



UNSW
THE UNIVERSITY OF NEW SOUTH WALES

FACULTY OF SCIENCE

School of Biological, Earth and Environmental Sciences



BIOS 3161

Life in Arid Lands

Course Manual
Session 1, 2020

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2. Information about the Course

Year of Delivery	2020			
Course Code	BIOS 3161			
Course Name	Life in Arid Lands			
Academic Unit	School of Biological, Earth and Environmental Sciences			
Level of Course	3 rd Year			
Units of Credit	6			
Session(s) Offered	Session 1			
Assumed Knowledge, Prerequisites or Co-requisites	Prerequisites: 1 of 3: Vertebrate Zoology (BIOS2061); Invertebrate Zoology (BIOS2031); Flowering Plants (BIOS2051)			
Hours per Week	4 contact hours			
Number of Weeks	10 weeks including field trip			
Commencement Date	17 Feb 2020			
Summary of Course Structure (for details see 'Course Schedule')				
Component	Hours	Time	Day	Location
Tutorial 1 (Weeks 1-4)	2	10a-12p	T	BioSci D26 G07
Tutorial 2 (Weeks 1-2)	2	10a-12p	Th	BioSci D26 G07
Field Trip (Week 5)	40	All day	18-24 th March	Fowlers Gap Arid Zone Research Station
Optional Stats Workshop (Week 7)	2	10a-12p	Th	Biosci South E26 TchLab 5
Workshop: Final Presentations (Week 9)	3	10a-12p	Th	BioSci D26 G07
TOTAL				
Special Details	<ul style="list-style-type: none"> A compulsory field trip is run in Week 5 of Term 1. Estimated cost of field trip, inclusive of travel between Sydney and Broken Hill by train and coach, travel from Broken Hill by hired bus, accommodation and catering from Lunch 19 March to Dinner 23 March is \$330-370 payable in advance. Costs of accommodation in Broken Hill for the night of 20 March and other meals not included. A workshop for final presentations will be held in Week 9. 			

University policy requires students to attend at least 80% of lectures and labs in order to qualify for course credit. Regular attendance of lectures and labs is essential for success in this course. Attendance will be taken.

Students should check *Moodle* regularly for content, instructions and announcements. Grades will be posted on Moodle.

3. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenors		A/Prof. Lisa Schwanz	l.schwanz@unsw.edu.au	By appointment
Additional Teaching Staff	Lecturers & Demonstrators	A/Prof. Will Cornwell Dr. Keith Leggett Claudia Crowther Dr. David Eldridge Dr. Michael Letnic	w.cornwell@unsw.edu.au k.leggett@unsw.edu.au claudia.crowther@unsw.edu.au d.eldridge@unsw.edu.au m.letnic@unsw.edu.au	By appointment
	Technical Staff	Guy Taseski Frank Hemmings	g.taseski@unsw.edu.au	By appointment

Field Trip Staff



A/Prof Lisa Schwanz (Course Convener)

My research focuses on the evolutionary and behavioural ecology of terrestrial vertebrates. I'm particularly interested in how animals respond to change in their environments. How do they cope behaviourally and physiologically with environmental stressors, and what does it mean for their reproduction and survival? My recent research has focused on how egg temperature impacts sexual development (male or female) and other phenotypes in reptiles. If you see a bearded dragon, catch it for me because it may be sex reversed as a result of climatic warming.



A/Prof Will Cornwell

I am interested in plants, fungi and climate change, and especially problems where big datasets can tell help us figure out what's happening with organisms across the globe. You can see my website here: willcornwell.org or my Instagram https://www.instagram.com/willcornwell_nature/ or my inaturalist <https://www.inaturalist.org/observations/wcornwell>



Claudia Crowther

I am a PhD candidate supervised by Lisa Schwanz in the Evolution and Ecology Research Centre. My research looks at how maternal behaviour and physiology can affect how offspring adapt to rapidly changing environments. I have been working with a captive colony of Jackie Dragons and a long term dataset of nesting behaviour in Painted Turtles to investigate how maternal effects can shift sex ratios in species with temperature dependent sex determination. I find arid zone ecology fascinating and I'm excited to be helping with the small mammal trapping course at Fowler's Gap this year.



Frank Hemmings

I have had an interest in natural history since childhood. I started birding seriously as a teenager and wrote natural history articles for the school newspaper. After completing a Bachelor of Science in Horticulture at UTS in 1994, I started working as a technician supporting undergraduate classes at Macquarie University and later at UNSW in 1998. My botanical expertise led me to take over as Curator of the John T. Waterhouse Herbarium in 2001. During my time as Curator, I have identified thousands of plant specimens. I have also led vegetation and bird surveys in the field for a number of courses, and has also spent time working on frog and small mammal surveys.



