ECOLOGY

INSTRUCTOR: Scott Gilbert, B.Sc., Ph. D.

OFFICE HOURS: Wed / Fri 11:00 –noon or by appt.
OFFICE LOCATION: A2515

TELEPHONE/E-MAIL: 668-8776, sgilbert@yukoncollege.yk.ca

COURSE OFFERINGS:
DAYS & TIMES

Lecture:	Tues. & Thur.
Time:	1:00-2:30
Room:	A2103
Lab:	Wednesday
Time:	1:00-4:00 pm
Room:	A2103

COURSE DESCRIPTION

Biology 220 introduces the science of ecology by focusing on the interrelations between individual organisms, their populations and communities. The course begins by reviewing the factors that limit distributions and then considers population demography, life tables, regulation of natural populations and managing harvested populations. We briefly review some of the mathematical models to explain interspecific competition and predation. The course continues with an overview of community ecology and considers selected topics: succession, species diversity gradients, energy flow, biogeochemistry, and the role of predation, competition and disturbance in structuring communities. Finally we conclude by considering the prospects for global change and the ecological processes that may shape these changes.

LEARNING OUTCOMES:

On successful completion of this course students will be able to:

- describe the ecological factors that affect the distribution and abundance of organisms;
- understand the interplay between evolution and ecology;
- construct simple life tables and interpret simple models of population growth, interspecific competition and predator-prey interactions;
- propose testable hypotheses along with experimental tests to resolve ecological questions.

PREREQUISITES
Biology 101/102 or equivalent, or permission of the instructor

EQUIVALENCY or TRANSFERABILITY

Please see the BC Transfer Guide for transferability options.

DELIVERY METHODS / FORMAT (3-3)
Lectures will be supplemented by practical exercises during a weekly lab to illustrate ecological principles and by seminars in which students will discuss ecological problems and ideas.

COURSE REQUIREMENTS

ASSESSMENTS

Attendance
This is a fast-paced course that covers a wide variety of topics and students are encouraged to attend lectures. Most of the labs and all of the seminars require attendance and participation if students wish to receive a grade for that exercise.

Assignments and Labs
Most lectures will start with a 3-minute quiz at the beginning of class to assess understanding of the previous lecture. This will reward students who show up to class on time and review their lecture notes and readings. Instead of one major mid-term there will be two 60 minute quizzes during the term; the first quiz will be scheduled after a month of classes to give students early feed back on their progress.
Three types of activities will take place during 11 laboratory periods over the term. In some weeks students will carry out sampling exercises and will prepare formal lab reports to be handed in after the lab. Several tutorials are scheduled during this period so students can get assistance working through problem questions. In the remaining periods students will take part in class seminars after completing a set of readings. Students will be expected to prepare a one page write-up before each of these seminars on an assigned question related to the readings.

Evaluation

3 minute quizzes	5%
Mid-term tests (2 @15)	30
Lab Exercises	35
Final Examination	30
	100%

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when students present the words of someone else as their own. Plagiarism can be the deliberate use of a whole piece of another person's writing, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material. Whenever the words, research or ideas of others are directly quoted or paraphrased, they must be documented according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Resubmitting a paper which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the College.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon College Academic Regulations (available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC) at (867) 668-8785 or lassist@yukoncollege.yk.ca.

REQUIRED TEXTBOOKS

Molles, M..C. and Cahill, J.F. 2014. *Ecology: Concepts and Applications* – 3rd Canadian Edition McGraw-Hill Ryerson 704 pp.

TOPIC OUTLINE / SYLLABUS

Yukon College - Biology 220 – *Draft* **Lecture Topic Outline and Schedule** – *July, 2014*
Course Text: M.C. Molles, Jr. & J.F. Cahill 2014. *Ecology: Concepts and Applications* 3rd Cdn Ed.

