which is the recommended course book. The book is available at UTSC's book store (hopefully both new and used books). The course's approach in regard to exam questions is as follows: questions will only cover material introduced in class or labs. If you do not understand certain concepts, the recommended Groom book should be consulted, but anything present in the book yet not covered in the lectures will not be on the exam.

In case a certain topic is not covered in the Groom book, the lecture material originated most probably from primary scientific literature. In each such case, there is a reference provided on the slide along with e.g. a table or figure. This reference will help you to find the article using either ISI web of science (with your UTOR ID and password, on the website of the Gerstein library; http://www.library.utoronto.ca/gerstein/) or through Google scholar (does not work in all cases).

Written Paper on Lab Project:

Herbivore damage of native and introduced plant species

1.1. Background

Biological invasion is a huge contributor to the current global biodiversity crisis, second only to habitat destruction (Vitousek et al. 1997). Invasive species can have many adverse effects, such as changing the physical features in a community, altering the competitive balance between species or influencing nutrient cycling. And all of these effects tend to decrease habitat biodiversity. Humans have served as both accidental and deliberate dispersal agents for hundreds of years, however, increased human mobility since the industrial revolution has brought about dramatically increased levels of introductions (Mack et al. 2000). Invasive species come from wide taxonomic backgrounds and various geographic origins, however, the proportion of non-native to native organisms at least in Ontario is the highest within the flowering plants with 32% of non-native species, whereas this fraction is much smaller in bryophytes (1.3%), birds (approx. 2%; based on the estimate at the Koffler Scientific Reserve KSR), mammals (4%) and insects (3% for odonates; data compiled from Ontario Ministry of Natural Resources 2008). Hence this project and the following text is focusing on plant species.

Only a small fraction of all species ever introduced actually become successful, i.e. most either fail to germinate or establish and build up a self-sufficient local population (Mack et al. 2000). Once successfully established, such a species is no longer dependent on recurrent input from the native range. Established immigrant organisms are referred to as “alien,” “adventive,” “exotic”, “introduced,” “non-indigenous,” or “non-native” (Mack et al. 2000). Most of introduced species occur at very low population densities and are of no threat to native species. Only when immigrant organisms become more wide-spread, build up large population sizes and start to outcompete native species, they are called “invasive.” The transformation of an non-native species into an invasive species typically follows a characteristic pattern. The phase at which a non-native species remains inconspicuous is referred to as lag phase. This lag phase can be followed by a phase of rapid exponential increase that continues until the species reaches its carrying capacity (Mack et al. 2000). For example, Brazilian pepper (*Schinus terebinthifolius*) was introduced to North America in the 19th century but did not enter the exponential growth until the 1960ies. It is now established on more than 280,000 ha in Florida and forms monoclonal stands, i.e. excluding all other plants (Schmitz et al. 1997). Unfortunately, it is almost impossible to predict which non-native species in a lag phase has the potential to enter the exponential phase (Mack et al. 2000). Thus, it is unclear what triggers a non-native species to enter the exponential growth phase, i.e. what turns it into such a good competitor compared to the native species with which it shares the habitat. There are however a number of hypotheses explaining this competitive edge of invasive species over natives, of which the “enemy release” hypothesis (ER; Keane and Crawley 2002; Colautti et al. 2004) and the “evolution of increased competitive ability” hypothesis (EICA; Liu and Stiling 2006; Hull-Sanders et al. 2007) have received a lot of attention in recent years and will be introduced in the following. At the core of both hypotheses lies the observation that invasive plant species commonly suffer less damage through herbivores or other pathogens (fungi, viruses) compared to native plants.

1.2. Phylogenetically controlled approach

Because defense against enemies is a genetically controlled trait, some groups of related species might be a priori more or less well defended than other groups. Thus, comparing the damage inflicted by enemies of just any native and non-native species might not be very meaningful and represent a comparison of "apples and oranges." In order to compare species that are similar except for their native/exotic status, we will compare plant damage in two closely related plants, a procedure called a phylogenetically controlled approach (Agrawal and Kotanen 2003; Agrawal et al. 2005; Hill and Kotanen 2009). We will hence compare herbivore damage of a pair of native and invasive plant species within a family: the native common milkweed (*Asclepias syriaca*) and the invasive dog-strangling vine (*Cynanchum rossicum*) in the family of Asclepiadaceae.