Dr. Keith Leggett (Director of Fowlers Gap Research Station)

In 2009, after 20 years in Africa, I became the Director of Fowlers Gap Arid Zone Research Station. Throughout most of my research career I have studied large mammals, my current field of study looks at the seasonal and annual fluctuations in small mammal populations in response to climatic conditions. It appears that arid conditions tend to favour the insectivores with Dasiurids dominating the captures; while above average rainfall appears to favour herbivores and granivores.



Guy Taseski

I am a technical officer in the School of BEES. I have always had a keen interest in the natural world and have always enjoyed collecting objects to examine since childhood. I did my undergraduate degree at UNSW (2016), and it is here where I began to appreciate the plant kingdom in all its variety and form. After my degree, I worked for the National Herbarium of New South Wales, where I looked after the herbarium collection, performed curatorial duties, and collected numerous botanical specimens from across New South Wales. While originally starting out in ecology, I have shifted my focus towards taxonomy and have a keen interest in Australian Lamiaceae (particularly the genus *Prostanthera*), and the distribution of weeds (particularly feral opuntoid cacti).

4. Course Details

Course Description ¹	<p>Forty-four percent of Australia is desert and a further 37% is semi-arid grassland or shrub communities. These arid lands contribute much to our unique biodiversity. This course offers advanced training in conducting independent research, in the context of Arid Zones. We examine the formation of global arid lands, the evolutionary history of the flora and fauna, adaptations of plants and animals to arid environments, the major arid lands ecosystems and conservation of biodiversity. A field trip to western NSW is an essential part of the course and students will incur expenses.</p>	
Course Aims ²	<p>Life in Arid Lands recognises that the majority of Australia's land surface is desert or semi-arid tussock grassland and shrub communities, and about a third of Earth's landscapes are deserts. It capitalises on expertise in animal and plant biology to provide students with a unique opportunity to learn about life in the arid lands and receive practical research training in the Broken Hill region of western NSW. The course combines a fundamental understanding of the adaptations of flora and fauna to life in the desert with an advanced practical training in scientific research. The course aims to:</p> <ol style="list-style-type: none"> 1) Expand conceptual knowledge of organismal ecology and evolution in Arid habitats; 2) Provide skills and knowledge in ecological research, including posing research questions, designing experiments and collecting and analysing data; 3) Provide understanding of issues in research design and sampling; 4) Develop skills in data interpretation & communication in presentations and reports. 	
Student Learning Outcomes ³	<p>By the end of this course, you will have an understanding of the biology of the major arid lands in the world with a particular focus on Australia. You will get hands-on experience in the field in the arid rangelands of western NSW. There are five, broad learning outcomes expected from this course:</p> <ul style="list-style-type: none"> • Describe ecosystem functioning and organismal ecology and evolution in arid lands • Apply common methodologies for sampling plant and animal taxa • Design, implement and communicate research projects, including planning the sampling regime, data collection methods, and graphical presentation of results • Critique scientific ideas through academic discussion • Make observations from and interpret graphically-presented data 	
Graduate Attributes Developed in this Course ⁴		
Science Graduate Attributes ⁵	<p>0 = NO FOCUS 1 = MINIMAL 2 = MINOR 3 = MAJOR</p>	Activities / Assessment
Research, inquiry and analytical thinking abilities	3	<ul style="list-style-type: none"> • Research proposal • Data sheets • Paper discussions • Report Figures & Critique • Research Report
Capability and motivation for intellectual development	3	<ul style="list-style-type: none"> • Research proposal • Paper discussions • Report Figures & Critique • Research Report
Ethical, social and professional understanding	2	<ul style="list-style-type: none"> • Research proposal • Research Report
Communication	3	<ul style="list-style-type: none"> • Research proposal • Paper discussions • Report Figures & Critique • Research Report
Teamwork, collaborative and management skills	3	<ul style="list-style-type: none"> • Research proposal • Data sheets • Paper discussions • Research Report
Information literacy	3	<ul style="list-style-type: none"> • Research proposal • Paper discussions • Report Figures & Critique • Research Report

¹ UNSW Virtual Handbook: <http://www.handbook.unsw.edu.au>

² Learning and Teaching Unit: <http://www.ltu.unsw.edu.au>

³ Learning and Teaching Unit – Learning Outcomes: http://www.ltu.unsw.edu.au/content/course_prog_support/outcomes.cfm?ss=0

