ENVIRONMENTAL SCIENCES MAJOR

Students in the undergraduate major build knowledge and skills relevant to further studies of, and/or careers in environmental science, with specific emphasis on areas of relevance to humans such as climate change, conservation and resource management, sustainability, and energy. It is ideal for the undergraduate who is interested in highly interdisciplinary science addressing many of the most profound issues facing the world in the 21st century.

The Environmental Science major is offered by the Department of Earth, Environmental, and Planetary Sciences (DEEPS), which also offers the Earth and Planetary Sciences major and minor, described elsewhere in this catalog.

Environmental Science majors are involved in the full spectrum of departmental activities beyond coursework, including research, seminars, field trips, and social functions. Many do research projects with faculty and graduate students that lead to honors theses and scientific publications. For more information, see the department website.

Many of the STEM Related Courses are prerequisites for advanced courses and should be completed as soon as possible. Students are encouraged to take the 200-level Core Courses as early as possible in their studies, beginning with EARTH 210-0 Earth Systems Science and Climate Change and EARTH 211-0 Data Analysis in Earth and Environmental Sciences.

Students envisioning graduate training in Environmental Sciences are encouraged to take additional math and one or more of the sequences in physics, biological sciences, and organic chemistry. Students interested in environmental health and medical professions are advised to take the full 200-level sequence in biological sciences and two additional quarters of organic chemistry.

Please note that ENVR_SCI course codes are transitioning to EARTH course codes as the major in Environmental Sciences is now offered by the Department of Earth, Environmental, and Planetary Sciences (DEEPS), which also offers a major and minor in Earth and Planetary Sciences, described elsewhere in this catalog.

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/undergraduate/requirements-policies/undergraduate-registration-requirement/) and the degree requirements of their home school.

NOTE: This Catalog describes Weinberg College BA requirements that pertain to students who matriculated at Northwestern after spring quarter 2023. Refer to the Archives (https://catalogs.northwestern.edu/archives/) if you are following BA requirements described in the 2018-2019 through 2022-2023 editions.

Major Requirements: Program Courses (12 units)

Students take 4 Core courses and 8 Advanced Studies courses as described below. Under WCAS double-counting rules, these 12 units are not generally eligible to be counted simultaneously to an additional major or minor (for more information see WCAS FAQ webpage (https://weinberg.northwestern.edu/undergraduate/degree/after-2023/double-counting-faq.html), and see this catalog for guidance for students who want to complete both Environmental Science and Earth and Planetary Science (p. 3)).

4 Core 200-Level Courses

Course	Title
EARTH 210-0	Earth Systems Science and Climate Change [1]
EARTH 211-0	Data Analysis in Earth and Environmental Sciences
EARTH 212-0	Ecology & Environmental Change [2]
EARTH 213-0	Decision-Making in the Anthropocene [3]

1 EARTH 210-0 is equivalent to ENVR_SCI 201-0 (Earth - A Habitable Planet) taught prior to academic year 2025-26.
2 EARTH 212-0 is equivalent to ENVR_SCI 202-0 (Health of the Biosphere) taught prior to academic year 2025-26.
3 EARTH 213-0 is equivalent to ENVR_SCI 203-0 (Humans and the Environment) taught prior to academic year 2025-26.

8 Advanced Studies Course Requirement (8 units)

- Among the Advanced Studies courses, students must complete 2 classified in the Society category (p. 2) (including at least one environmental policy and culture course), and 6 classified in the Science category (p. 1). Additionally, 3 courses must meet the Skill Areas requirement (p. 2). If a Skill Area course is on either the Science List or Society List, it may be directed to that requirement while also counting towards the Skill Area.
- Six of the eight Advanced Studies courses must be at the 300-level. One 400-level may be approved by the DUS to substitute for a specific 300-level course.
- See the Environmental Sciences webpage (https://envsci.northwestern.edu) for mid-year updates to the Advanced Studies lists.

Science List (students complete 6)

A course may be applied to the Science requirement and the Skills Area requirement at the same time. Note that only 1 unit of EARTH 399-0 may be applied.

