

ENVIRONMENTAL CONSERVATION

UNDERGRADUATE CURRICULUM & STUDENT EXPERIENCE REVIEW

Our mission is to provide our students with the knowledge and tools to solve the complex, global challenges of environmental sustainability, and to nurture their passions for changing the world.

We, in the Department of Environmental Conservation (ECo), are passionate about our mission and about making a BIG difference in the world. By virtue of our breadth of expertise and inherent ability to reach across disciplines, ECo is uniquely qualified and deeply committed to training the next generation of scholars and practitioners. We prioritize undergraduate education and our students emerge well prepared to solve the complex, global challenges of environmental sustainability.

The challenge to achieving our mission is the delivery of curricula and training that allow our students to navigate through their chosen degree programs with a high level of productivity, educational value, support and professional experiences.

Our primary responsibility is career preparation for our students, considering that a large proportion of graduating seniors in ECo and ENVSCI plan to enter the job market after graduation (Table 1). Consequently, our curricula and professional training are designed to meet the dual demands of **a) certification requirements of our diverse professional societies**, and **b) the workforce needs of employers**. Additionally, our curricula must also provide our students with the knowledge and training to continue their education via graduate school if they so choose.

Unit	Full-time employment	Part-time employment	Graduate or prof school	Volunteer
BCT	93%	2%	2%	0%
ENVSCI	69%	7%	21%	0%
NRC*	54%	14%	18%	5%
CNS	53%	10%	31%	2%
Campus	65%	9%	21%	1%

* Note: For this major, post graduation plans vary by concentration. For example, the Urban Forestry & Arboriculture concentration virtually all graduates enter the job market with 100% full-time employment.

Table 1. Post graduation plans of ECo and ENVSCI graduating seniors 2015 compared to CNS and campus wide undergraduate students.

Located within the College of Natural Sciences, the Department of Environmental Conservation (ECo) is deeply committed to undergraduate education. It is a priority for our department, and this is reflected in our approach to education and the quality of support we provide our students. In ECo, undergraduates are part of a vibrant learning community

where creative teaching methods are celebrated and applied, and hands-on experiences extend well beyond the classroom. Each of our faculty works closely with students, assisting them with academic advising and career planning. Further, as part of the largest and most diverse flagship campus for Environmental Conservation, Environmental Science, Sustainability Science, and Building & Construction Technology across all public and private universities in New England, we are committed to making UMass Amherst the “destination of choice” for students interested in sustainability and the environment throughout the Northeast.

Departmental Culture & Undergraduate Education

Despite our size of about 700 undergraduate students, ECo provides a **small college atmosphere** within a large university. This is because we **prioritize the undergraduate experience** with:

- High faculty accessibility with faculty-centered advising (all ECo faculty advise undergraduate students and each of our 700 majors is assigned a faculty advisor);
- A strong commitment to excellence in teaching and experiential learning with a special emphasis on field and laboratory experiences;
- Engaged, student-centered teaching that incorporates team-based learning and civic engagement;
- Interdisciplinary coursework that emphasizes global perspectives, environmental justice and civic responsibility.

Further, our programs have **topical relevance** that aligns with student interests and connects to real-world problems in environmental sustainability. The numerous majors and concentrations within our ECo programs also provide much sought-after **educational flexibility**, allowing students to tailor their studies to fit their individual interests in environmental conservation and sustainability. Lastly, our ECo programs offer **real-world experiences**, both in the classroom and beyond with hands-on training in the field and laboratories, internships, research experiences with faculty, and international exchange. Our curricula are designed to **meet the certification requirements of professional societies**. We also play a pivotal role in fulfilling the university’s promise of “*embracing responsibility for the sustainability of the planet, for the progress of society, and for the development of each individual*”.

Within ECo, there are three undergraduate majors programs. These include: Building & Construction Technology (BCT), Natural Resources Conservation (NRC), and Environmental Science (ENVSCI) that is co-administered by three academic units - ECo, Geosciences (GEO), and the Stockbridge School of Agriculture (SSA). The data available to analyze our programs varied. Where possible, we assessed each program individually; however, where data were limited to the departmental-level, our review focuses on ECo programs (BCT and NRC combined) and ENVSCI.

Synopsis of Our Undergraduate Programs

Building & Construction Technology (BCT)

Building and Construction Technology trains students in the fields of sustainable design and construction of the built environment. Students participate in coursework covering science, technology, business, and design to support the basis for advancing their careers. Graduates go on to be involved in virtually every area of building technology, including construction and project management, sustainable design, green building and energy conservation, wood design and building, and sales and marketing of building materials. Career paths span from technical and research disciplines through sales and construction management.

With over 200 undergraduates, the BCT program provides our students with rigorous training that makes them competitive in the workforce. Employment opportunities for our BCT majors are exceptional. Based upon our departmental surveys, with over 90% of graduates typically secure professional employment within their fields with average starting salaries of approximately \$50,000.

Environmental Science (ENVSCI)

Working with our partners in Geosciences and the Stockbridge School of Agriculture, ECo jointly administers the ENVSCI program. This program trains students to meet the challenges of creating a safe and healthy environment, and how to recognize and remediate the effects of pollution and environmental stress on ecosystems. Students participate in coursework covering the natural sciences, economics and policy to address problems caused by ecosystem degradation and environmental pollution. Graduates have diverse career opportunities in private industry and consulting firms, and governmental agencies responsible for environmental quality assessment and management.

There are approximately 250 undergraduates in the ENVSCI. About 75% of graduating seniors plan to enter the job market after graduating while 20% typically plan to continue onto graduate school.

Natural Resources Conservation (NRC)

The Natural Resources Conservation major trains students in the ecology of terrestrial and aquatic ecosystems, and the management of these systems to conserve biodiversity and ecosystem functions while providing sustainable benefits to society. Students participate in coursework covering the natural, conservation, and social sciences with hands-on field skills and field experiences that promote environmental sustainability. Students in the NRC major focus in one of the six concentrations that share a common core curriculum:

- Environmental Conservation (a general track)
- Fisheries Ecology & Conservation
- Forest Ecology & Conservation
- Urban Forestry & Arboriculture
- Water Resources
- Wildlife Ecology & Conservation

Graduates have diverse career opportunities in state and federal natural resource management agencies, consulting firms, green industry, and non-governmental organizations, or to continue their graduate education. However, a Master’s degree is typically needed to fully realize career opportunities for many of our fields with the notable exception of students in the Urban Forestry & Arboriculture field where employment opportunities are exceptional and 100% of our graduates obtain employment, primarily in the tree care industry.

