B.S. Biology, Geology, and Environmental Science Programs

Self-study

Academic Years 2012-2017

Department Of Biology, Geology & Environmental Science
The University Of Tennessee At Chattanooga

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PREFACE/ HISTORY

A. Recent Departmental History and Program Changes

Department Overview

The Department of Biology, Geology, and Environmental Science (BGE) is the largest department in terms of majors within the University of Tennessee at Chattanooga (UTC) College of Arts and Sciences (CAS), and offers the B.S. in Biology, B.S. in Geology, B.S. in Environmental Science, and M.S. in Environmental Science degrees. With an undergraduate enrollment of nearly 1,000 students, BGE serves about 26% of CAS undergraduate majors and about 9.5% of UTC majors. UTC is composed of four colleges (Arts and Sciences, Business, Engineering & Computer Science, and Health, Education & Professional Studies) with a total undergraduate enrollment of about 10,514 in 2017. CAS is the largest of the colleges with a 2017 undergraduate enrollment of about 3,855. UTC is a public Master's L Carnegie Classification with the additional voluntary/elective Community Engagement Classification.

The department has been reorganized several times in the last 50 years. Prior to 1974, the Biology Program stood alone. The undergraduate Environmental Science Program originated as an Environmental Studies Program created by the Department of Biology in 1974, moved to an Interdisciplinary Studies Program in 1978, and was revamped and reunited with the Department of Biology in 1991 as the Department of Biological and Environmental Sciences. During the 1970s, the department proposed an M.S. in Biology Program. However, UTC and the University of Tennessee system rejected this proposal, as the Tennessee Higher Education Commission was concerned with program proliferation at the state level. Subsequently, due in part to strong demand in the Chattanooga region, the department proposed an M.S. in Environmental Science Program that was approved in 1997. The M.S. program is a broad multidisciplinary program encompassing student research projects ranging from molecular biology studies to environmental policy analysis, and remains the only M.S. Environmental Science Program in Tennessee.

In 2014, the College of Arts and Sciences engaged in a budget reduction and realignment process. An outcome of the process was the breakup of the Department of Physics, Geology, and Astronomy. Geology was merged with the Department of Biological and Environmental Sciences in 2015 to form BGE, and Physics and Astronomy merged with the Department of Chemistry. The overall goal of the BGE merger was to create a unified department that maintains and promotes disciplinary identities, strengths, and resources. BGE consists of one integrated department with three divisions, representing the degree programs: Division of Biology, Division of Geology, and Division of Environmental Science. The divisions are intended to help preserve the disciplinary identity, prestige, and potential of our four degree programs. The merger proceeded pursuant to a merger plan developed by the department and approved by UTC upper-level administrators. The merger plan is contained in Appendix A. The disciplinary differences between Geology and the other two disciplines are more distinct than the differences between Biology and Environmental Science. For this reason, and because the Geology Program existed in a different department for most of the review period, a separate overview and brief history of the Geology Program is provided near the end of this section.

In Fall 2016, about 952 undergraduate students and about 32 graduate students majored in BGE academic programs. The undergraduate Biology curriculum requires students to complete general education courses, a common set of required core courses, and a program of study in General Biology, Preprofessional (Pre-medical, Pre-dental, Pre-vet), or STEM Education. The program instituted a major curriculum revision in Fall 2013 that simplified and streamlined the curriculum. The number of Biology Programs was reduced from six to the three referenced above, and course bottlenecks were reduced. The undergraduate Geology curriculum requires students to complete general education courses, a common set of core courses, and a program of study in Environmental Geology, Geology, or STEM Education. The undergraduate Environmental Science curriculum requires students to complete general education courses, a common set of core courses, and a program of study in 1) Biodiversity, Conservation and Natural Resources, 2) Earth, Atmosphere, and Geological Resources, 3) Engineering Science, 4) Environmental Health, 5) Environmental Policy and Planning, or 6) Geographic and Cartographic Sciences. The program instituted a major curriculum revision in Fall 2014 that reconfigured the curriculum, eliminated low enrolled programs, added two new programs, and reduced course bottlenecks. Each of the three degree programs require completion of 120 hours.

In Fall 2017, BGE had 30 full-time faculty (including 23 tenure-track faculty and seven non-tenure tract faculty lecturers), a non-tenure track faculty associate, a non-tenure track laboratory coordinator (Geology), 11 state funded graduate teaching assistants, 3-6 adjunct faculty per semester, a department advisor, an accounting specialist, and an administrative assistant. Twenty-five of the full-time faculty are in the Divisions of Biology and Environmental Science and five of the full-time faculty are in the Division of Geology. During the review period, BGE obtained four new tenure-track faculty positions and the academic advisor position. The graduate assistants are supervised by faculty and teach introductory Biology and Environmental Science laboratories. Adjunct faculty primarily teach introductory Biology, Geology, and Environmental Science lectures and laboratories. The Geology lab coordinator teaches and administers introductory Geology labs. The faculty associate coordinates introductory Biology laboratories and provides a multitude of department-wide services (e.g., equipment purchases, equipment maintenance and repair, lab safety, hazardous waste processing, BGE website updates). The accounting specialist administers payroll, personnel paperwork, and accounts for state, gift, grant, and scholarship accounts (45-55 separate accounts). The administrative assistant provides general administrative support (communications, copy room, supplies, etc.) and processes travel for all faculty.

All tenure-track faculty are expected to teach, engage in scholarly activity, and provide university, community, and professional service. Nearly all upper level undergraduate and graduate classes and laboratories are taught by tenure-track faculty. Occasionally an upper-level or graduate class will be taught by qualified adjunct faculty. Teaching loads for tenure-track faculty typically range from about 7 - 10 contact hours per semester, while teaching loads for non-tenure track faculty are typically 12 contact hours per semester. In 2016, the College of Arts and Sciences and university began moving toward a student credit hour production model based on Delaware disciplinary norms and away from a contact/credit hours or number of sections approach. The department is presently transitioning to the SCH approach. Teaching load and workload are discussed in section 4.2.

Student credit hour production per full-time faculty per semester averaged about 363 SCH for the last five years, compared with average values of about 367 SCH for full-time faculty in the College of Arts and Sciences and about 306 SCH university-wide. In Fall 2015, the student majors per full-time FTE faculty ratio was about 38 for Biology, about 13 for Geology, and about 39 for Environmental Science. For comparison, student to faculty ratios were about 18:1 in Chemistry, about 5:1 in Physics, and 17:1 for the College of Arts and Sciences. About eight tenure-track faculty regularly serve as graduate student chairpersons, and nearly all have served as graduate student committee members. Department tenure-track faculty secured an average of $552,588 per year in external funding from 2012-2016, for a total of $2,762,940. External awards exceeded $1 million during 2014 and 2016. Over the past 18 years, the department has averaged $454,393 per year, for a total of $8,179,080. At the time of this writing faculty in the department had four active NSF awards. UTC's annual measure of departmental scholarly works shows productivity slightly higher than across the College of Arts and Sciences, although it is suspected that BGE faculty underreport most years. The Tenure-track faculty regularly provide university, community, and professional service.

Historically, Biology and Environmental Science were housed primarily in Holt Hall, which was constructed in 1976 and shared with the English Department, the Philosophy and Religion Department, and the Psychology Department. Rapid enrollment growth began in the mid-2000s and the department quickly outgrew its space in Holt Hall. In 2010, the department received additional space in nearby Grote Hall, consisting of three teaching laboratories, one research laboratory, two storage rooms, and two instructor offices. Despite this additional space, two new tenure-track faculty that joined the department in 2012 were forced to use temporary office and research laboratory space in a separate modular building.

In 2012, due to extreme enrollment growth and deteriorating conditions in Holt Hall, the department was informed that a new life sciences building would be constructed to house the Biology and Environmental Science Programs. However, during the review period, UTC abandoned plans for a new building and, instead, developed plans to renovate Holt Hall and permanently relocate all departments except Biology and Environmental Science. The Holt Hall renovation is proceeding in two phases. Phase I, which began in May 2016, involved vacating and renovating the west end of the building. During phase I, BGE faculty are located in five separate academic buildings on campus (Holt, Grote, Davenport, Collins Lab Annex, Collins Office Annex). Phase I is scheduled for completion on March 1, 2018. Phase II will begin in earnest in May 2018, and will involve vacating and renovating the east end of Holt Hall. A complex series of moves will occur during Summer 2018, with shuffling of faculty, staff, research labs, and teaching labs between the five academic buildings mentioned above. If the renovation stays on schedule, all BGE faculty should be moved to permanent locations in Holt and Grote Halls by the start of Fall 2019. The Division of Geology is primarily located in Grote Hall which was renovated in 2010, and thus the Holt Hall renovation has few direct impacts on the Geology faculty and program. The perceived benefits and limitations of the Holt Hall renovation are discussed in greater detail in this section (page 8, summarizing factors significantly affecting the department's mission), pages 11-12 and 18-19 (providing BGE's response to the 2012 reviewer's recommendation that a new life sciences building be constructed to improve the Biology and Environmental Science Programs, respectively), and in part five of this self-study.

Overview of the Geology Program

The Geology Program currently offers a Bachelor of Science (B.S.) degree in Geology. Geology majors pursue one of three degree options—Geology, Environmental Geology, or STEM Education. The Geology curriculum also supports degree programs in Biology, Environmental Science, Civil Engineering, Environmental Engineering, Computer science, and Middle Grades Education; it provides for a minor in Geology; and some of its courses are certified to satisfy general-education requirements of the university.

The core curriculum of the Geology Program consists of Physical Geology, Historical Geology, Mineralogy, Petrology, Sedimentary Rocks and Stratigraphy, Structural Geology, and a 2-semester sequence of research seminars. In addition to these courses, students of the Geology degree option also take Paleontology and Field Methods in Structural Geology; those of the Environmental Geology option also take Environmental Geology and Hydrology; and those of the STEM education option also take Oceanography, Geology of Tennessee, and courses required of the STEM Education Program. The purpose of these options is to provide somewhat tailored preparations for graduate studies in Geology, for Geology-related employment, and for those who wish to be teachers.

The Geology curriculum is currently taught by five tenured and tenure-track faculty, two adjunct faculty, and a laboratory coordinator. These five faculty bring a remarkable breadth of expertise to the program, including economic geology, environmental geology, geographic information systems and geospatial analysis, geomorphology, hydrology, igneous and metamorphic petrology, mineralogy, oceanography, paleontology, petroleum geology, remote sensing, sedimentary petrology, soil science, stratigraphy, structural geology, tectonics, and x-ray diffraction. By virtue of their collective experiences, these faculty also bring knowledge of regional Geology to the program. In North America, this includes the Appalachians, the Basin and Range, the Colorado Plateau, and the Rocky Mountains. Elsewhere, this includes western Australia, the Bahamas, Central America, east Africa, the Pyrenees, and Southeast Asia.

Today, Geology is a strong academic program at UTC. By all measures, it has grown tremendously over the last 10 years. The number of majors has increased from 22 in 2007 to 54 in 2016 (Figure X). Numbers of graduates from the program fluctuate from year to year, but have also more than doubled. The number of faculty has also grown, but not commensurate with the number of majors. The present-day strength of the program was not always the case, as described in the following section.

A Brief History of the Geology Program

A brief history of the Geology Program, as gleaned from past self-study documents, archived university catalogs, and memories of current faculty, is described below.

The University of Chattanooga, predecessor to the University of Tennessee at Chattanooga (UTC), first offered a Bachelor of Arts (B.A.) degree in Geology in 1939. The B.A. degree was replaced by the Bachelor of Science (B.S.) degree in 1980. Two degree options, Geology (B.S. Geology: Geology) and Environmental Geology (B.S. Geology: Environmental Geology), were introduced in 2001. A third degree option, STEM education (B.S. Geology: STEM Education) was added in 2011, shortly after UTC began its UTeach (UTeaChattanooga) Program. This constitutes a strong 78-year history of preparing geologists and geoscience educators for their professional endeavors.

The original Geosciences Department incorporated Environmental Studies in 1985, after which the department offered B.S. degrees in Geology and Environmental Studies and minors in Geology, Environmental Studies, and Geography. Redistribution of these programs occurred in 1992, when the geography curriculum was added to the Department of Sociology and Anthropology, Environmental Studies was added to the Department of Biology, and Geology was combined with Physics and Astronomy, to form a new Department of Physics, Geology, and Astronomy. This department offered B.S. degrees and minors in Geology and Physics and several courses in astronomy. Another redistribution of programs occurred in the Fall of 2015, when Physics and Astronomy were added to the Department of Chemistry and Geology was added to the Department of Biological and Environmental Sciences, to form the current Department of Biology, Geology, and Environmental Science (BGE).

In terms of physical facilities, the sciences moved to the newly built Grote Hall in 1968. In 1981, Geosciences was displaced from Grote Hall to Bretske Hall, which was meant to be its temporary residence. For nearly three decades, the three to four faculty of the program, a limited support staff, and the laboratory, teaching, and rock preparation and storage space of the program occupied this small, reconfigured dining hall. From 1992 to 2010, the Department of Physics, Geology, and Astronomy was also encumbered by having its constituent programs scattered in widely separated buildings. This was an era of sorely inadequate facilities for the Geology Program and a fragmented academic department.

The 1980's also included a collapse of the oil and gas industry, which precipitated hard times for Geology Programs everywhere. Low enrollments lingered through the turn of the century and made Geology Programs at many institutions susceptible to being eliminated, merged, or modified in response to repeated budget cuts. Remarkably, the Geology Program at UTC is one of few undergraduate-only Geology Programs in the southeastern United States to have survived these difficult times. Many others became more encompassing geoscience degree programs, in which Geology is one of several options.

In Fall 2010, the Geology Program came full-circle to reoccupy a refurbished Grote Hall. With this move, the program went from 6,300 square feet of poorly configured floor space, that of a dining facility, in Bretske Hall to nearly 8,000 square feet of custom-configured floor space in Grote Hall. However, during the seven years since this move, the program has grown from three or four faculty to five faculty and from 20 to 30 majors to a sustained 50 to 60 majors, plus a few adjuncts and support staff. Consequently, the Geology Program has outgrown its expanded space in Grote Hall. In fact, a shortage of space currently limits future growth of the program.

Summary of Factors Significantly Affecting the Department's Mission

In 2007, student enrollment in Biology, Geology, and Environmental Science Programs began increasing dramatically. By 2013, enrollment in these programs had doubled. The growth trend now appears to have leveled off. The department maintained its historic teaching, research, and service productivity during the 5-year review period, despite substantial increases in student enrollment, severe space limitations, budget limitations, and insufficient numbers of faculty and support staff. These factors, however, have challenged the ongoing sustainability of the department's programs. During the previous review period (2007-2011), the departmental and university response to these challenges was largely reactive and incremental. Responses during the 2012-2016 period have been more strategic and have sought to provide comprehensive solutions to some of these problems. For example, in 2011, faculty evaluated student enrollment, course demand, curriculum, faculty expertise, and staffing levels. The findings provided a rational basis for changes and requests for additional resources, and led to revisions of the Biology and Environmental Science curriculums, hiring of a departmental advisor, and approval of four new tenure-track positions.

Enrollment

Dramatic increases in the number of majors and non-majors taking Biology, Geology, and Environmental Science courses have significantly affected the department's ability to perform its teaching mission. During the last ten years, the number of undergraduate students majoring in each of BGE's divisions - Biology, Geology, and Environmental Science - more than doubled. Overall enrollment appears to have stabilized around 1000 majors. In 2017, UTC reported 760 Biology majors, 192 Environmental Science majors, and 44 Geology majors. At the time of our last program review, Biology and Environmental Science Programs were facing very serious problems caused by an overly complex curriculum, too few faculty, and overwhelming student advising loads. Due to curriculum changes and provision of additional resources to the department, the situation is not as acute as it was five years ago. However, BGE remains understaffed and under resourced.

In the introductory courses, the department offers seven major courses that are certified for university general education science credit (BIOL 1110 and 1120, ESC 1500 and 1510, GEOL 1110, 1120, and 2250). The department offers one general education non-majors lab course for allied health programs (BIOL 2100). The department also offers several non-major non-lab science courses that are general education certified (BIOL/ESC 1100, GEOL 1025, GEOL 1160). The Department increased its offerings of BIOL/ESC 1100 during the review period by increasing the number of lecture sections and developing and offering online sections of this course.

In upper-level courses for majors, the department has increased offerings of several high demand "bottleneck" courses, including Microbiology (BIOL 3110), Genetics (BIOL3250/3260), Ecology (BIOL 3060/3070), Introductory Animal Physiology (BIOL 3230), Mycology (BIOL 3510), Taxonomy of Vascular Plants (BIOL 3520), and Cellular Biology (BIOL 4280). At the time of our last external review, five key factors limited the department from adding additional spaces in these courses: 1) understaffing at both the tenure-track and instructor level, coupled with limited redundancy in faculty expertise, 2) tenure-track faculty research, graduate program, and service obligations, 3) teaching laboratories that are limited by the fire code to a maximum of 24 students, 4) the lack of midsize classrooms on campus able to accommodate 30-60 students, and 5) limitations in our microbiology preparation lab to prepare cultures and media for microbiology lab courses. BGE has made progress in addressing some of these factors, yet challenges remain.

Staffing

Insufficient numbers of faculty and support staff during the last 10 years have significantly affected the department's teaching mission, especially in the Biology and Environmental Science divisions.   In 2006, at the time that when student enrollment began increasing dramatically, the Biology and Environmental Science Programs had 17 full-time faculty (including 15 tenure-track faculty, one non-tenure track faculty instructor, and one non-tenure track faculty associate), six graduate teaching assistants, and 3-5 adjunct faculty. At this time, the overall student to faculty ratio was about 29:1 and the student to tenured/tenure-track faculty ratio was about 33:1. The external reviewer at that time determined the department was understaffed, and recommended hiring additional faculty. By August 2012, student enrollment had increased by nearly 100%, yet the department faculty numbers had only increased by about 35% with 23 full-time faculty (including 18 tenured/tenure-track faculty and five lecturers), eight graduate teaching assistants, and 6-9 adjunct faculty per year. In 2017, BGE has 30 total full-time faculty, twenty-five in the Divisions of Biology and Environmental Science and five in the Division of Geology. From 2007 to 2017, Biology and Environmental Science full-time faculty only increased from 17 to 25, representing about a 47% increase in faculty numbers. Today, an overall student to faculty ratio of about 38:1 and a student to tenured/tenure-track faculty ratio of over 53:1 highlights the severity and worsening nature of this problem.

Geology also suffers from an insufficient number of faculty, although the problem manifests itself differently. While the student to faculty ratio is much lower in the Geology Division, due to the much smaller size of the program, faculty are hard pressed to offer courses required for students to progress through the Geology major while simultaneously serving the large number of non-major students that take Geology for general education credit. The result is that Geology faculty have historically had higher teaching loads than Biology and Environmental Science faculty, and thus less time to devote to scholarly activity. The research challenges for Geology faculty are compounded by the fact that Geology faculty have no dedicated research space.

The incremental addition of three new tenure-track faculty positions, three new non-tenure track lecturer positions, and three new graduate teaching assistant positions during the last several years is a welcome development, yet it has been outpaced by the dramatic increase in student enrollment. The department needs additional tenure-track and non-tenure track faculty to teach courses and meet student demand. BGE also needs several academic staff to assist full-time faculty with important tasks including animal care, large equipment maintenance, greenhouse management, and natural history collections management.

In addition to the modest changes in the number of instructional positions in the department, the program has seen some turnover in personnel since its last program review. The faculty associate retired and a tenure-track faculty member and a lecturer left the department. The faculty associate position was filled and BGE is presently conducting searches to fill the vacant tenure-track and lecturer lines. The department was awarded a new tenure-track position in 2012 and hired a microbiologist. The department was awarded a new tenure-track position in 2013 and hired a population geneticist (this is the tenure-track position that is presently vacant). In 2016, the department was awarded two new tenure-track positions and hired an integrated ecologist (with expertise in urban ecology and a strong interest in citizen science initiatives) and an environmental geoscientist (with expertise in the application of GIS, Remote Sensing, and Spatial Analysis in different areas of earth and Environmental Science).

The faculty hired over the review period increase capacity in the microbiology area and bring fresh expertise and interests. New tenure-track faculty have added areas of expertise to the department that were previously unrepresented, including population genetics, urban ecology using insects as a model, and coupling GIS and remote sensing techniques with numerical models to better understand our physical environments and the impact of human-environment interactions.

The department endured several periods of vacancy in its critical accounting specialist position during the review period. The retirement of a long-serving, and competent specialist in December, 2010, was followed by short stints by three different individuals, interspersed with vacancies. The department got through this difficult time due to partial reassignment of administrative assistant and faculty associate duties, and help from staff in the English Department and the College of Arts and Sciences. An extraordinarily competent accounting specialist has held the position since June, 2015, an unanticipated positive result of the merger with Geology.

Space

Insufficient, poorly designed, and degraded space negatively impacted BGE's teaching, student learning, and research mission during the review period. Historically, BGE was housed in Holt Hall, a building it shared with three other academic departments (English, Psychology, and Philosophy and Religion). BGE has had insufficient office and research laboratory space since, at least, the mid-1990s. Since that time, BGE has had to repurpose several rooms, including converting several teaching labs to research labs to accommodate new faculty, and, more recently, overflowing into the Engineering and Computer Science Building, Grote Hall, and the Collins Street trailers. The department has long recognized it needs additional space for teaching (mid-size class rooms and laboratories), research laboratories, full-time and adjunct faculty offices, student study areas (undergraduate and graduate), and equipment storage. Each of the last two five-year program reviews strongly recommended that a new life sciences building be constructed to remedy severe space needs of BGE. In response, the university began planning to build a new life sciences building, perhaps beginning construction sometime between 2016 and 2018. In 2013, the university abandoned the idea of a new life sciences building and decided to remove other departments from Holt Hall, renovate Holt Hall, and assign the entire building to BGE. The renovation began in May 2016 and is scheduled to be completed by May 2019. BGE's teaching, student learning, and research mission will continue to be negatively impacted by space issues until the renovation is complete. After the renovation is complete, BGE will have more space and improved space, although the renovation will not fully address all space shortcomings. BGE's space needs and the renovation are discussed in greater detail in the department's response to our last Biology and Environmental Science external reviewer's recommendations for a new building (pages 11-12 (Biology) and 18-19 (Environmental Science)), and in Part 5.

Budget

An inadequate operating budget negatively impacted BGE's teaching, student learning, and research mission during the review period. During the past ten years, student enrollment in each of BGE's majors, the number of BGE faculty, and the number of BGE degrees awarded have doubled. However, BGE's annual state operating budget allocation has increased by only about 24% (from $94,460 in 2008 to $117,000 in 2017), and lab fee and gift revenue remained static. The majority of this budget increase occurred during the past five years, which is a good sign, but the increases lag far behind the dramatic growth in student majors and faculty that has occurred in BGE.

One of the stated goals of the 2014/2015 budget reduction and realignment process was to ensure that university resources are directed to programs with demonstrated growth and productivity, to ensure the programs are adequately funded, and to reallocate funds if necessary. BGE serves about 26% of CAS undergraduate majors and about 9.5% of UTC majors; yet, in 2014 BGE, was allocated only about 10.8% of the College of Arts and Sciences operating budget. BGE's 2017 budget reflects a $12,787 increase from 2014, which is a positive sign, but nowhere near proportional to BGE's growth in service (and associated costs) to students. From 2012-2017, BGE received additional ad hoc annual budget adjustments averaging $55,000, ranging from a low of $23,963 in 2014 to a high of $91,851 in 2017. These additional monies were typically restricted to equipment purchases to maintain BGE teaching and research laboratories. The money is welcome, but because its existence, allowable use, and amount is uncertain, BGE is unable to plan for the future, produce an itemized budget from which we can understand spending within and across standard categories of an academic department, maintain teaching and research equipment, and integrate new tools and technologies. BGE's budget and critical need for substantial increases in funding for department operations, support staff, and major equipment maintenance, repairs, and purchases, is presented in greater detail in part 6.

B. Previous Undergraduate Program Reviews

The Biology and Environmental Sciences Department undergraduate programs were reviewed in 2012 by Maribeth Watwood, PhD, Professor and Chair, Department of Biological Sciences, Northern Arizona University, Flagstaff, AZ and Susan Power Bratton, PhD, Professor, Department of Environmental Science, Baylor University, Waco, TX. The Geology Program was part of the Department of Physics, Geology, and Astronomy when it was reviewed in 2012 by Dr. Edward Chatelain, of Valdosta State University. The reviewers identified strengths and shortcomings of BGE programs, and made a number of specific recommendations.

Biology

The reviewer's general comments for the Biology Program included:

- Faculty in the Department of Biological and Environmental Sciences are clearly devoted to providing outstanding instruction and facilitating student success.
- They [students] perceive the curriculum to be effective in providing them with rigorous content.
- There are wonderful opportunities for students to engage in research beyond the classroom.
- Program enrollment has risen dramatically over the past five years… [this has] resulted in extreme stress with respect to providing adequate faculty coverage of courses, especially required courses, in the curriculum.
- The single largest problem facing the program and the students in the program is the presence of 'bottleneck' courses where there is insufficient capacity to keep students on track with their degree progression.
- Furthermore, there is simply a dearth of faculty and teaching assistants to staff the courses.
- There has been incremental progress in hiring new tenure-track lines and lecturers, but the hiring progress has not kept up with demand and the bottlenecks still exit.
- Responding to this serious situation, the departmental faculty have undertaken a revision of the Biology curriculum with the goal of updating content, making navigation of requirements more straightforward, and, importantly, eliminating bottlenecks.
- We strongly suggest that the university continue to fund additional hires in order to keep students on track for timely graduation. This needs to include an appropriate mix of tenure-track and non-tenure track faculty as well as teaching assistantships.
- Another challenge that impacts the B.S. in Biology Program is space. The department has severe space shortages, and existing space is, in many cases, substandard for intended uses.
- We were pleased to learn that a new building for the department is at the top of the capital projects list, and we are very hopeful that planning and construction of this facility can proceed as quickly as reasonable.
- We suggest that the college hire a safety officer to deal with safety issues in this department as well as in other science departments.
- This is a strong program, enormously popular with students.
- The program enrollments have risen dramatically over the past five years, and further growth is anticipated.
- The faculty are completely engaged in teaching, advising, research and service and actively support student success.
- All aspects of the program are assessed regularly, thoroughly, and effectively, and results are used to improve the program.
- Students have meaningful opportunities for internships, field work and research in individual faculty laboratories.
- The review team was very impressed with the program and the department as a whole.

The reviewers suggested five goals relative to the B.S. in Biology for the next five years. The reviewer's goals are in bold text and a brief statement of BGE's response follows each goal.

1) **Hire additional regular faculty and lecturer lines as well as additional teaching assistants in order to reduce bottleneck problems in the curriculum, offer a broader range of upper division courses, and provide additional research opportunities for program majors.**

During the review, period the program gained three new tenure-track faculty positions, three new non-tenure track lecturer positions, and three new graduate teaching assistant positions. These faculty have helped reduce bottlenecks, created new courses, and provided additional research opportunities for program majors.

2) Implement curricular revisions and assess their effectiveness at preparing students adequately for occupations or entry into professional or graduate schools. Also assess effectiveness at reducing bottleneck problems.

BGE revised the Biology curriculum during the review period. The undergraduate Biology curriculum now requires students to complete general education courses, a common set of required core courses, and a program of study in General Biology, Preprofessional (Pre-medical, Pre-dental, Pre-vet), or STEM Education. The Biology Program instituted a major curriculum revision in Fall 2013 that simplified and streamlined the curriculum. The number of Biology Programs was reduced from six to the three referenced above, and course bottlenecks were reduced.

3) Plan and construct the new science building, paying careful attention to design details that will support the program. Hire a college level safety officer to oversee safety compliance for all science departments.

The university originally planned to build a new scientific building to house BGE. However, this plan was changed within the past five years, and BGE will now remain primarily in Holt Hall for the foreseeable future. The revised plan involves renovation of Holt Hall and permanent removal of three other academic departments (English, Psychology, Philosophy and Religion) from Holt Hall, leaving BGE as its sole occupant. The renovated Holt Hall will be an upgrade from the currently inadequate state of the facility, providing the department with much needed additional physical space and improved space. General improvements include a new roof, a new HVAC system, addition of a fire suppression system, addition of a second elevator, replacement and upgrading of much of the electrical wiring and plumbing, fresh paint, new flooring, new ceiling tiles, new LED lighting, new window blinds, new and expanded IT connections and equipment in all teaching areas (classrooms and labs), new furniture, new casework in newly created labs, and repair or replacement of degraded casework in existing labs.

Areas of Holt Hall previously unoccupied by BGE (nearly 50% of the building) consisted primarily of offices, seminar rooms, and classrooms. Many of these areas were gutted, walls removed, and new room layouts developed. The new areas include space for two new teaching labs, eight new research labs for existing faculty, three to four new unoccupied research labs for visiting scholars and growth, a larger microbiology preparatory lab, nine new rooms for museum collections, eleven new offices for existing faculty, five new unoccupied offices for future growth, a student computer lab, two general use student study rooms, and a graduate student study room. About 30% of the new space will be available for faculty and student research. For the most part, renovation of the portion of the building previously occupied by BGE did not involve changes to room layouts or casework. At the completion of the renovation, all BGE faculty will have offices in Holt or Grote Halls, and all Biology and Environmental Science tenured/tenure-track faculty will have research space in Holt or Grote Halls. At the conclusion of the renovation, research labs will have increased from thirteen to twenty, teaching labs from fifteen to seventeen, student use rooms from two to five, and animal space from seven to eleven rooms. Classrooms will decrease from eleven to nine, but total seating remains about the same because there will be three new mid-size (48 students) classrooms. Further, BGE will have a larger conference room, and several rooms dedicated to new uses, including a mud room for field equipment, a tool shop, a student computer lab, two student study rooms with kitchenettes, a graduate student study area, and an enlarged copy room with kitchenette for faculty use.

The renovation work commenced in 2016 and has temporarily disrupted some teaching and research activities and dispersed Biology and Environmental Science faculty across five academic buildings. The university conducted some significant renovations to a recently vacated building, Davenport Hall, to create temporary space for uses displaced during the renovation, including four temporary research labs, two teaching labs, animal space, and a microbiology preparatory lab. The second phase of the renovation, scheduled to begin in Spring 2018, will involve a complex series of moves of teaching labs, research labs, offices, and the departmental office. The moving plan for the second phase of the Holt renovation is in Appendix B.

Despite the benefits of the Holt renovation, many BGE faculty remain disappointed in the decision to pursue renovation rather than a new building. Specifically, these faculty believe there are serious shortcomings in the renovation, including inadequate modernization of teaching and research facilities, inadequate attention to current space needs (e.g., the need for graduate student research space), and inadequate accommodation of future departmental growth. Departmental faculty will remain spread out in at least two buildings. Further, the Holt renovation does not provide much needed research space for Geology faculty. Geology faculty must use storage closets, classroom, and teaching lab spaces for conducting research. This is not an ideal setting to support research activities by Geology faculty. The university is now planning a new health sciences building, and there is preliminary discussion of providing some research lab space in the new building for BGE faculty who conduct health-related research (5-6 faculty).

The university did not hire a college level safety officer to oversee safety compliance for all science departments.

4) Increase laboratory course fees to adequately cover equipment replacement, updating, and maintenance. Consider implementing course fees for non-laboratory courses to cover costs associated with field trips, etc.

The lab course fee was not increased during the review period. BGE is currently working with CAS on a formal proposal for submission to academic affairs. Fees have been assessed for several course-related field trips to local institutions, other states, and overseas.

5) Continue to request increased immediate access to full journal articles in appropriate disciplines.

UTC has a newly opened state-of-the-art library that provides access to 400,000+ print and online materials, relevant databases, and discipline-specific journals. The library provides access to information in every format available from books, e-books, and journals to online databases, digital image collections, CDs and DVDs. The library also administers a variety of technological devices such as laptops, chromebooks, digital and video cameras, scientific calculators, and sundry cables. All items are available to current UTC students, faculty, and staff for check out and many resources can be accessed online from home via the UTC Library WorldCat Local system. The library provides access to small and large study rooms, presentation rooms, conference rooms, and a computer classroom that can be reserved for instructional purposes. At the departmental level, we have a Library Committee and a departmental liaison to the library.

Geology

Dr. Edward Chatelain, of Valdosta State University, completed the most recent review of the Geology Program in 2012, based on data from six academic years, 2005-2006 through 2010-2011. At the conclusion of his overwhelmingly positive review, Dr. Chatelain ranked the Geology Program "in the top 10% in its class". Most notably, he commended the program's faculty for their devotion, their qualifications, their productivity, the way they relate to students, and their ability to manage the program so effectively despite their small number. The strong field component of the program also drew particular praise. Dr. Chatelain also made recommendations for improvement. These and the program's responses are described below.

1) GIS curriculum

Dr. Chatelain recommended that the program develop a GIS curriculum, starting with a course on GIS applications in Geology. Related to this, he further recommended that a room in Grote Hall be refurbished to serve as a GIS computer lab.

In response to this recommendation, a 3-credit-hour course, GIS Geological Applications, was taught as GEOL 4999 by Dr. Brock-Hon during Spring 2013. Ten undergraduate students completed the course.

Dr. Hossain, a geological engineer/environmental geologist and a GIS/remote-sensing specialist, joined the Geology faculty in Fall 2016. Dr. Hossain taught GIS for Geologists during Spring 2017, at both undergraduate and graduate levels, and is currently (Fall 2017) teaching Geological Remote Sensing, also at both levels. These are both 4-credit-hour laboratory courses. Seventeen undergraduate students and two graduate students completed GIS for Geologists. Six undergraduate students and six graduate students are currently enrolled in Geological Remote Sensing.

In lieu of a devoted GIS computer lab, Dr. Brock-Hon's GIS students used the Physics computer lab. At the time (Spring 2013), Geology and Physics were closely allied programs in the same department. This was also convenient, in that the Physics computer lab is on the 2nd floor of Grote Hall.

For his GIS and remote sensing courses, Dr. Hossain has used the IGT computer lab in the SimCenter. Although this lab serves the purpose, the practice of using it has distinct disadvantages. The SimCenter, which houses the Center of Excellence in Applied Computational Science and Engineering, is located on the opposite side of campus. For students and faculty of the Geology Program, this is a 10- to 15-minute walk from Grote Hall. This lab is managed by the SimCenter and UTC's IT staff to serve the more general needs of its users, rather than the specific needs of GIS and remote sensing. The SimCenter also limits faculty and student lab access to 8:00 am to 5:00 pm. Space permitting, a GIS computer lab in either Grote Hall or Holt Hall, managed by BGE, would still be a beneficial follow-up to Dr. Chatelain's recommendation, particularly considering the anticipated growth in this area. Such a lab would also serve other curricular needs in the Geology Program.

2) Additional computers

Dr. Chatelain recommended that accumulated lab fees be used to purchase 15 laptop computers for student use.

Although no additional computers were purchased, the program continued to provide six desktop computers in room 224 of Grote Hall, exclusively for student use. Faculty have noticed that demand for these computers is waning, despite a marked increase in the number of Geology majors. A growing proportion of students prefer to work on their own laptops and, with this independence, they commonly work in unoccupied classrooms, as well as in room 224. This being the trend, the purchase of additional computers for student use was not necessary and may not have made best use of available resources.

3) Recruit additional majors

Dr. Chatelain recommended an all-out effort to recruit additional Geology majors and made specific suggestions as to how this might be accomplished.

It is difficult to assess precisely why the number of Geology majors has increased as it has. This increase probably relates to a combination of favorable employment trends and forecasts in geotechnical fields and the program's recruitment efforts, some of which were among Dr. Chatelain's suggestions. Regardless, the desired outcome of this recommendation has been achieved. As shown in Figure X, the number of Geology majors has increased more than 25% since Dr. Chatelain's review and has more than doubled over the past 10 years.

4) Student teaching assistants

Dr. Chatelain recommended that lab fees be used to compensate student teaching assistants. Undergraduate students have served as teaching assistants in GEOL 1120 and GEOL 3410. These students have been paid from the student employee line of the department's state operating budget. Expenditure of lab fees for this purpose was not necessary.

Members of UTC's Geology Club, which is dominated by Geology majors and is advised by Dr. Brock-Hon, also volunteer their services as tutors for students in Physical Geology and Historical Geology. This practice began in the Fall of 2011.

5) New general-education classes

Dr. Chatelain recommended that new general education classes be established, with the expectation that such classes would draw additional Geology majors and could be used to demonstrate a need for additional Geology faculty.

Geology of the National Parks (GEOL 1025) was introduced to the Geology curriculum in the Fall of 2014 and was, at the same time, certified as a non-laboratory natural science course in the university's general education curriculum. This course has been offered in conventional face-to-face format six of the seven semesters since its inception, with high enrollments of up to 100 students. It was also offered as an online course for Fall 2014, Spring 2015, and Fall 2017. With the addition of GEOL 1025, the Geology Program offers a total of five natural science general education courses, two of which have been offered online.

6) New faculty lines

Dr. Chatelain recommended that, as the Geology Program grows and enrollments increase, new faculty lines be requested. Considering the needs of the program, he suggested new lines for an environmental geologist who is also a GIS specialist, a hydrogeologist, and a lab instructor for general education lab courses.

Considering the difficulty of hiring additional instructors and particularly that of securing a new faculty line, the program has been remarkably successful in its response to this recommendation, as described below.

Claire Landis, an alum of the program (B.S. Geology, 2010) who also holds a Master's degree from the University of Wyoming, served as an adjunct instructor from Fall 2013 through Spring 2015. During these four semesters, Ms. Landis taught both lecture and lab for Physical Geology and the lab for Historical Geology.

Dr. Azad Hossain, a geological engineer/environmental geologist and a GIS/remote-sensing specialist, joined the Geology faculty in the Fall of 2016 as a tenure-track assistant professor. During his first two semesters, Dr. Hossain taught Physical Geology, Geology Seminar, Senior Seminar, and GIS for Geologists. He is currently (Fall 2017) teaching Physical Geology and Geological Remote Sensing. Dr. Hossain is also engaged in the Environmental Science masters program. He directs one of the Environmental Science graduate students, serves on other graduate students' committees, and teaches his GIS and remote sensing classes at the graduate level. To support his ongoing research, Dr. Hossain also pursues external funding.

This semester (Fall 2017), Melanie Krautstrunk, who holds a Masters degree in Geology from the University of Nevada at Las Vegas, began her service to the program as an adjunct instructor. Ms. Krautstrunk is currently teaching a lecture section of Physical Geology.

In addition, Greg Brodie, adjunct instructor, and Wayne Williams, laboratory coordinator, continue to serve the Geology Program in teaching capacities.

Within the next year, we expect the retirement of one full-time faculty and as a result will require someone with expertise in Petrology (a required course for all students in our program) and Oceanography (required for one Environmental Science degree option and Geology:STEM Education degree). Our plan is to use this retirement opening to revamp our course offerings and meet the growing needs of those students that plan to pursue jobs in the Environmental Tech and Environmental Engineering market. We anticipate filling the retirement vacancy with a new tenure-track faculty who will to take over Hydrology from Dr. Mies, teach Oceanography, and will offer a course in aqueous geochemistry. Dr. Mies will then teach Petrology, a course that he is qualified and willing to instruct. This will also give Dr. Mies an opportunity to engage with students earlier in the program. We see this as a way to broaden the content of our program and perhaps lead to new degree options. An aqueous geochemist would also be valuable to Environmental Science, Chemistry, and Civil Engineering degree programs. In the long term, as opportunities arise for more faculty additions, we would like to broaden our offerings to students and include geophysics, and geohazards options, keeping the pace with workforce needs of the growing environmental and geotechnical industries.

Despite the program's success in its response to this recommendation, its recent growth should be met with additional faculty and instructors.

Environmental Science

There was some overlap between the Biology and Environmental Science findings and recommendations because the two programs are closely integrated, with many BGE faculty contributing to both programs. The reviewer's general comments for the Environmental Science Program included:

- Faculty in the Department of Biological and Environmental Sciences are clearly devoted to providing outstanding instruction and facilitating student success.
- To a person, the undergraduate students we interviewed expressed their appreciation for the hands-on approach of the faculty.
- They perceive the curriculum to be effective in providing them with rigorous content and laboratories, and providing practical experience applicable to their future employment.
- There are wonderful opportunities for students to engage in research beyond the classroom.
- The departmental faculty members are active in pursuing research concerning the environmental issues of highest concern in the Chattanooga region.
- The department has strengths in species conservation and aquatic and microbial systems.
- The Environmental Science enrollment has expanded in tandem with the Biology B.S. enrollment, while the rate of expansion has been slightly higher.
- This growth has also resulted in extreme stress in terms of providing adequate faculty coverage of courses, especially required courses, in the curriculum.
- The students in the Environmental Science B.S. degree program are less restricted by bottlenecks in enrollment than the pre-health students in the department, while still

encountering courses filled to capacity due to restrictions on laboratory sections or classroom seating.

- Further, the lack of van capacity for field trips is restricting environmental and field laboratory course size; access to a second passenger van would ease these constraints.
- There has been incremental progress in hiring new tenure-track lines and lecturers, but the hiring progress has not kept up with demand and the bottlenecks still exit.
- We strongly suggest that the university continue to fund additional hires in order to keep students on track for timely graduation, and evaluate means for providing field transportation for larger sections.
- The department needs more graduate teaching assistants to keep up with the increasing pressures on laboratory enrollments, including field laboratories.
- Another challenge that impacts the B.S. in Environmental Science Program is space. The department has severe space shortages, and existing space is, in many cases, substandard for intended uses.
- The field laboratories and GIS laboratories are offering excellent educational platforms for the program.
- The facilities available for other forms of laboratory instruction are overcrowded and lack adequate computer and projection technology.
- We were pleased to learn that a new building for the department is at the top of the capital projects list, and we are very hopeful that planning and construction of this facility can proceed as quickly as reasonable.
- Other space issues involve safety concerns in research and teaching laboratories. We suggest that the college hire a safety officer to deal with safety issues in this department as well as in other science departments.
- In addition, the teaching laboratories need adequate computers and projectors to deliver instruction based in environmental modeling and statistical analysis.
- This is a strong program, enormously popular with students.
- The program enrollments have risen dramatically over the past five years, and further growth is anticipated.
- The faculty are completely engaged in teaching, advising, research and service and actively support student success.
- All aspects of the program are assessed regularly, thoroughly, and effectively, and results are used to improve the program.
- Students have meaningful opportunities for internships, field work and research in individual faculty laboratories.
- The review team was very impressed with the program and the department as a whole.

The reviewers suggested ten goals relative to the B.S. in Environmental Science for the next five years. The reviewer's goals are in bold text and a brief statement of BGE's response follows each goal.

1) Hire additional regular faculty and lecturer lines in order to reduce bottleneck problems in the curriculum, offer a broader range of upper division courses, and provide additional research opportunities for program majors.

During the review period, the program gained three new tenure-track faculty positions, three new non-tenure track lecturer positions, and three new graduate teaching assistant positions. These faculty have helped reduce bottlenecks, created new courses, and provided additional research opportunities for program majors. The hire of a new environmental geoscientist has resulted in expanded offerings related to environmental uses of GIS and remote sensing.

2) Implement curricular revisions and assess their effectiveness at preparing students adequately for occupations or entry into professional or graduate schools. Also assess effectiveness at reducing curriculum bottlenecks.

The Environmental Science Program instituted a major curriculum revision in Fall 2014 that reconfigured the curriculum, eliminated low enrolled programs, added two new programs of emerging interest, and removed courses from the curriculum that were offered too infrequently to ensure timely student progression.

The undergraduate Environmental Science curriculum requires students to complete general education courses, a common set of core courses, and a program of study in Biodiversity, Conservation and Natural Resources, Earth, Atmosphere, and Geological Resources, Engineering Science, Environmental Health, Environmental Policy and Planning, or Geographic and Cartographic Sciences.

Each of the three degree programs require completion of 120 hours.

3) Plan and construct the new science building, paying careful attention to design details that will support the program. Hire a college level safety officer to oversee safety compliance for all science departments.

The university originally planned to build a new scientific building to house BGE. However, this plan was changed within the past five years, and BGE will now remain primarily in Holt Hall for the foreseeable future. The revised plan involves renovation of Holt Hall and permanent removal of three other academic departments (English, Psychology, Philosophy and Religion) from Holt Hall, leaving BGE as its sole occupant. The renovated Holt Hall will be an upgrade from the currently inadequate state of the facility, providing the department with much needed additional physical space and improved space. General improvements include a new roof, a new HVAC system, addition of a fire suppression system, addition of a second elevator, replacement and upgrading of much of the electrical wiring and plumbing, fresh paint, new flooring, new ceiling tiles, new LED lighting, new window blinds, new and expanded IT connections and equipment in all teaching areas (classrooms and labs), new furniture, new casework in newly created labs, and repair or replacement of degraded casework in existing labs.

Areas of Holt Hall previously unoccupied by BGE (nearly 50% of the building) consisted primarily of offices, seminar rooms, and classrooms. Many of these areas were gutted, walls removed, and new room layouts developed. The new areas include space for two new teaching labs, eight new research labs for existing faculty, three to four new unoccupied research labs for visiting scholars and growth, a larger microbiology preparatory lab, nine new rooms for museum collections, eleven new offices for existing faculty, five new unoccupied offices for future growth, a student computer lab, two general use student study rooms, and a graduate student study room. About 30% of the new space will be available for faculty and student research. For the most part, renovation of the portion of the building previously occupied by BGE did not involve changes to room layouts or casework. At the completion of the renovation, all BGE faculty will have offices in Holt or Grote Halls, and all Biology and Environmental Science tenured/tenure-track faculty will have research space in Holt or Grote Halls. At the conclusion of the renovation, research labs will have increased from thirteen to twenty, teaching labs from fifteen to seventeen, student use rooms from two to five, and animal space from seven to eleven rooms. Classrooms will decrease from eleven to nine, but total seating remains about the same because there will be three new mid-size (48 students) classrooms. Further, BGE will have a larger conference room, and several rooms dedicated to new uses, including a mud room for field equipment, a tool shop, a student computer lab, two student study rooms with kitchenettes, a graduate student study area, and an enlarged copy room with kitchenette for faculty use.

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Despite the benefits of the Holt renovation, many BGE faculty remain disappointed in the decision to pursue renovation rather than a new building. Specifically, these faculty believe there are serious shortcomings in the renovation, including inadequate modernization of teaching and research facilities, inadequate attention to current space needs (e.g., the need for graduate student research space), and inadequate accommodation of future departmental growth. Departmental faculty will remain spread out in at least two buildings. Further, the Holt renovation does not provide much needed research space for Geology faculty. Geology faculty must use storage closets, classroom, and teaching lab spaces for conducting research. This is not an ideal setting to support research activities by Geology faculty. The university is now planning a new health sciences building, and there is preliminary discussion of providing some research lab space in the new building for BGE faculty who conduct health-related research (5-6 faculty).

The university did not hire a college level safety officer to oversee safety compliance for all science departments.

4) Increase laboratory course fees to adequately cover equipment replacement, updating, and maintenance. Consider implementing course fees for non-laboratory courses to cover costs associated with field trips, etc.

The lab course fee was not increased during the review period. BGE is currently working with CAS on a formal proposal for submission to academic affairs. Fees have been assessed for several course-related field trips to local institutions, other states, and overseas.

5) Increase the number of teaching assistants, including those with expertise appropriate to field laboratories.

The number of graduate teaching assistants increased from eight to eleven during the review period.

6) Find a practical way to provide improved transportation to field study sites. This could be accomplished by additional van purchases, or by improved management of a motor pool shared with other departments. This limitation is adding to bottlenecks in laboratory enrollment.

Transportation to field study sites remains a challenge for BGE students and faculty. The department has greatly increased its rental of vehicles from Motor Pool, without a corresponding increase in the department's transportation budget line. Further, Motor Pool does not provide 4wd vehicles capable of safely accessing remote field sites. The department annually requests funding to purchase 4wd vehicles capable of transporting six to twelve students but has not yet been successful.

7) Improve the technology available in the teaching laboratories, including the availability of projectors and of computers for running environmental modeling software and statistical programs, such as SPSS.

Projection equipment has been added to a limited number of teaching laboratories. After the Holt Hall renovation is complete, all teaching laboratories should have multiple flat screen monitors or projectors and screens. However, there has been little progress in acquiring funding to purchase and replace computers or improve access to environmental modeling software and statistical programs.

8) Review and consider revising the Programs of Study offered with the major. Low enrollment Programs could be dropped or replaced with more effective options.

Faculty reviewed the Environmental Science curriculum and instituted a major curriculum revision in Fall 2014 that reconfigured the curriculum, eliminated two low enrolled programs, added two new programs, and reduced course bottlenecks.

9) Raise the laboratory fees, particularly field courses requiring vehicle use, and those deploying complex arrays of equipment.

The lab course fee was not increased during the review period. BGE is currently working with CAS on a formal proposal for submission to academic affairs. The proposal may include a differential lab fee system, with higher fees charged for certain higher cost labs. Fees have been assessed for several course related field trips to local institutions, other states, and overseas.

10) Continue to request increased immediate access to full journal articles in appropriate disciplines.

UTC has a newly opened state-of-the-art library that provides access to 400,000+ print and online materials, relevant databases, and discipline-specific journals. The library provides access to information in every format available from books, e-books, and journals to online databases, digital image collections, CDs and DVDs. The library also administers a variety of technological devices such as laptops, chromebooks, digital and video cameras, scientific calculators, and sundry cables. All items are available to current UTC students, faculty, and staff for check out and many resources can be accessed online from home via the UTC Library WorldCat Local system. The library provides access to small and large study rooms, presentation rooms, conference rooms, and a computer classroom that can be reserved for instructional purposes. At the departmental level, we have a Library Committee and a departmental liaison to the library.

PART 1. LEARNING OUTCOMES

1.1 Introduction

1.1.1 Department Missions

The current mission of the department, as listed in the undergraduate catalog, is the following:

"The Department of Biology, Geology and Environmental Sciences perceives that its role at the University of Tennessee at Chattanooga is to function as a vital part of the metropolitan university community in the promotion of scholarship, research, and service. To carry out this role the department has the following mission: to introduce students to the philosophy and methods of science through lecture, laboratory, and field experiences; to provide courses and programs in Biology and Environmental Sciences which have as their goal academic excellence and thereby provide an opportunity for students to obtain an education of a superior quality; to assist students in preparing for post-graduate goals, whether to enter the work force or continue in formal education; to develop student awareness of the need for critical thinking and lifelong learning; to nurture the evolution of a curriculum for majors in Biology, Environmental Science, and related areas that includes traditional information and contemporary frontiers in the life sciences; to remain alert for emerging curricular and service needs; to pursue opportunities for educational cooperation; to recruit, give opportunity to, and retain students of diverse personal backgrounds with special effort for those historically under-represented in the sciences, i.e., minorities and women; to encourage research by all faculty members; to maintain the humane treatment of animals used in research and teaching while realizing the necessity of animal experimentation in the biological sciences; to increase funding from outside sources for Biology and Environmental Science; to support interdisciplinary programs, e.g., University Honors; to remain committed to continuing faculty development; to encourage cooperation and respect among students, faculty, and administration; to recruit new faculty members, as needed, who are recognized as fully qualified for university level instruction and research; to remain committed to evaluation of departmental effectiveness".

The addition of the Geology Division is relatively recent and the above mission statement does not reflect the mission and goals of the Geology Program, nor the benefits of having the Geology Program as part of a new department. Prior to the reorganization (Fall 2015), the Geology Program shared its mission with the Physics program. In the 2014-2015 and several previous undergraduate catalogs, it states:

"The mission of the department [Physics, Geology, and Astronomy] is to provide students with basic knowledge in the respective disciplines of Earth sciences and Physics, and the intellectual skills necessary to become valuable members of society, as they apply their knowledge successfully to graduate studies or professional endeavors. To ensure this, our Geology students graduate with a general knowledge of Geology and specific knowledge of mineralogy, petrology, sedimentation and stratigraphy, and structural geology, while our Physics students graduate with a general knowledge of Physics and specific knowledge of mechanics, electromagnetism, thermodynamics, waves and optics, and modern Physics, appropriate to the undergraduate level".

The Strategic planning committee of the department is currently working on a new mission statement that should be completed during this (2017-2018) academic year that will define the purpose and intent of a new and integrated department.

1.1.2 Biology and Environmental Science Goals set 2006/2009

Prior to the incorporation of Geology into the department, the Biology and Environmental Sciences department had established a set of goals during the 2006-2007 academic year. While these are outdated, they remain in effect until the department votes on the new Strategic Plan this (2017-2018) academic year.

Goal 1. The department will maintain a commitment to its academic program through excellence in instruction, advisement and student recruitment.

Instruction
a. Hire one or more new replacement faculty to replace retiring faculty in instructional and research areas recommended by the faculty hiring committee and department faculty.
b. Maintain current high level of classroom instruction.
c. Support and encourage faculty-student collaborative learning through research.
d. Participate in teaching workshops for enhancing classroom instruction.
e. Explore the possibility of offering the M.S. in Environmental Sciences through distance education.
f. Establish cross listings for appropriate M.S. in ESC graduate courses and senior level BIOL and ESC courses (e.g., list 500-level courses as 400-level courses, and vice versa) to insure adequate enrollment in these courses each time they are offered.
g. Work with the College of Education and Applied Professional Studies in developing a joint B.S. Biology (education concentration) and B.S. Secondary Natural Sciences
h. Work with ARCS and other departments across campus to develop an interdisciplinary academic minor in Geographic Information Systems (GIS) and Remote Sensing.
i. Update course prerequisites across the departmental curriculum in preparation for the institution of a new Student Information System.
j. Develop new team taught course in modern microscopy techniques.

Advisement
a. Continue advising its own majors
b. Maintain a 3-year course schedule of course offerings at the undergraduate and graduate level.
c. Provide seminars and/or sources of information on job placement, successful entry into graduate schools, and successful entry into professional schools.

Student Recruitment
a. Cooperate with the College of Arts and Sciences effort to recruit and retain students. These efforts might include: department phone calls and letters to present and prospective students [graduate and undergraduate], department involvement with on-campus visits by prospective students [graduate and undergraduate], offering a recruitment day to highlight BESC faculty/student research and other activities, opening up our labs for visits and giving brief presentations on our research (this may have to be a Saturday event) providing regional

institutions a list of departmental speakers and their topics [graduate], having advisors available in the evenings if needed, sending faculty on short recruiting trips to other institutions [e.g., high schools, community colleges, other four-year institutions], developing a short PowerPoint presentation highlighting the strengths of the program and showing students in action. enhancing the webpage to highlight departmental strengths, accomplishments, and student research and activities, updating recruiting brochures and posters for undergraduate and graduate programs, maintaining a pre-professional webpage and brochure.

Goal 2. The department will increase its current level of research and publications.
a. Acquire funding for research through university and outside sources.
b. Evaluate, as peer reviewers, submitted research proposals forwarded by various federal agencies.
c. Become involved in collaborative research projects with other universities, state and/or federal agencies, and private industries and organizations.
d. Provide a mechanism to reduce teaching loads for faculty who are actively involved in research requiring submission of external funding proposals and/or submission of articles to peer-reviewed journals of national and international scope.
e. Provide a mechanism to reduce teaching loads for the first two years for new faculty actively involved in research.
f. Maintain graduate faculty teaching loads at levels commensurate with graduate faculty teaching loads at peer institutions.
g. Support and encourage faculty sabbatical leaves for professional advancement.

Goal 3. The department will remain committed to enhancing its operational effectiveness.
a. Support the role of departmental committees in departmental governance,
b. The department space committee will work with the department head and with other science departments (Chemistry, Physics/Geology/Astronomy) to determine the current and future space utilization of Holt and Grote Halls and help facilitate the development of planning ultimately leading to a new Science Building,
c. The department hiring committee will forward recommendations concerning the faculty areas of expertise that need to be represented in the department,
d. The pre-professional advising committee will continue to assist students in planning their pre-professional programs of study, coordinate activities and programs with area and regional professional health schools, coordinate the completion of student composite pre-professional forms, update the pre-professional *Health Career Guide*, and work in conjunction with faculty in the Chemistry Department to maintain a pre- professional webpage and brochure.
e. Use the tenure and promotion process to provide a systematic and constructive means to inform and advise tenure-track and promotion eligible faculty of procedures and progress toward retention, tenure, and promotion.
f. Periodically re-examine its statement of mission, goals, and long-range planning.
g. Incorporate new computer and communication technologies in the appropriate management of office, classroom, and laboratory operations.
h. Implement a live animal utilization protocol that involves the development, upkeep, and upgrading of appropriate facilities and the hiring of an individual(s) responsible for care and feeding.

Goal 4. The department will cooperate with the college and university offices to enhance programmatic support in the operating budget, equipment, library, and space facilities:

Operating Budget
a. Acquire an annual operating budget in Biology and Environmental Science commensurate with a growing undergraduate program and the addition of a graduate program.
b. Work with the Dean of the College of Arts and Sciences and other lab-intense departments to help develop a reasonable call for the institution of lab fees to provide the funding necessary to defray costs associated with laboratory based instruction and to plan for the future, and not simply focus on unmet past needs.

Equipment
a. Work with the Dean of Arts and Sciences to secure funding to obtain basic undergraduate and graduate instructional laboratory equipment through the development of prioritized equipment needs lists under the direction of the departmental Equipment Committee. As of last year, department equipment needs totaled $2,755,165.
b. Acquire the resources listed below to support the instructional program of the M.S. degree in Environmental Sciences: bioremediation laboratory equipment, toxicology laboratory equipment, computer laboratory equipment.
c. Acquire needed instructional equipment as prioritized by the department Equipment Committee.
d. Request needed start-up equipment funding for new faculty to initiate research programs.
e. Request increased budget funding to maintain and repair departmental equipment.
f. Acquire funding to periodically update expensive specialized software, such as the software used in the Geographic Information Systems Laboratory.
g. Acquire updated computer systems for the Graduate Teaching Assistants, the Adjunct Faculty Office Area, and the Graduate Student Study Area.

Library
a. Acquire needed library books and journals to support the M.S. program in Environmental Sciences.
b. Acquire permanent funding for subscriptions to on-line databases and CD-ROM databases, such as LEXIS, WESTLAW, and FNA Environment Library to support student research and faculty research and teaching.
c. Cooperate with the central administration in identifying solutions that will avoid cancellation of needed library journals.

Space and Facilities
a. Acquire and utilize additional space for: an introductory Biology learning resource center, second introductory Environmental Science laboratory, research centers/laboratories areas for faculty, undergraduate students, and graduate students, instructional toxicology laboratory, instructional bioremediation laboratory, instructional molecular Biology laboratory, expanded graduate computer laboratory, faculty offices, greenhouses (2), storage areas.
b. Seek ways for improving existing classroom and laboratory facilities of Holt Hall, including the UTC Natural History Museum and the Animal Care Facility.

c. Develop new and existing teaching and research field sites, including the Cash House/Wildlife Hospital property in the Tennessee River Gorge, the UTC parcel on the former VAAP property, and the wildlife refuge associated with the ATTI test track.

Goal 5. The department will maintain a continuing commitment to national, state, and/or regional professional organizations:
a. Continue our involvement as a participant of the Southern Appalachian NBII Node.
b. Attend and participate in annual meetings of state, regional, and national professional societies.
c. Continue preparation for hosting the Society of Conservation Biology Meeting that will occur in Chattanooga in 2008.

Goal 6. The department will remain committed to community service endeavors:
a. Communicate with alumni and community individuals through the publication of a periodical newsletter and/or by programs such as special lectures and seminars.

Goal 7. The department will submit proposals, appropriate to its mission and goals, that will have as an objective regional and national enhancement of the department and university.

Goal 8. The department will maintain a continuing commitment to university governance.

Goal 9. The department will develop or continue development of partnerships with appropriate entities to foster research, funding, internship, and educational opportunities (e.g., the Tennessee Aquarium Aquatic Research Institute, Gulf Cost Research Laboratory, the Highlands Biological Station, Lula Lake Land Trust, Sequatchie Valley Institute, Tennessee River Gardens, Tennessee River Gorge Trust and Bendabout Farms):
a. Continue the on-going partnership with Tennessee Aquarium with respect to the Lupton Renaissance funded research on turtle populations of the Tennessee River Gorge.

Goal 10. The department will remain committed to evaluation of its effectiveness:
a. Evaluate faculty instruction by student ratings of faculty instruction. One or more of the following can be used as well: testimonials from current or former students; evidence of student performance with regard to an appropriate outcome measure.
b. Evaluate instruction of untenured faculty by peer evaluations of instruction conducted by members of the departmental rank, tenure, and promotion committee.
c. Provide intended outcomes and assessment measures for all departmental undergraduate and graduate programs.
d. Examine the results of departmental outcomes and assessment measures in order to explore ways of contributing to university efforts in enhancing performance.
e. Provide the college with documentation of faculty and student research, creative scholarship, and service.
f. Undertake external program review during the upcoming academic year, 2006-2007, and begin implementation of any recommendations made as a result of this review.

A report on how the department performed under these goals is included as Appendix C**.**

1.2 Learning Outcomes and Assessment

Between 2011 and 2013, the university went through a series of administrative changes, triggering changes in learning outcomes (also referred in the text as SLOs: student learning outcomes) and their assessment multiple times throughout this period. In the past, BGE programs assessed their learning outcomes based on the Major Field Exam, and secondarily, on other parameters such as institutional/department surveys and number of graduates that have found employment. For that reason, data on institutional/department surveys as well as the educational and professional success of the department's graduates are presented at the end of section 1.2.

1.2.1 Biology

1.2.1.1 Biology Learning Outcomes

2011 to 2014

Prior to 2014, the following program outcomes were in effect for Biology:

1.1 General Knowledge of Biology - Students completing the baccalaureate program in Biology will compare favorably in their general knowledge of Biology with those students completing a similar program.

1.2 Specific knowledge in concentration area - Students completing the baccalaureate program in Biology will demonstrate knowledge in their concentration area of study.

1.3 Preparation for employment or post-graduate studies - Students completing the Biology program will be adequately prepared for employment or post-graduate study in their field.

2014 to present

Learning outcomes for Biology, as presented below, were established during the 2014-2015 academic year and were first tested during the 2015-2016 academic year.

1. Students are able to demonstrate knowledge of and differentiate among the different levels of biological organization (e.g., chemicals, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems, and biosphere).

2. Students are able to demonstrate knowledge of the three core areas of Biology (ecology, evolution, and genetics) and apply their knowledge to studies of various taxonomic groups (e.g., insects, fishes, mammals, fungi, vascular plants).

3.Students are able to apply their knowledge of cells and organ systems in a variety of biological contexts.

4. Students are able to demonstrate proper laboratory/ field techniques, formulate appropriate questions and hypotheses, collect laboratory/field data, and analyze collected data in a variety of biological contexts.

5.Students are able to communicate biological information effectively.

6. Students are able to retrieve specific information from the scientific literature and are able to evaluate the literature effectively and critically.

7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.

1.2.1.2 Biology Learning Outcomes Assessment

2011-2014

An example of how learning outcomes were assessed in the Biology Program prior to 2013 is attached as Appendix D for the academic year 2012-2013.

Outcome 1.1 was assessed based on the student performance on the Major Field Assessment Test (MFAT).

Outcome 2.1 was assessed based on the of student performance on the Major Field Assessment Test (MFAT) discipline sub-scores.

Outcome 3.1 was assessed based on the evaluation of student performance on oral presentations.

Outcome 4.1 was assessed based on the student performance on formal Lab reports in two classes, Principles of Biology II (BIOL 1120) and Ecology lab (BIOL 3070).

2014-present

The department (then Biology and Environmental Sciences) was tasked to establish a set of learning outcomes and complete the curriculum mapping during the 2014-1015 academic year. The following academic year (2015-2016) we started the assessment of SLOs. Given that this was the first year, we selected only two SLOs (1 and 2) and just a handful of classes to assess. The following year (2016-2017), we dramatically increased the number of classes assessed and we moved on to two new SLOs (3 and 4). This academic year (2017-2018) we will assess again a large number of classes for two not previously assessed SLOs (5 and 6) while revisiting one of the SLOs from the previous years.

During the 2014-2015 academic year the program was tasked to produce the curriculum map (Table 1.1) and the current learning outcomes and no assessment occurred. Since the implementation of the new learning outcomes, the primary mode of assessment is through our classes.

Table 1.1 Curriculum map for Biology.

The SLO numbers correspond to those present on section 1.1.1.2.1. I – Program SLO is introduced and assessed, R – Program SLO is reinforced and assessed, C – Level of competency is assessed.

Biology	Outcome 1 Demonstrate knowledge of Biological Organization	Outcome 2 Demonstrate knowledge of 3 core areas of biology	Outcome 3 Apply knowledge of cells and organ systems	Outcome 4 Demonstrate proper laboratory / field techniques	Outcome 5 Communicate information effectively	Outcome 6 Retrieve and Evaluate literature - Critical Thinking	Outcome 7 Ethical Professional Behavior
ENGL2820 Sci. Writing					I/R	I	
BIOL4995r Dept. Thesis		C	C		C	C	C
FLNF001 - Foreign Lang I					I		
FLNF002 - Foreign Lang II					I		
MATH2100 Intro Statistics				I			
MATH1130 - College Algebra				I			
MATH1830 Calculus for Management				I			
MATH1710 Precalculus I				I			
MATH1720 Precalculus II				I			

MATH1950 Calculus Analytic Geom				I			
CHEM1110 General Chemistry I	I			I			
CHEM1110L General Chemistry I Lab	I			I			
CHEM1120 General Chemistry II	I			I			
CHEM1120L General Chemistry II Lab	I			I			
CHEM3010 Org Chemistry I	R			R			
CHEM3010L Org Chemistry I Lab	R			R			
CHEM3020 Org Chemistry II	R			R			
CHEM3020L Org Chemistry II Lab	R			R			
PHYS1030 General Physics I				I			

PHYS1030L General Physics I Lab				I			
PHYS1040 General Physics II				I			
PHYS1040L General Physics II Lab				I			
GEOL1110 Physical Geol	I			I			
GEOL1110L Physical Geol Lab	I			I			
GEOL1120 Historical Geol	I	I		I			
GEOL1120L Historical Geol Lab	I	I		I			
BIOL 1110 Principles Biology I	I	I		I	I		
BIOL 1120 Principles Biology II	I	I		I	I	I	
BIOL 1130 Principles Biology III	I		I		I		
BIOL 2060 Anatomy	I		I		I		
BIOL 2080 Physiology	I		I	I	I		

BIOL 2100 Microbiology	I/R	I/R	I/R	I/R	I/R	I/R	I/R
BIOL 3060 Ecology	R	I				R	R
BIOL 3070 Ecology Lab		I/R		I/R	I/R	I/R	I/R
BIOL 3250 Genetics		C		R	R		R
BIOL 3260 Genetics Lab		R/C		R/C	R/C	R	R
BIOL 3350 Evolution	R	R			R		
BIOL 4050 Comparative Vert Zoology	C	C	C	C	C	C	
BIOL 4070 Entomology		R/C		R	R/C	I	
BIOL 4090 Herpetology	R	R	R	R	R	C	
BIOL 4110 Ichthyology	R	R	R	R	R		
BIOL 4130 Invert Zoology		R/C		R	R/C	I	
BIOL 4140 Mammalogy		C			C	C	
BIOL 4150 Mycology	R	R	R	R	R		
BIOL 4170 Ornithology	R	C	R	C			R
BIOL 4180 Plant Morphology		C		C	C	I	

BIOL 4190 Plant Tax		I		C	C	I	
BIOL 4200 Mol Genetics		R/C	R/C	R/C	R/C	R/C	R/C
BIOL 4210 Animal Phys	R			C	R		
BIOL 4220 Microbiology	I/R	R	I	I/R	R		R
BIOL 4280 Cellular Biol.	R/C	R/C	R/C	R	R	R	R
BIOL 4340 Human Disease Devel.	C	R	C		C	R	R
BIOL 4360 Plant Phys	R/C		R/C	R/C	R	R	R
BIOL 4380 Toxicology	R		R	R	R		R
BIOL 4400 Trop Mar Ecol.		R		R	R	R	
BIOL 4410 Animal Behavior	R	C		C	C	C	R
BIOL 4420 Biogeography	C	C			C	I	
BIOL 4430 Bioremediation	R	R	R	R	R	I	I
BIOL 4440 Dev Vert Embryology	C	R	C	R	R		R
BIOL 4460 Global Change Biology	R/C	R/C			R/C	R/C	R

BIOL 4470 Ecol Evol Sta		R		R/C	R/C	R/C	
BIOL 4500 Systematics	R	R		R	R		
BIOL 4510 Ecol Evol Genetics	C	C			C	C	R
BIOL 4520 Limnology	R	R		R	R		
BIOL 4530 Microbial E	R	R	R	R	R	I	I
BIOL 4540 Plant Ecology	R/C	R/C	R/C	R/C	R/C	R/C	R
BIOL 4590 Ad T Evol Ec		R			R/C	R/C	
BIOL 4610 Biol. Seminar		R			R		
BIOL 4620 Econ. Botany		R	R		R		
BIOL 4630 Endocrinology	R		R		R		
BIOL 4680 Intro Soil			R	R	I/R	R	R
BIOL 4710 Histology	C	R	C	C	C	C	C
BIOL 4720 - Immunology	R		R		R	I	
BIOL 4740 Virology		R			C	C	R
BIOL 4750 - Dendrology	R	R		R	R		

Outcomes assessments for the past two cycles (2015-2016, and 2016-2017) were reported in *Compliance Assist*. Pertinent parts of those reports, including assessment data, are shown in Table 1.2.

Table 1.2 Assessments of Current Student Learning Outcomes in the Biology Program.

SLO	**Measures and Assessment**
Outcome 1. Students are able to demonstrate knowledge of and differentiate among the different levels of biological organization (e.g., chemicals, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems, and biosphere).	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: BIOL 1100, BIOL 1130, BIOL 3060, BIOL3250, BIOL3350 2016-2017: not assessed. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: [cumulative scores for all questions, unless otherwise noted]. BIOL 1100, [4 different sessions were assessed] Question 1: 87.7%, Question 2: 85.9% BIOL 1130, [2 different sessions were assessed] Question 1: 97.9%, Question 2: 60.2%, Question 3: 83%, Question 4: 96.5% BIOL 3060, [2 sessions were assessed] 91% correct responses. BIOL 3250, 88% correct answers. BIOL 3350, 86% correct answers. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: BIOL 1100, none, CFS were met. BIOL 1130, CFS were met for Question 1 but not for Question 2. As a follow up the instructors plan to do the following: 1. reword the question, 2. plan to focus more on that subject matter during the next term. BIOL 3060, none, CFS were met. BIOL 3250, none, CFS were met. BIOL 3350, none, CFS were met. 2016-2017: not assessed, no actions planned.

Outcome 2. Students are able to demonstrate knowledge of the three core areas of biology (ecology, evolution, and genetics) and apply their knowledge to studies of various taxonomic groups (e.g., insects, fishes, mammals, fungi, vascular plants).	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: BIOL 1100, BIOL 3060, BIOL3250 2016-2017: list courses, or not assessed that year 2017-2018: BIOL 2100, BIOL 3070, BIOL 3260, BIOL 3350, BIOL 4050, BIOL 4070, BIOL 4190, BIOL 4260, BIOL 4420, BIOL 4530 **Assessment data:** 2015-2016: [cumulative scores for all questions, unless otherwise noted]. BIOL 1110, [4 different sessions were assessed] Question 1: 86.7%, Question 2: 57.8% BIOL 3060, [2 sessions were assessed] 78% BIOL 3250, Question 1: 73.5%, Question 2: 85.3%, Question 3: 47%, Question 4: 52.9%, Question 5: 52.9% 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: BIOL 1110, The CFS were not met for Question 2. The instructors plan to have more discussion during lecture and additional homework assignments for the specific topics. BIOL 3060, none CFS were met. BIOL 3250, The CFS were not met for Questions 3-5. The instructor plans to have a problem-solving session towards the end of the semester to improve students’ ability to solve problems and add a dedicated class review session for problem solving. 2016-2017: not assessed, no actions planned.

Outcome 3. Students are able to apply their knowledge of cells and organ systems in a variety of biological contexts.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: BIOL 2060, BIOL 2080, BIOL 4110, BIOL 4540, BIOL 4170, BIOL 4710. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: [cumulative scores for all questions, unless otherwise noted]. BIOL 2060 [all sessions]: 84.8% BIOL 2080 [all sessions]: 57.26% BIOL 4110: Question 1: 84.7%; Question 2: 81.8%; Question 3: 89%. BIOL 4170: Question 1: 88%; Question 2: 83%; Question 3: 75%. BIOL 4540: 80% BIOL 4710: 92.98% **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: BIOL 2060 [all sessions], none, CFS were met. BIOL 2080 [all sessions], the instructors plan to change the way the ask the particular question since it confused a lot of students. Additionally, they plan to spend more time and cover in greater detail the particular context area. BIOL 4110, none, CFS were met. BIOL 4170, none, CFS were met. BIOL 4540, none, CFS were met. BIOL 4710, none, CFS were met.

Outcome 4. Students are able to demonstrate proper laboratory/field techniques, formulate appropriate questions and hypotheses, collect laboratory/field data, and analyze collected data in a variety of biological contexts.	**Means of assessment**: Student performance on specific exam questions, lab practicals, and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: BIOL 1110L, BIOL 1120L, BIOL 2080 & 2080L, BIOL 4110, BIOL 4130, BIOL 4540, BIOL 4710. 2017-2018: not assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: [cumulative scores for all questions, unless otherwise noted]. BIOL 1110, 72.45% BIOL 1120, 74.95% BIOL 2080, 80.30% BIOL 4110, 70.4% BIOL 4130, 94.65% BIOL 4540, 85% BIOL 4710, 94.2% **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: BIOL 1110, none, CFS were met. BIOL 1120, none, CFS were met. BIOL 2080, none, CFS were met. BIOL 4110, none, CFS were met. BIOL 4130, none, CFS were met. BIOL 4540, none, CFS were met. BIOL 4710, none, CFS were met.

Outcome 5. Students are able to communicate biological information effectively.	**Means of assessment**: Student performance on specific exam questions, presentations, writing assignments and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: BIOL 2100, BIOL 3070, BIOL 3260, BIOL 3350, BIOL 4050, BIOL 4070, BIOL 4190, BIOL 4260, BIOL 4420, BIOL 4530 **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.
Outcome 6. Students are able to retrieve specific information from the scientific literature and are able to evaluate the literature effectively and critically.	**Means of assessment**: Student performance on specific exam questions, writing assignments, oral presentations and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: BIOL 2100, BIOL 3070, BIOL 3260, BIOL 4050, BIOL 4070, BIOL 4190, BIOL 4260, BIOL 4420, BIOL 4530 **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.

Outcome 7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework, student conduct in classroom. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.

Overall, since 2014, we have assessed four learning outcomes (and two never-assessed-before outcomes were assessed this academic year) and 22 classes. Of all these classes, we only had four instances where the criteria for success were not met and the instructors have taken follow-up measures.

1.2.1.3 Biology Student Performance on Major Field Exams

Student scores on the MFAT, a standardized exam measuring student knowledge in biological sciences, were used as indicators to evaluate achievement of the older Biology Program outcomes (Criterion 1.2) and used to strengthen program effectiveness (Criterion 1.3). To measure the B.S. Biology Program outcomes and effectiveness, MFAT scores of UTC Biology students (graduating seniors) were compared against scores in a national database comprised of MFAT scores of students completing similar programs at other universities.

For the 2012-2017 period (10 semesters), graduating senior Biology majors took the MFAT during four semesters of the review period (FA12, FA13, SP14, FA16). MFAT scores of UTC Biology students are presented in Figures 1.1 through 1.5. One-sample t tests were used to compare mean MFAT scores of UTC Biology students to the national average; statistical significance was set at an alpha level of 0.05.

In three (FA12, FA13, SP14) of the four semesters, UTC MFAT total scores (Figure1.1) and sub-scores [Cell Biology (Figure 1.2), Molecular/Genetics (Figure 1.3), Organismal Biology (Figure 1.4), and Ecology/Evolution (Figure 1.5)] were statistically similar to the national means (2010-16 national dataset). The FA16 scores were significantly lower than the national means.

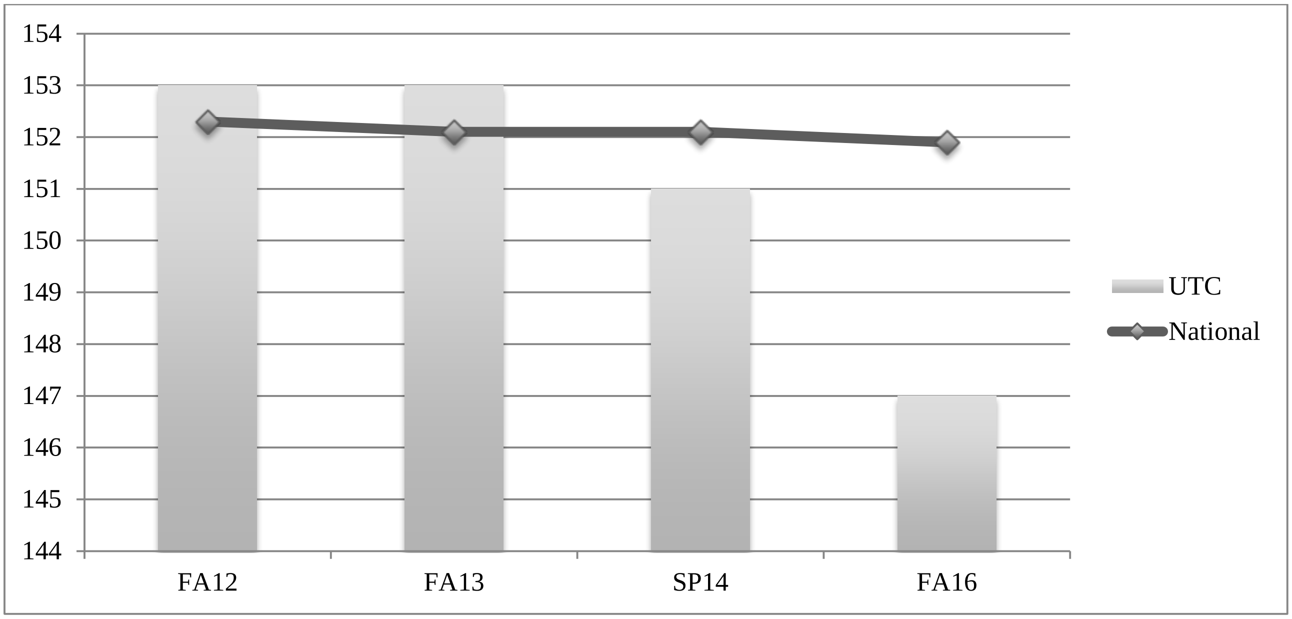


Figure 1.1 UTC Graduating Seniors in Biology vs. National Average MFAT Total Score

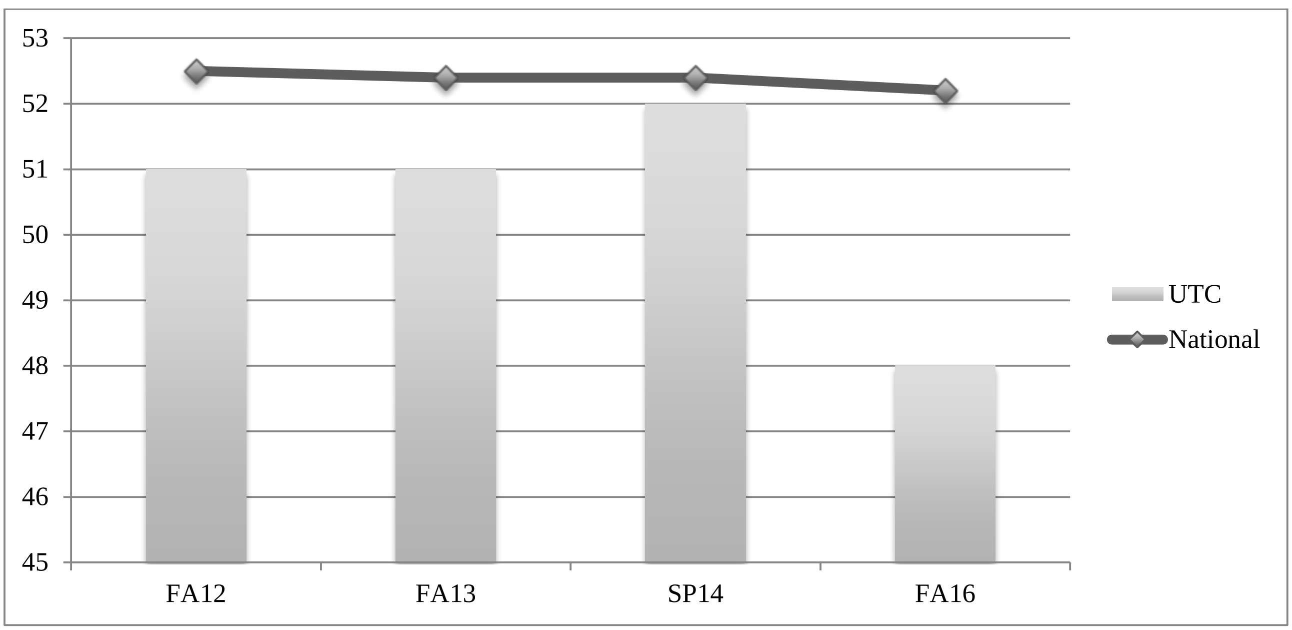


Figure 1.2 UTC Graduating Seniors in Biology vs. National Average MFAT Cell Biology Sub-score

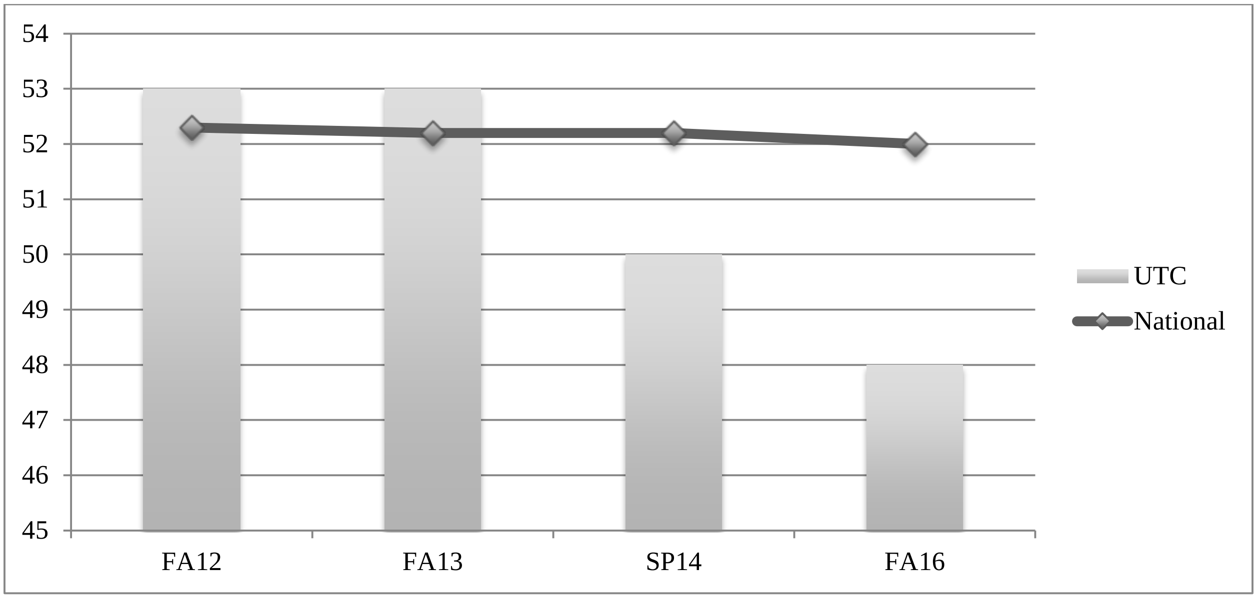


Figure 1.3 UTC Graduating Seniors in Biology vs. National Average MFAT Molecular/Genetics Sub-score.

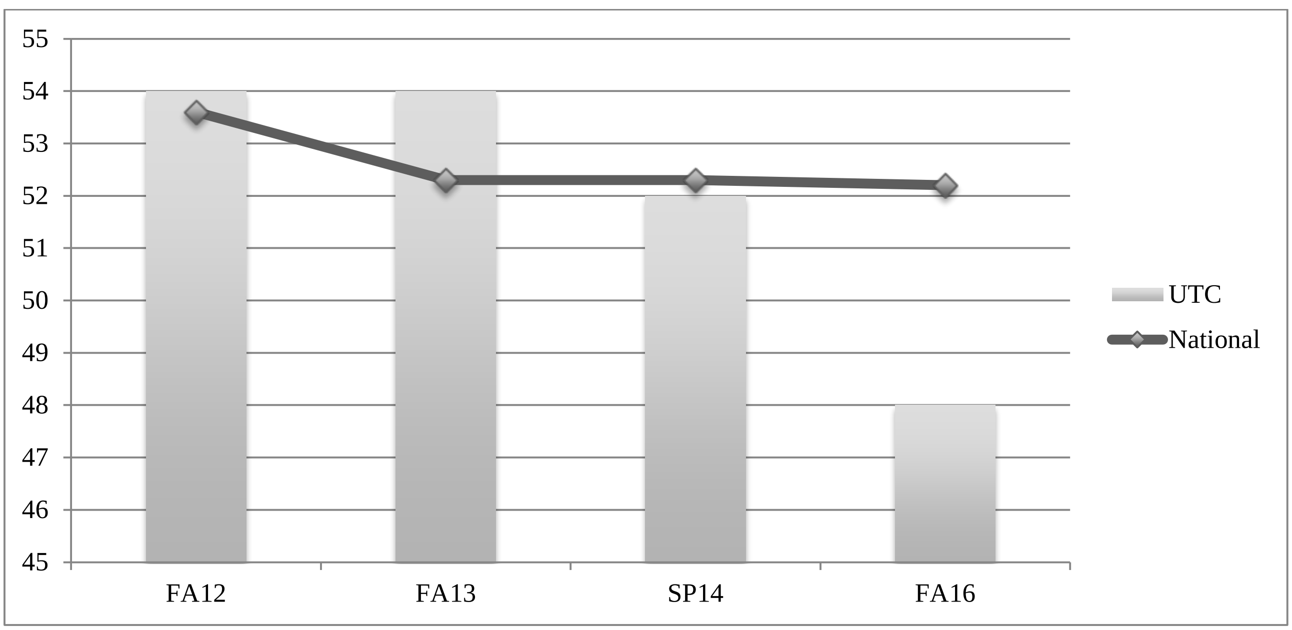


Figure 1.4 UTC Graduating Seniors in Biology vs. National Average MFAT Organismal Biology Sub-score.

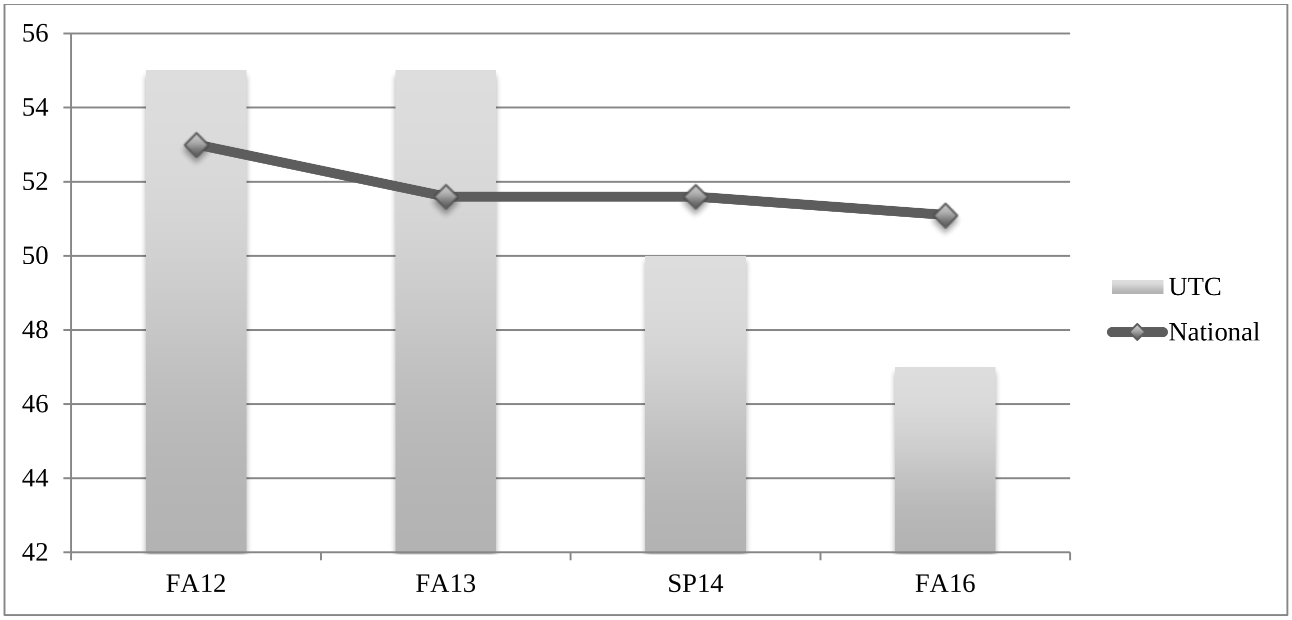


Figure 1.5 UTC Graduating Seniors in Biology vs. National Average MFAT Ecology/Evolution Sub-score.

1.2.2 Environmental Science

1.2.2.1 Environmental Science Learning Outcomes

2011 to 2014

Prior to 2014, the following program outcomes were in effect for Environmental Science:

1.1 Competency in Writing a Lab Report at the 1000 Level (in ESC 1510 - Introduction to Environmental Problems II): ESC Students will be properly trained in how to wield the scientific method and will be able to display this competency through properly constructed lab reports.

2.1 Competency in Writing a Lab Report at the 3000 Level (in BIO 3070 – Ecology Laboratory): ESC Students will be properly trained in how to wield the scientific method and will be able to display this competency through properly constructed lab reports.

3.1 Solid Internship Performances - Agencies and entities that employ junior and senior Environmental Science majors as interns will not only express satisfaction with their work, but will also benefit the interns by providing them with worthwhile experiences, as evidenced by the construction of quality student internship papers.

2014 to present

The learning outcomes for Environmental Science as presented below were established during the 2014-2015 academic year and were first tested during the 2015-2016 academic year.

1. Students are able to demonstrate knowledge of the natural world, within the context of key issues of Environmental Science (including human population increase, urbanization, sustainability, resource depletion, and environmental pollution).

2. Students are able to demonstrate knowledge of core areas of Environmental Science (including ecology, survey methodology, environmental resources, environmental law and policy, and environmental ethics) as they exemplify the interdisciplinary nature of the field.

3. Students are able to apply their knowledge towards addressing environmental problems, in a manner consistent with recognizing the unique role humans play in the environment.

4. Students are able to formulate research questions and/or hypotheses, utilize appropriate methodologies, and collect and analyze data toward addressing their questions and/or hypotheses within an environmental context.

5. Students are able to communicate Environmental Science information effectively.

6. Students are able to retrieve specific information from the relevant literature and are able to evaluate the literature effectively and critically.

7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.

8. Students are able to competently and professionally complete an applied capstone course (senior experience) that stresses experiential learning.

1.1.3 Sample Course Syllabi

Course syllabi for the following courses are included in Appendix E.

Biology: BIOL 1110, BIOL 1120, BIOL 2060, BIOL 3060, BIOL 4540

Geology: GEOL 1110, GEOL 1120, GEOL 3410, GEOL 3420, GEOL 3540, GEOL 4510, GEOL 4800, GEOL 4900

ESC: ESC 1500, ESC 1510, ESC 4100, ESC 4540

1.2.2.2 Environmental Science Learning Outcomes Assessment

2011-2014

An example of how learning outcomes were assessed in the Environmental Science Program prior to 2014 is attached as Appendix F for the academic year 2012-2013.

Outcome 1.1 was assessed based on the lab report done in the Introduction to Environmental Science II - ESC 1510.

Outcome 2.1 was assessed based on the lab report done in the Ecology Lab - BIOL3070.

Outcome 3.1 was assessed based on an Internship performance rubric.

2014-present

The department (then Biology and Environmental Sciences) was tasked to establish a set of learning outcomes and complete the curriculum mapping during the 2014-1015 academic year. The following academic year (2015-2016) we started the assessment of SLOs. Given that this was the first year, we selected only two SLOs (1 and 2) and just a handful of classes to assess. The following year (2016-2017), we moved on to two new SLOs (3 and 4). Unlike Biology, the number of classes offered in Environmental Science is smaller and we did not have the opportunity to dramatically increase the sample size as was done in Biology. A different problem is that some of the Environmental Science classes have limited enrollment and they cannot be easily evaluated statistically due to smaller sample sizes. This academic year (2017-2018) we will attempt to assess a larger number of classes for two not previously assessed SLOs (5 and 6), while revisiting one of the SLOs from the previous years.

During the 2014-2015 academic year the program was tasked to produce the curriculum map

(Table 1.3) with the current learning outcomes, but no assessment occurred. Since the 2014-2015 academic year, the primary mode of assessment is through our classes.

Table 1.3 Curriculum map for Environmental Science.

The SLO numbers correspond to those present on section 1.1.1.2.3. I – Program SLO is introduced and assessed, R – Program SLO is reinforced and assessed, C – Level of competency is assessed.

Env. Science	Outcome 1 Demonstrate Knowledge of the Natural World	Outcome 2 Demonstrate Knowledge of Core Area	Outcome 3 Apply knowledge in Environmental Problems	Outcome 4 Formulate questions and/or hypotheses	Outcome 5 Communicate information effectively	Outcome 6 Retrieve and Evaluate information - Critical Thinking	Outcome 7 Ethical Profession al Behavior	Outcome 8 Capstone Course
ANTH 1200 - Cultural Anthropology	I	I	I		I			
ANTH 3160 - Chinese Society and Culture	R	R	R					
ANTH 3000 - Forensic Anthropology				I		I	I	
ANTH 3220 - Medicine and Disease	R	R	R					
ANTH 3350 - Archaeological Field Methods	R	R	R	R	R	R	R	
COMM 4100 - Public Comm Environ Issues	R	R	R		R	R	R	

ECON 1010 - Principles of Economics I	I		I		I			
ECON 1020 - Principles of Economics II	I		I		I			
ECON 4300 - Environmental Economics	R		R		R			
ECON 4550 - Urban Economics	R		R		R			
ENGL 2820 - Sci Writing					I/R	I/R	I/R	
GEOG 2210 - Maps Mapping		I/R					I/R	
GEOG 4150 - Urban Geo	I/R						I/R	
MATH 1130 - College Algebra			I	I				
MATH 1710 - Precalculus I			I	I				
MATH 1720 - Precalculus II			I	I				
MATH 1830 - Calculus Management, Life Social Sci			I	I				
MATH 1950 - Calculus with Analytic Geometry I			I	I				

MATH 2100 - Introductory Statistics			I/R	I/R				
PANM 3200 - Public Management		R	R				R	
PANM 3250 - Legal Aspects of Nonprofit Management		R	R				R	
PANM 4400 - Program Planning and Evaluation		R	R				R	
POLS 1010 - American Government		I	I					
POLS 1020 - World Politics		I	I					
POLS 1030 - Controversies in Public Policy		I/R	I/R					
POLS 2440 - Comparative Public Policy		R	R					
POLS 3250 - American Public Policy		R	R				R	
POLS 3300 - Urban Public Policy		R	R					
SOC 1510 - Introduction to	I/R	I/R	I/R	I/R				

Sociology								
SOC 3000 - Urban Sociology	R	R	R					
SOC 3140 - Research Methods				R	I			
SOC 3450 - Social Inequality	R	R	R				R	
SOC 3500 - Social Change Globalization	R	R	R					
SOC 3550 - Sociology of Globalization	R	R	R					
SOC 3140 - Research Methods				R	I			
SOC 4140 - Research Seminar			R/C	R/C	C	C		
BIOL 1110 - Principles Biology I	I	I		I				
BIOL 1120 - Principles Biology II		I		I	I	I		
BIOL 3060 - Ecology	R	I	R		R		R	
BIOL 3070 - Ecology Lab	R	I/R		I/R	I/R	I/R	R	

ESC 1500 - Intro Env Sci I	I	I		I	I		I	
ESC 1510 - Intro Env Sci II	I	I	I	I	I	I	I	
ESC 2500 - World Res	R	R	R		R	R		
ESC 3400 - Survey Meth	R	R	R	R	R	R	R	
ESC 3600 - Air Water Pol	R	R	R		R		R	R
ESC 4070 - Env Conserv	R/C	R/C	R/C		R			
ESC 4100 - Law		R/C	R		R/C	R	R	
ESC 4300 - Prob Env Ma	R	R	R/C		R			
ESC 4520 - Limnology	R	R		R	R			
ESC 4650 - Remote Sens		R	R	C	R	R	R	
ESC 4660 - GIS		R	R	C	R	R	R	
ESC 4680 - Intro Soil	R	R	R/C	R	R	R	R	R
ESC 4800 - Seminar	R/C	R/C	R/C		R/C	R/C	R	C
ESC 4840 - Values Environ	R/C	R/C	R/C				R	
ESC 4900 - Senior Project	C	C	C	C	C	C	C	C
ESC 4910 - Internship	R	R	R	R	R		R	C

ESC 4920 - Advance GIS		R	C	C	R	C	R	C
ESC 4960 - Env Field C	R	R	R	R	R		R	C
ESC 4995 - Thesis	C	C	C	C	C	C	C	C
ESC 4997 - Research	R	R	R	R	R		R	C
ESC 4998 - Ind Studies	R	R	R	R	R		R	C

Outcomes assessments for the past two cycles (2015-2016, and 2016-2017) were reported in *Compliance Assist*. Pertinent parts of those reports, including assessment data, are shown in Table 1.4.

Table 1.4 Assessments of Current Student Learning Outcomes in the Environmental Science Program

SLO	**Measures and Assessment**
Outcome 1. Students are able to demonstrate knowledge of the natural world, within the context of key issues of environmental science (including human population increase, urbanization, sustainability, resource depletion, and environmental pollution).	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: ESC 1500, ESC 1510, BIOL 3060. 2016-2017: not assessed. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: [cumulative scores for all questions, unless otherwise noted]. ESC 1500, [two sessions were assessed] Question 1: 91%, 87%; Question 2: 77%, 83%; Question 3: 80%, 85%. ESC 1510, Question 1: 85.7%, Question 2: 71.4%. BIOL 3060, [two sessions] Overall assessment 69% 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: ESC 1500, none CFS were met. ESC 1510, none CFS were met. BIOL 3060, The CFS were not met, and part of the problem was differences in testing between different sessions. the instructors will consider ways to standardize assessments among multiple sections of classes and will reinforce the role of the natural world within the context of key issues of environmental science that are described during class. 2016-2017: not assessed, no actions planned.

Outcome 2. Students are able to demonstrate knowledge of core areas of environmental science (including ecology, survey methodology, environmental resources, environmental law and policy, and environmental ethics) as they exemplify the interdisciplinary nature of the field.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: ESC 1500, ESC 1510, BIOL 3060. 2016-2017: not assessed. 2017-2018: ESC 2500, BIOL 3070, ESC 3400, ESC 3600, ESC 4010, ESC 4100, ESC 4300, ESC 4650, ESC 4660 **Assessment data:** 2015-2016: [cumulative scores for all questions, unless otherwise noted]. ESC 1500, [two sessions were assessed] Question 1: 67%, 72%; Question 2: 79%, 78%; Question 3: 82%, 76%. ESC 1510, Question 1: 85.7%, Question 2: 95.2%, Question 3: 85.7%. BIOL 3060, Overall assessment 78% 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: ESC 1500, The CFS were not met for Question 1. The instructor plans to emphasize differences between renewable and non-renewable resources more in class. ESC 1510, none, CFS were met. BIOL 3060, none, CFS were met. 2016-2017: not assessed, no actions planned.

Outcome 3. Students are able to apply their knowledge towards addressing environmental problems, in a manner consistent with recognizing the unique role humans play in the environment.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: ESC 1510, ESC 4100, ESC 4480, ESC 4540. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: [cumulative scores for all questions, unless otherwise noted]. ESC 1510, Question 1: 75%; Question 2: 100%; Question 3: 83% ESC 4100, 86% ESC 4840, 72% ESC 4540, 90% **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: ESC 1510, none, CFS were met. ESC 4100, none, CFS were met. ESC 4840, none, CFS were met. ESC 4540, none, CFS were met.

Outcome 4. Students are able to formulate research questions and/or hypotheses, utilize appropriate methodologies, and collect and analyze data toward addressing their questions and/or hypotheses within an environmental context.	**Means of assessment**: Student performance on specific exam questions, lab practicals or exercises, and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017 ESC 1510 (Fall Semester), ESC 1510 (Spring Semester), ESC 4540 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: [cumulative scores for all questions, unless otherwise noted]. ESC 1510 (Fall), Question 1: 64%; Question 2: 62.5% ESC 1510 (Spring), Question 1: 79%; Question 2: 76.5% ESC 4540, 87.5% **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: ESC 1510, the class failed to reach the CFS benchmark in the Fall semester but due to the corrective action taken by the instructor in the spring semester (more emphasis on writing assignments), the class reached the CFS benchmark. No further actions are planned. ESC 4540, none, CFS were met.

Outcome 5. Students are able to communicate environmental science information effectively.	**Means of assessment**: Student performance on specific exam questions, presentations, writing assignments and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: ESC 2500, BIOL 3070, ESC 3400, ESC 3600, ESC 4010, ESC 4100, ESC 4300, ESC 4650, ESC 4660 **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.
Outcome 6. Students are able to retrieve specific information from the relevant literature and are able to evaluate the literature effectively and critically.	**Means of assessment**: Student performance on specific exam questions, presentations, writing assignments and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: ESC 2500, BIOL 3070, ESC 3400, ESC 4010, ESC 4100, ESC 4300, ESC 4650, ESC 4660 **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.

Outcome 7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.	**Means of assessment**: Student performance on specific exam questions, presentations, writing assignments, conduct and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.
Outcome 8. Students are able to competently and professionally complete an applied capstone course (senior experience) that stresses experiential learning.	**Means of assessment**: Student performance on specific exam questions, presentations, writing assignments and/or embedded coursework. **Criteria for Success**: At least 70% of the student will have the correct answers on specific questions designed by instructors to test the specific outcome. **Courses Evaluated**: 2015-2016: not assessed. 2016-2017: not assessed. 2017-2018: not to be assessed. **Assessment data:** 2015-2016: not assessed. 2016-2017: not assessed. **Follow up actions planned:** 2015-2016: not assessed, no actions planned. 2016-2017: not assessed, no actions planned.

Overall, since 2014, we have assessed four learning outcomes (and two never-assessed-before ones are assessed this academic year) and 13 classes. Among all these classes, we only had three instances where the criteria for success were not met and each of the instructors have taken follow-up measures.

1.2.3 Geology

1.2.3.1 Geology Learning Outcomes

This section describes student learning outcomes for the B.S. Geology Program for the 6-year period (2011 to 2017) covered in this review. Assessments of these outcomes have been used to help monitor the success of the program and to satisfy requirements of SACS (Southern Association of Colleges and Schools). A brief history at the outset of this section provides context. Enduring outcomes, those that were assessed for the entire period, are described at the conclusion of this section.

Brief History of Learning Outcomes in the Geology Program.

The B.S. Geology Program has been engaged in outcomes assessment since the 1997-1998 academic year. At the start of this 20-year history, the program's "intended educational outcomes" were defined as

1. Students completing the baccalaureate program in Geology at UTC will compare favorably in their general knowledge of Geology with respect to students that have completed similar programs.

2. Students completing the baccalaureate program in Geology at UTC will be satisfied with the education and training that they received.

3. Students completing the baccalaureate program in Geology at UTC will be competitive for positions of employment or admission to graduate school in Geology-related fields.

Assessment of these outcomes initially consisted of (1) the Graduate Record Exam (GRE, Geology subject test), which was replaced by the Area Concentration Achievement Test (ACAT) in Geology, (2) soliciting student opinion of the Geology Program by exit questionnaires and exit interviews, and (3) tracking professional and educational endeavors of Geology graduates. Outcomes and outcomes assessment have evolved over the years into the current set of nine "student learning outcomes" and the current means of assessing them.

Substantial changes in outcomes assessment accompanied changes in means by which assessments are reported, as required by the university's administration. Initially, intended educational outcomes, outcome assessment plans, and assessment results were reported in a standardized 4-column table. Starting with the 2007-2008 assessment cycle, the university adopted *TaskStream* (https://www1.taskstream.com/), a web-based solution for performance assessment. At this time, the Geology Program began assessing learning outcomes in its general education courses, in addition to using the ACAT and exit questionnaires and interviews to assess the original intended educational outcomes for its graduates.

Major revision of outcomes and outcomes assessment occurred in 2011-2012, immediately before use of *TaskStream* was discontinued. At this point, previously used means of assessment, which focused on assessing content knowledge and student opinion of the program, were replaced by constructed-response questions on final exams to assess students' problem-solving abilities and assessment of students' research and communication skills in the program's capstone seminar (research) course (GEOL 4900). Students' research and communication skills have been assessed every year since 2011-2012 and are among the program's current student learning outcomes. Although the ACAT has been administered since the 1998-1999 academic year, results were last reported as part of the program's outcomes assessment for the 2011-2012 assessment cycle.

Outcomes and outcomes assessment were completely redesigned in 2013-2014, resulting in the current set of nine student learning outcomes, each with defined means of assessment and criteria for success. This occurred in anticipation of using *Compliance Assist* (https://www.campuslabs.com), an online planning and reporting tool. Assessment of these outcomes began in 2014-2015.

Geology Program Learning Outcomes, 2010-2011

The 10 "Learning objectives/outcomes" for the 2010-2011 assessment cycle were established in 2007-2008. These were

1. Graduates will have a general knowledge of geology.
2. Graduates will have knowledge of mineralogy.
3. Graduates will have knowledge of petrology.
4. Graduates will have knowledge of stratigraphy.
5. Graduates will have knowledge of structural geology.
6. Graduates will be satisfied with education and training.
7. Enhanced competencies due to GEOL 1110 (General Education).
8. Enhanced competencies due to GEOL 1120 (General Education).
9. Enhanced competencies due to GEOL 1160 (General Education).
10. Enhanced competencies due to GEOL 2250 (General Education).

Outcome numbers one through five were further described by statements of the form

Students completing the baccalaureate program in Geology at UTC will compare favorably in their general knowledge of [geology, mineralogy, petrology, stratigraphy, or structural geology] with respect to students that have completed similar programs.

Outcome number six was further described by the statement

Students completing the baccalaureate program in Geology at UTC will be satisfied with the education and training that they received.

Outcome numbers seven through 10 address the expectation that students would have enhanced competencies due to general-education classes in Geology. Each of these outcomes were further described by statements of the form

Students that complete [GEOL 1110, GEOL 1120, GEOL 1160, or GEOL 2250] will have an enhanced knowledge of [physical geology, historical geology, current geological perspectives, or oceanography] and improved analytical skills due to the course.

Geology Program Learning Outcomes, 2011-2012

Outcomes assessment for the 2011-2012 cycle focused on students' problem-solving abilities and their research and communication skills. More specifically, the three "Learning objectives/outcomes" for this cycle were

1. Graduates will be proficient problem solvers.
2. Graduates will be productive researchers.
3. Graduates will be effective communicators.

These outcomes were further described by the statements

Students completing the baccalaureate program in Geology at UTC will be able to apply their knowledge, skills, and critical-thinking abilities to solve geological problems.

Students completing the baccalaureate program in Geology at UTC will be able to design and conduct research, and to convey the design, methodology, and results thereof, effectively.

and

Students completing the baccalaureate program in Geology at UTC will be able to communicate technical information by written, oral, and graphical means.

Geology Program Learning Outcomes, 2012-2013

Outcomes for the 2012-2013 cycle resembled those of 2011-2012. However, outcome number one was revised to describe improved problem-solving abilities due to the program, as follows:

Students completing the baccalaureate program in Geology at UTC will be able to apply their knowledge, skills, and critical thinking abilities, due to the program, to better solve geological problems.

Thus, student learning outcomes for the 2012-2013 cycle were

1. Graduates will have improved problem-solving abilities.
2. Graduates will be productive researchers.
3. Graduates will be effective communicators.

Geology Program Learning Outcomes, 2013-2014 to present

For faculty of the Geology Program, the 2013-2014 assessment cycle was devoted to a total redesign of its outcomes and outcome assessment plan. This effort resulted in nine "student learning outcomes". These are

1. Students are able to apply their knowledge of fundamental sciences to interdisciplinary studies of Earth.

2. Students are able to apply their computational skills to studies of Earth.

3. Students are able to characterize and identify common earth materials (minerals, rocks, and soils) in situ and in hand specimen, using commonly available tools and aids to observation.

4. Students are able to interpret and articulate the genesis of common rocks and of common associations of minerals, fossils and rock structures.

5. Students are able to relate imperceptibly slow geologic processes to the enormous scale of geologic time and the energy gradients that drive them.

6. Students are able to critically assess geology-related issues that impact society, using their knowledge of Geology.

7. Students are able to formulate a reasonable model of geologic structure, geologic process, and/or geologic history based on spatially, geometrically, and/or temporally related data.

8. Students are able to design and conduct geologic research, using their knowledge, skills and critical thinking abilities.

9. Students are able to communicate geotechnical information by written, oral, and graphical means.

Note that outcomes eight and nine are essentially the same as outcomes two and three from the previous two cycles.

Enduring outcomes in the Geology Program

Despite changes made to outcomes and their assessments during the past six years, some have endured in the Geology Program. Expectations of enhanced competencies due to general-education courses have been assessed continuously since they were first part of the program's stated outcomes in 2007-2008. Considering that numbers eight and nine of the current SLO's were assessed each of the past three cycles, students' abilities to conduct research and to communicate geotechnical information have been assessed every year since 2011-2012. Furthermore, ACAT pretests and outcomes (senior) tests have been administered, either as part of an outcomes assessment plan or as an independent major field test, continuously since 1998.

1.2.3.2 Geology Learning Outcomes Assessment

Geology Program Learning Outcomes Assessment, 2010-2011

Outcomes one through 5, which focus on students' knowledge of Geology, were assessed by ACAT overall scores and mineralogy, petrology, stratigraphy, and structural geology content-area scores, with the expectation (target) that the mean of students' scores, in each case would be at or above the 50^{th} percentile, compared to national norms.

Ten prospective graduates took the ACAT on April 14, 2011. Individual overall scores range from 390 (14th percentile) to 679 (96th percentile), with a mean of 514 (56th percentile). The mean of mineralogy content-area scores is 575 (77th percentile); that of petrology content-area scores is 462 (35th percentile); that of stratigraphy content-area scores is 482 (43rd percentile); and that of structural geology content-area scores is 530 (62nd percentile). The target was met for the mean of overall scores and for means of mineralogy and structural geology content-area scores.

Though not described in the assessment plan, the ACAT pretest was also administered to students at the start of their 2^{nd} year in the program, early in the Fall semester of 2010. Comparisons of pretest and outcomes (senior) test performances were also reported in relation to outcomes one through 5.

Nine 2nd-year Geology students took the ACAT pretest on August 30, 2010. The mean of their overall scores is 385, which corresponds to the 13th percentile. Means of their mineralogy, petrology, stratigraphy, and structural geology content-area scores are 400 (16th percentile), 438 (27th percentile), 427 (23rd percentile), and 403 (17th percentile), all well below means of corresponding scores for prospective graduates.

Outcome 6, which focused on student opinion of the Geology Program, was assessed by exit interviews and by exit questionnaires. As measured by exit interviews, it was expected (targeted) that prospective graduates would indicate satisfaction with the education and training that they received. As measured by exit questionnaires, it was expected (targeted) that prospective graduates would agree or strongly agree with each of the following statements:

1. I am satisfied with the education and training that I received as a student in the Geology Program at UTC.
2. I am satisfied with the academic advisement that I received as a student in the Geology Program at UTC.
3. Geology faculty at UTC convey an in-depth knowledge of the subjects that they teach.
4. Geology faculty at UTC relate to students in an academically productive way.
5. When called upon, Geology faculty at UTC are willing to help students.

Only one of 10 prospective graduates was interviewed by the department head. This student was generally positive about his/her experience in the Geology Program and, in particular, praised the faculty, but also offered suggestions for improvements to the program.

All 10 prospective graduates completed the exit questionnaire. All 10 respondents indicated satisfaction with the education, training, and academic advisement that they received; all agreed or strongly agreed that faculty are knowledgeable in their respective subject areas; and all strongly agreed that faculty relate well to students and are willing to help students.

Enhanced competencies due to general-education classes in Geology (outcomes 7 through 10) were assessed by a pretest and a post-test in each of the program's general-education classes, with the expectation (target) that the average of students' scores for the post-test would be at least 50 relative percent better than the average of students' scores for the pretest.

For each of GEOL 1110, GEOL 1120, GEOL 1160, and GEOL 2250, the average of students' scores for the post-test are at least 50 relative percent better than the average of students' scores for the pretest. For most sections of these general-education classes, the target was far exceeded.

Outcomes assessments for the 2010-2011 cycle were reported in *TaskStream*. The *TaskStream* report provides additional details (Appendix G).

Geology Program Learning Outcomes Assessment, 2011-2012

Student's problem-solving skills (outcome 1) were to be assessed by constructed-response questions on final exams in GEOL 3410, GEOL 3420, GEOL 3540. These questions caused students to apply their knowledge, skills, and critical-thinking abilities to solve a real-world problem appropriate to the subject matter of the class, and to explain their reasoning. The expectation (target) was that at least 80% of students completing each these courses would meet or exceed faculty expectations for each of four performance criteria, as judged using a common scoring rubric (Appendix H).

Overall (all criteria combined), only 38% of students met or exceeded expectations in Mineralogy (GEOL 3410); 96% of students met or exceeded expectations in Petrology (GEOL 3420); and 69% of students met or exceeded expectations in Sedimentary Rocks and Stratigraphy (GEOL 3540). In Petrology, the assessment was implemented as an out-of-class assignment, which may explain what appears to be exceptional performance. Also, several null responses (students that didn't answer the question on the final exam) contribute to the count of those that fell below expectations for GEOL 3410 and GEOL 3540. These factors make these findings difficult to compare. Nonetheless, the improved performance in GEOL 3540 (3rd- and 4th-year students), as compared to that of GEOL 3410 (2nd-year students), may indicate that students benefit from the Geology Program, in terms of their problem-solving abilities. This possibility compelled modification of this outcome for the 2012-2013 cycle.

Students' poster presentations made at the conclusion of the program's capstone seminar (research) course (GEOL 4900) were used to assess outcomes two and 3, which describe expectations of students' research and communication skills.

For outcome number 2, the expectation (target) was that research described on posters and otherwise conveyed by 80% of students would meet or exceed faculty expectations for research, in terms of (1) problem to be researched, (2) methodology, (3) data analysis, and (4) conclusion(s), as judged using a common scoring rubric (Appendix I). In fact, 100% of students met or exceeded expectations for criterion #1; 92% of students met or exceeded expectations for criterion #2; 100% of students met or exceeded expectations for criterion #3; and 88% of students met or exceeded expectations for criterion #4. Overall (all criteria combined), 95% of students met or exceeded expectations.

For outcome number 3, the expectation (target) was that at least 80% of students' posters would meet or exceed faculty expectations in terms of (1) organization, layout, and design and (2) written, (3) oral, and (4) graphical communication. It was also expected that 80% of students' presentations would meet or exceed faculty expectations in terms of (5) demonstrated knowledge of and enthusiasm for the subject and (6) professionalism, as judged using a common scoring rubric (Appendix J). In fact, 100% of students met or exceeded expectations for all six criteria. Overall (all criteria combined), 100% of students met or exceeded expectations.

Outcomes assessments for the 2011-2012 cycle were reported in *TaskStream*. The *TaskStream* report provides additional details (Appendix K).

Geology Program Learning Outcomes Assessment, 2012-2013

For outcome number 1, as revised from the 2011-2012 cycle, problem-solving abilities of graduating seniors were assessed in GEOL 4510 and were compared to problem-solving abilities of 2nd-year students in GEOL 3410. This was meant to identify improved abilities due to the Geology Program. The expectation (target) was that the number of graduating Geology majors that meet or exceed expectations for the combination of all four criteria would be at least 50 relative percent greater than that of 2nd-year Geology majors. A 58% relative improvement marginally exceeded the target.

Assessments of outcomes two and three were unchanged from the 2011-2012 cycle. Expectations (targets) for these assessments were substantially exceeded.

Outcomes assessments for the 2012-2013 cycle were not reported in *TaskStream*. Instead, assessments were reported in a standardized table (Appendix L).

Geology Program Learning Outcomes Assessment, 2013-2014

Although no outcome assessment was required of the Geology Program during this cycle, those of 2012-2013 were continued. Outcomes 7 through 10 of the 2010-2011 cycle (enhanced competencies due to general-education classes) were also assessed. ACAT pretests and outcomes (senior) tests were also administered.

Outcomes assessments for the 2013-2014 cycle were recorded in a standardized table (Appendix M). Results of the ACAT and those for assessment of outcomes 7 through 10 are discussed in sections 1.2.2.2 and 1.2.6.

Geology Program Learning Outcomes Assessment, 2014-2015 to present

Three or four of the nine current student learning outcomes (SLO's) were assessed during each of the past three cycles (2014-2015, 2015-2016, and 2016-2017), as shown in Table 1.5, such that SLO numbers 2, 3, 6, 8, and 9 have been assessed at least once. SLO numbers 1, 4, 5 and 7 will be assessed in the future.

Table 1.5 Student Learning Outcomes Assessed During the Past 3 Cycles

Student Learning Outcomes

Assess Cycle	1	2	3	4	5	6	7	8	9
2014-2015			X					X	X
2015-2016			X					X	X
2016-2017		X				X		X	X
2017-2018	X							X	X

Students are introduced (I), gain practice (P), or develop competency (C) in the skills and abilities described by these SLO's in required courses of the Geology curriculum, as shown in the curriculum map (Table 1.6).

Table 1.6 Curriculum map for Geology.

The SLO numbers correspond to those present on section 1.1.1.2.2. I – Program SLO is introduced and assessed, P – Program SLO is practiced and assessed, C – Level of competency is assessed.

Courses	Outcome 1 Knowledge of funda-mental sciences	Outcome 2 Apply computat-ional skills	Outcome 3 Characterize and identify common earth materials	Outcome 4 Interpret and articu-late the genesis of rocks and minerals	Outcome 5 Relate impercept-ibly slow geologic processes	Outcome 6 Critically assess geology-related issues	Outcome 7 Formulate a reason-able model based on related data	Outcome 8 Design and conduct geologic research	Outcome 9 Communi-cate geo-technical information
ENGL 2820 Sci. Writing									I
*BIOL 1110 Biology I	I								I
*BIOL 1120 Biology II	I								I
*CHEM 1110 Chemistry I	I	I							I
*CHEM 1120 Chemistry II	I	I							I
*PHYS 1030 Gen. Phys. I	I	I							I
*PHYS 1040 Gen. Phys. II	I	I							I
*MATH 1830 Calc. Life Sci		I, P, C							I
*MATH 1950 Calculus I		I, P, C							I
GEOL 1110 Phys. Geol.	I	I	I	I	I	I	I		I
GEOL 1120 Hist. Geology	I	I	I, P	I, P	I	I	I		I

GEOL 1230 Env. Geology	I	P	P	P	I	P	I, P	I	P
GEOL 2250 Oceanography	P	I	I	I	I	I	I		P
GEOL 3070 Geol. of TN	P			P	P, C	P	P		P
GEOL 3220 Soils	I	I	I, P	P	P	P	P	I	P
GEOL 3410 Mineralogy	P	P	P, C	P, C	P	P	P		P
GEOL 3420 Petrology	P	P	P, C	P, C	P, C	P	P, C		P
GEOL 3530 Paleontology	P	P	P, C	P, C	P, C	P, C	P, C	P	P
GEOL 3540 Sed./Strat.	P		C	C	P, C	P, C	P, C	P	P
GEOL 4070 Dynam. Earth	P	P		P	C		P		P
GEOL 4080 Geomorph.	P	P	P	P	P	P	P	I	P
GEOL 4360 Fossil Fuels	P	P	P	P	P	C	P		P, C
GEOL 4420 X-ray Diff.	P	P							P
GEOL 4450 Hydrology	P	C			P	P, C	P, C		
GEOL 4500 Econ. Geol.	P, C	P	P	P	P, C	P	P	I	P
GEOL 4510 Struct. Geol.	P	C	C	C	C	C	C	P	P
GEOL 4520 Field Methods	P	C	P, C	P, C	P, C	P, C	C	P, C	C
GEOL 4800 Geol. Seminar	P							C	C
GEOL 4900	C							C	C

Senior Sem.									
GEOL 4960				P	P		P		P
Field Exper.									
GEOL 4997	I, P, C							C	C
Research									

*Any 2 of 3 introductory science sequences, 4 courses

Outcomes assessments for the past three cycles (2014-2015, 2015-2016, and 2016-2017) were reported in *Compliance Assist*. Pertinent parts of those reports, including assessment data, are shown in Table 1.7.

Table 1.7 Assessments of Current Student Learning Outcomes in the Geology Program.

SLO	**Measures and Assessment**
Outcome 1. Students are able to apply their knowledge of fundamental sciences to interdisciplinary studies of Earth	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework **Criteria for Success**: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome. **Courses Evaluated**: 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed 2017-2018: GEOL 1110. GEOL 3410, GEOL 4070, GEOL 4500 **Assessment data:** 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed **Follow up actions planned:** 2014-2015: not assessed, no actions planned 2015-2016: not assessed, no actions planned 2016-2017: not assessed, no actions planned

Outcome 2. Students are able to apply their computational skills to studies of Earth.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework **Criteria for Success**: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome. **Courses Evaluated**: 2014-2015: not assessed 2015-2016: not assessed 2016-2017: GEOL 2250, GEOL 3410, GEOL 4420, GEOL 4450, GEOL 4510 2017-2018: not to be assessed **Assessment data:** 2014-2015: not assessed 2015-2016: not assessed 2016-2017: Percent (%) of students (all majors) that achieved a grade of 60% or better on exam questions or coursework in each of the following classes: Geol 2250, 69% (n=70) Geol 3410, 82% (n=17) Geol 4420, 83% (n=6) Geol 4450, 92% (n=36) Geol 4510, 83% (n=24) Percent (%) of **B.S. Geology** students (all options) that achieved a grade of 60% or better on exam questions or coursework in each of the following classes: Geol 2250, 100% (n=1) Geol 3410, 89% (n=9) Geol 4420, 83% (n=6) Geol 4450, 88% (n=16) Geol 4510, 87% (n=23) **Follow up actions planned:** 2014-2015: not assessed, no actions planned 2015-2016: not assessed, no actions planned 2016-2017: The instrument used for assessment of this outcome in GEOL 2250 will be changed for future assessments to something more appropriate for such a general education class. Met all CFS for B.S. Geology students.

Outcome 3. Students are able to characterize and identify common earth materials (minerals, rocks, and soils) in situ and in hand specimen, using commonly available tools and aids to observation.	**Means of assessment**: Student performance on lab final exams in (1) Mineralogy (GEOL 3410 minerals), (2) Petrology (GEOL 3420, igneous and metamorphic rocks), and (3) Sedimentary Rocks and Stratigraphy (GEOL 3540, sedimentary rocks) **Criteria for Success**: At least 80% of students completing the 3 courses will correctly identify at least 60% of mineral and rock specimens, calculated as a simple average of raw scores on the 3 exams. **Courses Evaluated**: 2014-2015: GEOL 3410, GEOL 3420 2015-2016: GEOL 3410, GEOL 3420, GEOL 3540 2016-2017: not assessed 2017-2018: not to be assessed **Assessment data:** 2014-2015: Percent (%) of B.S. Geology students that identified at least 60% of mineral and rock specimens on lab final exams in each of the following classes: GEOL 3410, 93% (n=16) GEOL 3420, 92% (n=12) GEOL 3540, NA Note: GEOL 3540, taught every other semester, was not taught during this cycle. 2015-2016: Eighty-one % (81%) of the 21 B.S. Geology students that completed all 3 courses correctly characterized and identified at least 60% of the mineral and rock specimens, calculated as a simple average of raw scores on the 3 exams. 2016-2017: not assessed **Follow up actions planned:** 2014-2015: met all CFS, no actions planned 2015-2016: met all CFS, no actions planned 2016-2017: not assessed, no actions planned

Outcome 4. Students are able to interpret and articulate the genesis of common rocks and of common associations of minerals, fossils and rock structures.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework **Criteria for Success**: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome. **Courses Evaluated**: 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed 2017-2018: not to be assessed **Assessment data:** 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed **Follow up actions planned:** 2014-2015: not assessed, no actions planned 2015-2016: not assessed, no actions planned 2016-2017: not assessed, no actions planned

Outcome 5. Students are able to relate imperceptibly slow geologic processes to the enormous scale of geologic time and the energy gradients that drive them.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework **Criteria for Success**: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome. **Courses Evaluated**: 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed 2017-2018: not to be assessed **Assessment data:** 2014-2015: not assessed 2015-2016: not assessed 2016-2017: not assessed **Follow up actions planned:** 2014-2015: not assessed, no actions planned 2015-2016: not assessed, no actions planned 2016-2017: not assessed, no actions planned
Outcome 6. Students are able to critically assess geology-related issues that impact society, using their knowledge of geology.	**Means of assessment**: Student performance on specific exam questions and/or embedded coursework **Criteria for Success**: Criteria for success (CFS) for GEOL 1230, GEOL 4080, GEOL 4360, and GEOL 4510: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome, in each of these classes. Criteria for success (CFS) for GEOL 1110: At least 80% of students will achieve a grade of 50% or better on an exam question designed to assess this outcome. (The rubric used to assess this outcome in GEOL 1110 for the 2016-2017 cycle provided for full credit, half credit or no credit). **Courses Evaluated**: 2014-2015: not assessed 2015-2016: not assessed 2016-2017: GEOL 1110, GEOL 1230, GEOL 4080, GEOL 4360, GEOL 4510 2017-2018: not to be assessed **Assessment data:** 2014-2015: not assessed

2015-2016: not assessed
2016-2017: Percent (%) of students (all majors) that achieved a grade of 60% or better on exam questions or coursework in each of the following classes:
GEOL 1230, 92% (n=13)
GEOL 4080, 100% (n=9)
GEOL 4360, 100% (n=10)
GEOL 4510, 82% (n=22)
Sixty eight % (68%, n=220) of GEOL 1110 students achieved a grade of 50% or better.

Percent (%) of B.S. Geology students (all options) that achieved a grade of 60% or better on exam questions or coursework in each of the following classes:
GEOL 1230, 100% (n=12)
GEOL 4080, 100% (n=8)
GEOL 4360, 100% (n=10)
GEOL 4510, 82% (n=22)
One hundred % (100%, n=4) of B.S. Geology students in GEOL 1110 achieved a grade of 50% or better.

Follow up actions planned:
2014-2015: not assessed, no actions planned
2015-2016: not assessed, no actions planned
2016-2017: met all CFS for B.S. Geology students, no actions planned

Outcome 7.

Students are able to formulate a reasonable model of geologic structure, geologic process, and/or geologic history based on spatially, geometrically, and/or temporally related data.

Means of assessment: Student performance on specific exam questions and/or embedded coursework

Criteria for Success: At least 80% of students will achieve a grade of 60% or better on exam questions or coursework specifically designed to assess this outcome.

Courses Evaluated:
2014-2015: not assessed
2015-2016: not assessed
2016-2017: not assessed
2017-2018: not to be assessed

Assessment data:
2014-2015: not assessed
2015-2016: not assessed
2016-2017: not assessed

Follow up actions planned:
2014-2015: not assessed, no actions planned

2015-2016: not assessed, no actions planned
2016-2017: not assessed, no actions planned

Outcome 8. Students are able to design and conduct geologic research, using their knowledge, skills and critical thinking abilities.	**Means of assessment**: Student research described by oral or poster presentation at the conclusion of Senior Seminar (GEOL 4900, capstone course) will be judged by the entire Geology faculty as having exceeded, met, or fallen below expectations for selected performance criteria, using a scoring rubric. **Criteria for Success**: At least 80% of faculty judgements will meet or exceed expectations for research, for each of the performance criteria. **Courses Evaluated**: 2014-2015: GEOL 4900 2015-2016: GEOL 4900 2016-2017: GEOL 4900 2017-2018: GEOL 4900 **Assessment data:** 2014-2015: Percent (%) of faculty judgments that met or exceeded expectations: criterion #1, 95% (n=40 judgements, 10 students) criterion #2, 80% (n=40 judgements, 10 students) criterion #3, 60% (n=40 judgements, 10 students) criterion #4, 70% (n=40 judgements, 10 students) average of all criteria, 76% 2015-2016: Percent (%) of faculty judgements that met or exceeded expectations: criterion #1, 94% (n=16 judgements, 4 students) criterion #2, 75% (n=16 judgements, 4 students) criterion #3, 81% (n=16 judgements, 4 students) criterion #4, 88% (n=16 judgements, 4 students) average of all criteria, 84% 2016-2017: Percent (%) of faculty judgments that met or exceeded expectations: criterion #1, 88% (n=81 judgements, 19 students) criterion #2, 79% (n=81 judgements, 19 students) criterion #3, 68% (n=79 judgements, 19 students) criterion #4, 73% (n=81 judgements, 19 students) average of all criteria, 77% Students of the Geology degree option (B.S. Geology: Geology) exceeded CFS for all criteria, whereas those of the Environmental Geology option (B.S. Geology: Environmental Geology) fell significantly short of CFS for criteria 2, 3 and 4.

Follow up actions planned:
2014-2015:
1. Particularly large classes of GEOL 4900, those greater than 10 students, will be divided into two sections, in order to provide each student with sufficient instruction and guidance.
2. Individual faculty (all Geology faculty) will provide supervision of research projects and will encourage that a project schedule be established and adhered to.
3. Faculty will meet at the conclusion of each semester to identify and discuss at-risk students.

2015-2016: Continue with follow up actions established for the 2014-2015 cycle.

2016-2017: Continue with follow up actions established for the 2014-2015 cycle and further consider differences of performance for students of Geology and Environmental Geology degree options

Outcome 9.

Students are able to communicate geotechnical information by written, oral, and graphical means.

Means of assessment: Students' communication skills, demonstrated by oral or poster presentation at the conclusion of Senior Seminar (GEOL 4900, capstone course) will be judged by the entire Geology faculty as having exceeded, met, or fallen below expectations for selected performance criteria, using a scoring rubric.

Criteria for Success: At least 80% of faculty judgements will meet or exceed expectations for communication, for each of the performance criteria.

