



Student Handbook

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What is so special about Appalachian Geological and Environmental Sciences (aGES)?

Appalachian Geological and Environmental Sciences provides a solid foundation for a successful career in the earth and environmental sciences that goes beyond these stereotypes of the disciplines that are listed previously. aGES has one of the nation's largest undergraduate-only departments focusing exclusively on Earth and the Environment. Many of our faculty are internationally recognized experts in their fields of research and have conducted research on all seven continents, in over 50 countries, and from the peaks of the Himalayas to the Pacific Ocean's floor.

We have chosen to focus entirely on high-quality, undergraduate instruction, rather than split our time between undergraduate and graduate students. This devotion to undergraduate education and research goes back a long way. Appalachian's first geology major graduated in 1949. Since then, we have awarded more than 450 degrees in Geology/Earth Science. Since 2017, the Environmental Science Program has been part of aGES. We look forward to graduating an equal number of these students in the years to come.

Special privileges, such as dedicated computer facilities, 24/7 student access to a variety of labs, and the world-class natural setting of the Boone region make Appalachian a great place to study the earth and environmental sciences. Close personal interactions between faculty and students provide many opportunities for independent research; we actively involve our undergraduate students in research, and many students typically author or co-author presentations at regional, national and international meetings, and publish peer-reviewed manuscripts with faculty members in top-tier journals. Explore more about the research our faculty are doing at [our website](#).

The fundamental goal of aGES is to promote a scientific understanding of earth and environmental systems - an awareness essential to an environmentally sound and sustainable future for the human race. Our specific goals are:

- To provide all students with the opportunity to learn about the nature of science and basic scientific principles through the study of geology and environmental science.
- To introduce students to the many ways in which geology and the environment are interwoven into the fabric of modern civilization.
- To provide students with an understanding of the interrelationships of the basic parts of Earth systems.
- To provide students who seek a career in geology and/or environmental science with the sound background for productive work in the profession and in graduate studies.
- To provide present and future teachers with the knowledge and methods necessary for competent instruction in earth and environmental sciences.
- To provide members of the public with the opportunity to gain a better understanding of the Earth systems of which they are a part.

Why study Geology? Why study Environmental Science?

Why study the Geological and Environmental Sciences at Appalachian?

These are questions that we receive all of the time from prospective students, current Appalachian students considering one of our degrees, and even students who are already in the department! Below we consider all of these questions and make an attempt to answer them. Two things to keep in mind, however, are:

Geology/Earth Science is about more than just rocks.

Environmental Science is about more than just ecology, policy, or regulations.

What degree is right for me?

Keeping track of the various environmentally-related and other degree tracks at Appalachian can be confusing. Below we answer typical questions that we get about degrees in aGES versus others available at Appalachian.

I want to work in the environmental industry, or for the U.S. Environmental Protection Agency or the U.S. Geological Survey. What degree should I get?

- We strongly recommend the **BS Geology – Concentration in Environmental Geology** or **Concentration in Quantitative Geoscience**. These degree tracks are designed to provide students with the hands-on, field-based training in demand by the environmental industry. Students in these programs receive considerable field-based training as well as GIS coursework, and typically find employment in the environmental industry immediately upon graduation. We have developed a strong alumni network in the environmental science industry in the southeast in the last several years, and Appalachian Geology graduates are in high demand. Moreover, students in these tracks will have the background to begin the licensure process to become a Professional Geologist (PG), which is a necessary licensure for career advancement in the environmental industry (companies with licensed PGs on staff are more competitive for contracts and grants). Students in our program are encouraged to take Part I of the Association of State Boards of Geology (ASBOG) licensure exam their senior year.
- The **BS Environmental Science** degree is also an option, and these graduates may also be eligible for PG licensure if they have at least 30 hours of geology courses as part of their degree. This is possible, and if interested, students should discuss those options with their academic advisor as soon as possible.
- If you aren't 100% sure you want to work in the environmental industry, but want to keep your options open, note that all geology degrees (except for the Geoscience Education track) in aGES make you eligible for a Professional Geologist (PG) license after you have five years of work experience and pass both the Geologist in Training exam upon graduation and the PG exam after you earn your experience.

I am interested in environmental policy or environmental law. What degree should I get?

- Students who are interested in working in environmental policy while desiring a strong science background typically choose the **BS Environmental Science – Concentration in Environmental Professional**. These students will be prepared for regulatory rather than

- technical jobs in environmental fields, but will still receive intense training in the natural sciences and in mathematics. Students are typically employed in environmental policy positions and state/local government.
- Students who wish to study the environment from a social justice angle may be better served by the **BS Sustainable Development – Concentration in Environmental Studies** degree, where students are prepared for careers that help build connections between environmental scientists, policy makers, and the general public. Graduates of this program tend to look for work with non-profit environmental organizations, advocacy groups, some government agencies, and private businesses, but do not receive the scientific/field training required for employment by environmental consulting firms.
 - For those who are interested in the role that business practices and economics plays on the environment, a **BA Economics - Concentration in Environmental Economics and Policy** may be what you are looking for. Students who go into this program typically find work with government or non-profits with a focus on environmental issues.

I am interested in doing some type of environmental work, but I do not like math or science. What degree should I get?

- All of our degree tracks require at least Calculus I, and nearly all require Calculus II, too. Additionally, all of our degree tracks require two semesters of chemistry and at least one, but mostly two, semesters of physics. For severely math-phobic students, the Geology and Environmental Science degree tracks are probably not your best choice of major. In our experience, though, many incoming students who think they hate math actually like it a lot once they come to college.
- Some students know they want to major in something associated with the environment but prefer a more hands-on degree involving sustainable building systems and sustainable technologies rather than studying the natural sciences. These students typically major in programs within the **Department of Sustainable Technology and the Built Environment**.
- Other students have found that the programs in the **Department of Recreation Management and Physical Education** better suit their needs, particularly those who want to lead outdoor education programs or work in adventure tourism.
- Students who are interested in agriculture and its role in the environment may be interested in the agroecology program in the **Department of Sustainable Development**.