⁴ Access the contextualised Science Graduate Attributes and your mapped courses:

<http://www2.science.unsw.edu.au/guide/slatig/sciga.html>

(Mapped courses are available at this site)

Major Topics (Syllabus Outline)	<ul style="list-style-type: none"> • Global deserts in perspective • Structure and function of arid landscapes • Thermal ecology • Physiological adaptation • Community ecology and coevolution • Dealing with temporal and spatial variation
Relationship to Other Courses within the Program	<p>This course is intended to be taken by 3rd year students pursuing a major in biology (or other 3rd year students with an interest and adequate background in biology) and interested in learning skills associated with independent research and field work. It is assumed that students will have completed one of the taxonomic diversity courses (BIOS2061-Vertebrate Zoology; BIOS2031-Invertebrate Zoology; BIOS2051-Flowering Plants) prior to enrolling in BIOS3161 (Life in Arid Lands).</p>

5. Rationale for the inclusion of content and teaching approach

Rationale for learning and teaching in this course⁵,	<p>The course uses a variety of teaching methods to enable learning about arid land biology: formal lectures, blended activities on Moodle, student-led discussions, a field trip with structured activities, an independent research project, student reflection, peer-based critique and a written report. Thus, many of the teaching approaches are hands-on and involve student-based inquiry. Students are actively engaged in the learning process and challenged with interesting material linked to biology in arid lands. Students take responsibility for their learning through participation in online and in-class discussions, library research, and through design of their independent projects in the field. Cooperative learning is encouraged through discussions, group projects on the field trip, and peer-based critique.</p> <p>As a science graduate, students should be able to understand scientific information presented in a professional and lay-person format. The assessment tasks in this course are therefore designed to develop skills associated with building and interpreting graphs, critiquing professional science, and communicating independent research in written and verbal format.</p>
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6. Teaching Strategies

Teaching Strategies	<p>The lecturers provide students with basic concepts and key information from contemporary research in arid zones. Lecture topics are associated with student-led paper discussions to promote the development of critical thinking abilities.</p> <p>A mandatory field trip to Fowlers Gap Arid Zone research Station provides students with hands-on training in field research skills, as well as developing critical thinking and practical research skills through developing and implementing an independent group research project (3-4 students). Collaboration is essential for efficient experimental design, data collection and analysis. The projects are assessed in project proposals, and as a group presentation.</p> <p>The assessments are designed to support the major aims of the course, in particular focusing on skills associated with 1) graph creation and interpretation and 2) planning a research project. The writing, speaking, discussion, and peer-critiquing components provide opportunities to develop scientific communication skills.</p> <p>Assessments employ both written and verbal tasks to provide participation and learning opportunities for diverse learners.</p>
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⁵ LTU – Teaching Philosophy: http://www.ltu.unsw.edu.au/content/teaching_support/teaching_portfolio.cfm?ss=0#putting

7. Assessment Tasks

Instructions and assessment criteria for assignments are included in this book.

	Task	% of Total Mark	Due Date	How to Submit
Literature discussion	1. Leading Discussion Paper (group)	10	See roster on Moodle	In class
	2. Discussion Paper Questions, 3 (independent)	10 (2 papers × 5%)	11pm on the day prior to discussion: 24 February 26 February 2 March 9 March	Moodle
Research project	3. Project proposal (group)	15	4pm, 6 March	Moodle
	4. Data sheet & materials list (group)	5	4pm, 6 March	Moodle
	5. Draft figures (independent)	5	4pm, 3 April	Moodle
	6. Comment/vote on 3 groups' draft figures (independent)	5	4pm, 10 April	Moodle
Field trip reflection	9. Field Trip Reflection (independent)	5	4pm, 27 March	Moodle
Field trip report	7. Project presentation (group)	10	16 April	In class
	8. Project Report (independent)	35	4pm, 24 April	Moodle

Late submission will result in a penalty of 10% per day.

8. UNSW Academic Honesty and Plagiarism Policy

PLEASE READ CAREFULLY

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.

*Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via: www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

BEES Academic Honesty and Plagiarism Policy

In addition to the UNSW Policy on Academic Honesty and Plagiarism, the School of Biological, Earth and Environmental Sciences (BEES) also considers any work submitted that has been produced outside of a given course in a given year to be plagiarism i.e:

- Work produced for a third party e.g. your place of employment, is considered intellectual property of the third party, and, as such, if such work is submitted in place of a required course work, it is deemed plagiarism.
- All work submitted for assessment must be created specifically for the given assessment task in the given year. Work produced in previous years or for other assessments is not acceptable.

