COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
FOREST RESOURCES AND ENVIRONMENTAL CONSERVATION
VIRGINIA TECH

Program Review and Strategic Plan

Department of Forest Resources and Environmental Conservation Virginia Tech 2021

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Executive Summary

Forests cover nearly one-third of the terrestrial surface of the earth, cover more than 60% of Virginia, and forested ecosystems and associated watersheds represent a critical aspect of state, national, and worldwide environmental health and human well-being. With their extent and composition, forests play an important role in sustaining the earth's climatic conditions, representing a key component of global carbon and water cycles, and land surface albedo. Forested watersheds are fundamental in providing quantities and qualities of water, both surface and subsurface, to support human life. Forests contain and support floral and faunal populations locally and internationally, and comprise critical habitats for threatened and endangered species. Economic and social systems in many parts of the world are dependent upon healthy forests and productive soils to provide products ranging from lumber and fiber to commercial biofuels, fertilizer, fodder, and household fuels, as well as many other market and non-market goods and services that sustain local households in developing countries and robust economic conditions in developed regions, including our own Commonwealth. Urban forests provide seemingly innumerable benefits to human-populated communities, as well. Conservation/management of forests and environmental resources is a complex endeavor, involving biological-geological-chemical aspects which are inseparably linked with social-political-economic institutions and realities, all of which span ownership and political boundaries. The work required to address the grand challenges we face ranges from hands-on, boots-on-the-ground field effort, remote sensing and data science, laboratory science, assessment of human needs and impacts, to planning and policy analysis. Forest Resources and Environmental Conservation (FREC) has been recognized as being at the forefront in addressing and providing the future professionals to address these complex issues, regionally, national, and internationally. We are committed to building a collaborative, diverse, and inclusive academic community that develops and passes on the science and practice of our interdisciplinary field, and we look forward toward increased efforts in growing in service to our students, our partners, our Commonwealth, and all those who rely on these forests and environmental resources in some way.

FREC is home to two undergraduate degrees, a B.S. in Forest Resources and Environmental Conservation and a B.S. in Water: Resources, Policy, and Management. Within these degrees we have five majors that provide a wide breadth of career opportunities for our students in conserving environmental resources:

- -Environmental Conservation and Society
- -Environmental Informatics
- -Environmental Resource Management
- -Forestry
- -Water: Resources, Policy, and Management

In addition, we host six minors that allow many across campus to explore our offerings:

- -Blue Planet
- -Climate and Society
- -Ecological Cities
- -Forestry
- -Natural Resource Recreation
- -Urban and Community Forestry

We also offer a research/thesis-based Master of Science (M.S.) degree, a professional Master of Forestry (M.F.) degree, and a Ph.D. degree. Supporting these programs are 29 teaching/research faculty members, 1 collegiate faculty member, and 1 administrative/professional faculty member. Our

outstanding faculty also support a strong research program and award-winning programs in extension and outreach.

Over recent years we in FREC have seen tremendous growth in our undergraduate student enrollment, and in the diversity of that population across our degrees and majors. Our graduates have been sought after for industry and agency positions, and as graduate students across North America. We have been active in developing and refining curricula, and have added innovative programs to support our students and the campus as a whole, including strong support for the university initiative on general education through the development of Pathways courses and minors. We continue to have strong, and respected programs, though at the same time we have experienced inevitable turnover in our faculty, resulting in transitional challenges in maintaining graduate student numbers and the size of our external grant portfolio. We anticipate recovery of those aspects of our program as newly hired faculty gain additional experience in grantsmanship. We have sought actively to enhance the diversity and inclusivity in all aspects of our program, but recognize that we have much progress yet to make.