2. DATA COLLECTION

2.1. Leaf collection

The TA or course instructor will show you the location where you will sample your leaves. Each student should sample four plants of each species, thus eight plants in total. For each plant, the leaf should be collected in an unbiased and uniform way. Leaves in both species are inserted opposite each other, i.e. at each node there are two leaves (Fig. 1). For both species, identify the two leaves located in the second-highest position on a given shoot, thus not the youngest, but second-youngest leaf pair (Fig. 1). Within this pair, collect one of them (or take the remaining leaf, if you belong to lab group 2). Make sure you tear off the entire leaf. Pack it into a plastic bag for later analysis in the lab. Be careful not to put any of the bitter, white and pressurized latex (milk) of the common milkweed into your eyes.

2.2. Analysis of leaf damage

In the lab, estimate the herbivore damage per leaf. Using the acetate paper with grid cells, essentially estimate the fraction of the damaged leaf area as the damaged leaf area divided by the whole leaf area (fraction damaged = damaged leaf area/total leaf area).

To do so, first check whether there is any damage at all on a given leaf (even the smallest blemish should be counted). If a leaf is spotless, score its fraction damaged leaf area as 0. If there is damage, put the leaf under the acetate paper, orienting the grid cells of the acetate paper facing down. With a sharpie, trace the outline of the leaf onto the acetate paper. If there is herbivore damage along the leaf edge, reconstruct the original outline of the leaf as closely as possible. Now count how many full and partial grid cells are contained in the traced outline of the (reconstructed) leaf on your acetate paper. In a second step, count the full and partial grid cells of the damaged leaf area. Then divide the number of damaged grid cells by the total number of grid cells of the (reconstructed) leaf.

For the next leaf damage assessment, clean the acetate paper using rubbing alcohol and paper tissue. Repeat the counting procedure for all your sampled leaves. On a piece of paper, enter your data into a table (using the organization shown in Table 1). Upon completion, give your data to the TA. The TA will assemble a class data file and send it to everybody for analysis and write-up.

