FRESHWATER SCIENCES, BS

Freshwater scientists focus on the scientifically sound management of natural and constructed water systems, ensuring equitable and productive use while sustaining biodiversity and freshwater availability. By combining expertise in water resources, social systems, and technology, they develop solutions to the challenges facing freshwater ecosystems through conservation practices and sustainable management strategies.

Freshwater and marine systems are deeply interconnected, making freshwater sciences an essential foundation for those interested in marine science or oceanography. Rivers, lakes, and groundwater feed the oceans, influencing coastal pollution, nutrient cycles, and ecosystem health. Climate change affects both freshwater and marine environments, highlighting the need to study water systems from their sources to their broader environmental impacts in order to fully understand global water dynamics.

At the nation's only School of Freshwater Sciences, students gain a comprehensive education in freshwater ecosystems, human and environmental health, aquatic research, and climate science, while learning to apply science to shape policy and drive real-world solutions. Understanding the interconnections within water systems—from rivers and lakes to groundwater—is crucial for managing both freshwater resources and their broader environmental impacts.

Students choose from two specialized tracks:

Aquatic Science Track

This track focuses on the science behind aquatic systems, exploring the biology, chemistry, and physics that shape freshwater environments. Students have the chance to take courses in fish health and management, aquatic ecology, limnology, hydrology, and water quality monitoring, all while learning about the health of ecosystems, biodiversity, and how humans impact freshwater systems.

Water Policy Track

This track explores water management through economics, law, and policy. Students learn how water resources are managed, study environmental law, and understand the role of public policy and sustainability in protecting water. Courses cover topics such as environmental issues, analysis, and the economics of water use, equipping students with the skills to influence the future of water policy.

Degrees in Freshwater Sciences also open doors to professional roles in business, government, non-profit organizations, and graduate studies in freshwater, marine, and environmental sciences. Hands-on experiences in research labs, state-of-the-art facilities, and internships prepare students to tackle real-world water issues, from water quality analysis and ecosystem monitoring to policy development and resource management.

Requirements

Students must earn a minimum of 120 credits to complete the BS in Freshwater Sciences degree. Students in this program must complete at least 30 credits in residence at UWM and must maintain an average of at least 2.00 in all 300-level and above courses in the freshwater sciences major.

General Education Requirements (GERs)

UW-Milwaukee has General Education Requirements (https://catalog.uwm.edu/policies/undergraduate-policies/#bachelorsdegreegeneraleducation) that must be met in order to earn a bachelor's degree. Some of the requirements of your program, including Foundation Courses, fulfill the campus GERs. Please review the requirements and consult with your academic advisor.

Foundation Courses

Code	Title	Credits
BIO SCI 150	Foundations of Biological Sciences I (satisfies GER-NS+)	4
CHEM 102	General Chemistry	5
COMPSCI 202	Introductory Programming Using Python	3
ECON 103	Principles of Microeconomics (satisfies GER-SS)	3
MATH 115	Precalculus	4
Total Credits		**19**

Core Courses

Code	Title	Credits
FRSHWTR 101	Elements of Water	3
FRSHWTR 120	Preparing for a Career in Freshwater Sciences	1
FRSHWTR 201	The Water Environment	3
FRSHWTR 202	Life in Water	4
FRSHWTR 391	Water and Natural Resource Economics	3
Select one of the following:		3-4
FRSHWTR 464	Chemical Hydrogeology	
GEO SCI 400	Water Quality	
GEO SCI 562	Environmental Surface Hydrology	
FRSHWTR 660	Professional and Capstone Planning	1
or FRSHWTR 662	Thesis Research Planning and Proposal Development	
FRSHWTR 661	Undergraduate Capstone	3
or FRSHWTR 663	Undergraduate Research and Thesis	
GEOG 215	Introduction to Geographic Information Science	3
Total Credits		**24-25**

Aquatic Science Track Requirements

Code	Title	Credits
Core courses cannot be double counted as elective courses.		
Required Courses		
BIO SCI 152	Foundations of Biological Sciences II	4
CHEM 104	General Chemistry and Qualitative Analysis	5
FRSHWTR 361	Introduction to Environmental Data Systems	3
Select one of the following:		3-4
FRSHWTR 362	Calculating Nature	
MATH 213	Calculus with Life Sciences Applications	
MATH 231	Calculus and Analytic Geometry I	

