



**Department of Animal Science
College of Agricultural Sciences
The Pennsylvania State University**

Graduate Program in Animal Science Student Handbook

Policies Effective August 2018

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GENERAL INFORMATION

I. Program of Study

The Department of Animal Science in Penn State's College of Agricultural Sciences offers a Graduate Program in Animal Science leading to the Master of Professional Studies (M.P.S.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) degrees. The plan of study followed by a degree candidate is determined by the candidate's background and interests. The academic program is developed jointly by the student and the advisor, with the approval of the student's graduate committee. The Animal Science Graduate Faculty members strive to provide students with an academic environment that will foster scholarly and creative activities. Successful completion of a graduate program in Animal Science requires the demonstration of an ability for independent thinking and creativity. Students have the opportunity to develop and display their individual abilities through participation in courses, seminars, and research activities.

The M.P.S. program is designed to prepare individuals for specialist and management positions in county agricultural extension, government, or industry, and requires a final paper. The M.P.S. is generally considered to be a terminal degree.

The M.S. is a research-oriented degree, requiring the successful completion of a research project and thesis. The completion of 30 credits, including at least 18 at the graduate level (500, 600), is required.

The Ph.D. degree is awarded for creative scholarship and research. A student is admitted to Ph.D. candidacy upon passing the candidacy examination. Doctoral candidates must satisfy the two-semester residence requirement, write an acceptable dissertation, and pass both comprehensive and final oral examinations.

II. Research Facilities

The department maintains numerous facilities for research involving both small and large animals. Laboratories are equipped with the latest instrumentation. Herds of dairy and beef cattle, swine, deer, horses, as well as flocks of poultry, including chickens, turkeys, and quail, are maintained for instruction and research. Students may specialize in animal management, breeding, genetics and genomics, growth and developmental biology, meat science, nutrition, and nutritional, reproductive, or lactational physiology.

III. Financial Aid

Financial assistance is awarded on a competitive basis. Fellowships varying from a complete stipend and tuition grant-in-aid to partial stipends or a grant-in-aid alone are available from the College and on a University-wide basis. Teaching and research assistantships are funded through either University funds or grants awarded to individual faculty members. Graduate assistants receive stipends and tuition grant-in-aid in exchange for performing assigned duties determined by the needs of the program and the faculty advisor. Responsibilities of graduate assistants are described on page 8.

IV. Cost of Study

Current tuition schedules can be found at: <http://tuition.psu.edu/tuitiondynamic/TuitionAndFees.aspx>.

V. Housing

Housing for students is available in apartment complexes located throughout the State College area. Dormitory accommodations provide both single and double rooms in two centrally located buildings on campus. Students may use the University food service. Married graduate students may apply for apartments designated by the University for their use.

VI. Student Population

The University Park campus has a total enrollment of approximately 46,000 students, of which about 6,100 are graduate students. Approximately 30 percent of the graduate students at University Park are international students. There are typically 20 graduate students in the Graduate Program in Animal Science, somewhat more women than men.

VII. The Area

Penn State is located in State College area (population approximately 42,000 not including students) in central Pennsylvania. Primarily a university town, State College offers many cultural, educational, recreational, and sports events. The area is rich in facilities for skiing, picnicking, hiking, biking, and swimming. State forest and game lands provide excellent venues for hunting and fishing.

VIII. The University

The Pennsylvania State University is the land-grant University of the Commonwealth of Pennsylvania. It was chartered in 1855 as the Farmers' High School. During the next century, the school evolved from the Agricultural College of Pennsylvania (1862) to the Pennsylvania State College (1874) and finally, in 1953, to The Pennsylvania State University. The original student body of 69 has grown to over 98,000, the faculty from four to over 5,200. Eleven undergraduate colleges offer 160 baccalaureate and 31 associate degree majors. The Graduate School, established in 1922, administers over 140 major programs. Approximately 1,700 advanced degrees are conferred annually, of which about 400 are doctorates.

IX. Applications

Applications for admission to the Animal Science Graduate Program may be submitted at any time, and will be processed on a space-available basis. Applicants should have a baccalaureate degree in Animal Science, Dairy Science, Poultry Science, or a related biological discipline, and a junior-senior GPA of at least 3.0 (4.0 basis). See page 22 for the application procedure or visit: <http://www.gradsch.psu.edu/portal>.

X. Contact for Correspondence and Information Regarding Applications or Admission:

Dr. Robert G. Elkin, Animal Science Director
of Graduate Studies
Department of Animal Science
323 Ag Sciences & Industries Building
The Pennsylvania State University
University Park, PA 16802
Phone: 814-863-2102
FAX: 814-863-6042
e-mail: rge3@psu.edu

THE GRADUATE FACULTY AND THEIR RESEARCH PROGRAMS

Paul A. Bartell, Ph.D. (University of Virginia), Associate Professor of Avian Biology. 301A Forest Resources Lab., (814) 867-2365, pab43@psu.edu. The neurobiology of biological clocks and their role in timing avian reproduction, migration, and sleep/wake cycles.

John W. Boney, Ph.D. (West Virginia University), Assistant Professor of Poultry Science. 318 ASI Bldg., (814) 863-8934, jxb2002@psu.edu. Applied poultry nutrition and feed quality.

Jonathan A. Campbell, Ph.D. (Iowa State University), Assistant Professor of Animal Science. 350 ASI Bldg., (814) 867-2880, jac69@psu.edu. Meat science.

Chad D. Dechow, Ph.D. (University of Tennessee), Associate Professor of Dairy and Animal Science. 333 Henning Bldg., (814) 863-3659, cdechow@psu.edu. Dairy cattle genetics.

Francisco J. Diaz, Ph.D. (University of Wisconsin), Associate Professor of Reproductive Biology. 313 Forest Resources Lab, (814) 865-1499, fjd10@psu.edu. Development of mammalian and avian transgenic model systems to study ovarian biology, molecular and cellular interactions between female germ cells and somatic cells of the ovary.

Robert G. Elkin, Ph.D. (Purdue University), Professor of Avian Nutritional Biochemistry. 323 ASI Bldg., (814) 863-2102, rge3@psu.edu. Amino acid and lipid nutrition and metabolism of poultry.

Terry D. Etherton, Ph.D. (University of Minnesota), Distinguished Professor of Animal Nutrition and Head of the Department of Animal Science. 303 ASI Bldg., (814) 863-3665, tetherton@psu.edu. Regulation of adipose tissue and skeletal muscle growth by somatotropin and IGF-I.

Tara L. Felix, Ph.D. (Ohio State University), Assistant Professor of Animal Science. 351 ASI Bldg., (814) 865-0065, tfelix@psu.edu. Beef cattle nutrition and management, novel feedstuffs for ruminants, and ruminant metabolism.

Erika Ganda, BVSc, Ph.D. (Cornell University) Assistant Professor of Food Animal Microbiomes. 311 Forest Resources Laboratory, (814) 865-4084, ganda@psu.edu. Microbiome, Epidemiology, and Antimicrobial Resistance.

Kevin J. Harvatin, Ph.D. (Cornell University), Assistant Professor of Nutritional Physiology. 321 ASI Bldg., (814) 865-6334, kjh182@psu.edu. Investigation of dietary factors that modify ruminal fatty acid biohydrogenation, regulation of synthesis of milk components, and basic regulation of lipid

synthesis with the continual goal of developing feeding strategies to improve the efficiency and performance of dairy cows.

