M.S. Environmental Science Program

Self Study

Academic Years 2012-2017

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

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PREFACE

A. Program Mission & History

The Master of Science in Environmental Science (MS ESC) program at the University of Tennessee at Chattanooga (UTC) focuses on student development of a strong scientific framework for addressing environmental issues. Toward this goal, the MS ESC program of study emphasizes sound scientific and technical training coupled with a contextual understanding of contemporary socioeconomic, political and legal realities. Graduates are prepared to meet the needs of business, government, and the non-profit sector as environmental professionals or to continue their education in doctoral or professional programs with environmental focus.

The MS ESC program is offered by the Department of Biology, Geology, and Environmental Science (BGE), which is the largest department in terms of total student enrollment in the UTC College of Arts and Sciences (CAS). The current Department is the result of the merger of the former Department of Biological and Environmental Sciences and the former Department of Geology in summer 2015 as part of a campus-wide restructuring process. In Department matters, we consider the three disciplines in BGE as Divisions. In addition to the MS ESC degree, BGE offers Bachelor of Science (BS) in Biology, BS in Geology, and BS in Environmental Science programs. In fall 2017, there are 31 graduate students enrolled in the MS ESC program (and 735, 190, and 41 undergraduate students enrolled in the BS in Biology, BS in Geology, and BS in Environmental Science programs, respectively).

The MS ESC program at UTC recently marked its 20th anniversary. Inception of the program in August 1997 was the result of a successful effort by the Department to propose the new program to the Tennessee Higher Education Commission (THEC) the year prior after more than a decade of consideration of offering a graduate program. The original THEC proposal outlined several lines of rationale for the development of an MS ESC program at UTC. First, a new MS ESC program would leverage the existence of a solid undergraduate program and faculty expertise in environmental science at UTC, and the multidisciplinary nature of the field also would accommodate student background and faculty expertise in biology. Second, the new program would solidify the Department's reputation as a leader in environmental science education in Tennessee and the Southeast. The Department's BS in Environmental Science program, created in 1974, was one of the first to be offered in the nation. Third, UTC was geographically well positioned to offer an MS ESC program. The proposal described widespread support for the new program from regional businesses, industry, government agencies, and non-profit organizations. Additionally, the diverse natural ecosystems and intense industrial activities in the region and Chattanooga's emerging interest in becoming a 'green' city provided many opportunities for graduate engagement and research. And fourth, an MS ESC program at UTC would comprise a unique graduate offering in the State, thus addressing THEC and University of Tennessee (UT) System concerns about duplication of existing programs at comparable State institutions, such as Middle Tennessee State University and East Tennessee State University, at that time. Such concerns had hindered am attempt by the Department to initiate an MS in Biology program in the 1970s. To date, the MS ESC program at UTC remains the only such program offered by a State institution in Tennessee.

B. Current Program Overview

Admission

Prior to applying to the M.S. ESC program at UTC, prospective students must meet associated academic requirements and identify a faculty member who will serve as the student's graduate advisor. Academic requirements include: 1) a baccalaureate degree from a regionally accredited institution of higher education or foreign equivalent, 2) an overall GPA of 2.75 or a GPA of 3.0 for the last 60 credit hours, 3) satisfactory scores on the general Graduate Record Examination (GRE), generally defined as scores above the 25th percentile for the verbal and quantitative sections, and 4) background knowledge of environmental science concepts equivalent to a two-semester undergraduate introductory environmental science sequence and/or an undergraduate or graduate ecology course. In addition, it is recommended that applicants have completed 1) at least four upper-level undergraduate science courses with lab components, 2) one course each in environmental ethics and environmental law, and 3) one course each in college calculus, introductory statistics, and computer science.

Applicants are informed that these admissions standards are minimums for consideration and do not guarantee acceptance into the program. Ultimately, admissions decisions are based on evaluations of quantitative and qualitative information provided in the application. The compatibility of each applicant's environmental science interests with that of our faculty and their availability is also considered.

Applicants submit all application materials via an online application portal to the UTC Graduate School, and complete applications are forwarded to program faculty for review. There are no deadlines for admission to the program (i.e., admission is rolling); however, it is suggested that prospective students apply by mid-March for fall semester enrollment or by early-October for spring semester enrollment to allow sufficient time for application review. In recent semesters, our faculty have discussed the implementation of fall and spring semester application deadlines for the MS ESC program to facilitate application review and best prepare for incoming students.

Program of Study

To earn the MS ESC degree at UTC, students must complete a program of study consisting of 36 total semester hours (i.e., credits) of coursework. These hours include academic credit associated with core courses, electives, and a graduate capstone experience consisting of either a thesis project, internship experience, or learned discourse. Core courses comprise 15 semester hours total; these courses include: ESC 5020 Mechanisms in the Environment (3 credits), ESC 5050 Biodiversity and Natural Resources Conservation (3 credits), ESC 5120 Applied Statistics for Environmental Scientists (4 credits), ESC 5140 Environmental Law and Regulations (3 credits), ESC 5700 Graduate Seminar I (1 credit), and ESC 5710 Graduate Seminar II (1 credit).

Elective courses comprise either 15 or 18 semester hours, depending on the capstone experience that a student chooses to pursue in partial fulfillment of the degree. Specifically, students conducting a thesis or internship in partial fulfillment of the degree requirements must complete 15 semester of hours elective coursework, while students conducting a learned discourse must

complete 18 semester hours of elective coursework. Elective hours may be comprised of graduate-level elective courses offered by BGE or graduate-level courses offered by other departments that are relevant to the study of environmental science and the degree program objectives as approved by each student's graduate advisor. Further description and discussion of the MS ESC curriculum is provided in Section 2.1 of this Self Study.

Capstone Experience

The choice of each student's capstone experience should support his/her academic objectives, research interests, and career goals, and should be informed by communication with the graduate advisor. Thesis projects and internship experiences are each associated with 6 semester hours of academic credit (ESC 5999 Thesis and ESC 5996 Internship), while a learned discourse is associated with 3 semester hours of academic credit (registered as ESC 5997 Individual Studies). A thesis project involves independent original research focused on a specific issue that is relevant to environmental science; it is an appropriate capstone choice for students who want to gain broadly applicable research experience. It is especially recommended that students who are considering future doctoral studies or a career involving research activities or oversight conduct a thesis project. An internship experience involves supervised environmental work with an appropriate sponsoring organization or business as a form of experiential learning that integrates academic knowledge with its practical application in a workplace setting. An internship is an appropriate choice for students who want to develop skills specialized for a particular type of environmental work and is especially recommended for students with very specific career goals that do not require further graduate study. A learned discourse allows students to deeply explore a specific topic relevant to environmental science through independent and original review of relevant available literature; it is an appropriate choice for students who want to further their knowledge base in an environmental science topic without focus on development of applied research or specialized workplace skills. It is especially recommended that students who want to advance in an already established career consider a learned discourse for the capstone experience.

To initiate the capstone experience, each student must prepare a written proposal for the work to be performed that is approved by the graduate advisor and two other members of the UTC Graduate Faculty who will serve as graduate advisory committee members. All capstone experiences culminate with the public defense of an associated written document. Further description and discussion of capstone experiences in the MS ESC program curriculum is provided in Section 2.6 of this Self Study.

Governance

Students pursing the MS ESC degree at UTC are governed by the overall policies and procedures implemented by the Graduate School at UTC and related program-specific requirements set forth by BGE. As such, students are instructed and expected to familiarize themselves with both sets of policies and procedures. The procedures and policies of the Graduate School are described comprehensively and updated annually in a Graduate Catalog, which is provided electronically on the Graduate School website. Program-level policies and procedures the affect MS ESC students are described comprehensively and updated annually in a Graduate Program Handbook,

which is provided electronically on the BGE website. To facilitate student familiarization with relevant policies and procedures, both the Graduate School and BGE have orientation sessions each semester for incoming graduate students. Students are instructed to direct any questions about policies and procedures to the MS ESC Program Coordinator (currently Dr. Jennifer Boyd; Dr. David Aborn from 2012-15), who will advise the student and/or seek clarification from the Graduate School as appropriate.

One BGE Graduate Faculty member is appointed each year to the UTC Graduate Council to represent the MS ESC program; this position is typically assumed by the MS ESC Program Coordinator. The Graduate Council, which is comprised of one faculty representative from each graduate program at UTC, is responsible for providing and periodically revising basic educational philosophy for graduate programs, ensuring that general policies and policies approved for individual graduate programs are maintained, and reviewing proposed new graduate courses and changes to existing curricula among other duties. As such, the MS ESC program maintains a voice in discussions of new and reviews of existing University-level policies and procedures.

Fees & Financial Assistance

A Graduate Fee Schedule for each academic year is published by the UTC Bursar's Office. For the current academic year, the maintenance fee for full-time graduate enrollment of 9 credit hours is $4,122/semester; the tuition fee for full-time graduate enrollment is an additional $8,059/semester charged to out-of-state students. Graduate students also are charged other student fees (e.g., student activity fee, green fee, technology fee, etc.); currently, these fees total $888/semester. In addition, students must pay any additional fees associated with courses in which they enroll, such as lab fees. Financial assistance in direct support of the pursuit of the MS ESC degree is available to students who serve as Graduate Assistants.

BGE currently has 11 full-time Graduate Teaching Assistant (GTA) lines to offer to qualified graduate students, and this number has been consistent throughout the past five years. GTA lines are funded by CAS and typically are awarded to students for one academic year, with possible renewal for a second academic year if the student remains academically eligible and performs well in assigned teaching duties. A typical GTA appointment involves 20 hours/week of work preparing and teaching laboratory sections of introductory environmental science or biology courses. Students with GTAs also help to organize and prepare lab classrooms for weekly lab activities; these duties are supervised on a weekly basis by lab coordinators in BGE (currently Drs. Cheryl Murphy and Brad Reynolds). Students interested in GTA appointments submit an application to the MS ESC Program Coordinator; applications are considered when a line becomes available. Applications are evaluated with a rubric that considers each applicant's academic preparation and performance and relevant experience. Attempts also are made to allocate GTA lines judiciously across Graduate Faculty advisors. GTAs are formally observed and evaluated by faculty twice each semester (at midterm and near the end) and by student evaluations near the end of the semester.

Students may be appointed as Graduate Research Assistants (GRAs) if supported by the grants and contracts of their graduate advisors. Typically, several students each year serve are

supported by GRA awards. GRAs play a fundamental role in the funded research, and may participate in related literature reviews, lab- or field-based research tasks, and/or preparation and presentation of research results. Graduate advisors serve as the supervisors of GRAs supported by their research funding.

Currently, all students awarded full-time Graduate Assistantships are supported by a waiver of maintenance fees (i.e., in-state costs) and tuition (i.e., out-of-state costs) and a minimum $3,500 stipend per semester, as per the policies of the Graduate School. The value of the waiver is adjusted each year to reflect changes in graduate student maintenance fees and tuition at UTC. The stipend amount has not changed during the past five years. GTAs are required to assume the costs of all other fees (e.g., student activity fee, green fee, technology fee, lab fees) required by the University.

Resources & Support

BGE is currently divided across five areas of the UTC campus (Holt Hall, Grote Hall, Davenport Hall, Collins Street Lab Annex, and the Collins Street Office Annex), and faculty active in the MS ESC program are located in each of these areas. Formerly, BGE was primarily housed in Holt Hall, which also housed the English, Philosophy and Religion, and Psychology Departments. Holt Hall was constructed in 1976 and has been undergoing significant renovations since spring 2017. When renovations are complete, Holt Hall will house only BGE and the department's space will roughly double. The Department also will retain its existing space in Grote Hall, which mainly houses our Geology faculty and Biology lecturers who teach Anatomy and Physiology, their associated teaching, laboratory, and storage spaces, and the Chemistry and Physics Departments. Faculty who are active in the MS ESC program will be housed primarily in Holt Hall after renovations are complete, with the exception of one faculty member who will be housed in Grote adjacent to her existing laboratory space. The Holt Hall renovations will include new common office/work space for graduate students with a separate area for GTAs to meet with undergraduates. The space for graduate students will be double the size of the space allocated to graduate students in Holt Hall prior to the renovations.

Students enrolled in the MS ESC program at UTC have access to various campus resources to support their program of study. These resources include the relatively new UTC Library (opened in January 2015), which provides print and electronic materials, computers, dedicated study spaces, and practice presentation rooms. The Library also houses a Graduate Student Lounge exclusively for use by graduate students. Information Technology (IT) manages access for all students to UTC's online services and email accounts and provides technological support and free software for students, including a number of products commonly used by MS ESC students. All UTC students also have access to the Counseling and Personal Development Center, which provides counseling at no charge to students who experience issues that adversely impact their academic progress and success. The Disability Resource Center at UTC provides support to students with disabilities seen or unseen (e.g., physical, learning, psychiatric), including special assistance or accommodation in courses. Further description and discussion of academic support services available to MS ESC students is provided in Section 3.6 of this Self Study.

The Graduate Student Association (GSA) at UTC represents its graduate and professional students in an official capacity. GSA members advocate for graduate students through regular communications with campus administrators and representation on the UTC Graduate Council. GSA also organizes and sponsors social networking events that bring together graduate and professional students from across campus. All MS ESC graduate students are encouraged to become involved with GSA.

C. Trends

Students

During the past five years, enrollment in the MS ESC program has ranged from 26-40 students, with an average semester enrollment of 32 students. Generally, more students are enrolled in fall semesters due to greater numbers of incoming students in the fall and graduations that occur during the academic year. When averaged across fall and spring semesters each academic year, enrollment was relatively high in the 2012-13 academic year (i.e., 40 students), but about average every year since then. The average semester student enrollment during the past five years is less than the average semester enrollment of 35 students during the five-year period described in the previous MS ESC review (i.e., 2006-2011).

In total, 41 students have earned the MS ESC degree from UTC during the past five years. This is comparable to the 42 graduates from the program during the previous five-year review period. The number of graduates produced by the program per academic year have fluctuated from 5-11 throughout the past five years, but these numbers have not followed any noticeable trend through time. On average, 8 students/year graduated from the MS ESC program during the past five years, which also is comparable to the yearly graduate rate during the previous review period. Of the 41 graduates since fall 2012, ~65% completed theses, ~30% completed internships, and ~5% completed learning discourses as their capstone experiences. This distribution differs from that during the previous two five-year program review periods, during which approximately equal numbers of graduates completed theses and internships. Changes to admission procedures that require applicants to secure a faculty chair prior to applying may have impacted this distribution.

While the majority of students enrolled in the MS ESC program during the past five years either graduated or are continuing to work toward the degree, 25 students were enrolled in the program at some time during the past five years but did not complete the program. Reasons for not completing the program likely vary and are not always known.

The MS ESC program always has attracted students who earned their undergraduate degrees at UTC, likely due to some combination of their familiarity with the institution, the Department, its faculty, and the local area. UTC undergraduates also are recruited to UTC graduate programs through an annual UTC Graduate Recruitment Fair sponsored by the Graduate School. About 45% of the current MS ESC student body earned their undergraduate degrees from UTC – the vast majority as Biology or Environmental Science majors – while the remaining 55% earned their undergraduate degrees primarily from other institutions in Tennessee or other states in the southeastern U.S. The percentage of current graduate students who have earned their undergraduate degrees from UTC is relatively high for our program; in our previous Program

Review, ~25% of MS ESC students had earned undergraduate degrees from UTC. Students currently enrolled in the MS ESC program include many from historically underrepresented groups in the natural sciences. At present, nearly 60% of our students are women and 20% identify as representing racial and/or ethnic minority groups. New students entering the program in fall 2017 were 70% women. Although in the past we have enrolled international students, all currently enrolled students are from the U.S. A female student from Belgium has completed all of her core and elective coursework, but has not yet completed her thesis project. Although not enrolled during fall 2017, she is planning to return to the program to complete her project in spring or summer 2018. At the program-level, we have not initiated a recruiting program to target students who represent minority groups; however, individual faculty members who are active in the MS ESC program have included the targeted engagement of students from underrepresented groups in research as broader impacts associated with externally funded projects.

Historically, the number of Graduate Teaching Assistantship (GTA) lines available to MS ESC students by the Department has increased from two at the program's inception to six in 2006, eight in 2011, and 11 at present. Of students who are currently enrolled in the program, about half have received financial support as current or past GTAs. About 20% of current students have served as GRAs. In addition, about 10% of current students have worked paid internships in partial fulfillment of the graduate program of study, two current students have been supported by other graduate assistantships, and one student's graduate education is supported via his military service.

The majority of graduates of the MS ESC program obtain jobs in environmental fields or continue their education in Ph.D. or professional programs. We have been able to follow the career and/or further educational paths of 36 of the 41 students who have graduated from the program in the past five years. These graduates are mostly employed in a variety of environmental career sectors, including consulting, government, industry, and education (~15% of graduates in each of these sectors) and non-profits (~10% of graduates), and one recent graduate works as a lab technician at a university. About ~10% of the recent graduates that we have tracked are enrolled in doctoral programs in biology, and one recent graduate is currently enrolled in medical school. Another ~10% of recent graduates are employed in non-environmental careers.

Faculty & Staff

Currently, the BGE faculty includes 25 full-time tenure-track faculty (Drs. David Aborn, Jose Barbosa, DeAnna Beasley, Jennifer Boyd, Amy Brock-Hon, Ethan Carver, Stylianos Chatzimanolis, Habte Churnet, Hill Craddock, Timothy Gaudin, David Giles, Loren Hayes, Anne Holmes, Azad Hossain, Hope Klug, Peggy Kovach, Jonathan Mies, Hong Qin, Sean Richards, Joann Romagni, Mark Schorr, Joey Shaw, Henry Spratt, John Tucker, Thomas Wilson), seven full-time non-tenure-track lecturers (Callie Adams, Nominanda Barbosa, Jeremy Bramblett, Dr. Jodi Caskey, Kate Harrell, Sarah Farnsley, Dr. Brad Reynolds), a faculty associate/lab coordinator (Dr. Cheryl Murphy), a lab coordinator (Wayne Williams), and an academic advisor (Joseph McCauley). All members of the Department do not contribute equally to the MS ESC program given their qualifications, relevance of their expertise and research foci

to environmental science, and contracted duties. Two administrative support personnel (Kelly Locke, Marketa Shutters) support the functions of the Department as a whole, including its undergraduate and graduate programs.

To be active in the MS ESC program, a faculty member must apply for Graduate Faculty status as per the policy set forth by the UTC Graduate School. There are three categories of membership in the Graduate Faculty at UTC – Full, Associate, and Special. Full members may teach courses, direct theses, and serve on thesis committees, while Associate members may teach courses and serve on thesis committee, but not direct theses. Special membership can be given to faculty without a terminal degree, visiting or adjunct faculty, and professionals in the field to teach specific graduate courses or serve on specific thesis committees. All appointments must be renewed every five (for Full and Associate members) or three (for Special members) years. Currently, the Graduate School lists 22 BGE faculty as having Graduate Faculty status – 19 Full, two Associate, and one Special. The Graduate School also lists 13 Special and two Associate Graduate Faculty from outside the Department who are affiliated with the MS ESC program.

During the past five years, 13 tenure-track BGE faculty members (Aborn, Boyd, Craddock, Gaudin, Giles, Hayes, Hossain, Klug, Richards, Schorr, Shaw, Spratt, Wilson) have served as graduate advisors/committee chairs for MS ESC students. This list includes the eight faculty who had served as graduate advisors/committee chairs during the five years of our previous Program Review (i.e., 2007-2012); new graduate advisors/committee chairs since that time have consisted primarily of new hires or faculty who were relatively new at the time of our previous Program Review (Giles, Hayes, Hossain, Klug). An additional four other tenure-track faculty members (Barbosa, Chatzimanolis, Kovach, Mies, O'Neill) served on graduate student committees within the past five years. In addition, 19 Associate and Special members of the UTC Graduate Faculty members from other UTC departments, other institutions, and professional capacities have served on MS ESC student committees during this time period.

Five faculty members (Aborn, Boyd, Richards, Schorr, Tucker) currently teach the core graduate courses; this list consists primarily of the same faculty who were teaching these courses during the five years of our previous Program Review (i.e., 2007-2012). An additional six other tenure-track faculty members (Barbosa, Hayes, Klug, Shaw, Spratt, Wilson) have taught graduate-level elective courses during the past five years. On occasion, local environmental professionals (as adjunct faculty) and faculty associates from other UTC departments have offered additional elective graduate special topics courses. The department uses all of its GTA lines to teach introductory biology and environmental science laboratories. One lecturer (Reynolds) and one faculty associate (Murphy) currently serve as coordinators of the undergraduate environmental science and biology labs, respectively, and oversee training, coordination, and supervision of GTAs. An administrative specialist who handles payroll, hiring, and bookkeeping (Locke) and an administrative assistant who handles communications, travel, and secretarial tasks (Shutters) support the MS ESC program in addition to the large BGE undergraduate programs. Several undergraduate students assist with these tasks as workstudy assignments. BGE also has an academic advisor (McCauley) who primarily advises undergraduate students in selecting their coursework; however, he also can provide overrides for MS ESC graduate students to enroll in graduate courses that are not available for general registration (e.g., ESC 5999 Thesis, ESC 5997 Internship).

BGE (considered with inclusion of its former existence as the Department of Biological and Environmental Sciences and the Department of Geology) has undergone modest staffing changes throughout the history of the MS ESC program. When the MS ESC program was instituted in 1997, the Department of Biological and Environmental Sciences included 15 full-time tenure-track faculty and two full-time non-tenure track faculty (a lecturer and a faculty associate). By the time of the previous program review in 2012, that Department had grown to include 17 full-time tenure track faculty, four non-tenure track lecturers, one non-tenure track faculty associate, an administrative specialist, and an administrative assistant. The current size of BGE has resulted in part from the merging of the former UTC Biological and Environmental Sciences Department with the UTC Geology Department (which included four full-time tenure track faculty, one lab coordinator, and an administrative specialist) in summer 2015. We also gained five new tenure-track faculty members (Beasley, Giles, Hossain, Qin, Romagni) within the past five years. A sixth new faculty member (Eric O'Neill) was hired but left UTC within this timeframe. One of these new faculty members is UTC Vice Chancellor for Research and Dean of the Graduate School (Romagni), and one has a joint appointment with Computer Science (Qin), which acts as his home department. Three of our current seven lecturers were hired within the past five years (Barbosa, Caskey, Farnsley). A faculty associate/lab coordinator (Becky Bell) retired within this time period, but this position was filled by a new hire (Murphy). A research assistant professor (Yukie Kajita) was hired but left UTC during the past five years. Our academic advisor (McCauley) also was hired in the past five years. With the merger of two previous departments, one administrative specialist position was eliminated.

As an institution, UTC is committed to embracing diversity of its faculty and staff. In the past five years, BGE has hired and retained three full-time tenure-track faculty members (Beasley, Giles, Hossain). One of these new hires is female and two represent underrepresented racial or/or ethic minority groups in the natural sciences. BGE also acquired two tenure-track faculty through other hiring processes (Qin, Romagni), who contribute additional female and minority representation to the Department. All three lecturers who joined the Department within the past five years are women, and one represents a minority group. Our new faculty associate/lab coordinator is also a woman.

D. Recent History, Changes & Developments

Improved Clarity and Accessibility of Policies & Procedures

During the past few years, we improved the clarity of policies and procedures of the MS ESC program for both our students and faculty by developing an updated MS ESC Graduate Program Handbook that is comprehensive, meets accessibility requirements, and is available electronically with hyperlinks to UTC Graduate School policies, information, and forms. In addition to policy and procedural information, the handbook provides updated lists of our Graduate Faculty and important dates and deadlines and includes checklists that MS ESC students can use to meet semester requirements. This MS ESC Graduate Program Handbook has been commended by the Graduate School and used as a template for the development of similar guides by other graduate programs at UTC. A printed copy of the MS ESC Graduate Program Handbook is provided in Appendix A.

In recent years, the MS ESC Program Coordinator has served on the UTC Graduate Council's Best Practices Committee, which has conducted a very thorough and extensive review of UTC Graduate School policies and procedures and the clarity of their descriptions in the UTC Graduate Catalog, which also is published online. This work, which spanned several semesters, was very recently completed and should improve clarity of University-level policies that affect MS ESC students.

To help ensure that MS ESC faculty and students are aware of University-level and program-level policies and procedures and recent changes in these requirements, the MS ESC Program Coordinator has begun in recent years to run an informal but required informational session/workshop for all MS ESC faculty at the beginning of each academic year. The Coordinator also has continued to host program-level orientation sessions for incoming MS ESC students at the beginning of each semester.

Program of Study Reduction

Effective in fall 2016, we reduced the total credit hours required for students to complete the MS ESC program of study from 38 to 36. The reduction in our total program of study semester hours to 36 keeps with the spirit of a two-year M.S. degree, aligns with our typical four-semester Graduate Teaching Assistantship appointments, and continues to match or exceed the semester hours associated with other thesis- or project-based M.S. in Environmental Science programs. The modification to our program of study accommodated a concurrent increase in the semester hours associated with our core ESC 5120 course from 3 to 4 and involved a reduction in the required credit hours of elective courses. Further description of the program-level change is provided in Section 2.1 of this Self-Study.

Development & Assessment of Student Learning Outcomes

As an institution, UTC has been increasingly focused on the development and assessment of clear and measurable student learning outcomes (SLOs) at both program and course levels in recent years. Prior to fall 2016, we listed MS ESC program objectives (but not student learning outcomes) that were limited and not being assessed consistently or comprehensively because they were not measurable or were difficult to measure. Effective in fall 2016, we implemented new program-level MS ESC objectives that would be more easily assessed and better reflect the emphases of the program. Since that time, we have further developed these objectives into SLOs. These MS ESC SLOs can be used by faculty teaching graduate courses to develop well-aligned course-level SLOs. Beginning in fall 2016, we are assessing select SLOs each year through well-aligned course-level assessments. Further description and discussion of the MS ESC SLOS is provided in Section 1.1 of this Self-Study.

Differentiation of Graduate Course Sections

Most of the elective coursework in which students in the MS ESC program enroll during their programs of study consist of graduate sections of courses that also include cross-listed undergraduate sections. However, University-level policy requires that instructors of these courses develop distinct SLOs for graduate students that reflect higher-order thinking with

associated distinct assessments. Beginning in fall 2015, faculty teaching in the MS ESC program have been required to provide separate syllabi for cross-listed graduate and undergraduate sections of courses that included these distinct SLOs and otherwise differentiated between these sections. Further description of graduate syllabi is provided in Section 2.3 of this Self-Study.

Improved Ability to Track Student Progress

Currently, the UTC Graduate School is testing the use of MyMocsDegree, which is a web-based degree evaluation and advising tool currently used by UTC undergraduates and their faculty advisors, for graduate students and advisors. This tool combines degree requirements and completed coursework in a clear way that allows students to track their progress toward a degree. Because graduate programs are generally more unique from one another than undergraduate programs (which share many requirements like general education courses), the use of MyMocsDegree for graduate programs is more complicated. The progress of current MS ESC graduate students can now be viewed in MyMocsDegree. Students in the MS ESC program who have used this tool have reported some minor issues with the ways in which degree requirements are listed or categories in which certain coursework is placed, so it is still important for students to have a clear understanding of their progress outside of MyMocsDegree. However, the Graduate School has been very receptive in modifying the system to address issues, and we are hopeful that this system will quickly become a helpful and reliable tool for our students and faculty.

Electronic Application Submission & Review

In fall 2017, the UTC Graduate School implemented a new fully online portal for applying for admission into all graduate programs at UTC. The previous system consisted of an online application form followed by email communication from the Graduate School explaining how to submit required materials such as a transcript, GRE scores, and CV. Applicants also had to arrange for the writers of letters of recommendation to email their letters directly to the Graduate School. The new online application system, which uses the RADIUS platform by Campus Management, provides a more streamlined approach, in which prospective students can complete the application form and submit required and requested materials in one place. Applicants also can send electronic requests for letters of recommendation to prospective writers, who can then upload their letters directly to the online system.

To prepare for using the new online application system, the MS ESC Program Coordinator worked with personnel in the UTC Banner Systems Support Services office to provide written material for the system that included a program description and list of admissions requirements and recommendations and templates of reference request and confirmation, application confirmation, and admission acceptance and decline emails. The Coordinator also worked with Banner personnel to tailor the system to solicit application materials specific to our program. Prior to the implementation of this system, MS ESC Program Coordinators reported receiving frequent emails from prospective students with questions about the application process, which they then had to direct to the Graduate School. Since the adoption of the new system, these kinds of emails have not been received.

In fall 2016, the Graduate School began using the AppReview system by Hobsons to handle incoming MS ESC applications and direct them to our program faculty to review and make a recommendation for or against admission. Prior to this system, all materials that comprised completed applications to our program were emailed from the Graduate School directly to the Program Coordinator, who would then distribute the application to all BGE Graduate Faculty to review. Individual faculty would email their reviews to the Program Coordinator to review. If he/she found that a consensus of the reviews of an application was not apparent, the MS ESC Graduate Faculty would then meet to discuss the application. Once a decision for or against recommendation was made, the Coordinator would then email that decision and its rationale to the Graduate School, which would then make a decision based on the recommendation and inform the applicant of that decision. This process was tedious, slowed down the review process, and added to faculty workloads. The new AppReview system automatically emails faculty when new applications are available for review and allows faculty to view all materials and make their recommendations with comments explaining their reasoning electronically in the system. The Coordinator can then see all of the comments and make a program-level recommendation. If there is a need for discussion, this can be handled electronically or brought forward during a faculty meeting. Once a program-level recommendation is made, the Graduate School is automatically informed of the recommendation. This system has streamlined the review of applications by our faculty; in most cases, we are able to make a recommendation to the Graduate School within two weeks of receiving an application.

Identification of Advisor by Applicants

Effective in fall 2016, applicants to the MS ESC program must identify a faculty advisor as part of the application process. We implemented this change, which was proposed to and approved by the UTC Graduate Council, to encourage prospective students to consider the relationships between their interests and the expertise of our faculty and to help incoming students to graduate in a more timely way (by enabling them to begin their capstone experience immediately upon enrollment in the program). This is standard procedure for many graduate programs in the natural sciences. Previous to this change, some students finished their core and elective coursework without making significant progress on a thesis, internship, or learned discourse due to a lack of advisement, which would prolong the time that it would take to earn the degree. Additionally, faculty with existing heavy graduate student advisement loads were concerned that they would not be available to advise incoming students who shared their research interests. Although it is too early to determine if this change will be effective, we have calculated that the average time for a student to earn the MS ESC degree during the past five years was ~3.5 years. We plan to compare this figure with the time that students entering the program since this change was implemented take to earn the degree.

Additional Graduate Teaching Assistantships

At the time of the previous MS ESC Program Review, the program had eight Graduate Teaching Assistantship (GTA) lines supported by CAS. As of fall 2012, the program has had 11 GTA lines supported by the College. The additional three lines have enabled BGE to staff 33 sections (24 student each) of introductory biology and environmental science labs each semester, which provides students with teaching experience while allowing our faculty to focus on more upper-

level teaching responsibilities. Typically, a few additional sections of these introductory labs remain each semester (i.e., more than 33 lab sections are offered); these sections are typically staffed by adjunct faculty.

Website Revision & Updates

Beginning in fall 2015, we have revised the MS ESC program website, which is linked from the BGE home page, to be more focused on our current and prospective students. Dr. Cheryl Murphy has been especially instrumental to the overall management of our website, in addition to her numerous other duties, and the BGE Graduate Faculty Committee has developed the new content. This new content includes scrolling photos and a 'Students in the Spotlight' feature that describe accomplishments of our current students, an 'Alumni Updates' feature that describes the accomplishments of our graduates, links to our Graduate Program Handbook, a list of important dates, and ways to learn how to apply and request more information about the program. The Committee views the revised website content as an improvement over its past version; however, there are concerns that the website navigation could be simplified/clarified. The design of UTC websites are restricted by a University-level template and format.

Transfer of Program Coordinator Role

The MS ESC Program Coordinator role is a continuing appointment. Dr. Jennifer Boyd is currently serving as the MS ESC Program Coordinator, a position that she assumed in fall 2015. Dr. David Aborn served as the MS ESC Program Coordinator for the earlier part of the past five years. Both faculty have been active in the program as instructors and advisors. For a year prior to the transition, they worked together to ensure that it would be smooth. In spring and summer 2017, Dr. Hill Craddock served as interim Coordinator while Boyd was on sabbatical. Throughout the past five years, Dr. Brad Reynolds has supported the coordinators by serving on Graduate Council as needed.

Creation of a Graduate Faculty Committee

Prior to fall 2015, discussions of significant matters that affected the MS ESC program, such as curriculum development and proposed changes to policies and procedures involved all MS ESC faculty with Graduate Faculty status. As our body of faculty has grown through the years, it became difficult for the MS ESC Program Coordinator to organize meetings at times that agreed with everyone's schedules. In fall 2015, Department Head John Tucker created a new BGE Graduate Faculty Committee to represent the larger body of Graduate Faculty in the Department. This Committee of ~6-8 faculty members appointed yearly has been better able to meet regularly (i.e., twice per month) to discuss important matters. Its role is to make recommendations to the larger body of BGE Graduate Faculty on such matters that can then be brought to a vote as appropriate during regularly scheduled Department meetings.

Changes in Graduate School Leadership

Leadership in the UTC Graduate School has changed twice in the past five years. During the 2012-13 and 2013-14 academic years, Dr. Jerald Ainsworth served as Dean of the Graduate

School; he is now the University Provost. During the 2014-15 academic year, Dr. Randy Walker acted as Interim Dean of the Graduate School; he had previously chaired the Graduate Council as its representative from Physical Therapy program. In summer 2015, Dr. Joanne Romagni was newly hired as the Vice Chancellor for Research and Dean of the Graduate School at UTC. Given the expanded scope of her position (to also include oversight of University research), Dr. Romagni appointed Dr. Ethan Carver from BGE to the position of Assistant Dean of the Graduate School. In this position, Carver serves on the Graduate Council and is responsible for the day-to-day functions of the Graduate School; as such, he is a primary point-of-contact for the MS ESC Program Coordinator for matters that require decisions. For more general questions and clarification of Graduate School policies and procedures, the Graduate School staffs program liaisons for all graduate programs at UTC. The Program Liaison for the MS ESC program is Jessica Dickerson.

E. Response To Previous Program Review

Drs. Susan Bratton (Professor, Department of Environmental Science, Baylor University) and Maribeth Watwood (Professor and Chair, Department of Biological Sciences, Northern Arizona University) conducted our 2012 Graduate Program Review. The reviewers provided an overall positive overview of our program, describing the effectiveness of our curriculum and research activity at providing students with advanced environmental training in a location with a growing need for such expertise and skills. However, the reviewers expressed concern that the large increase in undergraduate enrollment in the Department that had occurred in the previous five years could limit resources (i.e., faculty, coursework, space, support staff) for the MS ESC program. The reviewers also viewed our program as somewhat young with yet unrealized potential in scholarship and the ability to broaden in terms of the diversity of graduate options that we offer to students. In their report, Drs. Bratton and Watwood provided 11 specific recommendations and goals for our program. The following sections describe these recommendations/goals and our responses to them.