FRSHWTR 511	Ichthyology	3
or FRSHWTR 569	Fisheries Management	
MTHSTAT 215	Elementary Statistical Analysis	3
PHYSICS 120	General Physics I (Non-Calculus Treatment)	4
or PHYSICS 209	Physics I (Calculus Treatment)	
Electives		
Choose at least 12 credits from the following list, including at least 6 FRSHWTR or ATM SCI credits:		12
FRSHWTR 300	Topics in Freshwater Sciences:	
FRSHWTR 321	Exploration of Inland Seas	
FRSHWTR 322	Ecology and Evolution of Freshwater Organisms	
FRSHWTR 341	Sanitation and Sustainability	
FRSHWTR 342	Water Pollution, Technology and Management	
FRSHWTR 392	Water, Energy, Food, and Climate	
FRSHWTR 393	Water Law, Policy, and the Environment	
FRSHWTR 421	Molecular Level Tools to Understand Larger Scale Change	
FRSHWTR 471	Introduction to Sensing Networks	
FRSHWTR 490	Sustainable Design for Community Development	
FRSHWTR 497	Study Abroad:	
FRSHWTR 502	Aquatic Ecosystem Dynamics	
FRSHWTR 504	Quantitative Freshwater Analysis	
FRSHWTR 506	Environmental Health of Freshwater Ecosystems	
FRSHWTR 510	Economics, Policy and Management of Water	
FRSHWTR 511	Ichthyology	
FRSHWTR 513	Field Experimentation and Analysis in Freshwater Sciences	
FRSHWTR 514	Analytical Techniques in Freshwater Sciences	
FRSHWTR 524	Introduction to Stable and Radioactive Isotopes	
FRSHWTR 563	Fish Nutrition and Physiology	
FRSHWTR 567	Fish Health	
FRSHWTR 569	Fisheries Management	
FRSHWTR 583	Cost-Benefit Analysis for Environmental Resource Decisions	
FRSHWTR 585	Applied Water Statistics and Data Manipulation	
ATM SCI 240	Introduction to Meteorology	
ATM SCI 250	Introduction to Climate Science	
ATM SCI 330	Air-Pollution Meteorology	
ATM SCI 480	The General Circulation and Climate Dynamics	
ATM SCI 500	Statistical Methods in Atmospheric Sciences	
BIO SCI 310	General Ecology	
BIO SCI 406	Marine Biology	
BIO SCI 505	Conservation Biology	
BIO SCI 512	Limnology I	
CES 651	Principles of Stream Management and Restoration	
CIV ENG 311	Introduction to Energy, Environment and Sustainability	
GEOG 403	Remote Sensing: Environmental and Land Use Analysis	
GEOG 415	The Water Environment	
GEOG 515	Watershed Analysis and Modeling	
GEOG 525	Geographic Information Science	
GEO SCI 400	Water Quality	
GEO SCI 463	Physical Hydrogeology	
GEO SCI 562	Environmental Surface Hydrology	
MATH 213	Calculus with Life Sciences Applications	
or MATH 231	Calculus and Analytic Geometry I	
MATH 305	Introduction to Mathematical and Computational Modeling	
PH 303	Climate Change, the Environment and Human Health	
PH 303	Climate Change, the Environment and Human Health	
Total Credits		**37-38**

Electives

With the help of their academic advisor, students will select electives to complete the 120 total credits required for the degree. Electives are tailored to each student's interests and career goals. Students may choose a related area of specialization outside of the Freshwater Sciences by completing any minor or interdisciplinary certificate offered by UWM, typically comprised of 18-22 credits. In some cases, students may choose to study two related areas, or they may complement a certificate, microcredential, or minor with other courses of interest.

Water Policy Track Requirements

Code	Title	Credits
Core courses cannot be double counted as elective courses.		
Required Courses		
MTHSTAT 215	Elementary Statistical Analysis	3
BIO SCI 152	Foundations of Biological Sciences II	4
CHEM 104	General Chemistry and Qualitative Analysis	5
FRSHWTR 361	Introduction to Environmental Data Systems	3
Select one of the following:		3-4
FRSHWTR 362	Calculating Nature	
MATH 213	Calculus with Life Sciences Applications	
MATH 231	Calculus and Analytic Geometry I	
FRSHWTR 392	Water, Energy, Food, and Climate	3
FRSHWTR 393	Water Law, Policy, and the Environment	3
Electives		
Choose at least 12 credits from the following list, including at least 6 FRSHWTR or ATM SCI credits:		12
FRSHWTR 300	Topics in Freshwater Sciences:	
FRSHWTR 341	Sanitation and Sustainability	

