SOIL SCIENCE, PH.D.

The UW–Madison Department of Soil Science is one of the oldest, largest, and most prominent soil science departments in the United States. It is globally renowned for its excellence in soil research and education. The department's mission is to provide instruction, research, and extension leadership in soil chemistry, physics, biology, and pedology to economic and sustainable land use. Programs are designed to improve basic understanding and practical management of soil resources in natural, agricultural, and urban ecosystems, and to serve local, state, national, and global interests. The department implements the Wisconsin idea to the extended community and provides all generations with an appreciation of soil as a key natural resource and thorough understanding of the scientific basis of the environment and agriculture.

Soil science entails understanding soils and applying the principles of physics, chemistry, mathematics, and biology to the sustainable management of soil and the environment. Soil science deals with the effects of climate change and its interaction with the soil, with scarcity of water resources, and the increase of food production to feed 9 billion people. The link between soils and biodiversity as well as the effects of soils on biofuel production is widely researched in the Department of Soil Science.

The department is committed to integrated programs of instruction, research, extension, and outreach that address societal goals of responsible stewardship of soil and water resources.

The importance of soils in crop production, environmental issues, turf and grounds management, soil conservation, global climate change, carbon sequestration, rural and urban planning, and waste disposal are integrated into the department's course offerings and research programs. Graduate study in soil science provides the basic and applied scientific training needed for teaching, research, and other professional work in the agricultural, earth, and environmental sciences. The department office provides information concerning career placement and available vacancies.

Graduates from the department occupy leading positions in industry, government, education, and research in agriculture, natural resources and environmental science throughout the world. Of the more than 1,000 alumni of the department's graduate program, many are deans, directors, chairs, faculty, and staff at universities in the U.S. and other countries, or in leading positions in government, regulatory agencies, research institutions, agribusinesses, chemical industries, and recreational and conservation organizations.

The number of graduate students enrolled in the program over the past 10 years has averaged 20 per year, with about half pursuing master's degrees and half pursuing doctorates. International students generally comprise about 30% of the total. Department faculty also direct additional graduate students in multidisciplinary research in soils-related programs.

FACULTY RESEARCH

Research in the department focuses on an improved understanding of the soil, as well as on interactions between soil and the people of Wisconsin. The faculty have extensive and long-term experience and knowledge about the soils of Wisconsin, their genesis, properties and management. The department has an exciting suite of research activities ranging from the molecular level to the global. Research focuses on topical themes like climate change and soil changes to land use effects of biofuel production to DNA fingerprinting of soil life.

Many field-research projects on soil and water problems are conducted in cooperation with state and federal agencies, agribusinesses, municipalities, and private farmers. The department cooperates closely with the Wisconsin Geological and Natural History Survey, Molecular and Environmental Toxicology Center, and the USDA Natural Resource Conservation Service in conducting soil surveys and addressing problems of groundwater shortages and contamination. Relationships between soils and forests are studied at tree nurseries and in state, private, and commercial forests throughout the state in cooperation with the Wisconsin Department of Natural Resources and the pulp and paper industry.

Through a long commitment of our staff to international agriculture, the department has assisted in the creation of agricultural colleges in several developing countries and has attracted outstanding international graduate students. Current research involvement includes Brazil, Chile, China, Trinidad-Tobago, Spain, Australia, Argentina, and Antarctica.

Many department faculty have been recognized nationally and globally for their contributions to soil science. Three of only four soil scientists appointed to the National Academy of Sciences are from the UW–Madison Department of Soil Science. Several faculty members have received local and national academic, professional-society, trade-association, and industrial prizes and awards for teaching, research, and extension education and serve on important state, national, and international committees. Many faculty members have been recognized for their contributions by election to honorary fellowship in the Soil Science Society of America, the American Society of Agronomy, and allied professional societies.

Our faculty are heavily involved in cooperative interdisciplinary research undertakings with scientists and organizations within and beyond the university, such as UW–Madison’s Gaylord Nelson Institute for Environmental Studies, Molecular and Environmental Toxicology Center, Environmental Chemistry and Technology Program, and other science departments, state agencies, environmental consulting and service companies, agribusinesses, and trade organizations.