Courses Evaluated:
2014-2015: GEOL 4900
2015-2016: GEOL 4900
2016-2017: GEOL 4900
2017-2018: GEOL 4900

Assessment data:
2014-2015: Percent (%) of faculty judgments that met or exceeded expectations:
criterion #1, 90% (n=40 judgements, 10 students)
criterion #2, 83% (n=40 judgements, 10 students)
criterion #3, 100% (n=40 judgements, 10 students)
criterion #4, 98% (n=40 judgements, 10 students)
criterion #5, 93% (n=40 judgements, 10 students)
criterion #6, 100% (n=40 judgements, 10 students)
average of all criteria, 94%

2015-2016: Percent (%) of faculty judgements that met or exceeded expectations:

criterion #1, 94% (n=16 judgements, 4 students)
criterion #2, 88% (n=16 judgements, 4 students)
criterion #3, 100% (n=16 judgements, 4 students)
criterion #4, 100% (n=16 judgements, 4 students)
criterion #5, 93% (n=16 judgements, 4 students)
criterion #6, 100% (n=16 judgements, 4 students)
Average of all criteria, 96%

2016-2017: Percent (%) of faculty judgments that met or exceeded expectations:
criterion #1, 92% (n=79 judgements, 19 students)
criterion #2, 84% (n=81 judgements, 19 students)
criterion #3, 100% (n=71 judgements, 19 students)
criterion #4, 91% (n=79 judgements, 19 students)
criterion #5, 86% (n=81 judgements, 19 students)
criterion #6, 99% (n=80 judgements, 19 students)
average of all criteria, 92%
Students of the Geology degree option (B.S. Geology: Geology) generally performed better than those of the Environmental degree option (B.S. Geology: Environmental Geology).

Follow up actions planned:
2014-2015: met all CFS, no actions planned
2015-2016: met all CFS, no actions planned
2016-2017: met all CFS, no actions planned

Results of the ACAT pretests and outcomes (senior) tests, administered during each of the past 3 cycles, are discussed in section 1.2.2.2. Outcomes 7 through 10 of the 2010-2011 cycle were also assessed during each of the past 3 cycles. These results are discussed in section 1.2.6.

1.2.3.3 Geology Student Performance on the Area Concentration Achievement Test

The Area Concentration Achievement Test (ACAT) in Geology was administered as a means of outcomes assessment from 1998-1999 through 2010-2011 and has been administered nearly every year since then as a major field test (MFT). For each of these assessment cycles, the ACAT was administered both as a pretest and as an outcomes (senior) test. Second-year students took the pretest at the start (first week) of Mineralogy (GEOL 3410). Prospective graduates (seniors) took the outcomes test at the conclusion of the program, commonly as students of Sedimentary Rocks and Stratigraphy (GEOL 3540), Structural Geology (GEOL 4510), or Field Methods in Structural Geology (GEOL 4520). Both the pretest and the outcomes test consist of mineralogy, petrology, stratigraphy, and structural geology content areas. Results are reported as normalized standard scores and percentiles for each content area and as overall scores. Standard scores are based on a mean of 500 and a standard deviation of 100. Reference group sizes have ranged from 124 to 516.
Overall scores for the entire history, 1998-1999 to present, are shown in Figure 1.6.

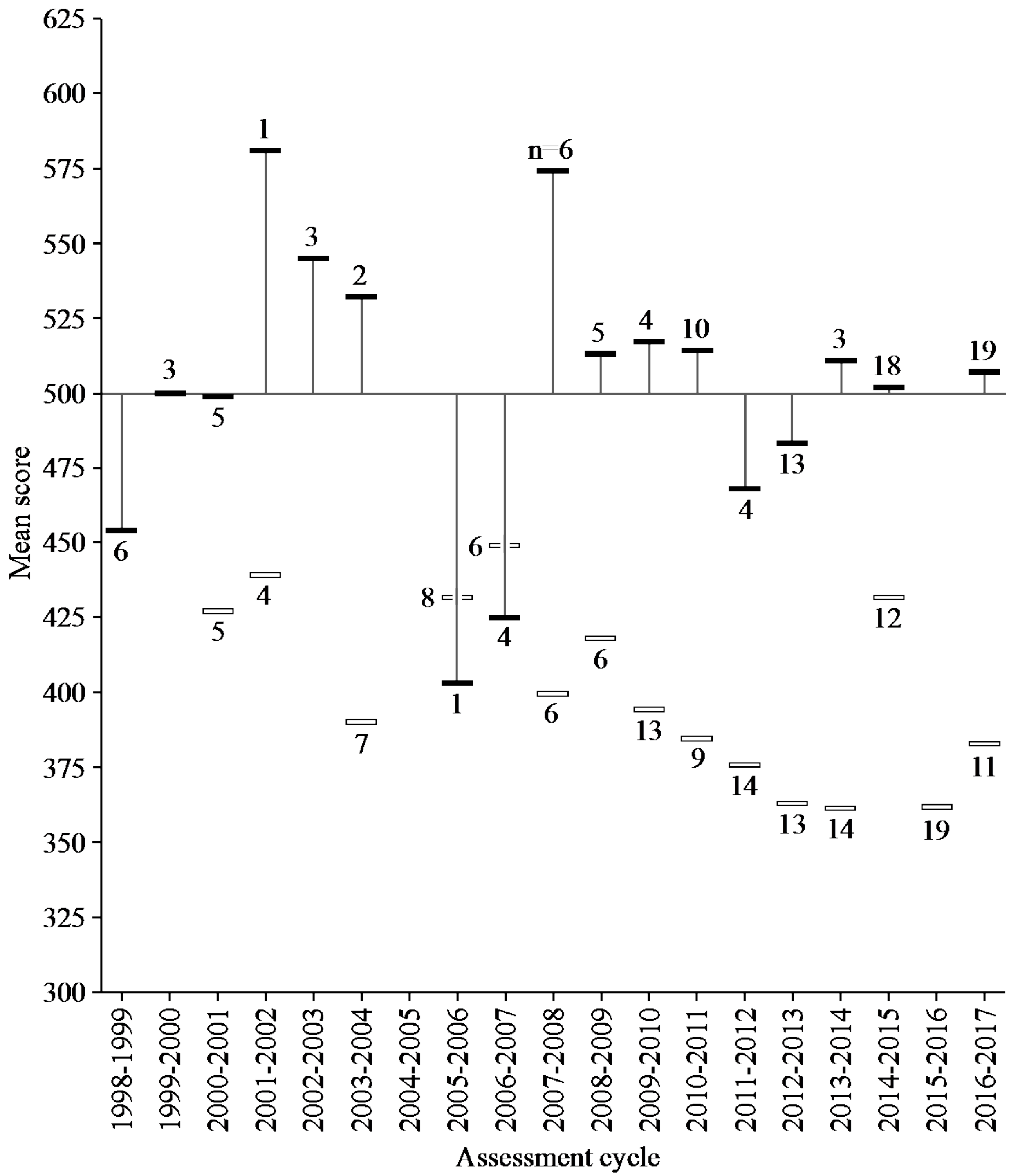


Figure 1.6 Mean overall ACAT scores, 1998-1999 to present.
Mean pretest scores (open boxes) and outcomes (senior) test scores (solid boxes) are shown for each assessment cycle with the number of test takers. Standard scores are based on a mean of 500.

Overall and content-area scores for the 6-year period of this review (2011 to 2017) are shown in Table 1.8. Considering all 92 students that took the pretest during this period, the mean of overall scores is 378, which corresponds to the 11th percentile. Considering all 67 students that took the outcomes test during this period, the mean of overall scores is 501, which corresponds to the high side of the 50th percentile.

Table 1.8 Average ACAT Content-Area and Overall Scores for 2010-2011 through 2016-2017.

Cycle		n	Mineral.	Petrol.	Strat.	Struct.	Overall
2010-11	pretest	9	400 (16th)	438 (27th)	427 (23rd)	403 (17th)	385 (13th)
	outcomes	10	575 (77th)	462 (35th)	482 (43rd)	530 (62nd)	514 (56th)
2011-12	pretest	14	394 (14th)	472 (39th)	385 (13th)	400 (16th)	376 (11th)
	outcomes	4	536 (64th)	453 (32nd)	506 (52nd)	441 (28th)	468 (37th)
2012-13	pretest	13	402 (16th)	450 (31st)	359 (8th)	391 (14th)	363 (9th)
	outcomes	13	552 (70th)	493 (47th)	483 (43rd)	464 (36th)	490 (46th)
2013-14	pretest	14	380 (12th)	444 (29th)	380 (12th)	365 (9th)	361 (8th)
	outcomes	3	576 (78th)	539 (65th)	458 (34th)	462 (35th)	510 (54th)
2014-15	pretest	12	436 (26th)	482 (43rd)	417 (20th)	429 (24th)	432 (25th)
	outcomes	18	520 (58th)	502 (51st)	458 (34th)	493 (47th)	502 (51st)
2015-16	pretest	19	401 (16th)	396 (15th)	423 (22nd)	373 (10th)	362 (8th)
	outcomes		NA	NA	NA	NA	NA
2016-17	pretest	11	401 (16th)	428 (24th)	413 (19th)	419 (21st)	383 (12th)
	outcomes	19	573 (77th)	499 (50th)	502 (51st)	483 (43rd)	507 (53rd)

1.2.3.4 Enhanced Competencies Due to General-Education Classes in Geology

Pretests and post-tests in general-education classes were administered as a means of outcomes assessment for the 2010-2011 cycle and have been administered in some of these classes since then. Results of these tests suggest that students come from these classes with enhanced knowledge of the subject matter (Table 1.9). Mean scores on post-tests are 50% to 250% higher, relative to mean scores on pretests.

Table 1.9 Mean Pretest and Post-test Scores and Relative Improvements for General-Education Classes in Geology

Semester	Class	Section	Mean pre-test score	Mean post-Test score	Relative % improvement
Fall 2010	GEOL 1110	0,1	42	67	60
	GEOL 1110	3,4	41	76	85
	GEOL 1160	0	57	87	53
	GEOL 2250	0	50	82	64
Spring 2011	GEOL 1110	0,1	41	76	85
	GEOL 1110	3	37	73	97
	GEOL 1120	0,1	39	78	100

	GEOL 2250	0,1	43	81	88
Fall 2011	GEOL 1110	0	40	77	93
	GEOL 1110	3	36	64	78
	GEOL 1110	4	48	73	52
	GEOL 1120	0	37	86	132
Spring 2012	GEOL 1110	0	38	65	71
	GEOL 1110	1	38	71	87
Fall 2012	GEOL 1110	1	36	63	75
Spring 2013	GEOL 1110	0	36	71	97
	GEOL 1110	1	37	69	86
	GEOL 1120	0	35	79	126
Fall 2013	GEOL 1110	0	34	69	103
	GEOL 1110	1	33	70	112
	GEOL 1110	2	34	74	118
	GEOL 1120	0	35	79	126
Spring 2014	GEOL 1110	0	42	67	60
	GEOL 1110	1	34	70	106
	GEOL 1120	0	35	79	126
Fall 2014	GEOL 1110	0	37	77	108
	GEOL 1110	1	35	61	74
	GEOL 1120	0	35	79	126
Spring 2015	GEOL 1110	0	38	67	76
	GEOL 1110	1	34	65	91
	GEOL 2250	0	32	49	53
Fall 2015	GEOL 1025	0	34	86	153
	GEOL 1110	0	38	67	76
	GEOL 1110	1	33	65	97
	GEOL 1160	0	37	82	122
Spring 2016	GEOL 1025	0	29	86	197
	GEOL 1110	0	37	63	70
	GEOL 1110	1	35	66	89
	GEOL 1120	0	48	75	56
	GEOL 1160	0	24	85	254
Fall 2016	GEOL 1110	1	31	66	113
	GEOL 1110	2	34	73	115
	GEOL 1120	0	39	76	95
Spring 2017	GEOL 1110	2	33	68	106
	GEOL 1120	0	45	74	64

1.3 Survey Results

1.3.1 Department Surveys

In 2017, the Department of Biology, Geology, and Environmental Science surveyed its sophomore and senior students. The results of sophomore surveys are presented in Tables 1.10

and 1.11. The results of the senior surveys are presented in Table 1.12. Nearly 80% of surveyed sophomores were planning to remain at UTC (Table 1.9). Approximately 80% of surveyed sophomores were satisfied with the clarity of objectives for completing their majors, the availability of faculty to help outside of class, the availability of needed courses to complete their general education requirements, and the availability of an advisor. Over half of the surveyed sophomores were satisfied with availability of needed courses to complete their course of study, opportunities for financial aid, and with advice and assistance received from advisors. Approximately 85% of surveyed seniors were satisfied with the clarity of objectives for completing their majors and the availability of faculty to help outside of class. Nearly 75% of surveyed seniors were satisfied with advice and assistance received from advisors, availability of needed courses to complete their general education requirements, and the availability of an advisor. Less than half of surveyed seniors were satisfied with the availability of needed courses to complete their course of study and opportunities for financial aid.

Table 1.10 Sophomores Question 14

	yes	no	I am not sure	N
Are you considering transferring to another institution?	5	34	4	43

Table 1.11 Sophomores Questions 7-13

	extremely satisfied	somewhat satisfied	neither satisfied nor dissatisfied	somewhat dissatisfied	extremely dissatisfied	N
Q7: Clarity of objectives for completing your major.	13	23	3	4	0	43
Q8: Availability of faculty to help outside class.	17	17	4	5	0	43
Q9: Availability of needed courses to complete your course of study.	8	17	1	13	4	43
Q10: Opportunities for financial aid.	7	16	7	11	2	43
Q11: Satisfied with advice and assistance from advisor.	11	18	5	5	4	43
Q12: Availability of needed courses to complete your general education requirements.	14	21	4	2	2	43

Q13: Availability of an advisor.	19	15	6	2	1	43

Table 1.12 Seniors Questions 7-13

	extremely satisfied	somewhat satisfied	neither satisfied nor dissatisfied	somewhat dissatisfied	extremely dissatisfied	N
Q7: Clarity of objectives for completing your major.	21	30	2	6	1	60
Q8: Availability of faculty to help outside class.	30	21	4	4	1	60
Q9: Availability of needed courses to complete your course of study.	11	11	6	19	14	61
Q10: Opportunities for financial aid.	9	15	21	12	3	60
Q11: Satisfied with advice and assistance from advisor.	30	15	2	8	5	60
Q12: Quality of courses in preparing you for employment or further academic study.	17	27	7	7	2	60
Q13: Quality of the program in your major.	16	29	6	7	2	60

1.3.2 Institutional Surveys

UTC's Office of Planning, Evaluation, and Institutional Research administers the National Survey of Student Engagement (NSSE) to students concerning overall satisfaction with their educational experience. Overall Biology, Geology, and Environmental Science students were satisfied with their educational experience at UTC. Fall 2016 are presented in Tables 1.13 and 1.14. Prior year' (2013-2015) data are presented as Appendix N.

Table 1.13 Question: How would you evaluate your entire educational experience at this institution?

Response Options	UTC	College of Arts & Sciences	Biology, Geology, & Environmental Science
Poor	2.9	3.5	4.2
Fair	14.0	14.7	16.9
Good-Excellent	83.1	81.8	78.9

Numbers are given as a percentage.

Table 1.14 Question: If you could start over again, would you go to the same institution you are now attending?

Response Options	UTC	College of Arts & Sciences	Biology, Geology, & Environmental Science
No	17.0	20.7	26.7
Yes	83.0	79.3	73.2

Numbers are given as a percentage.

1.4 Placement of Students in Graduate and Professional Programs

Every year, the departmental faculty, compiles a list of all the undergraduate majors that gain admission to graduate or professional programs. This information is voluntary/self-reported by the students and is gathered via LinkedIn and internet searches. The original lists include the names of the students and the programs to which they have been admitted. Tables 1.15-1.17 summarize these data for the past six years for each program. Each table shows the overall number of undergraduate majors who graduated each year, the number who were admitted to graduate programs, the number admitted to professional programs or discipline-related employment, and the percentage of the total graduates who entered graduate or discipline-related employment.

Table 1.15 Graduates in Biology Continuing onto Graduate or Professional Schools

Year	# Graduating / majors	# entering graduate programs	# entering professional schools/industry	% entering graduate or professional schools
2011-2012	69	5	29	49.3%
2012-2013	83	4	21	30.1%
2013-2014	95	6	18	25.3%
2014-2015	130	4	13	13.1%
2015-2016	136	5	22	19.9%
2016-2017	142	4	9	9.2%

Table 1.16 Graduates in Geology Continuing onto Graduate school and Geology-related employment

Year	# Graduating / majors	# entering graduate programs	# entering geology-related employment	% entering graduate or geology-related employment
2011-2012	5	0	3	60%
2012-2013	7	3	0	42.9%
2013-2014	12	0	7	58.3%
2014-2015	23	2	9	47.8%
2015-2016	4	0	3	75%
2016-2017	15	0	2	13.3%

Table 1.17 Graduates in Environmental Science Continuing onto Graduate school or ESC-related employment

Year	# Graduating / majors	# entering graduate programs	# entering ESC-related employment	% entering graduate or ESC-related employment
2011-2012	17	0	5	29.4%
2012-2013	18	2	13	83.3%
2013-2014	26	1	11	46.2%
2014-2015	30	1	10	36.7%
2015-2016	30	2	9	36.7%
2016-2017	31	3	2	16.1%

1.5 Biology, Geology, and Environmental Science Program Alignment with Institution's Mission

As indicated in the table below, BGE programs align well with the university's mission and values. The department's curriculum, student learning outcomes, and expectations align well with both the University and College of Arts and Sciences strategic plan and BGE embraces the opportunity to improve our department based on the goals of these strategic plans. A document highlighting how our current program learning outcomes are aligned with the CAS strategic plan is provided as Appendix O. Given the recent merging of Biology and Environmental Science with Geology in a new department, BGE is in the process of creating a new strategic plan of its own this academic year.

1.5.1 UTC Strategic Plan

"We Engage Students, Inspire Change and Enrich Community."
As a department comprised of sciences, this vision is directly related to all of our functions. Science is an experiential learning process that engages students. We provide opportunities to

learn hands-on skills in our laboratories, directed research projects, internships, and collaborative studies. Science is a discipline that initiates, contributes to and inspires changes. These changes can be small and incremental, or they can be seismic and student involvement in our programs help define them. Science enriches our community and as detailed in other sections of this review, our program has collaborations, interactions, and contributions to the local, regional, and ultimately the global community.

<table>
<tr><th colspan="3">Alignment of Mission and Values</th></tr>
<tr><td></td><td>UTC</td><td>Department of Biology, Geology and Environmental Science</td></tr>
<tr><td>Mission</td><td>The University of Tennessee at Chattanooga is a driving force for achieving excellence by actively engaging students, faculty and staff; embracing diversity and inclusion; inspiring positive change; and enriching and sustaining our community. At UTC… we develop a community on campus…enable students to go into the global community and achieve… provide a nurturing environment that connects students, community and opportunity.</td><td>1) Educate and train future scientists, health care professionals, and technical staff to positively contribute to the workforce in Chattanooga, Tennessee, and beyond.
2) Actively engage students in collaborative research endeavors.
3) Embrace community involvement through partnerships, internships, and collaborative research.
4) Provide scientific expertise to the community, region, and beyond.</td></tr>
<tr><td>Values</td><td>• Students are the primary reason we exist as an institution.
• We live integrity, civility and honesty.
• We relentlessly pursue excellence.
• We embrace diversity and inclusion.
• Creativity, inquiry and scholarship are our culture.</td><td>1) Our department constantly reviews our teaching, curriculum, and activities to better accommodate our student scholars.
2) Diversity and inclusion are paramount to the department and scientific inquiry overall.
3) We engage students continually through the sciences to encourage inquiry and solve problems using creativity and scholarship.</td></tr>
</table>

The university's strategic plan is attached as Appendix P.

1.5.2 College of Arts and Sciences Strategic Plan

The vision of the College of Arts and Sciences through its strategic plan also directly related to our program goals.

“The enduring vision of UTC's College of Arts and Sciences is…to transform lives through a modern liberal arts and sciences education.”

Our program directly relates to the education of sciences majors. The following table highlights how our programs directly impacts our students, the university, and community.

Alignment of Mission and Values		
	College of Arts and Sciences	**Department of Biology, Geology and Environmental Science**
Mission	The University of Tennessee at Chattanooga College of Arts and Sciences mission includes: • provide an environment for intellectual curiosity and a foundation for life-long learning, thinking, reflection, and growth • equip students with transferrable skills—critical thinking, communication, and complex problem-solving skills—that are needed to adapt and succeed in a rapidly evolving world • advance cultural and intellectual diversity (*e.g.*, studying competing theories as well as intellectual advancements within and beyond Western traditions) • advance new knowledge through research (theoretical and applied) and creative activities • advance integrated service as a part of personal and social responsibility	1) Educate and train future scientists, health care professionals, and technical staff to positively contribute to the workforce in Chattanooga, Tennessee, and beyond. 2) Actively engage students in collaborative research endeavors. 3) Embrace community involvement through partnerships, internships, and collaborative research. 4) Provide scientific expertise to the community, region, and beyond.
Values	Faculty, staff, and students in the College of Arts and Sciences value a **positive work and learning environment** as we likewise embrace **cultural and intellectual diversity** and practice **innovative teaching and mentorship**. We value a **foundational education** that leads to a life that is enriched by **continuous learning**. We value **scholarly research and creative expression**. We value being engaged with the **Chattanooga community**, as well as our **regional and global partners** and our ever-expanding **intellectual communities**. As such, our values are summed up in four words: **collaboration**, **inclusion**, **creativity**, and **innovation**.	1) Our department constantly reviews our teaching, curriculum, and activities to better accommodate our student scholars. 2) Diversity and inclusion are paramount to the department and scientific inquiry overall. 3) We engage students continually through the sciences to encourage inquiry and solve problems using creativity and scholarship.

The College of Arts and Sciences Strategic Plan is attached as Appendix Q.

1.6 Use of Learning Outcomes for Program Improvement

1.6.1 Biology and Environmental Science

Given that we have been using the latest learning outcomes for only the last three or four years (depending on the program), this section will refer to the learning outcomes valid since 2013 for Geology and 2014 for Biology and Environmental Science.

In the Biology and Environmental Science Programs, we had good results with the implementation of the new version of the learning outcomes, and the vast majority of classes exceeded the criteria for success for the learning outcomes assessed. However, we encountered a few cases where we used the learning outcomes to improve our program. For example, last year in the Environmental Science Program, we assessed learning outcome 4 in ESC 1510 both during the fall and spring semester. During the fall semester, the criteria for success were not met and that prompted the instructor to change part of the curriculum. Subsequently, when the class was re-assessed during the spring semester, the criteria for success were met. Similarly, in the Biology Program we identified particular classes in the Principles of Biology I and III sequence that were not meeting the criteria for success for learning outcomes one and/or 2, and these instructors have taken follow-up measures to correct these problems.

1.6.2 Geology

Outcomes assessments in the Geology Program are commonly based on relatively few students, making results particularly sensitive to outlying individuals and difficult to interpret. Consequently, the program tends to be rather conservative in its responses. Consistent with this philosophy, only minor changes of textbook, pedagogy, and course content in implicated courses were made in response to outcomes assessments of the 2010-2011, 2011-2012, and 2012-2013 cycles. These changes are described in Appendices 3, 7, and 8. More significant improvements to the Geology curriculum, made in response to assessments of the past 3 cycles, are described below.

Outcomes eight and nine of the current student-learning outcomes for the Geology Program, which address students' research and communication abilities, have a long history of assessment. In fact, students' poster presentations made at the conclusion of the program's capstone seminar (research) course (GEOL 4900) have been used to assess these outcomes since the 2011-2012 cycle. Only recently, for each of the past three cycles, have students fallen short of expectations as researchers for one or more of the performance criteria. In response to this potentially significant trend, the following policies were established:

1. Particularly large classes of GEOL 4900, those greater than 10 students, will be divided into two sections, in order to provide each student with sufficient instruction and guidance.
2. Individual faculty (all Geology faculty) will provide supervision of research projects and will encourage that a project schedule be established and adhered to.
3. Faculty will meet at the conclusion of each semester to identify and discuss at-risk students.

As per the first of these policies, particularly large classes for GEOL 4800 and GEOL 4900 during the 2016-2017 academic year were split into two sections of eight to 10 students each, for both classes.

Although these policies have been employed since 2014-2015, no obvious improvements were realized in the two subsequent assessments of outcome number 8. Nonetheless, these policies are seen as good practice and will be continued for the foreseeable future. Other potential improvements to the Geology curriculum, in response to these results, are being considered.

A cohort of 19 graduating seniors completed GEOL 4900 during Spring 2017. This record enrollment included ten students in the Environmental Geology option (B.S. Geology: Environmental Geology) and nine in the Geology option (B.S. Geology: Geology), providing opportunity to identify potentially significant differences among these groups. Students of the Geology option exceeded expectations for all criteria, whereas those of the Environmental Geology option fell significantly short of expectations for criteria 2, 3 and 4, suggesting that students of the Environmental Geology option may be less capable researchers and that this contributed to shortcomings in the most recent assessment of outcome 8. The significance of these differences, their relationships to other assessments and option-specific aspects of curriculum, and appropriate improvements to curriculum are being considered.

1.7 Assessment of Learning Objectives, Strengths, Weaknesses, and Recommendations for Change

1.7.1 Biology and Environmental Science

In Biology, we have assessed four out of seven learning outcomes (four out of eight in Environmental Science) and we will assess two additional outcomes (5 and 6) this academic year for both programs. Our goal this current academic year is to introduce the assessment of never before assessed outcomes, while revisiting some of the outcomes we have assessed before. We envision that by the next academic year we will have assessed all learning outcomes. The current implementation of the learning outcomes process has highlighted that in the vast majority of cases, we are doing a very good job meeting the criteria for success. In the few cases where classes have failed to meet the criteria for success, we have taken corrective actions to resolve the issues. While we currently assess only 2-3 learning outcomes per year, our goal is to eventually increase the number of learning outcomes assessed every year and the number of classes assessed for every outcome. One final item to be addressed – we noted in conducting this self-survey some inconsistencies in the curriculum map for Biology. Course in similar categories (e.g., our organismal survey courses such as Invertebrate Zoology, Ornithology and Plant Taxonomy) have dramatically different outcomes listed. We will be forming a committee in the near future to examine and correct such inconsistencies.

We remain unconvinced whether the Major Field Exams provide data that are useful for the assessment of the Biology Program. We used to give the exam regularly and included it as part of the program assessment prior to 2014, but since the implementation of the new learning outcomes, its value is unclear and we were asked by the state to give it again in 2016. While the data show a marked decline in the performance of our students, it is hard to know if this decline represents a knowledge deficiency. One issue is that our graduating seniors take the exam and know that it is of no consequence to their graduation or acceptance into graduate/professional programs. Some students make a serious effort while taking the Major Field Exam, but others simply provide random answers on the multiple-choice questions. In other words, we feel that we cannot make any serious inference for the status of our Biology Program (in comparison with other schools or previous years) by examining the results of the Major Field Exam. While we see little value in the test as currently administered, the state of Tennessee mandated that we offer the test during the last academic year (2016-2017). In the past (prior to 2014) results from the test were used to assess our learning outcomes but the test has not been used for assessment since 2014. If we were asked to continue using this test as an assessment tool, perhaps we could offer some incentives to our students for taking the exam, such as rewards for the students scoring in the top 10% of their departmental testing group.

Prior to 2014, the departmental and institutional surveys were to be used in the assessment of our learning outcomes. Even though we no longer use the surveys for assessment of learning outcomes, they provide good feedback on how satisfied our students are with their educational experience at UTC, and more specifically, with our department. Overall, we are pleased with the results of the institutional/departmental surveys, and we find the responses from our students very encouraging. One area of concern highlighted in both the sophomore and senior department survey is the availability of needed classes to complete their course of study. Our department recently (2013) went through some serious curriculum changes to alleviate bottlenecks in specific classes, mainly in the Biology Program. While the situation has considerably improved over the last four years, we still need to strive to offer more classes needed by our students for the timely completion of their degrees. More details on the curriculum changes and availability of classes is given in part II of this self-study.

One of the key objectives of all three of our undergraduate programs is that students are given the preparation they need to be successful in gaining entry into occupations related to the major field of study. For most of our students, this involves preparing them for postgraduate study in a variety of graduate and professional programs (predominantly in the area of the health professions) or discipline-related employment. It is difficult for students in this major to find quality, high paying jobs in the life sciences, health professions, and Environmental Sciences or Geology without some form of postgraduate training. Our faculty members are very much involved in assisting students with gaining admission to graduate and professional programs and discipline-related employment through the advising process, writing letters of recommendation, mentoring student research, and, in the case of some of the health professions, preparing recommendation packets to accompany student applications. However, we must rely on self-reporting by the students to learn whether or not they were successful in the application process. Students do not always remember to inform faculty when they are admitted, and are likely reluctant to admit when they have been turned down. Moreover, students are often going through the application process as they are preparing to graduate and leave the university, and too often they disappear before we learn what has become of their application. If determining the actual number of admissions is difficult, determining the actual admission rate is even more so. It is complicated by factors beyond those involved with tabulating admissions. For example, many students apply in multiple years (so that they may gain admission upon a second or third application) and most apply to multiple programs. It is unclear whether an admission rate should account for all applications or should be calculated on an all-or-none basis (one or more admissions vs. none at all).

The placement of our students in graduate/professional programs and discipline-related employment is an area in which we need to strive to obtain better data. The data in Tables 1.15-1.17 show a decline over the years in the percentage of graduates being admitted to graduate/professional schools or gaining meaningful discipline-related employment. However, rather than representing an actual trend in percentage of admission to these programs, it is perhaps more likely that we are having a more difficult time keeping track of our graduates. This is especially true for the Biology Program that has greatly expanded over the last few years (see data on section 6.2 of this report), with more than 1000 majors. In general, it is easier to keep track of the graduates of a particular program, if the program is the smaller in overall size. Thus, the numbers presented above are likely an underestimate of the actual number of admittees from among our students. Nevertheless, the data we do collect and analyze indicate substantial success (especially in Environmental Science) in preparing students for admission to graduate/professional programs and discipline-related employment. However, it is clear that we need to establish better means of tracking our graduates, perhaps by administering an electronic exit interview to all graduating seniors every semester.

1.7.2 Geology

Strengths

Despite university-wide changes made to outcomes and their assessments during the past six years, some have endured in the Geology Program. This provides a long history of comparable assessment data and is, in itself, a fundamental strength. The faculty feel that the most significant of these enduring outcomes are those that address students' research and communication abilities. These (current outcomes 8 and 9) have been assessed in the program's capstone seminar (research) course (GEOL 4900) consistently since the 2011-2012 cycle. Research, in particular, requires a comprehensive set of skills that graduates of the Geology Program should possess. Assessments of this outcome indicate that most of the program's graduates are capable researchers, although the high expectation (target) for this assessment is not always met.

A strength that is unique to the most recent assessment cycle relates to the record enrollment in GEOL 4900, which included 10 students in the Environmental Geology option (B.S. Geology: Environmental Geology) and nine in the Geology option (B.S. Geology: Geology). This provided opportunity to identify potentially significant differences among these groups, which will propel further study of these differences and consideration of appropriate responses.

Weaknesses

Assessment results for a small program, such as Geology, are particularly sensitive to outlying individuals and are difficult to interpret. This is a fundamental and unavoidable weakness of outcomes assessment based on relatively few students. Understanding this, faculty of the program are conservative in their responses to assessment results.

The record enrollment in GEOL 4900, described above as a strength of the most recent assessment cycle, was instrumental in identifying a potential weakness of the program. Early indications, those of a single cycle, are that some students of the Environmental Geology option may be less capable researchers than those of the Geology option, as measured by assessment of outcome 8.

The collective opinion of the Geology faculty, formed from their collective experiences, is that many of the Geology students are not sufficiently prepared in the area of mathematics to address the computational challenges they face in the Geology curriculum. This is a perceived weakness, despite apparent achievement of outcome 2, by its recent assessment.

Faculty of the Geology Program recognize a potential weakness in its use of the ACAT as a major field test (MFT). Considering that results of this test have no impact on students' records of academic achievement or their future success in their professions, they have little incentive to perform well, other than their loyalty to the program. Results of the most recent ACAT outcomes (senior) test, for example, include those of one individual whose overall score corresponds to the 8th percentile and that of a student that took the test in Spring 2015 corresponds to the 1st percentile. Carelessness of test takers could explain such low scores among others that are much higher.

Recommendations for Improvement

Use of GEOL 4900 for assessment of students' research and communication abilities have, in part, driven its evolution to become a research experience, rather than a traditional seminar. That research experience begins in GEOL 4800, which has evolved similarly. Considering that this is well established and will be continued for the foreseeable future, the faculty intend to change the names of these courses to better reflect their emphases on research and to be better aligned with the university's strategic plan.

Although no other firm conclusions have been drawn regarding recommendations for improvement, there are several that are under consideration. For example, the faculty are considering use of the ASBOG (Association of State Boards of Geology) Fundamentals of Geology (FG) Exam, in place of the ACAT, as a major field test (MFT). Because passing the ASBOG FG exam is required for licensure and professional certifications for geologists in many states, students would be compelled to perform well on it. To address the perceived weakness of many Geology students in the area of mathematics, the faculty are also considering changes to the mathematics requirement for the degree, particularly for the Environmental Geology option. The faculty are also considering ways to ensure that students complete their mathematics and statistics requirements early in the degree program, to take better advantage of these preparations in the Geology curriculum.

PART 2. UNDERGRADUATE CURRICULUM

The Department of Biology, Geology and Environmental Science offers three majors: a B.S. in Biology, a B.S in Geology and a B.S. in Environmental Science. All three majors have a number of programs that allow focus in a particular sub-discipline. In addition, the Department also offers different minors in Biology, Geology, Environmental Science, and Geographic Information Science.

2.1 Curriculum Review and Improvement

2.1.1 Review of Degree Programs Across BGE Majors

2.1.1.1 Biology

The Department of Biology, Geology, and Environmental Science offers three degree programs under the Biology major: General, Pre-professional, and STEM Education as well as a Biology minor. A copy of the 2017/2018 UTC catalog describing the courses of study in the Biology major and minor programs and a list of undergraduate courses is available online:

Biology: General Biology, B.S.
Biology: Preprofessional, B.S.
Biology: STEM Education, B.S.
Biology Minor

2.1.1.2 Environmental Science

The Department of Biology, Geology, and Environmental Science offers six degree programs under the Environmental Science major as well as an Environmental Science minor and Geographic Information Science minor. A copy of the 2017/2018 UTC catalog describing the courses of study in the Environmental Science major and minor programs and a list of undergraduate courses is available online:

Environmental Science: Biodiversity, Conservation and Natural Resources, B.S.
Environmental Science: Earth, Atmosphere, and Geological Resources, B.S.
Environmental Science: Engineering Science, B.S.
Environmental Science: Environmental Health, B.S.
Environmental Science: Environmental Policy and Planning, B.S.
Environmental Science: Geographic and Cartographic Sciences, B.S.
Environmental Science Minor
Geographic Information Science Minor

2.1.1.3 Geology

The Department of Biology, Geology, and Environmental Science offers three degree options under the Geology major: Geology: Geology, Geology: Environmental Geology and Geology: STEM Education, as well as a Geology minor. A copy of the 2017/2018 UTC catalog describing the courses of study in the Geology major and minor programs and a list of undergraduate courses is available online:

Geology: Geology, B.S.
Geology: Environmental Geology, B.S.
Geology: STEM Education, B.S.
Geology Minor

2.1.2 University Requirements

All university majors are required to complete General Education courses: Rhetoric and Writing (6 hours), Fine Arts and Humanities (12 hours), Natural Sciences (7-8 hours), Behavioral and Social Sciences (6 hours), Mathematics (3 hours), Statistics (3 hours), and Nonwestern Culture (3 hours).

2.1.3 Departmental Requirements Across BGE Degree Programs

2.1.3.1 Biology

2.1.3.1.1 Major Degree Requirements

General Biology majors are required to take 40 hours of Biology courses, including three Introductory courses, three Core courses, two Survey courses, one Cell and Physiology course, and one Advanced Ecology and Evolution course. Beyond this, students may self-select which other courses from these categories they wish to take to fulfill the 40-hour requirement. Additional requirements are that Biology majors complete a minimum of four Biology courses above the 4000-level, earn a minimum grade of a “C” in the Core courses, and no more than two hours of Seminar or four hours of Independent Study might be counted toward the 40-hour requirement for the major. Program requirements from departments outside of ours include students take Scientific Writing or Departmental Thesis, one year of a foreign language math through Calculus, Chemistry through Organic Chemistry II and either two semesters of Physics or Geology.

Pre-professional majors are required to trade one Survey Course for taking a second Cell and Physiology course. They must take Chemistry through Organic Chemistry and they must take the Physics sequence (i.e., they cannot substitute the Geology sequence for Physics).

STEM majors must take the Genetics and Ecology laboratories (the previous two Programs treat the labs for these courses as electives). Within the Survey category, they must still take two courses, but they must take a Botany and a Zoology course. They must also take the STEM sequence: Inquiry-based Mathematics and Science Teaching, Knowing and Learning, Classroom Interactions, Perspectives on Science and Mathematics, Research Methods in Science, Project-based Instruction, Apprentice Teaching, and Technology and Learning.

2.1.3.1.2 Biology Minor Degree Requirements

For a Biology minor a student must take 20 hours of Biology classes including the three-course Introductory Biology sequence and at least nine hours at the 3000 level or above. Further, they must maintain a 2.0 GPA in the minor.

2.1.3.2 Environmental Science

2.1.3.2.1 Major Degree Requirements

All ESC majors are required to complete the core curriculum, consisting of required courses, a senior experience, and courses in each specific program of study (Biodiversity, Conservation and Natural Resources; Earth, Atmosphere, and Geological Resources; Engineering; Environmental Health; Environmental Policy and Planning; Geographic and Cartographic Sciences).

Programs facilitate exploration of particular sub-disciplines within Environmental Science. They reflect the interdisciplinary nature of Environmental Science and allow majors to choose an area of study of particular interest. The program Requirements consist of: ENGL 2820 (Scientific Writing) or ESC 4995r (Departmental Thesis), MATH 1130 and 1830 (College Algebra and Calculus for Management, Life, and Social Sciences) or Math 1710, 1720, and 1950 (Precalculus I and II and Calculus with Analytical Geometry I), and Math 2100 Introductory Statistics.

In addition, students are required to take 34 to 35 hours of Core Courses including ESC 1500/1510 (Introduction to Environmental Science), BIOL 1110 (Principles of Biology I), BIOL 1120 (Principles of Biology II), GEOG 2210 (Maps and Mapping), BIOL 3060 (Ecology), BIOL 3070 (Ecology Laboratory), ESC 4100 (Environmental Law), and ESC 4840 (Values and the Environment). Furthermore, students may select one of the three following courses: ESC 3400 (Environmental Survey Method), ESC 3600 (Air and Water Pollution Control), or ESC 4520 (Limnology and Reservoir Ecology).

Besides the common core of courses there are a myriad of courses offered in the Department to fulfill specific needs for each of the six existing Environmental Science Programs:

Environmental Science: Biodiversity, Conservation and Natural Resources, B.S.
Environmental Science: Earth, Atmosphere, and Geological Resources, B.S.
Environmental Science: Engineering Science, B.S.
Environmental Science: Environmental Health, B.S.
Environmental Science: Environmental Policy and Planning, B.S.
Environmental Science: Geographic and Cartographic Sciences, B.S.

Finally, all ESC majors have a required Senior Experience (2 credit minimum) that can be met by taking any combination of the following courses that meet the two credit minimum: ESC 4800 (Seminar on the Environment), 4900 (Environmental Science Senior Project), 4910r (Environmental Science Internship), ESC 4920* (Advanced Applications of Remote Sensing and Geographic Information Systems), 4995r (Departmental Thesis), 4960r (Environmental Field Camp), 4997r (Research), or 4998r (Individual Studies)

* ESC 4920 is required for students in the Geographic/Cartographic Sciences program

2.1.3.2.2 Environmental Science Minor Degree Requirements

The Department offers two minors within Environmental Science Program: the Environmental Science Minor and Geographic Information Science Minor.

For the Environmental Sciences minor a student is required to take 20 hours of Environmental Science classes including ESC1500 and ESC 1510. The remaining 12 hours must be filled with hours of Environmental Science courses at the 3000-level or above. Furthermore, students must maintain a minimum of 2.0 GPA

For the Geographic Information Science Minor students must take 18 hours including:

CPSC 1100 - Fundamentals of Computer Science
GEOG 2210 - Maps and Mapping
MATH 1830 - Calculus for Management, Life, and Social Sciences
ESC 4650 - Remote Sensing and Imagery Analysis or GEOG 4650 - Remote Sensing and Imagery Analysis
ESC 4660 - Geographic Information Systems or GEOG 4660 - Geographic Information Systems
ESC 4920 - Advanced Applications of Remote Sensing and Geographic Information Systems

Similarly, students are required to maintain a minimum 2.0 average in courses attempted for the minor.

2.1.3.3 Geology

2.1.3.3.1 Major Degree Requirements

Geology: Geology majors must complete a minimum of 39 hours of 3000- and 4000-level courses. Within Geology, they are required to take 35 hours of Geology courses, including Physical Geology 1110 & lab, Historical Geology 1120 & lab, Mineralogy 3410 & lab, Petrology 3420 & lab, Paleontology 3530 & lab, Sedimentary Rocks and Stratigraphy 3540 & lab, Structural Geology 4510 & lab, Field Methods 4520 & lab, and two seminars – Geology Seminar 4800 and Senior Seminar 4900. Additional requirements are that Geology: Geology majors take Scientific Writing ENGL 2820 prior to seminar courses, Calculus with Analytic Geometry MATH 1950 & lab, and any two of introductory science sequences in Biology, Chemistry or Physics. Geology majors must earn a minimum grade of a “C” in Historical Geology, Mineralogy and Petrology courses and complete seven hours of Geology electives, including at least one course at the 4000 level. No more than four hours of Independent Study/Research may be counted toward the 40-hour requirement for the major. Majors are required to possess a 2.0 GPA in all required major and related courses, including General Education classes.

Geology: Environmental Geology majors are required to take 39 hours of 3000- and 4000-level courses. In Geology, they must take Physical Geology 1110 & lab, Historical Geology 1120 &

lab, Environmental Geology 1230 & lab, Mineralogy 3410 & lab, Petrology 3420 & lab, Hydrology 4450, Sedimentary Rocks and Stratigraphy 3540 & lab, Structural Geology 4510 & lab, and two seminars – Geology Seminar and Senior Seminar. They must complete eight hours of Geology electives, including at least one course at the 4000 level. Additional requirements are that majors take Scientific Writing ENGL 2820, Calculus for Management, Life and Social Sciences MATH 1830 or higher, and any two of introductory science sequences in Biology, Chemistry or Physics. Majors must earn a minimum grade of a "C" in Historical Geology, Mineralogy and Petrology courses, and no more than four hours of Independent Study/Research may be counted for the major. Majors are required to possess a 2.0 GPA in all required major and related courses, including General Education classes.

Geology: STEM Education majors must have a minimum of 39 hours of 3000 and 4000-level courses. Within Geology they are required to take Physical Geology 1110 & lab, Historical Geology 1120 & lab, Oceanography 2250, Geology of Tennessee 3070, Mineralogy 3410 & lab, Petrology 3420 & lab, Sedimentary Rocks and Stratigraphy 3540 & lab, Structural Geology 4510 & lab, and two seminars – Geology Seminar and Senior Seminar. Majors must earn a minimum grade of a "C" in Historical Geology, Mineralogy and Petrology courses, and no more than four hours of Independent Study/Research may be counted for the major. Also required are two of three science sequences - Chemistry I and II sequence, choosing between Biology I and II or Physics I and II, taught at either algebra or calculus level. Additional requirements include Astronomy I, Math 1950 Calculus with Analytic Geometry I, and Statistics Math 2100. Education requirements also include STEM courses 1030, 2010, 2020, 3010, 3020, 4010, 4020 and 4170. STEM requirements include a 2.75 cumulative and UTC GPA and 2.75 average in STEM courses with no grade lower than C.

2.1.3.3.2 Geology Minor Degree Requirements

For a Geology minor, a student must take 11 hours of Geology classes including Physical Geology 1110 & lab, Historical Geology 1120 & lab, The Dynamic Earth 4070, and at least eight hours of 3000+ level courses.

Geology Elective Courses
The Geology Program offers a number of elective courses that may be completed by Geology majors and minors to fulfill their elective hour requirements. These include Oceanography (GEOL 2250 and 2250L), Geology of Tennessee (GEOL 3070), Soil Properties, Genesis, and Development Across the Landscape (GEOL 3220), The Dynamic Earth (GEOL 4070), Geomorphology and Earth Surface Processes (GEOL 4080), Fossil Fuels (GEOL 4360), X-Ray Diffraction (GEOL 4420), Economic Geology (GEOL 4500) and Geology Field Experience (GEOL 4960r).

2.1.4 General Education Courses Across BGE Programs

All UTC students are required to take 7-8 hours of courses in the Natural Sciences. The purpose of this category is to allow students to participate in the systematic ways in which human beings analyze the physical universe, to appreciate the achievements of the human mind in comprehending the universe, and to understand the significant role of the natural sciences in human development. In addition, the courses must cultivate an understanding of scientific methods of thought, focus on discoveries fundamental to the current scientific representations of reality, develop an historical perspective that includes the contributions of scientists to the understanding of scientific principles, explore the strengths and limitations of science, develop an understanding of the roles of imagination and logical reasoning to the development of scientific thought, and explore the relationship between science and social issues, ethical principles, technology, and the environment. Upon successful completion of these courses, students will be able to explain intellectual foundations, conceptual approaches, and methodologies of the natural sciences; understand and explain scientific terminology; discuss historical, social and political issues related to scientific data and advances; construct graphic and analytical models from a description of a specific natural phenomenon; formulate a hypothesis based on empirical data; apply the scientific method to solve problems; design experiments to test hypotheses; and express conclusions and implications from scientific experiments using a variety of methods. All General Education courses in the department fulfill these criteria by focusing on historical perspectives through highlighting major discoveries in the discipline, training students to think critically, relating the courses to environmental issues and teaching the process of science by requiring students to perform experiments/exercises.

2.1.4.1 Biology

The departmental Biology Program offers the following General Education courses in the Natural Sciences: Principles of Biology I lecture and lab (BIOL 1110 and 1110L), Principles of Biology II lecture and lab (BIOL 1120 and 1120L), Microbiology and Health lecture and lab (BIOL 2100 and 2100L), and Conservation of Biodiversity lecture (BIOL 1100).

General education courses are reviewed on a 5-year cycle for recertification. These procedures and the recertification schedule can be found here: https://www.utc.edu/general-education/faculty-information/course-certification.php. The dates for the most recent recertification of Biology courses for the Natural Science and Natural Science lab categories are:

BIOL 1100 Conservation and Biodiversity-recertified 2015/16
BIOL 1110 & 1110L Principles of Biology I & Lab-recertified 2016/17
BIOL 1120 & 1120L Principles of Biology II & Lab -recertified 2013/14
BIOL 2100 & 2100L Micro and Health & Lab -recertified 2015/16

2.1.4.2 Environmental Science

The departmental Environmental Science Program offers the following General Education courses in the Natural Sciences: Introduction to Environmental Science I lecture and lab (ESC 1500 and 1500L), Introduction to Environmental Science II lecture and lab (ESC 1510 and 1510L), and Conservation of Biodiversity lecture (ESC 1100).

General education courses are reviewed on a 5-year cycle for recertification. These procedures and the recertification schedule can be found here: https://www.utc.edu/general-education/faculty-information/course-certification.php. The dates for the most recent recertification of Geology courses for the Natural Science and Natural Science lab categories are:

ESC 1100 Conservation and Biodiversity -recertified 2015/16
ESC 1500 & 1500L Introduction to Environmental Problems I & Lab -recertified 2014/15
ESC 1510 & 1510L Introduction to Environmental Problems II & Lab -recertified 2014/15
ESC 2250 Oceanography-deactivated effective FA 2016

2.1.4.3 Geology

The Geology Program offers the following General Education courses in the Natural Sciences: Physical Geology & lab (GEOL 1110 and 1110L), Historical Geology & lab (GEOL 1120 and 1120L), Oceanography (GEOL 2250 and 2250L), Current Geological Perspectives of Earth (GEOL 1160), and Geology of National Parks (GEOL 1025).

General education courses are reviewed on a 5-year cycle for recertification. These procedures and the recertification schedule can be found here: https://www.utc.edu/general-education/faculty-information/course-certification.php. The dates for the most recent recertification of Geology courses for the Natural Science and Natural Science lab categories are:

GEOL 1025 Geology of the National Parks-recertified 2013/14
GEOL 1110 and 1110L Physical Geology and lab-recertified 2015/16
GEOL 1120 and 1120L Historical Geology and lab-recertified 2015/16
GEOL 1160 Current Geological Perspectives on Earth-recertified 2016/17
GEOL 2250 Oceanography-recertified 2014/15

2.1.5 Service Courses Across BGE Programs

2.1.5.1 Biology

Biology offers the following service courses: Functional Human Anatomy (BIOL 1910 and 1910L), Human Physiology (BIOL 2080 and 2080L) and Microbiology and Health (BIOL 2100 and 2100L). Since these courses are required prerequisites for Nursing, Physical Therapy, and UTC Natural Sciences Secondary Education majors, the content of the courses gives students skills and depth of knowledge to ensure success in these majors. Frequent dialog between BGE faculty who teach these service courses and faculty of UTC’s Nursing, Physical Therapy, and Secondary Education Programs ensures that these service courses fulfill educational expectations.

2.1.5.2 Environmental Science

The Environmental Sciences Major offers the following service courses: Conservation of Biodiversity (ESC 1100), Introduction to Environmental Science I (ESC 1500), Introduction to Environmental Science II (ESC 1510).

These courses benefit the Health and Human Performance: Sport, Outdoor Recreation, & Tourism Management, the Engineering sciences and the Middle Grades Education: Mathematics, programs.

In addition, the following service courses benefit specifically the Environmental Engineering program: ESC 3400 - Environmental Survey Methods, ESC 3600 - Air and Water Pollution Control, ESC 4520 - Limnology and Reservoir Ecology, ESC 4100 - Environmental Law and Agencies, and ESC 4840 - Values and the Environment.

The content of the courses gives students skills and depth of knowledge to ensure success in their majors. To assure effectiveness of the service courses to the overall education of different majors that benefit from them, faculty from all departments involved maintain frequent dialog and coordination of the courses with BGE faculty.

2.1.5.3 Geology

Geology offers the following service courses beyond General Education: Physical Geology & lab (GEOL 1110 and 1110L) are required for 12 other majors at UTC and Historical Geology & lab (GEOL 1120 and 1120L) are required for 4 other majors. Environmental Science subcategory majors require Mineralogy and Petrology and these elective choices-Oceanography, Soil Properties, Dynamic Earth, Fossil Fuels, Hydrology, Geology Field Experience, and Geomorphology are also available. The program offers Hydrology at both graduate and undergraduate levels for Engineering and Environmental Science Programs, and GIS for Geologists and Geological Remote Sensing at both graduate and undergraduate levels.

2.1.6 Curriculum Improvement

Content and organization of the Department's curriculum is reviewed regularly. Faculty members wishing to propose a curriculum change must submit a curriculum proposal as either an information item (editorial change in course catalog) or a full proposal (new course proposal, change to core courses, etc). The Department Curriculum and Planning Committee reviews and votes on proposed changes in the curriculum. If the Department committee votes in favor of a proposal, the proposal moves on for approval by the Department faculty. If approved by the Department faculty, the proposal is then sent to the College Dean, Records Office, Provost, University Curriculum Committee, and Faculty Senate for final approval.

2.1.6.1 Biology

At the time of our previous self-study (2011-2012) we were in the middle of an overhaul of our Biology curriculum, which was implemented in Fall 2013. Prior to this curriculum overhaul, in addition to General Education requirements, all Biology majors were required to take 38 hours of Biology courses. Twenty-four to twenty-seven of these hours included the two-semester introductory sequence, Genetics, and one course from each of four categories: Botany, Zoology, Ecology and Evolution, Cell and Physiology. In addition to these 24-27 hours, students would also choose a program of study and complete additional requirements for the program. There were six such programs that each had special course requirements that are not discussed here. These were: General Biology, Pre-professional, Ecology, Organismal Biology, Molecular Biology, and UTeaChattanooga (renamed as STEM Education). These programs facilitated exploration of particular sub-disciplines within Biology, but a dramatic increase in the number of majors in the preceding years resulted in an unwieldy curriculum that slowed student progression and graduation. In 2013, this curriculum was scrapped and the new, simpler curriculum, described above, was established. It took approximately four years for students who were grandfathered into the old curriculum to pass through our department and during the last few years we have observed a great streamlining to graduation with students who have a more rigorous and thorough education in Biology.

Along with the development and implementation of the new Biology curriculum, four new courses were added to facilitate student progression to graduation: Parasitology, Human Infectious Disease, Urban Gardening and Organoponics, and Global Change Biology.

2.1.6.2 Environmental Sciences

During the review period, the Environmental Science curriculum was revised to remove roadblocks, eliminate two programs, add two new programs, and strengthen the required and elective offerings within several programs. Specifically, the Environmental Health and the Environmental Policy and Planning, are programs that did not exist before our last major curriculum changes. The program on Biodiversity, Conservation and Natural Resources; Earth, Atmosphere, and Geological Resources, replaced the Environmental Sciences programs of Biology, and Geology respectively. The Chemistry and the Mathematics programs were eliminated or absorbed by other programs within the Environmental Sciences Major.

In addition to the changes in the programs of Environmental Science Majors, the list and classification of courses student have to take to fulfill the requirements of each program were delineated and classified in different categories. Students are now required to have a specific number of courses or number of credits per category of courses. Such organization is intended to ease the selection of courses students need to take.

After our previous self-study (2011-2012) the following courses were added to the Environmental Sciences curriculum: ESC 4470 - Ecological and Evolutionary Statistics, BIOL/ESC 4460 - Global Change Biology, and BIOL/ESC 4590 Advanced Topics in Evolutionary Ecology.

2.1.6.3 Geology

Review of the Geology curriculum occurs several times a semester through formal and informal discussion between Geology faculty when faculty meet to discuss program Student Learning Outcomes (see section 1) and reflect on the results of that assessment. Other changes to curriculum stem from discussions with students and recent alumni of the program and from the last program review.

In addressing curriculum improvement, between the period since the last review, the Geology Program created four new courses. At the time of our previous self-study (2011-2012) we were organized in a different department—Physics, Geology and Astronomy, and Dr. Amy Brock-Hon was a recent hire (Fall 2010). Her expertise in Soils was sought after recent Geology graduates gave feedback regarding the courses they would like to see in the program. Dr. Brock-Hon created Soil Properties, Genesis and Development Across the Landscape (GEOL 3220) to address those needs. She also created Geomorphology and Earth Surface Processes (GEOL 4080). Dr. Azad Hossain (hired in 2016) has created two courses, GIS for Geologists and Geological Remote Sensing, both currently in the catalog with temporary course numbers. Dr. Hossain's hiring addressed a need stated by the reviewer of the previous Geology Program during the 2011-2012 review. The Geology of the National Parks course was also added in response to the last reviewer's suggestion to add another general education class that would help to draw in new majors.

2.2 Course Scheduling and Progress Toward Degrees

2.2.1 Biology

The Department offers many courses on a regular basis (every semester, every year, or every other year), which allows students to make reasonable progress toward their degree. The number of Biology majors has remained fairly stable over the last five years (Table 2.1). The large number of majors has resulted in high demand for a number of courses, particularly upper-level courses, which often close the first day of registration. The curriculum revision of 2013 addressed this problem for many students because students could substitute any number of courses for a category. However, upper-level classes still fill quickly in the registration cycle. We have also begun to offer several courses in the summer, with increased frequency, more lab sections, and larger lecture enrollment, or online.

The demand for service courses has remained stable during the last five years.

Table 2.1 B.S. Biology Enrollment Data 2013-2017.

Majors	**Fall 13**	**Fall 14**	**Fall 15**	**Fall 16**	**Fall 17**
BIOL: General	199	238	225	193	215
BIOL: Pre-professional	523	466	516	484	529
BIOL: STEM Education	25	28	25	16	15
BIOL: Minor	55	53	51	56	56
BIOL: Ecology (terminated)	17	8	2	0	0
BIOL: Molecular (terminated)	20	7	3	1	1
BIOL: Organismal (terminated)	21	16	7	0	0
Total	860	816	829	750	816

2.2.2 Environmental Science

BGE offers multiple sections of both the introductory level and service courses every semester, including summer semesters, thereby increasing student's opportunity to progress through the curriculum and graduate on time. From 2013 to 2017, the number of students majoring in Environmental Science increased by about 12% (Table 2.2). The curriculum revision in 2014 eliminated two low enrolled tracts, revised the other tracts to avoid or provide alternatives to bottleneck courses, and added two new tracts. The curriculum changes have streamlined progression through the degree tracts. We have also begun to offer several core and service courses online during regular semesters and the summer semester, increasing access to both UTC and transient students. Currently, more discussions and planning are taking place, concerning strategies to increase offerings of online courses, including piloting an online introductory general education natural science course with lab.

Table 2.2 B.S. Environmental Science Enrollment Data 2013-2017

Majors	**Fall 13**	**Fall 14**	**Fall 15**	**Fall 16**	**Fall 17**
ESC: Biodiversity, Conservation and Natural Resources (new 2014)	0	26	51	101	117
ESC: Earth, Atmosphere, and Geological Resources (new 2014)	0	3	7	12	14
ESC: Engineering Science	19	21	21	20	16
ESC: Environmental Health (new 2014)	0	1	9	7	6
ESC: Environmental Policy and Planning (new 2014)	0	6	16	27	22
ESC: Geographic and Cartographic Sciences	15	14	9	10	6
ESC: Biology (revised/renamed)	81	59	38	16	9
ESC: Chemistry (terminated)	3	0	0	0	0
ESC: Geography (revised/renamed)	1	1	1	0	0
ESC: Geology (revised/renamed)	29	22	11	8	1
ESC: Sociology & Anthropology (revised/renamed)	21	14	5	3	1
ESC: Minor	19	16	17	16	19
Total	188	183	185	220	211

2.2.3 Geology

The program offers required courses on a regular basis (every semester, every year, or every other year). A scheduling matrix summarizes the frequency with which required courses in the Geology curriculum are offered (Table 2.3) and when students of each graduating class should take them. During advisement, faculty advisors use the matrix to create a course plan for majors, thus helping students to enroll in required courses and make reasonable progress toward their degree. Over the past several years, there has been a steady increase in the number of Geology majors and minors (Table 2.4). With 45 Geology majors, Geology faculty feel the program is at the cusp of shifting some upper-level courses that have been taught every other year, to offering some of them on a yearly schedule.

Table 2.3 B.S. Geology scheduling matrix.

B.S. Geology—scheduling matrix of required geology courses, projected through 2023 (for planning purposes only)

Updated 12/5/2011	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa	Sp	Fa
GEOL 1110(L)	☐	16	☐	17	☐	18	☐	19	☐	20	☐	21	☐	22	☐	23	☐	244	☐	25	☐	26	☐	27
GEOL 1120(L)	15	☐	16	☐	17	☐	18	☐	19	☐	20	☐	21	☐	22	☐	23	☐	24	☐	25	☐	26	☐
e GEOL 1230(L)		14/15				16/17				18/19				20/21				22/23				24/25		
s GEOL 2250	☐	☐	☐	14/15	☐	☐	☐	16/17	☐	☐	☐	18/19	☐	☐	☐	20/21	☐	☐	☐	22/23	☐	☐	☐	24/25
s GEOL 3070		13/14				15/16				17/18				19/20				21/22				23/24		
GEOL 3410(L)		15		16		17		18		19		20		21		22		23		24		25		26
GEOL 3420(L)	14		15		16		17		18		19		21		21		22		23		24		25	
g GEOL 3530(L)				14/15				16/17				18/19				20/21				22/23				24/25
GEOL 3540(L)	12/13				14/15				16/17				18/19				20/21				22/23			
e GEOL 4450		14		15		16		17		18		19		21		21		22		23		24		25
GEOL 4510(L)		13/14				15/16				17/18				19/20				21/22				23/24		
g GEOL 4520(L)			13/14				15/16				17/18				19/20				21/22				23/24	
GEOL 4800	13		14		15	15		16		17		18		19		20		21		22		23		
GEOL 4900		13		14		15	15		16		17		18		19		20		21		22		23	

COURSE NUMBER AND NAME	HRS	PREREQUISITE(S)	FREQUENCY OFFERED
GEOL 1110(L) Physical Geology	3+1		Every semester
GEOL 1120(L) Historical Geology	3+1	GEOL 1110	Every semester
e GEOL 1230(L) Environmental Geology	4		Alt. Fall sem., even-numbered years (2014, 2016, ...)
u GEOL 2250 Oceanography	3		Every semester
u GEOL 3070 Geology of Tennessee	3	previous course in geology	Alt. Fall sem., even-numbered years (2014, 2016, ...)
GEOL 3410(L) Mineralogy	4	GEOL 1110 and CHEM 1110	Fall semesters
GEOL 3420(L) Petrology	4	GEOL 3410 (≥C)	Spring semesters
g GEOL 3530(L) Paleontology	4	GEOL 1120 (≥C)	Alt. Fall sem., odd-numbered years (2015, 2017, ...)
GEOL 3540(L) Sed. Rocks & Strat.	4	GEOL 3410 (≥C)	Alt. Spring sem., even-numbered years (2014, 2016, ...)
e GEOL 4450 Hydrology	3	GEOL 1110 and CHEM 1110	Fall semesters
GEOL 4510(L) Structural Geology	4	GEOL 3420 (≥C)	Alt. Fall sem., even-numbered years (2014, 2016, ...)
g GEOL 4520(L) Field Meth. Struct. Geol.	4	GEOL 4510	Alt. Fall sem., odd-numbered years (2015, 2017, ...)
GEOL 4800 Geology Seminar	1	ENGL 2820 and GEOL 3420 (≥C) and GEOL 3540 or 4510	Spring semesters
GEOL 4900 Senior Seminar	2	GEOL 4800	Fall semesters

g Required for **Geology option** — Core geol. courses (27 hrs) + GEOL 3530 + GEOL 4520 + 7 hrs geol. electives = 42 hours, MATH 1950

e Required for **Environmental Geol. option** — Core geol. courses (27 hrs) + GEOL 1230 + GEOL 4450 + 8 hrs geol. electives = 42 hours, MATH 1830

s Required for **STEM Education option** — Core geol. courses (27 hrs) + GEOL 2250 + GEOL 3070 + 7 hrs geol. electives = 40 hours, MATH 1950

Example (shaded cells)

An incoming freshman that enters the program (Geology option) in the Fall of 2014 will graduate in the Spring of 2018, assuming that all goes well.

The appearance of the class year in the matrix, e.g. "18" for graduation class of 2018, indicates the semester and year in which a class will be taken by students of that graduation class.

In terms of geology classes, the incoming freshman in this example will take GEOL 1110 in the Fall of 2014, GEOL 1120 in the Spring of 2015, GEOL 3410 in the Fall of 2015, and so on. This student will take GEOL 4900 during his/her final semester, the Spring of 2018.

Table 2.4 B.S. Geology Enrollment Data 2013-2016

Majors	**Fall 12**	**Fall 13**	**Fall 14**	**Fall 15**	**Fall 16**
GEOL: Geology	31	37	44	40	35
GEOL: Environmental Geology	9	15	11	8	18
GEOL: STEM Education	1	3	3	2	1
GEOL: minor	6	5	7	7	9
Total	47	60	65	57	63

2.3 Pedagogical and Technological Innovations to Enhance Student Learning

2.3.1 Pedagogical Enhancements

2.3.1.1 Biology

The greatest pedagogical enhancements to the Biology curriculum came in 2012 and 2013 with the changing of the introductory Biology sequence from two to three semesters and with the curriculum overhaul. Slowing down the pace of the introductory sequence, which concurrently includes Biology majors and general education non-biology majors, has allowed for more thorough coverage of these foundation subjects. Furthermore, the third majors-only introductory course has increased the overall preparation and maturity of students moving into 3000 and 4000 level courses.

2.3.1.2 Environmental Science

The Environmental Sciences curriculum was enhanced at the same time as the Biology curriculum in 2012 and 2013. Many programs were reorganized to better streamline with current issues in the discipline. Some programs were removed and other were introduced and or reorganized. Courses were regrouped into different categories to facilitate better selection of classes for students in each of the six Environmental sciences programs. Other advances are the introduction of two online courses - Evolution (BIOL 3350) and Conservation of Biodiversity (BIOL/ESC 1100). In addition, faculty engaged in teaching online courses are receiving or have received proper training for the purpose. All online courses and faculty teaching online course are in the process of being certified by the Quality Matters accessibility program.

2.3.1.3 Geology

Changes to pedagogy within the classroom are made by individual faculty in response to Student Evaluation of Faculty that occurs at the end of each semester. Faculty have the opportunity to reflect on the results of the course evaluations during their annual review and make changes accordingly for the next semester. Changes in Geology courses have also been made in response to discussions around the program Student Learning Outcomes.

Enhancements to the Geology curriculum came largely with the addition of new courses by Dr. Brock-Hon and Dr. Azad Hossain, with new courses in geomorphology, soils, GIS and Remote Sensing. Dr. Habte Churnet has also created a course in Economic Geology. Dr. Ann Holmes created online courses for Physical Geology and lab (offered in the fall semesters of 2011-2013) and Geology of the National Parks which is in the process of being certified by the Quality Matters accessibility program. Some pedagogical changes have occurred in courses with the incorporation of the Blackboard platform that is required across the university. Several courses have used Blackboard to assign quizzes to assess content knowledge in courses.

2.3.2 Technological Enhancements

2.3.2.1 Biology and Environmental Science

While we have computer and projector podia in most lecture classrooms, we do not have them in many of our laboratories. Furthermore, the computer systems tied to these podia often need updating.

Specific to the Environmental Science Program, the most recent acquisitions of technologies include laptop computers used in certain laboratories and some soil probes (penetrometers) for field sessions. Many microscopes were acquired to replace damaged microscopes resulting from many years of use, as well as to include additional microscopes with improved features.

2.3.2.2 Geology

Office, teaching and laboratory space in Grote Hall have computers and document projectors in all classrooms, and in most, those feed into overhead ceiling-mounted projection systems. We have a rock prep room complete with saws of several sizes and thin-section preparation equipment and a sonic bath. In our geochemistry laboratory, we have two fume hoods, one positive pressure. A new HP Designjet Z5200 Postscript plotter was acquired and is used by students in the seminar series courses and in GIS for Geologists for their final presentations. Students may also use the plotter for presentation of their research at professional meetings. Dr. Brock-Hon utilizes a library computer lab in the new library for her Mineralogy, Geomorphology, and Soils courses. Dr. Hossain uses the SIM Center computer lab and geospatial software for his GIS and Remote Sensing courses.

New technologies acquired for use in teaching and research since the last review period include:
SeisOpt Remi V30+ 24-Bit seismic system with 12 geophones
ARES Automatic Resistivity System with 5 and 2m spacing cables with electrodes
Guralp CMG-6TD broadband seismometer
Panalytical Epsilon 3^{XLE} XRF
Allegra X-22 centrifuge
6 new transmitted/direct lighting microscopes
2 reflected light microscopes with projection device

Specific examples of technological enhancements in the classroom that have occurred since the last review include:
Use of seismometer data for Senior Seminar projects to measure earthquake waves and test seismic models, and analyze microseisms from hurricane signals.

Students in Petrology are required to make a thin section from a rock sample as a project in Petrology and Economic Geology courses.

Use of online 3D simulations to observe mineral forms and symmetry in Mineralogy.

Use of Google Earth to view landforms and discuss landform processes in Geomorphology.

Remote access of Electron Microprobe to analyze samples in Mineralogy. Students use the data they collect to calculate mineral formula in an exercise.

2.3.3 Developing Technological Skills

Across the BGE Department, a variety of ways are provided in which students learn and practice computer and technology skills. Curriculum content of departmental courses require students to perform web-based research, and to access designated websites to obtain course assignments, reference materials, and grades. In addition, depending on their academic concentration, students are required to integrate a variety of technologies, computer skills and analytical software to address relevant issues and scientific queries in Biology, Environmental Science and Geology. There are courses in all majors that are technology driven or technology dependent that require such computer and technology skills.

2.3.3.1 Biology and Environmental Science

In Biology and Environmental Science, most upper level courses contribute to advancing the technological skills of our students. Specific examples of building technological skills in Biology and Environmental Science coursework includes:
Use of spreadsheet, graphing, and statistical analysis programs for students enrolled in Ecology (BIOL 3060/3070), Cell Biology (BIOL 4280), Environmental Survey Methods (ESC 3400), Remote Sensing and Imagery Analysis (ESC 4650), and Geographic Information Systems (ESC 4660); Use of software platforms and applications in bioinformatics in the Cell Biology (BIOL 4260) and Molecular Genetics (BIOL 4200) laboratories to predict the 3D structure of proteins based on known gene sequences, design and execute mutagenesis strategies for protein engineering and search a variety of cell and molecular databases.

2.3.3.2 Geology

In Geology, the courses that contribute to students' technological skills include Mineralogy (GEOL 3410), Petrology (GEOL 3420), Paleontology (GEOL 3530), Sedimentary Rocks and Stratigraphy (GEOL 3540), Hydrology (GEOL 4450), Field Methods (GEOL 4520), Geomorphology (GEOL 4080), and in our newest courses, GIS for Geologists and Geological Remote Sensing. Specific examples of building technological skills in Geology coursework includes:

Calculation of mineral formula from Electron Microprobe data in Mineralogy.

Use of software to perform mineral identification on XRD data in X-Ray Diffraction course.

Digital map compilation from field data in Field Methods.

Graphing of strike-and-dip data on stereonet with software in Structural Geology and Field Methods.

2.4 Curriculum Alignment with Program and Student Learning Outcomes

Refer to section 1.2, supra, and Table 1.1 (Biology Curriculum Map), Table 1.3 (Environmental Science Curriculum Map, and Table 1.6 (Geology Curriculum Map), for information on aligning the Biology, Environmental Science and Geology Programs with the Student Learning Outcomes.

2.5 Curriculum Content and Current Standards, Practices, and Issues in the Discipline

2.5.1 Biology and Environmental Science

Curriculum content is designed to emphasize fundamental principles of biology and Environmental Science in a variety of contexts. Faculty provide syllabi each semester that clearly outline the student learning outcomes for each course, as well as the standards and expectations for the student. Current standards and practices are rigorous, and provide the opportunity for students to utilize critical thinking and the principles from their past coursework. All content within the curriculum has the goal of cultivating students who are competitive and competent so that they will ultimately be successful in the career of their choice. Issues in the discipline are utilized as learning tools in the classroom and laboratory setting to enhance student comprehension and awareness. Keeping curriculum content and practices current ensures students are well-equipped for their future careers.

At all levels of the curriculum, there is a strong emphasis on hands-on, inquiry-based investigative activities in the laboratory and field setting. There is at the university level an organization, The Think Achieve, responsible for promoting the Active Experiential Learning. There are several courses in the Department that have obtained the certification for providing active experiential learning. Through curriculum proposals suggested by a single faculty member or by the whole department, a single course or the complete program may be subjected to changes to better align with current standards and prepare our students to compete in the professional world. Major curriculum changes in Biology and Environmental Sciences programs occurred between 2012 and 2013, and particular courses were added or modified annually to enhance our program of studies. Each faculty works zealously to stay current and bring the highest level of knowledge to their students. There are many classes that introduce reading and discussion of current issue publications in both lectures and seminar classes.

2.5.2 Geology

According to results from a recently published NSF-sponsored effort to develop a community vision for undergraduate geoscience education (Summa et al., 2017 in GSA Today, v. 27, doi: 10.1130/GSATG342GW.1., The Geological Society of America), ~95 employers and ~345 academics have concurrence in fields the Geology faculty work to cover in core and elective courses. Some of these concurrent skills valued by employers and academics include: strong field skills, make inferences, use scientific methods, awareness that earth is a complex and dynamic system, think critically, be quantitative, access and integrate new information, solve 3D/4D problems, manage uncertainty, integrate diverse data and communicate effectively. While we cannot focus on one type of employment for our Geology majors, we endeavor to include many of these skills in our curriculum. Select examples of how Geology courses help build these skills in students includes:

Critical thinking applied through data-set analyses in GIS, remote sensing, structural Geology, and paleontology.

Field methods through field investigations is taught in many classes including Petrology, Structure, Geomorphology, Soils, and culminates in Field Methods in Structural Geology.

Written and oral communication skills are practiced in many classes including Soils, Geomorphology, Dynamic Earth, Fossil Fuels, and culminate in our seminar research and presentations.

2.6 Analytical and Critical Thinking and Problem Solving in the Curriculum

The ability to think critically is an essential component of science. Critical thinking skills enable students to determine whether they accept, reject or suspend judgment about a problem, as well as assess the degree of confidence with their acceptance or rejection of the problem. Activities in the classroom and laboratory refine students' critical thinking skills by encouraging independent thinking, creating an awareness of the strengths and limitations of using the scientific method, and developing intellectual perseverance. Assignments are designed to engage students in the scientific endeavors of critiquing texts and articles, evaluating the credibility of sources of information, interpreting data, making predictions, proposing experiments to address specific hypotheses, and generating and assessing solutions. Development of critical thinking skills in the laboratory is encouraged by implementation of hands-on and inquiry-based activities in the lab that require students to interpret, analyze, evaluate, and explain ideas, processes, or problems that occur in nature.

Select specific examples of how courses in the Geology curriculum foster analytical and critical thinking, and problem solving include:

Mineral identification of a set of 120 unknown minerals via their properties in Mineralogy.

Assessment of soil development from soil data collected by students in the lab and field as part of the Soils course.

Investigation of an unknown feature given in Geomorphology. Students must propose hypothesis of the feature's formation and determine the methods by which they would investigate its genesis and development.

Mapping of geological units in an area and interpreting their subsurface geometry, etc., through measurements and observations in Field Methods.

2.7 Degree Program Designs Provide Students with Solid Foundation

The B.S. degree programs offered by the Department are united by a common set of educational goals as stated in the Departmental Goals (see section 1.1.2, supra). Programs and courses have been developed with academic excellence as a goal, thereby giving students the experience of a superior quality education. As students progress through the Department's courses, they are provided with the opportunity to develop a firm grasp of the philosophy and methods of science, as well as an awareness of the importance of critical thinking and lifelong learning. As is appropriate for any natural science curriculum, hands-on/inquiry-based laboratory and field experiences are heavily emphasized. Each course offers exposure to both traditional information and contemporary frontiers in the life and/or Environmental Sciences. Ample opportunities exist for students to actively participate in the scientific process by becoming involved in collaborative research projects with individual faculty members. The Department's courses also serve to prepare students successfully for their post-graduate occupations – whether in the work force or graduate/professional education. In addition to the formal course work, faculty introduce in their curriculum many other activities that enhance the quality of the course and preparedness of our students. Faculty engage students in their research activities, make field visits to different sites, invite guest speakers, among many other approaches to provide students with the best possible information.

In the Geology Program, students are active in their education and are provided multiple opportunities to engage in research, thus building on the foundation of basic Geology concepts learned through coursework in the program. The program is designed to progress students through the core courses of Geology whereby they also learn the skills and tools of our science. In these courses, students are introduced to, practice, and become competent at these skills (as outlined in program SLOs in section 1). During their senior year, students are required to take a two-course seminar series where they apply their base knowledge of geologic concepts, processes and analytical skills to identify and solve a problem through an individual research project. The solid foundation that is laid by the program course work allows the student to apply what they have learned throughout their major coursework to perform this research. Students also have ample opportunities to work with faculty on research and many of these have resulted in presentations at professional meetings. Examples of recent projects conducted by Geology students with faculty that have been presented at professional meetings include:

Cathodoluminescence study of Bahamian carbonates to answer questions on island stratigraphy.

Characterization of sediment from Raccoon Mountain Cave for future geochronological analyses.

Investigation into unique features found in a 4+ million-year old soil in Nevada.

Separation of barite crystals from indurated carbonate soils for future isotopic and geochronological analyses.

These research opportunities not only give Geology students the ability to apply their foundation of knowledge learned in the program, but allow them to expand upon this knowledge though application.

The curriculum in the Biology, Environmental Science and Geology Program is strong and reflects current standards, practices, and issues in the discipline.

2.8 Curriculum Progression, Depth, and Rigor

All majors in the Department have a detailed, rigorous and sequential list of courses for each program in the major. Students are required to take these courses in a sequential manner starting with the introductory courses which provide them with pre-requisites to enroll in most advanced courses as they progress through their programs. In addition to the introductory courses in the discipline, other essential courses across disciplines such as Chemistry, Mathematics, English and Physics may be required prior to taking some advanced courses in the disciplines. This strategy assures better preparation and higher chance of success.

2.8.1 Biology

Biology students begin with two semesters of introductory Biology in a mixed majors setting followed by a third majors only introductory course focused on an introduction to animal and plant physiology and anatomy. This third semester is also used to groom our majors from being among the general student population to being part of an academically rigorous major. Concurrent with the third semester of introductory Biology, our students begin taking the Core courses of Ecology, Evolution, and Genetics. Following the Core sequence, students are free to begin taking courses from the Survey and/or Cell and Physiology categories. As a capstone experience, we require our juniors and seniors to take at least one course from the Advanced Ecology and Evolution category.

2.8.2 Environmental Science

Likewise, students of Environmental Science begin with two semesters of introductory Environmental Science in a mixed and non-major setting, followed by taking the Core courses specific to their chosen concentration in the discipline. As a capstone experience, all seniors are required to complete a Senior Experience.

2.8.3 Geology

Students of Geology begin with two semesters of introductory Geology (Physical and Historical) in a mixed majors and non-majors setting. Students are advised to take the perquisite Chemistry I and lab courses before their 2nd year in the program, when they take Mineralogy and Petrology. As a capstone experience, we require our seniors to take Geology Seminar, where they practice scientific research and develop presentation skills, and Senior Seminar, where they conduct original research on a focused topic and hone presentation skills. Geology elective requirements allow students to select courses where they can investigate topics and regions in more depth (e.g. Economic Geology, Geomorphology, Fossil Fuels, Dynamic Earth, Geology Field Experience).

In terms of rigor, students must earn a 'C' or better in Historical Geology and lab, Mineralogy, and Petrology before proceeding to the next courses in the program. This sets high expectations that we hope students carry through their academic pursuits.

Students are given opportunities to interact with professionals and hear from recent graduates who are in the Geology profession or pursuing graduate studies. These interactions allow for students to see real-world examples and hear what skills are important beyond graduation. For example, we recently hosted the Society of Exploration Geologists Jahn's lecturer whose presentation was titled "What it takes to effectively monitor for environmental and engineering geology projects." Recent graduate students Sarah Ellen Johnston and Andrew Stevens spoke about their master's research projects and provided suggestions/recommendations for applying to graduate schools.

2.9 Written and Oral Presentation of Results and Ideas

Rhetoric & Composition I and II (ENG 1010 and 1020) introduce UTC students to basic oral and communication skills. The Department's introductory Natural Sciences courses in the department (BIOL 1110, BIOL 1120, ESC 1500, ESC 1510, GEOL 1110 and GEOL 1120) incorporate writing into every lab and include a formal lab report. The lecture sections also include a writing component. Further, these courses are certified as general education science courses at UTC, and must comply with general education science guidelines and outcomes. All Biology instructors must include a writing component so that we can verify we are achieving some of the general education requirements. Specifically, general education science courses must include communication skills, as described below:

> Communication skills are a central part of this proposed general education curriculum. While specific writing requirements are not detailed in the newly approved General Education categories, all approved courses must provide students with meaningful opportunities to communicate the results of their inquiries and analyses. All types of communication are encouraged, including any form of communication specific to a discipline: oral, written, visual, graphic, and other forms of communication. Departments and faculty teaching general education courses must determine the best way to provide students with meaningful practice with communication skills.

Additional details are available by viewing UTC General Education Guidelines and Natural Sciences Criteria (Outcomes).

2.9.1 Biology and Environmental Science

All Biology and Environmental Science majors take a writing intensive course in fulfillment of program requirements. This requirement may be met by completing Scientific Writing (ENGL 2820), Research Methods (STEM 3020) or Departmental Honors (BIOL/ESC 4995). In addition, upper level courses are designed to advance student's abilities to express scientific knowledge effectively. Upper level courses require students to create essays, research papers, lab reports, literature reviews, critiques of journal articles, and give oral presentations, and/or poster presentations. For example, formal laboratory reports, written in the format of professional journal articles, are required elements for several introductory (BIOL 1110, BIOL 1120, ESC 1500 and ESC 1520), core (BIOL 3070 and BIOL 3260) and upper level (BIOL 4200) laboratory courses. Students in Immunology (BIOL 4120) and Virology (BIOL 4470) must participate in several formal discussions of recent articles dealing with discipline specific research topics and develop written reports summarizing these articles. Moreover, the relatively smaller class size of most upper level courses provides opportunities for professors and students to interact and engage in discussions concerning current topics. For instance, in the Ecology Laboratory (BIOL 3070), Soil Resources (BIOL/ESC 4680), Behavioral Ecology (BIOL 4999), and Introductory Animal Physiology (BIOL 4210), among other courses in the department, students perform small research experiments, which give them the opportunity to have an oral or poster presentation at the end of the semester. This approach has helped students develop their research method skills, improving their public speaking and communication skills. Students in Environmental Law and Agencies (ESC 4100) are assigned specific roles and tasked with verbally advocating their interests during a mock public hearing involving environmental law and policy issues. This approach helps refine student public speaking skills and provides experience in a simulated real-world situation involving persons with diverse interests.

2.9.2 Geology

Geology majors are required to take Scientific Writing, which serves as a prerequisite to the capstone seminar courses. Multiple courses in Geology require students to present their work in written and oral form. For example, Dr. Brock-Hon's soil class conducts a research project where students present their hypotheses, methodology, data and conclusions at the end of the semester as a formal presentation, and submit their final product as a research report. Another example is Dr. Azad Hossian's GIS course where students present their final project as a poster presented to the faculty and students of the program. Most impressively, each student who graduates from the Geology Program must conduct a 1-semester research project that they design and carry out. During the semester prior to this research, students conduct literature searches and build a hypothesis that they will test. At the end of the research semester, students present their work as a poster (modeled after GSA's poster sessions) to the faculty and students of the program. This ensures that every student has the opportunity to design and conduct research and present that research both orally and in written format. This is a proud tradition of the Geology Program.

All upper level Geology courses are designed to advance student's abilities to express scientific knowledge effectively. Upper-level courses require students to create essays, research papers, lab reports, literature reviews, critiques of journal articles, and give oral presentations, and/or poster presentations. Moreover, the relatively smaller class size of most upper-level courses provides opportunities for professors and students to interact and engage in discussions concerning current topics.

2.10 Discipline-Specific Research Strategies

At all levels of the curriculum, there is a strong emphasis on hands-on, inquiry-based investigative activities in the laboratory and field setting. In the introductory courses, many investigative lab exercises require students to formulate hypotheses, design experiments, and collect and analyze data. Having the three majors in the department facilitates cross-collaboration between different programs. There are examples of many collaborative projects that include Biology, Environmental Sciences and the Geology faculty. Many peer review publications, poster and oral presentations have flourished from such collaborations.

Students have the opportunity to work with individual faculty members on research projects while earning credit (BIOL/ESC/GEOL 4997 or BIOL/ESC/GEOL 4998). Each student that registers for individual studies or research credit must complete an individualized course contract (Appendix R). This in-depth, independent research gives students valuable experience with laboratory and/or field equipment. Students enrolled in the University Honors College are required to complete a research project including a written thesis and oral examination and defense of the thesis. Students of any major who are in the University Honors program conduct research with Department faculty members who serve as directors of their projects. Other students who are not in the University Honors program may also complete a written thesis and oral examination to earn Departmental Honors. Additionally, the University Faculty Research Committee awards highly competitive Provost Student Research Awards ($1000 maximum) to fund wages, related travel, equipment, and supplies to qualified students. During the last five years, BGE faculty have directed 37 Provost Student Research awards and 16 Departmental Honors projects.

There are many other situations when initiatives start from individual students who approach members of the faculty expressing their interest in getting involved in a specific research subject. Many of these students successfully complete their research programs and present their findings at various regional and national scientific events including the Tennessee Academy of Science, The Association of Southeastern Biologists (ASB), the American Society of Plant Biologists (ASPB) and the Geological Society of America (GSA).

Students are encouraged to participate in internships to gain real-world experience in their field of study. They enroll in BIOL/ESC/GEOL 4998 for a maximum of four credit hours when a cooperative arrangement is made between UTC and an agency, organization, group, or business. This experience is designed to "provide students with a learning, observing, and work experience through direct contact with individuals working on problems related to their field". Internships may be paid or unpaid. UTC's Cooperative Education Program helps students secure paid positions. Locations of the internships are mostly in the Chattanooga area; however, some students travel not only across the country but also to other countries for work-related experience. A faculty member in the Department must approve the internship and agree to serve as faculty coordinator. An internship contract (Appendix S) must be completed and signed by the student, on-site supervisor, and faculty coordinator. Internships require a minimum of 30 hours of work per hour of credit earned. Students are also required to maintain a log of activities completed during the internship and must submit a final report at the end of the semester. An evaluation form is filled out by the supervisor and submitted to the faculty coordinator. The student's grade is based on the quality of the student's work and the final report. During the last five years, 104 BGE majors were placed in internships at a variety locations including the Chattanooga Zoo, Tennessee Valley Authority, Reflection Riding Arboretum and Nature Center, City of Chattanooga, Tennessee Aquarium, and Tennessee Department of Environment and Conservation.

2.10.1 Biology and Environmental Sciences

In addition to experimental exercises conducted inside a laboratory facility, a number of upper-level courses also include fieldwork. Students enrolled in Ornithology go into the field every lab period and have participated in a trip to Belle Baruch Field Station at Pawley's Island, South Carolina. Students enrolled in Mycology, Herpetology, and Ichthyology spend more than half of their lab sessions in the field, and the Mammalogy course includes a significant field component, including a weekend trip to the Nantahala National Forest in Graham Co., North Carolina. In Limnology students become knowledgeable of the physical, chemical, and biological characteristics of inland water ecosystems by collecting, analyzing, and interpreting data in local Chattanooga freshwater ecosystems. Students enrolled in Tropical Marine Ecology are required to participate in a one-week experience at a field station in the Bahamas (either the Gerace Field Station on San Salvador Island or the Forfar Field Station on Andros Island). A specialized class tour of the Tennessee Aquarium gives students of Comparative Vertebrate Zoology, Herpetology, and Ichthyology an opportunity to observe behavioral and physiological aspects of aquatic species. These trips instruct students in proper data collection techniques. Subsequent analysis of the data further trains students in classification and identification of specimens, interpretation of results, and formation of conclusions.

2.10.2 Geology

Diverse experiential learning opportunities are inherent to the Geology Program with opportunities for research (as discussed above) and through course embedded field trips and labs. Geology field trips in the curriculum help to enforce basic concepts and processes that provide the foundation for research opportunities. Field trips allow students to practice their observation skills, practice at sampling and collecting geologic data for later analyses, and be immersed in discussion at the location of interest. For example, the Geology Program conducts a spring seminar Field Experience course that culminates in 10-day to 3-week field trips to various places such as the Desert SW of the US, Costa Rica, Spanish Pyrenees, and an upcoming trip to study Geology in Scotland. Students enrolled in Tropical Marine Ecology are required to participate in a one-week experience at a field station in the Bahamas (either the Gerace Field Station on San Salvador Island or the Field Station on Andros Island). These field trips allow students to observe and examine a diversity of earth materials, structures, rock-types and relationships, landscapes and soils, etc. Table 2.5 lists select locations visited in Geology course field trips:

Table 2.5 Select locations visited in Geology course field trips.

Physical Geology
- Geology of building stone in Chattanooga

Petrology
- Vulcan Quarry, Bartow, GA
- Trench deposits near Woodstock, GA
- Granite of Stone Mountain, GA
- Metasedimentary rocks of the Ocoee Series at Chilhowie Dam
- Chunky Gal Mountain, NC

Sedimentary Rocks and Stratigraphy

- Type section of the Chattanooga shale
- Silurian and Devonian rocks of west Tennessee
- Point Park, TN
- Coal mines at Lookout, GA

Paleontology
- Fossils in exposures near Trenton, GA
- Falls of the Ohio

Structural Geology
- Linville Falls and Blue Ridge, GA

Field Methods in Structural Geology
- Deformed rocks near Chickamauga Lake
- Woodall Shoals near Clayton, GA
- Various locations near Chattanooga for group projects

Geomorphology
- Spring Mills State Park, Ooolitic, IN
- Various locations atop the Cumberland Plateau

Soils
- Soddy Wildlife Management Area
- Sale Creek Wildlife Management Area

Economic Geology
- Sulfide deposits of Ducktown, TN
- Gold deposits of Dahlonega, GA

2.11 Assessment of Curriculum Strengths, Weaknesses, and Recommendations for Change

Having well-prepared senior students increases not just departmental graduation rate, but also the students' ability to secure a position after graduation, either in a graduate or professional program or in a career within their field.

2.11.1 Curriculum Strengths

2.11.1.1 Biology

Strengths of the curriculum include numerous opportunities for students to explore different topics within their chosen program. General Biology students and Pre-Professional students both have chance to select from various upper level courses to meet graduation requirements. This flexibility provides students with a broader awareness and deeper understanding of principles fundamental to Biology by increasing the number and variety of scenarios when students must apply these principles. Furthermore, the curriculum facilitates an appropriate progression from introductory Biology to upper-level, and highly specialized courses over a four-year period. Students are well-prepared for their upper-level courses by the requirements of the introductory Biology sequence and the core courses (Genetics, Ecology & Evolution), and are less likely to struggle and need to repeat a course. Their strong academic foundation allows them to be more confident in their skills and take advantage of internship and research opportunities, thus making them more competitive.

2.11.1.2 Environmental Science

The field of Environmental Science is very broad and interdisciplinary. To that end, we offer six different foci that students can concentrate their efforts. All concentrations require the same core classes that not only provide them with the foundation they need, but expose them to different disciplines that make Environmental Science so unique and valuable. Furthermore, the curriculum facilitates an appropriate progression from introductory courses to upper-level, and highly specialized courses over a four-year period. The strong academic foundation the curriculum provides allows students to be more confident in their skills and take advantage of internship and research opportunities, thus making them more competitive. The Environmental Science Program takes advantage of many favorable conditions that Chattanooga and the surrounding area have to offer. The presence of biologically rich rivers and streams, mountains, ridge and valley, and forests, present our Environmental Science Program with a biological landscape that enriches the program. Chattanooga's history as an industrial city, associated legacy pollution, and recent initiatives to become a more sustainable city aligns well with the programs of study in the Environmental Science Program. These local and regional conditions offer numerous research opportunities for students and faculty to explore different topics within their chosen program.

2.11.1.3 Geology

The personalized education inherent in the smaller Geology Program, along with direct faculty advisement of students allows for close ties to students within the program, and for feedback in courses from students about the curriculum. This is evident in the creation of new classes from the suggestions by recent graduates. The ability for faculty to meet and discuss student learning outcomes and their impact on student learning through assessment has allowed for changes in pedagogy, incorporation of technology, etc., within the classroom. Geology has a strong field component and the close proximity of three geologic provinces provides field areas that are geologically diverse and students can easily conduct field exercises nearby. These relatively good exposures provide opportunity to develop strong field skills such as using the Brunton compass, measuring sections, identifying rock types and depositional environments, measuring joint planes, generating data for stereographic projections, and identifying soil types. These skills are applied in a variety of fields including stratigraphy, structural geology, paleontology, economic geology, petrology, and soils, among others. Geology faculty work hard to incorporate critical thinking and problem-solving based activities in each Geology course.

2.11.2 Curriculum Weaknesses: Bottleneck Courses

A principal challenge in the curriculum of Biology, Geology, and Environmental Science Programs, is the high demand for upper-level courses. To alleviate this problem, as well as to make the concentrations more relevant to the current state of Environmental Science (ESC) and the marketplace, we have completed a major revision of the curricula for all the concentrations in 2012. These changes align well with the revisions to the Biology curriculum, and we eliminated courses that were taught on an inconsistent basis by other departments and replaced them with appropriate, regularly-taught offerings. These changes have worked well, and we have not had any issues with students not being able to take courses required for their particular concentration.

One area where we are still lacking is in new faculty. Since the last review, we have not hired any new tenure-track faculty for the ESC program, and we have only hired one non-tenured lecturer. The reason for the lack of hires is that the growth in our Biology enrollment has been much greater than for the ESC program, necessitating additional resources. The changes to the ESC curriculum, however, have led to an increase in the ESC enrollment, and additional tenure-track faculty are needed to cope with the increase, and would further increase the frequency and diversity of courses ESC majors take.

Undoubtedly, the ongoing high demand for certain upper-level courses is linked to limited staffing and space as well as the steady increase of enrollment across all of the BGE degree programs.

Lack of office and laboratory space or adequate facility continues to pose challenges for the Department. Currently Holt Hall is under renovation so that the entire building may house teaching and lab space for the Department. However, newly hired, and current, faculty have had to set up temporary offices and labs in various retrofitted locations. Moving into these temporary spaces has been time consuming for faculty members, and has put half of the department on the other side of campus. In addition, other faculty member's offices, research and teaching laboratories have been located during the entire 5-year review period in mobile buildings intended for short-term use during renovations. These space constraints have limited BGE's ability to offer attractive functional space to prospective and recently hired faculty.

Six years ago the Department had insufficient space for offices and laboratories. At that time, the Biology and Environmental Science Programs were housed primarily in Holt Hall and the Geology Program was housed in Bretzke Hall. A move of the Geology Program to Grote Hall was anticipated to increase their space, but that space quickly filled. In fact, no Geology faculty have their own designated research space. Additionally, there is no permanent office/carrel space available for new graduate students who came to study GIS and Remote Sensing with Dr. Hossain. During this time, the Biology and Environmental Science department also gained three new laboratories and two offices in Grote Hall. However, the addition of six new faculty members during the review period has created even more demand for space.

PART 3. STUDENT EXPERIENCE

3.1 Student Evaluation

Students in BGE have the opportunity to evaluate the faculty through the Student Ratings of Faculty survey in each course, the National Survey of Student Engagement (NSSE) during their freshman and senior years, and with the BGE student satisfaction survey in their sophomore and senior years.

3.1.1 Student Rating of Faculty

Each semester, students are provided the opportunity to evaluate tenured and tenure-track faculty in every course with the exception of thesis, dissertation, independent study, clinical, co-op, exchange, and student teaching. The university's Office of Planning, Evaluation, and Institutional Research (OPEIR) administers the course evaluations using online survey software. Students are asked to rate seven aspects of their classes on a Likert-type scale. Students are also asked to respond to four open-ended questions requesting student ideas for improvement of curriculum and methodology. Students in online classes are asked to rate the effectiveness of web-based instruction. The following seven questions are used to evaluate the quality of faculty teaching effectiveness:

1. The instructor is willing to help students.
2. The instructor encourages students to be actively engaged in learning the content of this course.
3. The instructor provides timely feedback on assignments and exams.
4. The instructor includes activities and assignments that help students learn the content of this course.
5. The instructor clearly communicates expectation of students for this class.
6. The instructor expects high quality work from students.
7. Overall, this class has provided an excellent opportunity for me to increase my knowledge and competence in its subject.

Course evaluations are opened to students three weeks prior to the last day of classes. Students are emailed with instructions on how to access course evaluations through their web portal or links. They have until the end of the last day of classes to complete the process of rating their classes.

After final grades are due, course evaluations are available to faculty. Results are only available for classes with five or more responses, and for courses with fewer than five students enrolled, results are available as long as there is at least a 50% response rate.

These data are reported by faculty in their annual performance reports and are used to improve course instruction for following semesters. In their performance reports, BGE faculty must report and reflect upon these results, and are recommended to make comments on how they plan to address strengths and/or weaknesses in the course based on the evaluations. Data are compared with College of Arts and Sciences and university results. These data are also summarized for courses and instructors and made available to students through their MyMocs portal. Students may choose to use these data when registering for future classes. Student Rating of Faculty results for 2013-2016 are reported in section 4.1.4 and Table 4.2, infra.

National Survey of Student Engagement

The National Survey of Student Engagement is administered each year by OPEIR and is available to all first year and senior students. This survey is used to determine the extent to which the students are actively engaged in various aspects of their undergraduate education. The survey contains questions about students' satisfaction with UTC, curriculum, faculty involvement, and cultural experience. Questions from this survey (Likert-like scale) that directly relate to the quality of faculty teaching effectiveness are:

1. Quality of interactions with faculty members.
2. Talked about career plans with faculty members or advisor.
3. Worked with faculty member on activities other than coursework (committees, student groups, etc.)
4. Discussed course topics, ideas, or concepts with a faculty member outside of class.

The number of students who took the NSSE was very low considering the total number of majors in the department with only 72 students taking the survey in 2016 (Fig. 3.1). NSSE data are presented in more detail in section 1.3.2, supra, and in Appendix N.

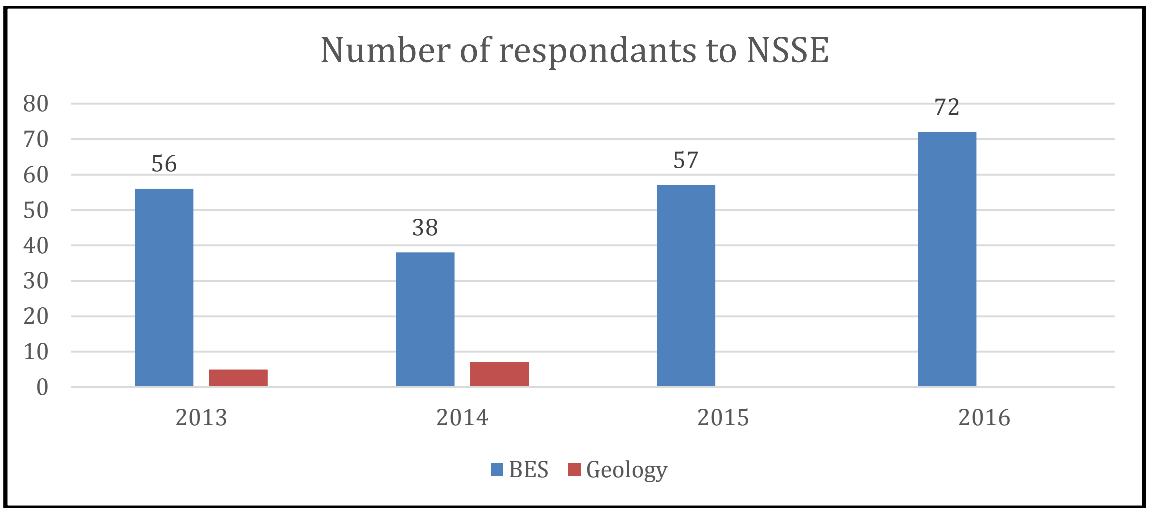


Figure 3.1 Number of NSSE Student Respondents 2013-2016.
Years 2013 and 2014 show numbers from both Geology and Physics majors during the time that those programs were combined. 2015-2016 data contain all Biology, Geology and Environmental Science majors who took the survey.

BGE Student Satisfaction Survey
In Spring 2017, the department issued its first Student Satisfaction Survey to seniors and sophomores in the department. By email, students were asked to complete a survey about their experiences in the department. The survey consisted of open-ended, dichotomous, and Likert-type questions. The Spring 2017 survey had 49 sophomore and 78 senior respondents. The data

will be used by department faculty to improve upon student experience in the classroom, and with advising, retention, and assessment of curriculum. Results from this survey are reported in Section 1.3.1 (Department Surveys), supra.

3.2 Student Exposure to Professional and Career Opportunities

3.2.1 Biology and Environmental Science

A key step in success in a science career is hands on experience in the lab and/or field. The Biology, Geology, and Environmental Science department offers a wide variety of professional and career opportunities in the form of internships, seminars, field trips, conference attendance, and conference participation. BGE students have the opportunity to participate in original research with faculty members through multiple avenues including the university's Provost Student Research Awards (PSRA), Departmental Individual Studies (BIOL 4998), and Department Honors Thesis (BIOL 4995). Since 2012, sixteen students received Departmental Honors upon graduation. A total of 37 students applied for and received funding to support research through the PSRA ($27,232.96) program; and multiple students have completed Individual Studies as part of their graduation requirement. In addition to BGE seminars, students have access to college level and university-wide guest lectures and seminars. BGE seminars hosted a number of local and regional researchers representing academia, government, and industrial fields. A particularly unique aspect of seminar is the opportunity to ask seminar speakers questions about their career path in addition to their research topic. The department has been particularly effective in inviting alumni to speak at seminars, allowing current students to see firsthand the projection of BGE graduates. Similarly, students have participated in a number of internships at the Chattanooga Zoo, Tennessee Valley Authority (TVA), Chattanooga Arboretum, Tennessee Aquarium, and City of Chattanooga, providing hands on experience with non-profit agencies. Finally, students in the BGE department have attended and presented their work in local, regional, and national conferences. Since 2012, 76 students have attended conferences with faculty mentors.

3.2.2 Geology

For students to be successful and adept at relating to professionals in and out of career settings, the Geology Program works to prepare students for future opportunities by training them in field data collection and research design, implementation, data synthesis, and presentation. Students are also provided with opportunities to meet with practicing Geology professionals both in and out of the classroom setting. Opportunities outside of the classroom are available through student club activities, speakers, and involvement in professional organizations.

Building professional skills

Skills necessary to work and relate on a professional level are practiced throughout the Geology curriculum. All students in the Geology Program practice their communication skills with presentations in required and elective courses. For example, oral presentations are required in Historical Geology (GEOL 1120), Paleontology (GEOL 3530), Sedimentary Rocks and Stratigraphy (GEOL 3540), Geomorphology and Earth Surface Processes (GEOL 4080), Soil

Properties, Genesis, and Development Across the Landscape (GEOL 3220), Geology Field Experience (GEOL 4960), Geology Seminar (GEOL 4800), and Senior Seminar (GEOL 4900). Students practice their scientific writing skills in Geology Seminar and Senior Seminar with submittal of a research grant proposal and written presentation of research on a poster. The capstone courses require students to formulate a research hypothesis, design a project to test the hypothesis, collect data, and make preliminary interpretations on that data. Students make class presentations on background information and data collection during the semester. At the conclusion of the semester, students present their detailed research project to the department as a poster during a poster session where they must communicate their science orally to session attendees. With their capstone research projects, most students choose projects within the local area, and must work to figure out field logistics and site access, thus encouraging interaction outside the university community. Because projects must be completed within one semester, they must also work on time management skills. Field note-taking skills are critical for students who plan to work as professional geologists. Most Geology courses that have a field component require students to maintain a field notebook that is evaluated as a part of their grade.

Multiple Geology classes contain problem-based lab exercises where students are presented with, or collect their own, real-world data. For example, Dr. Brock-Hon's Soil Properties, Genesis, and Development Across the Landscape students spend four days collecting soil data and samples from a field site. They choose which lab analyses to perform, and collect their lab and field data to make interpretations on formation of the soils before presenting their final interpretations to the class. In Sedimentary Rocks and Stratigraphy, Dr. Holmes presents a well-logging activity which includes a 4-part basin exercise starting with thin sections and ending with correlation across a basin (Book Cliff, UT). In X-ray Diffraction, students determine the mineralogical components of an unknown sample. Students in the GIS for Geology course use GIS to solve a real-world geologic problem as a part of their final grade.

Over the past three years, Dr. Brock-Hon's Geomorphology and Earth Surface Processes students have had the opportunity to learn about geophysical techniques applied to geomorphic questions alongside project geophysicists from a local geotechnical company, one of which is a graduate of the Geology Program. Students have been able to run a geophysical survey, setting lines for seismic, resistivity, and S and P data collection. Students have also volunteered to work on a project outside of class with geophysical data collection at several sites on the Cumberland Plateau. This interaction with Geology professionals in-and-out of the classroom has allowed them to work and learn alongside Geology professionals in a field setting.

Student Clubs

The Geology Program supports two student clubs available to all students in the program. These clubs provide opportunities to engage with professionals inside and outside of the Geology profession.

Geology Club

The UTC Geology Club is available to all UTC students, and is not exclusive to Geology majors. This allows Geology students the opportunity to communicate Geology and interact with non-majors. The purpose of the Geology Club is to provide students with a club that focuses on having fun learning about Geology and participating in Geology-focused activities. Club members also provide services to the department and community by offering tutoring assistance and help interpreting Geology for local organizations and businesses. The Geology Club has used its service component to partner with the Creative Discovery Museum (CDM) to help with conveying basic geologic concepts to children. One of the more impressive projects tackled by the Geology Club was the design of a rock and mineral identification station. Club members met with the CDM staff to ascertain the needs and restrictions on the project, then designed and collected samples for the display before presenting their final idea to the CDM. Students also collected and identified fossils for a separate display. These service activities alongside the staff of the CDM helped to build skills in communication to the non-geologic community.

The club occasionally hosts former graduates of the Geology Program who are currently in graduate school. These former graduates hold informal talks for club members about their experiences in graduate school, recommendations for the application process, how to pick a good advisor, and other useful information.

Student Chapter of the American Institute of Professional Geologists

The UTC Student Chapter of the American Institute of Professional Geologists (AIPG) applied for and received its charter in 2014, and works with the Tennessee Chapter of the AIPG. Membership to the national organization is free for student members but is solely for Geology majors as required by the national organization. The purpose of the club is to advance the professional skills of its members, and establish networking opportunities for students interested in a professional career as a geologist. The AIPG student club has attended Tennessee Chapter meetings in Nashville. At these meetings, students are able to interact with professional geologists and ask questions about working in the field. The UTC Student Chapter of the AIPG hosts speakers to discuss their experiences working in the profession, the necessary skills needed to excel, and other opportunities in Geology after graduation. A list of speakers hosted by the AIPG student chapter includes:

- *Former student Paul Hubbard discussed working as the lab supervisor at a local geotechnical company.*
- *Local geologist Melanie Krautstrunk discussed her work with the Peace Corps in Gauna.*
- *Society of Engineering Geologists Jahn's Lecturer Jerome DeGraff presented a talk titled:* "What does it take to effectively monitor for environmental and engineering geology projects"
- *A speaker from the National Association of State Boards of Geology (ASBOG) discussed the ASBOG licensure examination including resources available to students, when to take the exam, and the value of taking the exam soon after graduation.*

Geological Society of America

Students in the program are encouraged to become student members of the Geological Society of America (GSA). While it is unknown how many students are members, a number have been active in both regional and national meetings as volunteers, attendees, and research presenters. In 2015, Drs. Brock-Hon, Holmes, and Mies organized the GSA Southeastern Section Meeting which was held in Chattanooga. Students helped in the preparation for and organization of that meeting. At the 2015 meeting, 22 students attended the meeting, nine worked as volunteers, and two presented research. At GSA meetings, students may attend career luncheons and meet with professionals working in the field, prospective employers, and graduate schools.

3.3 Student Application of Learning Outside the Classroom

3.3.1 Biology and Environmental Science

Opportunities exist for undergraduate students to apply skills and knowledge learned in their coursework to situations outside the classroom. These opportunities range from attendance and presentations at conferences to Supplemental Instruction (SI) leaders to grant writing experiences. During the current review period, 174 students gave academic and scientific presentations at professional conferences and through opportunities provided on campus. Students in the BGE department also take advantage of grant writing opportunities in pursuit of support for research projects. Twelve of our Functional Human Anatomy and Human Physiology students have served as SI leaders. These students are tasked with leading three-hour tutoring sessions for an individual section of either Functional Human Anatomy or Human Physiology. SI leaders prepare review material, practice exams, and games to help current students learn. Our undergraduate students have ample opportunities to apply what they have learned through research with faculty members. Since 2012, 51 students have been actively involved as Research Assistants with an additional 139 students otherwise engaged in research. Forty-nine of these students went on to submit an academic paper for publication as lead author or co-author. As discussed in section 3.2, our students also participate in a diverse range of internships and opportunities for research with our UTC community partners. During the review period (Fall 2012-Fall 2017), 104 students in the Environmental Science Program completed an internship for credit (awarded as ESC 4910). Additionally, 25 students gained museum experience by preparing, cataloging, and preserving specimen held within the UTC Natural History Museum. Field trips or field work components are included in several Biology and Environmental Science courses such as Mammalogy (BIOL 4140), Ornithology (BIOL 4170), Entomology (BIOL 4070), Plant Taxonomy (BIOL 4190), Plant Morphology (BIOL 4180), Mycology (BIOL 4150), Environmental Survey Methods (ESC 3400), Tropical Marine Ecology (BIOL/ESC 4400), Limnology and Reservoir Ecology (BIOL/ESC 4520), Herpetology (BIOL 4090), Amphibian Conservation (ESC 4999), Introduction to Soil Resources (BIOL 4680), and Urban Gardening (BIOL 1999/4999).

3.3.2 Geology

The Geology Program provides students with ample opportunities to apply what they have learned to situations outside of the classroom. These opportunities range from service projects with the Geology Club to field courses designed around travel to study Geology outside of the United States.

Student Club Activities

Examples of club activities include the UTC Geology Club's work with the Creative Discovery Museum where students designed a rock and mineral identification station for children. Each semester, Geology Club members serve as tutors for Physical Geology and Historical Geology students. Club activities also include caving, fossil and mineral hunting, and kayaking trips so that students may observe geologic phenomena outside of the classroom.

Individual Studies

Over two semesters during the review period, four students worked with Dr. Brock-Hon and the Creative Discovery Museum to describe the mineralogy of approximately 10 sand samples from around the world for their "Sands Around the World" display. These students identified the mineralogy of grains, labeled images of the sand, and provided a brief description of the sand for children. Students applied their knowledge of mineral identification and provenance from Mineralogy, X-Ray Diffraction, and Sedimentary Rocks and Stratigraphy courses, and synthesized this information into a written form understandable to children.

Outside Lecturers

The Geology Program does not have an established lecture series. Since the merger with Biology and Environmental Science, several Geology faculty have presented their research in the Biology Seminar. During the review period, Geology faculty brought in two lecturers who gave presentations open to students in the program, the university community, and the general public. These were:

- Bill Witherspoon *"Golddiggers, Generals, and Tightrope Walkers—Geology's Impact on People.*
- Christine Powell *"East Tennessee Seismic Zone"*

Presentation of Research

Students who participate in research with faculty are often encouraged to present their work at meetings of the Tennessee Academy of Science (TAS), Southeastern Section of the Geological Society of America (GSA), and the Annual Meeting of the Geological Society of America. Over the review period, 12 students have presented their work at regional and national GSA meetings, six at TAS meetings and two at UTC RE*SEARCH* Dialogues. Four Geology majors have applied for and received Provost Student Research Awards totaling more than $3,000.

Teaching Assistants

Teaching Assistant (TA) positions are available to students to help in Mineralogy and Historical Geology classes. Students are selected for the TA positions based on their course grades, ability to interact and explain concepts, and availability. Over the review period, four students have been employed as TAs in the program.

3.4 Student Exposure to Diverse Perspectives and Experiences

3.4.1 Biology and Environmental Science

As discussed earlier, Biology and Environmental Science students are given access to a number of diverse learning opportunities. The department offers a course titled Biology Seminar (BIOL 4610) each fall and spring semester. Students attending the presentations in seminar are exposed to research being conducted by UTC faculty across multiple disciplines, as well as to research being conducted by guest speakers from other institutions. After the seminar, students get a chance to ask questions and network with the speakers.

Twelve upper level courses in Biology and Environmental Science have field components, including some courses that include field trips. These experiences move learning out of the classroom and into the surrounding communities, giving students the opportunity to experience, first-hand, the diverse organisms and locales of the area. Students are given the opportunity to practice newly learned skills in the natural environment, such as sampling techniques, data collection, and experimental design. In addition to three field stations that focus on the natural heritage of the Ridge and Valley Eco Region of Tennessee, UTC has affiliations with the Gulf Coast Research Laboratory (GCRL) in Ocean Springs, MS and Highlands Biological Station in Highlands, NC. These field stations afford our students experiences that are otherwise not available on the main UTC campus. Several students have taken Marine Biology and Ecology courses at GCRL.

The Environmental Science curriculum includes several courses that expose students to diverse perspectives that may challenge conventional understandings and preferences. In the introductory Environmental Science courses (ESC 1500 and 1510 lecture and lab) students are introduced to the complex interrelationships between environmental, economic, and social issues. Upper level courses delve into these issues in more depth, including Air and Water Pollution Control (ESC 3600), Environmental Conservation (ESC 4070), Environmental Law and Agencies (ESC 4100), Problems in Environmental Management (ESC 4300), and Values and the Environment (ESC 4840). In several of these courses students are assigned stakeholder roles in hypothetical and real-world situations, and are required to advocate their positions in written and oral form. These experiences prepare students to be effective professionals in the environmental arena.

The faculty in the department have a wide range of research interests. Students have the opportunity to engage with the faculty in research, enabling them to apply their knowledge in the laboratory or in the field. Undergraduate research typically leads students to attend regional and national meetings, where they are given the opportunity to interact with students and faculty from other institutions. Often, our students present their research at meetings, allowing them to interact with graduate faculty and potentially form valuable connections to graduate programs. Travel to regional meetings may also represent the first time that students have left the area that they call home. Being able to travel to new locales and interact with people with different experiences and backgrounds is an important opportunity for our students.

Many students in the Biology and Environmental Science Programs take part in study abroad and domestic exchange opportunities during their time at UTC. These programs allow students to continue their studies in another part of the country or world while enabling them to explore the culture of a different region. Study abroad experiences often allow students to study and experience unique areas of biodiversity, such as the rain forests of Costa Rica, the beaches and reefs of San Salvador, or the Great Barrier Reef of Australia. The department works closely with students that plan to study abroad to ensure that they take appropriate classes for their major, and that those courses are properly credited once they are transferred back to UTC.

3.4.2 Geology

Diverse experiential learning opportunities are inherent to the Geology Program with course embedded field trips and labs. Eleven out of 25 courses offered in the Geology Program require field trips, and 11 require a laboratory component. Field trips in Geology courses range from 2-hour day trips and weekend overnight trips, to week-long course trips. Locations visited range from local sites in Chattanooga to southern Indiana and Florida. These field trips allow students to observe and examine a diversity of earth materials, structures, rock type and relationships, landscapes, and soils.

Field Trip Courses

The Geology Program offers two courses that give students an opportunity to study and travel to geologic areas outside of the southeastern United States and the country. Since 1993, the Geology Program has offered Geology Field Experience (GEOL 4960) every spring semester that alternately travels to locations in the southwestern United States (odd years) and Costa Rica (even years until 2016). The course is open to all students who have passed Physical Geology (GEOL 1110). In 2016, the course traveled to the Pyrenees in northern Spain. This is a 3-hour course (4 for Spain) that culminates in a 10-day field trip. Region-specific Geology, taught by traditional lectures is followed by student-led discussions of specific field trip topics. Highlights of the Costa Rica trips have included active volcanoes, hot springs, emergent coral reefs, exposures of relatively young volcanic rock, sedimentary rock, and those of the ocean floor, flora and fauna of cloud forests, coastal rainforests, and local culture. One semester, students experienced the shaking due to an M 6.0 earthquake. In Spain, students experienced the Geology of the Pyrenees from geologic structures to glaciations.

The Tropical Island Ecology and Geology course is a cross-disciplinary 2-semester course which targets Geology, Biology, and Environmental Science majors, and satisfies a Geology elective for Geology majors. Students spend the spring semester learning about cross-disciplinary concepts, then travel to the Bahamas during the summer to conduct research. Upon return, students synthesize their data and present their findings to the campus community.

Senior Seminar Projects

In their capstone courses, Geology students conduct 1-semester research projects of their own formulation and design. In this course, students apply concepts learned throughout their coursework at UTC. A select list of Senior Seminar research titles includes:

- Watershed contamination from septic tank effluence on Signal Mountain, TN
- Examination of volumetric changes related to bentonite exposures in Chattanooga, TN
- Structural influence on the orientation of cave passageways in the Bangor Limestone: a study of Pettijohn's Cave, NW Georgia
- Determining a Mississippian age paleoenvironment through fossil assemblages found at Tims Ford State Park, TN
- Investigation of the sedimentation rate since 1940 of Wolftever Embayment in Hamilton County, TN
- Soil chronosequences of a meander cutoff on South Chickamauga Creek Near Mackey Branch
- Investigation into the development of a land mass formed in Rainbow Lake, Signal Mountain, TN
- Investigation for epibiont-host relationships from the Silurian Rockwood Formation Tiftonia, TN
- Correlations between UTC's seismometer data and three commonly used Reference Earth Models
- Subsurface correlation of Devonian-Mississippian strata, located in the Middlesboro Syncline, Southeastern KY
- Correlating paleobotanical diversity of the Late Carboniferous within the Southeastern Tennessee region to corresponding environmental and climatic differentiation
- Stratigraphic and structural analysis of Raccoon Mountain in Tennessee
- Comparing the Waccama, Duplin and Wicomico formations of the Southeastern United States: foram analysis of paleoecological setting
- An investigation of the vertical Sewanee Sandstone Formation at the Devils Racetrack
- Garnet growth in relation to the foliation of the Corbin Gneiss Complex of Cartersville, Georgia
- Micro-sedimentary features of the Chattanooga Shale
- Structural analysis of deformed Middle Ordovician Limestone, Chickamauga Dam, Chattanooga TN
- Correlating the contacts of the Ocoee Supergroup observed along the Ocoee and Hiwassee Rivers, Polk County, TN
- Structural analysis of the Sequatchie Valley Anticline, Tennessee
- Comparative sedimentologic and geomorphic analysis of Santa Rosa Island, Florida-Major Hurricane impacts of 2004-2005 and post-decadal recovery
- Investigation of an anomalous weathering pattern and lithological properties of Pennsylvanian sandstone on Mowbray Mountain near Chattanooga, TN
- Correlating specific yield and porosity to soils exposed during the Rough Ridge Wildfires
- XRD analysis of potential paleosol from Gray Fossil Site, TN
- Evidence for lichen-induced substrate biodegradation of the Monteagle limestone at Little Cedar Mountain, TN: Mechanisms and projects at the lichen-rock interface
- The search for microfossils in the Walden Creek Group, Ocoee Supergroup, using the liquid nitrogen (LN2) method for Chattanooga rock disintegration
- Characterization of outcrop at Woodstock, Georgia and possible mélange interpretation
- Assessing the morphology of soils found at Soddy Creek Wildlife management area
- Exploring landslide susceptibility in Hamilton County, Tennessee using GIS
- Interior pond sediments of San Salvador Island, Bahamas: Analysis and comparison of influence by Hurricane Matthew (2016) to Hurricane Joaquin (2015)
- Origin of doubly terminated quartz fragments in petrocalcic soil horizon gravels: Mormon Mesa, Nevada
- Detection of coal and PAHs in South Chattanooga soils
- Determining distance and direction of earthquakes using particle motion analysis and polarization analysis of the relative p-waves with single-station location
- Characterization of the alteration mineralogy of the Norris Lake Kimberlite
- Measuring storm intensity with microseism characteristics

Student Research with Faculty

Students often have the opportunity to work with faculty on diverse geologic problems from outside the Chattanooga area. For example, in the Geology Program, Dr. Brock-Hon investigates soils from arid regions. Students have worked with her using samples from Nevada, western Kansas, Arizona, Texas, and New Mexico. In 2016, one student was funded to travel with Dr. Brock-Hon to collect samples in Nevada. Dr. Mies recently incorporated students in research on global seismic signatures of earthquakes and hurricanes recorded on the department seismometer.

3.5 Student Access to Appropriate Academic Support Services

For students to be successful, they must have access to appropriate academic support services. Students in the Department of Biology, Geology, and Environmental Science have access to a wide range of services that are focused on student success. Services available to students include academic advising, tutoring and supplemental instruction, personal and career counseling, and career and employment services.

3.5.1 Biology and Environmental Science

Academic advising helps students navigate the curriculum and ensures that they make progress towards degree completion. The large number of Biology and Environmental Science majors (nearly 1000) requires several advising mechanisms. First-year students are paired with an advisor in the Center for Advisement who helps with course selection and major exploration. With the completion of 28 hours of coursework, students move to the department for advising. Biology and Environmental Science students are assigned advisors based on their concentration. About half of the students in the division meet with the departmental academic advisor (400-450 students per semester). Students are allowed to meet with any faculty advisor or the departmental advisor based on their preferences. For several weeks prior to each registration period, all faculty are available for several half day advising sessions, during which students sign up for individual advising. The departmental academic advisor and faculty are also available for advising throughout the semester by appointment. Academic advising prior to course registration is required, as students must obtain a unique PIN each semester that allows them to register their desired courses. Advising appointments also provide an opportunity for students to discuss their future academic and career goals with their advisor. Students receive guidance concerning application processes for graduate and professional programs as well as information about careers in their field and the skills needed to be successful in those careers.

3.5.2 Geology

Geology majors are advised by Geology faculty. The advising scheme is alphabetical by students' last name (Table 3.1). The UTC Center for Advisement has been asked to encourage freshmen Geology majors to see their Geology advisors during their first year. At advising sessions, students are informed about the course offering schedule and assisted with developing their program plan. Prior to registration for the next semester, students are given their registration

PIN. Geology faculty are also available outside of scheduled advising times throughout the semester.

Table 3.1 Geology advising scheme.

Student's Last Name	Advisor
A-B	Brock-Hon
C-F	Churnet
G-L	Holmes
M-R	Hossain
S-W	Mies

3.5.3 Biology, Geology, and Environmental Science

The Center for College and Student Success (CCSS) provides support to all university students in the form of tutoring, supplemental instruction, time management programs, study skills programs, and strategies to prepare for exams. All of these services are provided free of charge to all students enrolled at the university.

One-hour tutoring sessions are available for the courses shown in Table 3.2. Students applying as peer tutors must be upperclassmen with a minimum 3.0 GPA, and must have earned at least a B in the subject that they plan to tutor. Table 3.3 shows the number of students who sought out tutoring and the total number of visits to tutors from Fall 2012 to Fall 2016. The center does not record the student's major or department when they attend tutoring, though many of the classes for which tutoring is offered are required of our majors. The department has a standing committee called the Low GPA Committee that performs outreach to students who are struggling academically. One of the services that the committee recommends to students who are struggling is peer tutoring. In a report from Fall 2015, the CCSS shared that students attending five or more tutoring sessions for a course showed incredible success, with 54% of those students earning an A or B in the course and 82% scoring a C or better in the course. In eleven of the courses that offered tutoring sessions in Fall 2015, 100% of the students who attended five or more tutoring sessions for the course received a C or better in the course.

Table 3.2 Courses with Peer Tutoring

Discipline	Course Numbers
Biology	1110, 1120, 1130, 2060, 2080, 2100
Chemistry	1110, 1120, 3010, 3020
Economics	1010, 1020
Engineering	1030, 1040
Mathematics	1010, 1130, 1710, 1720, 1730, 1830, 1950, 1960, 2100, 2200, 2450
Nursing	2260
Physics	1030, 1040

Table 3.3 Number of Students Tutored and the Total Number of Tutoring Sessions Fall 2012-Fall 2016

Semester	Students Tutored	Total Number of Sessions
Fall 2012	233	1263
Spring 2013	231	1721
Fall 2013	443	3194
Spring 2014	290	2279
Fall 2014	397	2658
Spring 2015	329	2247
Fall 2015	372	2516
Spring 2016	327	2462
Fall 2016	598	2312

Supplemental Instruction (SI) is another resource that students can utilize to improve their academic performance in certain introductory courses. SI is provided free of charge through the CCSS. SI leaders are upperclassmen with an overall GPA of 3.0 and have completed the course that they plan to lead with an A or B grade. SI sessions provide an opportunity for students to review their notes, discuss class readings, and develop strategies for upcoming exams. SI leaders attend the same class meetings, take notes, and review those materials with students in the session. SI is available for Biology 2060, Biology 2080, Chemistry 1110, Chemistry 1120, Physics 1030, and Physics 1040. In a 2015-2016 report, the center reported that students who attended SI sessions for the courses in which they were enrolled had course GPAs 0.05 to 0.98 points higher than classmates who did not attend the sessions.

The Counseling and Personal Development Center (CPDC) is available to university students for a wide range of services. The center provides free counseling to students who need help with anxiety, depression, adjustment issues, relationship problems, substance abuse, crisis intervention, trauma, and academic concerns. Intake meetings with CPDC staff are available by appointment or on a walk-in basis. The center provides individual and group sessions to provide the help that students need with their issues. These sessions focus on helping the student gain the skills and abilities needed to better cope with the issues that they might be facing. The center also provides crisis services to assist students with traumatic events, thoughts of suicide, thoughts of harming others, and psychotic episodes. Some low-cost career and personality testing is available to students as well. The Myers Briggs Type Indicator and Strong Interest Inventory are provided to interested students for a nominal fee. The center also provides psychiatric support, including referrals for psychiatric services and medications, as well as medication management.

The Disability Resource Center (DRC) provides access and accommodations for students with disabilities across all courses and majors. Accommodations ensure that students with disabilities have the same level of access to the courses that they are taking. The DRC provides a range of services, including assistive technology and classroom, exam, and housing accommodations. Students can make a request for services at any time during the academic year. The DRC also directs the MOSAIC program, which is designed to aid and support students with Autism Spectrum Disorders.

University Career Services (UCS) strives to provide students with the tools they need to be successful in their job search and to provide students with the proper documents for employment and admission interviews. The office provides career exploration resources, assistance with resume development, preparation for interviews, and provides job listings for on and off campus employment opportunities. Professional U is a self-paced certificate program that helps students develop their resume and practice their interview skills, provides input on professional dress and grooming, and introduces them to networking. UCS also hosts a number of job fairs and program recruitment events on campus in an effort to connect students with employers and allow them to explore professional and graduate opportunities. The services are provided free of charge to current students and alumni.

3.6 Department Narrative, Strengths, Weaknesses, and Recommendations for Improvement

3.6.1 Biology and Environmental Science

Biology and Environmental Science students have opportunities to regularly evaluate the curricula and faculty teaching effectiveness. Students are also given the opportunity to provide their overall thoughts on the programs. Surveys are conducted at both the department and university levels to obtain feedback from our students concerning the programs and the faculty. Faculty and administration use results from various surveys to make meaningful changes to meet the needs of our students. Unfortunately, student participation is typically low. As a department, we need to think of strategies that will increase the number of students who participate in the surveys. We also need to communicate the value of the survey responses to our students.

Students are exposed to professional and career opportunities through research participation, seminars, professional meetings, and through interaction with faculty, advisors, and campus resources, such as University Career Services. The university recently hired a Pre-Health Advisor to serve as the campus-wide resource for students seeking admission to professional programs in medical and allied health fields. The department is also working with entities in the community to increase opportunities for student internships, job shadowing experiences, and job placement. Undergraduate research is a major draw for students in our department. The dedication and willingness of the faculty to offer these opportunities speaks to the importance of these experiences. Unfortunately, the number of faculty, space, and resources have not kept pace with the increase in student enrollment, so the number of students that can be involved in research is limited. Hopefully, the Holt Hall renovation will address some of the space issues. A number of existing Biology and Environmental Science lab courses include an experiential component, such as conducting research and presenting findings through posters or orally. BGE is presently identifying these courses and considering categorizing them as capstone experiences to further the UTC and department goal of involving all students in some form of experiential learning.

3.6.2 Geology

Students in the Geology Program are able to communicate their thoughts on the curriculum and program, teaching effectiveness, overall program experience through surveys at the department through university levels. Geology faculty work to meet the needs of students by reflecting on student survey data. However, student participation in these surveys is low. Additionally, determining student opinion of the Geology Program is complicated due to overwhelming numbers of Biology and Environmental Science student data that is included in the survey results. Dividing student responses by program would be more helpful in determining weaknesses and strengths at the program level.

Geology students are provided with professional and career opportunities through involvement in student clubs, engagement in research opportunities, and participation in professional organizations. Students should also be encouraged to become members of AIPG and interact with the professional geologists of the Tennessee Chapter. While student involvement in Geology clubs varies by semester, the program can do more to motivate students to become active members. The program can also endeavor to bring at least one professional speaker to campus each semester to talk with students about working as a Geology professional.

PART 4. FACULTY

4.1 Faculty Credentials

The Department includes 32 full-time faculty. One of the departmental faculty is Dean of the Graduate School and Vice-Chancellor for Research, and another is Provost and Vice-Chancellor for Academic Affairs (the former does some teaching for the department, the latter does not), and we have one computer science faculty member with a part-time appointment and some teaching responsibilities in the department. Excluding these, there are effectively 30 full-time faculty members, and this is the count we will employ for the remainder of this section. Of these 30 faculty, 23 are tenure-track, seven are full-time instructors (two of whom serve as laboratory coordinators, and one as Introductory Biology lecture coordinator), and we have two faculty associate/laboratory coordinators, and one full-time academic advisor. Twenty-five of the full-time faculty are in the Divisions of Biology and Environmental Science and five of the full-time faculty are in the Division of Geology. At least 26 part-time faculty members have taught undergraduate courses for the department over the past five years. Among the full-time faculty, 26 possesses terminal academic degrees, including 24 Ph.D.'s, one Ed.D., and one J.D./LL.M. The laboratory coordinator for introductory Biology holds a Ph.D. in Ecology. The laboratory/course coordinator for Environmental Science Program holds an E.D. in Learning and Leadership and the lab coordinator for Geology holds an M.S. in Geology. The educational backgrounds of our faculty represent a geographic spectrum, with graduate degrees deriving from institutions across the U.S. One faculty member received his terminal degree overseas.

The research and teaching interests of our faculty are diverse, allowing the department to serve a wide range of student programs of study in Biology, Geology, and Environmental Science. In the Biology and Environmental Science Divisions, our strengths are in the areas of (1) ecology and restoration ecology, (2) ecology, evolution, and behavior, (3) environment and human health, (4) environmental and natural resource law and policy, (5) microbiology, (6) molecular and cellular biology, (7) organismal biology, and (8) systematics and biodiversity, 9) toxicology, 10) human impacts on insect physiology and behavior, 11) and Geographic Information Systems (Table 4.1). We have four faculty members working primarily in Environmental Sciences, including the areas of toxicology, environmental law and policy, human impacts on insect physiology and behavior, and Geographic Information Systems, and many other faculty's research and teaching crosses over into both Biology and Environmental Science. Two of our faculty members regularly teach courses in biostatistics. Two of our faculty members are microbiologists and one faculty member is a developmental biologist, and two have expertise in paleontology. We have four botanists with interests in floristics, Chestnut tree restoration, plant ecology, plant physiology, and higher plant systematics. We have seven faculty members that study animal systems, including insects, amphibians and reptiles, birds, fish, and mammals. We have three faculty members with interests in behavioral ecology. Several members of our faculty are knowledgeable about molecular Biology and proficient in employing molecular techniques in their research. Specifically, four of our faculty members employ molecular tools such as: PCR and DNA sequencing to address questions of evolution and biogeography in plants; conservation genetics to facilitate restoration ecology; the identification and functional characterization of genes to determine their influences on nuclear functions such as DNA replication, chromosome segregation and gene expression; and integrating the study of molecular Biology with histological techniques and developmental questions.