Arlyn J. Heinrichs, Ph.D. (The Ohio State University), Professor of Dairy and Animal Science. 347 ASI Bldg., (814) 863-3916, JHeinrichs@psu.edu. Dairy calf and heifer nutrition and management, and forage utilization.

Elizabeth A. Hines, Ph.D. (Iowa State University), Assistant Professor; Swine Specialist, Livestock Extension. 353 ASI Bldg., (814) 865-3267, eah405@psu.edu. Swine Production and Management. Swine Growth and Development. Swine Reproductive Physiology. Nutritional Influences on Growth and Development.

Lisa A. Holden, Ph.D. (The Pennsylvania State University), Associate Professor of Dairy Science. 321 ASI Bldg., (814) 863-3672, LHolden@psu.edu. Dairy management.

Alexander N. Hristov, Ph.D. (Sofia University, Bulgaria) Professor of Dairy Nutrition. 352 ASI Bldg., (814) 863-3669, anh13@psu.edu. Nitrogen metabolism in the rumen and reducing losses from dairy operations.

Vivek Kapur, B.V.Sc.; Ph.D. (The Pennsylvania State University), Professor of Microbiology and Infectious Diseases and Huck Distinguished Chair in Global Health. 205 Wartik Lab, (814) 865-9788, vkapur@psu.edu. Microbial genomics of animal pathogens; Host-pathogen interactions; Zoonotic infections; Emerging infectious Diseases; Molecular Epidemiology; Microbial pathogenesis, Diagnostics, Vaccines, Global Health, One Health.

Wansheng Liu, Ph.D. (Northwest Agricultural University, China), Associate Professor of Genomics. 310 Forest Resources Lab., (814) 867-1673, wul12@psu.edu. Animal

genetics, structural, functional and comparative genomics, mammalian Y-chromosome and male fertility

Steven C. Loerch, Ph.D. (University of Illinois) Professor of Animal Science and Senior Associate Dean, College of Agricultural Sciences. 201 Ag Admin. (814) 865-2541. sloerch@psu.edu. Ruminant Nutrition.

A. Gino Lorenzoni, D.V.M.; Ph.D. (University of Arkansas), Assistant Professor of Poultry Science and Avian Health. 306 ASI Bldg., (814) 863-7302, agl20@psu.edu. Poultry enteritis.

Edward W. Mills, Ph.D. (Purdue University), Associate Professor of Dairy and Animal Science. 350 ASI Bldg., (814) 863-0669 or 16 Meats Laboratory, (814) 865-2394, EMills@psu.edu. Meat science and meat processing.

Troy L. Ott, Ph.D. (University of Florida), Professor of Reproductive physiology. 319 Forest Resources Lab, (814) 441-2657, tott@psu.edu. Uterine biology, reproductive immunology, fertility, mucosal immunity.

Joy L. Pate, Ph.D. (University of New Hampshire), Professor of Reproductive Physiology and C. Lee Rumberger Family Chair in Agricultural Sciences. 320 Forest Resources Lab, (814) 863-0558. Female reproductive biology, reproductive immunology, molecular and cellular approaches to ovarian function in cattle.

Paul H. Patterson, Ph.D. (University of Wisconsin), Professor of Poultry Science. 317 ASI Bldg., (814) 865-3414, php1@psu.edu. Poultry nutrition with management emphasis on commercial pullets and laying hens, egg production, egg quality, and poultry by-products.

Ramesh Ramachandran, Ph.D. (University of Maryland), Associate Professor of Avian Endocrinology. 301B Forest Resources Lab., (814) 865-5202, RameshR@psu.edu. Molecular and cellular mechanisms in

neuroendocrine control of growth and reproduction in birds.

Danielle Smarsh, Ph.D. (Rutgers University), Assistant Professor of Equine Science. 309 ASI Bldg., (814) 865-7810, dxs1172@psu.edu. Equine exercise physiology; specifically oxidative stress, age and training.

Kathy Soder, Ph.D. (Penn State University), Research Animal Scientist, USDA-Agricultural Research Service, Pasture Systems and Watershed Management Research Unit Bldg. 3702 Cutrin Rd. (814) 865-3158. Kathy.Soder@usda.gov. Grazing dairy management.

W. Burton Staniar, Ph.D. (Virginia Polytechnic Institute and State University), Associate Professor of Equine Science. 316 ASI Bldg., (814) 865-0698, wstaniar@psu.edu. Relationships of nutrition with metabolism in the horse. Specific areas: nutrition's influence on skeletal development, animal and feed factors that affect glycemic and insulinemic response, and implications of glycemic and insulinemic responses on growth hormone and IGF-I.

Robert J. Van Saun, D.V.M. (Michigan State), Ph.D. (Cornell University), Professor of Veterinary Science and Extension Veterinarian. 113 Central Milk Testing Lab, (814) 867-2038, rjv10@psu.edu. Ruminant nutrition, health and reproduction interactions.

Regina Vasilatos-Younken, Ph.D. (The Pennsylvania State University), Professor of Endocrine Physiology and Nutrition; Vice President for Graduate Education and Dean of the Graduate School. 211 Kern Bldg., (814) 865-2516, rxv@psu.edu. Endocrine regulation of nutrient partitioning and soft tissue deposition in meat-type poultry.

Jacob R. Werner, VMD. (University of Pennsylvania), Assistant Professor of Veterinary Medicine and Dairy and Animal Science. 116 Transportation Research Bldg., (814) 863-7793, jrw140@psu.edu. Attending Veterinarian for Agricultural Animals and Wildlife.

ADMISSION REQUIREMENTS

I. For Students Seeking the Master of Science or Master of Professional Studies Degree

- (1) For admission without deficiencies, a student must have completed a baccalaureate degree program in Animal Science, Dairy Science, Poultry Science, or another biological science with a junior-senior grade-point average of at least 3.0 (4.0 basis). The program must have included courses in biological science, chemistry, and mathematics. Exceptions to the minimum grade-point average may be made for students with special backgrounds, abilities, or interests.
- (2) GRE scores will be utilized in evaluating the applicant's qualifications. In 2015-16, the average scores for new enrollees in the Animal Science program were 150, 158, and 3.90 for verbal, quantitative, and analytical writing, respectively.
- (2) The language of instruction at Penn State is English. International applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System). The minimum acceptable score for the TOEFL is 550 for the paper-based test or a total score of 80 with a minimum 20 on the speaking section for the internet-based test. The minimum composite score for the IELTS is 6.5. International applicants are exempt from the TOEFL/IELTS requirement if they have received a baccalaureate or a master's degree from a college, university, or institution in any of the following locations: Australia, Belize, British Caribbean and British West Indies, Canada (except Quebec), England, Guyana, Republic of Ireland, Liberia,

New Zealand, Northern Ireland, Scotland, the United States, and Wales.

II. For Students Seeking the Ph.D. Degree

- (1) A student becomes a doctoral candidate upon passing a candidacy examination administered by the student's Advisory Committee (see page 12).
- (2) Any student admitted into the Graduate Program as an M.S. student has the option of pursuing the Ph.D. degree without first earning an M.S. degree. A student who desires to pursue this option must first be recommended to the Graduate Program and Admissions Committee by the student's advisor, the student's Advisory Committee, the department head, and the Graduate Program Chair, and must also pass the candidacy examination.

