CONSERVATION AND ENVIRONMENTAL SCIENCES, BS

At UWM, students with a passion for nature and the environment can obtain a solid education in the natural sciences that are central to environmental science - biology, geosciences, and chemistry - and the social sciences of geography, economics, and politics which guide the application of conservation and environmental science in the real world.

Students at UWM can focus their conservation and environmental science work around land resources, water resources, biological resources/biodiversity, or environmental analysis. Internships and field work complement classroom learning. These opportunities can be found locally at UWM's own Field Station (http://uwm.edu/letters-science/programs/?discipline=Field+Station), on Lake Michigan aboard UWM's R/V Neeskay vessel, and at local agencies, or abroad in places as far flung as Iceland, Africa, Romania and the Caribbean.

An active Conservation Club is another student advantage at UWM. Activities range from on-campus sustainability projects to professional networking and more.

UWM's CES major builds on students' passion to solve environmental issues through either a BS or a BA degree. The BS requires more courses in math, biology, chemistry, and science and is suitable for careers in field or laboratory work, while the BA has fewer electives in science for a career in public programming, education, or administration.

Because of the breadth and flexibility of this major, students should consult with the Director and/or Coordinator to plan a course of study, preferably before the start of their sophomore year. It is particularly important to begin the introductory course sequences early, since they are prerequisites for advanced courses.

It is recommended that students obtain at least one semester of practical work or internship experience, either as an employee or as a volunteer, with state or federal resource management agencies, consulting firms, conservation or environmental organizations, or with nature centers or local parks.

Course of Study – Bachelor of Science Degree

Complete 120 credits including 90 credits in the College of Letters & Science and with 36 of the 90 credits in L&S upper-level (numbered above 300) courses and 30 of those 36 credits in designated Advanced Natural Science courses (https://catalog.uwm.edu/letters-science/approved-courses-advanced-natural-science/). The College requires that students must complete in residence at UWM at least 15 credits in upper-division (numbered 300 or above) courses in their major. Students are also required to complete University-wide General Education Requirements and the specific L&S requirements listed below.

To complete a major, students must satisfy all the requirements of the major as stated in this catalog. Students who declare their majors within five years of entering the UW System as a degree candidate may satisfy the requirements outlined in any catalog issued since the time they entered. Credits used to satisfy the major also may be used to satisfy other degree requirements.

University General Education Requirements (GER)

Code	Title	Credits
Oral and Written Communication		
Part A		
Achieve a grade of C or better in the following course:		
ENGLISH 102	College Writing and Research (or equivalent)	
Part B		
Course designated as OWC-B; may be completed through a major-specific course requirement		
Quantitative Literacy		
Part A		
Earn at least 3 credits with a grade of C or higher in one of the following courses or an equivalent course, or achieve a placement code of at least 30 on the mathematics placement test (or other appropriate test, as determined by the Mathematical Sciences Department)		
MATH 102	Mathematical Literacy for College Students II	
MATH 103	Contemporary Applications of Mathematics	
MATH 105	Introduction to College Algebra	
MATH 108	Algebraic Literacy II	
MATH 111	Introduction to Logic - Critical Reasoning [1]	
or PHILOS 111	Introduction to Logic - Critical Reasoning	
MATH 116	College Algebra	
Or equivalent course		
Part B		
Course designated as QL-B; may be completed through a major-specific course requirement		
Arts		
Select 3 credits		3
Humanities		
Select 6 credits		6
Social Sciences		
Select 6 credits		6
Natural Sciences		
Select 6 credits (at least two courses including one lab)		6
UWM Foreign Language Requirement		
Complete Foreign Language Requirement through:		
Two years (high school) of a single foreign language		
Two semesters (college) of a single foreign language		
Or equivalent		
UWM Cultural Diversity Requirement		
One course from the Arts, Humanities, or Social Sciences must also satisfy UWM's Cultural Diversity requirement		

[1] Math 111 and Philosophy 111 are jointly offered and count as repeats of one another. Students cannot receive credit for both courses.

College of Letters & Science Requirements

I. English Composition Requirement

Students must satisfy the English Composition Requirement with one of the following options:

1) Completing ENGLISH 102 with a grade of C or higher; or

2) placing beyond English 102 on the English Placement Test (EPT) (or other assessment as determined by the English Department); or

3) transferring a course of at least 2.5 equivalent credits from another institution that is equivalent to English 102, or a UWM higher-level expository writing course, with a grade of C or higher.