1. Greater and Improved Lab Space to Support Graduate Student Research

At the time of the previous MS ESC Program Review in 2012, a new life sciences building for UTC was being discussed; it was listed as a priority project by both the University and the State. However, since that time, it has been decided that sole assignment of Holt Hall to BGE following a significant renovation would address the growing needs of BGE. Previously, we shared Holt Hall with the Departments of English, Philosophy & Religious Studies, Psychology, and Women's Studies, as well as CAS offices and the UTC Writing Center. Although somewhat disappointing when considered relative to the possibility of a new building, the new allocation and renovation of Holt Hall will provide >30% more space in that building to BGE faculty. Both prior to and during the renovation, graduate students have been provided space in their advisor's lab and/or in a relatively small, shared graduate student office in Holt Hall. The Holt Hall renovation includes a doubling of graduate student office space.

Our Geology faculty will continue to be housed in Grote Hall following the Holt Hall renovation, where they generally do not have dedicated research space. As it can be very challenging to be productive in research without dedicated research space, dedicated research space for Geology

faculty is needed for their effective participation in the MS ESC program. The most recent geology hire (Hossain, 2016) is already mentoring several graduate students and was provided temporary lab space in Holt Hall. Permanent space for Hossain will be provided after the Holt renovation is completed. One member of the Biology and Environmental Science faculty also will be housed in Grote Hall following the Holt Hall renovation – in an office adjacent to her existing research space (which was retrofitted to house her research equipment). This research space was acquired in the past five years by repurposing a former teaching lab (also allocated to BGE) that was underutilized due to noise issues. Retrofitting of this space began in fall 2013 to accommodate six large controlled-environment growth chambers that were acquired with support from the National Science Foundation. During the past few years, this new research space has been used by several graduate students for their thesis research.

Following the ongoing renovation of Holt Hall, there will be three or four vacant office spaces and four vacant research spaces in that building. If BGE hires a new tenure-track Biology and/or Environmental Science faculty member every two or three years, which has been our historical pace, the Department will be at capacity within 10 years. If we hire any Geology tenure-track faculty, there may not be space (office or research) in Grote Hall to accommodate that expansion. Thus, while the Holt Hall renovation will improve our space as a Department, we will soon likely require additional space. As such, it is critical that the University actively continues to seek ways to provide BGE with additional, high quality space. Further description and discussion of space resources and space allocation in BGE is provided in Section 5.1.2 of this Self-Study.

2. Increased Number of Graduate Teaching Assistants

The provision of Graduate Teaching Assistantship (GTA) awards supports the costs of graduate education, allowing us to recruit students more successfully. The utilization of GTAs in introductory laboratory courses allows our faculty to offer more upper-level (including graduate-level) coursework. In our previous Program Review, the reviewers assessed that the Department had an inadequate number of GTA lines, and that the desired ratio for graduate program development would be one GTA per tenure-track faculty line at a minimum. At that time, the MS ESC program received support from CAS to support eight GTA lines. In Fall 2011, we offered 44 sections of introductory-level biology and environmental science laboratories to meet student demand for these courses; our eight GTAs at that time covered 24 of these 44 laboratory sections. Eight adjuncts and three faculty members staffed the remaining laboratory sections.

In response to recommendations in our previous Program Review, the MS ESC program was given three additional GTA lines in 2012. In Fall 2017, we are offering 40 sections of introductory-level biology and environmental science laboratories. Our 11 current GTAs are able to cover 33 of these sections, which is a significantly more coverage than in the past. Three adjuncts and two faculty members currently are teaching the remaining laboratory sections.

Although we have received three additional GTA lines since the time of our previous Program Review, it should be noted that about half of our students did not receive any financial support for their education from UTC. As a comparison, Appalachian State (one of our 'aspirational peers') offers an M.S. in Biology program that currently enrolls 50 students and is able to

guarantee GTAs to all students who are accepted into the program by the application deadline. As such, nearly three-quarters of students in that program receive significant financial support from the University.

To support the MS ESC program, BGE continues to make periodic budget requests to CAS for additional GTA lines to support our students. We also have recently requested CAS support for a couple of competitive GRA awards that could help us to recruit high quality applicants; however, this request was not granted. The MS ESC program will continue to seek ways to provide more Graduate Assistantships to qualified students in our program.

3. Rise in Graduate Student Publication Levels

In our previous Program Review, the reviewers noted accurately that the majority of MS ESC student thesis projects were not being published in refereed outlets. To encourage graduate student publication levels, the reviewers recommended that the Department establish goals for thesis publications (such as having 50% of theses published) and consider ways to support those goals. Suggested areas to consider included teaching load reductions for exceptionally high graduate supervisory loads and the establishment of a policy that would allow publication of a refereed article to serve as an alternative to thesis completion.

In this area, there has been little change within the past five years. Overall, <20% of theses written by MS ESC graduates during the past five years have resulted in refereed publications. There also has continued to be high variability in the participation of BGE faculty as graduate advisors and high variability among faculty active in the program as to the number of graduate students advised. As noted above, this variation occurs because the research expertise and interests of some BGE faculty lends itself to participation in the MS ESC program, while the research expertise and interests of others does not. Regardless of whether faculty are active in the MS ESC program or not, all BGE tenure track/tenured faculty are required to establish ongoing research programs, and thus typically receive one course release to facilitate scholarly and creative activity. New University-level policy suggests that faculty with very large externally funded research projects (which typically include funding to support Graduate Research Assistantships) receive further reductions in their teaching loads, and this could improve focus on research and resultant publications of faculty active in the MS ESC program. However, the demands for faculty to teach due to high undergraduate enrollments have precluded the ability to consistently offer such release time. As a partial solution, BGE recently requested approval to hire a Ph.D. level generalist capable of teaching upper level core and elective courses. If approved, this position will make it more feasible to cover courses when faculty receive extraordinary teaching releases.

While it seems reasonable to allow a refereed publication to substitute for a thesis, which could incentivize MS ESC students to publish their work, the UTC Graduate School sets standards for thesis-track students that must be followed by all of its graduate programs. These standards require the writing a thesis in accordance with specific formatting standards and its public defense. At the program-level, we could consider ways in which a manuscript-style report could fit into these guidelines and discuss possibilities with the Graduate School. Further description

and discussion of research dissemination by MS ESC students is provided in Section 3.3 of this Self-Study.

4. Improved Compensation for Graduate Teaching Assistants

All students awarded full-time GTAs have continued to receive a full waiver of maintenance fees (i.e., in-state costs) and tuition (i.e., out-of-state costs) that has accommodated changes in the cost of graduate education at UTC during the past five years. Currently, the value of these waivers is $8,244/year for in-state students and $24,362/year for students from out of state. Graduate Assistants also receive a stipend; the minimum stipend amount is set by the Graduate School. The $3,500/semester stipend awarded currently to GTAs represents an increase of $225/semester that took effect in fall 2013; the amount has not been increased since that time. All graduate students are charged for other student fees (e.g., student activity fee, green fee, technology fee, etc.) that currently total $888/semester; these fees are not covered by the GTA awards. If paid out of the stipend that a GTA currently receives, $2,612/semester remains to support living expenses and other costs of attendance.

In our previous Program Review, the reviewers noted that our compensation for GTAs was below the lowest level reported by the *Chronicle of Higher Education* at that time and suggested that UTC improve GTA compensation to match levels comparable with similar programs at like institutions. At present, the minimum Graduate Assistantship stipend is $4,000/semester at Appalachian State University (one of our aspirational peer institutions). Since the previous MS ESC Program Review, the Department has regularly included funds to supplement the stipends of its GTAs in its budget requests to the UTC CAS; however, these requests have not been granted. The MS ESC program will continue to seek ways to improve compensation for our Graduate Teaching Assistants.

5. Establishment of a Long-term Protocol for Program Management

In our previous Program Review, the reviewers recommended that the Department establish a long-term protocol for managing the graduate program that would include outreach, regular revision of handbooks, and other activities. Management of the MS ESC program is primarily the responsibility of Graduate Program Coordinator appointed from our faculty with regular consultation with the Department Chair. The appointment to Graduate Program is a continuous appointment. Since fall 2015, Jennifer Boyd has been serving in this capacity; Hill Craddock served as interim Coordinator during Boyd's sabbatical in spring 2017. For the first three of the past five years, David Aborn served as the Coordinator.

Prior to fall 2015, discussions of significant matters that affected the MS ESC program involved all BGE Graduate Faculty. This involvement became difficult to manage as the size of our faculty grew through the years. The creation in fall 2015 of a new BGE Graduate Faculty Committee to represent the larger body of Graduate Faculty in the Department has facilitated the process of discussing important matters prior to input and voting (if appropriate) by the full Graduate Faculty. In the summer prior to her appointment as Coordinator, Boyd prepared a draft comprehensive and updated MS ESC Graduate Program Handbook as this has been identified as a significant need for the program. One of the first accomplishments of the new BGE Graduate

Faculty Committee was to review, provide feedback, and ultimately approve this Handbook. The Handbook was prepared to be available electronically with hyperlinks to supplemental information and materials and can be updated annually with minimal effort.

6. Evaluation of the Potential for Additional Degrees or Tracks

Our previous reviewers recommended that the BGE consider developing additional graduate degree programs (such as Organismal Biology or Biomedical Science) or tracks within the existing MS ESC program that would enable all tenure-track faculty in the Department better access to graduate assistants. They suggested that such access could improve overall faculty scholarship and the research profile of the Department as a result. With new leadership in the Graduate School during the past five years (since summer 2015) under a new position title (Vice Chancellor for Research and Dean of the Graduate School), there has been increased interest at the University-level for growing our research programs. This interest has been demonstrated by recent initiatives to provide internal funding to support 'seed' collaborations toward generating external proposals and to increase the profile of research within the UTC community through an annual 'Research Dialogues' showcase of student and faculty scholarship. Early drafts of a new Graduate School Strategic Plan include increasing graduate enrollments as a primary goal.

Although we have periodically entertained the idea of developing a more biology-focused graduate degree program that would be inclusive of broader faculty areas of expertise, historic concerns of the Tennessee Higher Education Commission about program proliferation and redundancy at the State level could be a likely issue. Prior to the development of the MS ESC program, the Department proposed an M.S. in Biology program but the proposal was rejected due to these concerns. However, given the current research-friendly climate of the University, it may be time to revisit the possibility of broadening our Department's M.S. degree offerings.

Currently the MS ESC program has three tracks (i.e., our 'capstone experiences') – Thesis, Internship, and Learned Discourse. It was recommended by program reviewers that we eliminate the Learned Discourse option. Although underutilized and typically used as 'fallback' option for students who encounter unexpected thesis and internship setbacks, this track remains one that we think could be useful to students who are currently employed in sectors where professional development in the area of environmental science could be marketable (e.g., high school teachers, TVA engineers). During the current academic year, the BGE Graduate Faculty Committee is thoughtfully exploring the potential to develop a more marketable and targeted non-thesis, non-internship track that would allow us to maintain (or even increase) enrollments while easing the advisement loads associated with thesis students. Increased MS ESC enrollment could have the added benefits of making it more feasible to offer new graduate level only course options and increasing the likelihood the program would receive additional Graduate Teaching Assistants.

7. Reorganization of the Departmental Safety Program

In our previous Program Review, the reviewers cited the 'very immediate need' to reorganize our departmental safety program to include better implementation of standard safety practices and formal training of graduate students of safety protocols in both teaching and research

laboratories. It was their assessment that the rapid expansion of teaching and research activities in the previous five-year period in our Department had overwhelmed our former system of safety management that relied on a single teaching laboratory coordinator. Although the responsibility of its management continues to involve a single laboratory coordinator, the Department has taken steps to reduce other responsibilities of the laboratory coordinator and to reorganize and improve its safety program. Specifically, teaching microbiology lectures and labs and coordinating the microbiology preparatory lab are no longer required of this position. Since our previous Program Review, the Department hired Dr. Cheryl Murphy as a faculty associate/lab coordinator. Among her other responsibilities, Murphy manages our departmental safety program as a trained Chemical Hygiene and Safety Officer and Emergency Management Officer. In this capacity, Murphy conducts formal training of all new Graduate Teaching Assistants and any graduate students with access to teaching or research laboratories in appropriate safety protocols. She also routinely inspects laboratory spaces to ensure that proper safety measures are being practiced and maintains a Chemical Hygiene Plan for the Department that is linked on our website. Further description and discussion of the BGE safety program is provided in Part 5 of this Self-Study.

8. Improved Access to Electronic Library Resources

It was recommended in our previous Program Review that the Department work to improve access to electronic journals, and especially full-text journal articles, toward enhancing scholarship in the MS ESC program. Since the Previous Review, the new state-of the-art UTC Library has opened. In addition to new physical space that includes study rooms, a computer classroom, presentation rooms, and conference rooms, the UTC Library provides faculty and students with access to 400,000+ print and online materials, relevant databases, and discipline-specific journals. The UTC Library also provides access to an Interlibrary Loan (ILLiad) system that allows faculty and students to obtain copies of items that it does not own.

At the Departmental level, we have a Library Committee and a Departmental Liaison in the library. To evaluate and assess our library needs, each spring, 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 how this money will be spent, but if we do not make such requests, the Departmental Liaison will choose resources to purchase for our Department. Most of our faculty do not make any or many requests for new materials, suggesting that existing resources are adequate. Further description and discussion of our library resources is provided in Section 3.6 of this Self-Study.

9. Improved Advertising and Outreach to Prospective Students

Our previous program reviewers recommended that we take advantage of resources provided by the Graduate School to improve advertising and outreach to prospective students. In fall 2015, the Graduate School began an initiative to create recruitment sheets for each graduate program at UTC that would be distributed at regional recruitment events. The sheets have a standardized format but allow for program control of content. We worked with the UTC University Relations Office to produce a recruitment sheet that reflected our program at that time. However, we

quickly realized the potential for print recruitment materials to become outdated due to changes to our program and the merger of our former Department with the Geology Department that occurred later that year. As a result, we have since been prioritizing electronic recruitment tools that can be easily updated, as well as face-to-face events. For example, our revised MS ESC program website is more student-focused and provides links direct links to the Graduate School application system and to request more information about the program. Recently, we modified the link to request more information so that it directs prospective students to a fill-in Inquiry Form in RADIUS that allows us to collect information about how they learned about our program, which can help us to design more effective recruitment strategies in the future. Currently, the BGE Graduate Faculty Committee is discussing the use of targeted emails to highly qualified students in our undergraduate program as a recruitment tool.

Each fall, the MS ESC program participates in a UTC campus Graduate Program Recruitment Event to encourage UTC undergraduates to apply to continue their education at UTC. Generally, our participation in this event generates several same-day applications to the program from current UTC undergraduates. A relatively high percentage of current MS ESC students have earned their undergraduate degrees from UTC as opposed to other institutions when compared with historical data for our program. While not necessarily a concern, the BGE Graduate Faculty Committee is going to consider this information when thinking about recruitment strategies. Active recruitment of students outside of UTC generally occurs somewhat informally when our faculty attend professional conferences or give invited lectures at other institutions. We could consider more formal ways of targeting the recruitment of students from other institutions in the future.

10. Retirement or Enhancement of the Learned Discourse Capstone Experience

Currently the MS ESC program has three tracks (i.e., our 'capstone experiences') – Thesis, Internship, and Learned Discourse. It was recommended by program reviewers that we eliminate the Learned Discourse option. Although underutilized and typically used as 'fallback' option for students who encounter unexpected thesis and internship setbacks, this track remains one that we think could be useful to students who are currently employed in sectors where professional development in the area of environmental science could be marketable (e.g., high school teachers, TVA engineers). During the current academic year, the BGE Graduate Faculty Committee is thoughtfully exploring the potential to develop a more marketable and targeted non-thesis, non-internship track that would allow us to maintain (or even increase) enrollments while easing the advisement loads associated with having many thesis students. Increased MS ESC enrollment could have the added benefits of making it more feasible to offer new graduate level only course options and increasing the likelihood the program would receive additional Graduate Teaching Assistants.

11. Monitoring of Productivity within the Context of Graduate Supervision

In our previous Program Review, the reviewers recommended that the Department Chair consider the impacts of graduate supervision on the scholarly productivity of faculty in the Department. It was suggested that such consideration include the monitoring of basic productivity metrics such as annual publication rate, percentages of theses published, and

graduate time to completion against graduate supervisory loads (i.e., the number of graduate students being advised) of faculty. In discussions among our faculty about graduate supervisory loads, arguments have been made that advising graduate students helps faculty to be productive while counterarguments have been made that heavy time investment in supervising graduate students does not always increase productivity and can even decrease productivity. While such monitoring could be insightful, we are concerned that it could be difficult to isolate graduate supervisory loads as primarily influential to scholarly productivity relative to the many other factors that could influence individual faculty productivity (e.g., teaching loads, contact hours, undergraduate research supervision, service activities, external funding, collaboration, resource allocation, etc.).

PART 1. LEARNING OBJECTIVES (OUTCOMES)

1.1 Program and Student Learning Objectives (Outcomes)

The Program Learning Objectives for the MS ESC program as listed in the current UTC Graduate Catalog follow:

- Students will demonstrate advanced core knowledge of areas of environmental science specific to the program of study.
- Students will be able to evaluate environmental issues with a holistic approach that reflects the interdisciplinary nature of the field.
- Students will hone advanced analytical and critical thinking skills and effective advocacy and communication skills.
- Students will contribute to the development of knowledge in the field of environmental science through scholarly research and/or experience.
- Students will be prepared to enter the environmental career sector and/or pursue advanced environmental studies in graduate or professional programs.

Our current Program Learning Objectives represent revisions that occurred during the past five years. Prior to fall 2016, we listed MS ESC program objectives that were limited and not being assessed consistently or comprehensively because they were not measurable or were difficult to measure. As an example, a previous program objective stating that a 'survey of job supervisors where graduates are employed will show performance rates for graduates that are equivalent to or higher for UTC than for peer institutions,' was not being assessed for graduates given the difficulty of tracking graduates through time and locating comparable information from employers and/or peer institutions for comparison. Instead, we were surveying the supervisors of students enrolled in the program who were conducting internships as their capstone experiences as an indicator of graduate job performance, and this was not being compared to the job performance of interns not affiliated with our program. Effective in fall 2016, we implemented our current program-level MS ESC objectives to allow for more feasible measurement and to better reflect the areas of emphases of the program.

As an institution, UTC has been increasingly focused on the development and assessment of clear and measurable student learning outcomes (SLOs) at both program and course levels in recent years. The Student Learning Outcomes (SLOs) for the MS ESC program follow:

1) Students are able to demonstrate knowledge of the natural world, within the context of key issues in environmental science (including human population increase, sustainability, resource depletion, urbanization, and environmental pollution).
2) Students are able to demonstrate and apply knowledge in the core areas of the environmental science graduate program: natural resource management, statistics, environmental law and policy, and environmental pollution.

3) Students are able to successfully defend their thesis, internship, or learned discourse by giving an associated public presentation that reflects independent, inquiry-driven work and accurately answering related audience questions.
4) Students are able to gather, evaluate, and synthesize relevant scientific literature.
5) Students are able to communicate scientific information effectively both in writing and orally.
6) 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.
7) Students are able to conduct themselves responsibly and recognize the importance of ethical professional behavior.

The MS ESC SLOs were drafted during the 2014-2015 academic year and were piloted during the 2015-2016 academic year. These MS ESC SLOs are available to our faculty on an electronic organization site and can used to develop well-aligned course-level SLOs. To facilitate this process, we developed a MS ESC Course Curriculum Mapping Worksheet that lists the program-level SLOs; faculty are asked to determine the level of each SLO associated with their course as: I – Program SLO is Introduced and Assessed, R – Program SLO is Reinforced and Assessed, or C – Level of Competency is Assessed. Faculty also list course-level SLOs on the worksheet. The worksheet provides a tool for considering course development and content within the context of the MS ESC SLOs and to consider alignment of course-level SLOs with program-level SLOs.

1.2 Evaluation of Program and Student Learning Outcomes

1.2.1 Current Evaluation Methods

Since fall 2015, we have been assessing select MS ESC SLOs each year through well-aligned course-level assessments. Our intention is to select a different set of MS ESC SLOS to assess each year, so that all SLOs are assessed every ~3 years in a regular rotation. A Departmental Outcomes Assessment Committee determines which MS ESC SLOs will be assessed early each academic year. The Committee then reviews the collection of Course Mapping Worksheets submitted by faculty teaching graduate courses to determine appropriate courses for the assessment of the selected SLOs. Table 1.1 shows the information used by the Committee for course selection.

Table 1.1 Information used to guide yearly selection of courses for the assessment of specific MS ESC Student Learning Outcomes (SLOs).

	MS ESC Program-level SLO						
Course	SLO 1	SLO 2	SLO 3	SLO 4	SLO 5	SLO 6	SLO 7
ENGR 5260	R/C	R/C				R/C	
ENGR 5280	R/C	R/C				R/C	
GEOG 5150	R	R/C		R	R	R/C	
POLS 5430	R	R/C		R	R	R/C	
GEOL 5450	R/C	R/C				R/C	

BIOL 5160	R					R	
BIOL 5200	R			R	R		
BIOL 5400	R					R	R
BIOL 5560						R	R
ESC 5010	R/C	R/C		R/C	R/C	R/C	R/C
ESC 5020	R/C			R/C	R/C	R/C	R/C
ESC 5030	R	R		R	R	R	R
ESC 5040	R	R		R	R		R
ESC 5050	R	R		R	R		R
ESC 5060	R	R/C		C	R	R/C	
ESC 5080	R	R		C	C	R/C	R/C
ESC 5120		R/C			R/C		
ESC 5140		C				C	
ESC 5170	R	C			C	C	R
ESC 5180	R	R				C	R
ESC 5360	R			R	R	R	R
ESC 5610		R		C	C	C	R
ESC 5660		R		C	C	C	R
ESC 5700		R		C	C	R/C	
ESC 5710		R		C	C	R/C	
ESC 5730	R/C	R/C		R/C	R/C	R/C	R/C
ESC 5996	C	C	C	C	C	C	C
ESC 5999	C	C	C	C	C	C	C

Attempts are made to ensure that both core and elective courses are included in yearly assessments. Once the Committee selects a course, the instructor is notified and directed to prepare a brief report at the end of the semester that describes how the SLO was assessed and the outcome of that assessment; assessments are designed by instructors and can include responses to specific essay questions, performance on specific assignments, etc. If at least 70% of students (i.e., a healthy majority) successfully complete the assessment, then we consider the SLO to have been met effectively by the course.

To date, we have assessed five of the MS ESC SLOs learning outcomes utilizing six courses. In all cases, the criteria for success have been met, so the instructors have not needed to take any follow-up measures. Table 1.2 shows the results of SLO assessments to date.

Table 1.2 Results of assessment of MS ESC Student Learning Outcomes (SLOs) during the 2015-16 and 2016-17 academic years.

SLO	**Assessment**

SLO 1	**Means of Assessment**: Comprehensive exam, critical thinking test, embedded coursework **Courses Evaluated**: 2016-2017: ESC 5020, ESC 5050 **Assessment Data:** ESC 5020 – 90.8% ESC 5050 - 100%
SLO2	**Means of Assessment**: Student performance on specific exam questions and/or embedded coursework. **Courses Evaluated**: 2015-2016: ESC 5010, ESC 5140 **Assessment Data: All Percentages Refer to Correct Answers** ESC 5010 – 84% ESC 5140 – question 1: 84%; question 2: 78%
SLO 4	**Means of Assessment**: Successful defense of thesis/internship/learned discourse **Courses Evaluated**: 2015-2016: ESC 5999 2016-2017: ESC 5996, ESC 5999 **Assessment Data:** 2015-2016: ESC 5999 – 100% success 2016-2017: ESC 5999 – 100% success

SLO 5	**Means of Assessment**: Comprehensive exam, critical thinking test, embedded Coursework **Courses Evaluated**: 2016-2017: ESC 5020, ESC 5050, ESC 5070 **Assessment Data:** ESC 5020 – 95% ESC 5050 – 91.5% ESC 5070 – 91%
SLO 6	**Means of Assessment**: Critical thinking test, embedded coursework, oral defense/presentation **Courses Evaluated**: 2015-2016: ESC 5010, ESC 5140 **Assessment Data:** ESC 5010 – presentations 87%, review paper 85% ESC 5140 – 100%

1.2.2 Previous Evaluation Methods

Prior to fall 2014, we assessed a single program-level outcome each year with an approved rubric called the Thesis Quality Index; TQI). The outcome focused on 'student learning and improvement in conceptualizing, organizing, presenting, and defending a major environmental research project.' The overall objective of the rubric was to provide a direct measure of student learning and competency related to hypothesis formulation, experimental design, knowledge, critical thinking, and written and verbal communication skills, and to allow for measure of student improvement through time. The research training process could be revised based on the results of this assessment. The single outcome, which is similar to our current SLO 4, follows:

Faculty serving on graduate advisory committees would apply the rubric near the beginning of the program of study when students presented proposals for their capstone experience to the graduate advisory committee. Students were assessed near the end of the program of study by faculty serving on their graduate advisory committees and other faculty in attendance when defending their capstone experiences. The rubric asked faculty to rate the presentation using each of the following ten criteria with a score of 1 = needs significant improvement, 2 = needs improvement, 3 = acceptable, 4 = very good, 5 = excellent:

- Clear definition of the research problem: Includes motivation for undertaking the research.

- Literature and previous work: Demonstrates sound knowledge of literature and prior work on the research problem.
- Impact of proposed research: Demonstrates the potential value of solution to the research problem in advancing knowledge.
- Solution plan: Applied sound state-of-the-field research methods/tools to solve the defined problem and has described the methods/tools effectively.
- Preliminary results/results: Analyzed and interpreted research results/data effectively (even if only the preliminary data of a proposal).
- Quality of communication: Communicates research proposal clearly and professionally.
- Quality of response to questions: Completeness, organization of argument, subject area knowledge exhibition.
- Critical thinking: has demonstrated capability for independent research in the area of study and expertise in the area.
- Broader impact: Demonstrates awareness of broader implications of the proposed research. Broader implications may include social, economic, technical, ethical, business, etc. aspects.
- Publication: Journal or conference publications have resulted (or are anticipated) from the research.

The scores for each of these ten criteria were summed to provide a TQI score for each student. The target for each of the criteria assessed by the rubric was that at least 80% of students would receive faculty TQI ratings of 'good' or above.

The TWI rubric was approved by the UTC Office of Institutional Evaluation, Planning, and Research near the end of fall 2012 and piloted in spring 2013. The rubric was completed for seven students who defended that semester, with between one and nine faculty members evaluating each student with the rubric. The average TQI across students was 37.4/50 (i.e., the upper end of a 'good' rating). Scores for individual students ranged from 25.6/50 ('fair') to 46.8 ('excellent'). When individual TQI questions were considered, students scored highest on average for the questions focused on providing a clear definition of the research (4.2/5) and demonstrating awareness of the broader impacts of the work (4.1/5). On average, students scored lowest (3.4/5) on the question focused on the production or expectation of associated publications.

1.3 Use of Program and Student Learning Outcomes for Program Improvement

The current MS ESC SLOs represent the emphases of our program, are measureable, and can be incorporated in our core and elective courses in different levels and ways. The capstone experience that each student must complete to earn the MS ESC provides an assessment of competency in each of our SLOs. By developing a list of SLOs that are each focused on specific outcomes, requiring instructors to consider their course content and assessments within the context of these SLOs, and assessing each SLO on a regular basis, we hope to provide means to

identify the strengths of our program, as well as areas in which we may need improvement.

Since the implementation of the current MS ESC SLOs in fall 2015, it has not been necessary to consider corrective actions because all assessments have indicated that the SLOs are being met. However, the MS ESC program is committed to making appropriate changes to our curriculum and course content should the need arise.

1.4 Program Alignment with our Institutional Mission

1.4.1 University Mission

In fall 2014, the UTC Provost assembled a task force to develop a 2015-2020 Strategic Plan for the University with the following associated mission statement:

> *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.*

1.4.2 Program Mission

The current mission statement of the MS ESC program follows:

> *The Department of Biology, Geology and Environmental Science at The University of Tennessee at Chattanooga offers a Master of Science degree in environmental science. The mission of this program is to meet the needs of academia, business, government and the non-profit sector for scholars and professionals in this interdisciplinary field. Toward this goal, the program provides sound scientific and technical training coupled with an understanding of contemporary socioeconomic, political and legal realities. Our faculty offer courses that emphasize the development of advanced critical thinking and effective advocacy and communication skills and engage students in research in a wide range of subdisciplines including biodiversity and systematics, conservation and restoration, ecology, environmental and human health, environmental policy and law, evolution and behavior, geospatial science, and molecular biology, cellular biology and physiology.*

The University mission is clear and aligns well with the MS ESC program. For example, the University mission involves the active engagement of all members of the campus community. Students in the MS ESC program work closely with faculty on experiential projects both in the classroom and beyond the classroom while working on a thesis, internship, or learned discourse; this training is part of our mission. The University mission describes the importance of embracing diversity. In their scientific work, environmental scientists must understand and consider contemporary, socioeconomic, political, and legal realities; this understanding also is part of our mission. In addition, the University mission describes its goal to enrich the world at large. MS ESC students often explore environmental issues that are global in scope through

focus on region and/or local systems. As such, students are prepared to enrich both their local community and the world at large as trained environmental professionals.

The MS ESC SLOs also echo many of the themes of our University mission. Inherently, by focusing on student abilities and activities, our SLOs require students to be engaged in their education and training. Our SLOs also acknowledge the importance of contribution to the greater community in the way our students are expected to apply their knowledge toward addressing environmental problems in a manner consistent with recognizing the unique role humans play in the environment (i.e., SLO 6). In addition, our SLOs presuppose an appreciation for and an acceptance of diversity in the way our students are expected to be able to conduct themselves responsibly and in the way they are expected to be able to recognize the importance of ethical professional behavior (i.e., SLO 7).

1.5 Assessment of Learning Objectives (Outcomes) Strengths, Weaknesses, and Recommendations for Change

In summary, the strengths of the current method of assessment are as follows: the current SLOs are more measureable and easier to measure than past assessment efforts. As a direct result of the functionality of our current SLOs, learning outcomes can now be assessed more thoroughly and more consistently. They are likewise more representative of both our core and elective course offerings. This is yet another strength. The major strength of the current approach is in how our SLOs force our faculty to take a more active role in ensuring the quality of their own courses, in that they encourage our instructors to routinely contemplate both the nature and design of the classes they teach. In terms of weaknesses, the MS ESC Program still needs a better way to track graduates of the Program, as a means of aiding assessment. A means by which both graduates of the Program and the employers of said graduates could be surveyed (as far as overall levels of satisfaction with the Program, in terms of how well the Program performs that which it espouses to do) would likewise prove helpful. In any case, at this point in time no serious recommendations for change are offered, given that so many of our recent graduates are either employed in the field or have gone on to pursue additional educational opportunities.

PART 2. CURRICULUM

2.1 Curriculum Review and Improvement

Currently, to earn the MS ESC degree at UTC, students must complete a 36-hour program of study with a cumulative grade point average of 3.0 or above. The coursework must include satisfactory completion of core courses, electives, and a graduate capstone experience consisting of either a thesis project, internship experience, or learned discourse. Core courses comprise 15 semester hours total; these courses include: ESC 5020 Mechanisms in the Environment (3 credits), ESC 5050 Biodiversity and Natural Resources Conservation (3 credits), ESC 5120 Applied Statistics for Environmental Scientists (4 credits), ESC 5140 Environmental Law and Regulations (3 credits), ESC 5700 Graduate Seminar I (1 credit), and ESC 5710 Graduate Seminar II (1 credit). Example recent syllabi for these core courses are provided in Appendix B.

Elective courses comprise either 15 or 18 semester hours, depending on the capstone experience that a student chooses to pursue in partial fulfillment of the degree. Specifically, students conducting a thesis or internship in partial fulfillment of the degree requirements must complete 15 semester of hours elective coursework, while students conducting a learned discourse must complete 18 semester hours of elective coursework. Elective hours may be comprised of graduate-level elective courses offered by BGE or graduate-level courses offered by other departments that are relevant to the study of environmental science and the degree program objectives as approved by each student's graduate advisor. Examples of elective coursework offered in recent semesters to students pursuing the MS ESC degree include: ESC 5040 Bioremediation, ESC 5080 Limnology and Reservoir Ecology, ESC 5460 Global Change Biology, and ESC 5660 Geographic Information Systems. Examples of recent syllabi for these courses are provided in Appendix B. The majority of ESC graduate electives are cross-listed with analogous undergraduate sections of those courses; however, instructors must have distinct learning outcomes and assessments for graduate students enrolled in cross-listed courses.

The BGE Graduate Faculty Committee meets on a regular basis (usually twice monthly) to discuss the state of the MS ESC program and how it might be improved, as well as any changes being proposed or implemented at the University level. The Committee discusses such aspects as course requirements, length of time to complete the program, and graduation rates. Any proposed changes to the program curriculum are received and discussed by the Committee prior to being brought to the attention of all BGE Graduate Faculty for discussion and vote. If approved, the proposed changes are submitted in the form of a formal curriculum proposal electronically via the SharePoint system. Proposals are processed through a chain of approvals in the SharePoint system that includes the Department Chair, Dean of the College, Dean of the Library, Dean of Lifelong Learning, other affected departments, the Graduate Council Curriculum Chair, the Dean of the Graduate School, and the Associate Provost for Academic Affairs.

Since our previous program review, we have made one change to our overall graduate curriculum. This change was a reduction of the total credit hours required for students to complete the MS ESC program of study from 38 to 36, which took effect in fall 2016. The change reflected our acknowledgement that a 38-hour program of study required students to overload their schedules slightly to complete the program of study in four semesters (i.e., 9 full-

time semester hours × 4 semesters = 36 semester hours). The reduction in our total program of study semester hours to 36 keeps with the spirit of a two-year M.S. degree, aligns with our typical four-semester Graduate Teaching Assistantship appointments, and continues to meet or exceed the semester hours associated with other thesis- or project-based M.S. in Environmental Science programs. The modification to our program of study accommodated a concurrent increase in the semester hours associated with our core ESC 5120 course from 3 to 4 to reflect a new lab component and involved a reduction in the required credit hours of elective courses from 18 to 15 for students engaged in thesis or internship capstone experiences and from 21 to 18 for students completing learned discourses.

The current core courses of the MS ESC program have been in place since academic year 2000/2001. The core course at the time of program adoption (academic year 1997/1998) included Advanced Ecology (3 hours), Environmental Impact Statements (2 hours), Environmental Law and Regulations (2 hours), and Research Models and Experimental Design (4 hours), Seminar I (1 hour), and Seminar II (1 hour). The 2000/2001 changes added an entirely new substantive area - biological and chemical mechanisms in the environment with a focus on air, soil, and water pollution - and refined the other core areas (environmental law, conservation/ecology, applied statistics). This core was developed by faculty to provide a solid foundation for environmental science, no matter the eventual career path of a program graduate. For example, a student who aspires to have a career in environmental law and policy needs some background in areas such as ecosystem management or toxicology, as that student will likely encounter policy issues dealing with those topics. Similarly, it benefits a student interested in conservation biology to be familiar with environmental regulations.