III. Admission Procedures

- (1) See the Graduate Application Materials Section (page 22) for methods of application. General inquiries about admission procedures for the Graduate Program in Animal Science should be made to:

Dr. Robert G. Elkin, Animal Science
Director of Graduate Studies
Department of Animal Science
323 Ag Sciences & Industries Building
The Pennsylvania State University
University Park, PA 16802
Phone: 814-863-2102; rge3@psu.edu

- (2) To apply to the Graduate School, complete the online application at: <http://gradschool.psu.edu/index.cfm/apply/>.
- (3) Applications for admission to the Graduate Program in Animal Science may be submitted at any time. Prospective students are encouraged to submit their application as early as possible in order to be competitive for assistantship offers. In addition, students must apply by January 1 of each year to be competitive for College of Agricultural Sciences and Graduate School Fellowships. Applicants are screened by the Graduate Program and Admissions Committee, who will consider the following criteria:

- Academic performance
- GRE scores
- Courses completed
- Course deficiencies
- Area(s) of interest
- Letters of recommendation
- Whether a thesis advisor has been identified

Following the vote of the Graduate Program Admissions Committee, a recommendation of acceptance or rejection of an applicant is made to the Graduate School by the Animal Science Director of Graduate Studies .

GUIDELINES FOR GRADUATE ASSISTANTS

I. Pay Dates

Graduate assistants are paid on the last working day of the month during the assistantship. Pay periods are August through May for the fall and spring semesters. Pay periods are June and July for students who receive stipends or wage payroll funds during the summer session.

The approved Assistantship and Fellowship Stipend form (with a W-4 form attached) must be submitted to the Payroll

Office one month before the first pay date of each semester or summer session.

II. Limits on the Duration of Support

Graduate assistant support provided from budgeted departmental resources shall be limited to six semesters for the M.S. program, 10 semesters for the Ph.D. program (with an M.S.), and 15 semesters for a Ph.D. program (with a B.S.). Extension beyond these limits is evaluated on an individual case basis and must be approved by the Head of the Department of Animal Science.

III. Requirement for Graduate Assistants

Students on assistantship must maintain a grade-point average of 3.0 (4.0 basis) and make satisfactory progress towards the degree to remain on assistantship.

IV. Responsibilities of a Graduate Assistant

All graduate students receiving an assistantship within the program, regardless of funding source, are required to perform 20 hours (half-time assistants) or 10 hours (quarter-time assistants) of service per week, related to the functions of the department. This service may include the following:

- (1) General laboratory maintenance
- (2) Support of farm operations
- (3) Literature searches and other library work
- (4) Field and laboratory assays from ongoing projects
- (5) Data management and statistical analyses
- (6) Assay development and preparation of laboratory protocols
- (7) Assistance in preparation and grading of quizzes, examinations, and homework exercises
- (8) Help in preparing and conducting teaching labs
- (9) Assistance in other classroom activities

- (10) Assistance in conducting extension field activities
- (11) Help in preparation of documents for other departmental activities
- (12) Help set up presentation materials for demonstration activities, such as Ag Progress Days
- (13) Other professional activities requested by supervisor or department head.

V. Academic Integrity

Unfortunately, as in all sectors of society, occasional instances of dishonesty occur within the scientific community. Some cases receive more publicity than others, but all result in negative consequences for the perpetrator. Moreover, supervisors and colleagues, who may have been completely unaware of the particular misdeed, also nonetheless suffer in terms of damaged reputations, retraction of published papers, etc. Therefore, all students should review section 49-20 of the University Faculty Senate Policies and Rules for Undergraduate Students (<http://www.psu.edu/ufs/policies/>) to familiarize themselves with the university policy concerning academic integrity. In addition to formal courses, these regulations apply to seminars, public presentations, and research-related endeavors. It is the collective responsibility of students and faculty to report suspected breeches of section 49-20 to the appropriate authorities.

VI. Termination for Unsatisfactory Scholarship

Termination of graduate student's support or program due to unsatisfactory scholarship or unsatisfactory progress in scholarship shall be provided to the student in advance by written notice. Furthermore, the written communication shall, in general terms, advise the student of the academic reasons for the termination according to the rules of the Graduate School, Graduate Degree Programs Bulletin Appendix III (see <http://www.psu.edu/bulletins/whitebook/>).

REQUIREMENTS OF THE GRADUATE PROGRAM IN ANIMAL SCIENCE

The program offers plans of study leading to the Master of Professional Studies (M.P.S.), Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees to selected students meeting the admission requirements established by the Graduate School and by the program. These plans are designed to provide the knowledge, training, and attitudes expected of holders of these degrees. Insofar as possible, the pattern of course work and the area of thesis research will be designed to meet the specific interests and needs of the student. These plans of study will be developed within the general procedures and regulations of the Graduate School.

I. Master's Degree Requirements

Time Limitation: All requirements for a master's degree, whether satisfied on the University Park Campus or elsewhere, must be met within five years or a period spanning six consecutive summers.

Residence: At least 20 credits must be earned in residence at the University Park Campus.

Minimum Number of Credits: 30

Minimum Grade-Point Average: A minimum grade-point average of 3.0 (4.0 basis) for graduate work done at the University is required for graduation.

Core Course Requirements: While in residency, 2 credits of AN SC 590, (*Colloquium*); 1 credit of AN SC 500 (*Foundation Readings in Animal Science*); 2 credits (Ethics offering) of AN SC 502 (*Scientific Scholarship*); and 1 credit of AN SC 602 (*Supervised Experience in College Teaching*). [**See Table 1 on page 25.**]

Master of Professional Studies (M.P.S) Degree

The plan of study leading to the MPS degree has an industry orientation and provides opportunities for students to increase their knowledge and competencies in the various fields of agriculture. A student may choose a broad plan of study over a wide spectrum of subject matter, or intensive training in a specialized area, according to his/her specific interests and needs.

The emphasis of this degree is for students to learn how to apply knowledge as professional practitioners. An appropriate portion of the student's time will be devoted to developing skills in communication, especially technical speaking and writing. However, students will be expected to have completed most of their general education needs as undergraduates.

A minimum of 30 graduate credits is required, of which 18 credits must be at the 500-level and above, with a minimum of six credits of formal courses at the 500 level. A maximum of 10 credits may be earned in special problem-type courses, which may include up to three credits for the M.P.S. paper. See Section III (page 16) for additional degree requirements.

A candidate's Student Advisory Committee (**SAC**) shall consist of an advisor, who shall be a member of the graduate faculty, and at least two additional members of the graduate faculty. Approval of the committee shall be by the Chair of the Graduate Program in Animal Science, after consultation with the student and appropriate faculty members. If a minor is selected, a faculty member representing the minor field shall serve on the SAC. The SAC is responsible for approving the candidate's program and for administering the final oral examination.

The candidate shall prepare a paper on a selected professional problem as part of the program. Up to three graduate credits may be awarded for the paper. Whether required as part of a course or independent of course work, the nature and extent of the paper, and when its development is to be undertaken,

shall be determined by the SAC. The paper shall contain an appropriate Literature Cited section. Two hard-bound copies of the paper, one for the advisor and one for the Animal Science Graduate program, shall be prepared at the candidate's expense and will be available to the public. The paper will be in a technical and grammatical form that is acceptable to the SAC; as such, the SAC may require the candidate to employ the services of a technical editor (at the candidate's expense) to aid the candidate to bring the paper into an acceptable form.

