



University of Wyoming's Program in Ecology

Graduate Courses in Ecology and Related Areas

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Agroecology/Microbiology

Soil 4140/5140 – Soil Microbiology - Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. *Prerequisite:* SOIL/AECL 2010. (Offered spring semester)

Molb 4540/5540 – Microbial Diversity and Ecology - Introduces the diversity and ecology of soil microbes through an integrated lecture and laboratory course. Emphasis on molecular approaches to analyzing microbial diversity and evolution, and student-directed experimental design. Provides a continuum of realistic research experiences in molecular microbial ecology, from field work to evolutionary analysis of DNA sequence data.

Aecl 4130 – Remote Sensing Ag Management - Addresses specific applications of remote sensing to cropland and rangeland management. Provides an overview of remote sensing, specific applications for crops, shrubs and range vegetation. The foundation is agriculture-specific remote sensing of green plants. Dual listed with AECL 5130; cross listed with BOT/RNEW 4130. *Prerequisites:* QA course and 9 credit hours in student's major field and junior or senior standing.

Aecl 4920 – Topics in Agroecology: Research Apprenticeships - Laboratory and/or field research apprenticeship. Emphasizes individual student-faculty interactions on current topics in agroecology. *Prerequisite:* AECL core courses.

Plnt 4975 – Problems in Plant Science - Provides an opportunity for students to conduct supervised research on specific topics of interest and importance in crop breeding, genetics, physiology, pathology, ecology and pest management. *Prerequisites:* junior/senior standing with at least 10 hours of agroecology core requirements.

Aecl 4400/5400 – Invasive Plant Ecology - Ecological Impacts of invasive, non-indigenous plant species, the ecological, genetic and evolutionary hypotheses for invasiveness, as well as management strategies for invasive plant species. Cross listed with RNEW 5400. *Prerequisite:* LIFE 3400.

Botany

BOT 4111/5111 – Remote Sensing of the Environment - Introduces students to the fundamentals of remote sensing with a strong emphasis on vegetation, land cover and environmental applications. Students learn to use digital spectral data to distinguish characteristics of the terrestrial biosphere important for ecological and land management applications. Dual listed with BOT 4111; cross listed with GEOG 4111/5111. *Prerequisites:* QA and one science course with laboratory.

BOT 4390/5390 – Fungal Physiology and Ecology - A comprehensive lecture-seminar-discussion course designed to familiarize advanced students with physiological processes underlying fungal ecology, and modern methods used to study those processes. A comparative organismal approach is taken, involving

both symbiotic and saprophytic fungi, with emphasis on ectomycorrhizal and decomposer modes of nutrition in forest ecosystems. *Prerequisite:* one course in plant physiology or ecology.

BOT/ZOO 4420 - Conservation Biology - Addresses the broadest environmental issues facing society (habitat loss, invasion, overexploitation) and the mechanisms driving them, with particular attention to the Intermountain West. Through computer exercises, students also learn how to evaluate conservation efforts and make management recommendations. Cross listed with ZOO & ENR 4420. *Prerequisites:* LIFE 3400 and one of the following: ENR 3500, STAT 2050, or STAT 2070.

BOT 4700/5700 - Vegetation Ecology - The ecology of major vegetation types, with emphasis on patterns of vegetation distribution, vegetation-environment relationships, succession, the effect of fire and management decisions, and methods of vegetation analysis. *Prerequisite:* LIFE 3400.

BOT 4745/5745 - Terrestrial Ecosystem Ecology - Advanced course examines fundamental ecosystem functions and their relationship to ecosystem structure using a systems approach. Study cycles of carbon, water and nutrients through ecosystem components with an emphasis on interactions among plants, soil, and the atmosphere. Current readings focus on responses of terrestrial ecosystems to global climate change and human disturbance. Dual listed with BOT 4745; cross listed with ECOL 5745. *Prerequisite:* one course in ecology.