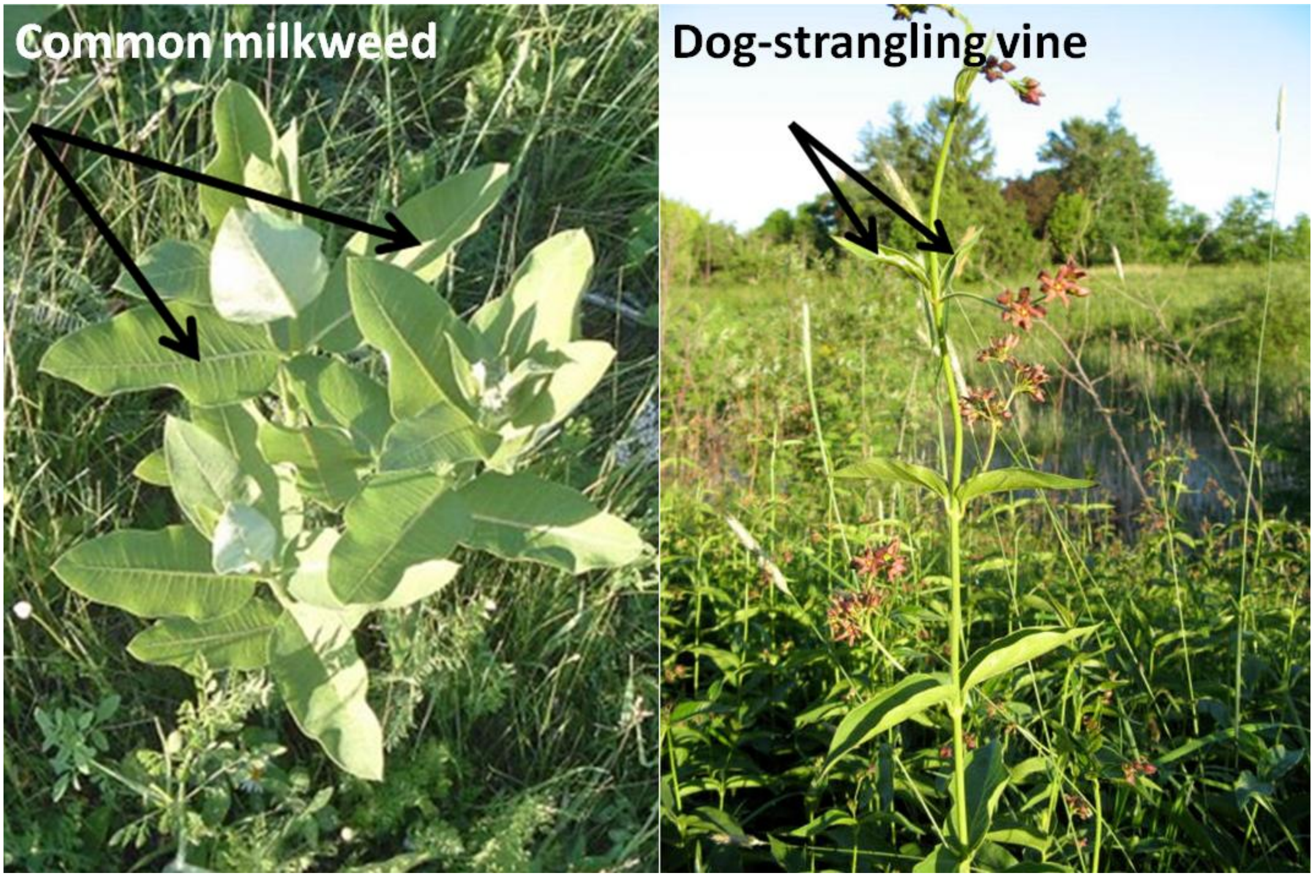


Fig. 1. Collect one of the two leaves inserted at the second highest position per plant (arrows).

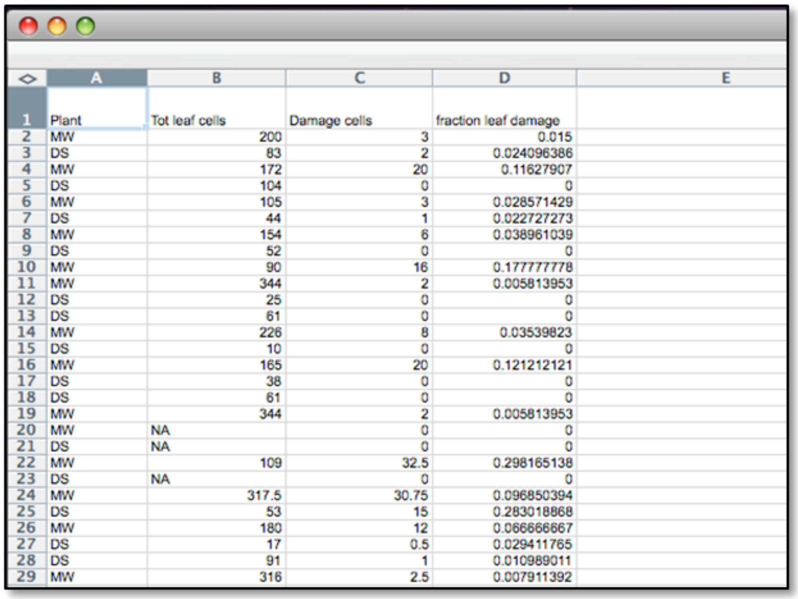
Table. 1. Organization of the data table.