The student shall submit the completed paper to the SAC at least two weeks prior to the scheduled final oral examination, which shall cover both coursework and the contents of the paper. The SAC may or may not request a presentation during the final exam. A favorable vote of two-thirds majority of the SAC is required for passing. After successfully passing the oral exam, the M.P.S. candidate will present a public seminar of the work. A report of the completed M.P.S. paper and public seminar will be filed with the Animal Science Graduate Program Office. If the candidate fails the final exam, it is the responsibility of the SAC to determine whether another examination may be taken at a future date.

The M.P.S. is often considered to be a "terminal degree"; therefore, completion of this degree usually does not provide adequate preparation for pursuing a Ph.D. degree. Such preparation is typically provided by completing an M.S. degree program.

Master of Science (M.S.) Degree

The Master of Science degree is oriented toward research and requires the successful completion of a research study and thesis. A student devoting half-time to graduate studies typically requires two years (six semesters) of course work and research to complete the M.S. degree (see page 8 for limits of duration of support).

A minimum of 30 graduate credits is required, of which 18 credits must be at the 500- or 600-level. Of the 30 credits, at least

12 credits must be taken as formal courses in the animal agriculture/biological science area, with at least 6 of these credits at the 500-level or above. The 30 graduate credits must also include a minimum of 6 credits of thesis research (AN SC 600 or AN SC 610) and the Animal Science core courses (see page 9). No thesis research credits (600) may be assigned a quality letter grade.

The SAC shall consist of an advisor, who shall be a member of the graduate faculty, and at least two additional members of the graduate faculty. At times it may be desirable to have two faculty serve as co-advisors. If a Minor is selected, a faculty member representing the minor field will serve on the SAC. Selection of the SAC shall be by the Chair of Graduate Program in Animal Science after consultation with the student and appropriate faculty members.

The SAC shall be appointed during the first semester of enrollment. The advisor, in consultation with the SAC, shall be responsible for selection and direction of the course of study to be followed by the student and for selection and supervision of thesis research. A plan of the proposed thesis research is to be submitted by the student to the SAC by the end of the first year. The SAC will subsequently meet with the student to provide feedback.

A thesis reporting the results of the student's research shall be prepared in accordance with the regulations of the Graduate School and the Animal Science Graduate Program. The thesis will be in a technical and grammatical form that is acceptable to the SAC. The SAC may require the candidate to employ the services of a technical editor (at the candidate's expense) to aid the candidate bringing the thesis into conformity. At least two hard-bound copies of the thesis must be prepared. If additional copies are required (e.g., for a granting agency or cooperator), they will be paid for by the committee chair's academic department. Good quality copies on paper equal to that required by the Graduate School are acceptable. One bound copy will be placed in the Animal Science Graduate Program collection; the second will be

provided to the SAC Chair. In cases where there are co-chairs or a separate chair and thesis research advisor, copies shall be prepared for both faculty members. Electronic thesis submission is required; for details visit: <http://www.gradsch.psu.edu/current-students/etd/>.

Upon completion of the thesis, the student shall be required to pass an oral examination given by the SAC. This examination shall cover both course work and the thesis defense. The student will submit the completed thesis to his/her SAC at least two weeks prior to the scheduled final oral exam. The SAC may or may not request a presentation during the oral exam. A favorable vote of a two-thirds majority of the SAC is required for passing. Alternately, if a candidate fails the oral exam, it is the responsibility of the SAC to determine whether another exam may be taken at a later date. Only one re-examination shall be offered.

Within two weeks after the successful passage of the oral exam, the M.S. candidate will present a scheduled public seminar of the work. Upon completion of the public seminar, the SAC will sign the appropriate forms (Thesis/Graduate School) for completion of the M.S. Degree.

The student shall be required to prepare at least one manuscript based on the thesis research results in a form suitable for publication in an appropriate refereed scientific journal.

II. Doctor of Philosophy Degree Requirements

Time Limitation: All requirements for a Doctor of Philosophy degree, whether satisfied on the University Park Campus or elsewhere, must be met within five years or a period spanning six consecutive summers.

Time Required to Earn Degree. A student devoting half-time to study for the degree normally will require 10 semesters beyond the Master's degree, or 15 semesters if entering the program without an M.S. degree. However, much will depend upon

the nature of the thesis research problem. In most cases a student will not take more than 5 years to complete the program from the date of admission to candidacy (see limits on duration of support on page 8).

Residence: Within some 12-month period between admission to candidacy and a Ph.D. completion, the candidate must spend at least two semesters in residence at the University Park Campus.

Minimum Number of Credits: 30 beyond a baccalaureate degree from an accredited school.

Minimum Grade-Point Average: A minimum grade-point average of 3.0 (4.0 basis) for graduate work done at the University is required for graduation.

Core Course Requirements: While in residency, 2 credits of AN SC 500 (*Foundation Readings in Animal Science*); 4 credits (Ethics offering **and** Grantsmanship offering) of AN SC 502 (*Scientific Scholarship*); 3 credits of AN SC 590; and 1 credit of AN SC 602 (*Supervised Experience in College Teaching*). Students who completed 2 credits of AN SC 590 as part of an M.S. degree program in Animal Science must take 1 additional credit of AN SC 590 during their Ph.D. program. For students entering the Ph.D. program with an M.S. degree from another institution, one credit of AN SC 590 will be waived; therefore, they will be required to complete 2 credits of AN SC 590 during their Ph.D. program at Penn State University. **[See Table 1 on page 25.]**

Student Dissertation Committee:

- (1) Each Ph.D. student shall have an appointed Dissertation Committee to guide their research training.
- (2) Dissertation Committee Appointment: A student's Dissertation Committee shall be nominated to the Graduate School by the student's major Graduate Program Head as soon as possible after the

student has secured an adviser, but in no event later than one calendar year following the date of the student's successful completion of the Qualifying Examination unless an alternative timing is approved through the Graduate Council's curricular review process.

- a. The guiding principle for members of the Dissertation Committee is the success of the student.
 - b. While it is expected that the Graduate Program Head will consult with the student, the student's adviser, and as appropriate the dual-title and/or minor Graduate Program Head, the Graduate Program Head is responsible for nominating members of the Dissertation Committee to the Graduate School, designating Dissertation Committee member roles, and ensuring appropriate Dissertation Committee composition that is in the best interests of the student and the completion of their dissertation. Dissertation Committees must be approved by the Dean of the Graduate School.
 - c. The Dean of the Graduate School may appoint one or more members to the Dissertation Committee in addition to those recommended by the Graduate Program Head.
- (3) Minimum Dissertation Committee Membership: A student's Dissertation Committee shall consist at minimum of four members of the Graduate Faculty, each of whom shall be in a position to contribute substantially to the student's education. At least two of these four members shall be from the student's major graduate program.
- (4) Dissertation Committee Member Roles: Each Committee shall have a Dissertation Committee Chair, Outside Field Member, Outside Unit Member, and include the student's Dissertation Adviser. The Dissertation Committee

Chair and Dissertation Adviser may be one and the same. For students pursuing a graduate minor, the Dissertation Committee shall include a Minor Field Program Member representing each graduate minor. Dissertation Committees may also include other participants who are not members of the Graduate Faculty but are otherwise qualified and have particular expertise in the student's research area. All Dissertation Committee Members are expected to participate fully in the affairs of the Dissertation Committee:

a. Dissertation Committee Chair: The Dissertation Committee Chair shall be a member of the Graduate Faculty and the student's major Graduate Program. The Dissertation Committee Chair is responsible for arranging and conducting all Dissertation Committee Meetings, ensuring that all Graduate Program, Graduate Council, and Graduate School standards and requirements relative to the doctoral degree are met, and that any conditions set by the Dissertation Committee are fulfilled.

