

BIOL377

Global Change and Biosecurity

0.125 EFTS 15 Points

Semester 1

Description

The general aim of the course is to **discuss major concepts in community and ecosystems ecology in the context of anthropogenic changes to the environment including pressure from invasive exotic species**. The central focus will be on the interactions of organisms with their physical and biotic environment, and the ways in which ecological principles can be used to predict responses to global change and to maintain biosecurity. Global change phenomena are often dealt with as independent problems or special cases. We will highlight the interdependence of these threats, and explain their effects on organisms using general ecological principles. We will also discuss biosecurity issues in the broad sense, including how to maintain the integrity of our ecosystems, maintain food supply, and protect human health.

Additional reading of recent books and scientific papers will be an essential adjunct to the lectures, and development of the ability to evaluate such readings is an important objective for the course. An understanding of basic ecological principles is assumed. If at any stage you feel that you do not understand the assumed basics, refer to the general reference materials listed below or seek help from the lecturer concerned as soon as possible.

Course Co-ordinator

Professor Matthew Turnbull, room 220 Biology, 364 2987, ext 7040,
email matthew.turnbull@canterbury.ac.nz

Lecturers

Professor Jason Tylianakis, room 330 Biology, ext 6735,
email jason.tylianakis@canterbury.ac.nz
Dr Daniel Stouffer, room 335 Biology, ext 7642,
email daniel.stouffer@canterbury.ac.nz

Goals of the Course

To introduce the methodology and principles of investigation into human impacts on ecological processes at the community and ecosystem level, to develop an understanding of the interdependent relationship between human well-being and ecosystem function, and to provide skills in field research and data analysis.

Intended Learning Outcomes and Associated Assessment

As a student in this course, I will develop the ability to:

- Apply concepts from community and ecosystem ecology to evaluate how the various drivers of global environmental change affect ecosystems and human wellbeing (*assessment task: final exam*).
- Evaluate the importance of direct vs. indirect pathways through which human activities drive community and ecosystem change at multiple scales (*assessment task: final exam*).
- Apply an understanding of scientific practice and of global change biology and ecology to the generation of new testable hypotheses (*assessment task: project report*).
- Synthesise primary scientific literature to generate a clear and concise argument in support of a perspective (*assessment tasks: project report & final exam*).
- Synthesise primary scientific literature to provide necessary background and context for understanding and interpreting experimental data (*assessment task: project report*).
- Reflect on how one's actions result in ecosystem change, and relate this to the social and economic trade-offs that underpin environmental decision making (*assessment task: final exam*).

Transferable Skills Register

As a student in this course, I will develop the following skills:

- Synthesising information. In everyday life and in many job situations you will be required to read information from different sources, construct your own understanding and shape your own viewpoint. *In lectures and tutorials we will discuss recent research papers in a group environment and this will develop your abilities to identify the essential elements of research outputs - you will then use in report writing.*
- Generating data. Important for research and in governmental and non-governmental organizations. *We will conduct research activities to provide both the real-world context for lectures and to develop hands-on skills in data generation and manipulation.*
- Analysing data. Important for research, as well as in a number of private-sector organizations. *This skill will be further developed when we assist you to analyse and present the data we generate in the research workshop.*
- Writing a report on findings. Clear written communication is essential for most professional careers. *We will provide instruction on the elements of successful reports and help you identify these elements with clear marking rubrics through peer and self-assessment.*

Feedback from Course Survey

Student ratings	2010	2011	2012	2013	2014
1. This was a well organized course	4.3	4.4	4.3	4.5	4.3
2. Course helped to stimulate my interest	4.2	4.2	4.4	4.3	4.3
3. Workload	3.3	3.5	4.1*	4.2	4.0
4. Difficulty (reasonable = 3.0)	3.2	3.4			
5. Opportunities for active learning			4.6	4.7	4.5
6. Helpful and timely feedback				4.3	4.3
7. Assessment measured learning effectively				4.4	3.9
7. Overall, this was a good quality course	4.1	4.3	4.5	4.5	4.3

*Question changed to “workload appropriate” in 2012.