In the Geology Division, faculty research and teaching emphases cover the core areas of Geology including mineralogy, sedimentology, paleontology, petrology, stratigraphy, structural geology, economic geology, geomorphology and environmental geology with applications to local, regional, national and global problems. Faculty research at the local and regional levels focus on the origins and deformation of rocks, stratigraphic and paleontological questions, economic mineral deposits in the southeastern USA, and structure, tectonics, and terrain boundaries of the southern Appalachians. Other interests include geomorphic landforms genesis and development across the Cumberland plateau. In addition to local and regional interests, faculty study arid soil-geomorphology of landforms developed in the southwestern USA, stratigraphic and paleontological history of the Bahamas, and the application of GIS, remote sensing and spatial analysis to better understand our physical environments and the impact of human-environment interactions, watershed processes, sediment/pollutant transfer, and flood and drought monitoring. One of our faculty has a budding interest in global seismicity as recorded at the UTC seismic station. Extraordinary field trips to the Spanish Pyrenees, Central America, and Scotland extend our teaching and learning, and research interests to include these areas. Above all else, the faculty in Geology emphasize collaborative research with students in broad areas of geoscience.

BGE faculty members collaborate with local, national, and international partners, providing students with a broad range of projects, educational opportunities, and networking locally and abroad. Local collaborations include organizations such as the Tennessee Aquarium, Erlanger Hospital, Reflection Riding Arboretum and Nature Center, Chattanooga Zoo, Tennessee River Gorge Trust, and North Chickamauga Creek Conservancy. Our faculty members collaborate with researchers at a wide range of universities in Tennessee and other states. Several BGE faculty members have international collaborations, including collaborations in Argentina, Australia, Canada, Chile, England, France, Germany, Italy, and Switzerland. BGE faculty members have given seminars and conference presentations, participated in workshops, and served on Ph.D. committees in numerous countries.

Table 4.1 Broad areas of expertise among BGE tenured/tenure-track faculty.

Areas of Expertise	**Faculty**
Conservation and Restoration Ecology	Aborn, Barbosa, Boyd, Craddock, Schorr, Spratt, Wilson
Ecology, Evolution and Behavior	Aborn, Beasley, Boyd, Hayes, Klug, Schorr, Wilson
Environmental and Human Health	Carver, Giles, Hossain, Kovach, Richards, Spratt
Environmental Law	Tucker
Geology	Brock-Hon, Churnet, Holmes, Hossain, Mies
Geospatial Services	Hossain, Wilson
Microbiology	Giles, Spratt
Molecular Biology and Cell Physiology	Barbosa, Carver, Giles, Kovach

Organismal Biology	Aborn, Boyd, Carver, Chatzimanolis, Craddock, Gaudin, Hayes, Klug, Schorr, Shaw, Wilson
Systematics and Biodiversity	Chatzimanolis, Craddock, Gaudin, Shaw, Wilson

Our full-time, non-tenure track instructors play an important role in departmental affairs. Our instructors and faculty advisor coordinate laboratories and teach large sections of introductory Biology and Environmental Science (see Section 4.2.2), allowing tenure-track faculty to teach upper-division undergraduate courses for the Biology and Environmental Science Programs. Our full-time instructors also participate in departmental and university governance and in departmental, college, and university service activities. Our academic advisor advises 450-500 undergraduate Biology and Environmental Science students per semester.

4.1.1 Academic Credentials of Full-Time Faculty

4.1.1.2 Biology and Environmental Science Faculty

David Aborn (Associate Professor)
B.S. in Zoology, Clemson University, 1985; M.S. in Zoology, Clemson University, 1989; Ph.D. in Biological Sciences, University of Southern Mississippi, 1996. – Bird migration, conservation, and management

Dr. Aborn is primarily interested in understanding how human activity impacts bird populations, especially migratory species. He engages his students in hypothesis-driven, primarily field-based research. The majority of his research has focused on the importance of urban greenspaces as stopover sites for migrating songbirds, the management and wintering biology of Sandhill Cranes (*Grus canadensis tabida*) on public and private lands, and the reproductive biology of Tree Swallows (*Tachycineta bicolor*) in Chattanooga

Meredith Adams (Lecturer and Principles of Biology Lecture Coordinator)
B.S. in Environmental Science, University of Tennessee at Chattanooga, 2006; M.S. in Environmental Science, University of Tennessee at Chattanooga, 2009. – Teaches Introduction to Environmental Science, Principles of Biology, and Problems in Environmental Management.

Meredith Adams is interested in student campus and community engagement, educational outreach, and environmental education. Her graduate research focused on the phylogeography of *Clematis fremontii* and incomplete nrDNA concerted evolution in *Clematis* subgenus *Viorna*.

José Maria Ferreira Barbosa (Associate Professor)
Licentiate in Agronomy Universidad Central de Las Villas Cuba 1988; M.Sc. Plant Nutrition /Plant Stress Physiology, Auburn University 1997; Ph.D. Plant Sciences (Plant Physiology, Biochemistry and Molecular Biology) 2002

Dr. Barbosa's research interests center on understanding the different molecular responses to a myriad of environmental stresses. In addition, he explores different molecular approaches to overcome many physiological and or molecular challenges to which many organisms (particularly plants and yeast) are exposed. He has also begun an extensive, student-driven program in Urban Gardening.

<u>Nominanda I. Barbosa (Lecturer)</u>
B.S. in Biology, Coimbra University, Coimbra, Portugal, 1989; M.S. in Soil Sciences (Soil Microbiology), Auburn University, Auburn, AL, 2000; M.S. in Microbiology, Auburn University, Auburn, AL; 2005.

<u>DeAnna E. Beasley (Assistant Professor)</u>
B.S. in Biology, Wofford College, 2002; Ph.D. in Biological Sciences, University of South Carolina at Columbia, 2013 –Insects as Indicators of Environmental Stress

The aim of Dr. Beasley's research is to investigate how organisms respond to human-driven environmental change and apply ecological principles to understand implications for human health. She uses insects as a model species to explore morphological responses and microbial interactions to environmental effects associated with urbanization. She also has a strong interest in citizen science initiatives.

<u>Jennifer Boyd (Associate Professor)</u>
B.S. in Environmental Science and English (double major), Allegheny College, 1997; M.A. in Earth and Environmental Sciences, Columbia University, 2001; M.Phil. in Earth and Environmental Sciences, Columbia University, 2002; Ph.D. in Earth and Environmental Sciences (concentration in Ecology), Columbia University, 2003. – Plant physiological ecology

The question of why some species are rare while others are common is enduring and has important implications for ecological theory, rare species conservation, and overall biodiversity. Dr. Boyd is working with a team of collaborators to address this question with a multi-faceted research approach that includes a foundational meta-analysis of existing knowledge, new empirical ecophysiological and genetic investigations to determine potential acclimatory and adaptive constraints to species commonness, and the development of innovative mechanistic trait-based models that attempt to use ecological and genetic information to predict species performance and/or persistence as a broader application.

<u>Jeremy L. Bramblett (Lecturer)</u>
B.S. in Geology, University of Tennessee at Chattanooga, 2000; B.S. in Biology University of Tennessee at Chattanooga, 2010 M.Ed. Secondary Education: Science and Environmental Studies University of Tennessee at Chattanooga, 2005.

Jeremy Bramblett teaches Functional Human Anatomy, Human Physiology, Principles of Biology, and Histology lab. His research interests include studies of late Pleistocene microvertebrate fossils from southeast Tennessee; the phylogeny of fossil and recent armadillos and their extinct relatives, glyptodonts and pampatheres; and using polymer clays to make molds and casts of fossil teaching specimens for use in undergraduate courses and outreach.

Ethan A. Carver (UC Foundation Collins Professor-Assistant Dean, The Graduate School)
B.S. in Biology, University of Tennessee at Chattanooga, 1991; Ph.D. in Biomedical Sciences, University of Tennessee-Oak Ridge Graduate School of Biomedical Sciences, 1999. – Murine Genetics and Genomics

Research in Dr. Carver's laboratory focuses on zebrafish as a model organism for studying different aspects of development. He is particularly interested in the differentiation of cells and their subsequent formation into specific tissues. As such, he studies different areas including bone and muscle development. Zebrafish homologs to genes known to be involved in vertebral column defects in mammals are isolated. , Dr. Carver aims to study different vertebral column defects in zebrafish and look for new interactions in developmental pathways associated with development of this structure. Zebrafish are also involved in his program to study muscle development. Overtime, he plans to explore the events at the junction of muscle and bone development to see how these structures interrelate and signal each other to form the correct relationships been muscle, connective tissue and bone. Overall, students learn basic laboratory techniques, zebrafish genetics, developmental staging and immunohistochemistry, as well as basic molecular biology and advanced microscopy.

As a newer theme, Dr. Carver also works with a tissue culture system as a screening tool to investigate the effects of electronic cigarette refill solutions on cell growth, viability, and gene expression. This work is in collaboration with Dr. Potts and Dr. Kovach.

Jodi L Caskey (Lecturer)
B.S. in Resource Biology and Biodiversity, University of Louisiana at Lafayette, 1998; M.S. in Biology, University of Louisiana at Lafayette, 2004; Ph.D. in Environmental and Evolutionary Biology, University of Louisiana at Lafayette, 2009. – Mate Recognition of Caridean Shrimp

Stylianos Chatzimanolis (Guerry Associate Professor, Associate Department Head)
B.S. Biology University of Crete, Greece, 1999; PhD Entomology, University of Kansas, 2004; Postdoc Santa Barbara Museum of Natural History, 2005–2007 – Entomology, Paleontology

Dr. Chatzimanolis is a beetle systematist working with rove beetles, one of the greatest success stories in evolution. With more than 60,000 described species, they are found virtually everywhere and have a plethora of forms and evolutionary novelties. Even though rove beetles are numerous, they have received relatively little attention. Dr. Chatzimanolis is involved in several research projects dealing with both systematic questions (description of new species, phylogenetic analyses and monographs) and broader evolutionary questions such as the evolution of coloration, of eye size and the diversification of major lineages. The overall goal of this project is to produce species-level revisions for all neotropical *Xanthopygina* genera. Recently he has started a project to catalogue and identify the beetles in the TN valley region and the Cumberland Plateau. Simple questions such as: "How many species of beetles are there in TN?" or "What is the conservation status of beetles in TN?" are without an answer. Additionally, he is interested in describing fossil insects and investigating how these discoveries affect the phylogenetic relationships of extant taxa. Dr. Chatzimanolis plans to continue his paleoentomological studies with several new enigmatic genera of Staphylinidae from Burmese amber and the Green River Formation that will help to delineate the tribes and eventually understand the paleobiogeographic history of beetles.

J. Hill Craddock (UC Foundation Davenport Professor in Biology)
Università di Torino, Turin, Italy, Pomology, 1992 Dottorato di Ricerca
Oregon State University, Corvallis, OR, Horticulture, Master of Science, 1987
Indiana University, Bloomington, IN, Biology & Fine Arts, Bachelor of Arts, 1983

Dr. Craddock has been teaching introductory Biology, Mycology (the study of fungi; mushrooms, molds and yeasts), Dendrology (the study of trees), and Economic Botany (the evolution and domestication of cultivated plants) at UTC since 1996. His research has been supported, in part, by the Summerfield Johnston Endowment for the Restoration of the American Chestnut, The American Chestnut Foundation, the Bettie J. Smith LLC, and Dollywood.

Dr. Craddock's current research is focused on the restoration of the American chestnut to the Appalachian hardwood forest ecosystem and the establishment of a commercial chestnut industry in Tennessee. Project areas include breeding for resistance to chestnut blight and *Phytophthora* root rot, *Castanea* germplasm collection and characterization, and chestnut cultivar evaluations.

Sarah Farnsley (Lecturer)
B.S. in Communications, University of Tennessee, Knoxville, 2004; B.S. in Ecology and Evolutionary Biology, University of Tennessee, Knoxville, 2010; M.S. in Environmental Science, University of Tennessee, Chattanooga, 2014. – Animal behavior and conservation

Sarah Farnsley's graduate work focused on the conservation of a state-endangered fish, and her collaborations within UTC and with Chattanooga-area animal facilities have focused on Educational Outreach and Animal Enrichment.

Timothy J. Gaudin (UC Foundation Professor and Senior Associate Head)
B.S. in Zoology, University of Georgia, 1987; Ph.D. in Organismal Biology & Anatomy, University of Chicago, 1993. – Mammalian Phylogeny, Paleontology, and Functional Morphology

The primary research interests of Dr. Gaudin are in the systematics and morphological evolution of "edentate" mammals (including anteaters, sloths, armadillos, pangolins and related fossil forms). He employs tools from phylogenetic systematics, paleontology, comparative anatomy and functional morphology to pursue questions related to the patterns of diversification of these unusual mammals. In addition, he is interested in the biodiversity and biogeography of living mammals in southeastern Tennessee. Dr. Gaudin is also working on a long-term project involving the recovery and analysis of Late Pleistocene vertebrate faunas from Lookout Mountain, TN, in order to better understand the historical biodiversity, biogeography, and paleoecology of southeastern Tennessee vertebrates.

David Giles (Assistant Professor)
B.A. in Biology, Maryville College, 2001; Ph.D. in Biomedical Sciences (Microbiology concentration), East Tennessee State University, 2008

The objective of Dr. Giles' research program is to contribute to an understanding of exogenous fatty acid acquisition and utilization in Gram negative bacteria. To achieve this goal, he uses hypothesis-driven laboratory research using several bacteria of medical importance. During his first five years, he established the impact of exogenous fatty acids in six Gram-negative bacteria, including alterations to membrane phospholipid structure, permeability, motility, biofilm formation and antibiotic resistance. His current focus is shifting toward definition of the mechanisms responsible for the phenotypic changes in *Vibrio cholerae*, while collaborative efforts involve molecular characterization of methicillin-resistant *Staphylococcus aureus* isolated from hospital environments and patients.

Katherine E. Harrell (Lecturer and Anatomy & Physiology Lab Coordinator)
B.S. in Molecular Biology, B.A. English Literature, Virginia Tech, 2002; M.S. in Animal & Veterinary Science, Developmental Physiology, Clemson University 2009. – Teaches Human Physiology and Functional Human Anatomy and coordinates the labs for those courses.

Katherine Harrell is interested in pre-professional student development and education. She is a licensed with the TWRA as a volunteer Class II wildlife rehabilitator and volunteers with a local non-profit Happinest Wildlife Rehabilitation and Rescue, and has been a guest speaker for several student organizations. Her graduate research characterized the effects of estrogen on the histological changes in mammary development in prepubertal Holstein calves.

Loren Hayes (Associate Professor)
B.S. in Biology, Bates College, 1996; M.S. in Zoology, Michigan State University, 1999; Ph.D. in Zoology, Miami University, 2004. – Vertebrate social systems

The objective of Dr. Hayes' research program is to contribute to an integrative understanding of vertebrate sociality. To achieve this goal, he engages in hypothesis-driven field and laboratory research using social rodents as model organisms. Most of his empirical work focuses on the reproductive consequences and stress responses of socially living *Octodon degus*, a caviomorph rodent endemic to Chile. Dr. Hayes is also examining how environmental conditions and life history influence intraspecific variation in mammalian social organization.

Hope Klug (UC Foundation Associate Professor)
B.S. in Zoology and Psychology, University of Florida, 2001; Ph.D. in Zoology, University of Florida, 2007. – Evolutionary ecology

Dr. Klug's research lies at the interface of evolution and ecology. To address key questions in evolutionary and behavioral ecology, she uses a combination of theoretical and empirical tools. Her research focuses on 1) unifying life history, mating system and parental care theory, 2) broadening our understanding of co-evolutionary dynamics between mating and parental behavior, 3) enhancing our understanding of the measurement of sexual selection, and 4) exploring the link between evolutionary traps and behavior. Dr. Klug's approach is integrative.

She strives to develop theoretical tools, directly assess novel predictions in relation to natural patterns of behavior, and in doing so, tackle central questions in evolutionary and behavioral biology.

Margaret Kovach (UC Foundation Professor)
B.A. in Microbiology, Southern Illinois University-Carbondale, 1986; Ph.D. in Microbiology, Colorado State University, 1995. – Molecular pathology of disease

Dr. Kovach's primary research interest is in mammalian genomics: the identification and functional characterization of genes. In particular, she is interested in genome organization and chromatin structure and their influences on nuclear functions such as DNA replication, chromosome segregation and gene expression. Currently she has two projects that focus on gene regulatory effects and mechanisms involved in the molecular pathology of cancer and hereditary deafness. She is also involved in a collaborative study with the University of Tennessee College of Medicine investigating the effectiveness of a nanofiber bone repair device for bone regeneration. Recently she has begun a collaboration with the UTC Departments of Biology, Geology & and Environmental Science and Chemistry & Physics to investigate the molecular effects of e-cigarettes on human lung tissue.

Joseph McCauley (Academic Advisor and Adjunct Professor)
B.S. in Biology with minor in Chemistry, Shorter College, 2000; M.S. General Biology, Mississippi State University, 2012.

As the academic advisor, Joseph McCauley assists students with navigating the curriculum for their major. He works with students to plan their schedules and develop a path that will lead to timely graduation. Joseph also helps students understand the requirements for professional programs and graduate programs and provides assistance with applications for those programs. He also refers students to appropriate campus resources for additional guidance or assistance. Lastly, Joseph works closely with the departmental administration on scheduling matters, assessment, retention, and curriculum matters.

Cheryl A Murphy (Faculty Associate/Introductory Biology Lab Coordinator)
B.S. Environmental Studies, Biology Emphasis, University of Nebraska-Lincoln, 1996; M.A. Ecology-plant/soil community ecology, University of Kansas, 2004; Ph.D. Ecology-plant/soil community ecology, University of Kansas, 2012.

Executes all teaching and research related purchases for the department: Responsible for procurement card purchases and POs; coordinating the shipment and receiving of large equipment delivered and making sure it gets to the correct end location; monthly review of the procurement card statement; consulting and coordinating with Department Accounting Specialist regarding purchases and accounts; when the Department did not have an Accounting Specialist (twice), I acted as the accounting specialist until someone could fill the position.

Departmental Inventory/Equipment transfers: Responsible for tagging equipment that falls under the Fiscal Policy of Sensitive Minor Equipment ($1500-4999) and equipment over $5000; responsible for maintaining a current equipment inventory of tagged equipment; properly transferring equipment to surplus when items are not needed/functioning anymore.

Coordinator for equipment and instrument maintenance and repair.

Facilities Inventory: Responsible for maintaining a current space inventory/survey; Assigning account numbers (grants/internal grants/payroll), personnel and use to each room in the department.

Departmental Safety and Chemical Officer: Responsible for ensuring our department is compliant with safety regulations and chemical hygiene guidelines; keeping Safety Data Sheets current for all substances in laboratories (teaching and research); properly disposing of hazardous and biohazard waste; maintaining a current chemical inventory list; maintaining current lab safety signs outside of laboratory doors; regularly training faculty and students about safety guidelines; emergency management.

Coordinator of Key/Swipe Card Access/Punch Code Access: Responsible for submitting key requests for faculty/staff and for checking out keys to students (and keeping track) when needed. Some rooms require access from a card swipe (Area Access Manager) using their UTC ID – I grant access to those students. Some rooms have a punch code access: Responsible for changing the punch codes every semester and giving the punch code to students when needed.

Coordinator of Introductory Biology Labs-30 sections/semester on average (BIOL 1110L and BIOL 1120L): Responsible for purchasing supplies and equipment for all sections; updating lab manuals; coordinating/overseeing laboratory instructors, which includes 10 graduate teaching assistants per semester, as well as adjunct faculty and lecturers; maintaining labs to be able to accommodate 30 sections of labs per semester.

Serve on University IACUC Committee.

Responsible for design and update of the Departmental website.

Serve on the Departmental Space Committee, Equipment Committee and Field Station Committee; participate in Departmental Faculty Meetings.

Holt Repair & Renovation: One of two primary liaisons (the other is Dr. John Tucker) between facilities and the department regarding the repair and renovation of Holt Hall; responsible for having regular meetings with facilities about the progress of the renovation; periodically inspecting space being renovated; liaison between electrician, plumber, etc. on project to make sure departmental equipment, etc. have correct support; liaison about casework/layout of renovated space, etc.

Coordinator for Departmental Moves (Offices, Teaching Labs, Research Labs, etc.): Responsible for moving logistics for Phase I & II of Holt repair & renovation project, working with faculty & staff to facilitate move of offices and labs, and serving as liaison between the department and facilities regarding moving.

Bradley R. Reynolds (Senior Lecturer)
B.S. in Chemistry, Tennessee Wesleyan College, 1996; M.S. in Environmental Science, University of Tennessee at Chattanooga, 2003; Ed.D. in Learning and Leadership, University of Tennessee at Chattanooga, 2013.

Although not really required to run and/or manage a research program or engage in research, Dr. Reynolds nevertheless does so, mostly for his own satisfaction and for the advancement of the University and the Department of Biology, Geology, and Environmental Science. Much of his research has been pedagogical in nature. Specifically, as a part of his dissertation, he took non-science majors to a local wetland and exposed them to nature and then charted the changes that took place in their conservation ethic as a result of that exposure and as a result of their exposure to me (having confirmed his own identity as a 'transformational leader'). Dr. Reynolds likewise provides support as a part of Dr. Thomas P. Wilson's UTC Herpetology Lab. Most recently they have been working on the prevalence of chytrid fungus in frogs at a local wetland, and have recently described the evolution of Team Salamander as the longest running group studies initiative at the University of Tennessee at Chattanooga, and together they have examined the factors underlying the selection of Environmental Science as a major.

Sean Richards (UC Foundation Professor)
B.S. in Biology, Arkansas Tech University 1992; M.S. in Toxicology and Environmental Health, University of Arkansas for Medical Sciences; Ph.D. in Environmental Toxicololgy, Texas Tech University, 2000.

Due to unknown factors, Hamilton County, TN produces some of the lowest birthweight infants in the United States. Dr. Richards has been working in conjunction with physicians and scientists from Columbia University, University of Rochester, University of Michigan, Erlanger Hospital, University of Salerno (Italy), and Southern Illinois University to determine the cause of this effect. To facilitate this, they have collected >2000 human placentas from Hamilton County residents and analyzed them for multiple metals. They have also found that metal concentrations are correlated with multiple birth outcomes in Hamilton County.

Research being conducted in Dr. Richard's laboratory is focusing on the effects of pharmaceuticals on *Daphnia magna*. This is an emerging issue in the environment. As the human population increases, so does the amount of direct and indirect consumption and excretion of pharmaceuticals, both in veterinary and medical application. The effects of this continual loading in the aquatic community are unknown. The goal of his laboratory is to determine the compounds that may be the most harmful to aquatic organisms so that actions may be taken to protect the environment, if necessary.

Another research focus of Dr. Richards' is that of Chattanooga Creek, which runs through the city of Chattanooga. This surface water was used as a dumping ground for many of the industries in the Alton Park region of Chattanooga. Many people live around the creek and are exposed to toxicants from the Chattanooga Creek. His laboratory is examining the types of compounds present and the potential for effects in humans.

Mark Schorr (UC Foundation Professor)
B.S. in Zoology, Southeastern Louisiana University, 1985; M.S. in Zoology, Mississippi State University, 1988; Ph.D. in Fisheries Ecology/Management, Mississippi State University, 1994

Dr. Schorr's primary research interest is stream fish ecology, with an emphasis on water pollution issues and population/community ecology. Graduate and undergraduate students working in his laboratory have conducted research to address the following problems: 1) influence of coal mine drainage on stream water chemistry, habitat, and aquatic macrofauna (macroinvertebrates, fishes, salamanders) in the Cumberland Plateau; 2) landscape-stream relationships that involve watershed land use, riparian buffers, limnological parameters, and macrofaunal assemblages in Ridge and Valley catchments; 3) localized effects of road culverts on in stream habitat and fish assemblages in Blue Ridge catchments; 4) lotic macrofaunal responses to stream restoration projects (artificial pools/riffles, constructed channels); and 5) historical and contemporary patterns in the distribution and abundance of the introduced redbreast sunfish (*Lepomis auritus*) and native congeneric sunfishes (*Lepomis* spp.; Centrarchidae) in reservoirs in the Tennessee River drainage.

Joey Shaw (UC Foundation Professor)
B.S. in Biology. The University of Tennessee at Chattanooga, 1998; M.S. Botany. University of Tennessee, Knoxville, 2001; Ph.D. in Botany. University of Tennessee, Knoxville, 2005.

Dr. Shaw's research interests have three foci. First, he is interested in alpha-taxonomy of plants and biodiversity surveys. In this capacity, his lab is focused on local to regional floristic investigations and environmental impact assessments. These research projects contribute specimens to herbaria and data regarding species of conservation concern and they ultimately lend themselves to websites and books, like the *Guide to the Vascular Plants of Tennessee*. Second, he has been working for nearly ten years toward biocollections digitization, which is making all 900,000 herbarium specimens in the state of Tennessee available through state, regional, national, and international data portals. Third, he employs modern tools from genetics toward molecular systematics studies of plants, especially plums, cherries, apricots, peaches, chestnuts, and the genus *Clematis*. This research had led to an offshoot focused on studying the varying rates of evolution of separate noncoding portions of the chloroplast genome.

Henry Spratt (Professor)
B.S. in Applied Biology, Georgia Institute of Technology, 1977; M.S. in Applied Biology. Georgia Institute of Technology, 1980; Ph.D. in Microbiology. University of Georgia, 1985.

With a Ph.D. in Microbiology, and trained in classical, lab-based microbiology, Dr. Spratt's graduate research focused on the field of biogeochemistry, studying microbes in different environments. Over the years he has been most interested in the prokaryotic biology of soils in either wetlands or temperate forests. He has directed one long-term study (nine years) of carbon and sulfur cycling in soils of Missouri Ozark forests subjected to timber cutting. Another human disturbance to natural ecosystems Dr. Spratt has studied in detail is the impact of sulfur pollution (via acid precipitation, or due to acidic mine drainage) of freshwater wetlands, and the role that sulfate reducing bacteria in those wetlands might play in maintaining the pH balance of local streams. He also has experience studying marine wetlands (both salt marshes and mangrove swamps) relative to microbial manganese oxidation. Several students of his have conducted research on the use of bacterial batteries in the degradation of polycyclic aromatic hydrocarbons and organic matter associated with raw sewage. Dr. Spratt has been involved with two collaborative projects with TVA to study the impact of coal ash leachates on water quality. Through another collaboration, this time with colleagues in UTC's College of Engineering, he and several of his students have studied roles that bacterial growth might play in the clogging of pervious concrete increasingly used in parking lots and on certain roads to reduce rates of runoff. Through collaborations with colleagues in UTC's Physical Therapy department he has recently formed a research group focused on infection control in outpatient clinics. To date they have conducted three studies focused on therapeutic ultra sound, dry needing, and massage. In each case they have sampled clinic environments associated with the different practices to determine whether potential pathogens are present. They have detected methicillin resistant *Staphylococcus aureus* (MRSA) on gel bottles used for ultrasound, and on bottles of massage lotion. The infection control group is about to initiate their first project in collaboration with Erlanger Hospital to sample the neonatal intensive care environment to determine whether potential pathogens are present in the unit.

<u>John Tucker (Department Head & Professor)</u>
B.S. in Biology, Stetson University, 1981, J.D., University of Florida College of Law, Gainesville, Florida, 1988; LL.M., Magna Cum Laude, Environmental and Natural Resources Law, Northwestern School of Law of Lewis & Clark College, Portland, Oregon, 1998. – Environmental law and policy related to biodiversity conservation and ecosystem management.

As department head, Dr. Tucker is responsible for overall administration of the department. Dr. Tucker's research program is largely on hold due to the time demands of serving as department head. The objective of his research program is to research and analyze important environmental law and policy issues. Recent topics of interest include environmental justice and hazardous substances, air toxics, sustainability, riparian buffers, water management, the BP Oil Spill, and the Apalachicola, Chattahoochee, and Flint River interstate dispute.

<u>Thomas P. Wilson (UC Foundation Associate Professor)</u>
A.S. in Biology, College of Lake County, 1990; B.S. in Zoology with a minor in Chemistry, Eastern Illinois University, 1992; M.S. in Zoology, Eastern Illinois University, 1994; Ph.D. in Environmental Science and Public Policy, George Mason University, 2002, Post-Doc in Aquatic Ecology, Tennessee Aquarium, 2005; GISP in Geospatial Sciences, GIS Certification Institute, 2009. – Spatial Ecology and Population Biology of Amphibians and Reptiles

Dr. Wilson is passionate about working with students so they can become independent scientists and forward thinkers. He is a broadly trained scientist who holds advanced degrees in Zoology, Environmental Science and Public Policy, and a certification as a Geographic Information Systems Professional (GISP). In short, he is a seasoned field biologist who enjoys the outdoors and excels at solving problems in the field. He is comfortable working with a variety of aquatic and terrestrial taxa and began his career researching the effects of landscape level changes on free-ranging populations of vertebrates. During this time, Dr. Wilson worked with several endangered and threatened (E&T) species from a variety of habitats. Some of these E&T species include Spotted Turtle, Bog Turtle, Wood Turtle, Blanding's Turtle, Timber Rattlesnake, and Eastern Massasauga Rattlesnake. The main focus of this research was tied to demographics, spatial ecology and habitat selection; and, his general interests still lie there today. However, his current research focuses less on E&T species and is more in line with keeping the common species common. Since his arrival at UTC, he has established two long-term studies concerning amphibians and freshwater turtles, and not surprisingly much of this research focuses on population viability and spatial ecology. Specifically, Dr. Wilson has designed a series of green-ways to study amphibian landscape dynamics so that managers can make adaptive conservation and management strategies. He accomplished this by blending life-history data with conservation genetics, restoration ecology and GIS. Dr. Wilson has always maintained an interest in solving field related problems. His background in classical ecological analyses developed an interest in designing new methods for measuring and monitoring biodiversity, and evaluating the statistical biases associated with sampling vertebrates in various habitats. To this end, he has collaborated with scientists in the public and private sectors in an effort to encourage decision makers to standardize ecological and environmental census techniques. The students working in his laboratory are using descriptive, comparative, and experimental studies to answer questions about the ecology of Ambystomatid salamanders, Hylid frogs, and freshwater turtles at different geospatial scales.

4.1.1.2 Geology Faculty

Amy Brock-Hon (Associate Professor of Geology)
B.S. Geology, Oklahoma State University, 1999; M.S. Geoscience, University of Nevada, Las Vegas, 2002; Ph.D. Geoscience, University of Nevada, Las Vegas, 2007

Dr. Brock-Hon currently investigates the development of late-stage petrocalcic horizons in semi-arid regions and the linkage of geomorphic, tectonic, and paleoclimatic changes to pedogenesis in these ancient soils. She is interested in the mode and timing of pedogenic silicate clay and barite formation and utilizes mineralogical and micromorphological techniques. She also holds interest in the genesis and formation of large depressions atop the Cumberland Plateau in Tennessee and the overall geomorphic development of the plateau.

Habte Giorgis Churnet (UC Foundation Professor)
B. Sc. in Geology, Haile Selassie I University, Ethiopia,1969, M.S. in Geophysics, Leeds University, United Kingdom, 1972; Ph.D., in Geology, University of Tennessee, 1975

Dr. Churnet's research interest broadly lies in revealing the origins, formations, and deformation of rocks and economic mineral deposits with emphasis on the southeastern USA.

Ann E. Holmes (Mildred Routt Distinguished Teaching Professor)
BA in Geology, University of Tennessee at Chattanooga, 1976, M.S. in Geology, University of Alabama, 1981, PhD in Geology, Columbia University, 1996.

Dr. Holmes conducts stratigraphic and paleontological research with undergraduate Geology majors, University Honors students, and education majors locally, regionally and internationally (Bahamas). She also co-teaches the Tropical Island Ecology and Geology class with Dr. Dawn Ford, has developed and taught online Geology classes in Physical Geology & lab 1110 and Geology of National Parks 1025, and is responsible for the scheduling of classes for the Geology Program.

A.K.M. Azad Hossain (Assistant Professor)
B.Sc. in Geology, University of Dhaka, 1995; M.Sc. in Geology, University of Dhaka, 1998; M.S. in Engineering Science (Geological Engineering), University of Mississippi, 2004; Ph.D. in Engineering Science (Geological Engineering), University of Mississippi, 2008.

Dr. Hossain’s research interests focus on the application of GIS, Remote Sensing, and Spatial Analysis in different areas of earth and Environmental Science. He is specifically interested in quantitative estimation of different geophysical variables in terrestrial and aquatic environments using remotely sensed data acquired in optical and microwave portions of the electromagnetic spectrum.

Recent and past research activities of Dr. Hossain include: coupling GIS and remote sensing techniques with numerical models to better understand our physical environments and the impact of human-environment interactions; integration of GIS and remote sensing techniques with hydrodynamic models for modeling watershed processes, free surface flow, sediment/pollutant transport, water quality, dam/levee breach, and decision support systems for integrated watershed management; and, potential of remote sensing techniques and available remotely sensed data in land use land cover mapping, flood and drought monitoring, crop yield forecasting and damage assessment, detection/ prediction of shallow surficial levee failure and estimation/mapping soil moisture in semi-arid environments.

Jonathan W. Mies (Robert Lake Wilson Professor of Geology)
B.S. in Geology, University of New Hampshire, 1981; M.S. in Geology, University of North Carolina at Chapel Hill, 1987; Ph.D. in Geology, University of North Carolina at Chapel Hill, 1990.

In the area of structural geology, Dr. Mies' present research interests include shaped structures, e.g., folds, as post-orogenic stress guides in the upper crust, and modern methods of kinematic and stress and strain analysis; in the area of mineralogy, they include powder X-ray diffraction and forensic mineralogy; and in the area of regional geology, they include structure, tectonics, and terrain boundaries of the southern Appalachians. He advises our students in each of these areas for their capstone research projects (GEOL 4800 and GEOL 4900). He also has a budding interest in seismology.

Wayne K. Williams (Laboratory Coordinator /Teaching Associate of Geology)
B.S. in Geology, University of Tennessee at Chattanooga, 1979, M.S. in Geology, Memphis State University, 1980.

4.1.2 Academic Credentials of Part-Time Faculty

At least 26 part-time faculty members and have taught undergraduate courses over the past five years. Twenty-five of the part-time faculty taught in the Division of Biology and Environmental

Science and two of the part-time faculty taught in the Division of Geology. Among the part-time faculty, seven possess a Ph.D., 18 possess a master's degree (15 M.S.'s, two M.Ed.'s, one M.A.), and one was enrolled in the BGE graduate program (32 completed hours) at the time of employment. These part-time faculty play a critical role in sustaining high-demand course offerings for introductory, general education courses such as Principles of Biology, Introduction to Environmental Science I, Conservation of Biodiversity, and Physical and Historical Geology. Meeting the enrollment demand for these courses aids in the timely graduation of our BGE students. Part-time faculty also serve to alleviate student credit hour production for our full-time faculty, which allows those faculty to advance the Biology, Geology, and Environmental Sciences programs through faculty development, research, advisement and new course development.

Andrea Benson
M.S. Environmental Science, University of Tennessee at Chattanooga, 2012. Principles of Biology I Lab and Human Physiology Lab

Wanda Bramblett
M.Ed. Secondary Education, University of Tennessee at Chattanooga, 2015. Principles of Biology I Lab and Human Anatomy Lab

Gregory Brodie
M.S. Engineering Geology, Purdue University, 1979. Introduction to Environmental Science I, Geology of the National Parks, Current Geological Perspectives of Earth, Environmental Geology

Brianna Burnette
M.S. Nursing, Southern Adventist University, 2011. Human Anatomy Lab

Nikki Carpenter
M.S. Environmental Science, University of Tennessee at Chattanooga, 2016. Principles of Biology I Lab

Andrew Carroll
M.S. Environmental Science, University of Tennessee at Chattanooga, 2002. Geographic Information Systems

John Fitzpatrick
Ph.D. Philosophy, University of Tennessee. (Lecturer - Department of Philosophy and Religion). Values and the Environment

Dawn Ford
Ph.D. Public Health, Walden University. (Executive Director – Walker Center for Teaching and Learning). Conservation of Biodiversity and Tropical Island Ecology and Geology.

Elizabeth Forrester
M.S. Life Cycle Biology, M.S. Molecular Biology, University of Kentucky, 2001. Principles of Biology II

Stephen Jones
Ph.D. Wildlife Biology, Clemson University. Ecology

Justin Hunteman
M.S. Geosciences, Murray State University, 2003. Geographic Information Systems

Daniel Huser
M.S. Environmental Science, University of Tennessee at Chattanooga, 2009. Principles of Biology I Lab

Carol Kimmons
M.S. Entomology and Plant Pathology, University of Tennessee, Knoxville, 1989. Conservation of Biodiversity and Introduction to Environmental Science I

John Kimmons
M.S. Biology, University of New Mexico, 1969. Principles of Biology I and II

Claire Landis
M.S. Geology, University of Wyoming, 2013. Physical Geology and Historical Geology Lab

Robert Litchford
Ph.D. Parasite Physiology and Biochemistry, Rice University, 1965. Coral Reef Ecology and Remote Sensing and Imagery Analysis

Laura Marsh
M.S. Environmental Science, University of Tennessee at Chattanooga, 2015. Introduction to Environmental Science I

Shannon McCarragher
Ph.D. Geography, Northern Illinois University, 2015. (Assistant Professor – Department of Social, Cultural, and Justice Studies). World Resources

Helen McDearman
M.Ed. Natural Sciences, University of Tennessee at Chattanooga, 1996. Principles of Biology I and Human Physiology

Ardyce Mercier
B.S. Environmental Science Biology, University of Tennessee at Chattanooga, 2013. Introduction to Environmental Science Lab

Colleen Mikelson
M.S. Environmental Science, University of Tennessee at Chattanooga, 2011. Conservation of Biodiversity

Sabrina Novak
M.S. Environmental Science, University of Tennessee at Chattanooga, 2004. Conservation of Biodiversity

Dennis Plaisted
Ph.D. Philosophy, University of California Santa Barbara. (Associate Department Head and Associate Professor – Department of Philosophy and Religion). Values and the Environment

Joseph Simpson
M.S. Environmental Science, University of Tennessee at Chattanooga, 2013. Principles of Biology I Lab and Introduction to Environmental Science Lab

Joshua Smith
M.S. Environmental Science, University of Tennessee at Chattanooga, 2009. Principles of Biology I Lab

Alice Tym
M.A. Geography, University of Florida. (Instructor – Department of Social, Cultural, and Justice Studies). World Resources

4.1.3 Faculty credentials and courses in which they teach

4.1.3.1 Biology

In the Division of Biology, our faculty are well prepared to teach core course offerings (introductory biology, genetics, ecology, and evolution) as well as offer a wide range of upper division courses in our undergraduate curriculum.

Introductory Biology: We offer three introductory Biology courses, BIOL 1110 (with BIOL 1110L), BIOL 1120 (with BIOL 1120L), and BIOL 1130 (lecture, only). Introductory Biology lectures are generally taught by instructors and tenure-track faculty. Laboratory sections are coordinated by our faculty associate, who holds a PhD in Ecology. Lab sections are typically taught by graduate assistants or instructors.

Core courses: Basic ecology (BIOL 3060) is taught by faculty members with ecology backgrounds including Aborn, Boyd, Hayes, Klug, Schorr, and Wilson. Genetics (BIOL 3250) is taught by faculty with backgrounds in genetics including Barbosa, Carver, and Kovach. Evolution (BIOL 3350) is taught by faculty with evolutionary backgrounds including Chatzimanolis, Beasley, and Klug.

Elective courses: The diverse backgrounds of our full-time tenure-track and adjunct faculty allow for a diverse offering of elective Biology courses. Some examples include animal behavior, animal physiology, behavioral ecology, biogeography, cell biology, comparative vertebrate zoology, development vertebrate embryology, dendrology, entomology, global change biology, human development and disease, immunology, invertebrate zoology, limnology and reservoir ecology, microbial ecology, mycology, parasitology, plant morphology, plant physiology, principles of microbiology, urban gardening, and virology.

4.1.3.2 Environmental Science

In the Division of Environmental Sciences, our faculty are well prepared to teach core course offerings (Introduction to Environmental Science I and II) as well as offer a wide range of upper division courses in our undergraduate curriculum.

Introduction to Environmental Science: We offer two introductory courses, ESC 1500 (with ESC 1500L) and ESC 1510 (with ESC 1510L). Lectures are taught by instructors and tenure-track faculty. Labs are taught by instructors, graduate teaching assistants, and adjunct faculty. Occasionally a tenure-track faculty person will teach a section of ESC 1500 lab. Instructors also teach ESC 2500 (World Resources).

Core courses: Maps and Mapping (GEOG 2210) is taught by a geography faculty member. Basic ecology (BIOL 3060) is taught by faculty members with ecology backgrounds including Aborn, Boyd, Hayes, Klug, Schorr, and Wilson. Genetics (BIOL 3250) is taught by faculty with backgrounds in genetics including Barbosa, Carver, and Kovach. Evolution (BIOL 3350) is taught by faculty with evolutionary backgrounds including Chatzimanolis, Beasley, and Klug. Environmental Survey Methods (ESC 3400), Air and Water Pollution Control (ESC 3600), and Limnology and Reservoir Ecology (ESC 4520), are taught by Wilson, Richards, and Schorr, respectively. Environmental Law and Agencies (ESC 4100) is taught by environmental law specialist Tucker. Values and the Environment (ESC 4840) is taught by Reynolds and Plaisted.

Elective courses: The diverse backgrounds of our tenure-track and adjunct ESC faculty (and some of our instructors) allow for a diverse offering of elective Environmental Science courses. Most of the courses are cross-listed with Biology. Some examples include environmental survey methods, global change biology, limnology and reservoir ecology, microbial ecology, and remote sensing and imagery analysis.

4.3.1.3 Geology

In the Division of Geology, our faculty are well prepared to teach general education course offerings as well as a wide range of upper division core courses and electives in our undergraduate curriculum. Three of our faculty hold graduate faculty status and may teach graduate courses and sit on graduate committees.

General Education courses: Tenured and tenure-track faculty and a laboratory manager offer introductory courses in Geology, including Physical Geology (GEOL 1110, with lab GEOL 1110L) and Historical Geology (GEOL 1120, with 1120L). Geology of National Parks (GEOL 1025) is occasionally taught by tenured faculty.

Core Courses: The diverse backgrounds of our full-time tenured and tenure-track faculty allow for course offerings designed to provide students with quality instruction in Geology. Core courses taught by Geology faculty and required of the B.S. Geology: Geology and B.S. Geology: Environmental Geology degrees include Physical Geology, Historical Geology, Mineralogy, Petrology, Sedimentary Rocks and Stratigraphy, Structural Geology, Geology and Senior Seminars, Paleontology and Field Methods in Structural Geology (both required of B.S. Geology: Geology major), and Hydrology and Environmental Geology (both required of the B.S. Geology: Environmental Geology major).

Elective Courses: Tenured and tenure-track faculty also contribute to various elective courses available to students in the program. These include Oceanography, Geology of Tennessee, Soil Properties, Genesis and Development across the Landscape, Dynamic Earth, Fossil Fuels, X-ray Diffraction, Field Experience, Tropical Island Ecology and Geology, Geomorphology and Earth Surface Processes, GIS for Geology, Geological Remote Sensing, and Economic Geology.

Graduate Level Courses: Two faculty teach graduate level courses that service Engineering and Environmental Science graduate degrees. These courses are GIS for Geologists, Geological Remote Sensing, and Hydrology.

4.1.4 Quality of Teaching

Despite high academic standards, the Department has received favorable student assessments of our teaching performance. Faculty at the university are evaluated by students in each class they teach during the academic year on the following seven evaluation items.

1. The instructor is willing to help students.
2. The instructor encourages students to be actively engaged in learning the content of this course.
3. The instructor provides timely feedback on assignments and exams.
4. The instructor includes activities and assignments that help students learn the content of this course.
5. The instructor clearly communicates expectations of students for this class.
6. The instructor expects high quality work from students.
7. Overall, this class has provided an excellent opportunity for me to increase my knowledge and competence in its subject.

Sample data of student rating of faculty in all BGE courses from fall semesters of 2013 to 2016 show that for all seven evaluation items, student ratings of BGE faculty are within 2.27% of the average College and university-wide ratings (see Table 4.2). Based on a seven-point scale (0= Unable to Judge, 1= Completely Disagree, 2= Mostly Disagree, 3= Slightly Disagree, 4= Neither Agree nor Disagree, 5= Slightly Agree, 6= Mostly Agree, 7= Completely Agree), more than half of all BGE students surveyed gave faculty the highest rating (7= Completely Agree). The mean score of BGE faculty is 6.00 or greater for all evaluation items, with the exception of the category "*inclusion of activities and assignments that help students learn the content of the course*" (mean score= 5.95).

As indicated by student evaluation of our faculty, the BGE Department has a reputation for exceptional teaching that both upholds academic rigor and fosters student success. Across all semesters sampled, the highest scored item for the department is the expectation of high quality work from students, which is 0.615% lower than the College and university-wide mean scores. The BGE faculty are also dedicated to student success, as demonstrated by the department's second-highest scored item of a willingness to help students, which is 1.56% and 1.87% lower than the College and university-wide ratings, respectively. The lowest overall rating for departmental faculty is the inclusion of activities and assignments that help students learn course content, which is 2.14% and 1.98% lower than the College and university-wide ratings, respectively. One challenge faced by the department is meeting the demands of student enrollment, particularly in introductory courses. To accommodate enrollment, most introductory courses are quite large (60 - 150 students per lecture), which necessitates a limited number of activities and assignments and could account for the lower, albeit still favorable, mean score for this item. Overall, the quality of BGE instruction is consistent across the Biology, Geology, and Environmental Science Programs, is well regarded by students (mean score of 6.16 and median of 7.0), and is continuously developed through the annual EDO process in which every faculty member reviews student evaluations and works to adjust his or her teaching methods accordingly (see Section 4.4).

Table 4.2 Mean score of student responses to seven faculty evaluation items for fall semesters 2013 to 2016. (Score: 0= lowest; 7= highest)

	BIOL	**GEOL**	**ESC**	**BGE**	**CAS**	**UTC**
1. The instructor is willing to help students.	6.34	6.18	6.35	6.29	6.39	6.41
2. The instructor encourages students to be actively engaged in learning the content of this course.	6.30	6.15	6.30	6.25	6.32	6.34
3. The instructor provides timely feedback on assignments and exams.	6.12	6.00	6.12	6.08	6.18	6.17
4. The instructor includes activities and assignments that help students learn the content of this course.	6.00	5.87	5.99	5.95	6.08	6.07
5. The instructor clearly communicates expectations of students for this class.	6.11	5.87	6.11	6.03	6.17	6.13
6. The instructor expects high quality work from students.	6.49	6.38	6.51	6.46	6.50	6.50
7. Overall, this class has provided an excellent opportunity for me to increase my knowledge and competence in its subject.	6.13	5.88	6.11	6.04	6.14	6.14
Mean Score (Items 1-7)	**6.21**	**6.21**	**6.05**	**6.16**	**6.25**	**6.25**

*** BGE-Biology, Geology and Environmental Science, CAS-College of Arts and Sciences**

4.2 Faculty Number and Program Needs and Teaching Loads

Policies for assigning and reporting faculty workload have changed during the five-year review period. Chapter 3 of the UTC Faculty Handbook establishes general criteria and expectations for faculty performance in three broad areas: Instructional and Advisement Activities, Research, Scholarly, and Creative Activities, and Professional Service Activities. In the instruction area, the Chapter 5 of the handbook states the normal course load for faulty member is twelve semester hours. Advising and counseling students is considered to be part of the teaching obligation. Adherence to the twelve semester hour requirement varied among UTC programs.

In BGE, all tenured and tenure-track faculty are expected to establish productive research programs, and the standard teaching assignment includes a one course release for research. Precise accounting is difficult, however, when contact hours often far exceed credit hours associated with teaching lab courses. In BGE, most courses have associated labs, and typically the lab portion equates to one credit hour, yet the lab contact hours vary from two to four. Thus, providing one course release and consistently achieving a true nine semester hour load has been unrealistic. Over time, BGE evolved to an approach that focuses on contact hours and the number of course preparations, with the goal being nine contact hours and no more than three course preps. BGE has treated preps for two different meetings of the same lab course as two separate preps. Thus, a semester assignment for a faculty member might involve one lecture section of a course plus two separate lab meetings of the same course. Another faculty member might be assigned one lecture course, one related lab course, and one unrelated lab course. Another faculty member might be assigned three different three hour lecture courses. Understanding that not all courses and labs require identical effort, the BGE course scheduler Senior Associate Head, who serves as the BGE course scheduler, consults with faculty members on a yearly basis, considers their preferences, and seeks to assign teaching load equitably. Given the variation in credit hours and contact hours associated with BGE lecture and labs, actual contact hour load for faculty receiving a one course release generally varies between seven and 10 contact hours. Some faculty may be assigned a lighter load one semester that is offset with a heavier load another semester. Using this approach, BGE has been able to teach the courses required for students to progress through degree programs, provide modest research releases to faculty, and conform to UTC workload policies.

During the review period the university and college began moving toward an average SCH production model based on Delaware national norms, and away from a course credit or contact hour basis. It turns out that BGE contact hour/number of preps approach results in average SCH production that meets or exceeds Delaware national norms. Thus, BGE has continued its practice of primarily considering contact hours and number of preps when assigning teaching load.

In 2016, CAS adopted a new workload policy intended to include the Delaware norm approach for teaching load and better recognize and categorize the other areas of faculty effort. This was in part a response to an institutional need to account for and report non-teaching related faculty activities, including scholarly activity and service. BGE is now in the process of implementing the new CAS policy. The policy embraces Delaware SCH norms, but creates reasonable ranges of acceptable individual faculty effort. The new policy is described in some detail in the following section.

4.2.1 Departmental workload model

The departmental workload model follows the policy adopted by the UTC College of Arts and Sciences in November 2016. The policy covers full-time faculty in the College as defined in Chapter 3 of the UTC Faculty Handbook. The annual period of the workload assignment for each full-time faculty member is commensurate with the annual period of the faculty member's appointment, typically either for 9- or 12-month periods.

The following text is taken directly from the UTC College of Arts and Sciences workload policy:

As described in the UTC Faculty Handbook, a faculty member's assignment serves to further the "three broad substantive areas" which define how UTC accomplishes its mission: Instruction, Research and Public Service.

However, the College recognizes that the entirety of this assignment may not be adequately captured by these three areas alone or by a simple measurement of hours of work. Accordingly, we may view all of a faculty member's workload as falling broadly within four general areas: teaching, scholarship, service, and additional faculty obligations. These terms are elaborated on below. The efforts from each area should sum to a total of 100% effort.

Teaching Workload (50-90% of effort)

The College hosts a broad and diverse collection of academic departments, and acknowledges the differences that varied disciplines and instructional modes require. The National Study of Instructional Costs and Productivity (colloquially known as The Delaware Study) provides a set of department-specific productivity measures, typically in terms of student credit hours (or SCH), and the College shall annually set average *teaching workload* expectations based on these measures.

Consistent with the UTC Faculty Handbook, this teaching workload carries with it certain implicit responsibilities, essential to the job but difficult to capture by a measurement of SCH. These include, but are not limited to: careful preparation for classes, development and distribution of a clear syllabus, fair and prompt grading of student work, freely given academic assistance through regular office hours (a minimum of three hours per week, when teaching at least one class), submission of midterm and final grades ahead of deadline, and informed advisement for student class progression.

Finally, faculty may serve their department by mentoring students, undergraduate or graduate, on an honors project or thesis.

Scholarship Workload (20-40%)

Chapter 5 of the UTC Faculty Handbook states that full-time faculty have a responsibility to "advance knowledge in their respective academic disciplines through individual research, creative writing and analysis *(n.b. and creative achievement in the arts)*, and presenting papers at colloquiums or professional meetings". This provides the basis for a standard *scholarship workload* for faculty whose position is defined to have such an expectation.

The expectation of scholarship applies primarily to tenured or tenure-track faculty. Non-tenure-track faculty will generally be exempt from this expectation.

Service Workload (10-20% of effort)

Full-time faculty have a responsibility to commit themselves to "a reasonable amount of service on university-wide committees" and to participate "in department, college and university faculty meetings" and activities. Some faculty may also contribute public service to the broader community, at the local, state, national, or international level. Further, faculty may contribute to their discipline through service to scholarly publications, recognized professional organizations, or program evaluations for other institutions.

Service that faculty perform within a partial administrative role within their department or the College, say as an associate department head or program director, is also counted within this area.

The totality of these efforts is a faculty member's *service workload*.

Additional Faculty Obligations

University faculty have additional obligations that do not clearly fall within one of the above areas. These include, but are not limited to (i) mentoring junior faculty within one's discipline; (ii) participation in at least two commencements (either graduate or undergraduate) per academic year (T/TT faculty only); (iii) attendance at the College of Arts & Sciences convocation, held on Reading Day each spring semester.

These responsibilities fall within the general area of *additional faculty obligations*.

College Level Guidelines for Workload

Teaching Workload Guidelines

Each department head will be responsible for assigning individual fall semester teaching workloads in an equitable manner that serves student, programmatic, and institutional needs. Those individual fall semester teaching workloads should also be consistent with guidelines set out in each department's bylaws. Finally, the department productivity average should reach at least 95% of the expectation set by the College.

Within those fall semester assignments, individual faculty teaching workload assignments should adhere to the ranges shown in Table 4.3.

Table 4.3 Fall semester teaching workload guidelines

Faculty Type	**Minimum Teaching Workload**	**Maximum Teaching Workload**
Tenured/Tenure-track Faculty	50% of expectation	150% of expectation
Non-TT Faculty	100% of expectation	200% of expectation

In the above table, note that the expectation will depend both on the rank and the specific discipline of the faculty member.

Exceptions to these ranges may be granted on a per-semester, per-faculty basis with prior approval of the College.

Each department head will be responsible for assigning individual spring semester teaching workloads in an equitable manner that serves student, programmatic, and institutional needs. Those individual spring semester teaching workloads should also be consistent with guidelines set out in each department's bylaws. Finally, individual spring semester teaching workloads can be used to address uneven faculty loads that arose in the prior fall semester.

Each faculty member's role within the department should be considered carefully when the department head assigns teaching workloads. For example, a faculty member who is also an associate department head or program coordinator may have a fall workload at the lower end of the ranges given above. Such roles may also be considered when assigning individual spring workloads.

The differentiation among faculty types provides for appropriate teaching loads for faculty members with a research, scholarship, or creative activity expectation. Faculty members who maintain scholarly productivity, as defined by the department's bylaws (see below), will remain eligible for a lower teaching load to permit continued activity.

Scholarship Workload Guidelines

Each academic department shall establish through its bylaws minimum research, scholarship, or creative activity workload guidelines, subject to approval by the College. These guidelines should be based on the continuation of and the production of measurable results from that work. Within annual EDO evaluations (see Section 4.4), the head of each department will be responsible for assessing each faculty member against the department's research, scholarship, or creative activity workload guidelines.

Service Workload Guideline

Within annual EDO evaluations, the head of each department will be responsible for assessing each faculty member's service within the expectations set forth in the *UTC Faculty Handbook* and the department's bylaws.

A defined role within a department, such as associate department head or program coordinator, may account for a majority of a faculty member's service workload. Of course, in their roles as tenured faculty, associate heads and program coordinators are required to serve on rank, tenure, and promotion committees.

Guidelines for additional faculty obligations

In order to meet expectations for rank, all tenured and tenure-track faculty should fulfill the additional faculty obligations outlined in Section 2.5.

Lecturers, clinical instructors, and visiting faculty are exempt from those additional faculty obligations.

4.2.2 Faculty course workloads across the department

Among the stated goals of the Department are the following: 1) "To provide a mechanism to reduce teaching loads for faculty who are actively involved in research requiring the submission of external funding proposals and/or submission of articles to peer-reviewed journal of national and international scope;" 2) "To provide a mechanism to reduce teaching loads for the first two years for new faculty actively involved in research;" and, 3) "To maintain graduate faculty teaching loads at levels commensurate with graduate faculty teaching loads at peer institutions."

The department has endeavored to reduce teaching loads for faculty and others involved in research via several mechanisms. These include the use of graduate teaching assistants to teach laboratories in our introductory Biology and Environmental Science sequences and the use of double lecture sections (i.e., dividing large groups of students into two sections that meet at the same time in the same room, in essence giving those who teach large numbers of students credit for twice the number of contact hours). In addition, the institution offers opportunities to earn partial reductions in course loads by providing research fellowships through the UTC Office of Research and Sponsored Programs.

Nearly all upper division courses are taught by full-time faculty, who also teach some lower-division undergraduate courses. We need more full-time faculty and graduate student teaching assistantships to help meet the needs of both students and the university. During the Fall Semester 2016, 94% of the credit hour production in BGE was provided by regular faculty members (i.e., either tenure-track faculty or lecturers). The remaining 6% of credit hour production in Biology was attributable to adjunct faculty. As a department, the credit hour production by regular faculty members has risen 7% since 2010. To partially offset the overall increase in student credit hours (from 8,000 to 11,000 during the past five years) the hiring of lecturers has for Biology and Environmental Science courses has prevented precipitous increases in teaching load for tenure-track faculty. The ability to attract and retain quality adjunct faculty members has been a persistent problem for the department, due in large part to the low pay received by these adjunct faculty.

The Student Credit Hour Production per full-time faculty equivalent (FTE) for our departmental faculty (taking into account only the regular faculty members) was higher than the university average in all five of the past five years, and higher than the average for the College of Arts and Sciences in two of the past five years (Table 4.4). With adjuncts included in this number, the Student Credit Hour Production per FTE Faculty exceeded both the College and university averages for each of the past five years (Table 4.5). Thus, despite our efforts to reduce teaching workloads for faculty involved in research, our faculty have remained among the most prolific at this institution in the production of student credit hours. To reflect the departmental teaching workload, Table 4.6 compares the department and college's SCH output. Importantly, the department's elevated SCH production compared to the college and university (Tables 4.4-4.6) is created/maintained with the teaching support provided by lecturers and graduate teaching assistantships.

Table 4.4 Student Credit Hours/Full-time Faculty Members/Semester

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
UTC	312.1	307.3	307.7	316.2	306.3
College of Arts & Sciences	369.9	368.6	372.6	363.0	361.4
BGE	377.5	369.1	350.3	362.0	356.4

Table 4.5 Student Credit Hours/Full-time Faculty Members/Semester (Adjuncts included)

	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
UTC	237.9	248.8	255.6	265.3	261.6
College of Arts & Sciences	280.6	296.4	302.0	302.7	311.2
BGE	346.1	342.7	325.3	330.1	334.8

Table 4.6 Student Credit Hours/Tenured and Tenure-Track Faculty Members/Semester

	Undergraduate		Graduate		Total	
	Fall 2014	Fall 2015	Fall 2014	Fall 2015	Fall 2014	Fall 2015
UTC	203	223	23	27	226	250
College of Arts & Sciences	236	254	8	7	244	263
BGE	255	273	11	7	265	280
National Norm*	**	192	**	15	**	195

*****_National Norms include institutions who submitted to the Delaware Cost Study with a similar institutional Carnegie classification: Comprehensive Master's Programs. Figures are averages of the norms for Biology, Geology, and Environmental Science disciplines._
** Data not available for Fall 2014

4.3 Faculty Diversity

The BGE faculty consists of more males than females, with most individuals being Caucasian (Tables 4.7 and 4.8). As a whole, the BGE faculty have less ethnic, racial and gender diversity than the College of Arts and Sciences (CAS) and the university (UTC). Numerous ethnicities are represented in the CAS and UTC faculty, whereas BGE faculty are comprised of three ethnic groups (Caucasian, Black, and Asian). Among the full-time BGE faculty, the percentage of Caucasian individuals is similar to the percentage in CAS and UTC; the percentage of Black individuals is higher than the percentage in CAS and UTC; and the percentage of Asian individuals is lower than the percentage in CAS and UTC. Among the part-time BGE faculty, the percentage of Caucasian individuals is higher than the percentage in CAS and UTC, and no other ethnicities are represented. The percentage of female full-time faculty in the BGE Department is lower than the percentage in CAS and UTC.

Within the full-time BGE faculty, the percentage of female tenured/tenure-track faculty is very low at 26% (6 females out of 23 tenured/tenure-track faculty). The percentage of female part-time faculty in the BGE Department is higher than percentage in CAS and UTC. The department recognizes the gender, racial and ethnic disparities apparent in Tables 4.8 and 4.9 and is committed to increasing diversity among faculty, particularly through the recruitment and retention of women and people of under-represented groups.

Table 4.7 Ethnic backgrounds of BGE, CAS and UTC faculty in Fall 2016.

	Full Time Faculty		**Part Time Faculty**	
	N	**%**	**N**	**%**
UTC				
American Indian	2	0.4%		0.0%
Asian	33	7.1%	4	1.7%
Black	33	7.1%	10	4.3%
Hispanic	10	2.2%	3	1.3%
Multiracial	1	0.2%	2	0.9%
Native Hawaiian	1	0.2%		0.0%
Unknown		0.0%	2	0.9%
White	384	82.8%	210	90.9%
Total	464	100.0%	231	100.0%
CAS				
American Indian	1	0.4%	0	0.0%
Asian	15	5.9%	1	1.0%
Black	16	6.3%	3	3.1%
Hispanic	7	2.8%	3	3.1%
Multiracial	1	0.4%	0	0.0%
Native Hawaiian	0	0.0%	0	0.0%
Unknown	0	0.0%	0	0.0%
White	214	84.3%	91	92.9%
Total	254	100.0%	98	100.0%
BGE				
American Indian	0	0.0%	0	0.0%
Asian	1	3.2%	0	0.0%
Black	4	12.9%	0	0.0%
Hispanic	0	0.0%	0	0.0%
Multiracial	0	0.0%	0	0.0%
Native Hawaiian	0	0.0%	0	0.0%
Unknown	0	0.0%	0	0.0%
White	26	83.9%	5	100.0%
Total*	31	100.0%	5	100.0%

Source: UTC Office of Planning, Evaluation, and Institutional Research
* Does not include Dean of the Graduate School

Table 4.8 Gender of BGE, CAS and UTC faculty in Fall 2016.

	Full Time Faculty		Part Time Faculty	
	N	**%**	**N**	**%**
UTC				
Male	239	51.5%	108	46.8%
Female	225	48.5%	122	52.8%
Unknown	0	0.0%	1	0.4%
Total	464	100.0%	231	100.0%
CAS				
Male	143	56.3%	43	43.9%
Female	111	43.7%	55	56.1%
Unknown	0	0.0%	0	0.0%
Total	254	100.0%	98	100.0%
BGE				
Male	20	64.5%	2	40.0%
Female	11	35.5%	3	60.0%
Unknown	0	0.0%	0	0.0%
Total*	31	100.0%	5	100.0%

Source: UTC Office of Planning, Evaluation, and Institutional Research
* Does not include Dean of the Graduate School

4.4 Faculty Evaluation System and Faculty Improvement

Chapter 3 of UTC's Faculty Handbook addresses faculty appointment, evaluation, promotion, tenure, and termination. Two distinct review processes occur each year: 1) annual reappointment, until such time as the faculty member is tenured, or is terminated, and 2) annual evaluation and development by objectives (EDO), which occurs for all full-time faculty, regardless of appointment classification. Documents generated through the EDO process are included in the dossier submitted for annual reappointment. Appendix T contains department, CAS, and UTC EDO criteria. Appendix U contains BGE and UTC tenure criteria, and Appendix V contains the complete departmental by-laws, which serve as the basis for the reappointment evaluations, as well as the criteria for tenure and promotion decisions.

A. Reappointment (UTC Faculty Handbook sections 3.3.1-3.4.11.7): Annual reappointment requires that the faculty member submit a dossier to the department's Rank, Tenure, and Reappointment (RTR) Committee, which is composed of all tenured faculty in the Department. The RTR committee reviews the dossier, and the Department Head, after consulting with the RTR committee, makes a recommendation to the next administrative level. The dossier should address the Criteria for Reappointment (UTC Faculty Handbook 3.3.1.2), which are similar to the Criteria for Appointment ((UTC Faculty Handbook 3.1), and the Criteria for Tenure (UTC Faculty Handbook 3.4.4). The handbook provides that "criteria set forth in the appointment letter shall apply" for reappointment of faculty in appointments other than Assistant Professor, Associate Professor, and Professor (UTC Faculty Handbook 3.4.3).

B. EDO (UTC Faculty Handbook 3.2.2): EDO requires that each faculty member develop annual Individual Objectives with the advice of the Department Head. At the end of the review period, the faculty member submits an Individual Performance Report Form to the Department Head. The Department Head reviews the Individual Objectives and Individual Performance Report Form and determines that the faculty member's performance 1) Exceeds Expectations for Rank, 2) Meets Expectations for Rank, 3) Needs Improvement for Rank, or is 4) Unsatisfactory for Rank. An additional review process, called Cumulative Performance Review (CPR), is triggered for tenured faculty whose 1) annual review is Unsatisfactory in any two of five consecutive years, or 2) annual review is any combination of Unsatisfactory or Needs Improvement in any three of five consecutive years.

Authority to develop department-specific EDO Criteria: UTC's Faculty Handbook provides general procedures and minimum requirements for appointment, reappointment, tenure, and EDO, and authorizes departments to adopt more specific criteria, subject to approval by the dean and provost. Specifically, the Handbook (section 3.2.2.3) states:

> Each academic department will define its standards for expected performance in each of these four areas. These standards must be approved by the dean and the Provost and should be kept on file in the office of the academic department's dean. Any change of standards that the academic department has agreed upon will be submitted to the dean and Provost for final approval. Once an academic department's standards for performance ratings have been established, the academic department head is charged with fairly and equitably identifying qualitative differences in performance. It is the role of the dean to encourage reasonably comparable levels of standards for the differing units within each college or school. It is the role of the Provost to encourage such comparable standards across the university.

Bases of the Department of Biology, Geology and Environmental Science EDO Criteria: The Department of Biology, Geology and Environmental Science has developed EDO Criteria to supplement the minimum criteria contained in the Faculty Handbook. The bases of these EDO criteria are the Criteria for Reappointment (UTC Faculty Handbook 3.3.1.2), the Criteria for Appointment (UTC Faculty Handbook 3.1.5), the Criteria for Tenure (UTC Faculty Handbook 3.4.4), and the following statement regarding EDO (UTC Faculty Handbook 3.2.2.3):

At UTC the evaluation of the professional responsibility of the faculty member focuses on three performance areas: (1) teaching and advising; (2) research, scholarship, and creative activities; and (3) professional service to the university, profession, and community. Among these obligations, teaching and advising are of highest importance at UTC. It is recognized, however, that research, and scholarly and creative achievement contribute significantly to good teaching and to the advancement of knowledge. It follows, then, that faculty members will be expected to be involved actively in research, scholarship or creative activity as well. Since, in its Mission Statement, the university specifies that a fundamental purpose of the institution is to serve the people of the community, state, and region it is expected that faculty members will contribute to this mission through university and professional service.

(1) Includes such activities as: teaching, student advising, development of new courses, preparation of instructional materials or other activities designed to enhance educational and instructional quality.
(2) Includes such activities as: disciplinary research, development of creative art forms, grant development and administration, scholarly publications and presentations, and other activities related to the development and dissemination of new knowledge or art forms.
(3) Includes such activities as: service through administrative and committee assignments, service to professional organizations, appropriate consulting, advisement or sponsorship of student activities, coordination of special departmental, school, college or university activities, and discipline- and university-related community services

The Department of Biology, Geology and Environmental Science expects its faculty to be productive and meet or exceed university and Departmental performance criteria. The objectives of these EDO criteria are to establish an evaluation process that provides 1) faculty with a clear understanding of expectations, 2) administrators with a clear framework to measure faculty performance, and 3) the flexibility to accommodate both discipline-specific differences among faculty and appropriate individual assignments that may alter the traditional balance of teaching, research, and service.

The Department of Biology, Geology and Environmental Science recognizes that its faculty represent multiple sub-disciplines, and that EDO criteria for individual faculty should be based on appropriate discipline-specific objectives. Accordingly, there may be some variation in expectations for individual faculty. The Department also recognizes that some existing positions within the Department have specific responsibilities that alter the traditional balance of teaching, research, and service. The Department also recognizes that from time-to-time it may want to alter expectations for specific positions, that have in the past involved a traditional balance of teaching, research, and service. Toward these ends, the Department embraces the concept that the specific objectives agreed upon in the individual EDO document are the appropriate criteria against which to measure individual performance, provided that the individual criteria fully satisfy the minimum university criteria in the Faculty Handbook.

The department has a teaching mentoring program for new faculty. Each semester tenured faculty observe and provide feedback to new faculty about their teaching. This process lasts for several years. This has proven to be a useful mechanism for new teachers. Appendix W contains the department’s Peer Evaluation of Instruction form.

4.5 Faculty Professional Development

Professional development: BGE faculty engage in a diversity of professional development activities, including programs arranged and led by the UTC Walker Center for Teaching and Learning. Our faculty have attended, participated in, or led professional development workshops on topics ranging from research skills (e.g., bird banding, genomics), faculty mentoring networks, development of online course initiatives, grant-writing workshops (e.g., NIH regional seminar), teaching creativity, IRB/IACUC training, and diversity and human resources training (e.g., SafeZone). Our faculty regularly develop new course proposals reviewed by the departmental curriculum committee. Several faculty members have received ThinkAchieve funding to support innovative teaching methods. Finally, several faculty members have engaged in fund raising efforts with the UTC Developmental Office.

Scholarly activity: BGE faculty have submitted numerous grant proposals to internal programs as well as private, state, and federal funding programs. Between 2011-2012 and 2015-2016, our faculty secured $2.75 million in extramural funding (Table 4.9), and applied for over $7 million in funding. Our faculty have contributed to or led >100 publications in peer reviewed journals, ranging from regional journals to international journals such as *Science*. They have published numerous book chapters, project reports, education guides, and a book (Appendix X). Faculty regularly present their research at regional, national and international scientific meetings (Appendix Y).

Service: Our faculty engage a diverse range of service activities. BGE faculty regularly serve on departmental, college, and university committees. Our faculty serve on 2-4 departmental committees annually with tenured faculty serving as chairs. Professionally, our faculty regularly review manuscripts for peer-reviewed journals and participate in professional societies. Some of our faculty serve as editors for scientific journals such as *Global Journal of Environmental Science & Management, Journal of Mammalogy, Journal of Mammalian Evolution, Journal of Medical & Biological Sciences*, *Journal of Paleontology*, and *Proceedings of the Royal Society B.* One faculty member has served as a president of a professional society. Two Geology faculty are active in regional and national organizations, serving as chairs of major committees and as a division panelist. Several Geology faculty coordinated a regional Geological Society of America meeting in Chattanooga in 2015. Some of our faculty members regularly review grant proposals, both internal and external to the university. Our faculty also engage in service in the community, including activities with local nature centers, serving as science fair judges, service as board members, mentoring K-12 students, making presentations at local schools, and conducting interviews with local TV and radio stations.

A full list of faculty activities, including faculty development, scholarly activity, service, and press regarding faculty activities, is provided in Appendix Z.

Table 4.9 External Grant Awards/Fiscal Year

	2011-2012			2012-2013		
	Dept.	College	Univ.	Dept.	College	Univ.
Grants Awarded	5	23	71	8	33	81
Total Amount	$108,685	$1,885,938	$10,157,139	$209,886	$964,040	$10,174,862

	2013-2014			2014-2015		
Grants Awarded	7	26	89	5	25	82
Total Amount	$1,027,360	$1,400,863	$9,270,122	$373,232	$709,237	$8,063,813

	2015-2016		
Grants Awarded	6	20	68
Total Amount	$1,043,777	$1,767,897	$8,833,814

4.6 Faculty Engagement in Planning, Evaluation, and Improvement Processes that Measure and Advance Student Success

The Department engages in numerous activities that advance student success. Some examples include:

Student learning outcomes: We assess student learning outcomes in our courses (see section 1.2, supra – Learning Outcomes and Assessment).

Student research: The departmental faculty engage undergraduate students in research, relying on resources from external grants and internal programs including the Office of Research and Sponsored Programs, Office of Undergraduate Research and Creative Endeavors, and the Honors College. Many of the presentations and peer-reviewed publications generated by our faculty include student contributors (Appendix Y, Appendix X). Many of our students participate in the UTC Research Dialogues, a campus-wide event offering opportunities to make oral and poster research presentations, held annually during the spring semester. Several of our laboratory courses are inquiry based, exposing a large portion of our undergraduate students to research. Faculty in the Division of Geology lead annual Geology field trips, and all students in the Geology Program graduate having formulated and conducted a research project.

Academic & career advising: The academic advisor provides advisement to 400-450 Biology and environmental students annually. Additionally, all BGE faculty advise undergraduate students during the spring and fall semesters. The Department has developed clear path documents for undergraduate students majoring in Biology, Environmental Sciences, and Geology. The Department maintains an online advising resource for students interested in a health-related career.

Course development and improvement: Many of our faculty have participated in professional activities aimed at improving instruction, including workshops and seminars sponsored by the UTC Walker Center for Teaching and Learning. Several of our faculty have been awarded small grants from the UTC ThinkAchieve program. These grants are used to develop activities that improve critical thinking skills and problem-solving.

Natural Science Living and Learning Community: The NSLLC is an opportunity for incoming freshman interested in the natural sciences. The program centers on teaching conservation-based research methods through hands-on field experiences at UTC's Biological Field Stations or elsewhere. Students will live together and attend a one credit hour, introductory BIOL 1999 course to become familiar with scientific research and field work. Students will later take specialized courses based on their research interest (BIOL/ESC 4998/4999) under faculty supervision.

Scholarships: The Department offers four scholarships in Geology and seven scholarships in Biology and Environmental Science. Awardees of these scholarships are recognized at a yearly department awards banquet where they are introduced by faculty.

4.7 Assessment of Faculty Strength, Weaknesses and Recommendations for Change

Strengths: The areas of expertise of the Department of Biology, Geology, and Environmental Sciences are diverse, allowing us to offer a diverse curriculum and contribute to a positive student experience. Our greatest strengths are our faculty accomplishments, our positive impact on student success, and our faculty awards (an indicator of esteem in the university community).

<u>Faculty accomplishments</u>: The BGE faculty, while understaffed, have amassed an outstanding record in all three areas of faculty responsibility over the past five years. The Department has been among the leaders at this institution in establishing high academic standards. The students have bestowed favorable ratings on the quality of our teaching. Student evaluations of BGE faculty (including instructors) are consistently strong and in line with evaluation results for other faculty in the College of Arts and Sciences and the university.

The faculty have amassed a strong record of scholarly activity during the past five years. Between 2011-2012 and 2015-2016, the Biology, Geology, and Environmental Science Department accounted for 41% of the extramural funding generated by the College of Arts and Sciences. This number was as high as 73% in 2013-2014. One faculty member was awarded a NSF CAREER grant. Departmental faculty have published >100 papers in refereed journals of regional, national, and international scope. They have also produced numerous book chapters, a book, government reports, and pedagogical works. The departmental faculty also have been active attendees and presenters at regional, national and international meetings. In line with the university mission, the department has a strong record of professional, departmental, college, and university service. We also have been engaged the community in numerous ways, including outreach activities with local wildlife centers, collaborations with local health care facilities, and the creation of a community garden.

<u>Impact on student success</u>: The strengths of our faculty benefit our undergraduate students. Local, regional, national, and international collaborations provide a strong professional network for students, increasing their likelihood for success. Many of the presentations and peer-reviewed publications generated by our faculty include student contributors (Appendix Y, Appendix X). Many of our undergraduate students have been successful in securing internal funding for projects from the UTC Provost Student Research Award (PRSA) program.

Faculty awards: As a measure of the esteem in which the faculty of this department are held by the university administration, the department has among the highest number of named professorships of any department on campus, including 10 UC Foundation Professors, one Distinguished Teaching Professorship, one Guerry Fellow, and one Professorship dedicated to research in Chestnut Biology. The departmental faculty also have earned institutional awards over the years for outstanding teaching, advising and research.

Weaknesses & needs: There remain serious challenges that must be faced by the Department. Our greatest need is for more resources, including more funding and equipment for instruction and research, more and better quality space, more tenure-track faculty lines, and funding for more support personnel (e.g., lab managers, museum collection managers, a greenhouse manager, more advisors, and more office help). Although faculty diversity has improved since our last program review (2012), we need to continue efforts to attract more women and under-represented minority applicants during future hires of tenure-track faculty.

Faculty workloads and new hires: The growth in undergraduate student enrollment has not been met with comparable growth in our faculty and in resources coming into the department. Our student credit hours/FTE numbers are consistently higher than the university average. We exceed national norms for student credit hours per faculty. Several of our faculty have received teaching load reductions due to high scholarly activity, successful grant writing, and administrative roles within the Department and the university. To accommodate these reductions in faculty availability, some faculty members take on teaching overloads, or teach core courses at the expense of more specialized, upper-level undergraduate or graduate courses. We regularly hire adjuncts to cover some courses that typically are offered by tenure-track faculty with teaching load reductions, or simply omit these courses from the schedule. Because of low pay levels set by the institution, and the difficulty of finding individuals with the expertise and willingness to teach advanced upper level course, the department faces ongoing problems in recruiting and retaining qualified adjunct faculty. Low pay for full-time faculty pose recruitment and retention difficulties at this level as well.

Faculty Diversity: Although gender and ethnic diversity have improved overall in the last five years (due to the merger with Geology and two recent hires), the Department continues to face challenges in increasing diversity as a whole and in increasing the number of tenure-track positions held by women. The merger has also presented several challenges including historical differences in expectation for promotion and tenure between the formerly separate departments. These issues have presented some challenges to developing departmental by-laws.

Space/equipment: The Department is under-equipped, and lacks a significant portion of the space, equipment, library, and personnel resources needed for our large undergraduate program. Although BGE space will increase substantially during the next five years, due to renovation and repurposing of Holt Hall, faculty remain concerned about disruptions to teaching and research during the renovation, the quality of the renovated space, and limited capacity for growth. The history and details of the renovation are discussed in detail in the Preface, page . This work commenced in 2016 and has temporarily disrupted some teaching and research activities and dispersed Biology and Environmental Science faculty across five academic buildings. The second phase of the renovation, scheduled to begin in Spring 2018, will displace more faculty and the departmental office. The renovated Holt Hall will be an upgrade from the currently inadequate state of the facility. However, the renovation will not adequately modernize the teaching and research facilities nor meet the growing space needs of the Department, it does not completely address all current space needs (e.g., the need for graduate student research space), and it does not much space to accommodate future growth of the Department. Departmental faculty will remain spread out in at least two buildings. Additionally, faculty in the Geology Program still will not have their own research space. Presently, Geology faculty must utilize storage closets, classroom, and teaching lab spaces for conducting research. This is not an ideal setting to support research activities by Geology faculty.

The lack of stable funding to purchase, repair, and replace equipment negatively impacts faculty engaged in formal and informal teaching research activities and student learning. Similarly, the absence of modern IT equipment in most teaching labs and out of date equipment in some classrooms negatively impacts faculty teaching and student learning. Computer labs and computers for individual student use are also non-existent or inadequate. Equipment, computer, and IT needs are discussed in more detail in part 5 of this self-study.

Recommendations for change: Despite having one of the largest undergraduate programs at the university, the Department remains understaffed and lacks key infrastructure and resources. To meet our needs, we make the following recommendations:

Additional faculty and staff: Due to growth in the number of majors and teaching reductions to several faculty, the Department remains understaffed and faces challenges to course scheduling. The addition of new tenure-track positions would help us to meet the needs of large undergraduate programs and our graduate program in Environmental Sciences. In particular, faculty with expertise in conservation biology, organismal biology (non-insect invertebrates), and the cellular/molecular area (who can teach courses related to microbiology, cell biology, immunology, and genetics) would provide the greatest support for the areas in greatest need: Biology and Environmental Sciences. Individuals with this expertise could contribute to our core courses, offer courses that currently are not offered, and provide research opportunities that would prepare many students for careers in ecology and Environmental Sciences. We also recommend the hiring of 1-2 academic staff to assist full-time faculty with important tasks including animal care, large equipment maintenance, and natural history collections management. To recruit the best faculty, we recommend that salaries (and start-up for tenure-track faculty, typically $50,000) be increased. Likewise, to retain faculty, we recommend that salaries for current faculty, including tenure-track faculty, instructors, faculty associates, and adjuncts, be increased to meet national norms. As for the Geology Program needs, with the trend of increasing Geology major numbers combined with an increase in expected research productivity, at least one new tenure-track hire is desired. With this increase in majors, the Geology Program may now be able to offer some of its core courses more often allowing for easier progression of our majors through their degree, and will specifically helping transfer students to finish a degree in a more reasonable timeframe. In order to do this, at least one new faculty is needed to accommodate the elevated teaching loads.

Within the next year, we expect the retirement of one full-time Geology faculty and as a result will require someone with expertise in Petrology (a required course for all students in our program) and Oceanography (required for one Environmental Science degree option and Geology: STEM Education degree). Our plan is to use this retirement opening to revamp our course offerings and meet the growing needs of those students that plan to pursue jobs in the Environmental Tech and Environmental Engineering market. We anticipate filling the retirement vacancy with a new tenure-track faculty who will to take over Hydrology from Dr. Mies, teach Oceanography, and will offer a course in aqueous geochemistry. Dr. Mies will then teach Petrology, a course that he is qualified and willing to instruct. This will also give Dr. Mies an opportunity to engage with students earlier in the program. We see this as a way to broaden the content of our program and perhaps lead to new degree options. An aqueous geochemist would also be valuable to Environmental Science, Chemistry, and Civil Engineering degree programs. In the long term, as opportunities arise for more faculty additions, we would like to broaden our offerings to students and include geophysics, and geohazards options, keeping the pace with workforce needs of the growing environmental and geotechnical industries.

New space: Our faculty are currently spread out over six academic buildings. After the completion of the Holt Hall renovations, Biology and Environmental Science faculty will be located in two academic buildings. Geology faculty will remain in Grote Hall. Geology faculty have no dedicated space for research. It is critical to provide research space to support Geology faculty research, now that Geology is merged with Biology and Environmental Science. To address our space needs (which impact our teaching and research), we recommend that the university begin planning to invest in a new building with sufficient space for our current BGE faculty, space for future hires, and modern teaching and research facilities for the entire department.

Equipment and computers: BGE needs a new and stable source of funding to purchase, repair, and replace equipment and computers.

IT resources in the classroom: BGE needs modern IT teaching capability and equipment in all teaching laboratories and classrooms. The Holt Hall renovation may largely address this concern.

Increased diversity: Although the diversity of our faculty has increased since the last program review, we need to continue efforts to increase the number of applications for future positions from women and under-represented minority groups.

PART 5. LEARNING RESOURCES

5.1 Evaluation and Improvement of Equipment and Facilities

A. Instructional Equipment

Current Equipment—
A detailed list of current departmental equipment that initially cost at least $1,500 is provided in Appendix AA. Of particular note, current major equipment includes: a confocal microscope, a scanning electron microscope, environmental controlled growth chambers, a fluorescence and gas exchange system package, a steam sterilizer (autoclave), a microarray scanning system, a microplate reader, an x-ray diffractometer, a spectrometer, an x-ray florescence, a seismometer, large cutting saws, a thin-section machine, multiple petrographic microscopes, and numerous computers. With regard to teaching microscopes, the department has approximately 209 compound microscopes, 94 stereoscopes, and 12-15 polarizing microscopes.

Process for Evaluating Equipment Needs—
Equipment needs are evaluated annually. The Equipment Committee maintains a ranked equipment needs list of items that play critical roles in teaching and/or research labs. A detailed ranked equipment list for 2012-2017 for Biology and Environmental Science and 2016-2017 for Geology is provided in Appendix BB. Faculty may request that new items be added to the list at any time, but the ranking of the list occurs one time per year in the early spring. All new items paced on the list are added to the bottom of the list; however if the justification for needing the equipment warrants moving that item up in the rankings, and the committee agrees, then that item will gain a better ranking than older items on the list that have lesser documented need. For a new item to be added to the list a faculty member fills out a form and submits the request to the committee chair. On that list details of the item(s) requested and costs for the item(s) must be detailed. In addition, justification for the requested items must be included: the category of the equipment needed (e.g., to maintain course instructional integrity, to meet existing infrastructure deficiencies, or to meet continuing student/faculty research objectives), and some estimation of the annual number of students to be impacted by the purchase of the equipment, and if in support of teaching labs a listing of the course number affected. Once the committee ranks the list for a given year that list is shared with the Department Head, who shares it with the rest of the faculty, asking for their comments. When funds become available the Department Head uses the list to select items to purchase that are most highly ranked first, unless upper level administrators or potential donors indicate a preference to fund purchase of lower ranked items. Following the merger of Geology with Biology and Environmental Science, the combined department began keeping two equipment needs lists: one for Biology & Environmental Science, and one for Geology.

B. Teaching Labs

The needs of teaching labs are evaluated annually, and lab fees are typically used to support the purchase of lab supplies. A high volume of students pass through introductory 1000-level labs each year, totaling about 1344 students in Biology labs, 384 students in Environmental Science labs, and 480 students in Geology labs. BGE has five rooms devoted to introductory labs, including three for Biology, one for Environmental Science, and one for Geology. The fire code seating limit in individual lab sections is 24 students for Biology and Environmental Science, and 30 for Geology. The department typically runs about 88 individual introductory lab sections per year. Approximately 2,200 students enroll in these lab sections each year. Below, we provide details on the major Biology, Geology, and Environmental Science labs and their associated resources.

Biology—
All introductory Biology labs have available to them a compound microscope, with a camera and small monitor that sits on top of the microscope. This microscope was purchased for those students that are visually impaired and cannot see through the ocular lenses of a regular microscope. This allows the students to still learn how to use a microscope and see the specimens. Details of the introductory Biology labs are provided in the following sub-sections.

Principles of Biology I (BIOL 1110L) (two rooms): Over the past five years, we have gotten enough microscopes serviced so that every student has their own scope to use (24 in each room). Previously, students were sharing microscopes. Last year, the Department was able to purchase a TV monitor and Chromebook for each room for the instructors to use. Instructors can use these items to show the required videos, show pictures of microscope slide specimens so the students know what they are looking for on their scopes, or any other items that the instructors would like to present to the students.

Principles of Biology II (BIOL 1120L): There are 24 microscopes available for the students to use, which means that there is one microscope per student. Last year, the Department was able to purchase a TV monitor and Chromebook for the instructors to use. Instructors can use these items to show the students microscope slide specimens. When the microscope with the camera is not in use for a visually impaired student, instructors can use this scope to show students microscope slide specimens.

Environmental Science—
Introductory Environmental Science Labs (ESC 1500L and 1510L): Currently, the Environmental Science teaching classroom is Collins Annex Room 104, but was previously in Holt 225 prior to the renovation of the west end of Holt. The Collins lab space, which is housed in a trailer, is smaller than the previous space and there is currently only one small supply closet to house the supplies. The labs are reasonably well stocked with glassware, etc. and supplies for specific lab activities. Because of the implementation of lab fees in 2007, the lab coordinator notes that he is able to maintain a well-stocked lab.

Anatomy & Physiology—
Anatomy: The space and primary equipment for the anatomy lab include the following: 12 lab benches with electricity; five lab benches without electricity; eight sinks (cold water only); two refrigerators (49 cu ft each); presentation materials (including white board; projector with screen, Dell podium computer, document camera, microscope camera); histology items including 15 light microscopes and prepared slides of selected tissue types; four hanging skeletons (3 real bone, one plastic); eight real bone disarticulated skeletons; four bone cast/plastic disarticulated skeletons; 11 real bone skulls; five bone cast/plastic skulls; Somso and 3B models of the

following compartments/organs/systems: arm muscles, leg muscles, torso muscles, oral cavity, thoracic cavity, abdominal cavity, male and female reproductive organs, eye models, brain models, and ear models; dissecting pans and tools.

Physiology: Human Physiology lab (Biol 2080L) includes twelve benches with electricity, five benches without electricity, 24 chairs, podium computer with projector, white board and screen, three iWorx units and three accompanying iMacs, 12 light microscopes, assorted blood histology slides and urine sediment slides, microcentrifuge, hotplate with stirrer, microwave, incubator, assorted glassware and Nalgene solution containers, 12 sphygmomanometers, 12 stethoscopes, two water baths, and 11 portable spirometers. Primary equipment for Animal Physiology (Biol 4210L) includes: IWorx software and hardware; three relatively new iMacs for the use of IWorx; a functional fume hood; and a ~ten-year-old computer for projecting slides/data.

Microbiology—
Microbiology labs include physical lab space, a dedicated preparation area, and a dedicated lab coordinator (discussed below). Supplies include: different types of media based on lab test and bacteria growth requirements (most of the more than ten types are pre-mixed and ordered from different manufacturers); petri dishes; one bench-top incubator; a refrigerator with freezer to store cultures, media and solutions; a hood to keep sterile environment for inoculations etc; one scale; three hot plates/mixers to prepare and dissolve media; two media dispensers (for test tubes-slants and broths; one pH meter; two Bunsen burners; one dishwasher; inoculating tools (loops and needles); glassware including Erlenmeyer flasks of different sizes (125 ml to 2 liters); test tubes of different sizes; graduated cylinders; beakers of different sizes; and disposable items such as gloves, paper towels, hand sanitizer, hand soap, detergent and dish washer soap, etc.

The Microbiology Laboratory Coordinator is responsible for supervising the microbiology science laboratories to ensure faculty access to the microbiological media, cultures and equipment necessary to meet the laboratory competencies of their courses in a safe, clean, and neat environment. The Microbiology Prep Lab and Coordinator is mainly responsible for the preparation of microbiology teaching laboratories, including BIOL 2100L, BIOL 4220L, BIOL 4430L, and BIOL 4530L. The coordinator along with an average of three student assistants per regular semester (expected around 4-5 hours weekly; expectation is sometimes not fulfilled) ensures that all labs meet applicable safety regulations and that the faculty have the materials and equipment needed to properly teach their courses in a timely manner. Specific responsibilities include the following activities: prepare media and reagents to be utilized in microbiology teaching labs; set up lab for teaching; clean lab after teaching (remove all the remainder materials, remove waste generated during each lab); use of autoclave for sterilization of media and decontamination of biohazard waste generated during teaching; prepare bacterial cultures for growth and to be used in each lab exercise and course; maintain bacterial cultures used in labs; wash reusable autoclaved test tubes after each lab and any glassware used to prepare media; and handle overall lab organization (hand wash glassware, load and unload dish washer, sort tubes and caps by size etc.).

Additional Biology and Environmental Science labs—
Upper-level and core Biology and Environmental Science labs are typically scheduled in all-purpose lab rooms in Holt Hall, which are equipped with lab benches and relevant equipment (e.g. scopes, slides, specimens). Biology and Environmental Science has dedicated teaching labs, some of which are also used for research. Details of the lab space available primarily for teaching Biology and Environmental Science lab classes is provided in Table 5.1.

Table 5.1 Current use of teaching lab space for Biology and Environmental Science.

Teaching Laboratory Space/Room	**Current Use**		**Classes Taught**
	Teaching	**Research**	
Grote 109	X		• Functional Human Anatomy (BIOL)
Grote 108	X		• Human Physiology (BIOL) • Introductory Animal Physiology (BIOL)
Grote 110	X	X	• Plant Ecology (BIOL/ESC)
Holt Greenhouse	X	X	• Plant Physiology (BIOL) • Soil Resources (ESC/BIOL) • Urban Gardening (BIOL)
Holt 103	X	X	• Autoclave Room: Services Labs in 123 Holt and several research labs
Holt 104	X	X	• Microbiology Prep Room: Services Labs in 123 Holt
Holt 104B	X	X	• Microbiology Prep Room: Services Labs in 123 Holt
Holt 104C	X	X	• Bioremediation (BIOL/ESC) • Microbial Ecology (BIOL/ESC)
Holt 112	X	X	• Entomology (BIOL) • Environmental Survey Methods (ESC) • History of Evolution (BIOL) • Parasitology (BIOL) • Plant Ecology (ESC/BIOL) • Plant Morphology (BIOL) • Plant Taxonomy (BIOL)
Holt 120	X	X	• Cellular Biology (BIOL) • Genetics (BIOL) • Molecular Genetics (BIOL)
Holt 123	X		• Bioremediation (BIOL/ESC) • Microbial Ecology (BIOL/ESC) • Microbiology (BIOL) • Microbiology and Health (BIOL)
Holt 216	X		• Principles of Biology I (BIOL)
Holt 223	X		• Principles of Biology I (BIOL)
Holt 224	X		• Principles of Biology II (BIOL)
Holt 225	X		• Introduction to Environmental Science I (ESC) • Introduction to Environmental Science II (ESC) • Introduction to Soil Resources (ESC/BIOL)

			• Plant Ecology (ESC/BIOL) • Soil Resources (ESC)
Holt 228	X	X	• Air & Water Pollution Control (ESC) • Developmental Vertebrate Embryology (BIOL) • Herpetology (BIOL) • Histology (BIOL) • Human Development & Disease (BIOL)
Holt 318	X	X	• Air & Water Pollution Control (ESC) • Ant Ecology (BIOL) • Ecology (BIOL) • Herpetology (BIOL) • Ichthyology (BIOL) • Introduction to Soil Resources (BIOL/ESC) • Limnology & Reservoir Ecology (BIOL/ESC) • Ornithology (BIOL) • Plant Ecology (BIOL) • Plant Physiology (BIOL) • Toxicology (BIOL/ESC)
Holt 321	X		• Animal Behavior (BIOL) • Comparative Vertebrate Zoology (BIOL) • Dendrology (BIOL) • General Zoology (BIOL) • Histology (BIOL) • Ichthyology (BIOL) • Invertebrate Zoology (BIOL) • Mammalogy (BIOL) • Mycology (BIOL) • Ornithology (BIOL)
Sim Center 102	X		• Geographic Information Systems (ESC) • Remote Sensing & Imagery Analysis (ESC)

Biology and Environmental Science faculty also have dedicated research space, some of which is also used for teaching. Details of the lab space available primarily for Biology and Environmental Science research is provided in Table 5.2.

Table 5.2 Current use of research lab space for Biology and Environmental Science

Research Laboratory Space/Room	**Current Use**		**Faculty-*Field of Research***
	Teaching	**Research**	
Fortwood Greenhouse		X	• Dr. Hill Craddock: *American Chestnut Restoration & Mycology*
Collins Classroom Annex 101		X X X	• Dr. Loren Hayes: *Mammalian Social Systems* • Dr. Yukie Kajita: *Population Genetics* • Dr. Eric O'Neill: *Population Genetics*
Collins Classroom Annex		X	• Dr. Hong Qin: *Bioinformatics*
Davenport 131		X	• Dr. DeAnna Beasley: *The Ecology of*

			Human-Driven Change
Grote 110		X	• Dr. Jennifer Boyd: *Plant Ecology*
Grote 111		X	• Dr. David Giles: *Microbial Lipidomics & Environmental Microbiology*
Holt 102		X	• Dr. Henry Spratt: *Microbial Ecology, Bioremediation & Biogeochemistry*
Holt 103	X	X	• Autoclave Room: Services teaching and research labs
Holt 104	X	X	• Microbiology Prep Lab
Holt 104B	X	X	• Microbiology Prep Lab
Holt 104C		X	• Dr. Henry Spratt: *Microbial Ecology, Bioremediation & Biogeochemistry*
Holt 107: Natural History Museum	X	X	• Primarily houses freezers for specimen prep
Holt 107A: Natural History Museum	X	X	• Houses Mammalogy, Ornithology, Entomology, Ichthyology and Herpetology Teachings and Research Collections
Holt 108: Herbarium		X	• Houses Herbarium Research Collections
Holt 109		X	• Dr. Stylianos Chatzimanolis: *Beetle Systematics & Paleoentomology*
Holt 110A		X	• Dr. John Tucker: *Environmental Law*
Holt 112A			• Dr. Jose Barbosa: *Plant Physiological, Biochemical & Molecular Responses to Environmental Stress* • Dr. Joey Shaw: *Molecular Systematics of Plants, Floristics of the Southeast & Exotic Invasive Species*
Holt 113A		X	• Dr. Joey Shaw: *Molecular Systematics of Plants, Floristics of the Southeast & Exotic Invasive Species*
Holt 114A		X	• Dr. Jose Barbosa: *Plant Physiological, Biochemical & Molecular Responses to Environmental Stress*
115 Holt		X	• Dr. Jose Barbosa: *Plant Physiological, Biochemical & Molecular Responses to Environmental Stress* • Dr. Joey Shaw: *Molecular Systematics of Plants, Floristics of the Southeast & Exotic Invasive Species*
116 Holt		X	• Dr. David Aborn: *Avian Ecology & Management* • Dr. Thomas Wilson: *Reptile & Amphibian Conservation Biology; Geospatial Science*
120A Holt		X	• Dr. Margaret Kovach: *Mammalian Genomics & Heredity Disorders*
Holt 218, 317E			• Dr. Mark Schorr: *Stream Fish Ecology & Conservation*
Holt 219		X	• Dr. Timothy Gaudin: *Mammalian Systematics & Palenotology*
Holt 221		X	• Dr. Hope Klug: *Evolutionary & Behavioral*

			Ecology
Holt 227A, 228		X	• Dr. Ethan Carver: *Vertebrate Embryogenesis*
313 Holt: Animal Facilities		X	• Shared space for -80 freezers
314 Holt: Animal Facilities		X	• Dr. Timothy Gaudin is currently using this space
316 Holt: Animal Facilities		X	• Dr. Thomas Wilson was using this space
317A Holt: Animal Facilities		X	• Dr. Ethan Carver was using this space • Dr. Yukie Kajita was using this space
317B Holt: Animal Facilities		X	• Dr. Hope Klug was using this space
317F Holt: Microscope Rm	X	X	• SEM and Confocal Microscopes: Serves various faculty and departments
317G Holt		X	• Dr. Hill Craddock: *American Chestnut Restoration & Mycology*
318A Holt		X	• Dr. Sean Richards: *Environmental Toxicology*

Geology—

Geology has three main teaching labs, two combination research/teaching labs, and three storage areas for teaching and research materials. The three main teaching labs are all equipped with projectors that can be hooked up to laptops. Details of the lab space available for all Geology lab classes is provided in Table 5.3.

Table 5.3 Current use of laboratory and research space for Geology.

Laboratory Space/Room	Current Use Teaching	Research	Classes Taught
Geochemistry Lab: Victor Goldschmidt Room (Grote 209)	X	X	• X-ray Diffraction Methods • Soil Prop., Genesis, and Development • Oceanography Lab • Geology Seminar/Senior Seminar
Geology Thin Section Lab (Grote 107)	X	X	• Petrology Lab • Geology Seminar/Senior Seminar • Sedimentary Rocks and Stratigraphy • Economic Geology • Independent Study
James Dwight Dana Room (Grote 210)	X		• Physical Geology Lab • Mineralogy Lab • Historical Geology Lab
James Hutton Room (Grote 208)	X	X	• Petrology Lab • Environmental Geology Lab
Hugo Benioff Room (Grote 206)	X		• Economic Geology • Geomorphology • Soil Prop., Genesis, and Development • Field Experience • Sedimentary Rocks and Stratigraphy

			• Paleontology • Geology Seminar/Senior Seminar
IGT Lab (SimCenter 102)	X		• GIS for Geologists • Geological Remote Sensing
Students' Computer Work Station: Lewis and Clark Room (Grote 224)	X		• Petrology • Geology Seminar/Senior Seminar • Structural Geology • Field Methods • Sedimentary Rocks and Stratigraphy
Geological and Environmental Remote Sensing (GERS) Lab (part of Holt 117)*		X	
Geology Sample Storage (Grote 106)		X	

* Temporary space

C. Facilities

Overview of Building Resources—

Prior to 2016, faculty and staff in the Department occupied space in Holt Hall, Grote Hall, the Collins Laboratory Annex, and the Collins Office Annex. Due to the renovation of Holt Hall, faculty and staff now occupy space in Holt Hall, Grote Hall, the Collins Laboratory Annex, and the Collins Office Annex, and Davenport Hall. After the renovation, Biology and Environmental Science faculty will primarily be housed in Holt Hall, and Geology faculty will continue to be housed in Grote Hall (see Table 5.3 above for description of current and future Geology space use). A detailed description of the anticipated space allocation following the completion of the renovation is provided in Appendix CC. An evaluation of this anticipated space use is provided in section 5.3.C, infra.

5.2 Learning and Support Resources to Support Teaching and Learning

A. Vehicles and Vessels

The Department currently has one 12-passenger van and one single cab 4wd truck that can be used by faculty, staff, and employed students for teaching and research activities. Additional vehicles can be reserved from motor-pool at a cost. BGE has two vehicles purchased to support specific research programs: a small Toyota SUV for the American Chestnut Restoration Program and a four door Ford heavy duty dually truck to trailer the BGE river research boat. BGE also has an electric utility car for on campus use.

The BGE river research boat is called the *utC. Serpentina* and it was designed by one of our faculty and built by Clarke Custom Boats and Trailers. The *Serpentina* is a 26 foot heavy-duty research vessel with a shallow draft and is designed to accommodate nets, turtle traps, etc., and carry up to 24 people. The boat is equipped with an auxiliary motor, fuel cell, running lights, submersible lights, three on board batteries, depth finder, GPS, underwater camera, sonar, two way communications, and appropriate safety gear. The department also has an 11 foot Kayak (made by Mokai Industries) that is jet propelled by a Honda inline motor. The department has two canoes, but other non-motorized vessels (i.e., canoes) can also be checked out for use by students and faculty through the UTC Aquatic and Recreation Center. The department has a 14 foot utility trailer for use on overnight field trips. The department had a general use 21 foot pontoon boat that was destroyed when a tree fell on the boat during the review period. The boat has not yet been replaced.

B. Environmental Growth Chambers

The University of Tennessee at Chattanooga (UTC) was awarded funds from the National Science Foundation Major Research Instrumentation program in Fall 2013 (Award # 1337530) to support the acquisition of six controlled-environment growth chambers to strengthen its active faculty scholarship, experiential graduate and undergraduate research opportunities, and involvement in community outreach. The growth chambers specifically support faculty research agendas requiring precise and simultaneous environmental controls with focus on global change biology at UTC. Projects completed to date have aimed to help elucidate the role that local adaptation could play in plant species migrations in response to climate warming and provide information about how imperiled eastern hemlock will respond to climate change within the context of hemlock woolly adelgid invasion. Ongoing NSF-funded research (Award #1655762) aims to improve understanding of species rarity by assessing the ability of rare endemic species to adjust to relatively rapid environmental changes compared to closely related species that are more common. By enabling faculty to conduct year-round campus-based research and consequently integrate more ongoing research into their sizeable teaching duties, the growth chambers have increased research productivity while fostering student research training and experiential learning. To date, ~150 UTC undergraduates have been engaged in research using the growth chambers during lab-based coursework (in Ecology, BIOL 3060; Plant Ecology, BIOL/ESC 4450, ESC 5730; Animal Physiology, BIOL 4210). Because more than 55% UTC students are women and nearly 20% represent racial or ethnic minorities, participation of these students in research has been inherently broadened by teaching applications of the chambers. In addition, the growth chambers have supported the research of two female students enrolled in the M.S. in Environmental Science Program at UTC and three undergraduate students (two female) conducting Departmental Honors (DHON) research projects, one of whom co-authored an associated research article in Southeastern Naturalist. Research conducted in the chambers has supported existing regional collaborations between UTC researchers and the U.S. Fish and Wildlife Service, and the chambers have facilitated the development of new research proposals with collaborators at the Atlanta Botanical Garden, Austin Peay State University, Seton Hill University, and the University of Georgia.

C. Greenhouse

The Department has access to two greenhouses. One greenhouse adjacent to Holt Hall is for general use and provides a wealth of teaching material that is used in multiple lectures/labs in these courses and from plant anatomy, morphology, evolution to pollination syndromes, growth and development, water use strategies (xerophytes vs mesophytes), and more. Greenhouse activities specifically support and strengthen our program by providing plant materials and space that is used in many different laboratory sessions of different courses including Plant Physiology, Plant Morphology, Taxonomy, Biogeography, and Cell Biology. In addition, there is space for many other activities including plant research under controlled environmental conditions, medicinal and other plant collections. The second greenhouse is located a block from Holt Hall and is devoted to the American Chestnut Restoration Program.

D. Urban Garden

This new resource was introduced in May 2016. The garden has thus far had great impact on our students and the community. Currently the greenhouse activities are spread between three different temporary fields on UTC's campus, but a permanent field near Engel Stadium will be provided once construction is complete near the field site. The Urban Gardening course is open to any UTC student and provides opportunities for active experiential learning.

E. Natural History Museum Collections

The museum holds a collection of fossil vertebrates and invertebrates numbering several thousand specimens (including 1102 catalogued mammals, 40 catalogued birds, 42 catalogued reptiles & amphibians, more than 500 invertebrate specimens, with approximately 3,000-4,000 uncatalogued specimens), and an extant vertebrate teaching collection of more than 500 specimens (216 whole body, whole skeleton, or mounted or preserved dissected specimens and models, roughly 300 microscope slides [chicken embryos, protochordates and misc. histology slides], and ~100 miscellaneous, isolated bones). Additional details of collections are provided below.

Mammal Collection—
The UTC Natural History Museum mammal collection, which is curated by Dr. Tim Gaudin, includes 2120 catalogued specimens, representing 209 species in 75 families and 23 orders (i.e., all but three of the living mammalian orders). Based on a 1997 survey [Hafner, M.S., Gannon, W.L., Salazar-Bravo, J. and Alvarez-Castañeda, S.T., 1997. Mammal collections in the Western Hemisphere. Lawrence (KS): American Society of Mammologists], the mammal collection would be the second largest in the state of Tennessee, and is positioned at the opposite end of the other significant mammal collection in the state at the University of Memphis. The mammal collection serves as an official repository for specimens collected in biotic surveys of two national parks (Chattanooga/Chickamauga National Battlefield and the Great Smoky Mountains), and includes significant collections of specimens from east and southeast Tennessee, northwest Georgia, and western North Carolina. Its taxonomic strengths are in small terrestrial soricids and rodents. These collections are used in the Comparative Vertebrate Zoology course (BIOL 4050, 24-48 students per year), the Mammalogy course (BIOL 4140, 24 students every two years), and the History of Evolutionary Thought course (BIOL 4550, roughly 10 students every two years).

Insect Collection—
The UTC Insect collection (UTCI), which is currently curated by Dr. Stelios Chatzimanolis, was established in the early 1970s by Charles Nelson, a plecoptera expert. Over his 30-year career, Nelson developed an outstanding teaching collection (identified at the family level), with representatives from most USA Southeastern families and approximately 40,000

specimens. Chatzimanolis arrived at UTC in 2008 and quickly established a modern research-focused collection of Coleoptera, which currently has ~30,000 specimens. Three new modern cabinets were acquired and dozens of Cornell drawers to rehouse the teaching collection and make room for the developing research collection. The main geographical focus of the research collection is the SE USA but due to the neotropical research program of Chatzimanolis, many neotropical materials are present as well. In fact, the collection has specimens from 40 different countries, excluding USA. Chatzimanolis' research focus is the largest family of animals, the rove beetles (with >60,000 species described) and the UTCI collection is quickly becoming one of the more diverse rove beetle collections in North America. The Xanthopygina rove beetle collection at UTCI is probably one of the top 10 in the world, regarding species diversity present in the collection. Due to the fact that Chatzimanolis is one of the only two rove beetle systematists currently employed in the USA at a university level, UTCI is also becoming the de facto collection for rove beetle specimen identification in the country. Recent donations of materials include 5,000 specimens of rove beetles from Mexico and a forthcoming donation from Puerto Rico. The UTCI collection is extensively used in BIOL4070 (Entomology) 24 students/year, BIOL4130 (Invertebrate Zoology) 24 students/year, and BIOL4999 (Parasitology) 24 students/year.

Amphibian and Reptile Collection—
This collection includes 4400+ specimens, including ~2000 species, 239 genera, and 78 families (of the 153 recognized), which does not account for a backlog of un-accessioned specimens. Of note, the oldest specimen in the collection from our region is *Regina septemvittata* (Queen Snake) Kenton Co. Kentucky, R.S.W. (Gift from GMU1998/UKR381). The taxonomic focus of the collection is variable but largely focused on Caudates, Chelonians and Colubrid snakes. Like the taxonomic focus its geographic focus is also variable. This collection is utilized by the following courses and students: BIOL 4090 (Herpetology) 24 students, Fall Even Years; BIOL 5400 (Special Topics) 2-4 students, Fall Even Years; BIOL 3070 (Ecology Laboratory) 24 students, Spring Semester; ESC 3400 (Environmental Survey Methods) 24 students, Fall Odd Years; BIOL/ESC4998/4995 (Team Salamander) 8-12 students, every semester; BIOL/ESC4999 (Amphibian Conservation) 24-30 students, Spring Odd Years, and Comparative Vertebrate Zoology course (BIOL 4050, 24-48 students per year),

Bird Collection—
The bird collection in the UTC Natural History Museum consists of approximately 200 bird specimens and about a dozen nests. The collection is used primarily for BIOL 4710 Ornithology, which has a limit of 24 students in it. Some specimens are occasionally used by BIOL 4520 Limnology and Reservoir Ecology and BIOL 4050 Comparative Vertebrate Zoology.

Fish and Additional Invertebrate and Salamander Collections—
Details of the collections managed by Dr. Mark Schorr are provided in Table 5.4. In summary, this collection contains numerous invertebrates, fish from more than 110 families, and more than four species of salamanders.

Table 5.4. An overview of the collections managed by Dr. Mark Schorr.
A superscript of 1 refers to research/reference collection(s), which contain site- & date-specific information, are used primarily by researchers or professional biologists; however, many of the reference specimens are used for teaching; a superscript of 2 refers to teaching collection(s), which may or may not contain site- & date-specific collection information, are used primarily for teaching; a superscript of 3 refers to the "North Chickamauga Creek Project" (NCCP) -- Site-specific location information is detailed in the following literature: Schorr, M.S., C.H. Nelson, and G. Van Horn. (1997). Ecological assessment of streams impacted by acid mine drainage in the North Chickamauga Creek System, Tennessee, and an evaluation of the mitigation potential of constructed wetlands. Contract Number ID-6-05876-6-00. Annual Report. Tennessee Wildlife Resources Agency, Nashville, Tennessee, 72 pp.; a superscript of 4 refers to the "Urban Streams Project" (USP) -- Site-specific location information is detailed in the following literature: Schorr, M.S., E. Crews, P. Freeman, J. Long, P. Johnson, and D. Fritz. (2001). Assessment of water quality and aquatic macrofauna in Chattanooga area streams. Contract No. R04101154-64. Final Report. City of Chattanooga, Department of Public Works, Stormwater Management Section, Chattanooga, Tennessee, 444 pp.; a superscript of 5 refers to the "Stream Restoration Project" (SRP) -- Site-specific location information is detailed in the following literature: Schorr MS, Carroll A, Cuervo J, Freeman PL, Genard L, Geren D, Ghazi H, Hubbuch JM, Landis L, Smith JB. (2013). Macrofaunal responses to habitat improvements in two urban streams in Chattanooga, Tennessee. Final Report. The City of Chattanooga, Department of Public Works, Water Quality Program. Chattanooga, Tennessee, 115 pp.

	Drainage	Watershed(s) or project	Year(s) of collection	Specimens	Families	Genera	Species
Invertebrates[1]	TN River	NCCP[3]	1996-97[3]	?	≥30	≥44	
Invertebrates[1]	TN River	USP/multi.[4]	1998-2000[4]	?	≥76		
Invertebrates[1]	TN River	SRP, multi.[5]	2012[5]	?	≥37		
Invertebrates[1]	TN River	Lookout Cr[6]	2014[6]	?	50		
Invertebrates[2]	multiple	multiple	multiple	?	?		
Ichthyological[1]	multiple	multiple	multi-year	?	?		
Ichthyological[2]	multiple	multiple[3,4]	multi-year[3,4]	?	≥110		
Salamanders[1,2]	TN River	NCCP[3]	1996-1997[3]	~20	1	4	≥4

Herbarium—
The herbarium at UTC is the oldest herbarium in Tennessee and was established in 1886, there are >45,0000 specimens that are mostly from SE Tennessee and NW Georgia, but we also have a

diversity of specimens from many of National Parks in the US (Mt. Rainier NP, North Cascades NP, Olympic NP, Grand Tetons NP, Yellowstone NP, Yosemite NP, Rocky Mountains NP, Zion NP, Bryce Canyon NP, and Grand Canyon NP). We are an official repository for the Chickamauga and Chattanooga National Military Park. The UTC herbarium is not just regional and national; it is also international in scope as we have many specimens from Africa, the Middle East (Abu Ghraib, Iraq), and Southeast Asia. While it is hard to put a monetary value on these things, averaging a couple of published estimates and adjusting for inflation since the late 1990's would value the UTC herbarium at about $4 million. It is used to support Plant Morphology, Plant Taxonomy, and Biogeography. In addition to those students, Dr. Shaw has had 10+ independent study student workers the last four semesters, and all of his graduate students (about 15 to this point) have used it as an education resource as well as a repository for voucher specimens.

F. Computers

A detailed list of departmental computers is provided in Appendix DD. The Department has acquired approximately 59 computers in the past five years through department, college, university, and grant funds. UTC Information Technology provides support for these computers, and initiated a Computer Refresh Program in 2016. The Computer Refresh Program was established to create an annual cycle of computer replacement so that all faculty and staff would receive a new, primary computing device every four years. The university refresh fund contributes up to $1,200 toward a refreshed device with departments paying for any overages. From 2012-2016, the College of Arts and Sciences supported computer refresh for BGE. Prior to this, computer refresh was ad hoc. The university additionally provides a range of relevant software, including Microsoft Office, Adobe Professional, SPSS, and MatLab.

G. Field Stations

UTC's Department of Biology, Geology and Environmental Science oversees the day-to-day operations of three Biological Field Stations (BFS). The BFS are located in the Ridge and Valley ecoregion, and their underlying Geology is dominated by limestone and dolomite formations and rolling hills. The BFS properties are comprised of three distinct parcels (LT6: 35° 6'20.51"N /-85° 7'46.94"W; LT7: 35° 5'54.78"N /-85° 5'52.13"W; WSP: 35°04'53.4000"N/-085°15'28.0800"W) and total 121.9 hectares. The landscapes are a mix of hardwoods and all are proximate to various water courses. The wetland habitats are ephemeral at LT6/LT7 and remain dry from late May through October depending on precipitation; however, WSP is largely fed by surface runoff and it being an urban wetland its hydro-period is more variable when compared to LT6 and LT7. The upland and aquatic landscapes at the BFS create habitat for 43 species of amphibians and reptiles, and 40 species of mammals. Infrastructure at the BFS includes two outdoor classrooms as well as permanent study plots, transects, drift fences, and a small weather station. This infrastructure provides a framework for training students on basic field techniques. LT6 and LT7 are about a 25 minute drive from UTC. WSP was donated to UTC in 2017, has an assessed value of about $1.5 million, and is about a five minute drive from UTC. Due to its close proximity to UTC, it will be feasible to integrate the 18 acre wetland site into multiple laboratory classes.

H. Health and Safety

A chemical hygiene plan for the department is provided in Appendix EE. The university also maintains an Office of Safety and Risk Management, and details of their activities can be found at the following website: https://www.utc.edu/safety-risk-management/emergency-management/index.php .

I. Illustrator

Julia Morgan Scott is an illustrator who works for Dr. Tim Gaudin. She has prepared hundreds of published illustrations in dozens of peer-reviewed publications in the more the 22 years she has worked for Dr. Gaudin. She has also prepared wonderful illustrations that are used in teaching materials for both Comparative Vertebrate Zoology (BIOL 4050) and Mammalogy (BIOL 4140). She has done limited work for other faculty, helping design logos and t-shirts for Tri-Beta, for several research-lab related projects, and for one scientific meeting hosted by UTC (ASB 2000). Her work has been published in papers co-authored by students, and she has discussed scientific illustration as a career with a number of interested students through the years.

J. Library

UTC has a state-of-the-art library that provides access to 400,000+ print and online materials, relevant databases, and discipline-specific journals. The library provides access to information in every format available from books, e-books, and journals to online databases, digital image collections, CDs and DVDs. The Library also checks out a variety of technological devices such as laptops, chromebooks, digital and video cameras, scientific calculators, and sundry cables. All items are available to current UTC students, faculty, and staff for check out and many resources can be accessed online from home via the UTC Library WorldCat Local system. The Library provides access to small and large study rooms, a computer classroom that can be reserved for instructional purposes, presentation rooms, and conference rooms.

At the Departmental level, we have a Library Committee and a Departmental Liaison to the library. To evaluate and assess our library needs, each February (or early March) the Collections Department releases money for our department to spend on one-time expenditure library resources (excluding journals or continuing resources like databases, textbooks, or duplicate items). We are allowed to make requests for what the money will be spent on, but if we do not the library will choose resources to purchase for our department. We do not typically have a lot of requested material from faculty. For example, the following materials were requested and purchased with March 2017's budget, which was $1,8000: 1) Chiappe, LM and M Qingjin. 2016. Birds of Stone. Chinese Avian Fossils from the Age of Dinosaurs. Johns Hopkins Univ. Press. ISBN 978-1-4214-2024-0; 2) Croft, DA 2016. Horned Armadillos and Rafting Monkeys. Indiana Univ. Press. ISBN978-0-253-02084-0; 3) Dial, KP, N Shubin and EL Brainerd. 2015. Great Transformations in Vertebrate Evolution. Univ. of Chicago Press ISBN 978-0-226-26811-8; 4) Farina, RA, SF Vizcaino, and G De Iuliis. 2013. Megafauna. Giant Beasts of Pleistocene South America. Indiana Univ. Press. ISBN 978-0-253-00230-3; 5) Losos, JB and RE Lenski. 2016. How Evolution Shapes our Lives. Princeton Univ. Press. ISBN 978-0-

691-17187-6; 6) Cox, Philip G. Cox and Lionel Hautier. 2015. Evolution of the Rodents: Volume 5: Advances in Phylogeny, Functional Morphology and Development (Cambridge Studies in Morphology and Molecules: New Paradigms in Evolutionary Biology). Cambridge Univ. Press. ISBN 9781107044333. The Department can also make requests for access to journals.

K. Research with vertebrate animals and human subjects

All research with vertebrate animals must be approved by the Institutional Animal Care and Use Committee (IACUC). The process for securing approval is detailed at the following link: https://www.utc.edu/research-integrity/institutional-animal-care-use-committee/application-process.php . All research involving human subjects must be approved by the Institutional Review Board (IRB), and details of the process for securing this approval can be found at the following link: https://www.utc.edu/research-integrity/institutional-review-board/index.php .

L. GIS Resources

The Office of Academic and Research Computing Services provides a variety of GIS resources and support services for the university community, including an ESRI site license, ESRI Virtual Campus Courses, ERDAS site license, Trimble site license, 2+ TB of regional geospatial data, Enterprise geospatial data server, Web mapping development and hosting, Mobile GIS application development, Survey and map-grade GPS equipment, On call support by certified GIS Professional, and Lab and classroom instruction.

5.3 Assessment of Learning Resources Strengths, Weaknesses, and Recommendations for Change

5.3.1 Equipment and Facilities

A. Instructional Equipment

The Chair of the Equipment Committee, Dr. Henry Spratt, has evaluated our equipment needs. The primary thing that he recommends is the establishment of a line item in the BGE operating budget for equipment purchase. Having such a budgetary line, and offering the department the ability to save funds from year to year to target higher costing equipment items would help the department meet many of its long-range goals with regard to curriculum and research. In a department like ours with so many labs that require some sort of equipment to do our work, the need to keep our equipment up to date is constant. For example, numerous microscopes are used in our teaching labs. Teaching microscopes produced today have shelf-lives of around 10 years. Thus, unless the department has some way to plan for the replacement of microscopes, presumably on some sort of rotational basis, it is possible that labs could begin to have so many defective microscopes as to not allow lab courses to meet their curricular objectives. The replacement costs for our teaching microscopes often run between $1,500 and $2,000 each. This problem is also present with other types of equipment as well, including the autoclave (steam sterilizer). Currently, the department has only one large (about 250-liter capacity) autoclave. Again, the problem of aging equipment comes up, with most autoclaves of this nature having an operational life time of about 15 years due to the high-pressure nature of the device. The unit we now have (a Primus model) is approaching 10 years of service time to the department. Replacement costs for our autoclave run between $40,000 and $50,000. An additional problem we have with our autoclave is the intense use it is subjected to. The volume of materials that need to be autoclaved in the department in support of both teaching and research labs has increased dramatically over the past five years. In fact, the need for this one piece of equipment is so critical to our overall departmental curriculum that the Equipment Committee has strongly recommended that the department purchase a second autoclave. This idea has gained importance with the ongoing Holt Hall renovation, which imposes critical impediments to faculty and staff as they try to sterilize items in Davenport Hall (the current location of the autoclave), and then transport the sterile items to Holt Hall.

In addition to the need for a dedicated budgetary line item for the purchase of critically needed pieces of equipment, the department also needs a budgetary line item to help cover the costs to purchase service contracts for the items we have and to cover unanticipated equipment failures. These ongoing expenses are important to maintain and replace the equipment that we own. These costs are not insignificant, as, for example, the current service contract we have for our autoclave runs about $7,000 per year. Total maintenance and repairs costs for 2018 are projected to be about $24,000, representing about 21% of the department's annual operating budget. Additional funds are needed to maintain and service the other major pieces of equipment in the Department as well.

B. Teaching Labs

Biology—
In the Principle of Biology I labs, it would be ideal for each lab to have its own microscope with a camera, so the instructors can show the students microscope slide specimens in real time. After the building renovation, it would also be ideal to have chalk boards taken down and a dry-erase board mounted onto the wall. We are currently using portable dry-erase boards. BGE has requested instructional computers, projection systems, and wall mounted dry erase boards in all teaching labs as part of the Holt Renovation. Additionally, new balances should be purchased to make sure that each group in the lab has its own balance; currently groups are sharing the balances that we have. In the Principle of Biology II lab, it would be ideal to have four more stereomicroscopes for the lab, so the students can have more practice in using these kinds of instruments. It would also be ideal to have a stereomicroscope that would be compatible with a camera to show students specimens that are larger than what can be shown on a compound microscope. The lab room also needs an instructor's chair that is tall enough for the front bench, and the lab would benefit from a refrigerator. This would be used to store dissected specimens over several days. That way the specimens would not dry out and could be used over multiple days.

Environmental Science—
A critical need for Environmental Science labs is prep space. The lab coordinator has gone without prep space for quite some time, although the Holt Renovation is expected to rectify this issue. Additionally, more professional-level water quality monitoring instruments would be a strong addition to our current stock of laboratory equipment and supplies.

Anatomy & Physiology—
Major needs for the anatomy and physiology labs include: 1) designated storage space (currently models and specimens are stored in inappropriate/inadequate spaces), as adequate space will ensure the models and specimens retain their quality over time; 2) ceiling panels to improve acoustics in the anatomy lab. The room currently lacks these panels. The ventilation system for the building is exposed and often generates extra noise, making it very difficult for students at the back of the room to hear their instructions because of the poor acoustics and excessive noise; 3) additional or improved lighting in the lab is needed to improve the student's ability to see structures during dissections. The current lighting arrangement creates large shadows that are difficult to avoid when working at the benches. These shadows become especially problematic when students are attempting to locate and identify various muscles, organs, and vessels on their specimens; 4) hot water is needed to wash hands and clean dissection pans and utensils; 5) adequate space for equipment and chemical storage; 6) repair of leaking pipes in the ceiling; 7) temperature control for the room, which is currently absent; and 8) new computers and a projector. In addition, a modern physiological lab would have space for preparation of chemicals, computers and software at each lab bench, easy access to spectrophotometry, a faraday cage, and dissecting scopes, which the current lab lacks.

Microbiology—
In addition to the autoclave needs listed above under 'Instructional Equipment,' the role of the lab coordinator may need to be refined. In 2012, BGE obtained a new microbiology lecturer/laboratory coordinator position. The position has benefited students and faculty, but coordination of the lab currently requires many hours each week supervising and training students and working in the lab making media and sterilizing and cleaning tubes or other lab glassware in an attempt to cover for the bulk of demand that is usually not fulfilled with the three student assistants. Additionally, there is substantial turnover among student assistants, and students typically need to be trained for 2-3 weeks before they are able to perform any kind of task on their own. A potential solution might be to hire a full-time lab technician and/or a graduate student technician and/or for microbiology instructors to have greater involvement in setting up their individual lab activities (as is the case with other courses) once all the materials are provided. Currently, prep room personnel have been providing all lab set up and clean up.

Additional Biology and Environmental Science labs—
Additional teaching lab space is needed to offer the diverse BGE lab based curriculum. In addition, a computer lab and computers within each individual lab would improve the scope of activities that can be done in lab. The renovated Holt Hall will include two new teaching labs and a designated computer lab for students. Presently, there is no funding to purchase computers for student use within individual teaching labs.

Geology—
As Table 5.3 clearly shows, many Geology laboratories are currently being used for both teaching and research activities. The faculty in Geology do not have dedicated research space. As the program has grown, it is very challenging to be productive in research without dedicated research space. Separate research and teaching space, as well as dedicated research space for individual Geology faculty, is needed. BGE has requested that three rooms on the first floor be available for Geology faculty research. Two of the rooms (Grote 111, 112) are being

temporarily used by Biology faculty who will move into Holt Hall after completion of the first phase of the renovation. The third room (Grote 113) is now vacant.

Currently all GIS and Remote Sensing classes are being held at the SimCenter's Integrated Geospatial Laboratory (IGT) Lab, which is located about 0.5 miles from the Department. The lab has bare minimum computing facility for GIS and Remote Sensing classes as the computers are very old. The lab also has restriction for after hour use. The availability of a classroom with efficient computing facility within the department or in the close proximity would be of great benefit by providing an optimum learning environment for GIS and Remote Sensing classes.

Additionally, the Geological and Environmental Remote Sensing (GERS) Laboratory is currently under development and is temporarily located in Holt 117. A suitable permanent location of this laboratory is required to conduct research in different areas of geological and environmental remote sensing. It is anticipated that this lab will also be used for advanced GIS/Remote Sensing classes in the future.

C. Research and Other Facilities

After the completion of the Holt Hall renovation, there will be a significant increase in overall space, primarily for use by Biology and Environmental Science faculty. For the first time in many years, all BGE faculty will be located in Holt and Grote Halls. All Biology and Environmental Science research faculty will have dedicated research/storage space, and many will have increased and improved space. A major need for Geology will continue to be independent research space, as mentioned above. Additionally, following the renovation, there will be three or four vacant office spaces and three vacant research spaces to accommodate visiting scholars and new positions. If the department hires a new tenure-track faculty every two or three years, as is the approximate pace we have been hiring new faculty, the department will be at capacity in 6-9 years. If there are any Geology tenure-track hires, there is not any space--office or research-- in Grote for that expansion. Thus, while the building renovation will improve our space, the department may soon require additional space. As such, it is critical that the university continues to actively seek ways to provide the Department with additional, high quality space. A new Health Sciences building is being planned, and there are preliminary discussions about lab space in that building for Biology and Environmental Science faculty that conduct health related research.

The following is a summary of what we have requested for IT needs in the new renovated Holt space: 1) all teaching labs should have a flat panel TV displays, non-ghosting whiteboards and overhead projectors. Teaching labs should also be equipped so images from microscopes can be transferred to displays. In certain labs, we asked for wireless connectivity between devices and display panels; 2) Lecture classrooms should be equipped with traditional teaching podiums, projectors, screens, whiteboards that do not overlap screens and electrical outlets for student devices. 3) We would like to equip two small classrooms to facilitate integrative/interactive teaching methods (NODE/Ethos chairs; chairs clustered around multiple tables). The success of our future teaching depends on the university meeting these needs.

Furniture requests for the Holt renovated space have not been finalized. We understand that portions of the building not previously occupied by BGE will have new cabinetry, lab benches, and furniture. We have requested new furniture in rest of Holt Hall, as well as repair or replacement of any degraded or damaged cabinetry or doors being reused in the portions of the building previously occupied by BGE. We are still waiting on budget approvals and notification concerning these items. Acquiring sufficient furniture is essential for the continued success of our program.

Following the renovation, we will have two new study rooms for undergraduate students. We've requested kitchenettes, white boards, and seating areas in each of these rooms. Additionally, the Department will have an in-house computer teaching lab. This is excellent and will broaden the scope of courses offered by our faculty; however, it will be key for the university to demonstrate a commitment to keeping those computers up-to-date and functioning. BGE will also have a larger conference room, a room for graduate teaching assistants, and a room for graduate students.

5.3.2 Other Resources to Support Teaching and Learning

A. General use vehicles

The two current general use vehicles are not sufficient for current teaching and research needs, particularly since there is no dedicated budget for using motor pool vehicles. No new vehicles have been purchased during the past five years, despite the addition of new faculty and students. Both an extended cab (¾ ton 4x4) truck or SUV and an additional Quigley (1 ton, 12 passenger) 4x4 van are needed to support research and teaching needs of the department.

B. Growth Chambers

No major needs are noted with respect to the growth chambers at this time. Annual maintenance costs are about $3,000.

C. Greenhouse

The greenhouse is in need of an automated irrigation system and a storage facility for materials (pots, tools, equipment, seeds plant parts, etc.) used in teaching and research programs. In addition, a greenhouse manager that could free faculty from being the caretaker of the structure would be beneficial. Ideally, the greenhouse manager would be a student in order to increase paid student research opportunities. Currently the greenhouse functions as what it is intended for (greenhouse), but also as storage place which deters taking advantage of its full capacity. As far as needs for the greenhouse and herbarium (and other biocollections here at UTC) there is a push to start thinking about these as pieces of equipment. Like any other teaching/research tools, they need maintenance and upgrades to keep them useful and functioning. These are valuable resources that span several professors, classes, students and they support and underlie publications, environmental impact assessments, and grant funding. As such, they need maintenance. However, there is no dedicated budget for any of this. Even more, the collections and greenhouse require constant attention (watering, weeding, repotting, monitoring dermestid beetle infestations, specimen repair when damage occurs because of use in teaching). This adds up to considerable time of the Ph.D. curators of these resources. At the very least, even small dedicated budgets would help protect and maintain these valuable resources.

D. Urban Garden

The needs to improve the Urban Gardening program include a dedicated storage facility for the small garden tractor, tillers and other equipment. In addition, the acquisition of irrigation systems for the area is a high priority for the urban garden.

E. Natural History Museum Collections

Major weaknesses in the museum have to do largely with a lack of labor and lack of a dedicated budget for the museum to purchase supplies. We depend on students for all curatorial activity, but between preparing backlogged specimens, maintaining a dermestid beetle colony to clean skeletons, the actual work of cleaning skeletons, identifying and labeling and databasing specimens, and specimen upkeep (including tasks like regular treatment for pest control, specimen repair, etc.), many tasks fall through the cracks. For the museum in general, we are in need of dedicated collection/curatorial staff and dedicated funding through the Departmental operating budget.