i. For students pursuing dual-title degrees, either the Dissertation Committee Chair or a co-Chair must be a Graduate Faculty member of the dual-title program.

b. Dissertation Adviser: Each Committee shall include the student's Dissertation Adviser. The Dissertation Adviser is responsible for the day-to-day guidance of the student's dissertation research, and academic and professional development.

i. Where day-to-day guidance is shared by two members of the Graduate Faculty, both may be appointed to the Dissertation Committee as co-Advisers.

ii. Co-advisers are jointly and severally responsible for the day-to-day guidance of the student's dissertation research, and academic and professional development.

iii. A Dissertation Adviser may also serve as the Dissertation Committee Chair (or co-Chair).

c. Outside Field Member: Each Dissertation Committee shall have appointed at least one Outside Field Member. The Outside Field Member must have a disciplinary expertise different from the student's primary field of study, and is responsible for broadening the disciplinary perspective available to the student and the Dissertation Committee. The Outside Field Member may be from student's graduate program, but may not also serve as a major program member. In cases where the candidate is also pursuing a dual-title program, any dual-title Graduate Faculty member of the Dissertation Committee may serve as the Outside Field Member.

d. Outside Unit Member(s): Each Dissertation Committee shall have appointed at least one Outside Unit Member. The Outside Unit Member is responsible for bringing to the attention of the student and the Dissertation Committee [non-academic] issues (including, for example, conflicts of interest) that may impact a student's progress. Outside Unit Members must have their primary academic appointment in an administrative unit different than the Dissertation Committee Chair(s) and Dissertation Adviser(s).

e. Minor Program Member(s): Dissertation Committees assigned to students pursuing graduate minors shall include at least one Minor Program Member for each graduate

minor. Each graduate minor pursued by a student shall be represented by at least one Minor Program Member who is a member of the Graduate Faculty and a member of that minor graduate program. Minor Program Members are responsible for providing the students and the Dissertation Committee with information, advice and perspective on student progress in fulfilling the graduate minor requirements in the graduate program they represent.

- f. Special Members: Dissertation Committees may include Special Members who are not members of the Graduate Faculty but are otherwise qualified and have particular expertise in the student's research area. Special members do not have to be affiliated with Penn State.

(5) Annual Review of Dissertation Committee Membership: It is crucial that all committee members remain actively engaged in the guidance of the student through the completion of their program. The Graduate Program Head of the student's major program shall review annually each student's Dissertation Committee to ensure that all Dissertation Committee members continue to qualify for service in their designated roles. The Graduate Program Head is responsible for promptly making any necessary changes and informing the Graduate School.

(6) When Dissertation Committee Members Retire or become Emeritus

- a. Dissertation Committee Members who retire or become emeritus may continue to serve for the duration of the student's program if they were appointed to the Dissertation Committee in this role prior to retirement, and they have the continuing approval of the student's

Graduate Program Head and the Graduate School. (In the case of students pursuing a dual-title degree, the dual-title Graduate Program Head must also approve.)

- b. As specified in 5 (above) it is the responsibility of the Graduate Program Head to ensure that all Dissertation Committee members continue to qualify for service in their designated roles. The Graduate Program Head will review the committee membership whenever any committee member retires to ensure that students receive expert faculty guidance through their dissertation project.

(7) When Dissertation Committee Members Leave the University: Dissertation Committee Members in any role who leave Penn State for reasons other than retiring or becoming emeritus may maintain their committee appointment for up to one year with the approval of the student's Graduate Program Head and the Dean of the Graduate School.

(8) Other Changes in Dissertation Committee Membership: If the need for Dissertation Committee membership change is required, whether at the time of an annual review or otherwise, the student's major Graduate Program Head will promptly make the necessary changes and notify the director of Graduate Enrollment Services.

Residence Requirements: Within some 12-month period between admission to candidacy and completion of the Ph.D., the candidate must spend at least two semesters (which may include the semester in which the qualifying examination is taken) as a registered, full-time student engaged in academic work on the University Park Campus. Full-time University employees must be certified by the department as devoting half-time or more to graduate

studies and (or) thesis research to meet the degree requirements.

Off-campus and Transfer Credits: In accordance with guidelines set forth by the Graduate School, the following types of off-campus and transfer credits may be applied toward requirements for the doctorate:

- (1) A maximum of 10 credits of high-quality graduate work (credits must be equivalent to 400-level or higher at Penn State) transferred from a regionally accredited U.S. institution or a recognized degree-granting international institution may be applied toward the requirements of a graduate degree. However, credits earned to complete a previous degree, whether at Penn State or elsewhere, may not be applied to a graduate degree program at Penn State, except for those students who are approved to double-count credits as part of an approved concurrent or integrated undergraduate-graduate degree or those students approved by the Graduate School to receive a master's degree along the way to a doctorate. For more information see: <http://bulletins.psu.edu/graduate/general/information/admission3>.
- (2) A student may register for research to be done away from the University Park Campus, provided it is approved by the advisor and the Chair of the Animal Science Graduate Program.

Qualifying Examination: The purpose of the qualifying examination is to determine the student's qualifications to pursue a doctoral degree and to determine any course deficiencies that should be considered. The examination can be given after at least 18 credits have been earned in graduate courses beyond the baccalaureate; however, it must be taken within three semesters (excluding summer sessions) of entry into the doctoral program.

The Qualifying Committee, consisting of two Animal Science graduate faculty members and the Chair of the Animal

Science Graduate Program, shall assess the student's English competency and administer the qualifying examination. The faculty advisor will be present as a non-voting member. The examinations may be administered at any time so long as this complies with the guidelines listed above.

The qualifying examination will consist of student presenting a critique of an assigned published manuscript to the qualifying committee. This presentation will also serve as a means to evaluate English competency.

The decision to pass, fail, or re-examine (only one re-examination shall be offered) will be decided by a majority vote of the Qualifying Committee. At the conclusion of the qualifying examination, the chair of the Qualifying Committee will notify the student, the Animal Science Graduate Program Coordinator, and the Dean of the Graduate School as to whether the student has been accepted as a doctoral candidate. A Qualifying Examination Report is also filed with the Animal Science Graduate Program and the Graduate School.

Master of Science (M.S.) as a Qualifying Exam: The completion of an M.S. degree in the appropriate biological topic area may be considered to fulfill the qualifying exam requirement. The M.S. advisory committee may request that this occur and provide the M.S. thesis and associated manuscripts to the qualifying committee for consultation. The three voting members shall render a yes or no decision.

Policy for English Competency Assessment and Rectifying Deficiencies: A candidate for the degree of Doctor of Philosophy is required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking, as part of the language and communications requirements for the Ph.D. (International students should note that passage of the minimal TOEFL requirement does not necessarily demonstrate the minimal level of competence expected of a Ph.D. candidate at Penn State).

