ERS 383 / BIOL 383 - TROPICAL ECOSYSTEMS

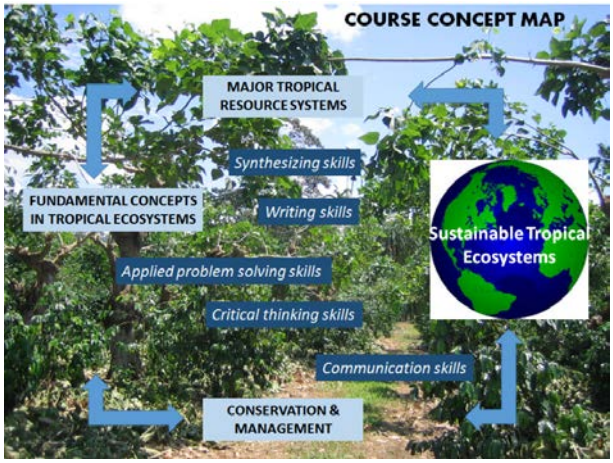
Course Outline: January 2020

"We don't need to clear the 4 to 6 percent of the Earth's surface remaining in tropical rain forests, with most of the animal and plant species living there" –E.O. Wilson

Please read this course syllabus. It will answer many of your questions related to this course.

COURSE OVERVIEW

This course examines the fundamental concepts of terrestrial ecosystems in tropical climates. This is NOT an ecology course. The course is divided into two major sections. The first section, *Fundamental Concepts in Tropical Terrestrial Ecosystems*, introduces tropical biomes and major tropical ecoregions. This section also includes a detailed characterization of vegetation, soils, carbon and nutrient cycling. The second section, *Major Tropical Resource Systems*, includes a detailed study of tropical forests and agroecosystems. Examples using case studies will be presented.



COURSE GOAL & LEARING OUTCOMES

To introduce the fundamental concepts of terrestrial ecosystems in the tropics, outline major tropical resource systems, and define conservation issues and their management within the framework of global change.

Fundamental Concepts in Tropical Terrestrial Ecosystems

- Tropical biomes: what an where are the tropics located
- Tropical ecoregions and landforms
- Tropical biology and ecology: characterizing vegetation, soils, and carbon and nutrient cycling

Major Tropical Resource Systems

- Tropical forest ecosystems
- Tropical agroecosystems

SKILLS LEARNED

- Applied problem solving skills
- Critical thinking skills
- Writing & time management skills
- Synthesizing new knowledge skills
- Communication & organizational skills
- Writing exams under pressure

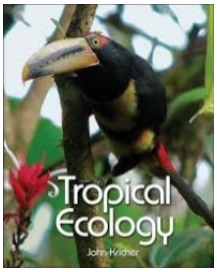
COURSE MEETINGS TIMES & LOCATION

Lecture Times	Location
Friday **8:30 am to 11:20 am**	**EV2, room 2002**

INSTRUCTIONAL TEAM

	PROFESSOR	TEACHING ASSISTANT
NAME	**Prof. Dr. M. Oelbermann**	**TBD**
CONTACT INFORMATION	**Office: EV-2, room 2008** **E-mail: moelbermann@uwaterloo.ca** **Phone: 519-888-4567 Ext. 37552**	**Via Learn**
OFFICE HOURS	**Mondays 11:30 – 12:00**	**TBD**

REQUIRED MATERIALS



The textbook available in UW Bookstore:
Kricher, J. 2011. Tropical Ecology. Princeton University Press. 632 pp.
ISBN-10: 0691115133 *(A copy of this text book is on reserve at Dana Porter)*

Additional *(but not required for the course)* readings to supplement the textbook will be available on Learn. These readings will be relevant to the material discussed in class; help with the assignment and provide further insight for interested students.