There are approximately 280 NRC undergraduates. About 70% of graduating seniors plan to enter the job market after graduating, while 20% typically plan to continue onto graduate school.

Part One. Curriculum Analysis

Curriculum Cohesion

Each of our three undergraduate programs, including the six concentrations in NRC, has its own unique curriculum, and each of the three majors has a relatively high number of course requirements in core math and science courses and in the core requirements for each major (Table 2). These “tight” curricula are largely due to our commitment to a) providing students with the multi-disciplinary professional training required for employment and graduate school, and b) the need to meet national certification requirements required by our professional societies.

	BCT	ENVSCI	NRC
Core Math & Sciences (BIO, CHEM, PHYS, MATH/RESECON)	25-27	38	34-36
Core Major Requirements & Focused Electives	61	35	50-63
Free Electives	21-23	32	12-23

Table 2. Numbers of credits required in core math and science foundational courses, core requirements within the major including focused electives, and available free electives by major.

First Year: During their first year, students typically focus on fulfilling core math and science requirements, 1-3 introductory courses within their major, and up to 2 introductory seminars (currently, only within ENVSCI and the Urban Forestry & Arboriculture concentration). We believe it is critical during their first-year that students take a minimum of 1 course within their major to a) expose them to the breadth of their chosen field, and b) start to build community within their major. Additionally, the first 1-credit ENVSCI seminar course in the fall provides our students with guidance and tools to successfully navigate their major and the university in that critical first year. The second 1-credit ENVSCI seminar in the spring is designed to introduce our students to a wide cross-section of their faculty, and to expose them to the types of environmental research conducted by their faculty.

Second Year: In their second year, students continue to complete core math and science requirements, but the emphasis shifts to taking core foundational courses within their majors. Once students have mastered the introductory math and science courses, we believe it is critical that students get their foundational courses within their major, taking 2-4 courses specific to their major. Additionally, for NRC majors, they obtain hands-on field experience via specialized field labs; depending on the concentration, students enroll in 1-3 field lab courses that provide them with the field skills critical to their professional training, and to feed their passions for working and learning outdoors. Our large investment in these core courses and field labs in the second year underscores the need to a) expose our students to the core knowledge within their major, and b) prepare them for their upper level required courses. Additionally, a 1-credit curriculum-planning seminar is required for our ENVSCI majors and the NRC majors in the Environmental Conservation concentration. These seminars guide students in selecting their upper level electives and planning for summer internships, independent study, research experiences, domestic and international exchanges, and career opportunities after graduation.

Third & Fourth Years: After completing their core math and science courses and the introductory foundational courses in their majors, students now focus on subject-intensive courses, including required and focused elective courses within their chosen field. Typically, our students take 6-13 courses (including their integrative experience (IE) requirement) and their junior year writing requirement. A large number of these required courses and focused electives include field and computer/design labs or service-based learning components into the coursework, providing students with valuable hands-on experiences required by employers or graduate programs.

Professional & Research Experiences: Considering the vast majority of our majors plan to enter the job market after graduation, we emphasize field and technical hands-on experiences throughout our curricula. Further, we recognize that our curricula cannot provide all of the professional experiences our students need to be most competitive in the job market, so we also strongly encourage and facilitate our students obtain additional professional experiences during the summer via internships and summer employment. We do not encourage our students to take summer classes, but rather to focus on gaining practical professional skills and experiences. All faculty work with their advisees, helping them to identify and apply for these summer training opportunities.

We also work hard to provide our students with opportunities to gain research experiences, especially for our Honors students, under-represented minorities, and students expressing a desire to go onto graduate school. There are multiple opportunities for gaining these research experiences, including:

- Working with individual faculty or graduate students on their research projects via independent studies, practica, and Honors projects. Each semester a list of available undergraduate research positions in faculty labs is generated and circulated to our NRC/ENVSCI students. We also help match students with faculty, when needed.
- Often students return back to campus excited from their summer internships and field assistant experiences. Faculty often work with these students via independent study or as their honors thesis, helping them analyze data, learn technical writing skills, and preparing manuscripts that sometimes result in published journal papers.

- There are 2-3 ECo research fellowships offered each summer to undergraduate students to conduct research with faculty and associated graduate students. Similarly, the U.S. Forest Service, Center for Research on Ecosystem Change, located in ECo, offers two summer research fellowships for students to work with Forest Service biologists.
- Faculty also work with students in developing honors theses in conjunction with the Commonwealth Honors College and from their research experiences with NSF Research Experiences for Undergraduates (REU) programs.

Curriculum Cohesion & Time to Graduation

If students declare one of our majors in their first year or transfer in from an environmental or science-focused program at other institutions, including community colleges, it is relatively easy for students to complete their program of study in 4 years. However, many students do not discover our BCT and NRC majors until late in their sophomore year or beginning of their junior year. Given the large number of curricular requirements, it is difficult for these transfer/change of major students to finish on schedule. Consequently, 72% of ECo majors complete their degree requirements ≤ 4 years, which is lower than the average 80% for all CNS units and the campus. Yet, this delay is not due to curricular accessibility, but rather the combined effects of discovering the major late, and large number of course requirements. In contrast, 88% of ENVSCI majors complete their degrees in ≤ 4 years, reflecting the relatively large proportion of students who begin this major in their freshmen year and relatively fewer core requirements compared to BCT and NRC (Table 2).

Opportunities and Plans for Improvement

- Review of all curricula to identify opportunities to reduce the large number of requirements for each major without jeopardizing certification of students by our professional societies (begin process Spring 2016).
- A full assessment of ENVSCI will be done in collaboration with Geosciences and Stockbridge School of Agriculture as we grow under the School of Earth and Sustainability.
- Expand marketing of our programs to attract students into our undergraduate majors as freshmen, including:
 - target high school counselors and students and undeclared freshmen via a new, digital “roadmap” to environmental and earth sciences programs planned as part of the marketing and advertising plan for the proposed School of Earth and Sustainability (begin process Spring 2016);
 - build upon existing outreach efforts to students at vocational high schools for the 2-year Associates degree in Arboriculture & Community Forestry program within the Stockbridge School of Agriculture;
 - expand offerings in ECo Rap as part of the Residential Academic Programs;
 - expand environmental offerings in the First Year Seminar program;
 - expand environmental offerings in the Summer College Program;
 - assess opportunities for offering new 100-level GenEd diversity courses (i.e. community forestry, marine conservation, renewable energy, climate change).