- (1) Assessment of English Competency. In conjunction with the qualifying examination, the Qualifying Committee will conduct the Assessment of English Competency. To evaluate competency in writing, each student will read and prepare a written critique of a journal article selected by the committee. The paper will be related to the field of study of the student. This exercise will be administered within three days after completion of the oral component of the qualifying examination, during which the student's competency in spoken English will be judged.
- (2) Improving English Competency of Students Having Deficiencies. Each student who has been judged deficient will be required to: (a) present an oral seminar; and (b) prepare a written review paper on the topic of his/her seminar for each of two semesters. The oral seminar will be evaluated by the Animal Science Department's Seminar Committee. The SAC will be responsible for evaluating the written papers.
- (3) Reassessment of English Competency for Students Having Deficiencies. After the student has completed one credit of AN SC 590 (*Colloquium*) with a grade of at least B, the student will be re-examined by the faculty members who comprised the SAC. He/she will be asked to read a journal article from his/her field and prepare a written critique for this examination. The student must make an oral presentation of the critique to the committee. Reassessment of English competency must be made before the comprehensive examination can be scheduled. Failure to demonstrate English competency to the satisfaction of the SAC at this reassessment will result in termination of the student from the Graduate Program in Animal Science.

Advisor(s) and Doctoral Committee: Coincident with admission to the Graduate School, the student shall be assigned to an advisor. The Animal Science Graduate

Program Chair shall designate the advisor after consultation with the student and the faculty member. At times, it may be desirable to have co-advisors; however, in most cases, the advisor will be the chair of the doctoral committee and the supervisor of the thesis research.

After the student has been admitted to qualifying for the Ph.D. degree, the Dean of the Graduate School, upon recommendation of the Chair of the Graduate Program in Animal Science, will appoint a doctoral committee consisting of four or more active members of the Graduate Faculty, which includes at least two faculty members in the major field. The dissertation advisor must be a member of the committee. At least one member must represent a field outside of the candidate's major field of study in order to provide a broader range of disciplinary perspectives and expertise. Additionally, in order to avoid potential conflicts of interest, the primary appointment of at least one regular member of the doctoral committee (referred to as the "Outside Unit Member") must be in an administrative unit that is outside of the unit in which the dissertation advisor's primary appointment is held. In the case of co-advisors, the Outside Unit Member must be from outside of the administrative home(s) of both co-advisors. In some cases, an individual may have a primary appointment outside of the administrative home of the student's dissertation advisor and also represent a field outside of the student's major field of study; in such cases, the same individual may serve as both the Outside Field Member and the Outside Unit Member. The committee will be responsible for: (1) establishing the candidate's program; (2) preparing, administering, and evaluating comprehensive and final examinations; and (3) supervising and evaluating the thesis. In most circumstances, the SAC will also serve as the Doctoral Committee.

Minor Field(s): If desired by the candidate, the candidate's advisor, in consultation with the Doctoral Committee, will aid in selecting a minor field of study. If the candidate elects

one, a minimum of 15 credits must be taken in the minor. The minor program must meet the approval of the department or program responsible for the minor.

Comprehensive Examination: This examination may be taken only after the candidate has demonstrated English competency, and after the candidate has completed a substantial amount of his/her required course work. Candidates are required to have a minimum grade point average of 3.0 for graduate courses completed at this University at the time the comprehensive examination is taken.

The examination is officially scheduled and announced by the Dean of the Graduate School upon recommendation of the Doctoral Committee. It will include both written and oral components and will be administered by the candidate's Doctoral Committee.

The written component, which should be completed within one week, will consist of questions prepared by each member of the Doctoral Committee. In order to prepare for the exam, the candidate should meet well in advance with each committee member individually in order to seek broad guidance regarding potential areas of study. Committee members should then submit their specific exam questions to the Chair (candidate's thesis advisor), who will distribute them to the candidate on the days of the exam. The candidate is to be allowed approximately one-half day to answer each committee member's questions.

The oral component will have two parts; one consisting of a departmental seminar and the second part will be an oral examination given by the Doctoral Committee. The candidate will be expected to demonstrate a high degree of competence in his/her specialty, in related areas, and in the solution of research problems. A favorable vote of at least two-thirds of the members of the Doctoral Committee is required for passing. Based on the candidate's performance in the examination, the committee may recommend to the Dean

of the Graduate School one of the following actions:

- (1) The candidate is passed, either with no reservations or subject to fulfillment of certain conditions.
- (2) The candidate will be re-examined at a later date.
- (3) The candidate is disapproved unconditionally for the degree.

Students must be registered, credit or noncredit (Thesis Preparation 601 or 611), continuously each semester (excluding summers) beginning with the semester following the passing of the comprehensive examination and continuing each semester until the final oral examination is passed. However, students must be registered the semester of both the oral comprehensive examination and the final oral examination—even if taken during Summer Session.

Dissertation: The dissertation shall be written in a form that: (1) meets the editorial standards of the Graduate School, so that it constitutes a suitable archival document for inclusion in the University Libraries; and (2) is in form that is technically and grammatically acceptable to the student's Doctoral Committee. The committee may require the candidate to employ the services of a technical editor (at the candidate's expense) to aid the candidate in bringing the dissertation into conformity.

The dissertation shall present data, results, and conclusions forthcoming from a research problem selected in consultation with the candidate's Doctoral Committee. Upon completion of the dissertation, the candidate shall present a public seminar on the research. The dissertation shall be in a final and polished form prior to the oral examination, and it shall be defended in a final oral examination conducted by the Doctoral Committee. Acceptance of the dissertation is indicated by the signatures of at least two-thirds of the Doctoral Committee, as well as the Chair of the Graduate Program, on the doctoral signatory page, as

well as by its acceptance as meeting the editorial standards of the Graduate School.

The dissertation notation and reference procedures, where not otherwise specified by the Graduate School, shall be in the form and style of a recognized scientific journal. One acceptable copy of the thesis shall be submitted electronically to the Graduate School as required (www.gradsch.psu.edu/current/thesis.html). Sufficient hard-bound copies shall be prepared to provide one copy each to the Animal Science Graduate Program, the advisor, and the co-advisor (if applicable). Good quality photocopies are acceptable. These copies shall be produced at the candidate's expense. If an additional copy is required for a granting agency, the Animal Science Department will pay for the binding.

Manuscript: The candidate shall prepare one or more manuscripts based on his/her thesis research in a form suitable for publication in an appropriate refereed scientific journal. The manuscript(s) shall be prepared and submitted according to guidelines established by the Graduate Program in Animal Science.

Final Oral Examination: A doctoral candidate who has satisfied all other requirements for the degree will be scheduled by the Dean of the Graduate School, on the recommendation of the Doctoral Committee, to take a final examination. The final examination must be scheduled with the Graduate School at least two weeks before the examination is to be held. The final examination may not be scheduled within three months of the comprehensive examination unless the Dean of the Graduate School grants permission. The deadline for holding the examination prior to Commencement is listed in the Graduate School calendar.

It is the responsibility of the doctoral candidate and the committee chair/dissertation advisor to provide a copy of the dissertation to each member of the Doctoral Committee at least two weeks before the date of the scheduled final oral

examination. The dissertation should be complete and in its final draft (i.e., correct and polished content and style, appropriate bibliography, tables, figures, etc.) at the time it is distributed to the committee members.

The oral examination shall cover both coursework and the dissertation defense. The Doctoral Committee may or may not request a presentation during this exam. A favorable vote of a two-thirds majority of the members of the committee is required for passing. The results of the examination are reported on a form provided by the Dean of the Graduate School and will be entered upon the candidate's official record. If a candidate fails, it is the responsibility of the Doctoral Committee to determine whether another examination may be taken at a later date.

The deadline for holding the examination prior to commencement is listed in the Graduate School calendar. After successful passage of the oral exam, the Ph.D. candidate will present a public seminar on the dissertation, scheduling in consultation with the advisor and the Doctoral Committee members. Upon completion of the public seminar, the Doctoral Committee will sign the appropriate forms (Thesis/Graduate School) for the completion of the Ph.D. degree.