Note: This requirement is the same as the University General Education Requirement for Oral and Written Communication Part A. The College of Letters & Science does not have a specific requirement for a writing course beyond English 102, but students must complete the university-wide requirement for Oral and Written Communication Part B listed above.

II. Mathematics and Formal Reasoning

To satisfy the Mathematics and Formal Reasoning Requirement, Bachelors of Sciences degree students must satisfy the following two requirements:

1. Complete one of the following courses or an equivalent course:

Code	Title	Credits
MATH 211	Survey in Calculus and Analytic Geometry I	4
MATH 213	Calculus with Life Sciences Applications	4
MATH 221	Honors Calculus I	5
MATH 231	Calculus and Analytic Geometry I	4

2. Complete one course (at least 3 credits) at the 200 level or above chosen from courses in Mathematics, PHILOS 211, or Letters and Science statistics courses:

Code	Title	Credits
Complete one of the following:		
3 or more credits in any 200-level or above Math course		
AFRIC 220	Introduction to Statistics in African and African Diaspora Studies	
ANTHRO 568	Introduction to Anthropological Statistics	
BIO SCI 465	Biostatistics	
ECON 210	Economic Statistics	
GEOG 247	Quantitative Analysis in Geography	
HIST 595	The Quantitative Analysis of Historical Data	
MTHSTAT 215	Elementary Statistical Analysis	
PHILOS 211	Elementary Logic	
POL SCI 390	Political Data Analysis	
POL SCI 392	Survey Research	
PSYCH 210	Psychological Statistics	
SOCIOL 261	Introduction to Statistical Thinking in Sociology	

Note: This requirement is NOT the same as the University General Education Requirement for Quantitative Literacy Part B. To complete the BS, students must take one of the L&S approved courses. **Not all of the courses listed here will satisfy the QL-B requirement**.

III. Foreign Language Requirement

Two courses (minimum of 6 credits) in a language (including American Sign Language) other than English at the 100 level or above are required.

Placement testing may be used to satisfy all or part of this requirement. Language courses (including American Sign Language) other than English taken in high school may be used to satisfy all or part of this requirement. One year of high school language equates to one semester of college work.

Completion of the L&S Language Requirement also satisfies the university-wide Foreign Language GER, but not vice versa.

IV. International Requirement

See Approved Courses for the L&S International Requirement (https://catalog.uwm.edu/letters-science/approved-courses-international-requirement/) for course options.

Code	Title	Credits
Completed in one of the following ways:		9
Complete 3 courses (min. 9 cr) in a single foreign language (not including literature-in-translation or American Sign Language) at the 3rd semester level and above.		
Complete 3 non-language courses (min. 9 credits) with an international content chosen from at least 2 curricular areas.		
Complete 9 credits in combination of the two options above.		

V. Breadth Requirement

Along with completing the University General Education Requirements of 3 credits in the Arts (A); 6 credits in the Humanities (HU), Social Sciences (SS), and Natural Sciences (NS/NS+); and a course with the Cultural Diversity (CD/+) designation, L&S students must complete the Breadth requirement.

Code	Title	Credits
Arts		
Select 3 credits		3
Humanities		
Complete 12 credits of L&S courses with Humanities Breadth designation; no more than 6 credits from a single subject area. *		12
Social Sciences		
Complete 12 credits of L&S Courses with Social Science Breadth designation; no more than 6 credits from a single curricular area. *		12
Natural Sciences		
Complete 12 credits of L&S Courses with Natural Sciences Breadth designation, including laboratory or field courses from three different curricular areas. *		12
Cultural Diversity		
Complete 3 credits in a course with Cultural Diversity (CD) designation. **		3

* Students should check their course selections carefully with the list of approved L&S Breadth Courses (https://catalog.uwm.edu/letters-science/breadth-requirement-course-list/). Students are advised to

select at least 6 credits worth of courses in each of the Humanities, Social Science, and Natural Sciences areas that can satisfy both the campus-wide General Education Requirements and the L&S Breadth requirement.

** Students are advised to select a course that satisfies the Cultural Diversity requirement as well as a Humanities or Social Science breadth/GER requirement.