BOT/RNEW 4775/5775 – Forest Ecology - Integrative study of the structure, function, and ecological diversity of forested ecosystems, and the physical factors that influence this diversity, including emergent properties of energy flow and nutrient cycling. Special emphasis is given to understanding forest disturbances and succession, and implications for impacts of management and sustainability are discussed throughout. Cross listed with BOT 4775. *Prerequisite:* LIFE 3400.

BOT/GEOL 4280/5280 – Paleobotany - An examination of the ecology and evolution of land plants throughout Earth history that emphasizes the profound impact plants have had on Earth's surface and atmosphere. Through a combination of lecture, discussion, and laboratory, the course will explore fossilized plant communities, their ecological properties, and effects of major environmental upheavals. Cross listed with Geol 4280/5280. *Prerequisite:* LIFE 1010 or Geol 1100.

BOT 4550 – Computational Biology - Introduces concepts and skills that are generally applicable to computational analysis of biological questions. Content is motivated by applied projects that require basic computer programming for analysis. Two computer languages are introduced and utilized. *Prerequisites:* MATH 2200 or STAT 2050 or equivalent; LIFE 1010 or equivalent.

BOT 5000 – Seminar - Selected topics on current research in the botanical sciences. Offered satisfactory/unsatisfactory only. *Prerequisite:* 15 hours of botany or biology.

BOT 5665 – Research Evolution – *Prerequisites:* graduate standing and consent of instructor

BOT 5730 Plant Physiological Ecology - Plant physiological ecology is the study of the mechanisms behind the growth, reproduction, use of resources, and geographical distribution of plants in response to the physical, chemical, and biological environment. At the end of this course, the successful student will be able to articulate these mechanisms at the biochemical, biophysical, molecular, organ, and whole-plant level and be able to scale these mechanisms to the ecosystem and/or crop level and beyond. Students will also improve their ability to critically evaluate and write about the scientific literature. Successful students will be equipped to quantitatively assess the costs, benefits, and consequences of modifying plants and their environments for human needs and the role of plants in ecosystems and to communicate these processes to a broad audience.

BOT 5750 - Seminar in Ecophysiology - *Prerequisite*: one course in physiology and one course in ecology.

BOT 5756 – Ecological Systems Modeling - Design, implementation, analysis, and interpretation of ecological models. Includes model development, sensitivity analyses, parameterization, uncertainty, and validation. Emphasizes empirical (data-driven) and mechanistic models that encompass a hierarchy of scales and processes. Primary ecological focus is terrestrial systems, including models that span leaf to ecosystem processes. *Prerequisites*: one course each in calculus, statistics and ecology.

BOT 5780 – Biogeochemistry - A comprehensive treatment of biogeochemistry with emphasis on biogenic elements and biological processes. Reviews occurrence of elements, their behavior in the biosphere, and how their cycles are affected by humans. Dual listed with BOT 4780. *Prerequisites*: a course in organic chemistry.

BOT 4790/5790 - Special Topics in Ecology - Designed to acquaint advanced students with various topics not covered in other courses. Emphasis is placed on recent developments appearing in the journal literature. Dual listed with BOT 4790. *Prerequisite*: two courses in ecology. Courses may include: “Macroevolution” and “Evolution of Development” among others.

Ecology

Ecol 5050 - Techniques in Environmental Data Management - Centers on the role of information technology in support of scientific research. Through integration of multiple software packages (e.g. Relational databases, ProgramR and ArcGIS), proven database designs, and SQL scripting, increased efficiency and utility will occur during data analyses. These information science principles are demonstrated using project-based examples. Cross listed with GEOG/ENR 5050. *Prerequisite*: graduate standing.

Ecol 5060 - Fundamental Concepts in Evolution - Explores fundamental concepts in evolutionary biology including evolutionary ecology, population genetics, and speciation with an emphasis on both theoretical frameworks and practical applications. Discussion included. Cross listed with BOT/ZOO 5060. *Prerequisite*: graduate student in good standing.

Ecol 5100 - Ecology as a Discipline - Covers the range of ecological questions, processes, scales, and research approaches, in context of the history and philosophy of science in general and of ecology in particular. Aimed at first-year students in the doctoral program in Ecology, although students in other graduate programs are welcome. *Prerequisite*: graduate standing.

