Agroecology/Microbiology

Micr 4140/5140 – Soil Microbiology - Fundamental principles of soil microbiology and how they relate to microbial ecology, environmental contamination, agriculture and forestry. Cross listed with SOIL/AECL 4140. 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 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 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. Dual listed with AECL 4400; cross listed with RNEW 5400. Prerequisite: LIFE 3400.

Botany

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

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 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. Dual listed with BOT 4700. 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 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.
Ecology

**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 5550 - Ecology as a Scientific Profession** - A capstone that prepares doctoral students for success and leadership in their careers as professional ecologists. Intended for students enrolled in the doctoral Program in Ecology in their second or third year. *Prerequisite:* graduate standing.

**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.

**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 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 3110 - Invertebrate Paleontology - Encompasses taxonomy and morphology of major groups of invertebrate fossils. Includes examples of their use in correlation, environmental reconstruction and interpretation of evolution. Prerequisite: GEOL 1200. (Normally offered spring semester)

Geol 4150 - Paleontology of Lower Vertebrates - Explores evolutionary histories of lower vertebrates including fishes, amphibians, reptiles and birds. Optional field trip. Prerequisites: acceptable previous training in geology or zoology, 12 hours of biology and/or geology or ZOO 4000. (Normally offered every third year)

Geol 4160 - Paleontology of Early Mammals - Examines evolutionary histories of mammals characteristic of Mesozoic era, plus Cenozoic monotremes and marsupials, as documented through fossil record study. Optional field trip. Prerequisites: 12 hours of biology and/or geology, ZOO 4000. (Normally offered every third year)

Geol 4170 - Paleontology of Cenozoic Placental Mammals - Explores evolutionary histories of placental mammals characteristic of Cenozoic era as documented through fossil record study. Optional field trip. Prerequisite: 12 hours of biology and/or geology or ZOO 4000. (Normally offered every third year)

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.).

Renewable Resources

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.

Rnew 4510/5510 – Research Planning in Renewable Resources - An interdisciplinary course examining the process and nature of scientific inquiry in renewable resources. Topics include: types of inquiry, forming and testing hypotheses, literature review, methodology, data summary and scientific writing. Each student prepares a study plan, grant, research proposal, journal article, or initial thesis draft. Writing is emphasized. Dual listed with RNEW 5510. Prerequisite: basic training in renewable resources, ecology or related discipline.
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. Dual listed with REWM 5750. 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.

Rewm 5280 – Stream Habitat Management - Trains students in planning, design, implementation and evaluation of stream rehabilitation measures. Includes principles of ecology, hydrology, and river processes as applied to mitigate adverse environmental impacts to watersheds and river systems.

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.

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.

**Zoology & Physiology**

**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: ZOO 4330. (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. (Normally offered spring semester)

**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?). Dual listed with ZOO 5415. Prerequisites: ZOO 3600 or LIFE 3400 or permission of the instructor. (Normally offered fall semester of odd-numbered years).
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 4560/5560 – Quantitative Conservation Biology - Covers the application of ecology and genetics to conservation biology, emphasizing the use of mathematical analysis and quantitative thinking. Includes mathematical homework, discussion sections, computer labs, and independent student projects. Dual listed with ZOO 5560. Prerequisite: approval of instructor.

Zoo 5430 – Ecology of the Greater Yellowstone Ecosystem - Covers plant and animal community ecology from both a qualitative and quantitative perspective. Topics include: community interaction of plants and animals; community dynamics, succession, and disturbance; basic data collection and statistical analysis of habitat association data; and the effect of abiotic factors on community structure. Prerequisite: LIFE 2022, 3400, and graduate standing.

Zoo 5840 - Advanced Fisheries Management - Familiarizes students in wildlife management and ecology with the advanced methods and techniques in 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.

Humanities

Amst/Art 4640 – Art and Ecology - Focuses on the intersection of contemporary art with ecological concerns. Readings present philosophical, historical and cultural aspects of the art/ecology relationship; students reflect and question their own beliefs. Examples of art/artists are reviewed as well as how ecological artwork is developed. Students propose solutions and/or create art in, out of, or about the environment; local sites are encouraged. Prerequisite: 6 hours of ART and/or AMST or consent of the instructor.

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.

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.