Student name	Plant ID	Total leaf area (# grids cells)	Damaged leaf area (# grid cells)	Fraction leaf damage
Jane	milkweed	38	6	0.158
Jane	milkweed	43	7.5	0.174
Jane	milkweed	39	5.5	0.141
Jane	dogstr. vine	-	0	0
Jane	dogstr. vine	22	1.5	0.068
Jane	dogstr. vine	24	3	0.125

3. DATA ANALYSIS

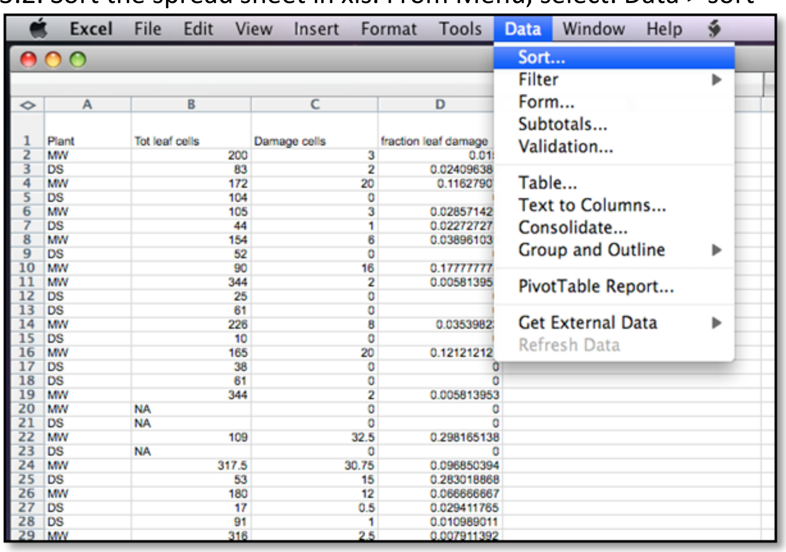
Run a T-test comparing the average herbivore damage of the two species. From the analysis, retrieve the mean fraction leaf damage per species including standard errors. Use this in your figure of your report. Below find step-by-step instructions on how to prepare the xls spreadsheet for the t-test analysis, which can be done in an online free program.

3.1. Open the spread sheet in xls

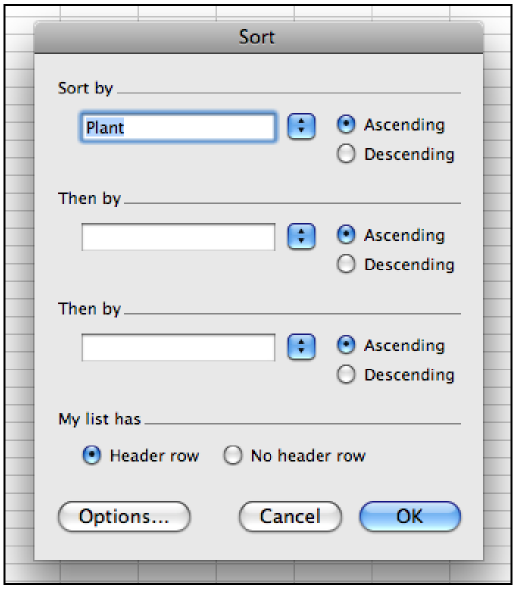


	A	B	C	D	E
1	Plant	Tot leaf cells	Damage cells	fraction leaf damage	
2	MW	200	3	0.015	
3	DS	83	2	0.024096386	
4	MW	172	20	0.11627907	
5	DS	104	0	0	
6	MW	105	3	0.028571429	
7	DS	44	1	0.022727273	
8	MW	154	6	0.038961039	
9	DS	52	0	0	
10	MW	90	16	0.177777778	
11	MW	344	2	0.005813953	
12	DS	25	0	0	
13	DS	61	0	0	
14	MW	226	8	0.03539823	
15	DS	10	0	0	
16	MW	165	20	0.121212121	
17	DS	38	0	0	
18	DS	61	0	0	
19	MW	344	2	0.005813953	
20	MW	NA	0	0	
21	DS	NA	0	0	
22	MW	109	32.5	0.298165138	
23	DS	NA	0	0	
24	MW	317.5	30.75	0.096850394	
25	DS	53	15	0.283018868	
26	MW	180	12	0.066666667	
27	DS	17	0.5	0.029411765	
28	DS	91	1	0.010989011	
29	MW	316	2.5	0.007911392	