9. Course Schedule (Please check Moodle regularly for content and instructions)

Week	Date(s)	Tutorial 1 Tuesday, 10am-12pm, BioSci D26 G07	Tutorial 2 Thursday, 10am-12pm, BioSci D26 G07	Research Project Timeline	Assessment Tasks **See Section 13 for more details
Week 1	17 Feb	Arid Lands background and project workshopping	Project workshopping & crystalization	Intro to Fowlers Gap, project workshopping and brainstorming	
Week 2	24 Feb	Thermal biology/Physiology Papers Physio Project refinement	Ecosystem ecology (Eldridge) Papers Ecosystem Project refinement	Choose & refine projects; How to make a datasheet	Questions, Paper <i>Physio</i> (24 Feb) Questions, Paper <i>Ecosystem</i> (26 Feb) Discussion Leading, Group <i>Physio</i> (25 Feb) Discussion Leading, Group <i>Ecosystem</i> (27 Feb)
Week 3	2 Mar	Community ecology (Letnic) Papers Community Project refinement	No class Appts by request to discuss Proposal and Datasheet	How to make good figures and datasheets	Questions, Paper <i>Community</i> (2 Mar) Discussion Leading, Group <i>Community</i> (3 Mar) Research Proposal Due Fr, 6 March, 4pm
Week 4	9 Mar	Temporal and spatial variation Papers Variation Proposal and Datasheet Feedback	No class	Animal Ethics & Discuss datasheets	Questions, Paper <i>Variation</i> (9 Mar) Discussion Leading, Group <i>Variation</i> (10 Mar)
Week 5	16 Mar	FIELD TRIP – Fowlers Gap **See details below			
Week 6	23 Mar	No class	No class		Reflection Due Fr, 27 March, 4pm
Week 7	30 Mar	No class	Optional Stats Workshop – Biosci South E26 TchLab 5		Draft Figures Due Fr, 3 April, 4pm
Week 8	6 Apr	No class	No class		Figure Vote Due Fr, 10 April, 4pm
Week 9	13 Apr	No class	Group project presentations		Presentation
Week 10	20 Apr	No class	No class		Final Research Report Due Fr, 24 April, 4pm

10. Additional Resources and Support

Text Books	Recommended texts (bookshop and UNSW library): Ward, D. (2008). <i>The Biology of Deserts</i> . (Oxford University Press, London) Whitford, W.G. (2002). <i>Ecology of Desert Systems</i> . (Academic Press, New York)
Course Manual	Available in print and as a pdf file on Moodle
Required and Supplementary Readings	Discussion papers will be announced and available on Moodle
Recommended Internet Sites	Links available on Moodle

11. Course Evaluation and Development

Student feedback is gathered periodically by various means. Such feedback is considered carefully with a view to acting on it constructively wherever possible. This course outline conveys how feedback has helped to shape and develop this course.

Mechanisms of Review	Last Review Date	Comments or Changes Resulting from Reviews
Major Course Review	2018	Major revision of the course was completed in 2016 in association with a change of Course Convener. Revision in 2018 to reconfigure for 10-week course. Based on feedback provided in 2018, additional opportunity for project workshoping was added.
MyExperience	2018	Student comments on MyExperience evaluations will contribute to course revisions, along with other comments provided verbally and in writing throughout the course.
More/Less/Start	2016	During the field trip, students can submit anonymous requests for 'more' or 'less' of any content, as well as request a 'start' of content not available. This will occur on Day 2 of the field trip.
Other	2018	Student feedback, provided via email or verbally, is always encouraged. Please feel free to provide suggestions on how course content, structure and teaching might be improved. The following questions are intended as a guide: (1) What topics did you find most interesting? (2) What exercises did you find most enjoyable? (3) What additional topics would you have liked to see covered? (4) What aspects of the course did you find most challenging? (5) What aspects of teaching did you find most effective? (6) What aspects of teaching did you find least effective? (7) Do you have any suggestions on how the course could be improved?

12. FIELD TRIP – FOWLERS GAP ARID ZONE RESEARCH STATION

*** This field trip is a MANDATORY component of the course. Failure to attend will result in course failure.

12.1 Background

The purpose of the field trip to Fowlers Gap Research Station is to give you first-hand experience in arid land ecology. The field station is in northwest New South Wales. The Station is operated by UNSW for research, and also serves as a working sheep station. On the field trip, you will participate in four structured tutorials to learn important ecological concepts and common research methods for working in the field with plants and animals. You will also perform independent group research projects planned in advance to gain experience conducting field research in arid lands and to increase your scientific skill.