VI. The Major

The College requires that students attain at least a 2.0 GPA in all credits in the major attempted at UWM. In addition, students must attain a 2.0 GPA on all major credits attempted, including any transfer work. Individual departments or programs may require higher GPAs for graduation. Some departmental majors require courses from other departments. Contact your major department for information on whether those credits will count as part of the major GPA. The College requires that students must complete in residence at UWM at least 15 credits in upper-division (numbered 300 or above) courses in their major.

Research Requirement

Within their majors, students must complete a research experience approved by the L&S faculty. A list of courses satisfying the research requirement in each major can be found here (https://catalog.uwm.edu/letters-science/approved-courses-research-requirement/).

VII. The Minor

The College requires that students attain at least a 2.0 GPA in all credits in the minor attempted at UWM. In addition, students must attain a 2.0 GPA on all minor credits attempted, including any transfer work. Individual departments or programs may require higher GPAs for graduation.

Conservation and Environmental Science Major Requirements

Conservation and Environmental Sciences offers two undergraduate tracks with separate sets of required classes: **Conservation and Natural Resources** and **Water Resources**.

The **Conservation and Natural Resources Track** is the broader of the two tracks, and gives students the widest range of options. Areas of emphasis, or focus areas, within this track include Land Resources, Conservation Biology, GIS Application, Natural Resource Policy, and Environmental Interpretation.

The **Water Resources Track** provides students with knowledge and skills critical for futures relating to water resources. Within this track, students may choose to focus on Environmental Chemistry and Toxicology, Surface and Groundwater Hydrology, or Aquatic Ecology and Limnology. Completion of this track will prepare students for graduate studies in water resources.

Coursework for the Major (Conservation and Natural Resources Track)

The **Conservation and Natural Resources Track** requires a minimum of 54 credits, 29 of which are advanced-level. All students in the Conservation and Natural Resources track must fulfill the required 36 credits (25 lower-level core credits, and 11 advanced-level credits) and an additional 18 advanced-level credits from among the approved Conservation and Natural Resources Track electives. The College of Letters & Science requires that students attain at least a 2.0 GPA on all credits in the major attempted at UWM. In addition, students must attain a 2.0 GPA on all major credits attempted, including any transfer work.

Code	Title	Credits
Required Introductory Core		
BIO SCI 150	Foundations of Biological Sciences I	4
BIO SCI 152	Foundations of Biological Sciences II	4
CES 210	Introduction to Conservation and Environmental Science	3
CHEM 102	General Chemistry	5
GEO SCI 100	Introduction to the Earth	3
or GEOG 120	Our Physical Environment	
GEO SCI 102	Principles of Historical Geology	3
or GEO SCI 150	Introduction to Ocean Sciences	
GEOG 215	Introduction to Geographic Information Science	3
Mid-Level Distributional Requirement		
BIO SCI 310	General Ecology	4
GEOG 350	Conservation of Natural Resources	3
Upper-Level Core		
Select 18 upper-level approved CES electives with at least 3 credits taken from each of the following areas		18
Biological Sciences		
Geosciences		
Geography		
Research Requirement		
CES 471	Practicum in Natural Resources Management	4
Total Credits		**54**

List of Approved Electives in the Conservation and Natural Resources Track

Code	Title	Credits
ANTHRO 103	Digging Up the Past: Approaches to Archaeology	3
BIO SCI 289	Internship in Biological Sciences, Lower Division	1-6
BIO SCI 315	Cell Biology	3
BIO SCI 325	Genetics	4
BIO SCI 358	Birds of Wisconsin	2
BIO SCI 370	Mammalian Physiology	3
BIO SCI 383	General Microbiology	4
BIO SCI 406	Marine Biology	3
BIO SCI 440	Ecology and Evolution of Amphibians and Reptiles	3
BIO SCI 451	Field Methods in Conservation	3
BIO SCI 465	Biostatistics	3
BIO SCI 480	Ecological Genetics	3
BIO SCI 489	Internship in Biological Sciences, Upper Division	1-6
BIO SCI 500	Plant Physiology	3
BIO SCI 501	Plant and Aquatic Ecophysiology Laboratory	3
BIO SCI 502	Introduction to Programming and Modeling in Ecology and Evolution	3