Course	Title
ANTHRO 306-0	Evolution of Life Histories
ANTHRO 312-0	Human Population Biology
ANTHRO 314-0	Human Growth & Development
ANTHRO 359-0	The Human Microbiome and Health
BIOL_SCI 332-0	Conservation Genetics
BIOL_SCI 333-0	Plant-Animal Interactions
BIOL_SCI 336-0	Spring Flora
BIOL_SCI 337-0	Biostatistics
BIOL_SCI 338-0	Modeling Biological Dynamics
BIOL_SCI 339-0	Critical Topics in Ecology and Conservation
BIOL_SCI 341-0	Population Genetics
BIOL_SCI 342-0	Evolutionary Processes
BIOL_SCI 346-0	Field Ecology
BIOL_SCI 347-0	Conservation Biology
BIOL_SCI 349-0	Community & Population Ecology
BIOL_SCI 350-0	Plant Evolution and Diversity Lab
CHEM 306-0	Environmental Chemistry
CHEM 393-0	Green Chemistry
CHEM_ENG 365-0	Sustainability, Technology, and Society
CIV_ENV 260-0	Environmental Systems and Processes
CIV_ENV 346-0	Ecohydrology

CIV_ENV 361-1	Environmental Microbiology
CIV_ENV 361-2	Public & Environmental Health
CIV_ENV 364-0	Sustainable Water Systems
CIV_ENV 365-0	Environmental Laboratory
CIV_ENV 367-0	Chemical Processes in Aquatic Systems
CIV_ENV 368-0	Sustainability: The City
CIV_ENV 370-0	Emerging Organic Contaminants
CIV_ENV 371-0	Introduction to Transportation Planning and Analysis
CIV_ENV 376-0	Transportation System Operations
CIV_ENV 387-0	Design of Sustainable Urban Developments
EARTH 300-0	Earth and Planetary Materials
EARTH 301-0	Petrology: Evolution of Crustal and Mantle Rocks
EARTH 310-0	Aqueous Geochemistry
EARTH 312-0	Stable Isotope Geochemistry
EARTH 313-0	Radiogenic Isotope Geochemistry
EARTH 314-0	Organic Geochemistry
EARTH 323-0	Seismology and Earth Structure
EARTH 324-0	Earthquakes and Tectonics
EARTH 327-0	Geophysical Time Series Analysis
EARTH 330-0	Sedimentary Geology
EARTH 331-0	Field Problems in Sedimentary Geology
EARTH 340-0	Physics of Weather & Climate
EARTH 341-0	Quaternary Climate Change: Ice Ages to the Age of Oil
EARTH 342-0	Contemporary Energy and Climate Change
EARTH 343-0	Earth System Modeling
EARTH 344-0	The Scientific Foundations of Decarbonization
EARTH 350-0	Physics of the Earth for ISP
EARTH 353-0	Mathematical Inverse Methods in Earth and Environmental Sciences
EARTH 354-0	Physics of Rock Deformation in Planetary Interiors
EARTH 360-0	Instrumentation and Field Methods
EARTH 361-0	Scientific Programming in Python
EARTH 370-0	Geobiology
EARTH 371-0	Biogeochemistry
EARTH 373-0	Microbial Ecology
EARTH 390-0	Special Topics in Earth, Environmental and Planetary Science [1]
EARTH 399-0	Independent Study [2]
ISEN 220-0	Introduction to Energy Systems for the 21st Century
MECH_ENG 241-0	Fluid Mechanics I
MECH_ENG 367-0	Quantitative Methods in Life Cycle Analysis
MECH_ENG 380-0	Thermal Energy Systems Design

[1] Only certain topics. Refer to Environmental Science webpage (https://envsci.northwestern.edu/) for updates. Recent EARTH 390-0 classes that qualify include: GIS Level 1, GIS Level 2, R Data Science, Analytical Techniques in Geochemistry, & Paleobiology.

[2] Only 1 unit of EARTH 399-0 may be applied to the major.

Society List (students complete 2)

One of the two units must be a course listed under the ENVR_POL (environmental policy and culture) course code.