Helpful features

1. Discussions within lectures (2). All the lecturers encouraged banter and debate in lecture and tutorial time. They encouraged reasoning with points of view
2. I really enjoyed the research campaign (2), and the session spent in the computer labs.
3. The mid-course test was a great idea! It took a bulk of the workload off and made us revise material throughout the semester, not all at the end. The quick marking of the online test was very timely and helpful. A good turn around time for results allowed good feedback on my progress.
4. Tutorials (developing critical thinking skills) allowed for interaction (3)
5. The peer-review feedback and response for the proposal was good (3) as it made my grade higher than not having it read by someone else.
6. I really enjoyed BIOL377 and it helped me understand the finer points to climate change and biosecurity which is a very important subject in today's society
7. Recording of lectures. Study for exams I have been able to jump back to lectures that didn't quite make sense
8. I really liked this course, all the lecturers were great and really helpful and very passionate about the subject area, and the content really interesting.
9. I found the tutorials were very helpful for developing critical analysis skills. It was also useful to have set face to face time with lecturers during the writing of the main report to ask questions and gain feedback on progress.
10. I found this course very useful in that it taught many practical skills which could be applied in future academic work. These kinds of skills (critically analysing papers, R, discussing and disputing the key points made etc.) are not often taught in other courses.
11. It expanded more on topics that have been only briefly covered before. This was interesting and having the space to discuss these topics was a definite bonus that had not been considered in other courses
12. The lectures were almost universally approached with a view to active participation from the students which was refreshing, also there was not an unrealistic requirement to do a large amount of reading or work before lectures to be able to participate
13. Provided a mixture of how to understand scientific practices, and how to construct a well planned report or proposal, which may help me in future employment or university assignments.

What to change? (Action/response indicated in bold)

In the research workshop, it would make more sense to give an overview of the three topics to be covered (GHG value, CLIMEX and r) and then introduce the examples to work through- this would help with finding a topic.

Thanks – we will think about the arrangement of the research workshop for 2015.

It was a shame that there was not more time between the field trip and the hand in for the write up. I understand this was because of the way the terms worked out this year and the desire to get the work handed back to us before we did the exam etc, however I believe that it was perhaps not as necessary as thought to have the marks and feedback returned to us.

In 2015 we are pushing back the final deadline for submission by three weeks, but also including a process of draft pre-submission and peer-feedback to help you improve your work.

All of the review methods were good but make sure the peer review is blind, I felt I was

biased by knowing who's paper I was reviewing.

The Learn “Workshop” system does not allow for this, as it is supposed to be a collegial team activity – there are benefits to blind review, but also just as many professional skills to be learned from reviewing colleagues work in an open and constructive way.

If you want the course to truly reflect global change drivers please add a lecture on human population dynamics, I have talked to people about the reasons you gave for excluding this topic and I continue to feel they are unjustified.

In this course we recognize the pivotal role that human population and activity has as a primary driver of global change, and of course social, cultural and economic drivers shift human behaviour. These indirect drivers do not directly affect species, but rather they drive changes in the environment that affect ecosystems. As this is a biology/ecology course with a limited number of lectures, we choose to focus on the impacts of these direct drivers of environmental change and their implications. However, the Millennium Ecosystem Assessment (the synthesis of which is provided as one of the core readings for this course) discusses human population growth and potential trajectories it may take.

Maybe some of that material could be condensed, or students could be asked to acquire the basics in their own time and we could cover more detailed aspects/studies in that study area? **This is a great idea, and we will use this to modify the mix of activities for 2015 – we will use a range of teaching styles, some of which will involve homework activities prior to class.**

Reading papers is something that I personally did not have time for! And if the tutorial discussions are not worth anything, they are not going to get me to do extra work that will take time away from my other courses!

The discussion sessions are for the benefit of student learning, and we will be continuing them. At 300 level, you do need to make time for extra reading. [Students should note that in the Science Faculty that the average student is responsible for 10-12 hours of study per credit point – this equates to approximately 4 hours of additional study for each hour of class contact at the 300-level.]

I almost feel the course was presented backwards. Maybe the broader view stuff (Daniels and Jason's) needs to go first and then get down to the detail of cycles later?

This is food for thought, and we will consider it – thanks! There are good reasons to follow either order.

Timetable

Lectures/tutorials

There will be a total of 24 lectures/tutorial topics in this course - two per week. There will be a mix of lectures, question times, and discussions on readings and homework. These have been included in the course to allow for in-depth group discussions on topics/papers of interest, and to enable you to be more effective in the course and in the future.