I want to work as a park ranger at a national or state park. I want to work for an agency like the U.S. Fish and Wildlife Service. What degree should I get?

- For those with an interest in the environment from a biological perspective, the **BS Biology – Concentration in Ecology, Evolution and Environmental Biology** is the degree track for you. Upon graduation, students in this degree track typically work with state and local governments or go into graduate programs.

I am interested in going to graduate school to study geology/earth science or environmental science instead of going directly into the workforce. What degree should I get?

- About 40% of our students go on to graduate school. **Our students typically receive full tuition waivers and stipends to attend graduate programs**, so paying for graduate school is not usually a problem in the geosciences. For students who wish to go on to graduate school in the earth/environmental sciences rather than directly into industry, we highly

recommend the **BS Geology – Concentration in Quantitative Geoscience** degree. This is one of our most intense (and popular) degree tracks, which provides students with a math minor and a variety of computational coursework.

- For those less interested in math, the **BS Geology** also provides an excellent gateway to graduate school, as does the **BS Geology – Concentration in Paleontology** degree for those interested in paleontology and earth history.

I want to work in a government or commercial laboratory doing environmentally-related work, such as water testing, toxicity analysis, etc. What degree should I get?

- Other students are interested in concentrating on the chemistry side of the environmental sciences. For these students, the **BS Chemistry – Concentration in Environmental Chemistry** degree is for you. Students in this program typically go on to graduate school or directly into laboratory positions within industry or government.

I am interested in instrumentation used in environmentally-related research. What degree should I get?

- Students who are more interested in physics, electronics, and developing instrumentation can get a **BS Applied Physics – Concentration in Environmental Physics** degree. Students in this program typically go on to graduate school or are employed in industry laboratories upon graduation.

I want to be a paleontologist or work in museums. What degree should I get?

- The **BS Geology - Concentration in Paleontology** is the track for you. We are one of the only schools in the country with a dedicated paleontology degree track!

I want to be a middle school or high school earth and environmental science teacher. What degree should I get?

- The **BS Geology – Concentration in Earth/Environmental Science Secondary Education** degree track qualifies graduates for double licensure in Earth/Environmental Science and Comprehensive Science in all NC schools.

Degree Programs in Geological and Environmental Sciences

aGES provides students with a solid foundation on which to build a successful career in the geology/earth science and environmental science disciplines. We are the largest undergraduate earth and environmental sciences department in the UNC system, and we have been successful in establishing a program that is arguably among the best Bachelor degree programs available in the southeastern United States.

The aGES Geology Program offers both a Bachelor of Arts and Bachelor of Science degrees in geology. Students may also opt to concentrate in a specific sub-discipline within geology/earth science, such as:

- B.S. Geology, Concentration in Paleontology
- B.S. Geology, Concentration in Environmental Geology
- B.S. Geology, Concentration in Quantitative Geoscience
- B.S. Geology, Concentration in Earth and Environmental Science Secondary Education

The aGES Environmental Science Program offers a Bachelor of Science degree in Environmental Science. Students may also opt to concentrate in:

- B.S. Environmental Science, Concentration in Environmental Professional

Academic Advising

The Department of Geological and Environmental Sciences has a long history of quality advising, and this tradition has grown along with the department. The process varies between the two departmental disciplines, and those are broken out in the paragraphs below.

Academic Advising for Geology Majors

Students at Appalachian that pursue degrees in geology tend to come to ASU either intended for another major or undecided about their major. Thus, the number of geology advisees tends to increase with rising class standing. It is for this reason that geology advisees are assigned a particular faculty advisor early in their career.

Advising of Geology Intended Majors

Prior to having 30 semester hours, or in their first semester as a transfer to ASU, students have an intended major but are unable to officially declare their major. Students in this category have two advisors: a primary advisor in University College Advising (located in D.D. Dougherty Hall) and a secondary advisor in aGES. The primary advisor gets students started on the correct path at Appalachian, especially with navigating General Education, figuring out transfer equivalencies, and setting the student on the right path for timely completion of a degree. The secondary advisor in aGES makes sure that students have chosen the correct departmental and ancillary science courses.

Typically, geology students in their first semester in aGES have not yet been assigned an aGES advisor. Secondary advising of these students is done by the Chair, Dr. William Anderson Jr., who will meet with each student, discuss degrees and concentrations that are available in the geology program, and discuss career options or other pertinent information for future geologists. The Chair will also assign the student a permanent advisor in the department at this meeting based on the geology degree that the student is seeking (see below). That advisor will serve as the student's advisor throughout their career in aGES. Each student will be issued a 'green form' by their secondary advisor that must be taken to the primary advisor in order to receive their registration PIN.

Advising is broken down by concentration with the following distribution of advisors:

- B.S. and B.A. in geology (no concentration): All aGES advising faculty may advise these students, but the primary advisors are Dr. Gabe Casale, Dr. Cole Edwards, and Dr. Jamie Levine.
- Concentration in Environmental Geology: Dr. Sarah Carmichael, Dr. Ellen Cowan, Dr. Chuanhui Gu
- Concentration in Paleontology: Dr. Steve Hageman, Dr. Andy Heckert
- Concentration in Quantitative Geoscience: Dr. William Anderson Jr., Dr. Scott Marshall
- Concentration in Earth/Environmental Science Secondary Education: Ms. Laura Mallard

Advising of Geology Declared Majors

Once students have officially declared geology as a major, they will gradually transition from University College Advising to aGES advising. Please note that during the first semester of transition, the PIN will still come from University College Advising and a 'green form' will be required to demonstrate that secondary advising has taken place.