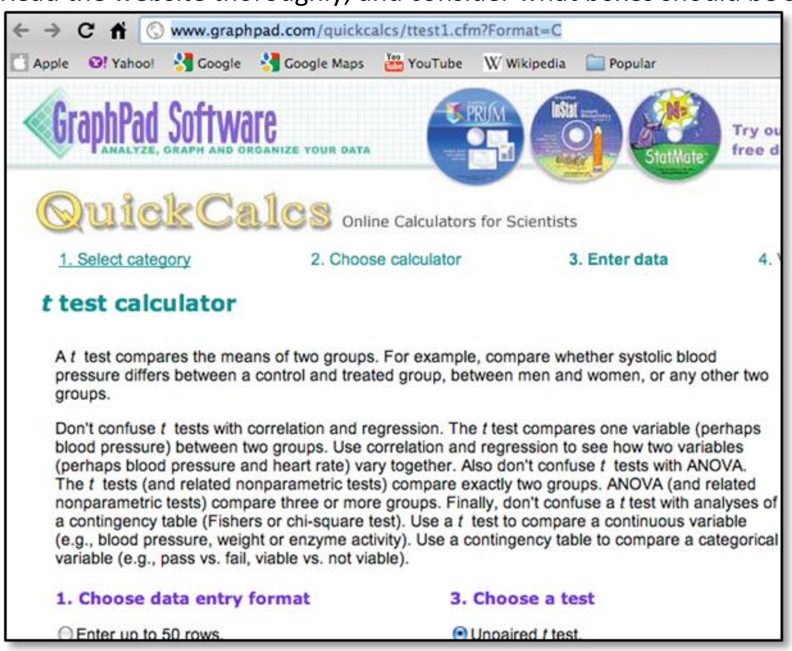
3.2. Sort the spread sheet in xls. From Menu, select: Data > sort



3.3. From “Sort” dialogue box: “Sort by” = “Plant”; “My list has” =
Header row”. Click “OK” to continue. The data should now show up sorted in Excel.



3.4. Data analysis. In your web browser, go to the URL:
http://www.graphpad.com/quickcalcs/ttest1.cfm?Format=C
Read the website thoroughly, and consider what boxes should be selected given the data set.

