

February 22, 2023

TO: Members of the Board of Trustees

FROM: Anne D'Alleva, Ph.D.  
Provost and Executive Vice President for Academic Affairs

RE: Master of Science in Environmental Earth Sciences



RECOMMENDATION:

That the Board of Trustees approve a new Master of Science in Environmental Earth Sciences in the College of Liberal Arts and Sciences.

BACKGROUND:

Earth Sciences is a STEM interdisciplinary field focused on the study of the Earth and the complex geologic, atmospheric, and hydrologic processes that sustain life and the economy. Understanding the Earth's surface and subsurface, as well as its resources, history, and hazards, allows us to develop solutions to critical economic, environmental, health, and safety challenges of the 21st century. Earth scientists are broadly trained in fundamentals of how the earth works from physical, chemical and biologic perspectives; they have an interdisciplinary understanding of the connections and feedbacks between earth system components (water, biota, atmosphere, and solid earth) and how these links shape human interaction with the environment. There are presently no other similar Master's programs in Connecticut.

Training in the Earth Sciences is critical for all students looking for employment in the environmental consulting or remediation field around New England and the nation. The proposed entrepreneurial 4+1 B.S./M.S. program in Environmental Earth Sciences through the Department of Earth Sciences is designed to provide an accelerated pathway for Earth Scientists, and dual degree students between Earth Science and Environmental Sciences or Engineering, to obtain a M.S. degree in Environmental Earth Science. This program provides a coherent curriculum centered on the themes of Earth, Water and the Environment that will put students on a path to employment in the field of Environmental Earth Sciences/Environmental Consulting. This is an underserved market and the Department of Earth Sciences is uniquely positioned to capitalize on this need. The goal of this program is to provide students with the skills needed to succeed in the Earth Sciences and Environmental workforce of the 21st century.

The program is intended for UConn students entering their junior year who are able to enroll in up to 12 credits of coursework that will count towards the M.S. while simultaneously completing their baccalaureate degree requirements. It's anticipated this program would graduate 10 students per year within 5 years of being established.



## Request for New Academic Degree Program

### General Information

Name of degree program:	Environmental Earth Sciences
Name of sponsoring Department:	Department of Earth Sciences
Name of School/College	College of Liberal Arts & Sciences
Type of Proposal:	New
Type of Program:	Master of Science (M.S.)
Location:	Storrs
Anticipated Initiation Date:	Fall 2023
Program Payment Type:	Tuition-based

### Justification for the New Program

Earth Sciences is a STEM interdisciplinary field focused on the study of the Earth and the complex geologic, atmospheric, and hydrologic processes that sustain life and the economy. Understanding the Earth's surface and subsurface, as well as its resources, history, and hazards, allows us to develop solutions to critical economic, environmental, health, and safety challenges of the 21st century. Earth scientists are broadly trained in fundamentals of how the earth works from physical, chemical and biologic perspectives; they have an interdisciplinary understanding of the connections and feedbacks between earth system components (water, biota, atmosphere, and solid earth) and how these links shape human interaction with the environment. Thus, Earth scientists have a unique set of skills required to address environmental remediation, natural hazards, resource needs, and adaptations to living in the Human Epoch, the Anthropocene. At present, Connecticut has the largest number of professional geologists per capita in all of New England + New York, yet the fewest number of university programs per capita to train this workforce. The US Bureau of Labor Statistics projects an average 4.9% increase in geoscience jobs between 2019 and 2029, yet there is no professional M.S. program similar to that proposed here in all of Connecticut. The lack of production of environmentally-focused earth science graduates reveals a critical skills gap today and into the future. Earth science occupations that are projected to gain the greatest number of jobs over the coming decade include environmental scientists, environmental science technicians, and environmental engineers, who all benefit from graduate training. Growth in the earth sciences/geoscience sector is compounded by the "Silver Tsunami" facing the Connecticut public employment sector. Based on the age demographics of the current earth sciences/geosciences workforce, the BLS predicts that c. 27% of the existing Earth science workforce will be retiring by 2029. At current rates, the number of earth science graduates entering the workforce each year will not be sufficient to fill the gap created by these retirements. As a result, the AGI 2019 Workforce Report predicts significant growth in the demand for Earth Scientists across all Earth and Environmental Sectors and specifically at the M.S. level. If Connecticut does not train scientists to fill these roles, other states in the region will do so. The majority of M.S. and a large percentage of B.S. students graduating in Earth Sciences at UConn and regional Universities embark on careers as professional geologists, hydrologists or certified environmental professionals in the environmental/remediation and groundwater fields. The majority of U.S. states have a formal licensing program for professional Geoscientists and Environmental Professionals in the Earth/Geoscience field. Connecticut is one of six states that offers licensing for Environmental Professionals only, which encompasses all groundwater, environmental quality, and geological engineering related subdisciplines. However, Earth/Geoscientists practicing in the Tri-State or regional New England area may pursue both a Professional Geologist (PG) and Environmental Professional (EP) License. A B.S./M.S. in Environmental Earth Science will provide a solid foundation for both PG and EP careers. UConn Earth Sciences is