Once the aGES advisor becomes the primary advisor to geology students, they must meet with their advisor each semester in order to receive a PIN for registration. It is important to maintain this advising relationship throughout the time at Appalachian in order to remain on track to graduate. Advising meetings should take place as early as possible each semester once official course schedules have been published by the University Registrar. In addition to academic advising, advisors can also discuss graduate school, careers, research, and other topics related to geology. Finally, all records of advising meetings are archived in the notes section of DegreeWorks. This website should be consulted regularly to ensure that courses, designators, etc., are not missed.

Academic Advising for Environmental Science Majors

Students at Appalachian that pursue environmental science degrees tend to come to ASU intended for that major. Because of the large number of students that come in with this degree in mind, aGES operates environmental science advising differently than it does with geology majors.

Advising of Environmental Science Intended Majors

Prior to having 30 semester hours, or in their first semester as a transfer to ASU, students have an intended major but are unable to officially declare their major. Students in this category have two advisors: a primary advisor in University College Advising (located in D.D. Dougherty Hall) and a secondary advisor in aGES. The primary advisor gets students started on the correct path at Appalachian, especially with navigating General Education, figuring out transfer equivalencies, and setting the student on the right path for timely completion of a degree. The secondary advisor in aGES makes sure that students have chosen the correct departmental and ancillary science courses.

Secondary advising of environmental science students is done with group advising sessions that meet three times each semester. The Director of the Environmental Science Program, Dr. Cindy Liutkus-Pierce, meets with groups of environmental science majors to discuss degrees and concentrations that are available in the program, and discuss career options or other pertinent information for future environmental scientists. The Director, Chair, and other faculty will then meet individually with these students. Each student at the meeting will be issued a 'green form' that must be taken to the primary advisor in order to receive their registration PIN.

Advising is broken down by concentration with the following distribution of advisors:

- B.S. Environmental Science: All aGES advising faculty may advise these students, but the primary advisors are Dr. William Anderson Jr., Dr. Chuanhui Gu, Dr. Cindy Liutkus-Pierce, Dr. Jessica Mitchell, and Dr. Bob Swarthout.
- Concentration in Environmental Professional: Dr. Lauren Waterworth

Advising of Environmental Science Declared Majors

Once students have officially declared environmental science as a major, they will gradually transition from University College Advising to aGES advising. Please note that during the first semester of transition, the PIN will still come from University College Advising and a 'green form' will be required to demonstrate that secondary advising has taken place.

Once the aGES advisor becomes the primary advisor to environmental science students, they must meet with their advisor each semester in order to receive a PIN for registration. It is important to maintain this advising relationship throughout the time at Appalachian in order to remain on track to graduate. Advising meetings should take place as early as possible each semester once official course schedules have been published by the University Registrar. In addition to academic advising, advisors can also discuss graduate school, careers, research, and other topics related to environmental science. Finally, all records of advising meetings are archived in the notes section of DegreeWorks. This website should be consulted regularly to ensure that courses, designators, etc., are not missed.

Geology and Environmental Science Requirements

General Degree Requirements

Each degree offered by aGES has specific requirements that can be found in the Undergraduate Bulletin (bulletin.appstate.edu). In addition to the General Education curriculum that is required of all ASU students, aGES degrees can be divided into five sections. In general, these are:

- (1) Geology or Environmental Science requirements;
- (2) concentration requirements;
- (3) Mathematics/Chemistry/Physics/Statistics requirements;
- (4) additional course requirements; and
- (5) general electives

Students also have the option of choosing a minor, requirements for which depend on the particular minor requirements. Geology majors most often minor in Mathematics (especially those pursuing the Quantitative Geoscience concentration), Physics, Chemistry, and Biology (especially those pursuing the Paleontology concentration). Environmental Science majors most often minor in Geology and Biology.

Senior Comprehensive Examination for Geology Majors

The Department of Geological and Environmental Sciences at Appalachian has administered a comprehensive examination of geology majors prior to graduation for the past 40 years. For the faculty, these exams assure us that students have retained an acceptable content base during their time in the department. For students, the senior exams serve as a comprehensive review of their geology coursework in preparation for graduate school or their first job. Students majoring in the Earth/Environmental Science Secondary Education concentration are required to take Part 2 of the Praxis exam in lieu of the senior exams.

Typically, the senior examination is administered on a Saturday or Sunday in the early portion of the semester in which the student is graduating. On exam day, students take five 45-minute examinations based on the requirements of their particular degree track. The examination for each course is developed and graded by the faculty member who taught the course. Review sheets are made available to students on ASULearn to facilitate preparation for the exams. Each exam is graded independently. Students have three opportunities to take or retake parts or all of the exam during the semester in an effort to pass all parts. Students who do not pass the senior exams will not graduate with a degree in Geology.

Exam choices are based on the student's degree track. Every student is required to take senior exams in GLY 2250 – Evolution of the Earth and GLY 2745 – Preparation of Geologic Reports. Beyond those requirements, choices are as follows:

B.A. Geology and B.S. Geology

Students must take exams from three of the following four geology courses: GLY 3150 – Principles of Structural Geology and Tectonics, GLY 3220 – Fundamentals of Mineralogy, GLY 3715 – Petrology and Petrography, and GLY 3800 – Sedimentology and Stratigraphy. In the event that a student is taking more than one of the above classes during his/her final semester, he/she may choose an advisor-approved, 3000- or 4000-level course that contains a laboratory as a replacement course for one of the senior exams.

B.S. Geology, Concentration in Environmental Geology

Students must take exams from two of the following six courses: GLY 3025 – Principles of Paleontology, GLY 3150 – Principles of Structural Geology and Tectonics, GLY 3220 – Fundamentals of Mineralogy, GLY 3333 – Geomorphology, GLY 3715 – Petrology and Petrography, and GLY 3800 – Sedimentology and Stratigraphy. Students must also take one exam from the following environmental courses: GLY 3131 – Geochemistry, GLY 3160 – Introduction to Geophysics, GLY 4630 – Hydrogeology, and GLY 4705 – Advanced Environmental and Engineering Geology. In the event that a student is taking more than three of the above classes during his/her final semester, he/she may choose an advisor-approved, 3000- or 4000-level course that contains a laboratory as a replacement course for one of the senior exams.