Ecol 5350 - Seminar in Ecology - Exploration of topical issues in ecology, based on discussions of relevant literature. *Prerequisites*: graduate standing and consent of instructor.

Ecol 5380 - Bayesian Data Analysis - Bayesian statistical methods for analyzing data, with emphasis on ecological and biological data. Includes Bayes rule, basic Bayesian formulation (priors, posteriors, likelihoods), single-and multiple-parameter models, hierarchical models, generalized linear models, multivariate models, mixture models, models for missing data, merging statistical and process models, and introduction to computation methods. Cross listed with BOT/STAT 5380. *Prerequisites*: at least 2 semesters of calculus and one semester of statistics.

Ecol 5500 – Quantitative Analysis of Field Data - A practical guide to the analysis of messy field data, including data exploration, generalized linear and additive models, mixed models, autocorrelation, and

model selection using Program R. Students will spend one intensive week learning methods and the rest of the semester analyzing their own data and writing a manuscript. Cross listed with Zoo 5890/5500. *Prerequisite:* graduate standing.

Ecol 5540 - Microbial Diversity and Ecology - Introduces the diversity and ecology of soil microbes through an integrated lecture and laboratory course. Emphasis on molecular approaches to analyzing microbial diversity and evolution, and student-directed experimental design. Provides a continuum of realistic research experiences in molecular microbial ecology, from field work to evolutionary analysis of DNA sequence data. Cross listed with MOLB 5540. *Prerequisite:* MOLB 2210.

ECOL/REWM 5610 - Quantitative Modeling in Landscape Ecology - Emphasis on quantitative, spatial analysis of landscapes and application of these quantitative tools to making sound management decisions. Work with real data, acquire high-level quantitative skills, develop problem-solving skills, and discuss management application of model results. Analysis will encompass abiotic, biotic (plant and animal), and human use of ecological systems in a spatial context. Cross listed with REWM 5610. *Prerequisite:* upper division stats course (e.g., STAT 4015 or STAT 4025) and graduate standing. Offered even fall semesters.

Ecol 5620 - Advanced Topics in Ecology - Provides advanced treatment of specific topics in ecology that are not covered in regular courses. *Prerequisites:* graduate standing and consent of instructor. Courses may include: “Tropical Ecology”, “Conservation Genomics”, “Population Genetics”, “Habitat Ecology”, and “Funding Success with NSF” among others.

Ecol/REWM 5650 – Landscape Genetics - Landscape Genetics provides a unique opportunity for interdisciplinary training and international collaboration uniting some of the most active landscape genetics groups in North America and Europe. A key objective of landscape genetics is to study how landscape modification and habitat fragmentation affect organism dispersal and gene flow across the landscape. Meeting this and other landscape genetic objectives requires highly interdisciplinary specialized skills making intensive use of technical population genetic skills and spatial analysis tools (spatial statistics, GIS tools and remote sensing). To bring these diverse topics and skills together effectively, we are using a distributed model of teaching. Offered even spring semesters.

Ecol 5745 - Terrestrial Ecosystem Ecology - Advanced course examines fundamental ecosystem functions and their relationship to ecosystem structure using a systems approach. We study cycles of carbon, water and nutrients through ecosystem components with an emphasis on interactions among plants, soil, and the atmosphere. Current readings focus on responses of terrestrial ecosystems to global climate change and human disturbance. Cross listed with BOT 5745. *Prerequisite:* one course in ecology.

Ecol 5780 - Research in Ecology - Designed for doctoral students pursuing exploratory research before they have determined a dissertation project, and for students to pursue independent research that will not comprise part of their dissertation. Research must be conducted under supervision of an Ecology Faculty member or Affiliate. *Prerequisite:* admission to doctoral Program in Ecology.

Geography

Geog 4040 – Conservation of Natural Resources - Geographically analyzes conservation of natural and human resources, as well as political, social and ethical ramifications of our environmental policy. Cross listed with BOT & ENR 4040. *Prerequisites:* 6 hours of GEOG courses or ENR.