III. Additional Degree Requirements

Scholarship and Research Integrity (SARI) Program: The SARI@PSU Program (<http://www.research.psu.edu/training/sari>) is designed to offer Penn State researchers and scholars comprehensive, multilevel education in the responsible conduct of research, in a way that is tailored to address the issues faced by individual disciplines. All Animal Science graduate students are required to complete the program.

Teaching Requirement: All graduate degree candidates shall assist in teaching at least one course. This teaching requirement will be met by completing one credit of AN SC 602 (*Supervised Experience in College Teaching*). Prior to assisting with a

course for credit, students are encouraged to attend at least one teaching workshop provided for graduate students by the Instructional Development Program. International students whose native tongue is not English must attend a certification workshop prior to teaching.

IV. Minor in Animal Science

The Minor in the Graduate Program in Animal Science is intended for students enrolled in other graduate programs.

General: Candidates who pursue a minor in the Graduate Program in Animal Science must include at least one Graduate Faculty member from the Graduate Program in Animal Science on their Master's or Doctoral Committee.

At the Master's Level: Six credits of Animal Science courses are required.

At the Doctoral Level: Fifteen credits of Animal Science courses are required. At least six of those must be at the 500-level.

SUMMARY OF GRADUATE SCHOOL REQUIREMENTS FOR PH. D. CANDIDATES

Ph.D. candidates must meet the following requirements below for graduation. For more detailed information on these and other requirements, please refer to the Graduate Degree Programs Bulletin (<http://bulletins.psu.edu/bulletins/whitebook/index.cfm>). Note: These are Graduate School requirements only and do not include specific program/department requirements.

I. Residency

After passing the doctoral candidacy examination, students must be registered full-time for two semesters in a twelve-month period. This may include the semester of candidacy examination if it is taken during spring or fall semester.

II. Communication and Foreign Language Requirement

A candidate for the Ph.D. degree must have satisfied the departmental communication and foreign language requirement (if applicable) before taking the comprehensive examination.

III. Scheduling of Exams

Three or more months must have elapsed between the passing of the comprehensive examination and the scheduling of the final oral examination. The final oral examination must be held within six years of the date the comprehensive examination was passed. If more than six years have passed, a second comprehensive examination must be given before the final oral examination may be scheduled.

IV. Minor in a Field of Study

A student pursuing a minor must earn at least 15 graduate credits in that field. If courses other than those offered in the minor field are to be used, a listing of those courses must be submitted to the office of the respective graduate program. Students pursuing a minor must have a representative from that field on their Doctoral Committee.

V. Continuous Registration

Students must be registered continuously each semester (excluding summers) beginning with the semester following the passing of the comprehensive examination and continuing each semester until the final oral examination is passed. However, students must be registered the semester of both the oral comprehensive examination and the final oral examination — even if it is taken during Summer Session.

VI. Time Limitation

All requirements, including submission of the dissertation, must be completed within eight years of the candidacy date.

VII. Grades

No missing or deferred grades may appear on a student's transcript at the time either the oral comprehensive examination or final oral examination is scheduled. Students must have at least a 3.0 (4.0 basis) grade point average to schedule an oral comprehensive examination or final oral examination and to graduate.

SEMESTER SCHEDULES FOR DEGREE PROGRESS

I. Master of Professional Studies

It is the responsibility of each M.P.S. candidate to accomplish the objectives below (assumes that the student carries 12-15 credits of course work per semester).

Prior to First Semester:

- (1) Identify a general area of study interest.
- (2) Identify an academic advisor.

First Semester (Fall):

- (1) Take formal coursework. Credit load may vary depending on time commitment to teaching or research.
- (2) Take 2 credits (Ethics offering) of AN SC 502 (*Scientific Scholarship*)
- (3) Take AN SC 590 (*Colloquium*).
- (4) Attend Graduate Program in Animal Science seminars and other seminars.
- (5) Become familiar with departmental programs.
- (6) Develop a plan of study in conjunction with advisor.
- (7) Begin to identify M.P.S. paper topic in conjunction with advisor.
- (8) Establish and convene the Student Advisory Committee (**SAC**) by mid-semester and decide on an M.P.S. paper topic; finalize course work schedule and begin work on the M.P.S. paper.

- (9) Determine opportunities for field experiences relative to student's interest in conjunction with advisor and perhaps extension specialist(s).

Second Semester (Spring):

- (1) Take formal coursework.
- (2) Take 1 credit of AN SC 500 (*Foundation Readings in Animal Science*).
- (3) Attend Graduate Program in Animal Science seminars and other seminars.
- (4) Take 1 credit of AN SC 602 (*Supervised Experience in College Teaching*).
- (5) The M.P.S. paper should be essentially complete and ready for review by the SAC by the end of the second semester.
- (6) Continue obtaining field experience in the area of the M.P.S. paper or other area of particular interest.

Third Semester (Summer):

- (1) Participate in technical meetings as appropriate.
- (2) Graduate.

II. Master of Science

It is the responsibility of each MS candidate to accomplish the objectives outlined below.

Prior to First Semester:

- (1) Identify a general area of study interest.
- (2) Identify an academic and research advisor, which is usually the same faculty member.

First Semester (Fall):

- (1) Take formal coursework. Credit load may vary depending on time commitment to teaching or research.
- (2) Take 2 credits (Ethics offering) of AN SC 502 (*Scientific Scholarship*)
- (3) Take AN SC 590 (*Colloquium*).

- (4) Attend Seminars of the Graduate Program in Animal Science and other seminars.
- (5) Become familiar with departmental programs.
- (6) Establish and convene the Student Advisory Committee (**SAC**) to plan courses to be taken during the degree program.
- (7) Develop a plan of coursework in conjunction with the advisor and SAC.
- (8) Identify an area of thesis research interest in conjunction with the advisor.
- (9) Determine opportunities for field experience relative to research interests in conjunction with advisor and perhaps extension specialist(s).

Second Semester (Spring):

- (1) Take formal coursework.
- (2) Attend Graduate Program in Animal Science seminars and other seminars.
- (3) Take 1 credit of AN SC 500 (*Foundation Readings in Animal Science*)
- (4) Schedule SAC meeting early in semester to discuss and develop specific thesis topic and a plan of action for its completion; discuss progress made in course work and any courses the committee feels should be taken by the candidate.
- (5) By the end of the second semester, a detailed thesis research proposal should be completed and submitted to the SAC. It should include a concise literature review, statement of hypothesis, objectives, and procedures.
- (6) Begin working on thesis research as early as appropriate.

Third Semester (Summer):

- (1) Conduct research.
- (2) Participate in scientific meetings as appropriate.

Fourth Semester (Fall):

- (1) Take formal coursework.
- (2) Attend Graduate Program in Animal Science seminars.
- (3) Take AN SC 590 (*Colloquium*).
- (4) Continue thesis research. Determine journals and other media most appropriate for publishing research findings.
- (5) Take 1 credit of AN SC 602 (*Supervised Experience in College Teaching*).

Fifth Semester (Spring):

- (1) Continue formal coursework as required to complete plan of study.
- (2) Attend Graduate Program in Animal Science seminars and other seminars.
- (3) Complete thesis research.

Sixth and Final Semester (Summer):

- (1) Write thesis and prepare final draft (from thesis) of journal article(s) and other types of publications as appropriate.
- (2) Schedule final oral examination with committee.
- (3) Present formal seminar on thesis research.
- (4) Graduate.