Our teaching philosophy is that students need to be actively engaged in learning – it is important that you do more than simply turn up to class and receive instruction from us. You will be given clear instructions on what preparation is expected before each class – please come to class prepared to make best use of the time. [Students should note that in the Science Faculty that the average student is responsible for 10-12 hours of study per credit

point – this equates to approximately 4 hours of additional study for each hour of class contact at the 300-level].

Research Workshop

The COMPULSORY 2-day field/lab exercise will be on **14-15 April** (see below).

During our hands-on research activity this year we will focus on key topics global change science:

1. How do we predict the likely success of potential invaders into new habitats? We will learn and use the software package CLIMEX to understand how predictions can be made of possible invasive success based on the environment of origin of the invader.

2. How can species-species interactions influence population and community dynamics? We will extend a simple multi-species model to understand (i) how the addition/removal of a species can influence other species in a community and (ii) the degree to which external disturbance can change community dynamics.

There will be a formal independent project report assessed from this workshop.

[We will also run an optional ‘help clinic’ in week 8 to assist you with project analysis and write-up].

Assessment

Mid-course test – 1 hr (Turnbull lectures)	20%
Wednesday 1 April, 7pm (on-line access through Learn)	
Peer-feedback on a class-mates project	5%
Draft Project due in Friday 15 May, 5pm (to Learn)	
Peer-review due by Fri 22 May, 5pm (on Learn)	
Project write-up (and self assessment against marking rubric)	30%
Final version due in Friday 29 May, 5pm (in hard-copy and to Learn)	
Final exam - 2 hrs (Stouffer/Tylianakis lectures)	45%
In exam period (TBA)	

Note that the course will be subject to the Biology policy on late submission of work (see below).

What is expected in assessments?

The expectations for assessment items relate to the learning outcomes above. A marking schedule will be given in advance for the proposal and field trip assignments, however, a general marking rubric is as follows:

A to A+ : Evidence that the student has developed an individual conception of the subject from wide reading and reflection. This individual understanding will likely be applied to a novel situation.

B+ to A- : Evidence of strategic reading from a few sources, and the ability to present lecture content in the student’s own words.

C to B: Reproduction of lecture content following the structure used by the lecturer.

D to C- : Reproduction of some lecture content without clear structure.

E : Confusion of content or no meaningful content presented beyond knowledge that would be expected at the start of the course.

Textbooks

There is no required text. During the course you will be directed to various books and to primary scientific papers. This allows us to include in this course the most current scientific knowledge available, and to provide greater breadth than would be found in a single textbook. **To do well in final exam you must show evidence that you have read and understood this material.**

Some of the examples used will come from the Millennium Ecosystem Assessment (MEA) (2005) *Ecosystems and Human Wellbeing: Synthesis*. Island Press, Washington D.C. This synthesis can be downloaded free at:

<http://www.millenniumassessment.org/documents/document.356.aspx.pdf> or ordered from the publishers (Island Press). We have also placed a copy on 3hr loan in the library.

The related Biodiversity synthesis may also be useful

<http://www.millenniumassessment.org/documents/document.354.aspx.pdf>

In addition, some general library books may be useful as background for different parts of the course:

Begon, M., Townsend, C.R. & Harper, J.L. (2006 Edition 4). *Ecology: Individuals, Populations and Communities*. Blackwell Scientific Publications, Oxford. **[Recommended reading for this course]**

Sax, D.F., Stachowicz, J.J. & Gaines, S.D. (2005) *Species Invasions: Insights into Ecology, Evolution, and Biogeography*. Sinauer, Massachusetts, USA.

Chapin, F.S., Matson, P.A. & Mooney, H.A. (2011) *Principles of Terrestrial Ecosystem Ecology* (2002). Springer, New York. Second edition available as e-book through library.

Class material on Learn & use of Turnitin

Resources used or referred to in lectures will be available on-line on the course link in Learn.

Please also note that we will be requesting that you submit written work in both hard copy (for grading) and in electronic form (for assessment of originality using “Turnitin”). Instructions will be given on how you do this via Learn.