COURSE ASSESSMENT

LEARNING OUTCOME	ASSESSMENT METHODS (FORMATIVE & SUMMATIVE)	% OF OVERALL GRADE	TEACHING & LEARNING METHODS
1. Fundamental Concepts in Tropical Terrestrial Ecosystems	• Class participation • Midterm ▪ Lectures & videos covered in lectures 1, 2, 3 & 4 ▪ held in class	5 20	• Interactive lectures • Case studies • Video presentation • Textbook readings • Course website (Learn) • PowerPoint slides
2. Major Tropical Resource Systems **3.** Conservation Issues & Management	• Class participation • Group Assignment • Final Exam (lectures, videos and guest lecture in lectures 5, 6, 7, 8, 9 & 10)	5 30 40	• Interactive lectures • Case studies • Video presentation & Guest Lecture • Textbook readings • Course website (Learn) • PowerPoint slides

SUMMARIZED SCHEDULE OF COURSE ACTIVITIES

MODULE #	DAY OF LECTURE	LECTURE #	TOPIC	READING MATERIAL
Module 1: Fundamental Concepts of tropical Ecosystems	January 10, 2020	1	- Introduction to the course - Tropical biomes & ecoregions **Video: Fire & Flood**	Chapter 1 Chapter 3: 79-82 Chapter 11 Chapter 12: 446-463
Module 2: Major Tropical Resource Systems	January 17, 2020	2	- Tropical vegetation **Video: The Amazon**	Chapter 3
	January 24, 2020	3	- Tropical soils	Chapter 10: 375-389
	January 31, 2020	4	- Nutrient cycling, carbon & climate change **Video: Panama**	Chapter 10 Chapter 9
	February 7, 2020	5	- Forest landscapes & forest loss **Video: Classic Rainforest**	Chapter 12 Chapter 15
	February 14, 2020		**MIDTERM (lectures 1 to 4)**	
	February 18 to 22, 2020		**READING WEEK**	
	February 28, 2020	6	- Rainforest development and dynamic	Chapter 6
	March 6, 2019	7	-Tropical forest management **Video: Odzala** **GROUP ASSIGNMENT DUE**	Not in textbook
	March 13, 2020	8	- Humans & terrestrial ecosystems **Video: Trees for Life**	Chapter 13
	March 20, 2020	9	- Tropical agroecosystems **Guest lecturer?**	Chapter 13: 491-494
	March 27, 2020	10	- Tropical agroecosystems & diversity **Video: When Two Worlds Collide**	Not in textbook

DETAILED SCHEDULE OF COURSE ACTIVITIES

A note on the DVD's:
The DVD's have been carefully selected to match with the lecture material. You may find some of the cast in the DVD's a little outdated in their appearance. The material presented in these DVD's however is still relevant to current issues relating to tropical ecosystems.

MODULE I: FUNDAMENTAL CONCEPTS IN TROPICAL TERRESTRIAL ECOSYSTEMS

LECTURE 1
Introduction

- Introduction to ERS 383/BIOL 383: Tropical Ecosystems: Course syllabus & expectations

What & Where are the Tropics (Chapter 1)

- Historical perspectives on tropical ecosystems
- Location of the tropics
- Tropical climates and seasons

Tropical Ecoregions (Chapter 3 pp. 79-82; Chapter 11; Chapter 12 pp. 446-463)

- Tropical rainforests (Chapter 3, pp. 79-82)
- Tropical and neo-tropical savannas
- Tropical dry forests
- Tropical wetlands and riverine ecosystems (Chapter 12 pp. 446-463)

Video: Brazil Land of Fire and Flood *–This series follows the intimate lives of an exceptional set of animal characters as they live through the vast floods of the wet season to the ravaging fires of the dry season. From the early days of a baby tufted capuchin, one of the cleverest monkeys in the world, to the giant river otter family forced to go head to head with the local jaguars, Wild Brazil brings some of the country's most iconic species to the screen, showcasing never-before-filmed behavior and providing an intimate window on this vibrant country (278 minutes).*

LECTURE 2
Characteristics of Tropical Vegetation (Chapter 3)

- Stratification and stature
- Roots, trunks, bark and crowns
- Leaves
- Flowers, fruits, seeds and vegetative reproduction
- Climbers, lianas, stranglers and epiphytes
- Deciduous behavior

Video: The Amazon *– Land of the Flooded Forest: Journey into a tropical jungle where terrestrial rains annually transform the dry forest floor into a watery world. Watch river dolphins navigate the flooded treetops and the masterful hunting techniques of the electric eel and notorious piranha (60 minutes).*

LECTURE 3

Tropical Soils (Chapter 10 pp. 375-389)

