

**FISHERIES
AND WILDLIFE**

FW

**Department of Fisheries
and Wildlife
College of Agriculture and
Natural Resources**

**101 Fundamentals of Fisheries and Wildlife Ecology
and Management**

Fall, Spring. 3(3-0)
Ecological and sociological concepts of fisheries and wildlife ecology and management. Career opportunities.

**101L Fundamentals of Fisheries and Wildlife Ecology
and Management Lab**

Fall. 2(0-4) P: FW 101 or concurrently R: Open to undergraduate students in the Fisheries and Wildlife major or in the Lyman Briggs Fisheries and Wildlife Coordinate major.

Natural history and ecology of primary terrestrial, wetland, and aquatic ecosystems. Species and communities in Michigan and the United States. Species identification in various ecosystem types. Impacts of disturbances on ecosystems. Field trips required.

**110 Conservation and Management of Marine
Resources**

Spring. 3(3-0)
Marine environment, resource distribution, and human impacts on selected marine commercial fisheries. Conflicts in management goals between government and industry. Management goals and techniques in preserving and conserving marine resource biodiversity.

**181 Introduction to Science, Technology, the
Environment and Public Policy**

Fall. 3(3-0) Interdepartmental with Lyman Briggs and James Madison College. Administered by Fisheries and Wildlife.

Relation of science and technology to ethics and public policy. Environmental law and public policy. Managing fish, water and wildlife resources at state, national, and international levels. Science and technology in developing countries. Impacts of military technology on environmental policy.

207 Great Lakes: Biology and Management

Spring. 3(3-0) Interdepartmental with Community Sustainability. Administered by Fisheries and Wildlife.

Living aquatic resources of the Great Lakes, environmental history, and biological resources and their management. Policy issues.

**224 Introduction to Probability and Statistics for
Ecologists**

Spring. 3(2-2) Interdepartmental with Statistics and Probability. Administered by Statistics and Probability. P: MTH 103 or MTH 116 or (MTH 124 or concurrently) or (MTH 132 or concurrently) or (MTH 152H or concurrently) or (LB 118 or concurrently) RB: BS 162 or BS 182H or LB 144 SA: FW 324 Not open to students with credit in STT 231.

Probability and statistics with computer applications for the analysis, interpretation and presentation of ecological data. Data analysis, probability models, random variables, estimation, confidence intervals, test of hypotheses, and simple linear regression with applications to ecology.

**238 Introductory Fisheries and Wildlife Field
Experience**

Summer of odd years. 3(1-4) RB: Introductory Biology, Botany, Zoology, Forestry, Natural Resources, Plant Biology, Fisheries and Wildlife course R: Approval of department; application required.

Terrestrial and aquatic field research techniques and their application to current issues. Interaction with professionals. Field trips required.

**278 Introduction to Conservation, Recreation and
Environmental Enforcement**

Fall. 1(1-0) Interdepartmental with Community Sustainability. Administered by Community Sustainability. R: Not open to freshmen.

Scope, history and application of conservation, recreation and environmental law enforcement at the international, federal, state and local level. Integration with traditional policing, resource management and public lands. Career opportunities.

**293 Undergraduate Seminar in Fisheries and
Wildlife**

Fall, Spring. 1(0-2) P: FW 101 or concurrently R: Open to undergraduate students in the Fisheries and Wildlife major or in the Lyman Briggs Fisheries and Wildlife Coordinate major.

Professional development and discussion of current case studies to prepare students for a career in Fisheries and Wildlife.

341 Nature and Environmental Writing

Fall of even years. 3(3-0) Interdepartmental with Writing, Rhetoric and American Cultures. Administered by Writing, Rhetoric and American Cultures. P: Completion of Tier I Writing Requirement R: Open to undergraduate students in the Department of Forestry or in the Professional Writing major or in the Fisheries and Wildlife major or approval of department. SA: AL 341

Place-based writing that engages the environmental imagination, shaped by the variety of human relationships with place.

364 Ecological Problem Solving

Fall, Spring. 3(2-2) P: ((MTH 124 or concurrently) or (MTH 132 or concurrently) or (LB 118 or concurrently)) and (STT 224 or STT 231 or STT 421) and (IBIO 355 or BE 230)

Application of ecological concepts and models to problems in natural resource and ecosystem management.