FRSHWTR 342	Water Pollution, Technology and Management
FRSHWTR 421	Molecular Level Tools to Understand Larger Scale Change
FRSHWTR 461	Politics and Policy of Sustainability
FRSHWTR 471	Introduction to Sensing Networks
FRSHWTR 490	Sustainable Design for Community Development
FRSHWTR 497	Study Abroad:
FRSHWTR 502	Aquatic Ecosystem Dynamics
FRSHWTR 504	Quantitative Freshwater Analysis
FRSHWTR 506	Environmental Health of Freshwater Ecosystems
FRSHWTR 510	Economics, Policy and Management of Water
FRSHWTR 583	Cost-Benefit Analysis for Environmental Resource Decisions
FRSHWTR 585	Applied Water Statistics and Data Manipulation
ATM SCI 250	Introduction to Climate Science
ATM SCI 330	Air-Pollution Meteorology
POL SCI 216	Environmental Politics
ATM SCI 480	The General Circulation and Climate Dynamics
ATM SCI 500	Statistical Methods in Atmospheric Sciences
CES 515	Environmental Law for Natural Resource Managers
CIV ENG 311	Introduction to Energy, Environment and Sustainability
ECON 210	Economic Statistics
ECON 301	Intermediate Microeconomics
ECON 310	Introduction to Econometrics and Data Science
HIST 432	North American Environmental History
GEOG 403	Remote Sensing: Environmental and Land Use Analysis
GEOG 415	The Water Environment
GEOG 515	Watershed Analysis and Modeling
GEOG 525	Geographic Information Science
GEOG 625	Intermediate Geographic Information Science
GEO SCI 400	Water Quality
GEO SCI 463	Physical Hydrogeology
GEO SCI 562	Environmental Surface Hydrology
GLOBAL 201	Introduction to Global Studies II: Economics and the Environment
GLOBAL 383	Environmental Political Theory
MATH 213	Calculus with Life Sciences Applications
or MATH 231	Calculus and Analytic Geometry I
MATH 305	Introduction to Mathematical and Computational Modeling
PH 303	Climate Change, the Environment and Human Health
URBPLAN 630	Budgeting and Finance in the Public Sector
Total Credits	**36-37**

Electives

With the help of their academic advisor, students will select electives to complete the 120 total credits required for the degree. Electives are tailored to each student's interests and career goals. Students may choose a related area of specialization outside of the Freshwater Sciences by completing any minor or interdisciplinary certificate offered by UWM, typically comprised of 18-22 credits. In some cases, students may choose to study two related areas, or they may complement a certificate, microcredential, or minor with other courses of interest.

Aquatic Science Example Pathway

Year 1		
Semester 1		**Credits**
FRSHWTR 120	Preparing for a Career in Freshwater Sciences	1
CHEM 100	Chemical Science	4
MATH 105	Introduction to College Algebra (QLA)	3
ENGLISH 101	Introduction to College Writing	3
Humanities GER		3
	Credits	**14**
Semester 2		
FRSHWTR 101	Elements of Water	3
CHEM 102	General Chemistry	5
MATH 115	Precalculus	4
BIO SCI 150	Foundations of Biological Sciences I	4
	Credits	**16**
Year 2		
Semester 3		
FRSHWTR 202	Life in Water	4
CHEM 104	General Chemistry and Qualitative Analysis	5
MATH 213	Calculus with Life Sciences Applications	4
BIO SCI 152	Foundations of Biological Sciences II	4
	Credits	**17**
Semester 4		
FRSHWTR 201	The Water Environment	3
ENGLISH 102	College Writing and Research	3
MTHSTAT 215	Elementary Statistical Analysis (QLB)	3
1st semester World Language		4
Arts GER		3
	Credits	**16**
Year 3		
Semester 5		
ECON 103	Principles of Microeconomics (SS)	3
COMPSCI 202	Introductory Programming Using Python	3
FRSHWTR 361	Introduction to Environmental Data Systems	3
2nd semester World Language		3
GER OWC-B		3
	Credits	**15**
Semester 6		
FRSHWTR 391	Water and Natural Resource Economics	3
FRSHWTR 511 or FRSHWTR 569	Ichthyology or Fisheries Management	3
PHYSICS 120	General Physics I (Non-Calculus Treatment)	4
FRSHWTR 464	Chemical Hydrogeology	4
	Credits	**14**
Year 4		
Semester 7		
FRSHWTR 660	Professional and Capstone Planning	1

GEOG 215	Introduction to Geographic Information Science	3
AS Elective		3
AS Elective		3
Humanities GER		3
Additional Elective		3
	Credits	**16**
Semester 8		
FRSHWTR 661	Undergraduate Capstone	3
Social Science GER		3
AS Elective		3
Cultural Diversity GER		3
	Credits	**12**
	Total Credits	**120**