Prerequisites

{BIOL 270 or FORE 202} and {BIOL 209 or FORE 222/FORE 224}

Teachers & Topics:

Week Topic Number

Matthew Turnbull: *Ecosystem processes & global change*

- 1 1. Introduction - what is Global Change? (discussion in class based on **preparatory podcast**)
2. The environmentalist's paradox (discussion based on **preparatory reading**)
- 2 3. Ecosystem function at a range of scales
4. Carbon sequestration in terrestrial ecosystems – human impacts
- 3 5. Vegetation and climate systems (discussion based on **preparatory podcast**)
6. Vegetation and climate regulation services (lecture based on **preparatory reading**)
- 4 7. Greenhouse gas issues in NZ (discussion with David Whitehead, Landcare [+ **prep podcast**])
8. Human impacts on nutrient cycling (lecture based on **preparatory podcast**)
- 5 9. Global change impacts on organisms – case studies

Daniel Stouffer: *Community ecology in the face of global change*

10. Understanding the complexity of community dynamics
- 6 11. The relative determinants of community structure

Mid-course test Wed April 1, 7-8pm (on-line access through Learn)

- 7 12. The links between history, ecology, and evolution in communities
13. Thresholds and regime shifts in ecological communities
- 8 14. Fragmentation effects on metapopulations and metacommunities
15. Food-web stability and persistence

Jason Tylianakis: *Invasions as agents of global change*

- 9 17. What makes an ecosystem easy to invade?
18. Pre-border preparation: can we predict impacts of invasive species on entire communities?

Draft project report for peer-review due in Friday 15 May, 5pm (to Learn)

- 10 19. How do we protect species against multiple drivers of decline?
20. How do interactions among species respond to global change?

Peer-review of class-mate's report completed by Fri 22 May, 5pm (on Learn)

Jason Tylianakis: *Ecosystem-wide impacts of global change*

- 11 21. Ecosystem goods and services: what is the value of nature?
22. Maintaining functioning ecosystems: how much biodiversity do we really need?

Final version of report due Fri 29 May, 5pm (in hardcopy to SBS drop-box and to Learn)

- 12 23. What are the direct and indirect impacts of global change on ecosystem functioning?
24. Global change and the future of human wellbeing: can we avoid the need for biodiversity?

RULES, REGULATIONS, AND WHAT TO DO WHEN THINGS GO WRONG

If in doubt: ASK! The course co-ordinator is happy to field questions at any time. All staff involved in the course are generally available for advice on specific issues.

What do I do if I'm sick?

If you feel that illness, injury, bereavement or other critical circumstances have prevented you from completing an item of assessment worth 10% or more of total course assessment or have affected your performance in a test or exam, you should visit a doctor within 24 hours and submit the application form within 7 days. The application form is available on-line or from the Student Health Centre. You should also notify the course co-ordinator. For further details on aegrotat applications, please refer to the University's website - <http://www.canterbury.ac.nz/exams/aegrotats.shtml>). **The aegrotat provisions are intended to assist students who have covered the work of a course but have been prevented by illness or other critical circumstances from demonstrating their mastery of the material or skills at the time of assessment – they do not excuse you from doing the assessment.** If the examiner cannot assess your aegrotat application because of lack of other evidence, you may be asked to sit a special assessment if you miss a final exam. You should also expect to be required to submit additional work if you miss a major assignment (e.g. a field trip for which a major write-up is required). **Please note: acceptance of the grounds for an aegrotat application does not simply excuse you from completing items of assessment if you are requested to do so. You will be given reasonable time to complete any such work.**

What do I do if I have to miss something?

In rare cases you may not be able to sit a test or exam, or attend a field trip, because of involvement in international or national representative sport or cultural groups. In such cases see the course co-ordinator, and a course of action (usually the sitting of an equivalent test or exam at a different time, or submitting an equivalent piece of written assessment) will be arranged. This should be done well in advance of the set date for a missed exam/test/assignment. **Please note – holiday trips, weddings, birthday parties etc. are not given special status in the University policy, so please do not ask for special consideration in these circumstances.**

Plagiarism

It is essential that you are aware that plagiarism is considered a very serious offence by the Academic community, the University and the School of Biological Sciences. Plagiarism is defined as taking content from another work or author and presenting it, without attribution, as if it is your own work. Content here includes text (sentences or major parts of sentences), display items (graphs and tables), and overall structure (the detailed sequence of ideas). Plagiarism includes:

- re-use of previous assignments (even if each individual sentence has been rephrased to say the same thing in different words, if the overall structure is re-used)
- copying of another student's work (with or without their consent)
- the unreferenced use of published material or material from the internet e.g. cutting and pasting of paragraphs or pages into an essay.