368 Zoo Animal Biology and Conservation

Summer. 3(3-0) Interdepartmental with Animal Science and Integrative Biology and Landscape Architecture. Administered by Integrative Biology. P: BS 162 or LB 144 or BS 182H or approval of department RB: Previous work in biology

Captive animal biology including illustrated examples of care, behavioral welfare and conservation work.

369 Introduction to Zoo and Aquarium Science

Spring. 3(3-0) Interdepartmental with Integrative Biology and Landscape Architecture and Veterinary Medicine. Administered by Integrative Biology. P: BS 162 or LB 144 or BS 182H SA: ZOL 369

Fundamentals of zoo and aquarium operations including research, interpretation, design, nutrition, captive breeding, conservation, ethics and management.

370 Introduction to Zoogeography

Fall. 3(3-0) Interdepartmental with Geography and Integrative Biology. Administered by Integrative Biology. P: IBIO 355 SA: ZOL 370

Patterns of geographical distribution of animals and the ecological and historical processes leading to these patterns.

410 Upland Ecosystem Management

Spring. 3(2-3) P: (IBIO 355 or FOR 404) or completion of Tier I writing requirement

Analysis and management of upland ecosystems to meet wildlife management and biodiversity objectives. Mitigation of human impact. Field trips required.

**413 Wildlife Research and Management
Techniques**

Fall. 3(2-3) P: (FW 101L or FW 238) and completion of Tier I writing requirement

Field techniques used in collecting, analyzing, and communicating data on wild animal populations and their habitats. Field trips required.

414 Aquatic Ecosystem Management

Fall. 3(3-0) P: (IBIO 355) and completion of Tier I writing requirement

Management of aquatic habitats and populations for ecological and socioeconomic objectives; human impacts on aquatic ecosystems.

416 Marine Ecosystem Management

Fall. 3(3-0) P: (IBIO 355) and completion of Tier I writing requirement RB: FW 110 or IBIO 303 or IBIO 353

Management of marine ecosystems and populations for ecological and socio-economic objectives. Anthropogenic impacts, mitigation, and marine resource conservation strategies. Field trips required.

417 Wetland Ecology and Management

Fall. 3(2-3) P: (IBIO 355) and completion of Tier I writing requirement SA: FW 412

Biological, physical, and chemical processes controlling wetland structure and function. Utilization, mitigation, and conservation of wetlands on a sustainable basis.