poised to fill this critical need for skills development, with minimal new resources. The 4+1 MS program in Environmental Earth Sciences is designed to provide motivated students with a fast track to a professional M.S. degree that is focused on the needs of the next generation of environmental professionals. This will be the only program of its kind in Connecticut, and will be a draw to students from around the region.

**Are there similar programs in CT or elsewhere?**

There are no professional Master's programs in Earth Sciences similar to that proposed here in all of Connecticut.

**What are the desired learning outcomes of the program?**

At present, the UConn Department of Earth Sciences offers research-focused Ph.D. and M.S. degrees, as well as a coursework-only (plan B) M.S. Here we propose a new 4+1 B.S./M.S. program through the Department of Earth Sciences focused on Earth, Water and the Environment and tailored to students looking to enter the field of Earth and Environmental Consulting as Professional Geoscientists and Environmental Professionals. This track is closely aligned with the direction the majority of our students already take, but provides an entrepreneurial masters program that allows them to achieve skills mastery and professional preparation faster and at lower cost.

**Program Description**

Training in the Earth Sciences is critical for all students looking for employment in the Environmental Consulting / Remediation field around New England and the nation. Success in this field requires cross-disciplinary knowledge of the structure and composition of the Earth, the natural and anthropological drivers of environmental change, and how humans interact with these systems. The new entrepreneurial 4+1 B.S./M.S. program in Environmental Earth Sciences through the Department of Earth Sciences is designed to provide an accelerated pathway for Earth Scientists, and dual degree students between Earth Science and Environmental Sciences or Engineering, to obtain a M.S. degree in Environmental Earth Science. This program provides a coherent curriculum centered on the themes of Earth, Water and the Environment that will put students on a path to employment in the field of Environmental Earth Sciences/Environmental Consulting. This is an underserved market and the Department of Earth Sciences is uniquely positioned to capitalize on this need. The goal of this program is to provide students with the skills needed to succeed in the Earth Sciences and Environmental workforce of the 21st century. At present, the Department of Earth Sciences is the only program at UConn with the coursework and expertise to provide this cross-disciplinary training that companies will recognize as preparation for positions as either Environmental Geologist/Geological Engineer or Environmental Consultant. Earth Sciences is interdisciplinary by its very nature. As a result, a diversity of courses exist within a single department to provide the skillset required for the 21st Century environmental Earth Sciences workforce. The new 4+1 program will be built around existing courses and faculty in the Department of Earth Sciences and will not incur any new costs associated with rollout. The curriculum is planned to be delivered on the Storrs campus for full and part-time students via Face to Face classes, though long-term plans may include a hybrid model to incorporate students who have internships or positions with Environmental Consulting companies following their B.S. The anticipated size of the program on a 3-5 year timeframe is 4-10 students per year. The program will recruit from Earth Sciences majors and dual majors with Environmental Sciences/Engineering and other programs, and will disseminate information regionally to attract new majors/enrollees to UConn interested in this program. Environmental Earth Sciences and the Applied Earth Sciences are one of the most diverse sub-fields within the Earth Sciences. A new 4+1 is an opportunity for increasing the diversity of UConn STEM students and the Earth Sciences



profession. The program is intended for UConn students entering their junior year who are able to enroll in up to 12 credits of coursework that will count towards the M.S. while simultaneously completing their baccalaureate degree requirements. Students will focus on two key areas of skill development. First, students will gain experience with data acquisition and analysis to provide real-world training in how earth and environmental scientists collect, analyze and interpret data. Second, students will be exposed to classroom and field training centered on the theme of Water, Climate and the Environment. 4+1 students are required to take 30 credits of coursework. All students should enroll in EARTH 4150/5150 and 6000 as Seniors. EARTH 6000 will serve as a nexus for bringing students together around a central theme that will catalyze further intellectual growth during the 1-year M.S. Courses are completed on the Storrs Campus. Upon earning the baccalaureate degree, 4+1 students complete the remaining M.S. requirements with other Earth Sciences graduate students on the Storrs Campus. Students may apply up to 12 credits of required 4+1 coursework that are taken during undergraduate to the degree. Six of these credits may be at the 3000/4000 level.