Curriculum Accessibility

Overall, ENVSCI and NRC students have excellent accessibility to their courses with less than 15% of core courses at or above capacity over the past academic year (Fig. 1). In contrast, over 70% of core courses in BCT are at or above capacity; yet, our BCT majors typically have ready access to the classes they need because faculty accommodate students when needed.

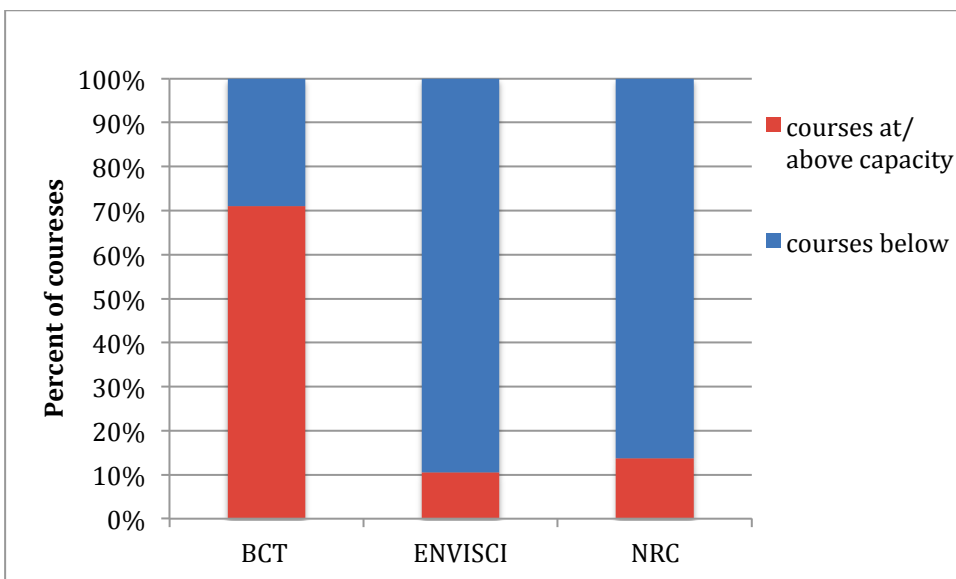


Figure 1. Proportion of undergraduate courses by major either below or at/above enrollment capacity in 2014/15.

This high course accessibility was reinforced by senior surveys for our BCT and ENVSCI majors who expressed high satisfaction with their access to classes (Fig. 2). However, NRC seniors expressed a much lower level of satisfaction with course accessibility, which was below the average for all CNS units and the campus (Fig. 2). We suspect that this low satisfaction with NRC course accessibility may be an artifact of students having difficulty enrolling in some of their core science courses outside of the department (e.g., Biology courses), conflicts between these courses and major core requirements, and continuing poor access to the Junior Year Writing course. For example, prior to fall 2013, it was often difficult for freshmen to enroll in BIO 100 due to capacity issues. Beginning in fall 2013, this limited capacity issue was solved and all students now have ready access to required introductory math and natural sciences courses in CNS. However, this limited access persists for the JYW course (NAT-SCI 397A) offered by CNS. This course is chronically over-subscribed; consequently the majority of our students across all three majors do not have ready access to this course until their senior year when they have priority registration.

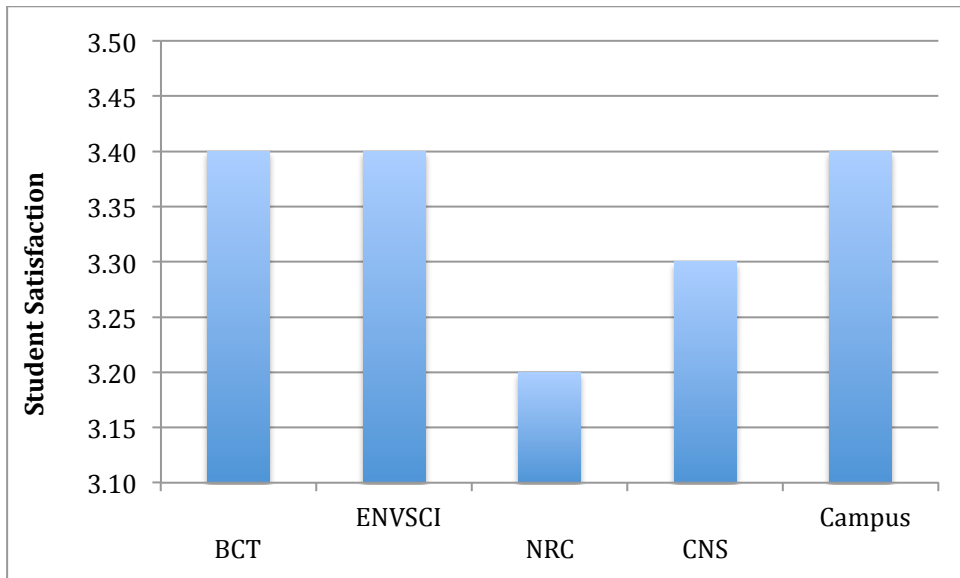


Figure 2. Senior survey scores on “access to classes in your major”, 2014-2015. Student satisfaction is expressed from 1: “Very Dissatisfied” to 4: “Very Satisfied”.

Despite these successes and challenges in course accessibility, several of our courses are chronically full or over-subscribed for a number of our courses (Table 3). These are typically field-based lab classes, one of our IE courses (NRC 382), and a number of technical skills-based courses, especially in BCT. Further, with proposed changes to the availability of “shadow seats” for Continuing Ed courses, students will have little access to two important ENVSCI courses that provide students with professional technical skills – ENVSCI 452 & 465. Both of these courses are taught by outside instructors and provide students important skills in pollution site assessment and hazardous waste management. They are consistently over-subscribed.