FW—Fisheries and Wildlife

- 419 Applications of Geographic Information Systems to Natural Resources Management**
Spring. 4(2-4) Interdepartmental with Biosystems Engineering and Forestry and Geography. Administered by Forestry. RB: GEO 221
Application of geographic information systems, remote sensing, and global positioning systems to integrated planning and management for fish, wildlife, and related resources.
- 420 Stream Ecology**
Fall. 3(3-0) Interdepartmental with Integrative Biology. Administered by Fisheries and Wildlife. P: IBIO 355 or approval of department RB: CEM 141
Biological and environmental factors determining structure and function of stream ecosystems.
- 422 Aquatic Entomology**
Fall of odd years. 3(2-3) Interdepartmental with Entomology and Integrative Biology. Administered by Entomology. P: BS 162 SA: ENT 420
Biology, ecology and systematics of aquatic insects in streams, rivers and lakes. Field trips and aquatic insect collection required.
- 423 Principles of Fish and Wildlife Disease**
Fall of odd years. 3(3-0) Interdepartmental with Large Animal Clinical Sciences. Administered by Fisheries and Wildlife. P: (BS 162 and BS 172) or (BS 182H and BS 192H) or LB 144 RB: Additional course work in ecology, zoology, microbiology or environmental science. R: Open to juniors or seniors or graduate students in the College of Agriculture and Natural Resources or in the College of Natural Science or in the College of Veterinary Medicine or approval of department.
Diseases of fish and wildlife species. Disease detection and diagnosis. Ecological and epidemiological analysis and management of major classes of wildlife diseases. Threatened and endangered species, game species, and fish and wildlife species that serve as vectors or reservoirs of human and domestic animal diseases.
- 423L Principles of Fish and Wildlife Disease Laboratory**
Fall of odd years. 1(0-3) Interdepartmental with Large Animal Clinical Sciences. Administered by Fisheries and Wildlife. RB: Additional laboratory course work in ecology, zoology, microbiology or environmental sciences. C: FW 423 concurrently.
Tools for diagnosis and assessment of disease in fish and wildlife populations.
- 424 Population Analysis and Management**
Fall. 4(3-2) P: (IBIO 355) and (STT 224 or STT 231 or STT 421) and (MTH 124 or MTH 132 or LB 118)
Statistical, ecological and management concepts and methods needed to analyze and interpret demographic data and manage fish and wildlife populations.
- 431 Ecophysiology and Toxicology of Fishes**
Spring of odd years. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and ((BS 162 or LB 144 or BS 182H) and completion of Tier I writing requirement) R: Not open to freshmen or sophomores.
Physiological processes and the effect of anthropogenic stresses on fishes. Fate of contaminants in the environment and biota. Individual, population and community effects. Temporal, spatial and scaling issues. Modeling tools and environmental risk assessment.
- 434 Human Dimensions of Fisheries and Wildlife Management (W)**
Fall. 3(2-2) P: (IBIO 355) and completion of Tier I writing requirement R: Open to juniors or seniors or approval of department.
Sociological implications of public policy and planning processes in fisheries and wildlife management.
- 435 Integrated Communications for the Fisheries and Wildlife Professional**
Fall. 3(3-0) P: Completion of Tier I writing requirement. R: Open to juniors or seniors or graduate students.
Role and practical application of communications for fisheries and wildlife professionals, which integrates public and media relations, community relations, social marketing, and courtroom testimony using a variety of communication tools including news releases, direct mail, storyboards, and business writing.
- 439 Conservation Ethics**
Spring. 3(3-0) P: Completion of Tier I Writing Requirement RB: Additional coursework in ecology, natural resources, philosophy, or environmental sciences. R: Open to juniors or seniors or graduate students.