Although the core courses in the MS ESC program of study have remained constant since fall 2000, we have added new graduate-level courses to the curriculum as electives as faculty areas of foci and expertise allow. Examples of new graduate-level ESC electives that have been added to the curriculum in recent years include ESC 5460 Global Change Biology and ESC 5660 Geographic Information Systems. In addition, many faculty periodically offer seminars and graduate-sections of upper-level undergraduate courses under the BIOL 5400 Advanced Topics in Organismic Biology and BIOL 5600 Advanced Topics in Genetics and Development headings. Examples of such topics have included Amphibian Conservation, Animal Behavior, Dendrology, Ornithology, Plant Taxonomy, and Population Genetics. As new faculty have joined the Department, potential elective courses for MS ESC students have increased. In light of new hires since the program's inception and given the rapidly changing pace of environmental knowledge and emergence/attention of 'new' environmental issues, it may be worthwhile to thoughtfully consider our core courses in a contemporary context.

2.2 Course Scheduling and Progress Toward Degrees

The six core classes are each offered once every year; ESC 5120 Applied Statistics for Environmental Scientists, ESC 5140 Environmental Law and Regulations, and ESC 5700 Seminar I are offered every fall semester, while ESC 5020 Mechanisms in the Environment, ESC 5050 Biodiversity and Natural Resource Management, and ESC 5710 Seminar II are offered every spring semester. As such, students always know when these courses will be offered and can plan ahead to fit them into their programs of study. A sufficient number of elective courses

are offered each semester so that students can complete that requirement. Many of our graduate-level electives consist of graduate sections of course that are also taught at the upper-level undergraduate level. The hiring of new lectures to teach introductory-level courses and the use of Graduate Teaching Assistants (GTAs) to teach sections of introductory-level laboratories have made it more possible for tenure-track faculty to offer upper-level coursework. The resultant more frequent offering of affiliated graduate-sections of these courses has made it easier for graduate students to complete their elective course requirement.

2.3 Advanced Academic Content

Courses taught in the MS ESC program include SLOs that reflect higher-order thinking (as described in *Bloom's Taxonomy of Cognitive Behavior*), such as analysis, synthesis, and evaluation. For example, in ESC 5050 Biodiversity and Natural Resource Management, students have to develop an ecosystem management plan; this involves evaluating the natural and cultural history of the ecosystem, communicating with stakeholders about their ideas and concerns for the ecosystem, evaluating information, and making management recommendations. Similarly, in ESC 5140 Environmental Law and Regulations, students may engage in mock trial exercises based on actual environmental court cases. Students are assigned roles (e.g., appellant's attorney, appellee's attorney, appellate judges) and have to research the cases from the perspective of these roles and serve as advocates and judges in a mock appellate judicial proceeding.

While core course in the MS ESC program are offered only to graduate students, most of the elective coursework in which students in the MS ESC program enroll during their programs of study consist of graduate sections of courses that also include cross-listed undergraduate sections. University-level policy requires that instructors of these courses develop distinct SLOs for graduate students that reflect higher-order thinking with associated distinct assessments. For example, students enrolled in the graduate section of a cross-listed course might be expected to analyze, synthesize, and evaluate course information, while students enrolled in the undergraduate section might be expected to know, comprehend, and apply course information. Students enrolled in graduate-level sections also may be expected to attain some lower-level cognitive skills necessary to be able to fulfill higher cognitive behaviors. As assessments, graduate students are often required to conduct an independent project not required of undergraduates, write a term paper of greater depth than undergraduates, prepare and lead learning modules, and answer different and/or additional questions on exams. Graduate work is graded with greater rigor than undergraduate work.

Beginning in fall 2015, faculty teaching in the MS ESC program have been required to provide separate syllabi for cross-listed graduate and undergraduate sections of courses that include distinct SLOs and assessments and otherwise differentiated between these sections. Table 2.1 provides an example of how the SLOs compare in a cross-listed graduate/undergraduate course (ESC 4460/5460 Global Change Biology). Our syllabi undergo review at Departmental and University levels to ensure that graduate sections are substantially more advanced than comparable undergraduate sections of cross-listed courses.

Table 2.1 Example of graduate-level and undergraduate-level student learning outcomes (SLOs) for an elective course in the MS ESC program with cross-listed graduate and undergraduate sections.

Graduate-level SLOs	Undergraduate-level SLOs
Demonstrate in-depth understanding of global change biology, the current state of the field, and its contemporary concerns.	Demonstrate understanding of global change biology, the current state of the field, and its contemporary concerns.
Integrate existing knowledge of other natural and social sciences with its global change applications to better understand complex environmental issues and challenges.	Apply knowledge of other natural and social sciences to better understand complex global biological issues and challenges.
Formulate informed thought on specific global change biology topics during written assignments and participation in class discussion.	Formulate informed thought on specific global change biology topics during written assignments and participation in class discussion.
Facilitate learning by creating and delivering an impactful mini-learning unit on a specific global change biology topic.	Evaluate the relevance and impact of diverse scientific research to building a dynamic body of scientific knowledge by preparing and attending presentations.
Evaluate and synthesize key findings of research on a specific global change biology topic in a comprehensive review paper.	Practice scientific communication skills through writing and presentation activities.
Refine advanced scientific communication skills through writing and presentation activities.	

2.4 Alignment with Program Mastery and Student Learning Outcomes

The program-level MS ESC SLOs are available to our faculty on an electronic organizational site. Instructors align their course content with these SLOs on an MS ESC Course Curriculum Mapping Worksheet. The worksheet lists the SLOs, and faculty are asked to indicate the level of each SLO associated with their course as: I = Program SLO is Introduced and Assessed, R = Program SLO is Reinforced and Assessed, or C = Level of Competency is Assessed. Faculty also list course-level SLOs on the worksheet. The worksheet provides a tool for considering course development and content within the context of the MS ESC SLOs and to consider alignment of course-level SLOs with program-level SLOs. Table 1.1 shows the level of each MS ESC SLO associated with core, common elective, and capstone experience courses in the program of study as indicated by their instructors.

Many of our courses reinforce or assess competency of the MS ESC SLOs by requiring students to apply knowledge of environmental science to real world problems (SLO's 1-3, 6), formulate research questions and answer those questions using appropriate methodological and analytical techniques (SLOs 3-4), communicate the information effectively (SLOs 3,5), and act in a responsible and ethical manner (SLO 7). Instructors can decide how to assess the SLOs associated with their courses; such assessments can include exams, writing assignments, class presentation and projects. Ultimately, the preparation and successful defense of a thesis, internship, or learned discourse as required by our program provides an opportunity for us to evaluate if all SLOs have been met.

2.5 Inclusion of Knowledge of Literature of the Discipline

The topics taught in our graduate-level courses are kept current by the faculty teaching them, and reflect the contemporary state of knowledge in the field as described in the primary literature. As such, knowledge of literature of the discipline is incorporated to some extent into all MS ESC courses. In the case of graduate sections of cross-listed elective courses, additional work may be expected of students that increases their exposure to primary literature.

The capstone experiences required of students in the MS ESC program begin with the preparation of a written proposal for the work to be performed, its approval by the graduate advisor, and its presentation to the graduate advisory committee. Although different graduate advisors may have different specific formatting guidelines for proposals, all proposals must include background information as relevant to the experience gathered from the primary literature and include well-defined questions to be addressed. The proposal also should detail the methodology for the project and discussion of how outcomes will be interpreted.

2.6 Engagement in Research and/or Professional Experience

To earn the MS ESC degree at UTC, students must complete a 36-hour program of study that includes core courses, electives, and a graduate capstone experience consisting of either a thesis project, internship experience, or learned discourse. This part of the program of study directly engages students in research and/or professional experiences. The choice of each student's capstone experience should support his/her academic objectives, research interests, and career goals, and should be informed by communication with the graduate advisor. Thesis projects and internship experiences are each associated with 6 semester hours of academic credit (ESC 5999 Thesis and ESC 5996 Internship), while a learned discourse is associated with 3 semester hours of academic credit (registered as ESC 5997 Individual Studies).

The thesis option involves independent original research focused on a specific issue that is relevant to environmental science. It is the recommended capstone experience for students who want to gain broadly applicable research experience and is especially recommended for students considering future doctoral studies. A thesis demonstrates broad knowledge of a topic, identifies a gap in the knowledge base, and attempts to fill that gap through appropriate study. Initiation of a thesis in partial fulfillment of the MS ESC degree requires acceptance of a thesis proposal by a three-person graduate advisory committee. A thesis proposal describes the thesis objectives,

provides a preliminary review of pertinent literature, outlines the methodologies to be used, and details the relevance of the work to the field. Once a thesis proposal is approved, the student will work independently but with close guidance by the graduate advisor toward meeting the thesis objectives.

The internship option provides an opportunity to acquire specialized technical/professional knowledge by working on an environmental project with an appropriate sponsoring organization or business. As a form of experiential learning, an internship integrates academic knowledge in environmental science with its practical application in a workplace setting. An internship is an appropriate capstone experience for students who want to develop skills specialized for a particular type of environmental work. It is especially recommended for students with very specific career goals (e.g., natural resource management, environmental consulting) that do not require further graduate studies. Initiation of an internship in partial fulfillment of the MS ESC degree requires that a student identify a suitable internship opportunity and prepare a proposal for the experience that a three-person graduate advisory committee and a workplace supervisor approve. An internship proposal describes the internship objectives, provides a preliminary review of pertinent literature, details work to be completed, and discusses the relevance of the internship to the workplace and the career goals of the student. Internships may be paid or unpaid. Once the internship is approved, the student will work independently but with close guidance by the workplace supervisor with oversight from the graduate advisor to complete 600 hours of work toward meeting the internship objectives. Interning students and their workplace supervisors are required to document the experience via a series of formal periodic reports to the graduate advisor.

The learned discourse option provides for deep exploration of a specific topic relevant to environmental science through independent and original review of relevant available literature and/or data. A learned discourse is an appropriate capstone experience for students who want to deepen their knowledge base in an environmental science topic without focus on development of applied research or specialized workplace skills. The learned discourse option is especially recommended for students who want to advance in an already established career. Initiation of a learned discourse in partial fulfillment of the MS ESC degree requires that a student prepare a proposal that describes the learned discourse objectives, provides a preliminary review of pertinent literature, outlines a comprehensive literature review, and discusses the relevance of the learned discourse to the field. The proposal must be approved by a three-person graduate advisory committee. Once the proposal is approached, the student will work independently but with close guidance by the graduate advisor toward meeting the learned discourse objectives.

Thesis, internship, and learned discourse capstone experiences all culminate with the submission of a document (i.e., a thesis, internship report, or written discourse) approved by the graduate advisor and the successful public oral defense of the document. During the public part of the defense, the students give a professional presentation that describes and justifies all aspects of the work. After the presentation, time is permitted for the audience to ask questions. During a private examination that immediately follows the public defense, the student is expected to field questions from the graduate advisory committee. These questions can range from ones specific to the presentation to questions about the broader research topic and related areas of environmental science. Questions also may focus on material covered in relevant graduate coursework. This part of the defense is intended to allow the graduate advisory committee to assess the student's

understanding of the topic, comprehension of its relevance to the broader field, competency and professionalism as an environmental expert, and communication skills.

2.7 Evaluation of Distance Education Programs

At present, the MS ESC program and all coursework involved in the program are delivered solely in face-to-face learning mode. As an institution, UTC has been recently expanding its online and hybrid course and program offerings. To date, four graduate programs are offered by UTC fully online (Doctorate of Nursing Practice, Master of Science in Criminal Justice, Master of Science in Engineering Management, Professional Master of Business Administration) and two graduate programs are offered in hybrid mode (Doctorate in Learning and Leadership, Master of Science in Nursing Nurse Anesthesia Program). BGE currently offers several undergraduate lecture courses fully online and has been asked recently by the Provost to develop an online introductory lab course for that would count toward the General Education requirement of UTC undergraduates. However, we have not been asked to consider the potential for development of online graduate courses. To ensure the quality of its online offerings, UTC participates in the Quality Matters program and faculty who teach online courses are required to complete training to apply the Quality Matters rubric.

2.8 Innovations that Advance Student Learning

The Walker Center for Teaching and Learning (WCTL) supports the strategic planning and academic initiatives of UTC to facilitate excellence in instruction by providing information, learning sessions, and consultation in the areas of teaching, learning, and technology integration. Faculty in the MS ESC program are encouraged to engage in professional development opportunities sponsored by the Center. Some of the opportunities in which our faculty have participated in the past five years have included the UTC Instructional Excellence Retreat, ThinkAchieve Faculty Fellows and WCTL Teaching Fellowship programs, and course redesign and technology training workshops.

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

Our graduate program is strong, as evidenced by our stable enrollment, as well as our graduation rates, post-graduation placement in environmentally-based jobs, and student authored peer-reviewed publications and professional presentations. While the physical journal holdings in the University library may be limited, the inter-library loan service allows students to access publications they need for their classes and major project. The courses our graduate students take are rigorous and provide the students with a solid foundation of major concepts in environmental science, as well as enhancing methodological, analytical, and critical thinking skills. Course offerings are diverse enough and frequent enough that students can complete the classroom portion of the degree in a timely manner. Our faculty possess degrees appropriate to the discipline, and the diversity of research interests ensures that students can find advisors and committee members who align with their interests, which facilitates expedient completion of the program, and ensures that the students will gain the knowledge and competency in their specific area of interest.

While our program is strong, there are areas where it can use improvement. One such deficiency is the number of teaching assistantships. We currently have funding for 11 assistantships, which leads to some applicants who would like to obtain their degree from our program going to another institution when they can be guaranteed financial support. In addition, the limited number of assistantships means that those students receiving a TA must teach 3 laboratories per week, which constrains the time they can devote to their coursework and research. Additional assistantships might also offer some students the opportunity to teach upper-level laboratories, which could enhance their ability to enter a Doctoral program or get hired into the workforce. The stipend is also barely adequate to meet student expenses, even with the accompanying tuition waiver. Increased stipends would help attract students and relieve economic burdens they face, and make our program even more competitive.

Another shortcoming in our program is space; students have little space for data analysis, studying, or assisting students (for those on a TA). The space limitation applies not just to dedicated space for graduate students, but also faculty lab space that could be utilized by a given faculty member's students. In addition, graduate students often have outdated computers with which to work. While the current building upgrades to Holt Hall may alleviate some of the space and equipment shortcomings, many students will likely continue to lack adequate resources for their needs.

One final need is additional faculty to broaden the scope of our program. For example, we have many faculty whose interests and research have an ecological focus, but we only have one person with a background in environmental law and policy. That person is currently our department head, and his administrative duties prevent him from supervising graduate students and offering elective law and policy graduate courses. This deters students interested in a careers related to environmental law and policy from entering our program. Similarly, we only have two people in the department qualified to teach courses in Geographic Information Systems and remote sensing. Training in these areas is extremely useful and marketable, and additional faculty with such expertise would allow us to expand our course offerings and research opportunities, perhaps even allowing for the awarding of a Certificate in Geographic Information Systems.

The most significant recommendations we can make are the construction of an up-to-date science building, substantial investment in research equipment, and an increase in the number and stipend of teaching assistantships. A new science building with state-of-the-art equipment would solve our Department's space and equipment needs, enhance both our undergraduate and graduate programs through improvements in teaching and research ability, and attracting new faculty. As previously stated, more and better paying assistantships would attract more students and make us more competitive with peer institutions.

We are also considering making the Learned Discourse option a coursework-only degree track. The written literature review requirement would be eliminated, and one or two additional courses would be required. As part of the change, we are also debating a requirement that students choosing this option would have to take a comprehensive examination to further demonstrate mastery of the discipline. We feel this change might appeal to many people, particularly those involved with environmental consulting, government agencies, and secondary education. The elimination of the literature review and defense would reduce the time needed to complete the

program, as well as reduce faculty supervisory workload because they would no longer need to spend time editing the Learned Discourse document. Increased MS ESC enrollment could have the added benefits of making it more feasible to offer new graduate level only course options and increasing the likelihood the program would receive additional Graduate Teaching Assistants. Along similar lines, we are also considering eliminating the internship report and defense for students choosing the Internship degree track. The rationale for this proposed change is also to reduce the time needed for those students to complete the program, and reduce faculty supervisory workloads.

PART 3. STUDENT EXPERIENCE

3.1 Peer Group Size

Enrollment in the MS ESC program has ranged from 26-40 students during any given semester, with an average semester enrollment of 32 students during the past five years. Although somewhat less that the average semester enrollment of 35 students during the previous five-year period, our enrollment continues to provide a critical mass of students necessary to develop appropriate peer groups. When averaged across fall and spring semesters each academic year, semester enrollment was relatively high in the 2012-13 academic year (i.e., 40 students), but about average every year since then.

In total, 85 students were enrolled in the MS ESC program during the past five years (i.e., from fall 2012 through summer 2017). Of these students, 41 graduated from the program, (in an average of ~7 semesters), 25 exited the program without graduating, and 19 are still currently enrolled in the program along with 12 new students who entered the program in fall 2017. Reasons for leaving the program not always known and likely varied; in conversations with the Graduate Program Coordinator and/or their advisors, some students cited personal/family issues, financial constraints, or decisions to pursue employment opportunities or switch to other fields of graduate study. In the future, it may be helpful to administer an exit interview to students in this instance so that the Department may better understand why a student would leave without graduating and if there is any need for improvement on our part.

All core courses in the MS ESC program and some electives are designed to accommodate students who work full-time by being scheduled in the evenings. The UTC Graduate School allows students to take up to six years to complete the program, which also facilitates the enrollment of students with full-time employment in the program. The inclusion of non-traditional students, along with a mix of graduate students with varying science backgrounds (i.e. environmental science, biology, chemistry), promotes the interdisciplinary nature of the graduate program and ties together different peer groups.

The MS ESC program always has attracted students who earned their undergraduate degrees at UTC, likely due to some combination of their familiarity with the institution, the Department, its faculty, and the local area. About 45% of the current MS ESC student body earned their undergraduate degrees from UTC – the vast majority as Biology or Environmental Science majors – while the remaining 55% earned their undergraduate degrees primarily from other institutions in Tennessee or other states in the southeastern U.S. (e.g., Austin Peay State University, Berry College, Clemson University, Covenant College, Dalton State College, Maryville College, Tennessee Wesleyan University, University of Tennessee). The percentage of current graduate students who have earned their undergraduate degrees from UTC is relatively high for our program. Our previous Program Review described that ~25% of MS ESC students had earned undergraduate degrees from UTC. Observably, it seems that once students enter the MS ESC program, their associations with their peers are not influenced by whether or not they attended UTC as undergraduates as all students seem to interact freely.

Historically, there has been some pressure to grow the size of the MS ESC program, and increased graduate enrollments across campus is a primary goal listed in a new UTC Graduate School Strategic Plan currently being developed. However, we believe that the program is at or near capacity in its current form due to current faculty advisement loads, space/resource limitations, and the fact that some BGE faculty member's expertise and interests do not align well with the MS ESC program. As discussed in the curriculum section, faculty are considering revising the learned discourse option to be a non-thesis coursework option. This could substantially increase enrollment without significantly impacting faculty advising workloads. Increased MS ESC enrollment could have the added benefits of making it more feasible to offer new graduate level only course options and increasing the likelihood the program would receive additional Graduate Teaching Assistants.

Completion of the ongoing Holt Hall renovations will provide more space for graduate students to meet, work, and converse, which should alleviate some of the limitations to growing the program. However, advisement loads continue to be an important factor to consider. One idea that the program may consider to help alleviate this issue is to raise admission standards for students, which could improve the efficiency with which they complete the program. Since our previous Program Review, we have revised our admission process to require applicants to identify an advisor before being accepted into the graduate to help students start on their capstone experiences earlier in their program of study. In the past, many students completed their core and elective coursework prior to making significant progress on a thesis, internship, or learned discourse. The change in admission procedures requiring applicants to secure a faculty chair prior to applying may have unintentionally made it more difficult for prospective internship students to be admitted to the program. We also have updated the MS ESC Graduate Program Handbook to help ensure that policies, procedures, requirements, and deadlines are clear to our students.

3.2 Student Evaluation of Curriculum and Faculty

MS ESC Graduate students are provided the opportunity to evaluate individual faculty through University-wide online evaluations of instruction (i.e., course evaluations) called the Student Rating of Faculty. Student ratings of BGE faculty are discussed in more detail in section 4.1.5. The department head annually reviews student ratings of faculty through the annual performance review process (EDO). If problems exist, the department head notes the problems in his written evaluation and discusses them verbally with the faculty member. If a serious problem exists, the faculty member is required to develop a formal written improvement plan with input and approval of the department head. The department head assesses progress toward correcting the problems in the subsequent year. Further, teaching evaluations for all untenured faculty are reviewed annually by the BGE reappointment, promotion, and tenure committee (RPT) (consisting of all tenured faculty). The RPT committee notes any teaching problems in its reappointment recommendation, as does the department head through an independent review. Similar processes exist when faculty apply for tenure and promotion. BGE also has a peer teaching mentoring program that involves tenured faculty observing and rating the performance of new faculty in all classes taught by the faculty member. Generally, student ratings of faculty teaching graduate classes fall within BGE's Bylaws expectation of "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." In previous semesters, graduate students were given survey forms to complete as part of an exit interview upon completion of the degree, but this practice was retired due to low response rates. It may be beneficial to reinstate graduate student surveys as part of the graduation process.

3.3 Professional Development Opportunities

The MS ESC program encourages students to join professional organizations and attend their meetings and conferences. The UTC Graduate Student Association makes travel awards available each semester to graduate students presenting results of their research at regional and national-level meetings. Individual faculty also regularly encourage MS ESC students to apply for travel awards provided by professional organization to which they belong. Our Graduate students have been very successful in past years in obtaining UTC Provost Student Research Awards (PSRAs) to support their research, which can include support for its dissemination in professional venues. In total, MS ESC students have received 18 of the 131 total PSRAs awarded University-wide since 2012.

Many of our thesis-track students give oral or presentations of their work at professional conferences during their time in the program, and some publish and/or co-author refereed articles based on their graduate studies. A list of presentations and publications given by MS ESC students during the past five years is provided in Appendix C. The Office of Research and Sponsored Programs at UTC has sponsored an annual Research Dialogues event to showcase research on campus in the past few years; many of our students participate in this event. While we are pleased with the high activity of our students in presenting their research, we would like to see more students generate refereed publications from their work.

Students in the MS ESC program who are engaged in internships for their capstone experiences are typically placed in positions at agencies and in firms that provide real career advancement potential. While the specific skill set that a student will learn and practice varies for different internship settings, these positions all require students to practice effective communication.

All of our students are required to take a two-semester seminar sequence as part of their core course requirements (i.e., ESC 5700 Seminar I, ESC 5710 Seminar II). The focus of this sequence is to engage students in discussions of effective research and scientific communication skills, as well as scientific responsibilities and ethics, toward advancing their professional development.

3.4 Scholarly Enrichment Opportunities

As described in the previous section (see Section 3.3), we encourage students in the MS ESC to join professional organizations and attend their meetings and conferences as opportunities for scholarly enrichment. On campus, BGE currently organizes a departmental seminar series that features weekly presentations primarily by scientists but also by other professionals in the field on occasion. Each semester, the series hosts speakers from the Department, other UTC departments, the local community and region, and of more national scope. Although seminars are open to the UTC community, they do not typically have high graduate student attendance. It may

be worthwhile to explore ways in which to increase the number of graduate student attendees. For example, undergraduate students majoring in Biology or Environmental Science at UTC can earn one course credit for attending all seminars each semester. Offering elective credit for seminar attendance to graduate students could be an effective way to increase their participation in seminars as a scholarly enrichment opportunity.

3.5 Diverse Perspectives and Experiences

Students currently enrolled in the MS ESC program include many from historically underrepresented groups in the natural sciences. At present, nearly 60% of our students are women and 20% identify as representing racial and/or ethnic minority groups. New students entering the program in fall 2017 were 70% women. Although in the past we have enrolled international students, all currently enrolled students are from the U.S. A female student from Belgium has completed all of her core and elective coursework, but has not yet completed her thesis project. Although not enrolled during fall 2017, she is planning to return to the program to complete her project in spring or summer 2018. At the program-level, we have not initiated a recruiting program to target students who represent minority groups; however, individual faculty members who are active in the MS ESC program have included the targeted engagement of students from underrepresented groups in research as broader impacts associated with externally funded projects. However, our program-level recruitment of a more diverse group of graduate students could be improved. Toward embracing diversity, the program also could more actively recruit individuals from diverse backgrounds to give presentations at the BGE Seminar Series.

Our seminar series also could be used more actively as a platform to promote the diversity of careers and community roles in which our students and graduates could engage through targeted speaker recruitment. MS ESC students conducting theses are engaged in research projects and acquire credentials suitable for entering a terminal degree program at another institution. In addition, thesis students are well prepared for entry into the work force, particularly into positions requiring laboratory or field skills. Students who work internships for their capstone experiences also are well prepared for employment in the field upon graduation. Showcasing more professionals as seminar speakers could expose students to diverse environmental career options.

The MS ESC faculty collaborate with local, national, and international partners, providing MS ESC students with a broad range of projects, educational opportunities, and networking both locally and abroad. Local collaborations include work with the City of Chattanooga, Chattanooga Zoo, Cherokee National Forest, Erlanger Hospital, North Chickamauga Creek Conservancy, Reflection Riding Arboretum and Nature Center, Tennessee Aquarium, Cumberland Trails Conference, Tennessee Valley Authority, Tennessee Department of Conservation and Environment, Tennessee Wildlife Resources Agency, and Tennessee River Gorge Trust. The friendly relationship between our program, government agencies, and local organizations has been very beneficial and has supported numerous thesis projects and internship experiences. Our Graduate Faculty members also collaborate with researchers at a wide range of universities in Tennessee and other states. Several BGE Graduate Faculty members have international collaborations, including collaborations in Australia, Chile, England, France, Italy, and Switzerland.

3.6 Academic Support Services

Students enrolled in the MS ESC program at UTC have access to various campus resources to support their program of study. These resources include the relatively new UTC Library (opened in January 2015), which provides all students with valuable resources and space, including print and electronic scholarly materials, Windows and Mac computers, group study rooms for reservation, private study carrels, 24-hour study space, and practice presentation rooms. The Library also houses a Graduate Student Lounge exclusively for use by graduate students.

Information Technology (IT) manages access for all students to UTC's online services (MyMocsNet, UTCLearn) and email accounts (MocsMail+) and provides technological support. IT also provides free software for students to install on their computers. This software includes the popular statistics packages SPSS and SAS, which often are used by MS ESC graduate students conducting empirical research. The bibliography management program Endnote also is available to current UTC students at no cost. Endnote is popular among MS ESC graduate students writing theses because UTC thesis standards require that bibliography management software be used. Information technology also provides free access to the online survey platform Qualtrics, which can be useful to MS ESC graduate students wanting to survey people as part of their capstone experience.

All UTC students also have access to the Counseling and Personal Development Center, which provides counseling at no charge to students who experience issues that adversely impact their academic progress and success. The Disability Resource Center at UTC provides support to students with disabilities seen or unseen (e.g., physical, learning, psychiatric), including special assistance or accommodation in courses.

3.7 Assessment of Student Experience Strengths, Weaknesses, and Recommendations for Change

Strengths of the program include the following:

- The program has experienced stable enrollment during the review period, with an average semester enrollment of 32 students during the past five years.
- Core courses in the MS ESC program and some electives are designed to accommodate students who work full-time by being scheduled in the evenings.
- Student enrollment includes a healthy mix of UTC graduates, graduates from other universities, non-traditional (working) and traditional students (full time), and gender diversity.
- Enrolled students come from a variety of academic backgrounds, complementing the interdisciplinary nature of the program and the environmental science discipline.
- Students are required to secure a graduate mentor prior to acceptance into the program. This is helping student progression in the program.
- Teaching quality is high as measured by student evaluations, peer mentoring, and institutional faculty review processes (EDO, Reappointment, Tenure, Promotion, and

Peer Mentoring). These same processes provide mechanisms to address any teaching problems that might exist.

- UTC has several funding programs (Graduate Student Association and Provost Student Research Awards) to support graduate student research, travel, training, and presentation of research. The department also provides support for graduate students (travel, research, publication fees, etc.) on an ad hoc basis.
- UTC has strong and easily accessible programs for students with disabilities or needing counseling.
- Program faculty strongly encourage students to present and publish research results, and many students do so.
- Graduates are well prepared for success in employment or additional graduate study, as evidenced by actual job placement and admission into graduate programs.

Weaknesses of the program and recommendations for change include the following:

- On average, about 5 students per year have left the program during the past five years. The department is considering conducting exit interviews of students that leave the program to determine what things can be done to increase retention.
- Program size is constrained by the number of faculty mentoring graduate students. Increasing program enrollment could increase the likelihood the program would receive additional university funded graduate assistantships, and support offering of additional dedicated graduate courses. The department is considering two potential solutions: 1) revising the non-thesis options (internship and learned discourse) to require less extensive graduate faculty mentoring while strengthening academic rigor, and 2) establishing additional incentives for faculty to mentor graduate students.
- The number of students pursuing the internship option decreased from about 50 to 25 percent of enrolled students during the past five years. This may have been an inadvertently made it more difficult for internship students to be admitted to the program because it often takes time to identify and secure an internship. The potential revision of the non-thesis options discussed above might provide a solution.
- Minority and international student enrollment is very low. The program is considering target recruiting to increase minority and international enrollment.
- Research space, office space, and computers for graduate student use are very limited. The space issues will be improved after the Holt Hall renovation is completed (>30% in faculty research space, dedicated graduate student study area). The department does not have funds available to purchase and replace computers for graduate students.

PART 4. FACULTY

4.1 Faculty Credentials

4.1.1 Full-time Tenure-Track Faculty

Currently, BGE includes 25 tenure-track faculty (Drs. David Aborn, Jose Barbosa, DeAnna Beasley, Jennifer Boyd, Amy Brock-Hon, Ethan Carver, Stylianos Chatzimanolis, Habte Churnet, Hill Craddock, Timothy Gaudin, David Giles, Loren Hayes, Anne Holmes, Azad Hossain, Hope Klug, Peggy Kovach, Jonathan Mies, Hong Qin, Sean Richards, Joanne Romagni, Mark Schorr, Joey Shaw, Henry Spratt, John Tucker, Thomas Wilson). Eighteen of these faculty have full-time appointments in the Divisions of Biology and Environmental Science, while five have full-time appointments in the Division of Geology. One Biology faculty member serves as the UTC Vice Chancellor for Research and Dean of the Graduate School (Romagni); another Biology faculty member serves as the Assistant Dean of the Graduate School (Carver); another Biology faculty member holds a joint appointment with the UTC Department of Computer Science (Qin). All tenure-track faculty in BGE have terminal academic degrees (23 Ph.D., one D.R., one J.D./LL.M.). The educational backgrounds of our tenure-track faculty represent a geographic spectrum; four earned their terminal degrees from institutions in Tennessee, eight from other institutions in the Southeast, 12 from other institutions elsewhere in the U.S., and one from an institution in Italy.

The research and teaching interests of our faculty are diverse, allowing the MS ESC program to serve a wide range of student programs of study. We have strengths in the areas of conservation and restoration; ecology, evolution, and behavior; environmental and human health; environmental and natural resource law and policy; geology; geospatial services; microbiology; molecular and cellular biology; organismal biology; and systematics and biodiversity. Table 4.1 shows the contribution of individual faculty members to these strengths.

Table 4.1 Broad areas of expertise and research focus of full-time tenure-track BGE faculty.

Areas of Expertise	**Faculty**
Conservation and Restoration	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, Richards, Spratt
Environmental & Natural Resource Law & Policy	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

In the Biology and Environmental Science Divisions, we have full-time tenure-track faculty members who focus in a variety of areas of the environmental sciences, including toxicology, environmental law and policy, and Geographic Information Systems. Among our full-time tenure-track biologists, we have ecologists, microbiologists, cell and molecular biologists, and systematics experts with diverse foci on systems that represent all Kingdoms of life. In the Geology Division, full-time tenure-track faculty areas of focus cover the core areas of mineralogy, sedimentology, paleontology, petrology, stratigraphy, structural geology, economic geology, geomorphology, hydrology, and environmental geology with application to local, regional, national and global problems. Table 4.2 provides detailed information about the academic preparation and areas of focus of full-time tenure-track BGE faculty.

Table 4.2 Detailed information about the academic preparation and areas of focus of full-time tenure-track BGE 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 – I am primarily interested in understanding how human activity impacts bird populations, especially migratory species. My students and I engage in hypothesis-driven, primarily field-based research. The majority of my research has focused on the importance of urban green spaces 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

José Maria Ferreira Barbosa (Associate Professor)

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

My research interests consist on the understanding of different molecular responses to a myriad of environmental stresses. In addition, I explore different molecular techniques to overcome many physiological and or molecular challenges to which many organisms are exposed.

DeAnna E. Beasley (Assistant Professor)

B.S. in Biology, Wofford College, 2002; PhD. in Biological Sciences, University of South Carolina at Columbia, 2013

Insects as Indicators of Environmental Stress – The aim of my research is to investigate how organisms respond to human-driven environmental change and apply ecological principles to understand implications for human health. I use insects as my model species to explore morphological responses and microbial interactions to environmental effects associated with urbanization.

Jennifer Boyd (Associate Professor, Graduate Program Coordinator)

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. I am 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.

Amy Brock-Hon (Associate Professor of Geology, Associate Department Head)

B.S. in Geology, Oklahoma State University, 1999; M.S. in Geoscience, University of Nevada, Las Vegas, 2002; Ph.D. in Geoscience, University of Nevada, Las Vegas, 2007

I currently investigate 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. I am interested in the mode and timing of pedogenic silicate clay and barite formation and utilize mineralogical and micromorphological techniques. I am also interested in the genesis and formation of large depressions atop the Cumberland Plateau in Tennessee and the overall geomorphic development of the plateau.

Ethan A. Carver (UC Foundation Collins Professor, Assistant Dean of 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 – My laboratory is focused on utilization of zebrafish as a model organism for studying different aspects of development. I am particularly interested in the differentiation of cells and their subsequent formation into specific tissues. As such, I study different areas including bone and muscle development. Zebrafish homologs to genes known to be involved in vertebral column defects in mammals are isolated. Eventually I wish 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 my program to study muscle development. Overtime, I plan 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, I also work with tissue culture experiments. Currently I use cell cultures as a screening tool to investigate the effects of electronic cigarette refill solutions on cell growth, viability, and gene expression.

Stylianos Chatzimanolis (Guerry Associate Professor, Associate Department Head)

B.S. in Biology, University of Crete, Greece, 1999; Ph.D. in Entomology, University of Kansas, 2004.