Table 3. BCT, ENVSCI and NRC undergraduate courses consistently at capacity or over subscribed. Courses identified as lecture-based do not include lab or discussion sections, whereas skill-based courses incorporate one of the following elements: one or more lab/discussion sections; taught in a team-based learning format; incorporate extensive hands-on activities; or is an IE course.

Course	Lecture-based	Skill-based	Capacity
BCT 204 Construction Materials & Meth.	✓		70
BCT 211 Energy Efficient Housing	✓		115
BCT 311 Sustainable Indoor Envir. Syst.	✓		75
BCT 313 Light Frame Structural Tech.	✓		65
BCT 314 Architectural Blueprint Rdg.		✓	46
BCT 320 Intro to CAD (both semesters)		✓	40
BCT 353 Business of Building	✓		30
BCT 397R Residential Constr. Mgt.	✓		20
BCT 420 Designing with 3D CAD & BIM		✓	30

BCT 494BI Senior Seminar (IE)		✓	45
BCT 520 Energy & Buildings	✓		30
BCT 530 Mechanics of Bldg. Materials	✓		40
BCT 550 Construction Project Mgt.	✓		40
BCT 597D Sustainable Bldg & LEED		✓	30
ENVSCI 213 Environmental Policy		✓	89
ENVSCI 390A Environmental Soil Sci.		✓	24
ENVSCI 452 Haz. Waste (offered both semesters) – CPE shadow seats only		✓	25
ENVSCI 465 Envir. Site Assessment – CPE shadow seats only		✓	20
NRC 212 Tree & Shrub ID		✓	50
NRC 297F Fish Sampling & ID		✓	40
NRC 382 Human Dimensions of NR Mgt. (IE)		✓	80
NRC 563 Wildlife Habitat Mgt.		✓	44
NRC 570 Ecology of Fish		✓	20
NRC 585 Intro. to GIS (offered both semesters)		✓	50

Opportunities and Plans for Improvement for Curriculum Accessibility

Overall, hiring of several new faculty and expansion of teaching appointments for our extension faculty have greatly contributed to our ability to keep pace with increasing student numbers and the associated higher demand for access to courses. Increasing course capacity may be an option for some of our over-subscribed courses, especially those that are lecture-based. However, there are several challenges to simply increasing capacities for skill-based courses, especially courses with field and computer components, our IE courses, and courses taught in team-based learning formats. Additionally, we are aware that some of our NRC major core courses (e.g., NRC 260, NRC 409) continue to have scheduling conflicts with some of the science core requirements. The Urban Forestry and Arboriculture concentration is also challenged because it no longer has access to a small business management course.

Field Labs

The logistics of field-based lab courses pose special challenges, including transporting students to field sites and providing safe and authentic field experiences, especially for our three sophomore field courses (NRC 211, 212 & 297F). Further, some labs require more than one teaching assistant to ensure safety, especially for field labs that include aquatic sampling (NRC 297F), chain saws and tree climbing (NRC 102, 210, 213). Consequently, enrollment in our field lab sections should not exceed a maximum of 20-24 students. Yet, with two sections now offered in the three field courses, the demand now exceeds capacity, and we need to have the capacity for up to 60 students to meet current demand.

In recent years, extra lab sections were added to help meet this demand; however, expanding student accessibility to field labs will require increasing the teaching load of some faculty or increasing the use of graduate students as the primary instructor in lab sections. However, both of these options would require additional graduate TA support to meet the logistical challenges of field labs. Another alternative is to reduce the number of labs meetings for

students by having them meet only once every other week, thereby reducing their lab experiences by 50%. This strategy is currently used in one of our field courses (NRC 211) to accommodate the high demand.

Computer Labs

The dual challenges of seating capacity in computer labs and access to computers with the necessary software limit our ability to meet the growing demands of students for our courses with computer-intensive training.

We were able to meet the demand in part by adding extra lab sections and offering the same course both semesters. However, meeting the current and future demands for these courses will require additional faculty, increasing the teaching load of some faculty, or increasing the use of graduate students as the primary instructor in course sections. All of these options would also require additional graduate TA support to meet the instructional challenges of these computer labs. Additionally, increased access to suitably equipped computer labs will also be needed to accommodate these extra sections.

The current search and hiring of a new joint lecturer in GIST in Geosciences and ECo will help provide greater access to introductory GIS courses. Yet, the challenge of expanding course access persists for two of our computer-intensive BCT courses (BCT 320 & 420), one of which is already offered both semesters.

IE Courses

Currently, our three IE courses (BCT 494BI, ENVSCI 445, NRC 382) are too large and fail to meet the aspirational goals for class size outlined by the Provost. Our current demand for IE courses total about 120 students across two courses for ENVSCI and NRC majors, and nearly 50 students for BCT majors. As a core partner in the ENVSCI program, Geosciences currently provides some seats for ENVSCI majors in their IE course, GEO 494LI. Up to 10 seats are also now provided to ENVSCI students in NAT-SCI 491I, the IE course offered by CNS.

To meet current and near-future IE enrollment demands for ENVSCI and NRC majors, we are developing two new IE courses expected to be available for 2016/17, which will enable us to accommodate another 84 students. Our best option for reducing the numbers of students in our BCT IE course is to redesign one of the existing upper level BCT courses to meet the IE requirements. Ultimately, our goal is to have no more than 42 students in any of one of our IE courses.

TBL Courses

As a faculty, we are committed to creative teaching methods. A substantial number of ECo faculty have participated in the Lilly Teaching Fellowships, Team-Based Learning (TBL) Scholars, Fellowships for Innovative Teaching (FIT), and Civic Engagement and Service-Learning Faculty Fellows programs. Further, all new ECo faculty are incorporating TBL learning strategies into one or more of their courses. Yet, effective TBL courses require that students be able to work together in small teams, which is often logistically difficult in classrooms designed for lecture format classes, especially for classes with high enrollment. The new Integrated Learning Building provides excellent facilities for offering TBL courses;

yet, the demand is great and several of our ECo faculty are unable to use these classrooms, despite having participated in the required training programs. To better meet the increasing needs of ECo faculty to teach in TBL classrooms, we have renovated two of our own labs into TBL classrooms. Although a great resource, the capacity of each of our TBL classrooms is 42 students, so we will also continue to need access to campus TBL classrooms for our TBL courses that exceed this capacity. This is a continuing challenge across campus as more faculty incorporate TBL pedagogies into their courses.