Ethical concepts and arguments underlying natural resources.
- 443 Restoration Ecology**
Fall of odd years. 3(2-2) Interdepartmental with Biosystems Engineering and Integrative Biology and Plant Biology. Administered by Plant Biology. P: FOR 404 or PLB 441 or IBIO 355 RB: CSS 210 or BE 230
Principles of ecological restoration of disturbed or damaged ecosystems. Design, implementation, and presentation of restoration plans. Field trips required.
- 444 Conservation Biology**
Spring. 3(3-0) Interdepartmental with Integrative Biology. Administered by Fisheries and Wildlife. P: (IBIO 355 or FOR 404 or PLB 441) and completion of Tier I writing requirement
Ecological theories and methodologies to manage species, communities and genetic diversity on a local and global scale.
- 445 Biodiversity Conservation Policy and Practice**
Spring of even years. 3(3-0) Interdepartmental with James Madison College. Administered by Fisheries and Wildlife. P: Completion of Tier I Writing Requirement RB: ((EC 201 or concurrently) or (EC 202 or concurrently) or (EC 251H or concurrently) or (EC 252H or concurrently)) and an interest in Conservation Biology
Social, economic, and policy considerations. Approaches to conserve biodiversity.
- 449 Wildlife Policy**
Spring of odd years. 3(2-2) RB: IBIO 355 and FW 364 R: Not open to freshmen or sophomores or approval of department.
Controversial issues in wildlife policy. Science and political analysis drawing on ecology, economics, sociology. Argument analysis.
- 449L Wildlife Policy – Study Away**
Spring of odd years. 1(0-3) P: FW 449 or concurrently or approval of department; application required R: Not open to freshmen or sophomores.
Onsite examination of controversial issues of in wildlife policy. Field trip required.
- 450 International Environmental Law and Policy**
Spring. 3(3-0) Interdepartmental with James Madison College. Administered by James Madison College. RB: FW 181
Overview of concepts, actors, norms, laws, and institutions related to international environmental policy. Case studies on current global environmental issues.
- 452 Watershed Concepts**
Fall, Spring, Summer. 3(3-0) Interdepartmental with Agricultural Engineering and Crop and Soil Sciences and Forestry. Administered by Agricultural Engineering. RB: Organic chemistry SA: ESA 452, RD 452, CSUS 452
Watershed hydrology and management. The hydrologic cycle, water quality, aquatic ecosystems, and social systems. Laws and institutions for managing water resources.
- 454 Environmental Hydrology for Watershed Management**
Spring of odd years. 3(3-0) P: (MTH 124 or MTH 132 or LB 118) and ((PHY 183 or concurrently) or (PHY 231 or concurrently)) RB: IBIO 355 or concurrently
Effect of climate, topography, geology, soil, vegetation, and anthropogenic land uses on the amount, timing, and quality of water yield. Implications for fish and wildlife resource management. Field trips required.
- 460 Green Roofs and Walls**
Fall. 2(2-0) Interdepartmental with Geography and Horticulture and Planning, Design and Construction. Administered by Horticulture. P: HRT 203 or FW 101 or GEO 206 or PDC 120 or EGR 100 R: Open to juniors or seniors or graduate students.
Green roof and wall design and installation practices including plant species and substrates. Environmental impact, ecosystem services, integration with other environmental practices. Influence of economics, public policy, and industry organizations on the implementation of green roofs on a wide scale. Multidisciplinary nature of planning and implementation of successful green roof and wall projects.
- 461 Field Ecology of Disease Vectors**
Summer. 3(1-4) Summer: W. K. Kellogg Biological Station. Interdepartmental with Entomology. Administered by Entomology. RB: (ENT 460 or FW 463) or Courses in Epidemiology or Public Health. R: Not open to freshmen.
Collection and identification of arthropod vectors of human and animal diseases in Michigan. Assays for associated pathogens. Integration of disease ecology and public health responses to vector-borne disease.

