

Ph.D. Degree in Ecology and Environmental Sciences (Interdisciplinary)

This cross-college doctoral degree represents a broad collaboration among departments and faculty from across MSU. It provides the opportunity for motivated students to integrate our world-class faculty research programs in diverse aspects of ecology and environmental sciences, often within the unparalleled natural laboratory that is the Greater Yellowstone Ecosystem. Particular program strengths include terrestrial and aquatic ecology, environmental biogeochemistry, evolutionary biology, hydrology and watershed analysis, quantitative ecology, agroecology, environmental risk assessment, invasive plant ecology and management, conservation biology, land rehabilitation/restoration ecology, environmental microbiology, remote sensing and spatial sciences, chemical ecology and land-atmosphere interactions.

Graduates will be well-trained professionals who will compete strongly in research, teaching, and related fields nationally and internationally.

Ecology and Environmental Sciences doctoral students will be affiliated with a home department that corresponds to that of their major faculty advisor. Other specific graduate program criteria, procedures, and processes vary among departments; students will follow those of their home department, which are also consistent with policies set forth by The Graduate School (<http://www.montana.edu/gradschool/>).

Core Curriculum

Because of the substantial diversity in disciplinary and multidisciplinary foci within the Ecology and Environmental Sciences doctoral program, there is no universal required core curriculum other than LRES 593- Grand Challenges in Ecology and Environmental Sciences, 1 credit. The student's individual coursework program will be developed in partnership with the major advisor and graduate committee, and must be consistent with the home department and the Graduate School guidelines and requirements. A minimum of 30 credits of resident coursework must be taken from MSU.

History - The Ph.D. program in Ecology and Environmental Sciences (EES) is a multi-disciplinary degree program (<http://www.montana.edu/ees/>) that is meant to train and provide skills allowing students to be successful across a spectrum of career tracks. Consistent with the original 2006 BOR request¹, several departments across campus would like to formally participate in this degree, given PhD students within those degrees would be better served with an EES PhD. Administration of those degrees would occur from within each of the participating departments. EES is the sole doctoral degree of Land Resources & Environmental Sciences and an option for Ph.D. students in Ecology; other departments interested in participating include Earth Sciences, Animal and Range Science, Plant Science and Plant Pathology, and Microbiology and Immunology. Here we propose some changes that will provide greater student and faculty collaboration, build community, appeal to a broader set of disciplines, increase recruitment potential, and respond to the Provost's request for an oversight committee.

EES Oversight Committee - The EES Oversight Committee will be made of faculty representatives from each of the Departments that train graduate students in the EES program. Doctoral credit goes to the Department of the major professor on the Program of Study. In order to track students by department, a separate 'rubric' will be associated with each department (e.g., ECES for Ecology and ESEC for LRES, with others added pending approval of the Oversight Committee). Additional departments training students through the EES PhD degree program will apply to the EES Oversight Committee to request membership in this degree program.

Once membership is granted, they will have a representative on the EES Oversight Committee. We are currently waiting on rubric approval from the Registrar, which is contingent on creation of an Oversight Committee, so only LRES and Ecology are currently formally part of the EES program.

However, as noted in the table below, there are current graduate students in EES who are housed in the Earth Sciences and the Animal and Range Science Departments.

Current MSU Students in EES Ph.D. Program & Committee membership:

EES Oversight

Committee Member

(as designated by)		No. of	Registrar's
Department			Dept Head)
students	Rubric		
Institute on Ecosystems as Director of IoE			Bruce Maxwell, Chair,
Land Resources & Environmental Sciences 26	ESEC-LRES		Tracy Sterling
Ecology 11	ECES-ECOL		Diane Debinski
Earth Sciences McWethy	2	proposed ES-ESCI	Dave
Animal and Range Science McNew	4	Proposed ECES-ANRS	Lance
Plant Science & Plant Pathology Thum	0	Proposed ECxx	Ryan
Microbiology and Immunology Plowright	0	Proposed ECxx	Raina

' "The principal participants will be drawn from the Department of Ecology in CLS and the Department of Land Resources and Environmental Sciences in COA. In addition, some faculty in Earth Science, Plant Sciences and Plant Pathology, and Animal and Range Sciences are also expected to participate."

Proposed Department Requirements:

Each Department will be required to submit their Department-specific requirements for students pursuing the EES Ph.D. to the EES Oversight Committee for review and recommendations. The Department-specific requirements will include required exams (qualifying, comprehensive and thesis/dissertation defense), expectation of subject matter for exams, and thesis/dissertation format requirements.

Proposed EES Degree Requirements:

EES Ph.D. students (AY21 on) will be required to take a cohort-building course focused on the principles and foundations of Ecology and Environmental Sciences. The course would be required for each new EES Ph.D. student during their first year they are in residence on the MSU campus, but also open to other interested Ph.D. students in appropriate disciplines. A Task Force (oversight committee) will develop the course proposal during Spring 2020; the course (to be co-taught by LRES and Ecology faculty) is envisioned to contain modules which address "Grand Challenges in Environmental Sciences" including major topics in ecology and environmental sciences such as hydrology/ecology of river systems,

population ecology, isotope biogeochemistry, etc. To enhance community building among EES PhD students, incorporating a field component focused on the Yellowstone Region will be explored (for example, offer the course each January with a field trip to YNP, Mammoth Conference Center). The Program of Study for each EES student will also require any other requirements of the home department (i.e. LRES requires LRES 594, 1 cr. For proposal presentation during the students' first year).

LRES 593	Grand Challenges in Ecology and Environmental Sciences	1
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Additionally, multiple courses relevant to EES could also be taken to meet The Graduate School requirements: <http://ou.montana.edu/environmental-science/>

Program Participants

The program is open to students and faculty mentors in several MSU departments who undertake relevant doctoral study. For more information about the Ph.D. Program in Ecology & Environmental Sciences, faculty and their areas of research, and the application requirements and procedures, visit the department by clicking on the links below.

College of Agriculture:

- Animal and Range Sciences (<http://animalrange.montana.edu/>)
- Land Resources & Environmental Sciences (<http://landresources.montana.edu/>)
- Microbiology & Immunology (<http://www.montana.edu/mbi/>)
- Plant Sciences and Plant Pathology (<http://plantsciences.montana.edu/>)

College of Letters & Science:

- Ecology (<http://www.montana.edu/ecology/>)
- Earth Sciences (<http://www.montana.edu/earthsciences/>)

Stipend and operations funding are generally from research grants awarded to faculty members, but graduate teaching assistantships and other forms of support are also available on a limited basis.