B.S. Geology, Concentration in Paleontology

Students must take an exam for GLY 3025 – Principles of Paleontology. Students must also take two exams from the following four core geology courses: GLY 3150 – Principles of Structural Geology and Tectonics, GLY 3220 – Fundamentals of Mineralogy, GLY 3715 – Petrology and Petrography, and GLY 3800 – Sedimentology and Stratigraphy. In the event that a student is taking more than two of the above classes during his/her final semester, he/she may choose an advisor-approved, 3000- or 4000-level course that contains a laboratory as a replacement course for one of the senior exams.

B.S. Geology, Concentration in Quantitative Geoscience

Students must take exams in two of the following four core geology courses: GLY 3150 – Principles of Structural Geology and Tectonics, GLY 3220 – Fundamentals of Mineralogy, GLY 3715 – Petrology and Petrography, and GLY 3800 – Sedimentology and Stratigraphy. Students must also take one exam from the following list of quantitative courses: GLY 3131 – Geochemistry, GLY 3160 – Introduction to Geophysics, GLY 4630 – Hydrogeology, and GLY 4705 – Advanced Environmental and Engineering Geology. In the event that a student is taking more than two of the above classes during his/her final semester, he/she may choose an advisor-approved, 3000- or 4000-level course that contains a laboratory as a replacement course for one of the senior exams.

Honors Programs

Honors Program in Geology

The Geology Program within the Department of Geological and Environmental Sciences offers an honors program in geology. Admission to the honors program requires completion of GLY 2250 (Evolution of the Earth lecture and lab) and a minimum grade-point average, both overall and in the major, of 3.40. To graduate with “honors in geology,” a student must have a minimum grade point average of 3.45, overall and in geology, and must take a total of nine semester hours of geology with honors at the 2000 level or above with a grade of “B” or better in each course. The required honors thesis in geology is the three-credit course GLY 4510 (Senior Honors Thesis). The Geology Honors Thesis must be approved by two readers, with the thesis director from the Department of Geological and Environmental Sciences, in order to graduate with honors in geology.

Honors Program in Environmental Science

The Environmental Science Program within the Department of Geological and Environmental Sciences offers an honors program which culminates in a senior honors research and thesis course (ENV 4510) open to majors in Environmental Science with an outstanding undergraduate record. In order to graduate with “honors in environmental science,” a student must have a minimum GPA of 3.45 overall and in environmental science, and must take nine semester hours of honors credit in environmental science including ENV 3560 (or the equivalent, as approved by the environmental science program director) and ENV 4510 (with a grade of “B” or higher). Students must apply for consideration of “honors in environmental science” with the environmental science program honors coordinator. To satisfy the nine semester hours of honors credit requirement, students may take honors courses or honors course sections in biology, chemistry, geology, or physics (with permission of the appropriate department chair) or students may arrange to take specific additional environmental science or science courses on an honors basis by negotiating an honors contract with the course instructor before class begins. The honors contract, which must be approved by the environmental science program honors coordinator, allows the student to receive honors credit for a regular course in environmental science or other science departments by specifying the additional assignments that the student must perform in order to receive honors credit.

Field Trips

Field trips are an integral part of study in Appalachian Geological and Environmental Sciences. We offer a variety of field trips, from international trips to Iceland and Italy to domestic trips that visit the Southwest or streams and outcrops near ASU.

International Field Trips

aGES runs a number of overseas field trips that serve as elective courses or that satisfy geology majors' field camp requirement.

Bermuda Carbonates Field Course (GLY 3530 – Special Topics)

The Bermuda Carbonates Field Course will be run for the first time in Summer 2019 by our carbonate specialist, Dr. Cole Edwards. Students will visit the island of Bermuda, where they will learn about modern carbonate systems and apply that knowledge to the older carbonates of Bermuda and the (much) older carbonates of the southeastern US.

Iceland: Land of Fire and Ice (GLY 1103 – Environmental Hazards, Resources, and Change; GLY 2500 – Independent Study)

Iceland: Land of Fire and Ice is run by Mr. Brian Zimmer, our resident volcanologist, and Dr. Scott Marshall, our geophysicist. Non-majors can take this course as GLY 1103, helping to fulfill their General Education Science Inquiry requirement, or as a sophomore-level independent. This trip runs annually at the end of July through early August for a total of 16 days. Some work prior to departure is required. Highlights include a visit to the Mid-Atlantic Ridge, the island of Heimaey, where a lava flow nearly buried the town, numerous hot springs and waterfalls, a bay full of icebergs, and the ultimate highlight – a 6-day backpacking adventure on the Laugavegur Trail, which visits valley glaciers and volcanoes.

Italy Field Camp (GLY 4835 – Summer Field Geology)

All geology degree tracks with the exception of the concentrations in Environmental Geology and Earth/Environmental Science Secondary Education are required to take a six-week field course. Our course takes place in central Italy in the Apennine Mountains of Le Marche, Umbria, and Tuscany. Students spend approximately two weeks at each study site, beginning in sedimentary strata to the east of the mountains and ending in metamorphosed equivalents to the same units to the west of the mountains. Other potential highlights are Rome, Assisi, and the island of Elba. This course takes place every other year in odd years and runs from mid-May to the end of June. Students may also elect to take their field course through another university (see the Student Handbook section on field camps for more information).

Domestic Field Trips

aGES also runs a number of domestic field trips that serve as elective courses or, for students concentrating in Paleontology, as a Program of Study requirement.