- 463 Wildlife Disease Ecology**
Spring of even years. 3(3-0) Interdepartmental with Large Animal Clinical Sciences. Administered by Fisheries and Wildlife. P: IBIO 355 or approval of department RB: (FW 423) or additional course work in integrative biology, microbiology and environmental sciences. R: Open to juniors or seniors or approval of department. Not open to students with credit in FW 863.
Role of wildlife disease in ecological interactions. Factors underlying pathogen emergence. Disease modeling. Conservation medicine.
- 466 Natural Resource Policy**
Spring. 3(3-0) Interdepartmental with Environmental Studies and Agriscience and Forestry. Administered by Forestry. R: Not open to freshmen or sophomores.
Natural resources policy-making in the context of scientific, environmental, social, and legal-institutional factors. Historical evolution of policies and case studies of contemporary policy issues.
- 469 Biomonitoring of Streams and Rivers**
Summer of odd years. 3(2-3) Interdepartmental with Entomology. Administered by Entomology. P: BS 162 or LB 144
Practical field and lab rapid bioassessment methodologies used to sample and assess the biota of streams and rivers. Sampling and identification of fish, macroinvertebrates and other biota.
- 471 Ichthyology**
Spring. 4(3-3) Interdepartmental with Integrative Biology. Administered by Fisheries and Wildlife. P: {(BS 162 and BS 172) or (BS 182H and BS 192H) or LB 144} and Completion of Tier I Writing Requirement
Fish morphology and physiology. Development, behavior, evolution, and ecology. World fishes with emphasis on freshwater fishes. Field trips required.
- 472 Limnology**
Spring. 3(3-0) Interdepartmental with Integrative Biology. Administered by Fisheries and Wildlife. P: (CEM 141 or LB 171) and IBIO 355
Ecology of lakes with emphasis on interacting physical, chemical, and biological factors affecting their structure and function.
- 474 Field and Laboratory Techniques for Aquatic Studies**
Fall. 3(2-3) Interdepartmental with Integrative Biology. Administered by Fisheries and Wildlife. P: (FW 101L or FW 238) and completion of Tier I writing requirement SA: FW 470
Field and laboratory techniques for the investigation and analysis of lake and stream ecosystems and their biota. Field trips required.
- 479 Fisheries Management**
Spring. 3(2-2) P: IBIO 355 and (FW 364 or concurrently) or approval of department
Quantitative analysis of fish populations. Case study of ecological interactions linking fish to aquatic ecosystems and the challenge of balancing multiple human values in managing fisheries resources.
- 480 International Studies in Fisheries and Wildlife**
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 12 credits in all enrollments for this course. RB: IBIO 355 R: Approval of department; application required.
Fisheries and wildlife ecology and management study in regions beyond the United States. Ecological, economic, social, and cultural influences on fisheries and wildlife resources.
- 481 Global Issues in Fisheries and Wildlife**
Spring of even years. 3(3-0) Interdepartmental with James Madison College. Administered by Fisheries and Wildlife. P: Completion of Tier I Writing Requirement RB: EC 201 or EC 202 or EC 251H or EC 252H R: Open to juniors or seniors or graduate students.
Global issues and their impacts on implications for the management of fisheries and wildlife resources.
- 489 Seminar in Zoo and Aquarium Science**
Fall, Spring. 1(1-0) A student may earn a maximum of 3 credits in all enrollments for this course. Interdepartmental with Community Sustainability and Integrative Biology and Landscape Architecture. Administered by Integrative Biology. R: Approval of department. SA: ZOL 498
Scientific writing and oral presentations related to zoo and aquarium studies.
- 490 Independent Study in Fisheries and Wildlife**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. RB: BS 162 R: Not open to freshmen or sophomores. Approval of department; application required.
Supervised individual research and study in fisheries and wildlife.
- 491 Special Topics in Fisheries and Wildlife**
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Not open to freshmen or sophomores.
Selected topics of current interest and importance in fisheries and wildlife.
- 492 Interdisciplinary Studies in Conservation Medicine**
Spring. 4(4-0) Spring: Abroad. Interdepartmental with Integrative Biology. Administered by Integrative Biology. P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department.
Interdisciplinary studies focused on "health" as defined by the interactions of animal health, ecosystem health, and human health, viewed through the lens of human culture in an off-campus, multicultural setting.
- 492L Advanced Research Applications in Conservation Medicine**
Spring. 4(0-12) Spring: Abroad. Interdepartmental with Integrative Biology. Administered by Integrative Biology. P: (BS 161 and BS 162) or (BS 181H and BS 182H) or (LB 144 and LB 145) R: Approval of department.
Field and laboratory techniques for assessing and monitoring biodiversity and health of humans, animals, and ecosystems in an off-campus, multicultural setting. Tools and techniques will be drawn from ecology, microbiology, molecular biology, genetics, histopathology, bioinformatics and statistics.
- 493 Professional Internship in Fisheries and Wildlife**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. A student may earn a maximum of 6 credits in all enrollments for any or all of these courses: ABM 493, AEE 493, ANR 493, ANS 493, CMP 493, CSS 493, CSUS 493, EEP 493, FIM 493, FSC 493, FW 493, HRT 493, PKG 493, and PLP 493. P: FW 101 and FW 101L R: Approval of department; application required.
Supervised professional experiences in agencies and businesses related to fisheries and wildlife professions.
- 498 Internship in Zoo and Aquarium Science**
Fall, Spring, Summer. 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. Interdepartmental with Integrative Biology and Landscape Architecture. Administered by Integrative Biology. R: Open to juniors or seniors. Approval of department. SA: ZOL 498
Application of zoological experience in a zoo or aquarium setting outside the university.
- 499 Senior Thesis in Fisheries and Wildlife**
Fall, Spring, Summer. 2(2-0) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open to seniors in the Fisheries and Wildlife major. Approval of department.
Faculty-guided undergraduate research in Fisheries and Wildlife. Thesis required.
- 810 Human Dimensions Research in Fisheries and Wildlife**
Spring of odd years. 3(3-0)
Quantitative and qualitative methods of involving the public in fish and wildlife management. Human dimensions research and current case studies.
- 813 Natural Resources and Environmental Governance**
Fall of odd years. 3(3-0)
Relationship between governance frameworks and environmental protection and management. Assessment of political actors' impacts on natural resource management.
- 821 Conservation Medicine**
Fall of even years. 3(3-0) Interdepartmental with Large Animal Clinical Sciences. Administered by Fisheries and Wildlife. RB: Prior course work in vertebrate ecology, epidemiology and/or animal disease management. R: Open to graduate students or approval of department. SA: FW 823
Ecological and epidemiological principles of wildlife disease impacts and management. Critical review of selected case studies.
- 824 Analysis of Wildlife Populations**
Spring of even years. 3(2-3)
Statistical and ecological concepts, methods and computer techniques needed to analyze and interpret demographic data from fish and wildlife studies.

