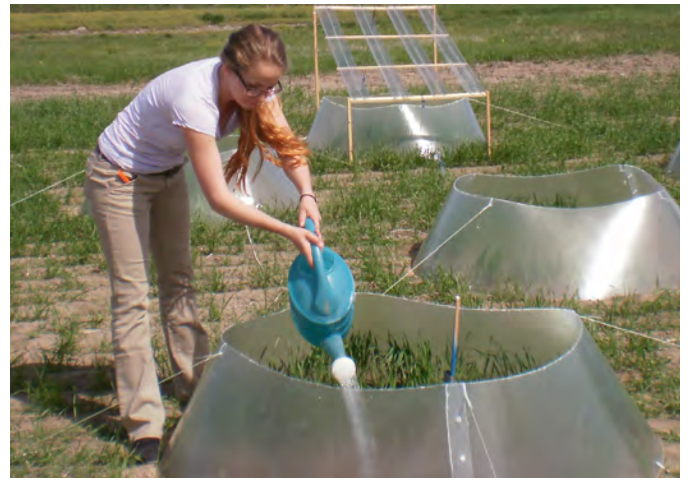


UNDERGRADUATE DEGREE PROGRAMS

Students in LRES degree programs receive a broad education. The foundation of our majors includes courses in biology, chemistry, earth science, ecology, mathematics, physics, soil science, economics, statistics, and written and oral communication. From there, students have room to tailor their studies to their interests. A senior-level capstone course allows students to apply their classroom knowledge by developing solutions for real-world environmental problems.

B.S in Environmental Sciences

Students may elect an option below or design their own course of study within the Environmental Sciences curriculum.

- Environmental Biology Option
- Geospatial and Environmental Analysis Option
- Land Rehabilitation Option
- Soil and Water Sciences Option

B.S. in Sustainable Food and Bioenergy Systems

- Agroecology Option

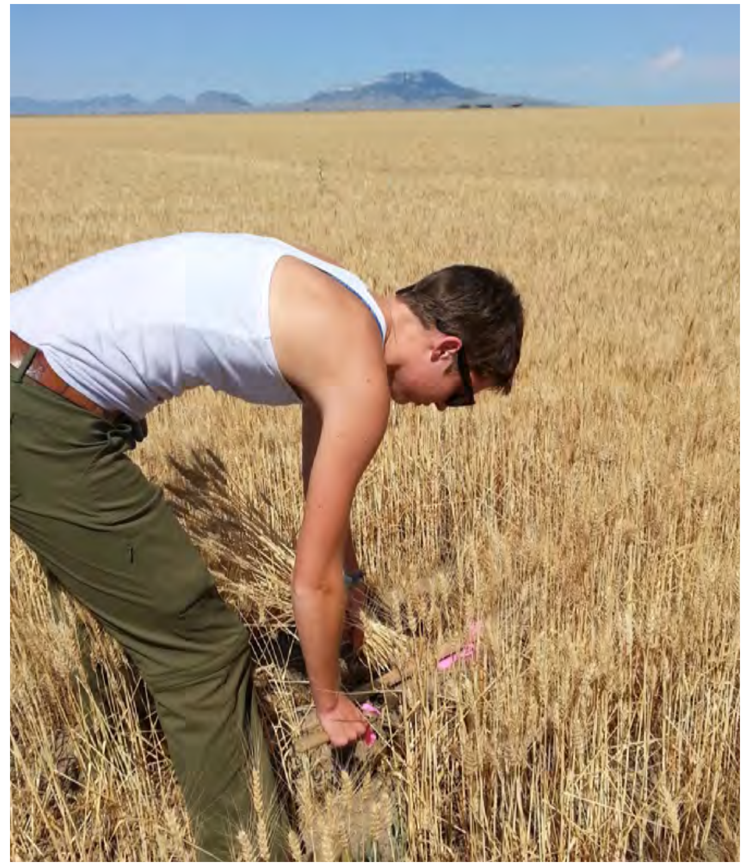
LRES Undergraduate Minors

- Soil Science
- Entomology (shared with other College of Agriculture departments)
- Water Resources (shared with other MSU Colleges)

GRADUATE DEGREE PROGRAMS

Students pursuing a master's degree or a doctoral degree in the LRES department are provided with a range of opportunities for specialization and the opportunity for cross-departmental study. Graduate student research projects are related to the diverse interests of LRES faculty members. The department also offers flexibility in coursework programs so students can address their individual career goals.

- M.S. in Land Resources and Environmental Sciences
- M.S. in Land Resources and Environmental Sciences (online)
- M.S. in Land Rehabilitation (Cross-departmental)
- M.S. in Entomology (Cross-departmental)
- Ph.D. in Ecology and Environmental Sciences (Cross-college)



CONTACT INFORMATION

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MONTANA STATE UNIVERSITY
College of AGRICULTURE

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Land Resources and Environmental Sciences

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Mountains & Minds

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Department of Land Resources and Environmental Sciences

OUR FOCUS: DISCOVERY AND COMMUNICATION

Land Resources and Environmental Sciences (LRES) offers a multi-disciplinary approach to understanding and managing land resources. Our coursework and research involves soils, microorganisms, insects, plants, climate and water; the options within our majors allow students to focus on their specific areas of interest.