Geog 4200 – Intro to GIS - Students must enroll in a laboratory section Basic theories and application in Geographic Information Systems and computer analytical techniques. *Prerequisites:* G&R 2150 or consent of instructor. (Normally offered fall semester) (A)

Geog 4220 – Spatial Modeling - Examines the theory and development of models of spatial patterns and process. Modeling these systems often requires techniques not readily available in a GIS environment. Examines GIS and geocomputational methods to solve these problems as well as issues related to error, representation, and scale. Dual listed with GEOG 5220. *Prerequisite:* GEOG 4200/4210.

Geog 4340 – Resource Management on Reservations - Designed to examine natural resource management techniques on western reservations. Topics to be discussed will focus on the management and planning of water, grazing, extractive industries and forestry. Field work on the Wind River Indian Reservation is a part of the class. Cross listed with AIST 4340. *Prerequisites:* 6 hours of 2000-level AIST classes.

Geog 4460 – Biogeography - A systematic study of the distribution of plants and animals, communities and ecosystems, the processes that produce patterns of distribution and their change over time. Interactions of climate, soil geomorphology, biota and human activities are emphasized. *Prerequisites:* junior standing and GEOG 1010 or LIFE 2022 or 2023. (P, R)

Geog 5060 - Landscape Ecology - A study of structure, function, and change in the biosphere on the scale of kilometers. Includes a consideration of the effects of human land uses, natural disturbances, and other processes on landscapes. *Prerequisite:* GEOG 4460 or LIFE 3400 or BOT 4700.

Geog 4470/5470 - Fire Ecology - Natural and human-caused fires are an important phenomenon affecting ecosystems and human communities throughout the world. Explores the geography, ecology, and management of fires. Dual listed with GEOG 5470. *Prerequisite:* GEOG 4460, BOT 4700, LIFE 3400 or graduate standing. (P, R)

GEOG 4540/5540 – Topics in Cultural Ecology - Examines selected topics of human-environment interaction from a cultural ecological perspective. May be repeated for a maximum of 6 credits under different course topics. Dual listed with GEOG 5540. *Prerequisites:* junior standing and 4 hours biological or earth science and 6 hours social science. (H)

Geology

Geol 2050 - Principles of Paleontology - Examines scientific principles, biological and geological, that underlie general study of ancient life on Earth. Includes interactions of evolutionary, stratigraphic, taphonomic and paleogeographic concepts within various approaches to paleobiology and systematic paleontology. Optional field trip. *Prerequisite:* GEOL 1100 or LIFE 1000 or 1010. (Normally offered spring semester)

Geol 5200 – Topics in Geology - Provides a detailed study at a graduate level of a particular topic in geology. *Prerequisite:* graduate standing in geology and geophysics and permission of the instructor (includes courses like Paleoecology, Paleoclimatology, etc.).

Geol 5525 – Environmental Data Analysis- Explores fundamentals of environmental data analysis including the display and description of data, uncertainty propagation, statistical significance and power, t-tests, ANOVA, time series, serial correlation, multiple regression, and sample collection strategies. Students must enroll in a computer-based lab session and complete a term project involving real-world problems in data analysis. Cross listed with ENR 4525. *Prerequisites:* C or higher in STAT 2050, STAT 2070, or MATH 2200; junior standing; at least one upper-division course in the natural sciences or a related field.

Ecosystem Science and Management

Rewm 4200 – Reclamation of Drastically Disturbed Lands - Overviews reclamation of drastically disturbed lands in the west, emphasizing surface mined lands. Includes principles of ecology, agronomy, soils and other relevant disciplines as applied to mitigate adverse environmental impacts of land disturbance. Prerequisite: LIFE 3400, AECL 2100. (Normally offered fall semester)

Ento 4300/5300 – Applied Insect Ecology - Examines concepts of insect ecology and their application to the management of agricultural and rangeland insect pests. Control of rangeland weeds using insects in also examined. Covers population dynamics, predator-prey and insect-plant interactions, biological control and integrated pest management. Prerequisite: ENTO 1000 or 9 hours of biology or ecology-related coursework.

