The Vertebrate Zoology Pathway is a suggested curriculum for students interested in studying the biology of vertebrates which can lead to a career in the following areas.

- **Zoology and Wildlife Biology**
- **Environmental Science**
- **Curators and Museum Workers**
- **Postsecondary Teaching**

See the links above to the Bureau of Labor Statistics web site which provides additional information regarding the appropriate training leading to occupational opportunities in those fields.

Students may choose to complete either a standard 36 hour major with a minor in another field, or a 50 credit hour concentration without a minor.

**Biology Major Requirements**

**Biology Major (no minor) Requirements**

The following courses offered by the Department of Biological Sciences are suggested by the faculty for those students whose interests are focused on studying the biology of vertebrates.

**Biodiversity menu suggestions**

- BIOL 3410 - **Vertebrate Zoology** (4 credits) - fall semester
- BIOL 4467 - **Ichthyology** (3 credits) – fall semester
- BIOL 4477 - **Ornithology** (4 credits) – spring semester

**Organismal menu suggestions**

- BIOL 3220 - **Comparative Anatomy** (4 credits) – fall, odd years
- BIOL 3230 - **Vertebrate Embryology** (4 credits) – spring semester

**Population menu suggestions**

- BIOL 3350 - **Ecology** (4 credits) – fall and spring semester
- BIOL 4360 - **Evolution** (3 credits) - spring semester

**Molecular menu suggestions**

- BIOL 3150 - **Cell Biology** (3 credits) - every semester
BIOL 3151 - **Cell Biology** Lab (2 credits) - every semester

**Electives suggestions**
- BIOL 3260 - Animal Physiology (4 credits)—spring semester
- BIOL 4147 - Biochemistry of Macromolecules (3 credits) – spring semester
- BIOL 4157 - Biochemistry of Macromolecules Lab (2 credits) – spring semester
- BIOL 4257 - Appalachian Fauna (3 credits)
- BIOL 4357 - Ethology (4 credits)—spring, even years
- BIOL 4367 - Modeling Biological Systems (3) - fall semester
- BIOL 4737 - Conservation Biology (4 credits) – fall, even years
- BIOL 4747 - Population Genetics (4 credits) – fall, odd years
- BIOL 4900 - Independent Study (1-4 credits) - every semester
- BIOL 4910 - Research in Biology (1-4 credits) - every semester

**Course descriptions:**

**Biodiversity:**
- BIOL 3410 - Vertebrate Zoology (4 credits)
  Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent. Biology, collection, identification, museum preparation, and natural history of vertebrates. Lecture, laboratory, and field studies. Emphasis on vertebrates of the Eastern United States. Two hours lecture and (2) two-hour labs per week. (fall)

- BIOL 4467 – Ichthyology (3 credits)
  Prerequisites: BIOL 3410 or permission of instructor. An introduction to the methodology of field collection, preservation, and identification of fishes. Quantitative analysis and preparation of summary reports on field collections will be emphasized. Two (2) one-hour lectures and one three-hour lab per week. (spring, odd years)

- BIOL 4477 – Ornithology (4 credits)
  Prerequisites: BIOL 3410 or permission of instructor. An introduction to the methodology of field identification, population censuses, seasonal diversity, and ecology of birds. One three-hour lecture and one three-hour lab per week. (spring)

**Organismal:**
- BIOL 3220 - Comparative Anatomy (4 credits)
  Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent. Comparisons of structure and development of representative vertebrate systems. Three hours lecture and 2 three-hour laboratories per week. (fall, odd years)

- BIOL 3230 - Vertebrate Embryology (4 credits)
Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent. Development of vertebrate embryos. Laboratory work based on representative organisms. Two hours lecture and (2) two-hour labs per week. (spring)

Population:
BIOL 3350 – Ecology (4 credits)
Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent. An introduction to the principles of ecology with emphasis on interspecific and organismal-environmental relationships as they affect the size, development, distribution, and structure of populations, communities, and ecosystems. Three hours lecture and one (2) two-hour lab per week. (fall, spring)