Looking forward, and consistent with our FREC Vision, Mission, and Core Values, our direction for the next 5 years entails:

-Continuing undergraduate enrollment growth to 400 or more students

-Having an increasingly diverse body of undergraduate students across majors and degrees that is reflective of the diversity of Virginia

-Having graduate student enrollment recovery to 60 or more students

-Having a diverse body of graduate students

-Diversifying our faculty

-Achieving an external research grant level that allows us to extend our ability to make meaningful contributions to grand challenges and support our desired graduate student population

-Continuing our excellence in extension/outreach to Virginia, and enhancing engagement of rural Southwest Virginia and underrepresented/underserved populations

-Continuing our team-oriented, service-oriented staff environment with greater development of specialized skills and roles

Achieving our goals will necessitate participation in university initiatives such as the Future Faculty Diversity program, participation in CNRE proposals in urban natural resources and invasive species, gaining STEM status for our degrees, in addition to re-evaluating aspects of our curricula, our staff resources, and our faculty hiring practices and priorities. We are hopeful that the university enrollment restriction that impact all programs across the university are eased, as well, and are hopeful for funding for lagging salaries to prevent faculty and staff attrition. Our faculty, staff, and students have a great deal of pride in who we are and what we have accomplished thus far together, and we have great enthusiasm about our future.

Table of Contents

Part I: Where is the Department Now?

A. DEPARTMENT OVERVIEW

1. History and background

The first forestry course was taught at Virginia Agricultural and Mechanical College and Polytechnic Institute (commonly VPI) in 1902, only five years following passage of the US Organic Act of 1897 which authorized management of the newly-established forest reserves that would become the National Forest system, and three years prior to the formal establishment of the USDA Forest Service in 1905. The catalog description for that course indicated it would cover "preserving and improving original forests; classification and study of native trees with notes on their economic importance, harvesting, etc., starting forest plantations" among other related topics (Brown 2007). With initially slow momentum, the first professor of forestry was hired in 1925, an extension forester, and a degree in forestry was first offered in 1938, a B.S. in Conservation and Forestry. At that time, courses in forestry and wildlife were taught in the Department of Biology. The Department of Forestry and Wildlife was established within the College of Agriculture in 1959, and the class of 1960 consisted of six graduates. Graduate degrees began being offered in Forestry and Wildlife after that time, as well. The undergraduate forestry curriculum was accredited by the Society of American Foresters in 1965.

During the 1970s, programs in forestry, wildlife, and forest products grew rapidly at the renamed Virginia Polytechnic Institute and State University (VPI&SU). Julian N. Cheatham Hall was dedicated in 1971, and has been the primary home of these programs since that time. In 1972, the programs were separated into the Department Forestry and Forest Products and the Department of Fisheries and Wildlife Sciences, and in 1979 the Department of Forest Products was established separately from the Department of Forestry. These three departments shared a single B.S. degree, and were housed administratively within the School of Forestry and Wildlife (since 1976), in the College of Agriculture and Life Sciences. The school achieved college status in 1993 as the College of Forestry and Wildlife Resources.

More recently (2008), the Department of Forestry was renamed as the Department of Forest Resources and Environmental Conservation (FREC) to recognize the broader scope of our majors, research, and outreach activities, and the department now resides in the College of Natural Resources and Environment. A new B.S. degree in Water: Resources, Policy, and Management was added in 2015, and the other departments developed their own B.S. degrees, though we continue to offer M.S./M.F. and Ph.D. degrees that also are utilized by Sustainable Biomaterials (formerly Wood Science and Forest Products). Hence, we now offer the following degrees, as recognized by the State Council of Higher Education for Virginia (SCHEV):

- -B.S. in Forest Resources and Environmental Conservation (CIP code 03.0501 Forestry, General)
- -B.S. in Water: Resources, Policy, and Management (CIP code 03.0299 Natural Resources Management and Policy, Other)
- -M.S./M.F. in Forestry and Forest Products (CIP code 03.0510 Forest Resources Production and Management)
- -Ph.D. in Forestry and Forest Products (CIP code 03.0510 Forest Resources Production and Management)

Within our B.S. degrees, FREC currently offers five undergraduate majors:

-Environmental Conservation and Society (concentrations in Recreation and Tourism Mgt., Environmental Education and Outreach, and Leadership and Sustainability)
-Environmental Informatics
-Environmental Resource Management
-Forestry (concentrations in Forest Resource Mgt., Forest Operations and Business, and Urban Forestry)
-Water: Resources, Policy, and Management

Our 30 research and teaching faculty conduct research and train graduate students in subject areas that include:

-Agroforestry/Forest Farming
-Ecosystem Science, Management, Climate, and Carbon
-Forest Biology, Silviculture, Soils, Wildland Fire
-Forest Biometrics, Geomatics, and Ecosystem Modeling
-Forest and Resource Economics, Policy, Management
-Forest Genetics and Biotechnology
-Forest Operations and Business
-Human Dimensions of Natural Resources
-Natural Resources Recreation
-Urban Forest Ecology and Management
-Water Resources, Hydrology

FREC contracts and grants have averaged around $5 million per year recently, with granting agencies including: National Science Foundation, USDA National Institute of Food and Agriculture, NASA, DARPA, USDA Forest Service, Virginia Department of Forestry, American Chestnut Foundation, and others.