Rewm 4580/5580 - Rangeland Restoration Ecology - Detailed analysis of various disturbed ecosystems unique to western rangelands. Primary emphasis on plant community restoration following degradation from edaphic, biotic, hydrologic, and topographic influences on degradation and strategies for vegetative rehabilitation. Strong focus on current research to formulate restoration strategies. Dual listed with REWM 5580. Prerequisites: REWM 4850 or 4200, BOT 4700.

Ento 4678/5678 – Aquatic Entomology - Emphasizes biology, ecology, distribution and taxonomy of aquatic insects. Includes aquatic insects as indicators of pollution. Students must make and identify a collection of immature aquatic insects. Dual listed with ENTO 5678. Prerequisite: ENTO 1000, 1001. (Normally offered fall semester of even-numbered years)

Ento 4685/5685 - Insect/Plant Interactions – Ecology of insect-plant interactions, including host finding and utilization and plant response to insect feeding. Aspects of chemical/physiological ecology, and management of insects using biologically-based techniques are addressed. Examples from various terrestrial systems, including cultivated lands, grasslands, and forest systems, are used. Dual listed with ENTO 5685. Prerequisites: one year of basic biology; course work in entomology and botany recommended. (Normally offered fall semester of even-numbered years)

Rewm 4750/5750 – Wildlife Habitat Restoration Ecology - Emphasis on fundamental and applied aspects of restoration ecology for terrestrial wildlife habitats following anthropogenic and natural disturbances. Although the course overviews theoretical concepts applicable to many systems, there is a focus on applications for wildlife habitats in western North America. Prerequisites: REWM 4330 and 4850.

Bot/Rnew 4775/5775 – Forest Ecology - Integrative study of the structure, function, and ecological diversity of forested ecosystems, and the physical factors that influence this diversity, including emergent properties of energy flow and nutrient cycling. Special emphasis is given to understanding forest disturbances and succession, and implications for impacts of management and sustainability are discussed throughout. Cross listed with BOT 4775. Prerequisite: LIFE 3400.

Rnew 5500 – Stable Isotope Ecology - Application of stable isotope measurements to organismal and systems ecology. Lectures address the theory underlying the use of stable isotopes at natural abundance levels as tracers and integrators of important physiological and ecological processes. Laboratory exercises provide hands on experience with stable isotope ratio measurements. Prerequisite: graduate classification in a natural science or agriculture discipline.

Rnew 5540 – Shrubland Ecology - Ecology of shrub-dominated lands and shrub species in grasslands. Location, importance and environmental constraints of shrub distributions. Topics include herbivory, woody plant invasions, competitive interactions, monitoring and population dynamics. Emphasizes

familiarity with scientific literature. Prerequisite: REWM 3000, 4800, BOT 4700. Offered spring of even years.

Rewm 5800 – Experiments in Restoration - A graduate-level course for students with interests in rangeland ecology, botany, and animal science/zoology. This course will examine the current status of restoration science and the application of ecological theory in restoration ecology. Namely, how have restoration ecologists incorporated ecological theory in research? Emphasis on concepts of population genetics, metapopulation biology and ecosystem science, food webs, biodiversity and invasion, conceptual models, experimental design and climate change. Prerequisites: STAT 2050 (or equivalent), LIFE 3400 (or equivalent), graduate standing.

Rewm 5830 – Wildlife Habitat Ecology - For students in animal ecology, wildlife science, or rangeland ecology emphasizing the relationships between wildlife populations and their habitats. Emphasis on concepts forming the basis of wildlife habitat ecology including habitat and niche, carrying capacity, habitat measurements, resource selection, habitat-relationships modeling, habitat management, and habitat restoration. *Prerequisites:* STAT 2050 (or equivalent) and graduate standing.

Ento 5882 - Insect Population Biology - Study of quantitative ecological processes as they relate to the ecology of pest populations, including pesticide resistance, pest outbreaks, biological control and integrated pest management. Prerequisite: ENTO 5683 or LIFE 2400.