Entomology, Paleontology – I am beetle systematist working with rove beetles, one of the greatest successes of 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. I am 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 I have 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, I am interested in describing fossil insects and investigating how these discoveries affect the phylogenetic relationships of extant taxa. I plan to continue my paleoentomological studies with several new enigmatic genera of Staphylinidae from Burmese amber and the Green River Formation that will help us delineate the tribes and eventually understand the paleobiogeographic history of beetles.

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

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

J. Hill Craddock (UC Foundation Davenport Professor in Biology)

Dottorato di Ricerca (D.R.) in Pomology, Università di Torino, Turin, Italy, 1992; M.S. in Horticulture, Oregon State University, 1987; B.A. Biology and Fine Arts (double major), Indiana University, 1983

My 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.

Timothy J. Gaudin (UC Foundation Professor, Senior Associate Head)

B.S. in Zoology, University of Georgia, 1987; Ph.D. in Organismal Biology and Anatomy, University of Chicago, 1993

Mammalian Phylogeny, Paleontology, and Functional Morphology – My primary research interests are in the systematics and morphological evolution of "edentate" mammals (including anteaters, sloths, armadillos, pangolins and related fossil forms). I employ 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, I am interested in the biodiversity and biogeography of living mammals in southeastern Tennessee. I am 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 my research program is to contribute to an understanding of exogenous fatty acid acquisition and utilization in Gram negative bacteria. To achieve this goal, I use hypothesis-driven laboratory research using several bacteria of medical importance. My first five years have established the impact of exogenous fatty acids in 6 Gram-negative bacteria, including alterations to membrane phospholipid structure, permeability, motility, biofilm formation and antibiotic resistance. The 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.

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

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

My research interests focus on the application of GIS, Remote Sensing, and Spatial Analysis in different areas of earth and environmental science. I am 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. My recent and past research activities include: 1) Coupling GIS and remote sensing techniques with numerical models to better understand our physical environments and the impact of human-environment interactions. 2) 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. 3) 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 environment.

Hope Klug (UC Foundation Associate Professor)

B.S. in Zoology and Psychology (double major), University of Florida, 2001; Ph.D. in Zoology, University of Florida, 2007

Evolutionary Ecology – My research lies at the interface of evolution and ecology. To address key questions in evolutionary and behavioral ecology, I use a combination of theoretical and empirical tools. My 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. My approach is integrative. I strive 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 – My primary research interest is in mammalian genomics: the identification and functional characterization of genes. In particular, I am interested in genome organization and chromatin structure and their influences on nuclear functions such as DNA replication, chromosome segregation and gene expression. Currently I have two projects that focus on gene regulatory effects and mechanisms involved in the molecular pathology of cancer and hereditary deafness. I am 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 I have 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.

Jonathan W. Mies (Robert Lake Wilson Professor of Geology)

B.S. in Geology, University of New Hampshire; M.S. in Geology, University of North Carolina at Chapel Hill; Ph.D. in Geology, University of North Carolina at Chapel Hill

In the area of structural geology, my 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. I also have a budding interest in seismology.

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 Toxicology, Texas Tech University, 2000

Due to unknown factors, Hamilton County, TN produces some of the lowest birthweight infants in the United States. I have 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, we have collected >2000 human placentas from Hamilton County residents and analyzed them for multiple metals. We have also found that metal concentrations are correlated with multiple birth outcomes in Hamilton County.

Research being conducted in my 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 my 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 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. My laboratory is examining the types of compounds present and the potential for effects in humans.

Mark Schorr (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

My primary research interest is stream fish ecology, with an emphasis on water pollution issues and population/community ecology. Graduate and undergraduate students working in my 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, University of Tennessee at Chattanooga, 1998; M.S. in Botany. University of Tennessee, Knoxville, 2001; Ph.D. in Botany, University of Tennessee, Knoxville, 2005

My research interests have three foci. First, I am interested in alpha-taxonomy of plants and biodiversity surveys. In this capacity, my 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, I have 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, I employ 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.

John Tucker (Professor, Department Head)

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 – My research program is largely on hold due to the time demands of serving as department head. The objective of my 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 water dispute.

Thomas P. Wilson (UC Foundation Associate Professor)

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; GISP in Geospatial Sciences, GIS Certification Institute, 2009

Spatial Ecology and Population Biology of Amphibians and Reptiles – I am passionate about working with students so they can become independent scientists and forward thinkers. I am 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, I am a seasoned field biologist who enjoys the outdoors and excels at solving problems in the field. I am comfortable working with a variety of aquatic and terrestrial taxa. I began my career researching the effects of landscape level changes on free-ranging populations of vertebrates. During this time, I 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, my general interests still lie there today. However, my current research focuses less on E&T species and is more in line with keeping the common species common. Since my arrival at UTC, I have 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, I have designed a series of green-ways to study amphibian landscape dynamics so that managers can make adaptive conservation and management strategies. I accomplished this by blending life-history data with conservation genetics, restoration ecology and GIS. I have always maintained an interest in solving field related problems. My background in classical ecological analyses developed my 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, I have 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 my 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.

Our full-time, non-tenure-track instructors play an important role in departmental affairs and thus, are crucial to the MS ESC program. BGE lecturers and faculty associates teach large sections of introductory biology and environmental science courses and coordinate laboratories, which allows tenure-track faculty to focus on teaching upper-division undergraduate and graduate-level courses in biology and environmental sciences. Our academic advisor handles large undergraduate advisement loads (~450-500 students/semester). All of the full-time, non-tenure-track faculty in BGE also participate in Department, College, and University service activities.

4.1.2 Full-time Non-tenure-track Faculty

The BGE faculty also includes seven full-time non-tenure-track lecturers (Callie Adams, Nominanda Barbosa, Jeremy Bramblett, Dr. Jodi Caskey, Kate Harrell, Sarah Farnsley, Dr. Brad Reynolds), a faculty associate/lab coordinator (Dr. Cheryl Murphy), a lab coordinator (Wayne Williams), and an academic advisor (Joseph McCauley). With the exception of the Geology lab coordinator (Williams), all of these faculty are in the Divisions of Biology and Environmental Science. Of these faculty, three have terminal academic degrees (two Ph.D., one Ed.D.) and others have advanced academic degrees (six M.S., one M.Ed.).

4.1.3 Part-time Faculty

Six adjunct faculty members have taught elective courses in the MS ESC program during the past five years. Three of adjunct faculty have terminal academic degrees (Ph.D.); the remaining three have graduate degrees (two M.S., one Master of City Planning). These part-time faculty allow BGE to expand its range of graduate course offerings to appeal to the diverse interests of our graduate students. Courses offered during the past five years that have been unique to adjunct faculty include Regional Environmental Management, Advanced Ecology, and Coral Reef Ecology. Table 4.3 provides detailed information about the academic preparation and areas of focus of part-time faculty who contribute to the MS ESC program. In addition to diversifying our course offerings, our adjunct faculty have played a critical role in sustaining regular course offerings for in demand courses such as Geographic Information Systems and Remote Sensing and Imagery Analysis. By teaching these in demand courses, adjuncts lighten the course loads of our full-time Graduate Faculty (and all other full-time BGE faculty) so they are better able to advance the graduate program through research, graduate student advisement, and new course development.

Table 4.3 Academic preparation and areas of expertise of part-time MS ESC faculty.

Andrew Carroll
M.S. Environmental Science, University of Tennessee at Chattanooga, 2002
Geospatial Services, Geographic Information Systems
Jeff Duncan
B.S. in Psychology, Minor in Biology, University of Tennessee-Knoxville, 1989; M.S. in Zoology, Minor in Ecology, University of Tennessee-Knoxville, 1996; Ph.D. in Ecology and Evolutionary Biology, Minor in Environmental Policy, University of Tennessee-Knoxville, 2001
Ecology

Karen Hundt

Bachelor of Architecture, Auburn University, 1987; Master of City Planning, Auburn University, 1989

Urban Planning, Regional Environmental Management, Regional Land Use and Transportation

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Justin Hunteman

M.S. in Geosciences, Murray State University, 2003

Geospatial Services, Geographic Information Systems

Gary Litchford

Ph.D. in Parasite Physiology and Biochemistry, Rice University, 1965

Geospatial Services, Remote Sensing and Imagery Analysis, Physiology and Biochemistry

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David Neely

B.S. in Wildlife and Fisheries Management, Frostburg State University, 1993; M.S. in Applied Ecology and Conservation Biology, Frostburg State University, 1999; Ph.D. in Biology, University of Alabama, 2003.

Ecology

4.1.4 Graduate Faculty Status

To teach and/or serve on graduate advisory committees at UTC, faculty credentials must been reviewed and certified by the program of interest and the UTC Graduate School. Qualified faculty are appointed to the UTC Graduate Faculty. There are three categories of membership in the Graduate Faculty at UTC: Full, Associate, and Special. Full members must have a terminal degree and may teach courses, direct theses, and serve on thesis committees, while Associates must have a terminal degree and may teach courses and serve on thesis committee, but not direct theses. Special membership can be given to faculty without a terminal degree, visiting or adjunct faculty, and professionals in the field to teach specific graduate courses or serve on specific thesis committees. All appointments must be renewed every five (for Full and Associate members) or three (for Special members) years. Currently, the Graduate School lists 22 BGE faculty as having Graduate Faculty status – 19 Full, two Associate, and one Special. The Graduate School also lists 13 Special and two Associate Graduate Faculty from outside the Department who are affiliated with the MS ESC program.

4.1.5 Quality of Teaching

MS ESC Graduate students are given the opportunity to evaluate individual faculty through University-wide online evaluations of instruction (i.e., course evaluations) called the Student Rating of Faculty. All UTC faculty are evaluated by students in each class that 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.

Students rate each criterion 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). As a sample of the results of student rating of BGE faculty, Table 4.4 depicts the average student responses to each of the evaluation criteria for all courses offered during fall semesters from 2012-2016. The ESC averages include ratings from a number of graduate courses including ESC 5800 Limnology & Reservoir Ecology, 5120 Applied Statistics ESC 5700 Graduate Seminar, ESC 5140 Environmental Law & Regulations, 5460 Global Change Biology, 5160 Remote Sensing, ESC 5030 Microbial Ecology). The mean score of BGE faculty is 6.0 or greater for all evaluation items, with the exception of inclusion of activities and assignments, for which the mean score is 5.95 (Table 4.4). For ESC courses specifically, the mean score of faculty is 6.0 or greater for all evaluation items, with the exception of inclusion of activities and assignments with a mean score of 5.99 (Table 4.4)
For all evaluation items, student ratings of BGE faculty overall and of BGE faculty teaching ESC courses specifically are within ~2.25% of the average College and University-wide ratings.

Table 4.4 Mean scores of student responses to faculty instruction evaluation criteria for fall semesters 2013-2016 across BGE, its Division, CAS; and the University as a whole. Score: 0 = lowest; 7 = highest.

	Faculty scope					
Evaluation criterion	BIOL	GEOL	ESC	BGE	CAS	UTC
The instructor is willing to help students.	6.34	6.18	6.35	6.29	6.39	6.41

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
The instructor provides timely feedback on assignments and exams.	6.12	6.0	6.12	6.08	6.18	6.17
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
The instructor clearly communicates expectations of students for this class.	6.11	5.87	6.11	6.03	6.17	6.13
The instructor expects high quality work from students.	6.49	6.38	6.51	6.46	6.50	6.50
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	**6.21**	**6.05**	**6.21**	**6.16**	**6.25**	**6.25**

As indicated by student evaluations of its faculty, BGE has a reputation for its commitment to student success and academic rigor. Across all semesters sampled, the highest scored item for the Department as a whole and for ESC courses is the expectation of high quality work from students. BGE faculty also are committed to student success, as demonstrated by our second-highest scored item of a willingness to help students. The lowest overall rating for departmental faculty is the inclusion of activities and assignments that help students learn course content. One challenge faced by BGE is meeting the demands of student enrollment, which necessitates the large undergraduate introductory and core courses (~60-150 students/section). Such large classes limit the number of activities and assignments that can be assessed effectively, and these courses could account for the lower, albeit still favorable, mean score for this item. The quality of instruction of individual BGE faculty can be continuously developed through the annual Faculty Evaluation and Development by Objectives (EDO) process, in which every faculty member annually reviews student evaluations and works to adjust his or her teaching methods accordingly. The EDO and other processes for reviewing and improving faculty teaching performance are discussed in greater detail in section 4.6.

4.2 Alignment of Faculty Teaching Loads with Individualized Instruction

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 7 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 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 BGE workload model follows the policy adopted by CAS in fall 2016. The policy is relevant to 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 majority of BGE faculty have 9-month annual appointments; however, some BGE faculty in administrative positions have 12-month appointments.

As described in the UTC Faculty Handbook, the assignment of a UTC faculty member serves to further the 'three broad substantive areas' that define how UTC accomplishes its mission – Instruction, Research, and Public Service. However, CAS recognizes that the entirety of a faculty assignment may not be adequately captured by these three areas alone or by a simple measurement of hours of work. Accordingly, the College views all of a faculty member's workload as falling broadly within four general areas: teaching, scholarship, service, and additional faculty obligations. The efforts from each area should sum to a total of 100% effort. Descriptions of these workload areas and associated guidelines for their allocation as taken directly from the CAS Workload Policy follow:

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 3 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 4.5.

Table 4.5 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, 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 Guidelines

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 BGE Graduate Faculty Workloads

Within the context of faculty workload, the Department has the following goals:

- 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.
- To provide a mechanism to reduce teaching loads for the first two years for new faculty actively involved in research.
- To maintain Graduate Faculty teaching loads at levels commensurate with Graduate Faculty teaching loads at peer institutions.

Nearly all graduate-level courses offered by BGE are taught by full-time tenure-track faculty, who also teach some lower-division undergraduate courses. BGE has endeavored to reduce teaching loads for graduate faculty and others involved in research via several mechanisms. These include the use of Graduate Teaching Assistants (GTAs) to teach laboratories in our introductory biology and environmental science sequences and the consideration 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 student credit for twice the number of contact hours). In addition, UTC offers opportunities to earn partial reductions in course loads by providing research fellowships through the UTC Office of Research and Sponsored Programs. However, it is difficult for our faculty to take advantage of course releases without negatively impacting the degree progress of our large number of undergraduates. To diversify our graduate course offerings and provide release time for faculty active with graduate student research without impacting our large undergraduate programs, we need more full-time faculty and GTA lines.

Although adjunct faculty could cover coursework to make release time possible for faculty active in advising graduate student research, it can be difficult to find qualified and available replacement faculty (i.e., adjuncts), due in part to the advanced and specialized academic content in graduate classes and the low compensation afforded to adjunct faculty. As an example of the typical contribution of adjuncts to our course offerings, 94% of the credit hour production in BGE during fall 2016 was provided by regular faculty members (i.e., either tenure-track faculty or lecturers). The remaining 6% of credit hour production in the Department was attributable to adjunct faculty. To partially offset the overall increase in SCH in BGE (from 8,000 to 11,000)

during the past five years, the hiring of lecturers has prevented precipitous increases in teaching load for tenure-track faculty.

The SCH for regular faculty members in the Department has risen 7% since 2010. The SCH production per full-time faculty equivalent (FTE) in the Department (taking into account only regular faculty members) has been greater than the University average in all five of the past five years, and higher than the average for CAS in two of the past five years (see Table 4.6). With adjuncts included in this number, the SCH production per FTE exceeded both the College and University averages for each of the past five years (Table 4.6). Thus, despite our efforts to reduce teaching workloads for faculty involved in graduate student research and advisement, our faculty have remained among the most prolific at UTC in the production of SCH. To reflect the teaching workload of BGE Graduate Faculty, Table 4.7 compares the graduate SCH output of both the Department and the College. When describing the SCH of Graduate Faculty, it is important to note that the SCH for the many hours spent advising thesis, internship, and or learned discourse projects is not inflated beyond the very few credits of these capstone experiences for which students are required to register. As such, a faculty member that advises a single student in 6 total credit hours of ESC 5999 Thesis generates a total of 6 SCH for that experience. It also is important to note that the Department's overall SCH production is created/maintained with the teaching support provided by lecturers and GTAs. However, the heavy undergraduate load is a continuing challenge, along with limited graduate program resources, contributing to the lower (than National Norm) graduate SCH production. These metrics also should be interpreted as identifying potential for growth of the graduate program in particular.

Table 4.6 Student Credit Hours per Full-time Faculty Equivalent per Semester for all UTC Faculty, all CAS faculty, and BGE Faculty (with adjuncts included).

	Semester				
	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
UTC	237.9	248.8	255.6	265.3	261.6
CAS	280.6	296.4	302.0	302.7	311.2
BGE	346.1	342.7	325.3	330.1	334.8

Table 4.7 Total Student Credit Hour (SCH) Production and SCH per Full-time Graduate Faculty per Semester for all CAS Graduate Faculty and BGE Graduate Faculty.

	Semester				
	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016
College					
Total graduate SCH	1,832	1,765	1,662	1,592	1,592
SCH/CAS Graduate Faculty	20.3	17.3	15.0	13.4	12.8
BGE					
Graduate SCH	227	234	234	209	193
SCH/BGE Graduate Faculty	14.2	13.8	13.8	11.6	10.2
National norm*	NA	NA	NA	15	NA

* National norms include institutions that 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.

4.2.3 Faculty Advisor Workloads

Graduate faculty in BGE advise a diversity of graduate capstone experiences, including thesis, internships, and learning discourses. Graduate student matriculation into the program has ranged between 9-12 students per year between 2012-2013 and 2016-2017. The Graduate student/graduate faculty ratio has remained steady, averaging about two graduate students to BGE faculty who hold UTC Graduate Faculty status since fall 2012. However, not all faculty with Graduate Faculty status contribute equally to graduate student advisement given the relevance of their expertise and research foci to the field, interest in working with graduate students, and contracted duties. During the past five years, 13 tenure-track BGE faculty members (Aborn, Boyd, Craddock, Gaudin, Giles, Hayes, Hossain, Klug, Richards, Schorr, Shaw, Spratt, Wilson) have served as graduate advisors/committee chairs for MS ESC students. The number of MS ESC graduates that each of these faculty has advised during that time period ranges from one

to five. The list of faculty who have served as graduate advisors during the past five years includes the eight faculty who had served as graduate advisors/committee chairs during the five years of our previous Program Review (i.e., 2007-2012). New graduate advisors/committee chairs since that time have consisted primarily of new hires or faculty who were relatively new at the time of our previous Program Review (Giles, Hayes, Hossain, Klug). An additional four other tenure-track faculty members (Barbosa, Chatzimanolis, Kovach, Mies, O'Neill) served on graduate student committees within the past five years. In addition, 19 Associate and Special members of the UTC graduate faculty members from other UTC departments, other institutions, and professional capacities have served on MS ESC student committees during this time period.

4.3 Faculty Diversity

Full-time faculty in BGE (including instructors, faculty associate, lab coordinator, and academic advisor) include 21 men and 12 women (i.e., ~36% of the total are female). This percentage is lower than the percentage of full-time faculty who are female in both CAS and the University (see Table 4.8). The percentage of Graduate Faculty in BGE who are female is exceptionally low at 20% (5 females out of 25 graduate faculty), and of these faculty, just two have served as graduate advisors during the past five years. The percentage of female part-time faculty in the BGE Department is higher than the percentage in CAS and UTC.

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	52.6%
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.

Most BGE faculty are Caucasian (see Table 4.9). Among full-time BGE faculty, the percentage of Caucasian individuals is similar, the percentage of Black individuals is higher, and the percentage of Asian individuals is lower than these percentages in CAS and the University as a whole. 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 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 4.9 Racial and ethnic backgrounds of BGE, CAS, and UTC faculty in fall 2016.

	Full-time Faculty		**Part-time Faculty**	
	N	%	N	
BGE				
American Indian	2	0.4%	0	0.0%
Asian	33	7.1%	4	1.7%
Black	33	7.1%	10	4.3%
Hispanic	10	100.0%	3	1.3%
Multiracial	1	2.2%	2	0.9%
Native Hawaiian	1	0.2%		0.0%
Unknown	0	0.2%	2	0.9%
White	384	82.8%	210	09.9%
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%**
UTC				
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.

4.4 Professional Development

BGE faculty engage in a diversity of professional development activities related to teaching and pedagogy, including programs offered by the UTC Walker Center for Teaching and Learning. The Department also has a teaching-mentoring program for its new faculty. Each semester for the first several years of faculty appointment, tenured faculty observe and provide feedback to new faculty about their teaching.

Our faculty have attended, participated in, and led professional development workshops on topics including 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 for review by the BGE 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.

In the past five years, BGE faculty have submitted numerous grant proposals to internal programs as well as private, state, and federal funding programs. Between fall 2012 and spring 2016 (for which data are available), our faculty secured >$2.5 million in extramural funding, which is more than of the total external funding awarded to faculty in CAS during those years. Despite dramatic enrollment growth, teaching loads, and budget and infrastructure shortcomings, BGE faculty have a long record of successfully obtaining and executing external grant awards ($8,179,080 total and $454,393 yearly average from 2001-2018; 2014 and 2016 totals of $1,027,360 and $1,043,777, respectively). In the past five years, our faculty have contributed to or led >100 publications in peer reviewed journals, ranging from regional to international. They have published numerous book chapters, project reports, and a book. BGE faculty also regularly present their research at regional, national and international scientific meetings.

Faculty in BGE also engage in a diverse range of service activities. All of our faculty serve on 2-4 Departmental committees annually with tenured faculty serving as chairs. At the University-level, our faculty have served on committees, steering committees, task forces, and the UTC Faculty Senate. Professionally, BGE 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 *Castanea*, *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

recently served as a president of a professional society, and several faculty members coordinated a regional scientific meeting in Chattanooga in spring 2015. Some of our faculty members regularly review grant proposals, both external and internal 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, 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 D.

4.5 Faculty Engagement in Measuring and Advancing Student Success

4.5.1 Orientation & Advisement

The Department engages in numerous activities that help students progress toward earning the MS ESC degree by ensuring that they are informed of relevant policies and required procedures. The MS ESC Graduate Program Coordinator organizes and runs a formal graduate student orientation at the beginning of each academic year. In the spring semester, when fewer students begin the program, the Coordinator meets individually with incoming MS ESC students to describe University- and program-level policies and procedures. The laboratory coordinators for introductory biology and introductory environmental science hold training sessions for GTAs; these students also must complete University-level orientation sponsored by the Graduate School.

Students in the MS ESC program must identify an advisor during the process of applying to the program. Graduate faculty members meet regularly with the graduate student who they advise. Early in their programs of study, MS ESC students form committees consisting of the advisor and two other members of the UTC Graduate Faculty. The role of graduate advisory committees is to advise students on project goals, methods, and outcomes. The committee formally assesses student progress at two stages – proposal and defense. Proposals are presented and discussed during meetings between students and their committees. All thesis, internship, and learned discourse oral defenses are open to the public and are attended by the members of the graduate advisory committee, as well as the Graduate Program Coordinator and/or BGE Department Head.

In addition to advising student capstone experiences, graduate advisors frequently discuss career and/or further academic paths with the MS ESC students who they advise. Graduate advisors also engage graduate students in research, relying on resources from various sources including external grants and internal sources of funding from the UTC Graduate School and UTC Office of Research and Sponsored Programs. Many of the presentations and peer-reviewed publications generated by our graduate faculty include graduate student contributors (see Appendices C, D). Many of our graduate students present their work internally at the UTC Research Dialogues event, held annually during the spring semester.

4.5.2 Curricular Development & Assessment

New BGE faculty are encouraged to develop graduate-level courses in their areas of expertise; as such, new hires help to broader our graduate course offerings, providing more capacity for individual graduate students to tailor their programs of study to suit their interests and career goals. Beginning in fall 2017, all new faculty hires at UTC also are required to participate in a semester-long New Faculty Pedagogy course sponsored by the UTC Walker Center for Teaching and Learning to support their success in the classroom. This course focuses on instructional design and delivery best practices that align with the Quality Matters guiding principles of student-centered and interactive learning environments. Numerous other BGE faculty participate in professional development activities aimed at improving instruction, including workshops and seminars sponsored by the WCTL each year.

In our graduate-level courses, we assess program-level Student Learning Outcomes (SLOs) each year (see Section 1.2 of this Self Study). The MS ESC SLOs represent the emphases of our program, are measureable, and can be incorporated in our core and elective courses in different levels and ways. The capstone experience that each student must complete to earn the MS ESC degree provides an assessment of competency in each of our SLOs. Since the implementation of the current MS ESC SLOs in fall 2015, it has not been necessary to consider corrective actions because all assessments have indicated that the SLOs are being met. However, the MS ESC program is committed to making appropriate changes to our curriculum and course content should the need arise.

4.6 Faculty Evaluation System and Faculty Improvement

Chapter 3 of the UTC Faculty Handbook addresses faculty appointment, evaluation, promotion, tenure, and termination. Two distinct review processes occur each year: 1) an annual reappointment, until such time as the faculty member is tenured, or is terminated, and 2) an annual Evaluation and Development by Objectives (EDO), which occurs for all full-time faculty, regardless of appointment classification.

The annual reappointment process requires that the faculty member submit a dossier to the department's Reappointment, Promotion, and Tenure (RPT) Committee, which is composed of all tenured faculty in the Department. The RPT committee reviews the dossier, and makes a recommendation to the Department Head. The Department Head makes an independent review of the dossier, considering the RPT committee recommendation, and makes a recommendation to the next administrative level. The EDO process 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. Documents generated through the EDO process are included in the dossier submitted for annual reappointment of untenured tenure track faculty and lecturers.

The UTC 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 That each academic department will define its standards for expected performance in teaching and advising; research, scholarship, and creative activities; and 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.

The standards developed by each academic department must be approved by the Dean and the Provost. Once standards for performance ratings have been established, the 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 of the University. It is the role of the Provost to encourage such comparable standards across the University.

BGE has developed criteria for faculty evaluation to supplement the minimum criteria contained in the Faculty Handbook. Appendix E contains Department and UTC EDO criteria. Appendix F contains Department and UTC tenure criteria.

4.7 Assessment of Faculty Strengths, Weaknesses, and Recommendations for Change

Our greatest strengths are in the credentials and expertise of our faculty (criteria for evaluation 1), faculty engagement in professional development that both enhances teaching, scholarship, and practice and student success (criteria 4 and 5), and a clear faculty evaluation system (criterion 6).

Strengths: The areas of expertise of the Department of Biology, Geology, and Environmental Sciences is diverse, allowing us to offer a diverse curriculum (see Part 2) and contribute to a positive student experience (see Part 3).

Faculty accomplishments: The BGE faculty have amassed an outstanding record in all three areas of faculty responsibility over the past 5 years. The department has been among the leaders at this institution in establishing high academic standards. 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 in 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.

Impact on student success: The strengths of our faculty benefit graduate students in the Environmental Sciences program. Local, regional, national, and international collaborations provide a strong professional network for graduate students, increasing research and career opportunities for our students. Many of the presentations and peer-reviewed publications generated by our graduate faculty include graduate student contributors (Appendices C, D). Many of our graduate students have been successful in securing funding for projects from the UTC PRSA program and external sources. Several students in our program have progressed to PhD programs while many others have been successful in securing jobs in the field of environmental sciences (see Section 6.2).

Student evaluations: 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.

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.

Weaknesses & needs: There remain serious challenges that must be faced by the MS ESC graduate faculty. Our greatest limitation is that we need more resources and graduate faculty to grow the graduate program. 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 (criteria 3). Finally, several faculty members who regularly participate in graduate program activities, including advisement of graduate student theses, internships, and learned discourses, do not teach graduate level courses (criteria 2).

Low pay/faculty recruitment: Because of low pay levels set by the institution, the department faces ongoing problems in recruiting and retaining qualified adjunct faculty. Relatively low pay and startup funds 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 ethnic diversity as a whole and in increasing the number of tenure-track positions held by women. The merger with Geology has also presented several challenges including differences in expectation for promotion and tenure. Historically, Geology faculty have had higher teaching loads and no dedicated space for research. BGE is committed to addressing

these inequities and has already hired added a new geology faculty member, begun reducing geology teaching loads, and identifying dedicated research space. These issues have also presented some challenges to developing departmental by-laws.

Inadequate resources: The Department remains under equipped and lacks a significant portion of the space, equipment, library, and personnel resources initially promised the MS ESC graduate program at its inception. The Department was originally promised a new scientific building by the administration. However, this plan was changed within the past five years. The revised plan, which includes renovations to Holt Hall, commenced in 2016 and has temporarily disrupted some teaching and research activities and dispersed faculty across five academic buildings. The second phase of the renovation, scheduled to begin in spring 2018, will displace more faculty, the departmental office, and a graduate student 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 and MS ESC program.

Faculty involvement in graduate teaching: Some faculty that regularly participate in the graduate program (e.g., by advising graduate students) do not regularly teach graduate level courses. This challenge is due in part to the need for faculty to teach undergraduate courses in Biology, Geology, and ES. We need to evaluate how we offer graduate elective courses to address this issue. If approved, a recent budget request for a new Ph.D. generalist capable of teaching a variety of upper level core and elective courses may occasionally relieve graduate faculty of some undergraduate teaching assignments. The position would involve full time teaching with no course release for research activity. Another action that could increase faculty involvement in the program would be to increase the program size by changing the learned discourse option to a non-thesis course based tract. This would likely increase enrollment without adding to the advising and mentoring load of faculty. Larger graduate enrollment would make it easier to justify additional graduate teaching assignments.

Program size: Graduate student credit hours declined by ~13% between Fall 2012 and Fall 2016 and the number of student credit hours per graduate faculty member has also declined by 28% during the same time period. The latter reduction is due in part, to an increase in graduate faculty in BGE since 2012 (partially due to the merger with Geology). We face two major impediments to graduate student recruitment. First, our graduate faculty contribute to advising and teaching in our large undergraduate programs in Biology, Geology, and Environmental Sciences. Supervision of graduate student theses, internships, and learned discourse projects are not included in faculty teaching loads, limiting the number of graduate students that individual faculty members can supervise. Second, the Graduate School offers a limited number of graduate assistantships. These assistantships do not provide a living wage to our graduate students, leaving some prospective students no choice but to accept positions at other universities with higher student assistantships.

Recommendations for change: Our goal is to grow the M.S. program in Environmental Sciences. Growing this program will require the following investments from the University: (1) Increased number and size of graduate student assistantships, in line with universities of comparable size, (2) Increased faculty salaries, including graduate faculty (tenure-track) and the instructors and

adjuncts that relieve graduate faculty of other duties, (3) 1-2 additional tenure-track lines, which will increase capacity to accept students, (4) 1-2 support staff, in areas of molecular biology lab management, animal care, and natural history collections management, (5) Inclusion of graduate student advisement (thesis, internship, learned discourse) in faculty workloads, and (6) Investment in modern academic and research facilities, including a new academic building. These changes will facilitate greater involvement of graduate faculty in the recruitment and advising of graduate students and ultimately, growth in the MS ESC program.

Internally, we need to evaluate how we offer graduate courses, seeking ways to increase inclusion of faculty with diverse interests in the curriculum. Although several recent faculty hires have improved diversity among our faculty, the department needs to continue efforts to recruit more women and members of under-represented groups in future hires.

PART 5. LEARNING RESOURCES

5.1 Improvement of Equipment and Facilities

5.1.1 Overview of Instructional Equipment

Faculty in the MS ESC program encourage students to pursue answers to numerous environmental questions through their course work and research. To facilitate student learning in both our graduate courses and through collaborative research with our faculty, the BGE department seeks to provide the necessary scientific equipment. In many instances, this equipment is provided for use in both undergraduate and graduate courses by the Department. A detailed list of current departmental equipment, including equipment acquired within the past five years, that initially cost at least $1,500 is provided in Appendix G. Of particular note, current major equipment includes a confocal microscope, controlled-environment growth chambers, electron microscope, fluorescence and gas-exchange system package, steam sterilizer (autoclave), microarray scanning system, microplate reader, seismometer, spectrometer, x-ray diffractometer, large cutting saws, a thin-section machine, multiple petrographic microscopes, and numerous computers. With regard to teaching microscopes, the department has 209 compound microscopes, 94 stereoscopes, and 12-15 polarizing microscopes. These resources are available to support teaching and research for both faculty and graduate students. For example, graduate students who serve as teaching assistants utilize the microscopes and other supplies and can request to use equipment that is housed in their advisor's lab or in the lab space of other faculty in the department.

Functional and well-equipped teaching labs are essential for the teaching needs of our faculty and Graduate Teaching Assistants (GTAs). The needs of teaching labs are evaluated annually, and lab fees paid by students to enroll in laboratory courses are typically used to support the purchase of lab supplies. GTAs staff the majority of our BIOL 1110L Principles of Biology I and BIOL 1120L Principles of Biology II lab sections. BIOL 1110L is taught in two rooms and BIOL 1120 is taught in one room. During the past five years, we have gotten enough microscopes serviced for these rooms 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. One teaching lab has a microscope equipped with a camera; when it is not in use for visually impaired students, instructors can use this scope to show students microscope slide specimens.

GTAs also staff the majority of our ESC 1500L Introduction to Environmental Science I lab sections. Currently, these labs share a room in Collins Annex while Holt Hall is undergoing renovations. The Collins 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, the lab coordinator notes that he is able to maintain a well-stocked lab.

5.1.2 Overview of Facilities

Prior to 2016, BGE faculty and staff occupied space in Holt Hall, Grote Hall, and the Collins Lab and Office Annexes. Due to the renovation of Holt Hall, faculty and staff now occupy space in Holt Hall, Grote Hall, the Collins Lab Annex, the Collins Office Annex, and Davenport Hall. In addition, all GIS and Remote Sensing classes, which are popular MS ESC electives, are being held at the SimCenter's Integrated Geospatial Laboratory (IGT) Lab, which is located about 0.5 miles from Holt Hall.

Both prior to and during the renovation, graduate students have been provided space in their advisor's lab and/or in a graduate student office in Holt 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. Table 5.1 describes the current and future Geology space use. Increased research lab space will potentially provide more space for MS ESC students conducting research. Additionally, following the renovation, the dedicated graduate student office space will be double its current size. Additionally, the Department will have an in-house computer teaching lab. This could broaden the scope of graduate 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. A detailed description of the anticipated space allocation following the completion of the renovation is provided in Appendix H.

Table 5.1 Current use of space by Geology faculty.

	Current use		
Room/space	**Teaching**	**Research**	**Courses 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 Petrology Lab Environmental Geology Lab Economic Geology Geomorphology Soil Prop., Genesis, and Development

James Hutton Room (Grote 208)	X		Field Experience Sedimentary Rocks and Stratigraphy Paleontology Geology Seminar/Senior Seminar
Hugo Benioff Room (Grote 206)	X	X	
IGT Lab (SimCenter 102)	X		GIS for Geologists Geological Remote Sensing
Students' Computer Work Station: Lewis and Clark Room (Grote 224)	X	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

5.2 Learning and Information Resources to Support Teaching and Learning

5.2.1 Growth Facilities

UTC was awarded funds from the National Science Foundation Major Research Instrumentation program in fall 2013 to support the acquisition of six controlled-environment growth chambers. The growth chambers, managed by Dr. Jennifer Boyd, specifically support research agendas requiring precise and simultaneous environmental controls with focus on global change biology at UTC. By enabling BGE faculty and students 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, the growth chambers have supported the thesis research of two female students enrolled in the MS ESC program. The chambers also are used regularly as a teaching resource for ESC 5730 Plant Ecology (~24-48 students/year). Research conducted in the chambers has supported existing regional collaborations between UTC researchers, government agencies, and other institutions.