- What is soil and tropical soil mineralogy
- Tropical soil chemistry, physics, biology and soil organic matter
- What are tropical soils?
- Soil formation & factors influencing soil formation
- Types of tropical soils
- Undisturbed and disturbed tropical soils
- Processes of tropical soil degradation
- The paradox of exuberant vegetation and poor soils: the case of tropical forest removal

LECTURE 4

Nutrient Cycling (Chapter 10)

- Nutrient cycling and the soil community
- Factors affecting nutrient cycling
- Rapid nutrient recycling
- Tropical soil types and nutrient cycling
- Nitrogen and phosphorus

Carbon & Climate Change (Chapter 9)

- Primary and net productivity
- Carbon in pioneer and successional species
- What is a carbon sink?
- Seasonal fluxes and carbon losses
- Climate change and tropical forests

Video: Panama *– Venture beyond the dense and green curtain, into the rainforest that thrives in splendid isolation on a Panamanian island. Marvel at the complex interactions among the exotic species that live, feed, breed and die here (50 minutes).*

MODULE 2: MAJOR TROPICAL RESOURCE SYSTEMS

LECTURE 5

Tropical Forested Landscapes & Landforms (Chapter 12)

- Montane and neotropical montane forests
- High elevation tropical ecosystems
- Mangroves
- Tropical dry forests

The Driving Forces Behind Tropical Forest Cover Loss (Chapter 15)

- Global forest cover: then and now
- Baluable hardwood tree species
- Forest removal: fuel wood & paper industry; grazing & agriculture; subsistence farming
- The effects of deforestation: local, regional and global
- What can be done to reduce tropical forest removal

Video: Classic Rainforest *– The tropical rainforests of the world are home to nearly half of the animal species on earth. More than 2500 mm of rainfall each year sustain this lush environment where some of the most fascinating examples of natural adaptation can be found. Journey to the dense rainforests of Costa Rica and watch as leaf-cutting ants carry sections of leaves many times their weight to underground fungus gardens; a basilisk lizard walks on water, and howler monkeys bark in the sun. (56 minutes).*

LECTURE 6
Rainforest Development & Dynamics (Chapter 6)

- Secondary succession in the tropics
- Early succession in the tropics
- Effect of ENSO on second-growth rainforests
- Resilient pastures: secondary succession in Amazonia
- Disturbance impacts and regeneration pathways
- Fire as disturbance in the tropics
- When succession does not succeed
- Forest gaps and tree demographics

LECTURE 7
Tropical Forest Management (not in textbook)

- Historical overview of logging in the tropics
- Conventional timber harvest
- Sustainable timber harvest
- Plantation forest: good, bad or indifferent?

Video: Odzala *– Islands in the Forest: Hidden deep inside the Republic of Congo lays Odzala National park, a dense, isolated rainforest that humans seldom visit. From forest elephants and lowland gorillas to water buffalo and cattle egrets show their coexistence around a swampy watering hole called a bai (53 minutes).*

LECTURE 8
Humans as Part of Tropical Ecosystems (Chapter 13)

- Human impact on ecology: traditional agriculture in tropical environments
- Hunting and gathering: the first human societies
- Emergence of tropical crops
- From simple beginnings: the discovery of agriculture
- Agriculture in the neotropics
- Agroforestry and hillside farming
- Ethnobotany
- Semi-commercial farming systems: tropical beverage crops
- Conventional agroecosystems: the commercialization of agriculture using plantation crops

Video: Trees for Life *– Discover how women in Mali enhance their livelihoods by integrating trees on their agricultural fields and homesteads (8 minutes).*

Homework: *Watch youtube video "Growing Hope in Sunyani West District Ghana" in preparation for the guest lecturer. The link is: https://www.youtube.com/watch?v=3r2BW34eRT8*

LECTURE 9

Sustainable Tropical Agroecosystems: An Old Idea Made Modern (Chapter 13, pp. 491-494)

- The principles of complex agroecosystems & examples of complex agroecosystems in the tropics
- A detailed look at agroforestry systems
- Historical perspectives on agroforestry
- Types of agroforestry systems
- Why do we need agroforestry: what are the benefits
- What is the role of multipurpose trees
- Can agroforestry stop deforestation
- Coffee and cacao agroforestry systems