Career Preparation & Guidance

Considering that a large proportion of our graduating seniors in ECo and ENVSCI plan to enter the job market after graduation (Table 1), one of our primary responsibilities is career preparation for our students. Consequently, our curricula and professional training are designed to meet the dual demands of a) certification requirements of our diverse professional societies, and b) the workforce needs of employers. These needs contribute to our “tight” curricula, and our large investments in field courses and computer labs designed to provide our students with professional skills. These needs also drive our major commitment to student advising, which is a hallmark of our ECo community.

Faculty-Centered Advising

All of our programs champion faculty-centered advising in which every student is assigned to an individual faculty advisor. Further, all of our students have a registration hold on their Spire accounts, and must see their faculty advisor to discuss their courses before the hold is released and they can pre-register for courses. This process ensures that every one of our 700 majors sees their faculty academic advisor during the pre-registration periods in fall and spring semesters. This is a large commitment of faculty time, but we are committed to providing this personal one-on-one time to all of our majors to promote student success. For our ENVSCI majors, this responsibility is shared with faculty in GEO and SSA; those departments advise approximately 40% of the students in the major.

Student Success Centers and Curriculum & Career Planning Seminars

Last year, ECo opened two new Student Success Centers to provide additional support and resources to students beyond their faculty advisors. Additionally, NRC and ENVSCI offer required 1-credit seminars to better prepare students for curricular planning and career opportunities (ENVIRSCI 191A, 194A and 294A, NRC 191A, 391A). These seminars deliver key information in an efficient and consistent way and provide students regular weekly interactions with program directors. We plan to expand these 1-credit seminars across our all our NRC concentration curricula.

For career preparation and guidance, ECo majors indicated a moderately high level (3.3-3.4) of satisfaction in comparison to other CNS units and the campus. Previously, ENVSCI students were less satisfied with career planning. However, the major now requires three seminar courses in their freshman and sophomore years that provide them with curriculum and career advising and guidance and weekly interactions with the ENVSCI program manager. This added support has clearly improved our students’ satisfaction.

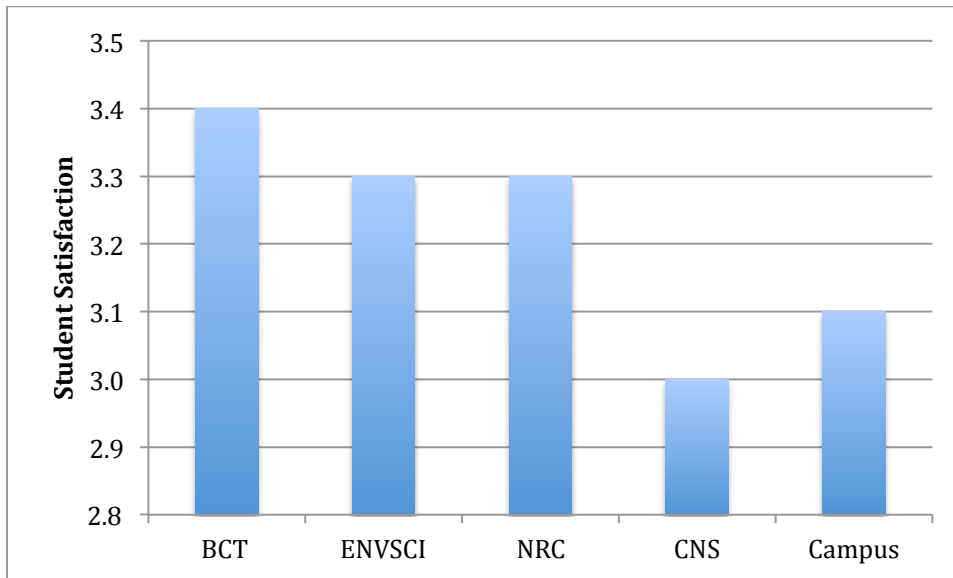


Figure 3. Senior survey scores on “career preparation and guidance in major”, 2014-2015.

Opportunities and Plans for Improvement for Career Preparation & Guidance

- Continue our long-standing commitment to faculty-centered advising in which every student is assigned a faculty major advisor who guides their curricular and career planning.
- Work with faculty to develop “best practices” advising guidelines to provide consistent, effective advising practices across all faculty.
- Explore with faculty and the personnel committee development of an assessment tool for students to evaluate faculty advising and incorporate into our cultural standards and annual faculty review.
- Expand workshops for faculty on advising best practices.
- Develop a peer advising program as part of our Student Success Centers to complement faculty advising and provide more accessibility for student advising.
- Incorporate 1-credit curriculum and career advising seminars, similar to those in ENVSCI, throughout all NRC concentrations.
- Develop departmental-based strategies for increasing contact with students post-graduation to build alumnae support, provide a mechanism to better track career success (e.g., job placement), and an opportunity to learn from graduates how to improve our curricula for career preparation.

Connections to Rest of their Academics

Solving the complex, global challenges of environmental sustainability is a multidisciplinary endeavor. Consequently, our curricula reach well beyond the courses we offer within ECo. Further, much of our coursework emphasizes global perspectives, environmental justice and civic responsibility.

For connections to rest of their academics, ECo majors indicated a notable level (3.4-3.5) of satisfaction in comparison to other CNS units and the campus (Fig. 4). This is a significant improvement for our ENVSCI majors; seniors expressed a lower satisfaction in previous

years. Again, we attribute this improvement to the added support and efforts the program incorporated to address these issues.