Course	Title
ANTHRO 357-0	Biocultural Perspectives on Water Insecurity
or GBL_HLTH 357-0	Biocultural Perspectives on Water Insecurity
CIV_ENV 303-0	Environmental Law and Policy
ECON 371-0	Economics of Energy
ECON 372-0	Environmental Economics
ECON 373-0	Natural Resource Economics
ENGLISH 384-0	Studies in Literature and the Environment
ENVR_POL 211-0	Food and Society: An Introduction
ENVR_POL 212-0	Environment and Society
ENVR_POL 251-0	The Politics of Disaster: A Global Environmental History
ENVR_POL 309-0	American Environmental History
ENVR_POL 337-0	Hazard, Disaster and Society
ENVR_POL 338-0	Environmental Justice
ENVR_POL 340-0	Global Environments and World History
ENVR_POL 375-0	Contemporary Issues In Energy
ENVR_POL 383-0	Environmental Anthropology
ENVR_POL 384-0	Political Ecology
GBL_HLTH 222-0	The Social Determinants of Health
GBL_HLTH 302-0	Global Bioethics
GBL_HLTH 325-0	History of Reproductive Health
INTL_ST 393-0	Development in the Global Context: Participation, Power, and Social Change
ISEN 210-0	Introduction to Sustainability: Challenges and Solutions
ISEN 230-0	Climate Change and Sustainability: Ethical Dimensions
or PHIL 275-0	Climate Change and Sustainability: Ethical Dimensions
PHIL 254-0	Introduction to Philosophy of the Natural Sciences
PHIL 268-0	Ethics and the Environment
POLI_SCI 329-0	U.S. Environmental Politics
POLI_SCI 349-0	International Environmental Politics
POLI_SCI 352-0	Global Development
or SOCIOL 317-0	Global Development
SOCIOL 301-0	The City: Urbanization and Urbanism
SOCIOL 305-0	Population Dynamics
SOCIOL 311-0	Food, Politics and Society

Skills Requirement (students complete 3)

Students must take at least one course from three of the following four Skills Areas. No course may be counted for more than one Skills Area simultaneously, but if a Skill Area course is on either the Science List or Society List, it may be directed to that requirement while also counting towards the Skill Area. Some topic offerings of EARTH 390-0 may be applied to a Skill Area with department approval, and new courses not yet in this Catalog edition may also be eligible. Refer to Environmental Science webpage (https://envsci.northwestern.edu/) for updates. Recent EARTH 390-0 classes that qualify include: GIS Level 1 & GIS Level 2 (*Spatial Reasoning*), R Data Science (*Computing*), and Analytical Techniques in Geochemistry (*Analytical/Instrumentation/Field*).

Computing

Course	Title
EARTH 361-0	Scientific Programming in Python

Quantitative

Course	Title
EARTH 310-0	Aqueous Geochemistry
EARTH 327-0	Geophysical Time Series Analysis
EARTH 340-0	Physics of Weather & Climate
EARTH 343-0	Earth System Modeling

EARTH 353-0	Mathematical Inverse Methods in Earth and Environmental Sciences
EARTH 354-0	Physics of Rock Deformation in Planetary Interiors

Spatial Reasoning

Course	Title
EARTH 300-0	Earth and Planetary Materials
EARTH 330-0	Sedimentary Geology

Analytical/Instrumentation/Field

Course	Title
EARTH 331-0	Field Problems in Sedimentary Geology
EARTH 360-0	Instrumentation and Field Methods
BIOL_SCI 336-0	Spring Flora
BIOL_SCI 346-0	Field Ecology

Major Requirements: Related/Foundations Courses in Science and Math (9.68-12.38 units)

Required Math and Chemistry Courses

Students should complete all of the following math and chemistry courses in their first two years. Total units depend on sequences taken. May double-count with another major or minor.