BIO SCI 505	Conservation Biology	3
BIO SCI 512	Limnology I	3
BIO SCI 523	Evolution and Ecology of Birds	3
BIO SCI 532	Behavioral Ecology	3
BIO SCI 540	Microbial Diversity and Physiology	3
BIO SCI 562	Topics in Field Biology:	1-2
BIO SCI 611	Seminar on Recent Advances in Limnology and Oceanography	2
BIO SCI 575	Evolutionary Biology	3
CES 289	Internship in Environmental Studies, Lower Division	1-6
CES 451	Field Methods in Conservation	3
CES 461	The Politics and Policy of Sustainability	3
CES 489	Internship in Environmental Studies, Upper Division	1-6
CES 497	Study Abroad:	1-12
CES 499	Ad Hoc:	1-6
CES 515	Environmental Law for Natural Resource Managers	3
CES 651	Principles of Stream Management and Restoration	3
CHEM 104	General Chemistry and Qualitative Analysis	5
CHEM 221	Elementary Quantitative Analysis	4
CHEM 341	Introductory Survey of Organic Chemistry	3
CHEM 342	Introductory Organic Chemistry Laboratory	2
CHEM 343	Organic Chemistry	3
CHEM 344	Organic Chemistry Laboratory	2
CHEM 345	Organic Chemistry	3
CHEM 501	Introduction to Biochemistry	3
CHEM 524	Instrumental Analysis	3
CHEM 560	Biophysical Chemistry	3
CHEM 603	Introduction to Biochemistry Laboratory	2
ECON 328	Environmental Economics	3
GEOG 215	Introduction to Geographic Information Science	3
GEOG 247	Quantitative Analysis in Geography	3
GEOG 304	Human Impact on the Environment	3
GEOG 306	Natural Hazards	3
GEOG 310	General Climatology	3
GEOG 340	Biogeography	3
GEOG 403	Remote Sensing: Environmental and Land Use Analysis	4
GEOG 405	Cartography	4
GEOG 415	Hydrogeography	3
GEOG 450	Climates of the Past and Climate Change	3
GEOG 464	Environmental Problems	3
GEOG 515	Watershed Analysis and Modeling	3
GEOG 520	Physical Geography of the City	3
GEOG 525	Geographic Information Science	4
GEOG 547	Spatial Analysis	4
GEOG 564	Urban Environmental Change and Social Justice	3
GEOG 625	Intermediate Geographic Information Science	4
GEOG 650	Geography Field Work	3
GEO SCI 301	Principles of Mineralogy	4
GEO SCI 400	Water Quality	4
GEO SCI 409	Process Geomorphology	4
GEO SCI 421	Conservation Paleontology	3
GEO SCI 422	Plant-Insect Interactions in Deep Time	3
GEO SCI 443	Glacial and Pleistocene Geology	4
GEO SCI 463	Physical Hydrogeology	4
GEO SCI 464	Chemical Hydrogeology	4
GEO SCI 511	Stratigraphy and Sedimentation	4
GEO SCI 515	Physical Sedimentology	4
GEO SCI 520	Introduction to Paleontology	4
GEO SCI 525	Terroir: Geology in a Glass	3
GEO SCI 562	Environmental Surface Hydrology	3
GEO SCI 563	Field Methods in Hydrogeology	4
GEO SCI 696	Topics in the Geological Sciences:	1-3
GEO SCI 697	Seminar in the Geological Sciences:	1-3
MTHSTAT 215	Elementary Statistical Analysis	3
POL SCI 383	Environmental Political Theory	3

Coursework for the Major (Water Resources Track)

The **Water Resources Track** requires a minimum of 61 credits, 29 of which are advanced-level. All students in the Water Resources Track must fulfill the required 43 credits (32 lower-level core credits, and 11 advanced-level credits) and an additional 18 advanced-level credits from among the approved Water Resources Track electives.