Laboratory spaces are located in Cheatham and Latham Halls, along with on-campus greenhouse space and a harvesting lab. A 1,400-acre Appalachian hardwood and mixed pine-hardwood forest provides teaching and research opportunities that are located approximately 10 miles from campus. Additionally, the Reynolds Homestead Forest Resources Research Center provides a 710-acre research facility approximately 70 miles from Blacksburg in the piedmont physiographic province. Facilities at Reynolds Homestead include laboratory space, greenhouses and nursery beds, and space for on-going field studies.

Extension and outreach activities, an important component of our program from its inception, have grown to include the following programs:

-Virginia Forest Landowner Education Program
-Virginia SHARP Logger Program
-Geospatial Education Program
-Virginia Master Naturalist Program
-Agroforestry/Forest Farming
-Urban Forestry Extension

Beginning as early as 1979, FREC faculty also have been involved with industrial partners though industrial affiliates programs:

-Forest Modeling Research Cooperative (FMRC)
-Forest Productivity Cooperative (FPC)
-Center for Environmental Applications in Remote Sensing (CEARS)

2. FREC Vision, Mission, and Core Values

VT VISION:

Virginia Tech will be a global leader by inspiring and empowering people to learn, innovate, and serve beyond boundaries.

FREC VISION:

An inclusive and collaborative department recognized as a regional, national, and global leader in addressing critical forest and environmental resource issues through teaching, research, and outreach

FREC Alignment with University Vision: We seek to be diverse and inclusive community that is the "go-to" place for those looking for answers to grand challenges of forest and environmental questions at the local, regional, national, and global scales, and to be the "go-to" place for those looking to hire the next generation of practitioners, researchers, and leaders. We seek to inspire our students, ourselves, and all those we serve to go out and solve those pressing and complex issues, and to build up and empower all those whose lives and well-being rely on those resources, whether they are found in rural, Southwest Virginia, or the other side of the globe.

VT MISSION:

Inspired by our land-grant identity and guided by our motto, *Ut Prosim* (That I May Serve), Virginia Tech is an inclusive community of knowledge, discovery, and creativity dedicated to improving the quality of life and the human condition within the Commonwealth of Virginia and throughout the world.

FREC MISSION:

To conduct impactful teaching, research, and outreach that advances the science, conservation, and sustainable management of forests and the environment

FREC Alignment with University Mission: Accomplishing our mission requires that we aggressively strengthen our capacity in "emerging" opportunity areas and our capacity in "traditional" areas that serve long-standing stakeholders. Accomplishing our mission requires that we aggressively seek opportunities to build on our international, national, and regional impact as leaders in the science, practice, and education in forestry and environmental conservation. Accomplishing our mission requires that we become the leaders of our field in diversity, aggressively seeking to grow the diversity of our student, faculty, and staff ranks, to build an inclusive environment where all are thriving, and to grow the diversity of the clientele that we serve.

FREC CORE VALUES:

KNOWLEDGE AND INNOVATION: We value creating and disseminating knowledge and innovative solutions that address critical challenges in the sustainable management and conservation of forests and the environment.

EXCELLENCE AND INTEGRITY: We commit to maintaining and promoting the highest standards of ethics and integrity in our pursuit of excellence in teaching, research and outreach about the sustainable management and conservation of forests and the environment.

DIVERSITY AND INCLUSIVITY: We actively seek and promote the contributions of diverse people and perspectives in pursuing our mission, and we commit to continuous improvement to foster an inclusive environment and to expand opportunities for all.

OPPORTUNITY AND AFFORDABILITY: We strive to provide affordable educational opportunities of the highest quality and commit ourselves to supporting aspirations of students and others to contribute to the science, conservation, and sustainable management of forests and the environment.