LECTURE 10

Tropical Agroecosystems & Biodiversity (not in textbook)

- Ecological role of biodiversity in modern agroecosystems
- What happens if biodiversity is lost in modern agriculture?
- Biodiversity in complex agroecosystems
- Biodiversity in cacao agroecosystems: a case study from Costa Rica

Tropical Agroecosystems & Climate Change (not in textbook)

- Potential impacts of climate change on agriculture in the tropics
- Biophysical responses to increased atmospheric greenhouse gas concentrations
- Adaptation to climate change and the limits of adaptation in the tropics
- Agroforestry as an adaptive agroecosystem: a case study from Costa Rica

Video: When Two Worlds Collide *-- In this tense and immersive tour de force, audiences are taken directly into the line of fire between powerful, opposing Peruvian leaders who will stop at nothing to keep their respective goals intact. On the one side is President Alan Garcia, who, eager to enter the world stage, begins aggressively extracting oil, minerals, and gas from untouched indigenous Amazonian land. He is quickly met with fierce opposition from indigenous leader Alberto Pizango, whose impassioned speeches against Garcia's destructive actions prove a powerful rallying cry to throngs of his supporters. When Garcia continues to ignore their pleas, a tense war of words erupts into deadly violence (1 hr & 47 minutes).*

STUDENT CONDUCT, APPROPRIATE BEHAVIOUR & MENTAL HEALTH

Pages 8 and onwards in this Course Syllabus

I encourage students to study together, however each student is expected to individually fulfill the requirements of the midterm and the final exam. The assignment is a group effort Please refer to the **Assignment Outline** on Learn for further details. It is the responsibility of each student to be aware of what constitutes responsible behaviour in class, what constitutes plagiarism, and your rights and responsibilities with respect to these issues.

STUDENT & FACULTY RESOURCES

The Faculty of Environment has an entire webpage https://uwaterloo.ca/environment/undergraduate-teaching-resources) dedicated to Student Resources including issues surrounding the following topics. Further detailed topics are outlined below:

- Teaching Resources
- Important Dates
- The Course Outline
- Student Privacy
- Academic Integrity
- Group Work
- Scheduling and Administration of Tests and Exams
- International Exchange Students
- Accommodation and Accessibility

ACCOMMODATION & ACCESSIBILITY

Please note that if you are registered with AccessAbility Services https://uwaterloo.ca/accessability-services/about, please write your midterm and final exam in accessibility if this is one of the requirements you requested. The instructor has to send a certain number of midterms and final exams to AccessAbility Services several days before the midterm/final exam is written. If you write in the class-room you must let the instructor know about a week ahead of time to ensure that sufficient number of midterms/exams are available.

AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

MENTAL HEALTH

The University of Waterloo, the Faculty of Environment and our Departments/Schools consider students' well-being to be extremely important. We recognize that throughout the term students may face health challenges - physical and / or emotional. **Please note that help is available**. Mental health is a serious issue for everyone and can affect your ability to do your best work. Counselling Services http://www.uwaterloo.ca/counselling-services is an inclusive, non-judgmental, and confidential space for anyone to seek support. They offer confidential counselling for a variety of areas including anxiety, stress management, depression, grief, substance use, sexuality, relationship issues, and much more. if you think you are experiencing mental health issues, please see this website for guidance and support: https://uwaterloo.ca/environment/get-mental-health-support-when-you-need-it

INTELLECTUAL PROPERTY:

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights. Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

RELIGIOUS OBSERVANCES: Students need to inform the instructor at the beginning of term if special accommodation needs to be made for religious observances that are not otherwise accounted for in the scheduling of classes and assignments.

GRIEVANCE: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. See Policy 70 - Student Petitions and Grievances, Section 4, www.adm.uwaterloo.ca/infosec/Policies/policy70.htm. When in doubt please contact your Undergraduate Advisor for details.

APPEALS: A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 – (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals)
www.adm.uwaterloo.ca/infosec/Policies/policy72.htm

COMMUNICATIONS WITH INSTRUCTOR AND TEACHING ASSISTANTS: All communication with students must be through either the student's University of Waterloo email account or via Learn. If a student emails the instructor or TA from a personal account they will be requested to resend the email using their personal University of Waterloo email account.