Code	Title	Credits
Required Introductory Core		
BIO SCI 150	Foundations of Biological Sciences I	4
BIO SCI 152	Foundations of Biological Sciences II	4
CES 210	Introduction to Conservation and Environmental Science	3
CHEM 102	General Chemistry	5
CHEM 104	General Chemistry and Qualitative Analysis	5
GEO SCI 100	Introduction to the Earth	3
or GEOG 120	Our Physical Environment	
GEOG 215	Introduction to Geographic Information Science	3
PHYSICS 120	General Physics I (Non-Calculus Treatment)	4
PHYSICS 121	General Physics Laboratory I (Non-Calculus Treatment)	1
Mid-Level Distributional Requirement		
BIO SCI 310	General Ecology	4
GEOG 350	Conservation of Natural Resources	3
Upper-Level Core		
Select 18 upper-level approved electives from the Water Resources electives		18

Research Requirement		
CES 471	Practicum in Natural Resources Management	4
Total Credits		**61**

List of Approved Electives for the Water Resources Track

Code	Title	Credits
BIO SCI 383	General Microbiology	4
BIO SCI 406	Marine Biology	3
BIO SCI 440	Ecology and Evolution of Amphibians and Reptiles	3
BIO SCI 465	Biostatistics	3
BIO SCI 500	Plant Physiology	3
BIO SCI 501	Plant and Aquatic Ecophysiology Laboratory	3
BIO SCI 502	Introduction to Programming and Modeling in Ecology and Evolution	3
BIO SCI 512	Limnology I	3
BIO SCI 532	Behavioral Ecology	3
BIO SCI 540	Microbial Diversity and Physiology	3
BIO SCI 575	Evolutionary Biology	3
BIO SCI 611	Seminar on Recent Advances in Limnology and Oceanography	2
CES 461	The Politics and Policy of Sustainability	3
CES 651	Principles of Stream Management and Restoration	3
CHEM 341	Introductory Survey of Organic Chemistry	3
CHEM 342	Introductory Organic Chemistry Laboratory	2
CHEM 343	Organic Chemistry	3
CHEM 344	Organic Chemistry Laboratory	2
CHEM 345	Organic Chemistry	3
CHEM 501	Introduction to Biochemistry	3
CHEM 560	Biophysical Chemistry	3
CHEM 561	Physical Chemistry I	3
CHEM 603	Introduction to Biochemistry Laboratory	2
ECON 328	Environmental Economics	3
GEOG 247	Quantitative Analysis in Geography	3
GEOG 304	Human Impact on the Environment	3
GEOG 306	Natural Hazards	3
GEOG 310	General Climatology	3
GEOG 340	Biogeography	3
GEOG 403	Remote Sensing: Environmental and Land Use Analysis	4
GEOG 405	Cartography	4
GEOG 415	Hydrogeography	3
GEOG 515	Watershed Analysis and Modeling	3
GEOG 520	Physical Geography of the City	3
GEOG 525	Geographic Information Science	4
GEOG 625	Intermediate Geographic Information Science	4
GEOG 650	Geography Field Work	3
GEO SCI 400	Water Quality	4
GEO SCI 421	Conservation Paleontology	3
GEO SCI 422	Plant-Insect Interactions in Deep Time	3
GEO SCI 463	Physical Hydrogeology	4
GEO SCI 464	Chemical Hydrogeology	4
GEO SCI 511	Stratigraphy and Sedimentation	4
GEO SCI 515	Physical Sedimentology	4
GEO SCI 520	Introduction to Paleontology	4
GEO SCI 525	Terroir: Geology in a Glass	3
GEO SCI 562	Environmental Surface Hydrology	3
GEO SCI 563	Field Methods in Hydrogeology	4
GEO SCI 637	Planetary Geology	3
GEO SCI 696	Topics in the Geological Sciences:	1-3
MTHSTAT 215	Elementary Statistical Analysis	3
POL SCI 383	Environmental Political Theory	3

Approved CES Course Electives for both Tracks Outside of the College of Letters and Science

Note: *Although the following courses may count as credits toward the CES major requirements, they do not count to satisfy the advanced L&S credits requirement for the degree. Consult the Coordinator before enrolling in any of these courses.*