Rnew 5990 – Advanced Topics - Special topics pertaining to renewable natural resource management. Intended to accommodate instruction in various specialized subjects not offered on a regular basis. Students may enroll in more than one section of this course provided topics are different. Dual listed with RNEW 5990. *Prerequisites:* consent of the instructor to pursue study of the topic.

Zoology & Physiology

Zoo 4190 – Comparative Environmental Physiology - Studies and interprets principles of physiology which adapt animals to various environmental constraints. Introduces discipline which has risen between traditional fields of physiology and ecology and provides understanding of animal distribution and survival. Fulfills degree requirements in physiology subsection for the zoology major. Dual listed with ZOO 5190. *Prerequisites:* LIFE 2022 or LIFE 2023 and CHEM 1030 or CHEM 1060.

Zoo 4300/5300 - Principles of Wildlife Ecology & Management - Integrates concepts of vertebrate ecology with the art of wildlife management, stressing approaches to deal with the inherent uncertainty of managing populations. Strategies to increase or decrease populations of target species, tools used to determine population status (e.g., viability analysis, monitoring, habitat assessment), and ecosystem management approaches. Laboratory included. Dual listed with ZOO 5300. *Prerequisite:* LIFE 3400. (Offered fall semester)

Zoo 4310/5310 - Fisheries Management - Acquaints students with theory and techniques of inland fisheries management. Includes methods of evaluating growth and production, rates of mortality and recruitment and use of yield models in fisheries biology. Includes laboratory and field exercises. Dual listed with ZOO 5310. *Prerequisite:* ZOO 4330. (Normally offered fall semester)

Zoo 4330/5330 – Ichthyology - Anatomy, physiology and classification of fishes, emphasizing classification and identification of Wyoming fishes. Includes laboratory. Dual listed with ZOO 5330. *Prerequisite:* LIFE 2022. (Normally offered spring semester).

Zoo 4350/5350 – Ornithology - Acquaints students with classification, identification, morphology, distribution, natural history and ecology of the birds of North America. Includes laboratory. Dual listed with ZOO 5350. *Prerequisite:* LIFE 2022. (Normally offered spring semester)

Zoo 4370/5370 – Mammalogy - Studies mammals of the world, emphasizing natural history, distribution, taxonomy, ecology and morphology of mammalian species. Includes laboratory. Dual listed with ZOO 5370. *Prerequisite:* LIFE 2022. (Normally offered fall semester)

Zoo 4380/5380 – Herpetology - Introduces the ecology, behavior, morphology, evolution, systematics and conservation of reptiles and amphibians. Dual listed with ZOO 5380. *Prerequisite:* LIFE 2022.

Zoo 4400/5400 - Population Ecology - Explores quantitative ecology of animal populations, emphasizing theoretical and empirical work. Provides modern coverage of principles of population ecology for wildlife majors and others who expect to deal with ecological problems in their careers. Dual listed with ZOO 5400. *Prerequisites:* LIFE 1010, 3400 and STAT 2050.

Zoo 4415/5415 – Behavioral Ecology - Behavioral ecology applies empirical and theoretical approaches to ecological and evolutionary underpinnings for behaviors ranging from foraging and predation to social grouping and mating systems. Emphasizes comparative analyses (what phylogenetic patterns exist across diverse species?) as well as genetic/fitness benefits (how do individuals benefit from apparently puzzling behaviors?): ZOO 3600 or LIFE 3400 or permission of the instructor. (Normally offered fall semester of odd-numbered years).

Zoo/Bot 4420 - Conservation Biology - Addresses the broadest environmental issues facing society (habitat loss, invasion, overexploitation) and the mechanisms driving them, with particular attention to the Intermountain West. Through computer exercises, students also learn how to evaluate conservation efforts and make management recommendations. Cross listed with ZOO & ENR 4420. *Prerequisites:* LIFE 3400 and one of the following: ENR 3500, STAT 2050, or STAT 2070.