12.2 Overview

WHERE: Fowlers Gap Research Station, near Broken Hill, western NSW

WHEN: 18-24 March 2020

GETTING THERE: NSW Trainlink <http://www.nswtrainlink.info/home>

	Day / Date	From	To	Depart	Arrive	Service
To Fowlers Gap	Wed 18 March 2020	Sydney Central*	Dubbo	6:18am	1:02pm	Train CLK427
	Wed 18 March 2020	Dubbo	Broken Hill Town**	2:15pm	10:45pm	Coach CLK589
	Thu 19 March 2020	Broken Hill Railway Station	FG	8:00am	9:30-10:00	Buslink Private Coach
From Fowlers Gap	Tue 24 March 2020	FG	Broken Hill Railway Station	5:00am	6:30-7:00	Buslink Private Coach
	Tue 24 March 2020	Broken Hill Station	Sydney Central *	7:45am	9:38pm	Train CLK446

*alert Course Convener of alternate boarding/return station (Central, Strathfield, Parramatta, Blacktown, Penrith and Katoomba)

****LODGING 20 MARCH IN BROKEN HILL:** costs and logistics are the responsibility of each student

12.3 Field Trip Schedule: catering provided from Lunch 19th March to Dinner 23rd March

Day	Dates	Morning (7-10am)	Lunch	Rest of day
1	19 March	Arrival; Orientation		Set up traps (1pm-4pm); Group Research Projects
2-5	20-23 March	Field Tutorials 1-4 in rotation Field tutorial 1: Pitfall trapping reptiles in eastern property Field tutorial 2: Bird observations on the dam Field tutorial 3: Homestead plant ecology Field tutorial 4: Pitfall and cage trapping mammals in Emu Pen	Guest research presentations	Group Research Projects (ending by 3pm on day 5)
6	24 March	Departure		

12.4 Required Equipment and Training

<p>Equipment Required</p>	<p>Research equipment and materials: groups are responsible for communicating required equipment and materials to the technical officer.</p> <p>Personal equipment:</p> <ol style="list-style-type: none"> 1. Strong closed-toe walking boots 2. Long pants and long-sleeved shirts to protect skin from sun and abrasions 3. Clothing suitable for outdoor wear in cold and warm weather 4. Broad-brimmed hat 5. Rain coat 6. Sunblock 7. Insect repellent 8. Water bottle <p>9. Gardening gloves</p> <p>10. (Head) torch</p> <ol style="list-style-type: none"> 11. Swimmers (optional) 12. Field notebook <p>13. Datasheets, pencils, clipboard</p> <ol style="list-style-type: none"> 14. Personal medication and toiletries 15. Laptop for data entry (optional) 16. Binoculars and camera (optional) <p>*** Linens, pillows and a towel will be provided, and are perfectly suitable. Students may choose to bring their own, if they prefer.</p>
<p>Enabling Skills, Training Required to Complete this Course</p>	<p>Understanding of Health&Safety requirements in field environment. Please see Moodle for links to necessary H&S documents.</p> <p>Group research with vertebrates will involve participating in a 20-min research ethics lecture.</p>

12.5 Research Station Amenities

Phone: limited phone access to call out. Please give the station number and website (below) to your family, 08 8091-2511. You will be in the Dorm or the Shearer's Quarters. If your family cannot get ahold of you via these extensions, they can choose the extension for the Director, Keith Leggett.

Accommodation: 2-4 people per room; Beds and bunks with linen, pillows and towels provided; flush toilets and showers (LIMITED WATER!!!); electricity and air conditioning; drinking water; eating utensils

Other resources: limited computer access; no internet access; limited mobile phone reception (only if on Telstra); laboratory facilities

<http://www.fowlersgap.unsw.edu.au/>

12.6 Group Research Projects

*** see assessment details in Section 13

With the aim of enhancing independent scientific abilities and learning about arid ecosystems in more depth, students will work in groups of 3-4 to conduct independent research during the field trip. Projects will be chosen in advance and will require substantial planning. This includes writing a research proposal, preparing a materials list and creating datasheets on which to collect data.

You may work on any aspect of life in arid lands (soils, birds, plants, insects, etc). It is best if you come up with a research idea that inspires you! Teaching staff are available to help you choose an interesting and feasible project. Having said that, if you want to conduct a project that involves handling or scaring vertebrates, you have to choose a project within the ethical and state permits that we already have.