Code	Title	Credits
ARCH 340	Urban Design	3
ATM SCI 100	Survey of Meteorology	3
ATM SCI 240	Introduction to Meteorology	4
ATM SCI 330	Air-Pollution Meteorology	3
CIV ENG 492	Environmental Impact Assessment	3
FRSHWTR 322	Ecology and Evolution of Freshwater Organisms	3
FRSHWTR 361	Introduction to Environmental Data Systems	3
FRSHWTR 391	Water and Natural Resource Economics	3
FRSHWTR 392	Water, Energy, Food, and Climate	3
FRSHWTR 393	Water Law, Policy, and the Environment	3
FRSHWTR 471	Introduction to Sensing Networks	3
FRSHWTR 502	Aquatic Ecosystem Dynamics	3
FRSHWTR 504	Quantitative Freshwater Analysis	3
FRSHWTR 506	Environmental Health of Freshwater Ecosystems	3
FRSHWTR 510	Economics, Policy and Management of Water	3
FRSHWTR 512	Freshwater Sciences Practicum:	2-4
FRSHWTR 563	Finfish Aquaculture and Nutrition Principles	3
FRSHWTR 567	Fish Health	3
PH 375	Topics in Public Health:	3
URBPLAN 591	Introduction to Urban Geographic Information Systems (GIS) in Planning	3

Declaration of Major

Students wishing to declare the major can obtain the necessary information and materials from the Biological Sciences Office (Lapham

Hall, Room 181) or the CES Program Coordinator's office (Lapham Hall, Room 393) or from their College of Letters and Science advisor.

In order to be accepted into the CES program, students should be in their sophomore year and have completed:

Code	Title	Credits
CES 210	Introduction to Conservation and Environmental Science	3
BIO SCI 150	Foundations of Biological Sciences I	4
GEO SCI 100	Introduction to the Earth	3
or GEOG 120	Our Physical Environment	

In addition to course work in the major, good communication skills are essential; students should take courses in public speaking and technical writing. Computer literacy and knowledge of statistics also are highly desirable. Additionally, introductory courses in economics, ethics, political science, and sociology are recommended. The coordinator or a Letters and Science advisor can provide a current list of recommended courses.

Letters & Science Advising

During your time at UWM, you may have multiple members of your success team, including advisors, peer mentors, and success coaches. Letters and Science students typically work with at least two different types of advisors as they pursue their degrees: professional College Advisors and Faculty Advisors. L&S College Advisors advise across your entire degree program while departmental Faculty Advisors focus on the major.

College Advisors are located in Holton Hall and serve as your primary advisor. They are your point person for your questions about navigating college and completing your degree. College Advisors will:

- assist you in defining your academic and life goals;
- help you create an educational plan that is consistent with those goals;
- assist you in understanding curriculum, major and degree requirements for graduation, as well as university policies and procedures;
- provide you with information about campus and community resources and refer you to those resources as appropriate; and
- monitor your progress toward graduation and completion of requirements.

Faculty Advisors mentor students in the major and assist them in maximizing their development in the program. You will begin working with a Faculty Advisor when you declare your major. Faculty Advisors are an important partner and will:

- help you understand major requirements and course offerings in the department;
- explain opportunities for internships and undergraduate research and guide you in obtaining those experiences; and
- serve as an excellent resource as you consider potential graduate programs and career paths in your field.

Students are encouraged to meet with both their College Advisor and Faculty Advisor at least once each semester. Appointments are available in-person, by phone or by video.

Currently enrolled students should use the Navigate360 website (https://uwm.navigate.eab.com/) to make an appointment with your assigned advisor or call (414) 229-4654 if you do not currently have an assigned Letters & Science advisor. Prospective students who haven't enrolled in classes yet should call (414) 229-7711 or email let-sci@uwm.edu.

College of Letters and Science Dean's Honor List

GPA of 3.750 or above, earned on a full-time student's GPA on 12 or more graded credits in a given semester.

Honors College Degree and Honors College Degree with Distinction

Granted to graduating seniors who complete Honors College requirements, as listed in the Honors College (https://catalog.uwm.edu/honors-college/) section of this site.

Commencement Honors

Students with a cumulative GPA of 3.500 or above, based on a minimum of 40 graded UWM credits earned prior to the final semester, will receive all-university commencement honors and be awarded the traditional gold cord at the December or May Honors Convocation. Please note that for honors calculation, the GPA is **not** rounded and is truncated at the third decimal (e.g., 3.499).

Final Honors

Earned on a minimum of 60 graded UWM credits: Cum Laude - 3.500 or above; Magna Cum Laude - 3.650 or above; Summa Cum Laude - 3.800 or above.