In addition, the UTCI research collection is growing very rapidly (more than 10,000 accessed in the last two years), and we will surpass our capacity to house specimens in the next year or so. The UTCI collection is housed in three modern Delta Design cabinets (two of the cabinets have 72-drawer capacity and the other has 48-drawer capacity) and six Lane cabinets (each 12-drawer capacity). All Lane cabinets are more than 40 years old and are in desperate need of repairs, both on the door handle mechanism and the rubber sealant around the door edge.

With regard to the amphibian and reptile collections, we are in need of increased drawer space, increased workspace, increased ventilation and lighting, lockable storage, and shelving. Additionally, with regard to the avian collection, there are three major weaknesses in the collection: 1) lack of space (the two cabinets the bird collection is housed in are full, although three new cabinets were purchased this summer), 2) the cabinets are old and do not seal well (again, the new cabinets should help alleviate this problem), and 3) there is a lack of staff to curate the existing collection and prepare new specimens. There are currently ~300 specimens in the freezer, and if there was someone who was capable of doing museum preparation on bird specimens, the collection could be greatly expanded, which would increase its usefulness both within the department, and potentially to outside researchers as well.

In addition to the herbarium needs mentioned above (see ‘Greenhouse’ section), additional herbarium needs include the following: 1) a small dedicated budget for specimen repair and new specimen preparation; 2) the herbarium is contained in 57 standard, museum-grade herbarium cabinets and many of these are old and failed or failing. In a recent NSF submission Dr. Shaw requested 10 new cabinets, but the herbarium could really use about 15 new cabinets, which are about $1800 each.

F. Computers

Teaching computers are refreshed through IT's Computer Refresh Program. However, there is currently no internal opportunity to update and refresh research computers. While the library has a computer classroom, the Department lacks dedicated computer space for students and for teaching, although the renovation will improve this situation (discussed page 11, supra). Additionally, computers in individual teaching labs would allow instructors to incorporate data entry and statistics into their lab classes. BGE has requested instructional computers and projection systems in all teaching labs as part of the Holt Renovation. The incorporation of more computers for student use into our teaching labs is a major need in the department.

G. Field Stations

Unfortunately, human encroachment is occurring along the borders of the BFS, and is primarily residential or industrial in nature. Hence, the primary challenges, as of late, are increased security at the BFS. Dr. Wilson has lobbied Dr. Brown for security cameras at the properties and he has promised to fulfil that request. We are hopeful that this will occur in the near future.

H. Health and Safety

No immediate modifications are needed to our current health and safety protocols.

I. Illustrator

No modifications are needed regarding the role of the illustrator in Dr. Gaudin's research activities.

J. Library

No major library needs are noted at this time.

K. Research with vertebrate animals and human subjects

The IACUC and IRB committees work well with students and faculty to approve and monitor relevant research. However, the review process if often time consuming, particularly with IACUC since the committee meets only once per month. Because of this, and because revisions and re-review of the protocols are typically required, the review process can make it challenging for students in particular to conduct vertebrate research. A more streamlined process would benefit both faculty and students. The IRB committee reviews applications on a more regular basis, and that committee is working to streamline human-based research that is conducted in collaboration with Erlanger Hospital.

L. GIS Resources

The availability of a GIS classroom with efficient computing facility within the department or in the close proximity would be of great benefit for providing optimum learning environment for

GIS and Remote Sensing classes. The GIS lab currently being used is located about 0.5 miles away from Holt Hall, in the SIM Center.

PART 6. SUPPORT

Support is measured in this Program Review according to four criteria, 6.1-6.4, below. These criteria concern the budget and needs, enrollment and graduation rates, responsiveness to needs, and an assessment of strengths and weaknesses of the Program.

Our Department has three distinct, “departmental” budgets that are treated as one. Until 2015, the Department of Geology was separate from the Department of Biological and Environmental Science; in fact, it was part of the Department of Physics, Geology, and Astronomy. Ever since the merger of Biology and Environmental Science in the early1990s, the budget of these two departments has remained separate, though urgent programmatic needs had resulted in reallocations such that the budget was essentially treated as one. Because the distinct budgets of Biology and Environmental Science were never treated as separate, and since the Geology budget has not been treated as distinct from Biology and Environmental Science since 2015, we describe and discuss Support for these three programs as one in this Program Review section. Numbers presented below were gathered from IRIS (UT accounting system), BGE records, UTC Factbook, and the Office of Planning, Evaluation, and Institutional Research (OPIER) for all “three” departments (programs), through the time period of this self-study.

Furthermore, while it is customary to split an Operating Budget into line items (e.g., student employees, travel, motor vehicle operation, printing, supplies, rentals, insurance, equipment) to better understand spending trends, we frequently reallocate funds as needed and adjust budgeted line items for the next year based on usage the previous year. Therefore, amounts in these categories have changed through the years and they do not necessarily reflect expenditures for the years listed. Additionally, our allocated budget only accounts for about 1/3 of the total funds necessary to run our department, so it can never be an accurate representation of a line-itemed operating budget. Thus, we will not discuss the allocation of funds into these line items, but focus on the Operating Budget, Salaries Budget, and Total Budget as aggregate totals with respect to faculty numbers, enrollment, and degrees conferred.

6.1 Program Budget and Needs

The combined Operating Budget for the Department of Biology, Geology, and Environmental Sciences has historically (>10 years) come from four sources: state allocations, lab fees, monies from the College of Arts and Sciences (= “Budget Revision totals” in the tables, below), and gift funds. Roughly, the first two sources each contribute about 1/3 of the total, necessary operating budget for BGE. Prior to 2007, the year that collecting lab fees was initiated in our department, state allocations fell far short of what was needed to effectively run the department, even modestly. The unstated governing philosophy at that time was that the CAS would make up the difference in operating costs at the end of the year. That is, upper administrators (long since retired) were very aware that state allocations were far too little to support a department of our size (undergraduate and graduate students as well as faculty) and it was standard practice that the Dean would help balance our budget out of CAS funds. In 2007, we initiated a lab fee for all courses with labs. This greatly enhanced our operating budget for a few years, especially during the onset of the recession. However, around 2012, a turnover in all ranks of the upper administration above Department Head, coupled to crippling student growth and the lingering effects of the recession, led to a shift in philosophy toward a business model where the CAS would not make up shortfalls and all departments needed to function within their allocated budgets (plus lab fees).

Currently, and through the period of this five-year review, our department is caught between an older philosophy that exacerbated the problem of insufficient state and college funds allocated to support our department and a newer business philosophy in which we need to run the department within the allocated Operating Budget. In addressing this shift in budget management and philosophy, it is important to realize that the five-year average of our departmental Operating Budget from state allocations has been $110,000, the average income from lab fees has been $105,000, the average income of monies from the College has been $55,000* (*which is unpredictable and has swung widely from $26,000 to $92,000), and the annual income from gifts has been $22,000. In summary, our actual operating budget through this review period has been about $290,000 (including gift funds), but the allocated operating budget from that state has been $110,000.

The Operating Budget is defined from here down as the state allocated funds (Allocation Totals), plus additional monies from the College (Budget Revision Totals). Within the Operating Budget, Allocation Totals remained constant at $104,213 from 2012-2014 and increased by ~$10,000 in 2015 and ~$3,000 in 2017 (Table 6.1). Extra funds from CAS (Budget Revision totals) declined by 40% from 2012-2014, before returning in 2016 to about what they were in 2012. In effect, the Operating Budget for BGE was $164,978 in 2012 and it declined to $156,237 in 2013. In 2014, the Operating Budget was effectively reduced by an additional 18% to $128,176. However, it was increased 19.1% in in 2015, but still did not reach the 2012 total. In 2016, non-lab fee income to BGE increased by 6.9% and in 2017 it was raised another 18.5% to $208,851. Reductions or increases were not in one particular department/major, but across all of Biology, Geology, and Environmental Science (Fig. 6.1).

Table 6.1 BGE Budget Summary

BIOLOGY, GEOLOGY, AND ENVIRONMENTAL SCIENCE - Combined Budgets						
Operating Budget	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Allocation Totals	104,213.00	104,213.00	104,213.00	114,263.00	114,263.00	117,000.00
Budget Revision Totals	60,765.00	52,024.00	23,963.00	44,242.00	55,991.00	91,851.00
Fiscal Year Totals	**164,978.00**	**156,237.00**	**128,176.00**	**158,505.00**	**170,254.00**	**208,851.00**
Percent change from previous to present		**-5.59**	**-17.96**	**19.13**	**6.90**	**18.48**
						208,851.00
Salaries Budget						
Allocation Totals	1,545,733.00	1,630,800.00	1,828,936.00	1,985,007.00	2,052,745.00	2,215,703.00
Budget Revision Totals	779,671.00	931,755.00	967,312.00	933,347.00	976,547.00	1,042,280.00
Fiscal Year Totals	**2,325,404.00**	**2,562,555.00**	**2,796,248.00**	**2,918,354.00**	**3,029,292.00**	**3,257,983.00**
Percent change from previous to present		**9.25**	**8.36**	**4.18**	**3.66**	**7.02**
						3,257,983.00
Fiscal Year Totals (Operating + Salaries Budgets)	**2,490,382.00**	**2,718,792.00**	**2,924,424.00**	**3,076,859.00**	**3,199,546.00**	**3,466,834.00**
Percent change from previous to present		**8.40**	**7.03**	**4.95**	**3.83**	**7.71**

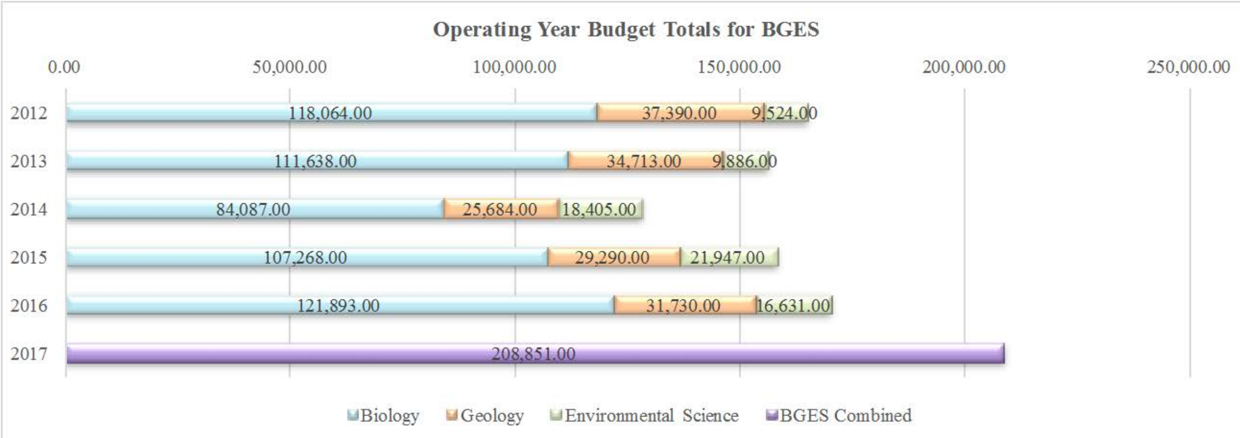


Figure 6.1 Operating year budget totals for Biology, Geology, and Environmental Science from 2012 through 2017.

The figure shows, except for Environmental science, a reduction in operating budget from 2012 through 2014, and more so in 2014. In detail, for 2014 the reduction in the budget was more severe for Biology than for Geology.

In 2012 the Operating Budget per Faculty Member was $6,345. However, during the next two years, cuts diminished this to $5,208 and $4,273. In 2016 and 2017 this ratio increased to near what it was in 2013 and in 2017 the Operating Budget per Faculty Member increased to $6,737 (Fig. 6.2), which is a slight increase from 2012.

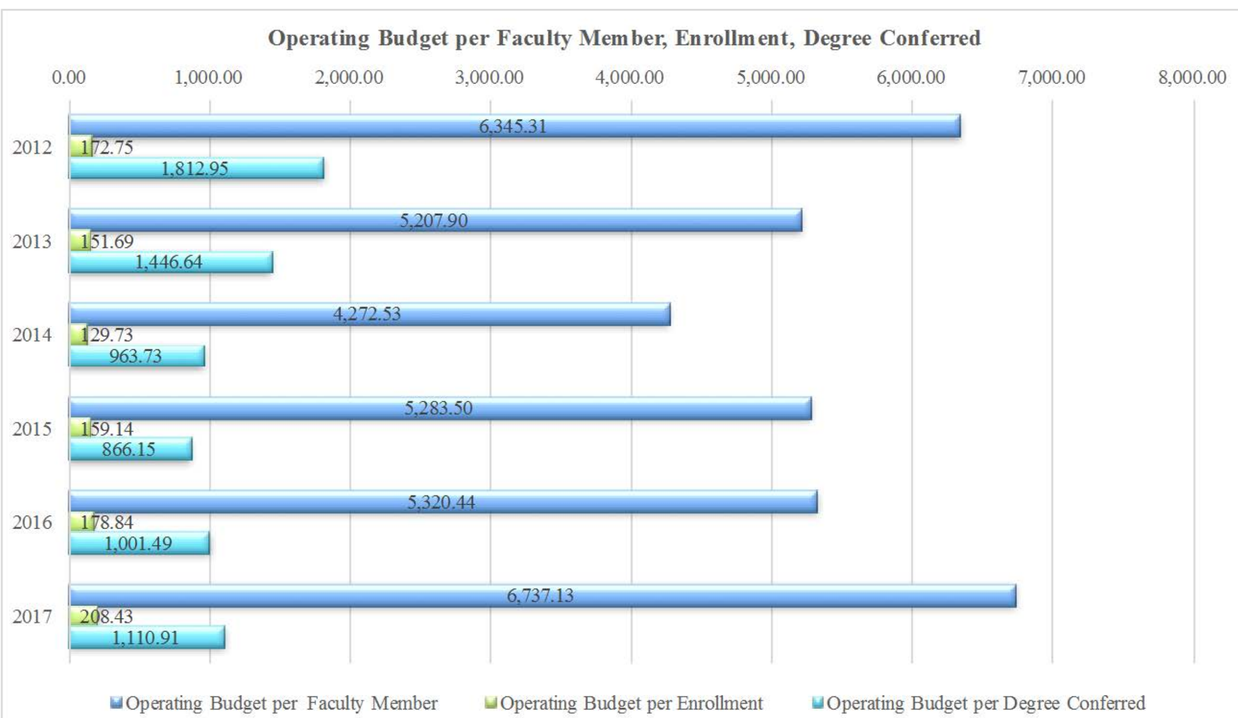


Figure 6.2 Operating Budget per faculty, per Enrollment or per Degree Conferred.

Operating Budget per faculty member was declining from 2012 through 2014, and increasing from 2015 to 2017. Operating budget per enrollment decreased from 2012 through 2014, rebounded in 2016 to slightly more than in 2012, and increased again in 2017. The Operating Budget per Degree Conferred was declining from 2012 through 2015, and increasing slightly in 2016 and 2017.

The Operating Budget per Enrollment was $173 in 2012 and dropped to a low of <$130 in 2014. In 2016 the Operating Budget per Enrollment was still significantly below where it was in 2012, but in 2017 it finally surpassed 2012 and was $208 (Fig. 6.2).

Perhaps the most surprising numbers of all of these are the Operating Budget per Degrees Conferred (Fig. 6.2) which for 2017 is still at nearly half of what it was in 2012. In 2012, the Operating Budget per Degrees Conferred was $1,812. Through substantial increases in enrollment and a revision of the curricula coupled to nearly static state allocations and a reduction in funds from CAS, this ratio decreased to $866 in 2015. Despite a constant increase in conferred degrees through 2017, we are still only spending $1,111 per conferred degree in BGE.

In addition to the Operating Budget, described above, BGE also has income through lab fees, which add about $105,000 to our actual, annual operating budget. That is, in 2013 lab fees increased our actual operating budget by $107,281 (by 40.7% of the total). This number increased to a high in 2014 to $115,443 (47.4%) and has been ~$93,000 for the last two years (36% and 32%). What should be restated and reinforced is this additional 30-50% added to our actual operating budget is still less than what is required to meet the minimum budgetary requirements of our program. From another perspective, the state and university allocated budget, plus the lab fees are only allocating about 74% of the minimum operating budget necessary to run a program that accounts for 7% of the degrees conferred at UTC.

In 2012 the combined Salaries Budget of BGE was $2,325,404 and in 2013 it increased to 2,562,555 (Table 6.1). It increased by 8.4%, 4.2%, 3.7%, and 7% from 2013-2017 (Fig. 6.3). While these increases seem promising, they were essentially due to faculty being added or promoted during this time (Fig. 6.4). That is, in 2012 we had 22 tenured or tenure-track faculty in BGE and four lecturers. Four lecturers were added to BGE in 2013 and two tenure-track faculty were added in 2016. The 10-year history of faculty additions shows a trend toward an increased number of lecturers (Fig. 6.4). In 2007 we had 20 tenured or tenure-track faculty and one lecturer, while at present we have 23 and 8, respectively. The total BGE budget for salaries is 21.3% higher in 2017 than it was in 2013, largely because of the additions of two tenure-track and five promotions (Boyd, Brock-Hon, Chatzimanolis, Klug to Associate Professor and Shaw to Full Professor).

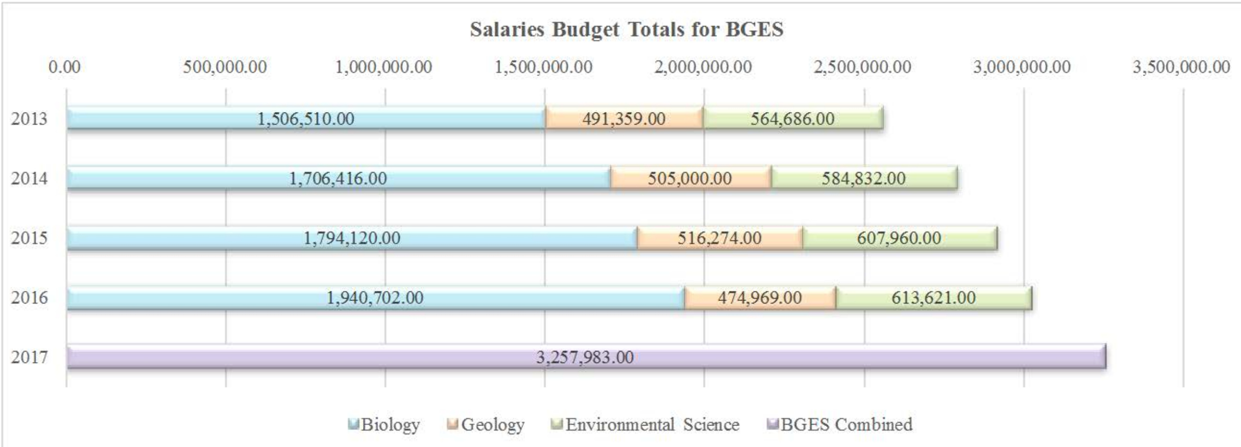


Figure 6.3 Salaries Budget totals from 2013 to 2017.

The dip in the Geology budget reflects the removal of funds for the departmental secretary position, and salary reduction associated with the change from a 12-month to a 9-month appointment of the former head of Physics, Geology, and Astronomy. The stated savings from the reorganization of the sciences was about $42, 000.

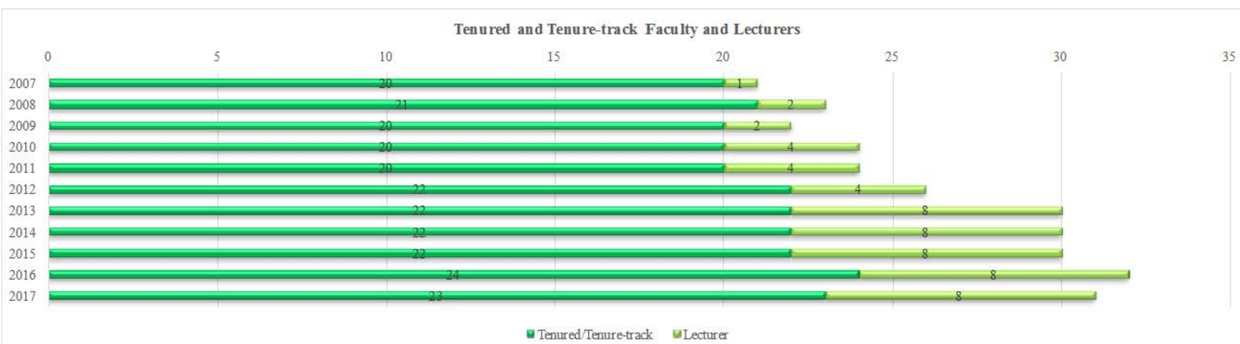


Figure 6.4 Totals of tenure-track and non-tenured lecturers.

Diagram shows a jump in tenured faculty from 20 to 22 from 2011 to 2012; from 22 to 24 for 2015 to 2016, and a reduction from 24 to 23 from 2016 to 2017 (as one faculty member took a position elsewhere and this position in now unfilled).

The Total Budget for all three programs in BGE, i.e., the Operating Budget plus the Salaries Budget, in 2012 was $2,490,382 (Table 6.1 and Fig. 6.5). In 2013 it increased to $2,718,792 and it was raised by 7%, 5%, 7%, and 18% from 2013-2017, respectively. The 2017 total BGE budget was 21.6% higher than in 2013.

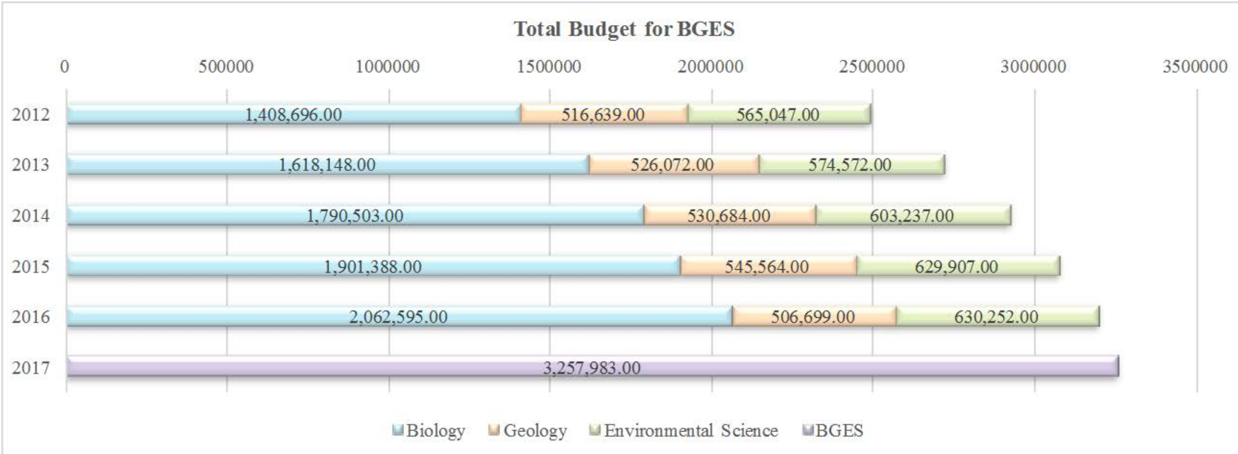


Figure 6.5 Total Budget of BGE. [Same data as Table 6.1]

6.2 Program Enrollment and Graduation Rates

The program has a history of enrollment and/or graduation rates sufficient to sustain high quality and cost-effectiveness.

Through the early 2000s enrollment in BGE remained relatively stable, slowly climbing to 472 BGE majors in 2007. Following 2007, enrollment increased at a staggering rate of >12% per year through 2013 and resulted in 1030 BGE majors that year (Fig. 6.6). This unchecked growth, coupled to substantial reductions in annual budget revisions provided to the BGE Operating Budget (defined as initial yearly budget allocation plus budget revisions from CAS, see above) crippled our department for several years. Following 2013, enrollment dropped slightly and stabilized near 1000 majors. Even still, the average rate of growth in enrollment in the time period from 2007 through 2017 was 7%.

Within BGE, the Biology track accounts for the large majority of the Degrees Conferred as well as the growth in BGE (Fig. 6.7). The number of Geology Degrees Conferred hovered between five and nine from 2008 through 2013 and increased to 23 in 2014 before settling to 12-15 in recent years. Environmental Science Degrees Conferred was between ten and 23 from 2008 through 2013 before climbing to 26 in 2013 and stabilizing in the low 30s in recent years. The Biology Degrees Conferred has climbed steadily from 55 in 2008 to 142 in 2017. Since 2007, enrollment has more than doubled in all three programs.

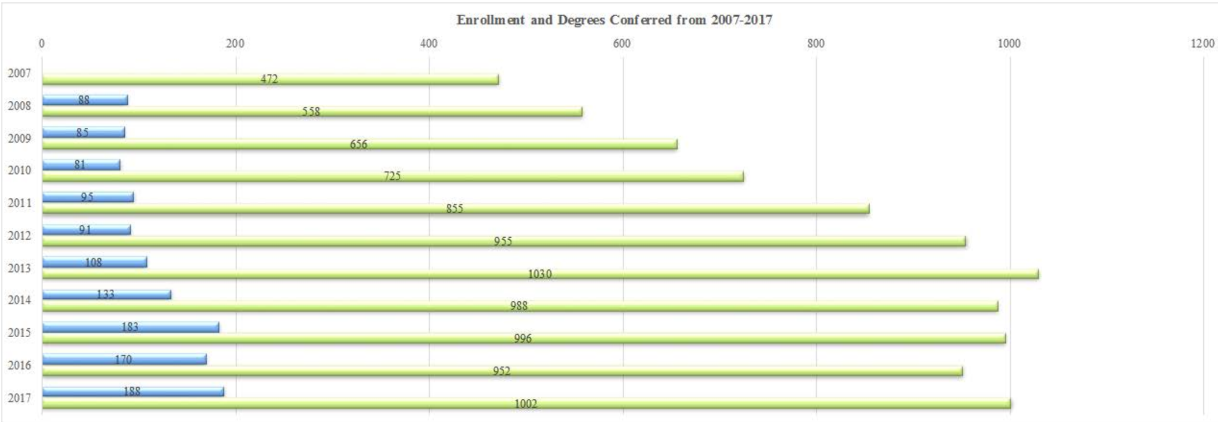


Figure 6.6 Ten years of data on Enrollment and Degrees Conferred in BGE.

Data show staggering growth from 2007 through 2013. Degrees conferred soars in 2014 and 2015.

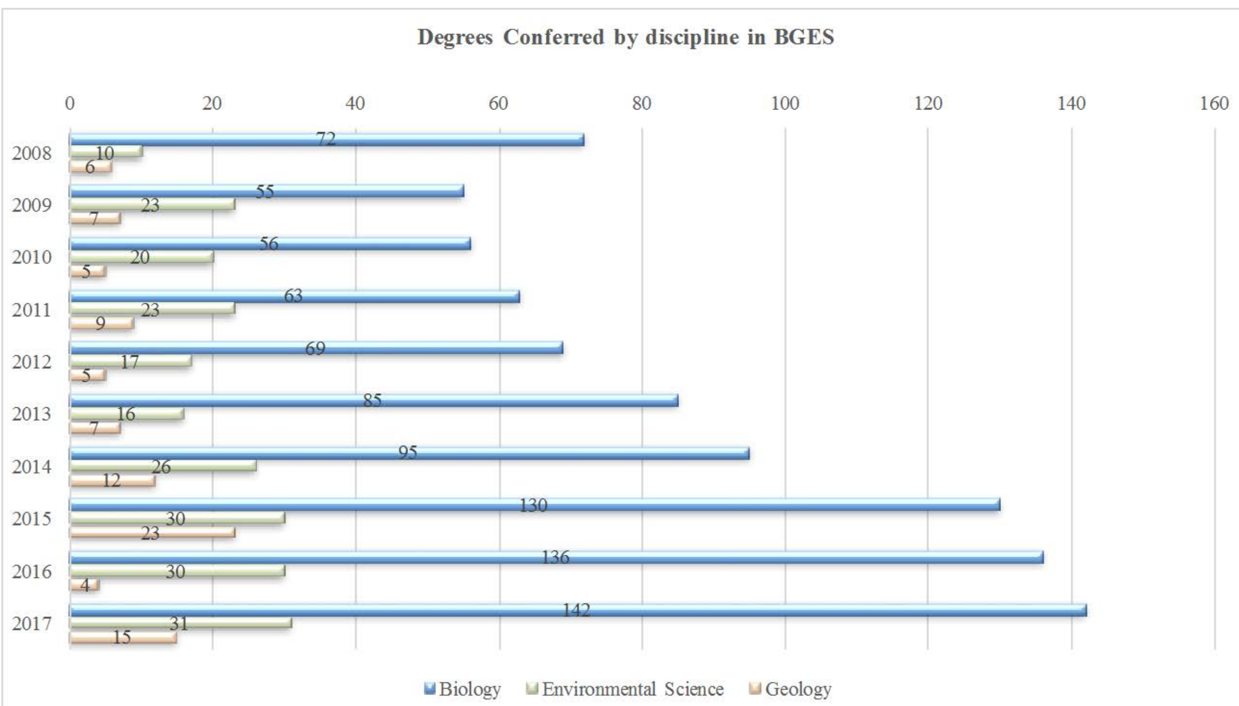


Figure 6.7 Degrees Conferred by discipline within BGE. Note the recent increases in Geology and Environmental Science.

Consideration of BGE Enrollment compared with total UTC enrollment indicated strong relative growth by our department. From 2007-2012 BGE accounted for an average of 5.2% of all UTC degrees conferred. However, in 2013 BGE accounted for 6.1% and from 2014-2016 BGE has accounted for 7.7% of total degrees conferred.

6.3 Program Responsiveness to Local, State, Regional, and National Needs

Through work initiated in 2012, we introduced a total revision of the Biology freshman sequence as well as the Biology and Environmental Science curricula. In short, the freshman Biology sequence was spread out over three semesters, instead of two, in order to give freshman an extra semester to mature before beginning majors related coursework. The number of concentrations in Biology and Environmental Science were greatly simplified and reduced and nearly all of our classes were integrated into six categories in the path to degree conference: introductory, core, survey, cell and physiology, advanced ecology/evolution, and elective courses. With all of our courses fitted into these categories, students were able to make choices that led to more streamlined paths to graduation. In other words, this greatly alleviated the problem that arose when students needed particular courses for graduation and those courses were either not offered or already full. This Biology and Environmental Science curriculum overhaul was introduced to the catalog in 2013 and its effects were immediate. BGE awarded 101 degrees in 2013 and in the four years following this overhaul nearly doubled degrees awarded by 2017 (188). The hiring of a departmental advisor skilled in resolving schedule conflicts and progression issues also likely contributed to the increase in degrees awarded.

If the last century saw progress in Physics, this century will be defined by progress in the biological sciences. Great advances are continuing to be made through technology and these continually require new skill sets to be learned and utilized. Our department is geared to claim this opportunity. Also, of the three programs of BGE, Biology is better known at all societal levels, from local, through to national. More citizens seek knowledge in Biology, as is explained by the growth in Biology majors in the last 10+ years. The department is keenly aware of such needs and continues its endeavor to meet the challenge. Over the last couple of decades, the environmental concerns of the nation have grown. Presently global climate change is of great scientific and societal concern, and, our Biology, Geology and Environmental Science Programs are geared to accommodate such concerns. Our programs help meet the needs of our students and provide opportunities for students and faculty to address local, regional, national, and international problems.

The need to understand Earth, its processes related to natural hazards, and the formation and distributions of Earthborn resources drives the education of students in the Geology Program, thus helping to solve problems faced by Earth's inhabitants today and in the future. For example, climate change and its effects can only be understood in the context of the whole Earth and its history; seismic hazards spur important and pressing research to better understand, mitigate, and publicize these hazards; The impact of environmental contaminants can only truly be assessed by understanding earth materials and how these contaminants move via pathways through these materials. Additionally, Geology's importance is fundamental in that the study of the Earth and other bodies of the universe are the foundation for all sciences, math, and engineering. Conversely, Geology utilizes principles from all of these to gain a better understanding of how it works, something vitally important for current and future generations. The courses we offer build the foundation of knowledge needed for our students to solve these problems in their communities and at the state, national and global level. Over the past five years we have produced students now employed with local environmental and geotechnical firms such as S&ME Inc., Arcadis, AECOM, and Marion Environmental. We have students employed by the

USGS and by the US Army Corps of Engineers, and the petroleum industry. These and other graduates are utilizing their knowledge of Geology and their problem solving skills gained through the Geology Program at UTC to be better citizens and stewards of their communities. Our program is also responsive to national needs in producing more geoscience graduates to fill greater demand in the work force as expressed by the Bureau of Labor and Statistics on Geoscience job outlook at www.bls.gov/ooh/life-physical-and-social-science/geoscientists.htm.

“Employment of geoscientists is projected to grow 14% from 2016-2016, 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.”

Similar to other programs of BGE, Geology is growing and has a plan for further growth. To accommodate the needs of our student as they seek employment in Geology and Environmental Geology careers, and add to their skills of evaluating earth surface processes and working with spatial data, Geology hired Dr. Brock-Hon, a geomorphologist and, more recently, hired Dr. Hossain, a specialist in environmental applications of remote sensing and GIS. These additions allow us to broaden areas in which we train students and accommodate growing demands for geologists. We hope that growth in our program, in turn, allows us to broaden the educational opportunities for our students by hiring new faculty in areas such as geophysics.

6.4 Assessment of Support Strengths, Weaknesses, and Recommendations for Change

From 2007 through 2013 our enrollment swelled from 472 BGE majors to 1030, while our Operating Budget (Allocated + Budget Revisions) was effectively and significantly decreased (Fig. 6.8). In the last couple of years we have seen promising increases in Operating Budget (both Allocation + Budget Revision, which includes start up funds) and Enrollment has stabilized at about 1000 majors for the last three years. However, over the last five years, general trends in increases and decreases in Operating Budget and increasing Enrollment, Tenure-track Faculty, and Degrees Conferred have placed pressures placed on our Program. Fig. 6.8, below, shows the percent change from one year to the next from 2012 through 2017. Through the last five years our Operating Budgets increases were offset by nearly equal decreases so that during the last five years our Operating Budget has made minimal gains. Additionally, some of the budgetary swings are the result of unreliable Budget Revisions from the CAS. During this same time period, there has also been the trend of increased Enrollment and substantially increased Degrees Conferred, while we have added very few tenure-track faculty.

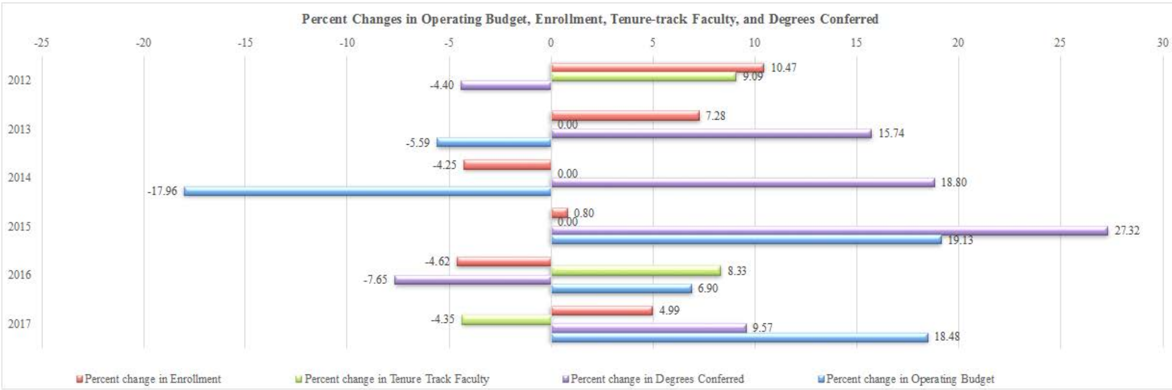


Figure 6.8 Percent changes in Operating Budget, Enrollment, Tenure-track Faculty, Degrees Conferred.

Percent change in enrollment has fluctuated but is definitely to the positive and percent change in Degrees Conferred is overwhelmingly to the positive. The percent change in Operating Budget shows substantial and swings from one year to the next and does not correspond to Enrollment or Degrees Conferred.

As noted above, our faculty responded to a critical problem related to the sudden doubling of our enrollment over a relatively short period of time between 2007 and 2012. Our response was to redesign our curriculum to streamline navigation of upper level courses to help provide courses needed for graduation. Another part of this redesign was the willful shifting of tenure and tenure-track faculty away from the large freshmen introductory courses (e.g., Introductory Biology and Environmental Science courses, Human Physiology and Anatomy courses) and into junior and senior level courses. By the most critical measure, the number of Degrees Conferred, this move was successful. We also gained four new tenure-track faculty lines from 2011-2016 that helped ease the bottleneck courses that had greatly slowed progress through the program for students from 2009 to 2012. For example, one critical bottleneck course, Principles of Microbiology BIOL 4220, was being taught by only one faculty member (Spratt), who was able to offer the course only during spring semester and during one summer session. By hiring a second microbiologist (Giles) the course was made available during both semesters. So, when new resources have been made available to the BGE program we have been able to effectively put them to work, helping more of our students graduate in a timely fashion. In Geology, the bottleneck starts early with Mineralogy and Petrology, taken by sophomores, that can only be taught once a year. Other classes such as Paleontology and Sedimentary Rocks and Stratigraphy are only taught once every other year because Dr. Holmes must also teach other introductory and elective courses for the major. Additional faculty in Geology are needed to reduce course load and free up other faculty to teach the required courses more often.

The thinning of the line between Enrollment, Degrees Conferred, and Operating Budget has come at significant cost. As is often the case when business models are applied regardless of other factors, during the last 10+ years we have failed to maintain, replace, or repair departmental equipment; furthermore, upgrading to newer, more modern pieces of equipment to teach from and give experiential learning opportunities has been out of the question. BGE does not have room in the actual operating budget, let alone the allocated Operating Budget for routine equipment upgrades, replacement, or the maintenance of equipment we currently own. This issue is discussed in detail part five of this document, but needs to be emphasized here as a key weakness of the current support given to the department. The department has notable “bottleneck” pieces of equipment that could prove major limitations to our ability to teach (let alone conduct research) should they malfunction. Case in point, the departmental autoclave. Having only one autoclave to serve the growing number of Cell and Molecular courses potentially puts in jeopardy all of those upper level laboratory courses. With the enrollment expansion, which led to the expansion of microbiology lab course sections, the single autoclave we have is overworked. A problem with this aging piece of equipment could have a significant ripple effect throughout our Program. Thus, the ongoing problem of planning for the replacement of various types of equipment will not go away unless the department gains new resources that can be used to purchase replacement equipment as necessary.

Tied in with the equipment limitations noted above, is the need to maintain the equipment we own, from research and teaching specimens and their storage cabinets in the Herbarium and Natural History Museum to PCR machines to a Gas Chromatograph-Mass Spectrophotometer (shared with the Chemistry Department). When possible, the latter are done through service contracts with the equipment providers. However, as with equipment purchase, there is no room in our Operating Budget for equipment maintenance. When these pieces of equipment malfunction, laboratory courses, student, and faculty research suffer and other areas of the Operating Budget suffer.

Another area of concern for lack of resources is the lack of support staff to help with numerous tasks necessary to maintain our program. For example, a number of our faculty utilize the departmental greenhouse for their courses and research. It takes weekly work by a tenure-track faculty member to water, weed, and maintain this living collection and while students can work as assistants during the spring and fall semesters maintaining this living collection requires work during winter, summer, spring, and fall breaks as well as some weekends when students are not available. Another area where staff help would help our faculty is in our Herbarium and Natural History Museum. Housing some 130,000 specimens, these facilities provide our faculty and students with excellent resources that serve as the center for many laboratory courses. Upkeep and maintenance of our collections in these facilities falls on tenure-track faculty. Lastly, with so many technically sophisticated instruments in many of our teaching and research labs being computer based, the need for a technician capable of working with computers to correct minor problems would also help our faculty be more efficient teachers and researchers. So, overall, the addition of technical staff to help our faculty could help improve our departmental productivity.

In conclusion, our department was caught between two different administrative philosophies regarding our budget and this change occurred over the course of about one year. Still, our faculty have proven to be highly effective at recognizing problems and coming up with effective measures to streamline our curricula, serve a doubled enrollment, and enhance graduation rates, even with no real increase in Support. However, evidence is suggesting that our ability to continue to increase graduation rates and increase enrollment may be reaching the upper limit that will not increase without the provision of increased, dependable support commensurate with the size of our department.

We need a dependable and accurate operating budget that will support 31 faculty, ~1000 undergraduate majors, 30-40 graduate students, and a heavy service course load. Our faculty have done excellent work and made due with very little during the lean times of the last five+ years. For longer than that, however, we have been unable to plan for the future because we cannot count on a budget reflective of the needs of one of the largest departments in the university. From our perspective, we are only “guaranteed” about 2/3 of the budget we need to function and half of this amount comes from lab fees. The rest of the budget we need we receive as “Budget Revisions” and Gift Funds. Without this, we are relegated to not being able to plan for the future, not being able to produce an itemized budget from which we can understand spending within and across standard categories of an academic department, not being able to maintain teaching and research equipment, and integrating new tools and technologies is out of our reach. It is imperative that our past thriftiness, budgetary introspection, and cobbling together of resources at hand to uphold a solid curriculum will result in our being able to move forward with the resources we deserve as a department that confers about 22% of the degrees awarded by CAS and 7% of the total degrees from UTC.

Appendix A. Merger Plan

Biological & Environmental Sciences and Geology
Draft Merger Plan
May 31, 2015

Goal: This is a plan to facilitate the merger of UTC's Geology Program with the Department of Biological & Environmental Sciences. The overall goal is to have one unified department that maintains and promotes disciplinary identity, strengths, and resources. The merged department will offer four degree programs (B.S. Biology, B.S. Environmental Science, B.S. Geology, M.S. Environmental Science) and consist of over 1000 majors and 31 fulltime faculty. The merged department will be home to about 24 percent of the majors in the College of Arts and Sciences (CAS), yet its operating budget will represent about 10 percent of the CAS operating budget (based on 2014/15 budget). Obtaining an adequate operating budget to support Biology, Environmental Science, and Geology students will remain a critical need. It is important to note that a merger of this magnitude requires careful consideration and time beyond what is described in this document.

ITEMS

1. Faculty Involvement – Faculty have already been involved and will continue to be involved in developing the merger details through face-to-face discussions and email.

2. Name: The Department of Biology, Geology, and Environmental Sciences (BGE). This is consistent with degrees, Division names, and other departments on campus. Two other options are Department of Biological, Geological, and Environmental Sciences (BGES) and Department of Life and Earth Sciences. The new name will be finalized in mid-June 2015.

3. Program Structure: One integrated department with three Divisions, representing the degree programs: Division of Biology, Division of Geology, Division of Environmental Sciences. The Divisions are intended to help preserve the disciplinary identity, prestige, and potential of our four degree programs. Preserving disciplinary identity is an important factor to facilitate student recruitment, faculty research and grantsmanship, and graduate employment. However, the department will function as an integrated faculty and administrative unit.

4. Administrative Structure: One unified department with shared administrators and administrative support staff. Administration will be provided by existing positions plus one new Associate Department Head. Initially, the new Associate Head will coordinate activities in the Geology program. This function is important to ensure a smooth transition and maintain the integrity of the Geology Division in the short term. Over time, as faculty learn about the respective disciplines, the duties of the associate heads will be adjusted to focus more on activities common to all divisions and less on individual disciplines, wherever feasible. Long term, a new Associate Head is important to cope with additional work and responsibilities associated with adding an additional academic program to a very large, understaffed, and under budgeted department. The Department Head and Associate Heads will coordinate their activities

to avoid unnecessary duplication and maximize efficiency. General duties of the positions include:

Department Head (existing, Tucker): Overall departmental oversight and administration, faculty and staff evaluation, petitions, budget, represent and advocate for department.

Senior Associate Department Head (existing, Gaudin): Biology and Environmental Science course scheduling, petitions, overrides, general backup to Department Head

Associate Head 1 (existing, Carver): Coordinate Student Relations, Advising, Retention, Progression, Graduation, Course and Program Student Learning Outcomes, ~~and~~ Assessment, Student Scholarships and Awards, Student Events, A & P Course Scheduling

Associate Head 2 (new): Initially, this position will focus on coordinating activities in the Geology program, such as Geology course scheduling, Geology Student Relations, Advising, Retention, Progression, Graduation, Course and Program Student Learning Outcomes, Assessment, Student Scholarships and Awards, Student Events. Initially, this position will be selected by, and will work closely with, the existing geology faculty.

Administrative Assistant (existing, Shutters): Manage department front office, respond to or direct face-to-face, email, and phone inquires, general administrative assistance to department head and faculty, process faculty and student travel, purchase office supplies, enter course overrides, co-supervise student workers

Budget Specialist (existing, Locke): Bookkeeping and accounting for all state, lab fee, gift, and grant accounts; payroll, personnel hiring and termination paperwork, co-supervise student workers, faculty evaluation paperwork

Faculty Associate (existing, Murphy): Purchase research and teaching supplies and equipment, oversee lab safety, develop and maintain department website, department credit card holder, coordinate introductory biology labs, coordinate equipment maintenance and repair

5. Space: Programs and faculty will retain their existing space.

6. Bylaws: Faculty will integrate the two sets of bylaws into one set of bylaws. As part of this process faculty will review reappointment, tenure, and promotion criteria, considering characteristics unique to each program such as existing criteria, teaching loads, research activity, and related factors. There may be instances where separate disciplinary specific criteria and procedures will be retained within the combined bylaws. RTR committee composition will also be addressed in the bylaws. Existing Geology criteria will apply to Geology faculty and existing BES criteria will apply to BES faculty during academic year 2015/2016. This will provide sufficient time for faculty to fully consider ramifications of any proposed changes.

7. Webpage: The Geology website will be integrated into the BES website. The department Faculty Associate (Murphy) will maintain and update the integrated website, with input from Geology faculty and the new Associate Head 2. The website structure will reflect an integrated department with Divisions of Biology, Environmental Sciences, and Geology.

8. Budget: The Geology budget will be integrated into the BES budget. Presently BES has separate state operating accounts for Biology and Environmental Sciences. Maintaining separate Geology state accounts would be consistent with the present practice in BES. Non-state accounts will be retained and used for existing designated purposes.

9. Evaluation: The Department Head will conduct EDO evaluations and the RTR committee and Department Head will perform their respective duties in the faculty reappointment, tenure, and promotion processes. The Department Head will conduct staff evaluations (SPDR).

10. Major Rosters: Persons responsible for generating and maintaining a list serve of majors for the four academic programs will be determined.

11. Advising: The department Professional Advisor will assign a geology faculty advisor for each geology major. The geology students will be divided equitably among the geology faculty. BES students will continue to be advised by department faculty and the Professional Advisor.

12. Summer School Teaching: Every fall semester the Department Head will distribute a form to faculty to gauge faculty interest in teaching during the upcoming summer. The Department Head will coordinate with the Associate Heads as they develop summer schedules.

13. Course Syllabi: All faculty will submit syllabi to the department Administrative Assistant.

14. Building and Room Access: A standard procedure to request building and room access for students and faculty will be developed.

15. Office Supplies: Faculty submit request to Administrative Assistant.

16. Teaching and Research Equipment and Supplies: Faculty submit requests to Faculty Associate.

17. Travel Requests: Faculty submit requests to Administrative Assistant.

18. Faculty Committee Assignments: Every summer, the Department Head will distribute a form to faculty to determine faculty preferences for departmental committee assignments for the academic year. The existing BES list of committees will be updated to include committees unique to Geology that are appropriate for crossover with BES faculty. The Department Head will consider faculty preferences when assigning faculty to committees and will strive to ensure the faculty of each division are adequately represented on committees.

19. Curriculum Impacts: The departmental curriculum committee will 1) propose catalog revisions to reflect merger (e.g. – department name), 2) assess whether there is duplication in environmental science and geology curriculum and propose revisions if warranted, and 3) consider whether existing course designations (BIOL, ESC, GEOL) and cross listing practices should be modified. Any curriculum decisions impacting Geology curriculum will involve at least two Geology faculty on the curriculum committee.

BES & GEOLOGY MERGER TIMELINE

BES Head Meeting with PGA Head & Faculty to Discuss Merger	April 16, 2015	Complete
BES Faculty Meeting to Discuss Geology Merger	April 17, 2015	Complete
BES Head Meeting with Geology Head & Faculty to Discuss Merger	April 21, 2015	Complete
BES Head Meeting with Dean & Provost to discuss Merger	April 24, 2015	Complete
BES Head Meeting with PGA Administrative Assistant, BES Administrative Assistant, and BES Faculty Associate, and BES Associate Head to discuss Merger Plan	May 21, 2015	Complete
Draft Merger Plan to BGES Faculty for Input	May 22, 2015	Complete
BES Head Meeting with Geology Faculty for Input	May 29, 2015	Complete
Draft Merger Plan to Dean & Provost	May 31, 2015	Complete
Mailboxes created for Geology Personnel in Holt 215 Mailroom	June 12, 2015	Complete
Department Name Finalized	June 22, 2015	Complete
Order Letterhead and Business Cards with New Department Name and Address	June 22 – July 1, 2015	Ongoing
Notify UTC Mailroom of New Geology Address beginning July 1, 2015	June 22, 2015	Complete
Geology Mail delivered to Holt 215	July 1, 2015	Complete
Geology budget transferred to BES	July 1, 2015	Complete
Geology office supply purchasing transfers to Administrative Assistant, Holt 215	July 1, 2015	Complete
Geology travel approvals and reimbursement processing transfers to Administrative Assistant/Department Head	July 1, 2015	Complete
Geology personnel files and department records transferred to Holt 215	July 1, 2015	Ongoing
Geology personnel paperwork processing responsibility transfers to BGES Accounting Specialist Position	July 1, 2015	Complete
Purchasing of Geology teaching and research equipment and supplies transfers to Faculty Associate, Holt 215	July 1, 2015	Complete
Submit Requests for Catalog Revisions to reflect Merger	July 1, 2015	
Merge BES and Geology Websites	Summer 2015	Ongoing
Select Associate Head 2 for Geology	Summer 2015	Complete
Draft Merged Bylaws including RTR criteria and procedures to Dean & Provost	April, 2016	

Appendix B. Holt Hall Phase II Moving Plan

Phase II Action - Stay in Davenport

Move to final location No move

Move to temporary location-will need to completely vacate at end of Phase II

Final Decision not made yet, as other factors need to be decided No move until phase II completed

	Tenure Track Faculty	---------------------------------- CURRENT ----------------------------------			---------------------------------- PHASE II ----------------------------------			---------------------------------- FINAL ---------------------------------- ---		
		Office	Lab	Other Space	Office	Lab	Other Space	Office	Lab	Other Space
1	Aborn, David	H 110B	H 116		H 232F	H 323		H 232F	H 107A	
2	Barbosa, Jose	H 114	H 112A, H 114A, H 115		H 121	H 120, H 120A		H 114	H 114A, H 115	
3	Beasley, DeAnna	D 204	D 131		D 204	D 131		H 308A	H 308	
4	Boyd, Jennifer	H 317H	G 110		G 112	G 110		G 112	G 110	
5	Brock-Hon, Amy	G 218C	G 209	G 207, G 209, G 210A	G 218C	G 209	G 207, G 209, G 210	G 218C	G 209	G 207, G 209, G 210A
6	Carver, Ethan	D 201	D 214	D 207, D 208, D 209	D 201	D 214	D207, D 208, D 209	H 307	H 307	H 228
7	Chatzimanolis, Stylianos	H 109A	H 109	H 317C	H 232E	H 201	H 201	H 232E	H 201	H 201
8	Churnet, Habte	G 218B	NA	G 207, G 209, G 210A	G 218B	NA	G 207, G 209, G 210	G 218B	NA	G 207, G 209, G 210A
9	Craddock, Hill	H 317G	H 317G		H 350H	H 350I		H 350H	H 350I	
10	Gaudin, Tim	H 220	H 219	H 314	H 227	H 227A, H 226	Holt Greenhouse	H 227	H 227A, H 226	H 320
11	Giles, David	G 112, G 112B	G 111		H 350J	H 304		H 350J	H 304	
12	Hayes, Loren	CC 102	CC 101	CC 101A, 317A, 317B	CO 106	CO 108	CO 105, CO 108	H 309A	H 309	309
13	Holmes, Ann	G 218D	NA	G 207, G 209, G 210A	G 218D	NA	G 207, G 209, G 210	G 218D	NA	G 207, G 209, G 210A
14	Hossain, Azad	G 218A	H 118D		G 218A	G 111		G 218A	G 111	
15	Kajita, Yukie	CO 104	H 317A	CC 101	CO 104	H 323	H 323	Depends on Pop Gen Needs		
16	Klug, Hope	H 222, D 203	H 221, D 206	H 317B	D 203	D 206	D 306C	H 222	H 219-221	H 110, H 221
17	Kovach, Margaret	D 226	D 210, D 211, D 228	D 207, D 208, D 209	D 226	D 210, D 211, D 228	D 207, D 208, D 209	H 121	H 120A	H 120, H 120A
18	Mies, Jon	G 218E	G 209	D 207, D 208, D 209	G 218E	G 209	G 207, G 209, G 210	G 218E	G 209	G 207, G 209, G 210A
19	New Faculty Hire to Replace O'Neill, Eric	CO 106	CC 101		H 232D	H 323		H 232D or ope	H 323	
20	Richards, Sean	H 319	H 316, H 318A	H 313, H 318	H 351B	H 304 or H 305D depen	H 304 or H 305D depending on need of hood,	H 319	H 318A	H 317H (freezers)
21	Schorr, Mark	H 217	H 218	H 111, H 225C	H 351C	H 323	H 101, H 101A H 177	H 217	H 218	H 110, H 111, H 218
22	Shaw, Joey	H 113	H 112A, H 113A, H 115	H 112B	H 122	H 122, H 328, H 120	H 328	H 113	H 113A, H 115	H 112B
23	Spratt, Rardy	D 310	D 301-303	G 112A	D 310	D 301-303	G 112A	H 351D	H 305	H 305, H 305B
24	Tucker, John	H 215A	H 110A		D 101	H 232K		H 215A	H 232K	
25	Wilson, Thomas	D 112	D 113, D 132	H 116	D 112	D 113, D 132	D 225, ??? if needed	H 306A	H 306, H 117	H 110, H 117, H 306
	Vacant Office							328		
	Vacant Office							232D		
	Vacant Office							122		
	Vacant Office							326		
	Vacant Research Space								323 (1 faculty)	
	Vacant Research Space								324 (2 faculty)	
	Joint Faculty									
26	Qin, Hong	EMCS	CC 103		EMCS	H 304 or H 305D depen	ding on need of hood	EMCS	H 109	

	Faculty Instructors									
27	Adams, Meredity Montgomery (Callie)	H 317D	NA		H 351A	NA		H 351A	NA	
28	Barbosa, Nominanda	D 317	NA		D 317	NA		H 351B	NA	
29	Bramblet, Jeremy	G 101	NA		G 101	NA		G101	NA	
30	Caskey, Jodi	CO 105	NA		H 232H	NA		H 232H	NA	
31	Farnsley, Sarah	225A	NA		H 232I	NA		H 232I	NA	
32	Harrell, Kate	G 102	NA		G 102	NA		G102	NA	
33	Reynolds, Bradley	108	NA	225C	H 232J	NA	CO 104-office for GTA/lab availability	H 232J	NA	
34	New Biology Lecturer				H 232G			H 232G	NA	
	Anatomy Lab			G 109			G 109			G 109

	Staff									
35	Locke, Kelly	H 215C		H 211, H 214, H 215, H 215B	D 108	NA	H 205, D 100, D 106	H 212		H 215, H 215D
36	McCauley, Joseph	H 213			D 109	NA		H 213		
37	Murphy, Cheryl	H 212		H 107, H 225, H 315, H 317B,	D 105, CO 104-o	NA	D 321	H 214		H 106, H 107, H 108
38	Shutters, Marketa	H 215		H 211, H 214, H 215, H 215B	D 100	NA	H 205, D 100, D 106	H 215		H 215, H 215D
39	Williams, Wayne	G 222			G 222	NA		G 222		
	Teaching Labs									
	Botany Lab (Plant Morph, Entomology, etc)			112			H 123			112
	1110L Intro Biology Lab			216			CC 103			216, 225B
	1110L Intro Biology Lab			223			CC 101, CC 101A			223, 225B
	1120L Intro Biology Lab			224			H 330			224, 225B
	Old Physiology Lab			318			H 324			318
	Zoology Lab			320			H 228			321

	Physiology Lab			G 108			G 108			G 108
	Geology Lecture/Lab			G 206			G 206			G 206
	Geology Lecture/Lab			G 208			G 208			G 208
	Geology Lecture/Lab			G 210			G 210			G 210
	Genetics Lab (Genetics, Cell Bio, Dev Bio)			D 207 (Peggy)			D 207			H 120
	Genetics Lab Closet			D 208 (Peggy)			D 208			H 120
	Developmental Biology Lab			D 207 (Ethan)			D 207			H 228
	Developmental Biology Lab Closet			D 208 (Ethan)			D 208			H 228
	Microbiology Teaching Lab			D 305			D 305			H 330
	Micro Prep Lab			D 301, D 309			D 301, D 309			H 305D
	Microbiology Prep Room			D 301?, D 305, D 309?			D 301, D 305, D 309			H 325
	ESC Teaching Lab			CC 104			CC 104			225
	ESC Prep Room			CC 104B, CC 104C			CC 104B, CC 104C			225 C
	Microbial Ecology Lab			D 305			H 331			H 331
	Computer Lab			NA			NA			H 399
	New Teaching Lab (Ecology)			NA			NA			H 123
	Other									
	Front Biology Office			H 215			D 100, D 106			H 176, H 215
	Copy Room (Holt)/ Office Supply Room			H 215D			Holt Second Floor Office Suites or Spare Roo	n in Holt		H 215D
	Front Office Kitchenette Room			H 215B			D 100, D 101, D 108			H 215D
	Conference Room			H 214			D 124			H 211
	Adjunct Office			H 225B, G 220			G 220, D 220? This would be temp			G 220
	Biology Library (Student Study Area)			H 211			H 205			H 205
	Student Study Area #2			NA						H 207
	GTA Office			H 210			CC 102, CO 109, H 351D, D 220?			H 210
	Graduate Student Office			NA			NA			H 209
	Specimen Prep Room-Natural History Museum			NA			NA			H 118
	Freezer Room-Natural History Museum			NA			NA			225A
	SEM/Confocal Room			H 317F			H 202			H 202
	Radioactive Lab			G 110, G 111			H 301			H 301
	Copy Room (Davenport)			D 204A			D 106			NA
	Davenport Supply Room			D 225			D 100, D 106			NA
	Autoclave			D 304			D 304			H 305C
	Herbarium			H 107, H 108A, H 112, H 118, H 118A, H 118B, H 118C			H 125			H 116, H 116A
	Mammal Collection			H 107, H 107A, H 117			H 104			H 104, H 118, H 225A
	Herp Collection			H 107A, H 117			H 102			H 102, H 118, H 225A
	Insect Collection			H 107A			H 103			H 103
	Fish Collection			H 107, H 107A, H 117, H 317E			H 101, H 101A, H 177			H 101,H 101A, H 177, H 118, H 22
	Bird Collection			H 107A			H 323			H 107A, H 225A (Freezer)
	Mushroom Collection			H 317G, H 317A			H 102A			H 102A
	Animal Quarters			D 306, D 306A, D 306B, D 306C, D 320, D 321			D 306, D 306A, D 306B, D 306C, D 320, D 321			H 313, H 314, H 315, H 316, H 317
	GIS Room			NA			H 327-storage room if needed			H 327
	Bacterial Culture Room			NA			H 329			H 329
	Mud Room			NA			NA			H 110
	Construction Room			NA			NA			H 173

Appendix C. Interim Department Report

Interim Assessment for the 2006-2007 Goals.

Biological & Environmental Sciences Goal	**Score (1-6) 6=Fully Performed 1=Underperformed**	**UTC Strategic Plan a=Students [Teaching/Learning] b=Education & Research c=Diversity d=Enabling**
1. The department will maintain a commitment to its academic program through excellence in instruction, advisement and student recruitment.		
Instruction		
a. Hire one or more new replacement faculty to replace retiring faculty in instructional and research areas recommended by the faculty hiring committee and department faculty.	6	a,b,c
b. Maintain current high level of classroom instruction.	6	a
c. Support and encourage faculty-student collaborative learning through research.	5	a,b
d. Participate in teaching workshops for enhancing classroom instruction.	3	a
e. Explore the possibility of offering the MS in Environmental Sciences through distance education.	1	a
f. Establish cross listings for appropriate MS in ESC graduate courses and senior level BIOL and ESC courses (e.g., list 500-level courses as 400-level courses, and vise versa) to insure adequate enrollment in these courses each time they are offered.	3	a
g. Work with the College of Education and Applied Professional Studies in developing a joint BS Biology (education concentration) and BS Secondary Natural Sciences	1	a,d
h. Work with ARCS and other departments across campus to develop an interdisciplinary academic minor in	4	a,b,d

Geographic Information Systems (GIS) and Remote Sensing.		
i. Update course prerequisites across the departmental curriculum in preparation for the institution of a new Student Information System.	1	a,d
j. Develop new team taught course in modern microscopy techniques.	2	a,b,d
Advisement		
a. Continue advising its own majors	5	a
b. Maintain a 3-year course schedule of course offerings at the undergraduate and graduate level.	4	a
c. Provide seminars and/or sources of information on job placement, successful entry into graduate schools, and successful entry into professional schools.	4	a
Student Recruitment		
a. Cooperate with the College of Arts and Sciences effort to recruit and retain students. These efforts might include:	3	a,b,c,d
-department phone calls and letters to present and prospective students [graduate and undergraduate],	3	a,b,c,d
-department involvement with on-campus visits by prospective students [graduate and undergraduate],	5	a,b,c,d
-offering a recruitment day to highlight BESC faculty/student research and other activities, opening up our labs for visits and giving brief presentations on our research (this may have to be a Saturday event)	1	a,b,c,d
-providing regional institutions a list of departmental speakers and their topics [graduate],	1	
-having advisors available in the evenings if needed,	2	a,b,c,d
-sending faculty on short recruiting trips to other institutions [e.g., high schools, community colleges, other four-year institutions],	2	a,b,c,d

-developing a short PowerPoint presentation highlighting the strengths of the program and showing students in action.	4	a,b,c,d
-enhancing the webpage to highlight departmental strengths, accomplishments, and student research and activities,	4	a,b,c,d
-updating recruiting brochures and posters for undergraduate and graduate programs,	4	a,b,c,d
-maintaining a pre-professional webpage and brochure.	5	a,b,c,d
2. The department will increase its current level of research and publications.		
a. Acquire funding for research through university and outside sources.	6	a,b,d
b. Evaluate, as peer reviewers, submitted research proposals forwarded by various federal agencies.	5	b,d
c. Become involved in collaborative research projects with other universities, state and/or federal agencies, and private industries and organizations.	5	a,b,d
d. Provide a mechanism to reduce teaching loads for faculty who are actively involved in research requiring submission of external funding proposals and/or submission of articles to peer-reviewed journals of national and international scope.	4	a,b
e. Provide a mechanism to reduce teaching loads for the first two years for new faculty actively involved in research.	6	a,b,d
f. Maintain graduate faculty teaching loads at levels commensurate with graduate faculty teaching loads at peer institutions.	5	a,b
g. Support and encourage faculty sabbatical leaves for professional advancement.	4	a,b,d
3. The department will remain committed to enhancing its operational effectiveness.		

a. Support the role of departmental committees in departmental governance,		
-the department space committee will work with the department head and with other science departments (Chemistry, Physics/Geology/Astronomy) to determine the current and future space utilization of Holt and Grote Halls and help facilitate the development of planning ultimately leading to a new Science Building,	5	a,b,d
-the department hiring committee will forward recommendations concerning the faculty areas of expertise that need to be represented in the department,	5	a,b,c
-the pre-professional advising committee will continue to assist students in planning their pre-professional programs of study, coordinate activities and programs with area and regional professional health schools, coordinate the completion of student composite pre-professional forms, update the pre-professional Health Career Guide, and work in conjunction with faculty in the Chemistry Department to maintain a pre-professional webpage and brochure.	5	a,c,d
b. Use the tenure and promotion process to provide a systematic and constructive means to inform and advise tenure-track and promotion eligible faculty of procedures and progress toward retention, tenure, and promotion.	5	a,b
c. Periodically re-examine its statement of mission, goals, and long-range planning.	4	a,b,c,d
d. Incorporate new computer and communication technologies in the appropriate management of office, classroom, and laboratory operations.	4	a,b
e. Implement a live animal utilization protocol that involves the development, upkeep, and upgrading of appropriate facilities and the hiring of an individual(s) responsible for care and feeding.	4	a,b,d
4. The department will cooperate with the college and university offices to enhance programmatic support in		a,b,d

the operating budget, equipment, library, and space facilities:		
Operating Budget		
a. Acquire an annual operating budget in biology and environmental science commensurate with a growing undergraduate program and the addition of a graduate program.	2	a,b,d
b. Work with the Dean of the College of Arts and Sciences and other lab-intense departments to help develop a reasonable call for the institution of lab fees to provide the funding necessary to defray costs associated with laboratory based instruction and to plan for the future, and not simply focus on unmet past needs.	6	a,b,d
Equipment		
a. Work with the Dean of Arts and Sciences to secure funding to obtain basic undergraduate and graduate instructional laboratory equipment through the development of prioritized equipment needs lists under the direction of the departmental Equipment Committee. As of last year department equipment needs totaled $2,755,165.	3	a,b,d
b. Acquire the resources listed below to support the instructional program of the MS degree in Environmental Sciences:		
bioremediation laboratory equipment,	-	a,b,d
toxicology laboratory equipment,	-	a,b,d
computer laboratory equipment.	2	a,b,d
c. Acquire needed instructional equipment as prioritized by the department Equipment Committee.	3	a,b,d
d. Request needed start-up equipment funding for new faculty to initiate research programs.	6	a,b,d
e. Request increased budget funding to maintain and repair departmental equipment.	6	a,b,d
f. Acquire funding to periodically update expensive specialized software, such as the software used in the Geographic Information Systems Laboratory.	3	a,b,d

g. Acquire updated computer systems for the Graduate Teaching Assistants, the Adjunct Faculty Office Area, and the Graduate Student Study Area.	1	a,b,d
Library		
a. Acquire needed library books and journals to support the MS program in Environmental Sciences.	1	a,b,d
b. Acquire permanent funding for subscriptions to on-line databases and CD-ROM databases, such as LEXIS, WESTLAW, and FNA Environment Library to support student research and faculty research and teaching.	1	a,b,d
c. Cooperate with the central administration in identifying solutions that will avoid cancellation of needed library journals.	3	a,b,d
Space and Facilities		
a. Acquire and utilize additional space for:		
an introductory biology learning resource center,	1	a,b,d
second introductory environmental science laboratory,	1	a,b,d
research centers/laboratories areas for faculty, undergraduate students, and graduate students,	1	a,b,d
instructional toxicology laboratory,	5	a,b,d
instructional bioremediation laboratory,	5	a,b,d
instructional molecular biology laboratory,	-	a,b,d
expanded graduate computer laboratory,	1	a,b,d
faculty offices,	1	a,b,d
greenhouses (2),	6	a,b,d
storage areas.	1	a,b,d
b. Seek ways for improving existing classroom and laboratory facilities of Holt Hall, including the UTC Natural History Museum and the Animal Care Facility.	3	a,b,c,d
c. Develop new and existing teaching and research field sites, including the Cash House/Wildlife Hospital property in the Tennessee River Gorge, the UTC parcel on the former VAAP property, and the wildlife refuge associated with the ATTI test track.	3	a,b,c,d
5. The department will maintain a continuing	6	a,b,d

commitment to national, state, and/or regional professional organizations:		
a. Continue our involvement as a participant of the Southern Appalachian NBII Node.	6	a,b,d
b. Attend and participate in annual meetings of state, regional, and national professional societies.	6	a,b,d
c. Continue preparation for hosting the Society of Conservation Biology Meeting that will occur in Chattanooga in 2008.	6	a,b,d
6. The department will remain committed to community service endeavors:		
a. Communicate with alumni and community individuals through the publication of a periodical newsletter and/or by programs such as special lectures and seminars.	1	a,b,c,d
7. The department will submit proposals, appropriate to its mission and goals, that will have as an objective regional and national enhancement of the department and university.	6	a,b,c,d
8. The department will maintain a continuing commitment to university governance.	5	a,b,c,d
9. The department will develop or continue development of partnerships with appropriate entities to foster research, funding, internship, and educational opportunities (e.g., the Tennessee Aquarium Aquatic Research Institute, Gulf Cost Research Laboratory, the Highlands Biological Station, Lula Lake Land Trust, Sequatchie Valley Institute, Tennessee River Gardens, Tennessee River Gorge Trust and Bendabout Farms):	4	a,b,d
a. Continue the on-going partnership with Tennessee Aquarium with respect to the Lupton Renaissance funded research on turtle populations of the Tennessee River Gorge.	4	a,b,d
10. The department will remain committed to evaluation of its effectiveness:		

a. Evaluate faculty instruction by student ratings of faculty instruction. One or more of the following can be used as well,	6	a
-testimonials from current or former students	2	a
-specific evidence of student performance with regard to an appropriate outcome measure.	5	a
b. Evaluate instruction of untenured faculty by peer evaluations of instruction conducted by members of the departmental rank, tenure, and promotion committee.	5	a
c. Provide intended outcomes and assessment measures for all departmental undergraduate and graduate programs.	5	a,c,d
d. Examine the results of departmental outcomes and assessment measures in order to explore ways of contributing to university efforts in enhancing performance.	4	a,c,d
e. Provide the college with documentation of faculty and student research, creative scholarship, and service.	5	a,b,c,d
f. Undertake external program review during the upcoming academic year, 2006-2007, and begin implementation of any recommendations made as a result of this review.	6	a,b,c,d

Appendix D. Biology Learning Outcomes Assessment (2012-2013)

Example of assessment for the biology program during the 2012-2013 year.

Degree and Major	Student Learning Outcome	Means of Assessment	Assessment Data	Improvements Based Upon Data	Assessment Results, if available
BS Biology	**General Knowledge of Biology:** Students completing the baccalaureate program in Biology will compare favorably in their general knowledge of biology with those student completing a similar program.	**Evaluation of student performance on the Major Field Assessment Test (MFAT)** **Details/Description:** The MFAT is a national standardized test measuring student knowledge in the areas of Cell Biology, Molecular Biology and Genetics, Organismal Biology and Population Biology/Ecology/Evolution given to graduating seniors in the Biology program. **Target:** The mean score of UTC's graduating seniors in the Biology program will not differ in a statistically significant manner from the national mean (as determined by appropriate statical tests based upon the sample size of students taking the exam). **Implementation Plan (timeline):** One-sample t-tests will be used to test for significant differences (P < 0.05) between UTC and national means (MFAT total score and subscores). The	The UTC MFAT (Biology) was administered in December 2012 and will be administered again in May 2013. Average UTC MFAT scores for December 2012 (mean = 153, SD = 12, N = 14) were within one SD of the national average for 2010-12 (mean = 152.3, SD = 8.0, N = 393 institutions) and were not significantly different from the national mean. However, the average UTC MFAT Total score for May 2013 (mean = 149, SD = 13, N =65), although within one standard deviation of the national average, was significantly lower ($p<0.05$). In December 2012, mean UTC subscores for all four areas were statistically	Overall, the Fall 2012 MFAT data indicate that UTC Biology graduates compared favorably with students completing similar undergraduate programs across the country. Five out of 5 UTC mean test subscores were statistically similar to the national averages. Five out of 5 means were within one SD unit of the national means. However, assessment of May 2013UTC Biology graduates, raises some concern in that the subscores for Cell Biology and Molecular Genetics were significantly lower when compared to the national average using a one sample t-test. **SEE ATTACHED TABLE 1: *STATISTICAL ANALYSIS OF ASSESSMENT SUBSCORES*** In order to determine, more specifically, content areas	

		national mean seems a reasonable goal, as average ACT scores in Science Reasoning for entering UTC (Fall 2008 class) are virtually identical (within 2%) to the national mean.	similar to the respective national means. However, in May 2013, although mean UTC subscores for all four areas were within one standard deviation of the national mean, the mean subscores for Cell Biology (48±13) and Molecular Biology/Genetics (48±12) were significantly lower ($p<0.05$). Additionally, the mean percent correct for UTC students was within one SD of the national mean for all eight *assessment indicators* in Biology.	that may need improvement the mean percent correct of UTC graduating seniors was compared to the national mean for eight individual Biology assessment indicators. (In that the number of questions specific for each indicator was not large, statistical values are not reported.) In December 2012 and May 2013, 8/8 means were within one SD unit of the national means. However, as seen with the reported assessment subscores (Table 1), student performance relative to the national average was lower in May 2013. Although still within one SD unit of the national means, these indicators should continue to be closely evaluated in future years. **SEE ATTACHED TABLE 2: *ASSESSMENT INDICATORS*** *RECOMMENDATIONS FOR IMPROVEMENT* We will continue to analyze/interpret MFAT data using the same statistical approach. Subsequent analyses of MFAT datasets may reveal	

				certain test-score patterns (e.g., semester differences, long-term trends) that can be elucidated further. If a particular subscore or assessment indicator continues to fall below our target achievement, we will then consider modification of the curriculum and key courses to strengthen student performance in these target areas. We recently have transformed the Biology curriculum to streamline progression of students through to graduation, improve retention and establish a solid base of required core courses to provide a foundation for student success in upper level courses. The Biology core consists of Ecology, Evolution and Genetics. These changes were designed to target “holes” in the curriculum and prevent a student from completing the degree program with deficiencies central to the discipline of Biology. Additionally, the Introductory Biology series has been expanded to three semesters, as a means to cover the increasing	

				content in Biology.	
BS Biology	**Specific knowledge in concentration area** Students completing the baccalaureate program in biology will demonstrate a knowledge in their concentration area of study.	**Evaluation of student performance on the Major Field Assessment Test (MFAT) discipline subscores** **Details/Description:** The MFAT is a national standardized test measuring student knowledge in the areas of Cell Biology, Molecular Biology and Genetics, Organismal Biology and Population Biology/Ecology/Evolution given to graduating seniors in the Biology program. **Target:** The mean subscores for graduating seniors in an existing biology concentration corresponding to one of the subdisciplines of the MFAT will score at or above the 50th percentile compared to national results in that subdiscipline. **Implementation Plan (timeline):** The MFAT will be administered to graduating seniors at the end of each fall and spring semester. Data collected for each term will be used to determine percent-ranking of students that share a concentration in Biology with one of the subdisciplines of the MFAT. These results will be compared to previous terms to establish any trends associated with changes within the program and/or to identify	Fourteen of the 79 graduating seniors taking the test in 2012-13 majored in biology concentrations corresponding to one of the MFAT subdisciplines (three in Molecular Biology and Genetics, five in Organismal and five in Ecology).Based on the 2010-12 national dataset [N = 18,270 examinees]) this student placed at the following percentiles: <u>Molecular Biology and Genetics</u> – 91st, 87th and 78th percentiles, respectively. <u>Organismal</u> – 87th, 66th, 66th, 29th and 18th percentiles, respectively. <u>Ecology</u> – 98th, 96th, 68th, 43rd and 31st percentiles, respectively.	Overall, 9/13 (69%) of graduating seniors majoring in biology concentrations corresponding to one of the MFAT subdisciplines, scored at or above the 50th percentile compared to the national results. Specifically, for the subdiscipline of Molecular Biology and Genetics, 100% of the graduates in this concentration scored above the 50th percentile compared to the national results. The mean subscore for the Molecular graduating seniors was 87%. For the subdiscipline of Organismal Biology, 60% of the graduates in this concentration scored above the 50th percentile (mean subscore percentile = 76%). Finally, for the subdiscipline of Ecology, 60% of the graduates scored above the 5oth percentile, with an average mean subscore of 67%. The data for the subdisciplines indicates that we need to continue to maintain our standards and keep watch for any developing trends that could indicate problem	

		areas of improvement.		with our students demonstrating knowledge in the concentration areas. Historically, individual subscores have reflected favorably on UTC graduates in biological concentrations corresponding to one of the subdisciplines of the MFAT. In the past seven years 78% of UTC graduates scored at or above 50th percentile in their respective subdisciplines. These findings suggest that our biological concentrations in continue to provide UTC graduates with a solid knowledgebase within these subdisciplines. **SEE ATTACHED TABLE 3: *SUBSCORES OF GRADUATING SENIORS***	

BS Biology	**Effective communication of Biological Knowledge** Students completing the baccalaureate program in Biology will demonstrate the ability to effectively communicate and critically analyze biological information and experimental results in oral form employing	**Evaluation of student performance on Oral Presentation** **Details/Description:** Students in the Biology program will prepare and deliver a clear and cogent presentation of experimental results derived from independent inquiry. Students will give an oral presentation of experimental findings as part of the Biology Seminar series. Presentations will be evaluated by faculty according to as assessment rubrics evaluating content, verbal skills and non-verbal skills. **Target:** At least 70% of graduating seniors evaluated will demonstrate effective oral communication and critical analysis of biological information by achieving a rank of GOOD or above as determined by faculty evaluation using an assessment rubric for oral presentation **Implementation Plan (timeline):** Beginning in the Spring 2013 semester, 2-4 graduating seniors will present research findings of independent inquiry as part of the Biology Seminar series.	The first round of oral presentations were evaluated in April 2013 when graduating seniors present their research findings during the Biology Seminar series. Three students presented research completed as part of their departmental honors (BIOL 4995) Students were evaluated using an assessment rubric evaluating Non-verbal skills, verbal skills and content. **SEE ATTACHED RUBRIC:** ***ORAL PRESENTATION ASSESSMENT***	Overall, the oral presentations were evaluated as good-excellent. Using a scale from 0-4, the final presentation scores ranged from 3.67-3.79 with an average of 3.71. These scores are not surprising in that 2/3 of the students had already presented and successfully defended their study as part of a departmental thesis. Additionally 2/3 had given an oral presentation of their findings at UTC Research Day and 2/3 had given poster presentations of their study at a regional scientific conference. Closer inspection of the individual components of the presentation indicates that the students were particularly strong in areas of ***poise, enthusiasm and mechanics.*** The lowest areas or performance were for ***elocution*** and ***subject knowledge.*** **SEE ATTACHED ORAL PRESENTATION SUMMARY:** ***SENIOR ORAL PRESENTATION ASSESSMENT***	

				The 70% target was met for demonstration of effective oral communication, suggesting that graduating seniors successfully presented and defended research findings resultant of independent inquiry. NO IMPROVEMENTS ARE RECOMMENDED AT THIS TIME	
BS Biology	**Knowledge and Application of the Scientific Method** Students completing the baccalaureate program in biology will demonstrate a knowledge of how to carry out scientific inquiry and apply the scientific method.	**Evaluation of student performance on formal Lab Report** **Details/Description:** Students in the Biology program will apply a method of inquiry for investigating scientific phenomena, acquiring new knowledge and integrating this knowledge with previous studies, based on gathering empirical and measurable evidence subject to specific principles of scientific reasoning. Demonstration of the scientific method will be formalized in completion of a laboratory report. Evaluation of lab reports assigned in the introductory BIOL 1120L course will be used as a survey to identify areas in which students need improvement in	Students in the Introductory Biology 2 laboratory (BIOL 1120L) and upper level Ecology laboratory (BIOL 3070) were evaluated for application of the scientific method by completion of a formal laboratory report. **SEE ATTACHED RUBRIC:** ***BIOL 1120L Lab Report Rubric*** **SEE ATTACHED RUBRIC:** ***BIOL 3060 Lab Report Rubric***	**BIOL 1120L:** Overall, the reports were very good, with 60% (13/22) of the students earning ≥ 2.75 for an overall effectiveness score. Only 1/22 scored a 2 ('average') or less. From the report categories, the lowest category was ***forming the hypothesis*** and including a prediction based on what they know about the study system. The next weakest section as a class was ***work cited***. The most common deductions were due to a complete lack of citation and improper formatting of citations, when provided. The future direction section	

		understanding and applying the scientific method. Evaluation of lab reports in the upper level BIOL 3070 course will be used to determine whether students successfully demonstrate knowledge and application of the scientific method. **Target:** At least 70% of graduating seniors evaluated will demonstrate knowledge and application of the scientific method by scoring GOOD or above (in accordance to the assessment rubrics) on a formal lab report applied in upper level biology course. **Implementation Plan (timeline):** In order to improve assessment across the curriculum, we are restructuring the introductory and upper level Biology courses BIOL 1120L and BIOL 3070, respectively, to include a required laboratory report based on a formal scientific inquiry. Data will be collected for each term and will be used to determine improvement in understanding the scientific method between freshmen and upperclassmen in the biology program.		was also rushed in several papers or left out entirely. **SEE ATTACHED LAB REPORT SUMMARY 1: *BIOL 1120L LAB REPORT ASSESSMENT*** **BIOL 3070:** In Ecology, three lab reports are assigned. For Report 1, for the reported data, 72% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. For Report 2, for the reported data, 89% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. For Report 3, for the reported data, 87% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. The 70% target was met for each of the three reports, suggesting that students at the 3000 level do indeed display greater competency than at the 1000 level in terms of wielding the scientific method and constructing properly-written laboratory reports.	

				Also, the latter reports were of much higher quality than the initial reports, suggesting improvement as the semester unfolds. **SEE ATTACHED LAB REPORT SUMMARY 2: *BIOL 3070 LAB REPORT ASSESSMENT*** *RECOMMENDATIONS FOR IMPROVEMENT* **BIOL 1120L:** New Assignment: Writing Hypotheses – A Student Lesson. New Emphasis on Writing Hypotheses on the Lab Midterm Exam. **BIOL 3070:** NO IMPROVEMENTS ARE RECOMMENDED AT THIS TIME AT THE 3000 LEVEL.	

TABLE 1: ASSESSMENT SUBSCORES

Major Field Achievement Test Results (Biology) – University of Tennessee-Chattanooga, Department of Biological/Environmental Sciences, **2012-13**. Test score data are presented from one national survey (2010-11) and two UTC surveys (2012 and 2013) of graduating seniors (biology majors). An asterisk (*) indicates that the UTC mean differed significantly from the national mean (P < 0.05; one-sample *t* test).

Test	National Sample, 2010-12 (N = 393 institutions) Mean ± SD	National Sample, 2010-12 (SD range)	UTC, December 2012 (N = 14 examinees) Mean ± SD (P-value)	UTC, May 2013 (N = 65 Examinees) Mean± SD (P-value)	Unpaired *t* test Comparison of FA2012 and SP2013 Means (P-value)
Total Score	152.3 ± 8.0	144.3 – 160.3	153 ± 12; (0.8306)	149 ± 13; (0.0448)*	0.2936
1. Cell Biology	52.5 ± 6.8	45.7 – 59.3	51 ± 12; (0.6477)	48 ± 13; (0.0069)*	0.4301
2. Molecular Biology/Genetics	52.3 ± 6.7	45.6 – 59.0	53 ± 13; (0.8343)	48 ± 12; (0.0053)*	0.1674
3. Organismal Biology	53.6 ± 7.6	46.0 – 61.2	54 ± 12; (0.9027)	51 ± 14; (0.1392)	0.4591
4. Ecology/Evolution	53.0 ± 7.7	45.3 – 60.7	55 ± 11; (0.5082)	50 ± 15; (0.1118)	0.2423

TABLE 2: ASSESSMENT INDICATORS

Major Field Achievement Test Results (Biology) – University of Tennessee-Chattanooga, Department of Biological/Environmental Sciences, **2012-13**. Test score data are presented from one national survey (2010-12) and two UTC surveys (2012 and 2013) of graduating seniors (biology majors)

Test	National Sample, 2010-12 (N = 393 institutions) Mean ± SD	National Sample, 2010-12 (SD range)	UTC, December 2012 (N = 14 examinees) Mean (% Below)	UTC, May 2013 (N = 65 Examinees) Mean (% Below)
1. Biochem & Cell Energetics	46.8 ± 8.2	38.6 – 55.0	43 (27)	42 (24)
2. Cell Structure, Organ, Fxn	50.5 ± 8.8	41.7 – 59.3	49 (39)	45 (21)
3. Mol. Biology & Mol. Genet	47.3 ± 8.8	38.5 – 56.1	48 (50)	42 (23)
4. Diversity of Organisms	42.7 ± 8.8	33.9 – 51.5	49 (75)	41 (36)
5. Organismal - Animals	41.5 ± 7.9	33.6 – 49.4	39 (33)	35 (16)
6. Organismal - Plants	33.1 ± 6.7	26.4 – 39.8	36 (64)	38 (77)
7. Pop. Genetics & Evolution	50.6 ± 9.1	41.5 – 59.7	58 (76)	47 (27)
8. Ecology	51.4 ± 8.6	42.8 – 60.0	51 (39)	50 (35)
9. Analytical Skills	47.0 ± 9.0	38.0 – 56.0	49 (55)	41 (21)

*In that the number of questions specific for each indicator was not large, statistical values are not reported.

TABLE 3: Subscores of Graduating Seniors with a Biology Concentration in MFAT Sub-discipline		
	National Percentile Ranking	**Mean Subscore Percentile Ranking**
2005-06		
Cell Biology		
Molecular/Genetics	83rd	83rd
Organismal	58th, 83rd, 98th	83rd
Ecology/Evolution	57th	57th
2006-07		
Cell Biology		
Molecular/Genetics	95th, 85th, 80th	90th
Organismal		
Ecology/Evolution	55th	55th
2007-08		
Cell Biology		
Molecular/Genetics		
Organismal		
Ecology/Evolution	45th, 85th	65th
2008-09		
Cell Biology		
Molecular/Genetics	90th, 80th, 80th, 70th, 45th	80th
Organismal	90th, 75th	80th
Ecology/Evolution	95th	95th
2009-10		
Cell Biology		
Molecular/Genetics		
Organismal		
Ecology/Evolution	70th, 45th	60th
2010-11		
Cell Biology		
Molecular/Genetics	95th, 25th	58th
Organismal	80th, 70th, 50th	67th
Ecology/Evolution	95th, 25th	60th
2012-13		
Cell Biology		
Molecular/Genetics	91st, 87th, 78th	87th
Organismal	87th, 66th, 66th, 29th, 18th	76th
Ecology/Evolution	98th, 96th, 68th, 43rd, 31st	67th

ORAL PRESENTATION ASSESSMENT					
	EXCELLENT 4 pts	**GOOD 3 pts**	**AVERAGE 2 pts**	**POOR 1 pt**	**TOTAL**
NONVERBAL SKILLS					
Eye contact	Holds attention of entire audience with the use of direct eye contact, seldom looking at notes	Consistent use of direct eye contact with audience, but still returns to notes	Displayed minimal eye contact with audience, while reading mostly from the notes	No eye contact with audience, as entire report is read from notes	
Poise	Student displays relaxed, self-confident nature, with no mistakes	Makes minor mistakes, but quickly recover from them; displays little or no tension	Displays mild tension; has trouble recovering from mistakes	Tension and nervousness is obvious; has trouble recovering from mistakes	
VERBAL SKILLS					
Enthusiasm	Demonstrates a strong, positive feeling about topic during entire presentation	Occasionally shows positive feelings about topic	Shows some negativity toward topic presented	Shows absolutely no interest in topic presented	
Elocution	Student uses a clear voice and correct, precise pronunciation of terms so that all audience members can hear presentation	Student uses a clear voice and pronounces most words correctly. Most audience members can hear presentation	Student's voice is low. Student incorrectly pronounces terms. Audience members have difficulty hearing presentation	Student mumbles, incorrectly pronounces terms, and speaks too quietly for a majority of students to hear	
CONTENT					
Subject Knowledge	Student demonstrates full knowledge by answering all class questions with explanation and elaboration	Student is at ease with expected answers to all questions, but fails to elaborate	Student is uncomfortable with information and is able to answer only rudimentary questions	Student does not have grasp of information; student cannot answer questions about subject	
Organization	Student presents information in logical, interesting sequence which audience can follow	Student present information in logical sequence which audience can follow	Audience has difficulty following presentation because student jumps around	Audience cannot understand presentation because there is no sequence of information	
Mechanics	Presentation has no misspellings or grammatical errors	Presentation has no more than two misspellings and/or errors	Presentation has three misspellings and/or errors	Student's presentation has four or more misspellings and/or errors	
Graphics	Student's graphics explain and reinforce screen text and presentation	Student's graphics relate to text and presentation	Student occasionally uses graphics that rarely support text and presentation	Student uses superfluous graphics or no graphics	

LAB REPORT ASSESSMENT RUBRIC FOR BIOL 1120L

	VERY GOOD 3 pts	AVERAGE 2 pts	POOR 1 pt
Components of the Report	VERY GOOD All required elements are present and organized. Includes additional elements that add to the report	AVERAGE One required element is missing, but additional elements that add to the report have been added	POOR Several required elements are missing
INTRODUCTION			
Background	VERY GOOD Clear, concise discussion of background information and previous observations that support the importance/ rationale of undertaking the experiment(s). Reputable background sources were used and cited correctly	AVERAGE Relevant background information was included, but the connection with the experiment was not made clear	POOR Some background information was included, but it was not particularly relevant
Hypothesis	VERY GOOD At least one clear, concise, relevant and testable overall hypothesis is stated along with one or more predictions	AVERAGE A clear, concise, relevant and testable overall hypothesis is stated, but predictions are absent	POOR One hypothesis or research question is partially stated and/or stated in somewhat unclear manner. No other hypotheses or predictions are given
MATERIALS AND METHODS			
Content	VERY GOOD Methods proved a brief description of the species identified, methodology, and used in the experiment while citing the protocol. Well-organized clear, concise narrative that does not include lists. Methods are described in the past tense, using active voice	AVERAGE Addresses only the techniques and procedures used, Summarizes all the methods used while citing the protocol. Does not include lists. Clarity is diminished by the presence of a few minor grammatical problems.	POOR Experimental procedure is summarized with a listing of materials. Contains numerous small grammatical errors or lacks citations.
RESULTS			
Figures/Tables	VERY GOOD Professional looking and accurate representation of the data in tables and/or figures that are labeled and titled. Legends are included where needed so that Table and Figures can stand-alone. Units are given	AVERAGE Title accurately describes content. Headers and stubs clearly organize data field without repetitive or redundant descriptors. Uncluttered. Plots appropriate for type of results obtained. Legend for notes complete.	POOR Appropriate figures and tables are included but contain some errors or inaccuracies (such as missing units, missing titles, legends, or captions, etc.). Tables and figures cannot stand alone, and some are not represented adequately
Results Narrative	VERY GOOD Results narrative can stand alone, and includes references to tables/figures. Does not include methodology or conclusions.	AVERAGE Results narrative does not include reference to tables/figures, but can stand-alone. Data are summarized and units are given. Some	POOR Results narrative present but it cannot stand-alone. Some major grammatical problems are present. Several sentences

	Data are summarized. Units are given	methods or conclusions are present	of methods or conclusions are included
DISCUSSION/CONCLUSIONS			
Analysis of Results	VERY GOOD The relationship between the variables is discussed and trends/patterns logically analyzed	AVERAGE The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data	POOR An attempt is made to discuss the relationships among different variables, but the arguments are not relevant or are unclear
Future Directions	VERY GOOD Effective discussion of at least one future direction with rationale	AVERAGE Discussion at least one future direction, but lacking supporting rationale	POOR Future directions not discussed
WORKS CITED			
Works Cited	VERY GOOD Includes complete bibliography, only issue is minor inconsistent formatting of list. Sources are appropriate and reputable	AVERAGE Includes complete bibliography for each in-text citation, but one or two references are incomplete. One or two sources are questionable sources for an academic work	POOR No work cited included.
OVERALL EFFECT/GRAMMAR			
Grammar	VERY GOOD Only a few minor problems (subject-verb agreement issues)	AVERAGE Some problems with grammar, few sentences poorly constructed	POOR Some poorly constructed sentences and paragraphs, but bad grammar doesn't completely misconstrue meaning.
Overall Effectiveness of the Report	VERY GOOD Very Good	AVERAGE Average	POOR Poor

LAB REPORT ASSESSMENT RUBRIC FOR BIOL 3070					
	EXCELLENT 5 pts	**VERY GOOD 4 pts**	**GOOD 3 pts**	**AVERAGE 2 pts**	**POOR 1 pt**
Components of the Report	EXCELLENT All required elements are present and organized. Includes additional elements that add to the report (e.g., thoughtful comments, graphics)	VERY GOOD All required elements are present and organized	GOOD One required element is missing, but additional elements that add to the report (e.g., thoughtful comments, graphics) have been added	AVERAGE Several required elements are missing	POOR No attempt was made to follow the proper format and organization of a formal laboratory report
Title	EXCELLENT The lab report has well-constructed, concise title that reflects the experiments and results	VERY GOOD The lab report has a title that reflects the experiments and results but could have been stated better	GOOD The lab report has a title that reflects the experiments and results but is not clearly stated	AVERAGE The lab report has a title that somewhat reflects either the experiments or results but is not clearly stated	POOR The lab report either has no title or the title is irrelevant/unclear
INTRODUCTION					
Purpose	EXCELLENT The overall purpose for undertaking the research or experiment(s) is stated in a clear, concise manner	VERY GOOD The overall purpose for undertaking the research or experiment(s) is stated fully, but could have been worded more concisely/directly	GOOD The overall purpose for undertaking the research or experiment(s) is stated fully, but in an unclear manner	AVERAGE The overall purpose for undertaking the research or experiment(s) is not stated fully, and is unclear	POOR The overall purpose for undertaking the research or experiment(s) is not stated, or is erroneous or irrelevant
Background	EXCELLENT Clear, concise discussion of background information and previous observations that support the importance/ rationale of undertaking the experiment(s). Reputable background sources were used and cited correctly	VERY GOOD Mostly clear discussion of background information that supports the importance/rationale of the experiment and includes at least a few previous observations	GOOD Relevant background information was included, but the connection with the experiment was not made clear	AVERAGE Some background information was included, but it was not particularly relevant	POOR No attempt was made to include background information.
Hypothesis	EXCELLENT At least one clear, concise, relevant and testable overall hypothesis is stated along with one or more	VERY GOOD A clear, concise, relevant and testable overall hypothesis is stated, but predictions are absent	GOOD One hypothesis or research question is partially stated and/or stated in somewhat unclear manner. No other	AVERAGE One hypotheses or research question has been stated, but appears to be based on flawed logic	POOR Objective, purpose, hypotheses, and predictions are all absent

	predictions		hypotheses or predictions are given		
MATERIALS AND METHODS					
Content	EXCELLENT Methods proved a brief description of the main organism, chemicals, and/or instruments used in the experiment while citing the protocol. Addresses only the techniques and procedures used, including statistical analysis when applicable. Well-organized clear, concise narrative that does not include lists. Methods are described in the past tense, using active voice	VERY GOOD Addresses only the techniques and procedures used, including statistical analysis when applicable. Summarizes all the methods used while citing the protocol. Does not include lists. Clarity is diminished by the presence of a few minor grammatical problems, such as vague language, excessive use of passive voice, dangling modifiers, or unclear antecedents	GOOD Experimental procedure is summarized with a listing of materials. Contains numerous small grammatical errors or lacks citations.	AVERAGE Description of the research procedure is too vague. Essential materials are missing or inaccurate. Contain one or two serious grammatical errors (e.g., written as instructions, mixed tenses, incomplete sentences). Or: contains numerous small grammatical problems and lacks citations	POOR One cannot follow the procedure described
RESULTS					
Figures/Tables	EXCELLENT Professional looking and accurate representation of the data in tables and/or figures that are labeled and titled. Legends are included where needed so that Table and Figures can stand-alone. Units are given	VERY GOOD Title accurately describes content. Headers and stubs clearly organize data field without repetitive or redundant descriptors. Uncluttered. Plots appropriate for type of results obtained (scatter, bar, histogram etc.) Legend for notes complete	GOOD Figure/Table Numbered and Title present, but cannot stand-alone. Headers and stubs organize data field. Columns and rows aligned. Plots appropriately sized and identified	AVERAGE Appropriate figures and tables are included but contain some errors or inaccuracies (such as missing units, mismatched scale, scale not starting from zero, missing titles, legends, or captions, etc.). Tables and figures cannot stand alone, and some are not represented adequately	POOR Figures and tables are absent or completely inappropriate
Results Narrative	EXCELLENT Results narrative can stand alone, and includes references to tables/figures. Does not include methodology or conclusions. Data are	VERY GOOD Results narrative does not include reference to tables/figures, but can stand-alone. Data are summarized and units are given. Statistical results	GOOD An important element (such as results of statistical tests) is missing. Some grammatical errors are present	AVERAGE Results narrative present but it cannot stand-alone. Some major grammatical problems are present. Several sentences of methods or conclusions	POOR Results narrative absent

	summarized. Units and results of statistical tests are given	are given. Some methods or conclusions are present		are included	
DISCUSSION/CONCLUSIONS					
Analysis of Results	EXCELLENT The relationship between the variables is discussed and trends/patterns logically analyzed. Predictions are made about what might happen if part of the lab were changed or how the experimental design could be changed	VERY GOOD The relationship between the variables is discussed and trends/patterns logically analyzed	GOOD The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data	AVERAGE An attempt is made to discuss the relationships among different variables, but the arguments are not relevant or are unclear	POOR The relationship between the variables is not discussed
Limitations of Design	EXCELLENT Several Limitations of the Experimental design are discussed clearly with alternative strategies given	VERY GOOD Several Limitations of the Experimental design are discussed clearly but few alternate strategies are suggested, although clearly	GOOD Several Limitations of the Experimental design are discussed but alternate strategies are not given	AVERAGE Limitations are discussed but are mostly irrelevant or are unclear	POOR No limitations are discussed
Implications of Findings	EXCELLENT Clearly states what results will contribute to the field in general. Link back to questions posed in the introduction. Clear statement of support/refute of hypothesis.	VERY GOOD Draws some connections back to questions posed in the introduction and suggests that the data supports the hypothesis	GOOD Attempt to Link back to questions posed in the introduction attempt to show data connection to hypothesis but poorly argued	AVERAGE Attempt to discuss implications made but not effectively written, no clear connection between results and hypothesis made	POOR Implications/Hypothesis not discussed.
Future Directions	EXCELLENT Clear, effective discussion of two or more future directions, with rationale	VERY GOOD Effective discussion of at least one future direction with rationale	GOOD Discussion of two or more future directions, but lacking supporting rationale	AVERAGE Discussion at least one future direction, but lacking supporting rationale	POOR Future directions not discussed
WORKS CITED					
Works Cited	EXCELLENT Includes a bibliography section that is consistently and neatly formatted with	VERY GOOD Includes complete bibliography, only issue is minor inconsistent	GOOD Includes complete bibliography for each in-text citation, but one or	AVERAGE Bibliography is not complete/missing a few of the citations given in-text,	POOR Bibliography either not included or extremely poor

	all references used in text listed. Sources are appropriate and reputable	formatting of list. Sources are appropriate and reputable	two references are incomplete. One or two sources are questionable sources for an academic work	and/or more than two sources are questionable sources for an academic work, and/or several citations are incomplete	
OEVERALL EFFECT/GRAMMAR					
Grammar	EXCELLENT Excellent	VERY GOOD Only a few minor problems (subject-verb agreement issues)	GOOD Some problems with grammar, few sentences poorly constructed	AVERAGE Some poorly constructed sentences and paragraphs, but bad grammar doesn't completely misconstrue meaning.	POOR Poorly constructed sentences and paragraphs, causing multiple instanced of completely misconstrued meaning.
Overall effective Report	EXCELLENT Excellent	VERY GOOD Very good	GOOD Good	AVERAGE Average	POOR Poor

LAB REPORT ASSESSMENT			
	VERY GOOD **3 pts**	**AVERAGE** **2 pts**	**POOR** **1 pt**
Components of the Report	VERY GOOD All required elements are present and organized. Includes additional elements that add to the report	AVERAGE One required element is missing, but additional elements that add to the report have been added	POOR Several required elements are missing
INTRODUCTION			
Background	VERY GOOD Clear, concise discussion of background information and previous observations that support the importance/ rationale of undertaking the experiment(s). Reputable background sources were used and cited correctly	AVERAGE Relevant background information was included, but the connection with the experiment was not made clear	POOR Some background information was included, but it was not particularly relevant
Hypothesis	VERY GOOD At least one clear, concise, relevant and testable overall hypothesis is stated along with one or more predictions	AVERAGE A clear, concise, relevant and testable overall hypothesis is stated, but predictions are absent	POOR One hypothesis or research question is partially stated and/or stated in somewhat unclear manner. No other hypotheses or predictions are given
MATERIALS AND METHODS			
Content	VERY GOOD Methods proved a brief description of the species identified, methodology, and used in the experiment while citing the protocol. Well-organized clear, concise narrative that does not include	AVERAGE Addresses only the techniques and procedures used, Summarizes all the methods used while citing the protocol. Does not include lists. Clarity is diminished by the presence of a few minor grammatical	POOR Experimental procedure is summarized with a listing of materials. Contains numerous small grammatical errors or lacks citations.

	lists. Methods are described in the past tense, using active voice	problems.	
RESULTS			
Figures/Tables	VERY GOOD Professional looking and accurate representation of the data in tables and/or figures that are labeled and titled. Legends are included where needed so that Table and Figures can stand-alone. Units are given	AVERAGE Title accurately describes content. Headers and stubs clearly organize data field without repetitive or redundant descriptors. Uncluttered. Plots appropriate for type of results obtained. Legend for notes complete.	POOR Appropriate figures and tables are included but contain some errors or inaccuracies (such as missing units, missing titles, legends, or captions, etc.). Tables and figures cannot stand alone, and some are not represented adequately
Results Narrative	VERY GOOD Results narrative can stand alone, and includes references to tables/figures. Does not include methodology or conclusions. Data are summarized. Units are given	AVERAGE Results narrative does not include reference to tables/figures, but can stand-alone. Data are summarized and units are given. Some methods or conclusions are present	POOR Results narrative present but it cannot stand-alone. Some major grammatical problems are present. Several sentences of methods or conclusions are included
DISCUSSION/CONCLUSIONS			
Analysis of Results	VERY GOOD The relationship between the variables is discussed and trends/patterns logically analyzed	AVERAGE The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data	POOR An attempt is made to discuss the relationships among different variables, but the arguments are not relevant or are unclear
Future Directions	VERY GOOD Effective discussion of at least one future direction with rationale	AVERAGE Discussion at least one future direction, but lacking supporting rationale	POOR Future directions not discussed
WORKS CITED			
Works Cited	VERY GOOD	AVERAGE	POOR

	Includes complete bibliography, only issue is minor inconsistent formatting of list. Sources are appropriate and reputable	Includes complete bibliography for each in-text citation, but one or two references are incomplete. One or two sources are questionable sources for an academic work	No work cited included.
OEVERALL EFFECT/GRAMMAR			
Grammar	VERY GOOD Only a few minor problems (subject-verb agreement issues)	AVERAGE Some problems with grammar, few sentences poorly constructed	POOR Some poorly constructed sentences and paragraphs, but bad grammar doesn't completely misconstrue meaning.
Overall Effectiveness of the Report	VERY GOOD Good	AVERAGE Average	POOR Poor

	Average
Components of the Report	2.95
INTRODUCTION	
Background	2.82
Hypothesis	2.45
MATERIALS AND METHODS	
Content	2.82
RESULTS	
Figures/Tables	2.91
Results Narrative	2.82
DISCUSSION/CONCLUSIONS	
Analysis of Results	2.73
Future Directions	2.73
WORKS CITED	
Works Cited	2.59
OVERALL EFFECT/GRAMMAR	

Grammar	2.95
Overall Effectiveness of the Report	2.76

Range of report averages (overall	
3-2.75	13
2.74-2.5	7
2.49-2.25	1
2.24-2	1
Total	22

Overall, the reports were very good, with the majority of the students earning at least a 2.75/3 (13/22 students) for an overall effectiveness score. Only 1/22 scored a 2 ('average') or less (out of 3). From the report categories, the lowest category was forming the hypothesis and including a prediction based on what they know about the importance of plankton in a community. They next weakest section as a class was work cited. Several did not reference their sources at all, but the other reduced scores came from lack of formatting properly (ie laziness). The future direction section was also rushed in several papers or left out entirely. The results and the Material and Methods sections were both very straight forward and generally students reported what was needed in those sections. Overall, this was a simple lab and a good introduction for introductory biology students to the layout and rigor of a lab report without too much added pressure of statistics or an overload of data or variables. With the help of the lab manual, students composed well written reports that looked at the Shannon Diversity Index of two plankton communities gathered from different habitat types.

BIOL 1120L Lab Report Assessment

Summary of BIOL 1120L Lab Report Sections*

Components of the Report	2.95
INTRODUCTION	
Background	2.82
Hypothesis	2.45
MATERIALS AND METHODS	
Content	2.82
RESULTS	
Figures/Tables	2.91
Results Narrative	2.82
DISCUSSION/CONCLUSIONS	
Analysis of Results	2.73
Future Directions	2.73
WORKS CITED	
Works Cited	2.59
OVERALL EFFECT/GRAMMAR	
Grammar	2.95
Overall Effectiveness	2.76

*Average scores based on 22 lab reports

Distribution of Report Averages

Score	**Scale**	**# of Reports (%)**
2.5-3	Very Good-Excellent	20 (9)
2-2.5	Good- Very Good	2 (9)
1.5-2	Average-Good	
1-1.5	Poor-Average	
0-1	Poor	

Distribution of Report Averages

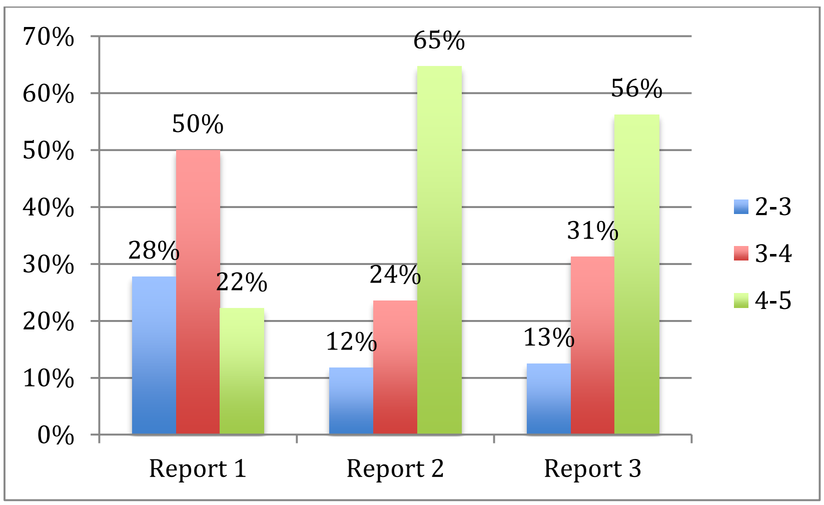
3-2.75	13
2.74-2.5	7
2.49-2.25	1
2.24-2	1
Total	22

BIOL 3070 Lab Report Assessment

Distribution of Lab Report Scores in BIOL 3070*

Score	Scale	Report 1	Report 2	Report 3
4-5	Very Good-Excellent	22% (4)	65% (11)	56% (9)
3-4	Good- Very Good	50% (9)	24% (4)	31% (5)
2-3	Average-Good	28% (5)	12% (2)	13% (2)
1-2	Poor-Average	0	0	0
0-1	Poor	0	0	0

* Distribution of actual number of students are provided in parentheses



Appendix E. BGE Sample Syllabi

BGE Sample Syllabi
(Click on the heading and another pdf file will open, 103 pages)

Appendix F. Environmental Science Learning Outcomes Assessment (2012-2013)

Example of assessment for the environmental science program during the 2012-2013 year.

Degree and Major	Student Learning Outcome	Means of Assessment	Assessment Data	Improvements Based Upon Data
BS Environmental Science	Competency in Writing a Lab Report at the 1000 Level (in ESC 1510 - Introduction to Environmental Problems II): ESC Students will be properly trained in how to wield the scientific method and will be able to display this competency through properly constructed lab reports.	At least 70% of students evaluated will demonstrate knowledge and application of the scientific method by scoring GOOD or above (in accordance with the assessment rubric) on a formal lab report assigned in a 1000 level course.	Spring 2012 data- Exactly 50% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. Students seemed to have the most difficulty with writing an effective, testable hypothesis. Only 50% of students scored GOOD or above on the HYPOTHESIS section of the formal lab report (as determined by the application of the assessment rubric). The other 50% scored at best AVERAGE on the HYPOTHESIS section. None of the 50% scored POOR, which is encouraging. Fall 2012 data - Exactly 68% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. Students still seemed to have some trouble with the HYPOTHESIS section. Only 59% of students	**New Assignment: Writing Hypotheses – A Student Lesson.** **New Syllabus (Showing the Addition of the New Assignment to the Course Schedule).** **New Emphasis on Writing Hypotheses on the Lab Midterm Exam.** **New Emphasis on Writing Hypotheses in Lichens and Air Pollution Lab..** **Based on the Spring 2013 results, the Writing Hypotheses lab exercise will be expanded in the coming year, and a full lab period devoted to writing hypotheses. Also, the Population Dynamics lab will be added back into the ESC 1510 schedule, in order to give the**

			scored GOOD or above on the HYPOTHESIS section of the formal lab report (as determined by the application of the assessment rubric). The other 41% scored at best AVERAGE on the HYPOTHESIS section. Only one student (out of 22 students) scored POOR. Spring 2013 data) Exactly 68% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. Students still seemed to have some trouble with the HYPOTHESIS section, although the trend towards better hypothesis construction continues to move in the positive direction. Exactly 61% of students scored GOOD or above on the HYPOTHESIS section of the formal lab report (as determined by the application of the assessment rubric). This was up from 50% in Spring 2012 and 59% in Fall 2012. The other 39% scored AVERAGE on the HYPOTHESIS section. No students (out of 23 students) scored POOR.	**students yet another opportunity where they can construct a hypothesis.**

	Competency in Writing a Lab Report at the 3000 Level (in BIO 3070 – Ecology Laboratory): ESC Students will be properly trained in how to wield the scientific method and will be able to display this competency through properly constructed lab reports.	At least 70% of students evaluated will demonstrate knowledge and application of the scientific method by scoring GOOD or above (in accordance with the assessment rubric) on a formal lab report assigned in a 3000 level course.	Fall 2012 data – In Ecology, three lab reports are assigned. For Report 1, for the reported data, 72% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. For Report 2, for the reported data, 89% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. For Report 3, for the reported data, 87% of the reports scored GOOD or above for the OVERALL EFFECTIVENESS OF THE REPORT. The 70% target was met for each of the three reports, suggesting that students at the 3000 level do indeed display greater competency than at the 1000 level in terms of wielding the scientific method and constructing properly-written laboratory reports. Also, the latter reports were of much higher quality than the initial reports, suggesting improvement as the semester unfolds. Spring 2013 data (no data were collected during Spring of 2013. Data collection for this evaluation point will resume when Ecology courses reconvene next fall).	**New improvements made from these data? NO IMPROVEMENTS ARE RECOMMENDED AT THIS TIME AT THE 3000 LEVEL.**

	Solid Internship Performances: Agencies and entities that employ junior and senior ESC majors as interns will not only express satisfaction with their work, but will also benefit the interns by providing them with worthwhile experiences. The quality of each ESC Intern's performance will be evidenced by the construction of quality student internship papers.	Rubric Attached. At least 70% of evaluated internship students will receive a positive Intern Performance Evaluation (ranking Very Good or Outstanding in all categories) AND construct an Internship Paper with an overall effectiveness score of GOOD or better.	Fall 2012 data Exactly 100% of the interns evaluated during fall 2012 received a positive Intern Performance Evaluation (ranking Very Good or Outstanding in all categories). These students likewise constructed an Internship Paper with an overall effectiveness score of GOOD or better. Spring 2013 data (For the second straight semester, exactly 100% of the interns evaluated during fall 2012 received a positive Intern Performance Evaluation (ranking Very Good or Outstanding in all categories). These students likewise constructed an Internship Paper with an overall effectiveness score of GOOD or better.	**New improvements made from these data? In order to improve the overall quality of the internship reports, the Internship Paper Assessment Rubric is now being made available to student interns (in advance) to aid them as they go about their internships and as they construct their internship reports.**

Improvements implemented in 2012 (based on 11-12 recommendations): A much greater emphasis on writing hypotheses was included in ESC 1510 Introduction to Environmental Problems II Laboratory (with one brand new assignment, a restructuring of an existing assignment, and hypothesis-related items on the laboratory midterm exam). The Internship Assessment Rubric is now made available to student interns in advance (right along with the Internship Policy, the Internship Contract, and the Internship Performance Evaluation Form) to aid the student interns in their internship experience/report preparation.

IINTERNSHIP PAPER ASSESSMENT					
	EXCELLENT 5 pts	**VERY GOOD 4 pts**	**GOOD 3 pts**	**AVERAGE 2 pts**	**POOR 1 pt**
1. The Journal	All required entries are present and organized. Includes thoughtful comments & evidence of critical reflection	All required entries are present and organized, with an adequate description of each day's activities.	Most required entries are present and organized, with an adequate description of each day's activities.	Few required entries are present and organized, with description of each day's activities lacking or occasionally missing.	No attempt or a halfhearted attempt was made to make and/or organize the required entries. Descriptions of day's activities also missing.
2. Performance Evaluation	Student received all 5s for quality of work, responsibility, attitude, and ability to work independently. Other comments were positive.	Student received all 5s and 4s for quality of work, responsibility, attitude, and ability to work independently. Other comments were positive.	Student received one 3 for either quality of work, responsibility, attitude, and ability to work independently. Comments were mostly positive.	Student received 3s for at least two of the following: quality of work, responsibility, attitude, and ability to work independently. Comments were mostly positive.	Student received either three 3s or lower than a 3 for any of the following: attitude, and ability to work independently. Some comments were less than positive.
3. Title	The internship paper has well-constructed, concise title that reflects the nature and location of the internship.	The internship paper has a title that reflects the nature and location of the internship but could have been better.	The internship has a title that reflects the nature of the internship but the location is not clearly stated.	The internship paper has a title that somewhat reflects the nature of the internship but the location is not clearly stated	The internship either has no title or the title is irrelevant/unclear as far as nature and location.
3. How Internship Was Found and Obtained	The details of how the internship was found and obtained are stated in a clear, concise manner	The details of how the internship was found and obtained are stated fully, but could have been worded more concisely/directly.	The details of how the internship was found and obtained are stated fully, but in an unclear manner	The details of how the internship was found and obtained are not stated fully, and are unclear	The details of how the internship was found and obtained are not stated or included.
4. Description of the Intern's Responsibilities and Activities Performed	Clear, concise description of intern's responsibilities and activities performed (with both being relevant to environmental science (ESC)).	Mostly clear discussion of intern's responsibilities and activities performed (with both being relevant to environmental science (ESC)).	No clear discussion of intern's responsibilities and activities performed (although both appear relevant to environmental science (ESC)).	No clear discussion of intern's responsibilities and activities performed; neither directly to environmental science (ESC).	No attempt was made to discuss responsibilities and activities.
5. Description of a Typical Day	Clear, concise description of typical day of intern; duties described relevant to ESC	Mostly clear discussion of typical day of intern; duties described relevant to ESC.	No clear discussion of typical day of intern; even so, duties described relevant to ESC	No clear discussion of typical day of intern; duties described not relevant to ESC	No attempt was made to describe a typical day
6. Description of New Skills and Knowledge Acquired	Clear, concise description of new skills and knowledge acquired; enhanced skill set relevant to ESC	Mostly clear discussion of new skills and knowledge acquired; enhanced skill set relevant to ESC	No clear discussion of new skills and knowledge acquired; even so, enhanced skill set appears relevant to ESC .	No clear discussion of new skills and knowledge acquired; enhanced skill set not relevant to ESC .	No attempt was made to describe new skills and knowledge acquired.
7. Description of How Internship will be of Future Benefit	Clear, concise description of how internship will be of future benefit	Mostly clear discussion of how internship will be of future benefit	Somewhat convoluted discussion of how internship will be of future benefit	Extremely convoluted discussion of how internship will be of future benefit	No attempt was made to describe how internship will be of future benefit
8. Scholarly Topic Background and Info	Clear, concise discussion of background information. Reputable background sources were used and cited correctly.	Mostly clear discussion of background information. Reputable background sources were used and cited correctly.	Relevant background information was included, but not in a clear format.	Some background information was included, but it was not particularly relevant and/or convoluted.	No attempt was made to include background information.
9. Body of the Scholarly Topic Section	Well-organized clear, concise narrative	Clarity is diminished by the presence of a few minor grammatical problems, but overall well-organized and	Contains numerous small grammatical errors or lacks citations, but still reasonably well-organized and clear.	Convoluted due to poor development, poor writing, and numerous small grammatical problems.	No attempt was made to include a well-organized and clear narrative.

		clear.		Citations lacking as well.	
10. Conclusion of the Scholarly Topic Section	Conclusion is excellent; does more than just restate main ideas; instead synthesizes a logical, impressive, original conclusion that flows from the paper.	Conclusion is very good; does more than just restate main ideas; instead synthesizes a logical conclusion that flows from the paper, although conclusion not as impressive or original.	Conclusion is good in that it restates the main ideas in a clear fashion.	Conclusion is average in that it restates the main ideas, but in a convoluted fashion.	Conclusion either is not included or brings in an idea not related to the ideas present in the main body.
11. Works Cited	Includes a bibliography section that is consistently and neatly formatted with all references used in text listed. Sources are appropriate and reputable	Includes complete bibliography, only issue is minor inconsistent formatting of list. Sources are appropriate and reputable	Includes complete bibliography for each in-text citation, but one or two references are incomplete. One or two sources are questionable sources for an academic work	Bibliography is not complete/missing a few of the citations given in-text, and/or more than two sources are questionable sources for an academic work, and/or several citations are incomplete	Bibliography either not included or extremely poor
12. Grammar	Excellent	Only a few minor problems (subject-verb agreement issues)	Some problems with grammar, few sentences poorly constructed	Some poorly constructed sentences and paragraphs, but bad grammar doesn't completely misconstrue meaning.	Poorly constructed sentences and paragraphs, causing multiple instanced of completely misconstrued meaning.
13. Overall Effectiveness of Report	Excellent	Very good	Good	Average	Poor

Appendix G. Geology Learning Outcomes Assessment (2011-2012)

Assessments of Learning Outcomes in the Geology Program, 2010-2011, as reported in TaskStream

Mission Statement

The mission of the geology program is to provide students with the knowledge of Earth sciences and the intellectual skills necessary for them to succeed in graduate studies or professional endeavors and as valuable members of society.

Outcomes and Measures

#1. Graduates will have a general knowledge of geology

Students completing the baccalaureate program in geology at UTC will compare favorably in their general knowledge of geology with respect to students that have completed similar programs.

Measure: ACAT: overall scores

Details/Description: Prospective graduates will take the Area Concentration Achievement Test (ACAT) for geology after completing the geology curriculum. The ACAT will include 4 content areas reflective of geology core courses—mineralogy, petrology, stratigraphy, and structural geology.

Target: The mean of overall scores on the ACAT for graduating seniors will be at or above the 50th percentile compared to national norms.

Implementation Plan (timeline): The ACAT will be administered by OPEIR staff during April of 2011. Results are expected during mid to late summer, 2011, and will be included in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten prospective graduates took the ACAT on April 14, 2011. Overall scores are generally good, 679, 569, 483, 634, 472, 440, 390, 420, 447, and 603. [Standard scores are based on mean = 500, std. dev. = 100.] The mean of overall scores is 514, which corresponds to the 56th %tile. Individual scores correspond to the 96th, 75th, 43rd, 91st, 39th, 27th, 14th, 21st, 30th, and 85th %tiles. Four of the 10 scores are well above the mean for the national comparison group with 2 scores above the 90th %tile; two are slightly below the mean; and 4 are markedly below the mean. These results are similar to those of 2009-2010.

Nine 2nd-year geology students took the ACAT pretest on August 30, 2010. The mean of their overall scores is 385, which corresponds to the 13th %tile and is similar to that of 2009-2010.

Comparison of pretest and outcomes test performances indicates radical improvement from the 13th to the 56th %tiles.

Results: Target Achievement: Met

Recommendations : While we are pleased with this result, we continue our efforts to improve upon ACAT test scores by requiring students to take cumulative and comprehensive exams in each course.

#2. Graduates will have knowledge of mineralogy

Students completing the baccalaureate program in geology at UTC will compare favorably in their knowledge of mineralogy with respect to students that have completed similar programs.

Measure: ACAT: mineralogy scores

Details/Description: Prospective graduates will take the Area Concentration Achievement Test (ACAT) for geology after completing the geology curriculum. The ACAT will include 4 content areas reflective of geology core courses—mineralogy, petrology, stratigraphy, and structural geology.

Target: The mean of mineralogy content-area scores on the ACAT for graduating seniors will be at or above the 50th percentile compared to national norms.

Implementation Plan (timeline): The ACAT will be administered by OPEIR staff during April of 2011. Results are expected during mid to late summer, 2011, and will be included in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten prospective graduates took the ACAT on April 14, 2011. Mineralogy content-area scores are generally good, 737, 572, 532, 612, 503, 452, 555, 520, 555, and 714. [Standard scores are based on mean = 500, std. dev. = 100.] The mean of mineralogy content- area scores is 575, which corresponds to the 77th %tile.

Nine 2nd-year geology students took the ACAT pretest on August 30, 2010. The mean of their mineralogy content-area scores is 400, which corresponds to the 16th %tile.
Comparison of pretest and outcomes test performances indicates radical improvement from the 16th to the 77th %tiles.

Results: Target Achievement: Met

Recommendations : While we are pleased with this result, we continue our efforts to improve upon ACAT mineralogy content-area scores by requiring students to take cumulative and comprehensive exams in Mineralogy (GEOL 3410).

#3. Graduates will have knowledge of petrology

Students completing the baccalaureate program in geology at UTC will compare favorably in their knowledge of petrology with respect to students that have completed similar programs.

Measure: ACAT: petrology scores

Details/Description: Prospective graduates will take the Area Concentration Achievement Test (ACAT) for geology after completing the geology curriculum. The ACAT will include 4 content areas reflective of geology core courses—mineralogy, petrology, stratigraphy, and structural geology.

Target: The mean of petrology content-area scores on the ACAT for graduating seniors will be at or above the 50th percentile compared to national norms.

Implementation Plan (timeline): The ACAT will be administered by OPEIR staff during April of 2011. Results are expected during mid to late summer, 2011, and will be included in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten prospective graduates took the ACAT on April 14, 2011. Petrology content-area scores are 644, 543, 452, 582, 390, 429, 260, 390, 350, and 582. [Standard scores are based on mean = 500, std. dev. = 100.] The mean petrology content-area score is 462, which corresponds to the 35th %tile.

These results are somewhat worse than those of 2009-2010 (mean petrology content-area score = 489, n=4, 46th %tile) and slightly better than those of 2008-2009 (mean petrology content- area score = 450, n=5, 31st %tile), despite there having been no significant change made to the petrology curriculum.
Nine 2nd-year geology students took the ACAT pretest on August 30, 2010. The mean of their petrology content-area scores is 438, which corresponds to the 27th %tile.

Comparison of pretest and outcomes test performances indicates substantial improvement from the 27th to the 35th %tiles.

Results: Target Achievement: Not Met

Recommendations : We are hopeful that changes of textbook and associated changes of pedagogy in the Petrology class (GEOL 3420), implemented in the Spring of 2011, will relate to improved results in 2013, when those students graduate and take the ACAT.

We are also concerned that this relatively poor result reflects students' interests, which may be swinging toward environmental geology and surface processes, away from igneous and metamorphic petrology (origins of igneous and metamorphic rocks).

We continue our efforts to improve upon ACAT petrology content-area scores by requiring students to take cumulative and comprehensive exams in Petrology.

Notes : As per a recommendation made at the conclusion of the 2009-2010 cycle, the instructor of Petrology (GEOL 3420) changed the textbook used for the Spring-2011 offering of the class. As indicated on the attached syllabi, Winter (2010, Principles of Igneous and Metamorphic Petrology) was used instead of Best (2002, Igneous and Metamorphic Petrology). Students that took GEOL 3420 during the Spring of 2011 will graduate and take the ACAT in 2013.

Syllabi for GEOL 3420 are attached.

Substantiating Evidence:

Syllabus for GEOL 3420 lab, Spring 2010 (Adobe Acrobat Document) (See appendix) See textbook.

Syllabus for GEOL 3420 lab, Spring 2011 (Adobe Acrobat Document) (See appendix) See [new] textbook.

Syllabus for GEOL 3420 lecture, Spring 2010 (Adobe Acrobat Document) (See appendix) See textbook.

Syllabus for GEOL 3420 lecture, Spring 2011 (Adobe Acrobat Document) (See appendix) See [new] textbook.

#4. Graduates will have knowledge of stratigraphy

Students completing the baccalaureate program in geology at UTC will compare favorably in their knowledge of stratigraphy with respect to students that have completed similar programs.

Measure: ACAT: stratigraphy scores

Details/Description: Prospective graduates will take the Area Concentration Achievement Test (ACAT) for geology after completing the geology curriculum. The ACAT will include 4 content areas reflective of geology core courses—mineralogy, petrology, stratigraphy, and structural geology.

Target: The mean of stratigraphy content-area scores on the ACAT for graduating seniors will be at or above the 50th percentile compared to national norms.

Implementation Plan (timeline): The ACAT will be administered by OPEIR staff during April of 2011. Results are expected during mid to late summer, 2011, and will be included in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten prospective graduates took the ACAT on April 14, 2011. Stratigraphy content-area scores are 576, 473, 532, 612, 473, 443, 355, 429, 510, and 421. [Standard scores are based on mean = 500, std. dev. = 100.] The mean of stratigraphy content-area scores is 482, which corresponds to the 43rd %tile.

These results are somewhat better than those of 2009-2010 (mean stratigraphy content-area score = 468, n=4, 37th %tile), despite there having been no significant change made to the stratigraphy curriculum.

Nine 2nd-year geology students took the ACAT pretest on August 30, 2010. The mean of their stratigraphy content-area scores is 427, which corresponds to the 23rd %tile.

Comparison of pretest and outcomes test performances indicates substantial improvement from the 23rd to the 43rd %tiles.

Results: Target Achievement: Not Met

Recommendations : We are hopeful that changes of pedagogy in the Sedimentary Rocks and Stratigraphy class (GEOL 3540), to be implemented in the Spring of 2012, will relate to improved results in 2012 and 2013, when those students graduate and take the ACAT. We also continue our efforts to improve upon ACAT stratigraphy content-area scores by requiring students to take cumulative and comprehensive exams in Historical Geology (GEOL 1120) and Sedimentary Rocks and Stratigraphy (GEOL 3540).

Notes : As per a recommendation made at the conclusion of the 2009-2010 cycle, the instructorof Sedimentary Rocks and Stratigraphy (GEOL 3540) will return to a more textbook-based teaching strategy in the next offering of the class, which will be during the Spring of 2012. (See attached syllabi.) Because GEOL 3540 is only taught every other year, roughly half of next year's graduates will have taken the course with the change of pedagogy (Spring 2012); the other half will have taken it as delivered in the Spring of 2010. All of those that graduate in 2013 should have taken GEOL 3540 during the Spring of 2012.

Substantiating Evidence:

Syllabus for GEOL 3540, Spring 2010 (Adobe Acrobat Document) (See appendix)

Syllabus for GEOL 3540, Spring 2012 (Adobe Acrobat Document) (See appendix)

#5. Graduates will have knowledge of structural geology

Students completing the baccalaureate program in geology at UTC will compare favorably in their knowledge of structural geology with respect to students that have completed similar programs.

Measure: ACAT: structural geology scores

Details/Description: Prospective graduates will take the Area Concentration Achievement Test (ACAT) for geology after completing the geology curriculum. The ACAT will include 4 content areas reflective of geology core courses—mineralogy, petrology, stratigraphy, and structural geology.

Target: The mean of structural geology content-area scores on the ACAT for graduating seniors will be at or above the 50th percentile compared to national norms.

Implementation Plan (timeline): The ACAT will be administered by OPEIR staff during April of 2011. Results are expected during mid to late summer, 2011, and will be included in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten prospective graduates took the ACAT on April 14, 2011. Structural geology content-area scores are generally good, 605,617, 453, 605, 544, 495, 495, 434, 440, and 605. [Standard scores are based on mean = 500, std. dev. = 100.] The mean of structural geology content-area scores is 530, which corresponds to the 62nd %tile.

Nine 2nd-year geology students took the ACAT pretest on August 30, 2010. The mean of their structural geology content-area scores is 403, which corresponds to the 17th %tile.

Comparison of pretest and outcomes test performances indicates radical improvement from the 17th to the 62nd %tiles.

Results: Target Achievement: Met

Recommendations : While we are pleased with this result, we continue our efforts to improve upon ACAT structural geology content-area scores by requiring students to take cumulative and comprehensive exams in Structural Geology (GEOL 4510).

#6. Graduates will be satisfied with education and training

Students completing the baccalaureate program in geology at UTC will be satisfied with the education and training that they received.

Measure: Exit interview

Details/Description: In lieu of or in addition to completing an exit questionnaire (see Measure: Exit questionnaire), prospective graduates will be invited to offer their opinions and constructive criticisms of the geology program during an exit interview by the department head.

Target: All interviewed graduates will indicate that they are satisfied with the education and training that they received as a student in the geology program.

Implementation Plan (timeline): Prospective graduates will be invited to discuss the geology program with the department head at or near the time of their graduation.

Key/Responsible Personnel: Habte Churnet (Department Head), Jonathan Mies

Summary of Findings: One (of 10) prospective graduates was interviewed by the department head. The student was generally positive about his/her experience in the geology program and, in particular, praised the faculty. The student further suggested that there should be more emphasis on environmental geology and related courses in the geology program, that the hydrology course should be further developed and should include a lab, that petrography should precede the petrology course or should be offered as an alternative, and that geology majors should be required to take more coursework in mathematics, beyond prcecalculus with trigonometry.

Results: Target Achievement: Met

Recommendations : We will make greater effort in the future to encourage students to discuss their experiences in the geology program with the department head.

Measure: Exit questionnaire

Details/Description: Prospective graduates will complete an exit questionnaire designed jointly by geology faculty and OPEIR.

Target: Prospective graduates will agree or strongly agree with each of the following statements: (1) I am satisfied with the education and training that I received as a student in the geology program at UTC; (2) I am satisfied with the academic advisement that Ireceived as a student in the geology program at UTC; (3) geology faculty at UTC convey an in-depth knowledge of the subjects that they teach; (4) geology faculty at UTC relate to students in an academically productive way; and (5) when called upon, geology faculty at UTC are willing to help students.

Implementation Plan (timeline): Prospective graduates will complete the exit questionnaire at or near the time of their graduation and will do so anonymously. Students will deliver completed questionnaires directly to the department secretary, who will provide them to responsible personnel during mid to late summer for inclusion in the 2010-2011 outcomes assessment report.

Key/Responsible Personnel: Jonathan Mies

Summary of Findings: Ten (of 10) prospective graduates completed the exit questionnaire.

All respondents indicated satisfaction with the education, training, and academic advisement that they received, all agreed or strongly agreed that faculty are knowledgeable in their respective subject areas, and all strongly agreed that faculty relate well to students and are willing to help students.