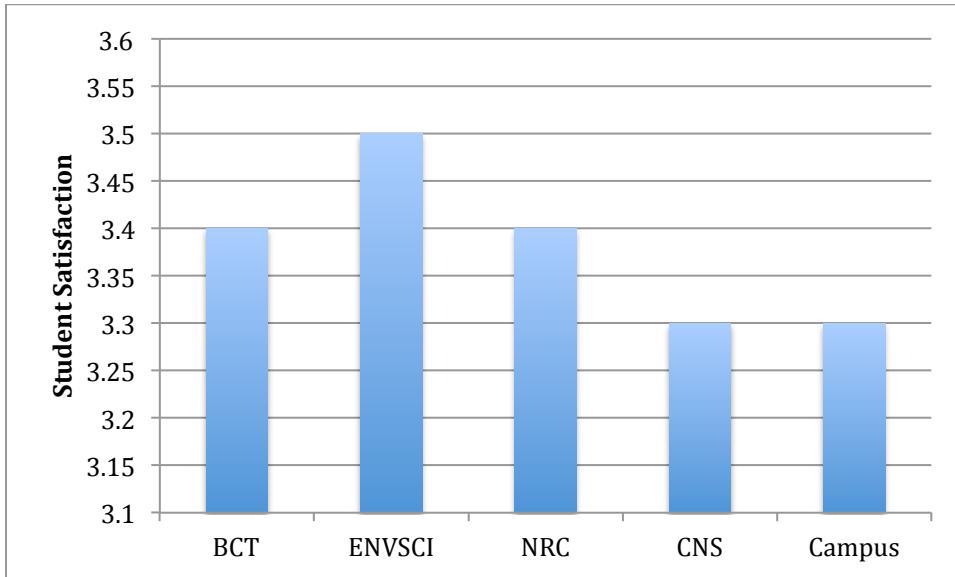


Figure 4. Senior survey scores on “connections to the rest of academics”, 2014-2015.

Writing Preparation

Our ECo majors indicated a moderately high-level of satisfaction (3.4) with the writing preparation they received, which corresponds to the campus average. In comparison, our ENVSCI students had a lower level of satisfaction (3.2) with their writing preparation, which was below the average for all CNS units and the campus (Fig. 5). This is a perplexing outcome for ENVSCI considering BCT and NRC students as well as 9 other majors in CNS use this same course to satisfy their Junior Year Writing requirement.

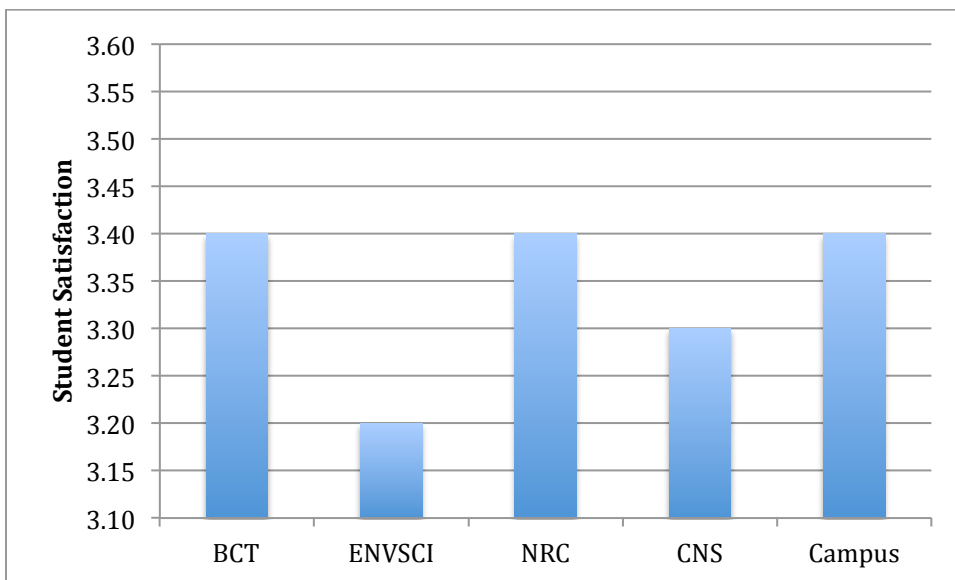


Figure 5. Senior survey scores on “writing preparation in your major”, 2014-2015.

Practicum & Independent Study Opportunities

Based on the senior survey, 67% of ECo students and 76% of ENVSCI students received hands-on experiences while at UMass, and 31% and 57%, respectively, work on a research projects with a faculty member outside the classroom. We took a closer look at the number of practicum and independent study experiences that our students participated in over the past three years by major (Fig. 6). Relatively large numbers of ENVSCI and NRC students registered for practicum and independent study credits within the department. For ENVSCI majors, many students also earn practica/independent study credit within their faculty sponsor's home department (e.g., Biology, Micro, Biochem, VASCI, NATSCI) or within iCons. Those experiences are not counted in our figures and therefore, the percent of ENVSCI students participating in these experiences is certainly higher. In contrast, smaller numbers of BCT students register for these credits; reflecting the very "tight" BCT curriculum and the extensive, hands-on training embedded into many of their core courses. At least eight of the required core BCT courses have a lab component or are full lab-based course. These data confirm that our students are gaining valuable experience outside the classroom and many are interacting with faculty in a professional setting.

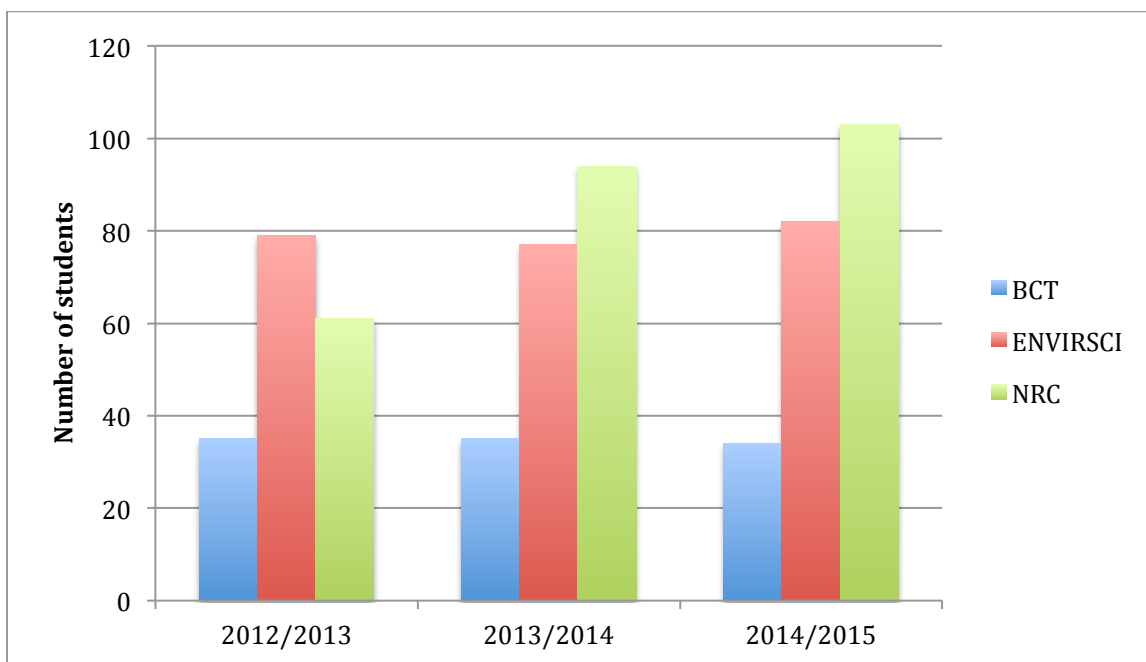


Figure 6. Numbers of students registering for practicum and independent study credits in BCT, ENVSCI, and NRC, 2012-2015.