FUNDING

Financial support is usually available to qualified students in the form of research assistantships, mostly funded from research grants; final decision for granting a research assistantship rests with the professor(s) supervising the research. Any assistantship for at least one-third time qualifies a student for remission of tuition (though students may be responsible for other administrative fees). The department does not offer teaching assistantships. A number of Graduate School fellowships are available to new students with outstanding records. The deadline for application for these competitive fellowships is early January of each year. The department selects the most qualified applicants and forwards their dossiers to a campus-wide selection committee. Support for graduate assistantships is available through two Wisconsin Distinguished Fellowships (the W.R. Kussow/Wisconsin Turfgrass Association and the Leo M. Walsh/Wisconsin Fertilizer and Chemical Association), the C.B. Tanner Agricultural Physics Award Fund, and the Charles and Alice Ream Soil and Water Protection Research Fund. In addition, there are two awards given annually to outstanding incoming...
graduate students, the O.N. Allen Graduate Fellowship for Agriculture and the Kelling Soil Fertility Award.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

DOCTORAL DEGREES

Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT

51 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

32 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

Candidates for the Ph.D. degree must earn a minimum of 26 credits of graduate coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS

With program approval, students are allowed to count no more than 12 credits of graduate coursework taken during graduate study at other institutions. coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE

With program approval, students are allowed to count no more than 7 credits of graduate coursework numbered 300 or above from a UW–Madison undergraduate degree. The coursework may also count toward the 50% graduate coursework requirement if the courses are numbered 700 or above. coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL

With program approval, students are allowed to count no more than 15 credits of coursework numbered 300 or above taken as a UW–Madison University Special student. The coursework may also count toward the 50% graduate coursework requirement if the courses are numbered 700 or above. coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED

15 credits

PROGRAM-SPECIFIC COURSES REQUIRED

Courses in basic sciences: Candidates for a Ph.D. in soil science are required to have completed the basic science courses outlined in the departmental Ph.D. requirements document.

Courses in soil science: Ph.D. candidates must meet the minimum departmental course requirements for soils graduate degrees outlined in the departmental Ph.D. requirements document. Ph.D. candidates must enroll in a minimum of 1 credit of research (SOIL SCI 990 Research) every semester.

Seminar: All Ph.D. candidates must present at least two soil science graduate seminars (SOIL SCI 728 Graduate Seminar) for letter grade (>B) during their Ph.D. program. One of the seminars must be on the student's prospectus. Each candidate must enroll in a soil science seminar every fall and spring semester; exceptions require the approval of the department chair.

Teaching qualifications: All candidates for a Ph.D. in Soil Science shall complete a minimum of 1 degree credit of SOIL SCI 799 Practicum in Soil Science Teaching. A written plan for satisfying this requirement shall be prepared by the student in conjunction with the advisor and approved by the certification committee. The type and level of effort required to earn one or more degree credits in SOIL SCI 799 shall be in accordance with the guidelines and standards set forth by the CALS Curriculum Committee and approved by the UW–Madison Divisional Committees in the spring semester 1981.

DOCTORAL MINOR/BREADTH REQUIREMENTS

Ph.D. candidates in soil science must supplement their major study with a minimum of 10 credits in graduate courses in another field. These courses must be selected according to a coherent plan under Option A or Option B as follows:

Option A–External: A student must offer at least 10 credits from a degree program outside the soil science major. Selection of this option requires approval of the minor department.

Option B–Distributed: A distributed minor for a student studying for a Ph.D. in soil science shall consist of a minimum of 10 credits of graduate level courses in one or more departments. Selection of this option requires approval of the certification committee. A minor program must be approved by the minor department (Option A) or by the Department of Soil Science Certification Committee (Option B) no later than the end of the second semester of Ph.D. graduate work (not including summer sessions). A copy of the completed minor agreement form is needed to obtain the warrant for the preliminary exam.

