SOIL AND ENVIRONMENTAL SCIENCES

The Department of Soil and Environmental Sciences provides undergraduate and graduate education in the environmental, agricultural, and natural resource aspects of soils. Areas of emphasis include soil ecology, soil erosion management, soil fertility and plant nutrition, soil physical and chemical characterization, biogeochemistry, urban soils, soil carbon, soil health, soil contaminants, waste management, pedology, and land-use analysis.

Soils are a critical natural resource in environmental protection, food and fiber production, turf and grounds management, rural and urban planning, and waste disposal. All of these facets are integrated into the department's course offerings and research programs. Soil Science majors prepare for professional, technical, consulting, and project positions in environmental sciences, ecology and restoration, crop and timber production, soil informatics, soil conservation, environmental pollution control, turf and grounds management, and land-use planning. Please contact the department for further information on career opportunities.

Students completing an undergraduate major in Soil Science earn a bachelor of science degree. A problem-solving "capstone course" that integrates knowledge gleaned from a diversity of courses is required.

The department also serves as the administrative home for the Environmental Sciences major in the College of Agricultural and Life Sciences.

DEGREES/MAJORS/CERTIFICATES

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- Environmental Sciences, BS (CALS) (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/soil-environmental-sciences/environmental-sciences-bs/)
- Environmental Soil Science, Certificate (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/soil-environmental-sciences/environmental-soil-science-certificate/)
- Soil Science, BS (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/soil-environmental-sciences/soil-science-bs/)

PEOPLE

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FACULTY

Dr. Francisco Arriaga

Applied Soil Physics, Soil and Water Management and Conservation: Conservation agriculture systems; development of conservation tillage practices that enhance soil quality, soil hydraulic properties, and plant water use through the adoption of cover crops and non-inversion tillage for traditional cropping systems.

Dr. Nicholas Balster

Soil Ecology, Plant Physiological Ecology, and Education: Energy and material cycling in natural and anthropogenic soils including forests, grasslands, and urban ecosystems; stable isotope ecology; environmental education; nutrition management of nursery soils; tree physiology, production and response; ecosystem response to global change; urban ecosystem processes; invasive plant ecology; biodiversity.

Dr. Phillip Barak

Soil Chemistry and Plant Nutrition: Nutrient cycling; nutrient recovery from wastewater; molecular visualization of soil minerals and molecules; soil acidification.

Dr. Zachary Freedman

Soil microbiology, ecology and sustainability: Effects of environmental change on biogeochemical cycles; community ecology and trophic dynamics; forest soil ecology; soil organic matter dynamics; sustainable agroecosystems; bio-based product crop production on marginal lands.

Dr. Alfred Hartemink

Pedology and Digital Soil Mapping: Pedology, soil carbon; digital soil mapping; tropical soils; history and philosophy of soil science.

Dr. Jingyi Huang

Soil Physics, Proximal and Remote Sensing, Soil Monitoring and Management, Digital Soil Mapping: Application of proximal and remote sensing technologies for understanding the movement of water, heat, gas, and solutes in soils across different spatial and temporal scales; application of physical and empirical models for monitoring, mapping, and managing soil changes due to natural processes and human activities.

Dr. Natasha Rayne

Soil Fertility and Nutrient management: Manure placement, timing, and nitrogen credits; Organic soil amendments and nutrient cycling; Climate-smart and site-specific nitrogen management; improvement of nitrogen use efficiency in cereal crop production.

Dr. Inna Popova

Environmental soil chemistry; understanding and mitigating the response of soil systems to the increased pressure of organic contaminants; application of biopesticides; development of novel separation and analyses methods for contaminants in environmental matrices.

Dr. Matthew Ruark

Soil Fertility and Nutrient Management: Soil fertility and management of grain biofuel, and vegetable crops; cover crop management; agricultural production and water quality; sustainability of dairy cropping systems; soil organic matter management.

Dr. Douglas Soldat

Turfgrass and Urban Soils: Turfgrass, urban soils, nutrient management, water resources, soil testing, landscape irrigation; soil contamination.

Dr. Thea Whitman

Soil Ecology, Microbiology, and Biogeochemistry: Soil microbial ecology; organic matter decomposition and carbon stabilization; global environmental change; stable isotopes; linking functional significance of microbial communities with ecosystem processes; fire effects on soil carbon and microbes; management and policy.

Dr. Xia Zhu-Barker

Soil Biogeochemistry, Land Management, and Environmental Sustainability: Nitrogen and carbon biogeochemical cycles; Greenhouse gas and air pollutant emissions; Nitrate leaching and runoff; Innovative manure and nutrient utilization; Composting; Climate change mitigation and adaptation; Ecosystem services and carbon markets; Dairy environmental sustainability; Novel methods in isotopic techniques; Mechanistic exploration of soil-plant-microbe interactions; Process-based modelling. The specific research topics include:

- Microbial and abiotic processes involved in the production and consumption of nitrogen and carbon gases (N2O, NOX, NH3, CO2, CH4)
- Land management practices (e.g., compost, fertilizer, cover crops, irrigation, and tillage) that change soil health, nitrogen use efficiency, crop productivity, nitrogen losses, carbon turnover.
- Process oriented modelling of carbon/nitrogen turnover in agricultural ecosystems.
- Environmental changes on the sustainability and resilience of agricultural ecosystems especially dairy production systems.

RESOURCES AND SCHOLARSHIPS

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Financial support — in the form of approximately 15 scholarships, part-time employment, paid internships, and work-study programs — is available to qualified undergraduate students. The department also provides opportunities and limited financial support in the form of research assistantships to qualified students seeking MS and/or PhD degrees (see the *Graduate Guide*).