Date	Topic	Concepts	Chapter
Sept. 4	Introduction, Hypothesis testing,	def'n ecology, levels of organization, hypothesis testing, theme of temporal and spatial heterogeneity, proximate vs. ultimate explanations	Chapter 1
Sept. 9	Land and water	Biomes, water & temperature as master limiting factors, soil horizons, hydrological cycle, flux, turnover time, oceanic zonation (horizontal and vertical), still waters, zonation, lake turnover, isothermal , limits to distributions, abiotic and biotic factors, allelopathy	Chap 2 (skip pp 23-45), Chap 3 (skip 59-76)
Sept. 11	Natural selection and evolution	Evolution, genetic drift, natural selection, adaptation, fitness, , phenotype, genotype, ecotypes, common garden expts., stabilizing selection, disruptive selection, directional selection	Chap 4
Sept. 16	Coevolution and speciation	Coevolution,, Mullerian and Batesian mimicry, Mayr's biological species concept,2 types of reproductive isolation – pre- and postzygotic isolating mechanisms, 3 types of speciation,	con'd
Sept. 18	Behavioural ecology / Optimal foraging	Kin selection, inclusive fitness, costs & benefits of group living Foraging decisions, numerical & functional responses, optimal foraging theory and assumptions, diet width mode & predictions. , 3 types of functional responses	Chap 8 -Read 203-212 Chap 7 Read 190-196
Sept 23	Intro to Populations & Estimating density	(see Sept 9 notes where we introduced limits to dist'n), what is an indivudal: unitary, modular organisms, genet, ramet; patterns of dist'n: random, regular clumped, def'n of pop'n, metapopulation, relative and absolute abundance	Chap 10 - Read 263-264, 266-270, 286-290
Sept 25	Population Structure	Intro to life tables, mortality, static and cohort life tables, n_x, l_x, d_x, q_x, 3 types of survivorship curves, fecundity schedules, net reproductive rate	Chap 11
Sept 30	Pop'n Structure (continued)	Generation time, T, actual or realized *r*, dispersal, jump dispersal , sex ratios & frequency dependent selection,	con'd
Oct 2	Population Growth	Density dependent and independent birth and death rates , , lambda - geometric rate of increase, exponential growth using $dN/dt = rN$, eq'n for logistic pop'n growth, assumptions of models, realized *r* vs r_{max}	Chapter 12 but skip 328-332

Oct 7	Population Growth	Conclude pop'n growth section	
Oct. 9	Temperature relations	How do organisms respond to temperature? range of tolerance, heart budgets, ectotherms, endotherms, thermal neutral zone, 8 strategies for extreme conditions	Chap 5 (skip 127, 134-135)
Oct 14	Nutrient & Energy relations	Energy sources, trophic classifications, light (PAR), 3 photosynthesis pathways by name, C:N ratios and challenges to herbivore diets,	Chap 7 skip 177-179
Oct. 16	Life History Patterns	Fundamental & realized niche, principle of allocation, trade-offs, life history classifications, r & K selection, principle of allocation, Grimes approach to plant life histories, disturbance, stress tolerance, Winemiller & Rose – 3 factors to classify life histories, climate change	Chap 9 up to page 250
Oct 21	Competition – Intraspecific & Interspecific	Concept of the niche, Types of spp interactions, exploitation or resource competition, interference competition, impacts of competition on growth, survival and reproduction, Lotka-Volterra model of interspecific comp. and how to interpret LV graphs, comp. coefficients	Pp 250-252, Chap13 (skip 357-358)
Oct. 28	Intro to Herbivory & Predation	Types of predation, impacts of exploitation on individuals and populations, invasive spp and enemy release hypothesis, LV-predation equations, coupled oscillations, neutral stability, Huffaker's case history showing role of prey refuges, other ways to escape predators	Chap 14
Oct. 30	Exploitation, Predation and Harvesting populations	Recruitment curves, role of intraspecific comp in determining shape of curve, maximum sustainable yield, fixed quotas harvests, managing harvest effort	
Nov. 4	Mutualism & Parasitism Community ecology	Parasites can affect behaviour; winter ticks and moose, flour beetles and competition affected by parasites. Plant-ant protection mutualisms Emergent properties of communities, species abundance, spp diversity, role of disturbance	Chapter 15 – only pp 385-390 Chapter 16
Nov. 6	Review 2nd midterm	Review 2nd midterm, conclude spp diversity & disturbance	
Nov. 11	**Holiday**	**No lecture**	
Nov 13	Food webs & keystone species	Who eats who? Food webs. Why are food chains short (2 hypotheses), Keystone species vs dominant spp, ecosystem engineers	Chapter 17 (skip 17.2)
Nov. 18	Community succession	Primary & secondary succession, climax, patterns in succession, Connell & Slatyer model of succession. Facilitation, inhibition & tolerance,	Section 18-18.3 (skip lakes p 462-463, skip streams p. 467-468)
Nov. 20	Community stability	Ecosystem stability, resilience and resistance – Park Grass expt	Section 18.4
Nov. 25	Energy flow	Primary production, GPP, NPP, limits to NPP in terrestrial and aquatic systems, tropic cascades , Top down or bottom up control,	Chapter 19 (skip p 498-504)
Nov. 27	Patterns in Spp Richness - Macroecology	Island Biogeography - Equilibrium model of biogeography, immigration & extinction rates	Chapter 22 (skip Sect 22.1)
	Continued	Gradients in species richness , hypotheses to explain patterns, detailed evaluation of hypotheses to explain latitudinal patterns	Chapter 22
Dec. 2	Ecology & Global Change	Course review & highlights – themes and integration	