Course	Title
MATH 220-1 & MATH 220-2	Single-Variable Differential Calculus and Single-Variable Integral Calculus
or MATH 218-1 & MATH 218-2 & MATH 218-3	Single-Variable Calculus with Precalculus and Single-Variable Calculus with Precalculus and Single-Variable Calculus with Precalculus
CHEM 131-0 & CHEM 141-0 & CHEM 132-0 & CHEM 142-0	Fundamentals of Chemistry I and Fundamentals of Chemistry Laboratory I and Fundamentals of Chemistry II and Fundamentals of Chemistry Laboratory II
or CHEM 151-0 & CHEM 161-0 & CHEM 152-0 & CHEM 162-0	General Chemistry I and General Chemistry Laboratory I and General Chemistry II and General Chemistry Laboratory II
or CHEM 171-0 & CHEM 181-0 & CHEM 172-0 & CHEM 182-0	Advanced General Inorganic Chemistry and Advanced General Inorganic Chemistry Laboratory and Advanced General Physical Chemistry and Advanced General Physical Chemistry Laboratory

5 Additional Math and Science Courses

Students must take 5 courses (and their associated lab, if applicable) from the following options, with at least 2 from the same subject. May double-count with another major or minor. Required labs do not count toward the 5-course total.[1]

Course	Title
BIOL_SCI 201-0	Molecular Biology
or BIOL_SCI 239-0	Fundamentals of Biological Mechanisms
BIOL_SCI 202-0 & BIOL_SCI 232-0	Cell Biology and Molecular and Cellular Processes Laboratory
BIOL_SCI 203-0 & BIOL_SCI 233-0	Genetics and Evolution and Genetics and Molecular Processes Laboratory
CHEM 215-1 & CHEM 235-1	Organic Chemistry I and Organic Chemistry Lab I
CHEM 215-2 & CHEM 235-2	Organic Chemistry II and Organic Chemistry Lab II
CHEM 220-0	Introductory Instrumental Analysis
ECON 201-0	Introduction to Macroeconomics
ECON 202-0	Introduction to Microeconomics
MATH 226-0	Sequences and Series
MATH 230-1	Multivariable Differential Calculus
MATH 240-0	Linear Algebra (Pre-requisite: MATH 230-1)
MATH 250-0	Elementary Differential Equations (Pre-requisites: MATH 226-0, MATH 230-2 and MATH 240-0)
PHYSICS 135-1 & PHYSICS 136-1	General Physics and General Physics Laboratory
PHYSICS 135-2 & PHYSICS 136-2	General Physics and General Physics Laboratory
PHYSICS 135-3 & PHYSICS 136-3	General Physics and General Physics Laboratory
STAT 202-0	Introduction to Statistics and Data Science
or STAT 210-0	Introduction to Probability and Statistics

[1] Note: Introductory Chemistry, Physics, Biology, and Math courses may be offered in parallel tracks. Consistent with restrictions at the University level, a student cannot receive credit for some course sequences if credit has already been awarded for an equivalent course. See Chemistry, Physics, Biology, and Math sections of this Catalog for details.

Dual Major in Environmental Sciences & Earth and Planetary Sciences

Students wishing to major in both Environmental Sciences and Earth and Planetary Sciences will take all 6 core 200-level EARTH courses (EARTH 210-0, EARTH 211-0, EARTH 212-0, EARTH 213-0, EARTH 214-0 and EARTH 215-0). Students will also be required to take the 8 Advanced Studies courses for each major. Dual majors will also take ONE additional Advanced Studies or other EARTH 300- or 400- level offering to apply to one major to make up one of the two double counted credits from the 200-level sequence. Courses for Advanced Studies and Skills Areas must not be double counted across majors.

Honors in Environmental Sciences

Majors with strong academic records and an interest in pursuing honors should discuss possible research projects with a faculty member and/or the director of undergraduate studies (DUS) early in their undergraduate career, but no later than spring quarter of their junior year. After the faculty mentor approves a proposed project, research is conducted and students must complete at least two credits of EARTH 399-0 Independent Study with the academic advisor of their project; only one EARTH 399-0 credit may count towards major requirements. To earn the honors distinction, students must complete a thesis following the guidelines published on the department webpage.

Students whose grades, research, and written thesis meet departmental criteria are recommended to the college for graduation with honors. For more information, students should consult the director of undergraduate studies and see Honors in the Major (https://catalogs.northwestern.edu/undergraduate/arts-sciences/#academicoptionstext).