The Department has access to one greenhouse. The greenhouse provides a wealth of teaching material that is used in multiple lectures/labs focusing on plant anatomy, morphology, evolution to pollination syndromes, growth and development, water-use strategies (xerophytes vs. mesophytes), and more. Greenhouse activities specifically support and strengthen the MS ESC

program by providing plant materials and space that is used in many different laboratory sessions of graduate courses.

5.2.2 Collections

The UTC Herbarium, curated by Dr. Joey Shaw, is the oldest herbarium in Tennessee and was established in 1886. It contains >45,0000 specimens that are mostly from southeastern Tennessee and northwestern Georgia, but also a diversity of specimens from many U.S. National Parks (e.g., Bryce Canyon, Grand Canyon, Grand Teton, Mt. Rainier, North Cascades, Olympic, Rocky Mountains, Yellowstone, Yosemite, Zion NP). The Herbarium also serves as an official repository for the Chickamauga and Chattanooga National Military Park. In addition, the Herbarium houses specimens from Africa, the Middle East (Abu Ghraib, Iraq), and Southeast Asia. While it is difficult to assign a monetary value to its collections, the averages of published estimates for such collections adjusted for inflation would put the value of the UTC Herbarium at ~$4 million. All of Dr. Shaw's ~15 graduate students have used the Herbarium as an education resource as well as a repository for voucher specimens.

The UTC Natural History Museum holds a collection of several thousand fossil vertebrate and invertebrate specimens (including 1102 catalogued mammals, 40 catalogued birds, 42 catalogued reptiles & amphibians, >500 catalogued invertebrate specimens, and ~3,000-4,000 uncatalogued specimens), as well as an extant vertebrate teaching collection of > 500 specimens (216 whole body, whole skeleton, or mounted or preserved dissected specimens and models; ~300 microscope slides; and ~100 miscellaneous isolated bones). The Museum collections can be accessed by MS ESC students for research purposes and are used in graduate courses.

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 3 of the living mammalian orders). Based on a 1997 survey, the Mammal Collection would be the second largest in Tennessee and is located at considerable geographic distance from the other significant mammal collection at the University of Memphis. The Mammal Collection serves as an official repository for specimens collected in biotic surveys of Chickamauga and Chattanooga National Military Park and Great Smoky Mountains National Park and includes significant collections of specimens from eastern and southeastern Tennessee, northwestern Georgia, and western North Carolina. The taxonomic strengths of the Mammal Collection are in small terrestrial soricids and rodents. These collections are used in BIOL 4050 Comparative Vertebrate Zoology (~24-48 students/year), BIOL 4140 Mammalogy (~24 students every two years), and BIOL 4550 History of Evolutionary Thought (~10 students every 2 years).

The UTC Natural History Museum Insect Collection (UTCI), which is currently curated by Dr. Stylianos Chatzimanolis, was established in the early 1970s by Dr. Charles Nelson, a plecoptera expert. During his 30-year career, Nelson developed an outstanding teaching collection (identified at the family level), with representatives from most southeastern U.S. families and approximately 40,000 specimens. Chatzimanolis arrived at UTC in 2008 and quickly established a modern research-focused collection of Coleoptera, which currently contains ~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 southeastern U.S., but due to the neotropical research program of Chatzimanolis, many neotropical materials are also present. In total, the collection contains specimens from ~40 countries. Chatzimanolis' research focus is the rove beetles, which are the largest family of animals (with >60,000 species described), and the UTCI 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 such collections in the world in terms of its diversity. Because Chatzimanolis is one of the only two rove beetle systematists currently employed in the U.S. at a university level, UTCI also is becoming the *de facto* collection for rove beetle specimen identification in the country. Recent donations include ~5,000 specimens of rove beetles from Mexico and a forthcoming donation from Puerto Rico.

The UTC Natural History Museum Amphibian and Reptile Collection, curated by Dr. Thomas Wilson, includes >4400 specimens, representing ~2000 species, 239 genera, and 78 families (of the 153 total families recognized), which does not include a backlog of unaccessioned specimens. Of note, the collection contains the oldest specimens of *Regina septemvittata* (Queen Snake) from any geographic place and from our region. The taxonomic focus of the collection is variable but largely focused on Chelonians and Colubrid snakes. The geographic focus is variable.

The UTC Natural History Museum Bird Collections, curated by Dr. David Aborn, consists of approximately 200 bird specimens and about a dozen nests.

The UTC Natural History Museum Fish and Additional Invertebrate and Salamander Collections, curated by Dr. Mark Schorr, includes invertebrates from more than 40 genera and 190 families, fish from more than 110 families, and more than four species of salamanders. Some specimens are used primarily by researchers or professional biologists; however, many of the reference specimens are used for teaching.

5.2.3 Field Stations

BGE oversees the day-to-day operations of three Biological Field Stations (BFS), which can be utilized by MS ESC students for research purposes. 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 5 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. Unfortunately, human encroachment from primarily residential and industrial areas is occurring along the borders of the BFS properties.

5.2.4 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. The faculty administering these specific programs are active in the graduate program and both vehicles have been used extensively by MS ESC students. 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, depthfinder, 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. This equipment is used primarily by one faculty member (and his MS ESC students) who is active in the MS ESC program. While potentially of use to other MS ESC faculty, the *Serpentina* is challenging to trailer and operate without specialized experience and training.

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. Some MS ESC students and faculty would benefit from purchase of a new boat that is easy to trailer and operate.

5.2.5 Health, Safety, and Welfare

A Chemical Hygiene Plan for the Department is provided in Appendix I. The University also maintains an Office of Safety and Risk Management to help provide a safe, healthy, and hazard-free environment for UTC students, faculty staff, and visitors and to ensure compliance with all applicable federal, State, and local regulatory requirements.

The UTC Institutional Animal Care and Use Committee guides and oversees animal care and use by UTC researchers and ensures compliance with relevant laws, regulations, and policies. All research with vertebrate animals must be approved by IACUC. The UTC Institutional Review Board ensures that UTC research involving human subjects protects the rights and welfare of those subjects in compliance with relevant laws, regulations, and policies. All research involving human subjects must be approved by the IRB.

5.2.6 Computing Resources

A detailed list of BGE computers is provided in Appendix J. The Department has acquired ~60 computers during the past five years through Department, College, University, and external grant funds. While some of these computers might be used by MS ESC students as facilitated and allowed by individual faculty advisors, BGE lacks funds for individual computers for graduate students. There is a shared computer in the shared graduate teaching assistant space in Holt Hall. Renovated Holt Hall will have a computer lab that is available to both undergraduate and MS ESC students.

From 2012-2016, the College of Arts and Sciences supported computer refresh for BGE faculty teaching computers. Prior to this, computer refresh was ad hoc. In 2016, UTC IT initiated a Computer Refresh Program for faculty teaching computers. This Program was established to create an annual cycle of computer replacement so that all UTC faculty receive a new, primary computing device every four years. The Program contributes up to $1,200 toward each refreshed device with departments paying for any overages. IT also provides a range of relevant software to both faculty MS ESC students that includes the Microsoft Office suite, Adobe Professional, SPSS, SAS, and MatLab. CAS and IT computer refresh programs are welcomed. However, the $1,200 limit per individual computer is inadequate for purchase of computers capable of efficiently meeting the computing needs of most science faculty. During the review period, BGE has regularly subsidized the cost of computer refresh from operating and gift funds, so that faculty have adequate computers.

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 laboratory and classroom instruction.

5.2.7 Library Resources

The state-of-the-art UTC Library 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 loans 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, 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 (currently chaired by Dr. Jodi Caskey) and a Departmental Liaison in the Library. To evaluate and assess our library needs, each spring, the Collections Department releases money for BGE to spend on one-time expenditure resources (excluding journals or continuing resources like databases, textbooks, or duplicate items). We are allowed to make requests for what resource to acquire; if there are no requests, the Library will choose resources to purchase for BGE.

5.3 Materials and Support to Encourage Research and Publication

5.3.1 Overview of Research and Publication Materials and Support

BGE' facilities and resources support research by MS ESC faculty and students and the ability to publish their research. Faculty research and graduate research advisement also is supported to varying degrees by practices that alleviate the teaching demands associated with our large undergraduate programs. In many departments at UTC, the typical teaching load is four class preparations per semester. To facilitate research and graduate student advising, all tenure-track BGE faculty typically teach three course preparations per semester. In part, this general release is facilitated by our practice of assigning Graduate Teaching Assistants to the vast majority of lab sections associated with our large introductory courses. BGE may provide additional course releases to faculty who are very research active as encouraged by new University-policy; however, our teaching demands often do not allow such releases to be granted in practice. Faculty teaching load is a complex issue and is discussed in more detail in section 4.2.

The costs associated with publication (e.g., page charges, open-access fees) may be paid by external grants, departmental funds, and/or CAS support. BGE often supports publication by paying for or offsetting publication costs. However, there is no formal process by which faculty and MS ESC students can request that the Department contribute to publication costs, and there is no dedicated budget for these expenses.

5.3.2 Online Courses

Online courses could provide support to research students by allowing them to have more flexibility in their schedule for research activities requiring fieldwork and/or internships. Similarly, online courses could provide flexibility for faculty research, especially that involving extensive fieldwork and/or collaborations with other institutions that make it difficult to be on

campus. UTC encourages online course development and delivery and provides extensive support and training for these activities through the Walker Center for Teaching and Learning. Faculty in the department have expressed differing views of the merits of online instruction at the undergraduate level, especially in lab based courses. BGE faculty presently offer two undergraduate non-lab courses (one non-majors 1000 level course and one 3000 level core course). BGE graduate faculty have not proposed developing any online graduate courses.

5.4 Assessment of Learning Resources Strengths, Weaknesses, and Recommendations for Change

5.4.1 Assessment of Instructional Equipment

Equipment needs are evaluated annually. The BGE Equipment Committee maintains a ranked equipment needs list of items that play critical roles in teaching and/or research labs. 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 placed 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 (currently Dr. Henry Spratt). Details of the item(s) requested and costs for the item(s) must be provided. In addition, justification for the requested items must be included that describes the need category (to maintain course instructional integrity, to meet existing infrastructure deficiencies, or to meet continuing student/faculty research objectives) and an estimate of the annual number of students to be impacted by the purchase of the equipment, as well as any specific course that will be 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 the former Department of Biology and Environmental Science with the former Department of Geology, the combined department began keeping two equipment needs lists: one for Biology and Environmental Science requests and one for Geology requests. While MS ESC graduate students do not directly add requests to this list, faculty can request equipment to support the research of their graduate students.

The primary action that the BGE Equipment Committee recommends is the establishment of a line item in the BGE operating budget for equipment purchase and service. 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 BGE meet many of its long-range goals with regard to curriculum and research to support the graduate program. Many faculty have teaching and research programs that require equipment, and as such, the need to keep equipment up-to-date is constant. For example, numerous microscopes are used in laboratory courses taught by GTAs. Contemporary teaching-quality microscopes have shelf lives of around 10 years. Thus, unless BGE 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. 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. This ongoing expense is important to maintain the equipment that we own. These costs are not insignificant, as the current service contract we have for our autoclave costs more than $7,000 per year, for example. Additional funds are needed to maintain and service the other major pieces of equipment in the Department as well.

For our GTAs in introductory biology and environmental science lab courses, it would be ideal for each lab to have its own microscope with a camera, so that the instructors would always have the capacity to show the students microscope slide specimens in real time. After the Holt Hall renovation, it would also be ideal to have chalkboards taken down and dry-erase boards mounted onto the walls. We are currently using portable dry-erase boards to teach these labs. 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 BIOL 1120L lab specifically, it would be ideal to have four more stereomicroscopes for the lab, so that 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 in over several days. A critical need for our environmental science labs is more professional-level water quality monitoring instruments. As mentioned above, BGE has requested some of this IT equipment as part of the Holt renovation planning.

Currently, some of our most popular electives among MS ESC students in their programs of study are our GIS and Remote Sensing courses. These courses currently utilize the SimCenter's Integrated Geospatial Laboratory (IGT) Lab, which is located about 0.5 miles from Holt Hall. The lab has bare minimum computing capabilities for GIS and Remote Sensing courses as the computers are very old. The lab also has restrictions for after hour use that make it difficult for students to work on assignments outside of class time. The availability of a classroom with efficient computing facility in Holt Hall or its close proximity would be of great benefit for providing an optimum learning environment for GIS and Remote Sensing classes. Additionally, the Geological and Environmental Remote Sensing (GERS) Laboratory initiated by a new environmental geoscientist faculty member 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.

Another area of teaching and research where specific equipment needs impact MS ESC graduate students is in the molecular and microbiology areas of research. In particular, graduate students working in these areas need access to the departmental autoclave (steam sterilizer) at some point in their work. The current autoclave, housed in Davenport Hall, is barely adequate for the number of users trying to use it. In addition, the location of the single autoclave is inconvenient

and can create safety issues (i.e., the need to move very hot containers across campus can lead to accidents). As the Holt Hall renovation proceeds, the BGE Equipment Committee has proposed the purchase of a second autoclave of the same approximate capacity (about 250 L). This new autoclave would possess a boiler that is double the size of the existing autoclave. Eventually, both autoclaves could be plumbed together; this arrangement would offer the ability to run both autoclaves off the one larger boiler in the event that the existing autoclave's boiler failed. Failure of the existing autoclave jeopardizes not only student research but also numerous courses tied to this critical piece of equipment. In an attempt to minimize such disruptions, BGE maintains a service contract to keep the existing autoclave functional. The acquisition of a second autoclave will add to these maintenance costs, with a yearly outlay of nearly $10,000 for the service contract alone. Thus, the costs of periodic purchases of new autoclaves, which cost approximately $40,000, and their regular maintenance requires substantial investment by the Department. This situation is repeated with many of the sophisticated instruments needed by BGE faculty and students. BGE recently submitted a 2019 budget proposal requesting funding for purchase and installation of a second autoclave.

A concern we have regarding equipment used by MS ESC students for both teaching and research is that very few equipment items are dedicated to the program. In our original proposal for the MS ESC program, funds had been requested to purchase equipment for three unique dedicated laboratories – one for toxicology work, one for general research, and one housing computers. The budget request including $60,000 for the toxicology and general research labs and $74,000 for the computer lab. This budget was approved by the UTC Administration at that time; however, these funds were not provided to the program. To this day, the MS ESC program lacks a computer lab dedicated to our students. The overall limited instrumentation dedicated to bench research has forced many faculty to allow graduate students to use their own research equipment for both teaching and research. This practice should be discouraged, as it can result in damage to the equipment and/or reduce the ability of faculty members to conduct their own research. An example of a piece of equipment that should have been purchased for the MS ESC program is a liquid scintillation counter (LSC) to support the use of radioactive isotope tracers in both course work and student research. Because the MS ESC program does not have a dedicated LSC for courses and student research, Dr. Spratt has allowed his research LSC to be used for course laboratories and student research. Similar use of faculty research instruments for the MS ESC program has occurred throughout the department. This is an unsustainable practice, as the loss of a key instrument could lead to the inability to teach a lab-based course, for a graduate student to conduct thesis research, or for a faculty member to conduct his/her own research.

5.4.2 Assessment of Facilities

After the completion of the Holt Hall renovation, there will an increase in overall space, primarily of that for Biology and Environmental Science faculty. A major need for Geology will continue to be independent research and teaching space. As Table 5.1 shows, many geology laboratories are currently being used for both teaching and research activities. The faculty in our Geology Division usually 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 for Geology faculty to effectively participate in our graduate program.

Following the Holt Hall renovation, there will be three or four vacant office spaces and four vacant research spaces. If BGE hires a new tenure-track faculty member every two or three years, as is the approximate pace at which 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 isn't any office or research in Grote for that expansion. Thus, while the building renovation will improve our space, the department will 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.

In designing our new space, we have made requests to UTC Information Technology (IT) specifying that all teaching labs should have a flat panel TV displays, non-ghosting whiteboards, and overhead projectors. In certain labs, we asked for wireless connectivity between devices and display panels. Lecture classrooms should be equipped with traditional teaching podiums, projectors, screens, whiteboards that do not overlap screens and electrical outlets for student devices. We would like to equip two small classrooms to facilitate integrative/interactive teaching methods (NODE/Ethos chairs; chairs clustered around multiple tables). Furniture requests for the Holt renovated space have not yet been worked out, but acquiring sufficient furniture is essential for the continued success of our program. We are still waiting on budget approvals. The success of our future teaching depends on the University meeting these needs.

5.4.3 Assessment of Teaching and Learning Resources

5.4.3.1 Growth Facilities

No major needs are noted with respect to the growth chambers at this time. However, the greenhouse is in need of an automated irrigation system and a storage facility for horticultural supplies used in teaching and research programs. In addition, a greenhouse manager that could free faculty from caretaking responsibilities would be beneficial. The greenhouse requires constant attention (e.g., watering, weeding, repotting, monitoring dermestid beetle infestations, specimen repair when damage occurs because of use in teaching), which amounts to considerable time for faculty who use these resources. Ideally, a greenhouse manager could be an MS ESC student, which would increase financial support for graduate students. Currently the greenhouse functions as both a growth facility, but also as a storage space, which limits its usefulness. In terms of acquisitions and upkeep, there has been a push to start thinking of our greenhouse, Herbarium, and Museum as equipment. Like any other valuable teaching/research tools, these facilities require maintenance and upgrades to maintain their function. However, there is no dedicated budget for such care. Even more, the collections and greenhouse require constant attention, which consumes faculty time that could be spent on other more productive activities.

5.4.3.2 Collections

Herbarium needs include a small dedicated budget for specimen repair and new specimen preparation, as well as new cabinets as many of its 57 standard, museum-grade herbarium cabinets are old and experiencing failure to some extent. In a recent NSF submission, Dr. Shaw requested 10 new cabinets, but the herbarium actually could use 15 new cabinets, which cost ~$1,800 each.

Major weaknesses in the Natural History Museum Mammal Collection include the lack of labor and a dedicated budget for supplies. Currently, the faculty curators depend on students to provide all curatorial activity. However, these activities are extensive (e.g., preparing backlogged specimens; maintaining a dermestid beetle colony to clean skeletons; the actual work of cleaning skeletons; identifying, labeling and databasing specimens; and specimen upkeep), and as such, many tasks fall through the cracks. Dedicated collection/curatorial staff and dedicated funding for upkeep of the Museum through the Department operating budget would be beneficial.

The Insect Collection is growing very rapidly (>10,000 specimens accessed in the last two years) and will surpass its capacity to house specimens within the next year or so. The Collection is housed currently 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 with 12-drawer capacity). All of the Lane cabinets are >40 years old and are in desperate need of repairs, both on the door handle mechanism and the rubber sealant around the door edge.

The Amphibian and Reptile Collections are in need of increased drawer space, increased workspace, increased ventilation and lighting, lockable storage, and shelf repair. The Bird Collection needs more functional space (the two cabinets the bird collection is housed in are full, old, and do not seal well, although three new cabinets were purchased this summer) and staff to curate the existing collection and prepare new specimens. Currently, there are ~300 bird specimens in the freezer, and these could greatly expand the Bird Collection if someone who was capable of doing museum preparation of bird specimens was available. Such expansion would increase the usefulness of the Collection to the Department and potentially to outside researchers as well.

5.4.3.3 Field Stations

At present, the primary challenges to the Biological Field Stations are security issues. Dr. Wilson has lobbied UTC Administration for security cameras to be installed at the properties, and administrators have promised to fulfill this request. However, this occurred more than six months ago and cameras have yet to be installed, so there is concern that the security issues will continue.

5.4.3.4 Vehicles and Vessels

The two vehicles currently available to all full-time to the Department are not sufficient for our current teaching and research needs, and the BGE state operating budget is insufficient to cover costs for using vehicles from the UTC motor pool. Despite our growth in both students and faculty during that past five years, BGE has not acquired any new vehicles in that time. Both an extended cab truck and an additional van are needed to support research and teaching needs of the Department and the MS ESC program. A new boat that is easy to trailer and operate would also benefit students and faculty involved in aquatic research in the MS ESC program.

5.4.3.5 Health, Safety, and Welfare

No immediate modifications are needed to our current health and safety protocols. The IACUC and IRB committees work well with students and faculty to approve and monitor relevant research. However, the review process is often time consuming, particularly with IACUC since that committee meets only monthly. Given this infrequency of meeting and the usual requirement that protocols be revised and re-reviewed, the review process can make it challenging for MS ESC students to conduct vertebrate research. A more streamlined process would benefit both BGE faculty and students. The IRB committee reviews applications on a more frequent basis, and that committee is working to streamline human-based research that is conducted in collaboration with Erlanger Hospital.

5.4.3.6 Computing Resources

Computers used for teaching are refreshed through the UTC IT Computer Refresh Program established in 2016. From 2012-2016, the College of Arts and Sciences supported computer refresh for BGE. Prior to this, computer refresh was ad hoc. Computer failures outside the refresh process must be covered by BGE operating and gift funds, or by special requests to CAS for additional funds. In addition, there are no dedicated funds to provide MS ESC students with computers. Although the Library has public-use computers and a computer classroom, the Department also lacks dedicated computer space that could be used by graduate students or instructors. Additionally, the provision of computers for individual teaching labs would allow instructors to incorporate data entry and statistics into their lab-based courses. The renovated Holt Hall will include a new computer lab for undergraduate and graduate student use.

As mentioned previously, the availability of a GIS classroom with efficient computing capacity in Holt Hall or in the close proximity would provide an optimum learning environment for our very popular GIS and Remote Sensing classes. Many MS ESC students, in particular, take these courses to learn skills useful to their thesis or internship work. Departmental support for a dedicated computer lab that includes equipment and software purchases, as well as maintenance and updates, is necessary to help sustain these courses and research and internship success.

5.4.3.7 Library Resources

No major library needs are noted at this time.

5.4.4 Assessment of Research and Publication Materials and Support

Advising graduate students is expected of BGE faculty whose research foci fit within the MS ESC program. Advising graduate students is a time-consuming process, however, and currently there are no tangible rewards for BGE faculty (e.g., reduced course load, additional stipend, additional support for research supplies) beyond the potential benefits of working with graduate students, who are presumably more educated, experienced, and competent than undergraduate students. Such rewards would likely enhance faculty enthusiasm to participate in our graduate program. Additionally, because Geology Division faculty did not have a graduate program prior to the merger with Biology and Environmental Science faculty, Geology faculty tend to have more than three course preparations per semester. To allow more Geology faculty to become involved in the MS ESC program, those who participate in the program also should receive

reduced course loads or other incentives for these efforts. The hiring of a new environmental geoscientist in fall 2016, increasing geology faculty from four to five, will help make it feasible to assign differential loads to geology faculty providing research mentoring.

A dedicated budget for publication costs would facilitate publication of manuscripts by our graduate students and their faculty advisors. A formal process by which individuals could request departmental support for publication cost could emphasize to our students that publication is strongly encouraged.

As appropriate and when there is BGE faculty interest in teaching such courses, online graduate courses should be considered, as such courses would increase the accessibility of courses to graduate students and their advisors, particularly when there is a need for flexibility in scheduling due to research or internship activities. The flexibility that offerings of online courses could provide also could make the MS ESC program more attractive to more types of prospective students, especially those with considerable outside obligations like work and family.

PART 6. SUPPORT

6.1 Program Operating Budget and Needs

The MS ESC program does not have an operating budget that is separate from that of the Biology or Environmental Science undergraduate programs in BGE. Instead, the MS ESC program has been essentially run as an additional component of those two programs. As such, the costs to teach our graduate courses for the past five years have been covered by the combined operating budgets for the Biology and Environmental Science Divisions. Table 6.1 shows our yearly operating budgets, which must cover the costs of all Department expenses.

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**
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**

It should be noted that the MS ESC program used a small fraction of the operating budget. The total operating budget presented for 2017 in the figure represents the addition of the former Geology Department budget to the former Biological and Environmental Sciences Department budget; these budgets were combined about a year after our merger into BGE. While the total department operating budget increased marginally due to the merger with BGE, the amount of funds available to the MS ESC program has not increased appreciably.

In the proposal to create the MS ESC program, which was approved through all levels of the UT System, funding in support of new lab courses to be offered for the program included (in 1995 dollars) $4,500 per year for lab equipment maintenance and supplies and travel unique to the program. However, from 1996 to 2001, a period that included one year before initiation of the MS ESC in 1997 followed by the first four years of the program, the Departmental operating budget increased only by $500 (from $61,102 to $61,564) total. Thus, the approved increase in basic operating funds to run the new program, which would have supported advanced lab courses and travel associated with fieldwork and/or presentations at professional meetings, was never received.

Since the MS ESC program requires funding to support course offerings and dedicated resources, the lack of a dedicated budget for the program means that the Graduate Program Coordinator and Graduate Faculty active in the program have no direct control over its fiscal aspects. To date, the Department Head has been able to locate and allocate funds for MS ESC needs and expenses when necessary. This situation has constrained growth in the MS ESC program to include new courses and new options for research by our students that require financial support. The almost complete lack of dedicated research equipment funding from UTC to support MS ESC graduate

student research has shifted the burden of providing this equipment to individual faculty who have managed to obtain external funding in support of their research. One example of a current critical equipment need for courses and research in the MS ESC program for which it is highly unlikely that we will find an external funding source is a request for a new four-wheel drive field vehicle that would allow travel to field sites for teaching and research that are difficult to reach. The two vehicles that the Department now operates are shared among its multiple programs. The 12 passenger van is not well suited for poor road conditions and the 4wd truck only seats three people.

By not having a source of regular funding to support the purchase of dedicated equipment to support graduate student learning or research, faculty active in the MS ESC program are constrained in their ability to keep the program current in its dynamic field. At a minimum, having a small dedicated annual MS ESC budget, with the ability to save funds from year-to-year for larger purchases might help to encourage more faculty involvement and student interest in the program.

One area of support that is dedicated to the MS ESC program is the funding provided by CAS to support our Graduate Teaching Assistants (GTAs). Our number of GTA lines has grown slowly from two at the inception of the program to 11 current lines. During the past five years, our GTA lines increased from 8 in fall 2012 to 11 in fall 2015. The service of our Graduate Teaching Assistants (GTAs) in teaching the vast majority of the many sections of introductory-level laboratories that BGE offers each semester have made it more possible for faculty to focus on research and student advisement. As such, GTAs represent an invaluable resource to the department and the MS ESC program. However, the $3,500/semester stipends paid our GTAs remain low and have increased only $225/semester during the past five years. It should be noted that this is an institution-level issue, as the minimum stipend to be paid to Graduate Assistants is set by the University. Faculty who write proposals for external funding are allowed to request additional stipends to involve graduate students in funded projects as Graduate Research Assistants provided that the amount is reasonable and aligned with market competition, suggesting that the University recognizes the value of graduate student compensation as an effective recruiting tool. Most often, our GRAs are paid at a higher rate than our GTAs.

In addition to a semester stipend, in-state GTAs also receive a waiver of maintenance fees and out-of-state GTAs receive an additional waiver of tuition costs at rates published on a Graduate Fee Schedule by the UTC Bursar's Office. For the current academic year, the maintenance fee for full-time graduate enrollment of 9 credit hours is $4,122/semester; the tuition fee for full-time graduate enrollment is an additional $8,059/semester charged to out-of-state students. Graduate students also are charged other student fees (e.g., student activity fee, green fee, technology fee, etc.); currently, these fees total $888/semester. In addition, students must pay any additional fees associated with courses in which they enroll, such as lab fees. Lab fees are UTC are $25 per lab.

6.2 Program Enrollment and Graduation Rates

There are 31 students enrolled in the MS ESC program in fall 2017. During the past five years, program enrollment has ranged from 26-40 students, with an average semester enrollment of 32 students. Generally, more students are enrolled in fall semesters due to greater numbers of

incoming students in the fall and graduations that occur during the academic year. When averaged across fall and spring semesters each academic year, enrollment was relatively high in the 2012-13 academic year (i.e., 40 students), but about average every year since then. The average semester student enrollment during the past five years is less than the average semester enrollment of 35 students during the five-year period described in the previous MS ESC review (i.e., 2006-2011).

In total, 41 students have graduated from the MS ESC program during the past five years. This number is comparable to the 42 students who earned the MS ESC degree during the previous five-year review period. On average, 8 students/year graduated from the MS ESC program during the past five years, which also is comparable to the yearly graduation rate during the previous review period. The number of students who graduate from the program each academic year has ranged from 5-11 during past five years, but these numbers have not followed any noticeable trend through time. Of the 41 graduates since fall 2012, ~65% completed theses, ~30% completed internships, and ~5% completed learning discourses as their capstone experiences. This distribution differs from that during the previous two five-year program review periods, during which approximately equal numbers of graduates completed theses and internships. While the majority of students enrolled in the MS ESC program during the past five years either graduated or are continuing to work toward the degree, 25 students were enrolled in the program at some time during the past five years but did not complete the program. Reasons for not completing the program likely vary and are not always known.

The majority of graduates of the MS ESC program obtain jobs in environmental fields or continue their education in Ph.D. or professional programs. We have been able to follow the career and/or further educational paths of 36 of the 41 students who have graduated from the program in the past five years. These graduates are mostly employed in a variety of environmental career sectors, including consulting, government, industry, and education (~15% of graduates in each of these sectors), and non-profits (~10% of graduates). About ~15% of the recent graduates that we have tracked are enrolled in doctoral programs in biology or work in an academic setting. Another recent graduate is currently enrolled in medical school, while ~10% of recent graduates are employed in non-environmental careers. Specific placement of our graduates in environmental careers and programs during the past five years is provided in Table 6.2.

Table 6.2 Placement of MS ESC graduates during in environmental careers and programs during the past five years.

Sector	Title	Employer or Institution	Location
Consulting	Botanist	Copperhead Environmental Consulting	Paint Lick, KY
	Field Biologist	Timber Creek Environmental, LLC	Fort Worth, TX
	Independent Consultant	Self-employed	Chattanooga, TN

	Senior Environmental Scientist	WSP, USA	Atlanta, GA
	Wetland Ecologist	Orbis Environmental Consulting	Columbus, OH
Government	Biologist	Florida Fish & Wildlife Conservation Commission	Lakeland, FL
	Civil Engineer	Tennessee Valley Authority	Chattanooga, TN
	Environmental Project Manager	Army Corps of Engineers	Charleston, SC
	Environmental Scientist	City of Chattanooga	Chattanooga, TN
	Park Manager	Tennessee State Parks	Chattanooga, TN
	Senior Environmental Scientist	Alabama Department of Environmental Management	Montgomery, AL
Industry	Director of Business	Chattanooga Environmental Lab, LLC	Chattanooga, TN
	Environmental Compliance Officer	Olin Corporation	Charleston, TN
	Environmental Engineer	Mohawk Industries	Dalton, GA
	Environmental Health and Safety Manager	Fibro Chem, LLC	Atlanta, GA
	Safety, Health, and Environmental Specialist	DENSO Manufacturing	Athens, TN
	Scientist	Mosquito Mate	Lexington, KY
Education	Biology Teacher	Hamilton County Department of Education	East Ridge, TN
	Biology Teacher	Hamilton County Department of Education	Ooltewah, TN
	Lecturer	Chattanooga State Community College	Chattanooga, TN

	Lecturer	UTC	Chattanooga, TN
	Science Teacher	Christian Heritage School	Dalton, GA
Non-profits	Adjunct Scientist	TN Aquarium Conservation Institute	Chattanooga, TN
	Executive Director	Friends of Moccasin Bend National Park	Chattanooga, TN
	Southeast Field Coordinator	Open Space Institute	Chattanooga, TN
		Flint Riverquarium	Albany, GA
Academia	Ecotoxicology Ph.D. Student	Arkansas State University	Jonesboro, AT
	Ecology Ph.D. Student	Montana State University	Bozeman, MT
	Biological Sciences Ph.D. Student	Simon Fraser University	Burnaby, BC
	Biology Ph.D. Student	University of New Mexico	Albuquerque, NM
	Scientist/Technician	University of California, Davis	Davis, CA

6.3 Program Responsiveness to Local, State, Regional, and National Needs

BGE faculty represent diverse scientific disciplines including conservation and restoration; ecology, evolution, and behavior; environmental and human health; environmental law and policy; geology; geospatial sciences; microbiology; molecular biology and cell physiology; organismal biology; and systematics and biodiversity. This diversity allows our programs to address diverse local, state, regional, and national needs for trained professionals in all aspects of the environmental career sector and is reflected in the diverse placement of our graduates (see Table 6.2).

Chattanooga, as a county seat and city known for its sustainability initiatives, offers excellent opportunities for environmental study and employment. One way in which we leverage our location is to incorporate internships with local, state, and regional entities in MS ESC programs of study as capstone experiences. We also provide opportunities for thesis students to network while conducting research through our engagement partners beyond campus. For example, recent thesis students have worked with professionals from the City of Chattanooga, Cumberland Trail Conference, Erlanger Health System, Tennessee Department of Environment and Conservation, U.S. Fish and Wildlife Services office, Tennessee Aquarium, Tennessee River Gorge Trust, and Tennessee Valley Authority. The MS ESC faculty integrate real-world experiences and applications into their courses, and the program was developed with feedback from key stakeholders to support professional development. Because dealing with environmental issues

requires an interdisciplinary approach, our program is designed to help students master their understanding of environmental issues in scientific, political, and social contexts while developing strong independent research and effective communication skills.

6.4 Evaluation of Graduate Placement

It is difficult to track every single graduate through time as people move to new locations and out of contact with our faculty. However, the MS ESC Program Coordinator and faculty advisors make concerted efforts to engage with our alumni for updates about their lives and careers, which has been helped enormously through time by various means of electronic communication. We have been able to follow the career and/or further education paths of nearly 90% of alumni who have completed the program in the past five years. Of the alumni who we have tracked, ~75% are employed in diverse environmental careers with consulting firms, government agencies, the industrial and non-profit sectors, and secondary schools. Five graduates from the past five years (~15% of alumni who we have tracked) are either furthering their scientific education or working in academia – four in Ph.D. programs and one as a scientist/lab technician in a University research lab. We consider these placement rates to be a strong indictor of our success at training environmental professionals and scholars. The program has been around long enough that a number of earlier graduates are now in senior leadership positions in government and corporate institutions.

Although we have been able to track the vast majority of our recent graduates primarily through communication between alumni and their former graduate advisors, we would like to find ways to have a more continued presence with all of our alumni. Given the accessibility and popularity of electronic means of communication, it would be worthwhile to consider developing a electronic alumni newsletter and/or having dedicated program content on popular social media platforms. We also would like to consider means to assess the overall satisfaction of our graduates with the program and its effectiveness and relevance to their post-graduate paths that would help us to assess and guide our program.