Zoo 4440 - Limnology (+4430 Limnology Laboratory) - Studies ecology of inland waters; biological, chemical and physical features on lakes and streams. *Prerequisites:* LIFE 1010, 2400 and one year of chemistry or consent of instructor. (Offered fall semester)

Zoo 4540/5540 - Invertebrate Zoology - Studies major invertebrate phyla of the animal kingdom. Studies each phylum with respect to morphological and taxonomic characteristics; functional and evolutionary relationships; environmental adaptations; life cycles of representative types. Includes laboratory. Dual listed with ZOO 5540. *Prerequisite:* LIFE 2020 or 2022. (Offered fall semester)

Zoo 4650/5650 - Tropical Field Ecology - Course comprises 10 days in Ecuador in January (before Spring semester), followed by one lecture per week during Spring semester. Focus will be ecology, biodiversity and conservation of tropical forests and behavioral ecology of birds and mammals. Field site is at 1100m on west slope of the Andes. *Prerequisite:* LIFE 2022 (graduate standing for 5650 credit).

Zoo 5520 – Habitat Selection - In this course we will cover theory and behavioral/evolutionary concepts related to the process of habitat selection, the contexts under which habitat choices are adaptive or maladaptive, and different types of anthropogenic habitat change and the consequences for animals in the wild. *Prerequisite:* Graduate students in good standing.

Zoo 5690 – Advanced Animal Behavior - An advanced consideration of research in, and theory of, animal behavior. *Prerequisite:* senior or graduate standing in zoology or psychology.

Zoo 5840 - Advanced Fisheries Management – Advanced study of theory and quantitative techniques related to managing freshwater fisheries. Emphasis will be placed on current research topics relevant to fisheries management. Prerequisite: ZOO 4310/5310 and consent of instructor.

Zoo 5890 - Seminar on Ecological Topics - Provides an opportunity for graduate students to critically evaluate publications on zoological research. *Prerequisite:* 20 hours of biological sciences. Courses may include “Art of Science Communication”, “Advanced Stream Ecology”, and “Advanced Evolutionary Biology” among others.

Humanities

Wmst 4450/5450 – Ecofeminism - Focus is on issues of gender, women and ecology. Ecofeminist thinkers argue that there is no liberation for women and no solution to the ecological crisis without a fundamental shift in relationships of domination. Uniting the two movements results in a radical reshaping of modern socioeconomic relations. Dual listed with WMST 5450. *Prerequisite:* 6 hours in WMST, PHIL, and/or ENR.

Social Sciences

Econ 4420 – Seminar: Economics for ENR - For students with little or no background in economics interested in economic perspectives on ENR. Emphasis is on integrated ecology-economics approach to investigate the economics environmental services, biological resources, and the ecosystems that contain them. CBEC and ECON majors cannot earn upper-division economics credit for this course. *Prerequisites:* successful completion of QB and senior standing.

Statistics

Stat 4015/5015 – Regression Analysis - Contains standard topics, as well as some newer and more unconventional ones. Oriented towards analysts who use computer packages for problem solutions. Includes balance of application and theory. *Prerequisites:* STAT 3050 or equivalent.

Stat 4045/5045 – Categorical Data Analysis - Applied methods for analyzing associations when some or all variables are measured in discrete categories, not continuous scales. Topics include the binomial, multinomial, and Poisson probability models, parameter estimation and hypothesis-testing about proportions, measures of association and tests for contingency tables, logistic regression, and long-linear models. *Prerequisites:* two courses in statistics.

Stat 4360/5360 – Spatial Statistics - Emphasis is on a generalized linear model approach to the modeling of continuous data, placing model building and the various kriging methods into a single conceptual framework. *Prerequisite:* STAT 4010.

Stat 5025 – Design and Analysis of Experiments 1 - Reviews design and analysis of one-factor experiments and introduces multifactor experiments, Latin squares, nested designs, and random effects. Includes topics such as polynomial response curves, trend analysis, split plots and incomplete blocks as time permits. Dual listed with STAT 4025. *Prerequisite:* STAT 3050 or equivalent.