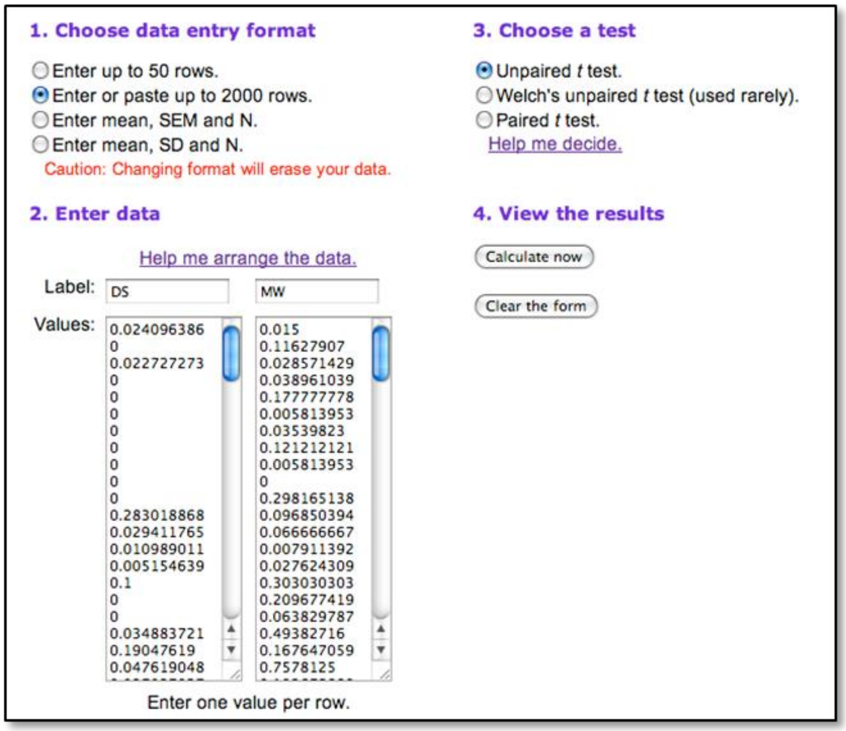


3.4.1. Choose data entry format: How many rows of data do we have? More than 50, therefore choose the option, “Enter or paste up to 2000 rows.”

3.4.2. Enter data:
What labels should we choose? We are comparing between Dog strangling vine and Milkweed, so use those as labels. What Values do we enter? Since we are comparing the predation between the two plant species, we want to use data from the column “Fraction Leaf Damage” (column D). You can simply copy the rows into the “Values” section of “2. Enter data”.

3.4.3. Choose a test: What test should you choose? Click on “Help me decide” to determine the test to be used for this analysis. (Hint: use the “Unpaired t test”)

3.4.4. View the results: Select “Calculate now”. Your analysis is immediate calculated and returned to you on the next page. Make sure to include in your text and figure the standard error (named SEM on the website) and sample sizes.



4. Writing Instructions

4.1. Individual subunits

The length of the text (references, figures and tables excluded) should be **1200 – 1500** and consist of the following parts

- Title
- Abstract: maximum of 200 words
- Key words: 6
- Introduction: approx. maximum of 300
- Methods: approx. maximum of 200 words
- Results: approx. maximum of 200 words
- Discussion: approx. maximum of 600 words
- References (do not count toward word count of a report)

Title. Concise title potentially containing the main finding of your study.

Abstract. The abstract should explain to the general reader why the research was done and why the results should be viewed as important. It should be able to stand alone; the reader should not have to get any information from the main paper in order to understand the abstract. The abstract should provide a brief summary of the research, including the purpose, methods, results, and major conclusions. Do not include literature citations in the abstract. Avoid long lists of common methods or lengthy explanations of what you set out to accomplish. The primary purpose of an abstract is to allow readers to determine quickly and easily the content and results of a paper. The following breakdown works well: purpose of the study (1-2 sentences), outline of the methods (1-2 sentences), results (1-2 sentences), conclusion (no introduction to this section, no discussion/guesses, no citations).

Key words. List 6 key words. Words from the title of the article may be included in the key words. Each key word should be useful as an entry point for a literature search if your report were to be published.

Introduction. A brief Introduction describing the paper's significance should be intelligible to a general reader. The Introduction should state the reason for doing the research, the nature of the questions or hypotheses under consideration, and essential background. The introduction is the place where you can show the reader how knowledgeable you are with a given field, without being too lengthy. Close the introduction with your main hypothesis/question(s).

Methods. The Methods section should provide sufficient information to allow someone to repeat your work. A clear description of your experimental design, sampling procedures, and statistical procedures is especially important.

Results. Results generally should be stated concisely and <u>without</u> interpretation. Present your data using figures and tables; guide your reader through them.

Discussion. The discussion section should explain the significance of the results. Distinguish factual results from speculation and interpretation. Avoid excessive review. Structure your discussion as follows. 1. First paragraph - restate your major findings concisely and then relate to the literature. 2. Discuss the problems that might have been present to influence your findings. 3. Compare your findings with those of others; examine why differences occurred and why this may have been so.

References. Use the correct format (also see the formatting of the literature in the course manual). You should search for and read related studies beyond those cited in the overview on a lab and your report should list at least 12 references, of which 9 should be new (and hence not included in the lab instructions).