In terms of written comments, three respondents expressed their appreciation of the extensive field trips and field work included in the geology curriculum; two respondents expressed that additional courses should be offered, particularly in the area of soils; one respondent expressed that our courses should do more with quantitative analysis; one respondent expressed that we should be more encouraging of students to conduct research; one respondent expressed his/her approval and appreciation of the faculty; and one respondent suggested that there should be a geology club for students.

Results: Target Achievement: Exceeded

Recommendations : We will continue to work to ensure that students are satisfied with the education and training that they receive.

Notes : The exit questionnaire is attached.

Substantiating Evidence:

B.S. Geology Exit Questionnaire (Adobe Acrobat Document) (See appendix)

#7. Enhanced competencies due to GEOL 1110 (General Education)

Students that complete Geology 1110 and its corequisite lab (GEOL 1110L) will have an enhanced knowledge of physical geology and improved analytical skills due to the course.

Measure: GEOL 1110: pretest/post-test

Details/Description: A subset of questions from the final exam for Geology 1110 will also constitute a pretest to be administered at the beginning of the semester. As part of the final exam, these questions will be graded as a post-test for each student. Pretest and post-test questions, if not identical, will be very similar, and will be the same for all sections of Geology 1110.

Target: The average of students' scores for the post-test (T2) will be at least 50 relative percent better than the average of students' scores for the pretest (T1), as calculated by [$((T2-T1)/T1) \geq 0.50$].

Implementation Plan (timeline): The pretest and post-test will be administered to all sections of Geology 1110 during fall semester of 2010 and the spring semester of 2011. The pretest will be administered at the beginning of each semester, within the first 3 hours of class. The post-test will be part of the final exam, to be administered at the end of each semester. Results will be included in the 2010-2011 outcomes assessment report.

UPDATE: The pretest was administered to all sections of Geology 1110 during the present semester (fall 2010).

Key/Responsible Personnel: class instructor (Brock-Hon, Brodie, Churnet, Holmes, Mies, Williams), Jonathan Mies

Summary of Findings: Fall 2010: For sections 0 and 1 (combined), the average pretest score was 42%. The average post-test score was 67%, which is 60 relative percent better.

For sections 3 and 4 (combined), the average pretest score was 41%. The average post-test score was 76%, which is 85 relative percent better.

There was no section 2.

Spring 2011: For sections 0 and 1 (combined), the average pretest score was 41%. The average post-test score was 76%, which is 85 relative percent better.

For section 2, the average pretest score was 48%. The average post-test score was 74%, which is 54 relative percent better.

For section 3, the average pretest score was 37%. The average post-test score was 73%, which is 97 relative percent better.

Results: Target Achievement: Exceeded

Recommendations : We will continue our efforts to ensure that students have an enhanced knowledge of physical geology and improved analytical skills due to GEOL 1110.

#8. Enhanced competencies due to GEOL 1120 (General Education)

Students that complete Geology 1120 and its corequisite lab (GEOL 1120L) will have an enhanced knowledge of historical geology and improved analytical skills due to the course.

Measure: GEOL 1120: pretest/post-test

Details/Description: A subset of questions from the final exam for Geology 1120 will also constitute a pretest to be administered at the beginning of the semester. As part of the final exam, these questions will be graded as a post-test for each student. Pretest and post-test questions, if not identical, will be very similar, and will be the same for all sections of Geology 1120.

Target: The average of students' scores for the post-test (T2) will be at least 50 relative percent better than the average of students' scores for the pretest (T1), as calculated by $[((T2-T1)/T1) \geq 0.50]$.

Implementation Plan (timeline): The pretest and post-test will be administered to all sections of Geology 1120 during fall semester of 2010 and the spring semester of 2011. The pretest will be administered at the beginning of each semester, within the first 3 hours of class. The post-test will be part of the final exam, to be administered at the end of each semester. Results will be included in the 2010-2011 outcomes assessment report.

UPDATE: The pretest was administered to all sections of Geology 1120 during the present semester (fall 2010).

Key/Responsible Personnel: class instructor (Brock-Hon, Brodie, Churnet, Holmes, Mies, Williams), Jonathan Mies

Summary of Findings: Fall 2010: The average pretest score was 45%. The average post-test score was 82%, which is 82 relative percent better.

Spring 2011: The average pretest score was 39%. The average post-test score was 78%, which is 100 relative percent better.

Results: Target Achievement: Exceeded

Recommendations : We will continue our efforts to ensure that students have an enhanced knowledge of historical geology and improved analytical skills due to GEOL 1120.

#9. Enhanced competencies due to GEOL 1160 (General Education)

Students that complete Geology 1160 will have an enhanced knowledge of Earth systems and environmental issues, and improved analytical skills due to the course.

Measure: GEOL 1160: pretest/post-test

Details/Description: A subset of questions from the final exam for Geology 1160 will also constitute a pretest to be administered at the beginning of the semester. As part of the final exam, these questions will be graded as a post-test for each student. Pretest and post-test questions, if not identical, will be very similar, and will be the same for all sections of Geology 1160.

Target: The average of students' scores for the post-test (T2) will be at least 50 relative percent better than the average of students' scores for the pretest (T1), as calculated by [((T2-T1)/T1) ≥ 0.50].

Implementation Plan (timeline): The pretest and post-test will be administered to all sections of Geology 1160 during the spring semester of 2010. The pretest will be administered at the beginning of each semester, within the first 3 hours of class. The post-test will be part of the final exam, to be administered at the end of each semester. Results will be included in the 2009-2010 outcomes assessment report.

UPDATE: The pretest was administered to all sections of Geology 1160 during the present semester (fall 2010).

Key/Responsible Personnel: class instructor (Brock-Hon, Brodie, Churnet, Holmes, Mies, Williams), Jonathan Mies

Summary of Findings: Fall 2010: The average pretest score was 57%. The average post-test score was 87%, which is 53 relative percent better.

Spring 2011: The average pretest score was 39%. As of 7/25/11, post-test scores for GEOL 1160, for the Spring semester, have not been received.

Results: Target Achievement: Met

Recommendations : We will continue our efforts to ensure that students have an enhanced knowledge of environmental geology and improved analytical skills due to GEOL 1160.

Notes : The target achievement was met for Fall 2010.

#10. Enhanced competencies due to GEOL 2250 (General Education)

Students that complete Geology 2250 will have an enhanced knowledge of oceanography and improved analytical skills due to the course.

Measure: GEOL 2250: pretest/post-test

Details/Description: A subset of questions from the final exam for Geology 2250 will also constitute a pretest to be administered at the beginning of the semester. As part of the final exam, these questions will be graded as a post-test for each student. Pretest and post-test questions, if not identical, will be very similar, and will be the same for all sections of Geology 2250.

Target: The average of students' scores for the post-test (T2) will be at least 50 relative percent better than the average of students' scores for the pretest (T1), as calculated by $[((T2-T1)/T1) \geq 0.50]$.

Implementation Plan (timeline): The pretest and post-test will be administered to all sections of Geology 2250 during fall semester of 2010 and the spring semester of 2011. The pretest will be administered at the beginning of each semester, within the first 3 hours of class. The post-test will be part of the final exam, to be administered at the end of each semester. Results will be included in the 2010-2011 outcomes assessment report.

UPDATE: The pretest was administered to all sections of Geology 2250 during the present semester (fall 2010).

Key/Responsible Personnel: class instructor (Brock-Hon, Brodie, Churnet, Holmes, Mies, Williams), Jonathan Mies

Summary of Findings: Fall 2010: The average pretest score was 50%. The average post-test score was 82%, which is 64 relative percent better.

Spring 2011: The average pretest score was 43%. The average post-test score was 81%, which is 88 relative percent better.

Results: Target Achievement: Exceeded **Recommendations :** We will continue our efforts to ensure that students have an enhanced knowledge of oceanography and improved analytical skills due to GEOL 2250.

Overall Recommendations, 2010-2011

I. CHANGES TO EXISTING CLASSES

Two recommendations were made in response to Assessment Findings for 2009-2010 and are reiterated in response to present findings. It was recommended that

1. a new textbook be used for Petrology (GEOL 3420) the next time the class is offered (Spring 2011).

and that

2. the pedagogy for Sedimentary Rocks and Stratigraphy (GEOL 3540) be changed from project-based to text-book based teaching strategies the next time the class is offered (Spring 2012).
The instructor of Petrology (GEOL 3420) changed the textbook used for the Spring-2011 offering of the class. As indicated on the attached syllabi, Winter (2010, Principles of Igneous and Metamorphic Petrology) was used instead of Best (2002, Igneous and Metamorphic Petrology). We remain hopeful that this change of textbook (and associated minor changes of pedagogy) in the Petrology class (GEOL 3420) will relate to improved ACAT petrology scores in 2013, when those students that took the revised class in 2011 graduate and take the ACAT. It is further recommended that the new textbook be used until that time.

Because Sedimentary Rocks and Stratigraphy (GEOL 3540) is only taught every other Spring semester and was not taught during the Spring of 2011, the second of these recommendations has not been implemented. Given that the present Assessment Findings are similar to those of 2009-2010, this recommendation is maintained. The change of pedagogy will be implemented in the Spring of 2012, as indicated on the attached syllabi. We remain hopeful that this will relate to improved ACAT stratigraphy scores in 2012 and 2013, when those students that take the revised class graduate and take the ACAT.

II. CHANGES TO ASSESSMENT PLAN

In response to present Assessment Findings, additional outcomes and measures for the 2011-2012-assessment cycle are recommended as follows:

New outcome: Graduates will be proficient problem solvers

Measurement of this outcome will be based on a constructed-response question on final exams for Mineralogy (GEOL 3410), Petrology (GEOL 3420), Sedimentation and Stratigraphy (GEOL 3540), and Structural Geology (GEOL 4510). The question will cause students to apply their knowledge, skills, and critical-thinking abilities to solve a real-world problem appropriate to the subject matter of the class, and to explain their reasoning. Responses to this question will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for several important traits of good problem solvers, using a scoring rubric. Details of the measure will be described in the 2011- 2012 Assessment Plan.

New outcome: Graduates will be productive researchers

Measurement of this outcome will be based on students' oral or poster presentations at the conclusion of Senior Seminar (GEOL 4900). The research described in the presentation, and otherwise conveyed by the student, will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for several important traits of good researchers, using a scoring rubric. Details of the measure will be described in the 2011-2012 Assessment Plan.

New outcome: Graduates will be effective communicators of technical information

Measurement of this outcome will be based on students' oral or poster presentations at the conclusion of Senior Seminar (GEOL 4900). The communications skills of the student, demonstrated at the time of their presentation, will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for several important traits of good communicators, using a scoring rubric. Details of the measure will be described in the 2011- 2012 Assessment Plan.

III. REVIEW OF ACAT SAMPLE TEST

It was recently noticed that the Petrology content area is now listed as “Petrology/Petrography” in ACAT documents. Spurned by this potentially significant change and by low scores in 2 content areas (Petrology and Stratigraphy), we have requested a sample test from ACAT, for our review. (ACAT provides sample tests for a 90-day review, but does not otherwise release test materials.) The sample test will be checked by faculty for alignment with what is taught in our content-area classes. If misalignments are found, adjustments will be made, either to our classes or to our use of the ACAT as an assessment instrument.

Appendix H. Geology Problem Solving Rubric

Rubric for Assessment of Student Artifacts in the Geology Program: Problem Solving

Outcome: #1. Graduates will be proficient problem solvers
Students completing the baccalaureate program in geology at UTC will be able to apply their knowledge, skills, and critical-thinking abilities to solve geological problems.

Measure: Constructed-response exam questions

Details/Description: Final exams in (1) Mineralogy (GEOL 3410), (2) Petrology (GEOL 3420), (3) Sedimentation and Stratigraphy (GEOL 3540), and (4) Structural Geology (GEOL 4510) will include at least one constructed-response question that causes students to apply their knowledge, skills, and critical-thinking abilities to solve a real-world problem appropriate to the subject matter of the class, and to explain their reasoning. Responses to this question will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (below):

- Understanding of the problem
- Recognition of pertinent information and/or resources
- Strategy and application of problem-solving skills
- Solution to problem

Performance criteria	Exceeds expectations	Meets expectations	Below expectations
1. Understanding of the problem	Demonstrates a perfect and in-depth understanding of the problem	Demonstrates an understanding of the problem that is sufficient to proceed with solving it	There is evidence that the student does not understand the problem or has serious misconceptions that compromise his/her ability to solve the problem
2. Recognition of pertinent information and/or resources	Efficiently recognizes information and/or resources needed to solve the problem	Recognizes information and/or resources needed to solve the problem, but may struggle to do so	Does not recognize basic information and/or resources needed to solve the problem

Rubric for Assessment of Student Artifacts in the Geology Program: Problem Solving (continued)

Performance criteria	Exceeds expect.	Meets expectations	Below expectations
3. Strategy and application of problem-solving skills	Efficiently identifies and executes the best of workable approaches to solving the problem and flawlessly employs problem-solving skills in doing so; may also describe alternative approaches and the rationale for the choice of approaches	Identifies and executes a workable approach to solving the problem, though it may not be the best of possible approaches or it may have been a struggle to do so	Fails to identify a workable approach to solving the problem
4. Solution to problem	The solution is correct and is stated clearly, with appropriate precision	The solution is essentially correct, though may not be as clearly stated as it should be; or, an incorrect solution is due solely to a single minor error of computation or transcription	The solution, if any, is incorrect due to serious or multiple error(s)

Appendix I. Geology Research Rubric

Rubrics for Assessment of Student Artifacts in the Geology Program: Research

Outcome: #2. Graduates will be productive researchers
Students completing the baccalaureate program in geology at UTC will be able to design and conduct research, and to convey the design, methodology, and results thereof, effectively.

Measure: Senior Seminar (GEOL 4900) oral or poster presentations

Details/Description: Senior Seminar (GEOL 4900) is described as a "culminating senior experience giving students an opportunity to design and conduct research related to geologic problems". The class traditionally concludes with students' oral or poster presentations. The research described by the oral or poster presentation, and otherwise conveyed by the student, will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (below):

• Problem to be researched
• Methodology
• Data analysis
• Conclusion(s)

Performance criteria	Exceeds expectations	Meets expectations	Below expectations
1. Problem to be researched	Identifies a manageable, appropriately focused problem that addresses potentially significant, yet previously less explored, aspects of a topic and understands the problem in the context of existing research findings	Identifies a manageable problem that addresses a potentially significant aspect of a topic	Identifies a problem that is far too broad to be manageable and doable or is so narrow that results are insignificant
2. Methodology	Methodology is skillfully developed, is appropriate in every respect and is described in detail; limitations and assumptions inherent to methods used have been identified and are clearly stated	An appropriate methodology has been identified and is described in sufficiently detailed terms; some, but not all, limitations and assumptions have been identified	Methodology is poorly documented or is inappropriate; important limitations and assumptions are omitted

Rubric for Assessment of Student Artifacts in the Geology Program: Research (continued)

Performance criteria	Exceeds expectations	Meets expectations	Below expectations
3. Data analysis	Data are prepared, integrated, analyzed, and presented, using appropriate modern methods thereof, to extract useful information and to identify trends	Although data are adequately processed and analyzed, resulting in useful information, additional processing and analysis may be beneficial	Data, if any, are not adequately processed and analyzed, resulting in little or no useful information
4. Conclusion(s)	Conclusions are perfectly consistent with data, reflect modern views, and are clearly stated; possible alternative conclusions, if any, and rationales for rejection are also described	Conclusions, while consistent with data, may be incomplete or may not be considered in the context of obvious alternatives	Conclusions, if any, are inconsistent with data and/or are irrelevant to the problem researched

Appendix J. Geology Communication Rubric

Rubric for Assessment of Student Artifacts in the Geology Program: Communication

Outcome: #3. Graduates will be effective communicators of technical information
Students completing the baccalaureate program in geology at UTC will be able to communicate technical information by written, oral, and graphical means.

Measure: Senior Seminar (GEOL 4900) oral or poster presentations

Details/Description: Senior Seminar (GEOL 4900) is described as a "culminating senior experience giving students an opportunity to design and conduct research related to geologic problems". The class traditionally concludes with students' oral or poster presentations. The communications skills of the student, demonstrated at the time of the oral or poster presentation, will be judged as having (1) exceeded expectations, (2) met expectations, or (3) fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (attached):

- Organization, layout, design
- Written communication
- Oral communication
- Graphical communication
- Demonstrated knowledge of and enthusiasm for subject
- Professionalism

Performance criteria	Exceeds expectations	Meets expectations	Below expectations
1. Organization, layout, design *Oral or poster presentation.*	The logical progression of information, with appropriate points of emphasis, contributes greatly to the audience's understanding	Information is presented in a logical sequence that the audience can follow	Information is poorly organized, seemingly unrelated, and lacks appropriate points of focus, contributing to the audience's disinterest and lack of understanding
2. Written communication *As applied to the abstract and to explanatory text used in the presentation, either on presentation slides or on the poster.*	The writing is of an appropriate tone for technical communication and sustains interest; sentences are varied in length and structure, flow smoothly from one to another, and are free of grammatical errors; word choice is consistently precise and accurate	The tone is generally appropriate for technical communication; sentences are well phrased; grammatical errors are few and are of little or no consequence; word choice serves the intended meaning, though the range of words is limited	The tone is inappropriate for technical communication; errors in sentence structure distract the reader and obscures intended meaning; inappropriate word choice causes confusion

Rubric for Assessment of Student Artifacts in the Geology Program: Communication (continued)

Performance criteria	Exceeds expectations	Meets expectations	Below expectations
3. Oral communication *As applied to oral presentation or to student's explanation of his/her poster.*	Holds attention of audience with direct eye contact and enthusiastic delivery; speaks clearly, with precise pronunciation and ample volume	Makes eye contact with audience, but returns to notes frequently; speaks clearly and pronounces most words correctly	Little or no eye contact with audience; little or no movement or descriptive gestures (body language); presentation is read from notes or is memorized; obvious nervousness
4. Graphical communication *Oral or poster presentation.*	All graphics are clear, easy to understand, and contribute greatly to the audience's understanding	All graphics relate to the subject and most contribute to the audience's understanding	Graphics, if any, are unclear, superfluous, or unrelated to the subject, and contribute little to the audience's understanding
5. Demonstrated knowledge of and enthusiasm for subject *Oral or poster presentation.*	Student communicates full knowledge of the subject and answers all questions, with explanation and elaboration	Student is reasonably comfortable with his/her knowledge of the subject and is able to answer most or all questions, without elaboration	Student does not have a grasp of information and cannot answer relatively simple questions about the subject
6. Professionalism *Refers to student's appearance and behavior at the time of either oral or poster presentation.*	The student is dressed appropriately, is well groomed, is relaxed and self confident (but not arrogant), takes all questions and comments seriously, is respectful of the audience, and otherwise conducts him/herself in a purely professional manner	With only minor exception, the student conducts him/herself in a professional manner	The student is unkempt, disrespectful or rude to the audience, and otherwise conducts him/herself in an unprofessional manner

Appendix K. Geology Learning Outcomes Assessment (2010-2011)

Assessments of Learning Outcomes in the Geology Program, 2011-2012, as reported in TaskStream

Mission Statement

The mission of the geology program is to provide students with the knowledge of Earth sciences and the intellectual skills necessary for them to succeed in graduate studies or professional endeavors and as valuable members of society.

Outcomes and Measures

#1. Graduates will be proficient problem solvers

Students completing the baccalaureate program in geology at UTC will be able to apply their knowledge, skills, and critical-thinking abilities to solve geological problems.

Measure: Constructed-response exam questions

Details/Description: Final exams in Mineralogy (GEOL 3410), Petrology (GEOL 3420), Sedimentation and Stratigraphy (GEOL 3540), and Structural Geology (GEOL 4510) will include at least one constructed-response question that causes students to apply their knowledge, skills, and critical-thinking abilities to solve a real-world problem appropriate to the subject matter of the class, and to explain their reasoning. Responses to this question will be judged as having exceeded expectations, met expectations, or fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (attached): (1) understanding of the problem, (2) recognition of pertinent information and/or resources, (3) strategy and application of problem-solving skills, and (4) solution to problem.

Target: At least 80% of students completing GEOL 3410, GEOL 3420, GEOL 3540, and GEOL 4510 will meet or exceed faculty expectations for problem solving, for each of the 4 performance criteria.

Implementation Plan (timeline): Students' problem-solving skills will be assessed by this measure every time each of these courses are offered. For GEOL 3410, this is every Fall semester; for GEOL 3420, this is every Spring semester; for GEOL 3540, this is every other Spring semester (even- numbered years); for GEOL 4510, this is every other Fall semester (even-numbered years). For the 2011-2012 cycle, assessments will be made in GEOL 3410, GEOL 3420, and GEOL 3540.

Key/Responsible Personnel: Jonathan Mies and the respective instructor: Amy Brock-Hon for GEOL 3410; Habte Churnet for GEOL 3420; Ann Holmes GEOL 3540; and Jonathan Mies for GEOL 4510.

Supporting Attachments:

Rubric for assessment of problem-solving skills, geology (Adobe Acrobat Document)

Summary of Findings: This measure was implemented in GEOL 3410, during the Fall of 2011, and in GEOL 3540, during the Spring of 2012. Final exams in these classes included a constructed-response question that caused students to solve real-world problems in the areas of Mineralogy and Sedimentary Rocks and Stratigraphy. A similar question, in the area of Petrology, was implemented as an out-of-class assignment in GEOL 3420, during the Spring of 2012. Questions used in these classes are attached.

Four of 17 students (24%) in GEOL 3410 and 6 of 27 students (22%) in GEOL 3540 simply did not answer the exam question. These null responses are included in the findings shown below and contribute to the count of responses that fell below expectations. Detailed findings are attached.

In Mineralogy (GEOL 3410), only 65% of students met or exceeded expectations for criterion #1 and only 29% met or exceeded expectations for criteria #'s 2, 3, and 4. Overall (all criteria, combined), 38% of students met or exceeded expectations.

In Petrology (GEOL 3420), 100% of students met or exceeded expectations for criteria #'s 1, 2, and 3 and 83% met or exceeded expectations for criterion #4. Overall (all criteria, combined), 96% of students met or exceeded expectations.

In Sedimentary Rocks and Stratigraphy (GEOL 3540), 74%, 67%, 63%, and 74% of students met or exceeded expectations for criteria #'s 1, 2, 3, and 4, respectively. Overall (all criteria, combined), 69% of students met or exceeded expectations.

Implemented as an out-of-class assignment, many Petrology (GEOL 3420) students received some guidance (clarifications) from the instructor and are likely to have collaborated while addressing the question. Thus, what appears to be exceptional performance by Petrology students may not be a good measure of individual student's abilities and cannot be compared straightforwardly to findings for GEOL 3410 and GEOL 3540.

Because findings for GEOL 3410 and GEOL 3540 include null responses, they are difficult to assess. The better performance in GEOL 3540, as compared to that of GEOL 3410, may be real. The apparent improvement may indicate that students benefit from the geology program, in terms of their problem- solving abilities. However, this comparison is further complicated by the fact that, although a rather discrete population of 2nd-year geology students that have had only 1 or 2 introductory geology courses take GEOL 3410, 3rd- and 4th-year geology students, and the occasional 2nd-year student, that have had anywhere from 3 to 10 geology courses take GEOL 3540. The summary of findings for GEOL 3540, shown above, includes a mixed population of students.

These were initial implementations of this measure. Both the outcome and the measure will be modified for the 2012-2013-assessment cycle to remedy obvious shortcomings. (See Recommendations.)

Results: Target Achievement: Not Met

Recommendations : The following changes are recommended in response to the present (2011-2012) findings for this measure.

CHANGES TO ASSESSMENT PLAN (OUTCOME AND MEASURE)

As initially described for the 2011-2012-assessment cycle, elements of this measure are misaligned with the outcome, that “Graduates will be proficient problem solvers”. In particular, GEOL 3410 and GEOL 3420 are taken by 2nd-year geology students that have commonly had only 1 or 2 introductory courses in geology (GEOL 1110 or GEOL 1110 and GEOL 1120). These students are not products (“graduates”) of the geology program; instead, they have just begun the program. This measure, implemented in these two classes, has little or no relevance to this outcome.

A more realistic outcome of the geology program that better indicates the program's effectiveness is that “Graduates will have improved problem-solving abilities”. (Note the emphasis on improvement.) This outcome will be assessed in 2012-2013 by the following modification of the present (2011-2012) measure.

Final exams in GEOL 3540 (Sedimentation and Stratigraphy), and GEOL 4510 (Structural Geology) will include a constructed-response question that causes students to apply their knowledge, skills, and critical-thinking abilities to solve a real-world problem appropriate to the subject matter of the class, and to explain their reasoning. This question will be administered as a supplement to the regular final exam. It will be delivered to students as a separate item, to be completed in the classroom, without aid or collaboration and without the benefit of suggestions or choices, during an adequate time period specifically allocated for it. Responses to this question by graduating geology majors that have completed the core geology curriculum will be judged as having exceeded, met, or fallen below the faculty's expectations of geology graduates for each of the following performance criteria (traits), using a scoring rubric (attached): (1) understanding of the problem, (2) recognition of pertinent information and/or resources, (3) strategy and application of problem-solving skills, and (4) solution to problem. (Note that, by any common variant of the geology curriculum, either GEOL 3540 or GEOL 4510 is the last core geology class taken by geology majors, in alternating years.)

The final exam in GEOL 3410 will also include a constructed-response question, like that used for GEOL 3540 and GEOL 4510, but in the area of Mineralogy, and similarly administered. Responses to this question by 2nd-year geology majors will be judged as having exceeded, met, or fallen below the faculty's expectations of geology graduates for the same performance criteria (traits) as those used for GEOL 3540 and GEOL 4510, using the same scoring rubric.

The extent to which “Graduates will have improved problem-solving abilities” will be assessed by comparison of results for graduating geology majors that have completed the core geology curriculum, in either GEOL 3540 or GEOL 4510, to those of 2nd-year geology majors, in GEOL 3410. As an initial target, which is modeled upon present (2011-2012) results, the number (%) of graduating geology majors that meet or exceed expectations for the combination of all criteria (T2), will be at least 50 relative percent greater than that of 2nd-year geology majors (T1), as calculated by [((T2- T1)/T1)=0.50].

It is important to note that, as described above and as modified from the measure used for the 2011- 2012 cycle, this measure

1. targets specific populations of students, graduating geology majors and 2nd-year geology majors (filtered from other students' responses), the comparison of which better assesses the new outcome, which emphasizes improvement of abilities (other students' responses will be filtered)
2. is more explicit as to how the constructed-response question is to be administered and how responses are to be judged.

and

3. addresses the problem of students not answering the constructed-response question when it was presented to them as a regular part of the final exam.

Syllabi for GEOL 3410 and GEOL 4510, describing use of such a question as a means of outcomes assessment, are attached.

CHANGE OF MINERALOGY CURRICULUM

The constructed-response question used for GEOL 3410 revealed that a substantial number of students failed to grasp important aspects of the mineralogy and economic importance of pegmatite (a particular type of mineral deposit). In response, that part of the lecture will be augmented with graphics that illustrate a pegmatite and the relationship of crystal chemistry and crystal structure in pegmatite minerals, e.g. beryl, tourmaline, spodumene. These graphics (attached) will be presented and explained to students in class and will be made available to them as downloadable files.

Notes : Suggested wording for syllabi:

The final exam will include a supplemental question that will also serve as part of the geology program's outcomes assessment. This question will be designed to test the student's ability to solve a real-world problem related to this class (lecture, lab, or both), without aid or collaboration and without the benefit of suggestions or choices, using his/her knowledge, skills and critical-thinking abilities.

Substantiating Evidence:

Geology constructed-response questions, 2011-12 (Adobe Acrobat Document)
Constructed-response questions used on final exams for GEOL 3410, GEOL 3420, and GEOL 3540, during Fall 2011 and Spring 2012

Geology outcome assessment findings, 2011-2012 (Adobe Acrobat Document)

Detailed findings for outcome #'s 1, 2, and 3

Illustration of a pegmatite for GEOL3410 (Adobe Acrobat Document)
PowerPoint slides intended to illustrate a pegmatite and the relationship of crystal chemistry and crystal structure in pegmatite minerals

Rubric for assessment of problem-solving skills, geology, 2012-13 (Adobe Acrobat Document)
Modified (from 2011-12) rubric for assessment of problem-solving skills, recommended for 2012-13 assessment cycle

Syllabus for GEOL 3410 (Adobe Acrobat Document)
Syllabus for GEOL 3410. See description of exams for that of the problem-solving question used for outcomes assessment of the Geology program

Syllabus for GEOL 4510 (Adobe Acrobat Document)
Syllabus for GEOL 4510. See description of exams for that of the problem-solving question used for outcomes assessment of the Geology program

#2. Graduates will be productive researchers

Students completing the baccalaureate program in geology at UTC will be able to design and conduct research, and to convey the design, methodology, and results thereof, effectively.

Measure: Senior Seminar (GEOL 4900) oral or poster presentations

Details/Description: Senior Seminar (GEOL 4900) is described as a “culminating senior experience giving students an opportunity to design and conduct research related to geologic problems”. The class traditionally concludes with students’ oral or poster presentations. The research described by the oral or poster presentation, and otherwise conveyed by the student, will be judged as having exceeded expectations, met expectations, or fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (attached): (1) problem to be researched, (2) methodology, (3) data analysis, and (4) conclusion(s).

Target: At least 80% of students completing GEOL 4900 will meet or exceed faculty expectations for research, for each of the 4 performance criteria.

Implementation Plan (timeline): Students' research skills will be assessed by this measure every time GEOL 4900 is offered, which is every Fall semester.

Key/Responsible Personnel: Jonathan Mies and the instructor of GEOL 4900 (Amy Brock-Hon, Habte Churnet, Ann Holmes, or Jonathan Mies)

Supporting Attachments:

Rubric for assessment of research skills, geology (Adobe Acrobat Document)

Summary of Findings: This measure was implemented, as described in the assessment plan. 100% of students met or exceeded expectations for criterion #1; 92% of students met or exceeded expectations for criterion #2; 100% of students met or exceeded expectations for criterion #3; and 88% of students met or exceeded expectations for criterion #4. Overall (all criteria, combined), 95% of students met or exceeded expectations.

Results: Target Achievement: Met

Recommendations : This measure will be used, as is, for the 2012-2013-assessment cycle.

#3. Graduates will be effective communicators

Students completing the baccalaureate program in geology at UTC will be able to communicate technical information by written, oral, and graphical means.

Measure: Senior Seminar (GEOL 4900) oral or poster presentations

Details/Description: Senior Seminar (GEOL 4900) is described as a "culminating senior experience giving students an opportunity to design and conduct research related to geologic problems". The class traditionally concludes with students' oral or poster presentations. The communications skills of the student, demonstrated at the time of the oral or poster presentation, will be judged as having exceeded expectations, met expectations, or fallen below expectations for each of the following performance criteria (traits), using a scoring rubric (attached): (1) organization, layout, design, (2) written communication, (3) oral communication, (4) graphical communication, (5) demonstrated knowledge of and enthusiasm for subject, and (6) professionalism.

Target: At least 80% of students completing GEOL 4900 will meet or exceed faculty expectations for communication, for each of the 6 performance criteria.

Implementation Plan (timeline): Students' communication skills will be assessed by this measure every time GEOL 4900 is offered, which is every Fall semester.

Key/Responsible Personnel: Jonathan Mies and the instructor of GEOL 4900 (Amy Brock-Hon, Habte Churnet, Ann Holmes, or Jonathan Mies)

Supporting Attachments:

Rubric for assessment of communications skills, geology (Adobe Acrobat Document)

Summary of Findings: This measure was implemented, as described in the assessment plan. 100% of students met or exceeded expectations for all 6 criteria. Overall (all criteria, combined), 100% of students met or exceeded expectations.

Results: Target Achievement: Exceeded **Recommendations :** This measure will be used, as is, for the 2012-2013-assessment cycle.

Overall Recommendations, 2011-2012

See CHANGES TO ASSESSMENT PLAN and CHANGE TO MINERALOGY CURRICULUM under recommendations for Outcome #1.

Appendix L. Geology Learning Outcomes Assessment (2012-2013)

Assessments of Learning Outcomes in the Geology Program, 2012-2013

Student Learning Outcome	**Means of Assessment**	**Assessment Data**	**Improvements Based Upon Data**
1. Students completing the baccalaureate program in geology at UTC will be able to apply their knowledge, skills, and critical thinking abilities, due to the program, to better solve geological problems. Geology majors will: 1. Demonstrate an understanding of the problem 2. Utilize pertinent information and/or resources 3. Identify and employ workable problem-solving strategies 4. Identify correct, precise solutions	1. A constructed-response question is administered to 2nd-year majors as part of the final exam for GEOL 3410 (Mineralogy) and to graduating majors as part of the final exam for GEOL 4510 (Structural Geology). Responses are assessed by the instructor, using a rubric (attached), as having exceeded, met, or fallen below expectations for 4 problem-solving traits. The number (%) of graduating geology majors that meet or exceed expectations for the combination of all criteria (T2), will be at least 50 relative percent greater than that of 2nd-year geology majors (T1), as calculated by [((T2-T1)/T1)≥0.50].	Percent (%) of students that met or exceeded expectations for each of 4 traits, and overall: GEOL 3410, Mineralogy (1) 58%, (2) 42%, (3) 17% (4) 17%, overall 33 % N=12 2nd-year majors GEOL 4510, Struct. Geol. (1) 69%, (2) 56% (3) 44% (4) 38%, overall 52% N=16 graduating majors [(52% - 33%)/33%] x 100 = 58% improvement, overall This marginally exceeds the target of 50%, overall.	Although the target (50% improvement, overall) was exceeded, the results are disappointing, particularly for trait 1 (understanding of the problem, only 19% improvement). Beginning in the Fall of 2013, core classes in the geology curriculum (GEOL 3410, 3420, 3540, and 4510) will make greater use of constructed response questions on exams and in problems sets. This will provide students additional practice applying their knowledge and critical-thinking abilities to solving problems. This means of assessment will be used as is, for the 2013-2014 cycle.

Assessments of Learning Outcomes in the Geology Program, 2012-2013 (continued)

Student Learning Outcome	**Means of Assessment**	**Assessment Data**	**Improvements Based Upon Data**
2. Graduates will be productive researchers	2. Research conducted by graduating majors in GEOL 4900 (Senior Seminar) is assessed by all geology faculty, using a rubric (attached), as having exceeded, met, or fallen below expectations for 4 research-related traits. At least 80% of students completing GEOL 4900 will meet or exceed faculty expectations for research, for each of the 4 performance criteria.	Percent (%) of students that met or exceeded expectations for each of 4 traits, and overall: (1) 93%, (2) 93%, (3) 89%, (4) 95%, overall 93%. N=6 students, 4 graders This exceeds the target of 80%, for each of the 4 traits.	Although no change to the curriculum due to this assessment result is called for, improvements made related to outcome #1 (above) should favorably impact this assessment in the future. This means of assessment will be used as is, for the 2013-2014 cycle.
3. Graduates will be effective communicators	3. Oral or poster presentations by graduating majors in GEOL 4900 (Senior Seminar) are assessed by all geology faculty, using a rubric (attached), as having exceeded, met, or fallen below expectations for 6 communication-related traits. At least 80% of students completing GEOL 4900 will meet or exceed faculty expectations for communication, for each of the 6 performance criteria	Percent (%) of students that met or exceeded expectations for each of 6 traits, and overall: (1) 100%, (2) 91%, (3) 100%, (4) 98%, (5) 100%, (6) 100%, overall 98%. N=6 students, 4 graders This substantially exceeds the target of 80%, for each of the 6 traits.	Although no change to the curriculum due to this assessment result is called for, improvements made related to outcome #1 should favorably impact this assessment in the future. This measure will be used as is, for the 2013-2014 cycle.

Appendix M. Geology Learning Outcomes Assessment (2013-2014)

Assessments of Learning Outcomes in the Geology Program, 2013-2014

Outcome #1. Graduates will be proficient problem solvers

GEOL 3410, Mineralogy

	Criterion/trait	Exceeds expectations	Meets expectations	Below expectations	% meets or exceeds
#1	Understanding of the problem	0	12	1	92
#2	Recognition of pertinent information	1	11	1	92
#3	Strategy and application of skills	1	4	8	38
#4	Solution to problem	1	4	8	38
	TOTAL	3	31	18	65

GEOL 3420, Petrology

	Criterion/trait	Exceeds expectations	Meets expectations	Below expectations	% meets or exceeds
#1	Understanding of the problem	3	9	0	100
#2	Recognition of pertinent information	6	6	0	100
#3	Strategy and application of skills	10	2	0	100
#4	Solution to problem	5	5	2	83
	TOTAL	24	22	2	96

GEOL 3540, Sedimentary Rocks and Stratigraphy

	Criterion/trait	Exceeds expectations	Meets expectations	Below expectations	% meets or exceeds
#1	Understanding of the problem	6	14	7	74
#2	Recognition of pertinent information	10	8	9	67
#3	Strategy and application of skills	8	9	10	63
#4	Solution to problem	10	10	7	74
	TOTAL	34	41	33	69

Assessments of Learning Outcomes in the Geology Program, 2013-2014 (continued)

Outcome #2. Graduates will be productive researchers

GEOL 4900, Senior Seminar

	Criterion/trait	Exceeds expectations	Meets expectations	Below expectations	% meets or exceeds
#1	Problem to be researched	6	13	1	95
#2	Methodology	5	14	1	95
#3	Data analysis	6	14	0	100
#4	Conclusions	10	9	1	95
	TOTAL	27	50	3	96

Based on 20 total grades for each criterion (4 students, 5 graders)

Outcome #3. Graduates will be effective communicators of technical information

GEOL 4900, Senior Seminar

	Criterion/trait	Exceeds expectations	Meets expectations	Below expectations	% meets or exceeds
#1	Organization, layout, design	11	9	0	100
#2	Written communication	10	8	2	90
#3	Oral communication	17	3	0	100
#4	Graphical communication	8	12	0	100
#5	Demonstrated knowledge and enthusiasm	8	12	0	100
#6	Professionalism	13	7	0	100
	TOTAL	67	51	2	98

Based on 20 total grades for each criterion (4 students, 5 graders)

Appendix N. National Survey of Student Engagement (NSSE) (2013-2015)

National Survey of Student Engagement (NSSE) Results from 2013 and 2014 presented as separate data for Biological & Environmental Sciences (BES) department and Geology (GEO) program prior to the merger. Data from 2015 represents the Biology, Geology, and Environmental Science (BGES) department.

Table 1. Biological and Environmental Sciences, 2013, Question 1.

BES NSSE 2013: Question: *How would you evaluate your entire educational experience at this institution?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Biological & Environmental Sciences**
Poor	3.2	3.0	3.6
Fair	13.2	12.2	16.4
Good-Excellent	83.6	84.8	80.0
Numbers are given as a percentage.			

Table 2. Biological and Environmental Sciences, 2013, Question 2.

BES NSSE 2013: Question: *If you could start over again, would you go to the same institution you are now attending?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Biological & Environmental Sciences**
No	16.5	20.7	21.8
Yes	83.4	79.3	78.1
Numbers are given as a percentage.			

Table 3. Geology, 2013, Question 1

GEO NSSE 2013: Question: *How would you evaluate your entire educational experience at this institution?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Geology**
Poor	3.2	3.0	0
Fair	13.2	12.2	0
Good-Excellent	83.6	84.8	100
Numbers are given as a percentage.			

Table 4. Geology, 2013, Question 2

GEO NSSE 2013: Question: *If you could start over again, would you go to the same institution you are now attending?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Geology**
No	16.5	20.7	20
Yes	83.4	79.3	80
Numbers are given as a percentage.			

Table 5. Biological and Environmental Sciences, 2014, Question 1.

BES NSSE 2014: Question: *How would you evaluate your entire educational experience at this institution?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Biological & Environmental Sciences**
Poor	3.0	3.8	2.6
Fair	11.2	11.7	10.3
Good-Excellent	85.7	84.5	87.2
Numbers are given as a percentage.			

Table 6. Biological and Environmental Sciences, 2014, Question 2

BES NSSE 2014: Question: *If you could start over again, would you go to the same institution you are now attending?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Biological & Environmental Sciences**
No	16.5	17.0	12.9
Yes	83.4	83.0	87.2
Numbers are given as a percentage.			

Table 7. Geology, 2014, Question 1

GEO NSSE 2014: Question: *How would you evaluate your entire educational experience at this institution?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Geology**
Poor	3.0	3.8	0
Fair	11.2	11.7	14.3
Good-Excellent	85.7	84.5	85.8
Numbers are given as a percentage.			

Table 8. Geology, 2014, Question 2

GEO NSSE 2014: Question: *If you could start over again, would you go to the same institution you are now attending?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Geology**
No	16.5	17.0	14.3
Yes	83.4	83.0	85.7
Numbers are given as a percentage.			

Table 9. the Biology, Geology, and Environmental Science, 2015, Question 1.

BGES NSSE 2015: Question: *How would you evaluate your entire educational experience at*

this institution?			
Response Options	**UTC**	**College of Arts & Sciences**	**Biology, Geology, & Environmental Science**
Poor	3.1	1.9	0.0
Fair	14.8	16.8	21.1
Good-Excellent	82.1	81.3	78.9
Numbers are given as a percentage.			

Table 10. the Biology, Geology, and Environmental Science, 2015, Question 2.

BGES NSSE 2015: Question: *If you could start over again, would you go to the same institution you are now attending?*			
Response Options	**UTC**	**College of Arts & Sciences**	**Biology, Geology, & Environmental Science**
No	20.8	19.3	12.3
Yes	79.2	80.8	87.7
Numbers are given as a percentage.			

Appendix O. Alignment of Learning Outcomes with CAS Strategic Plan

BS Biology

1. Students are able to demonstrate knowledge of and differentiate among the different levels of biological organization (e.g., chemicals, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems, and biosphere).

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

2. Students are able to demonstrate knowledge of the three core areas of biology (ecology, evolution, and genetics) and apply their knowledge to studies of various taxonomic groups (e.g., insects, fishes, mammals, fungi, vascular plants).

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

3. Students are able to apply their knowledge of cells and organ systems in a variety of biological contexts.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4. Students are able to demonstrate proper laboratory/field techniques, formulate appropriate questions and hypotheses, collect laboratory/field data, and analyze collected data in a variety of biological contexts.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

5. Students are able to communicate biological information effectively.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the 5 presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

6. Students are able to retrieve specific information from the scientific literature and are able to evaluate the literature effectively and critically.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the 5 presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

3d. Offer educational opportunities that promote an awareness of and an appreciation of divergent worldviews.

BS Geology

1. Knowledge of fundamental sciences.
Students are able to apply their knowledge of fundamental sciences to interdisciplinary studies of Earth.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

3e. Showcase and promote multidisciplinary and interdisciplinary research, teaching, and creative activities.

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

2. Apply computational skills
Students are able to apply their computational skills to studies of Earth.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

3. Characterize and identify common earth materials.
Students are able to characterize and identify common earth materials (minerals, rocks, and soils) in situ and in hand specimen, using commonly available tools and aids to observation.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4. Interpret and articulate the genesis of rocks and minerals.
Students are able to interpret and articulate the genesis of common rocks and of common associations of minerals, fossils and rock structures.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

5. Relate imperceptibly slow geologic processes.
Students are able to relate imperceptibly slow geologic processes to the enormous scale of geologic time and the energy gradients that drive them.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

6. Critically assess geology-related issues.
Students are able to critically assess geology-related issues that impact society, using their knowledge of geology.

Link with CAS Goals and (Institutional Strategic Plan):

1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

1e. Increase opportunities and preparation for students, faculty, and staff to have an international or study abroad experience to ensure first-hand exposure to global examples of cultural, architectural, intellectual and scientific achievement. (ISP 4c; see Goal 3c in this plan)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

3e. Showcase and promote multidisciplinary and interdisciplinary research, teaching, and creative activities.

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

7. Formulate a reasonable model based on related data.
Students are able to formulate a reasonable model of geologic structure, geologic process, and/or geologic history based on spatially, geometrically, and/or temporally related data.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

1c. Mindfully integrate up-to-date technology and sustain best teaching practices to provide students in the College with the best possible 21st century classroom and learning experience. This includes increasing the accessibility and modality of courses that make up the General Education curriculum. (ISP Goal 1)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

8. Design and conduct geologic research.
Students are able to design and conduct geologic research, using their knowledge, skills and critical thinking abilities.

<u>Link with CAS Goals and (Institutional Strategic Plan):</u>
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

2c. Increase student participation in research and creative activities under faculty guidance. (ISP 1b, 2a)

2d. Showcase and reward faculty/student research and creative achievement through department- and college-level awards, grant funding, reassigned time, and more. (SP 3h)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

9. Communicate geotechnical information.
Students are able to communicate geotechnical information by written, oral, and graphical means.

<u>Link with CAS Goals and (Institutional Strategic Plan):</u>
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)
.

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

2c. Increase student participation in research and creative activities under faculty guidance. (ISP 1b, 2a)

2d. Showcase and reward faculty/student research and creative achievement through department- and college-level awards, grant funding, reassigned time, and more. (SP 3h)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

BS Environmental Science

1. Students are able to demonstrate knowledge of the natural world, within the context of key issues of environmental science (including human population increase, urbanization, sustainability, resource depletion, and environmental pollution).

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

2. Students are able to demonstrate knowledge of core areas of environmental science (including ecology, survey methodology, environmental resources, environmental law and policy, and environmental ethics) as they exemplify the interdisciplinary nature of the field.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

3. Students are able to apply their knowledge towards addressing environmental problems, in a manner consistent with recognizing the unique role humans play in the environment.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

4. Students are able to formulate research questions and/or hypotheses, utilize appropriate methodologies, and collect and analyze data toward addressing their questions and/or hypotheses within an environmental context.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

5. Students are able to communicate environmental science information effectively.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the 5 presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

4i. Integrate sustainability and its values—human interactions with and responsibilities to the natural environment—into both the Gen Ed and programmatic curricula.

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

6. Students are able to retrieve specific information from the relevant literature and are able to evaluate the literature effectively and critically.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the 5 presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

7. Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

3d. Offer educational opportunities that promote an awareness of and an appreciation of divergent worldviews.

8. Students are able to competently and professionally complete an applied capstone course (senior experience) that stresses experiential learning.

Link with CAS Goals and (Institutional Strategic Plan):
1a. Promote a liberal education and broadly communicate the value of such an educational experience. (ISP 1g)

2a. Provide undergraduate and graduate programs that offer a framework for personal and professional growth and that expose students to the scope and range of human achievement in the arts and sciences. (ISP 1c, 1g)

2b. Provide instruction and enable student learning through innovative teaching strategies, including flipped classrooms, team-based learning, problem-based learning, facilitations and presentations, online and hybrid instructional delivery. (ISP 1d, 2d)

3c. Increase student participation in research and creative activities under faculty guidance. (ISP 1b, 2a).

4a. Increase student involvement in experiential learning, research, creative endeavors, internships, senior capstone projects, practica, and service. (ISP 1)

4b. Promote greater student engagement in research and creative activity, including the 5 presentation of student/faculty work in scholarly and creative outlets. (ISP 1)

5c. Promote the College of Arts and Sciences as UTC's locus for a rich and rigorous General Education curriculum.

-Appendix P. UTC Strategic Plan

UTC Strategic Plan
(Click on the heading and another pdf file will open, 13 pages)

Appendix Q. College of Arts and Sciences Strategic Plan

College of Arts & Sciences Strategic Plan
(Click on the heading and another pdf file will open, 13 pages)

Appendix R. Individual Studies and Research Contract

Name: ______________________ **Date:** ____________ **UTC ID:** ____________

Individual Studies/Research Contract
UTC Records Office, 125 University Center
615 McCallie Avenue, Dept. 5155
Chattanooga, TN 37403
Ph: (423) 425-4416 Fax: (423) 425-2172

This form must be submitted when registering for any individualized course including 4994r, 4995r, 4997r, 4998r, 5997r, 5998r, or 7997r course. If additional space is needed, please provide attachments.

Course Title: ______________________

Department, Course #, Section: ______________________ CRN: ____________

Credit Hours: ______ Year: ______ Semester: (circle one) Fall Spring Summer

Completion Date: ____________ Faculty Director: ______________________

Please Describe:

(A) Nature of individualized study: ______________________

(B) Specific responsibilities and/or learning objectives of student ______________________

(C) Criteria which will be used for evaluation and grading of this project: ______________________

(D) Arrangements and frequency of meetings with faculty director of this specialized course:

Student: Please photocopy approved form and distribute copies to:
•Records Office (Original form) •Department Head •Student

I, ______________________ understand that I will not be registered in the course listed above until the faculty director and department head have signed and this form is submitted to the Records Office. I also understand that once I am registered for this course, I am responsible for all fees.
This form must be submitted to the Records Office by the deadline to register for courses listed on the Academic Calendar.

______________________ Student's Signature ____________ Date

______________________ Faculty Director's Signature ____________ Date

______________________ Department Head's Signature ____________ Date

______________________ Director Honors Program or Designee (required for 4995 registrations only) ____________ Date

Appendix S. Internship Contract

Internship Contract
B.S. Environmental Science

Semester: ____________

Student Information: ____

Address: ____

Phone: ______________________ **Email:** ______________________

Sponsor Information

Name of Company, Agency, or Organization: ______________________________

Internship Supervisor: ____

Address: ____

Phone Number: ______________________ **Email:** ______________________

Internship Information

Position Title: ____

Number of Hours Worked: ______________

Number of ESC 491 hours desired: __________

Activities that student will complete during internship:

____

____

____

____

____

The Undersigned Agrees to the Conditions Set Forth in this Contract for the Internship:

Student: ______________________________ Date: __________

Intern Supervisor: ______________________________ Date: __________

Faculty Coordinator: ______________________________ Date: __________

Appendix T. EDO

* * *

C. Annual Performance Evaluation (EDO)

Annual evaluation and development by objectives (EDO), occurs annually for all full time faculty, regardless of appointment classification (UTC Faculty Handbook §§ 3.7.1 – 3.7.4). EDO requires that each faculty member develop annual Individual Objectives with the advice of the Department Head. At the end of the review period, the faculty member submits an Individual Performance Report Form to the Department Head. The Department Head reviews the Individual Objectives and Individual Performance Report Form and completes an Individual Evaluation Form which includes a determination that the faculty member's performance 1) Meets Expectations for Rank, 2) Needs Improvement for Rank, or is 3) Unsatisfactory for Rank. After reviewing all faculty in the department, the department head then considers recommending faculty for Exceeds Expectations for Rank ratings. An additional review process, called Cumulative Performance Review (CPR), is triggered for tenured faculty whose 1) annual review is Unsatisfactory in any two of five consecutive years, or 2) annual review is any combination of Unsatisfactory or Needs Improvement in any three of five consecutive years. Documents generated through the EDO process are included in the dossier submitted for annual reappointment, tenure, and promotion.

The BES has developed EDO Criteria to supplement the minimum criteria contained in the Faculty Handbook. The BES EDO criteria are incorporated by reference and included in Appendix A of these bylaws.

The College of Arts and Sciences has adopted a policy clarifying the difference between EDO ratings of "Meets Expectations" and "Exceeds Expectations" in performance evaluations. The department follows a comparable process in distinguishing between "Meets Expectations" and "Exceeds Expectations," where evaluation is based on both 1) the individual's performance compared to EDO Individual Objectives established at the beginning of the yearly EDO cycle and 2) the individual's performance compared to the performance of colleagues in the department. The College of Arts and Sciences criteria for distinguishing between meets "Meeting Expectations" and "Exceeds Expectations" are incorporated by reference and included in Appendix B of these bylaws.

APPENDIX A [of Bylaws]

Department of Biological and Environmental Sciences EDO Criteria

Overview of Faculty Reappointment and Evaluation: Chapter 3 of UTC's Faculty Handbook addresses faculty appointment, evaluation, promotion, tenure, and termination. Two distinct review processes occur each year: 1) annual reappointment, until such time as the faculty member is tenured, or is terminated, and 2) annual evaluation and development by objectives (EDO), which occurs for all full time faculty, regardless of appointment classification. Documents generated through the EDO process are included in the dossier submitted for annual reappointment.

A. Reappointment (UTC Faculty Handbook §§ 3.3.1-3.5.1): Annual reappointment requires that the faculty member submit a dossier to the department's Reappointment, Promotion, and Tenure (RTR) Committee, which is composed of all tenured faculty in the Department. The RTR committee reviews the dossier, and the Department Head, after consulting with the RTR committee, makes a recommendation to the next administrative level. The dossier should address the Criteria for Reappointment (UTC Faculty Handbook § 3.4.3), which are similar to the Criteria for Appointment ((UTC Faculty Handbook § 3.1.6), and the Criteria for Tenure (UTC Faculty Handbook § 3.6.4.2). The handbook provides that "criteria set forth in the appointment letter shall apply" for reappointment of faculty in appointments other than Assistant Professor, Associate Professor, and Professor (UTC Faculty Handbook § 3.4.3).

B. EDO (UTC Faculty Handbook §§ 3.7.1 – 3.7.4): EDO requires that each faculty member develop annual Individual Objectives with the advice of the Department Head. At the end of the review period, the faculty member submits an Individual Performance Report Form to the Department Head. The Department Head reviews the Individual Objectives and Individual Performance Report Form and determines that the faculty member's performance
1) Exceeds Expectations for Rank, 2) Meets Expectations for Rank, 3) Needs Improvement for Rank, or is 4) Unsatisfactory for Rank. An additional review process, called Cumulative Performance Review (CPR), is triggered for tenured faculty whose 1) annual review is Unsatisfactory in any two of five consecutive years, or 2) annual review is any combination of Unsatisfactory or Needs Improvement in any three of five consecutive years.

Authority to develop department-specific EDO Criteria: UTC's Faculty Handbook provides general procedures and minimum requirements for appointment, reappointment, tenure, and EDO, and authorizes departments to adopt more specific criteria, subject to approval by the dean and provost. Specifically the Handbook states

> Each faculty member's annual review should proceed from guidelines and criteria which are appropriate to the department, college, and campus and this annual review should be a key element in merit pay or performance-based

> salary adjustments. College and department bylaws should make clear the contexts, criteria, and procedures to be followed for these reviews, including specific evaluation criteria for each level of performance.
>
> UTC Faculty Handbook § 3.7.3

Bases of the Department of Biological and Environmental Sciences EDO Criteria: The Department of Biological and Environmental Sciences has developed EDO Criteria to supplement the minimum criteria contained in the Faculty Handbook. The bases of these EDO criteria are the Criteria for Reappointment (UTC Faculty Handbook § 3.4.3), the Criteria for Appointment ((UTC Faculty Handbook § 3.1.6) , the Criteria for Tenure (UTC Faculty Handbook § 3.6.4.2), and the following statement regarding EDO:

> The University of Tennessee at Chattanooga seeks to make clear to each faculty member from the start both the general expectations directed to all faculty and the specific duties that go with their appointment in the department or academic unit. Heads are required to schedule regular conferences with their faculty to make plans, set goals and objectives and review performance as part of an ongoing concern for making each person an effective and responsible participant in the definition and achievement of the University's goals. In such conferences, which are held three times each year, accomplishments are compared with the specific goals that the faculty member and the head have previously set, or new goals are set. The nature of this discussion is highly individual, reflecting the personal interests and talents of the faculty member quite as much as the general definitions of standard accomplishment. This process is subtle and demanding: it must take account of all the diverse things that occupy a faculty member's time, and it must draw upon all of them for evidence--the classroom, students, colleagues, laboratory, library, committees, the public. The central aim of such conferences is the improvement of performance, the enablement of shared ambitions and projects and the enhancement of the sense of this sharing through honest, realistic assessments given, received and discussed. At its best, such faculty evaluation is the clue and basis for faculty development which has the following indispensable ingredients:
>
> 1. clear, mutually agreed upon, individual objectives;
> 2. appropriate, clearly understood standards, methods and procedures for assessing the degree of achievement of objectives;
> 3. provision of the necessary support (resources, environment, personal and official encouragement) to do the job;
> 4. honest judgments by peers and administrative colleagues, reflecting reliable assessments of achievement;
> 5. appropriate recognition and reward for good work.
>
> All five of these ingredients should be amply and regularly reviewed by the faculty member and the head.
>
> UTC Faculty Handbook §§ 3.7.1)

The Department of Biological and Environmental Sciences expects its faculty to be productive and meet or exceed University and Departmental performance criteria. The objectives of the these EDO criteria are to establish an evaluation process that provides 1) faculty with a clear understanding of expectations, 2) administrators with a clear framework to measure faculty performance, and 3) the flexibility to accommodate both discipline-specific differences among faculty and appropriate individual assignments that may alter the traditional balance of teaching, research, and service.

The Department of Biological and Environmental Sciences recognizes that its faculty represent multiple sub-disciplines, and that EDO criteria for individual faculty should be based on appropriate discipline-specific objectives. Accordingly, there may be some variation in expectations for individual faculty. The Department also recognizes that some existing positions within the Department have specific responsibilities that alter the traditional balance of teaching, research, and service. The Department also recognizes that from time-to-time it may want to alter expectations for specific positions, that have in the past involved a traditional balance of teaching, research, and service. Toward these ends, the Department embraces the concept that the specific objectives agreed upon in the individual EDO document are the appropriate criteria against which to measure individual performance, provided that the individual criteria fully satisfy the minimum university criteria in the Faculty Handbook.

EDO Criteria
Department of Biological and Environmental Sciences

Faculty members will be evaluated in three areas:

A. Instructional and Advising Activities
B. Research, Scholarly, and Creative Activities
C. Professional Service Activities

At the end of each academic (or EDO) year, EDO evaluations will be made according to the following criteria in the three areas: Note that more weight will be given to significant contribution in any area.

A. Teaching and Advising

1. Credit Hour Production and Course Preparation:

   More weight will be given to new course preparation, number of preparations, and large credit hour production

   New course preparation
   Number of preparations
   Credit hour production
   Course overload without extra financial compensation

2. Directing students in research, internships or individual studies

More weight will be given to a thesis advisor or director/chair of a committee.
Biology/ESC 495, 496, 497, 498, 499 ESC 480, 490, 491, 597, 598, 599

3. Advising:

   More weight will be given to a larger than average number of undergraduate advisees in major and pre-professional programs and graduate advisees.

4. Recommendation letters

   More weight will be given to a larger than average number of recommendation letters.

5. Selection for teaching award
   SGA Outstanding Professor, UTNAA Outstanding Teacher, Arts and Sciences Outstanding Teacher

   Nomination for teaching award

6. Individual Instruction Evaluations

   More weight will be given to higher than average evaluations and significant improvement from previous years:

   Student evaluations Peer evaluations

7. Directing a teaching workshop
   Participation in teaching workshop

B. Scholarship, Research, and Creative Activities

1. Publications

   More weight will be given to primary or sole authors of international and national peer-reviewed publications or technical journals and primary or sole authors or editors of books.

   a. Journal publications or technical reports

      Original research or technical report accepted by sponsoring entity Publication of previously published work in treatise, book or other collection
      Publication acknowledgement of contribution of authorship of data used in research project
      Publications in the field of pedagogy including textbooks and instructional materials.

   b. Books

      More weight will be given to authorship in the following order of priority:

Author of book published by an international, national, or nationally-recognized regional publisher
Author of a book published by a regional, state or local publisher Author of a chapter or section in a book
Author of book in preparation, contract awarded

c. Bulletins

2. Grants

More weight will be given to principal investigators of large external grants in the following order of priority:

External:
Funded major* proposal
Funded minor proposal
Submitted major proposal
Submitted minor proposal

Internal
Funded major proposal
Funded minor proposal
Submitted major proposal
Submitted minor proposal

* Whether a grant is major or minor is determined by several factors, including but not limited to common funding levels in the faculty member's sub-discipline, the dollar amount of the grant, the duration of the grant, faculty time devoted to performing the grant, the extent of student involvement, the extent of collaboration with other departments or institutions, and production of a publication or substantive final report linked to the grant.

3. Editor or reviewer for a book, journal or grant proposal

4. Mentor to a post-doctoral student

5. Professional Meetings

More weight will be given to invited presentations, international and national meetings, and directing the organization of a meeting in the following order of priority:

Paper/poster presentation or panelist (invited) at recognized professional society meeting, university, government agency, etc.
Paper/Poster presentation (noninvited) at recognized professional society meeting, university, government agency, etc.
Organization of a professional meeting or professional development workshop
Director
Committee Member
Attendance at a professional meeting or professional development workshop

C. Professional Service Activities

1. Departme

   ntal

   Acting

   Head
   Graduate Program Coordinator Committee,
   Chair
   Member
   BBB or EDGE Sponsor
2. Institutional

   Faculty Senate,
   President
   Executive Committee
   Elected Member
   University Committee/Graduate Council,
   Chair Member
   Chancellor's/Ad Hoc Committee,
   Chair Member
   Faculty Marshal,
   Head
   Assistant
   College Council Member
   Faculty mentor (to new faculty)
   Invited speaker, panelist (on campus) Public Service Award Recipient

3. Professional Organizations/Government Agencies

More weight will be given to international and national organizations.

Organization,
President
Officer
Committee
Chair
Advisor
Author of monthly
column Speaker at a
keynote address
Organizer of a meeting
Recipient of award from organization

4. Public Service

Speaker/Field Trip leader to state/local
organization Consultant to media, e.g. radio,
television, newspaper
Attendance at university functions, e.g. department seminars, lectures, annual awards ceremonies, more than one graduation, etc.
Science fair judge
Presentation to primary or secondary students or
teachers Reviewer for an award

APPENDIX B: COLLEGE OF ARTS AND SCIENCES [of Bylaws]

Performance Evaluation: Meets Expectations and Exceeds Expectations

The following information aims to clarify the difference between EDO ratings of "Meets Expectations" and "Exceeds Expectations" as it outlines activities indicative of these ratings. Faculty are, of course, evaluated based on three performance criteria: teaching and advising; research, scholarship, and creative activities; and service to the University, profession, and community. The *Faculty Handbook* clearly links success in these areas to performance ratings by department heads. It is important to note, too, that collegiality is expected of all faculty.

College Statement on Collegiality: *Collegiality requires the capacity to relate well and constructively with peers and members (faculty, staff, students and administrators) of our campus community. Collegial behavior and support for the common good, therefore, is highlighted by civility and respect for one another, particularly as we may disagree with one another from time to time. Even in our disagreement, we must work well with one another as we share in institutional and departmental goals and responsibilities.*

Department Heads should seek corrective action when destructive behavior interferes with departmental goals and functions. If a lack of civility is negatively affecting the health and function of the department, the Department Head will be able to link collegiality (or the lack thereof) to the criteria used in evaluating annual performance—*i.e.*, teaching, research/scholarship, and service.

Faculty Handbook (Section 3.2.2.3: EDO Performance Ratings)

> *At UTC the evaluation of the professional responsibility of the faculty member focuses on three performance areas; teaching and advising[27]; research, scholarship, and creative activities[28]; and professional service to the University, profession, and community.[29]*
>
> *Among these obligations, teaching and advising are of highest importance at UTC. It is recognized, however, that research, and scholarly and creative achievement contribute significantly to good teaching and to the advancement of knowledge. It follows, then, that faculty members will be expected to be involved actively in research, scholarship or creative activity as well. Since, in its Mission Statement, the university specifies that a fundamental purpose of the institution is to serve the people of the community, state, and region it is expected that faculty members will contribute to this*

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27 Includes such activities as: teaching, student advising, development of new courses, preparation of instructional materials or other activities designed to enhance educational and instructional quality.

28 Includes such activities as: disciplinary research, development of creative art forms, grant development and administration, scholarly publications and presentations, and other activities related to the development and dissemination of new knowledge or art forms.

29 Includes such activities as: service through administrative and committee assignments, service to professional organizations, appropriate consulting, advisement or sponsorship of student activities, coordination of special departmental, school, college or university activities, and discipline- and university-related community services.

mission through University and professional service. See Appendices A-C for best practices pertaining to each of these three categories.

While the individual faculty member is expected to participate in each of the three areas, annual achievement will vary in accordance with the objectives established in conference with the academic department head. Lesser participation in one area should be counterbalanced by greater participation in others.

In the three areas of responsibility[30] *(teaching, research, and service), the academic department head will evaluate the faculty member's routine responsibilities established by the academic department, those defined in the Faculty Handbook chapter entitled "Faculty Responsibilities," and those identified on the Individual Objectives Sheet for the period being evaluated.*

EDO Rating: Meets Expectations vs. Exceeds Expectations

College Guidelines for Standard and Exceptional Performance: The following are representative activities of the faculty, though not exhaustive, for the areas of: teaching and advising; research, scholarship, and creative activity; and service. Faculty are responsible for documenting specific activities and outcomes in each area. Department Heads are responsible for assessing performance in these areas. In doing so, Department Heads should think of faculty performance in terms of quality, scope, and impact. (For example, in the area of scholarship, refereed publications and monographs published with university presses should carry more weight than nonrefereed publications.) Similarly, Department Heads should be mindful that faculty performance is evaluated based on

1. appropriate objectives for the academic year, specifically objectives set by the faculty member and approved by the Department Head,[31] and
2. a comparison with the performance of peers within the same department/program.

With the latter point in mind, it is unreasonable to expect that ALL faculty in a single department or program may be nominated for the performance rating of "Exceeds Expectations." Department Heads, therefore, must be judicious in making such recommendations ("Exceeds Expectations") to the Dean. Likewise, the Dean will require that such recommendations be ranked. Finally, despite the fact that a faculty member may "counterbalance" a weaker area with strong performance in another area for the performance rating of "Meets Expectations," failure to

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30 Faculty on sabbatical or other special assignment (e.g. educational leave, research leave) may not be active in each of the three areas during this assignment. With prior agreement, these faculty will be evaluated and, depending on performance, be eligible for a merit salary increment. In accordance with the Faculty Handbook statement, "leaves of absence are normally granted for no more than one year and are normally without university compensation." Faculty on non-academic leave without pay will not normally be evaluated, nor will they normally be eligible for merit salary increment for the year on leave.

31 Faculty Handbook, Section 3.2.2.1, Establishing Objectives: Since the objectives of the faculty are fundamental components of the EDO process, it is important that they be carefully prepared. It is the responsibility of the faculty member to clearly articulate specific objectives and to demonstrate how these relate to his or her professional development and responsibilities. It is the responsibility of the academic department head to provide an unambiguous review of the merit and quality of these objectives within the context of the disciplinary standards for the profession and the expectations of the faculty member specified in the letter of appointment.

meet expectations in any single area shall exclude a faculty member from being considered for the performance rating of "Exceeds Expectations."

EDO Activities: Meets Expectations vs. Exceeds Expectations

Teaching and Advisement

Instructors, Lecturers, and Professorial Ranks: All faculty, regardless of rank or status (part time or full time), are expected to demonstrate commitment to good teaching, and they are expected to provide quality instruction in all courses. Unlike the other categories for performance evaluation, the category of teaching and advising carries *basic responsibilities*.

Select teaching materials which are appropriate to the course description
Select teaching materials that reflect current developments in the discipline or field
Submit orders for course materials (i.e., books, textbooks) upon request
Prepare and submit upon request syllabi that follow UTC guidelines
Specify in the syllabus a set of reasonable grading practices and follow them carefully
Teach courses in accordance with the syllabus
Meet classes as scheduled or, if it is necessary to be absent, notify the Department Head
Hold office hours and be available to meet with students outside of regular class hours
Demonstrate satisfactory teaching that encompasses and is informed by student & peer evaluation
Submit midterm and final grades on time
Share in the responsibility for advising students, according to departmental arrangements for advisement
Write letters of recommendation when appropriate Representative Activities for

Exceptional EDO Rating

Prepare new and innovative course materials
Direct Departmental Honors Project(s)
Direct student research project(s), independent studies or directed studies
Prepare advising materials
Participate in professional development activity
Receive teaching and/or advising award
Attain superior student and/or peer evaluations

Research, Scholarship and Creative Activities

Instructors and Lecturers: There are no research requirements for faculty appointed at the rank of Instructor or Lecturer. However, published or presented research, scholarship, and creative activity should be considered when present in performance evaluation.
Occasionally, Instructors will have a contract that specifies that continuation of their appointment is dependent on the completion of the terminal degree.

Professorial Ranks: All faculty who hold the ranks of Assistant Professor, Associate Professor, or Professor are expected to maintain a program of scholarly engagement in their discipline. Specific expectations for each faculty member are to be developed annually in consultation with the Department Head and included in the statement of EDO objectives. (Faculty should consult "Criteria for Tenure" in the *Faculty Handbook* for cumulative standards of evaluation.) Whether or not a particular activity meets or exceeds expectations depends on the quality, scope, and impact of the work.

<u>Representative Activities for *Standard* EDO Rating</u>

Engage in research, scholarship, or creative activity
Prepare/submit book review for publication
Prepare/submit article or creative work for publication
Participate or perform in juried exhibition
Attend a professional conference
Organize/lead a professional workshop
Present paper at professional meeting (regional, national, international)
Submit proposal to outside funding agency

<u>Representative Activities for *Exceptional* EDO Rating</u>

Publish article
Author or edit a book, collection, journal, or reference work
Present paper at professional meeting (regional, national, international)
Receive national/international recognition
Develop and/or coordinate professional seminars, workshops, etc.
Present/Perform invited work, exhibition, seminar, or lecture
Organize, chair session, or serve as discussant at professional meeting
Receive awarded grant
Administer a funded research grant

Service to the University, Profession, and Community

Instructors and Lecturers: Faculty appointed at the rank of Lecturer are expected to provide departmental and university service through committee assignments or less formal arrangements developed in consultation with the Department Head and specified in the statement of EDO objectives.

Professorial Ranks: Faculty appointed at the professorial ranks are expected to provide departmental and university service through committee assignments or less formal arrangements developed in consultation with the Department Head and specified in the statement of EDO objectives. They are likewise expected to engage in community and professional service activities as may be appropriate to the discipline.

<u>Representative Activities for *Standard* EDO Rating</u>

Attend commencement
Attend university and college-wide faculty meetings
Maintain active membership in professional organization(s)
Organize/chair a professional workshop or conference panel
Participate in student recruitment, e.g., Fall Visitation Day, meet w/ prospective students
Participate in retention activities, e.g., First Year Reading Experience activities, "First Class" meetings, Freshman Academic Success Tracking (FAST) program, etc.
Participate in departmental activities, e.g., faculty meetings; awards banquets; alumni receptions
Respond in a timely manner to queries from the public or community
Review grant proposals for campus or regional funding agencies
Support and assist colleagues
Serve on departmental committee(s)
Serve on university committee(s)

Representative Activities for *Exceptional* EDO Rating

Marshal or otherwise participate in commencement
Chair time-intensive, departmental or university committee
Coordinate student recruitment activities
Engage in special service to department or university, *e.g.*, SACS review process, Strategic Planning
Organize a professional conference (regional or national)
Provide ongoing service to local schools/community
Provide professional consulting services
Review manuscript(s) for a journal or press
Review grant proposal(s) for a major funding agency, *e.g.*, NSF, NEH, *etc*.
Serve as officer in professional national or international organization
Serve on committee of professional national or international organization
Serve on Faculty Senate or other time-intensive university committees

Approved and adopted by A&S Department Heads on February 5, 2014

3.2.2 Tenure-Track and Tenured Faculty Annual Evaluation and Development by Objectives (EDO)

Annual Performance and Planning reviews are required by the “Board of Trustees Policies Governing Academic Freedom, Responsibility, and Tenure” and are required as a term of employment by The University of Tennessee system. At UTC, Faculty Evaluation and Development by Objectives (EDO) is an annual performance oriented system that is based on identifying objectives, establishing a realistic program for obtaining these objectives, and evaluating and rewarding performance in achieving them. An effective faculty EDO system is one where a faculty member’s objectives are clear and where discussion occurs between a faculty member and the academic department head regarding performance so that surprises for either the faculty member or the academic department head will be unlikely when the evaluation occurs.

Evaluation of faculty performance is an essential component of the EDO process, providing formative and summative assessment of the individual’s performance so that he/she can maintain or improve subsequent performance; serving as a basis for promotion, tenure, salary, and other decisions; and providing accountability with regard to the quality of teaching, research and service to those concerned with the institution.

Within the context of the institutional goals and long-range plans, individual faculty members propose objectives to their academic department heads. Joint negotiation and agreement between the individual faculty member and the academic department head results in a written set of faculty member objectives. A periodic review of the objectives between the faculty member and the academic department may occur which could alter the written document.

The scope of the EDO is broad in that the format of the review process is consistent for all members of the faculty, is evidentiary based, and represents common goals of all faculty members. The EDO process also recognizes unique disciplinary characteristics and expectations of the faculty members working within their academic discipline.

3.2.2.1 Establishing Objectives

Since the objectives of the faculty are fundamental components of the EDO process, it is important that they be carefully prepared. It is the responsibility of the faculty member to clearly articulate specific objectives and to demonstrate how these relate to his or her professional development and responsibilities. It is the responsibility of the academic department head to provide an unambiguous review of the merit and quality of these objectives within the context of the disciplinary standards for the profession and the expectations of the faculty member specified in the letter of appointment.

The following guidelines should be consulted during the objective setting stage of the EDO process:

1. The objectives should contribute to his or her development as an effective faculty member.

2. The objectives should be realistic and they should identify needed resources. Although a good objective will be challenging, it should also be attainable within the capabilities and resources of the individual and the University. Objectives should reflect the resources available to the faculty member.

3. Objectives should specify an action to be taken or a task to be accomplished. At the time of evaluation it should be clear whether or not a particular objective has been achieved.

4. Objectives should be described in such a way that their completion may be objectively evaluated in a manner keeping with disciplinary standards. Not all objectives can or even should be quantified; but for those that so lend themselves, objectives should be stated so that the result is specific and subject to quantitative measures. When an objective aims for a qualitative result, understanding should be reached beforehand as to how and by what standards the outcome is to be judged.

5. Once formulated, objectives should be written down and consulted periodically by the faculty member, academic department head, and others who might have an interest or role in their attainment.

3.2.2.2 EDO Calendar

Departmental Objectives Conference April 1-15	Overall departmental objectives, derived from university and college objectives, are discussed and agreed upon by the academic department heads and the departmental faculty members to provide guidelines for the development of individual objectives.
Individual Objectives Conference for Returning Faculty member April 15-30	Faculty member submits written objectives for forthcoming year (May 1 - April 30) on Individual Objectives Sheet to the academic department head; followed by a conference between the faculty member and head to negotiate and agree on the objectives.
Individual Objectives Conference for New Faculty members Sept. 15-Oct. 15	Same as above.
Review Individual Objectives (optional) Sept. 15-Oct. 15	Individual objectives may be reviewed by faculty member and head and, if necessary, modified. Faculty member may discuss progress to date.
Individual Performance Evaluation March 1 – 16*	Faculty member submits Individual Performance Report Form to academic department head. The head evaluates performance of routine responsibilities and individual objectives met, and assigns the faculty member a performance ranking. The faculty member has the right to request a meeting with the head within one working week to discuss and/or respond in writing to the evaluation.
March 30	Two copies of EDO Individual Objectives Sheet, Individual Performance Report Form, Individual Evaluation Form, and any other supporting documentation, including the faculty member's written response to the evaluation, are submitted by the academic department head to the dean.

*EDO evaluation conferences of faculty members being considered for tenure or promotion and first year appointees, where possible, should be completed at least two weeks prior to departmental consideration for tenure/promotion or reappointment.

3.2.2.3 EDO Performance Ratings

At UTC the evaluation of the professional responsibility of the faculty member focuses on three performance areas; teaching and advising[1]; research, scholarship, and creative activities[2]; and professional service to the University, profession, and community.[3]

Among these obligations, teaching and advising are of highest importance at UTC. It is recognized, however, that research, and scholarly and creative achievement contribute significantly to good teaching and to the advancement of knowledge. It follows, then, that faculty members will be expected to be involved actively in research, scholarship or creative activity as well. Since, in its Mission Statement, the university specifies that a fundamental purpose of the institution is to serve the people of the community, state, and region it is expected that faculty members will contribute to this mission through University and professional service. See Appendix A-C for best practices pertaining to each of these three categories.

While the individual faculty member is expected to participate in each of the three areas, annual achievement will vary in accordance with the objectives established in conference with the academic department head. Lesser participation in one area should be counterbalanced by greater participation in others.

In the three areas of responsibility[4] (teaching, research, and service), the academic department head will evaluate the faculty member's routine responsibilities established by the academic department, those defined in the Faculty Handbook chapter entitled "Faculty Responsibilities," and those identified on the Individual Objectives Sheet for the period being evaluated. During the course of the year, an individual

[1] Includes such activities as: teaching, student advising, development of new courses, preparation of instructional materials or other activities designed to enhance educational and instructional quality.

[2] Includes such activities as: disciplinary research, development of creative art forms, grant development and administration, scholarly publications and presentations, and other activities related to the development and dissemination of new knowledge or art forms.

[3] Includes such activities as: service through administrative and committee assignments, service to professional organizations, appropriate consulting, advisement or sponsorship of student activities, coordination of special departmental, school, college or university activities, and discipline- and university-related community services.

[4] Faculty on sabbatical or other special assignment (e.g. educational leave, research leave) may not be active in each of the three areas during this assignment. With prior agreement, these faculty will be evaluated and, depending on performance, be eligible for a merit salary increment. In accordance with the Faculty Handbook statement, "leaves of absence are normally granted for no more than one year and are normally without university compensation." Faculty on non-academic leave without pay will not normally be evaluated, nor will they normally be eligible for merit salary increment for the year on leave.

may undertake teaching, research, or professional service activities in addition to those listed on the Individual Objectives Sheet and report these for consideration in the EDO evaluation process.

The mechanics for the EDO as they apply to tenure-track and tenured faculty members do not differ. However, the EDO process for Tenure-track faculty members can and does have bearing on reappointment and tenure decisions. In turn, the EDO process for Tenured faculty members can and does have bearing on Promotion decisions, and is linked directly to the Cumulative Performance Review (CPR) process which is described in section 3.4.7. It is the responsibility of the academic department head to insure that the EDO process takes into account the distinction between Tenure-track and Tenured faculty members as follows:

1. **Tenure-track Faculty Members**
   The EDO process should focus on faculty development and mentorship, and should help to determine whether the faculty member is making adequate progress towards receiving tenure.

2. **Tenured Faculty Members**
   The EDO process should focus on innovation and long-term goal setting and should insure that the faculty member continues to meet the expectations of a tenured member of the faculty at rank.

A brief narrative evaluation of each area, and a composite evaluation of all three areas, will be reported by the academic department head on the Individual Evaluation Form using one of the four designations of performance defined below.

1. **Exceeds Expectations for Rank**
   Eligible for significant merit pay or performance-based salary adjustment that is consistent with campus, college, and departmental fiscal situations

2. **Meets Expectations for Rank**
   Eligible for minimum merit pay or performance-based salary adjustment that is consistent with campus, college, and departmental fiscal situations

3. **Needs Improvement for Rank**
   Not eligible for merit pay or performance-based salary adjustment and required to implement an Annual Review Improvement Plan (see below)

4. **Unsatisfactory for Rank**
   Not eligible for any salary adjustment and required to implement an Annual Review Improvement Plan (see below)

Each academic department will define its standards for expected performance in each of these four areas. These standards must be approved by the dean and the Provost and should be kept on file in the office of the academic department's dean. Any change of standards that the academic department has agreed upon will be submitted to the dean and Provost for final approval. Once an academic department's standards for performance ratings have been established, the academic department head is charged with fairly and equitably identifying qualitative differences in performance. It is the role of the dean to encourage reasonably comparable levels of standards for the differing units within each college or school. It is the role of the Provost to encourage such comparable standards across the University.

Faculty members must sign the EDO evaluation form to indicate that they have read and understood the academic department head's evaluation. The faculty member's signature does not indicate agreement with the academic department head's rating. A faculty member who disagrees with the head's recommended designation may submit a written response to the academic department head within five working days. This response will be forwarded to the dean along with the EDO documentation and will become a part of the faculty member's official EDO record. The dean forwards his or her recommendation to the Provost and, in the case of a "Needs Improvement for Rank" or "Unsatisfactory for Rank" rating, must copy that recommendation to the head and to the faculty member.

Within 30 days of the annual review, any tenured faculty member rated Needs Improvement for Rank or Unsatisfactory for Rank must collaborate with the head on an Annual Review Improvement Plan to be reviewed by the head and recommended by him/her to the dean for review and approval/denial. The next year's annual review must include a progress report that clearly describes improvements in any area(s) noted as Needs Improvement for Rank or Unsatisfactory for Rank.

Exceeds Expectations for Rank

In cases where the faculty member has exceeded expectations for rank within the academic department, and at the discretion of the academic department head, the head will forward to the dean a recommendation for "Exceeds Expectations for Rank" by attaching the Exceeds Expectations for Rank Consideration Form to the faculty member's Individual Evaluation Form.

The dean will forward his or her recommendations for "Exceeds Expectations for Rank" to the Provost and will send a copy of that recommendation to the head. The Provost will make his/her recommendation to the Chancellor for final award.

3.2.2.4 EDO Rating Appeals Process

1. Appeal of "Needs Improvement for Rank" and "Unsatisfactory for Rank"

A faculty member who wishes to contest an EDO performance rating of "Needs Improvement for Rank" or "Unsatisfactory for Rank" must, within five working days of notification from the dean, notify the dean in writing of the intent to contest, and must send a copy of the intent to contest to the academic department head. Within ten working days of receiving notification of the intent to contest the dean must schedule a meeting that includes the faculty member, the academic department head, and the dean (or, in the case of a contest by a academic department head, the academic department head, the dean, and the Provost).

If no resolution emerges from this initial meeting, then the faculty member may formally appeal to the Ad Hoc EDO Appeals Committee. This committee will consist of the non-voting dean of the faculty member's college (or, in the case of an appeal by a academic department head, the Provost, etc.), and five additional members as follows:

- The chair of the faculty member's departmental Rank and Tenure Committee, who will serve as Chair of the Ad Hoc EDO Appeals Committee
- Two (2) academic department heads plus one (1) alternate, selected annually each August by the Committee on Committees to serve for the academic year
- Two (2) faculty members plus one (1) alternate, selected annually each August by the office of the Provost to serve for the academic year

All relevant EDO materials, including departmental and college bylaws outlining criteria for evaluation, will be provided to this committee by the academic department head and the dean. Both the faculty member under review and the faculty member's academic department head shall reserve the right to present his or her case before the committee. The committee, in turn, reserves the right to request that the faculty member under review or the faculty member's academic department head appear before the committee.

A recommendation to accept or reject the appeal is forwarded by the committee to the Provost, who then weighs the recommendation of the Ad Hoc EDO Appeals Committee against all other available evidence in making his or her determination. The Provost then informs the faculty member of his or her decision. The faculty member may formally appeal the Provost's decision to the Chancellor. The Chancellor's decision may be appealed to the UT System President. The President's decision is final.

In the case of a successful appeal, any salary adjustments will be awarded retroactively.

2. Appeal of "Meets Expectations for Rank"

The faculty member wishing to appeal a rating of "Meets Expectations for Rank" must, within five working days of notification from the Dean, make a written appeal to the Provost and must provide the dean with a copy of the written appeal. Within ten working days of receiving notification of the appeal, the Provost must schedule a meeting that includes the faculty member and the dean of the faculty member's college. The academic department head reserves the right to participate in this meeting. If no resolution emerges from this meeting, then the faculty member may appeal to the Chancellor. The Chancellor's decision may be appealed to the UT System President. The President's decision is final.

In the case of a successful appeal, any salary adjustments will be awarded retroactively.

3.2.3 Standard Dossier Format

Faculty members being considered for reappointment, promotion in rank or tenure will be asked to submit a dossier which is standard to the extent that it describes the way in which the faculty member has met each of the respective criteria as listed in this Handbook.

The dossier should include a preface that <u>must contain</u> a Curriculum Vita (CV) describing the candidate's education and experience (both prior to coming to UTC and while at UTC) and a one page executive summary of the same. In addition, the preface <u>may contain</u> a summary of EDO evaluations.

The dossier should be divided into the three distinct components based on the performance areas outlined in the EDO; teaching and advising[1]; research, scholarship, and creative activities[2]; and professional service to the University, profession, and community.[3]

The respective divisions of this dossier should include all documentation for and evidence of activities related to teaching, research, and service in which the faculty member has engaged since his/her initial appointment at UTC. A teaching philosophy and a record of Student Ratings of Faculty (for a minimum of five years) must be included in the dossier. Other materials should be included at the discretion of the

[1] Includes such activities as: teaching, student advising, development of new courses, preparation of instructional materials or other activities designed to enhance educational and instructional quality.

[2] Includes such activities as: disciplinary research, development of creative art forms, grant development and administration, scholarly publications and presentations, and other activities related to the development and dissemination of new knowledge or art forms.

[3] Includes such activities as: service through administrative and committee assignments, service to professional organizations, appropriate consulting, advisement or sponsorship of student activities, coordination of special departmental, school, college or university activities, and discipline and university related community services.

Appendix U. Tenure Criteria

(Excerpted from Department of Biological and Environmental Sciences Bylaws, adopted March 21, 2014, and Department of Physics, Geology, and Astronomy. The Department of Biology, Geology, and Environmental Science is currently in the process of harmonizing the tenure criteria)

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4. Tenure Process and Criteria

The process and criteria for tenure are contained in Section 3.4 of the UTC Faculty Handbook. Tenure is awarded after a thorough review which culminates in the University acknowledging a reasonable presumption of the faculty member's professional excellence and the likelihood that excellence will contribute substantially over a considerable period of time to the mission and anticipated needs of the academic department in which tenure is granted. Professional excellence is reflected in the faculty member's teaching, research, and service, including the faculty member's ability to interact appropriately with colleagues and students. The relative weights of these factors will vary according to the fit between the faculty member and the mission of the academic department in which he or she is appointed.

The Handbook authorizes academic departments to establish more specific criteria for tenure in that unit, provided the department criteria include and are consistent with criteria in the handbook and in the College of Arts and Sciences. The BES expects its faculty to be productive and meet or exceed University and Departmental tenure criteria. This section includes and expands upon the Criteria for Granting Tenure as presented in the UTC Faculty Handbook, with special application to tenure in the BES (BES). To the extent possible, it attempts to be objective, or at least to present more specific criteria and expectations held by the Department for many years.

This document can serve as a guideline for new faculty in the Department to help plan their goals and objectives and to provide direction for their careers at UTC, as well as UTC and departmental administrators, faculty serving on the departmental Rank, Tenure, and Reappointment Committee, and external reviewers.

The UTC Faculty Handbook contains eight criteria for tenure. BES reorders and combines the eight criteria into the five criteria, in order to align the criteria with the format required for the standard dossier and EDO documents. As stated in the UTC Faculty Handbook, teaching is considered primary.

a. Teaching and Advising Excellence

This criterion combines and expands upon UTC Faculty Handbook criterion requiring "Demonstrated excellence in teaching" and "Quality of academic advisement to UTC students."[6]

In BES, evidence of "Demonstrated excellence in teaching" means the candidate for must become an effective teacher at UTC. BES considers faculty performance in the classroom, student advising, and research mentoring in determining whether "excellence in teaching" has been achieved. Faculty performance in the classroom is the most important factor and the requirements for this expectation are:

i) Student evaluation mean values of 5.0 or greater for the seven university level questions (scale of 0-7 with 7 being best) on average during the three years prior to tenure consideration.

ii) Peer teaching ratings of "very good" or "excellent" during the last two semesters of peer evaluations.[7]

iii) Evidence of responding positively to reasonable criticisms offered through student and peer evaluations, by showing a willingness to change and improve.

iv) Other evidence of teaching excellence or commitment such as

- Nomination or receipt of college, university, or external teaching awards
- Quality of teaching materials and examinations
- Updating and developing of courses
- Unsolicited positive feedback from former students
- Use or development of innovative teaching methods, such as flipped classrooms, experiential learning, recitation section, or similar activities
- Participation in teaching development workshops or training sessions or similar activities

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[6] UTC Faculty Handbook 3.4.4a, g.

[7] A candidate for tenure and promotion to Associate and Full Professor exceeding expectations in other areas of teaching excellence will not necessarily be denied tenure or promotion without reaching this minimum.

The requirements for establishing excellence in student advising are

i) Offering sufficient opportunities for student advising, based on College expectations for availability
ii) A record of maintaining regular, posted office hours
ii) Other evidence of advising excellence or commitment such as
- Service on advising-related departmental committees,
- Nomination or receipt of college, university, or external advising award
- Other comparable activities.

The requirements for excellence in research mentoring require achievement of the following criteria:

i) Meaningful involvement[8] of an average of one undergraduate or graduate students in research per semester after the first year of employment at UTC.

ii) Complete at least three activities from a minimum of two of the following

- Serving as a committee chair for undergraduate honors or graduate students (this counts as two activities)
- Serving as a committee member for undergraduate honors or graduate students
- Sponsoring student presentations at meetings;
- Sponsoring grant proposal submissions by students
- Awards for faculty sponsored student presentations at meetings;
- Student publications in student or in regional, national or international peer reviewed journals.
- Published lab manuals
- Other comparable activities

b. Scholarly Competence

This criterion expands upon the UTC Handbook criterion "Evidence of scholarly competence in the discipline.[9]

In BES, evidence of "scholarly competence in the discipline" means the tenure candidate must establish an independent and externally recognized research program that involves students at UTC. The ***minimum*** requirements for this expectation are:

i) Ongoing research activity

[8] Meaningful involvement of students in research may include any student participating in an independent study/research course (4995, 4997, 4998) and/or involved in the experimental design, collection of data, analysis or writing process, or participating in curatorial/data archiving work.

[9] UTC Faculty Handbook 3.4.4b.

ii) Three full-length peer-reviewed papers (one may be submitted at the time of review) one of which must be a substantive paper published in a national or international journal[10,11].

iii) Lead PI or co-PI[12] on a two competitive pre-proposals (individual or collaborative) or one full proposal (individual or collaborative) submitted to a federal agency (e.g. DOD, EPA, NIH, NSF). Alternatively, lead PI or co-PI[3] on a competitive grant proposal (individual or collaborative) submitted to a major private foundation (e.g. American Cancer Society, Benwood Foundation, MacArthur Foundation) or state agency (e.g. Tennessee National Guard).

iv) Meaningful involvement[13] of an average of one undergraduate or graduate students in research per semester after the first year of employment at UTC.

v) Three presentations at professional meetings, one of which must be national or international.[14]

vi) Complete six activities from a minimum of three of the following:

- Invited seminar at a conference or academic institution other than UTC
- Book chapter in research book or volume
- Editor or co-editor of a scholarly book (not professional editing for service) or an invited special feature or proceedings in a peer-reviewed journal
- Author or co-author of a book on a scientific or other environmental science discipline (does not include lab manuals)
- Book review in a peer-reviewed journal
- Textbook (does not include lab manuals)
- PI on a funded grant from an in-house (intramural) competition (e.g. Faculty Development)[15]
- Author on peer-reviewed publication in a regional, national or international journal beyond the minimum expectation stated in (i)

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10 In most cases, two substantive papers must be based on research initiated as a faculty member at UTC. In certain cases, a faculty member may bring an active, ongoing research program with publications in national or international journals with them to UTC and be granted a shortened probationary period by the departmental RTR committee and/or Dean of the College. Under these circumstances, the faculty member is expected to publish the minimum number of papers cited in (i) but is not necessarily expected to publish a paper based on research initiated at UTC during the probationary period.

11 A candidate exceeding expectations in other areas of scholarly competence (ii-v) as well as in teaching or service, will not necessarily be denied tenure without reaching this minimum.

12 A substantial proportion of the proposal budget must support the co-PI's professional activities. 13 Meaningful involvement of students in research may include any student participating in an independent study/research course (4995, 4997, 4998) and/or involved in the experimental design, collection of data, analysis or writing process, or participating in curatorial/data archiving work.

14 Provided funding is accessible.

15 No more than two in-house grants can be counted towards tenure expectations.

- Short publication in a regional, national or international journal (e.g. Note, Short Commentary, Species List)
- PI or co-PI[16] on a major private foundation, state or federally funded grant
- Other examples of scholarly productivity (e.g. technical report of a finished research project to a granting agency)[17]

The department recognizes that some faculty members have research programs that do not require external funding or that are recognized by a relatively small or regionally located, but equally important group of peers. Additionally, some faculty will be asked to take a larger teaching or service loads than others, affecting their ability to be research active during the probationary period. Thus, it is important that the department allow for some flexibility in tenure expectations. For example, the departmental RTR committee may consider the following alternatives to the stated minimums:

- Tenure track faculty members with higher than average teaching or university service loads can substitute extra time spent in teaching or service for activities listed above (i - iv), in consultation with the department head and the chair of the departmental RTR committee. Any special arrangement of this nature should be recorded in writing and signed by the candidate, department head and chair of the of the departmental RTR committee.

- A tenure track faculty member that does not seek funding to sustain a research program (criterion ii, above; e.g., a theoretical biologist, environmental lawyer) can substitute a grant submission to a private foundation or state agency or pre-proposal or full proposal to federal agency with one peer-reviewed paper in a regional, national or international journal (resulting in an expectation of 4 papers) and two additional activities listed in criterion iv (resulting in an expectation of 8 activities). The exception should be discussed in consultation with the department head and the chair of the departmental RTR committee. Any special arrangement of this nature should be recorded in writing and signed by the candidate, department head and chair of the of the departmental RTR committee.

- The department reserves the right to adjust the bylaws regarding scholarly activity expectations for tenure in the event that teaching expectations change.

c. Service

This criterion combines and expands upon two UTC Faculty Handbook criteria requiring 1) “Membership and participation in professional organizations” and 2) “Service to the University of Tennessee at Chattanooga, the community and the region as appropriate”.[18]

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16 A substantial proportion of the proposal budget must support the co-PI’s professional activities.

17 The candidate must provide evidence of the level of quality, effort, peer review, and potential impact of the activity to the departmental RTR committee.

18 UTC Faculty Handbook 3.4.4e, f.

In BES, tenure track faculty members are expected to provide service that supports the university mission as an engaged metropolitan university, and the research mission of the department, to serve as productive members of the wider professional research community. Candidates for tenure are expected to actively participate in departmental committees as assigned by the Department Head as well as provide service to the university and community and their profession. Additionally, the faculty member should provide quality advisement to UTC students.

(i) Departmental service

Tenure-track faculty member is expected to actively serve on an average of three departmental committees per year; the actual number will depend on annual departmental needs and number of faculty in the department. Committee assignments are determined by the Department Head, with input from the faculty, at the beginning of each academic year.

(ii) University and Community Service

Each faculty member will provide service to The University of Tennessee at Chattanooga, the community and the region as appropriate. Examples of potential university and community serve include, but are not limited to, the following:

- Active participation university committees
- Participation in university events
- Workshops for UTC students
- Participation in outreach or volunteer programs with community organizations
- Mentoring of K-12 students, or discipline relevant presentations at local K-12 schools
- Submission of grants for community/university service activities
- Serving as a judge for school, local and regional science fairs
- Participation in outreach or volunteer programs associated with local schools
- Other comparable examples

(iii) Professional Service

Candidates for tenure are expected to participate in at a minimum of two professional activities on average per year. Examples of professional activities include, but are not limited to the following:

- Participation in professional organizations
- Membership on a committee or leadership position for a professional organization
- Leadership position in a student (e.g., EDGE) or campus based scientific organization (e.g., adviser for UTC chapter of Sigma Xi)
- Participation in a professional development activity at a scientific meeting or a regionally or nationally recognized program (e.g., mentoring activity at a professional meeting, attending workshops sponsored by professional organizations, NSF or various regional and national laboratories)
- Reviewer for an academic journal

- Reviewer for a granting agency
- Any editorial position for an academic journal (chief editor receives credit for two activities)
- Host or co-host of a professional meeting or workshop
- Other comparable examples

d. Evidence of professional growth and activities appropriate to the discipline[19]

In BES, faculty that satisfy tenure criterion 1-3 (Teaching and Advising, Scholarly Competence, and Service, are presumed to have satisfied this handbook criterion.

e. Collegiality

This criterion expands upon the UTC Handbook criterion requiring "Demonstrated ability to relate effectively to UTC students and colleagues."[20]

In BES, collegiality consists of a shared decision making process and a set of values which regards members of the department and other university constituencies as essential for the success of the department, the college and university. Central to collegiality is the foundation of academic freedom – the respect for differing opinions and points of view – which welcomes diversity and actively sponsors its opinions. Collegiality between faculty and staff, regardless of rank or status, incorporates mutual respect for similarities and for differences in background, expertise, judgments, assignment responsibilities and visions for the department. Collegiality also consists of an ability to relate with students and a respect for similar and different opinions of students.

In BES, the candidate for tenure and promotion must be a good citizen of the department, college and university, must interact in a collegial and professional manner with colleagues, staff and students, and must serve as a good role model for students and a good representative of UTC. In turn, members of the RTR committee are expected to be collegial to candidates for tenure and promotion and promote an environment in which different forms of collegiality can be expressed freely. The department supports a vision that differing viewpoints are valuable and essential to promoting academic freedom.

The department policy conforms with the College of Arts and Science's vision that collegiality (or the lack thereof) impacts the assessment of performance.[21] For this reason, the departmental

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19 UTC Faculty Handbook 3.4.4c.

20 UTC Faculty Handbook 3.3.4d.

21 In BES, the absence or lack of collegiality is defined as 'substantial evidence of sustained, intentional actions and statements that are detrimental to or interfere with the teaching, scholarly, and service goals of the department, college, or university as well as the physical or mental well-being of students, faculty, and staff.' The absence or lack of collegiality shall not be based on civil disagreements over academic issues or personality conflicts that do not result in disruptions to departmental, college, or university activities or are not detrimental to the physical or mental well-being of students, faculty, and staff. The perceived, undocumented, and/or unaddressed absence of collegiality does not, by itself, constitute a basis for a departmental recommendation of nonreappointment or denial of tenure or promotion.

faculty is mindful of the College of Arts and Science ‘Statement on Collegiality’. The department will assess collegiality based on:

(i) Evaluation of the candidate’s Statement of Collegiality in tenure and promotion documents.

(ii) Evidence that a candidate receiving criticisms regarding collegiality during an annual review has appropriately responded to those criticisms. In the event that concerns are expressed about a candidate’s collegiality, the RTR chair must submit these concerns in writing to the candidate and Department Head as part of the candidate’s annual review for reappointment. The candidate should arrange a meeting with the Department Head and/or chair of the RTR committee to discuss the concerns. The candidate is also encouraged to write a rebuttal to written criticisms regarding a perceived lack or absence of collegiality, to be submitted to the RTR chair and Department Head. The candidate should also address how s/he addressed these perceived concerns – if deemed appropriate and legitimate – in his/her subsequent annual review or as part of Statement of Collegiality in a tenure or promotion application.

h. Staffing Needs

BES embraces the UTC Faculty Handbook requirement that there be “Evidence of meeting the staffing needs of the University.”[22]

Trustees acts only on positive recommendations. After positive action by the Board of Trustees, the Chancellor shall give the faculty member written notice of the effective date of tenure.

Dates	The following are the normal deadlines for the Promotion Calendar. There will be allowances for cases where it is appropriate or necessary to extend one or more deadlines.
October 15	Deadline for academic department heads to call organizational meetings and request dossiers from all members of their academic departments who wish to be considered for tenure or promotion.
November 1	Deadline for academic departments to empanel complete Rank, Tenure, and Reappointment Committees.
November 15	Deadline for initial meetings of Rank and Tenure committees.
March 1	Rank, Tenure, and Reappointment Committees make final written recommendations to academic department heads with records of committee membership, attendance at final discussions and voting results.
March 7	Academic department heads make written recommendations to deans with supporting materials.
March 17	Deans make recommendations to Provost with supporting materials.
April/May	Provost makes recommendations to Chancellor and notifies each candidate of the decision.
April/May	Chancellor makes written recommendations for approval to President.
Summer	Final notifications are mailed to candidates following approval by the UT Board of Trustees.

3.4.3 Probationary Period

A tenure-track faculty member must serve a probationary period prior to being considered for tenure.

It is the policy of UTC to review a probationary faculty member annually to determine whether reappointment is recommended and appropriate.

3.4.3.1 Length of Probationary Period

The probationary period at The University shall be no less than one and no more than seven academic years; however, for good cause, the President, upon the recommendation of the Chancellor, may approve a probationary period of less than one academic year. If a faculty member has served in a tenure-track appointment at another institution, his or her total probationary service may extend beyond seven years. The original appointment letter shall state the length of the faculty member's probationary period and the academic year in which he or she must be considered for tenure if he or she has met the minimum eligibility requirements for consideration. The stipulation in the original appointment letter of the length of the probationary period and the year of mandatory tenure consideration does not guarantee retention until that time.

For good cause related to procedural error, The University and a tenure-track faculty member may agree in writing to extend a seven-year probationary period for a maximum of two additional years. The proposed extension must be approved in advance by the chief academic officer, the Chancellor, the Senior Vice President (or designee), and the General Counsel (or designee).

3.4.3.2 Suspension of Probationary Period

The Provost shall decide whether the probationary period will be suspended when the following circumstances occur: The faculty member accepts a part-time faculty position; the faculty member accepts an administrative position; or the faculty member is granted a leave of absence. The Provost shall give the faculty member written notice of the decision concerning suspension of the probationary period.

3.4.3.3 Notice of Non-Renewal

Notice that a tenure-track faculty member's appointment will not be renewed for the next year shall be made in writing by the Provost, upon the recommendation of the academic department head and dean, according to the following schedule: in the first year of the probationary period, not later than March 1 for an academic year appointment and no less than three months in advance for any other term of appointment; in the second year of the probationary period, not later than December 15 for an academic year appointment and no less than six month in advance for any other term of appointment; and in the third and subsequent years of the probationary period, not less than twelve months in advance.

These notice requirements relate only to service in a probationary period with the University. Credit for prior service shall not be considered in determining the required notice. Notice of non-renewal shall be effective upon personal delivery or upon mailing to the faculty member's residential address of record at the University.

The procedure for appeal of a decision to terminate a probationary period is described in Chapter 4.

3.4.4 Eligibility and Criteria for Tenure Consideration

Eligibility for tenure consideration shall be subject to the following minimum standards:

Regular, full-time, tenure-track faculty appointments at the academic rank of assistant professor, associate professor, or professor are eligible for tenure; visiting, temporary, term, and part-time appointments are not eligible for tenure. Faculty members pursuing degrees at the campus where they are appointed are not eligible for tenure.

No faculty member shall be appointed initially with tenure except by positive action of the Board of Trustees upon the recommendation of the President and after review by the tenured faculty members and academic department head, dean, Provost, and Chancellor.

Tenure is awarded after a thorough review which culminates in the University acknowledging a reasonable presumption of the faculty member's professional excellence and the likelihood that excellence will contribute substantially over a considerable period of time to the mission and anticipated needs of the academic department in which tenure is granted. Professional excellence is reflected in the faculty member's teaching, research, and service, including the faculty member's ability to interact appropriately with colleagues and students. The relative weights of these factors will vary according to the fit between the faculty member and the mission of the academic department in which he or she is appointed.

This presumption of tenure is may be rebutted; it is not a guarantee of lifetime employment. However, the burden of rebutting the presumption of professional fitness of a tenured member of the faculty rests with the University. A tenured member of the faculty may be dismissed only in accordance with the procedures outlined in 3.4.8.

There is no absolute correlation between disciplines and administrative units. The shape of learning and, therefore, of disciplines changes in ways that make necessary interdisciplinary, interdepartmental and intercollegiate arrangements for programs of study. If there is a knowledgeable group of peers in a program of study, a faculty member may be tenured in the program even though no administrative unit corresponds precisely to the field. In such cases, the head of the program, in consultation with the program faculty members, is responsible for the original recommendation and must relate to the faculty members in the program as a head or dean/director would in ordinary circumstances.

The awarding of tenure is based not only on the individual's professional performance, but also includes consideration of the anticipated needs of the academic program for the foreseeable future. Professional excellence is reflected in good teaching, scholarship and/or other creative work in the discipline, participation in professional organizations, willingness to contribute to the common life of the University, and effective work with colleagues, students and in public service. The relative weigh of these factors in tenure determination will vary according to the mission of the particular academic department and the characteristics of the individual.

A decision not to award tenure is in no sense a judgment of incompetence. Not all competent faculty meet the high standards necessary for tenure, nor are all those who meet such standards automatically fitted to serve the needs of the University's programs. The burden of proof that tenure should be awarded rests with the faculty member.

The criteria for appointment reflect the basic elements for tenure consideration; however, a positive recommendation for tenure requires demonstrated excellence in performance. Expectations necessarily vary within the respective disciplines and in light of the faculty member's rank. In all cases, however, excellence in teaching or as a librarian is considered primary. The nature of the disciplines is such that they emphasize differing levels of performance and differing mixes and types of research and service. Consequently the faculty members of the disciplines will recommend the standards, degrees of emphasis, and the appropriate types of research and service required for tenure.

The following criteria pertain to decisions governing the awarding of tenure. The list is not necessarily comprehensive, nor should it be assumed that the items are of equal significance, or that they are listed in order of relative importance (except for item #1 below, which is considered primary).

a. Demonstrated excellence in teaching or as a librarian at The University of Tennessee at Chattanooga, in the academic department in which tenure is to be granted;
b. Evidence of scholarly competence in the discipline;
c. Evidence of professional growth and activities appropriate to the discipline;
d. Demonstrated ability to relate effectively to UTC students and colleagues;
e. Membership and participation in professional organizations;
f. Service to The University of Tennessee at Chattanooga, the community and the region as appropriate;
g. Quality of academic advisement to UTC students;
h. Evidence of meeting the staffing needs of the University.

An academic department may also establish more specific criteria for tenure in that unit. After approval by the dean and Provost, these criteria for tenure shall be published in the bylaws of the academic department. The tenure criteria for an academic department shall include and be consistent with the criteria stated in this policy as well as any criteria established by the academic department's college.

3.4.5 Procedures for Effecting Tenure

An adequate evaluation of a tenure candidate's qualifications, professional contributions, potential and determination of whether he or she should be accepted as a tenured member of the campus academic community requires the judgment of both the candidate's faculty colleagues and the responsible administrators. Thus, although recommendations for tenure are administrative actions that must be approved by the Board of Trustees, there should be no positive recommendation for tenure without formal consultation with the tenured faculty members of the academic department in which the candidate holds his or her position.

Each academic department shall adopt bylaws governing the tenured faculty member's consideration of a candidate for tenure. The bylaws shall provide for a meeting of the tenured faculty members to debate and discuss the tenure candidacy. The bylaws shall also provide for the manner of taking and recording a formal vote of the tenured faculty members on whether the candidate should be recommended for tenure and shall establish the minimum number of votes necessary to constitute a positive recommendation.

These bylaws may extend, but not contradict, the constitution of the departmental Rank, Tenure, and Reappointment Committee described in section 3.2.4 or procedures described in sections 3.4.1 and 3.4.2.

The vote of the tenured faculty members is advisory to the academic department head. After making an independent judgment on the tenure candidacy, the head shall submit a recommendation to the dean with a written summary of his or her judgment on, or normally before, the end of the first full week of March. If the head's recommendation differs from the recommendation of the tenured faculty members, the summary must explain the reasons for the differing judgment, and the head must provide a copy of the summary to the tenured faculty members. The tenured faculty members may forward a dissenting report to the next level of review.

All tenure recommendations of the academic department head, whether positive or negative, shall be reviewed by the dean of the college. The dean may establish a college-wide committee for review of tenure and promotion recommendations. The recommendation of a college-wide committee shall be advisory to the dean. After making an independent judgment on the tenure candidacy, the dean shall forward a recommendation to the Provost. Recommendations shall be forwarded to the Provost on or before the end of the third full week in March.

All tenure recommendations of the dean, whether positive or negative, shall be reviewed by the Provost. After making an independent judgment on the tenure candidacy, the Provost shall forward his or her recommendations to the Chancellor. Recommendations shall be forwarded to the Chancellor on or before the end of the second full week in April.

All tenure recommendations of the Provost, whether positive or negative, shall be reviewed by the Chancellor. After making an independent judgment on the tenure candidacy, the Chancellor shall forward only positive recommendations to the System President.

If the President concurs in the positive recommendation of the Chancellor, he or she shall submit the recommendation for tenure to the Board of Trustees.

No person shall acquire or be granted tenure except by positive action of the Board of Trustees upon the recommendation of the President. The Board of Trustees acts only on positive recommendations. After positive action by the Board of Trustees, the Chancellor shall give the faculty member written notice of the effective date of tenure.

The faculty member will be informed in writing of the progress of his or her tenure candidacy at each step, as in promotion, as described in Section 3.4.2 of this Handbook. The procedure for appealing a negative recommendation on tenure is discussed in Chapter 4 of this Handbook. Appeals may not be initiated until after notification of the Provost's recommendation.

3.4.6 Expedited Procedures for Considering and Granting Tenure by UT Board of Trustees

1. Procedures for faculty appointment may be expedited, on an accelerated schedule that follows the campus[1] policies and procedures for faculty appointment.

2. The Chancellor may request that the President recommend an expedited Board of Trustees decision for tenure. Exceptional circumstances in which an expedited Board of Trustees action may be warranted include, but are not limited to, outstanding persons who hold a tenured faculty position at their current institution and who the Chancellor believes cannot satisfactorily be recruited to UT without expediting their tenure process.

3. Procedures for tenure recommendation and approval may be expedited, following all of the steps outlined in Appendix A but on an accelerated schedule for the Board's action: review by tenured professors in the base department followed by formal recommendations by the department head, dean, chief academic officer, Chancellor, and President

4. The President will recommend expedited tenure recommendations to the Executive and Compensation Committee, in lieu of the full UT Board of Trustees, in the circumstances described above.

5. On the recommendation of the Chancellor, the

Appendix V. BGE Bylaws

BGE Bylaws
(Click on the heading and another pdf file will open, 35 pages)

Appendix W. BGE Peer Evaluation of Instruction Form

Department of Biological and Environmental Sciences

Peer Evaluation of Instruction Form

Instructor_____________________ Course__________ Bldg/Room#_____________

Hour______________ Date______________ Evaluator____________________

Was the presentation primarily: _____lecture; _____discussion; _____demonstration;

_____lecture/discussion; _____lecture/demonstration; _____other__________________

What were the objectives of this class?

Were the objectives addressed?

GENERAL RATING

In comparison with other university presentations in my experience and of a similar type, I would rate this presentation as:

_____Excellent _____Very Good _____Satisfactory _____Unsatisfactory

____
Signature of Evaluator

Comments of the evaluated instructor:

____
Signature of Instructor

Evaluation Criteria	Yes	No	NA*	Comments
1. Instructor showed genuine concern for the learning of his/her students.				
2. Instructor actively encouraged questions and provided ample time for these to occur.				
3. Instructor encouraged class discussion and provided ample time for this to occur.				
4. Instructor organized valuable classroom experiences.				
5. Instructor showed visible respect for all students.				
6. Instructor used instructional materials that promoted learning.				
7. Instructor was tolerant and accepting of student holding different points of view.				
8. Instructor presented course material at an appropriate level of difficulty.				
9. Instructor was intellectually stimulating during presentation.				
10. Instructor demonstrated a thorough knowledge of the course content.				
11. Instructor was well prepared for this presentation.				
12. Instructor described how topics related to each other, and the course as a whole.				
13. Instructor was enthusiastic about helping students learn.				
14. Instructor was an effective speaker during this presentation.				
15. Instructor provided illustrative situations and examples that promoted learning.				
16. Instructor used class time wisely and efficiently to maximize student learning.				
17. Instructor was able to answer student questions effectively.				
18. Instructor exhibited enthusiasm for the discipline.				
*) not applicable				

If the evaluator had the opportunity to observe the following please comment:

1. Instructor set high, but reasonable, standards for students.

2. Instructor helped students identify important objectives of the course.

3. Instructor was flexible about trying new approaches to help students learn.

4. Instructor provided opportunities for students to obtain assistance outside the classroom (office hours, appointments, etc.).

5. Instructor was appropriately responsive to feedback and/or constructive criticism from students.

6. Instructor described how topics related to other disciplines (if applicable).

Comments and Suggestions:

What characteristics of the instructor and the class did you find strong?

What characteristics of the instructor and the class do you think were weak?

What specific suggestions would you make to this instructor to strengthen his/her classroom performance?

Appendix X. BGE Publications

BGE Publications 2012-2017

Bolded and asterisked entries involved student contributors. The list includes peer reviewed publications, books and book chapters (including laboratory manuals), and technical reports.

PUBLICATIONS

Peer Reviewed Publications

1. **Wade, M. L., and D. A. Aborn. 2016. A Study of Avian Nest Predation at Audubon Acres in Chattanooga, TN. The Migrant 87:37-50**

2. Thomas P. Wilson*, Bradley R. Reynolds, Penni Jo Wilson, Paul-Erik Bakland, Jeremy Hooper, Nyssa Hunt, Simone Madsen, Maria Cooksey, Patricia Garland, Wes Grigsby, Brittany Killian, Nakeisha Ricks, Liz Staundt, Micah Taylor, Emily Busby, Jose Barbosa, Ethan Carver, Daniel Armstrong, Mark Dillard, Joe Simpson, Mark Wisdom, Tabitha M. Wilson, and Team Salamander (2017) Team Salamander and Its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga. Southeastern Naturalist Vol.16 (Special Issue 10):70–93.

3. Wilson TP, Barbosa J, Carver E, Reynolds BR, Team Salamander, and Wilson TM. (2015). An Assessment of *Batrachochytrium dendrobatidis* Prevalence in two species of Ranid Frogs on a FormerUnited States Department of Defense Installation in southeastern Tennessee. Herpetological Review. 46(1):37-41.

4. Cao J, Barbosa JM, Singh NK, Locy RD (2013) GABA transaminases from *Saccharomyces cerevisiae* and *Arabidopsis thaliana* complement function in cytosol and mitochondria. Yeast. 30(7): 279–289.

5. Cao J, Barbosa JM, Singh NK, Locy RD (2013) GABA shunt mediates thermotolerance in *Saccharomyces cerevisiae* by reducing reactive oxygen production. Yeast. 30(4): 129-144.

6. Dunn, R.R. and Beasley, D.E. (2016). Democratizing evolutionary biology, lessons from insects. Curr Opin Insect Sci. 18: 89 – 92.

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20. J. Conley* and S. Richards. 2013. Environmental Teratogenesis. In (ed) J.F. Férard and C. Blaise, Encyclopedia of Aquatic Ecotoxicology. Invited Submission. Publisher: Springer, New York, New York.

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<u>Project Reports</u>

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2. Boyd J, Benson A, Montgomery C, Hoover D, Odell J, Raymond G, Russo L. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Milan, TN. Submitted to the Tennessee Army National Guard. June 2015. 93 pp.

3. Boyd J, Benson A, Montgomery C, Hoover D, Odell J, Raymond G, Russo L. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Smyrna, TN. Submitted to the Tennessee Army National Guard. April 2015. 84 pp.

4. Boyd J, Alexander K, Clark R, Holder T, Hultman W, Majors C, Parker S, Prater A, Russo L, Sellge S, Smith H, Snellgrove E, Turner A. Experiential student research to support the federal

protection of rare *Platanthera integrilabia* (white fringeless orchid) on Starr Mountain, Cherokee National Forest, TN. Submitted to the Cherokee National Forest and the U.S. Fish and Wildlife Service. December 2013. 9 pp.

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7. Benson AR, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Submitted to the Tennessee Army National Guard. December 2012. 50 pp.

8. Shaw J, Boyd J. *Scutellaria montana* Chapm. Transplantation monitoring report 2012 Enterprise
South Industrial Park, Hamilton County, TN. Submitted to the Tennessee Department of Transportation. June 2012. 18 pp.

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16. Shaw, J. 2017. A Report and Summary of Reports on the Health of Scutellaria montana Chapm. Eight Years Post Transplantation at Enterprise South Industrial Park, Hamilton County, TN And Cutting Back Competitive Undergrowth and the Effects on Scutellaria montana. Submitted to Civil and Environmental Consultants for the TDOT.

17. J. 2015. Botanical survey with emphasis on rare species and communities of the wetlands surrounding South Chickamauga Creek near the I-24/I-75 interchange in Hamilton County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

18. Shaw, J. 2015. Rare plant species and communities survey of the mesic forest, glade, and riparian habitats of Catalina, Williamson County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

19. Shaw, J. 2014. Rare plant species and communities survey of the Clarkrange Industrial Park, Fentress County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

20. Shaw, J., and D. Estes. 2013. Botanical survey and ecological systems mapping of the Ocoee River Gorge, Polk County, Tennessee. Prepared for the Tennessee Department of Transportation under a contract from URS Inc.

21. Shaw, J., and D. Estes. 2012. Botanical survey and ecological systems mapping of the Ocoee River Gorge, Polk County, Tennessee. Prepared for the Tennessee Department of Transportation under a contract from URS Inc.

22. Armstrong, D.S., Simpson, J.F. III, Team Salamander and T.P. Wilson. 2012. A Conservation Genetics Assessment of a Spotted Salamander (Ambystoma maculatum, Shaw 1802) Population at the LT6 Study Area in Hamilton County, Tennessee. A Final Technical Report Submitted to the Tennessee Wildlife Resources Agency, and the USGS Leetown Science Center. Pgs. 59. December 31, 2012.

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24. Dillard, M.J., Hooper, J., Team Salamander, and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle (Terrapene carolina carolina) at the LT7 Study Area in Hamilton County,

Tennessee. A Final Technical Report Submitted to the Tennessee Wildlife Resources Agency and the Tennessee Herpetological Society. Pgs. 44. October 31, 2016.

Appendix Y. BGE Presentations

BGE Presentations 2012-2017

Bolded and asterisked entries involved student contributors. The list includes invited presentations (111) and conference presentations (326).

PRESENTATIONS

Invited Presentations (111)

1. D. A. Aborn. 2016. “Bird Banding 101”. Memphis Chapter of the Tennessee Ornithological Society, Memphis, TN.

2. D. A. Aborn. 2016. “Birding makes cents (and dollars): the economic benefits of birding and bird festivals”. Hiwassee Sandhill Crane Festival, Birchwood, TN.

3. D. A. Aborn. 2014. “The breeding biology of Tree Swallows in Chattanooga, TN”. Chattanooga Civitan Club.

4. D. A. Aborn. 2013. “Environmental issues in the Middle East”. Jewish Community Federation of Greater Chattanooga.

5. J. Barbosa. 2017. Plant and yeast molecular response to stresses. The Southern University.

6. J. Barbosa. 2017. The urban gardening project. The Sierra Club of Chattanooga.

7. J. Barbosa. 2017. The urban gardening and organoponics. The Science Café of Chattanooga.

8. Beasley, D.E. (2016). The ecology of human-driven change. University of Tennessee, Chattanooga, TN.

9. Beasley, D.E. (2017). Invisible Life: Exploring pathogen diversity in an urban environment. UTC Research Dialogues, Chattanooga, TN. *Winner of the Faculty Elevator Speech Competition in the STEM category*.

10. Beasley, D.E. (2017). What ants, cicadas and stomachs teach us about how to design healthy environments. Science Café: Chatt about Science. Chattanooga, TN.

11. Beasley, D.E. (2016). What ants, stomachs and classrooms teach us about how to design environments. Growing IN Place: Design for Children, Families and Nature in the City, Raleigh, NC.

12. Boyd J. Biology Seminar, University of North Carolina at Asheville. Reasons for rarity? Exploring adaptive and acclamatory constraints to commonness. November 2016.

13. Boyd J. Investigating intraspecific variability of responses of Appalachian plant species to climate change. College of Arts and Sciences Convocation, University of Tennessee at Chattanooga. May 2015.

14. Boyd J. Plant species conservation in a changing world – land use, invasions, and climate considerations. Biology Seminar, University of Colorado at Colorado Springs. February 2015.

15. Boyd J. Adaptations of photosynthesis: from course concepts to research applications. Biology Seminar, College, Salt Lake City, UT. January 2015.

16. Boyd J. Experiential student research to support the conservation of a rare locally endemic orchid species. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2014.

17. Covino R, Auchter J, Boyd J, Irvin L, Klug H, Laing C, Peacock J. Pop culture in the classroom. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2014.

18. Boyd J. Experiential student research to support the conservation of a rare locally endemic orchid species. Research Day, University of Tennessee at Chattanooga. April 2014.

19. Boyd JN. Community-based learning on the urban campus. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2013.

20. Boyd J. November 2016. The mysterious white monkeyface orchid. Presented at the *Chatt about Science* Science Café, Chattanooga, TN.

21. Boyd J. December 2015. The tipping point of trees. Presented to the Chattanooga Institute of Noetic Sciences, Chattanooga, TN.

22. Boyd J. July 2014. Core course: Plant communities. Presented at Reflection Riding Arboretum & Nature Center, Chattanooga, TN.

23. Boyd J. June 2013. A new resident: invasion of the hemlock woolly adelgid in Signal Mountain, TN. Presented at the Signal Mountain Library, Signal Mountain, TN.

24. Boyd J. March 2013. Treating the hemlocks: but what about the bees? Presented to the Tennessee Valley Beekeepers Association, Chattanooga, TN.

25. Boyd J. May 2012. Tree-cover analysis in the Town of Signal Mountain. Presented to the Signal Mountain Town Council, Signal Mountain, TN.

26. Fossil Presentation to 1st Grade Class at St. Nicholas School, Chattanooga, Tennessee (28 March 2017).

27. Fossil Presentation to 2nd Grade Class at St. Nicholas School, Chattanooga, Tennessee (16 May 2017).

28. Electronic cigarettes and their effects on oral and respiratory tissue: A research and public health perspective. CADHA Fall Symposium. Chattanooga, Tennessee. November 18, 2016.

29. Research meanderings between Fish and vaping. Biology Department Seminar Speaker. Covenant College, Lookout Mountain, Georgia. September 30, 2016.

30. Effects of electronic cigarettes on cell cultures, and their implications for human health. E.O. Grundset lecture. Southern Adventist University, Collegedale, Tennessee. September 24, 2015.

31. E Cigarettes. UTC Biology, Geology, & Environmental Science Seminar. University of Tennessee at Chattanooga, Chattanooga, Tennessee. August 28, 2014.

32. 2016. Structures at Green Gap, Whiteoak Mountain, Tennessee. Chattanooga Geology Club.

33. 2014. Structures at the Wildwood, Georgia, Chattanooga Geology Club.

34. Craddock, H. (2014) The return of the chestnut; a tree crop archetype. TEDxUTChattanooga https://www.youtube.com/watch?v=bz_NgKnVKxE.

35. Gaudin, T.J. 2012. Vertebrate Biodiversity in the Chattanooga area. Presented to local organization "Skeptics in the Pub," Chattanooga TN.

36. Gaudin, T.J. 2012. The Bat Colony: Measuring ecological disturbances with fossils. Presented to Dalton Science Café, Dalton GA.

37. Gaudin, T.J. 2013. Invasion of the Flying Killer Armadillos. Presented to UTC Wildlife-Zoology Club, University of Tennessee at Chattanooga, Chattanooga TN.

38. Gaudin, T.J. 2013. Sampling Methods for Mammals. Lecture and field survey exercise for Tennessee Naturalist Program, Chattanooga Nature Center, Chattanooga TN.

39. Gaudin, T.J. 2013. Armadillos and the Mammal Tree of Life. Presented to Alexian Village Continuing Ed lecture series, Chattanooga TN.

40. Gaudin, T.J. 2014. Of faeries, softballs, and the invasion of the Flying Killer Armadillos. Presented to Brown Bag Lunch Presentation series, Nashville Zoo, Nashville TN.

41. Guest speaker at the UTC Wildlife and Zoology Club meetings on 3/9/2016 and 11/2/2016

42. Guest speaker for UTC EDGE club meeting on 11/16/2016.

43. Guest speaker Tennessee Naturalist Program at Audubon Acres 1/28/2017.

44. Presentation on Chile work to Results Physiotherapy, Chattanooga, TN.

45. R. Covino, J. Auchter, J. Boyd, H. Klug, L. Irvin, C. Laing, & J. Peacock. 2014. Pop culture in the classroom. University of Tennessee Chattanooga Instructional Excellence Retreat.

46. Klug, H. 2014. Engaging students in large classes. University of Tennessee at Chattanooga Think-Achieve Workshop.

47. Murphy CA. Grass ID Workshop. Wild Ones Tennessee Valley Chapter Meeting. Chattanooga, TN. October 10, 2015.

48. Murphy CA. Native grasses of the Tallgrass Prairie (and around here). Wild Ones Tennessee Valley Chapter Meeting. Chattanooga, TN. February 10, 2014.

49. Spratt, H. G., Jr. 2013. Fracking". A presentation to the University of Tennessee at Chattanooga's student environmental group, "EDGE", Chattanooga, TN.

50. Spratt, H. G., Jr., and J. Wilferth. 2013. Overview of Fracking Relative to UT's Proposed Fracking Study in the Cumberland Forest. A presentation to the University of Tennessee Faculty Council, Chattanooga, TN.

51. Spratt, H. G., Jr., and J. Wilferth. 2013. Fracking. A presentation to the Cherokee Group, Tennessee Chapter, Sierra Club, Chattanooga, TN.

52. Williams, Wayne K. 2017. "Evidence of an Ancient Meteorite Impact, Sudbury, Canada" presented to the Chattanooga Geology Club.

53. Williams, Wayne K. 2016. "Cruise Ship Geology" presented to the Chattanooga Geology Club.

54. Chatzimanolis, S. 2016. Myrmecophily in xanthopygine rove beetles (Coleoptera: Staphylinidae). XXV International Congress of Entomology, Orlando, Florida.

55. Chatzimanolis, S. 2014. The evolution of myrmecophily in xanthopygine rove beetles. University of Oslo, Norway.

56. Churnet, HG. Structures of the Blue Ridge. University of Tennessee Biology seminar.

57. Gaudin, T.J. 2012. Armadillos and the Mammal Tree of Life. Lecture for Biology Seminar course (BIOL 4940), University of Tennessee at Chattanooga.

58. Gaudin, T.J. 2015. Patriomanis, America's pangolin (by the way, what on earth is a pangolin?!). E.O. Grundset Lecture Series, Southern Adventist University.

59. Exogenous Fatty Acids Impact Phospholipid Remodeling and Virulence Phenotypes in Pathogenic Vibrio Species. Invited Chemistry Seminar. The University of the South. Sewanee, TN. 2016.

60. Insane in the Membrane: Bacterial Assimilation of Exogenous Fatty Acids Affects Virulence Phenotypes. Invited Biology Seminar. The University of Tennessee at Chattanooga. Chattanooga, TN. 2015.

61. It's What's on the Outside that Counts: Bacterial Lipid Strategies for Adapting to their Environment. Invited Chemistry Seminar. The University of Tennessee at Chattanooga. 2013.

62. Diversifying Your Lipid Portfolio: Bacterial Membrane Remodeling for Adaptation to the Environment. Invited Biology Seminar. The University of Tennessee at Chattanooga, TN. 2013.

63. Hayes, L.D. 2016. Costly breeding: Why do mammal females rear offspring together? University of West Georgia.

64. Hayes, L.D. 2016. Costly breeding: Why do mammal females rear offspring together? Southern Adventist University (TN).

65. Hayes, L.D. 2016. Costly living: Why do Octodon degus females live in groups despite fitness costs? Miami University (Ohio).

66. Hayes, L.D. 2015. Costly living: Why do Octodon degus females live in groups despite fitness costs? Vanderbilt University (Tn).

67. Hayes, L.D. 2015. Mammalian plural breeding: Why Bother? University of North Texas.

68. Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? University of Memphis.

69. Hayes, L.D. 2014. Research on Octodon degus sociality in Bosque Fray Jorge National Park, Chile – an information presentation (in Spanish) to CONAF-Chile park rangers.

70. Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? Institut Pluridisciplinaire Hubert Curien, Strasbourg, France.

71. Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? UC-Davis.

72. Hayes, L.D. 2013. Mammalian plural breeding: Why Bother? University of North Carolina-Asheville.

73. Hayes, L.D. 2013. Mammalian plural breeding: Why Bother? Universidad de Chile, Santiago, Chile.

74. Hayes, L.D. 2013. Mammalian plural breeding: Direct fitness consequences and neuroendocrine mechanisms. Georgia Gwinnett College.

75. Estimation of suspended sediment associated mercury concentration in Enid Lake, MS, using the Moderate-Resolution Imaging Spectroradiometer (MODIS) imagery and in situ measurements. Department of Biology, Geology, and Environmental Science Seminar Class. The University of Tennessee at Chattanooga, November 11, 2016.

76. Klug, H. 2016. Parental care, filial cannibalism, & the evolution of social behavior. Florida State University.

77. Klug, H. 2016. Computational Evolutionary Ecology: Parental Care, Filial Cannibalism, and Social Behavior. This presentation was part of a Computational Science presentation given to Chancellor Angle and his Executive Team and President DiPietro, UT System Administrators, and Washington DC Liaisons. University of Tennessee at Chattanooga.

78. Klug, H. 2016. Parental care, filial cannibalism, & the evolution of social behavior. Southern Connecticut State University.

79. Klug, H. 2015. Parental care, filial cannibalism, & the evolution of social behavior. Kennesaw State University.

80. Klug, H. 2014. Parental care, filial cannibalism, & the evolution of social behavior. Breeding System Evolution Workshop, Sun-Yat Sen University, Guandong, China.

81. Klug, H. 2014. The (mis)measurement of sexual selection. University of Tennessee at Chattanooga.

82. Klug, H. 2013. Parental care, filial cannibalism, & the evolution of social behavior. Norwegian University of Science and Technology.

83. Klug, H. 2013. Parental care, filial cannibalism, & the evolution of social behavior. Southern Adventist University.

84. Klug, H. 2012. Parental care, filial cannibalism, & the evolution of social behavior. Vanderbilt University.

85. Klug, H. 2012. Parental care, filial cannibalism, & the evolution of social behavior. University of North Carolina – Ashville.

86. Murphy CA. Aboveground-belowground interactions: Investigating the role of plant communities in structuring soil bacterial communities. Biology Seminar, Department of Biological and Environmental Sciences, University of Tennessee-Chattanooga. September 19, 2014.

87. S. Richards. 2017. Environmental Exposures Associated with Low Birth Weight. American Osteopathic College of Occupational and Preventive Medicine Conference. March 8-12th. Chattanooga, TN. Invited Presentation.

88. S. Richards, E. Hussar*, Z.Q. Lin, R.P. Dixon, and K. A. Johnson. 2012. Human Health Risk Assessment of 16 Priority Polycyclic Aromatic Hydrocarbons in Soils of Chattanooga, Tennessee, USA. The International Workshop for Environmental Health and Pollution Control. September 23-28th, Harbin Normal University and Beijing Normal University, Heilongjiang Province, Peoples Republic of China. Invited Presentation.

89. S. Richards. Occurrence and ecological hazard of pharmaceuticals in surface water. The Ecology, Evolution, Behavior, & Organismal Biology (EEBOB) seminar series. Kennesaw State University on April 22nd, 2015. Invited Presentation.

90. S. Richards. 2014. Pharmaceuticals in the Aquatic Environment. Presented to UTC Sigma Xi, Chattanooga, TN on March 5th, 2014. Invited Presentation.