Here are some suggestions:

1. Thermal preference in skinks.
2. Shelter preference of geckos.
3. Lizard or bird surveys at the homestead across habitats and time of day.
4. Thermal ecology of geckos.
5. Ideal Free Distribution of Kangaroos
6. Kangaroo or bird flight initiation distance
7. Kangaroo thermoregulation
8. Kangaroo vigilance and activity budgets
9. Home range in large mammals (cats, foxes)
10. Predator activity
11. Comparative seed predation by diurnal seed eaters (ants and birds)
12. Ant foraging behaviour
13. Spider fighting behaviour
14. Island biogeography of tree/shrub outcrops.
15. Facilitation, microhabitats, or leaf litter as a function of distance from tree/shrub stands.
16. Plant physical parameters as a function of microhabitat or community characteristics
17. Plant species composition / percent cover along water courses.
18. Plant allocation to defence, reproduction, photosynthesis, support, etc in response to competition or water.

13. ASSESSMENT TASK DETAILS

Feedback will be given in the form of marks & comments within 2 weeks after submission for each assessment, with the exception of the project proposal and datasheets, which will be returned within 1 week in preparation for the field trip. Marking rubrics will also be returned to students with their marks for the project proposal and final report

13.1 Leading Paper Discussion (group)

During class time in Weeks 2-4, we will discuss as a class two scientific papers from the primary literature (15 mins each). The papers will be available on Moodle. For each paper, an assigned group of students will provide 2-3 slides oriented towards stimulating class discussion of the paper. Each student will be involved in leading discussion for one paper during the term. The grading for this is focused on 1) facilitation of class discussion – THIS IS NOT a paper presentation; 2) clear understanding of the concepts and findings of the paper; 3) description of one data figure from the paper.

Slides – 1-3 slides on Motivation, Results and Implications. Have a clear description of at least one graphical result from the paper. You will be graded down if you have too many slides. The slides should be designed to facilitate discussion. This is NOT a presentation, it is a discussion.

Leading discussion – VERY FEW STUDENTS will have read the paper. Engender class participation in discussion with broad concept questions (e.g. When you think of [TOPIC X], what images/ideas come to mind? How do the results inform the impact of climatic warming?). Consider having a 3-minute small group discussion on a question prior to class discussion. Your score will depend strongly on your ability to encourage class discussion.

Learning Objectives:

- Enhance critical thinking
- Practice presentation skills
- Practice graph explanation
- Increase leadership skills

13.2 Questions for Paper Discussion (independent)

Eight (8) total papers will be discussed in class, you are encouraged to look at all of them. For two of these papers, you must read the paper and provide short answers to questions on Moodle – due the night before the paper is discussed. The papers will be available on Moodle, along with 3-4 short-answer questions designed to encourage critical thinking. Scores will be based on accuracy, as well as depth and breadth of understanding of the paper and its implications.

You can choose the 2 papers you answer questions for, with the following rules (designed to make sure you have a breadth of topic exposure):

1. The two papers have to be from two separate class days
2. You cannot answer the questions for the paper you lead discussion on
3. You cannot answer questions for the OTHER paper discussed on the same day as your discussion

As an example, Jennifer Lopez is assigned to lead discussion on Paper *Community A*, and she chooses to answer questions for Paper *Physio B* and Paper *Variation A* because they look the most interesting to her.

Learning Objectives:

- Enhance critical thinking
- Increase comprehension of professional scientific literature
- Improve graph interpretation skills

13.3 Group Research Project Proposal (group)

Each group will prepare a scientific proposal for their research project to be completed at Fowlers Gap. This proposal will help students learn the conceptual background to their project, improve science communication, and assist in planning the project prior to the trip. The aim of this assignment is to focus your mind on the how and why of the research, and to help you visualize the process of the research.

The Proposal should be ~4 pages single-spaced (no strict page limits) and contain the following:

1. The names of all group members (*Please nominate 1 group member to be the contact person for the project. This person will receive and share with the group any feedback and can help the course coordinator and technical staff with questions about the materials list (below)).
2. A 2-3-paragraph introduction explaining the conceptual background and motivation for the research project, including 3-6 citations of primary literature.
3. A clear statement of aims, objectives, hypotheses and/or predictions.
4. Proposed methods (future tense), including an initial overview that describes how the methods meet the objective(s) followed by detailed methodologies.
5. A graphical/pictorial presentation of the methods. For example, this may be a diagram of an experimental design, a diagram of a sampling regime, or a timeline.
6. Identify 2 potential challenges/issues you could run into with your project in the field and nominate a response strategy or 'Plan B' to ensure you get data.