SUSTAINABILITY: We value sustainability, acknowledge its critical importance for the well-being of current and future generations, and strive to advance the science and practice of sustainability in our teaching, research, and outreach.

3. Alignment with college and institutional goals and priorities

CNRE Strategic Priority 1: Advance Regional, National, and Global Impact

The College of Natural Resources and Environment will be globally recognized for its research strengths, world-class faculty, and ability to integrate its learning, discovery, and engagement missions as a comprehensive research land-grant university. We will prepare graduates to contribute and lead in a complex world by offering person-centered and purpose-driven student experiences designed to educate the whole person. The College's impact will be regional, national, and global.

Associated FREC Goals:

1) Promote excellence in research and discovery
2) Advance teaching and learning excellence for a holistic education
3) Expand institutional impact and visibility
4) Pursue strategic growth of undergraduate and graduate enrollment across majors and degrees
5) Expand extension and outreach efforts

CNRE Strategic Priority 2: Increase Representational Diversity and Inclusiveness

The *Ut Prosim* (That I May Serve) Difference, a foundational differentiator for Virginia Tech, recognizes the integral connection with Virginia Tech's land-grant responsibility of access and opportunity and its mission of service to humanity. Consistent with InclusiveVT, the institutional and individual commitment to *Ut Prosim* (That I May Serve) in the spirit of community, diversity, and excellence, the College of Natural Resources and Environment will build and support communities of discovery where global citizens engage with different ideas, beliefs, perspectives, experiences, identities, backgrounds, and cultures.

Associated FREC Goals:

1) Increase representational diversity and inclusiveness
2) Increase cultural competency
3) Address societal issues facing broader and more diverse audiences
4) Expand land grant services and outreach by students and non-extension faculty

CNRE Strategic Priority 3: Be a Destination for Talent

The College of Natural Resources and Environment will attract bold and dynamic faculty, staff, and students to a diverse and inclusive community to be a force for positive change. The College will support the well-being and quality of life of students, staff, and faculty. Alumni and local communities will recognize the College as a lifelong learning destination. The College of Natural Resources and Environment will invest, empower, support, and value a workforce that will champion our vision for the future.

Associated FREC Goals:

1) Attract and retain diverse and talented faculty, staff, and students
2) Promote the professional development of faculty, staff, and students

CNRE Strategic Priority 4: Ensure Institutional Excellence

The College of Natural Resources and Environment will, through continuous strategic planning, create opportunities to solicit and explore innovative ideas, inform resource allocation, and engage the university's system of shared governance. The College will also optimize efficiency and effectiveness of administrative functions to ensure alignment of personnel, physical campus, and fiscal resources and processes in support of strategic goals.

Associated FREC Goals:

1) Establish a continuous strategic planning process that is responsive to changing conditions and emerging opportunities
2) Diversify and increase funding sources that enhance opportunities for departmental impact and excellence
3) Improve internal communications about departmental budget and fiscal planning
4) Engage in college-level planning to ensure strategic allocation of facilities and technological infrastructure to departmental research and instruction
5) Utilize staff resources to provide greatest support for teaching, research, and outreach missions of the program

4. Significant accomplishments, challenges, and major changes, most recent 5 years

a) Curriculum/Program Accomplishments:

i) FREC undergraduate enrollment increased from 190 students in fall semester of 2015 to 333 students in fall 2020 (75% increase)
ii) FREC was identified as the #1 program in the US to study forestry for 4 consecutive years by Collegefactual.com (2017, 2018, 2019, and 2020, the only years in which that ranking existed)

iii) FREC has made progress in diversity and inclusion primarily through development and implementation of a D&I strategic plan, by engaging and participating in the Howard Hughes Medical Institute Inclusive Excellence grant, and through establishment of a FREC Diversity and Inclusion Committee.

iv) FREC has developed and implemented an accelerated graduate degree program on campus, and extended that to a 3+2 program with Biological Sciences at James Madison University.