TURNITIN: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, and are subject to the USA PATRIOT ACT, 2001; therefore, students must be given an alternative (e.g., scaffolded assignment or annotated bibliography) if they are concerned about their privacy and/or security. Students will be due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin® in this course.

RECORDING LECTURES:
Use of recording devices during lectures is only allowed with explicit permission of the instructor of the course. If allowed, video recordings may only include images of the instructor and not fellow classmates. Posting of videos or links to the video to any website, including but not limited to social media sites such as: facebook, twitter, etc., is strictly prohibited.

CO-OP INTERVIEWS AND CLASS ATTENDANCE: Co-op students are encouraged to try and choose interview time slots that result in the least amount of disruption to class schedules. When this is challenging, or not possible, a student may miss a portion of a class meeting for an interview. Instructors are asked for leniency in these situations; but, a co-op interview does not relieve the student of any requirements associated with that class meeting.

When a co-op interview conflicts with an in-class evaluation mechanism (e.g., test, quiz, presentation, critique), class attendance takes precedence and the onus is on the student to reschedule the interview. CECA provides an interview conflict procedure to manage these situations. Students will be required to provide copies of their interview schedules (they may be printed from WaterlooWorks) should there be a need to verify class absence due to co-op interviews.

MENTAL HEALTH

Everyone struggles at some point

From transition to university life, to changes in expectations, to relationships, there are a lot of reasons you might seek help for your mental health. 1 in 5 Canadians experience poor mental health in their lifetime. **You are not alone.**

Signs that something might not be quite right

If you notice any of the following situations, consider getting some support:

- Your mood is low for more than two weeks
- You've lost focus or motivation
- You're having difficulty sleeping or your energy levels are poor
- You feel extreme loneliness

- You think about harming yourself
- You feel extreme fear about certain situations

Counselling Services is here to support you

We offer a variety of confidential services at no charge to University of Waterloo students who are currently registered or are on a co-op term. Our mental health professionals are here for you and interested in helping you through whatever you are experiencing. Our regular hours are Monday to Friday 8:30 a.m. to 4:30 p.m.

Emergency appointments

Emergency appointments are available during our regular hours and are provided to any student who is at **immediate risk** of self harm or harming someone else, or have recently experienced a trauma.

Booked appointments

Regular booked appointments can be made and scheduling depends on the urgency of your needs. When you meet with a counsellor they will listen to your concerns and develop a plan that suits your individual situation and needs. This plan could consist of booking a series of regular appointments, readings, meditations, or practical exercises.

Walk-in appointments

Walk-in appointments are available each **Wednesday and Thursday between 11:30 a.m. and 3:30 p.m.** These appointments are 90-minutes in length and are focused on finding you practical solutions for your most pressing concern.

UW MATES peer counselling

Peer counselling is available on a walk-in or booked basis. MATES student volunteers are trained by Counselling Services and are available to offer confidential support to students struggling with social issues, mental health issues, and transitioning to university life.

Coping Skills seminars

Over the last couple of years, hundreds of students have found our Coping Skills seminars valuable. Coping Skills seminars are 1-hour seminars that focus on cultivating resilience, challenging thinking, managing emotions, and changing behaviour. They are offered a variety of times per term and can be registered for on LEADS.

Group therapy and workshops

Our groups and workshops provide you with the opportunity to learn more about topics such as: Managing anxiety and stress, regulating emotion, increasing motivation, sustaining recovery from depression, learning to meditate, and much more. Registration is online through LEADS.

More information about all of our services can be found at: https://uwaterloo.ca/counselling-services

After-hours and off campus resources

If you need to speak with someone outside of our regular hours the following resources are available 24/7.

Good2Talk

Good2Talk is a free confidential help line for post-secondary students.
1-866-925-5454

Grand River Hospital Mental Health Emergency Care

Grand River Hospital offers 24/7 emergency care for mental health emergencies. 834 King Street West, Kitchener.
519-749-4300 x 6880.

Here 24/7

Here 24/7 is Waterloo Region's Mental Health and Crisis Services team.
1-844-437-3247

WatSAFE app

Download the WatSAFE app to have access to a list of support contacts at all times.