For most pieces of in-term assessment you will be given information concerning the use of direct and indirect quotes from previously published work. If you are in any doubt about appropriate use of published material, please speak with a member of academic staff. If you are still unsure what plagiarism is, then seek advice.

It is a School policy that courses may request you submit work electronically for subsequent analysis of originality using *Turnitin*. Students agree that by taking courses in BIOL, assessments may be submitted to Turnitin.com for textual similarity review. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Terms and Conditions of Use posted on the Turnitin.com site.

Where do I hand in assignments and then collect them once marked?

All assignments should be placed in the designated collection box in the foyer of the 2nd floor of the School of Biological Sciences (near the main office), unless directed otherwise by the course co-ordinator. All assignments must be accompanied by a cover sheet signed by you stating that the submitted work is not plagiarised. Cover sheets are available on top of the collection boxes, or you can download one from the Biology website (under Undergraduate). In addition, you may also be asked to submit your work electronically (via Learn) for analysis in *Turnitin*. You will be given instructions on how to do this in the assignment handout.

Marked assignments can be collected from the Secretaries' Office during office hours, unless directed otherwise by the course co-ordinator. Teaching staff will endeavour to return work as soon as possible, and should contact you if there are likely to be any delays that will prevent return within the maximum 4-week timeframe.

What if I can't get it finished in time?

Reports and assignments should be handed in on time. Extensions may be granted if you have a valid reason. **If you require an extension, you should request one from the course co-ordinator** (or the lecturer responsible for marking the work), with as much notice as possible. Please do this BEFORE the deadline for the assignment. **If you have been given an extension you should hand the work DIRECTLY to the course coordinator** (do not put it in the drop box as it may not be cleared after the due date).

If an extension has not been granted:

- work must be handed in by the due date to gain full credit
- work handed in up to 7 days after the deadline will be marked, but the marks will be discounted 25% before they are recorded to the student's credit
- any work handed in more than 7 days after the deadline date will not be marked or earn credit.

What if I have written more than the word or page limit?

If there is a word limit on an assignment, it is usually there to stop you doing too much work and to encourage you to write succinctly. It also makes things easier to assess. You can be up to 10% over without too much worry, but if the length increases beyond that your mark may suffer due to failure to follow the requirements. If you find yourself way over the word limit talk to the lecturer concerned about how to get your assignment to an acceptable length.

What if I fail part of the course?

In BIOL, we require a satisfactory level of achievement in both the theoretical aspects of the discipline and in practical activities. This means you must attend all class activities and submit all items of assessment unless you have a very good reason not to (e.g. medical reasons). **A student must attain an average score of at least 40% for in-course assessments (e.g. assignments, reports) and an average score of at least 40% in the exam and/or test, AND score at least 50% overall for the course, to be awarded a passing grade. See course outline for clarification of the assessment items included in each category and ask the coordinator if you are still unsure.**

What's the best way to give feedback?

We welcome constructive feedback at all times – help us to make this a valuable course for you. We endeavour to remain approachable at all times. If you would rather give feedback anonymously, please use the on-line course survey or talk to lab demonstrators, or your class rep (who will all report back to the staff-student liaison committee that includes a representative from each of the undergraduate classes). Class representatives will be selected from each class at the start of course.

What's the best way to complain?

If you feel you have not been fairly treated during this course, please raise the issue with the lecturer or course co-ordinator in the first instance. Other avenues include your class rep., who can raise issues anonymously, or the UCSA education coordinator.

SBS Grading

A+	90% or above
A	85 – 90
A-	80 – 84
B+	75 – 79
B	70 – 74
B-	65 – 69
C+	60 – 64
C	55 – 59
C-	50 – 54

A restricted pass (R) **may** be awarded to those who are close to a pass (i.e. an overall score of 48-49.9%) AND who have achieved at least a 40% overall score in both in-course assessment and tests/exams. If an R grade is awarded you gain credit for the course but **cannot continue into papers that require this course as a pre-requisite**. NB. The R grade is only available at 100 and 200 level - it cannot be awarded for third year papers.

Failing grades: D 40-49 E 0-39