Triassic Trip (GLY 2857 – Paleontology Field and Museum Methods)

Since May 2006, Dr. Andy Heckert has led students to the desert Southwest to learn about fossil extraction, preparation, and display in museums. This popular trip involves several days in the remote field extracting a specimen, in addition to behind-the-scenes work in museums, most notably the New Mexico Museum

Fall & Spring Break Field Trips

aGES has a tradition of taking longer field trips over Spring Break. In years past these trips have ventured out west to Big Bend National Park, TX, and Death Valley National Park, CA, and also to sites overseas, such as the Dominican Republic and Jamaica. Spring Break trips have been on hiatus for the past five years or so, but plans are being made for new field trips beginning in the Fall 2018 semester. Keep your eyes and ears open for information about these trips.

Class Field Trips

Finally, aGES courses take advantage of our setting in the Blue Ridge Mountains to deliver some course content in the field. We operate a number of vans that we utilize to get upper-level classes into the field. Some are to rock outcrops in North Carolina, Tennessee, and Virginia, or to the coast to examine marine environments, but some, especially those in environmentally-related courses, go to the Town of Boone Greenway to visit the ASU Educational Wellfield for hydrogeology and environmental geochemistry classes, or to utilize geophysical equipment in a new field setting.

Field Camp

Geology majors in all degree tracks except the Concentrations in Environmental Geology and Earth and Environmental Science Secondary Education are required to complete an approved geology summer field course that carries at least 6 semester hours of credit. Typically, pre-requisites for field camps include courses in structural geology, sedimentology and stratigraphy, mineralogy, and petrology. aGES geology majors usually take field camp after their senior year, but if the pre-requisites are met earlier, students can take the course after their junior year.

In an effort to diminish the confusion of choosing an appropriate field course, each fall semester the department convenes a field camp information meeting. This meeting is meant to inform students about field camp options from the aGES field course in Italy, which is offered every other odd year, to field camp opportunities at other universities, both domestic and international. Many universities offer field camps that fulfill the aGES field course requirement.

The following universities offer domestic field courses that have been approved over the past six years:

- University of North Carolina System Field Camp (operated by East Carolina University)
- Ball State University
- Florida State University
- Idaho State University
- Illinois State University
- Indiana University
- Miami University
- University of Arkansas
- University of Illinois
- University of Missouri – Columbia
- University of Montana
- South Dakota School of Mines
- Southern Illinois University – Carbondale
- West Virginia University

The following universities offer international field courses that have been approved over the past six years:

- Cornell University – Cornell offers courses in Argentina that are conducted in Spanish.
- James Madison University – JMU offers a field course in Ireland.
- Massey University, New Zealand – Massey's course is offered during the spring semester and is ideal for those students finishing up their course requirements in December.
- South Dakota School of Mines & Technology – A number of aGES students have taken international courses in Turkey and Sardinia, Italy, through SDSMT. SDSMT also offers courses in Spain and Morocco.
- University of St. Andrews, Scotland – St. Andrews offers their field course in Scotland.

The field camp approval process involves a number of steps:

- (1) Departmental Approval: After the informational meeting early in the Fall semester, students should choose a field course. Factors to consider are cost, location (domestic or international), and curriculum. In general, the course must be the equivalent of six semester hours of credit at Appalachian – typically a five to six-week course. Prior to applying for admittance to the chosen program, students **MUST** get the course approved by the Chair. Do not apply to any field camp unless it has been approved by the aGES Chair.
- (2) Apply to the Program: Once the course has been approved, students should apply for the chosen course. Some of the more popular or smaller courses, such as those going overseas, may be more difficult to get into than other, larger programs. It is important to decide where to apply early on so that a spot can be secured in the desired program. It is generally advisable to apply to several different schools in order to assure yourself of a good chance of acceptance. If you are having difficulty choosing a field camp, please discuss options with the Chair or Drs. Levine and Casale.
- (3) Paperwork at ASU: Once a student is accepted to a field course, it is essential to complete paperwork at ASU. The student must field out paperwork with the Office of Transfer Services (OTS) to set up the transfer of the department-approved course. OTS will take the information and contact the Chair to make sure that the chosen course is equivalent to the required GLY 4835 – Summer Field Geology course.
- (4) Complete the Field Course: Students must then take the chosen course. aGES geology students are typically well-prepared for field camp because of the amount of time we spend in the field in our regular courses.
- (5) Send an Official Transcript: In order to complete the paperwork, students must request an official transcript from the Registrar at the field camp university. This official transcript must be sent to the ASU Registrar's Office. Only then will the course show up on your official transcript as a transferred course. The College of Arts and Sciences will then verify the course and the student will be ready to graduate (if finished with all other requirements).

Awards and Financial Support in the Department and College

aGES Awards and Scholarships

Departmental awards and scholarships are presented by the aGES faculty at the department's annual awards banquet in April. To be eligible for these merit-based awards, a student must be taking a full-time load of aGES courses and be making reasonable progress toward graduation. Substantial factors in determining scholarship and award winners are enthusiasm, academic achievement, and promise as a professional. Definitions of academic class (i.e. freshman, sophomore, etc.) are those specified in the Undergraduate Bulletin. Please note that several of these scholarships require applications.

aGES Scholarships

aGES gives a number of scholarships to Geology and Environmental Science majors. The number of scholarships and the amount that is awarded varies year-to-year due to variations in the output of the endowment. The following paragraphs list the name of each scholarship and a brief description of the requirements of each scholarship.

Lloyd L. Hobbs Scholarship

This scholarship goes to rising juniors or seniors majoring in an area of the physical sciences within the College of Arts and Sciences. GES awards two of these scholarships, one to a geology major and one to an environmental science major. Nominations are made by aGES faculty, who also vote on the recipients. Nominees must demonstrate and maintain satisfactory academic progress and have at least a 3.0 GPA. The award amount varies in accordance with investment performance.