4.2. Formatting your report, writing tips

Use the formatting style of the journal of "Ecology." It might seem tedious to you to have to follow the many rules the journal prescribes, but adhering to one style makes a paper more organized, increases readability and bad formatting typically is a sign that the contents are also of sub-par quality.

Formatting of species names. When mentioning a species in English, also provide the Latin name, at least the first time. Latin names have to be in italics and the first time a Latin name is mentioned, the genus name (first part of the official binary name) has to be spelled out, later on it can be abbreviated, such as in the following example: "Common milkweed, *Asclepias syriaca*, is a hermaphroditic perennial common to Southern Ontario. The leaves of *A. syriaca* are toxic to cattle."

Formatting of references. In the body of the text, references to papers by one or two authors in the text should be in full, e.g. Liang and Stehlik (2009) show *blablabla*. Or: *Blablabla* (Liang and Stehlik 2009). If the number of authors exceeds two, they should always be abbreviated; e.g. Campitelli et al. (2008)

show *blablabla*. Or: *Blablabla* (Campitelli et al. 2008). If providing more than one reference in brackets, the order should be chronological with the oldest first and the younger ones later. In the case of two studies from the same year, the order should be alphabetical. E.g. Blablabla (Zuk 1963; Korpelainen 1998; Stehlik and Barrett 2005, 2006; Stehlik et al. 2008)."

All references cited (and read by you!) in the main text should be included in "Literature cited." References should be in alphabetical order and their formatting should follow the format exemplified below.

<u>Citing articles in scientific journals:</u>
Michaels., D. R., Jr., and V. Smirnov. 1999. Postglacial sea levels on the western Canadian continental shelf: revisiting Cope's rule. Marine Geology 125:1654-1669.

<u>Citing whole books:</u>
Carlson, L. D., and M. Schmidt, eds. 1999. Global climatic change in the new millennium. 2nd ed. Vol. 1. The coming deluge. Oxford Univ. Press, Oxford, U.K.

<u>Citing individual articles/chapters in books (if the individual chapters have different authors than the book):</u>
White, P.S. and S. T. A. Pickett. 1985. Natural disturbance and patch dynamics: An introduction. Pp. 3-13 *in* S. T. A. Pickett and P. S. White, eds. The Ecology of Natural Disturbance and Patch Dynamics. Academic Press, San Diego, California, USA.

<u>Citing a webpage (avoid as much as possible, cite a paper or book instead):</u>
IUCN, Conservation International, and NatureServe. 2004. Global amphibian assessment. Available at www.globalamphibians.org. Accessed October 15, 2004.

Formatting of tables. Tables (if present) should NOT be inserted in your text, but follow, one table per page, after your Literature cited. Give a brief description what the table is about (table caption) and introduce the parameters stated in the table in a text inserted <u>above</u> the table (see examples in all project descriptions). The description should be self-explanatory, thus the reader should not be forced to read the main body of text in order to understand the message of a table. Each column and row in the table should be labeled (with units if necessary). If mentioning a species name, provide the spelled out Latin name (in italics). In the table, round numbers to two meaningful digits.

Formatting of figures. The design of a figure should clearly convey a major result, thus scale your data appropriately. Label all axes with sufficiently large font and meaningful labels. Keep it simple; do not use unnecessary elements such as 3D diagrams if not absolutely necessary as based on the data structure. Similarly as tables, figures should NOT be inserted in your text, but follow, one figure per page, after your tables. Give a brief description what the table is about (figure caption) and introduce the parameters stated in the figure in a text inserted <u>below</u> the figure (see examples above). The description of the figure should be self-explanatory, thus the reader should not be forced to read the main body of text in order to understand the message of a figure. Also, each axis in a plot should be labeled (with units) and each bar in a bar chart should be labeled. If mentioning a species name, provide the spelled out Latin name (in italics).

References to tables and figures in the text. In your text, refer to figures as follows: 'In the spring, temperatures are higher than in the winter (Fig. 1).' Or: Figure 1 shows that temperatures are higher in the spring than in the winter. In your text, refer to tables as follows: 'In the spring, temperatures are higher than in the winter (Table 1)'. Or: Table 1 shows that temperatures are higher in the spring than in the winter.