6.5 Review of Alignment of Program with Institutional Policies and Mission

BGE has a Graduate Faculty Committee of 6-8 annually appointed graduate-active faculty to represent the larger body of Graduate Faculty in the Department. They meet regularly (i.e., twice per month) to discuss significant matters that affect the MS ESC program, such as curriculum development and proposed changes to policies and procedures. The role of the Committee is to make recommendations to the larger body of BGE Graduate Faculty on such matters that can then be brought to a vote as appropriate during regularly scheduled Department meetings. Our Graduate Coordinator serves on the Graduate Council and is always made aware of any changes to institutional policies and mission that are relevant to our graduate program. All institutional or system wide changes are then brought to the attention of the BGE Graduate Faculty Committee via the graduate coordinator. The UTC Graduate School also uses forms that assist our program in documenting and tracking procedures and policies. All forms require approval from the Graduate School Dean once they are completed at the programmatic level. All proposed curriculum changes are funneled in the form of electronic proposals through a chain of approvals that includes the Department Chair, Dean of the College, Dean of the Library, Dean of Lifelong

Learning, other affected departments, the Graduate Council Curriculum Chair, the Dean of the Graduate School, and the Associate Provost for Academic Affairs. Through these procedures, any proposed changes must be approved at multiple levels to ensure that they are in compliance with UTC's policies and mission.

In fall 2014, the UTC Provost assembled a task force to develop a 2015-2020 Strategic Plan for the University with the following associated mission statement:

> *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.*

The MS ESC program aligns well with our institutional mission. For example, the University mission involves the active engagement of all members of the campus community. Students in the MS ESC program work closely with faculty on experiential projects both in the classroom and beyond the classroom while working on a thesis, internship, or learned discourse; this training is part of our mission. The University mission describes the importance of embracing diversity. In their scientific work, environmental scientists must understand and consider contemporary, socioeconomic, political, and legal realities; this understanding also is part of our mission. In addition, the University mission describes its goal to enrich the world at large. MS ESC students often explore environmental issues that are global in scope through focus on region and/or local systems. As such, students are prepared to enrich both their local community and the world at large as trained environmental professionals.

6.6 Assessment of Support Strengths, Weaknesses, and Recommendations for Change

Strengths of the program include the following:

- The funding provided by CAS to support our Graduate Teaching Assistants (GTAs). Our number of GTA lines has grown slowly from two at the inception of the program in 1997 to 11 current lines. During the past five years, GTA lines increased from 8 in fall 2012 to 11 in fall 2015.
- Faculty have been successful in obtaining grant funding to support some graduate students and provide higher stipends that state funded assistantships.
- Faculty have been relatively successful in obtaining grant funding to purchase high cost equipment to support graduate faculty and student research.
- The program has experienced stable enrollment during the review period, with an average semester enrollment of 32 students during the past five years.
- The program has graduated an average of eight students per year during the past five years.
- The program has successfully tracked about 90% a students graduating during the past 5 years.
- The program successfully trained environmental professionals and scholars, as evidenced by about 75% of recent graduates that were tracked employed in diverse environmental

careers and about 15% of alumni furthering their scientific education or working in academia.
- Program faculty represent diverse scientific disciplines that allows our programs to address diverse local, state, regional, and national needs for trained professionals.
- The program aligns well with UTC's institutional mission to engage all members of the campus community as an engaged metropolitan university. Students in the MS ESC program work closely with faculty on experiential projects.

Weaknesses of the program and recommendations for change include the following:

- Funds for lab equipment maintenance and supplies and travel promised when the program was approved in 1995 never materialized. BGE has requested additional funding for these purposes each year in its annual budget request. One time money to purchase specific equipment has been authorized in many years. However, the lack of an ongoing source of funding for equipment purchase and maintenance prevents the department from developing a meaningful equipment purchase and replacement plan and from banking funds for costly equipment purchases.
- Program funding is administered out of the general BGE budget, potentially de-incentivizing program innovation. The program may consider requesting dedicated funding for the graduate program. The overall BGE budget is inadequate to full support its four academic programs, so any meaningful dedicated budget would require and increase.
- Inadequate funding for equipment purchases has severely limited the development of graduate laboratory courses.
- Inadequate funding for advanced equipment and instruments has limited student research opportunities. External grant awards was the only source of funding for high cost equipment and instruments purchased during the review period. The department continues to request an ongoing and meaningful line of equipment funding from the university.
- Inadequate access to field capable vehicles has limited student research and field lab opportunities. The department continues to request funding from the university to purchase research vehicles capable of accessing remote education and research sites.
- University funded graduate assistantships are lower than at many peer insitutions, thus making it challenging to attract competitive students to the program. Faculty grant awards have provided higher stipends for a limited number of students. The program continues to request that the Graduate School/University increase graduate stipends and cover the student fees for students that receive assistantships.
- The program had remarkable success tracking alumni who graduated during the past 5 years. However, there is less information known about alumni from earlier years. The program is considering developing a more formal system for tracking and communicating with alumni.

APPENDIX A: M.S. ENVIRONMENTAL SCIENCE HANDBOOK

M.S. in Environmental Science
Graduate Program Handbook

Department of Biology, Geology, and Environmental Science

Welcome to the Master of Science in Environmental Science (M.S. ESC) program offered by the Department of Biology, Geology, and Environmental Science (BGES) at the University of Tennessee at Chattanooga (UTC). Our program is designed to prepare scholars and professionals to meet the needs of academia, business, government, and the non-profit sector in the field of environmental science. Toward this goal, we emphasize sound scientific and technical training coupled with an understanding of contemporary socioeconomic, political and legal realities.

Our Students

- Have the opportunity to contribute to the development of knowledge in the field of environmental science through scholarly research and/or experience.
- Prepare for careers with diverse employers including conservation organizations, consulting firms, government agencies, and schools, and for admission into doctoral and professional degree programs.

Our Faculty

- Offer courses that emphasize the development of advanced critical thinking and effective advocacy and communication skills useful to addressing environmental issues in a holistic and real-world context.
- Engage students in research in a wide range of subdisciplines including biodiversity and systematics, conservation and restoration, ecology, environmental and human health, environmental policy and law, evolution and behavior, geospatial science, and molecular biology, cellular biology and physiology.

Our Department

- Supports student experiential learning with access to state-of-the-art research and teaching facilities and resources both on and off campus.
- Connects with its community through relations with local organizations and agencies such as the Chattanooga Zoo, City of Chattanooga, Erlanger Health Systems, North Chickamauga Creek Conservancy, Tennessee Aquarium, Tennessee River Gorge Trust, and Tennessee Valley Authority.

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1. Admissions

Prior to applying to the M.S. ESC program at UTC, you should ensure that you meet associated academic requirements *and* identify a faculty member who will serve as your graduate advisor. It is important to note that the requirements listed here are minimums for consideration and do not guarantee acceptance into the program. Ultimately, admissions decisions are based on evaluations of quantitative and qualitative information, including the compatibility of your environmental science interests with that of our faculty.

1.1 Academic Requirements

As an applicant to the M.S. ESC program, you should meet the following academic *requirements*:

- A baccalaureate degree from a regionally accredited institution of higher education or foreign equivalent
- An overall GPA of 2.75 or a GPA of 3.0 for the last 60 credit hours
- Satisfactory scores on the general Graduate Record Examination (GRE), generally defined as scores above the 25th percentile for the verbal and quantitative sections
- Background knowledge of environmental science concepts equivalent to a two-semester undergraduate introductory environmental science sequence and/or an undergraduate or graduate ecology course

The following additional academic preparation is r*ecommended*:

- At least four upper-level undergraduate science courses with lab components
- One course each in environmental ethics and environmental law
- One course each in college calculus, introductory statistics, and computer science

1.2 Identifying a Graduate Advisor

Because a close advisory relationship between every graduate student and a graduate faculty member is a hallmark of the program, you must identify a faculty member willing to serve as your graduate advisor as part of the admission process. To initiate this process, we suggest that you email one or more graduate faculty members who share your interests in environmental science at least one full semester before you anticipate starting the program to allow time for consideration of their background and interests. Providing a CV or résumé and/or other relevant information with your email will facilitate this communication. A list of program faculty and research interests is provided inside the back cover of this Handbook.

1.3 Applying to the Program

All applications for admission to the program are initially handled by the Graduate School at UTC and then forwarded to the Department of Biology, Geology, and Environmental Science (BGES) for review by its graduate faculty. Application instructions and links to the online application process are available at https://www.utc.edu/apply/. To be considered complete, your application to the M.S. ESC program must include the following materials:

- Official transcripts from every institution of higher education that you attended
- An official report of your GRE scores
- A cover letter that serves as a statement of purpose by detailing your relevant experiences, reasons for pursuing the degree, and general plans for the graduate program of study, including identification of a graduate advisor who has agreed to serve in this capacity
- A CV or résumé
- Letters of recommendation from at least three individuals familiar with your academic ability and/or relevant experience

  In addition, you may submit optional supplementary materials evidencing any relevant and substantial preparation and/or experience, such as a copy of a written undergraduate capstone project or publication

Complete applications are forwarded from the Graduate School to the ESC Graduate Program Coordinator and then distributed to members of the program faculty for review. Admission to the program is rolling. However, we suggest that you submit your application materials by mid-March for fall semester enrollment or by early-October for spring semester enrollment to allow sufficient time for application review. If you submit your application after these suggested submission times, it may not be reviewed in time for admission for the following semester.

2. Program of Study

To earn the M.S. ESC degree at UTC, you must complete a program of study consisting of 36 total semester hours (i.e., credits) of course work. These hours include academic credit associated with core courses, electives, and a graduate capstone experience. Descriptions of these requirements follow.

2.1 Core Courses

All ESC graduate students must complete 15 semester hours of required core courses. These course are listed in the table below:

Core Courses of the M.S. ESC Program

Course Number	Title	Credit Hours
ESC 5020	Mechanisms in the Environment	3
ESC 5050	Biodiversity and Natural Resources Conservation	3
ESC 5120	Applied Statistics for Environmental Scientists	4
ESC 5140	Environmental Law and Regulations	3
ESC 5700	Seminar I	1
ESC 5710	Seminar II	1

2.2 Electives

Every ESC graduate student also must complete either 15 or 18 semester hours of unrestricted graduate electives. Your required number of elective hours is determined by the capstone experience that you choose to pursue in partial fulfillment of the degree. Specifically, students conducting a thesis or internship for the capstone experience must complete 15 hours of electives, while students conducting a learned discourse must complete 18 hours of electives. Your elective hours may be comprised of graduate-level elective courses offered by the Department of Biology, Geology, and Environmental Science (BGES) or graduate-level courses offered by other departments that are relevant to the study of environmental science and your specific degree program objectives as approved by your graduate advisor. Questions about the relevance of specific courses to your degree program (especially those offered outside of BGES) should be directed to your advisor and to the ESC Graduate Program Coordinator.

2.3 Capstone Experience

Each ESC graduate student must choose one of three capstone experiences for the program of study – thesis, internship, or learned discourse. You should consult with your graduate advisor to devise a formal plan for this experience appropriate for your academic objectives, research interests, and career goals. Ideally, you initiated this conversation with your prospective advisor when you were applying to the program.

Thesis

The thesis option involves independent original research focused on a specific issue that is relevant to environmental science. This research will demonstrate broad knowledge of the topic, identify a gap in the knowledge base, and attempt to fill that gap through appropriate study. Initiation of a thesis requires acceptance by your graduate advisory committee of a proposal that describes your thesis objectives, provides a preliminary review of pertinent literature, outlines the methodologies that you will use, and details the relevance of your thesis to the field. You then will work closely with your graduate advisor toward meeting your thesis objectives. A thesis is an appropriate choice for your capstone experience if you want to gain broadly applicable research experience. It is especially recommended if you are considering future doctoral studies or a career involving research activities or oversight.

A thesis capstone experience culminates with your submission of a successful written thesis and your successful public oral defense of this thesis as assessed by your graduate advisory committee. A successful written thesis will include a clear and focused statement of purpose, comprehensive review of relevant literature, explanation of study design and methodologies, appropriate analyses and interpretation of data, and description of the significance of findings. A successful defense will involve clear presentation of your thesis and informed and thoughtful answers to questions from your graduate committee and the audience about its substance and significance. Once approved by the Graduate School, your written thesis becomes part of the permanent body of scientific knowledge and is considered a reflection of you, your advisor, BGES, and the UTC as a whole.

If you opt to conduct a thesis in partial fulfillment of the M.S. ESC degree, you must enroll in at least 6 semester hours of ESC 5999 (Thesis) while actively engaged in your thesis research, writing, and/or defense preparation, with at least two of these credit hours completed during the semester of your graduation. Once you initiate your thesis, you must register for thesis hours continuously (i.e., every semester) until you graduate. For determining continuous thesis registration, the summer term is not considered. As such, you do not need to register for ESC 5999 during summer sessions while conducting your thesis research; however, you may opt to do so if this is suggested and approved by your graduate advisor. You should consult with your graduate advisor to determine the number of ESC 5999 hours for which you should register each semester, depending on the work that you plan to do toward completing your thesis.

Internship

The internship option is designed to provide you with an opportunity to acquire specialized technical/professional knowledge by working on an environmental project with an appropriate

sponsoring organization or business. As a form of experiential learning, an internship will integrate your academic knowledge in environmental science with its practical application in a workplace setting. Initiation of an internship in partial fulfillment of the M.S. ESC degree requires that you identify a suitable internship opportunity and that your graduate advisory committee and a workplace supervisor approve a proposal that describes your internship objectives, provides a preliminary review of pertinent literature, details work to be completed, and discusses the relevance of the internship to the workplace and your career goals. Your internship may be paid or unpaid. During the internship, you will work closely with your workplace supervisor with oversight from your graduate advisor toward meeting your internship objectives. You and your workplace supervisor will be required to document your experience via a series of formal periodic reports to your graduate advisor. An internship is an appropriate choice for your capstone experience if you wish to develop skills specialized for a particular type of environmental work. It is especially recommended if you have very specific career goals (e.g., natural resource management, environmental consulting) that do not require further graduate studies.

An internship capstone experience culminates with your submission of a successful written internship report and its successful public oral defense as assessed by your graduate advisory committee. A successful written internship report will include a clear and focused statement of goals, comprehensive review of relevant literature, description of specific activities performed, and explanation of the significance of those activities to meeting the internship objectives. A successful defense will involve clear presentation of your internship and informed and thoughtful answers to questions from the graduate advisory committee and audience about the substance and significance of your experience.

If you opt to conduct an internship in partial fulfillment of the M.S. ESC degree, you must complete 600 hours of environmentally focused work as a supervised intern with an external employer or other agency. This obligation amounts to 15 weeks of full-time (i.e., 40 hours/week) or 30 weeks of part-time (i.e., 20 hours/week) work. While actively engaged in your internship work, report writing, and/or defense preparation, you must enroll in at least 6 semester hours of ESC 5996 (Internship); at least two of these hours must be during the semester of your successful defense.

Learned Discourse

The learned discourse option allows you to explore deeply a specific topic relevant to environmental science through independent and original review of relevant available literature. Initiation of a learned discourse requires acceptance by your graduate advisory committee of a proposal that describes your learned discourse objectives, provides a preliminary review of pertinent literature, outlines a comprehensive literature review, and discusses the relevance of your learned discourse to the field. You then will work closely with your graduate advisor toward meeting your learned discourse objectives. A learned discourse is an appropriate choice for your capstone experience if you want to further your knowledge base in an environmental science topic without focus on development of applied research or specialized workplace skills. The learned discourse option is especially recommended if you want to advance in an already established career.

A learned discourse program of study culminates with your submission of a successful written discourse and its successful public oral defense as assessed by your graduate advisory committee. A successful written discourse will include a clear and focused statement of purpose, comprehensive review of relevant literature, synthesis of findings, and description of their significance to the field. A successful defense will involve clear presentation of your learned discourse and informed and thoughtful answers to questions from your graduate committee and audience about its substance and significance.

If you opt to conduct a learned discourse in partial fulfillment of the M.S. ESC degree, you must complete at least 3 semester hours of associated ESC 5998 (Research) while actively engaged in your learned discourse research and/or writing. You may complete these 3 hours prior to the semester of your defense; however, your program of study will not be complete until you successfully defend your learned discourse. You should consult with your graduate advisor to determine the number of ESC 5998 hours for which you should register each semester, depending on the work that you plan to do toward completing your thesis.

3. Policies & Procedures

Students pursing the M.S. ESC degree at UTC are governed by the overall policies and procedures implemented by the Graduate School at UTC and related program-specific requirements set forth by the UTC Department of Biology, Geology, and Environmental Science. As such, you should familiarize yourself with both the policies and procedures described in this Handbook and those outlined in UTC's Graduate Student Catalog, which is linked on the Graduate School website. Questions about policies and procedures should be directed to the ESC Graduate Program Coordinator.

3.1 Program of Study Declaration

Prior to admission or very early in your first semester of enrollment in the M.S. ESC program, you should have conversations with your graduate advisor that focus on the details of your program of study. You must officially declare your program of study by filing a Program of Study form with the Graduate School by the end of your first semester of enrollment.

On the form, you should declare 'ESC' as your major, and 'Thesis', 'Internship', or 'Learned Discourse' as your concentration. When describing your program of study coursework, you need only to list the *core* courses for the M.S. ESC degree program, as well as any courses taken prior to enrollment for which you are requesting Transfer Credit (see Handbook section 3.3). You are permitted also to include planned elective courses on the form, but you would then need to document formally any subsequent changes to these planned courses prior to program completion. For this reason, you are encouraged to include only the *core* courses of the degree program on this form. Prior to its submission to the Graduate School, you, your graduate advisor, and the ESC Graduate Program Coordinator must sign your Program of Study form. It is preferred that you submit all forms electronically.

Program of Study Changes

If you decide to change your program of study (e.g., from thesis to internship), you must officially document this change with the Graduate School prior to graduation. You should wait to make this formal notification until you near program completion and apply for a Graduation Audit (see Handbook section 3.9); do not submit a second Program of Study form to the Graduate School. However, you should inform the ESC Graduate Program Coordinator of your program of study change by email before the end of the current semester or the beginning of a new semester if the change is made during summer or winter break so that departmental records can be kept current.

3.2 Advisement

Advisory Roles

The role of your graduate advisor is to supervise your entire program of study, including the selection of appropriate coursework and your thesis, internship, or learned discourse progress. Early consultations between you and your graduate advisor should include discussion of at least two additional people with graduate faculty status and expertise in the study area to serve on

your graduate advisory committee. The role of the committee members is to provide you with supplementary advisement and additional evaluation of your thesis, internship, or learned discourse. (In the event that a committee member's role is expected to extend beyond such supplemental advisement, you may identify that committee member as a co-advisor.) You should meet with your graduate advisor regularly and with your entire graduate advisory committee as needed (as determined with the help of your advisor).

A current list of faculty in the Department of Biology, Geology, and Environmental Science with graduate faculty status is provided inside the back cover of this Handbook. An updated and more comprehensive list of approved Graduate Faculty Members at UTC is maintained by the Graduate School on its website. Other qualified persons may be appointed to the graduate faculty if your graduate advisor suggests that they will provide special academic expertise or professional experience to your graduate advisory committee. If you are interested in seeking committee appointment for a qualified external individual, talk with the ESC Graduate Program Coordinator for more information about this process.

Graduate Committee Appointment

Before the end of your first semester of enrollment in the M.S. ESC program, you must officially identify your graduate advisor and graduate advisory committee members. The process for doing this varies according to the capstone experience that you choose to pursue. If you are planning to conduct a thesis, you must identify your graduate advisor and committee members by filing an official Graduate Committee Appointment form with the Graduate School. You, your graduate advisor, all of your graduate advisory committee members, and the Department Chair must sign this form prior to its submission.

If you are planning to conduct an internship or learned discourse, you must identify your graduate advisor and committee members by filing an Internship/Learned Discourse Committee Appointment form with the ESC Graduate Program Coordinator. You, your advisor, and all of your graduate committee members must sign this form.

Graduate Committee Changes

If you decide to change your graduate advisor and/or any of your graduate committee members, you must officially document such changes. To do so, you should submit a new Graduate Committee Appointment form (thesis students only) or Internship/Learned Discourse Committee Appointment form before the end of the semester in which the change is made or by the beginning of the next semester if the change is made during summer or winter break.

Student & Faculty Responsibilities

Both ESC graduate students and faculty are responsible for following the policies and procedures of the Graduate School and the M.S. ESC program as set forth by the Department of Biology, Geology, and Environmental Science. This responsibility includes full understanding of program of study requirements and expectations for academic performance and thesis, internship, or learned discourse progress.

As a student, you are primarily responsible for fulfilling the requirements and meeting the expectations of the Graduate School and the program. This includes meeting expectations for performance and progress, as well as correct and timely submission of all required documents (i.e., forms, proposals, reports, final documents) associated with your program of study. Your graduate advisor will play a significant role in your education and training as a graduate student. As such, your graduate advisor assumes responsibility for helping you to select coursework appropriate to your program of study and being aware of your academic progress and status. Your graduate advisor also is responsible for guiding and facilitating your thesis, internship, and learned discourse objectives and activities toward the promotion of your environmental science knowledge, experiential learning, and professional skill development.

Frequent communication between you and your graduate advisor is imperative to your success in the program. This correspondence will facilitate early identification of concerns or issues that could impede your performance and/or progress so that those concerns or issues can be addressed. As such, we recommend that you devise a schedule for regular communication with your graduate advisor throughout enrollment in the program.

3.3 Course Enrollment

Registration

You must consult with your graduate advisor to discuss appropriate courses in which to enroll each semester. We recommend initiating this discussion just prior to the course registration periods designated by the UTC Records Office (around early November for spring courses and early April for fall courses). After the consultation, your advisor will provide you with a six-digit PIN that will enable you to register for classes via the online UTC registration system located in MyMocsNet under the 'Academics' tab. For complete details, including your eligibility and appointment times, see the Important Information for Registration at UTC posted by the Records Office on its website.

Course Loads

If you are *not* receiving a Graduate Assistantship provided by UTC (see Handbook section 4), you technically may register for up to 15 semester hours during the fall and spring semester. However, this course load is not typical or recommended by our faculty given the intensive nature of graduate courses. If you are funded by a Graduate Assistantship (see Handbook section 4), you may register for up to 12 semester hours during the fall and spring semesters. We recommend that you consult with your advisor to determine semester course loads that are appropriate for you given your time expectation to complete the program and other major obligations (such as outside employment). A good rule of thumb to consider is that graduate courses typically require about 4-5 hours of study time per week outside of class for each hour spent in class. So, a typical 3-credit graduate course could involve a 12-15-hour total time commitment each week with most of this time occurring outside of class.

If you are *not* receiving a Graduate Assistantship provided by UTC during the summer, you may register for up to 12 total semester hours during the summer academic terms. If you are funded

by a Graduate Assistantship during the summer, you may register for up to 6 semester hours. However, graduate courses are typically extremely limited in summer. Given this, graduate students often use the summer as an opportunity to focus intensively on their thesis, internship, or learned discourse. During this time, you may register for ESC 5999 (Thesis), ESC 5996 (Internship), or ESC 5998 (Research; for learned discourses) hours if appropriate sections are available and this registration is approved by your graduate advisor.

Enrollment Status

The University will consider you to have full-time status as a graduate student if you are enrolled in 9 or more semester hours for graduate credit and half-time status if you are enrolled in 6-8 semester hours for graduate credit during the fall and spring semesters. In addition, you will be reported as full-time equivalent for external financial aid purposes if you are enrolled in less than 6 hours of ESC 5999 (Thesis) toward the end of your program of study regardless of the total number of semester hours for which you are registered. If you are supported by a Graduate Assistantship provided by UTC (see Handbook section 4), are approaching graduation, and do not need to register for full-time hours to complete your program of study, you may request prior authorization from the Dean of the Graduate School to enroll in less than full-time hours by submitting a GA Nine Hour Waiver form. If you have specific concerns about how your enrollment status will influence your financial aid, you should discuss these concerns with the ESC Graduate Program Coordinator.

Transfer Credit

You must complete at least 24 of the 36 semester hours required to earn the M.S. ESC degree for graduate credit at UTC. You may request that up to 12 semester hours of other qualified courses that carry graduate credit from a regionally accredited institution of higher education count as credit toward the M.S. ESC degree. Qualified courses must be associated with a grade of B or better, fit within the time limit of the M.S. ESC program of study (see Handbook section 3.9), and *not* have counted toward a previous undergraduate or graduate degree.

If you want to request that credit from a qualified course be included in your M.S. ESC program of study, you should talk with the ESC Graduate Program Coordinator about your request and provide him or her with a copy of the course syllabus. The Coordinator then will review the syllabus with consultation from appropriate members of the graduate faculty given the scope of the course. If your request for transfer credit is approved at the program level, the course may be listed either when you declare your program of study (see Handbook section 3.1) or listed when you apply for a graduation audit (see Handbook section 3.9). All program approvals of transfer credits are subject to final approval by the Dean of the Graduate School.

Continuous Enrollment

As an ESC graduate student, you should work continuously toward the completion of your program of study. If you are conducting a thesis, this also means that you must register for semester hours every fall and spring semester until your program of study is complete (i.e., until you graduate), as this continuous enrollment requirement is part of the thesis program of

study. Registration during summer sessions is not required as part of a continuous program of study. If you are conducting an internship or learned discourse, continuous enrollment also is expected, but not mandated. However, all breaks in enrollment will require readmission to the M.S. ESC program. Questions about these policies should be directed to the ESC Graduate Program Coordinator.

Leaves of Absence & Stop Outs

All breaks in continuous enrollment in the M.S. ESC program will require that you apply for readmission to the program. Informing the Graduate School of a need to break your continuous enrollment in M.S. ESC program will facilitate your subsequent readmission into the program. If you are experiencing circumstances that preclude your continued enrollment in the M.S. ESC program, you should consult with your graduate advisor and the ESC Graduate Program Coordinator to discuss filing a possible leave of absence request with the Graduate School.

If extenuating circumstances preclude your continuous enrollment in ESC 5999 (Thesis), you may use a Request for Stop Out form to request a one-time 'stop out' of your thesis progress for up to four continuous semesters. This request must be made even if you will continue to enroll in other (i.e., non-thesis) coursework. Your stop out request must be made no later than the end of the enrollment period of the semester preceding the start of your requested stop out and must include rational and justification for your request. For the purposes of stop out requests, the entire summer *is* counted as a semester. Your stop out request must be approved by your graduate advisor, the ESC Graduate Program Coordinator, and the Dean of the Graduate School.

3.4 Thesis Requirements

Initiation of a thesis for partial fulfillment of the M.S. ESC degree involves the development of an approved proposal for your thesis research. Your thesis will culminate with the submission of an approved written thesis and its successful public defense.

Thesis Proposal Development

If you opt to complete a thesis, you should begin to prepare a thesis proposal outlining all aspects of your planned thesis research with guidance from your graduate advisor during your first semester in the program. A standard thesis proposal will describe your thesis objectives, provide a preliminary review of pertinent literature, outline the methodologies that you will use, and detail the relevance of your thesis to the field. Your graduate advisor may have additional specific ideas and requests for the content of your proposal. Your proposal should be sufficiently detailed to provide you with a plan to follow to conduct your research, including a timeline for significant accomplishments.

A final draft of your thesis proposal should be approved by your graduate advisor prior to its distribution to your other graduate advisory committee members for their review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your proposal. Once all of your committee members have had adequate time to

review the proposal (at least two weeks is recommended), you should organize a full committee meeting to discuss your proposal and acquire constructive feedback.

As evidence of timely progress, your thesis proposal should be approved by your graduate advisory committee by the end of your second semester of enrollment in the program. However, you are encouraged to complete your proposal by the end of the *first* semester of enrollment so that you can initiate your thesis work as early as possible.

ESC 5999 Registration & Grading

After your thesis has been approved by your graduate advisory committee, you may register for ESC 5999 (Thesis) semester hours. In total, you must register for 6 semester hours of ESC 5999 while engaged in your thesis research, writing your thesis, and/or preparing for its defense. You must register for at least 2 of these semester hours of ESC 5999 during the semester of your graduation. You should consult with your graduate advisor to determine an appropriate plan for registration and completing your 6 total ESC 5999 semester hours.

For all semesters that you register for ESC 5999 hours prior to the semester of your graduation, you will earn a grade of SP (Satisfactory Progress) or NP (Non-satisfactory Progress) as determined by your graduate advisor. These grades are not factored into your grade point average. However, if you earn an NP grade for ESC 5999 for two semesters, the departmental Graduate Faculty Committee will review your thesis proposal and progress to determine an appropriate course of action. If you are found to be responsible for the lack of timely progress toward completing your thesis, such actions could involve formal probation or dismissal from the program.

To compete your ESC 5999 hours, you must prepare a written thesis that is approved by your graduate advisory committee and successfully defend it. You also much submit a final version of your thesis to the Graduate School for review. (These tasks are detailed later in this section of the Handbook). If approved, you will be assigned a grade of S (Satisfactory) for your final ESC 5999 semester, indicating completion of your thesis. This grade is not factored into your grade point average.

Written Thesis Preparation

As a culmination of your degree program, you must prepare and successfully defend an approved written thesis that includes a clear and focused statement of purpose, comprehensive review of relevant literature, explanation of study design and methodologies, appropriate analyses and interpretation of data, and description of the significance of findings. Your graduate advisor may have additional specific ideas and requests for the content and organization of your written thesis depending on the nature of your project.

When complete, the final draft of your thesis should be approved by your graduate advisor prior to its distribution to your other graduate committee members for their review. This distribution must occur at least two weeks prior your planned defense date to allow adequate time for thorough review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your thesis.

Because your final approved and successfully defended written thesis will be submitted to the Graduate School, it must conform to the UTC Thesis and Dissertation Standards detailed on the Graduate School website. We strongly recommend that you familiarize yourself with these formatting guidelines early in the process of writing your thesis and incorporate them into your early drafts. The standards are detailed and extensive. As such, planning to format your thesis as a last-minute exercise is not a good strategy for meeting submission deadlines.

Scheduling the Thesis Defense

You must present your approved thesis during a thesis defense and 'pass' this defense as part of the M.S. ESC degree program. A successful defense will involve clear presentation of your thesis and informed and thoughtful answers to questions from your graduate advisory committee and the audience about its substance and significance. As with your written thesis, you should consult with your graduate advisor while preparing your defense. Your thesis defense must occur no later than the relevant date posted on the Graduate School Calendar to qualify for graduation during that semester.

You should have approval from your graduate advisor and graduate advisory committee members prior to scheduling your thesis defense. After receiving this approval, you should discuss multiple possible dates and times with your committee and then inform the ESC Graduate Program Coordinator of several possible dates and times during which all of your committee members are available. Either the Program Coordinator or Department Chair also must be available to attend your defense, so your defense date and time also will need to consider their availability. Once an agreeable date and time are determined, the Program Coordinator will schedule your defense and inform you and your graduate advisory committee of its date, time, and location.

Once your defense is scheduled, you must email a Notice of Scheduled Defense to Amy-Campbell@utc.edu at least two weeks prior to your scheduled defense date so that a public announcement may be made.

Thesis Defense Format

A thesis defense in the M.S. ESC program involves a public presentation and a private examination. Your graduate advisor and graduate advisory committee members will attend both parts of your defense. The UTC community will be invited formally to the public presentation part of your defense by the Graduate School. Outside persons also may attend the presentation, and you are encouraged to invite your family and friends to this part of your thesis defense. Only your graduate advisor and committee members typically attend the private examination that follows the public presentation. The ESC Graduate Program Coordinator or Department Chair also may attend the examination as an observer if invited by you or a member of your graduate advisory committee.

During the public part of your defense, you should give a professional presentation that describes and justifies all aspects of your thesis. Typically, this is achieved with a PowerPoint presentation that is about 30-45 minutes in length. After your presentation, you should solicit and field questions from the audience about the information that you presented.

During the private examination that immediately follows, you will be expected to field questions from your graduate advisor and graduate advisory committee members. These questions can range from ones specific to your presentation to questions about your broader research topic and related areas of environmental science. Questions also may focus on material covered in your relevant graduate coursework. This part of your thesis defense is intended to enable your graduate advisor and committee members to assess your understanding of your thesis topic, comprehension of its relevance to the broader field, competency and professionalism as an environmental expert, and communication skills.

Following the examination, your advisor and committee members will request that you leave the room so that they can discuss in private your written thesis and its defense. Ultimately, your committee will provide a collective 'pass' or 'fail' assessment of your defense that also conveys general acceptance or rejection of your written thesis and inform you of their assessment. Even if you pass your defense, you may be required to make minor conditional changes to your written thesis prior to its final approval for submission to the Graduate School. The committee also may request to review your revised written thesis to evaluate requested changes. If you fail your defense, you may be permitted to repeat the defense after an interval to allow for improvement at the discretion of your committee.

Thesis Defense Results

Your final thesis defense results will be recorded by your graduate advisor on a Graduate Degree Examination Results form. This form will be signed by your advisor and other graduate advisory committee members. You must subsequently obtain the signatures of the ESC Graduate Program Coordinator and the Dean of the College of Arts and Sciences prior to having the ESC Graduate Program Coordinator submit this form to the Graduate School on your behalf. You may not submit this form yourself. The completed form must be submitted no later than the relevant date posted on linked from the Graduate School website to qualify for graduation during the semester of the defense.

Thesis Submission

You must submit your approved final written thesis electronically via UTC Scholar to the Graduate School no later than the relevant date specified on the Graduate School Calendar linked from the Graduate School website to qualify for graduation during the same semester as the defense. Once submitted, your thesis will be checked by the Graduate School for determination of its adherence to the UTC Thesis and Dissertation Standards. If your submitted thesis is not approved, you will be required to make necessary changes to the document in UTC Scholar. Failure to make timely requested revisions to your thesis may result in delayed graduation.

3.5 Internship Requirements

Initiation of an internship for partial fulfillment of the M.S. ESC degree involves the development of an approved proposal for your internship experience. Your internship will

culminate with the submission of an approved written internship report and its successful public defense.

Internship Proposal Development

If you opt to complete an internship, you should begin to prepare an internship proposal outlining all aspects of your planned internship experience with guidance from your graduate advisor and a proposed workplace supervisor during your first semester in the M.S. ESC program. A standard internship proposal will describe your internship objectives, provide a preliminary review of pertinent literature, detail the work to be completed, and discuss the relevance of the planned internship to the workplace and your career goals. Your graduate advisor and/or workplace supervisor may have additional specific ideas and requests for the content of your proposal. Your proposal should be sufficiently detailed to provide you with a plan to follow during your internship, including a timeline for significant accomplishments. You should specify how you will spend the 600 hours of internship experience required for partial fulfillment of the M.S. ESC degree.