Additional Information:

During the summer, students are expected to pursue thesis research and participate in regional or national scientific and technical meetings as appropriate. From the inception of their program, graduate students are expected to attend departmental seminars as well as Graduate Program in Animal Science seminars.

III. Doctor of Philosophy

It is the responsibility of each candidate for the Ph.D. degree to accomplish the objectives outlined below.

Prior to First Semester:

- (1) Identify academic/research advisor.

First Semester (Fall):

- (1) Take formal coursework. Credit load may vary depending on the time commitment to teaching or research.
- (2) Attend Graduate Program in Animal Science seminars and other seminars.
- (3) Take 2 credits (Ethics offering **or** Grantsmanship offering) of AN SC 502 (*Scientific Scholarship*).
- (4) Take AN SC 590 (*Colloquium*).
- (5) Establish and convene the Student Advisory Committee (**SAC**) and develop a plan of study for the degree program.
- (6) Identify potential areas for thesis research.
- (7) Determine opportunities for field experience relative to research interests in conjunction with advisor and perhaps extension specialist(s).

Second Semester (Spring):

- (1) Take formal coursework.
- (2) Attend Graduate Program in Animal Science and other seminars.
- (3) Take 1 credit of AN SC 500 (*Foundation Readings in Animal Science*)
- (4) Schedule and complete Qualifying Examination. (Candidates for the Ph.D. without the M.S. degree should schedule the Qualifying Examination after 18 credits of courses have been completed).
- (5) Identify areas of research that will be addressed in the thesis research proposal.

Third Semester (Summer):

- (1) Conduct research.
- (2) Establish a Doctoral Committee and discuss coursework taken, as well as

proposed courses to be taken, with committee.

Fourth Semester (Fall):

- (1) Take formal coursework/research credits.
- (2) Attend Graduate Program in Animal Science seminars and other seminars.
- (3) Take AN SC 590 (*Colloquium*).
- (4) Take 1 credit of AN SC 602 (*Supervised Experience in College Teaching*).
- (5) Take 2 credits (Ethics offering, if student previously took the Grantsmanship offering, or *vice versa*) of AN SC 502 (*Scientific Scholarship*).
- (6) Write a detailed proposal for research to be undertaken. Submit proposal to Doctoral Committee. In conjunction with input from committee, finalize objectives of research, methods of procedure, and begin thesis research as early as possible.
- (7) Prepare for Comprehensive Examination.

Fifth Semester (Spring):

- (1) Finalize formal coursework as required to complete plan of study.
- (2) Take 1 credit of AN SC 500 (*Foundation Readings in Animal Science*)
- (3) Attend Graduate Program in Animal Science seminars and other seminars.
- (4) Continue thesis research.
- (5) Schedule and successfully complete The Comprehensive Examination.
- (6) Inform Doctoral Committee of research progress, including any problems encountered.

Sixth Semester (Summer):

- (1) Conduct research.

Seventh and Subsequent Semesters:

- (1) Conduct and complete thesis research.

- (2) Attend Graduate Program in Animal Science seminars and other seminars.
- (3) Take AN SC 590 (*Colloquium*) for the third and final time if needed (see core course requirements on pages 11-12 and Table 1 on page 22).
- (4) Write dissertation and prepare manuscript(s) for submission to scientific journal(s).
- (5) Schedule and successfully complete the final oral examination.

Additional Information:

During the summer, students are expected to pursue thesis research and participate in regional or national scientific and technical meetings as appropriate. From the inception of their program, graduate students are expected to attend departmental seminars as well as Graduate Program in Animal Science seminars.

SERVICES AND SUPPLIES

I. General Information

The fundamental determining factor for use of department supplies and services should be if the need or purpose is for official University business. In such case, the department will provide the necessary materials and services. If the need or purpose is for personal use, class work, or thesis work, the cost will be borne by the student. Here are a few specific examples to illustrate the guidelines:

- (1) No University (department) resource, such as telephones, paper, supplies, notebooks, or photocopier, shall be used for personal business. However, on a limited scale, the department's photocopiers can be used for non-University business on a fee-for-service basis.
- (2) Paper supplies (e.g., notebooks, pencils, pens) from the stockroom are not to be used for classes you are taking. The department will provide

paper and forms for recording and analysis of thesis research data because the data belong to the University.

- (3) The photocopiers in the Department are not to be used to copy classwork or items for personal use—such as class notes, journal or magazine articles, or parts of books — unless reimbursement is made to the department. Copying done at Pattee Library for similar purposes should not be billed to the department or charged on department copy cards.

II. Procedures for Obtaining Keys

The security of facilities and equipment is the responsibility of all members of the Department of Animal Science. With departmental laboratories and offices located in several buildings through which many people pass daily, it is important to realize the importance of locking the doors to unoccupied offices and laboratories. This is for the security of valuable equipment and supplies, as well as the safety of individuals. Any laboratory facility in which radioactive materials are stored must be locked when unoccupied.

Graduate students are entitled to hold keys for the main entrance of the building in which their offices are located, as well as their offices and laboratories. These keys may be obtained through the department's designated Administrative Staff Assistant in 324 Henning Building. A deposit is required for each key. In certain situations, individuals may need access to other offices or laboratories. If such situations arise, the student should contact the faculty member supervising the laboratory in order to obtain approval prior to requesting a key. This practice should be kept to a minimum. Individuals are also expected to help maintain a secure environment by avoiding unnecessary lending of keys to others. Individuals must return all keys upon departure from the department (for graduation, termination, or for any other reason).

III. Procedures for Parking Permits

Graduate students are required to register any motor vehicle or bicycle used on campus. Students may register their motor vehicles and obtain parking permits from the Parking Office, Eisenhower Parking Deck. Bicycles should be registered with the Department of University Safety, Eisenhower Parking Deck.

IV. Availability of Services to Students in the Animal Science Graduate Program

On-campus assistance with statistical analyses and experimental design are

available through consultation with College of Agricultural Sciences statisticians and the Penn State Statistical Consulting Service. There are also many shared technology facilities available through the Huck Institutes of the Life Sciences (<http://www.huck.psu.edu/>). The student should arrange such assistance with the aid of his/her advisor. Many other resources are available, such as health services, health insurance, etc. The student should visit the Graduate School's website (<http://www.gradsch.psu.edu/>) or contact the Graduate School by phone (814-865-2516) for current services and information.

Table 1. Summary of Core Course Requirements for Animal Science Graduate Students

Course	M.S.	Ph.D.
AN SC 500 (<i>Foundation Readings in Animal Science</i>)	1 credit	2 credits
AN SC 502 (<i>Scientific Scholarship</i>)	2 credits. Must take the Ethics offering (even numbered FA years), which satisfies the SARI requirement. The Grantsmanship offering (odd numbered FA years) can be taken as an elective course.	4 credits. Must take the Ethics and the Grantsmanship offerings. Waived if both completed during M.S. program at Penn State University.
AN SC 590 (<i>Colloquium</i>)	2 credits (i.e., 2 semesters)	3 credits. Two credits waived if taken during M.S. program at Penn State University. One credit waived if M.S. degree is from another institution
AN SC 602 (<i>Supervised Experience in College Teaching</i>)	1 credit	1 credit

GRADUATE APPLICATION MATERIALS

How to Apply to the Graduate Program in Animal Science

- 1) Apply to the Penn State Graduate School (<http://www.gradschool.psu.edu/apply>) which only accepts online applications.