Assessment criteria
Background logically and concisely summarized
Aims/objectives clearly stated
Methods presented in a logical and easy-to-follow manner
Information communicated through graphical/pictorial presentation
Clear identification of challenges and plausible solutions
Clarity in expression; correct grammar, spelling and punctuation

Learning Objectives:

- Practice writing and communication skills
- Enhance familiarity with literature search engines
- Practice synthesis of concepts
- Practice communication through graphical approaches
- Develop skills for designing research

Using the Web of Science

Web of Science is a great resource for finding peer-reviewed scientific papers. Go to the library website <http://info.library.unsw.edu.au/> and click on "databases & e-journals" (under quicklinks). Click "find resource", and search for "web of science". Bookmark the Web of Science homepage for future use. To search, put your search terms in the top line. You can use AND, OR, and NOT to combine search terms. It is often necessary to use 'wildcard' terms to allow for plural uses of a word or words with alternate suffixes. For example, if you want to look for papers on climate change impact in lizards and snakes, you might search '(lizard* OR snake* OR squamat*) AND (climat*)'. Once you've found a relevant article, click on its title to see the abstract. If you want to read the whole paper, click on the SFX button. This gives you links to the full text in pdf format (as long as our library subscribes to the journal in question). A way to find other potentially useful papers is to look at the papers cited in a relevant paper, or the papers that have cited this paper since it's been published: just click on the blue, underlined numbers next to "times cited" or "references".

References

Please use the referencing style of a major journal such as *Ecology* or *Austral Ecology*. References should be cited within the text by name and date when first discussed. If there are two authors, include both names. For three authors, name the first author naming both authors where there are two authors, eg: (Veritas and Aziz 1998), or naming the first author followed by "et al.". An alphabetical Reference List should be included at the end of the research proposal. Web sites and popular science books are not appropriate references.

13.4 Datasheet and Materials list (group)

Datasheet (pdf): As part of designing the overall group research project, each student group will design a datasheet to use in the field. These datasheets should anticipate the quantity, type and frequency of data collection. **A good datasheet prompts the user to collect all of the necessary data.** Data sheets may be busy data tables with a single row for each object sampled and columns for the data collected on that object. A datasheet like this may allow 30 objects to be sampled on a single sheet. Alternatively, datasheets can have a lot of open space with a single object sampled per datasheet. Depending on your project, you may need more than one type of datasheet.

Materials list (excel): Each group must also provide a list of equipment and materials needed to complete the research. Each group is responsible for bringing their own basic materials: clipboard, pens/pencils, printed datasheets, gloves, etc.

The datasheet and materials list will be submitted with the Proposal.

Tips:

1. Always have 1-sided datasheets in case you change your project in the field and need blank paper.
2. Include a column or section for 'comments', so you can include observations you didn't plan for.
3. Always include space to collect general data such as date, time, general location, weather, etc.

Learning Objectives:

- Develop skills for designing research

13.5 Field Trip Reflection (independent)

Immediately following the field trip, students will submit a Reflection on the field trip via Moodle. A series of questions on the research and field experiences will be provided. Students should provide their personal opinions and feelings about these experiences.

Learning Objectives:

- Enhance critical thinking
- Develop research skills through hindsight
- Develop insight into personal attributes, strengths and weaknesses

13.6 Draft figures (independent)

Following the field trip, each student must independently generate a publication-style graphical presentation of their main data. Students may discuss the importance and implications of their data with their group mates, but the figures must be generated individually.

1. The figure must present data collected on the field trip; the data can be raw (e.g. scatter plot) or summarized (e.g. bar graphs presenting means)
2. Create a figure that conveys the important finding of the results
3. Try different visual approaches to increase the clarity in the figure (e.g. should a bar plot be 'grouped'?)
4. The figure can include up to 2 panels
5. A caption (aka 'legend') describing the figure must be included
6. You can use whatever software program you choose, but I suggest avoiding the default settings of Excel

Figures will be submitted via Moodle. The 3-4 figures submitted for each group will compete against each other in a class vote for best group figure. The winner within each group will get 1 percentage point extra credit on their final report, up to the maximum report score.

Learning Objectives:

- Develop graph-making skills
- Practice communication through graphical approaches

13.7 Comment/vote on 3 groups' draft figures (independent)

Following draft figure submission, each student will go onto Moodle and select three research groups to cast a vote in. After selecting a research group, view all 3-4 figures submitted individually by the group members. Vote for which figure in the group is the best and provide constructive comments on why you think it is the best.