A final draft of your internship proposal should be approved by your graduate advisor prior to its distribution to your other graduate advisory committee members for their review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your proposal. Once all committee members have had adequate time to review your proposal (at least two weeks is recommended), you should organize a full committee meeting to discuss your proposal and acquire constructive feedback. Simultaneous to the review of your internship proposal by your committee, you should seek the approval of your planned workplace supervisor for the work that you are proposing.

As evidence of timely progress, your internship proposal should be approved by your graduate advisory committee by the end of your second semester of enrollment in the program. However, you are required to complete these tasks earlier if you plan to begin your internship prior to the end of your second semester in the program.

ESC 5996 Registration & Grading

After your internship proposal has been approved by your graduate advisory committee, you may register for ESC 5996 (Internship) semester hours. In total, you must register for 6 semester hours of ESC 5996 while engaged in your internship experience, drafting your internship report, and/or preparing for its defense. You must register for at least 2 of these semester hours of ESC 5996 during the semester of your successful defense. You should consult with your graduate advisor to determine an appropriate plan for registration and completing your ESC 5996 semester hour requirements.

For all semesters that you register for ESC 5996 hours prior to the semester of your defense, you will earn a grade of SP (Satisfactory Progress) or NP (Non-satisfactory Progress) as determined by your graduate advisor. These grades are not factored into your grade point average. However, if you earn an NP grade for ESC 5996 for two semesters, the departmental Graduate Faculty Committee will review your internship proposal and progress to determine an appropriate course of action. If you are found to be responsible for the lack of timely progress

toward completing your internship, such actions could involve formal probation or dismissal from the program.

To complete your ESC 5996 hours, you must prepare a final internship report that is approved by your graduate advisory committee and successfully defend it. (These tasks are detailed later in this section of the Handbook.) If approved, you will be assigned a grade of S (Satisfactory) for your final ESC 5996 semester, indicating completion of your internship. This grade is not factored into your grade point average.

Internship Progress & Evaluation Reports

Internships generally occur off-campus without direct supervision by a graduate advisor. As such, if you are completing an internship in partial fulfillment of the M.S. ESC degree, you must take responsibility for the completion and filing of two sets of internship-specific reports while your internship is underway.

As a student, you must submit a set of three Student Intern Progress Reports to your graduate advisor at specified regular intervals during your internship (i.e., beginning, middle, and end). In these reports, you will describe the activities that you are conducting as an intern and their relevance to the sponsoring organization or business. The third and final report also will include your assessment of the overall internship experience. These reports also provide a mechanism for you to describe the workplace environment and any resource deficiencies that may exist therein.

In addition, you must ensure that a set of three Student Intern Evaluation Reports are submitted by your workplace supervisor to your graduate advisor at specified regular intervals while your internship is underway (concurrent with the progress reports submitted by you to the advisor). These reports will solicit your supervisor's rating of you as an intern for qualities like initiative, attention to detail, and mastery of critical skills. The third and final report also will include an overall evaluation of you as an intern. Collectively, these internship reports will help your graduate advisor to assess your progress.

Internship Report Preparation

As a culmination of your degree program, you must prepare and successfully defend an approved internship report that includes a clear and focused statement of goals, comprehensive review of relevant literature, description of specific activities performed, and explanation of the significance of those activities to meeting your internship objectives. Your graduate advisor may have additional specific ideas and requests for the content and organization of your internship report depending on the nature of your experience.

When complete, the final draft of your internship report should be approved by your graduate advisor prior to its distribution to your other graduate committee members for their review. This distribution must occur at least two weeks prior your planned defense date to allow adequate time for thorough review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your report.

Unlike theses, internship reports are *not* to be submitted to the Graduate School. Instead, you must submit your final approved and successfully defended internship report to the ESC Graduate Program Coordinator on behalf of the Department. For consistency, we recommend that your report be formatted professionally in accordance with the UTC Thesis and Dissertation Standards as detailed on the Graduate School website.

Scheduling the Internship Defense

You must present your approved internship report during a defense and 'pass' this defense to advance toward the M.S. ESC degree. A successful defense will involve clear presentation of your internship and informed and thoughtful answers to questions from your graduate advisory committee and the audience about its substance and significance. As with your written internship report, you should consult with your graduate advisor while preparing your defense.

The Graduate School does not specify a deadline for internship defenses each semester. However, as a Department, we require that your internship defense occur no later than the relevant date posted for thesis defenses posted on the Graduate School Calendar linked from the Graduate School website to qualify for graduation during that semester.

You should have approval from your graduate advisor and graduate advisory committee members prior to scheduling your internship defense. After receiving this approval, you should discuss multiple possible dates and times with your committee and then inform the ESC Graduate Program Coordinator of several possible dates and times during which all of your committee members are available. Either the Program Coordinator or Department Chair also must be available to attend your defense, so your defense date and time also will need to consider their availability. Once a mutually agreeable date and time are determined, the Program Coordinator will schedule your defense and inform you and your graduate advisory committee of the date, time, and location.

Once your internship defense is scheduled, your report title, names of your graduate advisor and committee members, and abstract should be emailed to the ESC Graduate Program Coordinator at least two weeks prior to the defense date so that a public announcement may be made. The email subject line should read 'Notice of Scheduled Internship Defense'.

Internship Defense Format

An internship defense in the M.S. ESC program involves a public presentation and a private examination. Your graduate advisor and graduate advisory committee members will attend both parts of your defense. The UTC community is invited formally to the public presentation part of your defense. Outside persons also may also attend the presentation, and you are encouraged to invite your family and friends to this part of your thesis defense. Only your graduate advisor and committee members typically attend the examination that follows the public presentation. The ESC Graduate Program Coordinator or Department Chair also may attend the examination as an observer if invited by you or a member of your graduate advisory committee.

During the public presentation, you should give a professional presentation that describes and justifies all aspects of your Internship. Typically, this is achieved with a PowerPoint presentation that is about 30-45 minutes in length. After your presentation, you should solicit and field questions from the audience about the information that you presented.

During the private examination that immediately follows, you will be expected to field questions from your graduate advisor and committee members. These questions can range from ones specific to your presentation to questions about the broader field of your internship and related areas of environmental science. Questions also may focus on material covered in your relevant graduate coursework. This part of your internship defense is intended to enable your graduate advisor and committee members to assess your understanding of your internship area, comprehension of its relevance to the broader field, competency and professionalism as an environmental expert, and communication skills.

Following the examination, your advisor and committee members will request that you leave the room so that they can discuss in private your internship report and its defense. Ultimately, your committee will provide a collective 'pass' or 'fail' assessment of your defense that also conveys general acceptance or rejection of your report and inform you of their assessment. If you pass your defense, you may be required to make minor conditional changes to your internship report prior to its final approval for submission to the ESC Graduate Program Coordinator. The committee also may request to review your final report to evaluate requested changes. If you fail your defense, you may be permitted to repeat the defense after an interval to allow for improvement at the discretion of your committee.

Internship Defense Results

Your final internship defense results will be recorded by your graduate advisor on a Graduate Degree Examination Results form. This form will be signed by your advisor and other graduate advisory committee members. You must subsequently obtain the signatures of the ESC Graduate Program Coordinator and the Dean of the College of Arts and Sciences prior to having the ESC Graduate Program Coordinator submit this form to the Graduate School on your behalf. The completed form must be submitted no later than the relevant date posted on linked from the Graduate School website to qualify for graduation during the semester of the defense.

Internship Report Submission

Following a successful defense and final committee approval, you must submit an electronic copy of your internship report as a single professionally formatted PDF file to the ESC Graduate Program Coordinator on behalf of the Department. You should submit your report by the same date that approved final written theses are due electronically to the Graduate School as posted on the Graduate School Calendar linked from the Graduate School website.

3.6 Learned Discourse Requirements

Initiation of a learned discourse for partial fulfillment of the M.S. ESC degree involves the development of an approved proposal for your project. A learned discourse culminates with the submission of an approved written discourse and its successful public defense.

Learned Discourse Proposal Development

If you opt to complete a learned discourse, you should begin to prepare an associated proposal with guidance from your graduate advisor outlining all aspects of your planned project. A standard learned discourse proposal will describe your objectives, provide a preliminary review of pertinent literature, outline a comprehensive literature review, and discuss the relevance of your learned discourse to the field. Your graduate advisor may have additional specific ideas and requests for the content of your proposal. Your proposal should be sufficiently detailed to provide you with a plan to follow, including a timeline for significant accomplishments.

A final draft of your learned discourse proposal should be approved by your graduate advisor prior to its distribution to your other committee members for their review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your proposal. Once all of your committee members have had adequate time to review your proposal (at least two weeks is recommended), you should organize a full committee meeting to discuss your proposal and acquire constructive feedback.

As evidence of timely progress, your learned discourse proposal should be approved by your graduate advisory committee by the end of your second semester of enrollment in the program. However, you are encouraged to complete your proposal by the end of the *first* semester of enrollment so that you can initiate your learned discourse work as early as possible.

ESC 5997 Registration & Grading

After your learned discourse proposal has been approved by your graduate advisory committee, you may register for ESC 5998 (Research) semester hours specific to your proposed learned discourse work.

In total, you must register for 3 semester hours of ESC 5998 while engaged in your learned discourse project, writing your learned discourse, and/or preparing for its defense. As a learned discourse student, you are not required to register for any semester hours (of ESC 5998 or other courses) during the semester of your defense. You should consult with your graduate advisor to determine an appropriate plan for registration and completing your ESC 5998 semester hour requirements.

For all semesters that you register for ESC 5998 hours prior to the semester of your defense, you will earn a grade of I (Incomplete) as assigned by your graduate advisor. Incomplete grades are not factored into your grade point average. However, the Records Office automatically will convert an I grade to an F if the course instructor (in this case, your graduate advisor) does not indicate that the course was completed successfully by three weeks before the last day of classes in the next semester. If you are making satisfactory progress toward completing your

learned discourse but will require additional time to complete and defend it, your graduate advisor may submit a written request for an extension to this next-semester timeframe on your behalf to the Dean of the Graduate School. Extension requests must be made by two weeks prior to the I grade change deadline described above. Ideally, such requests would be made earlier than this deadline.

To complete your ESC 5998 hours, you must prepare a final written discourse that is approved by your graduate advisory committee and successfully defend it. (These tasks are detailed later in this section of the Handbook.) You then will earn an appropriate letter grade for ESC 5998 as determined by your committee. To formally assign this grade to your ESC 5998 semester hours, your graduate advisor must submit an electronic Grade Change Request to convert each I grade assigned for ESC 5998 to the letter grade. This may involve changes to multiple semesters of ESC 5998 registrations. As an ESC graduate student, it is your responsibility to be aware of any I grades earned in your coursework and to ensure that those grades are converted to appropriate letter grades by the regular University deadline or the deadline associated with an extension request if filed. Because no course with a grade below C can be counted toward the M.S. ESC degree, conversation of an I grade for ESC 5998 to an F would prevent you from earning the degree.

Written Learned Discourse Preparation

As a culmination of your degree program, you must prepare and successfully defend an approved written discourse that includes a clear and focused statement of purpose, comprehensive review of relevant literature, synthesis of findings, and description of their significance to the field. A successful defense will involve clear presentation of your learned discourse and informed and thoughtful answers to questions from your graduate committee and audience about its substance and significance.

When complete, the final draft of your written discourse should be approved by your graduate advisor prior to its distribution to your other graduate committee members for their review. This distribution must occur at least two weeks prior your planned defense date to allow adequate time for thorough review. As a courtesy, you should ask your committee members of their preferences for electronic or hard copies of your learned discourse.

Unlike theses, written discourses are *not* to be submitted to the Graduate School. Instead, your final approved and successfully defended written learned discourse will be submitted to the ESC Graduate Program Coordinator on behalf of the Department. For consistency, we recommend that your written discourse be formatted professionally in accordance with the UTC Thesis and Dissertation Standards as detailed on the Graduate School website.

Scheduling the Learned Discourse Defense

You must present your approved learned discourse during a defense and ‘pass’ this defense to advance toward the M.S. ESC degree. A successful defense will involve clear presentation of your learned discourse and informed and thoughtful answers to questions from your graduate committee and audience about its substance and significance. As with your written discourse, you should consult with your graduate advisor while preparing your defense.

The Graduate School does not specify a deadline for learned discourse defenses each semester. However, as a Department, we require that your learned discourse defense occur no later than the relevant date for thesis defenses posted on the Graduate School Calendar linked from the Graduate School website to qualify for graduation during that semester.

You should have approval from your graduate advisor and committee members prior to scheduling your learned discourse defense. After receiving this approval, you should discuss multiple possible dates and times with your committee and then inform the ESC Graduate Program Coordinator of several possible dates and times during which all of your committee members are available. Either the Program Coordinator or Department Chair also must be available to attend your defense, so your defense date and time also will need to consider their availability. Once a mutually agreeable date and time are determined, the Program Coordinator will schedule your defense and inform you and your graduate advisory committee of the date, time, and location.

Once your learned discourse defense is scheduled, your project title, names of your graduate advisor and committee members, and abstract should be emailed to the ESC Graduate Program Coordinator at least two weeks prior to the defense date so that a public announcement may be made. The email subject line should read 'Notice of Scheduled Learned Discourse Defense'.

Learned Discourse Defense Format

A learned discourse defense in the M.S. ESC program involves a public presentation and a private examination. Your graduate advisor and graduate advisory committee members will attend both parts of your defense. The UTC community is invited formally to the public presentation part of your defense. Outside persons also may also attend the presentation, and you are encouraged to invite your family and friends to this part of your thesis defense. Only your graduate advisor and committee members typically attend the examination that follows the public presentation. The ESC Graduate Program Coordinator or Department Chair also may attend the examination as an observer if invited by you or a member of your graduate advisory committee.

During the public presentation, you should give a professional presentation that describes and justifies all aspects of your Internship. Typically, this is achieved with a short PowerPoint presentation that is about 30-45 minutes in length. After your presentation, you should solicit and field questions from the audience about the information that you presented.

During the private examination that immediately follows, you will be expected to field questions from your graduate advisor and graduate advisory committee members. These questions can range from ones specific to your presentation to questions about the broader field of your learned discourse and related areas of environmental science. Questions also may focus on material covered in your relevant graduate coursework. This part of your defense is intended to enable your graduate advisor and committee members to assess your understanding of your learned discourse topic, comprehension of its relevance to the broader field, competency and professionalism as an environmental expert, and communication skills.

Following the examination, your advisor and committee members will request that you leave the room so that they can discuss in private your learned discourse and its defense. Ultimately, your committee will provide a collective 'pass' or 'fail' assessment of your defense that also conveys general acceptance or rejection of your written discourse and inform you of their assessment. If you pass your defense, you may be required to make minor conditional changes to your written work prior to its final approval for submission to the Department. The committee also may request to review your final report to evaluate requested changes. If you fail your defense, you may be permitted to repeat the defense after an interval to allow for improvement at the discretion of your committee.

Learned Discourse Report Submission

Following a successful defense and final committee approval, you must submit an electronic copy of your written learned discourse as a single professionally formatted PDF file to the ESC Graduate Program Coordinator on behalf of the Department. You should submit your report by same date that approved final written theses are due electronically to the Graduate School as posted on the Graduate School Calendar linked from the Graduate School website.

3.7 Academic Performance

The Graduate School sets continuation standards for UTC graduate students based on their performance in graduate courses.

Grade Requirements

As an ESC graduate student, you are expected to earn high grades for all of your coursework. As such, credit in fulfillment of the M.S. ESC degree will not be assigned for courses in which you earn a grade below a C. You may repeat a course with approval from your graduate advisor. However, all letter grades earned while you are a graduate student at UTC will be computed into your cumulative grade point average (GPA), including all grades earned in repeated courses. In contrast, only the final grade earned for a repeated course will be used to calculate your M.S. ESC program GPA.

Continuation Standards

You must maintain a 3.0 cumulative grade point average for all courses taken for graduate credit. If you fail to meet this standard, you will be placed on 'academic probation' for the next semester or two semesters if the cumulative GPA remains below 3.0. If you earn a *semester* GPA below 3.0 while on academic probation, you will be dismissed from the program. Program dismissal also will occur if you fail to raise your cumulative GPA to 3.0 or higher by the end of the next two semesters while on academic probation. For the purposes of evaluating continuation standards, the entire summer term would be counted as a semester. You also may be dismissed from the program if you earn a grade of NC, D, or F in any course; earn more than two grades lower than a B; or receive unsatisfactory assessment of your completed thesis, internship, or learned discourse. Decisions regarding continuation are made by the Dean of the Graduate School.

3.8 Capstone Experience Progress

At the Departmental level, we consider your thesis, internship, or learned discourse progress along with your academic performance to be reflective of your overall success in the M.S. ESC program. To assess your thesis, internship, or learned discourse progress, you and your graduate advisor are required to define associated goals for each semester. Your advisor then will evaluate your progress toward those goals at the end of each semester. If you are an internship student, you and your workplace supervisor will be required to file additional progress reports while your internship is in progress to inform your advisor of progress not under his or her direct supervision (see section 3.5 of this Handbook).

Semester Goals & Reports

Very early during the first semester of your enrollment in the ESC graduate program, you should meet with your graduate advisor to set first-semester progress goals for your thesis, internship, or learned discourse. You should have similar meetings at the end of each semester (including the first semester) to set your progress goals for the *next* semester. You are encouraged to describe these goals and a plan for meeting them on a Capstone Progress Goals form each semester and obtain your advisor's signature on this form. This form may be filed with the ESC Graduate Program Coordinator, who will retain it as an official record, or it may be retained by you or your advisor.

At the end of each semester, you also should meet with your graduate advisor to discuss your progress toward achieving your goals for that semester. This is good opportunity to refer back to your capstone progress goals for the semester to determine if you met expectations and discuss a plan for improvement if necessary. In the event that you do not meet expectations for two consecutive semesters, your graduate advisor may request that the departmental Graduate Faculty Committee members review your progress to determine an appropriate course of action. If you are found to be responsible for the lack of timely progress, such actions could involve formal probation or dismissal from the program.

The purpose of setting goals associated with your capstone experience each semester and reporting on progress toward meeting those goals is to help you to manage your time in the program effectively and stay on track, to ensure your advisor has clearly articulated expectations to you, and to ensure you are aware of and agree with the expectations of your advisor. Additionally, this process should help both you and your advisor to quickly recognize if there is an area of concern regarding your research progress and allow you and your advisor to come up with a plan of action to address issues of timely progress.

3.9 Graduation

To earn the M.S. ESC degree, you must successfully complete your program of study (i.e., core courses, electives, and capstone experience) within the specified time limit, be admitted to candidacy for the degree as determined by your academic record, apply for graduation, and meet all other graduation eligibility criteria specified by the Graduate School.

Time Limit

All credit applied toward the M.S. ESC degree must be earned within six years of registration for the earliest course counted toward the degree. This time limit includes any transfer courses being counted toward your degree and the semester of your thesis, internship, or learned discourse submission. You may request in writing an extension of this time limit of up to one year by filing a Graduate Student Petition with the Graduate School. Your extension request must be signed by your graduate advisor and the ESC Graduate Program Coordinator prior to submission to the Dean of the Graduate School for approval.

Requesting a Graduation Audit & Applying for Graduation

By formally requesting a graduation audit, you cue specialized academic advisors affiliated with the Graduate School to review your file for expected compliance with the specific graduation requirements of your program. Applying for Graduation similarly cues the Records Office to review your status. Requesting a graduation audit and applying for graduation are required to earn the M.S. ESC degree. You should both request a graduation audit and apply for graduation in the semester prior to your anticipated semester of graduation.

To request a graduation Audit, you must submit a Graduation Audit form to the Graduate School. You, your graduate advisor, and the ESC Graduate Program Coordinator must sign this form prior to its submission. Your request for an audit should list any additions to the courses that you listed on the Program of Study form that you submitted during your first semester of enrollment. These additions should include any elective courses that you have completed, as well as credit hours completed that are associated with the capstone experience (i.e., ESC 5996, 5998, or 5999). If you have changed your capstone experience (e.g., thesis to internship, internship to learned discourse, etc.) and/or have any other special course-based circumstances of which the Graduate School should be aware, you should attach a note to the form describing those circumstances. The due dates for requesting a graduation audit for graduation during specific academic semesters are posted on the Graduate School Calendar linked from the Graduate School website.

To apply for graduation, you must use the online graduation application located in your MyMocsNet account under the 'Academics' tab. The due date for applying for graduation is October 15th for anticipated spring graduation, March 15th for anticipated summer degree conferral, and June 15th for anticipated fall graduation. Late graduation applications may be submitted on paper to the UTC Records Office by November 1st for fall graduation, July 5th for summer degree conferral, and April 1st for spring graduation. You should obtain late graduation application forms from the Records Office. Late applications require an application fee.

Graduation Eligibility

To be eligible for degree conferral, you must have completed all coursework listed in your application for candidacy with no grades below C for courses presented for the degree and a minimum grade point average of 3.0 or better on: 1) all coursework that you took for graduate credit at UTC, 2) all coursework that you transferred to UTC for graduate credit, and 3) all

coursework that you completed to fulfill the program as approved in your application for candidacy.

4. Financial Assistance

Financial assistance in direct support of the pursuit of the M.S. ESC degree may be available to you in various forms. Other financial assistance can help to support your research activities, associated travel, and participation in professional meetings and conferences relevant to your environmental science interests and capstone experience.

4.1 Graduate Teaching Assistantships

The Department of Biology, Geology, and Environmental Science can offer a limited number of Graduate Teaching Assistant (GTA) positions to qualified graduate students each year. These positions are funded by the UTC College of Arts and Sciences and typically are awarded for one academic year with possible renewal for a second academic year if a GTA remains eligible and performs well in his or her assigned duties.

A typical GTA appointment involves teaching laboratory sections of the introductory environmental science or biology courses offered by the Department. GTAs also help to organize and prepare lab classrooms for weekly lab activities. As such, GTAs are expected to devote time to lab preparation, instruction, grading, and office hours. GTAs are supervised by a Lab Coordinator in the Department.

GTAs in the ESC graduate program are considered to be full-time assistants; as such, GTAs should expect to work 20 hours/week performing associated duties. Collectively, the responsibilities of a GTA and graduate coursework represent a significant workload. As such, GTAs in the ESC graduate program may not be otherwise employed (i.e., outside the department or off-campus) for more than an additional 10 hours/week. Part-time GTAs may not be otherwise employed for more than an additional 20 hours/week.

Currently, full-time GTAs are supported by a maintenance fee (i.e., tuition) waiver and a $3,500 stipend per semester. GTAs are required to assume the costs of all other fees (e.g., student activity fee, green fee, technology fee, lab fees) required by the University. All full-time GTAs must maintain a full-time course load of at least 9 semester hours during each semester of the GTA appointment. GTAs may register for up to 12 semesters hour during each semester; the maintenance fee waiver will cover the cost of semester hours in excess of 9 hours. All GTAs must demonstrate satisfactory progress in their program of study to retain their appointments.

Applying for a GTA Appointment

GTA awards are typically made late in the spring semester for the following academic year. A few GTA positions may be awarded at other times if they become available. If you are a current graduate student in good standing or an entering graduate student with a cumulative undergraduate GPA of 3.25 or higher, you are eligible to apply for a GTA position. All GTA awards are competitive and are based on consideration of the qualifications of all applicants.

To apply for a GTA position, you should request and file a Graduate Assistantship Application with the ESC Graduate Program Coordinator. Priority consideration of GTA applications will be given to those received by February 15th. We strongly recommend that you include a cover

letter with you application expressing your interests in and summarizing your qualifications for a GTA appointment.

If you are selected as a GTA, you will receive a GTA Appointment Letter from the ESC Graduate Coordinator prior to the first semester of your assistantship. The letter will outline the terms and duties associated with your award. You will need to sign this letter indicating your agreement with the terms of the assistantship and return it to the Department.

Continuing a GTA Appointment

Departmental needs, your evaluations from the supervisory Lab Coordinator, feedback from introductory lab students during your end-of-semester course evaluations, your academic performance, and your capstone experience progress will be used to determine the continuation of your GTA appointment.

If you are accepting a new GTA appointment or planning to continue your GTA duties into a new semester, you should submit a copy of your class schedule for that semester to your supervisory Lab Coordinator as soon as possible to facilitate scheduling.

If you are interested in continuing an existing GTA appointment beyond the term of your original appointment, you must notify the ESC Graduate Program Coordinator via email of your intent to continue prior to the last day of classes during the final term of the original appointment.

4.2. Graduate Research Assistantships

Students may be awarded graduate research assistant (GRA) positions funded by the research grants and contracts of their graduate advisors. GRAs play a fundamental role in the funded research, and may participate in related literature reviews, lab- or field-based research tasks, and/or preparation and presentation of research results. Graduate advisors serve as the supervisors of GRAs supported by their research funding.

GRA appointments can require full-time (20 hours/week) or part-time (10/hours week) performance of associated duties. Collectively, the responsibilities of a GRA and graduate coursework represent a significant workload. As such, full-time GRAs in the ESC graduate program may not be otherwise employed (i.e., outside the department or off-campus) for more than an additional 10 hours/week. Part-time GRAs may not be otherwise employed for more than an additional 20 hours/week.

Currently, all GRAs are supported by a maintenance fee (i.e., tuition) waiver and a minimum stipend of $3500/semester for full-time appointments and $1750/semester for part-time appointments. GRA support also may include coverage of additional student fees (e.g., student activity fee, green fee, technology fee, lab fees) charged by the University. All GRAs must maintain either full-time (9 semester hours) or part-time (6 semester hours) enrollment status in accordance with their GRA award. To retain their appointments, GRAs must demonstrate satisfactory progress in their program of study.

Applying for a GRA Appointment

The timing of GRA awards is dependent largely on the cycles of external funding competitions. As such, GRA positions can be awarded at any time that they become available. If you are a current graduate student in good standing or an entering graduate student, you are eligible for a GRA awards. GRA awards are offered at the discretion of the supervisory graduate advisor with approval from the Graduate School. Typically, students who are offered GRA positions are already involved in their advisor's research as returning students or have communicated extensively with the advisor about their interests and qualifications as incoming students.

You may apply for GRA positions by corresponding directly with the supervisory graduate advisor and filing a Graduate Assistantship Application with the ESC Graduate Program Coordinator.

4.3 Other Institutional Support

Historically, GRA and GTA appointments have been the most common and substantial types of institutional support for ESC graduate students. However, UTC also provides internal funding to support graduate students and their activities in the form of other types of assistantships, institutional employment, and graduate student awards.

Other Assistantships

On occasion, the University may make additional graduate assistantships available for students to assist with University needs as Graduate Professional Service Assistants or Graduate Administrative Assistants. Current or incoming students can check with the Graduate School and ESC Graduate Program Coordinator for information about any available positions.

In addition, the Office of Equity and Diversity at UTC sponsors Opportunity Graduate Assistantship positions for first-generation graduate students in degree programs who will promote the benefits of a diverse graduate student body. More information about the OGA program can be found by referring to the Opportunity Assistantship Application.

Graduate Scholarships

The Graduate School offers a limited number of scholarships to graduate students with a cumulative institutional GPA of 3.0 or higher. Each scholarship has its own specific additional eligibility criteria. A complete list of Graduate Scholarships is linked from the Graduate School website. To apply for a graduate scholarship, you should complete the Application for Graduate Scholarships. The priority deadline for applications is February 15th.

Graduate Student Awards

Graduate students are encouraged to apply for competitive internal awards to support activities associated with their capstone experiences. If you are a full-time M.S. ESC students engaged in research, you are eligible to apply to the Provost Student Research Award (PSRA) program for up to $1000 of funding to support original research with faculty members.

Information and application materials can be found on the Office of Research and Sponsored Programs website.

In addition, the Graduate Student Association (GSA) offers Graduate Student Travel Awards to defray the cost of engaging in professional development activities, such as attending a conference or gathering data for research. All ESC graduate students are eligible to apply. Information and application materials are located on the GSA website.

Institutional Employment

Employment opportunities for graduate students to perform specific duties on behalf of the Department or its faculty members may become available at times. These duties could include assistance with faculty research, courses, and/or departmental needs. Such employment would involve an appropriate hourly pay rate for a specified amount of work each week. Typically, students learn of these opportunities directly from the Department or involved faculty.

4.4 Graduate Student Loans

Graduate students pursing the M.S. ESC degree who are enrolled at least half time may be eligible for low-interest unsubsidized federal loans. Graduate students also may be eligible for private education loans; eligibility requirements vary by private loan lender. For more information about Graduate Student Financial Aid, please visit the UTC Office of Financial Aid website.

5. Campus Resources

5.1 Graduate Student Association

The Graduate Student Association (GSA) represents graduate and professional students at UTC in an official capacity. GSA members advocate for graduate and professional students through regular communications with campus administrators and representation on the UTC Graduate Council. GSA also organizes and sponsors social networking events that bring together graduate and professional students from across campus. As an ESC graduate student, you are encouraged to become involved with GSA. More information is available on the GSA website.

5.2 Library

The UTC Library provides all students with valuable resources and space, including print and electronic scholarly materials, Windows and Mac computers, group study rooms for reservation, private study carrels, 24-hour study space, and practice presentation rooms. The Library also houses a Graduate Student Lounge on the 1st floor exclusively for use by graduate students. For more information about the library or to reserve a study room, please visit the UTC Library website.

5.3 Technology

Information Technology (IT) manages access to UTC's online services (MyMocsNet, UTCLearn) and email accounts (MocsMail+) and provides technological support for both students and faculty. Students should become familiar with how to access and use UTC's online services as they provide general and up-to-date campus information, resources specific to individual students, and course content. As a UTC student, you should expect to use your UTC email account for official University business, including correspondence with faculty and being notified of important announcements by the Graduate School, the Department, and the ESC Graduate Program Coordinator. For this reason, even if you primarily use a different existing email account, you should check your UTC email account frequently.

IT also provides free software for current UTC students to install on their computers. This software includes the popular statistics packages SPSS and SAS, which often are used by ESC graduate students conducting empirical research. The bibliography management program Endnote also is available to current UTC students at no cost. Endnote is popular among ESC graduate students writing theses because UTC thesis standards require that bibliography management software be used. Information technology also provides free access to the online survey platform Qualtrics, which can be useful to ESC graduate students wanting to survey people as part of their capstone experience. A complete list of Software Available to Students is available on the IT website.

5.4 Research Compliance

If you are planning to use animal subjects or human participants in your research as an ESC graduate student, you must have your plans approved by UTC's Institutional Animal Care and

Use Committee (IACUC) or Institutional Review Board (IRB), respectively. Such research may not be initiated without IACUC or IRB approval. Information about the IACUC process and IRB process is available online.

5.5 Counseling

The Counseling and Personal Development Center at UTC provides counseling at no charge to students struggling with stress, feeling depressed or anxious, having time management difficulties, or experiencing other issues that are adversely impacting their academic progress and success. For more information, you are encouraged to visit the Center's website.

5.6 Accommodation

The Disability Resource Center (DRC) at UTC provides support to students with disabilities seen or unseen (e.g., physical, learning, psychiatric), including special assistance or accommodation in courses. For more information, you are encouraged to visit the DRC website.

David A. Aborn, Ph.D.
University of Southern Mississippi
Ornithology, Behavior, Conservation

José M. F. Barbosa, Ph.D.
Auburn University
Plant Physiology, Cell Biology, Genetics

DeAnna Beasley, Ph.D.
University of South Carolina
Insect Ecology, Evolutionary Biology, Urban Ecology, Citizen Science

Jennifer Boyd, Ph.D.
Columbia University
Plant Ecology, Physiological Ecology, Global Change Biology

Ethan Carver, Ph.D.
University of Tennessee
Developmental Biology, Human Anatomy, Environmental Genetics

Stylianos Chatzimanolis, Ph.D.
University of Kansas
Entomology, Invertebrate Zoology, Evolution, Systematics, Paleoentomology

Habte Giorgis Churnet, Ph.D.
University of Tennessee
Origins, Formations, and Deformation of Rocks and Economic Mineral Deposits

J. Hill Craddock, D.R.
University of Torino, Italy
Horticulture, Dendrology, Mycology

Timothy J. Gaudin, Ph.D.
University of Chicago
Comparative Vertebrate Zoology, Vertebrate Paleontology, Mammalogy

David Giles, Ph.D.
East Tennessee State University
Environmental Microbiology

Loren Hayes, Ph.D.
University of Miami, Ohio
Behavioral Physiology, Social Behavior

Azad Hossain, Ph.D.
University of Mississippi
GIS, Remote Sensing, Spatial Analysis, Environmental Geoscience

Hope Klug, Ph.D.
University of Florida
Evolutionary Ecology, Behavioral Ecology

Margaret J. Kovach, Ph.D.
Colorado State University
Mammalian Genomics, Molecular Biology

Sean M. Richards, Ph.D.
Texas Tech University
Environmental Toxicology, Environmental Chemistry

Mark S. Schorr, Ph.D.
Mississippi State University
Limnology, Ichthyology, Stream Ecology

Joey Shaw, Ph.D.
University of Tennessee
Plant Taxonomy, Biogeography, Molecular Phylogenetics, Evolution

Henry G. Spratt, Jr., Ph.D.
University of Georgia
Microbiology, Microbial Ecology, Biogeochemistry, Bioremediation

John C. Tucker, J.D., LL.M.
University of Florida, Lewis & Clark College
Environmental Law & Policy

Thomas P. Wilson, Ph.D.
George Mason University
Herpetology, Ecology, Spatial Sciences

Appendix B – Important Dates & Deadlines

These lists are provided to help you meet required deadlines of M.S. ESC students during the 2017-2018 academic year. You should note that they do not substitute for the details of requirements as described in the full contents of the Graduate Student Handbook.