Communication

We invest greatly in our communication strategies, working with students in curriculum and career planning, including:

- Faculty-centered advising, in which every student is assigned a major advisor and must meet with every semester to pre-register for classes;

- Required curriculum and career planning seminars (ENVIRSCI 191A, 194A and 294A, NRC 191A, 391A) that provide students regular weekly interactions with program managers/directors;
- Two new Student Success Centers to help students in course planning and professional development;
- Readily accessible printed and on-line materials on program requirements, major, learning goals, and career opportunities;
- Regular email communications from faculty alerting students to key deadlines, advising, courses, and campus events;
- Regular email circulation of available undergraduate research/field and scholarship opportunities;
- Current Academic Requirement Reports (ARR), so that students have ready access to their academic status and requirements;
- Maintenance of Facebook pages affiliated with the department and its programs, contributions to the Sustainable UMass Facebook page, and close collaboration with the undergraduate fellows program for sustainable marketing and communication.

Opportunities and Plans for Improvement for Communications

We are especially proud of the two new Student Success Centers we developed last year. These centers provide expanded student support over and above the support provided by their major advisors. In the coming year, we plan to expand our communications opportunities, including:

- Expand our 1-credit curriculum and career planning seminars across all our NRC concentrations;
- Hire an engagement specialist, who will help to establish a peer advising centers and a comprehensive framework for disseminating internship and job opportunities;
- Once the School of Earth and Sustainability is launched (pending Faculty Senate approval), develop a new website to better market and recruit students into our undergraduate programs in earth, sustainability and environmental sciences.
- Develop targeted communications to better promote our majors/concentrations with high job placement rates and/or underutilized resources.

Class Size Goals & Faculty Time

For this review, ECo invested much time examining our course offerings over the past three years, taking a close look at class size, enrollment, and capacity. In general, ECo is on target for meeting the aspirational goals proposed by the Provost. Within our majors, class sizes become smaller as students progress through their programs. Overall, our average class size is 38 students.

As for many other majors across campus, enrollments are very high in the introductory core math and sciences courses, enrolling in excess of 200-400 students. Similarly, our introductory BCT and NRC courses at the freshman and sophomore levels typically enroll 125-250 students, as does the introductory course in ENVSCI with 200 students. Several of these courses are GenEds and attract students from a wide diversity of other majors.

Despite these high enrollments, our enrollments in the core sophomore-level NRC field courses, which we restrict to majors, typically number no more than 24 students per section, making these field courses logistically feasible. Sophomore- and junior-level core ENVSCI courses, which are largely restricted to majors, typically enroll 45-95 students.

At the junior and senior levels, BCT courses typically range from 15-80 students with over 50% of courses with 35 or fewer students. For juniors and seniors in NRC, their courses typically range from 10-80 students with nearly 90% of courses with 35 or fewer students.

BCT and three NRC concentrations (Forest Ecology, Urban Forestry & Arboriculture, and Water Resources) provide senior capstone courses. For example in the Urban Forestry and Arboriculture capstone course (NRC 310), students integrate material learned in previous courses and complete a service-learning project, conducting a street tree inventory in a community of their choice. For other concentrations, students gain the experience through a combination of upper-level courses (e.g., NRC 564, NRC 565) and/or hands-on experience (e.g., internships).

The investment we make in our students directly benefits our overall program effectiveness. Students have expressed satisfaction with their courses and instructors within their major. For example, ECo programs earned a 3.5/4 for quality of teaching.

Opportunities and Plans for Improvement for Class Size & Faculty Time

We present plans for improving class size across our curricula in the **Curriculum Accessibility** section on p. 9.

Part Two. Goals for Student Learning and the Student Experience

Our student learning goals and objectives, developed in 2013, are an integral part of our curricula and shape our student experiences (Appendix 1). Still very new, ECo does not have any major revisions for our learning goals and objectives.

Diversity

ECo recognizes the value of a more diverse learning and research community. Over the past few years, our faculty has been evaluating the diversity within our department, identifying potential diversity barriers, and exploring opportunities for how to infuse a more inclusive and diverse perspective into our faculty, student body and curriculum. Below is a brief review of our undergraduate demographic data relative to various diversity metrics.

Women

- Women comprised 48% of ECo and 56% of ENVSCI majors from 2009-2013, similar to campus (50%) and CNS (55%) metrics. However, the female: male ratio is highly skewed towards men for our BCT major.
- Overall, our proportion of women is similar to that at 62 institutions with Colleges of Natural Resources at National Association of University Forest Resource Program (NAUFRP) institutions (52%) (Sharik et al. 2012).

ALANA

- Relatively few (6%) of our ECo undergraduate students (2009-2013) list themselves in a non-white ALANA racial/ethnic category; yet, we have the same percentage reported at 63 institutions with Colleges of Natural Resources at NAUFRP institutions (Sharik et al. 2012).
- In contrast, 20% of our ENVSCI undergraduate students (2009-2013) list themselves in a non-white ALANA racial/ethnic category, reflecting similar percentages reported for CNS (27%) and the campus (22%).

LGBT community

- CNS has been a leader on this issue, participating in special university training and sensitivity courses, and identifying, both institutionally and publically, as an “ally” for this community. ECo values this leadership and hopes to incorporate similar training and information to support our faculty and student body and promote a more inclusive and welcoming community.