BIOL 4360 – Evolution (3 credits)
Prerequisites: Completion of 20 credits in biological science courses. A survey of current topics related to the evolution of life on earth. Intended for senior biological sciences majors. One hour lecture and two hours discussion per week. (spring)

Molecular:
BIOL 3150 - Cell Biology (3 credits)
Prerequisites: BIOL 3100 or equivalent; CHEM 1110 - General Chemistry Lecture I / CHEM 1111 - General Chemistry Laboratory I, CHEM 1120 - General Chemistry Lecture II / CHEM 1121 - General Chemistry Laboratory II recommended. A study of structural and functional relationships in the eukaryotic cell. Two (2) hours lecture, one (1) hour oral component. (fall, spring)

BIOL 3151 - Cell Biology Laboratory (2 credits)
Prerequisites: BIOL 3100 or equivalent. Laboratory exercises demonstrating cell structure and function. Two (2) hour labs per week. (fall, spring)

Electives:
BIOL 3260 - Animal Physiology (4 credits)
Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent; plus one year general chemistry. An introductory course in general and comparative physiology dealing with physical and chemical processes in animals. Two hours lecture and (2) two-hour labs per week. (spring)

BIOL 4147 - Biochemistry of Macromolecules (3 credits)
Prerequisites: BIOL 3100 or equivalent; CHEM 2020/CHEM 2021 or equivalent. Topics include cellular organization: pH and buffering, energy changes in molecular interactions. structure and characteristics of amino acids and proteins, structure/function relationships of enzymes, carbohydrates, lipids, and studies of the production, structure, and function of nucleic acids. Three hours lecture per week. (spring)

BIOL 4157 - Biochemistry of Macromolecules Lab (2 credits)
Prerequisites: BIOL 3100 or equivalent. The theory and use of lab instruments and techniques will be introduced through a series of experiments designed to explore buffering, enzyme isolation and characterization, and DNA isolation and characterization. Experiment planning and interpretation of data generated by the students will culminate in journal-style reports. One four-hour lab per week. (spring)

BIOL 4357 – Ethology (3 credits)
Prerequisites: BIOL 1110/BIOL 1111, BIOL 1120/BIOL 1121, BIOL 1130/BIOL 1131, or equivalent. An introduction to the study of animal behavior. Emphasis is placed on the ecology and evolution of behavioral patterns. Three hours lecture per week. (spring)

BIOL 4367 - Modeling Biological Systems (3 credits)
Prerequisites: BIOL 3350 or permission of instructor. Computer simulation modeling of ecological systems. Three hours lecture/discussion/workshop per week. (fall)

BIOL 4737 - Conservation Biology (4 credits)
Prerequisites: BIOL 3100 or equivalent. Underlying ecological and population genetic forces governing the structure and dynamics of populations. Evaluation of current conservation strategies. Labs include field experiments on biodiversity, species monitoring strategies, field trips and use of population viability analysis. Two hours lecture, one hour discussion, and three hours laboratory per week. (fall, even years)

BIOL 4747 - Population Genetics (4 credits)
Prerequisites: BIOL 3100 or equivalent. An exploration of mechanisms of genetic change in populations. Theoretical predictions and empirical evidence are considered. Emphasis on molecular-based methods. A combination of field and lab exercises. Three hours lecture and one three-hour lab per week. (fall, odd years)

BIOL 4910 - Research in Biology (1-4 credits)
Prerequisites: Permission of the instructor. Independent directed research for the advanced student. Field of study to be determined by mutual consent of the student and faculty advisor.

BIOL 4257 - Appalachian Fauna (3 credits)
Prerequisites: BIOL 1110 /BIOL 1111, BIOL 1120 /BIOL 1121, BIOL 1130 /BIOL 1131, or equivalent; or permission of the instructor. Field and laboratory identification and ecology of the animals of the Southern Appalachian environs. Sixteen hours Lecture and labs/field per week. (summer)