FW—Fisheries and Wildlife

- 828 Molecular Ecology and Conservation Genetics**
Fall of even years. 3(2-2) Interdepartmental with Integrative Biology and Plant Biology. Administered by Fisheries and Wildlife. RB: IBIO 341 or CSS 350 or ANS 314
Population and evolutionary genetic principles applied to ecology, conservation, and management of fish and wildlife at the individual, population, and species level.
- 829 Economics of Environmental Resources**
Spring. 3(3-0) Interdepartmental with Agricultural, Food, and Resource Economics and Community Sustainability and Economics and Forestry. Administered by Agricultural, Food, and Resource Economics. RB: Undergraduate intermediate microeconomics, calculus, and statistics SA: AEC 829
Economic principles, theoretical models, and empirical methods related to environmental problems and policy interventions. Applications to air, land, water, forests, energy, fish and wildlife, and climate change, including in developing countries.
- 836 Modeling Natural Resource Systems**
Spring. 3(3-0) Interdepartmental with Community Sustainability and Environmental Science and Policy. Administered by Community Sustainability. RB: ecology, statistics, and calculus SA: ACR 851, CSUS 851
System dynamics modeling in human-environment systems. Sustainability applications, including renewable and non-renewable resource use, greenhouse gas emissions and climate change, pollutants and limits to growth.
- 840 Landscape Ecology**
Spring of odd years. 3(2-2) RB: Knowledge or course work in the natural sciences, particularly ecological concepts, as well as exposure to GIS and data analysis.
Ecological patterns and processes. Spatial variation in landscapes at multiple scales as affected by natural causes and human activity. Landscape ecology in natural resource decision-making and management.
- 845 Environmental Risk Perception and Decision-Making**
Spring of odd years. 3(3-0) Interdepartmental with Criminal Justice and Environmental Science and Policy. Administered by Criminal Justice. R: Open to master's students or doctoral students in the School of Criminal Justice or in the Department of Fisheries and Wildlife or approval of school.
Theoretical underpinnings of individual decision-making and risk perception processes. Case studies of the interplay of risk perception and decision-making in an environmental and or criminological context.
- 846 Corporate Environmental Crime and Risk**
Spring of even years. 3(3-0) Interdepartmental with Criminal Justice and Environmental Science and Policy. Administered by Criminal Justice. R: Open to master's students or doctoral students in the Department of Fisheries and Wildlife or in the School of Criminal Justice or approval of school.
Theoretical accounts and multiple interventions relevant to corporate environmental crime and risk. Use of "Smart Regulation" principles to design interventions to match specific problems.
- 847 Global Risks, Conservation, and Criminology**
Fall. 3(3-0) Interdepartmental with Criminal Justice and Environmental Science and Policy. Administered by Criminal Justice. R: Open to graduate students or approval of school.
Theories, actors, characteristics and legal instruments associated with risk, conservation, and criminology related to globalization. Current case studies in criminological conservation.
- 849 Applied Bayesian Inference using Monte Carlo Methods for Quantitative Biologists**
Fall of even years. 3(2-2) Interdepartmental with Animal Science and Statistics and Probability. Administered by Fisheries and Wildlife. RB: (STT 814 and IBIO 851) or equivalent courses. R: Not open to undergraduate students.
Applications of Bayesian inference using software in quantitative biology and genetics. Hierarchical and non-hierarchical models. Model checking, model selection and model comparison. Markov chain Monte Carlo methods.
- 850 Applied Multivariate Statistical Methods**
Spring of even years. 4(3-2) Interdepartmental with Statistics and Probability. Administered by Fisheries and Wildlife. RB: (STT 422 or concurrently) and MTH 314 SA: FOR 976
Application of multivariate methods to research problems. Hotelling's T-test, profile analysis, discriminant analysis, canonical correlation, principal components, principal coordinates, correspondence analysis, and cluster analysis.
- 854 Uncertainty in Natural Resource Management**
Spring of odd years. 3(2-2) RB: IBIO 355
Methods and challenges associated with accounting for uncertainty in natural resource decision making. Decision analysis, structured decision making, and adaptive management.
- 858 Gender, Justice and Environmental Change : Issues and Concepts**
Fall. 3(3-0) Interdepartmental with Anthropology and Criminal Justice and Community Sustainability and Forestry and Geography and Sociology and Women's Studies. Administered by Community Sustainability. RB: Background in social science, environmental science, or natural resources.
Issues and concepts related to gender, ecology, and environmental studies. Key debates and theoretical approaches to addressing environmental issues from a gender and social justice perspective. Gender and environment issues and processes from a global perspective.
- 859 Gender, Justice, and Environmental Change: Methods and Application**
Spring. 3(3-0) Interdepartmental with Anthropology and Community Sustainability and Forestry and Geography and Sociology and Women's Studies. Administered by Anthropology. RB: Background in social science, environmental science, or natural resources.
Methods and case studies related to gender, ecology, and environmental studies. Methodological and fieldwork issues from a feminist perspective in international and intercultural contexts. Qualitative and quantitative methods for integrating social and environmental data.
- 863 Wildlife Disease Ecology**
Spring of even years. 3(3-0) Interdepartmental with Integrative Biology and Large Animal Clinical Sciences. Administered by Fisheries and Wildlife. RB: Additional course work in ecology, zoology, microbiology and environmental sciences. R: Open to graduate students. Not open to students with credit in FW 463.
Role of wildlife disease in ecological interactions, factors underlying pathogen emergence, mathematical modeling of infectious diseases, conservation medicine.
- 868 Water Policy and Management**
Fall of odd years. 3(3-0) RB: Familiarity with biological and ecological science and environmental policy issues. SA: FW 468
Environmental policy issues associated with the use, management, and protection of water resources and aquatic ecosystems. Case studies in water science and management.
- 869 Community and Conservation**
Fall of even years, Summer of even years. 3 credits. Interdepartmental with Resource Development and Sociology. Administered by Sociology. RB: Social Science methods, social science theory and environmental coursework.
Use of experiential, participatory, field-based mode of inquiry to develop understanding of social and cultural issues associated with conservation. Understanding of different social positions and perspectives.
- 870 Spatial Ecology**
Fall. 3(2-2) Interdepartmental with Forestry. Administered by Forestry. RB: (ZOL 851 or concurrently) or Equivalent
Science of understanding and predicting ecological patterns in space.
- 876 Advanced Fish Ecology**
Fall of odd years. 3(2-2) RB: (IBIO 355, FW 471 and FW 479) or Ecology, Biology of Fish (Ichthyology), and Fish Management R: Open to graduate students or approval of department.
Advanced ecology of fishes in freshwater and marine ecosystems.
- 877 Fish Population Dynamics**
Spring of even years. 4(3-2) RB: Course in Ecology and Statistics.
Quantitative analysis of fish populations. Evaluation, causes, and impacts of the rates of change in survival, growth, reproduction, and recruitment for fish populations and their yield.
- 885 Leadership in Natural Resources and Environmental Management**
Fall of odd years. 3(3-0) Interdepartmental with Forestry. Administered by Fisheries and Wildlife.
Theory and practice of leadership in natural resource and environmental management. Integration across disciplinary and jurisdictional divisions.