Fall 2017

Aug 18	Fri	• Graduate Teaching Assistant Workshop for GTA students
Aug 21	Mon	• First day of classes
Sept 1	Fri	• Deadline for Fall 2017 GSA travel award applications: Graduate Student Travel Award Application
Sept 6	Wed	• Thesis Formatting Workshop
Oct 15	Sun	• Deadline to apply online for Spring 2018 graduation
Oct 19	Thurs	• Last day for defenses for Fall 2017 graduation
Nov 6	Mon	• Thesis and thesis/internship defense results due for Fall 2017 graduation: UTC Scholar Graduate Degree Examination Results • Internship reports and learned discourses due for Fall 2017 graduation (to be submitted to the ESC Graduate Program Coordinator) • Registration for Spring 2018 begins
Nov 17	Fri	• Deadline to apply for a graduation audit for Spring 2018 graduation: Graduation Audit
Nov 20	Mon	• Deadline for Spring 2018 GSA travel award applications: Graduate Student Travel Award Application
Dec 4	Mon	• Last day of classes • Program of Study declarations due from first-semester students: Program of Study • Committee appointments due from first-semester students: Graduate Committee Appointment (for thesis) Internship/Learned Discourse Committee Appointment
Dec 6	Wed	• Final exams begin
Dec 15	Fri	• Graduate Student Commencement

Spring 2018

Jan 8	Mon	• First day of classes
Jan 19	Fri	• Thesis Formatting Workshop
Mar 8	Thurs	• Last day for defenses for Spring 2018 graduation
Mar 15	Thurs	• Deadline to apply online for Summer 2018 degrees
Mar 19	Mon	• Registration for Summer 2018 courses begins
Mar 30	Fri	• Thesis and thesis/internship defense results due for Spring 2018 graduation: UTC Scholar Graduate Degree Examination Results
		• Internship reports and learned discourses due for Spring 2018 graduation (to be submitted to the ESC Graduate Program Coordinator)
Apr 2	Mon	• Deadline for returning students to apply for ESC graduate assistantships: Graduate Assistant Application
		• Registration for Fall 2018 begins
Apr 16	Mon	• Deadline to apply for a graduation audit for Summer 2018 degrees: Graduation Audit
Apr 23	Mon	• Last day of classes
		• Program of Study declarations due from first-semester students: Program of Study
		• Committee appointments due from first-semester students: Graduate Committee Appointment (for thesis) Internship/Learned Discourse Committee Appointment
		• Deadline for capstone experience proposal approval for second-semester students
Apr 25	Wed	• Final exams begin
May 4	Fri	• Graduate Student Commencement

Summer 2018

June 15	Fri	• Deadline to apply for a graduation audit for Fall 2018 graduation: Graduation Audit
		• Deadline to apply online for Fall 2018 graduation
July	Fri	• Thesis and thesis/internship defense results due for Summer 2018 degrees: UTC Scholar Graduate Degree Examination Results
		• Internship reports and learned discourses due for Summer 2018 degrees (to be submitted to the ESC Graduate Program Coordinator)
Aug 11	Sat	• Summer degrees awarded (no ceremony)

Appendix B – Important Dates & Deadlines

These checklists are provided to help you make timely and successful progress through M.S. ESC degree program. Specific checklists are provided for your first and second semesters of enrollment, the semester before your graduation, the semester of your graduation, and all other semesters in which you are enrolled in the program. You should note that they do not substitute for the details of requirements as described in the full contents of the Graduate Student Handbook.

ESC Graduate Student Checklist - First Semester

Early:

- ☐ Set up a schedule for regular meetings with your advisor.
- ☐ Define capstone progress goals for the semester with your advisor.
- ☐ Submit Capstone Progress Goals to the Graduate Program Coordinator.

During:

- ☐ Discuss the details of your capstone experience plans with your advisor.
- ☐ Discuss appropriate graduate committee members with your advisor.
- ☐ Discuss course offerings for *next* semester with your advisor and register.
- ☐ Work on your thesis, internship, or learned discourse proposal.

By the End:

- ☐ Declare your Program of Study to the Graduate School.
- ☐ Appoint your graduate committee members:

  Graduate Committee Appointment (thesis students)

  Internship/Learning Discourse Committee Appointment
- ☐ Discuss your progress for the semester with your advisor.
- ☐ Define capstone progress goals for the *next* semester with your advisor.

ESC Graduate Student Checklist - Second Semester

Early:

- ☐ Set up a schedule for regular meetings with your advisor.
- ☐ Submit Capstone Progress Goals to the Graduate Program Coordinator.

During:

- ☐ Discuss course offerings for *next* semester with your advisor and register.
- ☐ Finalize your thesis, internship, or learned discourse proposal (if still in progress).
- ☐ Begin your capstone experience (if proposal has been approved/submitted).

By the End:

- ☐ Discuss your progress for the semester with your advisor.
- ☐ Define capstone progress goals for the *next* semester with your advisor.

ESC Graduate Student Checklist – Semester *before* Graduation

Early:

- ☐ Set up a schedule for regular meetings with your advisor.
- ☐ Attend a UTC Thesis and Dissertation Formatting Workshop (recommended if not previously attended).
- ☐ Submit Capstone Progress Goals to the Graduate Program Coordinator.

During:

- ☐ Discuss course offerings for *next* semester with your advisor and register.
- ☐ Prepare the final written document of your capstone experience.

By the Due Dates:

- ☐ Submit your Graduation Audit request to the Graduate School.
- ☐ Apply for graduation online.

By the End:

- ☐ Discuss your progress for the semester with your advisor.

ESC Graduate Student Checklist – Semester of Graduation

Early:

- ☐ Set up a schedule for regular meetings with your advisor.
- ☐ Submit Capstone Progress Goals to the Graduate Program Coordinator.

During:

- ☐ Finalize the final written document of your capstone experience.
- ☐ Plan and schedule your defense.

By the Due Dates:

- ☐ Defend your thesis, internship, or learned discourse.
- ☐ Report the results of your defense (thesis *and* internship students)

  Graduate Degree Examination Results

- ☐ Submit your final written document to the Graduate School or the Graduate Program Coordinator.

ESC Graduate Student Checklist – All Other Semesters

Early:

- ☐ Set up a schedule for regular meetings with your advisor.
- ☐ Submit Capstone Progress Goals to the Graduate Program Coordinator.

During:

- ☐ Discuss course offerings for *next* semester with your advisor and register.
- ☐ Work on your capstone experience toward meeting semester goals.

By the End:

- ☐ Discuss your progress for the semester with your advisor.
- ☐ Define capstone progress goals for the *next* semester with your advisor.

APPENDIX B: SAMPLE SYLLABI OF GRADUATE COURSES

Graduate Course Syllabi
(Click on the heading and another pdf file will open, 37 pages)

APPENDIX C: GRADUATE STUDENT PUBLICATIONS AND PLATFORM AND POSTER PRESENTATIONS

Graduate Student Publications

Names of graduate students are in bold type.

Turk JR, Alp N, Dattilo A, Boyd JN (2017) Cost-benefit analysis of native warm season grasses for transmission line right-of-way revegetation. *Ecological Engineering* 108: 123-131.

Wilson TP, Reynolds BR, Wilson PJ, **Bakland PE**, **Hooper J**, **Hunt N**, Madsen S, Cooksey M, Garland P, Grigsby W, Killian B, Ricks N, Staudt E, Taylor M, Busby E, Barbosa J, Carver E, **Armstrong D**, **Dillard M**, **Simpson J**, Wisdom M, Wilson TW, Team Salamander (2017) Team Salamander and its evolution as the longest-running group-studies initiative at the University of Tennessee at Chattanooga. *Southeastern Naturalist* 16: 70-93.

Davis G, Vasquez R, Poulin E, Oda E, Bazan- León EA, Ebensperger LA, Hayes LD (2016) *Octodon degus* kin and social structure. *Journal of Mammalogy* 97: 361-372.

Farnsley S, Kuhajda B, George A, 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: 523-533.

Bauer CM, Hayes LD, Ebensperger LA, Ramírez-Estrada J, León C, **Davis GT**, Romero LM (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.

Mikelson C, Kovach MJ, Troisi J, Symes S, Adair D, Miller RK, Salafia C, Johnson K, Lin Z, Richards S (2015) Placental 11β-Hydroxysteroid Dehydrogenase Type 2 Expression: Correlations with Birth Weight and Placental Metal Concentrations. *Placenta*. 36:1212-7.

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.

Strom M, **Carroll KA**, **Davis G**, Hultman W, Kosycarz T, Hayes LD (2015) Finding 'Garrett': An evolutionary language development game. *American Biology Teacher* 77: 608-612.

Wilson TP, Barbosa J, Carver E, Reynolds BR, **Team Salamander**, Wilson TM (2015) *Batrachochytrium dendrobatidis* prevalence in two ranid frogs on a Former United States Department of Defense installation in southeastern Tennessee. *Herpetological Review* 46: 37-41.

Wolfe D, Schorr M, Hanson M, Nelson CH, Richards S (2015) Hazard assessment for a pharmaceutical mixture detected in the upper Tennessee River using Daphnia magna. *Global Journal of Environmental Science Management* 1: 1-14.

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.

Troisi J, **Mikelson C**, Richards S, Symes S, Adair D, Zullo F, Guida M (2014) Placental concentrations of bisphenol A and birth weight from births in the southeastern U.S. *Placenta*. Vol 35: 947-952.

Conley J, Richards S (2013) Environmental teratogenesis. In: Férard JF, Blaise C (eds) Encyclopedia of Aquatic Ecotoxicology. Springer, New York, New York.

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.

Graduate Student Platform Presentations

Names of graduate students are in bold type.

Dillard MJ, **Bakland PE**, **Hooper JW**, Wilson PJ, **Team Salamander**, Wilson TP (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 Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education, Charleston, SC.

Hall J, Hossain A (2017) Investigating the impact of land use/land cover change on water quality in Chattanooga, TN using GIS and remote sensing. Tennessee Geographic Information Council Conference, Knoxville, TN.

Madsen S, Altonen R, Wilson TP, **Team Salamander** (2017) Clean water and river health education using freshwater turtles: a charismatic approach. Turtle Survival Alliance Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education, Charleston, SC.

Richards S, **Mikelson C** (2017) Environmental Exposures Associated with Low Birth Weight. American Osteopathic College of Occupational and Preventive Medicine Conference, Chattanooga, TN.

Webb ES, Spratt HG Jr. (2017) Degradation of aromatic dyes by bacteria isolated from soils previously exposed to aromatic compounds and by common lab bacterial cultures. Association of Southeastern Biologists, Montgomery, AL.

Wilson TP, **Dillard MJ**, **Manis C**, Moss S, Wilson PJ, 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 Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education, Charleston, SC.

Hooper J, Mowry CB, Wilson TP, Gaudin TJ (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, Raleigh, NC.

Wilson TP, Reynolds B, Dempsey M, Korshun A, Mitchell A, Schrenker E, Schwartz R, **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. Joint Meeting of Herpetologists and Ichthyologists, New Orleans, LA.

Leavell A, Mcgee K, Muegge C, Spratt HG Jr. (2016) Microbial community dynamics related to the function of an artificial wetland. Association of Southeastern Biologists, Charlotte, NC.

Perkins MT, Shaw J, Craddock JH (2016) Phylogeographic examination of *Castanea* Mill. (Fagaceae) morphotypes in the eastern United States. Association of Southeastern Biologists, Concord, NC.

Strom M, Ebensperger LA, Hayes LD (2016) Habitat specific fitness consequences of group-living. International Society of Behavioral Ecology, Exeter, England.

Strom M, Abbot P, Nowak K, Calhoun K, Bauer C, Romero LM, Ebensperger LA, Hayes LD (2016) Are ectoparasites or their bacterial communities correlated with the endocrine stress response in degus *Octodon degus*? American Society of Mammalogists, Minneapolis, MN.

Aborn DA, **Marsh LK** (2015) Urban stopover: do pedestrians hinder fattening in migratory birds? International Urban Wildlife Conference, Chicago, IL.

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.

Farnsley S, Kuhajda B, George A, Klug H (2015) Escaping evolutionary history: Training the Barrens Topminnow to escape an evolutionary trap. Tennessee Chapter of the American Fisheries Society, Chattanooga, TN.

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.

Klug H, **Farnsley S**, Kuhajda B, George A (2015) Escaping evolutionary history: Training an endangered fish to escape an evolutionary trap. Evolution 2015, Guarujá, Brazil.

Tsukide K, **Quinn K**, **Leavell A**, Spratt HG Jr. (2015) Evaluation of the efficacy of different bioremediation methods for the degradation of waste motor oil added to soil. Association of Southeastern Biologists, Chattanooga, TN.

Dillard MJ, Wilson TP (2014) Lewis Award: The spatial ecology of the eastern box turtle in urban and fragmented landscapes of Southeast Tennessee. The Tennessee Herpetological Society, Nashville TN.

Klug H, **Farnsley S**, Kuhajda B, George A (2014) Escaping evolutionary history: Training an endangered fish to escape an evolutionary trap. International Society for Behavioral Ecology Congress, New York, NY.

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. Teratology Society, Bellevue, WA.

Simpson JF III, Wilson TP (2014) An assessment of a herpetofaunal community in southeastern Tennessee: ecology, biodiversity, threats, and conservation status. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.

Wilson TP, **Bakland P**, **Hunt N**, Madsen S, Altonen R, Wilson TM, **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, Spartanburg, SC.

Wilson TP, Reynolds B, **Team Salamander** (2014) The importance of biological field stations in local conservation and education: a UTC perspective. The Tennessee Herpetological Society, Nashville TN.

Wilson TP, Carroll A, **Simpson J**, **Manis C**, Team Salamander (2014) Amphibians, wetlands and the faces of development: who gets the gig? Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.

Wilson TP, Carroll A, **Simpson J**, **Manis C**, Team Salamander (2014) Amphibians, wetlands and the faces of development: who gets the gig? The Tennessee Herpetological Society, Nashville TN.

Benson A, Shaw J, Boyd J (2013) Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Association of Southeastern Biologists. Charleston, WV.

Carpenter C (2013) Phylogeography of short-tailed shrews (genus: *Blarina*) of Southeast Tennessee. Association of Southeastern Biologists, Charleston, WV.

Hudson AB, Aborn DA (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.

Mikelson C, Troisi J, Kovach M, Symes S, Adair D, Johnson K, Lin Z, Richards S (2013) Analysis of elemental composition and 11b-HSD2 expression in human placenta: relationship with birth weight in Chattanooga, TN. Society of Environmental Toxicologists and Chemists, Nashville, TN.

Odell J, **Sikkema J**, Hoover D, Raymond G, Boyd J (2013) Ten years of monitoring of federally threatened *Scutellaria montana* in Catoosa County, Georgia: findings and recommendations. Tennessee Academy of Science. Tullahoma, TN.

Spratt HG Jr., Brown MM, Gann TM, **Wilson DB** (2013) The influence of bacterial growth in pores of pervious concrete on the flow of water through pervious pavements. Association of Southeastern Biologists, Charleston, WV.

Wilson DB, **Harris KA**, Spratt HG Jr. (2013) Mineralization of the herbicide simazine in golf course pond sediment: Comparison of passive bioremediation, biostimulation, and bioagumentation. Association of Southeastern Biologists, Charleston, WV.

Benson A, Shaw J, Boyd J (2012) Impacts of large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. Tennessee Academy of Science. Jackson, TN.

Carpenter C (2012) Phylogeography of short-tailed shrews (genus: *Blarina*) of Southeast Tennessee. Tennessee Academy of Science, Nashville, TN.

Carpenter C, Gaudin T, Wilson TP, Shaw J (2012) Phylogeography of short-tailed shrews (*Blarina*) of southeast Tennessee. The Tennessee Academy of Sciences, Nashville, TN.

Harris A, Shaw J, and Craddock JH (2012) A floral survey and census of American Chestnut at Bendabout Farm, Bradley County, Tennessee. The American Chestnut Foundation and the USDA Forest Service 2012 Chestnut Summit, Asheville, NC.

Graduate Student Poster Presentations

Names of graduate students are in bold type.

Aborn DA, **Marsh LK** (2017) Age-related differences in body condition in areas of different pedestrian activity. Ornithological Congress of the Americas, Puerto Iguazu, Argentina.

Bakland PE, Wilson TP (2017) Investigation of the amphibian chytrid fungus in East Tennessee. Southeastern Partners in Amphibian and Reptile Conservation, Little Rock, AR.

Daniels K, Wilson TP, Carroll A (2017) Comparing unmanned aerial vehicles (UAVs) to traditional field methods in surveying of basking riverine turtles. Turtle Survival Alliance Symposium on Freshwater Turtles of the Southeastern United States: A Marriage of Conservation and Education, Charleston, SC.

Hayes LD**, Carroll K**, Gao L, Ebensperger LA (2017) 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.

Hunt NR, Carroll A, Wilson TP (2017) Predictive spatial modeling and assessment for a rare Tennessee anuran: Barking Treefrog (*Hyla gratiosa*). Southeastern Partners in Amphibian and Reptile Conservation, Little Rock, AR.

Johnson NE, **Grillo S**, Gilliam EH, Hayes LD, Ebensperger LA, Vasquez RA (2017) Impacts of long-term predation risk on stress response and behavior in the rodent, *Octodon degus.* American Society of Mammalogists, Moscow, ID.

Miles M, Hayes LD (2017) Artiodacytl and Perrisodactyl Social Organization: Re-evaluation and Re-assessment. Society of Comparative and Integrative Biology, New Orleans, LA.

Schorr MS, **Cuervo J** (2017) Fish assemblage response to mitigation of a channelized stream reach in Tennessee. Association of Southeastern Biologists, Montgomery, AL.

Strom M, Abbot P, Nowak K, Calhoun K, Bauer C, Romero LM, Ebensperger LA, Hayes LD (2017) 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.

Wilson TP, **Bakland PE**, **Hunt N**, Collins DE (2017) Reproductive ecology of a freshwater turtle community at Reelfoot Lake, Tennessee. Association of Southeastern Biologists, Montgomery, AL.

Bakland PE, **Team Salamander**, Wilson TP (2016) A species checklist of plethodontid salamanders from Hamilton and Marion Counties in Southeast Tennessee. Special Highlands Conference on Plethodontid Salamander Biology, Highlands, NC.

Bakland PE, Wilson TP (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, Raleigh, NC.

Bakland PE, Wilson TP, **Hunt N**, **Manis C**, **Simpson JF**, **Team Salamander** (2016) Herpetofaunal checklist for Hamilton County as generated through various projects of the Herpetology Laboratory at the University of Tennessee at Chattanooga. Tennessee Valley Chapter of the Wild Ones Native Plant Symposium, Chattanooga, TN.

Brocco C, Nabors M, Schrenker E, **Bakland PE**, Team Salamander, Wilson TP (2016) Spatial analysis of prevalence of chytrid fungus in a plethodontid salamander assemblage. Special Highlands Conference on Plethodontid Salamander Biology, Highlands, NC.

Carroll KA, Abades S, Gao C, Ebensperger LA, Hayes LD (2016) Harsh and unpredictable ecological conditions modulate social structure and direct fitness in a plurally breeding mammal. Association of Southeastern Biologists, Concord, NC.

Dillard MJ, **Hooper J**, **Team Salamander**, Wilson TP (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 southeastern Tennessee. The Wildlife Society, Raleigh, NC.

Dillard MJ, **Hooper J**, **Team Salamander**, Wilson TP (2016) The spatial ecology of the Eastern Box Turtle in an urban and fragmented landscape of Southeast Tennessee. Association of Southeastern Biologists, Concord, NC.

Dillard MJ, **Hooper J**, **Team Turtle**, Wilson TP (2016) The spatial ecology of the Eastern Box Turtle in urban and fragmented landscapes of Southeast Tennessee. Tennessee Valley Chapter of the Wild Ones Native Plant Symposium, Chattanooga, TN.

Houser J, Craddock H, Richards S (2016) Arsenic uptake by beets (*Beta vulgaris*) cultivated in roxarsone-contaminated soil. Society of Environmental Toxicologists and Chemists, Orlando, FL.

Hunt NR, Carroll A, Wilson TP (2016) Land cover trends in *Hyla gratiosa* presence at watershed scale in Tennessee. Tennessee Geographic Information Council (TNGIC), Chattanooga, TN.

Hunt NR, Wilson TP, Carroll A (2016) Land cover trends in *Hyla gratiosa* presence at watershed scale in Tennessee. Tennessee Valley Chapter of the Wild Ones Native Plant Symposium, Chattanooga, TN.

Hunt NR, Carroll A, Wilson TP (2016) Predictive spatial modeling for a rare Tennessee anuran: Barking Treefrog. The Wildlife Society, Raleigh, NC.

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.

Wilson TP, **Dillard MJ**, **Hooper J**, **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.

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). Tennessee Chapter of the American Fisheries Society, Chattanooga, TN.

Carroll KA, Ebensperger LA, Hayes LD (2015) How ecological variables influence social network structure and fitness in *Octodon degus*, American Society of Mammalogists, Jacksonville, FL.

Carroll KA, Ebensperger LA, Hayes LD (2015) How ecological variables influence social network structure and fitness in *Octodon degus*, Association of Southeastern Biologists meeting, Chattanooga, TN.

Marsh LK, Aborn DA (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.

Perkins MT, Craddock JH (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, Pennsylvania State University, State College, PA.

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. Tennessee Chapter of the American Fisheries Society, Chattanooga, TN.

Strom MK, Ebensperger LA, Vasquez R, Bazán E, **Taig-Johnston M**, Hayes, LD (2015) Habitat specific fitness consequences of sociality in *Octodon degus.* Association of Southeastern Biologists meeting, Chattanooga, TN.

Walley J (2015) Diet Analysis of wintering waterfowl in agricultural and natural wetlands. Association of Southeastern Biologists, Chattanooga, TN.

Russo L, Montgomery C, Hoover D, Odell J, Raymond G, Boyd J (2014) Invasive plant species distribution and abundance in Tennessee Army National Guard Volunteer Training Sites: from ground surveys to Geographic Information System layers. Association of Southeastern Biologists. Spartanburg, SC.

Szarka GW, Wilson TP (2014) Sampling amphibians and reptiles in southeastern Tennessee: lessons learned and implications for conservation and management. Association for Southeastern Biologists, Spartanburg, SC.

Szarka GW, Wilson TP (2014) Sampling amphibians and reptiles in southeastern Tennessee: lessons learned and implications for conservation and management. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.

Wilson TP, **Bakland PE**, **Hunt H**, Madsen S, Altonen R, Wilson TM, **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. Joint Meeting of Ichthyologists and Herpetologists, Chattanooga, TN.

Wilson TP, **Bakland PE**, **Hunt H**, Madsen S, Altonen R, Wilson TM, **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, Nashville TN.

Wilson TP, Barbosa J, Carver E, Reynolds BR, **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, TN.

Wilson TP, Barbosa J, Carver E, Reynolds BR, **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. The Tennessee Herpetological Society, Belmont University, Nashville TN.

Wilson TP, **Manis C**, Moss S, Minton R, Schorr M, **Team Turt**le (2014) Sex ratios and size dimorphisms in the Tennessee River Gorge turtle community. The Tennessee Herpetological Society, Nashville TN.

Wilson TP, **Simpson JF**, Reynolds BR, **Bakland PE**, **Hunt N**, Madsen S, Altonen R, Bird B, Cooksey M, Grigsby W, Taylor M, **Dillard M**, Wisdom M, **Mercier A**, **Szarka G**, **Hooper J**, **Manis C**, Wilson TM, **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, TN.

Wilson TP, **Simpson JF**, Reynolds BR, **Bakland PE**, **Hunt N**, Madsen S, Altonen R, Bird B, Cooksey M, Grigsby W, Taylor M, **Dillard M**, Wisdom M, **Mercier A**, **Szarka G**, **Hooper J**, **Manis C**, Wilson TM, **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, Nashville TN.

Wilson TP, **Armstrong D**, Bascom M, Barbosa J, Carver E, **Dillard M**, Reynolds B, **Simpson J**, Wisdom M, **Manis C** (2013) A swamp-walker's journal: herpetology at the University of Tennessee at Chattanooga. Southeastern Partners for Amphibian and Reptile Conservation, Hickory Knob State Park, SC.

Wilson TP, **Armstrong D**, **Simpson J** (2013) Demographic characteristics and genetic status of an isolated population of spotted salamanders: implications for management and recovery. The Wildlife Society, Milwaukee, WI.

Wisdom MD, Wilson TP, Reynolds B, **Dillard MJ** (2013) Constructing Vernal Pools to Create and Enhance Amphibian Habitat. Southeastern Partners for Amphibian and Reptile Conservation, Hickory Knob State Park, SC.

Perkins MT, Craddock JH (2012) The effect of phosphite on mycorrhiza formation in Chinese-American hybrid chestnuts. American Chestnut Summit, Asheville, NC.

Wolfe N, Schorr M, Hanson M, Nelson C, Richards S (2012) Life-cycle exposure of *Daphnia magna* to a environmentally relative mixture of pharmaceuticals. Society of Environmental Toxicologists and Chemists, Boston, MA.

APPENDIX D: 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.

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

Books and book chapters
Published
None

Project reports
None

Grants
External
M. N. Vitousek, D. R. Ardia, D. A. Aborn, and A. Rose. Coping with stress: integrating hormones, behavior, phenotypic damage, and fitness, National Science Foundation. $498,891. 2015.

D. A. Aborn. "Post-fledging movement and survival of Cerulean Warblers in the Tennessee River Gorge", Tennessee River Gorge Trust, 2014. $40,000

D. A. Aborn. “Population dynamics of Northern Saw-whet Owls in the Southern Appalachians”, Tennessee Wildlife Resources Agency, 2013. $7,000

Internal
None

Invited Research Seminars
None

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's of Science degree in Environmental Science (2013-2015)

Schedule Committee (2012-2015)

Wildlife-Zoology Club Faculty Advisor (2012-present)

Community

None

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)

Jose Barbosa

Scholarly activity

Peer reviewed publications (Not including Published abstracts)
Team Salamander and Its Evolution in Becoming the Longest Running Group Studies Initiative

at the University of Tennessee at Chattanooga
Thomas P. Wilson[1]*, Bradley R. Reynolds[1], Penni Jo Wilson[2], Paul-Erik Bakland[1], Jeremy Hooper[1], Nyssa Hunt[1], Simone Madsen[3], Maria Cooksey[3], Patricia Garland[3], Wes Grigsby[3], Brittany Killian[3], Nakeisha Ricks[3], Liz Staundt[3], Micah Taylor[3], Emily Busby[3], Jose Barbosa[1], Ethan Carver[1], Daniel Armstrong[3], Mark Dillard[1], Joe Simpson[3], Mark Wisdom[3], Tabitha M. Wilson[4], and Team Salamander[3] 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 Former United States Department of Defense Installation in southeastern Tennessee. Herpetological Review. 2015; 46(1): pp 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 2013; 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 2013; 30(4): 129-144.

In preparation:
Barbosa, J., **Patel, V.,** Singh, N., Locy, R. 2017. Identification of Arabidopsis thaliana aminotransferases that complement functions of GABA transaminase in Saccharomyces cerevisiae. Their Involvement in Stress Responses. (to be resubmitted)

Barbosa, J., **Felgueira, C., Sims, D.,** Mikelson, C., **Stephens, N.** 2017/18 Oxidative stress patterns of ald3 and ald4 knockouts of *Saccharomyces cerevisiae* and possible abatement by caffeine. Yeast… Vol?

Detchemendy, T., Santiago, M., Locy, R., **Morris R., Ayres, M.**, Barbosa, J. 2017. Effects of Exogenous ß-alanine on Primary Root Growth, Potassium Accumulation and Polyamine Biosynthesis in *Arabidopsis Thaliana.* Plant Physiol. & Biochemistry.

Grants
external
2014-2015. **Nephrogenesis.** Efficacy of Lipocalin Mediated Binding and Displacement of Non-polar Uremic Toxins from Protein Binding Stores.
Dr. Jose Barbosa (PI) **Amount awarded $80,510.00**

2016-2018. **DCI / Nephrogenesis**: 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 (PI) **Amount awarded $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.
Amount committed by different offices **…** **(\$7,700 awarded)**

2012-13. **UTC Provost Student Award**: with student Megan Ayres. Effect of β-Alanine on Expression of Potassium Transporter Genes in *A. thaliana.* **Amount awarded \$1,000.00**

2014-2015. 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.
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. **(\$20,000 awarded)**

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 will 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 - to present

Think achieve Task force January 2012 – 2017

Department
Department review (2017-present; Chair of 'undergraduate curriculum' section)
Curriculum committee (Chair) 2013 - present
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

Nominanda Barbosa

Professional, University, Departmental and Community Service
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
2016-current- University committee: Learning Support and Auxiliary Services

Departmental

2013 – 2014- departmental committees: Departmental Low Student GPA;
Committee Student Awards and Relations Committee Tri-Beta Committee;
Retention Committee (participated in the discussion and elaboration of the student "Report on First Year of Retention Guidelines"

2014 – 2015- departmental committees: Departmental Low Student GPA Committee;
Student Awards and Relations Committee; Retention Committee - participated in the discussion and elaboration of "biology curriculum mapping"
During Fall 14, served as reference for internship applications. I wrote one recommendation letter intended to a student searching internship. I also wrote and directed a reference form for national student exchange on behalf of one of my former students.

2015 – 2016 - departmental and University committees: Departmental Low Student GPA;
Committee Departmental Student Awards and Relations Committee
Fall 2015, prepared and submitted the recertification package for approval for Microbiology and Health course

2016-2017- departmental Low Student GPA Committee; Departmental Student Awards and Relations Committee; Assessment and Retention Committee; Regular Faculty Hires – part of a search committee for a new biology lecture.

2015-current - Ongoing Micro Prep Lab Coordinator tasks

Community
2015 to current - Mentor for high school students and have been assigned to CSAC (Chattanooga School of Art and Science).

Faculty Commons Christian Campus Ministry "faculty of faith group" member.

DeAnna E. Beasley

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., Heděnec, 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).

Books and book chapters
None

Project reports
None

Grants
External
2015, National Science Foundation, Dimensions of Biodiversity Workforce REU-Broadening Participation Supplement, PI: Rob R. Dunn, Lead investigators: DeAnna E. Beasley, Mary Jane Epps, Award: $20,000

2014, National Science Foundation, Dimensions of Biodiversity Workforce REU-Broadening Participation Supplement, PI: Rob R. Dunn, Lead investigators: DeAnna E. Beasley, Mary Jane Epps, Award: $20,000

Internal
2017, UTC Research and Creative Grant, Award: $6,950

2017, UTC Research Dialogues Symposium Faculty Elevator Speech Competition, Award: $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. *Invited talk.*

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. *Invited talk.*

Conference Presentations
None

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.

Books and book chapters
Accepted or published
None
Submitted or in preparation
None

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

Jeremy L. Bramblett

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

Research

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)

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

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 (I added this in case you wanted it)
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

Ethan Carver

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.

Project reports
None

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 $8000.

Invited Research Seminars
none

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:
"Measuring the presence of the amphibian pathogen Batrachochytrium dendrobatidis in east Tennessee." Erin A. Schrenker, Ethan A. Carver, Jose M. Barbosa, and Thomas P. Wilson, (Poster) East Tennessee Collegiate Division meeting of the Tennessee Academy of Science, Pellissippi State, Friday April 21, 2017.

"Prevalence of Batrachochytrium dendrobatidis (Bd) in watercourses situated in southeast Tennessee." Macall A. Nabors, Thomas P. Wilson, Ethan A. Carver, Jose M. Barbosa, and Team Salamander. (Poster) 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" Poster 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" (Poster) 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" (Poster) 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" (Poster) 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" (Poster) 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" (Poster) 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 (Poster) 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" (Poster) 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." (Poster) 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." (Poster) 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." (Poster) 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." (Poster) 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" (Poster) 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" (Poster) Joint 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)
Bachelors 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)

Jodi L. Caskey

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.]

Research

Books and book chapters
None

Published project reports
None

Grants
None

Invited Research Seminars
None

Invited Educational Presentations
None

Conference presentations
None

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)

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.

Project reports
none

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

Invited Educational Presentations
none

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

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

Books and book chapters
None

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 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.

1. **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
Department Head of Physics, Geology, and Astronomy: 1991- 2015

Chair of the Geology & Geography at the Tennessee Academy conference; 2014-2015

University

Senator of the UTC Senate committee 2015-2016

Department of BGE

Member of Bylaws committee
Member of Equipment committee
Co-Chair of Rank and Tenure committee: 2016
Member of RTR committee

J Hill Craddock

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 and Foundation Support
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, Coolidge 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).

Sarah Farnsley

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)

Tim Gaudin
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.

Project reports

None

Grants

External

None

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 Microbiology*.

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.

Books and book chapters

None

Project reports

None

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.

Invited Educational Presentations
None

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)

Research
Peer reviewed publications (Not including Published abstracts)
Accepted or published
Submitted or in preparation

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).

Submitted or in preparation

None

Project reports

None

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.

Ann E. Holmes

Faculty development

Attend and present at meetings of Geological Society of America – national and regional

Research

Peer reviewed publications (Not including Published abstracts)

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 Research Seminars

Invited Educational Presentations

Conference Presentations
coauthored with undergraduates in bold
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.

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.

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.

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.

Coauthored without students:
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.

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.

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.

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.

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

A.K.M. Azad Hossain

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).

Books and book chapters
None.

Project reports
None.

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.

Invited Educational Presentations
None

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

Departmental Committee:
Bylaws (Fall 2016 - present)
Graduate (Fall 2016 - present)
Curriculum and Planning (Fall 2017 - present)

Departmental Program Review (2017 – present):
Undergraduate learning resources
Graduate learning resources

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.

Hope Klug

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 review. 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.

Submitted or in preparation
None

Project reports
None

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 Chattanooga 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 Renovation

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 activities for local high school students (Summer 2017)

GEAR UP High School Student Aquatic Science Day, Organized and led activities 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 Activities (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.

Books and book chapters
None

Project reports
None

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.

Invited Research Seminars
None

Invited Educational Presentations
None

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

Faculty development
Introduction to Advising
Advising with Technology
Advising Transfer Students
Green Zone Training (Veteran Support)
Question, Persuade, Refer (Suicide Prevention)

Research
None

Professional, University, Departmental and Community Service

Professional
None

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)

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

Peer reviewed publications (Not including Published abstracts)

Accepted or published
Submitted or in preparation

None (published abstracts listed under conference presentations)

Books and book chapters
Accepted or published
Submitted or in preparation

None

Project reports

None

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

Invited Research Seminars

None

Invited Educational Presentations

None

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

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.

Conference Presentations
None

Professional, University, Departmental and Community Service

University
Serves on University IACUC Committee.

Department
Serve on the 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.

Project reports
None

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

Invited Research Seminars
None

Invited Educational Presentations
None

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

Professional
None

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

Sean Richards

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**

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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).

Books and book chapters
None

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.

Internal
None

Invited Research Seminars
None

Invited Educational Presentations
None

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.

Joey Shaw

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.

Books and book chapters
Published

None

Project reports
None

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 children's 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.

University
None.

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.

John Tucker

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)

Scholarly activity

Peer Reviewed publications (Not including Published abstracts)
Accepted or published
None

Books and book chapters
None

Project reports

None

Grants
External
None

Internal
None

Invited Research Seminars
None

Invited Educational Presentations

None

Conference presentations

None

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

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

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).

Submitted or in preparation
NONE

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).

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).

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.

APPENDIX E: EDO CRITERIA

* * *

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

A. 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

b. Publications in the field of pedagogy including textbooks and instructional materials.

c. 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

d. 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

A. Professional Service Activities

1. Departmental

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

[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.

Representative Activities for *Standard* EDO Rating

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

Representative Activities for *Exceptional* EDO Rating

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.

Representative Activities for *Standard* EDO Rating

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 must contain 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 may contain 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 F: 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

[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 G: DEPARTMENTAL 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
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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
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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
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
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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
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 H: SPACE ALLOCATION IN RENOVATED HOLT HALL

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 Greenhouse		Bldg	1167	
Holt Greenhouse		Bldg	1200	
Teaching and Learning Garden			????	
Teaching Lab at Water Treatment Facility			????	

APPENDIX I: CHEMICAL HYGIENE PLAN

Chemical Hygiene Plan
(Click on the heading and another pdf file will open, 35 pages)

APPENDIX J: DETAILED 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**