Water Policy Example Pathway

Year 1		
Semester 1		**Credits**
FRSHWTR 120	Preparing for a Career in Freshwater Sciences	1
CHEM 100	Chemical Science	4
MATH 105	Introduction to College Algebra (QLA)	3
ENGLISH 101	Introduction to College Writing	3
Humanities GER		3
	Credits	**14**
Semester 2		
FRSHWTR 101	Elements of Water	3
CHEM 102	General Chemistry	5
MATH 115	Precalculus	4
BIO SCI 150	Foundations of Biological Sciences I	4
	Credits	**16**
Year 2		
Semester 3		
FRSHWTR 202	Life in Water	4
CHEM 104	General Chemistry and Qualitative Analysis	5
MATH 213	Calculus with Life Sciences Applications	4
BIO SCI 152	Foundations of Biological Sciences II	4
	Credits	**17**
Semester 4		
FRSHWTR 201	The Water Environment	3
ENGLISH 102	College Writing and Research	3
1st semester World Language		4
MTHSTAT 215	Elementary Statistical Analysis (QLB)	3
Arts GER		3
	Credits	**16**
Year 3		
Semester 5		
ECON 103	Principles of Microeconomics (SS)	3
COMPSCI 202	Introductory Programming Using Python	3
FRSHWTR 361	Introduction to Environmental Data Systems	3
FRSHWTR 393	Water Law, Policy, and the Environment	3
2nd semester World Language		4
	Credits	**16**
Semester 6		
FRSHWTR 392	Water, Energy, Food, and Climate	3
FRSHWTR 391	Water and Natural Resource Economics	3
FRSHWTR 464	Chemical Hydrogeology	4
GER OWC-B		3
Social Science GER		3
	Credits	**16**
Year 4		
Semester 7		
FRSHWTR 660	Professional and Capstone Planning	1
GEOG 215	Introduction to Geographic Information Science	3
WP Elective		3
WP Elective		3
Humanities GER		3
	Credits	**13**
Semester 8		
FRSHWTR 661	Undergraduate Capstone	3
WP Elective		3
Additional Elective		3
Cultural Diversity GER		3
	Credits	**12**
	Total Credits	**120**

Freshwater Sciences BS Learning Outcomes

Students graduating from the Freshwater Sciences BS program will be able to:

- **Describe** the intricacies of aquatic life and ecological interactions within the physical environment.
- **Examine** and **analyze** the interconnectedness of biological, ecological, physical, climate, and economic systems related to water.
- **Analyze** the hydrologic cycle, including atmospheric, surface, and groundwater dynamics, and address water quality concerns.
- **Examine** chemical and biogeochemical interactions within global earth systems and water management.
- **Engage** in multidisciplinary data collection, analysis, and communication, utilizing various methodologies including geographic systems, modeling, sampling, and genomics.

Accelerated Program Option

This program is offered as part of an accelerated graduate program. For more information, see Accelerated Graduate Degrees (https://catalog.uwm.edu/opportunities-resources/accelerated-graduate-degrees/).

This fast-track program enables high-achieving students to begin their mater's degree in their senior year of the freshwater sciences program. Up to 21 credits can be applied toward both a bachelor's degree and a graduate degree. The five-year program consists of 3.5 years in undergraduate status and 1.5 years in graduate status.

To be considered for admission to the Graduate School prior to completing their bachelor's degree, students must meet the minimum criteria for admission established by a Freshwater Sciences, MS: Aquatic Science (Professional) or Freshwater Sciences, MS: Water Policy (Professional) program, and the Graduate School. Students must also be in progress to complete 105 bachelor's credits prior to their first term as a graduate student.

Once admitted to the accelerated graduate program, you must meet the academic standards of the Graduate School.

How It Works

1. Meet with your undergraduate academic advisor during your 5th semester to determine your eligibility for the program.
2. Meet with the graduate program manager to discuss the accelerated graduate program and the application process by the end of your 5th semester.

3. Apply to the graduate program between the end of your 5th semester and the start of your 6th semester. This application process will include a one-to-two page personal statement and letters of recommendation from faculty who can speak to your critical thinking and writing skills, and your ability to manage an increased workload. Students must also be in progress to complete 105 bachelor's credits prior to their first term as a graduate student.
4. If your program of study is approved, work with your undergraduate advisor to register for two graduate-level courses (6 credits) in your 7th semester. Note: to earn credit for these courses, you must receive a grade of "B" or better.
5. You will be a graduate student and pay graduate school tuition your 8th semester.

Honors in the Major – Freshwater Sciences

Students in Freshwater Sciences who meet all the following criteria can be awarded honors in the major upon graduation:

1. A 3.000 cumulative GPA in all UWM graded credits;
2. A 3.500 GPA over all UWM courses counting toward the Freshwater Sciences major;
3. Completed one of the following in a water- or climate-related field:
   - Internship (not part of a capstone or thesis)
   - Independent research project (not part of a capstone or thesis)
   - Leadership role in an organization

A letter of recommendation from a supervisor or advisor associated with this experience is required.

School of Freshwater Sciences Dean's Honor List

GPA of 3.500 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.