91. S. Richards. 2014. Investigations into the cause of low birth weight in Hamilton County, TN. Presented to the UT College of Medicine, Erlanger Hospital, Chattanooga, TN on January 10th, 2014. Invited Presentation.

92. East Tennessee State University. 2017. Digitizing Tennessee’s herbarium collections will expand their support of research, teaching and service.

93. Tennessee Technological University. 2017. Digitizing Tennessee’s herbarium collections will expand their support of research, teaching and service.

94. Austin Peay State University. 2017. Digitizing Tennessee’s herbarium collections will expand their support of research, teaching and service.

95. Botanical Research Institute of Texas. 2015. Herbaria support and promote research from field to molecular studies.

96. Kennesaw State University. 2015. Herbaria support and promote research from field to molecular studies.

97. Ozark Chinquapin Foundation. 2014. Preliminary findings of genetic differences between geographically spaced Ozark chinquapins (Castanea ozarkensis, Fagaceae).

98. Southern Adventist University. E.O. Grundset Lecture Series. 2014. The importance of Tennessee herbaria and their use in field studies and building taxonomic guides to database creation, modeling, policy formation, and even the search for variable molecular markers.

99. Middle Tennessee State University. 2013. Herbaria are keystone to botanical research from field studies and building taxonomic guides to database creation, modeling, policy formation, and even the search for variable molecular markers.

100. Ozark Chinquapin Foundation. 2013. Preliminary findings of genetic differences between geographically spaced Ozark chinquapins (Castanea ozarkensis, Fagaceae).

101. Spratt, H. G., Jr., and D. Giles. 2016. Investigations of select bacterial pathogens in the physical environment of Erlanger Hospital's neonatal and pediatric intensive care units. A presentation, University of Tennessee College of Medicine – Chattanooga, and Erlanger Hospital personnel, Grand Rounds.

102. Spratt, H. G., Jr. 2016. Infectious disease agents in the environment of the Children's Hospital at Erlanger's neonatal intensive care unit: Preliminary results. A presentation to officials and staff of Erlanger's NICU.

103. Bakland, P.E., Team Salamander, and T.P. Wilson. 2016. A Species Checklist of Plethodontid Salamanders from Hamilton and Marion Counties in southeast Tennessee. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P15, Pg. 4.

104. Brocco, C., Nabors, M., Schrenker, E., Bakland., P.E., Team Salamander, and T.P. Wilson. 2016. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P19, Pg. 4.

105. Dillard, M.J., Bakland, P.E., Hooper, J.W., Wilson, P.J., Team Salamander, and T.P. Wilson. 2017. In the Shadows of a Brownfield: Using Citizen Scientists to Better Elucidate the Spatial Ecology of the Eastern Box Turtle (Terrapene carolina carolina, Linnaeus, 1758) in Southeastern Tennessee. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

106. Madsen, S., Altonen, R., Wilson, T.P., and Team Salamander. 2017. Clean Water and River Health Education Using Freshwater Turtles: A Charismatic Approach.   Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

107. Wilson, T.P., Dillard, M.J., Manis, C., Moss, S., Wilson, P.J., and Team Salamander. 2017. Application of Design Process Thinking and Structured Decision Making to the Conservation of Freshwater Turtles in the Thrive 2055 Region. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

108. Wilson, T.P. 2016. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Reflection Riding Arboretum and Nature Center.   I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

109. Wilson, T.P. 2015. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Tennessee Aquarium, and Reflection Riding Arboretum and Nature Center.   I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

110. Wilson, T.P. 2014. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Tennessee Aquarium, and Reflection Riding Arboretum and Nature Center.   I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

111. Wilson, T.P. 2013. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Tennessee Aquarium, and Reflection Riding Arboretum and Nature Center.   I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

Conference Presentations

1. **D. A. Aborn and L. K. Marsh. 2017 "Age-related differences in body condition in areas of different pedestrian activity". Ornithological Congress of the Americas, Puerto Iguazu, Argentina.**

2. D. A. Aborn. 2016. Differences Between First and Second Broods of Tree Swallows (*Tachycineta bicolor*) in Chattanooga, TN. North American Ornithological Conference, Washington, DC.

3. D. A. Aborn. 2015. Reproductive Biology of Tree Swallows (*Tachycineta bicolor*) in Chattanooga, TN. Joint Wilson Ornithological Society, Association of Field Ornithologists, and Canadian Society of Ornithology meeting, Wolfville, Nova Scotia

4. **D. A. Aborn and L. K. Marsh. 2015. The Effect of Human Disturbance on Avian Body Mass: Do Recreationists Hinder Birds' Abilities to Maintain Body Condition During Migration" International Urban Wildlife Conference, Chicago, IL**

5. **L. K. Marsh and D. A. Aborn. 2015. The Effect of Human Disturbance on Avian Body Mass: Do Recreationists Hinder Birds' Abilities to Acquire Fat During Migration. Association of Southeastern Biologists, Chattanooga, TN.**

6. **A. B. Hudson and D. A. Aborn. 2013. Seasonal correlations between *Pueraria montana* var. *lobata* (kudzu) and avian diversity and relative abundance in Hamilton County, Tennessee. Eastern Bird Banding Association, Fall Creek Fall State Park, TN.**

7. D. A. Aborn. 2012.Mass changes of passage migrants during autumn stopover at an urban park in Tennessee. North American Ornithological Conference, Vancouver, British Columbia.

8. Detchemendy, T., Santiago, M., Barbosa, J. 2017. Effects of Exogenous ß-alanine on Primary Root Growth, Potassium Accumulation and Polyamine Biosynthesis in *Arabidopsis Thaliana.* National Council Undergraduate Research (NCUR) Memphis, TN USA. (Two variants of this abstract were presented in different events: a) National Council Undergraduate Research (NCUR) Memphis, TN USA April 6-8 2017 and b) The American Society of Plant Biologists (ASPB) Orlando, FL USA April 8-10 2017).

9. **Paul-Erik Bakland, Ethan Carver, Jose Barbosa, Bradley Reynolds, Team Salamander, and Thomas Wilson. Investigation of the Amphibian Chytrid Fungus in East Tennessee. Research Dialogues UTC. University of Tennessee Chattanooga, TN April 11-12 2017.**

10. **Thomas P. Wilson, Jose Barbosa, Ethan Carver, Brad Reynolds, Penni Jo Wilson, Team Salamander, Tabitha M Wilson. 2016. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions For The Future. The Wildlife Society's Annual Conference. Raleigh, NC October 15-19 2016.**

11. **Barbosa, J., Morris R., Ayres, M. 2012. Presence of Exogenous Amino Acids and Ion Concentrations in the Growth Medium Differentially Affect Primary Root Growth in *Arabidopsis thaliana* Seedlings. American Society of Plant Biologists (Abstract # P24028), Austin, TX USA.**

12. Boyd J, Tyree G. Exploring the role of local adaptation in plant species responses to climate warming. Poster presentation. Ecological Society of America. Fort Lauderdale, FL. August 2016.

13. Boyd J, Raymond G, Call G, Pistrang M. Adaptive leaf-level physiology exhibited by the rare orchid *Platanthera integrilabia* across contrasting habitats. Oral presentation. Botany 2016. Savannah, GA. July 2016.

14. Boyd J. How do light and soil moisture availability affect white fringeless orchid growth and reproduction? Oral presentation. Big South Fork National River and Recreation Area/Obed Wild and Scenic River 2016 Science Meeting. Rugby, TN. April 2016.

15. Boyd J. An energetic approach to understanding plants in a changing climate. Oral presentation. UTC Research Dialogues. April 2016.

16. Frey S, Tyree G, Hiestand J, Boyd J. Collaborative construction: building a calorimeter to expand plant ecophysiological research at UTC. Poster presentation. UTC Research Dialogues. April 2016.

17. Wilder L, Foster K, Boyd J. An ecophysiological investigation of climate change impacts on the imperiled eastern hemlock. Poster presentation. UTC Research Dialogues. April 2016.

18. Wilson J, Tyree G, Stamper J, Boyd J. Exploring the role of local adaptation in plant species responses to climate warming. Poster presentation. UTC Research Dialogues. April 2016.

19. Raymond G, Boyd J. How do light availability and soil characteristics affect growth and reproduction of *Platanthera integrilabia* (white fringeless orchid)? Poster presentation. Association of Southeastern Biologists. Spartanburg, SC. April 2014.

20. Russo L, Montgomery C, Hoover D, Odell J, Raymond G, Boyd J. Invasive plant species distribution and abundance in Tennessee Army National Guard Volunteer

Training Sites: from ground surveys to Geographic Information System layers. Poster presentation. Association of Southeastern Biologists. Spartanburg, SC. April 2014.

21. Odell J, Sikkema J, Hoover D, Raymond G, Boyd J. Ten years of monitoring of federally threatened *Scutellaria montana* in Catoosa County, Georgia: findings and recommendations.

22. Oral presentation. Tennessee Academy of Science. Tullahoma, TN. November 2013.

23. Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Association of Southeastern Biologists. Charleston, WV. April 2013.

24. Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Tennessee Academy of Science. Jackson, TN. October 2012.

25. Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Association of Southeastern Biologists. Athens, GA. April 2012.

26. Lyon A, Craddock JH, Boyd J. Using leaf-level gas-exchange characteristics to investigate the shade tolerance of *Castanea dentata* and *C. mollissima*. Oral presentation. Association of Southeastern Biologists. Athens, GA. April 2012.

27. Sikkema J, Shaw J, Boyd J. Effects of invasive species on federally threatened *Scutellaria montana* Chapm. Poster. Association of Southeastern Biologists. Athens, GA. April 2012.

28. Lyon A, Craddock JH, Boyd J. Investigating the shade tolerance of *Castanea dentata*, *C.*

29. Bramblett, Jeremy L. and Gaudin, Timothy J. 2017. Using Polymer Clays to Make Molds and Casts of Teaching Specimens. *10th Annual Meeting of the Southeastern Association of Vertebrate Paleontology June 14th-17th.*

30. Brock-Hon, A.L., Hon, K.D., 2017. A geophysical investigation of three closed topographic depressions atop the Cumberland Plateau, Tennessee. Accepted for presentation at the Annual GSA meeting in Seattle, WA.

31. Mies, J.W., Brock-Hon, A.L., Churnet, H.G., Holmes, A.E., Williams, W.K., 2016. The curricular benefits of a seismometer in UTC's Geology program. Geological Society of America Abstracts with Programs, v. 48, n. 3.

32. Dudley, D., Brock-Hon, A.L., 2016. Mineralogical study at Mormon Mesa, Nevada. Geological Society of America Abstracts with Programs v. 48, n. 3.

33. Brock-Hon, A.L., Hon, K.D., 2016. Preliminary results from a geophysical survey on a large depression in the Pennsylvanian clastic caprock of the Cumberland Plateau: Geological Society of America Abstracts with Programs v. 48, n. 3.

34. Brock-Hon, A.L., 2016. Whole and partial clast solution and the impact on interpretation of morphological and chemical change over time in petrocalcic soil horizons: ASA-CSSA-SSSA Annual meeting abstract.

35. Petsch, J., Brock-Hon, A.L., 2014. Sediment characterization for future cosmogenic dating in Raccoon Mountain Caverns, Hamilton County, TN: Geological Society of America Abstracts with Programs v. 46, n. 3, p. 98.

36. Morgenthaler, S.E., Brock-Hon, A.L., 2014. Report of an ongoing investigation into the development of dissolution voids in petrocalcic materials at Mormon Mesa, Nevada: Geological Society of America Abstracts with Programs v. 46, n. 6, p. 511.

37. Brock-Hon, A.L., 2013. Preliminary investigation of post-cementation gravel dissolution in petrocalcic horizons, southern Nevada: Geological Society of America Abstracts with Pograms v. 45, n. 7.

38. Robins, C.R., Buck, B.J., Brock-Hon, A.L., 2013. Micromorphology of pedogenic ooids and pisoids in petrocalcic soils of the southwestern United States. Soil Science Society of America, abstract.

39. Thakkar, K., Brock-Hon, A.L., 2012. Preliminary geologic and geomorphic map of Late Neogene and younger sediments in the eastern portion of the Overton, NE 7.5 minute quadrangle, Nevada: Geological Society of America Abstracts with Programs. V. 44, n. 7, p. 236.

40. Erin A. Schrenker, Ethan A. Carver, Jose M. Barbosa, and Thomas P. Wilson. Measuring the presence of the amphibian pathogen Batrachochytrium dendrobatidis in east Tennessee. East Tennessee Collegiate Division meeting of the Tennessee Academy of Science, Pellissippi State, Friday April 21, 2017.

41. Macall A. Nabors, Thomas P. Wilson, Ethan A. Carver, Jose M. Barbosa, and Team Salamander. Prevalence of Batrachochytrium dendrobatidis (Bd) in watercourses situated in southeast Tennessee. East Tennessee Collegiate Division meeting of the Tennessee Academy of Science, Pellissippi State, Friday April 21, 2017.

42. C.M. Hale et al. The Effects of E-cigarette Exposure on Cell Viability and Gene Expression. ASB 2017 in Montgomery, Alabama, March, 29 – April, 1, 2017.

43. Cameron Brocco, Dr. Ethan Carver, Dr. Jose Barbosa, Brad Reynolds, Team Salamander, and Dr. Thomas P. Wilson. An Analysis of Prevalence of Chytrid Fungus in an Amphibian Assemblage in Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

44. Macall Nabors, Dr. Ethan Carver, Dr. Jose Barbosa, Team Salamander, Dr. Thomas Wilson. The Prevalence of Batrachochytrium dendrobatidis in Watercourses Situated in Southeast Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

45. Erin Schrenker, Dr. Ethan Carver, Dr. Jose Barbosa, Team Salamander, and Dr. Thomas P. Wilson Measuring the Presence of the amphibian pathogen Batrachochytrium dendrobatidis in East Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

46. Paul-Erik Bakland, Dr. Ethan Carver, Dr. Jose Barbosa, Bradley Reynolds, Team Salamander, Dr. Thomas Wilson. Investigation of Habitat Effects on the Prevalence of the Amphibian Chytrid Fungus in East Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

47. C.M. Hale et al. The Effects of E-cigarette Exposure on Cell Viability and Gene Expression. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

48. Ethan A. Carver, Marlowe, M., Kovach, M.J., and Potts, G.E. Gene Regulation and Viability of Cell Cultures Exposed to E-Cigarette Refill Solutions. NIDA Genetics Consortium Meeting. Rockville, MD 20852, December 1-2, 2016.

49. Wilson, T., Barbosa, J., Carver, E., Reynolds, B., Wilson P.J, Team Salamander, and T.M. Wilson. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions for the Future. The Wildlife Society's 2016 Annual Conference. October 15-19, 2016.

50. Marlowe, M., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Cell Viability and Gene Regulation In Response to Contents of E-Cigarette Refill Solutions. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee April 13, 2016.

51. Marlowe, M., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Cell Viability and Gene Regulation In Response to Contents of E-Cigarette Refill Solutions. 77th Annual Meeting, Association of Southeastern Biologists, Concord, NC. March 31– April 3, 2016.

52. Marlowe, M., Beavers, C., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Effects of Alkaloids Found in Electronic Cigarette Refill Solutions on Cell Growth and Gene Expression. UTC Research Day, University of Tennessee at Chattanooga, Chattanooga, Tennessee. April 14, 2015.

53. Marlowe, M., Beavers, C., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Effects of Alkaloids Found in Electronic Cigarette Refill Solutions on Cell Growth and Gene

Expression. 76th Annual Meeting Program Association of Southeastern Biologists, Chattanooga, Tennessee. April 1-4, 2015.

54. Beavers, C. and E.A. Carver. The Effects of E-cigarette Solutions on Cell Growth. UTC Research Day, University of Tennessee at Chattanooga, Chattanooga, Tennessee. March 21, 2014.

55. Wilson, T., Barbosa, J., Carver, E., Reynolds, B., and Team Salamander. An Assessment of Batrachochytrium dendrobatidis Infection in Two Species of Ranid Frogs on a Former United States Department of Defense (DoD) Installation in Southeastern Tennessee. Meeting of Ichthyologists and Herpetologists. Chattanooga, Tennessee. July 30-August 3, 2014.

56. Sircy, L. and Carver, E.A. "Evaluation of skeletal muscle developmental mutations in Danio Rerio." The Southeast Regional Meeting of the Society for Developmental Biology. Vanderbilt University, Nashville, Tennessee. May 13-15, 2013.

57. Cho C.Y., Vaughn, A.R., Albu, T.V., Carver E.A., and Kim, J. "Studies of Ribonuclease A modifications induced by para-benzoquinone." American Chemical Society 243rd National Meeting , San Diego, CA. March 25 - 29, 2012.

58. Brunke, A., S. Chatzimanolis and H. Schillhammer. 2016. The first fossil of the subtribe Anisolinina reveals another case of boreotropical relictualism in the Staphylinini. 31st International Staphylinidae Meeting, Brussels, Belgium.

59. Marlowe, M. C. Murphy and S. Chatzimanolis. 2015. Sexual dimorphism in the rove beetle Triacrus dilatus. Southern Regional Honors Conference, Greenville, South Carolina.

60. Chatzimanolis, S and A. Brunke. 2014. The evolution of myrmecophily in xanthopygine rove beetles. Entomological Society of America Annual Meeting, Portland, Oregon.

61. Brunke, A., A. Solodovnikov and S. Chatzimanolis. 2014. Molecular, morphological and fossil data reveal the Cyrtoquediina (Coleoptera: Staphylinidae: Staphylinini), a new subtribe of rove beetles with multiple biogeographic disjunctions. Entomological Society of America Annual Meeting, Portland, Oregon.

62. **Jonathan C. Stanfield and Habte G. Churnet. 2016. Characterization of the Silurian Rockwood Formation Ironstone at Lauderback Ridge, South East Tennessee. Tennessee Academy of science.**

63. Mies..J.W., Brock-Hon. A.L, Churnet, H.G., Holmes A.E and Williams W.K. 2016. The curriculum benefits of a seismometer in UTC's Geology Program. *Geol. Soc. Am. Abs. with Prog.* To be presented in the March-April meeting in Columbia, South Carolina.

64. Churnet, H. G., 2015, The Lauderback Ridge fault bend fold at Green Gap, Whiteoak Mountain, Tennessee, *Geol. Soc. Am. Abs. with Prog.* v. 47, n. 2, p. 34.

65. Churnet, H. G., 2015, Implications of the variation in lithology of the Wilhite Formation exposed along roads by three rivers in the Southern Tennessee Blue Ridge. *Geol. Soc. Am. Abs. with with Prog.* v. 47, n. 2, p. 21.

66. Churnet, H.G,, 2014, Ramp folds in the Valley and Ridge: an example from the Wildwood exit of I-24 southbound lane, Georgia, Tennessee Academy of science, P.

67. Mies, J. W., Holmes, A. E., and Churnet, H. G., 2014, The Costa Rican field experience at UTC: 20 years in the making. *Geol. Soc. Am. Abs. with Prog.* v. 46, n. 6, p. 47.

68. Churnet, H.G., 2013. The Cretaceous Cayo Formation at Puerto Cayo, Western Ecuador. GSA, abstract N0 195-9, V. 45, No 7.

69. **Steven, A. J. and Churnet, HG., 2013. The nature of the contact between the Dean and theWilhite formations at milepost 26.5 along US Highway #64, Ocoee Gorge, Southeast Tennessee** Blue Ridge, Annual Meeting: Tennessee Academy of Science, Program, Nov. 15, P.13

70. **Petsch, J. A. and Churnet, HG., 2013. Structures within the Walden Creek Group proximal to** the confluence of the Hiwassee River and Wolf Creek, Polk County, Tennessee, Southeast Tennessee Blue Ridge, Annual Meeting: Tennessee Academy of Science, Program, Nov. 15, P.13

71. J. Houser, H. Craddock, Richards S. Arsenic Uptake by Beets (Beta vulgaris) Cultivated in Roxarsone-Contaminated Soil. Abstracts of the 2016 Society of Environmental Toxicologists and Chemists. November 6-10, 2016. Orlando, FL.

72. Perkins, M.T., J. Shaw, and J.H. Craddock. 2016. Phylogeographic examination of Castanea Mill. (Fagaceae) morphotypes in the eastern United States. Meeting of the Association of Southeastern Biologists. March 31-April 3 2016. Concord, NC. In: Southeastern Biology 63(2): 163.

73. Perkins, M.T. and J.H. Craddock. (2015) Phylogeny and biogeography of North American Castanea (Fagaceae): chloroplast and nuclear DNA sequences as indicators of cryptic diversity in the Southeast. Schatz Tree Genetics Symposium. (Poster Abstract) 23-24 October, 2015. Pennsylvania State University.

74. Perkins, M.T. and Craddock, J.H. (2012). The effect of phosphite on mycorrhiza formation in Chinese-American hybrid chestnuts. Poster at 2012 American Chestnut Summit. 19-21 October 2012, Asheville, NC.

75. Harris, A., Shaw, J., and Craddock, J.H. (2012) A Floral Survey and Census of American Chestnut at Bendabout Farm, Bradley County,Tennessee. In: Proceedings for the 2012 Chestnut Summit. The American Chestnut Foundation and the USDA Forest Service, October 19-21, 2012, Asheville, NC.

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194. Schorr MS, Huser, D. 2016. Effects of perched road culverts on the abundance of Blacknose Dace (Rhinichthys atratulus) in Blue Ridge streams in Cherokee National Forest, Tennessee. Southeastern Biology. Association of Southeastern Biologists, Concord, NC (April 2016).

195. Atwell AK, Huser D*, Smith JB*, Schorr MS. 2015. Environmental correlates of lotic macroinvertebrate diversity in the Lookout Creek watershed (Tennessee River drainage). Association of Southeastern Biologists, Chattanooga, TN (April 2015).

196. Genard LM, Schorr MS, Saylor CF. 2015. Ecoregion-specific patterns in the distribution and abundance of the introduced Redbreast Sunfish (Lepomis auritus) and native Longear Sunfish (L. megalotis; Centrarchidae) in mainstem reservoirs of the Tennessee River drainage. Association of Southeastern Biologists, Chattanooga, TN (April 2015).

197. Atwell AK, Huser D, Smith JB, Schorr MS. 2015. Relationships Between Benthic Macroinvertebrate Assemblages, Stream Habitat, and Catchment Landscape Features in the Lookout Creek System (Tennessee River Drainage). Annual Meeting of the Tennessee Chapter of the American Fisheries Society, Chattanooga, TN (March 2015).

198. Schorr MS, Genard LM, Saylor CF. 2015. Spatiotemporal patterns in the distribution and abundance of the introduced Redbreast Sunfish (Lepomis auritus) and native Longear Sunfish (L. megalotis; Centrarchidae) in reservoirs of the Tennessee River drainage. Annual Meeting of the Tennessee Chapter of the American Fisheries Society, Chattanooga, TN (March 2015).

199. Shafer HL, Schorr MS, Kovach M, Shaw J. 2013. Chloroplast DNA sequence utility for the inference of low-level phylogenetic or phylogeographic studies among plants. Association of Southeastern Biologists, Chattanooga, TN (April 2013).

200. Harris, J., J. Shaw, and A. Morris. 2017. An investigation into the phylogeny, taxonomy, and biogeography of North American Clematis. Botany 2017, Ft. Worth, TX.

201. Irick, Z. and J. Shaw. The vascular flora of the Big Soddy Creek Gorge, Hamilton and Sequatchie counties, Tennessee. 2017. Association of Southeastern Biologists meeting in Montgomery, AL.

202. Harris, J. and J. Shaw. 2017. An investigation into the population structure and gene flow in North American Castanea Mill. (Fagaceae). Association of Southeastern Biologists meeting in Montgomery, AL.

203. Harris, J. and J. Shaw. 2016. Phylogenetic study of Castanea ozarkensis Ashe (Fagaceae) to determine the geographic distribution of genetic variability. Botany 2016 in Savanna, GA.

204. Morris, A., J. Shaw, C. Germaine-Aubrey, James Beck. 2016. Documenting a need for community data standards and a call for a new collaborative network in plant systematics and phylogeography. Botany 2016 in Savanna, GA.

205. Irick, Z. and J. Shaw. Preliminary vascular flora of the Big Soddy Creek Gorge. 2016. Association of Southeastern Biologists meeting in Concord, NC.

206. Perkins, M.T. and J.H. Craddock (should have listed J. Shaw). 2016. Phylogeographic examination of Castanea morphotypes in the eastern United States. Association of Southeastern Biologists meeting in Concord, NC.

207. Konrade, L, J. Shaw, and J. Beck. 2015. Evaluating range genetics in black cherry (Prunus serotina Ehrh.) with an expansive set of herbarium specimens. Paper presented at Botany 2015 in Alberta Canada.

208. Morris, A., O.R. Leonard, H. Shafer, M. Schorr, M. Kovach, and J. Shaw. 2015. Variation in noncoding chloroplast DNA regions at the lowest taxonomic levels: Tortoise and Hare IV and beyond. Paper presented at Botany 2015 in Alberta Canada.

209. Irick, Z. and J. Shaw. 2015. Preliminary Vascular Flora of Big Soddy Creek Gorge, Hamilton County, Tennessee. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

210. Harris, J. and J. Shaw. 2015. Phylogeographic study of Castanea ozarkensis Ashe to determine the geographic distribution of genetic variability across the ozarks. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

211. Morris, A., O.R. Leonard, C. Germaine-Aubrey, and J. Shaw. 2015. The state of plant phylogeography: a review of methodological approaches. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

212. Prater, A. and J. Shaw. 2015. The Vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker County, Georgia and a Biogeographical Analysis of the Coastal Plain Element on the Cumberland Plateau. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

213. Shaw, J. D. Estes, and A. Morris. 2014. Digitization of Tennessee herbarium collections. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

214. Irick, Z., and J. Shaw. 2014. Preliminary vascular plant flora of the Big Soddy Creek Gorge, Hamilton and Sequatchie counties, TN. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

215. Prater, A., and J Shaw. 2014. The vascular flora of the Lula Lake Land Trust on Lookout Mountain in Walker County, GA. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

216. Morris, A.B., O.R. Leonard, C. Germaine-Aubrey, and J. Shaw. 2014. Markers in time and space: The current state of the field of plant phylogeography. presented at Botany 2014 in Boise, ID.

217. Prater, R.A. and J. Shaw. 2014. The vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker Co. Georgia. Paper presented at the Association of Southeastern Biologists meeting in Spartanburg, SC.

218. Estes, D., A. Floden, T. Whitsell, J. Shaw, and B. Keener. Untangling the viny viornas: taxonomic studies in the genus Clematis (Ranunculaceae). Paper presented at the Association of Southeastern Biologists meeting in Spartanburg, SC.

219. Shafer, H. M. Schorr, M. Kovach, and J. Shaw. 2013. Chloroplast DNA sequence utility for the inference of low-level phylogenetic and phylogeographic studies of plants. Paper presented at the Tennessee Academy of Sciences meeting in Morristown, TN.

220. Prater, A. and J. Shaw. 2015. The Vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker County, Georgia. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

221. Carpenter, C., T. Gaudin, T. Wilson, and J. Shaw. 2013. Phylogeography of short-tailed shrews (Blarina) of southeast Tennessee. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

222. Harris, A., J. Shaw, and J.H. Craddock. 2013. A floral survey and census of American chestnut at Bendabout Farm, Bradley County, TN. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

223. Benson. A..R, J. Shaw, and J. Boyd. 2013. Impacts of large mammal herbivory on Scutellaria montana Chapm. at the Tennessee Army National Guard Training Site, Catoosa County, Georgia. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

224. Dennis, W.M. and J. Shaw. 2013. Taxonomy of Clematis subgenus Viorna and speciation in subsection Viornae. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

225. Shaw, J. and W. M. Dennis. 2013. A preliminary phylogeny of Clematis subg. Viorna (Ranunculaceae): toward the understanding of the complex biogeographic patterns of this taxon. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

226. Carpenter, C., T. Gaudin, T. Wilson, and J. Shaw. 2012. Phylogeography of short-tailed shrews (Blarina) of southeast Tennessee. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

227. Turk, J. J. Barbosa, and J. Shaw. 2012. Seed viability and vitality in Clematis fremontii (S. Wats.) W.A. Weber. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

228. Hart, S. D. Estes, B.E. Wofford, A. Floden, R. Shephard, M. Brock, and J. Shaw. 2012. Rare plants and habitat delineation of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

229. Benson. A..R, J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on Scutellaria montana Chapm. at the Tennessee Army National Guard Training Site, Catoosa County, Georgia. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

230. Chin, Siew-Wai, J. Wen, J. Shaw, R. Haberle, P.Z. Jorge, and D. Potter. 2012. Phylogeny and Historical Biogeography of Prunus (Rosaceae, Amygdaloideae). Paper presented at Botany 2012 in Columbus, OH.

231. Sisco, P.H., F.V. Hebard, T.C. Neel, J.H. Craddock, and J. Shaw. 2012. Cytoplasmic male-sterility in interspecific hybrids between American and Asian Castanea species is associated with the American "D" cytoplasm genotype. Paper presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

232. Craddock, J.H, and J. Shaw. 2012. Cytoplasmic genotypes of North American Castanea based on chloroplast DNA. Paper presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

233. Harris, A., J. Shaw, and J.H. Craddock. 2012. A floral survey and census of American chestnut at Bendabout Farm, Bradley County, TN. Poster presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

234. Shaw, J. H. Shafer, and M. Kovach. 2012. Chloroplast DNA sequence utility for inference of low-level or phylogeographic relationships among plants. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

235. Hart, S. D. Estes, B.E. Wofford, D. York, E. Blyveis, C. Klagstad, R. Shephard, C. Gorman, A.J. Floden, and J. Shaw. 2012. Floristic inventory and vegetation mapping of

the Ocoee River Gorge, Polk County, TN. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

236. Harris, A., J.H. Craddock, and J. Shaw. 2012. A floral survey and chestnut census of Castanea dentata (Marsh.) Borkh. (American chestnut, Fagaceae) at Bendabout Farm, Bradley County, TN. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

237. Alford, K., A. George, D. Neely, and J. Shaw. 2012. Population status and conservation genetics of the flame chub, Hemitrema flammea. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

238. Benson, A., J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on Scutellaria montana in the Tennessee Army National Guard Volunteer training site, Catoosa County, GA. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

239. Sikkema, J., J. Shaw, and J. Boyd. 2012. Effects of invasive species on federally threatened Scutellaria montana Chapm. Poster presented at the Association of Southeastern Biologists meeting in Athens, GA.

240. Blyveis, E., and J. Shaw. The vascular flora and phytogeographical analysis of the Tennessee River Gorge, Hamilton and Marion counties, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

241. Shaw, J., S. Hart, E. Blyveis, and D. Estes. 2012. Mapping the vegetational and ecological systems and associations of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

242. Benson, A., J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on Scutellaria montana in the Tennessee Army National Guard Volunteer training site, Catoosa County, GA. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

243. Hart, S., D. Estes, E. Blyveis, and J. Shaw. 2012. The vascular flora of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

244. Minchew, K., and J. Shaw. 2012. Investigating Clematis L. subgenus Viorna A.Gray: A closer look at the eastern North American virgin's bowers. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

245. Levine, D., and H.G. Spratt, Jr. 2017. Healthcare-associated infections and prevention strategies for the rehabilitation professions. Ann. meeting, United States Public Health Service, Scientific and Training Symposium. Chattanooga, TN.

246. Spratt, H. G., Jr. 2017. UTC's Clinical Infectious Disease Control research group: Helping local healthcare facilities in the battle against healthcare acquired infections. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

247. Melchionna, M., W. Harden, J. Gunn. M. Brzezienski, M. Epps, D. Levine, and H.G. Spratt, Jr. 2017. Efficacy of antibacterial saline wash during placement of breast prosthesis in bacterial load reduction. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

248. Smith, C., E. Kilpatrick, M. Rowin, J. Huff, D. Levine, D. Giles, and H. G. Spratt, Jr. 2017. Potential environmental reservoir for bacterial species that may serve as agents of nosocomial infections in neonatal and pediatric intensive care units of a local hospital. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

249. Webb, E. S., and H. G. Spratt, Jr. 2017. Degradation of aromatic dyes by bacteria isolated from soils previously exposed to aromatic compounds and by common lab bacterial cultures. Ann. meeting, Assoc. SE Biologists, Montgomery, AL (Southeastern Biology XX:XXX).

250. Spratt, H. G., Jr., D. Levine, D. Giles, M. Rowin, and J. Huff. 2017. Bacterial contamination in the environment of neonatal and pediatric intensive care units. Ann. meeting, Assoc. SE Biologists, Montgomery, AL (Southeastern Biology XX:XXX).

251. Spratt, H. G., Jr., and D. Giles. 2016. Investigations of select bacterial pathogens in the physical environment of Erlanger Hospital's neonatal and pediatric intensive care units. A presentation, University of Tennessee College of Medicine – Chattanooga, and Erlanger Hospital personnel, Grand Rounds.

252. Levine, D., H.G. Spratt, Jr., J. Bage, S. Boden, A. G. Collier, S. Douglas, L. A. Norris, E. Smith. 2016. Topical lotions and creams utilized in outpatient rehabilitation clinics as a potential source of bacterial contamination. Abstracts of Ann. Meeting, American Physical Therapy Association, Nashville, TN.

253. Leavell, A., K. Mcgee, C. Muegge, and H.G. Spratt, Jr. 2016. Microbial community dynamics related to the function of an artificial wetland. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:323).

254. Collier, A. Grace, H. G. Spratt, Jr., D. Levine, and J. Bage. 2016. Potential bacterial contamination from lotions and creams used for soft tissue mobilization and massage in outpatient rehabilitation clinics. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:322-323).

255. Spratt, H. G., Jr., D. Levine, A. G. Collier, and R. Kropp. 2016. Incidence of bacterial contamination in a hospital's neonatal intensive care unit. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:322).

256. Spratt, H. G., Jr. D. Levine, R. Walker, R. Tobias, H. Harmon, B. Rock, Z. Cooper, and D. Winkleman. 2015. Potential for bacterial contamination as a result of dry needling. Abstracts of Fall meeting, Tennessee Physiological Society, University of Tennessee at Chattanooga.

257. Tsukide, K., K. Quinn, A. Leavell, and H. G. Spratt, Jr. 2015. Evaluation of the efficacy of different bioremediation methods for the degradation of waste motor oil added to soil. Abstracts of Ann. meeting, Assoc. SE Biologists, Chattanooga, TN (Southeastern Biology 62:259).

258. Spratt, H. G., Jr., D. Levine, and R. Walker. 2015. Potential for deep tissue bacterial contamination as a result of dry needling. Abstracts of Ann. meeting, Assoc. SE Biologists, Chattanooga, TN (Southeastern Biology 62:259).

259. Spratt, H. G., Jr., M. M. Brown, E. Liner, and W. C. Hayes. 2014. Development of sporulating bacterial cultures for incorporation into pervious concrete before curing. Abstracts of Ann. meeting, Assoc. SE Biologists, Spartanburg, SC (Southeastern Biology 61:314-315).

260. Spratt, H. G., Jr., M. M. Brown, T. M. Gann, D. B. Wilson. 2013. The influence of bacterial growth in pores of pervious concrete on the flow of water through pervious pavements. Abstracts of Ann. meeting, Assoc. SE Biologists, Charleston, WV (Southeastern Biology 60:211).

261. Wilson, D. B., K. A. Harris, and H. G. Spratt, Jr. 2013. Mineralization of the herbicide simazine in golf course pond sediment: Comparison of passive bioremediation, biostimulation, and bioagumentation. Abstracts of Ann. meeting, Assoc. SE Biologists, Charleston, WV (Southeastern Biology 60:210-211).

262. Bakland, P.E., Carver, E., Barbosa, J., Reynolds, B., Team Salamander, and T.P. Wilson. 2017. Prevalence and Severity of Batrachochytrium dendrobatidis in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

263. Bakland, P.E., and T.P.Wilson. 2017. Investigation of the Amphibian Chytrid Fungus in East Tennessee. Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

264. 260. Bakland, P.E., Wilson, T.P., Hunt, N., Manis, C., Simpson, J.F., and Team Salamander. 2016. Herpetofaunal Checklist for Hamilton County as Generated Through Various Projects of the Herpetology Laboratory at the University of Tennessee at Chattanooga. Native Plant Symposium: Tennessee Valley Chapter of the

Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

265. Brocco, C., Carver, E., Barbosa, J., and T.P. Wilson. 2017. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. University of Tennessee at Chattanooga: Research Dialogues. Oral Presentation, April 2017.

266. Brocco, C., and T.P. Wilson. 2017. Spatial Analysis of Prevalence of Chytrid Fungus in an Amphibian Assemblage in Tennessee. Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

267. Daniels, K., and T.P. Wilson. 2017. Comparing unmanned aerial vehicles (UAVs) to traditional field methods in surveying of basking riverine turtles. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

268. Daniels, K., Wilson, T.P., and A. Carroll. 2017. Comparing Unmanned Aerial Vehicles (UAVs) to Traditional Field Methods in Surveying of Basking Riverine Turtles. Turtle Survival Alliance, Charleston, SC, Poster.

269. Dillard, M.J., Bakland, P.E., Hooper, J.W., Wilson, P.J., Team Salamander, and T.P. Wilson. 2017. In the Shadows of a Brownfield: Using Citizen Scientists to Better Elucidate the Spatial Ecology of the Eastern Box Turtle (Terrapene carolina carolina, Linnaeus, 1758) in Southeastern Tennessee. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

270. Harris, C., Hedrick, D., Bakland, P.E., Hunt, N., Elmore, J., Team Salamander, and T.P. Wilson. 2017. The Status and Conservation of the eastern hellbender (Cryptobranchus alleganiensis): Directions for the Future. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

271. Harris, C., Hedrick, D., Bakland, P.E., Hunt, N., Elmore, J., Team Salamander, and T.P. Wilson. 2017. The Status and Conservation of the eastern hellbender (Cryptobranchus alleganiensis): Is it Functionally Extinct? University of Tennessee at Chattanooga: Research Dialogues. Oral Presentation (Lightning Pitch), April 2017.

272. Hunt, N.R., Carroll, A., and T.P. Wilson. 2017. Predictive Spatial Modeling and Assessment for a Rare Tennessee Anuran: BARKING TREEFROG (Hyla gratiosa). Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

273. Hunt, N.R., Wilson, T.P., and A. Carroll. 2016. Land Cover Trends in Hyla gratiosa Presence at Watershed Scale in Tennessee. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

274. Hunt, N.R., Carroll, A., and T.P. Wilson. 2017. Land Cover Trends in Hyla gratiosa Presence at Watershed Scale in Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

275. Madsen, S., Altonen, R., Wilson, T.P., and Team Salamander. 2017. Clean Water and River Health Education Using Freshwater Turtles: A Charismatic Approach. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

276. Nabors, M., Carver, E., Barbosa, J., and T.P. Wilson. 2017. The Prevalence of Batrachochytrium dendrobatidis in Watercourses Situated in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

277. Schrenker, E., Carver, E., Barbosa, J., and T.P. Wilson. 2017. Measuring the Presence of the amphibian pathogen Batrachochytrium dendrobatidis in East Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

278. Wilson, T.P., Bakland, P.E., Hunt, N., and D.E. Collins. 2017. Reproductive Ecology of a Freshwater Turtle Community at Reelfoot Lake, Tennessee. Association of Southeastern Biologists Annual Meeting, Montgomery, AL; March 29 - April 1, 2017, P266.

279. Wilson, T.P., Dillard, M.J., Manis, C., Moss, S., Wilson, P.J., and Team Salamander. 2017. Application of Design Process Thinking and Structured Decision Making to the Conservation of Freshwater Turtles in the Thrive 2055 Region. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

280. Bakland, P.E., and T.P. Wilson. 2016. Prevalence and Severity of Batrachochytrium dendrobatidis in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

281. Bakland, P.E., and T.P. Wilson. 2016. Prevalence and Severity of Batrachochytrium dendrobatidis in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. 3-Minute Thesis, Oral Presentation, April 14, 2016.

282. Bakland, P.E., and T.P.Wilson. 2016. Preliminary Results of an Investigation of the Amphibian Chytrid Fungus, Bactrachochytrium dendrobatidis, at Retention Ponds and Natural Wetlands in Southeast Tennessee. The Wildlife Society Annual Meeting, Raleigh, NC; October 18, 2016, Poster #210, Pg. 74.

283. Bakland, P.E., Team Salamander, and T.P. Wilson. 2016. A Species Checklist of Plethodontid Salamanders from Hamilton and Marion Counties in southeast Tennessee.

Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P15, Pg. 4.

284. Brocco, C., Nabors, M., Schrenker, E., Bakland., P.E., Team Salamander, and T.P. Wilson. 2016. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P19, Pg. 4.

285. Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., Reynolds, B., and T.P.Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

286. Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., Reynolds, B., and T.P.Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 13, 2016.

287. Dillard, M.J., Hooper, J., Team Turtle, and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in Urban and Fragmented Landscapes of Southeast Tennessee. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

288. Dillard, M.J., and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in Urban and Fragmented Landscapes of Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

289. Dillard, M.J., Hooper, J., and T.P. Wilson. Home range, habitat use, and movement patterns of the Eastern Box Turtle in a fragmented landscape in southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

290. Dillard, M.J., Hooper, J., Team Salamander, and T.P.Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in an Urban and Fragmented Landscape of Southeast Tennessee. Association of Southeastern Biologists Annual Meeting, Concord, NC; March 31 - April 3, 2016, P212.

291. Dillard, M.J., Hooper, J., Team Salamander, and T.P. Wilson. 2016. In the shadows of a Brownfield at the Dawn of Gig City: The Spatial Ecology of the Eastern Box Turtle in an Urban and Fragmented Landscape of Southeaster Tennessee. The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #60, Pg. 54.

292. Hooper, J., Mowry, C.B., Wilson, T.P., and T.J. Gaudin. 2016. I Think a Coyote Attacked My Pet. Potential Effects of Assumption and the Need for Investigations to

Validate Human-Coyote Conflict. The Wildlife Society Annual Meeting, Raleigh, NC; October 19, 2016, 4:00PM, Pg. 92.

293. Hunt, N.R., Carroll, A., and T.P. Wilson. 2016. Land Cover Trends in Hyla gratiosa Presence at Watershed Scale in Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

294. Hunt, N.R., Carroll, A., and T.P. Wilson. 2016. Land Cover Trends in Hyla gratiosa Presence at Watershed Scale in Tennessee. Tennessee Geographic Information Council (TNGIC), Chattanooga Convention Center, Chattanooga, TN, April 27-28, 2016, Poster.

295. Hunt, N.R., Carroll, A., and T.P.Wilson. 2016. Predictive Spatial Modeling for a Rare Tennessee Anuran: Barking Treefrog. The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #145, Pg. 71.

296. Schrenker, E., Dempsey, M., Korshun, A., Mitchell, A., Schwartz, R., Reynolds, B, and T.P. Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Station at the University of Tennessee at Chattanooga. Association of Southeastern Biologists Annual Meeting, Concord, NC; March 31 - April 3, 2016, P175.

297. Schrenker, E., Dempsey, M., Korshun, A., Mitchell, A., Schwartz, R., and T.P. Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. The Wildlife Society Annual Meeting, Raleigh, NC; October 18, 2016, Poster #217, Pg. 74.

298. 294. Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B., Wilson, P.J., Team Salamander and T.M. Wilson. 2016. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions for the Future. The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #61, Pg. 54.

299. Wilson, T.P., Dillard, M.J., Hooper, J., and Team Salamander. 2016. The Spatial Ecology of the Eastern Box Turtle (Terrapene carolina carolina) in an Isolated Urban Landscape of Southeast Tennessee. 14th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles. New Orleans, LA, August 2, 2016. g. 14.

300. Wilson, T.P., Reynolds, B., Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., and Team Salamander. 2016. The Development and Implementation of a Natural Science Living and Learning Community and a Case for Hands-On Herpetology Utilizing the Biological Field Stations at UT-Chattanooga. JMIH 2016, July 9, 2016, New Orleans, LA, Lightning Talk #778, Pg. 28.

301. Dillard, M.J. and T.P. Wilson. 2014.   Lewis Award: The spatial ecology of the eastern box turtle in urban and fragmented landscapes of southeast Tennessee. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

302. Reynolds, B.R., and Wilson, T.P. 2014. “Lessons Learned Using Transformational Leadership and Reflective Journaling: A Case for Hands-on Herpetology.” Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

303. Reynolds, B.R., and Wilson, T.P. 2014. “A Walk in the Woods: Battling Herpetophobia among Non-Science Majors.” Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

304. Reynolds, B.R., and Wilson, T.P. “Transformational Leadership, Hands-On Herpetology, and Reflective Journaling: Impacting Student Conservation Ethic.” Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

305. Reynolds, B., and T.P. Wilson. 2014. “A walk in the woods: battling herpetophobia among non-science majors”. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

306. Simpson, J.F. III, and T.P. Wilson. 2014. An Assessment of a Herpetofaunal Community in Southeastern Tennessee: Ecology, Biodiversity, Threats, and Conservation Status. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

307. Szarka, G.W., and T.P. Wilson. 2014. Sampling Amphibians and Reptiles in Southeastern Tennessee: Lessons Learned and Implications for Conservation and Management. Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

308. Szarka, G.W., and T.P. Wilson. 2014. Sampling Amphibians and Reptiles in Southeastern Tennessee: Lessons Learned and Implications for Conservation and Management. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

309. Wilson, T.P., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2014. “In the shadows of a brownfield: Nest site selection by marbled salamanders (Ambystoma opacum) in an isolated wetland in southeastern Tennessee.” Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

310. Wilson, T.P., Bakland, P.E., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2104. In the Shadows of a Brownfield at the Dawn of Gig City: Nest Site Selection by Marbled Salamanders (Ambystoma opacum) in an Isolated Wetland in Southeastern Tennessee. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

311. Wilson, T.P., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2014. “In the shadows of a brownfield at the dawn of Gig City: nest site selection by marbled salamanders (Ambystoma opacum) in an isolated wetland in southeastern Tennessee”. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

312. Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B.R., and Team Salamander. 2014. “An Assessment of Batrachochytrium dendrobatidis Infection in Two Species of Ranid Frogs on a Former United States Department of Defense (DOD) Installation in Southeastern Tennessee.” Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

313. Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B., and Team Salamander. 2014. “An assessment of Batrachochytrium dendrobatidis infection in two species of ranid frogs on a former United States Department of Defense (DoD) installation in southeastern). The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

314. Wilson, T.P., Carroll, A., Simpson, J., Manis, C., and Team Salamander. 2014. “Amphibians, Wetlands and the Faces of Development: Who gets the Gig?” Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

315. Wilson,T.P., Carroll, A., Simpson, J., Manis, C., and Team Salamander. 2014. “Amphibians, wetlands and the faces of development: who gets the gig?” The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

316. Wilson, T.P., Manis, C., Moss., S., Minton, R., Schorr, M., and Team Turtle. 2014. “Sex ratios and size dimorphisms in the Tennessee River Gorge turtle community”. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

317. Wilson, T.P., Reynolds, B., and Team Salamander*. 2014. “The importance of biological field stations in local conservation and education: a UTC perspective”. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

318. Wilson, T.P., Simpson, J.F., Reynolds, B.R., Bakland, P.E., Hunt, N., Madsen, S., Altonen, R., Bird, B., Cooksey, M., Grigsby, W., Taylor, M., Dillard, M., Wisdom, M., Mericier, A., Szarka, G., Hooper, J., Manis, C., Wilson, T.M., and Team Salamander. 2014. “Team Salamander and its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga (UTC).” Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

319. Wilson, T.P., Simpson, J., Reynolds, B., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Bird, Bird, Cooksey, M., Grigsby, W., Taylor, M., Dillard, M., Wisdom, M.,

Mericier, A., Szarka, G., Hooper, J., Manis, C. Wilson, T.M. Wilson, and Team Salamander. 2014. “Team Salamander and its evolution in becoming the longest-running group studies initiative at the University of Tennessee at Chattanooga (UTC)”. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

320. Wilson, T.P., Armstrong, D., and J. Simpson. 2013. Demographic Characteristics and Genetic Status of an Isolated Population of Spotted Salamanders: Implications for Management and Recovery. The Wildlife Society Annual Conference, Oct. 5-10, 2013, Milwaukee, WI.

321. Wisdom, M.D., Wilson, T.P., Reynolds, B., and M.J. Dillard. 2013. Constructing Vernal Pools to Create and Enhance Amphibian Habitat. Southeastern Partners for Amphibian and Reptile Conservation. Feb. 21-24, 2013. Hickory Knob State Park, SC.

322. Wilson, T.P., Armstrong, D., Bascom, M., Barbosa, J., Carver, E., Dillard, M., Reynolds, B., Simpson, J., Wisdom, M., and C. Manis. 2013. A Swamp-Walker’s Journal: Herpetology at the University of Tennessee at Chattanooga. Southeastern Partners for Amphibian and Reptile Conservation. Feb. 21-24, 2013. Hickory Knob State Park, SC.

323. Carpenter, C., Gaudin, T., Wilson, T.P., and J. Shaw. 2012. Phylogeography of short-tailed shrews (Blarina) of southeast Tennessee. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

324. Carpenter, C., Gaudin, T., Shaw, J., and T.P. Wilson. 2012. Phylogeography of short-tailed shrews (genus: Blarina) of southeast Tennessee. Abstracts of 22nd Colloquium on the Conservation of Mammals in the Eastern United States, Louisville, MS.

325. Wilson, T.P. 2012. The Chronicles of Green-Printing: The Great Salamander Ball. Annual Meeting for the Tennessee Geographic Information Counsel (TNGIC). March 28, 2012. Montgomery Bell State Park, TN.

326. Wilson, T.P. 2012. Salamanders: Landuse Planning, Conservation and Greenspace. Annual Meeting for the Society of Conservation GIS. July 19-22, 2012, Monterey, CA.

Appendix Z. Faculty Development, Scholarship, and Service

Detailed professional development, scholarly activity, and service of full-time BGE faculty

Bolded entries in peer reviewed publications and conference presentations involved student contributors. Examples of press regarding faculty activities are listed in some responses. Geology faculty are listed separately near the end of this document (pages Z-105 – Z-119).

Biology and Environmental Science Faculty

David Aborn

Faculty development
Participated in the Advanced Banding and Molt Techniques Workshop, Iguazu National Park, Argentina

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Wade, M. L., and D. A. Aborn. 2016. A Study of Avian Nest Predation at Audubon Acres in Chattanooga, TN. The Migrant 87:37-50

Submitted or in preparation
Marsh, L. K. and D. A. Aborn. In Review. Relationship Between Human Intrusion and Avian Body Condition During Fall Migration. Journal of Urban Ecology

Hudson, A. B., and D. A. Aborn. In Review. Seasonal Correlations Between Kudzu and Avian Species Diversity and Abundance in Southeast Tennessee. The Wilson Journal of Ornithology

Aborn, D. A. In Review. Clutch and brood differences between first and second broods of Tree Swallows in southeast Tennessee. Southeastern Naturalist

Grants
External
National Science Foundation. Coping with stress: integrating hormones, behavior, phenotypic damage, and fitness (2015; M. N. Vitousek, D. R. Ardia, D. A. Aborn, and A. Rose). Funding: $498,891.

Tennessee River Gorge Trust Post-fledging movement and survival of Cerulean Warblers in the Tennessee River Gorge (2014; PI, D. A. Aborn). Funding: 40,000.

Tennessee Wildlife Resources Agency. Population dynamics of Northern Saw-whet Owls in the Southern Appalachians. (2013; PI, D. A. Aborn). Funding: $7,000.

Invited Educational Presentations
D. A. Aborn. 2016. “Bird Banding 101”. Memphis Chapter of the Tennessee Ornithological Society, Memphis, TN.

D. A. Aborn. 2016. “Birding makes cents (and dollars): the economic benefits of birding and bird festivals”. Hiwassee Sandhill Crane Festival, Birchwood, TN.

D. A. Aborn. 2014. “The breeding biology of Tree Swallows in Chattanooga, TN”. Chattanooga Civitan Club

D. A. Aborn. 2013. “Environmental issues in the Middle East”. Jewish Community Federation of Greater Chattanooga

Conference presentations
D. A. Aborn and L. K. Marsh. 2017 “Age-related differences in body condition in areas of different pedestrian activity”. Ornithological Congress of the Americas, Puerto Iguazu, Argentina.

D. A. Aborn. 2016. Differences Between First and Second Broods of Tree Swallows (*Tachycineta bicolor*) in Chattanooga, TN. North American Ornithological Conference, Washington, DC.

D. A. Aborn. 2015. Reproductive Biology of Tree Swallows (*Tachycineta bicolor*) in Chattanooga, TN. Joint Wilson Ornithological Society, Association of Field Ornithologists, and Canadian Society of Ornithology meeting, Wolfville, Nova Scotia

D. A. Aborn and L. K. Marsh. 2015. The Effect of Human Disturbance on Avian Body Mass: Do Recreationists Hinder Birds’ Abilities to Maintain Body Condition During Migration” International Urban Wildlife Conference, Chicago, IL

L. K. Marsh and D. A. Aborn. 2015. The Effect of Human Disturbance on Avian Body Mass: Do Recreationists Hinder Birds’ Abilities to Acquire Fat During Migration. Association of Southeastern Biologists, Chattanooga, TN

A. B. Hudson and D. A. Aborn. 2013. Seasonal correlations between *Pueraria montana* var. *lobata* (kudzu) and avian diversity and relative abundance in Hamilton County, Tennessee. Eastern Bird Banding Association, Fall Creek Fall State Park, TN.

D. A. Aborn. 2012.Mass changes of passage migrants during autumn stopover at an urban park in Tennessee. North American Ornithological Conference, Vancouver, British Columbia.

Professional, University, Departmental and Community Service

Professional
2016-present: Local Organizing Chairperson for the joint Wilson Ornithological Society and Association of Field Ornithologists meeting, to be held in Chattanooga June 2018

2016-2017: Local Organizing Chairperson for the 14th North American Crane Workshop, held in Chattanooga January 2017

2014-2017: Editor of the Proceedings of the 13th North American Crane Workshop

2014-present: Board Member-Ornithological Societies of North America; I am a representative for the Association of Field Ornithologists

2012-present: Board Member-North American Crane Working Group

2012-2014: Editor of the Proceedings of the 12th North American Crane Workshop

University
Sustainability Committee (2012-2016)
Environmental Task Force (2007-present)
General Education (2013-2015)

Departmental
Environmental Science Lecturer Search Committee (2016-2017)
Strategic Plan Committee (2015-present; Chair, 2015-2016)
Chair, Integrative Ecologist Search Committee (2015-2016)
By-laws Committee (2015-2017)
Population Geneticist Search Committee. (2013-2014)
Program Coordinator for the Master of Science degree in Environmental Science (2013-2015)
Schedule Committee (2012-2015)
Wildlife-Zoology Club Faculty Advisor (2012-present)

Press Regarding your work
2014: Tennessee's WildSide. Sandhill Cranes
2013: Tennessee's WildSide. Tree Swallows

Meredith Adams

Faculty development
Instructional Excellence Conference. UTC Walker Center for Teaching and Learning (2016, 2017)
Green Zone Training. UTC student veteran ally (2016)
Safe Zone Training. UTC LGBTQ student ally (2016)
Critical Thinking Assessment Test (CAT) Grading Session. UTC Walker Center for Teaching and Learning (2015, 2016)
MyMediasite Training. UTC Walker Center for Teaching and Learning (2015)
Scholarship of Teaching. Association of Southeastern Biologists 76th Annual Meeting, Chattanooga, TN (2015)
Getting Started on Course Redesign. UTC Walker Center for Teaching and Learning (2015)
Critical Thinking Assessment Analog Training. UTC Walker Center for Teaching and Learning (2014)

Instructional Excellence Retreat. Walker Center for Teaching and Learning (2012, 2013, 2014)
Flipped Classroom Learning Community. UTC Walker Center for Teaching and Learning (2013)
Pop Culture in the Classroom Seminar. UTC Walker Center for Teaching and Learning (2013)
A New Vision for Undergraduate Biology Education Symposium. Association of Southeastern Biologists 74th Annual Meeting, Charleston, WV (2013)
Cultivating Critical Thinking through Critical Reflection and Experience within and Beyond the Classroom. UTC Walker Center for Teaching and Learning (2013)
A New Vision for Undergraduate Biology Education Symposium. Association of Southeastern Biologists 73nd Annual Meeting, Athens, GA (2012)

Scholarly activity

Books and book chapters (Lab Manuals)
Bell, R., Boyd, J., Collins, L., Klug, H., Montgomery, M., and Nelson, C. 2015. *Investigations in Biology Laboratory Manual: Biology 1120.* 3rd ed. Plymouth: Hayden McNeil.

Bell, R., Boyd, J., Collins, L., Klug, H., Montgomery, M., Nelson, C., and Shaw, J. 2013. *Investigations in Biology Laboratory Manual: Biology 1110.* 3rd ed. Plymouth: Hayden McNeil.

Professional, University, Departmental and Community Service

University
Admissions Committee (2017-present)
Academic Standards & Scholarships Committee (2015-2017)
Admissions Committee (2012-2015)
Read2Achieve (2016)
Critical Thinking Assessment Test grading (2014-2016)
House Calls: Office of the Dean of Students (2015)
Late Night Breakfast: Office of the Dean of Students (2012-2013)
Operation: Move-In (2013)
House Calls: Office of the Dean of Students (2015)
First Year Reading Experience (2012)

Department
Strategic Plan Committee (2016-2017)
Student Awards & Relations Committee (2013-2017)
Low Student GPA Committee (2012-2017)
Biology Lecturer search committee (2017)
Biology 1110 General Education Recertification (2016)
EDGE Student Advisory Committee (2012-2016)
Integrative Ecologist Search Committee (2015)
Curriculum Mapping: BIOL 1110, 1120, 1130 and ESC 1500 (2014)
Student Retention Committee (2012-2013)
Tri-Beta Student Advisory Committee (2012)
Space and Planning Committee (2012)

Community
Chattanooga Area Chamber of Commerce: Reality Check program for Hamilton County high schools (2017)
Signal Mountain Middle High School: Science fair judge (2015)
Tennessee Environmental Council 50K Tree Day: collaboration with Ivy Academy and UTC EDGE (2016)
Chattanooga School for the Arts and Sciences: Senior project evaluator (2012-2014)
Tyner Academy: Science fair judge (2014)
Neema Resettlement Outreach: STEM and ESL education (2013-2014)
Tennessee River Rescue: UTC EDGE students (2012-2014)

<u>Jose Barbosa</u>

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
*Accepted or Published*Thomas P. Wilson*, Bradley R. Reynolds, Penni Jo Wilson, Paul-Erik Bakland, Jeremy Hooper, Nyssa Hunt, Simone Madsen, Maria Cooksey, Patricia Garland, Wes Grigsby, Brittany Killian, Nakeisha Ricks, Liz Staundt, Micah Taylor, Emily Busby, Jose Barbosa, Ethan Carver, Daniel Armstrong, Mark Dillard, Joe Simpson, Mark Wisdom, Tabitha M. Wilson, and Team Salamander (2017) Team Salamander and Its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga. Southeastern Naturalist Vol.16 (Special Issue 10):70–93.

Wilson TP, Barbosa J, Carver E, Reynolds BR, Team Salamander, and Wilson TM. (2015). An Assessment of *Batrachochytrium dendrobatidis* Prevalence in two species of Ranid Frogs on a FormerUnited States Department of Defense Installation in southeastern Tennessee. Herpetological Review. 46(1):37-41.

Cao J, Barbosa JM, Singh NK, Locy RD (2013) GABA transaminases from *Saccharomyces cerevisiae* and *Arabidopsis thaliana* complement function in cytosol and mitochondria. Yeast. 30(7): 279–289.

Cao J, Barbosa JM, Singh NK, Locy RD (2013) GABA shunt mediates thermotolerance in *Saccharomyces cerevisiae* by reducing reactive oxygen production. Yeast. 30(4): 129-144.

Submitted or in preparation
Barbosa, J., Patel, V., Singh, N., Locy, R. Identification of Arabidopsis thaliana aminotransferases that complement functions of GABA transaminase in Saccharomyces cerevisiae. Their Involvement in Stress Responses.

Barbosa, J., Felgueira, C., Sims, D., Mikelson, C., Stephens, N. Oxidative stress patterns of ald3 and ald4 knockouts of *Saccharomyces cerevisiae* and possible abatement by caffeine. Yeast.

Detchemendy, T., Santiago, M., Locy, R., Morris R., Ayres, M., Barbosa, J. 2017. Effects of Efficacy of Lipocalin Mediated Binding and Displacement of Non-polar Uremic Toxins from Protein Binding Stores**. Plant Physiol. & Biochemistry.**

Grants

External

Nephrogenesis, Llc. Efficacy of Lipocalin Mediated Binding and Displacement of Non-polar Uremic Toxins from Protein Binding Stores. (2014-2015; PI: Jose Barbosa) Funding: $80,510.

Dialysis Clinic, Inc.: Balloon Angioplasty of Dialysis AV Fistulae: Effect of Local Delivery of Inhibitors of Lysyl Oxidase on Serial Angioplasty and Time to Restenosis
Dr.Jose Barbosa (2016-2018**;**PI: Jose Barbosa). Funding: $426,043.00.

Internal

Teaching and Learning In Urban Gardening. An agrochemicals free project is to give UTC students the opportunity to learn basic skills they can use for plant production (food crops or ornamentals) while they simultaneously learn about composting recyclable waste products. UTC students will familiarize with techniques of plant production, which can motivate and enable them to have their own personal garden where they can produce genuine organic foods. No pesticides will be used this garden. Students will likewise use recyclable products to prepare their own potting material for plant production in pots. This project will provide opportunities to organize field visit for different community groups including local schools to share the UTC experience. Funding committed by different University offices: $7,700.

UTC Provost Student Award. Effect of β-Alanine on Expression of Potassium Transporter Genes in *A. thaliana* (2012-2013; Student: Megan Ayres)Funding: $1,000.

Research Center for Applied Biomolecular, Behavioral, and Health Studies. A myriad of research projects that involves faculty from different departments, including Chemistry, Biology, Psychology, Mathematics, HHP, and Anthropology. (2014-2015; Collaborators: Santiago M, Amanda J Clark, Barbosa Jose F, Barlow Sue J, O'Neill Eric M, Gao Cuilan, Gary Maynard, Giles David K, Nicky Ozbek, Foerder Preston G, Whitson Stefanie R, Kajita Yukie. Funding: $20,000

Invited Research Seminars

November 2017. Plant and yeast molecular response to stresses. The Southern University.

Invited Educational Presentations

August 2017. The urban gardening project. The Sierra Club of Chattanooga.

October 2017. The urban gardening and organoponics. The Science Café of Chattanooga

Conference Presentations

Detchemendy, T., Santiago, M., Barbosa, J. 2017. Effects of Exogenous ß-alanine on Primary Root Growth, Potassium Accumulation and Polyamine Biosynthesis in *Arabidopsis Thaliana.* National Council Undergraduate Research (NCUR) Memphis, TN USA **

** Two variants of this abstract were presented in different events:
- National Council Undergraduate Research (NCUR) Memphis, TN USA April 6-8 2017
- The American Society of Plant Biologists (ASPB) Orlando, FL USA April 8-10 2017

Paul-Erik Bakland, Ethan Carver, Jose Barbosa, Bradley Reynolds, Team Salamander, and Thomas Wilson. Investigation of the Amphibian Chytrid Fungus in East Tennessee. Research Dialogues UTC. University of Tennessee Chattanooga, TN April 11-12 2017

Thomas P. Wilson, Jose Barbosa, Ethan Carver, Brad Reynolds, Penni Jo Wilson, Team Salamander, Tabitha M Wilson. 2016. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions For The Future. The Wildlife Society's Annual Conference. Raleigh, NC October 15-19 2016

Barbosa, J., Morris R., Ayres, M. 2012. Presence of Exogenous Amino Acids and Ion Concentrations in the Growth Medium Differentially Affect Primary Root Growth in *Arabidopsis thaliana* Seedlings. American Society of Plant Biologists (Abstract # P24028), Austin, TX USA.

Professional, University, Departmental and Community Service

Professional
Member of advisory Board of Journal of Cape Verdean Studies (2015–present)
Founding member of the Cape Verdean Academy of Sciences and Humanities (ACHCV)

University
Sustainability Committee (2015-present)
Think achieve Task force (2012–2017)

Department
Department Self-Study Review (2017-present; Chair of ‘undergraduate curriculum’ section)
Curriculum Committee (2013–present; Chair)
Pre-Professional Committee (2008–2017)
Field Station Committee (2009–present)
Retention Tenure and Promotion (2013–present)

Press regarding your work
2017: Teaching and learning Garden. Puts Down Roots. CHATT, a magazine for the alumni and friends of UTC’s College of arts and sciences Spring 2017, Vol. 1 Issue 1.

2016: UTC helps feed and teach the community. News channel 9 July 30 2016

<u>Nominanda Barbosa</u>

Professional
Experience summary: Microbiology Lecturer Duration: August 2015 to Current Department of Biology, Geology and Environmental Sciences at UTC, Chattanooga, TN • Assigned to a

microbiology and health course, including both lecture and laboratory components • Micro lab prep coordinator • Prepares and grade all class assignments and examinations. • Maintains regular office hours for students. • Participates in departmental, and college professional activities.
Biology Lecturer Duration: August 2013 to August 2015 Department of Biological and Environmental Sciences at UTC, Chattanooga, TN • Assigned to an introductory Biology courses, including both lecture and laboratory components • Prepares and grade all class assignments and examinations. • Maintains regular office hours for students. • Participates in departmental, and college professional activities.

Others: during Fall 13 and 14, developed and tough an introductory lesson on "flow cytometry" for immunology class (4000's level).

During Fall 13, participated in an interview "foreign teacher" a project for a geography class.

University
Learning Support and Auxiliary Services (2016-present)

Departmental
Departmental Low Student GPA Committee (2013 – present)
Student Awards and Relations Committee (2013 – present)
Tri-Beta Committee (2013 – 2014)
Assessment and Retention Committee (2013 –present)
General Education Recertification for Microbiology and Health course (2015)
Search Committee for a new biology lecturer (2016-2017)
Microbiology Prep Lab Coordinator (2015-present)

Community
Mentor for high school students and have been assigned to CSAC (Chattanooga School of Art and Science; 2015-present).

Faculty Commons Christian Campus Ministry "faculty of faith group" member.

<u>DeAnna E. Beasley</u>

Faculty development
Faculty Mentoring Network: Resources for Collections-Based Undergraduate Education Workshop, University of Florida (2017)

Ant Workshop Organizer, Tennessee Naturalist Program, Audubon Acres (2017)

Certificate in Teaching Techniques (CITT) Program Participant, North Carolina State University (2015)

Preparing Future Faculty (PFF) Program Participant, University of South Carolina (2013)

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Dunn, R.R. and Beasley, D.E. (2016). Democratizing evolutionary biology, lessons from insects. Curr Opin Insect Sci. 18: 89 – 92.

Miller, E.A., Beasley, D.E., Dunn, R.R. and Archie, E.A. (2016). Lactobacilli dominance and vaginal pH: Why is the human vaginal microbiome unique? Front. Microbiol. 7. doi: 10.3389%2Ffmicb.2016.01936.

Li, H., Li, T., Beasley, D.E., Hedĕnec, P., Xiao, Z. et. al. (2016). Diet diversity is associated with beta but not alpha diversity of pika gut microbiota. Front. Microbiol. doi: 10.3389/fmicb.2016.01169.

Beasley, D.E., Koltz, A.M., Lambert, J.E., Fierer, N. and Dunn, R.R. (2015). The evolution of stomach acidity and its relevance to human microbiome. *PLOS ONE.* doi: 10.1371/journal.pone.0134116.

Beasley, D.E., Bonisoli-Alquati, A. and Mousseau, T.A. (2013). The use of fluctuating asymmetry as a measure of environmentally induced developmental instability: A meta-analysis. *Ecological Indicators*. 30: 218-226.

Beasley, D.E., Bonisoli-Alquati, A., Welch, S.M., Møller, A.P. and Mousseau, T.A. (2012). Effects of parental radiation exposure on developmental instability in grasshoppers. *Journal of Evolutionary Biology*. 25(6): 1149-1162.

Beasley, D.E., Benson, E.P., Welch, S.M., Reid, L.S. and Mousseau, T.A. (2012). The use of citizen scientists to record and map 13-Year periodical cicadas (*Hemiptera: Cicadidae: Magicicada*) in South Carolina. *Florida Entomologist*. 95(2): 486-488.

Submitted or in preparation
Beasley, D.E., Penick, C.A., Boateng, N.S.*, Menninger, H.L. and Dunn, R.R. Urbanization disrupts latitude-size rule in 17-year cicadas. Ecol. Evol. (*in review*).

Beasley, D. E., Epps, M.J., Morgan, S., and Dunn, R.R. Effects of temperature on immune function in a temperate ant (*Formicidae: Camponotus chromaiodes*). (in prep).

Beasley, D.E., Keleher, K., Fitzgerald, J, Fowler, A., Frank, S., Tarpy, D. and Dunn, R.R. Variation in bee wing morphology across an urban environment. (in prep).

Grants
External
National Science Foundation, Dimensions of Biodiversity Workforce REU-Broadening Participation Supplement (2015; PI: Rob R. Dunn, Lead investigators: DeAnna E. Beasley, Mary Jane Epps) Funding: $20,000.

National Science Foundation, Dimensions of Biodiversity Workforce REU-Broadening Participation Supplement (2014; PI: Rob R. Dunn, Lead investigators: DeAnna E. Beasley, Mary Jane Epps) Funding: $20,000

Internal
UTC Research and Creative Grant (2017). Funding: $6,950

UTC Research Dialogues Symposium Faculty Elevator Speech Competition (2017). Funding: $1,500

Invited Research Seminars
Beasley, D.E. (2016). The ecology of human-driven change. University of Tennessee, Chattanooga, TN.

Invited Educational Presentations
Beasley, D.E. (2017). Invisible Life: Exploring pathogen diversity in an urban environment. UTC Research Dialogues, Chattanooga, TN. *Winner of the Faculty Elevator Speech Competition in the STEM category.*

Beasley, D.E. (2017). What ants, cicadas and stomachs teach us about how to design healthy environments. Science Café: Chatt about Science. Chattanooga, TN.

Beasley, D.E. (2016). What ants, stomachs and classrooms teach us about how to design environments. Growing IN Place: Design for Children, Families and Nature in the City, Raleigh, NC.

Professional, University, Departmental and Community Service

Professional
Member, Association of Southeastern Biologists
Member, Council of Undergraduate Research

University
Planning committee member, Mocs I^3 Interdisciplinary Group

Department
Equipment committee
Natural History Museum committee

Community
Advisor, Chatt about Science, Science Cafe

Press regarding your work
Guest interview, 2017. National Science Foundation: The Rules of Life.
https://beta.prx.org/stories/210378

Guest interview, 2017. University of Tennessee at Chattanooga, WUTC: Dr. Beasley's research has UTC buzzing about these insects. http://wutc.org/post/dr-beasley-s-research-has-utc-buzzing-about-these-insects - stream/0

Contributing writer, 2015. Students Discover: Ant Health Watch. Your Wild Life. http://www.yourwildlife.org/2015/09/students-discover-ant-health-watch/

Guest interview, 2015. North Carolina Museum of Natural Sciences Bugfest 2015.WUNC: The State of Things. http://wunc.org/post/stream-state-things-live-museum-natural-sciences

Guest interview, 2015. The Ecology of the Future and the Future of Ecology. National Science Foundation. http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=135712&org=NSF

Guest interview, 2015. The Evolutionary Link between Diet and Stomach Acidity. North Carolina State University News. https://news.ncsu.edu/2015/07/beasley-acid-2015/

Guest interview, 2013. The Art and Science of Life after Chernobyl. Your Wild Life. http://www.yourwildlife.org/2014/01/the-art-and-science-of-life-after-chernobyl/

Jennifer Boyd

Faculty development
Serving as a Faculty Fellow with Walker Center for Teaching and Learning at UTC during 2016-2017 to help lead online course initiatives at UTC.

Participating in the Institute for Emerging Leadership in Online Learning (IELOL) during fall 2016.

Completed 'Applying the Quality Matters Rubric' training in fall 2017.

Participated in a ThinkAchieve Faculty Fellows cohort at UTC during 2013-2014 called 'Creating Meaningful Connections: Pop Culture in the Classroom' to explore best practices for the use of popular culture in teaching.

Developed three new courses for the University curriculum: Plant Ecology (BIOL/ESC 4540, ESC 5730) in fall 2012; Global Change Biology (BIOL/ESC 4460, ESC 5560) in fall 2013; and Controversies in Science (UHON) in fall 2015 (with colleague Dr. Hope Klug).

Earned ThinkAchieve designation for my Plant Ecology course (BIOL/ESC 4540, ESC 5730) in fall 2014 by demonstrating its contribution to the development of critical thinking skills.

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published

Turk JR, Alp N, Dattilo A, Boyd JN (*In Press*). Cost-benefit analysis of native warm season grasses for transmission line right-of-way revegetation. *Ecological Engineering*.

Wilder L, Boyd JN (2016) Ecophysiological responses of *Tsuga canadensis* (Eastern Hemlock) to projected atmospheric CO_2 and warming. *Southeastern Naturalist* 15: 697-713.

Boyd JN, Raymond GA. Call GP, Pistrang MJ(2016) Ecophysiological performance of the rare terrestrial orchid *Platanthera integrilabia* across contrasting habitats. *Plant Ecology* 217: 1259-1272.

Peacock J, Covino R, Irvin L, Boyd J, Klug H, Auchter J, Laing C (2016) University faculty perceptions and utilization of popular culture in the classroom. *Studies in Higher Education* 41: 1-13.

Sikkema JJ, Boyd JN (2015) Impacts of invasive *Ligustrum sinense* and *Lonicera japonica* removal on the co-occurring rare forest herb *Scutellaria montana* . *Acta Oecologica* 69: 182-191.

Benson AR, Boyd JN (2014) Individual- and population-level effects of *Odocoileus virginianus* herbivory on the rare forest herb *Scutellaria montana*. *Global Ecology and Conservation* 1: 80-92.

Kile HM, Shaw J, Boyd JN (2013) Response of federally threatened *Scutellaria montana* (large-flowered skullcap) to pre-transplantation burning and canopy thinning. *Southeastern Naturalist* 12: 99-120.

Submitted or in preparation

Russo L, Boyd JN. The effects of invasive *Lonicera maackii* leaves on survival and growth of invasive *Aedes albopictus* mosquitoes. To be submitted to *Southeastern Naturalist* in summer/fall 2017.

Project reports

Boyd J, Benson A, Montgomery C, Hoover D, Odell J, Raymond G, Russo L. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Submitted to the Tennessee Army National Guard. May 2015. 92 pp.

Boyd J, Benson A, Montgomery C, Hoover D, Odell J, Raymond G, Russo L. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Milan, TN. Submitted to the Tennessee Army National Guard. June 2015. 93 pp.

Boyd J, Benson A, Montgomery C, Hoover D, Odell J, Raymond G, Russo L. Invasive non-native plant species survey and assessment, Tennessee Army National Guard Volunteer Training Site, Smyrna, TN. Submitted to the Tennessee Army National Guard. April 2015. 84 pp.

Boyd J, Alexander K, Clark R, Holder T, Hultman W, Majors C, Parker S, Prater A, Russo L, Sellge S, Smith H, Snellgrove E, Turner A. Experiential student research to support the federal protection of rare *Platanthera integrilabia* (white fringeless orchid) on Starr Mountain, Cherokee National Forest, TN. Submitted to the Cherokee National Forest and the U.S. Fish and Wildlife Service. December 2013. 9 pp.

Boyd J, Hoover D, Majors C, Odell J, Parker S, Raymond G. 2013 large-flowered skullcap (*Scutellaria montana*) relocation from Hamilton County Parcel 121 010 to the Enterprise South Nature Park, Chattanooga, Tennessee. Submitted to S&ME Engineering Consultants. October 2013. 9 pp.

Boyd J, Sikkema J, Hoover D, Odell J, Raymond G. 2013 monitoring of large-flowered skullcap (*Scutellaria montana*) in the Volunteer Training Site, Tennessee Army National Guard, Catoosa Co., Georgia. Submitted to the Tennessee Army National Guard. September 2013. 277 pp.

Benson AR, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Submitted to the Tennessee Army National Guard. December 2012. 50 pp.

Shaw J, Boyd J. *Scutellaria montana* Chapm. Transplantation monitoring report 2012 Enterprise South Industrial Park, Hamilton County, TN. Submitted to the Tennessee Department of Transportation. June 2012. 18 pp.

Grants

External

Boyd J (PI; Lead Institution) Collaborative Research: RUI: Reasons for rarity? Exploring acclimatory and adaptive constraints to commonness. National Science Foundation, Division of Environmental Biology, Population and Community Ecology core program. September 2017 – August 2021. $519,385. Award #1655762 (Collaborative Awards #1655532, $218,562; #1655732, $373,745)

Boyd J. U.S. Fish and Wildlife Service. Assessing and enhancing the success of transplantation to support *Platanthera integrilabia* conservation. January 2017–December 2021. $22,354

Deardorff M (PI); Carver E, Romagni J, Boyd J (co-PIs). Collaborative Research: ASPIRE: Appalachian Students Promoting the Integration of Research in Education. National Science Foundation, Division of Undergraduate Education, Standard Grant program. September 2017–August 2021. $2,112,010. Award # 1643402

Boyd J (PI); Chatzimanolis S, Klug, H, Shaw J, Wilson TP (co-PIs); Potts GE, Spratt HG (major participants). MRI: Acquisition of growth chambers for global change biology research and teaching at the University of Tennessee at Chattanooga. National Science Foundation, Division of Biological Infrastructure, Major Research Instrumentation. January 2014–December 2016. $342,945. Award #1337530

Boyd J. Transplantation of *Scutellaria montana* from Hamilton County Parcel 121 010, TN. S&ME Engineering Consultants. September 2013–August 2014. $5,812

Boyd JN. How do light and soil moisture availability affect *Platanthera integrilabia* growth and reproduction? U.S. Fish and Wildlife Service. June 2013–December 2015. $10,815

Boyd JN. 2013 monitoring of the large-flowered skullcap (*Scutellaria montana*) in the Tennessee Army National Guard Volunteer Training Site (VTS) in Catoosa County, Georgia. The Tennessee Army National Guard. May 2013–September 2013. $18,926

Boyd JN. Invasive species survey and rare species impact assessment in the Tennessee Army National Guard Volunteer Training Sites. Tennessee Army National Guard. January 2013–December 2014. $89,000

Internal

Boyd J. Exploring the development of innovative models to predict species performance from ecologically important trait values. The University of Tennessee at Chattanooga, Faculty Research Grant. January 2017–December 2017. $1,174

Boyd J (PI); Bonsall M, Hiestand J, Carroll A (co-PIs) Investigating intraspecific variability in energetic responses to climate change toward a mechanistic approach to modeling plant species distributions. The University of Tennessee at Chattanooga, Collaborative Research Initiative for Sponsored Programs. July 2015–June 2016. $7,962

Boyd J. Intraspecific variability of climate change responses of Appalachian plant species. The University of Tennessee at Chattanooga Faculty Research Grant. July 2014–June 2015. $2,808

Boyd J. Investigating intraspecific variability of responses of Appalachian plant species to climate change toward an improved understanding of species migration. The University of Tennessee at Chattanooga Research and Creative Activity Grant. July 2014–June 2015. $3,861

Boyd J. Experiential student research to support the federal protection of a rare and locally endemic orchid species. The University of Tennessee at Chattanooga, ThinkAchieve Beyond the Classroom program. September 2013–December 2014. $1,470

Boyd J. How do light and soil moisture availability affect *Platanthera integrilabia* growth and reproduction? The University of Tennessee at Chattanooga Faculty Research Grant. May 2013–December 2014. $2,938

Invited Research Seminars

Boyd J. Biology Seminar, University of North Carolina at Asheville. Reasons for rarity? Exploring adaptive and acclamatory constraints to commonness. November 2016.

Boyd J. Investigating intraspecific variability of responses of Appalachian plant species to climate change. College of Arts and Sciences Convocation, University of Tennessee at Chattanooga. May 2015.

Boyd J. Plant species conservation in a changing world – land use, invasions, and climate considerations. Biology Seminar, University of Colorado at Colorado Springs. February 2015.

Boyd J. Adaptations of photosynthesis: from course concepts to research applications. Biology Seminar, Westminster College, Salt Lake City, UT. January 2015.

Boyd J. Experiential student research to support the conservation of a rare locally endemic orchid species. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2014.

Covino R, Auchter J, Boyd J, Irvin L, Klug H, Laing C, Peacock J. Pop culture in the classroom. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2014.

Boyd J. Experiential student research to support the conservation of a rare locally endemic orchid species. Research Day, University of Tennessee at Chattanooga. April 2014.

Boyd JN. Community-based learning on the urban campus. Instructional Excellence Retreat, University of Tennessee at Chattanooga. May 2013.

Invited Educational Presentations

Boyd J. November 2016. The mysterious white monkeyface orchid. Presented at the *Chatt about Science* Science Café, Chattanooga, TN.

Boyd J. December 2015. The tipping point of trees. Presented to the Chattanooga Institute of Noetic Sciences, Chattanooga, TN.

Boyd J. July 2014. Core course: Plant communities. Presented at Reflection Riding Arboretum & Nature Center, Chattanooga, TN.

Boyd J. June 2013. A new resident: invasion of the hemlock woolly adelgid in Signal Mountain, TN. Presented at the Signal Mountain Library, Signal Mountain, TN.

Boyd J. March 2013. Treating the hemlocks: but what about the bees? Presented to the Tennessee Valley Beekeepers Association, Chattanooga, TN.

Boyd J. May 2012. Tree-cover analysis in the Town of Signal Mountain. Presented to the Signal Mountain Town Council, Signal Mountain, TN.

Conference Presentations

Boyd J, Tyree G. Exploring the role of local adaptation in plant species responses to climate warming. Poster presentation. Ecological Society of America. Fort Lauderdale, FL. August 2016.

Boyd J, Raymond G, Call G, Pistrang M. Adaptive leaf-level physiology exhibited by the rare orchid *Platanthera integrilabia* across contrasting habitats. Oral presentation. Botany 2016. Savannah, GA. July 2016.

Boyd J. How do light and soil moisture availability affect white fringeless orchid growth and reproduction? Oral presentation. Big South Fork National River and Recreation Area/Obed Wild and Scenic River 2016 Science Meeting. Rugby, TN. April 2016.

Boyd J. An energetic approach to understanding plants in a changing climate. Oral presentation. UTC Research Dialogues. April 2016.

Frey S, Tyree G, Hiestand J, Boyd J. Collaborative construction: building a calorimeter to expand plant ecophysiological research at UTC. Poster presentation. UTC Research Dialogues. April 2016.

Wilder L, Foster K, Boyd J. An ecophysiological investigation of climate change impacts on the imperiled eastern hemlock. Poster presentation. UTC Research Dialogues. April 2016.

Wilson J, Tyree G, Stamper J, Boyd J. Exploring the role of local adaptation in plant species responses to climate warming. Poster presentation. UTC Research Dialogues. April 2016.

Raymond G, Boyd J. How do light availability and soil characteristics affect growth and reproduction of *Platanthera integrilabia* (white fringeless orchid)? Poster presentation. Association of Southeastern Biologists. Spartanburg, SC. April 2014.

Russo L, Montgomery C, Hoover D, Odell J, Raymond G, Boyd J. Invasive plant species distribution and abundance in Tennessee Army National Guard Volunteer Training Sites: from ground surveys to Geographic Information System layers. Poster presentation. Association of Southeastern Biologists. Spartanburg, SC. April 2014.

Odell J, Sikkema J, Hoover D, Raymond G, Boyd J. Ten years of monitoring of federally threatened *Scutellaria montana* in Catoosa County, Georgia: findings and recommendations. Oral presentation. Tennessee Academy of Science. Tullahoma, TN. November 2013.

Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Association of Southeastern Biologists. Charleston, WV. April 2013.

Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Tennessee Academy of Science. Jackson, TN. October 2012.

Benson A, Shaw J, Boyd J. Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Oral presentation. Association of Southeastern Biologists. Athens, GA. April 2012.

Lyon A, Craddock JH, Boyd J. Using leaf-level gas-exchange characteristics to investigate the shade tolerance of *Castanea dentata* and *C. mollissima*. Oral presentation. Association of Southeastern Biologists. Athens, GA. April 2012.

Sikkema J, Shaw J, Boyd J. Effects of invasive species on federally threatened *Scutellaria montana* Chapm. Poster. Association of Southeastern Biologists. Athens, GA. April 2012.

Lyon A, Craddock JH, Boyd J. Investigating the shade tolerance of *Castanea dentata*, *C.*

Professional, University, Departmental and Community Service

Professional
Physiology subject editor for *Castanea*, 2012–present.

Fulbright Discipline Peer Reviewer (Environmental Sciences), Council for International Exchange of Scholars, September 2015, September 2016, September 2017.

Member-at-large of the Southern Appalachian Botanical Society for 2015–2017.

National Science Foundation Panel Reviewer, Division of Environmental Biology, January 2016, November 2016.

Chaired the Tennessee Academy of Science Botany Section during 2013–2014 and served as section secretary during 2012–2013.

Chaired the Association of Southeastern Biologists Poster Award Committee during 2013–2014 and served as a committee member from 2011–2013.
Reviewer for *Acta Oecologia*, *American Journal of Botany*, *Castanea*, *Ecosphere*, *New Phytologist*, *Plant Ecology*, *PLoS One*, and *Southeastern Naturalist*.

Reviewer for W.H. Freeman and Oxford University Press.

University
Academic Standards Committee, 2014-present
Committee on Committees, 2014-present
Faculty Senate, 2014-present
Graduate Council, 2014-present
Graduate School Best Practices Committee, 2014-present
Academic Affairs/Student Development Task Force, 2016-2017
Strategic Plan Steering Committee, 2014-2015
Faculty Development Grants Committee, 2013–2014
Sustainability Committee, 2012–2013
Scholarships Committee, 2012–2013 (chair in 2012–2013)
Library Committee, 2012

Department
M.S. in Environmental Science Program Coordinator, 2015-present
Retention, Promotion & Tenure Committee, 2014-present
Assessment & Retention Committee, 2013–present
Graduate Committee, 2012–present (chair 2015–present)
Hiring & Planning Committee, 2014-2016
Student Awards & Relations Committee, 2014-2016 (chair in 2014–2015)
Curriculum Committee, 2012–2014

Tri-Beta Advisory Committee, 2012–2013
Library Committee, 2012

Community
Presented my research to Sale Creek Middle School students as a kickoff to their *Conservation Challenge* independent research program, August 2017.

Secretary of the Signal Mountain Tree Board (advisory to Town Council), 2009–2016

Assisted the Town of Signal Mountain, TN, in preparing its successful application to the Arbor Day Foundation to become a *Tree City USA* and its renewal applications, December 2010, December 2013, December 2016.

Tutored Sudanese refugees in GRE-level science and math as volunteer with the NEEMA Resettlement Project, Chattanooga, TN, 2012-2014.

Served as a panelist for 'Career Day' at Thrasher Elementary School, Signal Mountain, TN in to talk with 5th grade students about future career possibilities in STEM fields, April 2013.

Coordinated natural science activities and led an ecology activity during the Girl Scouts STEM Event at UTC to provide girls from regional high school schools with experiential learning opportunities in the STEM fields, March 2012.

Press regarding your work
Web feature, August 25, 2014, UTC homepage, student involvement in my research investigating climate change ecotypes in the Appalachians

<u>Jeremy L. Bramblett</u>

Faculty development
ANTH 2080 Cultural Anthropology (Fall 2012), The University of Tennessee at Chattanooga
ANTH 1520 Introduction to Anthropology (Spring 2013), The University of Tennessee at Chattanooga
SOC 1510 Introduction to Sociology (Summer 2013), The University of Tennessee at Chattanooga
ANTH 3060 World Prehistory (Fall 2013), The University of Tennessee at Chattanooga
ANTH 3350 Archaeological Field Methods (Summer 2014), The University of Tennessee at Chattanooga
ANTH 3210 Anthropological Theory (Spring 2015), The University of Tennessee at Chattanooga
Hazardous Materials Training (18 Nov 2016), The University of Tennessee at Chattanooga

Books and book chapters
Collins, L., K. Harrell, and J. Bramblett. 2012. *Human Physiology: Biology 2080 Laboratory Manual 1st Edition*. Hayden-McNeil Publishing, Plymouth, MI. 77pp.

Collins, L., K. Harrell, and J. Bramblett. 2013. *Human Physiology: Biology 2080 Laboratory Manual. 2nd Edition.* Hayden-McNeil Publishing, Plymouth, MI. 78pp.

Collins, L., K. Harrell, and J. Bramblett. 2015. *Human Physiology: Biology 2080 Laboratory Manual. 3rd Edition.* Hayden-McNeil Publishing, Plymouth, MI. 80pp.

Invited Educational Presentations
Fossil Presentation to 1st Grade Class at St. Nicholas School, Chattanooga, Tennessee (28 March 2017)

Fossil Presentation to 2nd Grade Class at St. Nicholas School, Chattanooga, Tennessee (16 May 2017)

Conference Presentations
Bramblett, Jeremy L. and Gaudin, Timothy J. 2017. Using Polymer Clays to Make Molds and Casts of Teaching Specimens. *10th Annual Meeting of the Southeastern Association of Vertebrate Paleontology June 14th-17th*.

Professional, University, Departmental and Community Service

University
Admissions Committee (AYs 2012-2013, 2013-2014, 2014-2015)
Integrated Studies Committee (AY 2014-2015)
Non-Tenure-Track Faculty (AYs 2012-2013, 2013-2014)
Petitions Committee (AY 2015-2016)

Department
Assessment & Retention Committee (AYs 2014-2015, 2015-2016, 2016-2017)
Bylaws Committee (AYs 2015-2016, 2016-2017)
Low-Student GPA Committee (AY 2012-2013)
Natural History Museum Committee (AYs 2012-2013, 2013-2014, 2014-2015, 2016-2017)
Pre-Professional Advisory (AYs 2012-2013, 2013-2014, 2014-2015)
Student Awards & Relations Committee (AY 2012-2013)
Space Planning Committee (AYs 2013-2014, 2015-2016)

Community
UTC Chattanooga Alumni Chapter Board (2013-2015)

<u>Ethan Carver</u>

Faculty development
2017 CGS New Deans Institute and Summer Workshop, Denver, Colorado, July 8-12, 2017.

2016 Institutional Animal Care and Use Committee (IACUC) Conference
Bellevue, WA. April 1-April 2, 2016.

2015 Institutional Animal Care and Use Committee (IACUC) Conference
Boston, MA. March 17-20, 2015.

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Wilson, T.P., Reynolds, B.R, Wilson, P.J., Bakland, P.E., Hooper , J., Hunt, N., Madsen, S. Cooksey, M., Garland, P., Grigsby, W., Killian, B., Ricks, N., Staundt, L., Taylor, M., Barbosa, J., Carver, E., Armstrong, D., Dillard, M., Simpson, J., Wisdom, M., Wilson, T.M, and Team Salamander (2017) Team Salamander and its Evolution in becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga. *Southeastern Naturalist* (Accepted-in press)

Kim, J., Albu, T. V., Vaughn, A. R., Kang, S. M., Carver, E. A., & Stickle, D. M. (2015). A comparison study on ribonuclease A modifications induced by substituted p-benzoquinones. *Bioorg Chem,* 59, 106-116.

Wilson, T.P., Barbosa, J.M., Carver, E.A., Reynolds, B.R. Richards, D., Team Salamander, Wilson, T.M. (2015). *Batrachochytrium dendrobatidis* Prevalence in Two Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee. *Herpetological Review,* 46(1), 37–41.

Elso ,C., Lu, X., Weisner, P.A., Thompson, H.L., Skinner A., Carver E., Stubbs, L. (2013) .A reciprocal translocation dissects roles of Pax6 alternative promoters and upstream regulatory elements in development of pancreas, brain, and eye. *Genesis*. 51(9):630-46.

Kim, J., Vaughn, AR., Cho, C., Albu, TV. and Carver, E.A. (2012). Modifications of Ribonuclease A Induced by p-Benzoquinone. *BioOrganic Chemistry* 40:92–98.

Books and book chapters
Published
Charles A. Lessman and Ethan A. Carver (co-editors) (2014). "*Zebrafish: Topics in Reproduction, Toxicology and Development.*" Nova Scientific Press, New York.

Dew, I., Sircy, L.M., Milleville, L., Taylor, M.R., Lessman, C.A.,Carver, E.A., (2014). Localization of the Sodium-Potassium-Chloride Cotransporter (Slc12a2) during Zebrafish Embryogenesis and Myogenesis and a Screen for Additional Antibodies to Study Zebrafish Myogenesis. *Zebrafish: Topics in Reproduction, Toxicology and Development.* Nova Scientific Press, New York :135-154.

Carver, E.A., Milleville, L., Barbosa, N.I. Taylor, M.R., Lessman, C.A. (2014). Localization of the Sodium-Potassium-Chloride Cotransporter (Slc12a2) during Zebrafish Embryogenesis and Myogenesis and a Screen for Additional Antibodies to Study Zebrafish Myogenesis. *Zebrafish: Topics in Reproduction, Toxicology and Development.* Nova Scientific Press, New York :155-178.

Grants

External

National Science Foundation (#1643402): Collaborative Research: ASPIRE: Appalachian Students Promoting the Integration of Research in Education. NSF S-STEM (09/2015-08/2021. PI: Ethan Carver; Co-PIs: Dr. Deardorff, Dr. Boyd, and Dr. Romangi). Funding: $2,112,010.

THEC- STEM Professional Development grant Learning Science Through Writing: Improving Content Knowledge and STEM-Related Literacy in Middle and High School Science Classes (05/2012-12/2013. PI: Dr. Ingraham, Co-PIs: Dr. Ellis, participant Ethan Carver). Funding: $197,109.

Internal

UTC CRISP: In-depth analysis of e-cigarette filling solutions and their biological implications. 7/15 – 6/16. PI: Dr. Potts, Co-PIs: Dr. Carver, and Dr. Kovach). Funding: $8,000.

Invited Educational Presentations

Electronic cigarettes and their effects on oral and respiratory tissue: A research and public health perspective. CADHA Fall Symposium. Chattanooga, Tennessee. November 18, 2016.

Research meanderings between Fish and vaping. Biology Department Seminar Speaker Covenant College, Lookout Mountain, Georgia. September 30, 2016.

Effects of electronic cigarettes on cell cultures, and their implications for human health. E.O. Grundset lecture. Southern Adventist University, Collegedale, Tennessee. September 24, 2015.

E Cigarettes. UTC Biology, Geology, & Environmental Science Seminar. University of Tennessee at Chattanooga, Chattanooga, Tennessee. August 28, 2014.

Conference presentations

Posters:

Erin A. Schrenker, Ethan A. Carver, Jose M. Barbosa, and Thomas P. Wilson. Measuring the presence of the amphibian pathogen Batrachochytrium dendrobatidis in east Tennessee. East Tennessee Collegiate Division meeting of the Tennessee Academy of Science, Pellissippi State, Friday April 21, 2017.

Macall A. Nabors, Thomas P. Wilson, Ethan A. Carver, Jose M. Barbosa, and Team Salamander. Prevalence of Batrachochytrium dendrobatidis (Bd) in watercourses situated in southeast Tennessee. East Tennessee Collegiate Division meeting of the Tennessee Academy of Science, Pellissippi State, Friday April 21, 2017.

C.M. Hale et al. The Effects of E-cigarette Exposure on Cell Viability and Gene Expression. ASB 2017 in Montgomery, Alabama, March, 29 – April, 1, 2017.

Cameron Brocco, Dr. Ethan Carver, Dr. Jose Barbosa, Brad Reynolds, Team Salamander, and Dr. Thomas P. Wilson. An Analysis of Prevalence of Chytrid Fungus in an Amphibian

Assemblage in Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

Macall Nabors, Dr. Ethan Carver, Dr. Jose Barbosa, Team Salamander, Dr. Thomas Wilson. The Prevalence of Batrachochytrium dendrobatidis in Watercourses Situated in Southeast Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

Erin Schrenker, Dr. Ethan Carver, Dr. Jose Barbosa, Team Salamander, and Dr. Thomas P. Wilson Measuring the Presence of the amphibian pathogen Batrachochytrium dendrobatidis in East Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

Paul-Erik Bakland, Dr. Ethan Carver, Dr. Jose Barbosa, Bradley Reynolds, Team Salamander, Dr. Thomas Wilson. Investigation of Habitat Effects on the Prevalence of the Amphibian Chytrid Fungus in East Tennessee. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

C.M. Hale et al. The Effects of E-cigarette Exposure on Cell Viability and Gene Expression. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee, April 2-3 2017.

Ethan A. Carver, Marlowe, M., Kovach, M.J., and Potts, G.E. Gene Regulation and Viability of Cell Cultures Exposed to E-Cigarette Refill Solutions. NIDA Genetics Consortium Meeting. Rockville, MD 20852, December 1-2, 2016.

Wilson, T., Barbosa, J., Carver, E., Reynolds, B., Wilson P.J, Team Salamander, and T.M. Wilson. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions for the Future. The Wildlife Society's 2016 Annual Conference. October 15-19, 2016.

Marlowe, M., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Cell Viability and Gene Regulation In Response to Contents of E-Cigarette Refill Solutions. UTC Research Dialogues, University of Tennessee at Chattanooga, Chattanooga, Tennessee April 13, 2016.

Marlowe, M., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Cell Viability and Gene Regulation In Response to Contents of E-Cigarette Refill Solutions. 77th Annual Meeting, Association of Southeastern Biologists, Concord, NC. March 31– April 3, 2016.

Marlowe, M., Beavers, C., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Effects of Alkaloids Found in Electronic Cigarette Refill Solutions on Cell Growth and Gene Expression. UTC Research Day, University of Tennessee at Chattanooga, Chattanooga, Tennessee. April 14, 2015.

Marlowe, M., Beavers, C., Potts, G.E., Kovach, M.J., and Ethan A. Carver. Effects of Alkaloids Found in Electronic Cigarette Refill Solutions on Cell Growth and Gene

Expression. 76th Annual Meeting Program Association of Southeastern Biologists, Chattanooga, Tennessee. April 1-4, 2015.

Beavers, C. and E.A. Carver. The Effects of E-cigarette Solutions on Cell Growth. UTC Research Day, University of Tennessee at Chattanooga, Chattanooga, Tennessee. March 21, 2014.

Wilson, T., Barbosa, J., Carver, E., Reynolds, B., and Team Salamander. An Assessment of *Batrachochytrium dendrobatidis* Infection in Two Species of Ranid Frogs on a Former United States Department of Defense (DoD) Installation in Southeastern Tennessee. Meeting of Ichthyologists and Herpetologists. Chattanooga, Tennessee. July 30-August 3, 2014.

Sircy, L. and Carver, E.A. "Evaluation of skeletal muscle developmental mutations in *Danio Rerio."* The Southeast Regional Meeting of the Society for Developmental Biology. Vanderbilt University, Nashville, Tennessee. May 13-15, 2013.

Cho C.Y., Vaughn, A.R., Albu, T.V., Carver E.A., and Kim, J. "Studies of Ribonuclease A modifications induced by para-benzoquinone." *American Chemical Society* 243rd National Meeting , San Diego, CA. March 25 - 29, 2012

Professional, University, Departmental and Community Service

Professional
Scientific Journals International (reviewer)
Associate Editor for SJI: Journal of Medical & Biological Sciences
Major Research Instrumentation Panel ID: P121057, April 19-20, 2012.

University
UTC Athletic Board (Chair: Compliance and Equity committee 2014-present)
IACUC Chair (2014-present)
IACUC co-chair (2013)
Housing Strategic planning committee (2017)
Banner Core team (2016-17)
COB CRM (Radius) committee (2016-17)
CRM planning committee(2016-17)
Research dialogs planning committee (2016-17)
Scholarship Luncheon Planning Committee (2017)
Pre-Health Professions Advisor Interview (3/24/17 and 3/27/17)
NCAA appeals committee (6/22/17)
Admin Spec I, Dir of UG Research Hiring committee (9/17)
BRAD Steering Committee (Chair: 2014-present)
Think Achieve Committee (2013-2016)
Alpha Society Nominations Committee (2013-2015)
Athletics Committee (2010-2013)
Bachelor's of Integrated Studies committee (2012-2015)

Racquetball Club Faculty Sponsor (2006-2015)

Departmental
Retention, Promotion, Tenure (2011-present)
By-Laws Committee (2016-present)
Assessment and Retention Committee (2014-Present) *Committee Chair (2014-16)
Pre-Professional Advisory Committee (2005-present) *Committee Chair (2011-15)
Student Awards & Relations *Committee Chair (2011-14)
Departmental Self Study section chair (2011-2012)
Low Student GPA committee (2009-2014)
Curriculum/Planning Committee (2007-2014)
Academic Advisor Hiring (2014)

Community
Boy Scout Loop-A-Palooza 2012 and 2013, science station
Signal Mountain Students TEAMS competition (2016)

<u>Jodi L. Caskey</u>

Faculty development
FERPA training (2013)
MyMocsDegree training (2014)
MyMediaSite training, Walker Center for Teaching and Learning (2015)
Camtasia training, Walker Center for Teaching and Learning (2017) [this is ongoing. I have completed half of the training, am waiting for the in-person training to be scheduled.]

Professional, University, Departmental and Community Service

Professional
Chapter Review [Cardiovascular System] for Vander's Human Physiology textbook (McGraw Hill Publishing, 2016)
Electronic Book Review [Human Anatomy] for TopHat Educational Software (2016)

University
Grant Reviewer for Provost Student Research Awards (2014, 2016)
First Class Experience (Fall 2015)
Commencement Volunteer (Spring 2017)

Departmental
Fall Visitation Day (Fall 2014)
Integrated Ecologist Search Committee (2016)
BGES Library Committee (Chair) [current]
BGES Award and Student Relation Committee (Member) [current]
BGES EDGE Faculty Sponsor (2014-2016)

Community
GEAR-UP Program volunteer, Howard High School, May 2017

Stylianos Chatzimanolis

Faculty development
Green Zone training
Safe Zone training

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Chatzimanolis, S. In Press. And then there were six: a revision of the genus *Phanolinopsis* Scheerpeltz (Coleoptera: Staphylinidae: Staphylininae). Zootaxa.

Chatzimanolis, S. In Press. An update to the diagnosis and key of *Ocyolinus* Sharp, with the inclusion of *Torobus principalis* (Bernhauer) (Staphylinidae: Staphylininae: Staphylinini). The Coleopterists Bulletin.

Chani-Posse, M. R., A. J. Brunke, S. Chatzimanolis, H. Schillhammer, A. Solodovnikov. In Press. Phylogeny of the hyper-diverse Philonthina rove beetles with implications for classification of the tribe Staphylinini (Coleoptera: Staphylinidae). Cladistics.

Brunke, A. J., H. Schillhammer and S. Chatzimanolis. 2017. The first fossil rove beetle from the middle Eocene Kishenehn formation (North America) provides evidence for ancient Eocene relicts within the hyperdiverse Staphylinini (Coleoptera: Staphylinidae: Staphylininae). Journal of Systematic Palaentology 15(12): 1015–1025.

Chatzimanolis, S and E. Caron. 2016. New species and synonymies in *Xenopygus* Bernhauer (Staphylinidae: Staphylinini). Zootaxa 4200(1): 131–142.

Ceríaco, L. M. P.,Gutiérrez, E. E., Dubois, A., et al. (493 coauthors including S. Chatzimanolis). 2016. Photography-based taxonomy is inadequate, unnecessary, and potentially harmful for biological sciences. Zootaxa 4196(3): 435–445.

Chatzimanolis, S. 2016. A revision of the myrmecophilous genus *Smilax* Laporte (Coleoptera: Staphylinidae: Staphylininae). Zootaxa 4162(2): 283–303.

Brunke, A. J., S. Chatzimanolis, H. Schillhammer and A. Solodovnikov. 2016. Early evolution of the hyper-diverse rove beetle tribe Staphylinini (Coleoptera: Staphylinidae: Staphylininae) inferred from molecular and morphological data, and a revision of its higher classification. Cladistics 32: 427–451.

Chatzimanolis, S. and M. Chani Posse. 2016. On the myrmecophilous species of

Plociopterus (Coleoptera: Staphylinidae: Staphylinini) Kraatz described by E. Wasmann. The Coleopterists Bulletin 70(2): 214–216.

Greenwalt, D., T. Rose and S. Chatzimanolis. 2016. Preservation of mandibular zinc in a beetle from the Eocene Kishenehn Formation of Montana, USA. Canadian Journal of Earth and Sciences 53: 614–621.

Chatzimanolis, S. 2015. New records, redescription and notes on nomenclature for *Triacrus* Nordmann (Staphylinidae: Staphylininae: Staphylinini). The Coleopterists Bulletin 69(3): 514–520.

Chatzimanolis, S. 2015. A revision of the genus *Trigonopselaphus* Gemminger and Harold (Coleoptera: Staphylinidae: Staphylininae). Koleopterogische Rundschau 85: 167–189.

Marlowe, M. H., C. A. Murphy and S. Chatzimanolis. 2015. Sexual dimorphism and allometry in the sphecophilous rove beetle *Triacrus dilatus*. PeerJ 3: e1123.

Engel, M. S., D. S. Peris, S. Chatzimanolis and X. Delclòs. 2015. An earwig (Insecta: Dermaptera) in early Cretaceous amber from Spain. Insect Systematics and Evolution 46:291–300.

Chatzimanolis, S. 2015. A review of the genus Scaponopselaphus Scheerpeltz (Insecta: Coleoptera: Staphylinidae). Biodiversity Data Journal 3: e4735.

da Silva, M. R. and S. Chatzimanolis. 2015. Additional records and descriptions of male specimens for Nordus stomachoponos Chatzimanolis, 2004 (Insecta: Coleoptera: Staphylinidae: Xanthopygina). Revista Brasileira de Entomologia 59: 58-60.

Caterino, M. S., S. Chatzimanolis and M. Richmond. 2014. On the origins of the insect fauna of California’s Channel Islands: A comparative phylogeographical study of island insects. Western North American Naturalist 7: 276–296.

Chatzimanolis, S. 2014. Darwin's legacy to rove beetles (Coleoptera: Staphylinidae): a new genus and a new species including materials collected on the Beagle's voyage. Zookeys 379: 29–41.

Peris, D., S. Chatzimanolis and X. Delclòs. 2014. Diversity of rove beetles (Coleoptera: Staphylinidae) in Early Cretaceous Spanish amber. Cretaceous Research 48: 85–95.

Chatzimanolis, S. 2014. Phylogeny of xanthopygine rove beetles (Coleoptera) based on six molecular loci. Systematic Entomology 39(1): 141–149.

Chatzimanolis, S. 2013. *Terataki*, a new genus of Staphylinini (Coleoptera: Staphylinidae: Staphylininae) from South America. Zootaxa 3750(3): 251–264.

Chatzimanolis, S. and M. S. Engel. 2013. The fauna of Staphylininae in Dominican amber. Annals of the Carnegie Museum 81(4): 281–294.

Ortega-Blanco, J., S. Chatzimanolis, H. Singh and M. S. Engel. 2013. The oldest fossil of the subfamily Osoriinae (Coleoptera: Staphylinidae), from Eocene Cambay amber (India). The Coleopterists Bulletin 67(3): 304–308.

Chatzimanolis, S., A. F. Newton, C. Soriano and M. S. Engel. 2013. Remarkable stasis in a phloeocharine rove beetle from the Late Cretaceous of New Jersey (Coleoptera: Staphylinidae). Journal of Paleontology 87(2): 177–182.

Books and book chapters

Chatzimanolis, S. In Press. A review of the fossil history of Staphylinoidea. *In* Betz, O., Irmler U. and Klimaszewski J. (eds.) Biology of rove beetles (Staphylinidae). Springer.

Grants

External

NSF: DBI-1337530: Acquisition of growth chambers for global change biology research and research training at the University of Tennessee at Chattanooga (2013-2016) ($342,945), [PI: J. Boyd, other Co-PIs: H. Klug, J. Shaw, T. Wilson].

Internal

University of Tennessee at Chattanooga Faculty Development Grant (2016) ($1,412).

Ruth S. Holmberg Grant for Faculty Excellence, University of Tennessee at Chattanooga (2015) ($4,950).

Research and Creative Activity Award, College of Arts and Sciences, University of Tennessee at Chattanooga (2014) ($4,065).

University of Tennessee at Chattanooga Faculty Development Grant (2014) ($600).

University of Tennessee at Chattanooga Faculty Research Grant (2013) ($715).

Invited Research Seminars

Chatzimanolis, S. 2016. Myrmecophily in xanthopygine rove beetles (Coleoptera: Staphylinidae). *XXV International Congress of Entomology, Orlando, Florida.*

Chatzimanolis, S. 2014. The evolution of myrmecophily in xanthopygine rove beetles. University of Oslo, Norway

Conference Presentations

Brunke, A., S. Chatzimanolis and H. Schillhammer. 2016. The first fossil of the subtribe Anisolinina reveals another case of boreotropical relictualism in the Staphylinini. 31st International Staphylinidae Meeting, Brussels, Belgium.

Marlowe, M. C. Murphy and S. Chatzimanolis. 2015. Sexual dimorphism in the rove beetle *Triacrus dilatus*. Southern Regional Honors Conference, Greenville, South Carolina.

Chatzimanolis, S and A. Brunke. 2014. The evolution of myrmecophily in xanthopygine rove beetles. Entomological Society of America Annual Meeting, Portland, Oregon.

Brunke, A., A. Solodovnikov and S. Chatzimanolis. 2014. Molecular, morphological and fossil data reveal the Cyrtoquediina (Coleoptera: Staphylinidae: Staphylinini), a new subtribe of rove beetles with multiple biogeographic disjunctions. Entomological Society of America Annual Meeting, Portland, Oregon.

Professional, University, Departmental and Community Service

Professional
Associate Editor, Journal of Paleontology (2012–present).
Book Review Editor, The Coleopterists Bulletin (2015–present).
Editorial Board, The Coleopterists Bulletin (2013–2015).
Subject Editor, Biodiversity Data Journal (2013–present).

Ad hoc *Grant Reviewer*:
Reviewer for several National Science Foundation DEB grant proposals: October 2014, October 2015, October 2016.

Panel member, NSF DEB pre-proposals Spring 2013, Spring 2017

Ad hoc *Journal Reviewer*:
Acta Entomologica Musei Nationalis Pragae, Alavesia, Annals of the Carnegie Museum of Natural History, Annals of the Entomological Society of America, Canadian Journal of Arthropod Identification, Biological Journal of the Linnaean Society, Dugesiana, Geodiversitas, Insect Systematics and Evolution, Invertebrate Systematics, Insect Conservation and Diversity, Journal of the Kansas Entomological Society, Journal of Natural History, Journal of Paleontology, Journal of Systematic Paleontology. Molecular Ecology, Nature Communications, PLOS One, Proceedings of the Entomological Society of Washington, Proceedings of the Royal Society B, Psyche, Systematic Entomology, The Coleopterists Bulletin, Transaction of the Kansas Academy of Sciences, ZooKeys, Zoological Journal of the Linnean Society, Zootaxa.

University
Faculty Commencement Marshall: Dec 2012, Dec 2013, May 2014, Dec 2014, Dec 2015, Dec 2016.
University DHON committee 2012–2016.
University Honor Court 2016–present.

Department
Associate Department Head
Assessment and Retention Committee (Chair), Dept. BGES, 2016–present.
DHON Committee Dept. BGES, 2016–present.

Equipment Committee, Dept. Biological and Environmental Sciences, 2012–2013.
Graduate Committee, Dept. Biological and Environmental Sciences, 2012–2015.
Hiring Planning Committee, Dept. Biological and Environmental Sciences, 2013–2014.
Natural History Museum Committee, Dept. BGES, 2012–present.
Retention, Tenure and Promotion Committee, Dept. BGES, 2013–present.

Community
Talk at Little Miss Mag pre-K school about insects (June 2017)
Participated at the 67th Annual Spring Wildflower Pilgrimage in the Great Smoky Mountains National Park and had four outreach programs (April 2017).
Talk at Thrasher Elementary (Signal Mt.) to Robotics Lab (Nov. 2015)
TV interview on Channel 3 (March 2014)
Radio Interview on "Live and Local" Talk 102.3 (March 2014)
Talk at the Skeptics in a Pub (Chattanooga, TN) about beetle evolution (October 2012)

Press regarding your work
The following are press regarding the description of *Darwinilus sedarisi*, all appearing in 2014.

NBC NEWS
Science
National Geographic
FOX NEWS
Christian Science Monitor
Nooga.com
Atlanta Journal - Constitution
International Business Times
ScienceDaily
Examiner.com
Yahoo News
ScienceNews
Zeit online
International Science Times
Eureka alert
phys.org
El Pais
El Mundo
Die Welt
Spiegel
ria.ru
gazeta.ru
IL Secolo XIX
News.mail.ru
wn.com
continent-news.info
Scienexx
Publico

derStandard.at
Science 2.0
Livescience
HNGN
University Herald
UPI
Science Recorder
UTC News Release
WRCB - Channel 3 Chattanooga
KU Alumni Magazine
UT Alumnus Magazine
Entomology Today
BBC Earth

<u>J Hill Craddock</u>

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Georgi, L., Craddock, J.H., Bevins, D., Kling, R., and Hebard, F. (2014) Grafting chestnuts. *J. Amer. Chestnut Foundation* 28(1): 20-23.

Sisco, PH, TC Neel, FV Hebard, **JH Craddock**, and J Shaw. (2014) Cytoplasmic male sterility in interspecific hybrids between American and Asian *Castanea* species is correlated with the American D chloroplast haplotype. *Acta Hort.* 109:215-222.

Shaw,J., Craddock, J.H., and Binkley, M.A.* (2012). Phylogeny and Phylogeography of North American *Castanea* Mill. (Fagaceae) Using cpDNA suggests Gene Sharing in the Southern Appalachians (*Castanea* Mill., Fagaceae). *Castanea* 77(2):186-211.

Project reports
Perkins, M.T.* and J.H Craddock. (2014). The effect of phosphite fungicides on mycorrhiza formation in a family of BC4 Chinese-American chestnut seedlings. Technical Report to USDA NE-1333: Biological Improvement of Chestnut through Technologies that Address Management of the Species, its Pathogens and Pests. 6-5 September 2014, La Crosse, WI.

Craddock. J.H. 2014. The Tennessee Report. Technical Report to USDA NE-1333: Biological Improvement of Chestnut through Technologies that Address Management of the Species, its Pathogens and Pests. 6-5 September 2014, La Crosse, WI.

Grants
External
Bettie J Smith Family Limited Partnership (2002-present, continuing support, $6000/year)

The Chestnut Project at Dollywood (2000-2014, continuing support, $20,000/year)

The Summerfild K. Johnston Endowment for the Restoration of the American Chestnut (1996 – present, continuing support, $7000/year)

Arkansas Natural Heritage Commission grant ($4600) for study of the systematics of the North American *Castanea* (with Taylor Perkins and Joey Shaw).

American Chestnut Foundation external grants program award ($5000) to partially fund the Craddock Lab's research on *Phytophthora* resistance in chestnut (with Taylor Perkins).

Provost Student Research Award to partially fund the Craddock Lab's research on *Phytophthora* resistance in chestnut ($1000)(with Taylor Perkins).

Invited Educational Presentations
Craddock, H. (2014) *The return of the chestnut; a tree crop archetype*. TEDxUTChattanooga https://www.youtube.com/watch?v=bz_NgKnVKxE

Conference Presentations
J. Houser, H. Craddock, Richards S. Arsenic Uptake by Beets (*Beta vulgaris*) Cultivated in Roxarsone-Contaminated Soil. Abstracts of the 2016 Society of Environmental Toxicologists and Chemists. November 6-10, 2016. Orlando, FL.

Perkins, M.T., J. Shaw, and J.H. Craddock. 2016. Phylogeographic examination of *Castanea* Mill. (Fagaceae) morphotypes in the eastern United States. Meeting of the Association of Southeastern Biologists. March 31-April 3 2016. Concord, NC. In: Southeastern Biology 63(2): 163.

Perkins, M.T. and J.H. Craddock. (2015) Phylogeny and biogeography of North American *Castanea* (Fagaceae): chloroplast and nuclear DNA sequences as indicators of cryptic diversity in the Southeast. Schatz Tree Genetics Symposium. (Poster Abstract) 23-24 October, 2015. Pennsylvania State University.

Perkins, M.T. and Craddock, J.H. (2012). The effect of phosphite on mycorrhiza formation in Chinese-American hybrid chestnuts. Poster at 2012 American Chestnut Summit. 19-21 October 2012, Asheville, NC.

Harris, A., Shaw, J., and Craddock, J.H. (2012) A Floral Survey and Census of American Chestnut at Bendabout Farm, Bradley County,Tennessee. In: Proceedings for the 2012 Chestnut Summit. The American Chestnut Foundation and the USDA Forest Service, October 19-21, 2012, Asheville, NC.

Professional, University, Departmental and Community Service

Professional

The American Chestnut Foundation (since 1986), Board of Directors (1997-2014), V.P. and Chair, Science Cabinet (1997-2001), Science Oversight Committee, Research Advisory Committee, Restoration Committee, and the Awards Committee (Chair, current)

Highlands Biological Station, Board of Scientific Advisors (2009-2012)

Reviewer/referee for *Castanea*, *Journal of the American Society for Horticultural Science*, *HortScience*, and *J. American Chestnut Foundation*

U.S. Dept. Agriculture Regional Project NE1033: Biological Improvement of Chestnut through Technologies that Address Management of the Species, its Pathogens and Pests (was NE-1015 from 2008-2013), 2017 Meeting Chair (2016 - present)

International Society for Horticultural Science, Member, Reviewer

Northern Nut Growers Association, (member since 1978), Reviewer, Editor

University
Campus Landscape (1999 – present)
Curriculum Committee of the College of Arts and Sciences

Department
Beta Beta Beta Biological Honor Society, Faculty Advisor (1996 – present)

Community
Reflection Riding Arboretum and Nature Center, Board of Directors (2000-2014)
City of Chattanooga Tree Commission (2011- present)
Led public classes at the Reflection Riding Arboretum and Nature Center including "The Fungi" and "Tree ID" as part of the core course offerings for the Certificate of Native Plants program (2013-2014).
City of Chattanooga Tree Commission, planned and coordinated a series of lectures and volunteer workdays for the "Take-Root Chattanooga Citizen Forester" program (2010-2015).City of Chattanooga
Tree Commission, helped plan and coordinate the "If Trees Could Sing" installation and launch party, in collaboration with The Nature Conservancy, Coolige Park (2016).
Coordinated the led the training workshops Appalachian Trail Mega Transect Project, in collaboration with The American Chestnut Foundation, Nantahala Outdoor Center, (2008-2010).

Press regarding your work
Numerous public lectures and radio and newspaper interviews about restoration of the American chestnut (1996-present).

<u>Sarah Farnsley</u>

Faculty development
Safe Zone training (2017)

Walker Center teacher conference (2017)

Research
Peer reviewed publications (Not including Published abstracts)
Accepted or published
Farnsley, S., Kuhajda, B., George, A., and Klug, H. 2016. *Fundulus catenatus* (Northern studfish) response to the potential alarm cue chondroitin sulfate. *Southeastern Naturalist*. 15: 523-533.

Conference Presentations
Farnsley, S. and Foerder, P. "Enrichment for students and animals: using animal behavior to encourage STEM learning." Living With Animals Conference, Richmond, KY (March 2017)

Professional, University, Departmental and Community Service

Professional
Quality Matters certification (2017)

Department
EDGE: Co-chair (2016-present)
Tri-Beta: Faculty advisor (2016)

Community
Animal Enrichment activities with GEAR UP and Reflection Riding Nature Center (2016-2017)
Operation Move-In volunteer (2017)

Press regarding your work
Associated Press article highlighting conservation work, published in Chattanooga Times Free Press, Washington Times, Los Angeles Times (April 2016)

<u>Tim Gaudin</u>

Faculty development
Trained to use CPI system implemented for campus scheduling of courses (January, 2014).
Attended a Teaching Creativity workshop, sponsored by the UTC Honors College, entitled "Teaching Design Process" (May, 2015).
Attended an Honors Course Development workshop sponsored by the UTC Honors College (May, 2015).

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Pujos, F., Gaudin, T.J., De Iuliis, G. & Cartelle, C. 2012. Recent advances on variability, morpho-functional adaptations, dental terminology, and evolution of sloths. *Journal of Mammalian Evolution* 19(3):159 - 169.

Babot, J., García-López, D.A. & Gaudin, T. J. 2012. The most ancient xenarthran petrosal: morphology and evolutionary significance. *Journal of Vertebrate Paleontology* 32(5): 1186-1197.

O'Leary, M. A., Bloch, J. I., Flynn, J. J., Gaudin, T. J., Giallombardo, A., Giannini, N. P., Goldberg, S. L., Kraatz, B. P., Luo, Z.-X., Meng, J., Ni, X., Novacek, M. J., Perini, F. A., Randall, Z., Rougier, G. W., Sargis, E. J., Silcox, M. T., Simmons, N. B., Spaulding, M., Velazco, P. M., Weksler, M., Wible, J. R. & Cirranello, A. L. 2013.The placental mammal ancestor and the post-KPg radiation of placentals. *Science* 339:662-667. DOI: 10.1126/science.1229237

O'Leary, M. A., Bloch, J. I., Flynn, J. J., Gaudin, T. J., Giallombardo, A., Giannini, N. P., Goldberg, S. L., Kraatz, B. P., Luo, Z.-X., Meng, J., Ni, X., Novacek, M. J., Perini, F. A., Randall, Z., Rougier, G. W., Sargis, E. J., Silcox, M. T., Simmons, N. B., Spaulding, M., Velazco, P. M., Weksler, M., Wible, J. R. & Cirranello, A. L. 2013. Technical Comment: Response to comment on "The placental mammal ancestor and the post-KPg radiation of placentals." *Science* 341:613.

McDonald, H.G., Rincón, A. & Gaudin, T.J. 2013. A new genus of megalonychid sloth (Mammalia, Xenarthra) from the late Pleistocene of Sierra de Perijá, Zulia State, Venezuela. *Journal of Vertebrate Paleontology* 33(5):1226-1238.

Gaudin, T.J., DeIuliis, G., Toledo, N. & Pujos, F. 2015. The basicranium and orbital region of the early Miocene *Eucholoeops ingens* Ameghino, 1887 (Xenarthra, Pilosa, Megalonychidae). *Ameghiniana* 52:226-240.

Gaudin, T.J. & Croft, D.A. 2015. Paleogene Xenarthra and the evolution of South American mammals. *Journal of Mammalogy,* special feature 96(4):622-634.

Lyon, L. M., Powell, C., McDonald, H. G. & Gaudin, T. J. 2016. Premaxillae of the extinct megalonychid sloths *Acratocnus*, *Neocnus*, and *Megalonyx*, and their phylogenetic implications (Mammalia, Xenarthra). *Journal of Mammalian Evolution* 23:121-132. DOI 10.1007/s10914-015-9308-7

Gaudin, T.J., Emry, R.J. & Morris, J. 2016. Description of the skeletal anatomy of the North American pangolin *Patriomanis americana* (Mammalia, Pholidota) from the latest Eocene of Wyoming (USA). *Smithsonian Contributions to Paleobiology* 98:1-102.

Amson, E., de Muizon, C. & Gaudin, T.J. 2017. A reappraisal of the phylogeny of the Megatheria (Mammalia: Tardigrada), with an emphasis on the relationships of the Thalassocninae, the marine sloths. *Zoological Journal of the Linnean Society* 179(1):217–236. DOI: 10.1111/zoj.12450

McDonald, H.G., Chatters, J.C. & Gaudin, T.J. 2017. A new genus of megalonychid ground sloth (Mammalia, Xenarthra) from the late Pleistocene of Quintana Roo, Mexico. *Journal of Vertebrate Paleontology* 3:e1307206 [14 pp.]

Gaudin, T.J. & Nyakatura, J.A. 2017. Epaxial musculature in armadillos, sloths, and opossums: functional significance and implications for the evolution of back muscles in the Xenarthra. *Journal of Mammalian Evolution*. DOI 10.1007/s10914-017-9402-0 [10 pp.]

Gaudin, T.J., Hicks, P. & Di Blanco, Y. In press. *Myrmecophaga tridactyla* (Pilosa: Myrmecophagidae). *Mammalian Species*.

Submitted or in preparation

Gaudin, T.J. & Lyon, L.M. Submitted. Cranial osteology of the pampathere *Holmesina floridanus* (Xenarthra: Cingulata; Blancan NALMA), including a description of an isolated petrosal bone. *PeerJ*

Hooper, J.W., Mowry, C.B., Gaudin, T.J. & Wilson, T.P. Submitted. I think a coyote attacked my pet: potential effects of assumption and the need for human-coyote conflict investigations. *Human Dimensions of Wildlife*.

Hooper, J.W., Mowry, C.B., Wilson, T.P. & Gaudin, T.J. Submitted. Human-Coyote interactions in an urban environment: the importance of landscape characteristics and scale. *Urban Naturalist*.

Gaudin, T.J., Wible, J.R., Rose, K.D., Emry, R.J. & Spaulding, M. In prep. Analysis of the skeletal anatomy of the basicranium and auditory region in the metacheiromyid palaeanodont *Metacheiromys* (Mammalia, Pholidotamorpha) based on high-resolution CT-scans.

Boscaini, A., Iurino, D.A., Billet, G., Hautier, L., Sardella, R., Tirao, G., Gaudin, T.J. & Pujos, F. In prep. Digital cranial endocast of the ground sloth *Glossotherium robustum* (Owen, 1842) (Xenarthra, Pilosa) from the Pleistocene of Argentina.

Heck, C.T., Varricchio, D.J., Gaudin, T.J., Woodward, H.N. & Horner, J.R. In prep. Ontogenetic changes in the long bone microstructure in the nine-banded armadillo (*Dasypus novemcinctus*).

Books and book chapters

Published

Gaudin, T.J. & Pujos, F. 2012. Form and function in the Xenarthra – an introduction to the symposium proceedings volume. *Journal of Mammalian Evolution* 19(3):155-157.

Gaudin, T.J. & Pujos, F. 2012. Form and Function in the Xenarthra – Symposium Proceedings Volume. *Journal of Mammalian Evolution* 19(3):155-234.

Grants

Internal

2016. UTC College of Arts & Sciences Travel Award. Travel to Society of Vertebrate Paleontology Society Meetings (Salt Lake City, UT). Funding: $500.

Invited Research Seminars

Gaudin, T.J. 2012. Armadillos and the Mammal Tree of Life. Lecture for Biology Seminar course (BIOL 4940), University of Tennessee at Chattanooga.

Gaudin, T.J. 2015. *Patriomanis,* America's pangolin (by the way, what on earth is a pangolin?!). E.O. Grundset Lecture Series, Southern Adventist University.

Invited Educational Presentations

Gaudin, T.J. 2012. Vertebrate Biodiversity in the Chattanooga area. Presented to local organization "Skeptics in the Pub," Chattanooga TN.

Gaudin, T.J. 2012. The Bat Colony: Measuring ecological disturbances with fossils. Presented to Dalton Science Café, Dalton GA.

Gaudin, T.J. 2013. Invasion of the Flying Killer Armadillos. Presented to UTC Wildlife-Zoology Club, University of Tennessee at Chattanooga, Chattanooga TN.

Gaudin, T.J. 2013. Sampling Methods for Mammals. Lecture and field survey exercise for Tennessee Naturalist Program, Chattanooga Nature Center, Chattanooga TN.

Gaudin, T.J. 2013. Armadillos and the Mammal Tree of Life. Presented to Alexian Village Continuing Ed lecture series, Chattanooga TN.

Gaudin, T.J. 2014. Of faeries, softballs, and the invasion of the Flying Killer Armadillos. Presented to Brown Bag Lunch Presentation series, Nashville Zoo, Nashville TN.

Conference presentations

Carpenter, C., Gaudin, T., Shaw, J. & Wilson, T. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. Colloquium on the Conservation of Mammals in the Eastern United States, Louisville, MS (February, 2012).

Carpenter, C., Gaudin, T., Shaw, J. & Wilson, T. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. UTC Research Day, Chattanooga, TN (April 2012).

Carpenter, C., Gaudin, T., Shaw, J. & Wilson, T. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. Association of Southeastern Biologists, Athens, GA (April 2012).

Carpenter, C., Gaudin, T., Shaw, J. & Wilson, T. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. Tennessee Academy of Science, Nashville, TN (November, 2012).

Gaudin, T.J. Premaxillae of extinct Antillean megalonychid sloths *Acratocnus* and *Neocnus* and a potential new synapomorphy for Megalonychidae (Xenarthra, Mammalia). Society of Vertebrate Paleontology, Raleigh, NC (October, 2012).

Carpenter, C., Gaudin, T., Shaw, J. & Wilson, T. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. Association of Southeastern Biologists, Charleston, WV (April 2013).

Lyon, L. & Gaudin, T.J. Premaxillae of extinct megalonychid sloths *Acratocnus, Neocnus,* and *Megalonyx,* and their phylogenetic implications. Southeastern Association of Vertebrate Paleontology, Jackson, MS (October, 2014).

Heck, C., Varicchio, D., Gaudin, T., Ballard, H. & Horner, J.R. Bone growth in the nine-banded armadillo (*Dasypus novemcinctus*): implications for extinct taxa. International Symposium on PaleoHistology, Bonn, Germany. (July 2015).

Gaudin, T.J. & Lyon, L.M. Cranial osteology of *Holmesina floridanus* (Mammalia, Xenarthra, Cingulata, Pampatheriidae) from the Pliocene of Florida. Association of Southeastern Biologists, Chattanooga, TN (April, 2015).

Gaudin, T.J. & Croft, D.A. Paleogene Xenarthra and the evolution of South American mammals. Society of Vertebrate Paleontology, Dallas, TX (October, 2015).

Heck, C., Varicchio, D., Gaudin, T., Ballard, H. & Horner, J.R. Bone growth in the nine-banded armadillo (*Dasypus novemcinctus*): implications for extinct taxa. Society of Vertebrate Paleontology, Dallas, TX (October, 2015).

Gaudin, T.J. 2016. An isolated petrosal of the pampathere *Holmesina floridanus* (Mammalia, Xenarthra, Cingulata) from the Blancan NALMA of Florida. International Congress of Vertebrate Morphology, Washington, DC (July 2016).

Gaudin, T.J., Wible, J.R., Rose, K.D., Emry, R.J. & Spaulding, M. 2016. Analysis of the skeletal anatomy of the basicranium and auditory region in the metacheiromyid palaeanodont *Metacheiromys* (Mammalia, Pholidotamorpha) based on high-resolution CT-scans. Society of Vertebrate Paleontology, Salt Lake City, UT (October, 2016).

Heck, C.T., Varricchio, D.J., Gaudin, T.J., Woodward, H.N. & Horner, J.R. Ontogenetic changes in the long bone microstructure in the nine-banded armadillo (*Dasypus novemcinctus*). American Society of Mammalogy, Minneapolis, MN (June 2017).