Loren A. Raymond Research Grant

This scholarship goes to support field-based research by a junior or senior in the broad fields of petrology, structural geology, stratigraphy and geologic mapping. The awardee must supply a project proposal, a budget and a letter of support from a faculty member, who will be the student's research advisor. The award amount varies in accordance with investment performance.

Fred Webb, Jr. and Barbara Haynes Webb Endowed Scholarship for Summer Field Course

This award goes to a junior or senior geology major who is attending a field geology course outside of North or South America. The student must have a GPA of 2.8 or higher, have significant academic potential, and demonstrated sustained dedication to the profession of geology. The awardee must submit a letter of application. The award amount varies in accordance with investment performance.

McKinney Paleontology Scholarship

The McKinney Paleontology Scholarship was established in 2011 in honor of Dr. Ken McKinney's contributions to paleontology and the Department of Geology at Appalachian. The award varies based on fund availability.

Mark DeBroder Memorial Scholarship

This scholarship was started by Mr. Glen DeBroder in memory of his son, Mark, who opened the EspressoNews coffee shop in downtown Boone. Geology faculty, staff and students were such regulars at the shop when it opened in 1994 that Mark was named an honorary member of the department. The scholarship is typically awarded to a rising senior. The award amount varies in accordance with investment performance.

aGES Undergraduate Research Assistantships

aGES offers undergraduate research assistantships to Geology and Environmental Science students. Awards are made based on nominations by faculty members of aGES, who vote on the recipients of the awards. The number of funded URAs varies by year based on funding, and awards may be given to an aGES student at any point in their career. URAs are awarded primarily on the basis of superior academic performance and promise as a professional. Awardees are given \$1000 per semester and are expected to (1) do mentored research for at least 5 hours per week, (2) attend the weekly aGES seminar, and (3) be active in the department. Awardees must also remain in good academic standing while holding the URA. Once supported by a URA, awardees typically hold these assistantships until graduation as long as expectations are met.

aGES Awards

aGES gives a number of awards to Geology and Environmental Science majors. The awards are presented at the spring banquet. Awards vary year-to-year, but usually include some sort of appropriate prize. The following categories list a description of each scholarship.

Promising New Major Award for Geology and Environmental Science Majors

This award goes to new aGES majors who have completed GLY 2250 – Evolution of the Earth and who show promise of being a successful major in GES. An overall GPA of 3.0 or greater, and performance in introductory geology, environmental science, GLY 2250 and other science courses, including independent research, will be the criteria on which this award will be based. The non-cash award varies year-to-year.

Outstanding Field Geology Student Award

This award goes to a geology student with a geology GPA of greater than 2.70. Performance in field work in GLY 2745 – Preparation of Geologic Reports, GLY 3150 – Principles of Structural Geology and Tectonics and GLY 3800 – Introduction to Stratigraphy and Sedimentology are

major criteria on which this award is based. The award varies year-to-year in accordance with investment performance.

Outstanding Junior Environmental Science Student Award

This award is meant for an environmental science major who shows promise of being an outstanding senior. An overall GPA greater than 3.0, and performance in ENV 3105 (WID) and ENV 3560 will be the main criteria on which this award is based. The award amount varies in accordance with funding availability.

Geology Transfer Student Award

This award goes to a student majoring in geology who has transferred 28 student credit hours or more to Appalachian from other colleges or universities, not including any AP credits. This student will have completed a minimum of 14 student credit hours at ASU, and in these courses the student will have a cumulative GPA of greater than 3.00. This award will also look at academic achievement, participation in extra-curricular departmental activities, financial need, and promise, potential and intent for a career in geology. The award amount varies in accordance with funding availability.

Quantitative Geoscience Major Award

This award goes to a student with a geology GPA greater than 2.7. Performance in GLY 3160 – Introduction to Geophysics, GLY 3455 – Quantitative Data Analysis for Earth and Environmental Scientists, GLY 4630 – Hydrogeology and GLY 4705 – Advanced Environmental and Engineering Geology and other quantitative science courses, including independent research, will be the criteria on which this award is based. The awardee receives a student edition of MATLAB.

Mineralogy Award

This award is determined on the basis of the awardee's performance in GLY 3220 – Fundamentals of Mineralogy and/or GLY 3715 – Petrology and Petrography. The student must be participating in research related to mineralogy, geochemistry, petrology or a related field. The awardee receives an Estwing rock hammer.

Outstanding Leadership Award in Environmental Science

This award recognizes students with the highest potential for successful leadership in an academic or professional career. Winners hold leadership position(s) in academic, intramural, and/or extramural organization(s). They also served as examples of a strong scholarly ethic with the demonstrated ability to lift a group of peers to a higher level.

Geology Distinguished Senior Award

This award is given to the seniors who have distinguished themselves through academic achievement, service to student colleagues and the department or other meritorious activities. To be eligible, students must have an aGES GPA greater than 3.00.

Environmental Science Distinguished Senior Award

This award is given to the seniors who have distinguished themselves through academic achievement, service to student colleagues and the department or other meritorious activities. To be eligible, students must have an aGES GPA greater than 3.00.

Roy Sidle Award for Outstanding Achievement in Environmental Science Research

This award recognizes a senior student who has a GPA of greater than 3.0 and has demonstrated exceptional achievement in student research, as demonstrated through active, positive, and sustained membership in a research team or teams at Appalachian or elsewhere (e.g. REU, International, etc.). This is purely an academic achievement award and should be heavily weighted to the student's potential for productive and valued research at the graduate level and beyond.

Environmental Science Academic Achievement Award

This award is given to the graduating environmental science senior who, while at ASU, has (1) completed at least 40 credit hours of science and mathematics courses, (2) taken a load of at least 12 credit hours in each semester in which science or mathematics courses were completed, and (3) earned the highest GPA among his or her classmates in science and mathematics courses.