Other diversity considerations

- Socio-economic status and first-generation: The percent of first generation students in ECo (27%) and ENVSCI (23%) were similar to campus values (25%) for 2013. Percent of low-income (Pell recipient) first-year students was quite low for ECo (7%) compared to ENVSCI (30%), CNS (28%) and campus (22%).
- Out-of-state: Percent of out-of-state students for ECo and ENVSCI from 2009-2013 averaged 14% and 16%, respectively. In comparison, the Campus and CNS averaged 21% and 18%, respectively, over the same 5-year period. This is potentially an area of growth for ECo’s program. The enhanced marketing efforts through the proposed School of Earth and Sustainability will help address this opportunity.
- Internationalism: We have 17 international students in our undergraduate programs with ENVSCI attracting the most students. In contrast to our ECo graduate program, very few international students enroll in our ECo or ENVSCI majors.

Internationalization

- Our department has a rich global perspective that includes international students and scholars, and our research addresses topics and sites worldwide. This international culture infuses our curriculum and our undergraduate experience. Several faculty members also lead international courses that take students abroad to learn specialized topics, such as tropical ecology, Cree culture, and African wildlife ecology. We also strongly encourage our students to incorporate study abroad opportunities into their program. Approximately, 14% of last year’s graduating seniors took advantage of the opportunity to learn abroad.

Opportunities and Plans for Improvement for Diversity

Overall, we’ve had mixed success attracting a more-diverse student body; yet, our ECo community remains committed to promoting diversity and inclusion. We are deeply committed to expanding the diversity of our students, faculty and staff, including:

- Working with Enrollment Management Office to improve our capacity to identify, attract and enroll UMR students.
- Continuing to prioritize our recruitment of diverse faculty and staff.

- Providing greater support to URM students within our major via targeted advising by faculty who are particularly sensitive and committed to helping URM students be successful throughout their undergraduate program and beyond.
- Encouraging more ECo faculty to participate in the [Louis Stokes Alliance for Minority Participation \(LSAMP\)](#) program that supports URM undergraduate students to gain research experiences in STEM disciplines.
- Continuing our work with the U.S. Fish and Wildlife Service to identify and recruit URM for the Conti Fellowship that provides scholarship support and externship appointments with Service.
- Encouraging and expanding ECo faculty leadership and participation in Eureka!, a remarkable summer program for middle and high school-aged girls from Holyoke that introduces young women from disadvantaged backgrounds to the STEM disciplines.
- Developing a departmental diversity plan to identify how best to integrate diversity into our community and curriculum.

Part Three. Curricular Revision Action Plan

Throughout this document, we have identified opportunities and plans for improvement by individual sections, including:

- Curriculum Cohesion (p. 6)
- Curriculum Accessibility (p. 9)
- Career Development & Guidance (p. 12)
- Communications (p. 15)
- Class Size & Faculty Time is included in the Curriculum Accessibility section (p. 9)
- Diversity (p. 17)

Overall, many of our plans for improvement can be accomplished within existing resources. However, additional resources will be needed to accomplish the following tasks.

- To address curricular issues with course accessibility for BCT students, ECo needs to create more capacity for student enrollment. We are hopeful that we can secure additional faculty hires in the coming years – either independently or as a joint hire with our campus partners (e.g., Architecture and Landscape Architecture & Regional Planning as part of the proposed School of the Built Environment). It would also be an opportunity to further expand enrollment in the program through development of a new concentration in Construction Management, which would make us more competitive and comparable to our primary peer – Wentworth Institute of Technology). New faculty would also help facilitate development of online courses and take advantage of distant learning opportunities in Springfield. These changes would improve the student experience, attract transfer students, and benefit a subsection of our student body that we recruit from the Springfield area.
- Applied, hands-on experience is an integral part of how we teach and learn in ECo. Consequently, greater access is needed to computer labs and Team-Based Learning classrooms to meet the professional training needs in our curricula.

- Hire an Academic Advisor – Immersive Learning Program Manager to establish peer advising centers and a comprehensive framework for disseminating internship and job opportunities (this position was approved but delayed in the recent campus hiring freeze).
- Additional Graduate Teaching Assistant support is needed to meet the existing and growing demands of offering our field courses that are so critical to the professional training of our undergraduate students.

Appendix 1. ECo Student Learning Goals & Objectives (March 2013)

Building and Construction Technology

Graduates will provide the required leadership and vision for the building construction industry through their understanding of science, technology, business, and design.

- Specify materials, methods, and building/structural systems common to residential and commercial construction projects.
- Evaluate and specify building energy systems and materials with respect to their ecological impact and their contribution to sustainable design.
- Understand physical, mechanical and environmental attributes of wood construction.
- Analyze, estimate and communicate building project requirements using a thorough knowledge of blueprint specifications, contractual documents, CAD (Computer-Aided Design) and BIM (Building Information Modeling).
- Apply a breadth of management skills and an understanding of key business aspects of design, construction and materials supply industries.
- Contribute responsibly to a sustainable built environment.

Environmental Science

Graduates will understand the basic theories and techniques needed to monitor environmental quality, interpret the impact of human actions on terrestrial and aquatic ecosystems, develop strategies for ecosystem restoration, and apply scientific data to develop policies and regulations for protecting the environment.

- Understand the complex interactions that define ecosystems and how they may be affected by human activities.
- Measure, analyze, and monitor environmental contaminants introduced into air, soil, and water.
- Prevent or decrease the negative effects of adverse human activities on ecosystems and human health.
- Develop comprehensive methods to restore or remediate contaminated ecosystems.
- Apply an interdisciplinary approach to the technical assessment and analysis of global environmental challenges, and develop effective policy options to meet those challenges.

Natural Resources Conservation

Graduates will have the tools and knowledge to serve as conservation professionals for state, federal, and non-profit conservation organizations, as well as environmental consulting firms and the green industry, and to live a more sustainable life and to be a strong advocate for sound environmental stewardship.

- Acquire and analyze data describing the biological and social aspects of the environment.

- Make management decisions about land and water that integrate relevant ecological, physical, and social information.
- Appreciate the natural complexity of ecosystems, and the interdisciplinary nature of their conservation.
- Understand the multiple values of ecosystems and the environment across the spectrum of circumstances, from urban to rural and from developed to wild.
- Communicate to the public that natural resource conservation is essential to long-term sustainability.
- Behave professionally and ethically in the management of the environment for the benefit of society.