Bramblett, J.L. & Gaudin, T.J. 2017. Using polyform clays to make molds and casts of teaching specimens. Southeastern Association of Vertebrate Paleontology, Johnson City, TN (June 2107).

Gaudin, T.J. 2017. Early evolution of Xenarthra – What we do and don’t know. Southeastern Association of Vertebrate Paleontology, Johnson City, TN (June 2107).

Gaudin, T.J. 2017. An isolated petrosal of the pampathere *Holmesina floridanus* (Mammalia, Xenarthra, Cingulata) from the Blancan NALMA of Florida. Society of Vertebrate Paleontology, Calgary, Canada (August 2017).

Boscaini, A., Iurino, D.A., Billet, G., Hautier, L., Sardella, R., Tirao, G., Gaudin, T.J. & Pujos, F. Digital cranial endocast of the ground sloth *Glossotherium robustum* (Owen, 1842) (Xenarthra, Pilosa) from the Pleistocene of Argentina. Society of Vertebrate Paleontology, Calgary, Canada (August 2017).

Buchholtz, E.A., Feldman, A., McDonald, H.G. & Gaudin, T.J. Is the mammalian presternum composite? Evidence from *Paramylodon harlani*. Society of Vertebrate Paleontology, Calgary, Canada (August 2017).

Professional, University, Departmental and Community Service

Professional
2012-2015: Book Review Editor: *Journal of Mammalian Evolution*
2012-Present: Editorial Board member: *Journal of Mammalian Evolution*
2017-Present: Editorial Board member: *Eastern Paleontologist*

Journal Reviewer for the following journals: *Journal of Vertebrate Paleontology* (2012, 2013, 2015, 2017), *Swiss of Journal of Paleontology* (2013), *Geodiversitas* (2013), *Edentata* (2013), *Ameghiniana* (2014, 2016), *Journal of Paleontology* (2015), *Zoological Journal of the Linnean Society* (2015), *Journal of Mammalogy* (2015), *Earth & Environmental Science Transactions of the Royal Society of Edinburgh* (2016), *PlosOne* (2016), *Palaeontology* (2017), *Journal of Mammalian Evolution* (2017), *PeerJ* (2017).

Reviewer for Scholarly Books & Edited Volumes: Mammals of Africa, Vol. 5. Carnivores, Pangolins, Equids and Rhinoceroses, Bloomsbury Academic Press, New York (2013); Biology of the Nine-Banded Armadillo, University of Oklahoma Press, Norman, OK (2013); Bipedal Posture and Locomotion in *Glyptodon clavipes* (book proposal), Springer DE Publishing (2016)

Miscellaneous: Judge for student talks, Colloquium on the Conservation of Mammals in the Eastern United States, Louisville, MS (February, 2012); hosted Dr. Steve Freedberg’s Vertebrate Paleontology class from St. Olaf College (Northfield, MN), took the class to collect local Paleozoic invertebrate fossils, set up an exercise working with fossil vertebrates I collected from local cave deposits (January, 2016); external promotion reviewer for Dr. Darin Croft, Case Western Reserve University, Cleveland, OH, considered for promotion to Full Professor (June 10, 2016).

University
Faculty-Administrative Relations Committee (Spring 2012, Spring 2014, Chair Fall 2012-Summer 2013)
Honor’s College Planning Committee and on Honors College Undergraduate Research Subcommittee (2013-4)
Departmental Honors Committtee (2014-5)
Student Evaluation of Faculty Committee (2015-6)
Budget and Economic Status Committee (2016-Present)
Ad-hoc nominating committee to elect new members, UTC Council of Scholars (Spring 2015).
Ad-hoc committee of current and former chairs of the UTC Faculty Administration Committee (FARC), responding to a proposal by the Faculty Senate President to overhaul the Faculty grievance procedure (2016-Present).
Review panelist for UTC Provost Student Research Award proposals (2013, 2017).
Submitted two motions to UTC Faculty Senate (both rejected): 1) to change the student petition procedure; and, 2) to eliminate the membership fee for faculty to join the campus Aquatic and Recreation Center, and to offer a 50% discount for family memberships (February, 2014).
Met with UTC General Education committee on 30 April, 2014, to discuss why they should deny a petition from a student to have an introductory Biology course from Southern Adventist University that includes creationist content count for the second semester of UTC’s Principles of Biology sequence (BIOL 1120).
Wrote letter to Provost Ainsworth about UTC’s overly convoluted grade change system. Met with Yancy Freeman on April 20, 2015, to discuss making changes to the system.
Interviewed applicants to UTC's Brock Scholars program (Jan 28, 2017), after attending a brief orientation meeting (Jan 25, 2017). Completed written evaluations for each candidate interviewed, and submitted these to the Honors College
Gave a talk on the topic ""Why Do Research?", as part of a UTC Council of Scholars Panel Discussion Luncheon, held in conjunction with the UTC Research Dialogues events (April 14, 2016).
Served on the Hiring Committee for a new Assistant Director of the Honors College in charge of advising, assessment, and national scholarship applications.
Served as a Marshall for the 9 am, May 2016 UTC graduation ceremony.
Faculty focus group member, UTC Office of Research & Sponsored Programs (May 23, 2017).

Submitted a proposal to the Faculty Senate asking to have a new building for the Department of Biology, Geology, and Environmental Science reinstated as the campus #1 capital building priority (approved on Feb 16, 2017).

Departmental
Senior Associate Department Head (2012-Spring 2015, Fall 2016-Present)
Department Schedule Committee (Chair 2012-present)
Hiring & Planning Committee (2012-Present, Chair 2012-4)
Departmental Rank, Tenure & Reappointment Committee (2012-Present; Co-Chair 2012-3, 2014-5)
Natural History Museum Committee (2012-Present)
Ad-hoc committee revising Biology Curriculum (2012)
Pre-Professional Advising Committee (2012- 2015)
Graduate Committee (2012-3)
Hiring Committee for Professional Advisor (2014-5)
Strategic Plan Committee (2015-6)
By-Laws Committee (2016-Present)
Panelist for panel discussions on applying to Graduate School for departmental undergraduates (October & November, 2013)
Ad-hoc departmental committee concerning the potential hiring of a new faculty position split between the department and the Tennessee Aquarium (August, 2013)
Ad-hoc committee advising the IACUC committee on standard operating procedures for field research (August 25, 2015).
Hiring Committee for position of lab technician in Dr. Jose Barbosa's lab, March 2016.
Arranged meeting with Kathy Kenwright from UT Memphis' Biomedical Technology program for departmental faculty to discuss entrance requirements and how our students can apply to the program (August, 2013).
Arranged visit from Mr. Mackel Harris, admissions representative from Life College of Chiropractic [Kennesaw, GA], to meet with departmental majors (February, 2014).
Organized trip by UTC Wildlife/Zoology club to Nashville Zoo, with a behind the scenes tour, including a tour of the giant anteater barn (April, 2014).
Met with 2 representatives of the AUIS Medical School, from the island of St. Maarten [Netherland Antilles], to discuss opportunities for UTC Preprofessional students. (April, 2015)

Community
Creative Discovery Museum, Chattanooga, TN: worked with museum to update their exhibitry on fossils and dinosaurs, including a new video on local fossils for the permanent exhibit (2012); manned an educational booth during “Dinosaur Day” (2012); gave fossil demonstration and discussed paleontology with patrons as part of "Meet a Scientist" summer program (2016).

American Institute for Biological Sciences (AIBS): List manager for EVOLISTTN, AIBS-sponsored listserv discussion group designed to assist biologists and biology teachers to teach evolution and combat creationism in the public school system of Tennessee (2012-Present).

National Center for Science Education (NCSE): Coordinated with UTC faculty and NCSE, to combat efforts by the Tennessee legislature to pass anti-evolution legislation; prepared a letter signed by Biology and Geology faculty at UTC urging Governor Haslam to veto the measure;

contacted State Senator Bo Watson, an alumnus of our department and sponsor for the senate version of the bill, to ask for revisions in the text of the bill (2012).

Interviewed by reporter Helen Thompson regarding passage of anti-evolution law by Tennessee legislature; excerpts of interview appeared in Ms. Thompson's article "Tennessee 'monkey bill' becomes law," published on-line in *Nature* News, April 11, 2012 (http://www.nature.com/news/tennessee-monkey-bill-becomes-law-1.10423).

Chattanooga magazine: Provided commentary on the question "Why is understanding the diversity of animal species on the planet important to us as humans?" to reporter Debbie Petticord, for her piece on the 75th anniversary of the Chattanooga Zoo (April 25, 2012).

St Jude School (K-8), Chattanooga, TN: Gave dissection demonstration using dogfish shark (*Squalus*), sheep heart and sheep brain to 7th grade classes (~50 students; December 14, 2012); presented class activity and lecture on fossils to two 8th grade classes (~50 students; November 8, 2013); presented class activity and lecture on fossils to two 5th grade classes (~50 students; March 7, 2014); met with Cub Scout troop at Chickamauga Dam to talk about paleontology and help them collect fossils (Dec 3, 2016); presented on dinosaurs and paleontology to 2nd grade classes (~50 students; April 27, 2017).

Donald P. Yates Primary School, Cleveland, TN: Attended Career Day and discussed careers in paleontology with three 2nd grade classes (~60 students, September 14, 2015).

Wolftever Creek Elementary School, Ooltewah, TN: Gave a presentation on bats to two classes of 4th grade "researchers" (~ 50 students, October 4, 2015).

Girls Inc. Bookworm Club, Brainerd Methodist Church, Chattanooga, TN: Gave an afterschool presentation on careers in paleontology (~ 20 elementary age girls, February 17, 2016).

Appalachian Landscape Conservation Cooperative/ Tennessee River Gorge Trust: Attended partners meeting (April 24, 2017).

Press Regarding your work

2013 (March, April): Chattanooga Times Free Press [Chattanooga, TN], Associated Press, Columbia Daily Herald [Columbia, TN]; The Greeneville News [Greeneville, TN]; WJHL-TV [CBS affiliate, Johnson City, TN]; Knoxville News Sentinel [Knoxville, TN]; WBIR-TV News [NBC affiliate, Knoxville, TN]; WATE TV [ABC affiliate, Knoxville, TN]; The Nashville Tennessean [Nashville, TN]; WKRN-TV News2 [ABC affiliate, Nashville, TN]; NewsChannel5, WTVF [CBS affiliate, Nashville, TN]; WZTV Fox 17 [Nashville, TN]; WSMN-TV [NBC affiliate, Nashville, TN]; Shelbyville Times-Gazette [Shelbyville, TN]; Washington Examiner [Washington, D.C.]; WGOW Talk Radio FM 102.3 [Chattanooga, TN]; WOOP Radio [Cleveland, TN,]. Armadillo invasion of southeast Tennessee.

2013 (September): The Post and Courier [Charleston, SC]. Armadillo invasion of southeast Tennessee.

2013 (March, April): UTC Homepage (www.utc.edu); University Echo. Mammal Tree of Life project, paper published in *Science*.

2013 (August): UTC Homepage. Research on the extinct Eocene North American pangolin *Patriomanis americana*.

2014 (June): UTC Homepage. Independent study students prepare anteater specimen donated by Nashville Zoo.

2016 (July): *Get Out Chattanooga*, [a local outdoor magazine]. Armadillo invasion of southeast Tennessee.
2016 (November): online publication "Livescience.com" [http://www.livescience.com/56703-mummified-poop-reveals-extinct-sloth-diet.html]. New studies (not my own) of extinct ground sloth coprolites.
2017 (January): *Discover* magazine. Armadillo invasion of southeast Tennessee, body size in nine-banded armadillos.
2017 (August): online publication "Livescience.com" [http://www.livescience.com]. New extinct Pleistocene sloths from Mexican cenotes.

Miscellaneous
Awards
Honored as "favorite professor" by UTC Outstanding Senior Award winner Ali Blach (BS Secondary Ed., Natural Science:Biology) (April, 2012).
Honored as "favorite professor" by UTC Outstanding Senior Award winner Julie Barnes (BS Biology: Organismal) (April, 2013).
Dr. John R. Freeman Memorial Endowment Fund Award, Dept. of Biology, Geology, and Environmental Science, UTC (2017)

Museum-related activities
Maintained permit [#1506 from Tennessee Wildlife Resources Agency for scientific collection of vertebrate specimens (2012-Present)
Maintained permit [#11-SC00122] from North Carolina Wildlife Resources Commission for scientific collection of mammals and salamanders (2012-Present)

Maintained an Endangered Species permit (NC 12-ES00355) from the North Carolina Wildlife Resources Commission for collection of threatened and endangered mammals, reptiles and amphibians (2012-Present)

Obtained a scientific collection permit for mammals from the U.S. Forest Service for Mammalogy class (BIOL 4570/4140) field trips to high-elevation habitats in Nantahala National Forest, Graham County, NC (September, 2012; September, 2014; September, 2016),

Maintained two approved UTC IACUC Protocols for use of Live Vertebrates: #0607TJG-02, entitled "Surveys of Volant and Small Terrestrial Mammals for the Laboratory portion of the UTC Mammalogy course BIOL 4570/4140;" and, 0607TJG-03, entitled "Surveys of Volant and Small Terrestrial Mammals for UTC Research and Individual Studies students, BIOL 4995/4997/4998" (2012-Present)

Collected, prepared and digitally cataloged specimens (skulls, skeletons, and skins) of local and regional mammal species, as well as Pleistocene fossil vertebrates collected from local caves, and ordered commercially available specimens or obtained donations of extant and fossil mammals to enhance the teaching and research Natural History Museum collection (2012-Present)

Trained and supervised graduate and undergraduate curatorial assistants (26 students, 2012-Present)

Arranged to become permanent repository for mammal specimens collected by UTC in the Great Smoky Mountains National Park from 1999-2003; arranged for permanent loan of specimens and assignment of Park Service catalog numbers (2013)

Met annually with representative of the Chickamauga Chattanooga National Military Park to conduct annual check on mammal specimens from park for which we are serving as a repository (2012-Present)

Ordered and installed 3 new zoology cabinets for the mammal collection (one donated by the National Park Service and intended to house their specimens from Chicakamauga/Chattanooga National Battlefield and the Great Smoky Mountains); reorganized all cabinets, labeled new cabinets and relabeled old cabinets, arranged storage space to allow for future growth of collection (2013)

Applied for and obtained a Researcher permit from the Tennessee Board of Pharmacy (#0000011023) to use the euthanasia agent Isoflurane for collecting small mammals in the field as part of my teaching and research activities (2017)

Received and curated a historic collection of horse fossils (primarily; collection also includes a small amount of fossil elephant, camel, bison, oreodont, and miscellaneous vertebrate material) that had been stored in UTC's Geology department (Spring 2017).

Loaned skeletal specimens to UTC's Department of Sociology, Anthropology and Geography, for Fall Forensic Anthropology course (every Fall, 2013-Present)

External, outgoing loans: May 2012, March 2013, Nine-banded armadillo, *Dasypus novemcinctus*, Dr. David Varicchio, Montana State University, bone histology study; October 2014, Pygmy shrew, *Sorex hoyi*, Dr. Steve Wallace, East Tennessee State University, fossil shrew taxonomy; December 2015, Armadillos *Chaetophractus villosus, Dasypus novemcinctus, Dasypus hybridus,* and *Euphractus sexcinctus*, Dr. Jonathan Bloch, University of Florida, armadillo head shield study; October 2016, giant anteater, *Myrmecophaga tridactyla*, Dr. Michael Butcher at Youngstown State University, study of epaxial muscle anatomy; December 2016, Nine-banded armadillo, *Dasypus novemcinctus,* Dr. Jeremy Green, Kent State University Tuscarawas, dental histology study; August 2017; multiple shrew species, Dr. Wighart von Koenigwald, Bonn University [Germany], dental histology study.

Specimen swap: Fall 2016, received pelts of the two-toed sloth (*Choloepus* sp.), the collared anteater (*Tamandua* sp.), and the endangered black-footed ferret (*Mustela nigripes*), in exchange for UTC skull and skeletal material of local shrews and rodents, Dr. Steve Wallace, East Tennessee State University.

External, incoming loans: Multiple specimens from Southern Adventist University, for use in Mammalogy course (BIOL 4570/4140, Fall 2012, 2014, 2016); August 2014, extinct Pliocene sloth *Megalonyx leptostomus*, Florida Museum of Natural History; January 2016, extinct early Eocene fossil mammal *Metacheiromys marshi* from U.S. National Museum of Natural History [Smithsonian Institution, Washington, DC]; July 2016, extinct Miocene sloth *Schismotherium fractum,* U.S. National Museum of Natural History [Smithsonian Institution, Washington, DC]; July 2016, extinct Pleistocene sloth *Glossotherium tropicorum*, Royal Ontario Museum; September 2016, extant skeletons of Collared anteater, *Tamandua mexicana*, and Pygmy anteater, *Cyclopes didactylus*, from the Field Museum of Natural History; July 2017, extinct Pleistocene mylodontid sloth, Florida Museum of Natural History.

David Giles

Faculty development
NIH Regional Seminar, New Orleans, Spring 2017
NSF CAREER Workshop, UTC, Spring 2016
NIH R15 Workshop, UTC, Spring 2015
NIH Regional Seminar, Baltimore, Spring 2014

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Moravec AR, Siv AW, Hobby CR, Lindsay EN, Norbash LV, Shults DJ, Symes SJK, Giles DK. Exogenous polyunsaturated fatty acids (PUFAs) impact membrane remodeling and affect virulence phenotypes among pathogenic *Vibrio* species. *In Press. Appl Environ Microbiol*

Madsen, JA, Xu H, Robinson MR, Horton AP, Shaw JP, Giles DK, Kaoud TS, Dalby KN, Trent MS, Broadbelt JS. 2013. High-throughput database search and large-scale negative polarity LC-MS/MS with Ultraviolet photodissociation for complex proteomic samples. *Mol Cell Proteomics* 12: 2604-2614.

Pride AC, Herrera C, Guan Z, Giles DK, Trent MS. 2013. The outer surface lipoprotein VolA mediates utilization of exogenous lipids by *Vibrio cholerae*. *MBio* 14: e00305-00313.

Needham BD, Carroll S, Giles DK, Georgiou G, Whiteley M, Trent MS. 2013. Modulating the innate immune response by combinatorial engineering of endotoxin. *Proc Natl Acad Sci USA* 110: 1464-1469.

Maue AM, Mohawk K, Poly F, Giles DK, Ewing CP, Monteiro MA, Trent MS, Guerry P. 2013. The polysaccharide capsule of *Campylobacter jejuni* 81-176 modulates the host immune response. Infect Immun 81: 430-440.

Cullen TW, Hendrixson DR, Giles DK, Hobb RI, O'Brian J, Thompson SA, Brodbelt JS, Trent MS. 2013. EptC of *Campylobacter jejuni* mediates phenotypes involved in host interactions and virulence. *Infect Immun* 81: 665-672.

Submitted or in preparation
Baker LY, Hobby CR, Siv AW, Bible WC, Glennon MS, Anderson DM, Symes SJ, Giles DK. Exogenous polyunsaturated fatty acids (PUFAs) impact phospholipid remodeling and virulence phenotypes in *Pseudomonas aeruginosa*. Submitted to *BMC Micriobiology*.

Eder AE, Munir SA, Hobby CR, Anderson DM, Herndon JL, Siv AW, Symes SJK, Giles DK. Exogenous polyunsaturated fatty acids (PUFAs) impact membrane remodeling and affect phenotypes associated with virulence in *Acinetobacter baumannii*. Submitted to *Microbiology*.

Hobby CR, Herndon JL, Symes SJK, Giles DK. Exogenous polyunsaturated fatty acids (PUFAs) impact membrane phospholipid structure and influence phenotypes associated with virulence in *Klebsiella pneumoniae*. In preparation.

Grants

External

National Science Foundation (#1520672): I-MATH: An Interdisciplinary Math Training Program (2015-2018; PI: Jin Wang). Funding: $500,000

Internal

UTC Collaborative Research Initiative for Sponsored Programs (CRISP): Physiological and Behavioral Adaptations of *Vibrio cholerae* to Fatty Acids in a Continuous Culture (Bioreactor) Model (2016-2017; PI: Bradley Harris). Funding: $7,975

UTC (CEASCE): A computational study of the impact of fatty acid substitutions on the *Vibrio cholerae* outer and inner membranes (2017-2018; PI: Bradley Harris). Funding: $24,985.30

UTC Collaborative Research Initiative for Sponsored Programs (CRISP): Environmental factors related to bacterial contamination in hospital intensive care units in Children's Hospitals: Assessment and recommendations for practice (2016-2017; PI: Henry Spratt). Funding: $8,000

UTC Collaborative Research Initiative for Sponsored Programs (CRISP): Quantitative and Structural Characterization of Bacterial Phospholipids Following Fatty Acid Exposure (2015-2016; PI: David Giles) Funding: $8,000

UTC Research and Creative Activity (RCA) Grant: Environmental DNA and Lipidomic Analyses of Raccoon Mountain Caverns (2015-2016; PI: David Giles) Funding: $5,057

UTC Summer Fellowship: A Proteomics approach to identifying bacterial response pathways to exogenous fatty acids (2015; PI: David Giles) Funding: $2,500

UTC Grant for Research Centers: Research Center for Applied Biomolecular, Behavioral, and Health Studies (2014-2015; PI: Manuel Santiago) Funding: $20,000

Group Faculty Grant: Biology Seminar (2014; PI: David Giles) Funding: $700

Faculty Research Grant: Determining the lipid handling capabilities of *Vibrio vulnificus* (2013-2014; PI: David Giles) Funding: $2,799

Invited Research Seminars

Exogenous Fatty Acids Impact Phospholipid Remodeling and Virulence Phenotypes in Pathogenic *Vibrio* Species. Invited Chemistry Seminar. The University of the South. Sewanee, TN. 2016

Insane in the Membrane: Bacterial Assimilation of Exogenous Fatty Acids Affects Virulence Phenotypes. Invited Biology Seminar. The University of Tennessee at Chattanooga. Chattanooga, TN. 2015.

It's What's on the Outside that Counts: Bacterial Lipid Strategies for Adapting to their Environment. Invited Chemistry Seminar. The University of Tennessee at Chattanooga. 2013.

Diversifying Your Lipid Portfolio: Bacterial Membrane Remodeling for Adaptation to the Environment. Invited Biology Seminar. The University of Tennessee at Chattanooga, TN. 2013.

Conference Presentations

Ammon J, Giles DK. 2017. Molecular monitoring of MRSA: Identification and Prevention in Healthcare Settings. UTC Research Dialogues Undergraduate Lightning Round. The University of Tennessee at Chattanooga, TN.

Battles M, Sorenson E, Giles DK. 2017. SlowMo Microbio: Time-lapse video of microbiological tests. UTC Research Dialogues. Poster (Computer) Presentation. The University of Tennessee at Chattanooga, TN.

Schoonover MA, Asemota ST, Avello Z, Anderson D, Symes SJ, Giles DK. 2016. A Survey of Bacterial Biodiversity and Lipid Content within Raccoon Mountain Caverns. Association of Southeastern Biologists Meeting. Oral Presentation. Concord, NC.

Schoonover MA, Asemota ST, Avello Z, Anderson D, Symes SJ, Giles DK. 2016. Shining a Light on What's Hiding in the Dark: Bacterial and Lipid Analyses of Subterranean Sediments. UTC Research Dialogues. Oral Presentation. The University of Tennessee at Chattanooga, TN.

Anderson D, Avello Z, Symes SJ, Giles DK. 2016. UPLC-MS Characterization of Membrane Phospholipids from *Vibrio* Species Following Exposure to Exogenous Fatty Acids. Southeastern Regional Meeting of the American Chemical Society. Columbia, SC.

Baker LY, Giles DK. 2016. Polyunsaturated Fatty Acids (PUFAs) impact antimicrobial peptide resistance in *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* and cause reduced motility in *P. aeruginosa*. UTC Research Dialogues. The University of Tennessee at Chattanooga, TN.

Clavin M, Ferrando B, Irvin B, Harris B, Giles DK. 2016. Utilization of Exogenous Lipids: The effects of various fatty acids on *Vibrio cholerae*. UTC Research Dialogues. The University of Tennessee at Chattanooga, TN.

Munir SA, Shults DJ, Symes SJ, Giles DK. Scavenging Fatty Acids Confers Phenotypic Advantages to *Acinetobacter baumannii*. National Conference on Undergraduate Research. Eastern Washington University, April 16-18, 2015.

Eder AE, Shults DJ, Symes SJ, Giles DK. The Effects of Lotion Fatty Acids on *Acinetobacter baumannii.* National Conference on Undergraduate Research. Eastern Washington University, April 16-18, 2015.

Eder AE, Santiago MF, Giles DK. 2015. Exogenous fatty acids from lotion affect phospholipid structure and alter permeability characteristics in *Acinetobacter baumannii*. Association of Southeastern Biologists Meeting. Chattanooga, TN. Oral presentation.

Munir SA, Shults DJ, Symes SJ, Giles DK. 2015. Exposure to exogenous fatty acids impacts phospholipid composition, membrane permeability, and virulence phenotypes in *Acinetobacter baumannii*. Association of Southeastern Biologists Meeting. Chattanooga, TN. Oral presentation.

Moravec AR, Siv AW, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous fatty acids impact phospholipid remodeling and virulence among pathogenic *Vibrio* species. American Society for Microbiology General Meeting. New Orleans, LA.
Eder AE, Symes SJ, Giles DK. 2015. Lotion fatty acids impact membrane remodeling and affect phenotypic characteristics of *Acinetobacter baumannii*. American Society for Microbiology General Meeting. New Orleans, LA.

Siv AW, Norbash LV, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous polyunsaturated fatty acids (PUFAs) impact *Vibrio vulnificus* phospholipid remodeling, biofilm formation and resistance to environmental stresses. American Society for Microbiology General Meeting. New Orleans, LA.

Moravec AR, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous polyunsaturated fatty acid (PUFA) scavenging affects phospholipid composition and virulence phenotypes in *Vibrio cholerae* and *Vibrio parahaemolyticus*. American Society for Microbiology General Meeting. New Orleans, LA.

Munir SA, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous polyunsaturated fatty acid (PUFA) utilization involves phospholipid remodeling and impacts virulence phenotypes in *Acinetobacter baumannii*. American Society for Microbiology General Meeting. New Orleans, LA.

Moravec AR, Shults DJ, Symes SJ, Santiago MF, Giles DK. 2015. Membrane remodeling via utilization of exogenous polyunsaturated fatty acids (PUFAs) modifies virulence phenotypes in *Vibrio cholerae* and *Vibrio parahaemolyticus*. Association of Southeastern Biologists Meeting. Chattanooga, TN.

Siv AW, Norbash LV, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous fatty acids affect phospholipid structure, membrane remodeling, biofilm formation and susceptibility to environmental stress in *Vibrio vulnificus*. Association of Southeastern Biologists Meeting. Chattanooga, TN.

Munir SA, Shults DJ, Symes SJ, Giles DK. 2015. Exposure to exogenous fatty acids impacts phospholipid composition, membrane permeability, and virulence phenotypes in *Acinetobacter baumannii*. UTC Research Day. The University of Tennessee at Chattanooga, TN.

Eder AE, Symes SJ, Santiago MF, Giles DK. 2015. Lotion fatty acids impact membrane structure and permeability in *Acinetobacter baumannii*. UTC Research Day. The University of Tennessee at Chattanooga, TN.

Siv AW, Norbash LV, Shults DJ, Symes SJ, Giles DK. 2015. Exogenous fatty acids affect phospholipid structure, membrane remodeling, biofilm formation and susceptibility to environmental stress in *Vibrio vulnificus*. UTC Research Day. The University of Tennessee at Chattanooga, TN.

Glennon MM, Bible WC, Giles DK. 2014. Scavenging fatty acids confers phenotypic advantages to *Pseudomonas aeruginosa*. Association of Southeastern Biologists Meeting. Spartanburg, SC.

Needham BD, Carroll S, Giles DK, Georgiou G, Whiteley M, Trent MS. 2012. Modulating the Immune Response by Combinatorial Engineering of Endotoxin. 12th Annual IEIIS Meeting. Tokyo, Japan.

Professional, University, Departmental and Community Service

Professional
Journal Reviewer for the following journals: *Journal of Bacteriology, Journal of Clinical Microbiology, Journal of Functional Foods, NCUR Proceedings*

Association of Southeastern Biologists: Oral and Poster Presentation Judge (2015-present); ASB Student Award Committee (2015-present, co-chair 2016-2017, chair 2017-2018); Chair, ASB and Affiliate Awards Committee (2017-2018)

University
Faculty Advisor, Pre-Medical Society (2015-present)
Learning Support and Auxiliary Services Committee (2013-2014; 2015-2017)
Honors College Advisory Committee (2015-2017)
Hiring Committee, Grants Specialist (2015-2016)
Scholarships Committee (2014-2015)

Department
Tri-Beta Advisory Committee (2013-present)
Pre-Professional Advisory Committee (2014-present)
Student Awards and Relations Committee (2013-2016)
Graduate Committee (2013-present)

Community
Volunteer, Kids for Clean Water, Summer Camp (2017)

Press regarding your work
UTC Research Dialogues 2017 Promotional Video
(https://www.youtube.com/watch?v=Y0VA4PBm2ao&t=18s)

Katherine Harrell

Faculty development
Critical Thinking Assessment Test (CAT) Grading Session. UTC Walker Center for Teaching and Learning (2013, 2015, 2016, 2017)
Instructional Excellence Retreat. Walker Center for Teaching and Learning (2012, 2013, 2014, 2015, 2016)
Webinar 10 Ways to Improve Blended Learning Course Design, Walker Teaching Resource Center (2014)
Attended Lunch and Learn demo of MindTap and CourseMate software hosted by Cengage (2015)
Freshmen Advising Training (2012, 2013, 2014)

Scholarly activity

Books and book chapters (Lab Manuals)
BIO2080L Human Physiology Laboratory Manual 3rd edition; Linda Collins, Katherine Harrell, Jeremy Bramblett 2015

Invited Educational Presentations
Guest speaker at the UTC Wildlife and Zoology Club meetings on 3/9/2016 and 11/2/2016
Guest speaker for UTC EDGE club meeting on 11/16/2016
Guest speaker Tennessee Naturalist Program at Audubon Acres 1/28/2017

Professional, University, Departmental and Community Service

Professional
Eight letters of recommendation for former & current students (2012)
Eleven letters of recommendation for former & current students (2013)
Eighteen letters of recommendation for former & current students (2014)
Nineteen letters of recommendation for former & current students (2015)
Eight letters of recommendation for former & current students (2016)

Nine advising sessions (2012)
Four advising sessions (2013)
Three advising sessions (2014)
Four advising sessions (2015)
Four advising sessions (2016)

University
FYRE & First Class meeting with freshmen (2012, 2013, 2014
Petitions Committee (2012-2015)
House Calls: Office of the Dean of Students (2015)
Late Night Breakfast: Office of the Dean of Students (2012-2013)
Review panel for Provost Student Research Awards (2015, 2016, 2017)
Commencement (2012, 2013, 2014, 2015, 2016)

Department
SLO development for BIO2060, BIO2080 and BIO4630
Scheduling for A&P lectures and labs (2013-present)
Student Awards & Relations Committee (2013-present)
Low Student GPA Committee (2012-present)
Preprofessional Advisory Committee (2012- 2015, Chair 2016-present)
Curriculum Planning Committee (2012, 2013)
Physiology Lecture Search Committee (2013)
Library Committee (2012-present)
Space and Planning Committee (2012, 2013)
Organized UTC Wildlife & Zoology Club Nestbox-Building Day (2016)

Community
Signal Mountain Middle High School: Science fair judge (2015)
Chattanooga School for the Arts and Sciences: Senior project evaluator (2012-2014)
Tyner Academy: Science fair judge (2014)
Neema Resettlement Outreach: STEM and ESL education (2013-2014)
Volunteer Class II Wildlife Rehabilitator with Happinest Wildlife Rehabilitation & Rescue (2014-present)

Loren Hayes

Faculty development
IACUC training
IRB training
OED and Taleo Training

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Taig-Johnston, M., Strom, M.K.*, Calhoun, K.*, Nowak, K.*, Ebensperger, L.A. & Hayes, L.D. Long-term studies of vertebrates in central and South America. Submitted to *Revista Chilena de Historia Natural*. Impact Factor: 0.702.

Chock, R.* Wey, T.*, Ebensperger, L.A. & Hayes, L.D. 2017. Evidence for a behavioural syndrome and negative social assortment by exploratory personality in the communally nesting rodent, *Octodon degus. Behaviour* 154: 541-562. Impact Factor: 1.39

Schradin, C. & Hayes, L.D. 2017. Long-term studies of mammals: An integrative view. *Journal of Mammalogy.* (Special Feature organized by L.D. Hayes & C. Schradin). Submitted to *Journal of Mammalogy* 98: 670-677. Impact Factor: 1.63

Hayes, L.D., Ebensperger, L.A., Kelt, D.A., Meserve, P.M., Viblanc, V., Pillay, N. & Schradin, C. 2017. Long-term field studies in rodents. *Journal of Mammalogy.* (Special Feature organized by L.D. Hayes & C. Schradin). *Journal of Mammalogy* 98: 642-651. Impact Factor: 1.63

Hayes, L.D. & Schradin, C. 2017. Long-term field studies in mammals: An introduction. *Journal of Mammalogy.* (Special Feature organized by L.D. Hayes & C. Schradin). *Journal of Mammalogy* 98: 600-602. Impact Factor: 1.63

Chapin, K.*, Nonacs, P., & Hayes, L.D. 2017. Cheating to Learn: An open-exam approach to engaging students in evolutionary paradoxes. *American Biology Teacher* 79: 144-148. Impact Factor: 0.318

Ebensperger, L. A., Correa, L. A., León, C., Ramírez-Estrada, J., Abades, S., Villegas, Á. & Hayes, L. D. 2016. The modulating role of group stability on fitness effects of group size is different in females and males of a communally rearing rodent. *Journal of Animal Ecology* 85: 1502–1515. doi:10.1111/1365-2656.12566 Impact Factor: 4.47

Ebensperger, L. A., de Arce, F. P., Abades, S., & Hayes, L. D. 2016. Limited and fitness-neutral effects of resource heterogeneity on sociality in a communally rearing rodent. *Journal of Mammalogy.* Impact Factor: 1.63

Bauer C.M., Ebensperger L.A., León C., Ramírez-Estrada J., Hayes L.D., & Romero L.M. 2016. Post-natal development of the degu (*Octodon degus*) endocrine stress response is affected by maternal stress and care. *Journal of Experimental Zoology*. 00: 1-14. Impact Factor: 1.44

Chappell, A.*, Lin, Y.K., Freeman, S.*, LaPierre, J*., Inoue, K., Young, L.J., & Hayes, L.D. 2016. Distributions of oxytocin and vasopressin 1a recaptors in the Taiwan vole and their role in social monogamy. *Journal of Zoology*. Impact factor: 1.88

Davis, G.*, Vasquez, R., Poulin, E., Oda, E., Bazan- León, E.A., Ebensperger, L.A., & Hayes, L.D. 2016. *Octodon degus* kin and social structure. *Journal of Mammalogy* 97, 361-372. Impact Factor: 1.84

Valomy, M.,* Hayes, L.D. & Schradin, C. in press. Social organization in Eulipotyphla: evidence for a social shrew. *Biology Letters* 11, 20150825. Impact Factor: 3.67

Bauer, C.M.,* Hayes, L.D., Ebensperger, L.A. Ramírez-Estrada, J., León, C., Davis, G.T.* & Romero. L.M. 2015. Maternal stress and plural breeding with communal care affect development of the endocrine stress response in a wild rodent. *Hormones and Behavior* 75, 18-24. Impact factor 4.632

Ebensperger, L.A., Leon, C., Ramirez-Estrada, J., Hayes, L.D., Nova, E., Salazar, F., Bhattacharjee, J. & Becker, M.I. 2015. Immunocompetence of breeding females is sensitive to cortisol levels but not to communal rearing in the degu (*Octodon degus*). *Physiology & Behavior* 140, 61-70 Impact factor 3.033

Taborsky, M., Hofmann, H., Beery, A.K., Blumstein, D.T., Hayes, L.D., Lacey, E.A., Martins, E.P., Phelps, S.M., Solomon, N.G., & Rubenstein, D.R. 2015. Taxon matters: promoting integrative studies of social behavior. *Trends in Neuroscience* 38, 189-191. Impact factor: 12.902

Strom, M.*, Carroll, K.A.*, Davis, G.*, Hultman, W.*, Kosycarz, T.*, & Hayes, L.D. 2015. Finding 'Garrett': An evolutionary language development game. *American Biology Teacher*.77, 608-612.Impact Factor: 0.369

Hofmann, H.A., Beery, A.K., Blumstein, D.T., Couzin, I.D., Earley, R.L, Hayes, L.D., Hurd, P.L., Lacey, E.A., Phelps, S., Solomon, N.G., Taborsky, M., Young, L.J., & Rubenstein, D.R. 2015. An evolutionary framework for studying mechanisms of social behavior. *Trends in Ecology & Evolution*, 29, 581-589. Impact factor: 15.389

Ebensperger, L.A., Villegas, A., Abades, S., & Hayes, L.D. 2014. Mean but not variance in ecological conditions modulate fitness effects of group-living and communal rearing. *Behavioral Ecology* 25, 862-870. Impact factor: 3.216

Bauer*, C.M., Hayes, L.D., Ebensperger, L.A. & Romero, L.M. 2014. Seasonal variation in the degu (*Octodon degus*) endocrine stress response. *General and Comparative Endocrinology* 197: 26-32. Impact factor: 2.823

Ebensperger, L.A., Tapia, D., Ramirez-Estrada, J., Leon, C., Soto-Gamboa, M. & Hayes, L.D. 2013. Fecal cortisol levels predict breeding but not survival of females in short-lived rodent, *Octodon degus*. *General and Comparative Endocrinology*. 186: 164-171. Impact factor: 2.823

Wey, T.*, Burger, J.R*., Ebensperger, L.A. & Hayes, L.D. 2013. Sex, seasonality and social networks: An analysis of *Octodon degus* sociality. *Animal Behaviour*. 85: 1407-1414. Impact factor: 3.068

Bauer, C.M.*, Skaff, N.K.*, Bernard, A.B.,* Trevino, J.M.*, Ho, J.M.*, Romero, L.M., Ebensperger, L.A. & Hayes, L.D. 2013. Habitat type influences endocrine stress response in the degu (*Octodon degus*). *General and Comparative Endocrinology*. 186, 136-144. Impact factor: 2.823

Ebensperger, L.A., Rivera, D.S.* & Hayes, L.D. 2012. Direct fitness of group living mammals varies with breeding strategy, climate and fitness estimates. *Journal of Animal Ecology* 81, 1013-1023. Impact factor: 4.841

Submitted or in preparation

Carroll, K.*, Gao, L., Ebensperger, L.A., Hayes, L.D. Costs of increasing social network structure in the communally breeding rodent *Octodon degus*. *Submitted to Behavioral Ecology and Sociobiology*.

Agnani, P.*, Kauffman, C.*, Hayes, L.D., & Schradin, C. Intra-specific variation in social organization of Strepsirrhines. Submitted to *American Journal of Primatology*.

Correa, L., León, C., Ramírez-Estrada, J., Ly-Prieto, A., Abades, S., Hayes, L.D., Soto-Gamboa, M., & Ebensperger, L.A. Masculinized and younger males attain higher reproductive success in a social rodent. Submitted to *Journal of Animal Ecology*.

Schradin, C., Hayes, L.D., Pillay, N., & Bertelsmeier, C. The evolution of intra-specific variation in social organization. Submitted to *Ethology*.

Books and book chapters

Accepted or published

Sociobiology of caviomorph rodents: An integrative view. 2016. Editors: Luis A. Ebensperger & Loren D. Hayes. John Wiley & Sons.

Smith, J. E., Lacey, E. A., & **Hayes, L. D.** 2017. 10 Sociality in Non-Primate Mammals. *Comparative Social Evolution*, 284.

Ebensperger, L. A., & **Hayes, L. D.** (2016). Causes and evolution of group-living. Pgs. 173-200 in *Sociobiology of Caviomorph Rodents: An Integrative Approach* (Eds: Luis A Ebensperger & **Loren Hayes**, Wiley Blackwell).

Ebensperger, L. A., & **Hayes, L. D.** (2016). An integrative view of caviomorph social behavior. Pgs. 326-355 in *Sociobiology of Caviomorph Rodents: An Integrative Approach* (Eds: Luis A Ebensperger & **Loren Hayes**, Wiley Blackwell).

Hayes, L. D., & Ebensperger, L. A. (2016). Fitness consequences of social systems. Pgs. 306-325 in *Sociobiology of Caviomorph Rodents: An Integrative Approach* (Eds: Luis A Ebensperger & **Loren Hayes**, Wiley Blackwell).

Beery, A., Kamal, Y., Sobrero, R., & **Hayes, L. D.** (2016). Comparative neurobiology and genetics of mammalian social behavior. Pgs. 59-in *Sociobiology of Caviomorph Rodents: An Integrative Approach* (Eds: Luis A Ebensperger & **Loren Hayes**, Wiley Blackwell).

Grants

External

Community Foundation of Greater Chattanooga: Enrichment for Students and Animals: Using animal behavior to encourage STEM learning (2012-2014; PI: Preston Foerder, Hope Klug & Loren Hayes). Funding: $15,000

National Science Foundation (#1261026): U.S.-Chile International Research Experience for Students (IRES): Intraspecific variation and genetic mechanisms of animal sociality (2013-2017; PI: Loren Hayes; co-PIs, Margaret Kovach & Cecelia Wigal). Funding to UTC: $249,801.

Community Foundation of Greater Chattanooga: The Chile-Chattanooga Connection: Improving STEM education for K-12 and University Students (2012-2014; PI: Loren Hayes). Funding to UTC: $15,000.

Internal
UTC Faculty Fellow. Support for summer research. Funding: $2500.

UTC Office of Equity and Diversity Professional Development grant. Travel support for a meeting with colleagues at UC-Davis (including UTC students Carroll and Strom). Funding: $1833.

Invited Research Seminars
Hayes, L.D. 2016. Costly breeding: Why do mammal females rear offspring together? University of West Georgia.

Hayes, L.D. 2016. Costly breeding: Why do mammal females rear offspring together? Southern Adventist University (TN).

Hayes, L.D. 2016. Costly living: Why do *Octodon degus* females live in groups despite fitness costs? Miami University (Ohio).

Hayes, L.D. 2015. Costly living: Why do *Octodon degus* females live in groups despite fitness costs? Vanderbilt University (Tn).

Hayes, L.D. 2015. Mammalian plural breeding: Why Bother? University of North Texas.

Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? University of Memphis.

Hayes, L.D. 2014. Research on *Octodon degus* sociality in Bosque Fray Jorge National Park, Chile – an information presentation (in Spanish) to CONAF-Chile park rangers.

Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? Institut Pluridisciplinaire Hubert Curien, Strasbourg, France.

Hayes, L.D. 2014. Mammalian plural breeding: Why Bother? UC-Davis.

Hayes, L.D. 2013. Mammalian plural breeding: Why Bother? University of North Carolina-Asheville.

Hayes, L.D. 2013. Mammalian plural breeding: Why Bother? Universidad de Chile, Santiago, Chile.

Hayes, L.D. 2013. Mammalian plural breeding: Direct fitness consequences and neuroendocrine mechanisms. Georgia Gwinnett College.

Invited Educational Presentations
Presentation on Chile work to Results Physiotherapy, Chattanooga, TN.

Conference Presentations
Hayes, L.D., Carroll, K.*, Gao, L., & Ebensperger, L.A. Fitness consequences of sociality in *Octodon degus*: Are benefits of increasing group size under harsh conditions offset by costs of high network strength? Behaviour-2017, Lisbon, Portugal. (July 2017)

Johnson, N.E.*, Grillo, S.*, Gilliam, E.H., Hayes, L.D., Ebensperger, L.A. & Vasquez, R.A. Impacts of long-term predation risk on stress response and behavior in the rodent, *Octodon degus.* American Society of Mammalogists, Moscow, Idaho. (June 2017).

Cychowski, M. *, Schradin, C. & Hayes, L.D. Sociality of marine mammals: a re-evaluation of what is happening beneath the surface. Society of Comparative and Integrative Biology, New Orleans, La. (January 2017).

Miles, M. *, & Hayes, L.D. Artiodacytl and Perrisodactyl Social Organization: Re-evaluation and Re-assessment. Society of Comparative and Integrative Biology, New Orleans, La. (January 2017).

Strom, M.,* Abbot, P., Nowak, K.*, Calhoun, K.*, Bauer, C., Romero, L.M., Ebensperger, L.A. & Hayes, L.D. Are ectoparasites or their bacterial communities correlated with the endocrine stress response in degus *Octodon degus?* Society of Comparative and Integrative Biology, New Orleans, La. (January 2017).

Hayes, L.D. & Ebensperger, L.A. 2016. Costly breeding: Why do females breed plurally in *Octodon degus*. International Society of Behavioral Ecology, Exeter, England.

Strom, M.*, Ebensperger, L.A., & Hayes, L.D. 2016. Habitat specific fitness consequences of group-living. International Society of Behavioral Ecology, Exeter, England.

Ebensperger, L.A., & Hayes, L.D. 2016. Group stability modulates social benefits in a plural breeding rodent. International Society of Behavioral Ecology, Exeter, England.

Strom, M.*, Ebensperger, & Hayes, L.D. 2016. Habitat specific fitness consequences of group-living. American Society of Mammalogists, Minneapolis, MN.

Strom, M.*, Abbot, P., Nowak, K.*, Calhoun, K.*, Bauer, C., Romero, L.M., Ebensperger, L.A. & Hayes, L.D. 2016. Are ectoparasites or their bacterial communities correlated with the endocrine stress response in degus *Octodon degus*? American Society of Mammalogists, Minneapolis, MN.

Carroll, K.A.*, Abades, S., Gao, C., Ebensperger, L.A., & Hayes, L.D. 2016. Harsh and

unpredictable ecological conditions modulate social structure and direct fitness in a plurally breeding mammal. Association of Southeastern Biologists, Concord, NC.

Cychowski, M.*, Hayes, L.D. & Schradin, C. 2016. Sociality of marine mammals: a re-evaluation of what is happening beneath the surface. Council for Undergraduate Research, Asheville, TN.

Carroll, K. A.*, Ebensperger, L.A. & Hayes, L.D. 2015, How ecological variables influence social network structure and fitness in *Octodon degus*, Poster presentation at the 2015 American Society of Mammalogists meeting, Jacksonville, FL.

Strom, MK*, Ebensperger, LA, Vasquez, R., Bazán, E, Taig-Johnston, M* & Hayes, LD. 2015. Habitat specific fitness consequences of sociality in *Octodon degus.* Poster presentation at the 2015 Association of Southeastern Biologists meeting, Chattanooga, TN.

Carroll, K. A.*, Ebensperger, L.A. & Hayes, L.D. 2015, How ecological variables influence social network structure and fitness in *Octodon degus*, Poster presentation at the 2015 Association of Southeastern Biologists meeting, Chattanooga, TN

Hayes, L.D. 2015. Mammalian plural breeding: Why bother? Oral presentation at the 2015 La Société Française pour l'Etude du Comportement Animal, Strasbourg, France.

Hayes, L.D. 2015. Mammalian plural breeding: Why bother? Oral presentation at the 2015 Association of Southeastern Biologists meeting, Chattanooga, TN.

Bauer, C., Hayes, L., Ebensperger, L., & Romero, L.M. Seasonal variation in the degu (*Octodon degus*) endocrine stress response. American Society of Mammalogists annual meeting, June 2013. Presenter: Carolyn Bauer (oral)

Hayes, L.D. & Ebensperger, L.A. 2013. Mammalian plural breeding: Why bother? American Society of Mammalogists annual meeting, June 2013. Presenter: Loren Hayes (oral)

Hayes, L.D. & Ebensperger, L.A. 2013. Mammalian plural breeding: Why bother? University of Tennessee at Chattanooga Provost Research Day, April 2013. Presenter: Loren Hayes (oral)

Ebensperger, L.A., Villegas, A. & Hayes, L.D. 2013. Mean and variance in ecological conditions influence fitness consequences of group-living and communal rearing in the rodent, *Octodon degus*. Association for the study of animal behaviour annual meetings, Newcastlegateshead, England, August 2013. Presenter: Luis Ebensperger (oral)

Ebensperger, L.A. & Hayes, L.D. 2012. An integrative approach to sociality in degus, a communally breeding rodent. XXX Encontro Anual de Etologia (EAE), Ribeirão Preto, Brazil. Presenter: Luis Ebensperger (oral)

Professional, University, Departmental and Community Service

Professional
Associate Editor, *Journal of Mammalogy* (2011-present).

Journal Reviewer for the following journals: *Behavioral Processes, General and Comparative Endocrinology, Journal of Animal Ecology, Journal of Mammalogy, Journal of Zoology, Physiology & Behavior, PloS ONE*

Grant reviewer for NSF, NRC (South Africa).

University

Department
Department self-study (Faculty section) (2017; Chair)
Biology Lecturer search committee (2017; Chair).
Hiring and Planning (2012-present; Chair, 2014-present)
Student awards (2016-present).
By-laws (2014-2016)
Graduate (2012-present)
Faculty Associate Search (2012)
Assessment Committee (2012-2015)

Community
Chile-Chattanooga Connection: collaboration with UTC STEM group, UTC Engineering, Chattanooga Girls Leadership Academy, and Chattanooga Zoo. (2013-present)

Press regarding your work
Article in College in Arts and Science newsletter.
WUTC radio interview: Round and About Chattanooga.

<u>Hope Klug</u>

Faculty development
2015-2016: Participated in the Walker Center for Teaching and Learning Course Redesign Cohort
2015: Participated in the My Mediasite Training Workshop
2015: Accepted to teach in the Brock Scholars University Honors Program
2013-2014: Participant in Think Achieve 'Pop-Culture in the Classroom' Faculty Fellows Working Group
2012: Attended UTC's Instructional Excellence Retreat, 'Promoting Deep Learning and Critical. Thinking'
2012: Attended and Participated in General Education Retreat

Scholarly activity

Peer reviewed publications (Not including Published abstracts)

Accepted or published

Farnsley, S., Kuhajda, B., George, A. and Klug, H. 2016. The effect of the potential alarm cue chondroitin sulfate on Northern Studfish (*Fundulus catenatus*) behavior and its potential use in the conservation of stream fishes. Southeastern Naturalist. 15(3): 523-533.

Peacock, J., Covino, R., Irvin, L., Boyd, J., Klug, H., Auchter, J., & Lang, C. 2016. University faculty perceptions and utilization of popular culture in the classroom. Studies in Higher Education. DOI:10.1080/03075079.2016.1180673

Reyes, E., Thrasher, P., Bonsall, M.B., & Klug, H. 2016. Population-level density dependence influences the origin and maintenance of parental care. PLOS ONE.

Thrasher, P., Reyes, E., and Klug, H. 2015. Parental investment and mate choice in the giant water bug Belostoma lutarium. Ethology 121: 1018-1029 (Note: Thrasher and Reyes contributed equally to this work and share first authorship)

Klug, H. 2014. Evolution: students debate the debate (Correspondence in response to Laland et al., Wray et al. 2014. Does evolutionary theory need a rethink? Nature 514: 161-164.). Nature 515:343.

Klug, H & Hicks, P.. 2014. The Giant Water Bug Belostoma lutarium: An Ideal System for Studies of Ecology, Evolution, and Behavior. Journal of the Tennessee Academy of Science. 89: 51-58.

Klug, H. & Bonsall, M.B. 2014. The benefits of parental care in relation to increased offspring survival and parental effects on developmental rate. Ecology and Evolution. 4: 2330-2351

Klug, H., Bonsall, M.B., & Alonzo, S.H. 2013. Sex differences in life history drive transitions between maternal, paternal and bi-parental care. Ecology & Evolution. 3:792-806.

Klug, H., Bonsall, M.B., & Alonzo, S.H. 2013. The origin of parental care in relation to male and female life-history. Ecology & Evolution. 3:779-791.

Kokko, H., Klug, H. & Jennions, M.D. 2012. Unifying cornerstones of sexual selection: operational sex ratio, Bateman gradient, and the scope for competitive investment. Ecology Letters 15:1340-1351.

Jennions, M.J., Kokko, H., & Klug. H. 2012. The opportunity to be misled in studies of sexual selection. Journal of Evolutionary Biology. 25: 591-598.

Kazancıoğlu, E., Klug, H., & Alonzo, S.H. 2012. The evolution of social interactions changes predictions about interacting phenotypes. Evolution. 66(7):2056-64.

Submitted or in preparation
Farnsley, S., Kuhajda, B., George, A. and Klug, H. in reivew. Learning to overcome evolutionary history: conditioning as a mechanism to escape an evolutionary trap. Journal of Evolutionary Biology.

Ratz, T., Klug, H., & Bonsall, M.B. in revision. The evolution of plasticity in parental care in variable environments.

Klug, H. & Stone, L. in prep. Chance, sexual selection, and the outcome of mate competition.

Klug, H. in prep. Revisiting the operation of sexual selection. Invited review for Proceedings of the Royal Society B.

Books and book chapters
Accepted or published
Reyes, E. and Klug, H. 2017. Parental investment and sexual selection. Brief Communication in The Encyclopedia of Evolutionary Psychological Science (eds: T.K. Shackelford and V.A. Weekes-Shackelford). doi:10.1007/978-3-319-16999-6_1691-1

Klug, H. 2016. A brief history of mating systems. In The Encyclopedia of Evolutionary Biology (Ed.: R.M. Kilman). vol 2, pp. 459-464. Oxford: Academic Press.

Kokko, H., Klug, H., & Jennions, M.J. 2014. "Mating systems theory", in The Evolution of Insect Mating Systems (eds. Shuker and Simmons). Oxford University Press, Oxford.

Klug, H., Alonzo, S.H., & Bonsall, M.B. 2012. "Theoretical foundations of parental care", in The Evolution of Parental Care (eds. Royle, N.J., Smiseth, P.T., Kölliker, M.). Oxford University Press.

Alonzo, S.H. & Klug, H. 2012. "Maternity, paternity and parental care", in The Evolution of Parental Care (eds. Royle, N.J., Smiseth, P.T. & Kölliker, M.). Oxford University Press.

Grants
External
National Science Foundation, Division of Environmental Biology: CAREER: The operation of mate acquisition revisited (2016-2021; PI: H. Klug). Funding: $655,000.

Foundation of Greater Chattanooga Grant: Enrichment for students and animals: Using Animal Behavior to Encourage STEM Learning (2015-2017; PI: P. Foerder; Co-PIs: H. Klug & L. Hayes). Funding: $15,000.
National Science Foundation: MRI: Acquisition of growth chambers for global change biology research and research training at the University of Tennessee at Chattanooga. NSF Division of Biological Infrastructure, Major Research Instrumentation. (2013-2016; PI: J. Boyd; Co-PIs: S. Chatzimanolis, H. Klug, J. Shaw, & T. Wilson). Funding: $342,945.

Internal
THEC – Center Of Excellence: The development and application of computational tools to address fundamental questions in ecology and evolution (2017-2018; PI: H. Klug; Co-PIs: J. Boyd and H. Qin). Funding: $88,998.

University of Tennessee at Chattanooga Engaged Grant: Developing a UTC-TN Aquarium Partnership (2016-2017; PI: H. Klug; Co-PIs: P. Foerder & A. Carroll). Funding: $20,000.

University of Tennessee at Chattanooga CRISP Grant: iChimp: Using internet technology to connect captive chimpanzees (2016-2017; PI: P. Foerder; Co-PIs: F. Kandah & H. Klug. Funding: $8,600.

University of Tennessee at Chattanooga Faculty Development Grant: Overcoming Evolutionary History: Teaching the Endangered Barrens Topminnow to Escape Predation by an Invasive Species (2015-2016; PI: H. Klug). Funding: $3000.

University of Tennessee at Chattanooga Faculty Development Grant. (2015-2016; PI: H. Klug). Funding: $750.

University of Tennessee at Chattanooga Faculty Development Grant (2012; PI: S. Chatzimanolis; Co-PI: H. Klug). Funding: $500.

University of Tennessee at Chattanooga Faculty Development Grant (2012; PI: H. Klug). Funding: $1,500.

Invited Research Seminars
Klug, H. 2016. Parental care, filial cannibalism, & the evolution of social behavior. Florida State University.

Klug, H. 2016. Computational Evolutionary Ecology: Parental Care, Filial Cannibalism, and Social Behavior. This presentation was part of a Computational Science presentation given to Chancellor Angle and his Executive Team and President DiPietro, UT System Administrators, and Washington DC Liaisons. University of Tennessee at Chattanooga.

Klug, H. 2016. Parental care, filial cannibalism, & the evolution of social behavior. Southern Connecticut State University.

Klug, H. 2015. Parental care, filial cannibalism, & the evolution of social behavior. Kennesaw State University.

Klug, H. 2014. Parental care, filial cannibalism, & the evolution of social behavior. Breeding System Evolution Workshop, Sun-Yat Sen University, Guandong, China.

Klug, H. 2014. The (mis)measurement of sexual selection. University of Tennessee at Chattanooga.

Klug, H. 2013. Parental care, filial cannibalism, & the evolution of social behavior. Norwegian University of Science and Technology.

Klug, H. 2013. Parental care, filial cannibalism, & the evolution of social behavior. Southern Adventist University.

Klug, H. 2012. Parental care, filial cannibalism, & the evolution of social behavior. Vanderbilt University.

Klug, H. 2012. Parental care, filial cannibalism, & the evolution of social behavior. University of North Carolina – Ashville.

Invited Educational Presentations

R. Covino, J. Auchter, J. Boyd, H. Klug, L. Irvin, C. Laing, & J. Peacock. 2014. Pop culture in the classroom. University of Tennessee Chattanooga Instructional Excellence Retreat.

Klug, H. 2014. Engaging students in large classes. University of Tennessee at Chattanoog Think-Achieve Workshop.

Conference Presentations

Klug, H. & Stone, L. Sometimes you just get lucky: chance, mating dynamics and sexual selection (Poster Presentation). Behaviour 2017, Estoril, Portugal. (July 2017).

Darbashi, A., Clifford, C., Farnsley, S., Foerder, P., Hayes, L., & Klug, H. Behavioral effects of habitat enrichment on the bald eagle, *Haliaeetus leucocephalus* (Poster Presentation). Posters at the Capitol, Nashville, TN. (February 2016).

Klug, H., Farnsley, S., Kuhajda, B., George, A. Escaping evolutionary history: Training an endangered fish to escape an evolutionary trap (Oral presentation). Evolution 2015, Guarujá, Brazil. (July 2015).

Farnsley, S., Kuhajda, B., George, A., Klug, H. (presenter). Escaping evolutionary history: Training the Barrens Topminnow to escape an evolutionary trap (Oral presentation). Tennessee Chapter of the American Fisheries Society, Chattanooga, TN. (February 2015).

Klug, H., Farnsley, S., Kuhajda, B., George, A. Escaping evolutionary history: Training an endangered fish to escape an evolutionary trap (Oral presentation). International Society for Behavioral Ecology Congress, NYC. (July 2014).

Klug, H., Kokko, H., Jennions, M. The opportunity to be misled in studies of sexual selection. (Poster). International Society for Behavioral Ecology Congress, Lund, Sweden. (August 2012).

Kokko, H. (presenter), Klug, H., & Jennions, M.D. Unifying cornerstones of sexual selection theory: OSR and Bateman unite. International Society for Behavioral Ecology Congress, Lund, Sweden. (August 2012).

Professional, University, Departmental and Community Service

Professional
2012-2017: Reviewing Editor: *Journal of Evolutionary Biology*
2012-2017: Associate Editor: *Proceedings of the Royal Society B*
Journal Reviewer for the following journals: *Ecology Letters (August 2017), Animal Behavior (January 2017), Philosophical Transactions of the Royal Society B (December 2016), Nature Communications (August 2016), Quarterly Review of Biology (July 2016), Biological Reviews (June 2016), Behavioral Ecology (March 2016), Behavioral Ecology (November 2015), Behavioral Ecology (October 2015), Ecology & Evolution (September 2015), Behavioral Ecology (July 2015), Peer J (June 2015), Behavioral Ecology (April 2015), Evolution (March 2015), Ethology (March 2015), Behavioral Ecology (January 2015), Biological Reviews (December 2014)***,** *Oecologia (October 2014)***,** *Behavioural Processes (June 2014)***,** *Animal Behavior (May 2014)***,** *Ecology Letters (January 2014), Behavioral Ecology and Sociobiology (December 2013)***,** *American Naturalist (November 2013)***,** *Ecology and Evolution (October 2013)***,** *Ecology Letters (September 2013)***,** *Oecologia (April 2013)***,** *Journal of Evolutionary Biology (March 2013), Evolution (December 2012)***,** *Journal of Evolutionary Biology (November 2012)***,** *Evolution (October 2012)***,** *Proceedings of the Royal Society B (September 2012)*

2017: Grant reviewer: Aarhus Institute of Advanced Studies Marie Curie Co-Fund Grant: Reviewed 1 full proposal
2016: Grant reviewer: National Science Foundation: Reviewed 16 full proposals and served on the Postdoctoral Research Fellowships in Biology review panel
2016: Grant reviewer: National Science Foundation: Reviewed 14 full proposals proposal and served on the Division of Environmental Biology full proposal panel
2016: Grant reviewer: National Science Foundation: Reviewed 25 pre-proposals and served on the Division of Environmental Biology pre-proposal panel
2015: Grant reviewer: National Science Foundation: Reviewed 13 full proposals and served on the Postdoctoral Research Fellowships in Biology review panel
2015: Grant reviewer: National Science Foundation, Division of Evolutionary Biology: *ad hoc* reviewer (reviewed 1 full proposal)
2015: Grant reviewer: Graduate Women in Science: reviewed 1 full proposal
2014: Grant reviewer: National Science Foundation: reviewed 24 pre-proposals and served on DEB Evolutionary Processes pre-proposal review panel
2014: Grant reviewer: National Geographic Society: reviewed 1 full proposal

University
2017: SimCenter Director Search Committee Member
2017: Grant reviewer: UTC Provost Student Research Awards: Reviewed 6 proposals
2017: Co-organized (with J. Boyd and UTC Multi-Cultural Office) Hidden Figures Event in celebration of Black History Month
2015-2016 Committee Member: GENI Taskforce
2015-2016 Committee Member: Wheeler Odor Grant Board
2015-2016 Committee Member: College of Arts and Sciences Strategic Planning Committee
2015-2016: Co-Advisor for Women in the Natural Sciences
2014: Grant reviewer: UTC Provost Student Research Awards: Reviewed 12 proposals

2014-2015: UT System Committee Member: TN Transfer Pathways, UTC Biology Representative
2013-2016: Co-Advisor for Sigma Beta Rho (UTC's Multi-Cultural Fraternity)
2013-2016 Committee Member: Student Rating of Faculty Instruction
2012 and 2013: Participated in Late Night Breakfast Event
2012: Participated in Student Recruitment at Annual Fall Visit Day

Department
2017: Population Genetics Assistant Professor Search Chair
2012-2017 Committee Member: Graduate Committee
2014-2017 Committee Member: Hiring and Planning
2015-2017 Committee Member: Strategic Plan
2013-2017 Committee Member: Building Rennovation
2012-2015: Committee Member: Curriculum and Planning
2013-2014: Committee Member: Space Planning
2012-2013: Committee Member: Student Awards and Relations
2012-2013: Co-Organizer, Biology Seminar Series
2012: Microbiology Search Committee Member

Community
GEAR UP Animal Enrichment Days, Co-organized activites for local high school students (Summer 2017)
GEAR UP High School Student Aquatic Science Day, Organized and led activites for local high school students (Summer 2016 and Summer 2017)
High School Student Mentoring in Computational Biology Research, mentoring one high school student (2016-2017)
Enrichment for Students and Animals: Using Animal Behavior to Encourage STEM Learning (2015-2017)
GEAR UP High School Student Lab Outreach Day, Organized Shark Dissection and Firefly Lab Activites (Summers 2012, 2013, 2014, 2015, 2016, 2017)
TNACI CLAW Summer Camp High School Student Mentoring Event (2012 and 2016)
Girl Scout STEM Outreach Event, Shark Dissection (2012)
Collaborative Research with Chattanooga Zoo and TN Aquarium (2012-ongoing)

Press regarding your work
2016: University of Tennessee at Chattanooga, News Story, CAREER Award Grant and Student Research

2015: UTC Blog, Animal enrichment research highlighted in '"S.S. Why I Otter" provides environment enrichment at the aquarium', by. S Hedrick

2015: WUTC-NPR, Interviewed for 'UTC Partners with the Zoo' about Animal Enrichment.

2014: New Scientist, Parental care research highlighted in the article 'The father enigma: why do nature's devoted dads care' by L. E. Ogden

2014: Earth Touch News, Filial Cannibalism research highlighted in the article ‘Honey I ate the kids: Infanticide in the animal world’ by L. E. Ogden

2-14: Royal Society Publishing, Research highlighted in the article ‘Royal Society Publishing Celebrates International Women’s Day”, by E. Aime’

Margaret Kovach

Faculty development
Genome Consortium for Active Teach (GCAT): Synthetic Biology Workshop (2012)

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Mikelson, C., Kovach, M. J., Troisi, J., Symes, S., Adair, D., Miller, R. K., Salafia, C., Johnson, K., Lin, S. & Richards, S. (2015) Placental 11β-Hydroxysteroid dehydrogenase type 2 expression: Correlations with birth weight and placental metal concentrations. *Placenta* 36:1212-1217.

Shaw, J., Shafer, H. L., Leonard, O. R., Kovach, M. J., Schorr, M. & Morris, A. B. (2014) Chloroplast DNA sequence utility for the lowest phylogenetic and phylogeographic inferences in angiosperms: The tortoise and the hare IV. *Am. J. Bot.* 101(11):1987-2004.

Grants
External
Department of Defense U. S. Army: Nanofiber Based Bone Repair Device for Limb Salvage (2011-2013; PI: Thomas Currey; co-PIs, Margaret Kovach, Steven Symes & Jayesh Doshi). Funding: $29,796 contract of larger proposal with UT College of Medicine.

Internal
UTC CRISP Award. In depth analysis of e-cigarette filling solutions and their biological implications (2014-2015; PI: Gretchen Potts; co-PIs, Margaret Kovach & Ethan Carver). Funding: $8,000.

Conference presentations
Hale, C. M., Carver, E. A., Potts, G. E. & Kovach M. J. (2017) *The effects of e-cigarette exposure on cell viability and gene expression.* Southeastern Biology 64(3).

Marlowe, M., Potts, G. E., Kovach, M. J. & Carver, E. (2016) *Cell viability and gene regulation following exposure to contents of e-cigarette refill solutions.* Southeastern Biology 63(3):417.

Marlowe, M., Beavers, C., Potts, G. E., Kovach, M. J. & Carver, E.A. (2015) *Effects of Alkaloids Found in Electronic Cigarette Refill Solutions on Cell Growth and Gene Expression*. Southeastern Biology 62(3):419.

Patterson AJ, Mejia MB, Kovach MJ (2015) ***In vitro characterization of a nanofiber-based bone repair device.*** **Southeastern Biology 62(3):408.**

Mejia MB, Carver TA, Kovach MJ (2014) ***An Analysis of Differentially Expressed Genes in the Context of Cochlear Malfunction in Charcot-Marie Tooth Syndrome*****. Southeastern Biology 61(3):359-360.**

Mikelson CK, Mejia MB, Kovach MJ (2014) ***A Feasibility Study of Utilizing a Biocompatible Nanofiber Matrix for Bone Regeneration*****. Southeastern Biology 61(3):310-311**

Shafer H, Kovach MJ, Shaw J (2013) ***Chloroplast DNA sequence utility for the inference of low-level or phylogeographic relationships among plants.*** **Southeastern Biology.**

Mejia MB, Bolus WR, Kovach MJ (2013) ***An Analysis of Differentially Expressed Genes in the Context of Cochlear Malfunction in Charcot-Marie Tooth Syndrome.*** **Southeastern Biology**

Hall EC, Carver TA, Kovach MJ (2013) A ***Further Investigation of the Role of PMP22 and Other Genes of Interest in Sensorineural Deafness.*** **Southeastern Biology.**

Professional, University, Departmental and Community Service

Professional
2014-2017: Executive Committee Member at Large: *Association of Southeastern Biologists*

University
2002-2015: Institutional Animal Care and Use Committee (Chair, 2005-2008; Co-chair, 2014)
2012-2016: ThinkAchieve Grants Review Committee
2013: UTC Stem Task Force
2013-2014: Honor Court
2013-2014: UTC Scholarship Committee
2013-2015: Director/Co-Director of STEM Education program
2014: College Council
2015: UTC Curriculum Committee

Departmental
2007-2014: Departmental Outcomes Assessment Committee (Chair)
2007-present: Retention, Promotion and Tenure Committee (; Co-chair, 2012, 2016 & 2016)
2002-present: Pre-professional Advisory Committee (Chair, 2005-2011)
2012-present: Beta Beta Beta Honor Society Advisory Committee (Chair, 2012-2014)
2013: Search Committee for three Biology Instructors
2015-2016: Senior Associate Department Head
2017: Strategic Planning Committee (Chair)

Community
2012-2013: Gear Up participant
2012: Girl Scouts STEM event participant
2015: Chattanooga Girls Leadership Academy, Science Advisor
2017: Soddy Daisy High School, presentation of Genetics as a profession

Joseph McCauley

Faculty development
Introduction to Advising
Advising with Technology
Advising Transfer Students
Green Zone Training (Veteran Support)
Question, Persuade, Refer (Suicide Prevention)

Professional, University, Departmental and Community Service

University
Advisors' Council (2014-present)
Assessment Committee (Advisors' Council, 2014-2015)
Freshmen Advisor search committee (2015-2016)
Pre-Health Advisor search committee (2016-2017)
Pre-Health Committee (2015-present)

Department
Assessment and Retention Committee (2014-present)
Low Student GPA Committee (2014-present, chair 2017-2018)
Pre-professional Advisory Committee (2014-present)
Student Awards and Relations (2014-2015)
Curriculum Planning Committee (2015-present)
Schedule Committee (2015-present)

Community
Friends of the Library- Chattooga County, GA (President- 2015-2016)
Trion Band Boosters- (2016-present, Vice President 2017-present)

Cheryl Murphy

Faculty development
UT Marketplace Purchasing Training: Change in PO and NCJ submission process. August 31, 2017.
Space Inventory Training. June 7, 2017.
Hazardous Materials and Hazardous Waste Training. November 28, 2016.
New Contract Management System Training. November 16, 2016.
Website Accessibility Training. March 1, 2016.
SafeZone Ally Training Session. List faculty development activities for report. Fall 2015.

Scholarly Activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Murphy CA, Foster BL and Gao C. 2016. Temporal dynamics in rhizosphere bacterial communities of three perennial grassland species. Agronomy 6:17 doi:10.3390/agronomy6010017.

Marlowe, MH, Murphy CA and Chatzimanolis S. 2015. Sexual dimorphism and allometry in the sphecophilous rove beetle *Triacrus dilates.* PeerJ 3:e1123; doi 10.77171/perrj.1123.

Murphy CA and Foster BL. 2014. Soil properties and spatial processes influence bacterial metacommunities within a grassland restoration experiment. Restoration Ecology 22(5): 685-691.

Invited Research Seminars
Murphy CA. Aboveground-belowground interactions: Investigating the role of plant communities in structuring soil bacterial communities. Biology Seminar, Department of Biological and Environmental Sciences, University of Tennessee-Chattanooga. September 19, 2014.

Invited Educational Presentations
Murphy CA. Grass ID Workshop. Wild Ones Tennessee Valley Chapter Meeting. Chattanooga, TN. October 10, 2015.

Murphy CA. Native grasses of the Tallgrass Prairie (and around here). Wild Ones Tennessee Valley Chapter Meeting. Chattanooga, TN. February 10, 2014.

Professional, University, Departmental and Community Service

University
University IACUC Committee.

Department
Departmental Space Committee
Equipment Committee and Field Station Committee
Participate in Departmental Faculty Meetings.

Community
Assisting Gilbert Elementary School (Georgia) convert front lawn area into native grassland. 2014-2015.
Chattanooga Arboretum and Nature Center: Member: Initiative for Native Grassland Conversion 2012-2014.
Chattanooga Arboretum and Nature Center: Member: Horticulture Committee 2012-2014.
Chattanooga Arboretum and Nature: Volunteer 2012-2014.

Bradley Reynolds

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Thomas P. Wilson, Bradley R. Reynolds, Penni Jo Wilson, Paul-Erik Bakland, Jeremy Hooper, Nyssa Hunt, Simone Madsen, Maria Cooksey, Patricia Garland, Wes Grigsby, Brittany Killian, Nakeisha Ricks, Liz Staundt, Micah Taylor, Emily Busby, Jose Barbosa, Ethan Carver, Daniel Armstrong, Mark Dillard, Joe Simpson, Mark Wisdom, Tabitha M. Wilson, and Team Salamander (IN PRESS). Team Salamander and its Evolution in becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga. *Southeastern Naturalist Special Edition.*

Wilson T.P., Barbosa J., Carver E, Reynolds B.R., Team Salamander, and Wilson T.M. (2014). An assessment of *Batrachochytrium dendrobatidis* prevalence in two species of ranid frogs on a former United States Department of Defense installation in southeastern Tennessee. *Herpetological Review 46* (1): 37-41.

Books and book chapters
Published
Ford, D.M., & Reynolds, B.R. (2014) A Laboratory Manual for Introduction to Environmental Science. Dubuque, Iowa: Kendall Hunt Publishing.

Grants
External
National Science Foundation Proposal Number: 1504950, Title: Integrating Hands-on Herpetology with the SMART Approach to STEM Education (Drs. Barbosa, Carver, Reynolds, and Wilson); not funded but favorably reviewed; fall 2015

Internal
Recipient of UT Chattanooga Think Achieve Grant with Dr. Thomas P. Wilson, fall 2012, $1500

Conference presentations

Oral
Reynolds, B.R., & Wilson, T.P. "Transformational Leadership, Hands-On Herpetology, and Reflective Journaling: Impacting Student Conservation Ethic." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Poster
Wilson, T.P., Reynolds, B.R., Baklund, P., Hunt, N., Dillard, M., Simpson, J., Hooper, J., Madsen, S., and Team Salamander. "Team Salamander and its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga (UTC)." Association for Southeastern Biologists Meeting, Chattanooga, Tennessee, 2015.

Wilson, T.P., Reynolds, B.R., Simpson, J., Armstrong, D., Hunt, N. Baklund, P. Madsen, S. Hooper, J., and Team Salamander. "Ecology of Syntopic Ambystomatid Salamanders in an Isolated Wetland in Southeastern Tennessee: Population Characteristics, Threats, and Conservation Status." Association for Southeastern Biologists Meeting, Chattanooga, Tennessee, 2015.

Reynolds, B.R., & Wilson, T.P. "A Walk in the Woods: Battling Herpetophobia among Non-Science Majors." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B.R., & et al. "An Assessment of *Batrachochytrium dendrobatidis* Infection in Two Species of Ranid Frogs on a Former United States Department of Defense (DOD) Installation in Southeastern Tennessee." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Simpson, J.F, Reynolds, B.R., & et al. "Team Salamander and its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga (UTC)." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Reynolds, B.R., & Wilson, T.P. "Lessons Learned Using Transformational Leadership and Reflective Journaling: A Case for Hands-on Herpetology." Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

Wilson, T.P., Armstrong, D.S., Bascom, M., Barbosa, J., Carver, E., Dillard, M.J., Reynolds, B.R., Simpson, J.F., Wisdom, M.T., & Manis, C.B. "A Swamp Walker's Journal; Herpetology at the University of Tennessee at Chattanooga." Southeast Partners in Amphibian and Reptile Conservation, Hickory Knob State Park, South Carolina, 2013

Reynolds, B.R., & Wilson, T.P. "Building a Conservation Ethic in Non-Science Majors through Hands-On Herpetology." University of Tennessee at Chattanooga Instructional Excellence Retreat, Chattanooga, Tennessee, 2013.

Professional, University, Departmental and Community Service

University
Environmental Task Force (2006 - present)

Departmental
Departmental Graduate Committee
Senior/Junior Faculty Advisor to UTC Wildlife and Zoology Club
Senior Faculty Advisor to EDGE, UTC's Student Environmental Group
Field Station Committee
Departmental Student Awards Committee
ESC Lecturer Search Committee (2017)

Community
Tennessee River Rescue

<u>Sean Richards</u>

Faculty development
Lead Exposure and Health Effects in Hamilton County, TN (Sabbatical, Fall 2017)

Research
*Accepted or published (*indicates student)*
R. Chianese*#, J. Troisi*#, S. Richards#, M. Scafuro, S. Fasano1, M. Guida, R. Pierantoni, R. Meccariello. 2017. Bisphenol A in reproduction: epigenetic effects. ***Current Medicinal Chemistry*. (In Press)**
#These authors equally contributed to the manuscript

C Mikelson*, MJ Kovach, J Troisi, S Symes D Adair, Z Lin., S. Richards. **2015. Placental 11β-Hydroxysteroid Dehydrogenase Type 2 Expression: Correlations with Birth Weight and Placental Metal Concentrations.** ***Placenta*. 36(11):1212-7**

D. Wolfe*; M. Schorr; M. Hanson; C. H. Nelson; S. Richards. 2015. Hazard assessment for a pharmaceutical mixture detected in the upper Tennessee River using Daphnia magna. ***Global Journal of Environmental Science Management.*** **1 (1): 1-14, Winter 2015. ISSN 2383 - 3572**

J. Troisi*, C. Mikelson*, S. Richards, S. Symes, D. Adair, F. Zullo, M. Guida. 2014. Placental concentrations of bisphenol A and birth weight from births in the Southeastern U.S. ***Placenta*. Vol. 35 (11) 2014. 947–952.**

Schorr MS, Dyson MC, Nelson CH, Van Horn GS, Collins DE, Richards SM**. 2013. Effects of stream acidification on lotic salamander assemblages in a coal-mined watershed in the Cumberland Plateau.** ***Journal of Freshwater Ecology*** **Vol. 28, No. 3, 339-353**

E. Hussar*, S. Richards, ZQ Lin, R.P. Dixon , and K. A. Johnson. 2012. Human Health Risk Assessment of 16 Priority Polycyclic Aromatic Hydrocarbons in Soils of Chattanooga, Tennessee, USA. ***Water, Air, & Soil Pollution.*** **223, 9:5535-5548**

S. Richards, D. Ford, and K. Adsit. 2012. Integrating Inquiry-Based Field Investigations into an Environmental Science Curriculum. *Journal of Tennessee Academy of Sciences* 87, (2) 105-115

Submitted or in preparation
J. Troisi*, S. Symes, S. Richards. 2017. Placental tissue metabolome analysis by GC-MS: Oven-drying is a viable sample preparation method. ***Placenta*. (Submitted)**

Mikelson C*., J. Troisi*, Symes S., Gao, L., DiRe, L.M., Adair D. , Miller, R.K., Richards, S. 2017. Elemental analysis of human placenta and its relationship with infant health parameters in Hamilton County, TN. ***Environmental Research (*Submitted*).***

Books and book chapters

J. Conley* and S. Richards. 2013. Environmental Teratogenesis. In (ed) J.F. Férard and C. Blaise, *Encyclopedia of Aquatic Ecotoxicology*. Invited Submission. Publisher: Springer, New York, New York.

Grants

External

$2,500,000 – National Children's Study, Bradley County, TN (2013). D. Adair and C. Hall (PI), G. Heath (Co-PI), and **S. Richards**. Source: National Institutes of Health (awarded but rescinded after NIH cancelled the National Children's Study).

Internal

$4145 - Training in Metabolomic Techniques to Investigate Low Birth Weight in Hamilton County, TN. 2017. **S. Richards (PI)** Source: Research and Creative Activity (RCA) Grant. University of Tennessee at Chattanooga

$8000 - Lead Concentrations in Hamilton County's School Drinking Water and Associated Low Birth Weight. 2017. **S. Richards (PI)** and S. Symes. Source: Collaborative Research Initiative for Sponsored Projects. University of Tennessee at Chattanooga

Invited Research Seminars

Invited International Conference Presentations:

S. Richards. 2017. Environmental Exposures Associated with Low Birth Weight. American Osteopathic College of Occupational and Preventive Medicine Conference. March 8-12th. Chattanooga, TN. *Invited Presentation.*

S. Richards, E. Hussar*, Z.Q. Lin, R.P. Dixon, and K. A. Johnson. 2012. Human Health Risk Assessment of 16 Priority Polycyclic Aromatic Hydrocarbons in Soils of Chattanooga, Tennessee, USA. The International Workshop for Environmental Health and Pollution Control. September 23-28th, Harbin Normal University and Beijing Normal University, Heilongjiang Province, Peoples Republic of China. *Invited Presentation.*

Other Invited Presentations (Regional, University, Departmental, Lecture Series, etc.):

S. Richards. Occurrence and ecological hazard of pharmaceuticals in surface water. The Ecology, Evolution, Behavior, & Organismal Biology (EEBOB) seminar series. Kennesaw State University on April 22nd, 2015. *Invited Presentation.*

S. Richards. 2014. Pharmaceuticals in the Aquatic Environment. Presented to UTC Sigma Xi, Chattanooga, TN on March 5th, 2014. *Invited Presentation.*

S. Richards. 2014. Investigations into the cause of low birth weight in Hamilton County, TN. Presented to the UT College of Medicine, Erlanger Hospital, Chattanooga, TN on January 10th, 2014. *Invited Presentation.*

Conference Presentations

International Conference Presentations:

***J. Houser, H. Craddock,** Richards S**. Arsenic Uptake by Beets (*Beta vulgaris*) Cultivated in Roxarsone-Contaminated Soil. Abstracts of the 2016 Society of Environmental Toxicologists and Chemists. November 6-10, 2016. Orlando, FL.**

Mikelson, C; *Dire, L ; Troisi, J ; Adair, D ; Salafia, C ; Richards, S**. (2014). Perinatal Effects of Gestational Metals Exposures: Evidence for Gender-Specific Fetal Toxicity. Abstracts of the 2014 Teratology Society, June 28-July 2nd, 2014. Bellevue, WA.**

C. Mikelson, Troisi J., Kovach M., Symes S., Adair D., Johnson K., Lin Z., Richards S. **(November, 2013).** ***Analysis of elemental composition and 11β-HSD2 expression in human placenta: relationship with birth weight in Chattanooga, TN*****. Abstracts of the 2013 Society of Environmental Toxicologists and Chemists. November 11-15, 2013. Nashville, TN.**

S. Richards, E. Hussar*, C. Morris*, ZQ Lin, , and K. A. Johnson. 2012. Human Health Risk Assessment of 16 Priority Polycyclic Aromatic Hydrocarbons in Soils of Chattanooga, Tennessee, USA. Abstracts of the 2012 Society of Environmental Toxicologists and Chemists. November 11-15, 2012. Long Beach, CA.

Professional, University, Departmental and Community Service

Professional Service
Chair of the Service Committee for Society of Environmental Toxicology and Chemistry. Nov. 17-21st, Nashville, TN (2013)
Editorial Board: *Global Journal of Environmental Science & Management*
Associate Editor for Ecological Risk Assessment: *Ecotoxicology*

***Ad hoc* Reviewer:**
Journals:
Aquatic Toxicology
Aquatic Biology
Chemosphere
Ecotoxicology
Environmental Chemistry Letters
Environment International
Environmental Research
Environmental Science and Technology
Environmental Toxicology and Chemistry
Food Research International
International Aquatic Research
Journal of Environmental Management
Journal of Environmental Monitoring and Assessment
Journal of Freshwater Ecology
PLOS one
Regulatory Toxicology and Pharmacology
Science of the Total Environment

Books:
Human Pharmaceuticals in the Environment: Current and Future Perspectives, Springer Publishers
Hormones and Pharmaceuticals Generated by CAFO's: Transport in Water and

Grant Proposals:
EPA
NSF – MRI and Rapid Response Research (RAPID)
NIEHS - Superfund Basic Research Program
National Research, Development and Innovation Office (Hungary)

Professional Consultant
The Water Works and Sewer Board of The City Of Gadsden vs. The Dixie Group, LLC. Served as expert consultant on Perfluorinated Compounds.

University
Building Renovation Committee (ad hoc) – Chair
Search Committee for Dean of College of Arts and Sciences

Department
Rank Promotion and Tenure Committee
Pre-Professional Advisor
Hiring and Planning
Graduate School Committee
Space Allocation Committee
Equipment Committee
Field Station Committee
Low GPA

Community
Chattanooga-Hamilton County Regional Health Council (Current Vice-Chair)
North Chickamauga Creek Conservancy Board of Directors

Press regarding your work
Chattanooga Times Free Press. *Tennessee scientists urge Corker, Alexander to oppose Trump's EPA pick.* January 17th, 2017. This interview highlighted my opinion and facts of the environmental record of President-elect Trump's pick (Scott Pruitt) to be the Executive Director of the USEPA.

Sept 21st, 2015. I was interviewed by WTVC Channel 9 Chattanooga regarding environmental and health effects of nitrogen oxides released by fraudulent VW cars (https://www.youtube.com/watch?v=mmpIvvBT6DQ). The AP picked up the story and then the interview was featured on Good Morning America (proprietary video not available on Youtube). The video and transcripts quickly circulated on various websites around the world. This led to numerous phone calls locally and abroad. For example, I gave a phone interview to a morning radio show in Busan, South Korea (http://befm.or.kr/radio/main.jsp?prgmId=morning).

Pharmaceuticals in the TN River – WDEF Chattanooga Channel 12 News - Aired on Thursday May 7th, 2015 on the 6 and 11pm newscasts. This covered my past work with pharmaceuticals in the Tennessee River and present work exploring pharmaceutical toxicity to Daphnia magna.

Chattanooga Times Free Press. *Scientists eye prescription drug amounts in Tennessee River*. March 12th, 2014.

WATE. Channel 6 News. ABC Knoxville Affiliate. *Researchers find small traces of pharmaceuticals in Tennessee River*. March 12th, 2014.

Mark Schorr

Faculty development

Three Curriculum Proposals Submitted (Mark Schorr, 2015): Course Modifications to Improve the Quality of Learning at UTC. In an effort to expand/improve the quality of my instruction in undergraduate and graduate courses and thus increase the student knowledge and competency, I prepared/submitted a total of three curriculum proposals. Curriculum proposals were approved at departmental and university levels for: 1) Limnology and Reservoir Ecology BIOL 4520/4520L; ESC 4520/4520L)*; 2) Limnology and Reservoir Ecology (5080/5080L)*; 3) Applied Statistics for Environmental Scientists (ESC 5120)**.

*Limnology and Reservoir Ecology (proposal to improve cross-listed undergraduate course; separate proposal to improve graduate-level ESC course): Modifications – (i) increased number of credits from 3 hours to 4 hours; and (ii) modified catalog description (to specify the change in credit hours and addition of statistics laboratory component). Rationale – (i) additional time for in-depth lectures/discussions; (ii) additional time for more meaningful lab/field experiences; (iii) consistency with other 4000- and 5000-level lecture/lab courses in the Department; and (iv) allow students to earn the number of credit hours that correspond to the actual amount of work and number of weekly contact hours required to successfully complete this course.

**Applied Statistics for Environmental Scientists (proposal to improve graduate-level course): Modifications -- (i) Increased number of credits from 3 hours to 4 hours; (ii) added a laboratory component to the course; and (iii) modified catalog description (to specify the change in credit hours and addition of statistics laboratory component). Rationale – (i) additional time for in-depth lectures/discussions with graduate students of hypothesis testing and statistical procedures and their applications in science; (ii) real time is needed in a laboratory for teaching graduate students how use SAS and other statistical applications to analyze/interpret data required to test hypotheses and draw conclusions that relate to scientific research; (iii) maintain consistency with the other 4-hour statistics lecture-lab courses taught in the BGE Department; (iv) allow graduate students in ESC 5120 to earn the number of credit hours that correspond to the actual amount of work and actual number of weekly contact hours required to successfully complete this course; 5) learn how to understand/apply statistics to address real problems as developing scientists.

Scholarly activity

Peer reviewed publications (Not including Published abstracts)

Accepted or published

Schorr MS, Dyson MC*, Nelson CH, Van Horn GS, Collins DE, Richards SM. 2013. Effects of stream acidification on lotic salamander assemblages in a coal-mined watershed in the Cumberland Plateau. Journal of Freshwater Ecology, DOI:10.1080/02705060.2013.778219.

Shaw J, Shafer HL*, Leonard OR, Kovach MJ, Schorr MS, Morris AB. 2014. Chloroplast DNA sequence utility for the lowest phylogenetic and phylogeographic inferences in angiosperms: the tortoise and the hare IV. American Journal of Botany 101(11):1-17.

Wolfe DN*, Schorr MS, Hanson M, Nelson CH, Richards SM. 2015. Hazard assessment for a pharmaceutical mixture detected in the upper Tennessee River using *Daphnia magna*. Global Journal of Environmental Science and Management 1(1):1-14.

Submitted or in preparation

Huser, D, & Schorr MS. *In preparation* (target journal: Southeastern Naturalist). Effects of perched road culverts on the abundance of Blacknose Dace (*Rhinichthys atratulus*) in Blue Ridge streams in Cherokee National Forest, Tennessee.

Schorr, MS, Cuervo, J, & Smith, JB. *In preparation* (target journal: Urban Naturalist). Fish assemblage response to the mitigation in an urban stream in Chattanooga, Tennessee.

Atwell, AK, & Schorr, MS. *In preparation* (target journal: Southeastern Naturalist). Correlations of catchment landscape features with stream habitat and macroinvertebrate assemblages in the Lookout Creek system (Tennessee River drainage).

Project reports

Schorr, MS, Carroll A, Cuervo, J, Freeman, PL, Smith, JB. 2013. Macrofaunal responses to habitat improvements in two urban streams in Chattanooga, Tennessee. Final Report. The City of Chattanooga, Department of Public Works, Water Quality Program (Contract No. S-11-006-101). Chattanooga, Tennessee. 99 pp.

Grants

External

City of Chattanooga, Department of Public Works, Water Quality Program (Contract No. S-11-006-101): Post-stream restoration assessments for Citico Creek and Friar Branch (2012-2013). PI: Mark Schorr. Funding $42,079.

Conference Presentations

Schorr MS, Cuervo J. 2017. Fish assemblage response to mitigation of a channelized stream reach in Tennessee. Association of Southeastern Biologists, Montgomery, AL (April 2017).

Schorr MS, Huser, D. 2016. Effects of perched road culverts on the abundance of Blacknose Dace (*Rhinichthys atratulus*) in Blue Ridge streams in Cherokee National Forest, Tennessee. Southeastern Biology. Association of Southeastern Biologists, Concord, NC (April 2016).

Atwell AK, Huser D*, Smith JB*, Schorr MS. 2015. Environmental correlates of lotic macroinvertebrate diversity in the Lookout Creek watershed (Tennessee River drainage). Association of Southeastern Biologists, Chattanooga, TN (April 2015).

Genard LM, Schorr MS, Saylor CF. 2015. Ecoregion-specific patterns in the distribution and abundance of the introduced Redbreast Sunfish (*Lepomis auritus*) and native Longear Sunfish (*L. megalotis*; Centrarchidae) in mainstem reservoirs of the Tennessee River drainage. Association of Southeastern Biologists, Chattanooga, TN (April 2015).

Atwell AK, Huser D, Smith JB, Schorr MS. 2015. Relationships Between Benthic Macroinvertebrate Assemblages, Stream Habitat, and Catchment Landscape Features in the Lookout Creek System (Tennessee River Drainage). Annual Meeting of the Tennessee Chapter of the American Fisheries Society, Chattanooga, TN (March 2015).

Schorr MS, Genard LM, Saylor CF. 2015. Spatiotemporal patterns in the distribution and abundance of the introduced Redbreast Sunfish (*Lepomis auritus*) and native Longear Sunfish (*L. megalotis*; Centrarchidae) in reservoirs of the Tennessee River drainage. Annual Meeting of the Tennessee Chapter of the American Fisheries Society, Chattanooga, TN (March 2015).

Shafer HL, Schorr MS, Kovach M, Shaw J. 2013. Chloroplast DNA sequence utility for the inference of low-level phylogenetic or phylogeographic studies among plants. Association of Southeastern Biologists, Chattanooga, TN (April 2013).

Professional, University, Departmental and Community Service

Professional
2012-2017 / Requested Scientific/Technical Assistance -- Provided requested information (e.g., data, literature, observations, reprints of scientific papers) and professional assistance (e.g., fish identifications, statistical advice) to colleagues, students, and the general public.

2013-2014 / Peer Reviewer of 3 Manuscripts for Journals – 1) Ecotoxicology (Dr. Sean Richards, Associate Editor); 2) Journal of the American Water Resources Association (Dr. Mark Rains, Associate Editor); 3) Frontiers of Environmental Science and Engineering (Prof. Xuehua Liu, Responsible Editor)

2013-2014 / Peer Reviewer of 1 Research Grant Proposal: Pilot Funding for New Research Program, Louisiana Board of Regents (Susan Jernigan); reviewed proposal submitted by tenured scientist at University of Louisiana-Monroe

2013-2014 / External Reviewer of 1 Promotion Dossier of Tenure-Track Research Scientist -- Illinois National History Survey, University of Illinois at Urbana-Champaign (Dr. John Epifano, Chair, Professional Advancement Committee); reviewed promotion dossier of tenure-track faculty member

2014-2015 / Manuscript Reviewer -- Reviewed a Field Trip Manuscript **("Coal Mining Impacts and Remediation in the Chattanooga Region Field Trip to North Chickamauga Creek Upper Watershed,"** UTC Department of Geology) for the Southeast Geological Society.

2016 / Manuscript Reviewer -- Reviewed an original research manuscript (sent to me by The Royal Society of New Zealand Editorial Office) to consider for publication in: New Zealand Journal of Marine and Freshwater Research

2016 / Association of Southeastern Biologists (ASB) -- Awards Committee for Annual Meeting

2016 / ASB Annual Meeting – Judge for Oral/Poster Presentations by Students

2017 / ASB Annual Meeting – Judge for Oral/Poster Presentations by Students

University
2013-2017 / University Committee: Wheeler Odor Advisory Board

Department
2012-2013 / Dept. Committees – Natural History Museum (Chair), Curriculum Planning, ESC Graduate Program, Retention, Promotion, Tenure (RTR), Search, Specific Issue.

2013-2014, Dept. Committees: RTR (Co-Chair, with Sean Richards), Natural History Museum (Chair), ESC Graduate Program, Building Renovation, Curriculum Planning.

2013-2014: Graduate Student Office/Lab -- Working with IT Helpdesk (Marcus Meyer et al.) and Cheryl Murphy, I coordinated the installation of five (5) new Dell computers/monitors, maintenance/refurbishment of several older computers, and removal of obsolete computers in Graduate Student Office/Lab (Holt 210). The following UTC faculty/staff were responsible for the acquisition of the new computers: Andy Carroll, GIS Manager; Tom Hoover, Associate Vice Chancellor and Chief Information Officer, Michael Ward, UT Chattanooga - ARCS, IT Security.

2014-2015 / Dept. Committees: Bylaws (Chair), RTR, Natural History Museum, Curriculum Planning, Building Renovation, ESC Graduate Program.

2015 / Field Trip for Colleagues: Organized and led an all-day field trip for departmental colleagues doing research in North Chickamauga Creek (Jennifer Boyd, Eric O'Neill, Yukie Kajita), GIS Lab – Charlie Mix), graduate students (Kimika Tsukide), and other interested parties in Chattanooga area (Davis Mounger, CSAS science teacher; Charles Walton, TDEC aquatic biologist) to selected sites in upper NCC watershed (Cumberland Plateau); involved preliminary sampling/assessments of water chemistry, macrofauna, and riparian vegetation.

2016-2017 / Dept. Committees – Bylaws (Chair), ESC Graduate Program, Natural History Museum, RTR.

2017-2018 / Dept. Committees – Bylaws (Chair), ESC Graduate Program, Space Planning, Search Committee (Population Geneticist), RTR.

Community
2012-2016: Taught five all-day field labs (one per year) on stream fish ecology/taxonomy for students/teachers at Cleveland High School; students participated in collection/recording of data on fishes in Mouse Creek (Bradley Co., TN); interpretation/discussion of data at the field site. On any given day, approximately 6 classes participate. This would average about 120 to 130 students total and about three different teachers. I teach the following classes: Environmental Science, Biology I, Aquatic Biology (Scientific Research) Honors, and Special Needs. The Aquatic Biology students use the data collected in original scientific research that is submitted to the Tennessee Junior Academy of Science and the Tennessee Junior Science and Humanities Symposium. The dataset that has been created over time is used by the Aquatic Biology students as well as Environmental Science classes as part of curriculum including lessons on biodiversity, invasive species, and population dynamics. It is rare for high school students to work with a biologist to conduct a long-term field study of a local ecosystem (per Jeannie Cuervo, CHS science teacher and event planner).

2012-2016: Organized and co-taught five field labs (one per year) on river fish ecology and taxonomy (with Tennessee Aquarium aquarist, Rob Mottice), for students from Cleveland High; work involved collecting/recording sample data on fishes/macroinvertebrates in the Tennessee River (boat electrofishing, seining at TRM 469) with CHS Aquatic Biology students/teacher (Jeannie Cuervo, CHS science teacher); final data summary and field notes sent to teacher.

2014: Organized and caught field lab on Cumberland Plateau streams and water pollution related to acid mine drainage (AMD). This project involved 50-60 students and 4-5 teachers from Hixson High / CSAS; they were transported to/from the sites in a chartered bus. Lab included measuring/recording water chemistry data (temp., DO, pH, cond., selected metals) in two streams (Standifer Creek, Falling Water Creek [North Chickamauga Creek system]), drainage from abandoned coal mine, and pollution-abatement system; complete data summary and field notes were sent to the teachers.

2015: Partner on collaborative science/technology education project (funded by Mozilla). The primary project team includes teachers/educators at Chattanooga School for the Arts and Sciences (CSAS; Davis Mounger), Hixson High School (Ashley Patterson, Joyce Perdue), and Chattanooga Public Library (Meg Backus); secondary collaborator (Mark Schorr, UTC). The focal point is the real-time monitoring of the water quality in the North Chickamauga Creek watershed and air quality in Hamilton County, Tennessee. Students from live classrooms have designed long-term monitoring equipment using the Arduino platform to monitor water quality at multiple sites along the North Chickamauga Creek watershed. As a project partner, I reviewed proposed designs of water quality monitoring equipment, suggested multiple monitoring sites in the upper watershed (provided draft map and descriptions of stream sites), shared my research findings (reports, data, published papers) on water quality in upper North Chickamauga Creek; lead a field trip to sites in upper North Chickamauga Creek watershed (noted above), and participated in multiple meetings with project leaders.

2016: Co-taught all-day field lab (with departmental colleague, Eric O’Neill) on stream ecology for Upward Bound students and teachers (contact: Trevor Slayton, UTC graduate and teacher); we sampled benthic macroinvertebrates and salamanders – teaching students/teachers about their ecology and taxonomy – in the upper Mountain Creek (Ridge and Valley; Hamilton Co., TN).

2017: Participated in the Silverdale Baptist Academy (Chattanooga, TN) All Taxa Biodiversity Inventory Survey, which involved collecting/recording/summarizing sample data on Friar Branch fishes with UTC students; site-specific data collected in 2017 ATBI and earlier surveys were sent to a science teacher/contact (Will Smith) at Silverdale Baptist Academy.

2017: Taught all-day field laboratory on stream fish ecology/taxonomy with students/teachers from The Howard School (Chattanooga, TN), which involved collecting/recording sample data on Mountain Creek fishes with students/teachers (Jessica Hubbuch, science teacher / department head, and another teacher from Howard); final data summary and field notes sent teachers.

Press regarding your work

2012-2013: Channel 12 News. Interviewed on location by news reporter/anchor, Amy Katcher about my research on the Friar Branch Restoration Project.

2017: Tennessee Alumnus magazine. Interviewed by journalist writing an article on UTC professors who do research related to water quality.

<u>Joey Shaw</u>

Faculty development
Attended annual Association of Southeastern Biologists meetings
Attended iDigBio Summit II and IV
Attended Specify workshop at University of Kansas

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Nelson, G. P. Sweeney, L.E. Wallace, R.K. Rabeler, D. Allard, H. Brown, J.R. Carter, M.W. Denslow, E.R. Ellwood, C. Germain-Aubrey, E. GIlbert, E. Gillespie, L.R. GOertzen, B. Legler, D.B. Marchant, T.D. Marsico, A.B. Morris, Z. Murrell, M. Nazaire, C. Neefus, S. Oberreiter, D. Paul, B.R. Ruhfel, T. Sasek, J. Shaw, P.S. Soltis, K. Watson, A. Weeks, and A.R. Mast. 2015. Digitization workflows for flat sheet and packets of Plants, Algae, and Fungi. *Applications in Plant Sciences.* 3: 1500065.

Estes, L.D., J. Shaw, and C. Mausert-Mooney. 2015. *Lysimachia lewisii* (Primulaceae), a new species from Tennessee and Alabama. *Phytoneuron* 17: 1-15.

Shaw, J. H. Shafer, O.R. Leonard, M.J. Kovach, M. Schorr, and A.B. Morris. 2014. Chloroplast DNA sequence utility for the lowest phylogenetic and phylogeographic inferences in angiosperms: Tortoise and Hare IV. *American Journal of Botany* 101: 1987-2004.

Beck, J., C. Ferguson, M. Mayfield, and J. Shaw. 2014. Reduced population genetic variation in black cherry (*Prunus serotina* subsp. *serotina*, Rosaceae) at its western range limit in Kansas. *Northeastern Naturalist* 21:472-478.

Chin, S-W., J. Shaw, R. Haberle, J. Wen, and D. Potter. 2014. Diversification of almonds, peaches, plums, and cherries – Molecular systematics and biogeographic history of *Prunus* (Rosaceae). *Molecular Phylogenetics and Evolution* 76: 34-48.

Sisco, P.H., T.C. Neel, F.V. Hebard, J.H. Craddock, and J. Shaw. 2014. Cytoplasmic male sterility in interspecific hybrids between American and Asian *Castanea* species is correlated with the American D chloroplast haplotype. *Acta Horticulturae* 1019: 215-222.

Kile, H.M., J. Shaw, and J. Boyd. 2013. Response of federally threatened *Scutellaria montana* (large-flowered skullcap) to pre-transplantation burning and canopy thinning. *Southeastern Naturalist*: 12: 99-120.

Blyveis, E., and J. Shaw. 2012. The vascular flora and phytogeographical analysis of the Tennessee River Gorge, Hamilton and Marion counties, Tennessee. *Southeastern Naturalist* 11: 599-636.

Hart, S., D. Estes, and J. Shaw. 2012. Noteworthy collections, Tennessee. *Castanea* 77: 381-382.

Montgomery, M., and J. Shaw. 2012. *Clematis fremontii* in the southeastern United States, naturally occurring relicts or recently introduced populations? *Tipularia* 27: 11-18.

Shaw, J., J.H. Craddock, and M. Binkley. 2012. Phylogeny and phylogeography of North American *Castanea* Mill. (Fagaceae) using cpDNA suggests gene sharing in the Southern Appalachians (*Castanea* Mill., Fagaceae) *Castanea* 77:186-211.

Submitted or in preparation

Morris, A.B., C. Germaine-Aubrey, and J. Shaw. Markers in space and time: the current state of plant phylogeography. (target: *Journal of Biogeography* or *PlosOne*).

Alford, M., A.C. Fennell, D.M. McNair, S.W. Leonard, J.R. Carter, J. Shaw, H.M. Sullivan, J.R. Gwaltney, and M.H. Mayfield. submitted. *Euphorbia buckatunna* (Euphorbiaceae), a new species from limestone outcrops in Mississippi, and a new hypothesis of the phylogenetic relationships of eastern North American *Euphorbia* subgenus *Chamaesyce* section *Alectoroctonum*. *Castanea.*

Leonard, O.R., J. Shaw, and A.B. Morris. Using comparative plastomics to identify potentially informative noncoding regions for basal angiosperms, with a focus on *Illicium*. (target: *PlosOne*).

Prater, A.R. and J. Shaw. The vascular flora of the Lula Lake Land Trust on Lookout Mountain in Walker County, Georgia and a biogeographical analysis of the Coastal Plain element on the Cumberland Plateau. (target: *Southeastern Naturalist*)

Shaw, J. and D. Estes. Comprehensive vascular plant investigation of the Tennessee Army National Guard Volunteer Training Site, Catoosa County, Georgia (target: *Southeastern Naturalist*)

Carpenter, C., T. Gaudin, and J. Shaw. Phylogeographic sampling reveals that the Tennessee River is a break between shrew species. (target: *Journal of Biogeography* or *Journal of Mammalogy*)

Shaw, J. and D. Estes. Comprehensive vascular plant investigation of the Tennessee Army National Guard Volunteer Training Site, Catoosa County, Georgia. *Castanea*.

Shaw, J., S. Hart, B.E. Wofford, A. Floden, D. Estes. Comprehensive vascular plant investigation of the Ocoee River Gorge, Polk County, Tennessee. (target: *Journal Botanical Research Institute of Texas*)

Books and book chapters
Accepted or published
Tennessee Flora Committee. 2015. Guide to the Vascular Plants of Tennessee (editors: E.W. Chester, B.E. Wofford, J. Shaw, D. Estes, and D. Webb [ranked in order of contribution]). University of Tennessee Press, Knoxville, Tennessee.

Project reports
Shaw, J. 2017. A Report and Summary of Reports on the Health of Scutellaria montana Chapm. Eight Years Post Transplantation at Enterprise South Industrial Park, Hamilton County, TN And Cutting Back Competitive Undergrowth and the Effects on *Scutellaria montana*. Submitted to Civil and Environmental Consultants for the TDOT.

, J. 2015. Botanical survey with emphasis on rare species and communities of the wetlands surrounding South Chickamauga Creek near the I-24/I-75 interchange in Hamilton County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

Shaw, J. 2015. Rare plant species and communities survey of the mesic forest, glade, and riparian habitats of Catalina, Williamson County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

Shaw, J. 2014. Rare plant species and communities survey of the Clarkrange Industrial Park, Fentress County, Tennessee. Submitted to Civil and Environmental Consultants for the TDOT.

Shaw, J., and D. Estes. 2013. Botanical survey and ecological systems mapping of the Ocoee River Gorge, Polk County, Tennessee. Prepared for the Tennessee Department of Transportation under a contract from URS Inc.

Shaw, J., and D. Estes. 2012. Botanical survey and ecological systems mapping of the Ocoee River Gorge, Polk County, Tennessee. Prepared for the Tennessee Department of Transportation under a contract from URS Inc.

Grants

External

2017 Tennessee Native Plant Society, $18,500
2016 Arkansas Natural Heritage Program $4,600
2015 UTK Department of Ecology and Evolutionary Biology $10,186
2015 Ozark Chinquapin Foundation $1,200
2014 NSF-ADBC Digitization TCN ($301,164 to UTC) $2,543,058
2013 Breedlove, Dennis Associates $5,000
2012 USFWS – $680 + $7,398
2012 TN Army National Guard – $89,000
2012 TDOT/URS ($16,810 to UTC) – $34,010

Internal

2014 Research and Creative Activity Grant (internal award) – $6,000

Invited Research Seminars

East Tennessee State University. 2017. Digitizing Tennessee's herbarium collections will expand their support of research, teaching and service.

Tennessee Technological University. 2017. Digitizing Tennessee's herbarium collections will expand their support of research, teaching and service.

Austin Peay State University. 2017. Digitizing Tennessee's herbarium collections will expand their support of research, teaching and service.

Botanical Research Institute of Texas. 2015. Herbaria support and promote research from field to molecular studies.

Kennesaw State University. 2015. Herbaria support and promote research from field to molecular studies.

Ozark Chinquapin Foundation. 2014. Preliminary findings of genetic differences between geographically spaced Ozark chinquapins (*Castanea ozarkensis*, Fagaceae).

Southern Adventist University. E.O. Grundset Lecture Series. 2014. The importance of Tennessee herbaria and their use in field studies and building taxonomic guides to database creation, modeling, policy formation, and even the search for variable molecular markers.

Middle Tennessee State University. 2013. Herbaria are keystone to botanical research from field studies and building taxonomic guides to database creation, modeling, policy formation, and even the search for variable molecular markers.

Ozark Chinquapin Foundation. 2013. Preliminary findings of genetic differences between geographically spaced Ozark chinquapins (*Castanea ozarkensis*, Fagaceae).

Invited Educational Presentations

Conference Presentations

Harris, J., J. Shaw, and A. Morris. 2017. An investigation into the phylogeny, taxonomy, and biogeography of North American Clematis. Botany 2017, Ft. Worth, TX.

Irick, Z. and J. Shaw. The vascular flora of the Big Soddy Creek Gorge, Hamilton and Sequatchie counties, Tennessee. 2017. Association of Southeastern Biologists meeting in Montgomery, AL.

Harris, J. and J. Shaw. 2017. An investigation into the population structure and gene flow in North American *Castanea* Mill. (Fagaceae). Association of Southeastern Biologists meeting in Montgomery, AL.

Harris, J. and J. Shaw. 2016. Phylogenetic study of Castanea ozarkensis Ashe (Fagaceae) to determine the geographic distribution of genetic variability. Botany 2016 in Savanna, GA.

Morris, A., J. Shaw, C. Germaine-Aubrey, James Beck. 2016. Documenting a need for community data standards and a call for a new collaborative network in plant systematics and phylogeography. Botany 2016 in Savanna, GA.

Irick, Z. and J. Shaw. Preliminary vascular flora of the Big Soddy Creek Gorge. 2016. Association of Southeastern Biologists meeting in Concord, NC.

Perkins, M.T. and J.H. Craddock (should have listed J. Shaw). 2016. Phylogeographic examination of Castanea morphotypes in the eastern United States. Association of Southeastern Biologists meeting in Concord, NC.

Konrade, L, J. Shaw, and J. Beck. 2015. Evaluating range genetics in black cherry (Prunus serotina Ehrh.) with an expansive set of herbarium specimens. Paper presented at Botany 2015 in Alberta Canada.

Morris, A., O.R. Leonard, H. Shafer, M. Schorr, M. Kovach, and J. Shaw. 2015. Variation in noncoding chloroplast DNA regions at the lowest taxonomic levels: Tortoise and Hare IV and beyond. Paper presented at Botany 2015 in Alberta Canada.

Irick, Z. and J. Shaw. 2015. Preliminary Vascular Flora of Big Soddy Creek Gorge, Hamilton County, Tennessee. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

Harris, J. and J. Shaw. 2015. Phylogeographic study of *Castanea ozarkensis* Ashe to determine the geographic distribution of genetic variability across the ozarks. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

Morris, A., O.R. Leonard, C. Germaine-Aubrey, and J. Shaw. 2015. The state of plant phylogeography: a review of methodological approaches. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

Prater, A. and J. Shaw. 2015. The Vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker County, Georgia and a Biogeographical Analysis of the Coastal Plain Element on the Cumberland Plateau. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

Shaw, J. D. Estes, and A. Morris. 2014. Digitization of Tennessee herbarium collections. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

Irick, Z., and J. Shaw. 2014. Preliminary vascular plant flora of the Big Soddy Creek Gorge, Hamilton and Sequatchie counties, TN. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

Prater, A., and J Shaw. 2014. The vascular flora of the Lula Lake Land Trust on Lookout Mountain in Walker County, GA. Paper presented at the Tennessee Academy of Sciences, meeting in Morristown, TN.

Morris, A.B., O.R. Leonard, C. Germaine-Aubrey, and J. Shaw. 2014. Markers in time and space: The current state of the field of plant phylogeography. presented at Botany 2014 in Boise, ID.

Prater, R.A. and J. Shaw. 2014. The vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker Co. Georgia. Paper presented at the Association of Southeastern Biologists meeting in Spartanburg, SC.

Estes, D., A. Floden, T. Whitsell, J. Shaw, and B. Keener. Untangling the viny viornas: taxonomic studies in the genus *Clematis* (Ranunculaceae). Paper presented at the Association of Southeastern Biologists meeting in Spartanburg, SC.

Shafer, H. M. Schorr, M. Kovach, and J. Shaw. 2013. Chloroplast DNA sequence utility for the inference of low-level phylogenetic and phylogeographic studies of plants. Paper presented at the Tennessee Academy of Sciences meeting in Morristown, TN.

Prater, A. and J. Shaw. 2015. The Vascular flora of Lula Lake Land Trust on Lookout Mountain in Walker County, Georgia. Paper presented at the Association of Southeastern Biologists meeting in Chattanooga, TN.

Carpenter, C., T. Gaudin, T. Wilson, and J. Shaw. 2013. Phylogeography of short-tailed shrews (*Blarina*) of southeast Tennessee. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

Harris, A., J. Shaw, and J.H. Craddock. 2013. A floral survey and census of American chestnut at Bendabout Farm, Bradley County, TN. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

Benson. A..R, J. Shaw, and J. Boyd. 2013. Impacts of large mammal herbivory on *Scutellaria montana* Chapm. at the Tennessee Army National Guard Training Site, Catoosa County, Georgia. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

Dennis, W.M. and J. Shaw. 2013. Taxonomy of *Clematis* subgenus *Viorna* and speciation in subsection *Viornae.* Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

Shaw, J. and W. M. Dennis. 2013. A preliminary phylogeny of *Clematis* subg. *Viorna* (Ranunculaceae): toward the understanding of the complex biogeographic patterns of this taxon. Paper presented at the Association of Southeastern Biologists meeting in Charleston, WV.

Carpenter, C., T. Gaudin, T. Wilson, and J. Shaw. 2012. Phylogeography of short-tailed shrews (*Blarina*) of southeast Tennessee. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

Turk, J. J. Barbosa, and J. Shaw. 2012. Seed viability and vitality in *Clematis fremontii* (S. Wats.) W.A. Weber. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

Hart, S. D. Estes, B.E. Wofford, A. Floden, R. Shephard, M. Brock, and J. Shaw. 2012. Rare plants and habitat delineation of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

Benson. A..R, J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on *Scutellaria montana* Chapm. at the Tennessee Army National Guard Training Site, Catoosa County, Georgia. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

Chin, Siew-Wai, J. Wen, J. Shaw, R. Haberle, P.Z. Jorge, and D. Potter. 2012. Phylogeny and Historical Biogeography of *Prunus* (Rosaceae, Amygdaloideae). Paper presented at Botany 2012 in Columbus, OH.

Sisco, P.H., F.V. Hebard, T.C. Neel, J.H. Craddock, and J. Shaw. 2012. Cytoplasmic male-sterility in interspecific hybrids between American and Asian Castanea species is associated with the American “D” cytoplasm genotype. Paper presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

Craddock, J.H, and J. Shaw. 2012. Cytoplasmic genotypes of North American *Castanea* based on chloroplast DNA. Paper presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

Harris, A., J. Shaw, and J.H. Craddock. 2012. A floral survey and census of American chestnut at Bendabout Farm, Bradley County, TN. Poster presented at the Fifth International Chestnut Congress, Shepherdstown, WV.

Shaw, J. H. Shafer, and M. Kovach. 2012. Chloroplast DNA sequence utility for inference of low-level or phylogeographic relationships among plants. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

Hart, S. D. Estes, B.E. Wofford, D. York, E. Blyveis, C. Klagstad, R. Shephard, C. Gorman, A.J. Floden, and J. Shaw. 2012. Floristic inventory and vegetation mapping of the Ocoee River Gorge, Polk County, TN. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

Harris, A., J.H. Craddock, and J. Shaw. 2012. A floral survey and chestnut census of *Castanea dentata* (Marsh.) Borkh. (American chestnut, Fagaceae) at Bendabout Farm, Bradley County, TN. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

Alford, K., A. George, D. Neely, and J. Shaw. 2012. Population status and conservation genetics of the flame chub, *Hemitrema flammea*. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

Benson, A., J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer training site, Catoosa County, GA. Paper presented at the Association of Southeastern Biologists meeting in Athens, GA.

Sikkema, J., J. Shaw, and J. Boyd. 2012. Effects of invasive species on federally threatened *Scutellaria montana* Chapm. Poster presented at the Association of Southeastern Biologists meeting in Athens, GA.

Blyveis, E., and J. Shaw. The vascular flora and phytogeographical analysis of the Tennessee River Gorge, Hamilton and Marion counties, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.
Shaw, J., S. Hart, E. Blyveis, and D. Estes. 2012. Mapping the vegetational and ecological systems and associations of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

Benson, A., J. Shaw, and J. Boyd. 2012. Impacts of large mammal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer training site, Catoosa County, GA. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

Hart, S., D. Estes, E. Blyveis, and J. Shaw. 2012. The vascular flora of the Ocoee River Gorge, Polk County, TN. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

Minchew, K., and J. Shaw. 2012. Investigating *Clematis* L. subgenus *Viorna* A.Gray: A closer look at the eastern North American virgin's bowers. Paper presented at the Tennessee Academy of Sciences meeting in Jackson, TN.

Professional, University, Departmental and Community Service

Professional
Association of Southeastern Biologists
Past-President April 2017-April 2019
President April 2015-April 2017
President Elect April 2014-April 2015
Vice President April 2013-April 2014
Chair of the Field Trips Committee for Athens, GA meeting
Coordinated and co-chaired symposium: *Next Generation Approaches to Phylogenetics and Phylogeography in Southeastern Systems* at the Association of Southeastern Biologists meeting in Athens, GA 2012
Chair of Field Trips Committee for Huntsville, AL meeting
Chaired a botanical section at 2010 meeting in Asheville, NC
Chair on the Graduate Student Support Award Committee 2010
Member at Large 2009 – 2012

Guest Editor Southeastern Naturalist 2007-2017
Editor Journal Torry Botanical Society 2015-2016
Wildflower Pilgrimage Organizing Committee 2012-present; Chair from 2016-present
Highlands Biological Station: Board of Scientific Advisors 2015 – present
Hosted the *Scutellaria montana* Coordination meeting 2011 & 2012 for state agencies
Ozark Chinquapin Foundation: Board of Scientific Advisors 2014 – present
Tennessee Rare Plant Scientific Advisory Committee: Appointed 2009 – present

Manuscript reviewer for: *American Journal of Botany*, *Annals of Botany*, *Applications in Plant Sciences*, *Biotropica*, *Botanische*, *Castanea*, *Genome*, *Journal of the Botanical Research Institute of Texas*, *Journal of Plant Research*, *Modrono*, *Molecular Phylogenetics and Evolution*, *Novon*, *Plant Systematics and Evolution*, *PlosOne*, *Sida*, *Southeastern Naturalist*, *Tree Genetics and Genomes*

University
Graduate Coordinator (2011 – 2013)
Graduate Council (2009 – 2013)

Department

Community
Board member of Tennessee Native Plant Society 2015 – present.

Press regarding your work
List press activities, including date, source, and theme.

Biocollections digitization, 2017, UT Martin: www.utm.edu/1148/07/31/2017.html

Biocollections digitization, 2017, Tennessee Tech: https://www.tntech.edu/news/releases/tech%E2%80%99s-hollister-herbarium-to-become-part-of-digitized-database

Henry Spratt

Faculty development
Over the 2013 to 2014 academic year I organized a fund raiser, with the help of UTC's Development Office, to raise money to purchase some critically needed equipment for teaching and research labs. The fund raiser netted a total of just over $16,000, which allowed the purchase of three key pieces of equipment.

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Spratt, H. G., Jr., D. Levine, J. Bage, D. K. Giles, and A. G. Collier. 2017. Topical lotions utilized in outpatient rehabilitation clinics as a potential source of bacterial contamination. *Physiotherapy Theory and Practice*. IN-PRESS.

Spratt, H. G., Jr., D. Levine, and L. Tillman. 2014. Physical therapy clinic therapeutic ultrasound equipment as a source for bacterial contamination. *Physiotherapy Theory and Practice*. 30:507-511. ISSN: 0959-3985 (print), 1532-5040 (electronic), DOI: 10.3109/09593985.2014.900836.

Grants
External
2017, Spratt, Jr., H. G., J. Boyd, and A. Carroll. Cumberland Trails Conference connector program, Building the next generation of recreation and conservation corridors in Tennessee – Year Two. Cumberland Trails Conference. $40,040.

2017, McAllister, D., H. G. Spratt, Jr., and S. McCarragher. Leveraging GLOBE resources to implement middle grades science and mathematics standards. Improving Teacher Quality Grant Program, Tennessee Higher Education Commission. $75,000.

2016, Boyd, J, A. Carroll, H. G. Spratt, Jr., Andrew Bailey. Cumberland Trails Conference connector program, Building the next generation of recreation and conservation corridors in Tennessee – Year One. Cumberland Trails Conference. $68,267.

2016, Spratt, Jr., H. G. - PI, with D. Levine. Development of a protocol to disinfect GelShot ultrasound retaining clips. Richmar, 4120 S. Creek Rd., Chattanooga, TN. $6,698.00.

2013, Boyd, J., S. Chatzimanolis, H. M. Klug, J. Shaw, T. Wilson – PI's, with G. Potts, and H. G. Spratt, Jr as major participants. MRI Acquisition of growth chambers for global change biology research and research training at the University of Tennessee at Chattanooga. NSF Division of Biological Infrastructure, Major Research Instrumentation. $342,945.

Internal

2016, Spratt, Jr., H. G. - PI, with D. Levine, D. Giles, A. Kohrt, J. Huff, M. Rowin, E. Reade, P. Klingborg, S. Harding, and S. Berry. Environmental factors related to bacterial nosocomial infection in hospital intensive care units in childrens hospitals: Assessment and recommendations for practice. University of Tennessee at Chattanooga, Collaborative Research Initiative for Sponsored Programs. $8,600.

2015, Levine, D. and H. G. Spratt, Jr. Infectious disease agents in the Erlanger hospital neonatal intensive care unit: An investigation. UTC, Dean of Graduate Studies and Research, UTC Honors College. $2,660.

2015-16, UTC Provost Student Award: with students Sarah Boden, Scott Douglas, Leigh Ann Norris, and Beth Smith (in association with Dr. David Levine, and Dr. Julie Bage, UTC Physical Therapy). Topical lotions and cream utilized in outpatient rehabilitation clinics as a potential source of bacterial contamination. $1,000.

2014-15, UTC Provost Student Award: with student Heather Harmon (in association with Dr. David Levine, UTC Physical Therapy). Dry needling as a source of bacterial contamination. $765.

2014-15, UTC Provost Student Award: with student Kimika Tsukide. Seasonal trophic status of Bee Creek by mineralization analysis. $1,000.

Invited Research Seminars

Spratt, H. G., Jr., and D. Giles. 2016. Investigations of select bacterial pathogens in the physical environment of Erlanger Hospital’s neonatal and pediatric intensive care units. A presentation, University of Tennessee College of Medicine – Chattanooga, and Erlanger Hospital personnel, Grand Rounds.

Spratt, H. G., Jr. 2016. Infectious disease agents in the environment of the Children’s Hospital at Erlanger’s neonatal intensive care unit: Preliminary results. A presentation to officials and staff of Erlanger’s NICU.

Invited Educational Presentations

Spratt, H. G., Jr. 2013. Fracking”. A presentation to the University of Tennessee at Chattanooga’s student environmental group, “EDGE”, Chattanooga, TN.

Spratt, H. G., Jr., and J. Wilferth. 2013. Overview of Fracking Relative to UT’s Proposed Fracking Study in the Cumberland Forest. A presentation to the University of Tennessee Faculty Council, Chattanooga, TN.

Spratt, H. G., Jr., and J. Wilferth. 2013. Fracking. A presentation to the Cherokee Group, Tennessee Chapter, Sierra Club, Chattanooga, TN.

Conference presentations

Levine, D., and H.G. Spratt, Jr. 2017. Healthcare-associated infections and prevention strategies for the rehabilitation professions. Ann. meeting, United States Public Health Service, Scientific and Training Symposium. Chattanooga, TN.

Spratt, H. G., Jr. 2017. UTC's Clinical Infectious Disease Control research group: Helping local healthcare facilities in the battle against healthcare acquired infections. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

Melchionna, M., W. Harden, J. Gunn. M. Brzezienski, M. Epps, D. Levine, and H.G. Spratt, Jr. 2017. Efficacy of antibacterial saline wash during placement of breast prosthesis in bacterial load reduction. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

Smith, C., E. Kilpatrick, M. Rowin, J. Huff, D. Levine, D. Giles, and H. G. Spratt, Jr. 2017. Potential environmental reservoir for bacterial species that may serve as agents of nosocomial infections in neonatal and pediatric intensive care units of a local hospital. Ann. Research Dialogs meeting, University of Tennessee at Chattanooga, Office of Research and Sponsored Programs.

Webb, E. S., and H. G. Spratt, Jr. 2017. Degradation of aromatic dyes by bacteria isolated from soils previously exposed to aromatic compounds and by common lab bacterial cultures. Ann. meeting, Assoc. SE Biologists, Montgomery, AL (Southeastern Biology XX:XXX).

Spratt, H. G., Jr., D. Levine, D. Giles, M. Rowin, and J. Huff. 2017. Bacterial contamination in the environment of neonatal and pediatric intensive care units. Ann. meeting, Assoc. SE Biologists, Montgomery, AL (Southeastern Biology XX:XXX).

Spratt, H. G., Jr., and D. Giles. 2016. Investigations of select bacterial pathogens in the physical environment of Erlanger Hospital's neonatal and pediatric intensive care units. A presentation, University of Tennessee College of Medicine – Chattanooga, and Erlanger Hospital personnel, Grand Rounds.

Levine, D., H.G. Spratt, Jr., J. Bage, S. Boden, A. G. Collier, S. Douglas, L. A. Norris, E. Smith. 2016. Topical lotions and creams utilized in outpatient rehabilitation clinics as a potential source of bacterial contamination. Abstracts of Ann. Meeting, American Physical Therapy Association, Nashville, TN.

Leavell, A., K. Mcgee, C. Muegge, and H.G. Spratt, Jr. 2016. Microbial community dynamics related to the function of an artificial wetland. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:323).

Collier, A. Grace, H. G. Spratt, Jr., D. Levine, and J. Bage. 2016. Potential bacterial contamination from lotions and creams used for soft tissue mobilization and massage in outpatient rehabilitation clinics. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:322-323).

Spratt, H. G., Jr., D. Levine, A. G. Collier, and R. Kropp. 2016. Incidence of bacterial contamination in a hospital's neonatal intensive care unit. Abstracts of Ann. meeting, Assoc. SE Biologists, Charlotte, NC (Southeastern Biology 63:322).

Spratt, H. G., Jr. D. Levine, R. Walker, R. Tobias, H. Harmon, B. Rock, Z. Cooper, and D. Winkleman. 2015. Potential for bacterial contamination as a result of dry needling. Abstracts of Fall meeting, Tennessee Physiological Society, University of Tennessee at Chattanooga.

Tsukide, K., K. Quinn, A. Leavell, and H. G. Spratt, Jr. 2015. Evaluation of the efficacy of different bioremediation methods for the degradation of waste motor oil added to soil. Abstracts of Ann. meeting, Assoc. SE Biologists, Chattanooga, TN (Southeastern Biology 62:259).

Spratt, H. G., Jr., D. Levine, and R. Walker. 2015. Potential for deep tissue bacterial contamination as a result of dry needling. Abstracts of Ann. meeting, Assoc. SE Biologists, Chattanooga, TN (Southeastern Biology 62:259).

Spratt, H. G., Jr., M. M. Brown, E. Liner, and W. C. Hayes. 2014. Development of sporulating bacterial cultures for incorporation into pervious concrete before curing. Abstracts of Ann. meeting, Assoc. SE Biologists, Spartanburg, SC (Southeastern Biology 61:314-315).

Spratt, H. G., Jr., M. M. Brown, T. M. Gann, D. B. Wilson. 2013. The influence of bacterial growth in pores of pervious concrete on the flow of water through pervious pavements. Abstracts of Ann. meeting, Assoc. SE Biologists, Charleston, WV (Southeastern Biology 60:211).

Wilson, D. B., K. A. Harris, and H. G. Spratt, Jr. 2013. Mineralization of the herbicide simazine in golf course pond sediment: Comparison of passive bioremediation, biostimulation, and bioagumentation. Abstracts of Ann. meeting, Assoc. SE Biologists, Charleston, WV (Southeastern Biology 60:210-211).

Professional, University, Departmental and Community Service

Professional
2017, Served as a Judge for the University of Tennessee College of Medicine – Chattanooga and Erlanger Hospital, 35th annual Research Week Competition. Reviewed/Judged 19 presentations by Residents if different UTCOM departments.
2017, Served as a peer reviewer for the University of Tennessee at Chattanooga, Office of Research and Sponsored Programs, "Pre-Tenure Enhancement Program" proposals. Reviewed 3 proposals focused faculty research.
2017, Served as a peer reviewer for University of Tennessee "CORNET" Awards proposals. Reviewed 20 proposals focused on cancer research.
2016, Served as chair for "Microbiology" session, annual meeting Association of SE Biologists, Charlotte, NC.
2016, Served as a peer reviewer for a proposed text book in Microbiology, Oxford University Press USA.
2016, Served as a peer reviewer for a proposed text book in Immunology, Oxford University Press USA.

2015, Served as a peer reviewer for a proposed text book in Microbiology, Oxford University Press USA.
2014, Served as a peer reviewer for a proposed text book in Immunology, Oxford University Press USA.
2014, Served as a peer reviewer for the *Journal of Anesthesia and Clinical Care*.
2014, Served as chair for “Microbiology” session, annual meeting Association of SE Biologists, Spartanburg, SC.
2013, Served as chair for “Microbiology” session, annual meeting Association of SE Biologists, Charleston, WV.

Departmental
2017 to present, Department review (Chair of ‘Resources’ section – Undergraduate and Graduate)
2015 to 2016, Departmental Holt Hall Renovation Committee (Co-Chair)
2013 to present, Departmental Equipment Committee (Chair)
2013 to present, Departmental Graduate Committee (Member)
2013 to present, Departmental Rank, Tenure, & Promotion Committee (Member and Chair)

Community
2015, for Tim Glasscock and Elizabeth Winkleman. Provided assistance in the setup of a new microbiological testing company, Chattanooga Environmental Lab, LLC.
2014, for Tim Glasscock, Surgery Pharmacy Services, inc. Provided assistance in the design of a new lab to be used for microbiological tests for current and future products.
2013 to Present, Serving on the Board of Directors, Tennessee Clean Water Network, Knoxville, TN.
2013 to Present, Serving on the Board of Directors, Tennessee River Gorge Trust, Chattanooga, TN.

2013 to Present, Elected to serve as Secretary, Tennessee Clean Water Network, Knoxville, TN.
2013 to Present, Elected to serve as Chair of the Outreach & Education Committee, Tennessee River Gorge Trust, Chattanooga, TN.
2013, Consulting work for RWM Technologies, LLC. Provided assistance in the design of a new lab to be used for microbiological tests for current and future products.

Press Regarding your work
2017, “Trughseekers: ReSEARCH Dialogs digs for answers”, A report about a presentation on research conducted at Erlanger Hospital. UTC News Releases.