Formatting of statistical references. In the text, the results of a statistical test should be cited in parentheses, in support of a specific statement. Example: Xylem tension at the top of trees was significantly higher (25 bars) than at the bottom (20 bars) of the tree ($P < 0.05$). When mentioning the result of a statistical test, always provide the P value, R^2 or χ^2 were applicable, mean values, sample sizes and standard errors or confidence intervals. Format your text according to the following example. "There was a significant difference in the frequency of flowering between low and high elevation sites, with greater bias among low than high elevation populations (average flowering frequency: low elevation = 0.93, SE = 0.01; high elevation = 0.78, SE = 0.02; $\chi^2 = 35.04$, $P < 0.0001$; df = 1)."

Miscellaneous. Avoid quotations - paraphrase your sources instead while making sure you are not plagiarizing.

5. General grading scheme for reports

When writing the report, you should also consider the criteria and grading scheme that will used to evaluate your report.

5.1. Information content (30%)

This portion of the grade reflects whether or not you have presented and adequately discussed all of the relevant information. This includes background information on the topic being addressed, as well as the information you have gathered (or should have gathered). Specifically, do not forget to include all relevant statistical result parameters, statistical and other tables, data figures and the written explanation of the results. Also make sure you have cited the adequate number of required articles.

27-30: All of the relevant information was included and discussed adequately.
24-26: One of the pieces of information was not included or discussed adequately.
20-23: One of the most important pieces of information was not included or discussed adequately.
15-20: Two or more of the most important pieces of information were not included or discussed adequately.
<15: Little of the important information was included or discussed.

5.2. Interpretation and persuasiveness (30%)

This portion of your grade reflects whether or not you interpreted the information correctly and provided persuasive arguments to support your interpretation. Specifically, does your reasoning make sense on its own and also in the light of the published literature, with which you compare your results?

27-30: All of the relevant information was interpreted correctly, and the arguments were very persuasive.
24-26: Most of the information was interpreted correctly, and the arguments were persuasive.
20-23: One of the important pieces of information was not interpreted correctly, or some of the arguments were not persuasive.

15-20: Two or more important pieces of information were not interpreted correctly, and some of the arguments were not persuasive
<15: Little of the information was interpreted correctly, and few of the arguments were persuasive.

5.3. Clarity of writing (20%)
This portion of the grade reflects whether or not you wrote your sentences and paragraphs clearly. In particular, do you avoid overly long sentences? Are your paragraphs succinct and mostly dealing with one major line of reasoning each? Do your paragraphs preferably start with an introductory sentence and end with a strong summarizing statement? Do you use scientific terms correctly?

19-20: Very clear
16-18: Mostly clear
14-15: Several unclear sentences
10-13: Many unclear sentences
<10: Few clear sentences

5.4. Formatting (10%)
This portion of the grade reflects whether or not you formatted your report well. This includes the overall structure, the references, and the figures and tables (see instructions above).

9-10: The entire report was formatted correctly, and looked very professional.
8-9: The report was formatted correctly, and looked fairly tidy.
7-8: There were a few formatting errors, or one of the relevant questions was not posed in the introduction.
5-7: There were several formatting errors, or several of the relevant questions were not posed in the introduction.
<5: There were many formatting errors, or few of the relevant questions were posed in the introduction.

5.5. Spelling, grammar and punctuation (10%)
This portion of the grade reflects whether or not you used correct spelling, grammar and punctuation.

9-10: There were no errors in spelling, grammar, or punctuation
8-9: There were a few minor errors
7-8: There were several minor errors, or a few major errors
5-7: There were several major and minor errors
<5: There were many errors

6. Literature cited

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Vitousek, P. M., C. M. D'Antonio, L. L. Loope, M. Rejmánek and R. Westbrooks. 1997. New Zealand Journal of Ecology 21: 1-16.