Students have the opportunity to join LRES faculty members in cutting-edge, internationally recognized investigations, many of which take place in the many outstanding and diverse natural laboratories within the Greater Yellowstone Ecosystem. We address issues affecting cropland, rangeland, forests, reclaimed land, extreme environments, and protected natural areas.

Through our classes, research, and service-learning opportunities, we challenge our students to share the knowledge they gain about local and global environments with agricultural producers, land owners and managers, the general scientific community, and the citizens of Montana. Our students graduate with a broad, scientifically-sound education and are well-prepared for careers in the environmental sciences.

RESEARCH OPPORTUNITIES

LRES research programs offer opportunities for advanced study to undergraduates, graduates, and postdoctoral researchers. Our department collaborates with allied disciplines, institutions, and stakeholders to address land resource and sustainability issues that are complex, that bridge spatial scales from microscopic to landscape, and that integrate the ecological and environmental sciences. Our work in managed and natural ecosystems spans from the Greater Yellowstone Ecosystem and Montana's Golden Triangle to Mongolia and Antarctica.

Agroecosystems

Integrate soil and crop management principles with modern tools to maximize profitability and environmental stewardship in water-limited cropping systems. Focus areas include:

- Improved economics through diversified and low-input cropping systems and innovations with alternative crops
- Impacts of technology abundance (precision agriculture, nutrients, herbicides, GMOs) on agroecosystems
- Integrated weed and insect pest management to develop economically viable, ecologically healthy, and relatively weed- and pest-resilient rangeland and cropping systems (agroecology)
- Interaction of land, climate, and agronomic practices on soil and water conservation, nutrient cycling, biodiversity, and pest dynamics
- Land management and cropping system strategies that mitigate greenhouse gas emissions and enhance soil biological function

Analysis, Management, and Decision-Making

Apply biological, socio-economic, and physical data to land resource management. Focus areas include:

- Environmental and biological risk assessment with particular emphasis on pesticides, biotechnology, and invasive species
- Risks and opportunities associated with climate change through long-term ecological research in the Greater Yellowstone and Antarctic regions
- Modern tools for land analysis (satellite remote sensing, GIS, GPS, and computer decision support and simulation modeling)
- Documenting soil-landscape patterns and causes of change to define strategies for using and sustaining land resources

Environmental Biology

Specialize in understanding microbial and plant ecology across natural and disturbed environments. Focus areas include:

- Microbial ecology of extreme geothermal environments in nearby Yellowstone National Park
- Bioremediation ecology, where environmental biophysics and chemistry are combined with microbial ecology to understand the ecology of contaminant-degrading bacteria
- Ecology of areas impacted by weeds, mining, recreation, and other activities, including those at high elevations
- Microbial ecology of Antarctic ecosystems focusing on the biogeo-chemistry, survival, and evolution of microbes associated with ice
- Physiology, biochemistry, and genetics of microbe-plant interactions

Invasive Plants

Study the biology, ecology, and management of invasive plant species in a wide range of systems (agriculture, range, restored or wild lands), including:

- Quantify the environmental and biotic drivers of plant invasion from local to global scales
- Evaluate above- and below-ground mechanisms of plant/environment interactions
- Develop revegetation and restoration strategies for disturbed and invasive plant-dominated areas
- Create integrated and ecologically framed management approaches for invasive plants in all systems

Land Rehabilitation

Address mechanisms of restoration and reclamation focused on soil, water, plant, and microbial processes on disturbed lands. We partner with government agencies and private industry to ask questions related to:

- Ecological principles of revegetation
- Geochemical characterization of mining wastes
- Decision tools for large-scale land reclamation strategies
- Microbial influence of geochemical processes
- Invasive species management on disturbed and restored sites
- Hydrological processes that affect contaminant transport

Soil and Water Science

Interact with faculty with expertise in soil and environmental physics, chemistry, hydrology, watershed analysis and modeling, limnology, microbiology, nutrient cycling, pedology, land rehabilitation, and landscape science to explore:

- Biogeochemical cycling of trace elements associated with geothermal or mine impacted areas
- Interactions between plants and soils, including water relationships, plant physiological ecology, biophysics, and bioremediation
- Interactions of climate, landscapes, plants, soils, and humans
- Nutrient loading and algal growth impacts on lake, reservoir, and river quality
- Management alternatives to improve surface and ground water quality, such as vegetative filter strips, riparian and/or constructed wetlands, and summer fallow replacement with grain legumes or cover crops
- Land use impacts on hydrology, vegetation, and biogeochemistry
- Watershed hydrologic modeling

Entomology

Specialize in several areas of entomological science and its interface with agriculture and natural resource sciences. Research areas include:

- Insect-plant interactions, including chemical ecology and plant and insect physiology, and insect behavior and ecology as they relate to insect distribution, abundance, and evolution
- Using arthropods, microorganisms, and other natural enemies to manage weed and insect pests in wildlands and crops
- Integrated pest management and economic entomology for arthropod pests of small grains, forage, and specialty crops