Learning Objectives:

- Enhance critical thinking
- Improve graph interpretation and graph-making skills through critique
- Practice peer critique

13.8 Project presentation (group)

Each group will give a 10-minute powerpoint presentation on their research project. The presentation should include conceptual background/motivation, objectives of the research, graphical presentation of the results (including clear verbal explanation of the graph), and discussion of the results. Each student in the group must speak.

Learning Objectives:

- Enhance critical thinking
- Practice presentation skills
- Practice graph explanation
- Practice science communication

13.9 Project Report (independent)

A final report (5-6 pages, excluding references) on the research project is due in the last week of term. The report must be prepared independently by each student, but can use text written by the group in the Proposal (subject to improvement). Include the following sections:

1. A 2-3-paragraph introduction explaining the conceptual background and motivation for the research project, including at least 6 citations of primary literature. **Here, each student may use the text from the Proposal, but has to expand on that text individually.**
2. A clear statement of aims, objectives, hypotheses and/or predictions.
3. Methods in past tense, including an initial overview that describes how the methods meet the objective(s) followed by detailed methodologies. **This section may be modified from the Proposal.**
4. A graphical/pictorial presentation of the methods. **This can be copied from the Proposal if unchanged.**
5. Written results of data collected, detailing the major findings, and including statistical summaries and tests (where appropriate). A table of results may also be appropriate. **This must be written independently by each student.**
6. At least one graphical presentation of the data. **This must be completed independently by each student. Please do not share figures with your teammates, as it makes it difficult for me to assess who actually made what.**
7. A discussion summarizing your results and discussing them within the context of what is known in the scientific literature. **This must be completed independently by each student.**
8. References Cited.

Assessment criteria
Background logically and concisely summarized, Aims/objectives clearly stated;
Appropriate presentation of data and use of statistics; Methods communicated through graphical/pictorial presentation;
Results figure(s) convey information clearly and are professional looking;
Synthesis and critical interpretation of results wrt the literature;
Methods and results in logical format; correct grammar, spelling and punctuation;
Clarity in expression; well-structured paragraphs

Learning Objectives:

- Practice writing and communication skills
- Enhance familiarity with literature search engines
- Practice synthesis of concepts
- Practice communication through graphical approaches
- Improve critical thinking and data interpretation

14. Administration Matters

Expectations of Students	http://www.bees.unsw.edu.au/current/ugradguidelines.html		
Assignment Submissions	Unless otherwise advised, assignments must be submitted through the BEES student office (see http://www.bees.unsw.edu.au/current/studentoffice.html), fulfilling the conditions of the BEES Assignment cover sheet (see http://www.bees.unsw.edu.au/school/docs/assignmentcover.doc) which must be attached. The BEES assignment cover sheet lists penalties for late submission. For further information about the school see http://www.bees.unsw.edu.au/		
<u>Occupational Health and Safety</u>⁶	For information on relevant Occupational Health and Safety policies and expectations at UNSW see www.riskman.unsw.edu.au/ohs/ohs.shtml and for BEES specific requirements see http://www.bees.unsw.edu.au/ohs/indexohs.html .		
Assessment Procedures	If illness or misadventure intervenes to prevent a student meeting an assessment deadline or class meeting then he/she should contact the lecturer in charge of the assessment. The conditions for special consideration are given at Http://www.bees.unsw.edu.au/current/ugradguidelines.html .		
Equity and Diversity	Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or www.equity.unsw.edu.au/disabil.html). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made. Information on designing courses and course outlines that take into account the needs of students with disabilities can be found at: www.secretariat.unsw.edu.au/acboardcom/minutes/coe/disabilityguidelines.pdf		
<u>Grievance Policy</u>⁷	School Contact	Faculty Contact	University Contact
	Dr Jes Sammut j.sammut@unsw.edu.au ph: 9385 8281	A/Prof Julian Cox Associate Dean (Education) julian.cox@unsw.edu.au Tel: 9385 6063 or Dr S Mooney Associate Dean (Undergraduate Programs) s.mooney@unsw.edu.au Tel: 9385 8063	Graduate Research School Tel: 9385 2969 Compass University Counselling Services ⁸ Tel: 9385 5418

⁶ UNSW Occupational Health and Safety: www.riskman.unsw.edu.au/ohs/ohs.shtml

⁷ UNSW Grievance Policy: http://www.infonet.unsw.edu.au/poldoc/student_grievance_resolution.pdf

⁸ Compass – University Counselling Service http://www.counselling.unsw.edu.au/compass_programs/