Stat 5050 – Stat Methods for Biological Science - General statistical analyses and their application to the biological and behavioral sciences. Analysis of variance, regression and correlation methods are studied from a data analytic perspective, emphasizing the conceptual understanding of where and when these techniques should be used and the interpretation of their results. Available computer programs will be

utilized. Credit cannot be earned in more than one of the following courses: STAT 3050, 5050, 5060, 5070. Cross listed with ZOO 5050. *Prerequisite*: one course in statistics (all introductory courses except 2000).

Stat 5055 – Stat Methods for Bio II - The statistical toolkit (regression and ANOVA-driven) of methods applicable to the biological and behavioral sciences will be extended to include multiple logistic regression, power and sample size considerations, and computer-intensive methods such as bootstrapping and randomization tests, which will considerably expand the repertoire of methods that a person could use. *Prerequisite*: STAT 5050 or equivalent.

Stat 5080 – Methods for Ag and Nature - Brief review of statistical principles. Use of SAS programming. Numerous analysis of variance techniques along with commonly-used experimental designs. Multiple mean comparison, linear contrasts, power of F test, simple linear regression, polynomial regression, analysis of covariance, and some categorical data techniques for students in the agriculture and natural resources sciences. Credit cannot be earned in more than one of the following courses: STAT 2110, 3050, 5050, 5060, 5070, 5080. Cross listed with ENTO 5080. *Prerequisite*: STAT 2050 or equivalent.

Stat 5300 – Applied Multivariate Analysis - The application of multivariate statistical methods in behavioral science research. Topics include: multivariate regression, canonical correlation, discriminate analysis, factor analysis and multivariate regression, canonical correlation, discriminate analysis, factor analysis and multidimensional scaling. A wide range of computer assistance is incorporated. *Prerequisite*: STAT 5050, 5060, 5070, 5080.

Stat 5380 – Bayesian Data Analysis - Bayesian statistical methods for analyzing various kinds of data. Topics include basic Bayesian ideas and model formulation (priors, posteriors, likelihoods), single- and multiple-parameter models, hierarchical models, generalized linear models, multivariate models, survival models and an introduction to computation methods. *Prerequisites*: at least 2 semesters of calculus and one semester of statistics at or beyond the 4000 level.

Honors Program

HP 4152: Cloud Forest Ecology - The class covers high-elevation tropical forest ecology. Topics include: tropic webs, insects and plant community structure, plant defense mechanisms against herbivory, canopy structure and epiphytes, and the evolution of crypsis, aposematism, and mimicry systems. We fly to Quito, Ecuador, where students experience Ecuadoran culture including restaurants, native marketplaces, historical architecture and cathedrals, as well as visiting the equator. From Quito we travel by bus to Cosanga and onwards by foot to the Yanayacu Research Station, where most of the course will be conducted. After orientation hikes and practical teaching along the trails, all students conduct independent research projects in the cloud forest. 3 credits; can be a non-honors program graduate student to enroll. Usually taught in May or June.

Other

PATB/ENR 5240– Disease Ecology- This course will help students build knowledge, critical thinking skills, and tools for applying the interdisciplinary science of Disease Ecology in:

- How interactions among species, ecosystems, human systems, and abiotic components of the environment affect patterns and processes of disease,
- Considerations for coevolution of hosts and pathogens, conservation biology, models used to understand disease dynamics,
- Approaches to manage and control disease in animals, plants, and humans

Cross-listed with PATB/ENR 4240. Pre-requisites: LIFE 2022 or 2023 and STAT 2050 or 2070, or permission of instructor.

PATB 5120—Topics in Conservation Genomics- For graduate students and postdocs interested in learning more to apply diverse sets of genomic tools to natural population conservation and management. Your choice of 1-3 units: 1 unit- Journal article discussion and group activities to build understanding of applications, science and art of applying genomic DNA analyses to wild organism conservation. One hour class time per week. 2-3 units- the activity listed above, plus active student participation (provide presentations and study assignments) and additional 30-60 min class time per week. Cross-listed with ECOL 5620.