OVERALL GRADUATE GPA REQUIREMENT

3.00 GPA required

OTHER GRADE REQUIREMENTS

Required courses in soil science must be completed with a grade of B or better (BC and C may not be offset by AB and A). For all other courses, the requirement is an average record of B or better in all work taken as a graduate student.

PROBATION POLICY

The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result
in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE
The doctoral committee is a committee of five or more faculty members chosen by the major professor and the student, subject to approval by the certification committee. A minimum of three must be drawn from the soil science faculty. Representation of the minor department (see graduate minor requirements, below) is at the option of the minor department, but the Department of Soil Science recommends that the minor professor be on the committee.

It is the responsibility of the student and the major professor to form a doctoral committee and schedule a meeting before the end of the second semester (not including summer sessions) of Ph.D. graduate work. The doctoral committee will prepare a draft "degree clock" for the student specifying all significant Ph.D. milestones (certification of Ph.D. coursework, approval of minor, presentation of prospectus, preliminary examination, and final examination) during their initial meeting.

A student who does not meet deadline requirements in the departmental Ph.D. requirements document will not be allowed to register in the subsequent semester until a written plan for meeting the requirements has been approved by the major advisor and the department certification committee.

A proposed program for a Ph.D. candidate satisfying the minimum course requirements must be approved by the certification committee before the end of the first semester of Ph.D. graduate work.

ASSESSMENTS AND EXAMINATIONS
Candidates must complete the Ph.D. prospectus, which consists of the prospectus seminar and the written prospectus.

Candidates are required to take a preliminary examination.

Candidates for the Ph.D. degree are subject to a final oral examination on their dissertation and the general fields of the major and minor studies. Candidates must present an open seminar on their Ph.D. research findings, followed by oral defense of the dissertation in front of the doctoral committee.

Deposit of the doctoral dissertation is required.

TIME CONSTRAINTS
Prospectus: The written prospectus and the prospectus seminar must be completed by the end of the third semester (not including summer sessions).

Preliminary exam: Students who obtain their M.S. degree in the department and who continue in the department for their doctorate must take the preliminary examination by the end of the fourth semester (not including summer sessions) of Ph.D. graduate work. Candidates who are approved to retake a failed examination must have passed by the end of the fifth semester.

Candidates for the Ph.D. degree who obtained an M.S. or M.A. degree elsewhere, must take the Preliminary Examination by the end of the fourth semester (not including summer sessions) of Ph.D. graduate work. Candidates who are approved to retake a failed examination must have passed by the end of the fifth semester.

Candidates who do not adhere to this deadline must show justification for the delay to the department certification committee.

Final oral exam and deposit of dissertation: A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may require to take another preliminary examination and to be admitted to candidacy a second time.

LANGUAGE REQUIREMENTS
No language requirements.

ADMISSIONS
A foundation in the basic sciences is essential for graduate study in soil science. The program requires all students to have successfully completed one semester of calculus for the M.S. degree and two semesters of calculus (differential and integral) for the Ph.D., one course in statistics, nine credits of chemistry, and one year of physics. Admission with deficiencies is possible but is likely to delay completion of graduate studies.

The following materials must be submitted when applying to the program: an online application, official transcripts, Graduate Record Exam (GRE) scores, and three references. TOEFL scores are required for applicants whose native language is not English. Because graduate requirements presuppose extensive science coursework, continuing undergraduate students are encouraged to select undergraduate courses carefully if they are considering advanced degrees in soil science.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• Articulates research problems, potentials, and limits with respect to theory and practice in soil science.
• Formulates ideas, concepts, designs, and/or techniques beyond the boundaries of soil science knowledge.
• Articulates testable hypotheses and conducts research that makes a substantive contribution to soil science.
• Communicates clearly in ways appropriate to the field, in oral and written forms, for scholarly and general public audiences.

PROFESSIONAL CONDUCT
• Fosters ethical and professional conduct, adhering to accepted standards such as that of the Soil Science Society of America.

PEOPLE

Faculty: Professors Hartemink (chair), Barak, Bland, Bleam, Hickey, Kung, Laboski, Long, Pedersen, Powell, Ventura; Associate Professors Balster, Ruark, Soldat; Assistant Professors Arriaga, Whitman