### **Proposed Graduate Catalogue Copy**

The 4+1 M.S. in Environmental Earth Sciences prepares students for a career as an Environmental Professional/Professional Geoscientist. Courses cover the fundamentals of how the earth works from physical, chemical and biologic perspectives and provide program participants with a unique set of skills to address the environmental, water and climate challenges of the 21st century. Students complete 30 credits. Up to 12 credits of the required graduate coursework at the 5000 level or higher may be used toward both the undergraduate and M.S. plans of study and students are expected to take between 9 and 12 credits of required courses while they are undergraduates. However, courses taken at the 3000-4000 level that are counted on a graduate plan of study cannot also be counted toward an undergraduate degree. Only 6 credits of 3000 or 4000 level coursework may count toward the M.S.

#### Required Courses:

ERTH 4150/5150 and EARTH 6000

#### Track Courses:

Students must take at least 2 courses from group A (Data Acquisition and Analysis), 2 from the group B (Water, Climate, and the Environment), and select 2 from either group chosen in consultation with the student's advisor.

#### Group A: Data Acquisition and Analysis

ERTH 3030  
ERTH 3710  
ERTH 5/4230  
ERTH 5/4240  
ERTH 5/4430  
ERTH 5/4440  
ERTH 5/4710  
ERTH 5/4810

#### Group B: Water, Climate and the Environment



ERTH 3020  
ERTH 3230  
ERTH 5/4130  
ERTH 5/4210  
ERTH 5/4720  
ERTH 5/4735  
ERTH 5/4740  
ERTH 5/4850

Electives: Students must complete six additional credits of graduate-level coursework chosen in consultation with the student's major advisor.

The program is offered by the College of Liberal Arts and Sciences.

### **Faculty Involvement**

The program coordinator will be an Earth Sciences faculty member. The anticipated size of the new 4+1 program is relatively small, so the effort associated with program coordination will be counted as part of faculty member service. Faculty member Michael Hren will be the program coordinator for the start of the M.S. program.

### **Enrollment and graduate projections**

We project initial enrollments of 2 students in the first FY of the program, increasing to a total of 10 graduate students by year 5.

### **Program Evaluation**

The department of Earth Sciences has developed a five year plan for the implementation and growth the 4+1 program in Environmental Earth Sciences. There are two metrics that will be used to judge the success of the program. First, we anticipate FY1 enrollments of approximately two students. The target for growth of the program is to reach 10 enrolled students by Y5 of the program. Growth of this program is one metric of success. Second, career placement of graduate students within the field of earth sciences is critical to the long-term success of the program. The Department of Earth Sciences will engage with 4+1 MS students to track career placement and will engage alums to assess employment in the field in the years following completion of the program.

### **Program Administration**

The new MS will be administered by the Department of Earth Sciences. Advising will be managed by the program coordinator and admissions, oversight and programmatic changes will be managed jointly by the Graduate and Curriculum Committees in the Department of Earth Sciences.

### **Funding and Financial Resources Needed**

The department of Earth Sciences has all the required resources to start this program. No additional funds are required.

### **Consultation with other potentially affected units**



There are no potential overlaps with existing programs. It is anticipated that 4+1 program participants will come from the ranks of undergraduate Earth Sciences Majors.

**Who can apply to this program?**

Internal applicants (current UConn students enrolled in another UConn degree or certificate program)

**Anticipated term and year of first enrollment**

Fall 2023

**Admission Requirements**

The 4+1 program in Environmental Earth Science is intended for students who have maintained a strong academic record (a minimum 3.0 GPA through 4 semesters of college), have a strong background in one or more of the foundation earth sciences (e.g., atmospheric sciences, biology, chemistry, geology, math, physics, statistics) and are committed to a career in Environmental Earth Sciences. To be considered for admission your application should include:

- Official college transcript(s)
- Two (2) letters of recommendation
- A statement of your interests and goals.

If English is not your primary language, you may be required to submit evidence of your proficiency in the English language.

**Term(s) to which students will be admitted**

Fall

**Program Director Name**

Michael Hren, Associate Professor, Earth Sciences