Geology Academic Achievement Award

This award is given to the graduating senior in any non-teaching GLY degree track who has (1) completed at least 40 hours of science and mathematics courses, (2) taken a load of at least 12 hours in each semester in which science or mathematics courses were completed, (3) completed 12 or more hours of geology courses above the 1000 level, (4) earned a GPA of 3.0 or greater in science and mathematics courses, and (5) earned the highest GPA amongst her or his peers in science and mathematics courses.

Outstanding Senior in Environmental Science Award

This award is meant to recognize students with strong academic performance and achievement in research, service, internships, work abroad, outreach, and/or other forms of engagement or leadership. Award winners have their names placed on a granite plaque on the wall outside the McKinney Museum.

Outstanding Senior in Geology Award

This award is given to a student who has an overall GPA greater than 3.0, has taken an average of 14 hours per semester, has placed a higher priority on geological rather than other activities, has participated in extra-curricular geology activities such as field trips, has attended professional meetings, and has demonstrated a level of interest in the profession beyond that expected in formal classes. Those eligible for the award must have graduated in the December prior to the banquet, or will graduate in May or August following the banquet. Award winners have their names placed on the granite plaque on the wall outside the McKinney Museum.

aGES Employment Opportunities

Undergraduate Teaching Assistantships

Undergraduate Teaching Assistantships (UTAs) are competitive awards available to geology majors who have completed Geology 2250 with a C or better. These awards of \$300/semester provide majors with the opportunity to gain experience in assisting professors in introductory geology laboratories. Service required of recipients consists of approximately two (2) hours per week during laboratory and 0.5 to 1 hour of preparation. Duties include answering students' questions, aid in test administration, and other tasks associated with preparation of and teaching laboratories.

Answersphere

The Answersphere is the in-house tutoring system in the Department of Geological and Environmental Sciences and the McKinney Teaching Museum. The Department hires aGES majors to assist students in introductory geology classes. All sessions are held in the McKinney Teaching Museum located on the first floor of Rankin Science South. Working in the Answersphere is excellent experience for aGES majors planning to attend graduate school, planning a career in secondary education, or polishing those interpersonal communication skills that are so important.

College of Arts and Sciences (CAS) Scholarships

There are a couple of scholarships that are available specifically for STEM students through CAS. Details are listed below.

The Jonathan K. Perryman Memorial Scholarship for the Sciences

This endowed scholarship was established in memory of Jonathan K. Perryman by family members, friends and colleagues. Applicants must be full time students, rising juniors and seniors and majoring in either Biology, Chemistry, Geology, Physics and Astronomy, Mathematics or Computer Science. Applicants must demonstrate satisfactory performance of at least a 3.0 grade point average. The award is renewable based upon reapplication and reselection. The Office of the Dean of the College of Arts and Sciences collects applications and nominations, then conducts the selection process according to established guidelines. For

additional information, please contact Dr. Dru Henson (hensonda@appstate.edu), Assistant Dean, College of Arts and Sciences at (828) 262-3078.

The Richard A. Thomas Memorial Scholarship for Arts and Sciences

This endowed scholarship is established as a memorial to Richard A. Thomas. The scholarship guidelines specify that applicants must demonstrate a verifiable need for financial support and that a financial aid form must be on file. Applicants must have completed the freshman year at Appalachian and must be pursuing a major within the College of Arts and Sciences. In addition, applicants must display success and progress in academics, leadership potential, and co-curricular activities. The award is directed to be renewable based upon reapplication and reselection. Mrs. Alice T. Thomas, the donor who established this scholarship endowment, would genuinely appreciate a letter from scholarship recipients detailing their background and ambitions. The Office of the Dean of the College of Arts and Sciences collects applications and nominations and then conducts the selection process in accordance with established guidelines. For additional information, please contact Dr. Dru Henson (hensonda@appstate.edu), Assistant Dean, College of Arts and Sciences at (828) 262-3078.

Job Prospects and Salaries

Job Outlook for Earth and Environmental Scientists

Data on career outlook for Earth and Environmental Scientists can be found in the U.S. Department of Labor – Bureau of Labor Statistics' Occupational Outlook Handbook, specifically in the Life, Physical, and Social Science Occupations [section](#). This report, which is updated annually, has much information on job prospects that apply directly to our graduates. Listed below are job descriptions, median pay, number of jobs, job outlook (growth) and employment change for workers with the listed entry-level education from the DoL – BLS handbook. Note that the projected growth rate for all occupations is 7% and that the median annual wage for life, physical, and social science occupations was \$63,340 in May 2016.

Environmental Scientists and Specialists

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment and human health. They may clean up polluted areas, advise policymakers, or work with industry to reduce waste. Environmental scientists and specialists work in offices and laboratories. Some may spend time in the field gathering data and monitoring environmental conditions firsthand. Most environmental scientists and specialists work full time. Environmental scientists and specialists need at least a bachelor's degree in a natural science or science-related field for most entry-level jobs. Some similar occupations include civil and environmental engineering, geoscience, hydrology, occupational health and safety, and zoologists and wildlife biologists. Note that many of the positions listed below are also occupied by geologists.

Entry Level = Bachelor's degree
Number of Jobs in 2016 = 89,500 (Number of Jobs in NC including health-related = 3,370)
Projected Job Outlook, 2016-2026 = 11% growth (faster than average)
Projected Employment Change, 2016-26 = 9,900
2016 Median Pay = **\$68,910** (Mean Annual Pay in NC = \$63,850)

Geoscientists

Geoscientists study the physical aspects of the Earth, such as its composition, structure, and processes, to learn about its past, present, and future. Most geoscientists split their time between working indoors in offices and laboratories, and working outdoors. Doing research and investigations outdoors is commonly called fieldwork and can require irregular working hours and extensive travel to remote locations. Geoscientists need at least a bachelor's degree for most entry-level positions. However, some workers begin their careers as geoscientists with a master's degree. Employment of geoscientists is projected to grow 14 percent from 2016 to 2026, faster than the average for all occupations. The need for energy, environmental protection, and responsible land and resource management is projected to spur demand for geoscientists in the future. Some similar occupations include atmospheric science and meteorology, civil and environmental engineering, environmental science, hydrology, mining and geological engineering, petroleum engineering, and physics and astronomy.