- 891 Advanced Topics**
 Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 10 credits in all enrollments for this course.
 In-depth study of advanced topics in fisheries and wildlife.
- 893 Seminar in Fisheries and Wildlife**
 Fall, Spring. 1(1-0) A student may earn a maximum of 15 credits in all enrollments for this course.
 Study and research in advanced problems and current developments in fisheries and wildlife.
- 894 Principles and Perspectives in Fisheries and Wildlife**
 Fall. 2(2-0) R: Open to graduate students in the Department of Fisheries and Wildlife or approval of department.
 Multidisciplinary investigation, management, exploitation and conservation of fisheries and wildlife species, their habitats, and effects on human society.
- 895 Practice of Fisheries and Wildlife Outreach and Engagement**
 Spring. 2(2-0) R: Open to graduate students in the Department of Fisheries and Wildlife or approval of department.
 Participatory approaches used in managing natural resources. Science communication, outreach, and engagement skills.
- 897 Ecosystem Ecology and Global Change**
 Fall of odd years. 4(4-0) Interdepartmental with Integrative Biology and Plant Biology. Administered by Integrative Biology. SA: ZOL 897
 Structure and function of natural ecosystems and their responses to global environmental change. Biogeochemical cycles, food webs, energy flow, nutrient cycling, and ecosystem management and restoration.
- 898 Master's Research**
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 10 credits in all enrollments for this course. R: Open only to graduate students in the Fisheries and Wildlife major.
 Master's degree Plan B research paper.
- 899 Master's Thesis Research**
 Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to graduate students in the Fisheries and Wildlife major.
 Master's thesis research.
- 999 Doctoral Dissertation Research**
 Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open to doctoral students in the Department of Fisheries and Wildlife.
 Doctoral dissertation research.