<u>John Tucker</u>

Faculty development
2017: Taleo and OED training, UTC (2/3/17)
2016: Department Heads Workshop, College of Arts and Sciences (8/17/16).
2016: SharePoint Workshop, UTC (1/14/16)
2015: Department Heads Workshop, College of Arts and Sciences (8/10/15)

2015: Biological and Environmental Sciences Faculty Retreat, Hilton Garden Inn, Chattanooga (4/29/15-4/30/15).
2014: Department Heads Workshop, College of Arts and Sciences (8/13/14)
2014: Grants Workshop, UTC (3/24/14)
2014: SACS Training Session, UTC (4/22/14)
2014: SSC Demonstration and Training (10/9/14)
2013: Hiring Training, UTC (1/9/13)
2013: EDO (faculty evaluation) Workshop, UTC (2/5/13)
2013: Compensation Administration Workshop, UTC (12/5/13)
2013: Faculty Evaluation Training, UTC (12/17/13).
2012: Learning from the Pros – How to Manage Large Classes with Ease (9/6/12).
2012: Banner Training, UTC (9/26/17)

Professional, University, Departmental and Community Service

Professional
Journal Reviewer for the following journals: *International Journal of Environmental Research and Public Health* and *Journal of the Society for Latin American Studies*

Fall 2003- Present: Board of Advisors, Center for Governmental Responsibility, University of Florida College of Law

University
2007 – Present: Department Head (Biology and Environmental Science (2007-2015), Biology, Geology, and Environmental Science (2015-2017)
2015 – Present: Co-Chair, UTC Wheeler Odor Board
2014 – Present: Member College of Arts and Sciences ad hoc Budget Committee
2013 – Present: Member, College of Arts and Sciences Executive Committee
2007 – Present: Member UTC Council of Academic Department Heads
Fall 2015-2016: Member, UTC Provost’s ad hoc Work Load Policy Committee
2015: Co-leader, College of Arts and Sciences department heads budget reduction and program reorganization workshops
2015: Member, UTC Provost’s ad hoc Indirect Costs Allocation Committee
2013-2014: Member, College of Arts and Sciences ad hoc committee developing standardized department head performance objectives and performance report forms
2013-2014: Member, UTC ad hoc Tenure and Promotion Criteria Review Committee
Fall 2013-Spr 2014: Chair, UTC SunTrust Chair of Excellence in Humanities Search Committee
Fall 2012: Member, UTC Chancellor Search Committee
Fall 2012-Spring 2013: Chair, UTC Political Science, Public Administration, and Non-Profit Management Department Head Search Committee

Departmental
2007 – Present: Department Head (Biology and Environmental Science (2007-2015), Biology, Geology, and Environmental Science (2015-2017)

Community
Spring 2008 – Present: Chattanooga-Hamilton County Air Pollution Control Bureau Board (reappointed to 3-year term by Hamilton County Board of Commissioners Resolution 117-3, January 4, 2017.)
2014: Chattanooga Inter-Tribal Association Seminar (3/20/14)
Fall 2008- 2013: Mayor's Green Committee, Chattanooga, Tennessee

Press Regarding your work
2017: In press, Consciousness of Streams by Gary Hengstler, *Tennessee Alumnus*, Fall 2017

Thomas P. Wilson

Faculty development
2016 Diversity and Human Resources Training
2016 Honors College Development Lecture/Seminar- Challenges in Honors!
2015 Diversity and Human Resources Training
2015 Honors College Development Lecture/Seminar- David O'Hara, Design Process Thinking
2014 GISP Recertification in Geospatial Sciences, GIS Certification Institute
2014 Honors College Development Lecture/Seminar- What is Innovation?
2014 Diversity and Human Resources Training
2013 UTC Think and Achieve Working Session
2012 $1,600 (Co-PI with B. Reynolds). Impact of Transformational Leadership, Hands-On Herpetology, and Reflective Journaling on the Conservation Ethic of Tertiary-Level Non-Science Major. UTC Think and Achieve
2012 Conservation of GIS Training- Integrating Remote Sensing and GIS Technologies

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
Wilson, T.P., B.R. Reynolds, P.J. Wilson, P.E. Bakland, J. Hooper, N. Hunt, S. Madsen, M. Cooksey, P. Garland, W. Grigsby, B. Killian, N. Ricks, E. Staudt, M. Taylor, E. Busby, J. Barbosa, E. Carver, D. Armstrong, M. Dillard, J. Simpson, M. Wisdom, T.M. Wilson, and Team Salamander. 2017. Team Salamander and its Evolution as the Longest-Running Group-Studies Initiative at the University of Tennessee at Chattanooga. Southeastern Naturalist (The Outdoor Classroom) 16(Special Issue 10):70-93.

Wilson, T.P., J. Barbosa, E. Carver, B.R. Reynolds, Team Salamander, and T.M. Wilson. 2015. *Batrachochytrium dendrobatidis* Prevalence in Two Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee. Herpetological Review 46(1):37-41.

Manis, C., and T.P. Wilson. 2012. Geographic Distribution: *Lampropeltis getula* (Common Kingsnake). Herpetological Review 43(2): 308.

Manis, C., T.P. Wilson, and J. Patrick. 2012. Geographic Distribution: *Trachemys scripta scripta* (Yellow Bellied Slider). Herpetological Review 43(2): 304.

Wilson, T. P., C. B. Manis, S. L. Moss, R. M. Minton, Collins, E. and T. M. Wilson. 2012. New distributional records for reptiles from Tennessee, USA. *Herpetological Review* 43(1):111-112.

Submitted or in preparation

Hooper, J.W., Mowry, C.B., Wilson, T.P., and T.J. Gaudin. 2016. "I Think a Coyote Attacked My Pet: Potential Effects of Assumptions and the Need for Human-Coyote Conflict Investigations". Human Dimensions of Wildlife: UHDW-2016-0085.

Hooper, J.W., Mowry, C.B., Wilson, T.P., and T.J. Gaudin. 2016. "Human-Coyote Interactions in an Urban Environment: The Importance of Landscape Characteristics and Scale". Urban Naturalist: U130.

Reynolds, B.R., and T.P. Wilson. 2017. "Factors Leading to the Selection of an Undergraduate Environmental Science Major at the University of Tennessee at Chattanooga". Journal of Tennessee Academy of Science: JTAS-D-17-00002.

Books and book chapters

Accepted or published

Akre, T. S. B., J. D. Willson, and T. P. Wilson. 2012. *Alternative methods for sampling freshwater turtles and squamates*. In Ch 11, Techniques for Reptiles in Difficult to Sample Habitats, Reptile Biodiversity: Standard Methods for Inventory and Monitoring, edited by Roy W. McDiarmid, Mercedes S. Foster, Craig Guyer, J. Whitfield Gibbons, and Neil Chernoff. The Regents of the University of California.

Wilson, T.P., and T.S.B. Akre. 2012. Published three line drawings (pgs. 188, 190, and 191) for use as illustrations in Alternative methods for sampling freshwater turtles and squamates. In Ch 11, Techniques for Reptiles in Difficult to Sample Habitats, Reptile Biodiversity: Standard Methods for Inventory and Monitoring, edited by Roy W. McDiarmid, Mercedes S. Foster, Craig Guyer, J. Whitfield Gibbons, and Neil Chernoff. The Regents of the University of California.

Ford, D.M, and B.R. Reynolds. 2014. A Laboratory Manual for Introduction to Environmental Sciences. Kendall Hunt Publishing. 120pgs. (with Contributions from Jennifer Boyd, David Stanislawski, and Thomas Wilson).

Project reports

Armstrong, D.S., Simpson, J.F. III, Team Salamander and T.P. Wilson. 2012. A Conservation Genetics Assessment of a Spotted Salamander (*Ambystoma maculatum*, Shaw 1802) Population at the LT6 Study Area in Hamilton County, Tennessee. A Final Technical Report Submitted to the Tennessee Wildlife Resources Agency, and the USGS Leetown Science Center. Pgs. 59. December 31, 2012.

Simpson, J.F. III, Armstrong, D.S., Team Salamander and T.P. Wilson. 2013. An Ecological Assessment of a Herpetolfaunal Community at the LT6 Study Area in Hamilton County, Tennessee: Baseline Ecology, Species Richness, and Relative Abundance. A Final Technical Report Submitted to the Tennessee Wildlife Resources Agency. Pgs. 78. May 31, 2103.

Dillard, M.J., Hooper, J., Team Salamander, and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle (*Terrapene carolina carolina*) at the LT7 Study Area in Hamilton County, Tennessee. A Final Technical Report Submitted to the Tennessee Wildlife Resources Agency and the Tennessee Herpetological Society. Pgs. 44. October 31, 2016.

Grants

External

2014 Boyd, J. (PI), S. Chatzimanolis, H. Klug, J. Shaw, T.P. Wilson (Co-PIs), G.E. Potts and H.G. Spratt. NSF funding awarded to purchase six environment growth chambers for global change research and instruction.

2013 $500 (PI with M.Dillard). Home Range and Habitat Use of Eastern Box Turtles in a Developing Landscape. Tennessee Herpetological Society.

2012 $ 50,000 (**Co-PI** with A. Carroll). Natural History Inventory and Mapping Project of the Tri-State Area surrounding Hamilton County, Tennessee. Lyndhurst Foundation.

Internal

2016. Bakland, Paul-Erik. Advisor: T.P.Wilson. Prevalence and Severity of *Batrachochytrium dendrobatidis* in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. Provost Student Research Award ($1,000.00). University of Tennessee at Chattanooga, July 1, 2016 – June 30, 2017.

2016. Brocco, Cameron. Advisor: T.P.Wilson. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. Provost Student Research Award ($1,000.00). University of Tennessee at Chattanooga, July 1, 2016 – June 30, 2017.

2016. Nabors, Mcall. Advisor: T.P.Wilson. The Prevalence of *Batrachochytrium dendrobatidis* in Watercourses Situated in Southeast Tennessee. Provost Student Research Award ($996.00). University of Tennessee at Chattanooga, July 1, 2016 – June 30, 2017.

2016. Schrenker, Erin. Advisor: T.P.Wilson. Measuring the Presence of the amphibian pathogen *Batrachochytrium dendrobatidis* in East Tennessee"Provost Student Research Award ($946.00). University of Tennessee at Chattanooga, July 1, 2016 – June 30, 2017.

2012 $1,600 (Co-PI with B. Reynolds). Impact of Transformational Leadership, Hands-On Herpetology, and Reflective Journaling on the Conservation Ethic of Tertiary-Level Non-Science Major. UTC Think and Achieve

Invited Research Seminars

Bakland, P.E., Team Salamander, and T.P. Wilson. 2016. A Species Checklist of Plethodontid Salamanders from Hamilton and Marion Counties in southeast Tennessee. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P15, Pg. 4.

Brocco, C., Nabors, M., Schrenker, E., Bakland., P.E., Team Salamander, and T.P. Wilson. 2016. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P19, Pg. 4.

Dillard, M.J., Bakland, P.E., Hooper, J.W., Wilson, P.J., Team Salamander, and T.P. Wilson. 2017. In the Shadows of a Brownfield: Using Citizen Scientists to Better Elucidate the Spatial Ecology of the Eastern Box Turtle (*Terrapene carolina carolina*, Linnaeus, 1758) in Southeastern Tennessee. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Madsen, S., Altonen, R., Wilson, T.P., and Team Salamander. 2017. Clean Water and River Health Education Using Freshwater Turtles: A Charismatic Approach. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Wilson, T.P., Dillard, M.J., Manis, C., Moss, S., Wilson, P.J., and Team Salamander. 2017. Application of Design Process Thinking and Structured Decision Making to the Conservation of Freshwater Turtles in the Thrive 2055 Region. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Invited Educational Presentations

Wilson, T.P. 2016. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Reflection Riding Arboretum and Nature Center. I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

Wilson, T.P. 2015. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Tennessee Aquarium, and Reflection Riding Arboretum and Nature Center. I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

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Wilson, T.P. 2013. Amphibian and Reptile Biology: Life in Cold Blood. Tennessee Naturalists Program. Hosted by Tennessee Aquarium, and Reflection Riding Arboretum and Nature Center. I have presented a short course on Tennessee Amphibians and Reptiles. The course has a traditional lecture, lab and field experiences. The course culminates with a comprehensive exam that the students are required to pass to become recognized as a Tennessee Naturalist through the Tennessee Wildlife Resources Agency (TWRA).

Conference Presentations

Bakland, P.E., Carver, E., Barbosa, J., Reynolds, B., Team Salamander, and T.P. Wilson. 2017. Prevalence and Severity of *Batrachochytrium dendrobatidis* in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Bakland, P.E., and T.P.Wilson. 2017. Investigation of the Amphibian Chytrid Fungus in East Tennessee. Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

Bakland, P.E., Wilson, T.P., Hunt, N., Manis, C., Simpson, J.F., and Team Salamander. 2016. Herpetofaunal Checklist for Hamilton County as Generated Through Various Projects of the Herpetology Laboratory at the University of Tennessee at Chattanooga. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

Brocco, C., Carver, E., Barbosa, J., and T.P. Wilson. 2017. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage. University of Tennessee at Chattanooga: Research Dialogues. Oral Presentation, April 2017.

Brocco, C., and T.P. Wilson. 2017. Spatial Analysis of Prevalence of Chytrid Fungus in an Amphibian Assemblage in Tennessee. Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

Daniels, K., and T.P. Wilson. 2017. Comparing unmanned aerial vehicles (UAVs) to traditional field methods in surveying of basking riverine turtles. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Daniels, K., Wilson, T.P., and A. Carroll. 2017. Comparing Unmanned Aerial Vehicles (UAVs) to Traditional Field Methods in Surveying of Basking Riverine Turtles. Turtle Survival Alliance, Charleston, SC, Poster.

Dillard, M.J., Bakland, P.E., Hooper, J.W., Wilson, P.J., Team Salamander, and T.P. Wilson. 2017. In the Shadows of a Brownfield: Using Citizen Scientists to Better Elucidate the Spatial Ecology of the Eastern Box Turtle (*Terrapene carolina carolina*, Linnaeus, 1758) in Southeastern Tennessee. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Harris, C., Hedrick, D., Bakland, P.E., Hunt, N., Elmore, J., Team Salamander, and T.P. Wilson. 2017. The Status and Conservation of the eastern hellbender (*Cryptobranchus alleganiensis*): Directions for the Future. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Harris, C., Hedrick, D., Bakland, P.E., Hunt, N., Elmore, J., Team Salamander, and T.P. Wilson. 2017. The Status and Conservation of the eastern hellbender (*Cryptobranchus alleganiensis*): Is it Functionally Extinct? University of Tennessee at Chattanooga: Research Dialogues. Oral Presentation (Lightning Pitch), April 2017.

Hunt, N.R., Carroll, A., and T.P. Wilson. 2017. Predictive Spatial Modeling and Assessment for a Rare Tennessee Anuran: BARKING TREEFROG (*Hyla gratiosa*). Southeastern Partners in Amphibian and Reptile Conservation Annual Meeting, 2017, Poster, February 16, 2017.

Hunt, N.R., Wilson, T.P., and A. Carroll. 2016. Land Cover Trends in *Hyla gratiosa* Presence at Watershed Scale in Tennessee. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

Hunt, N.R., Carroll, A., and T.P. Wilson. 2017. Land Cover Trends in *Hyla gratiosa* Presence at Watershed Scale in Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Madsen, S., Altonen, R., Wilson, T.P., and Team Salamander. 2017. Clean Water and River Health Education Using Freshwater Turtles: A Charismatic Approach.   Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Nabors, M., Carver, E., Barbosa, J., and T.P. Wilson. 2017. The Prevalence of *Batrachochytrium dendrobatidis* in Watercourses Situated in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Schrenker, E., Carver, E., Barbosa, J., and T.P. Wilson. 2017. Measuring the Presence of the amphibian pathogen *Batrachochytrium dendrobatidis* in East Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 2017.

Wilson, T.P., Bakland, P.E., Hunt, N., and D.E. Collins. 2017. Reproductive Ecology of a Freshwater Turtle Community at Reelfoot Lake, Tennessee. Association of Southeastern Biologists Annual Meeting, Montgomery, AL; March 29 - April 1, 2017, P266.

Wilson, T.P., Dillard, M.J., Manis, C., Moss, S., Wilson, P.J., and Team Salamander. 2017. Application of Design Process Thinking and Structured Decision Making to the Conservation of Freshwater Turtles in the Thrive 2055 Region. Turtle Survival Alliance, Charleston, SC, Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education (Invited Presenter).

Bakland, P.E., and T.P. Wilson. 2016. Prevalence and Severity of *Batrachochytrium dendrobatidis* in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

Bakland, P.E., and T.P. Wilson. 2016. Prevalence and Severity of *Batrachochytrium dendrobatidis* in Natural Wetlands and Urban Retention Ponds in Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. 3-Minute Thesis, Oral Presentation, April 14, 2016.

Bakland, P.E., and T.P.Wilson. 2016. Preliminary Results of an Investigation of the Amphibian Chytrid Fungus, *Bactrachochytrium dendrobatidis*, at Retention Ponds and Natural Wetlands in Southeast Tennessee.   The Wildlife Society Annual Meeting, Raleigh, NC; October 18, 2016, Poster #210, Pg. 74.

Bakland, P.E., Team Salamander, and T.P. Wilson. 2016. A Species Checklist of Plethodontid Salamanders from Hamilton and Marion Counties in southeast Tennessee. Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P15, Pg. 4.

Brocco, C., Nabors, M., Schrenker, E., Bakland., P.E., Team Salamander, and T.P. Wilson. 2016. Spatial Analysis of Prevalence of Chytrid Fungus in a Plethodontid Salamander Assemblage.   Special Highlands Conference on Plethodontid Salamander Biology (Invited Presenter); Highlands, NC, August 4-7, 2016. Poster #P19, Pg. 4.

Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., Reynolds, B., and T.P.Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., Reynolds, B., and T.P.Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 13, 2016.

Dillard, M.J., Hooper, J., Team Turtle, and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in Urban and Fragmented Landscapes of Southeast Tennessee. Native Plant Symposium: Tennessee Valley Chapter of the Wild Ones. University Center, University of Tennessee at Chattanooga, Poster, March 5, 2016.

Dillard, M.J., and T.P. Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in Urban and Fragmented Landscapes of Southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

Dillard, M.J., Hooper, J., and T.P. Wilson. Home range, habitat use, and movement patterns of the Eastern Box Turtle in a fragmented landscape in southeast Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

Dillard, M.J., Hooper, J., Team Salamander, and T.P.Wilson. 2016. The Spatial Ecology of the Eastern Box Turtle in an Urban and Fragmented Landscape of Southeast Tennessee. Association of Southeastern Biologists Annual Meeting, Concord, NC; March 31 - April 3, 2016, P212.

Dillard, M.J., Hooper, J., Team Salamander, and T.P. Wilson.   2016. In the shadows of a Brownfield at the Dawn of Gig City: The Spatial Ecology of the Eastern Box Turtle in an Urban and Fragmented Landscape of Southeaster Tennessee. The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #60, Pg. 54.

Hooper, J., Mowry, C.B., Wilson, T.P., and T.J. Gaudin. 2016. I Think a Coyote Attacked My Pet. Potential Effects of Assumption and the Need for Investigations to Validate Human-Coyote Conflict. The Wildlife Society Annual Meeting, Raleigh, NC; October 19, 2016, 4:00PM, Pg. 92.

Hunt, N.R., Carroll, A., and T.P. Wilson. 2016. Land Cover Trends in *Hyla gratiosa* Presence at Watershed Scale in Tennessee. University of Tennessee at Chattanooga: Research Dialogues. Poster, April 14, 2016.

Hunt, N.R., Carroll, A., and T.P. Wilson. 2016. Land Cover Trends in *Hyla gratiosa* Presence at Watershed Scale in Tennessee. Tennessee Geographic Information Council (TNGIC), Chattanooga Convention Center, Chattanooga, TN, April 27-28, 2016, Poster.

Hunt, N.R., Carroll, A., and T.P.Wilson. 2016. Predictive Spatial Modeling for a Rare Tennessee Anuran: Barking Treefrog. The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #145, Pg. 71.

Schrenker, E., Dempsey, M., Korshun, A., Mitchell, A., Schwartz, R., Reynolds, B, and T.P. Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Station at the University of Tennessee at Chattanooga. Association of Southeastern Biologists Annual Meeting, Concord, NC; March 31 - April 3, 2016, P175.

Schrenker, E., Dempsey, M., Korshun, A., Mitchell, A., Schwartz, R., and T.P. Wilson. 2016. The Development and Implementation of a Natural Science Living and Learning Community Utilizing the Biological Field Stations at the University of Tennessee at Chattanooga. The Wildlife Society Annual Meeting, Raleigh, NC; October 18, 2016, Poster #217, Pg. 74.

Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B., Wilson, P.J., Team Salamander and T.M. Wilson. 2016. Prevalence of Chytrid Fungus in Two Species of Ranid Frogs on a Former United States Department of Defense Installation in Southeastern Tennessee: Directions for the Future.   The Wildlife Society Annual Meeting, Raleigh, NC; October 17, 2016, Poster #61, Pg. 54.

Wilson, T.P., Dillard, M.J., Hooper, J., and Team Salamander. 2016. The Spatial Ecology of the Eastern Box Turtle (*Terrapene carolina carolina*) in an Isolated Urban Landscape of

Southeast Tennessee. 14th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles. New Orleans, LA, August 2, 2016. g. 14.

Wilson, T.P., Reynolds, B., Dempsey, M., Korshun, A., Mitchell, A., Schrenker, E., Schwartz, R., and Team Salamander. 2016. The Development and Implementation of a Natural Science Living and Learning Community and a Case for Hands-On Herpetology Utilizing the Biological Field Stations at UT-Chattanooga. JMIH 2016, July 9, 2016, New Orleans, LA, Lightning Talk #778, Pg. 28.

Dillard, M.J. and T.P. Wilson. 2014. Lewis Award: The spatial ecology of the eastern box turtle in urban and fragmented landscapes of southeast Tennessee. The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Reynolds, B.R., and Wilson, T.P. 2014. "Lessons Learned Using Transformational Leadership and Reflective Journaling: A Case for Hands-on Herpetology." Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

Reynolds, B.R., and Wilson, T.P. 2014. "A Walk in the Woods: Battling Herpetophobia among Non-Science Majors." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Reynolds, B.R., and Wilson, T.P. "Transformational Leadership, Hands-On Herpetology, and Reflective Journaling: Impacting Student Conservation Ethic." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Reynolds, B., and T.P. Wilson. 2014. "A walk in the woods: battling herpetophobia among non-science majors". The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Simpson, J.F. III, and T.P. Wilson. 2014. An Assessment of a Herpetofaunal Community in Southeastern Tennessee: Ecology, Biodiversity, Threats, and Conservation Status. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Szarka, G.W., and T.P. Wilson. 2014. Sampling Amphibians and Reptiles in Southeastern Tennessee: Lessons Learned and Implications for Conservation and Management. Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

Szarka, G.W., and T.P. Wilson. 2014. Sampling Amphibians and Reptiles in Southeastern Tennessee: Lessons Learned and Implications for Conservation and Management. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2014. "In the shadows of a brownfield: Nest site selection by marbled salamanders (*Ambystoma opacum*) in an isolated wetland in southeastern Tennessee." Association for Southeastern Biologists Meeting, Spartanburg, South Carolina, 2014.

Wilson, T.P., Bakland, P.E., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2104. In the Shadows of a Brownfield at the Dawn of Gig City: Nest Site

Selection by Marbled Salamanders (*Ambystoma opacum*) in an Isolated Wetland in Southeastern Tennessee. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Wilson, T.M., and Team Salamander. 2014. "In the shadows of a brownfield at the dawn of Gig City: nest site selection by marbled salamanders (*Ambystoma opacum*) in an isolated wetland in southeastern Tennessee". The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B.R., and Team Salamander. 2014. "An Assessment of *Batrachochytrium dendrobatidis* Infection in Two Species of Ranid Frogs on a Former United States Department of Defense (DOD) Installation in Southeastern Tennessee." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Barbosa, J., Carver, E., Reynolds, B., and Team Salamander. 2014. "An assessment of *Batrachochytrium dendrobatidis* infection in two species of ranid frogs on a former United States Department of Defense (DoD) installation in southeastern). The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014. Tennessee.

Wilson, T.P., Carroll, A., Simpson, J., Manis, C., and Team Salamander. 2014. "Amphibians, Wetlands and the Faces of Development: Who gets the Gig?" Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson,T.P., Carroll, A., Simpson, J., Manis, C., and Team Salamander. 2014. "Amphibians, wetlands and the faces of development: who gets the gig?" The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Wilson, T.P., Manis, C., Moss., S., Minton, R., Schorr, M., and Team Turtle. 2014. "Sex ratios and size dimorphisms in the Tennessee River Gorge turtle community". The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Wilson, T.P., Reynolds, B., and Team Salamander*. 2014. "The importance of biological field stations in local conservation and education: a UTC perspective". The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Wilson, T.P., Simpson, J.F., Reynolds, B.R., Bakland, P.E., Hunt, N., Madsen, S., Altonen, R., Bird, B., Cooksey, M., Grigsby, W., Taylor, M., Dillard, M., Wisdom, M., Mericier, A., Szarka, G., Hooper, J., Manis, C., Wilson, T.M., and Team Salamander. 2014. "Team Salamander and its Evolution in Becoming the Longest Running Group Studies Initiative at the University of Tennessee at Chattanooga (UTC)." Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, Tennessee, 2014.

Wilson, T.P., Simpson, J., Reynolds, B., Bakland, P., Hunt, N., Madsen, S., Altonen, R., Bird, Bird, Cooksey, M., Grigsby, W., Taylor, M., Dillard, M., Wisdom, M., Mericier, A., Szarka, G., Hooper, J., Manis, C. Wilson, T.M. Wilson, and Team Salamander. 2014. "Team Salamander and its evolution in becoming the longest-running group studies initiative at the University of Tennessee at Chattanooga (UTC)". The Tennessee Herpetological Society, Belmont University, Nashville TN. September 2014.

Wilson, T.P., Armstrong, D., and J. Simpson. 2013. Demographic Characteristics and Genetic Status of an Isolated Population of Spotted Salamanders: Implications for Management and Recovery. The Wildlife Society Annual Conference, Oct. 5-10, 2013, Milwaukee, WI.

Wisdom, M.D., Wilson, T.P., Reynolds, B., and M.J. Dillard. 2013. Constructing Vernal Pools to Create and Enhance Amphibian Habitat. Southeastern Partners for Amphibian and Reptile Conservation. Feb. 21-24, 2013. Hickory Knob State Park, SC.

Wilson, T.P., Armstrong, D., Bascom, M., Barbosa, J., Carver, E., Dillard, M., Reynolds, B., Simpson, J., Wisdom, M., and C. Manis. 2013. A Swamp-Walker's Journal: Herpetology at the University of Tennessee at Chattanooga. Southeastern Partners for Amphibian and Reptile Conservation. Feb. 21-24, 2013. Hickory Knob State Park, SC.

Carpenter, C., Gaudin, T., Wilson, T.P., and J. Shaw. 2012. Phylogeography of short-tailed shrews (*Blarina*) of southeast Tennessee. Paper presented at the Tennessee Academy of Sciences meeting in Nashville, TN.

Carpenter, C., Gaudin, T., Shaw, J., and T.P. Wilson. 2012. Phylogeography of short-tailed shrews (genus: *Blarina*) of southeast Tennessee. Abstracts of 22nd Colloquium on the Conservation of Mammals in the Eastern United States, Louisville, MS.

Wilson, T.P. 2012. The Chronicles of Green-Printing: The Great Salamander Ball. Annual Meeting for the Tennessee Geographic Information Counsel (TNGIC). March 28, 2012. Montgomery Bell State Park, TN.

Wilson, T.P. 2012. Salamanders: Landuse Planning, Conservation and Greenspace. Annual Meeting for the Society of Conservation GIS. July 19-22, 2012, Monterey, CA.

Professional, University, Departmental and Community Service

Professional
2017- Reviewer for the United States Fish and Wildlife Service's Species Status Assessment (SSA) for the Kirtlands' Snake (*Clonophis kirtlandii*) under the Endangered Species Act.

Journal Reviewer for the following journals: *Herpetologica, Herpetological Conservation and Biology, Journal of Herpetology, Journal of Wildlife Management*

Judge for Herpetologists League (HL): Jaeger Award (New Orleans, 2016)

Judge for Society for the Study of Amphibians and Reptiles (SSAR): Victor Hutchinson Conservation Award (New Orleans, 2016).

University
Field Station (Chair)
Institutional Animal Care and Use Committee (Vice Chair)
Physical Geography, Lecturer search committee (2016)
Physical Geography, Assistant Professor search committee (2016)
GIS Laboratory Manager, IGT Lab search & Thrive 2055 committee (2015)
GIS Laboratory Technician, IGT Lab search & Thrive 2055 committee (2015)
Interdisciplinary Geospatial Technology Laboratory- Steering Committee (2012-present)
Innovation in Honors I & II Curriculum Development Committee (2014-2016)

Department
ESC Graduate Committee (2012-2017)
Field Station Committee (Chair)
Wildlife-Zoology Club Committee (Chair 2011-2014, Co-Chair 2015-2017)
Department review (2017-present; Self-Study Coordinator, B.S. Environmental Science)
Environmental Science Lecturer search committee (2017; Chair)
Geoscientist, Assistant Professor search committee (2016)
Integrated Ecologists, Assistant Professor search committee (2016)
Natural History Museum Committee
Bylaws Committee

Community
Wildlife Research and Collections Committee, Reflection Riding Arboretum and Nature Center
Hellbender Liaison, Chattanooga Zoo
Enterprise South Nature Park- Horse Trails Committee (2014-present)
Tennessee Wetlands Festival, Athens, Tennessee (2015-2017)
Green Day Festival, Cleveland State Community College (2017)

Press regarding your work
Thomas P. Wilson and Team Salamander (May 2016) were interviewed by Calvin Sneed and featured on WTVC- News Channel 9. Where we discussed spiders, ticks and other invertebrates and their role in the food-web; and we got to highlight the importance of Amphibians as a predator of invertebrates. The story by William Lenzi appeared on Monday, May 16, 2016 and can be found here <http://newschannel9.com/news/local/summer-pests-promo-05-16-2016>
Thomas P. Wilson featured as part of Natural History story that appeared in the July 2015 issue of Get-Out-Chattanooga Magazine. The story was focused on the Amazing and Wonderful World of Amphibians and Reptiles.

Thomas P. Wilson and Team Salamander (May 2014) featured in “Turtle Tracks” by David Cobb of the Chattanooga Times Free Press, May 10, 2014.

Thomas P. Wilson and Team Salamander (May 2014) were featured in a local TV story entitled, "Keeping Tabs on Box Turtles to Study Local Ecology" by Nick Austin with David Carroll and Cindy Sexton, NBC Eyewitness News 3, May 4, 2014.

Thomas P. Wilson and Team Salamander (May 2014) were featured in a local TV story entitled, "Box Turtle Population in Endanger" story by Amy Catcher, WDEF News 12, May 4, 2014.

Thomas P. Wilson and Team Salamander (May 2014) were featured in a local TV story entitled, "Tracking Turtles as Enterprise South Nature Park" by Latrica Thomas, WTVC- News Channel 9, May 4, 2014.

Thomas P. Wilson featured as part of Natural History story on the Dangers of the Outdoors and appeared in the April 2012 issue of Get-Out-Chattanooga Magazine. The story was focused on Spiders, Tick, Bears, and Rattlesnakes.

Geology Faculty

Amy Brock-Hon

Faculty development
2016-Attended Grant Writer's Workshop at UTC.

2015-Completed 4-hour NASA webinar on incorporating Mars data in undergraduate courses.

2012-Attended Tem Based Learning workshop at UTC.

2012-Attended CUR Institute "Beginning a Research Program in the Natural Sciences at a Predominantly Undergraduate Institution" in Hope College, Holland, MI

2012-Attended workshop titled Introductory Remote Sensing for Geoscientists at the annual GSA meeting in Charlotte, NC.

2012-Attended UTC Instructional Excellence Retreat

Scholarly activity
Accepted or published
Peer reviewed publications (Not including Published abstracts)

Brock-Hon, A.L., Morgenthaler, S.E., in preparation. Gravel dissolution in petrocalcic soils.

Brock-Hon, A.L., Hon, K., in preparation. Geophysical investigation of large depressions atop the Cumberland Plateau, Tennessee.

Robins, C.R., Deurlington, A., Buck, B.J., Brock-Hon, A.L., 2015. Micromorphology and formation of pedogenic ooids in calcic soils and petrocalcic horizons: Geoderma v. 251-252, p. 10-23.

Brock-Hon, A.L., Johnston, S.E., 2014. Separation and characterization of pedogenic barite crystals from petrocalcic horizon materials for future isotopic and geochronological applications: Geoderma v. 217-208, p. 129-134.

Brock-Hon, A.L., Elliot, T.R., 2013. Three-dimensional investigation of petrocalcic materials: Insight into pedogenic processes and future applications: Soil Science Society of America Journal v. 77, p. 1436-1441.

Brock-Hon, A.L., Robins, C., Buck, B.J., 2012. Micromorphological investigation of pedogenic barite in Mormon Mesa petrocalcic horizons, Nevada USA: Implication for genesis: Geoderma v. 197-180, p. 1-8.

Robins, C., Brock-Hon, A.L., Buck, B.J., 2012. Conceptual mineral genesis models for calcic pendants and petrocalcic horizons, Nevada: Soil Science Society of America Journal v. 76 n. 5, p. 1887-1903.

House, P.K., Pearthree, P.A., Brock, A.L., Bell, J.W., Ramelli, A.R., Faulds, J.E., Howard, K.A., 2011. Robust geological evidence for latest Miocene-earliest Pliocene river integration via lake-spillover along the lower Colorado River—Review and new data, in Beard, L.S., Karlstrom, K.E., Young, R.E., Billingsley, G.H., (Eds), CREvolution 2—Origin and Evolution of the Colorado River System, Workshop Abstracts: USGS Geological Survey Open-file Report 2011-1210, p. 137-142.

Grants

Internal

2013-UTC Faculty Development Grant ($1000)

2013-Student Jonathan Petsch awarded Provost Student Research Award for Raccoon Mountain Cave study ($790)

2014-Student Sarah Morgenthaler awarded Provost Student Research Award for Mormon Mesa dissolution feature study ($946)

2015-UTC College of Arts and Sciences Research and Creative Award for Mormon Mesa barite study ($5439)

2015-Student Dylan Dudley awarded Provost Student Research Award for Mormon Mesa mineralogy study ($820)

2016-UTC Faculty Development Grant ($1500)

Conference Presentations
Brock-Hon, A.L., Hon, K.D., 2017. A geophysical investigation of three closed topographic depressions atop the Cumberland Plateau, Tennessee. Accepted for presentation at the Annual GSA meeting in Seattle, WA.

Mies, J.W., Brock-Hon, A.L., Churnet, H.G., Holmes, A.E., Williams, W.K., 2016. The curricular benefits of a seismometer in UTC's Geology program. Geological Society of America Abstracts with Programs, v. 48, n. 3.

Dudley, D., Brock-Hon, A.L., 2016. Mineralogical study at Mormon Mesa, Nevada. Geological Society of America Abstracts with Programs v. 48, n. 3.

Brock-Hon, A.L., Hon, K.D., 2016. Preliminary results from a geophysical survey on a large depression in the Pennsylvanian clastic caprock of the Cumberland Plateau: Geological Society of America Abstracts with Programs v. 48, n. 3.

Brock-Hon, A.L., 2016. Whole and partial clast solution and the impact on interpretation of morphological and chemical change over time in petrocalcic soil horizons: ASA-CSSA-SSSA Annual meeting abstract.

Petsch, J., Brock-Hon, A.L., 2014. Sediment characterization for future cosmogenic dating in Raccoon Mountain Caverns, Hamilton County, TN: Geological Society of America Abstracts with Programs v. 46, n. 3, p. 98.

Morgenthaler, S.E., Brock-Hon, A.L., 2014. Report of an ongoing investigation into the development of dissolution voids in petrocalcic materials at Mormon Mesa, Nevada: Geological Society of America Abstracts with Programs v. 46, n. 6, p. 511.

Brock-Hon, A.L., 2013. Preliminary investigation of post-cementation gravel dissolution in petrocalcic horizons, southern Nevada: Geological Society of America Abstracts with Pograms v. 45, n. 7.

Robins, C.R., Buck, B.J., Brock-Hon, A.L., 2013. Micromorphology of pedogenic ooids and pisoids in petrocalcic soils of the southwestern United States. Soil Science Society of America, abstract.

Thakkar, K., Brock-Hon, A.L., 2012. Preliminary geologic and geomorphic map of Late Neogene and younger sediments in the eastern portion of the Overton, NE 7.5 minute quadrangle, Nevada: Geological Society of America Abstracts with Programs. V. 44, n. 7, p. 236.

Professional, University, Departmental and Community Service

Professional
2017- Reviewer of manuscripts for *Geoderma* and *Catena*
2016-present-Member of Geological Society of America Annual Planning Committee.

2016-present-Member of Southeastern Section Geological Society of America Grant Review committee.
2015-Technical Session Chair for the Southeastern Section Geological Society of America meeting in Chattanooga.
2015- Reviewed grant proposal for the NSF Land Surface Dynamics Division.
2015-Reviewed manuscripts for *Geology, Geoderma,* and *Journal of Mountain Research.*
2015-present-Campus Rep for the Geological Society of America.
2013-Reviewed of manuscript for *Geophysical Research Letters*.
2013-2015 Elected panelist for Quaternary Geology and Geomorphology Division of the Geological Society of America.
2012-Reviewed manuscript for the Journal *Catena*.
2012- Reviewed grant proposal for NSF.
2012-Review panelist for NASA's Mars Fundamental Research Program Geochemistry Division in Washington, DC.
2011-Appointed member of Soil Science Society of America Reorganization Task Force.
2011- Member of scientific committee for the International Union of Soil Sciences Commission 1.1 Soil Morphology and Micromorphology working Meeting in Lleida, Spain/
2011-Member of Soil Science Society of America S884 Soil Micromorphology Committee

Active Professional Memberships
Soil Science Society of America
Geological Society of America
Sigma Xi
National Association of Geoscience Teachers
Tennessee Academy of Sciences
Council on Undergraduate Research

University
2017-Reviewed UTC Ruth Holmberg grants.
2017-Emergency contact for the UTC Clarence Jones Observatory
2016-Member of search committee for Physical Geography Assistant Professor.
2016-present-Mentor to new Physical Geography Assistant Professor.
2015-2017-Member of College of Arts and Sciences Strategic Planning Committee
2015-Member of search committee for Physical Geography Lecturer.
2014-2015—Classroom Technology Committee
2014-2015—UTC Faculty Research Committee
2014-2015-Member of UPRAC Technology Budget Committee
2013-2014-UTC Bachelor of Integrated Studies Committee
2013-2014-UTC Scholarship Committee
2011-present—Member of Graduate Faculty
2011-2012 UTC Faculty Development Grant Committee
2011-2012 UTC Classroom Technology Committee

Department
2015-2016-BGE Chair of Student Awards and Relations Committee
2015-2016-BGE Hiring and Planning Committee

2015- Chair of Environmental Geoscientist Assistant Professor Search
2014-present-Advisor of UTC Student Chapter of the American Institute of Professional Geologists
2011-present- Advisor of UTC Geology Club

Community
2016-Visiting scientist for 2 afternoons at Creative Discovery Museum.
2016-Gave talk to Chattanooga Geology club about depressions atop Cumberland Plateau.
2015-Answed questions as 'expert in my field' for Ivy Academy 5th graders.
2015-Gave talk to Chattanooga Geology club about gravel dissolution in Mormon Mesa soils.
2015-Identified fossils for Ruby Falls.
2014-Channel 9 television interview about landslides.
2014-Gave talk to Chattanooga Geology club about LaPopa, Mexico work.
2013-Interview for Channel 3 on sinkholes.
2012-Gave workshop for Girl Scout STEM event on campus.
2012-Gave talk to Chattanooga Geology club about petrocalcic soils.
2011-Led hike and gave talk about local geology to Friends of Cumberland Trail Hiketoberfest event.
2011-WRBC Channel 3 television interview on the Japan earthquake and tsunami.
2011-David Karnes' radio show interview on the Japan earthquake and tsunami.
2011- Channel 9 phone interview about potential sinkhole in Cleveland, TN.
2011- Blue Cross Blue Shield intranet interview about geology of Chickamauga Creek Gorge.

Press regarding your work
2016 UNLV College of Sciences Alumna of the Year

Habte Giogis Churnet

Scholarly Activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
None

Submitted or in preparation
Lecture notes on: Introduction to Oceanography with emphasis on climate change
Lecture notes on: Geology of Tennessee

Grants
Internal
Summer 2016. Develop online course of Oceanography: $ 2000
Spring 2016. From department: To present research at GSA, Richmond: $750
Summer 2015. From the dean to collect rocks from California: $1500

Invited Research Seminars
Churnet, HG. Structures of the Blue Ridge. University of Tennessee Biology seminar.

Invited Educational Presentations
2016. Structures at Green Gap, Whiteoak Mountain, Tennessee. Chattanooga Geology Club
2014. Structures at the Wildwood, Georgia, Chattanooga Geology Club

Conference Presentations
Jonathan C. Stanfield and Habte G. Churnet. 2016. Characterization of the Silurian Rockwood Formation Ironstone at Lauderback Ridge, South East Tennessee. Tennessee Academy of science.

Mies..J.W., Brock-Hon. A.L, Churnet, H.G., Holmes A.E and Williams W.K. 2016. The curriculum benefits of a seismometer in UTC's Geology Program. *Geol. Soc. Am. Abs. with Prog.* To be presented in the March-April meeting in Columbia, South Carolina.

Churnet, H. G., 2015, The Lauderback Ridge fault bend fold at Green Gap, Whiteoak Mountain, Tennessee, *Geol. Soc. Am. Abs. with Prog.* v. 47, n. 2, p. 34.

Churnet, H. G., 2015, Implications of the variation in lithology of the Wilhite Formation exposed along roads by three rivers in the Southern Tennessee Blue Ridge. *Geol. Soc. Am. Abs. with with Prog.* v. 47, n. 2, p. 21.

Churnet, H.G,, 2014, Ramp folds in the Valley and Ridge: an example from the Wildwood exit of I-24 southbound lane, Georgia, Tennessee Academy of science, P.

Mies, J. W., Holmes, A. E., and Churnet, H. G., 2014, The Costa Rican field experience at UTC: 20 years in the making. *Geol. Soc. Am. Abs. with Prog.* v. 46, n. 6, p. 47.

Churnet, H.G., 2013. The Cretaceous Cayo Formation at Puerto Cayo, Western Ecuador. GSA, abstract N0 195-9, V. 45, No 7.

Steven, A. J. and Churnet, HG., 2013. The nature of the contact between the Dean and the Wilhite formations at milepost 26.5 along US Highway #64, Ocoee Gorge, Southeast Tennessee Blue Ridge, Annual Meeting: Tennessee Academy of Science, Program, Nov. 15, P.13

Petsch, J. A. and Churnet, HG., 2013. Structures within the Walden Creek Group proximal to the confluence of the Hiwassee River and Wolf Creek, Polk County, Tennessee, Southeast Tennessee Blue Ridge, Annual Meeting: Tennessee Academy of Science, Program, Nov. 15, P.13

Professional, University, Departmental and Community Service

Professional
Chair of the Geology & Geography at the Tennessee Academy conference; 2014-2015

Departmental
Department Head of Physics, Geology, and Astronomy: 1991- 2015

Department of Biology Geology and Environmental Science
Member of Bylaws committee
Member of Equipment committee
Co-Chair of Rank and Tenure committee: 2016
Member of RTR committee

University
Senator of the UTC Senate committee 2015-2016

Ann E. Holmes

Faculty development
Attend and present at meetings of Geological Society of America – national and regional

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Holmes, A.E., ed., 2015, Diverse Excursions in the Southeast: Paleozoic to Present, GSA Field Guide 39, Geological Society of America, Denver, CO, ISBN 978-0-8137-0039-7, 266p.

Grants
External
NSF/NAGT Review Camp, Denver CO October 26, 2013

Internal
Faculty Development Grant Proposal, 2017, $1500, *requested*
CAS Travel Fund request, 2017, $500 *funded*
Faculty Development Grant, 2016, $1500 *funded*
UTC Think Achieve Grant, 2014, $1370 *funded*
2013 UTC faculty development grant for SE GSA meeting Puerto Rico

Invited Educational Presentations

Conference Presentations
Brock, Jonathan, and Holmes, Ann E., 2017, Evidence for a reinstatement of the Dixon Hill Member to the Grotto Beach Formation, San Salvador, Bahamas, GSA Abstracts with Programs, Seattle, WA, TBD.

Firat, Connor B., and Holmes, Ann E., 2017, Silurian-Devonian boundary location narrowed at Mustoe, VA outcrop on the basis of stromatoporoid genera, species, SE GSA Abstracts with Programs, Richmond, VA, 49 (3), doi: 10.1130/abs/2017SE-291376.

Holmes, Ann E. and Dawn M. Ford, 2016, Effects of Hurricane Joaquin on the sediment, biota, and water chemistry of interior ponds of San Salvador, Bahamas, GSA Abstracts with Programs, Denver, CO, 48 (7), doi: 10.1130/abs/2016AM-278908.

Brock, Jonathan and Holmes, Ann E., 2016, Preliminary petrographic and cathodoluminescence study of San Salvador, Bahamas stratigraphy, GSA Abstracts with Programs, Denver, CO, 48 (7), doi: 10.1130/abs/2016AM-285094

Wood, Chad M., and Holmes, Ann E., 2015, Comparative sedimentological and geomorphic analysis of Santa Rosa Island, Florida – pre-major hurricane impacts of 2004-2005 and post-decadal recovery, SE GSA Abstracts with Programs, Chattanooga, TN p. 89.

Denley, T, Lewis, C., Stevens, A., Wood, C., and Holmes, A., 2015, Connecting Manhead Cay Stratigraphy to existing San Salvador late Cenozoic stratigraphic framework in the Bahamas, SE GSA Chattanooga, TN, Abstracts with Programs, vol. 47, n. 2, p. 29.

Denley, T, Lewis, C., Stevens, A., Wood, C., and Holmes, A., 2014, Connecting Manhead Cay Stratigraphy to existing San Salvador late Cenozoic stratigraphic framework in the Bahamas. Journal of TN Academy of Science, v. 90, n. 1-2, p. 21.

Holmes, A.E., and Ford, D.M., 2014, International Undergraduate Experiential Learning and critical thinking through two linked upper-level cross-disciplinary courses, Vancouver, B.C., Canada, GSA Abstracts with Program. v. 46, no. 6, p. 47.

Johns, T.C., Skipworth, K., Ford, D.M., Holmes, A., and Brock, J., 2014, Recovery monitoring of sea urchins on San Salvador Island, Bahamas, Journal of TN Academy of Science, v. 90, n. 1-2, p. 22-23.

Mies, J.W., Holmes, A.E., and Churnet, H.G., 2014, The Costa Rican Field Experience at UTC: 20 years in the making, Vancouver, B.C., Canada, GSA Abstracts with Program. v. 46, no. 6, p. 47.

Brown, A.R., and Holmes, A.E., 2014, Petrographic analysis of Silurian Rockwood strata near Chattanooga, TN, SE GSA Abstracts with Programs, Blacksburg, VA p. 80.

Abernathy, J., Donley, C., Salinas, C., Welborn, R., Holmes, A., and Ford, D., 2013, A comparison of algal and coral species diversity and fish species richness of natural and artificial reefs in northern San Salvador, Bahamas, *TN Academy of Science* meeting poster, Motlow State community College, Lynchburg, TN

Brown, A.R., and Holmes, A.E., 2013, Correlation of Lithofacies and Depositional Environments in Silurian Rockwood Formation Outcrops near Chattanooga, TN, *SE GSA Abstracts with Programs,* San Juan, Puerto Rico, 45 (2), p. 10.

Holmes, A.E. and E. Noseworthy, 2012, Developing Online Physical Geology Lecture and Laboratory – Best Practices, *GSA Abstracts with Programs*, Charlotte, NC, 44 (7), p. 148-149

Supervised research for:
Robey, N., 2015, Using Paleontology and Stratigraphy to Determine the Age of an NW Georgia Outcrop, SE GSA Chattanooga, TN, Abstracts with Programs, vol. 47, n. 2, p. 73.

Krikorian, S., 2015, Subsurface Correlation of Devonian-Mississippian Strata Located in the Middlesboro Syncline, Southeastern Kentucky, SE GSA Chattanooga, TN, Abstracts with Programs, vol. 47, n. 2, p. 73.

Professional, University, Departmental and Community Service

Professional
Helped organize the regional meeting of southeast GSA meeting held in Chattanooga, TN in 2015.
Edited the field guide publication for the regional meeting of southeast GSA meeting held in Chattanooga, TN in 2015.
Member of AAAS
Member of GSA

University
Serve on committees

Department
Serve on committees and schedule for geology courses
Help organize field experience courses with Dr. Jonathan Mies

Community
TEST (TN Earth Science Teachers) advisory board member
Fossil and rock queries from the general public

<u>A.K.M. Azad Hossain</u>

Faculty development
Attended the annual conference of the American Society of Photogrammetry and Remote Sensing, the Imaging & Geospatial Technology Forum (IGTF) 2017 held in Baltimore, MD, on March 12–16, 2016.

Presented my paper, "Exploring the Potential of Remote Sensing Techniques for Quantitative Estimation of Mercury Concentration in Inland Surface Water Bodies".

Attended several presentations on different environmental applications of remote sensing and GIS involving new cutting-edge technologies and research methods.

Attended a two-hour long workshop, "Photogrammetry on the Cloud; Challenges and Opportunities".

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Accepted or published
Chao, X., Jia, Y. and Hossain, A., 2016, Numerical Modeling of Sediment Transport and Its Effect on Algal Biomass Distribution in Lake Pontchartrain Due to Flood Release from Bonnet Carré Spillway, *Journal of Geoscience and Environment Protection* 4(9), pp 64-79.

Submitted or in preparation

Hall, J. and Hossain, A., Mapping Urbanization in Hamilton County, TN for Environmental Sustainability Studies Using GIS and Remote Sensing (in preparation).

Grants

External

Downscaled gridded GRACE data for predicting groundwater storage: A proof of concept using satellite- and ground-based hydro-gravity data for the Mississippi River Valley alluvial aquifer. Agency: NASA. Program: ROSES 2017. Proposed duration: 07/01/2018 - 06/30/2021. Principal Investigator: Andrew O'Reilly (University of Mississippi). Role: Co-I and UTC Principal Investigator. Total award amount (UTC): $ 46,170. Status: Pending.

ICompBio - Engaging Undergraduates in Interdisciplinary Computing for Biological Research. Agency: NSF. Proposed duration: 04/01/2018 - 03/30/2021. Principal Investigator: Hong Qin. Role: Senior Personnel. Total award amount: $ 359,484. Status: Pending.

Internal

Spring 2017 Faculty Grant Proposal. The University of Tennessee at Chattanooga. Research presentation at the annual conference of the American Society of Photogrammetry and Remote Sensing (ASPRS), the Imaging & Geospatial Technology Forum (IGTF) 2017. *Funded amount: $1500.*

Invited Research Seminars

Estimation of suspended sediment associated mercury concentration in Enid Lake, MS, using the Moderate-Resolution Imaging Spectroradiometer (MODIS) imagery and in situ measurements. Department of Biology, Geology, and Environmental Science Seminar Class. The University of Tennessee at Chattanooga, November 11, 2016.

Conference Presentations

Hossain, A., Chao, X., Cizdziel, J., Jia, Y., and Altinakar, A., 2017, Exploring the Potential of Remote Sensing Techniques for Quantitative Estimation of Mercury Concentration in Inland Surface Water Bodies, ASPRS Annual Conference 2017 - Imaging & Geospatial Technology Forum (IGTF), March 12-16, 2017. Baltimore, MD.

Bell, J.*, Hossain, A., and Easson, G., 2017, Evaluating the impacts of the Land Use Land Cover Change in the Coastal Watersheds of Mississippi using Remote Sensing Technology, ASPRS Annual Conference 2017- Imaging & Geospatial Technology Forum (IGTF), March 12-16, 2017. Baltimore, MD. *[This work was presented by my former student Jarett Bell at the University of Mississippi].*

Hossain, A., Chao, X., Cizdziel, J., Jia, Y., and Altinakar, A., 2017, Quantitative Estimation of Mercury in Surface Water Using Remote Sensing, 2nd Annual UTC'S Research Dialogue, April 11-12, 2017. The University of Tennessee at Chattanooga.

Hall, J.* and Hossain, A., 2017, Application of remote sensing and GIS to study the impact of urbanization on surface water quality in Hamilton County TN, 2nd Annual UTC Research Dialogue, April 11-12, 2017. The University of Tennessee at Chattanooga.

Prahl, J.* and Hossain, A., 2017, Mapping and Characterizing Flooding Events in the Greater Chattanooga Area using GIS and Remote Sensing, 2nd Annual UTC'S Research Dialogue, April 11-12, 2017. The University of Tennessee at Chattanooga.

Professional, University, Departmental and Community Service

Professional
Journal Reviewer: *Sustainability*, *Natural Hazard*, *Scientific Report*, and *Sensor*.

Conference Moderator: Served as a moderator at the American Society of Photogrammetry and Remote Sensing (ASPRS 2017) annual conference (IGTF 2017) held in Baltimore, MD, on April 12-16, 2017.

University
University Committee: Undergraduate Curriculum (Fall 2017 – Present)

Helped the Department of Human Resources to create a video "Why I Chose to Work at UTC" by taking personal interview and videos of my class room teaching. The video was created to enhance and promote new faculty recruitment process.

Taking the initiative to form a campus-wide GIS User Group involving faculty, researchers, and students.

Department
Bylaws Committee (Fall 2016-present)
Graduate Committee (Fall 2016-present)
Curriculum and Planning Committee (Fall 2017-present)
Departmental Program Review Committee; sub-sections: Undergraduate and Graduate Learning Resources (2017-2018):

Community
I am planning and taking necessary initiatives to: (1) organize workshops for the K-12 administrators and instructors in Hamilton County, TN to demonstrate how GIS technology can be used for efficient learning in STEM. (2) organize GIS summer camps for the K-12 students in Hamilton County, TN.

I am also exploring for other opportunities to serve UTC community providing my academic training and research expertise.

Jonathan W. Mies

Faculty development

2017, Co-chair of technical session, T101. Better Together: Partnerships That Facilitate or Enhance Experiential Learning in Undergraduate Geoscience Education, at the GSA Annual Meeting and Exhibition, Seattle, WA, October 24, 2017 (planned)
Professional meetings attended:
Annual Meeting of the Southeast Section of the Geological Society of America, Ashville, NC, March 31-April 1, 2012.
Annual Meeting of the Southeast Section of the Geological Society of America, San Juan, Puerto Rico, March 20-21, 2013.
GSA Section Seminar, Geological Society of America, Boulder, Colorado, June 2-4, 2013.
Annual Meeting of the Southeast Section of the Geological Society of America, Blacksburg, VA, March 10-11, 2014.
Annual National Meeting of the Geological Society of America, Vancouver, British Columbia, Canada, October 19-22, 2014.
Annual Meeting of the Southeast Section of the Geological Society of America, Chattanooga, TN, March 19-20, 2015.
Annual Meeting of the Southeast Section of the Geological Society of America, Columbia, SC, March 31-April 1, 2016.
Annual Meeting of the Southeast Section of the Geological Society of America, Richmond, VA, March 30-31, 2017.
Annual National Meeting of the Geological Society of America, Seattle, WA, October 12-25, 2017 (planned).
Extraordinary curriculum, curriculum development, and related field trips:
Led field trip to the desert southwest (Colorado Plateau, Basin and Range, AZ, CA, NV, UT), GEOL 4960r, April 30 - May 10, 2012.
Led field trip to Costa Rica (active convergent margin, volcanoes, basins, etc.), GEOL 4960r, May 1 - May 10, 2013.
Led field trip to the desert southwest (Colorado Plateau, Basin and Range, AZ, CA, NV, UT), GEOL 4960r, April 29 - May 9, 2014.
Led field trip to Costa Rica (active convergent margin, volcanoes, basins, etc.), GEOL 4960r, May 1 - May 10, 2015.

Developed a course on the geology of the Pyrenees in northern Spain, the Principality of Andorra, and southern France, jointly with Miriam Barquero-Molina at the University of Missouri. This course was taught Spring 2016 via live video stream between Mizzou and UTC (Fletcher 212) and culminated with a field trip to the Pyrenees, July 18-August 3, 2016.

Scholarly activity

Grants (and contracts)
External
2011, Chattem Chemicals, Inc., Distinction of Pharmaceutical Polymers using Powder X-ray Diffraction, $1,984
2012, Chattem Chemicals, Inc., Distinction of Pharmaceutical Polymers using Powder X-ray Diffraction, $2,500
2015, Chattem Chemicals, Inc., Distinction of Pharmaceutical Polymers using Powder X-ray Diffraction, $1,608

2015, Chattem Chemicals, Inc., Distinction of Pharmaceutical Polymers using Powder X-ray Diffraction, $2,085

Internal
2014, Research and Creative Activity Grant, UTC College of Arts and Sciences, Funds to attend 2014 GSA meeting, Vancouver, BC, Canada, $463

Conference Presentations
Howard, C. W. (student), Mies, J. W., Bodkin, T. E., and Brackett, D. G., 2011, Bentonite-Controlled Deformation of Middle Ordovician Limestone at Chickamauga Dam, Chattanooga, Tennessee. Geol. Soc. Am. Abs. with Prog. v. 43, n. 5, p. 99. Presented October 10, 2011, Minneapolis, MN.

Mies, Jonathan W., Holmes, Ann E., and Churnet, Habte G., 2014, The Costa Rican Field Experience at UTC: 20 Years in the Making, Geological Society of America Abstracts with Programs, v. 46, n. 6., p. 47. Presented October 19, 2014, Vancouver, BC, Canada.

Mies, Jonathan W., Brock-Hon, Amy L., Churnet, Habte G., Holmes, Ann E., and Williams, Wayne K., 2016, The Curricular Benefits of a Seismometer in UTC's Geology Program, Geological Society of America Abstracts with Programs, v. 48, n. 3. Presented April 1, 2016, Columbia, SC.

Mies, Jonathan W., 2017, Hurricane Matthew's Microseismic Impression on Chattanooga, Geological Society of America Abstracts with Programs, v. 49, n. 3. Presented March 31, 2017, Richmond, VA.

Professional, University, Departmental and Community Service

Professional
Geological Society of America (GSA)
2011-2016, Chair of the Southeastern-Section Student Support Committee, GSA
2011-present, Member of the Management Board for the Southeastern Section, GSA.
2015, Chair for the 2015 (64th) Annual Meeting of the Southeast Section, GSA, Chattanooga, TN, March 19-20, 2015, local committee established Fall 2012
2017, Co-chair of technical session, T101. Better Together: Partnerships That Facilitate or Enhance Experiential Learning in Undergraduate Geoscience Education, at the GSA Annual Meeting and Exhibition, Seattle, WA, October 24, 2017 (planned)
2017, Chair of the Southeastern Section, GSA

University
University committees
2009-2013, Distance Learning Council/UTC Online Advisory Group
2013, Review panelist for Provost Student Research proposals
2013-2014, Classroom Technology Committee
2014-2015, College of Arts and Sciences, Curriculum Mapping Team
2015-2017, UTC STEM Education Advisory Board

2015-2017, Sustainability Committee
2015-present, College of Arts and Sciences, Wheeler Odor Research Advisory Board
2017-present, Ad Hoc Committee List

Graduate student committees
2011-2013, Jessica Hubbuch, M.S. Environmental Science
2014-2015, Amelia Atwell, M.S. Environmental Science
2014-2016, Nikki Carpenter, M.S. Environmental Science

DHON student committees
2015-2016, Katherine Adorati, Chemistry DHON student
2015-2016, Jackson Stone, Computer Science DHON student

Department
2015-2016, Co-chair, with Margaret Kovach, of the Departmental RTR Committee
2015-2017, Departmental Assessment & Retention Committee
2015-2017, Departmental Curriculum Planning Committee

Community
2011, Presentation: The Story of Bentonite at Chickamauga Lake, from Volcanic Eruption to Valley-and-Ridge Deformation, Chattanooga Geology Club and general public, Chattanooga, TN, May 3, 2011

2012, Presentation: Earthquakes and Volcanoes of the Chattanooga area, Skeptics in the Pub (SitP), Jefferson's Restaurant, Chattanooga, May 16, 2012

Interviewed by Bill Erfurth, retired from the Miami-Dade Police Department (Miami, FL), as part of episode #5 (The Daredevil) of the TV series, The Great American Manhunt. Initially aired May 31, 2012, on the National Geographic Channel. Interpreted the significance of carnotite (potassium uranium vanadate mineral, "uranium ore") on target's clothing and that of outcrops visible in a surveillance photo as consistent with a setting on the Colorado Plateau, particularly the area of Moab, Utah. Interview filmed July 7, 2011, at Signal Point.

Presentation: Bentonite and Ordovician Volcanoes of the Chattanooga/Dalton Area, Dalton Science Café, Tunnel Hill, GA, November 3, 2012

Presentation: Earthquakes and Seismology in the Chattanooga Area, Thrasher Elementary School, 5th grade STEM classroom, December 19, 2012

2013, Presentation: Earthquakes and Seismology in the Chattanooga Area
Lookout Mountain Elementary School, 5th grade science (D'Arcy Hughes, LME Science Teacher), February 8, 2013

Interviewed by Nick Austin, WRCB-TV, Chattanooga, TN, (Ch. 3), December 12, 2013, Could a big earthquake strike the Tennessee Valley, aired 12/12/13
www.wrcbtv.com/story/24208189/could-a-big-earthquake-strike-the-tennessee-valley

Presentation: Earthquakes and Seismology in the Chattanooga Area, Thrasher Elementary School, 5th grade STEM classroom, October 31, 2013

2014, Presentation: Earthquakes and Seismology in the Chattanooga Area, Chattanooga Geology Club, April 1, 2014

Presentation: On the Importance of Education, Webelo Cubscouts (3rd and 4th grade students), April 21, 2014

2015, Presentation: The Geology of Costa Rica as it Relates to UTC's Geology Field Experience, Chattanooga Geology Club, March 3, 2015

Presentation: Unearthing the Geology of Chattanooga—The Story of Ordovician Volcanoes and the Sequatchie Valley, Alexian Village, Signal Mountain, TN, April 28, 2015

2016, Interviewed by Nick Austin, WRCB-TV, Chattanooga, TN, (Ch. 3), February 18, 2016, Recent earthquakes shake up conversation, aired 02/18/16 as part of 5pm news broadcast, http://www.wrcbtv.com/story/31258805/recent-earthquakes-shake-up-conversation

Presentation: The Geology of Spain, Chattanooga Geology Club, Chattanooga, TN, February 2, 2016

Wayne K. Williams

Faculty development
47 hours of training classes over a variety of subjects provided by UTC

Scholarly Activity

Invited Educational Presentations
Williams, Wayne K. 2017. “Evidence of an Ancient Meteorite Impact, Sudbury, Canada” presented to the Chattanooga Geology Club.
Williams, Wayne K. 2016. “Cruise Ship Geology” presented to the Chattanooga Geology Club.

Professional, University, Departmental and Community Service

Department
2016-2017 Ad-hoc committee for Learning Resources

Community
2012-2017 Field Trip Coordinator for the Chattanooga Geology Club

Appendix AA. BGE Equipment

Current departmental equipment that had an initial cost of at least $1,500 and the approximate date of acquisition of each item. Items less than five years old are bolded.

Item	Date
MICROSCOPE NIKON SKE	9/1/75
SINGLE CHANNEL SEISMOGRAPH (BY10) (CABINET)	6/1/79
MICROSTAR IV	5/1/87
HISTOSTAT CRYOSTAT 220V 50HZ	5/1/89
SAMDRI-790 SEMIAUTO CRITICAL POINT DRYER W/ACCS	1/1/90
HACH DREL/2000 WATER TESTING KIT	6/1/93
LEICO WILD MZ-8 STEROMICROSCOPE W/ATTACHMENTS	1/1/95
STEROMICROSCOPE W/ATTACHMENTS (DR GAUDIA)	3/1/95
LIQUID SCINTILLATION COUNTER SYSTEM 1409-012	1/1/95
CNS 2000 W/LOADER	1/1/95
LEICA LEITZ LABORLUX II POL S MICROSCOPE	9/1/96
GPS /BEACON PROXR CBS FOR EDUCATORS	5/1/97
LEICA GZ6 STEREO MICROSCOPE W/TRANSMITTED LIGHT (D	2/1/98
LEICA DM LSP POLARIZING MICROSCOPE (BY8)	6/1/98
LEICA DM LSP POLARIZING MICROSCOPE (BY8)	6/1/98
Trinocular HC Photo/Video/Observation Tube	4/19/04
LABCONVO FREEZER DRY W/SHELL & PURG 6L	4/1/99
NIKON ECLIPSE E600 ADVANCED RESEARCH MICROSCOPE	3/1/99
WATER 2690 ALLIANCE SYSTEMS	8/1/99
M32 COMPUTER SINGLE SYSTEM 350MHZ W98	8/1/99
996 PHOTODIODE ARRAY DETECTOR	8/1/99
POWER MAC G4	9/1/00
POWER MAC G4	9/1/00
HP LASERJET 4050N PRINTER	1/1/01
Dell Dimension 8100 Series w/Monitor & KB	7/27/01
Ashcroft Aerobic Type A Chamber, Automatic Airlock	5/2/01
Dell Inspiron 8100 Multimedia Mobile Desktop Comp.	7/1/02
867MHz PowerPC G4	10/4/01
Dell Latitude C840 Computer	6/20/02
PowerGen Model 125	7/29/02
Multi Probe System Instrument	6/30/02
Transillum, Variable Intensity 8" x 16"	6/14/02
Power Supply 4000V 110V	6/21/02
Lab Refrigerator (49 cu. ft) - Bell	3/14/02
Dell part # 392420, Epson Projector - Powerlite 51	6/20/02
HP Designjet 800ps printer	2/6/02
Fluorescence Microscope and Digital Imaging System	7/29/02
Dell GX260 Computer	9/20/02
Dell Latitude C640 Laptops	10/7/02

Dell Latitude C640 Laptops	10/7/02
Dell Latitude C640 Laptops	10/7/02
Synergy ABS/FLR w/inc. Reader & KC-4 Software	10/1/02
OptiPlex GX260 Small Desktop Computer	10/7/02
Sony VPL-CS5 LCD Projector SVGA 1800 Lumens 5.8	11/27/02
Fisher Isotemp Co2 and Three-Gas Incubators	9/13/02
Biological Safety Cabinet - Class II Type A/B3	8/8/02
Graphtec CS-1000 Large Format Scanner	5/8/03
PTC-150 MiniCycler with Hot Bonnet Heated Lid	6/10/03
OptiPlex GX270 Small MiniTower	10/8/03
OptiPlex GX270 Small MiniTower	10/8/03
Hitachi FM Bio III Multi-View Laser-based Imaging	10/15/03
D800 Dell Computer	4/20/04
Trinocular Photo/Observation Tube	4/19/04
Digital Firewire Camera and SW Kit	4/19/04
Balance - Mettler Toledo AG Series Standard Level	6/25/02
PERCIIVAL INCUBATOR	4/20/04
Compound Microscope Package #1	6/22/04
compound microscope package #1	6/22/04
compound microscope package #1	6/22/04
compound microscope package #1	6/22/04
compound microscope package #1	6/22/04
Vertical Pipette Puller	11/17/04
Trimble Geo XT w/o software	3/30/04
GeoXT Standalone System	1/6/05
Multi Probe System w/Barometer	6/14/04
Zoom stereomicroscope ACCU-SCOPE	7/16/04
Mircopublisher, 3.3 MP CCD, 10 Bit Real Time View	1/19/05
Eppendrolf Centrifuge 5415-D	10/6/05
Fotoanalyst/Apprentice System	10/6/05
Eppendorf Mastercycler EP Gradient S	10/6/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
PowerBook 15" 1.67GHz SuperDrive	11/11/05
CIRAS-2 Portable Photosynthesis System	11/8/05
Table Top Zebrafish Rack	11/8/05
Centrifuge - "Brushless" RC-5C Plus Microcomputer	12/2/05
Centrifuge w/Free Rotor and Tubes	9/13/05
SS-34 Superspeed Fixed-Angle Rotor	11/22/05
SLA-1500 Super-Lite Rotor	11/14/05
Power Supply 4000V 110 V	10/28/05

High Speed Micro Centrifuge	11/22/05
High Speed Micro Centrifuge	11/22/05
High Speed Micro Centrifuge	11/22/05
High Speed Micro Centrifuge	11/22/05
Incubated shaker with universal platform	12/12/05
Plant Water Studus Console, compact model	12/5/05
Centrivap DNA Concentrator 115	1/19/06
Stereozoom Seapo Trans Light (Microscope)	11/16/05
Foto/Convertible Dual It Trans	11/9/05
Thermo Hybaid PX2 Thermal Cycler Chassis	11/9/05
Model 400 Benchtop Centrifuge	10/6/05
EPPENDORF Instruments Centrifuge, model # 5415D	10/6/05
WESCOR Dew Point Microvoltmeter	12/2/05
Shimadzu Scientific Bio-Mini UV Spectrophotometer	10/27/05
Quattro Micro System	12/2/05
EPPENDORF Mastercycler	1/9/06
Leica L5 FL (GFP) Stereozoom	2/22/06
Fotodyne FOTO/Analyst Apprentice System	10/18/05
24.4 cubic feet, -86 C freezer	4/11/06
Bio-Mini Promo, UV/visible spectrophotometer	4/11/06
BTX 630 Electroporation System	4/7/06
Wolfvision Portable Visualizer - Presenter	3/1/06
Inspiron 710m Pentium Laptop computer	4/11/06
Leica Binocular Microscope	5/3/06
Leica Binocular Microscope	5/3/06
Leica Binocular Microscope	5/3/06
Leica Binocular Microscope	5/3/06
Savant Speed-Vac Concentration System	5/16/06
ISO TEMP FISHER Gen Purpose Lab Freezer	9/29/06
Herbarium Case	12/13/06
Herbarium Case	12/13/06
Mokai Watercraft	2/8/07
Unispense Dispenser	12/7/06
X-RAY DIFFRACTOMETER	3/10/00
Visual Presenter	6/21/06
CoolSnapCF Dig Color Camera	3/28/06
Sliding Door Refrigerator (38 cubic feet)	3/29/06
C25 Incubator/Shaker with Universal Platform	7/31/06
Dell Optiplex GX620 Minitower Computer	8/22/06
Buehler Thin Sectioning System	6/28/06
MJ Mini Cycler, 48-Well	10/10/06
Thermo Bath Shaking Medium 120V	1/11/07
Spoting Scope: Straight Armor	7/14/06
Optiplex 745 Minitowers	8/1/07
Optiplex 745 Minitowers	8/1/07
Optiplex 745 Minitowers	8/1/07

Optiplex 745 Minitowers	8/1/07
Dell Latitute D620 laptops	6/25/07
Leica DME Transmitted POL Binocular Microscope	6/28/07
DR2800 SPECTRO W/ATTACHMENTS	7/1/08
iMac, 24-inch, Intel Core 2 Duo	5/23/08
Eppendorf Mastercycler Thermal Cycler, Gradient	11/19/07
Olympus SZX10 Stereo Microscope	2/1/08
Imaging System, Photodoc-it 50	10/31/07
BioLogic LP System with BioFrac Fraction Collector	3/20/08
Cell Disruption Bomb from Parr Inst	5/21/08
Eppendorf Mastercycler Gradient	11/19/07
Eppendorf Centrifuge (Model 5424)	11/8/07
Humminbird 997 SICombo (depth finder)	5/19/07
Revco Ultra low freezer (24.4 cu. ft - upright	6/30/07
iMac, 24-inch, Intel Core 2 Duo	9/22/08
IMac, 24-inch, Intel Core 2 Duo	3/6/09
Dell Latitude D630 and accessories	8/21/08
professional Laser Tech Laser Rangefinder with	9/4/08
Dell Optiplex 755	11/11/08
Advanced Co2 Analysis Package (with Flow Meter)	9/22/08
Revolution (TM) 4200 Microarray Scanning System	11/24/08
iQ5 RealTime PCR System BIO RAD	11/18/08
Freezer - Thermo Sci Revco Ultima plus Upright	9/5/08
LI-6400XTR Fluorescence &Gas Exchange System Pkg	12/17/08
Leica DM EP Polarizing Microscope	5/19/09
VZ-8 Light Document Camera	8/13/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
iMac, 24-inch, Intel Core 2 Duo	8/26/09
MacBook Pro, 17", aluminum, 2.8 GHz	9/22/09
Nanodrop 2000C w/cuvette	6/23/09
Latitude E6500 Laptop	1/14/10
Macbook 15"	3/4/10
Confocal Microscope	2/9/10
OPLYMUS BX61 Electron Microscope	4/5/10
MacBook 15"	7/30/10
Dell Latitude E6510 Base System	4/28/11
Leica DM 750 P Polarizing Microscope	10/21/10
Leica DM 750 P Polarizing Microscope	10/21/10
Leica DM 750 P Polarizing Microscope	10/21/10
MacBook Pro 15" w/dual adapters	1/21/11
27" iMac, 3.06GHz Intel Core 2 Duo w/AppleCare	8/12/10

MacBook Pro i5	3/3/11
MacBook Pro, 13-inch	10/1/10
iMac 27"	1/28/11
iMac 27"	1/28/11
Macbook Pro 15"	1/28/11
MacBook Pro w/AppleCare Protection Plan	6/7/11
iMac 27-inch Quad-Core Z0M7	8/1/11
Apple MacBook Pro	9/19/11
iMac Apple 27" w/3yr extended warranty	9/19/11
Latitude E4200 Computer	8/20/10
27 iMac for L. Hayes	1/9/12
Dell E6520 LAPTOP	1/17/12
MacBook Pro 15"	2/6/12
MacBook Pro 15-inch for Dr. Joey Shaw	**2/12/15**
Leica MC170 HD Camera	**6/11/15**
Leica S8 APO Stereozoom	**8/5/15**
Meiji Techno Trinocular Polarizing Microscope	**9/14/15**
Meiji Techno Trinocular Polarizing Microscope	**9/14/15**
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
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Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Scientific Laboratory Steam Sterilizer	6/21/10
Working Jon Boat (heavy duty; all welded)	6/4/07

Steam Sterilizer	3/18/10
Combination nucleic acid workstation	1/6/11
Combination nucleic acid workstation	9/22/09
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
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Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
iWorx KIt	6/22/09
MacBook 13-inch (Black), 2.4gHz Intel Core 2 Duo	9/4/08
Stereo Microscope (Olympus SZ-6145TR)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
Compound Micrscope (Olympus CX31)	6/20/11
54-Well HotBlock and AirLite HEPA Enclosure	2/13/08
Soil CO2 Flux Chamber	8/16/10
Canon camera (digital camera w/field kit)	3/6/08
Stereomicroscope (Olympus SZ61)	3/3/10
Velocity Meter	4/18/08
iMAC 27" Quad-Core	3/22/12
Leica DM 750 P Polarizing Microscope	6/22/11
Leica DM 750 P Polarizing Microscope	6/22/11
Leica DM 750 P Polarizing Microscope	6/22/11
centrifuge - Allegra X-22	2/18/11
rotor assembly w/4 buckets SX-4250 (INSIDE 617078)	2/18/11
Millipore Water Purification System	12/14/11
Leica DM 750 P Polarizing Microscope	6/22/11

seismometer	1/21/11
Single Lane Mouse Treadmill Item 760304	3/2/12
iMac 27" 3.2Hz Quad Core	**3/20/13**
iMac 27" w/Apple Care & Apple Thunderbolt	**4/5/13**
iMac 27" w/Apple Care App	**7/16/13**
iMac 27" w/Applecare Protection & Apple USB Supdrv	**7/31/13**
Apple MacBook Pro 15" w/AplCare Protect, 85W Adapt	**9/23/13**
Dell All in one 9010 Optiplex	**10/15/13**
Mastercycler Nexus Gradient (D-5000-3)	**1/27/14**
25 cu ft U700 Premium Freezer (F-4111-25R)	**1/21/14**
Dell Latitude E6530 w/ Dock Setup For Mark Schorr	**12/9/13**
MacBook Pro 13-in with Retina Display	**2/17/14**
13-inch MacBook Air	**5/5/14**
Cannon EOS 5D Mark III Digital Camera Body Kit	**5/27/15**
Challenger Receiver with nylon case R2000	**5/21/14**
Challenger Receiver with nylon case R2000	**5/21/14**
Challenger Receiver with comp int R4000	**5/21/14**
iMac 27 inch	**6/16/14**
iMac 27 inch	**6/16/14**
iMac 27 inch	**6/16/14**
iMac 27 inch	**6/16/14**
Percival Scientific Incubator Model I-30BLL	**8/19/14**
Percival Scientific Incubator Model I-30BLL	**8/19/14**
Macbook Air 13" w/Applecare Protection Plan	**5/7/13**
BioSafety Cabinet	**6/30/14**
MaxQ 4000Ref Digital Promo Pkg	**1/31/13**
LabConco Dishwasher	**10/1/14**
Dell XPS 15 Touch for Dr. Loren Hayes	**12/31/14**
Conviron model E7/2 Plant Growth Chambers: Boyd	**10/13/14**
Conviron model E7/2 Plant Growth Chambers: Boyd	**10/13/14**
Conviron model PGR15 Plant Growth Chambers: Boyd	**12/15/14**
Conviron model PGR15 Plant Growth Chambers: Boyd	**12/15/14**
Conviron model PGR15 Plant Growth Chambers: Boyd	**12/15/14**
Conviron model PGR15 Plant Growth Chambers: Boyd	**12/15/14**
21.5 inch iMac (Z0PE)	**3/25/15**
ThermoScientific Spectronic 200	**3/15/16**
SHEL LAB Reach-In Lab Incubator	**1/14/16**
IsoTemp WJ CO2 Incubator	**11/17/15**
Jenoptik Dig Scope Camera	**2/23/16**
BioTek Synergy H1 Microplate Reader	**3/15/16**
High Definition Video/Digital Camera	**9/14/15**
Benchtop EDXRF Spectrometer	**5/21/14**
High Definition Video/Digital Camera	**9/14/15**
15 inch MacBook Pro for (T J Gaudin)	**5/1/15**
Leica DM750P microscope	**6/20/13**
Electrofisher Combo LR-24	**10/24/16**

MSI WS72 M1000 Mobile Workstation (Laptop)	**8/30/16**
Dell Mobile Precision 7710 XCTO BAS E	**10/6/16**
iMac 27"/3.2QC/M380/CTO	**10/11/16**
27" iMac	**8/12/16**
iMac 27"	**7/27/16**
iMac 27"	**9/1/16**
27" iMac	**8/12/16**
iMac 27"	**8/5/16**
iMac 27"	**7/27/16**
YSI H2O Qual Meter: DSS-30 Meter & Handheld	**8/17/16**
SC Ultra Low Upright Freezer PV85-22	**8/31/16**
Bertin Minilys	**9/20/16**
Sharp LC-70LE661U 70" TV	**12/12/16**
Sharp LC-70LE661U 70" TV	**12/12/16**
Sharp LC-70LE661U 70" TV	**12/12/16**
SH-3000 Swinging Bucket Rotor -Rec'vd 12/30/10	3/25/11
CFX Connect RT-PCR	42780
Cambridge BioStar Inverted Scope	6/1/90
Leica 1311 100X Objective	6/1/90
Jeol Sputter Coater	
Craftsman 5200 Riding Lawn Mower	**5/13/16**
Disarticulated Human Skeleton	**1/11/17**

Appendix BB. Biology, Geology & Environmental Science Ranked Equipment Need List

Biology, Geology & Environmental Science Equipment Needs List – 2012 to 2017. Tables 1-6 below provide details of the ranked equipment for each year, the year the item was added to the list, the justification, cost, the category (described below), and the course impacted by the equipment.

Table 1.
2017 – Carry Over From 2016 (New unranked items begin with item #17)
CATEGORIES OF EQUIPMENT:
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Rank	**Item**	**Justification**	**Cost**	**Category**	**Courses impacted**
1	3 –sets of adjustable pipets	Microbiology labs, to enhance accuracy and reduce waste volume	$2,895	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
2	1 - Multiprobe water quality field kits	Modernize/improve environmental science labs	$6,000 total	I	BIOL 3070 BIOL/ESC 4520 ESC 1500L, 1510L
3	3 - Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$1,410 (3 x $470)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
4	5 - Analytical balances	Modernize/improve toxicology labs	$30,000 total (5 x $6,000)	I, II	BIOL/ESC 4380
5	UTC Hybrid 4X4 Field Consortium Vehicle	Access to remote field sites (multiple seating required)	$38,535	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
6	Electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
7	Utility building	Space to store teaching & research	$1951	II, III	Field oriented courses

		field equipment			In BIOL & ESC
8	Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
9	Total Organic Carbon Analyzer	Modernize/improve microbiology & ESC labs	$30,000	III	BIOL 4220L, 4010L, 4040L, + graduate equivalent courses
10	Electric Winch	Safety – self rescue from remote sites	$3500	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
11	Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
12	8 Apple Macbook Pro Laptops	For use in genetics labs for bioinformatics based labs	$12,000 (8 x $1,500)	I	BIOL 4200/4200L
13	Liquid Scintillation Counter	Needed to replace old, broken unit in Spratt's lab	$34,744	I, II, III	BIOL 4430, 4530, ESC 5030, 5040, 5997, 5998, 5999
14	Free-standing outdoor walk-in cooler made by Polar King	Replacement for old cool room	$13,000	I, II, III	BIOL 4050, 4090, 4110, 4141, 4150, 4750, 4995, 4998
15	Apple MacBook laptop computes	Est. of a mobile computer lab that could be checked out by BGES faculty	$38,376 (24 x $1,599)	I, II, III	Any BGE course, especially: BIOL 3250, 3260, 3350, 3060, 3070
16	Fisher Isotemp Ultra-low (-80 C), undercounter freezer	For long-term storage of our bacterial culture collection – many of these cultures should not be stored	$8,884	I, II, III	BIOL 2100, 4220, 4280, 4530, 4430, ESC 4010, 4430, 5030, 5040

		with other teaching & research materials from diff. disciplines			
17	5 Half-sized herbarium cabinets (Forestry Supply # 53980)	Growth of herbarium from 6,000 to nearly 45,000 specimens over last 10 yrs	$6,075 (5 x $1,215)	I, II, III	BIOL 4180, 4190, 4360, 4750
18	Primus Steam Sterilizer – Remanufactured unit with new, larger steam generator (a second autoclave, with steam generator large enough to run two autoclaves)	The micro teaching labs and research now needing an autoclave requires that a backup be available	$32,000	I, II, III	BIOL 2100, 4220, 4280, 4530, 4430, ESC 1510, 4010, 4430, 5030, 5040
19	Eppendorf 5424 Microcentrifuge	Microbiological labs needing to use microcentrifuges must use the Genetics equipment. Increasing number of Microbiology labs require a dedicated unit	$2,500	I, II, III	BIOL 4220, 4280, 4530, 4430, ESC 4010, 4430, 5030, 5040
20	Eppendorf I 2500 Series, Floor Model Incubating Platform shaker + Accessories	Microbiology labs must use shaking incubators for many culture needs. The units now in the lab are old and too small for growing lab needs.	$17,000	I, II, III	BIOL 2100, 4220, 4280, 4530, 4430, ESC 4010, 4430, 5030, 5040
21	2 – Insect Cabinets for the Natural History Museum	The insect teaching collection is at capacity and cannot accommodate any new specimens. These cabinets are vital for the growth and well being of	$7,766 (2 x $3,883 shipping inc.)	I, II, III	BIOL4070, BIOL4130, BIOL4999 (Parasitology)

		the collection.			
	TOTAL		$317,833		

Table 2. 2016 – Final List
CATEGORIES OF EQUIPMENT
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Rank	**Year Added to List**	**Item**	**Justification**	**Cost**	**Category**	**Courses impacted**
1	2014	3 –sets of adjustable pipets	Microbiology labs, to enhance accuracy and reduce waste volume	$2,895	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
2	2012	12 Flammable Spill Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$8,508 (12 x $709)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
3	?	Multiprobe water quality field kits	Modernize/improve environmental science labs	$12,000 total (2 x $6,000)	I	BIOL 3070 BIOL/ESC 4520 ESC 1500L, 1510L
4	2011	HD microscope camera	Modernize/improve microbiology labs	$1200	I	BIOL 2100,4220 ESC 4010, 4040, 5030, 5040
5	2013	2 steel museum cabinets for the bird collection	Needed to house the growing bird collection in the Natural History Museum	$6,256	I, II, III	BIOL 4580, BIOL 1110, BIOL 1120, BIOL 41110, BIOL 4050
6	2012	5 Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$2,350 (5 x $470)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
7	?	Electrofishers	Fish sampling for labs	$9,779 total (1 x $9,779)	I	BIOL 3070, 4520, 4110
8	2013	Millipore Water Systems (1 unit @ $9,075)	Critical need to replace faiing unit in plant sciences lab	$9,075	I,II,III	BIOL, 4150L, 4280L, 4530L + ESC 1500L,

						1510L, +
9	?	Analytical balances	Modernize/improve toxicology labs	$18,000 total (6 x $3,000)	I, II	BIOL/ESC 4380
10	2006	UTC Hybrid 4X4 Field Consortium Vehicle	Access to remote field sites (multiple seating required)	$38,535	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
11	?	Electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
12	2006	Utility building	Space to store teaching & research field equipment	$1951	II, III	Field oriented courses In BIOL & ESC
13	2006	Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
14	2008	Total Organic Carbon Analyzer	Modernize/improve microbiology & ESC labs	$30,000	III	BIOL 4220L, 4010L, 4040L, + graduate equivalent courses
15	2006	Electric Winch	Safety – self rescue from remote sites	$3500	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
16	2006	Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
17	2011	8 Apple	For use in genetics	$12,000 (8	I	BIOL

		Macbook Pro Laptops	labs for bioinformatics based labs	x $1,500)		4200/4200L
18	2012	3 Flat screen TVs (55”), mounting brackets, computer systems	Introductory Biology Laboratories (Holt 216, 223, & 224)	$4,140 (3 x $1,380)	I,II,III	BIOL 1110, 1120 ESC 1500, 1510
19	2014	Liquid Scintillation Counter	Needed to replace old, broken unit in Spratt’s lab	$34,744	I, II, III	BIOL 4430, 4530, ESC 5030, 5040, 5997, 5998, 5999
20	2014	Minilys tissue homoginizer	Cell biology, microbiology & genetics labs for DNA extraction from samles	$2,400	I, II, III	BIOL 2100, 4200, 4220, 4280, 4430, 4530, ESC 5030, 5040 & others
21	2015	Free-standing outdoor walk-in cooler made by Polar King	Replacement for old cool room	$13,000	I, II, III	BIOL 4050, 4090, 4110, 4141, 4150, 4750, 4995, 4998
22	2016	Parr Inst. Co. pellet press	Allows effective sample prep for calorimetry	$990	I, II, III	BIOL 3070, BIOL/ESC 4540, ESC 5730
23	2016	Apple MacBook laptop computes	Est. of a mobile computer lab that could be checked out by BGES faculty	$38,376 (24 x $1,599)	I, II, III	Any BGE course, especially: BIOL 3250, 3260, 3350, 3060, 3070
24	2016	Fisher Isotemp Ultra-low (-80 C), undercounter freezer	For long-term storage of our bacterial culture collection – many of these cultures should not be stored with other teaching & research materials from diff. disciplines	$8,884	I, II, III	BIOL 2100, 4220, 4280, 4530, 4430, ESC 4010, 4430, 5030, 5040
		TOTAL		$272,980		

Table 3. 2015 – Final List
CATEGORIES OF EQUIPMENT
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Rank	**Year Added to List**	**Item**	**Justification**	**Cost**	**Category**	**Courses impacted**
1	2014	3 –sets of adjustable pipets	Microbiology labs, to enhance accuracy and reduce waste volume	$2,895	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
2	2012	12 Flammable Spill Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$8,508 (12 x $709)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
3	?	Multiprobe water quality field kits	Modernize/improve environmental science labs	$18,000 total (3 x $6,000)	I	BIOL 3070 BIOL/ESC 4520 ESC 1500L, 1510L
4	2011	HD microscope camera	Modernize/improve microbiology labs	$1200	I	BIOL 2100,4220 ESC 4010, 4040, 5030, 5040
5	2013	2 steel museum cabinets for the bird collection	Needed to house the growing bird collection in the Natural History Museum	$6,256	I, II, III	BIOL 4580, BIOL 1110, BIOL 1120, BIOL 41110, BIOL 4050
6	2014	2-Refrigerators (approximately 20 cu ft)	Microbiology labs, to replace lost space in walk-in cool room and one defunct frig.	$1,200	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
7	2012	5 Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$2,350 (5 x $470)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
8	?	Electrofishers	Fish sampling for	$19,558	I	BIOL 3070,

			labs	total (2 x $9,779)		4520, 4110
9	2013	Millipore Water Systems (1 unit @ $9,075)	Critical need to replace faiing unit in plant sciences lab	$9,075	I,II,III	BIOL, 4150L, 4280L, 4530L + ESC 1500L, 1510L, +
10	?	Analytical balances	Modernize/improve toxicology labs	$18,000 total (6 x $3,000)	I, II	BIOL/ESC 4380
11	2006	UTC Hybrid 4X4 Field Consortium Vehicle	Access to remote field sites (multiple seating required)	$38,535	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
12	?	Electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
13	2006	Utility building	Space to store teaching & research field equipment	$1951	II, III	Field oriented courses In BIOL & ESC
14	?	Sputter coater	For electron microscopy sample preparation for teaching and research	$6000	I, III	BIOL 4070, 4180 New microscopy class
15	2006	Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
16	2008	Total Organic Carbon Analyzer	Modernize/improve microbiology & ESC labs	$30,000	III	BIOL 4220L, 4010L, 4040L, + graduate equivalent courses
17	2006	Electric Winch	Safety – self rescue from remote sites	$3500	III	Field oriented courses

						In BIOL, ESC, CHEM, GEOL
18	2006	Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
19	2011	8 Apple Macbook Pro Laptops	For use in genetics labs for bioinformatics based labs	$12,000 (8 x $1,500)	I	BIOL 4200/4200L
20	2012	3 Flat screen TVs (55”), mounting brackets, computer systems	Introductory Biology Laboratories (Holt 216, 223, & 224)	$4,140 (3 x $1,380)	I,II,III	BIOL 1110, 1120 ESC 1500, 1510
21	2014	Liquid Scintillation Counter	Needed to replace old, broken unit in Spratt’s lab	$34,744	I, II, III	BIOL 4430, 4530, ESC 5030, 5040, 5997, 5998, 5999
22	2014	Minilys tissue homoginizer	Cell biology, microbiology & genetics labs for DNA extraction from samles	$2,400	I, II, III	BIOL 2100, 4200, 4220, 4280, 4430, 4530, ESC 5030, 5040 & others
23	2015	Free-standing outdoor walk-in cooler made by Polar King	Replacement for old cool room	$13,000	I, II, III	BIOL 4050, 4090, 4110, 4141, 4150, 4750, 4995, 4998
		TOTAL		$247,709		

Table 4. 2014 – Final List
CATEGORIES OF EQUIPMENT
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Year Added to List	**Item (Ranked)**	**Justification**	**Cost**	**Category**	**Courses impacted**
2012	1 - Biosafety Cabinet (Class II), 4 ft	Replacement of old laminar flow hood in microbiology lab. Necessary to insure BSL 2 lab safety status	$7,956	I, II, III	BIOL 2100L, 4220L, 4150L, 4010L, 4040L, 4280L, 4997, 4998 + ESC 5030L, 5040L
2012	2 - Free Standing Laboratory-grade Dishwasher	Laboratory dishwasher to provide improved washing of lab glassware Including test tubes	$7,694	I, II, III	BIOL 2100L, 4220L, 3260, 4010L, 4040L, 4220L, 4280L, 4997, 4998 + ESC 1500L, 1510L, 5030L, 5040L
?	3 -_ iWorx stations	Modernize/improve human physiology labs	$10,500 total (3 x $3,500)	I	BIOL 2080, 4210
2014	4 - 3 –sets of adjustable pipets	Microbiology labs, to enhance accuracy and reduce waste volume	$2,895	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
2012	5 - 12 Flammable Spill Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$8,508 (12 x $709)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
?	6 - Multiprobe water quality field kits	Modernize/improve environmental science labs	$18,000 total (3 x $6,000)	I	BIOL 3070 BIOL/ESC 4520 ESC 1500L, 1510L

2011	7 - HD microscope camera	Modernize/improve microbiology labs	$1200	I	BIOL 2100,4220 ESC 4010, 4040, 5030, 5040
2013	8 – 2 steel museum cabinets for the bird collection	Needed to house the growing bird collection in the Natural History Museum	$6,256	I, II, III	BIOL 4580, BIOL 1110, BIOL 1120, BIOL 41110, BIOL 4050
2014	9 - 2-Refrigerators (approximately 20 cu ft)	Microbiology labs, to replace lost space in walk-in cool room and one defunct frig.	$1,200	I, II, III	BIOL 2100, 4220, 4430, 4530, ESC 5030, 5040
2012	10 - 5 Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$2,350 (5 x $470)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
?	11 - Electrofishers	Fish sampling for labs	$19,558 total (2 x $9,779)	I	BIOL 3070, 4520, 4110
2013	12 – Millipore Water Systems (1 unit @ $9,075)	Critical need to replace faiing unit in plant sciences lab	$9,075	I,II,III	BIOL, 4150L, 4280L, 4530L + ESC 1500L, 1510L, +
?	13 - Analytical balances	Modernize/improve toxicology labs	$18,000 total (6 x $3,000)	I, II	BIOL/ESC 4380
2006	14 - UTC Hybrid 4X4 Field Consortium Vehicle	Access to remote field sites (multiple seating required)	$38,535	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
?	15 - Electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
2006	16 - Utility building	Space to store teaching & research field equipment	$1951	II, III	Field oriented courses In BIOL & ESC
?	17 - Sputter coater	For electron microscopy sample preparation for teaching and research	$6000	I, III	BIOL 4070, 4180 New microscopy class

2006	18 - Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
2008	19 - Total Organic Carbon Analyzer	Modernize/improve microbiology & ESC labs	$30,000	III	BIOL 4220L, 4010L, 4040L, + graduate equivalent courses
2006	20 - Electric Winch	Safety – self rescue from remote sites	$3500	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
2006	21 - Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
2011	22 - 8 Apple Macbook Pro Laptops	For use in genetics labs for bioinformatics based labs	$12,000 (8 x $1,500)	I	BIOL 4200/4200L
2012	23 - 3 Flat screen TVs (55”), mounting brackets, computer systems	Introductory Biology Laboratories (Holt 216, 223, & 224)	$4,140 (3 x $1,380)	I,II,III	BIOL 1110, 1120 ESC 1500, 1510
2014	24 - Liquid Scintillation Counter	Needed to replace old, broken unit in Spratt’s lab	$34,744	I, II, III	BIOL 4430, 4530, ESC 5030, 5040, 5997, 5998, 5999
2014	25 – Minilys tissue homoginizer	Cell biology, microbiology & genetics labs for DNA extraction from samles	$2,400	I, II, III	BIOL 2100, 4200, 4220, 4280, 4430, 4530, ESC 5030, 5040 & others
	TOTAL		$260,859		

Table 5. 2013 – Final List
CATEGORIES OF EQUIPMENT
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Year Added to List	**Item (Ranked)**	**Justification**	**Cost**	**Category**	**Courses impacted**
2013	1 – Millipore Water Systems (3 units @ $9,075; $5,522; and $4,537 ea)	Critical need to replace failed units in micro prep lab, genetics lab, and plant sciences lab	$19,134	I,II,III	BIOL 2100L, 4220L, 3250L, 4150L, 4280L, 4530L + ESC 1500L, 1510L, 4010L, 4040L, 5030L, 5040L +
2012	2 - Biosafety Cabinet (Class II), 4 ft	Replacement of old laminar flow hood in microbiology lab. Necessary to insure BSL 2 lab safety status	$7,956	I, II, III	BIOL 2100L, 4220L, 4150L, 4010L, 4040L, 4280L, 4997, 4998 + ESC 5030L, 5040L
2012	3 - Free Standing Laboratory-grade Dishwasher	Laboratory dishwasher to provide improved washing of lab glassware Including test tubes	$7,694	I, II, III	BIOL 2100L, 4220L, 3260, 4010L, 4040L, 4220L, 4280L, 4997, 4998 + ESC 1500L, 1510L, 5030L, 5040L
?	4 - Multiprobe water quality field kits	Modernize/improve environmental science labs	$18,000 total (3 x $6,000)	I	BIOL 3070 BIOL/ESC 4520 ESC 1500L, 1510L
?	5 -_ iWorx stations	Modernize/improve human physiology labs	$10,500 total (3 x $3,500)	I	BIOL 2080, 4210
?	6 - Analytical balances	Modernize/improve toxicology labs	$18,000 total (6 x $3,000)	I, II	BIOL/ESC 4380
?	7 -	Fish sampling for	$19,558 total (2	I	BIOL 3070,

	Electrofishers	labs	x $9,779)		4520, 4110
2006	8 - UTC Hybrid 4X4 Field Consortium Vehicle	Access to remote field sites (multiple seating required)	$38,535	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
?	9 - Electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
2006	10 - Utility building	Space to store teaching & research field equipment	$1951	II, III	Field oriented courses In BIOL & ESC
?	11 - Sputter coater	For electron microscopy sample preparation for teaching and research	$6000	I, III	BIOL 4070, 4180 New microscopy class
2011	12 - HD microscope camera	Modernize/improve microbiology labs	$1200	I	BIOL 2100,4220 ESC 4010, 4040, 5030, 5040
?	13 - Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
2008	14 - Total Organic Carbon Analyzer	Modernize/improve microbiology & ESC labs	$30,000	III	BIOL 4220L, 4010L, 4040L, + graduate equivalent courses
2006	15 - Electric Winch	Safety – self rescue from remote sites	$3500	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
2006	16 - Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
2011	17 - 8 Apple Macbook Pro Laptops	For use in genetics labs for bioinformatics based labs	$12,000 (8 x $1,500)	I	BIOL 4200/4200L

2012	18 - 12 Flammable Spill Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$8,508 (12 x $709)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
2012	19 - 5 Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$2,350 (5 x $470)	I, II, III	BIOL 4070, 4130, 4050, 4090, 4110, 4140, 4170
2012	20 - Lab Frig, 78 cu ft, Revco	Chestnut Project, Hill’s lab	$10,900	III	BIOL4150?
2012	21 - 3 Flat screen TVs (55”), mounting brackets, computer systems	Introductory Biology Laboratories (Holt 216, 223, & 224)	$4,140 (3 x $1,380)	I,II,III	BIOL 1110, 1120 ESC 1500, 1510
	TOTAL		$234,323		

Table 6. 2012 – Final List
CATEGORIES OF EQUIPMENT
I. Equipment needed to maintain course instructional integrity
II. Equipment needed to meet existing infrastructure deficiencies
III. Equipment needs to meet continuing student/faculty research objectives

Item (Ranked)	**Justification**	**Cost**	**Category**	**Courses impacted**
1 - 1 Biosafety Cabinet (Class II), 4 ft	Replacement of old Laminar flow hood in Microbiology lab. Necessary to insure BSL 2 lab safety status.	$7,956	I, II, III	BIOL 2100L, BIOL 3110L, BIOL 3510L, 4010L, BIOL 4040L, BIOL 4280L, BIOL 4997, BIOL 4998 +
2 -1 Free Standing Lab Dishwasher	Laboratory Dishwasher to provide improved Washing Lab ware Including Test Tubes	$7,694	I, II, III	BIOL 2100L, BIOL 3110L, BIOL 3260, BIOL 4010L, BIOL 4040L, BIOL 4200L, BIOL 4280L, BIOL 4997, BIOL 4998 + Grad Course Eq
3- 3 multiprobe water quality field kits	Modernize/improve environmental science labs	$18,000 total (3 x $6,000)	I	ESC 1500,1510, BIOL/ESC 4060, BIOL 3070
4- 3 iWorx stations	Modernize/improve human physiology labs	$10,500 total (3 x $3,500)	I	BIOL 2080, 3230
5- 6 analytical balances	Modernize/improve toxicology labs	$18,000 total (6 x $3,000)	I, II	BIOL/ESC 4600
6- 2 electrofishers	Fish sampling for labs	$19,558 total (2 x $9,779)	I	BIOL 3070, 4060, 4560
7- UTC	Access to	$38,535	III	Field oriented

Hybrid 4X4 Field Consortium Vehicle	remote field sites (multiple seating required)			courses In BIOL, ESC, CHEM, GEOL
8- 6 electronic balances	Modernize/improve intro biology labs	$3000 total (6 x $500)	II	BIOL 1110
9- Plant growth chamber	Modernize/improve plant labs	$14,000	III	BIOL 3040, 4999
10- Utility building	Space to store teaching & research field equipment	$1951	II, III	Field oriented courses In BIOL & ESC
11- Sputter coater	For electron microscopy sample preparation for teaching and research	$6000	I, III	BIOL 3420, 2070 New microscopy class
12- HD microscope system	Modernize/improve microbiology labs	$8,116	I	BIOL 2100,3110, ESC 4010, 4040, 5030, 5040
13- Departmental data server	Increase electronic data storage capacity & reliability	$4154	III	GIS and new microscopy class
14- Total Organic Carbon Analyzer	Modernize/improve microbiology labs	$30,000	III	BIOL 3110L, 4010L, 4040L, + graduate equivalent courses
15 – Electric Winch	Safety – Self Rescue from remote sites	$3500	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
16 – Honda Four Trax 4X4	Access to remote field sites	$7,243	III	Field oriented courses In BIOL, ESC, CHEM, GEOL
17 - 8	For use in	$16,000 (8 x $2,000)	I	BIOL

Apple Macbook Pro Laptops	genetics labs for bioinformatics based labs			4200/4200L, 4950
18 -12 Flammable Spill Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$8,508 (12 x $709)	I, II, III	BIOL3420,BIOL3120, BIOL3130, BIOL4450, BIOL4560, BIOL4570, BIOL4580
19 -5 Clear View Storage Cabinets	Nat. History. Museum – Replacement of old wooden shelves	$2,350 (5 x $470)	I, II, III	BIOL3420,BIOL3120, BIOL3130, BIOL4450, BIOL4560, BIOL4570, BIOL4580
TOTAL			**$225,065**	

Appendix CC. Holt Hall Renovation Space Allocation

An overview of space allocation following the completion of the Holt Hall renovation.

Specifically, we provide information of anticipated office and research space (Table 1), teaching lab space (Table 2), lecture space (Table 3), and specialized use space (Table 4).

Table 1. Anticipated office and research space following the renovation.

Last Name	**First Name**	**Final Office**	**Final Office SqFt**	**Final Research Lab**	**Final Research Lab SqFt**	**Other Comments**
Aborn	David	232F Holt	124	107A Holt	575	Research Lab space includes any field work supplies and museum storage space
Adams	Callie	351A	119			
Admin Long-Term Storage		176 Holt	100	Storage		
Barbosa	Jose	114 Holt	124	115 Holt & 114A Holt	1037 & 207	
Barbosa	Nominanda	351B Holt	124			
Beasley	DeAnna	308A Holt	145	308 Holt	300	
Boyd	Jennifer	112 Grote	233	110 Grote	811	
Bramblett	Jeremy	101 Grote	136			
Brock-Hon	Amy	218C Grote	176			Needs Research Space?
Carver	Ethan	307 Holt	445			Office and Research Space in Same Room
Caskey	Jodi	232H Holt	124			
Chatzimanolis	Stylianos	232E Holt	191	201 Holt	309	
Churnet	Habte	218B Grote	246			

Craddock	Hill	350H Holt	188	350I	400?	
Farnsley	Sarah	232I Holt	124			
Gaudin	Timothy	227 Holt	123	227A, 226 Holt	546	
Giles	David	350J Holt	126	304 Holt	467	
Harrell	Kate	102 Grote	188			
Hayes	Loren	309A	145	309 Holt	300	
Holmes	Ann	218D Grote	176			Needs Research Space?
Hossain	Azad	218A Grote	110	111 Grote	126	
Klug	Hope	222 Holt	207	219-221 Holt	453	
Kovach	Peggy	121 Holt	125	120A Holt	423	
Locke	Kelly	212 Holt	121			Move door facing interior to 215 Holt
McCauley	Joseph	213 Holt	121			
Mies	Jon	218E Grote	176			Needs Research Space?
Murphy	Cheryl	214 Holt	240			
New Biology Lecturer		232G Holt	124			
New Faculty Hire-Replacing O'Neill		328 Holt?	122	324 Holt?	Total for room 1030: Researcher would use half this space	
Qin	Hong			109 Holt?	365	
Reynolds	Bradley	232J Holt	124			
Richards	Sean	319 Holt	123	318A Holt	423	
Schorr	Mark	217 Holt	123	218 Holt	207	
Shaw	Joey	113 Holt	124	113A Holt	207	
Shutters	Marketa	215 Holt	506			Front Biology Office
Spratt	Rardy	351D	163	305 Holt	641	

		Holt				
Tucker	John	215A Holt	320			Department Head Office
Tucker	John			232K Holt	259	
Vacant Office		232D Holt	124			
Vacant Office		122 Holt	125			
Vacant Office		326 Holt	104			Office for person whose research space is there?
Vacant Research Space				323 Holt	1335	Space for 2 faculty's Research Space
Williams	Wayne	222 Grote	153			
Wilson	Thomas	306A Holt	145	306 Holt	300	
Adjunct Office		220 Grote	168			
		218 Grote	659	Geology Front Office		

Table 2. Anticipated teaching lab space following the renovation.

Last Name	**First Name**	**Final Teaching Lab Room Number**	**Final Teaching Lab SqFt**	**Final Teaching Lab Use**	**Other Classes?**
Shaw	Joey	112 Holt	1092	Botany Lab	Entomology; Dendrology?
Kovach	Peggy	120 Holt	1221	Genetics Lab	Cell Biology
		123 Holt	1110		Opened up teaching lab
Murphy	Cheryl	216 Holt	999	BIOL 1110L	
Murphy	Cheryl	223 Holt	1036	BIOL 1110L	
Murphy	Cheryl	224 Holt	1036	BIOL 1120L	
Reynolds	Brad	225 Holt	1036	ESC Teaching Lab	
Murphy	Cheryl	225B Holt	249	Intro Bio Prep Room	

Reynolds	Brad	225C Holt	167	ESC Lab Prep	
		228 Holt	1036	Developmental Teaching Lab	Herpetology
		318 Holt	1184	Old Physiology Lab	Sean and Mark primarily use this lab
Zoology Teaching Lab		321 Holt	962	Zoology, Mammalogy, Invert Zoology, Dendrology	
Microbiology		325 Holt	200	Prep/Storage room for Microbiology Teaching Lab	
Microbiology		330 Holt	1030	Microbiology Teaching Lab	
Microbial Ecology		331 Holt	667	Microbial Ecology Teaching Lab	
		399 Holt	480	Computer Lab	
Microbiology Prep Lab		305D Holt	509		
		108 Grote	900	Physiology Teaching Lab	
		109 Grote	1109	Anatomy Teaching lab	
		206 Grote	975	Geology Teaching Lab	
		207 Grote	653	Geology Prep Room/Research Storage	
		208 Grote	1070	Geology Teaching Lab	
		209 Grote	1120	Geology Prep Room/Research Lab	
		210 Grote	813	Geology Teaching Lab	
		210A Grote	200	Geology Prep Room/Research Lab	

Table 3. Anticipated lecture classroom space following the renovation.

Renovated Lecture Classroom Number	Renovated Lecture Classroom SqFt
119 Holt	772
124 Holt	1150
125 Holt	772
203 Holt	642
204 Holt	773
208 Holt	643
229 Holt	1511
230 Holt	1334
322 Holt	1335

Table 4. Anticipated special use space following the renovation.

Last Name	First Name	Specialized Space Rm No	Specialized Space SqFt	Specialized Space Use
Schorr	Mark	101 Holt	186	Fish Collection
Schorr	Mark	101A Holt	238	Fish Collection
Wilson	Thomas	102 Holt	299	Herp Museum Specimens
Craddock	Hill	102A	218	Cold Storage Room; Mycology Collection
Chatzimanolis	Stylianos	103 Holt	258	Entomology Museum Specimens
Gaudin	Tim	104 Holt	390	Mammal Museum Specimens
Murphy	Cheryl	106 Holt	250	Flammable Storage
Murphy	Cheryl	107 Holt	184	Surplus Storage
Aborn	David	107A Holt	575	Ornithology Museum Specimens
Murphy	Cheryl	108 Holt	163	Haz Waste Storage
		110 Holt	493	Mud Room; wet storage; open to everyone
Schorr	Mark	111 Holt	90	Wet Storage - similar to use now
Shaw	Joey	112B Holt	225	Graduate Student Space/Research
Shaw	Joey	116 Holt	859	Herbarium
Shaw	Joey	116A Holt	145	Herbarium/Digitization
Wilson	Tom	117 Holt	160	Dry Storage
Natural History Museum		118 Holt	118	Specimen Prep
Schorr	Mark	177 Holt	40	Fish Collection

Carver/Chatzimanolis	Ethan/Stelios	202 Holt	377	Confocal/SEM
		205 Holt	643	Student Study Area/Library
		207 Holt	639	Student Study Area
Graduate Coordinator		209 Holt	643	Graduate Student Office
Graduate Coordinator		210 Holt	392	Graduate Teaching Assistants Office
		211 Holt	357	Conference Room
		215C&D Holt	208	Mail Room/Kitchenette/Office Supplies
Natural History Museum		225A Holt	252	Museum Freezer Storage Room
Giles/Spratt	Davy/Rardy	301 Holt	210	Radioactive Research
Microbiology		305B Holt	125	Freezer Room
Microbiology		305C Holt	125	Autoclave
Animal Facilities		313 Holt	126	Animal Observation
Animal Facilities		314 Holt	126	Animal Quarters
Animal Facilities		316 Holt	153	Animal Quarters
Animal Facilities		317A Holt	253	Animal Quarters
Animal Facilities		317B Holt	266	Animal Quarters
Animal Facilities		317C Holt	144	Animal Quarters
Animal Facilities		317D Holt	126	Animal Observation
Animal Facilities		317E Holt	234	Animal Quarters
Animal Facilities		317F Holt	187	Animal Quarters Storage
Animal Facilities		317G Holt	414	Cage Wash
Richards	Sean	317H Holt	251	Freezer Storage -80
Gaudin	Tim	320 Holt	123	Dermestids/Dissecting
Wilson	Thomas	327 Holt	122	GIS Room
		M173 Holt	226	Construction Room - open to everyone
Animal Facilities		M315 Holt	126	Animal Quarters
Spratt	Rardy	329 Holt	104	Bacterial Culture Room
		102A Grote	30	Office Closet
		112A Grote	175	Office Closet
		106 Grote	371	Geology Rock Storage
		106 Grote	687	Geology Work Room
		224 Grote	292	Geology Student Room
		231 Grote	90	Copy Room/Shared with Physics
		227 Grote	176	Storage closet/shared with Physics
Biology Field Station lab		Bldg	1900	
Craddock		Bldg	1167	

Greenhouse				
Holt Greenhouse		Bldg	1200	
Teaching and Learning Garden			????	
Teaching Lab at Water Treatment Facility			????	

Appendix DD. BGE Computer List

Detailed list of departmental computers. Computers purchased within past 5 years are indicated in bold.

Last Name	First Name	Purpose	Manufacturer	Model	Type	Purchase Date	Notes
Aborn	David	Secondary	Dell	Optiplex 780	Desktop	22-Apr-10	
Aborn	**David**	**Primary**	**Dell**	**Optiplex 5040**	**Desktop**	**07-Apr-16**	
Adams	Meredith	Primary	Apple	Macbook Pro 15"	Laptop	23-Sep-13	
Barbosa	Jose	Lab	Dell	Latitude C640	Laptop	07-Oct-02	
Barbosa	Jose	Lab	Dell	Latitude C640	Laptop	07-Oct-02	Research Lab computer
Barbosa	Jose	Lab	Dell	OptiPlex GX620	Desktop	13-Sep-05	Research Lab
Barbosa	Jose	Lab	Dell	OptiPlex 745	Desktop	19-Nov-07	Research Lab
Barbosa	Jose	Lab	Apple	iMac 27"	Desktop	15-Mar-10	
Barbosa	Jose	Lab	Apple	iMac 21.5"	Desktop	21-Jun-10	
Barbosa	Jose	Secondary	Apple	iMac 21.5"	Desktop	21-Jun-10	
Barbosa	Jose	Primary	Dell	OptiPlex 780	Desktop	15-Jul-10	
Barbosa	**Nominanda**	**Student**	**Apple**	**iMac 27"**	**Desktop**	**05-Apr-13**	
Barbosa	**Jose**	**Secondary**	**Apple**	**MacBook Air 13"**	**Laptop**	**01-Jun-14**	
Barbosa	Jose	Lab	HP	ProBook	Laptop	NA	Research Lab computer
Barbosa	**Nominanda**	**Primary**	**Dell**	**OptiPlex 9020**	**Desktop**	**01-May-15**	
Beasley	**DeAnna**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**05-Aug-16**	
Beasley	**DeAnna**	**Lab**	**Apple**	**iMac 21.5"**	**Desktop**	**06-Jun-17**	**Research Lab computer**
Boyd	Jennifer	Secondary	Dell	Latitude E4200	Laptop	20-Aug-10	
Boyd	**Jennifer**	**Primary**	**Apple**	**MacBook Air 13"**	**Laptop**	**07-May-13**	
Boyd	**Jennifer**	**Lab**		**Cooler Master PC**	**Desktop**	**15-Dec-14**	**Research lab computer for growth chambers**
Bramblett	Jeremy	Secondary	Dell	Inspiron 710	Laptop	11-Apr-06	
Bramblett	Jeremy	Secondary	Apple	Macbook Pro 13"	Laptop	04-Sep-08	
Bramblett	**Jeremy**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**20-Mar-13**	
Brock-Hon	Amy	Classroom	Apple	MacBook Pro	Laptop	21-Jan-11	Used for

							teaching in Geology
Brock-Hon	Amy	Secondary	Apple	iMac 27"	Desktop	12-Aug-10	
Brock-Hon	Amy	Lab	Dell	OptiPlex 790	Desktop	18-Jan-12	
Brock-Hon	**Amy**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**08-Jul-16**	
Brock-Hon	**Amy**	**Classroom**	**Apple**	**Macbook Pro 13"**	**Laptop**	**30-Aug-16**	**Laptop for faculty to use in classrooms (Geology)**
Brodie	Greg	Primary	Dell	OptiPlex 780	Desktop	10-Jul-10	
Carver	Ethan	Lab	Dell	OptiPlex GX260	Desktop	07-Oct-02	Uses in research lab
Carver	Ethan		Dell	Latitude D630	Laptop	21-Aug-08	
Carver	Ethan	Lab	Dell	OptiPlex 780	Desktop	30-Jul-10	In Research Lab
Carver	Ethan	Secondary	Dell	Vostro 3700 Config 39	Laptop	09-Mar-11	
Carver	**Ethan**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**16-Jul-13**	
Carver	Ethan	Secondary	Apple	Macbook Pro 13"	Laptop		
Carver	Ethan	Lab	Dell	Dimension 3000	Desktop	NA	In Research Lab
Caskey	**Jodi**	**Primary**	**Dell**	**Optiplex 9010**	**Desktop**	**15-Oct-13**	
Chatzimanolis	Stylianos	Lab	Apple	iMac 27"	Desktop	01-Aug-11	Research Lab
Chatzimanolis	Stylianos	Lab	Apple	iMac 27"	Desktop	25-Feb-10	Research Lab
Chatzimanolis	**Stylianos**	**Secondary**	**Apple**	**MacBook 13"**	**Laptop**	**05-May-14**	
Chatzimanolis	**Stylianos**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**07-Jul-16**	
Churnet	Habte	Secondary	Apple	iMac 27"	Desktop	15-Feb-10	
Churnet	Habte	Secondary	Apple	MacBook Pro	Laptop	07-Jun-11	
Churnet	**Habte**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**01-Sep-16**	
Craddock	J Hill	Student	Dell	OptiPlex 755	Desktop	20-Oct-08	Graduate Student Desktop
Craddock	J Hill	Secondary	Dell	Latitude E6500	Laptop	14-Jan-10	
Craddock	Hill	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	Graduate Student Computer; Originally from English
Craddock	Hill	Student	Dell	OptiPlex 780	Desktop	25-May-10	Graduate Student Desktop
Craddock	Hill	Lab	Dell	Dimension 4100	Desktop	NA	Research Lab
Craddock	**J Hill**	**Primary**	**Dell**	**Optiplex 9020 SFF**	**Desktop**	**01-May-15**	
Farnsley	**Sarah**	**Primary**	**Apple**	**iMac 21.5"**	**Desktop**	**07-Apr-16**	
Gaudin	Tim	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	
Gaudin	Timothy	Primary	Apple	iMac 27"	Desktop	31-Jul-13	
Gaudin	Timothy	Secondary	Apple	Macbook Pro 15"	Laptop	01-May-15	

Giles	**David**	**Primary**	**Apple**	**MacBook Pro**	**Laptop**	**Spring 2017**	
Giles	**David**	**Lab**	**Apple**	**iMac 21.5"**	**Desktop**	**03-Jun-14**	**Research Lab computer**
Harrell	**Katherine**	**Primary**	**Apple**	**iMac 24"**	**Desktop**	**Spring 2017**	
Harrell	Katherine	Lab	Apple	iMac 21.5"	Desktop	01-Nov-11	Anatomy teaching lab
Harrell	Katherine	Lab	Apple	iMac 21.5"	Desktop	01-Nov-11	Anatomy teaching lab
Harrell	Katherine	Lab	Apple	iMac 21.5"	Desktop	01-Nov-11	Anatomy teaching lab
Harrell	**Katherine**	**Lab**	**Apple**	**iMac 21.5"**	**Desktop**	**07-Apr-16**	
Harrell	**Katherine**	**Lab**	**Apple**	**iMac 21.5"**	**Desktop**	**07-Apr-16**	
Harrell	**Katherine**	**Lab**	**Apple**	**iMac 21.5"**	**Desktop**	**07-Apr-16**	
Hayes	Loren	Lab	Dell	Latitude E6520	Laptop	17-Jan-12	Research Lab computer
Hayes	**Loren**	**Secondary**	**Dell**	**XPS 15"**	**Laptop**	**31-Dec-14**	
Hayes	**Loren**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**10-Jun-15**	
Holmes	Ann	Primary	Apple	iMac 27"	Desktop	15-Feb-10	
Holmes	**Ann**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**11-Oct-16**	
Hossain	Azad	Student	Dell	OptiPlex 960	Desktop	03-Mar-10	Azad Hossains Graduate Student Lab
Hossain	Azad	Student	Dell	OptiPlex 960	Desktop	03-Mar-10	Azad Hossains Graduate Student Lab
Hossain	**Azad**	**Secondary**	**MSI**	**WS72 6QJ-026US 17.3"**	**Laptop**	**30-Aug-16**	
Hossain	**Azad**	**Secondary**	**Dell**	**Mobile Precision 7710 XCTO Base**	**Laptop**	**06-Oct-16**	
Hossain	**Azad**	**Primary**	**Dell**	**Optiplex 5040**	**Desktop**	**07-Apr-16**	
Hossain	**Azad**	**Lab**	**Dell**	**OptiPlex 5040**	**Desktop**	**08-Feb-17**	
Hossain	**Azad**	**Lab**	**Dell**	**OptiPlex 5040**	**Desktop**	**08-Feb-17**	
Klug	Hope	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	
Klug	Hope	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	
Klug	Hope	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	
Klug	**Hope**	**Primary**	**Apple**	**MacBook Pro**	**Laptop**	**Spring 2017**	
Klug	Hope	Student	Apple	iMac 27"	Desktop	19-Sep-11	Graduate Student Desktop
Klug	Hope	Student	Apple	iMac 27"	Desktop	22-Mar-12	Graduate Student Computer Lab
Klug	Hope	Student	Dell	Inspiron 700m	Laptop	NA	Graduate Student Computer Lab;

							Hope's old graduate school laptop with software
Kovach	Margaret	Classroom	Dell	OptiPlex 960	Desktop	03-Mar-10	In teaching lab; for VisionWorks
Kovach	**Margaret**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**12-Aug-16**	
Kovach	Margaret	Classroom	Dell	OptiPlex 960	Desktop	Unknown	In teaching lab; for Mitsubishi printer
Kovach	Margaret	Lab	IBM	NetVisata	Desktop	NA	Research Lab computer - connected to Olympus BX51
Kovach	**Margaret**	**Lab**	**HP**	**ProBook 650 G1**	**Laptop**	**14-Feb-17**	**Research Lab - connected to RT-PCR**
Kovach	Margaret	Lab	HP	Compaq 5800 Microtower	Desktop	NA	Research Lab - At student desk
Locke	**Kelly**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**Spring 2017**	
McCauley	Joseph	Dept	Dell	OptiPlex 960	Desktop	04-Mar-10	
McCauley	Joseph	Secondary	Apple	MacBook Pro	Laptop	03-Mar-11	
McCauley	**Joseph**	**Primary**	**Dell**	**Latitude E5570**	**Laptop**	**07-Apr-16**	
Mies	Jonathan	Secondary	Apple	iMac 27"	Desktop	15-Feb-10	
Mies	Jonathan	Secondary	Apple	MacBook Pro	Laptop	06-Feb-12	
Mies	**Jonathan**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**12-Aug-16**	
Mikelson	**Colleen**	**Primary**	**Dell**	**Optiplex 9010**	**Desktop**	**05-Sep-13**	**Colleen is no longer full time faculty in the department - we still have the computer**
Murphy	**Cheryl**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**Spring 2017**	
Murphy	**Cheryl**	**Lab**	**Dell**	**ChromeBook**	**Laptop**	**08-Dec-16**	**Teaching Lab; 216 Holt**
Murphy	**Cheryl**	**Lab**	**Dell**	**ChromeBook**	**Laptop**	**08-Dec-16**	**Teaching Lab; 223 Holt**
Murphy	**Cheryl**	**Lab**	**Dell**	**ChromeBook**	**Laptop**	**08-Dec-16**	**Teaching Lab; 224 Holt**
O'Neill	Eric	Lab	Apple	iMac 24"	Desktop	24-Jul-09	Research Lab computer
O'Neill	Eric	Lab	Apple	iMac 21.5"	Desktop	21-Jun-10	Research Computer; was originally from English
O'Neill	Eric	Lab	Apple	iMac 21.5"	Desktop	21-Jun-10	Research Computer; was originally from English
O'Neill	**Eric**	**Primary**	**Apple**	**Macbook Pro 13"**	**Laptop**	**17-Feb-14**	

O'Neill	**Eric**	**Secondary**	**Apple**	**iMac 21.5"**	**Desktop**	**25-Mar-15**	**Was Dr. Kajita's originally; is no longer employed with the Department, but the computer is still here; Computer is now in Eric's office**
Reynolds	Brad	Lab	Dell	OptiPlex GX260	Desktop	20-Sep-02	Teaching lab computer
Reynolds	Brad	Lab	Dell	Precision 650	Desktop	20-Mar-03	Teaching lab computer
Reynolds	Brad	Lab	Dell	OptiPlex GX620	Desktop	NA	Teaching Lab
Reynolds	Brad	Lab	Dell	OptiPlex 960	Desktop	03-Mar-10	Teaching lab computer
Reynolds	Bradley	Secondary	Dell	OptiPlex 780	Desktop	26-Apr-10	
Reynolds	**Bradley**	**Secondary**	**Dell**	**XPS 15"**	**Laptop**	**11-May-15**	
Reynolds	**Bradley**	**Primary**	**Dell**	**Optiplex 5040**	**Desktop**	**07-Apr-16**	
Richards	Sean	Secondary	Apple	iMac 24"	Desktop	22-Sep-08	
Richards	Sean	Secondary	Apple	MacBook Pro 17"	Laptop	22-Sep-09	
Richards	Sean	Lab	Dell	OptiPlex 780	Desktop	25-May-10	Research Lab
Richards	Sean	Secondary	Apple	Macbook Pro 13"	Laptop	01-Oct-10	
Richards	**Sean**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**14-Jun-14**	
Schorr	Mark	Lab	Dell	Latitude C840	Laptop	20-Jun-02	Research Lab computer
Schorr	Mark	Lab	Dell	OptiPlex 780	Desktop	29-Jun-09	
Schorr	Mark	Lab	Dell	OptiPlex 780	Desktop	26-Apr-10	
Schorr	**Mark**	**Primary**	**Dell**	**Latitude E6530**	**Laptop**	**09-Dec-13**	
Schorr	**Mark**	**Primary**	**Dell**	**OptiPlex 5040**	**Desktop**	**Jan 17 ,2017**	**Primary Office Computer**
Shaw	Joey	Lab	Dell	OptiPlex 745	Desktop	01-Aug-07	Digitizing Lab
Shaw	Joey	Lab	Dell	Optiplex 745	Desktop	01-Aug-07	Digitizing Lab
Shaw	Joey	Lab	Dell	OptiPlex 745	Desktop	01-Aug-07	Digitizing Lab
Shaw	Joey	Lab	Dell	OptiPlex 745	Desktop	01-Aug-07	Digitizing Lab
Shaw	Joey	Lab	Apple	Macbook Pro 15"	Laptop	04-Mar-10	Used in teaching lab
Shaw	Joey	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	Graduate Student Computer; Originally from English

Shaw	**Joey**	**Primary**	**Apple**	**Macbook Pro 15"**	**Laptop**	**12-Feb-15**	
Shutters	Marketa	Primary	Apple	iMac 27"	Desktop	16-Jun-16	
Spratt	Henry		Dell	OptiPlex GX270	Desktop	08-Oct-03	
Spratt	Henry		Apple	Power Mac G5	Desktop	Dec 17. 2004	
Spratt	Henry	Secondary	Apple	iMac 24"	Desktop	06-Mar-09	
Spratt	Henry	Student	Apple	iMac 21.5"	Desktop	21-Jun-10	Graduate Student Desktop; Was originally purchased by English
Spratt	Henry	Secondary	Apple	Macbook Pro 15"	Laptop	30-Jul-10	
Spratt	**Henry**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**16-Jun-14**	
Spratt	Henry	Lab	Dell	Dimension B110	Desktop	NA	
Tucker	John	Secondary	Dell	Inspiron 8100	Laptop	01-Jul-02	
Tucker	John	Secondary	Dell	OptiPlex GX60	Desktop	12-Apr-04	
Tucker	John	Secondary	Apple	iMac 24"	Desktop	23-May-08	
Tucker	John	Secondary	Apple	iMac 24"	Desktop	24-May-10	
Tucker	John	Secondary	Apple	Macbook Pro 15"	Laptop	28-Jan-11	
Tucker	**John**	**Primary**	**Apple**	**iMac 27"**	**Desktop**	**16-Jun-14**	
Williams	Wayne	Secondary	Apple	iMac 24"	Desktop	26-Aug-09	
Williams	**Wayne**	**Primary**	**Dell**	**Optiplex 5040**	**Desktop**	**Spring 2017**	
Williams	Wayne	Dept	Dell	OptiPlex 780	Desktop	03-Jan-11	Computer for seismometer
Wilson	Tom	Lab	Dell	Latitude C640	Laptop	07-Oct-02	Research Lab computer
Wilson	Thomas	Secondary	Dell	Optiplex 745	Desktop	12-Jun-07	
Wilson	Thomas	Lab	Dell	OptiPlex 745	Desktop	01-Aug-07	Research Lab computer
Wilson	Thomas	Secondary	Dell	Optiplex 780	Desktop	26-Apr-10	In main office
Wilson	Thomas	Lab	Apple	iMac 21.5"	Desktop	21-Jun-10	Research Computer; was originally from English
Wilson	**Thomas**	**Primary**	**Dell**	**Optiplex 9020**	**Desktop**	**01-May-15**	
		Dept	Dell	Dimension 8100	Desktop	27-Jul-01	Geology lab/research computer
		Dept	Apple	Power Mac G4	Desktop	04-Oct-01	Not sure how this is used
		Lab	Dell	OptiPlex GX270	Desktop	08-Oct-03	Research Lab Computer; Need to check who's it

							is
		Lab	Dell	OptiPlex GX270	Desktop	08-Sep-04	Zoology Teaching Lab 'podium computer'
		Dept	Dell	OptiPlex GX620	Desktop	22-Aug-06	Geology lab/research computer
		Lab	Dell	OptiPlex 745	Desktop	12-Jun-07	Teaching lab computer for scope/camera; Spratt/Nbarbosa typically supervises use
		Lab	Apple	Mac Mini	Desktop	NA	Podium' Computer for lab room
		Student	Apple	iMac 21.5"	Desktop	02-Apr-09	Front Office Student Worker Computer
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	In lounge area - tracking earthquakes
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	
		Dept	Apple	iMac 24"	Desktop	26-Aug-09	
		Lab	Dell	OptiPlex 960	Desktop	03-Mar-10	Anatomy teaching lab podium computer
		Lab	Dell	OptiPlex 960	Desktop	03-Mar-10	In teaching lab: Anaotomy podium computer
		Lab	DDI	Plextor PX-880SA	Desktop	NA	Computer for Confocal Microscope
		Lab	Dell	OptiPlex 760	Desktop	NA	Computer for SEM
		Dept	Apple	iMac 21.5"	Desktop	21-Jun-10	Computer in lounge area; from English
		Student	Dell	OptiPlex 780	Desktop	30-Jul-10	Front Office Student Worker Computer
		Student	Desktop	OptiPlex 9010	Desktop	Unknown	Graduate Student Office
		Dept	Dell	OptiPlex 9010	Desktop	Unknown	Graduate Student Office
		Dept	Dell	OptiPlex 9010	Desktop	Unknown	Graduate Student Office
		Dept	Dell	OptiPlex 9010	Desktop	Unknown	Graduate Student Office
		Dept	Dell	OptiPlex 9010	Desktop	Unknown	Graduate

							Student Office
		Dept	**Dell**	**OptiPlex 5040**	**Desktop**	**17-Apr-17**	**Graduate Student Computer Lab**
		Dept	**Dell**	**OptiPlex 5040**	**Desktop**	**17-Apr-17**	**Graduate Student Computer Lab**
		Dept	Dell	OptiPlex 7010	Desktop	NA	Geology lab/research computer
		Dept	Dell	?	Desktop	NA	Geology lab/research computer; connected to X-Ray diffractor
		Lab	**Apple**	**iPad Air**	**iPad**	**21-Nov-14**	**Growth Chamber computers**
		Lab	**Apple**	**iPad Mini**	**iPad**	**21-Nov-14**	**Growth Chamber computers**

Appendix EE. BGE Chemical Hygiene Plan

Chemical Hygiene Plan
(Click on the heading and another pdf file will open, 35 pages)