Entry Level = Bachelor's degree
Number of Jobs in 2016 = 32,000 (Number of Jobs in NC = 440)
Projected Job Outlook, 2016-2026 = 14% growth (faster than average)
Projected Employment Change, 2016-26 = 4,500
2016 Median Pay = **\$89,780** (Mean Annual Pay in NC = \$78,300)

Hydrologists

Hydrologists study how water moves across and through the Earth's crust. They use their expertise to solve problems in the areas of water quality or availability. Hydrologists work in offices and in the field. In offices, hydrologists spend much of their time using computers to analyze data and model their findings. In the field, hydrologists may have to wade into lakes and streams to collect samples or to read and inspect monitoring equipment. Hydrologists need at least a bachelor's degree for entry-level positions; however, some workers begin their careers with a master's degree. Some similar occupations include civil and environmental engineering, atmospheric science, meteorology, environmental science, geoscience, and mining and geological engineering.

Entry Level = Bachelor's degree
Number of Jobs in 2016 = 6,700 (Number of Jobs in NC = 200)
Projected Job Outlook, 2016-2026 = 10% growth (faster than average)
Projected Employment Change, 2016-26 = 700
2016 Median Pay = **\$80,480** (Mean Annual Pay in NC = \$65,130)

Atmospheric Scientists, including Meteorologists

Atmospheric scientists study the weather and climate, and examine how those conditions affect human activity and the earth in general. Entry Level = Bachelor's degree. (Note: ASU does not offer a degree in Atmospheric Science or Meteorology, so students interested in this field are encouraged to pursue the B.S. Geology, Concentration in Quantitative Geoscience and then pursuing a M.Sc. degree in atmospheric science or meteorology. The Quantitative Geoscience degree will ensure that the graduate has the proper mathematics and computing background for this math-intensive M.Sc. program. Some similar occupations include civil and environmental engineering, environmental science, geoscience, hydrology, mathematics and statistics, physics and astronomy, and computer science.

Entry Level = Bachelor's degree
Number of Jobs in 2016 = 10,400 (Number of Jobs in NC including space scientists = 160)
Projected Job Outlook, 2016-2026 = 12% growth (faster than average)
Projected Employment Change, 2016-26 = 1,300
2016 Median Pay = **\$92,460** (Mean Annual Pay in NC = \$84,310)

Employment of aGES Graduates

Job prospects for geology and environmental science students are bright. aGES graduates do well in the job market, and a majority of those graduates are employed in fields related to geology and environmental science. An analysis of aGES graduates since 1998, primarily

based on geology graduates based on a lack of environmental science student data, show the following employment trends amongst those for whom we have data:

- (1) **Environmental Industry:** 35% of our graduates are employed in the environmental industry, either with environmental consulting firms (28%) or with federal, state and local agencies (7%) dealing with environmental issues. Some examples of environmental firms employing our graduates are Altamont Environmental, Antea Group USA, Apex Environmental, Aspect Consulting, CH2M-Hill, Golder Associates, Nobis Engineering, PSI Inc., URS, and Xeritech, to name a few. Agencies employing our graduates include the Environmental Protection Agency (EPA), Florida Geological Survey, Los Alamos National Laboratories, National Oceanic and Atmospheric Administration (NOAA), NC Department of Agriculture and Consumer Services, and the NC Department of Environment and Natural Resources (DENR).
- (2) **Academia:** 17% of our graduates are in academia, either at universities, community colleges, or secondary schools. Several of our graduates are now professors at institutions such as Middlebury College, the University of Missouri, and a number of community colleges. A large number of our graduates are Earth Science or general science teachers at secondary schools throughout the Southeast.
- (3) **Petroleum/Natural Gas:** 10% are employed in the petroleum industry. While the availability of these jobs fluctuate with the base price of a barrel of oil, they are generally high-paying jobs, especially for those with master's degrees in geophysics. Our graduates in this field are employed by Anadarko, Cabot Oil, Chevron, ExxonMobil, Halliburton, HessWilco, and Schlumberger amongst others.
- (4) **Earth Materials:** 9% are employed in the earth materials industry. These jobs range from running mine operations to exploring for minerals that power our economy and keep us happy (think of your iPad or cell phone). Our graduates in this field are working for Active Minerals, the Gemological Institute of America, Global Venture Natural Resource Consulting, Nova Copper, and UNIMIN (to name just a few).
- (5) **Graduate School:** 21% of our most recent graduates are in graduate school working on master's degrees and PhDs. We send students to graduate schools all over the United States and even overseas. Our graduates have attended schools such as Brown University, Scripps Institute of Oceanography, Virginia Tech, the University of Maryland, the University of Utah, the University of Oregon, Colorado School of Mines, the University of Wisconsin-Madison, the University of Texas, Texas A&M, the University of Tennessee, Boise State University, the University of Alaska (Fairbanks), the University of Chicago, the University of Florida, the University of Idaho, the University of Iowa, the University of Kansas, and the University of Nebraska, among others. This is only a partial list, but the evidence is strong that our students are quite marketable to graduate programs. Overall, approximately 40% of our graduates have gone on to earn a graduate degree.

- (6) **Other Fields:** Less than 10% of our graduates are employed in fields outside of geology/environmental science. There are a variety of reasons that our graduates may opt for another field (particularly if they are bound to a specific geographic region for family reasons), but the point is that the college degree opens up many opportunities, some of which may be outside of the field of the degree. For example, some of our graduates are working as software developers, accountants, as brewers, as organic farmers, but the bottom line is that their education created the opportunity.