

# Master of Science in Animal and Range Sciences

## Animal Science Emphasis

Graduate students in the Animal Science emphasis receive broad-based training resulting in experiences that qualify them for many agricultural jobs as well as pursuit of advanced degrees and academic positions. Areas of emphasis include nutrition, breeding and genetics, physiology, production systems, and meat science/muscle growth. Research problems may involve beef cattle, sheep, horses and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics, Plant Sciences, Land Resources and Environmental Sciences, and Economics.

## Range Science Emphasis

Research and training opportunities in the Range Science programs are diverse, and students with a wide variety of backgrounds, goals, and educational needs are accepted. Major areas of study are grass-shrubland ecology, habitat management, watershed management, grazing management, natural resource monitoring, riparian ecosystems, and plant-animal (livestock and wildlife) interactions. The Range Science emphasis prepares students for careers in grass-shrubland management, wildlife management, habitat management, natural resource conservation and restoration, research, land-use planning, and consulting. Cooperative projects with ranchers and federal and state agencies are part of the educational experience. Supporting courses at the graduate level include botany, wildlife biology and management, soils, animal science, earth science, plant science, statistics and biochemistry.

## Biology Emphasis

Graduate students in the Biology emphasis receive training directed toward the basic biological functions as they relate to animal production, meat science/meat food safety or wildlife. Research projects may involve beef cattle, sheep and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics and Plant Sciences.

## Facilities

Research laboratories are available in the department and specialized equipment is also available through cooperation with other departments.

The department conducts cooperative research with the U.S. Livestock and Range Research Station at Miles City, Montana, and the U.S. Sheep Experiment Station at Dubois, Idaho. Facilities for the maintenance of beef cattle and sheep are available at the Red Bluff Research Ranch, 30 miles west of Bozeman, the Fort Ellis Research Center, near Bozeman, and the Northern Agricultural Research Center at Havre. The main station has facilities for sheep, horses and beef cattle (a cattle feedlot and nutrition laboratory). A wool laboratory is located on campus.

## Minimum Requirements for a M.S. in Animal & Range Sciences

- At least one 3 credit upper level (400 or 500) course in statistics.
- One semester of ARNR 507 Research Methods.
- One semester of ARNR 594 Seminar.
- Students must declare either the Animal Science, Range Science or Biology Emphasis:

- Course requirements for students in the Animal Science Emphasis:
  - At least six credits from the Graduate Animal Science block (must be 500 level course)
- Course requirements for students in the Range Science Emphasis:
  - At least six credits from the Graduate Range Science block (must be 500 level course)
- Course requirements for students in the Biology Emphasis:
  - At least six credits of biology-related 500-level courses in their area of emphasis
  - At least three credits from the Graduate Animal Science block or Range Science block

NOTE: *students emphasizing meat science in the Biology Emphasis can substitute –Biochemistry of Macromolecules for one of the two 500-level courses.*

## Graduate Animal Science Block

ARNR 505	Ruminant Microbiology	2
ARNR 513	Advanced Forage Production	1
ARNR 520	Nutrient Metabolism	3
ARNR 521	Adv Ruminant Nutrition	3
ARNR 523	Adv Physiology of Reproduction	3
ARNR 524	Adv Animal Breeding	3
ARNR 525	Muscle Growth & Biology	3
ARNR 527	Livestock Mineral Nutrition	1

## Graduate Range Science Block

ARNR 508	Rangeland Ecological Theory and Application	3
ARNR 541	Range Ecophysiology	3
ARNR 543	Riparian Process & Function	3
ARNR 544	Advanced Grazing Management and Ecology	3
ARNR 555	Rangeland Wildlife Ecology & Management	3

*Students must meet the proficiency requirements for their emphasis area (see Proficiencies below).*

## Proficiency Requirements for Animal Science Emphasis

By the time a student completes a M.S. or Ph.D. in Animal & Range Sciences (Animal Science Emphasis), he/she must have successfully completed undergraduate or graduate coursework in three of the four areas listed below. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student's Graduate Committee. Undergraduate courses in these categories are not intended to comprise a substantial portion of a student's graduate curriculum. These courses should be taken in addition to, not in lieu of, other courses in a graduate program. While some courses may apply toward requirements for the M.S. in Animal & Range Sciences and proficiency requirements, the student's Graduate Committee must not allow the need to meet proficiency requirements detract from a student completing a rigorous graduate degree program.

- Breeding/Genetics (ANSC 322 Principles of Animal Breeding and Genetics or BIOB 375 General Genetics)
- Physiology/Reproduction (ANSC 321 Physiology of Animal Reproduction)
- Nutrition (ANSC 320 Animal Nutrition)
- Production/Management (ANSC 434R Beef Cattle Management)

## Proficiency Requirements for Biological Science Emphasis

By the time a student finishes the M.S. degree in Animal & Range Sciences (Biological Science Emphasis), he/she must have successfully completed a minimum of 15 credit hours in the biological sciences with at least 9 credit hours in upper division course work which may include: biological sciences, chemistry, microbiology, food science, entomology, and ecology. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student's Graduate Committee. Undergraduate courses in these categories are not intended to comprise a substantial portion of a student's graduate curriculum. These courses should be taken in addition to, not in lieu of, other courses in a graduate program. While some courses may apply toward requirements for the M.S. in Animal & Range Sciences and proficiency requirements, the student's Graduate Committee must not allow the need to meet proficiency requirements detract from a student completing a rigorous graduate degree program.

- Biology (BIOB 160 Principles of Living Systems, BIOB 170IN Principles of Biological Diversity, BIOB 260 Cellular and Molecular Biology )
- Ecology (BIOE 370 General Ecology ; BIOE 405 Behavioral and Evolutionary Ecology)
- Chemistry (CHMY 141 College Chemistry I and CHMY 142 College Chemistry I Lab, CHMY 143 College Chemistry II and CHMY 144 College Chemistry II Lab , CHMY 211 Elements of Organic Chemistry; CHMY 311 Fundamental Analytical Chem, CHMY 321 Organic Chemistry I and CHMY 322 Organic Chemistry I Lab)
- Biochemistry (BCH 380 Biochemistry)
- Entomology (BIOO 262IN Introduction to Entomology)
- Food Science / Meat Science (Introductory Food Science or upper division food science or food safety course)