Biology 220 Laboratory Schedule

Draft Schedule – Fall 2014

Sept. 3	No lab before start of lectures	
Sept. 10	#1 Tutorial: Hypothesis Testing in Ecology	Due Sept 19
Sept. 17	#2 Lab Exercise: Decomposition and Forest Soil CO_2 Emissions	Due Oct 22
Sept 24	#3 Seminar: Natural Selection question /	Due before class
Oct. 1	#4 Life Table Analysis Tutorial	Due Oct 3 (Fri)
Oct. 8	**Quiz #1** // Begin #5 Lab Exercise: Population estimate using mark recapture	
Oct. 15	#6 Seminar – Critique of paper (TBD) with Jen Line	Due before class
Oct. 22	#4 Seminar – Critique of paper (Loons or Eels)[1]	Due before class
Oct. 29	#7 Seminar: Critique of paper (Eider ducks or Arctic Charr)[2] + Mark recap analysis developing Jolly-Seber estimate for vehicle dataset	Critique due before class
Nov. 5	**Quiz #2 (aprox date)** + #8 Tutorial: Harvesting Populations[3]	Nov 15
Nov. 12	#9 Lab Exercise: Population Interaction	Due Nov. 26
Nov. 19	#10 Seminar: TBD	
Nov. 26	#11 Seminar: Critique of snail paper[4]	Due before class

[1] Dickson, Lynne 1992. The Red-throated Loon as an indicator of environmental quality. Canadian Wildlife Service, Occasional Publication No. 73.

Marcogliese , Lucian A., Casselman, John M. and Hodson , Peter V. 1997. Dramatic declines in recruitment of American Eel (*Anguilla rostrata*) entering Lake Ontario -- Long-term trends, causes and effects. *Plenary presentation at the 3rd National EMAN Meeting, Saskatoon, Saskatchewan, 22 January 1997*

[2] Reed, J.A., D.L. Lacroix and P.L. Flint 2007. Depradation of Common Eider, *Somateria* mollissima, Nests on a Central Beaufort Sea Barrier Island: A Case Where No One Wins. *Can. Field-Nat. 121*: 308-312.

Laakonen, Mika V.M. 2006. The effects of long-term predator exposure on body composition and condition of young Arctic charr (*Salvelinus alpinus*). Annales Zoologici Fennici 43:263-270

[3] Readings from Pauly, D. V. Christensen, S. Guénette T.J. Pitcher, U.R. Sumaila, C.J. Walters, R. Watson and D. Zeller. 2002. Toward sustainability in world fisheries. Nature 418: 689-695

[4] Hershey, Anne 1990. Snail populations in Arctic lakes: Competition mediated by predation? Oecologia 82: 26-32.