b) Challenges:

i) Enrollment cap - A university cap on enrollment at 30,000 students has led to a stagnation in FREC enrollment growth, even amidst continued increases in applications (e.g., 24% increase in FREC applications between 2020 and 2021). We work closely with the office of the Vice Provost for Enrollment Management to strategically allocate our limited offers across programs that takes into account our goals and capacities, as well as historical yield and retention rates, to keep us at capacity. We are hopeful that the enrollment cap will be lifted by fall 2024, and we continue to refine our majors to prepare to continue to be relevant when enrollment increases are allowed. One example is revisions that are being undertaken for the Environmental Informatics major to distinguish the major from similar existing and proposed programs on campus.

ii) STEM status for degree programs – Under the Homeland Security definition of STEM, neither our undergraduate nor our graduate programs qualify as STEM degrees (https://www.ice.gov/sites/default/files/documents/Document/2016/stem-list.pdf). Our degree CIP codes are:

03.0501 Forestry, General - FREC B.S.
03.0299 Natural Resources Management and Policy, Other - WRPM B.S.
03.0510 Forest Resources Production and Management - FREC M.S./M.F. and Ph.D.

STEM status could provide additional recognition for our programs, would allow students receiving some ROTC scholarships to enroll in our programs, and would allow our international students to have the opportunity to apply for two-year Optional Practical Trainings (OPT) rather than one-year OPTs. Of course, there is no single definition of STEM, and our programs fall under the NSF definition (https://www.nsf.gov/statistics/nsf13327/pdf/tabb1.pdf), but the Department of Homeland Security STEM definitions are what are relevant to the ROTC scholarship and international student issues.

We have been exploring the possibility of changing our degree CIP codes to those recognized by Homeland Security as STEM programs, and that reflect accurately the identity and diversity of our curricular offerings. As these requests must be approved by the State Council of Higher Education of Virginia (SCHEV), we recognize the need to have our goals, our degree core curricula, general education requirements, and other details of our degrees where we want them to be prior to submitting a request to SCHEV. We also have submitted a request to Homeland Security to consider including our existing degree CIP codes 03.0501 and 03.0510 on the recognized STEM list, on the basis of: 1) forestry programs in fact are STEM (evidenced by SAF requirements, NSF designation, and our own checksheets/degree core), and 2) that similar CIP codes are designated as STEM (including 03.0101 Natural Resources/Conservation, General; 03.0103 Environmental Studies, 03.0508 Urban Forestry, and others).

iii) Graduate enrollment decline and cost of graduate education – Our graduate enrollment has declined, due to a variety of factors that include the cost of graduate education to contracts and grants (tuition costs, in particular), turn-over in faculty from some established researchers to less experienced junior faculty who are in early stages of building their research programs. We have received additional funds to support Graduate Teaching Assistantship in the past 5 years, and we seek to utilize those funds as effectively as possible to support our teaching endeavor. We also are working with the VT Graduate School to optimize use of our allocated graduate tuition waivers, as well as seeking to best utilize university funding sources (e.g., Graduate School Doctoral Assistantships and ICTAS Doctoral Scholars fellowships) to maximize our graduate enrollment. Applications have been sufficient to cover faculty needs for the most part, and individual faculty advertise for students with specified skills, as needed.

c) Major Curricular Changes:

i) Curriculum reorganization – We reorganized our undergraduate curricula from 10 separate curriculum options with 10 individual checksheets into 5 majors under our 2 B.S. degrees. These changes were made to better promote marketing and recruiting students into our undergraduate programs, and to reduce paperwork associated with annual checksheet approvals. Our current majors are:

-Environmental Conservation and Society (with concentrations in Recreation and Tourism Mgt., Environmental Education and Outreach, and Leadership and Sustainability)
-Environmental Informatics
-Environmental Resource Management
-Forestry (with concentrations in Forest Resource Mgt., Forest Operations and Business, and Urban Forestry)
-Water: Resources, Policy, and Management

ii) FREC undergraduate degree core – We modified our FREC B.S. degree core to allow us to transition to the Pathways general education requirements of Virginia Tech, and to ensure that we met the SCHEV 25% course requirement across all major within the degree, as follows:

Degree Core Requirements (21 credits)
FREC 2004 Forest Ecosystems or FREC 3314 Forest Ecology and Silvics (3 credits) (Students in Environmental Informatics should take FREC 2004 Forest Ecosystems.)
FREC 2214 Introduction to Land and Field Measurements (3 credits)
FREC 2314 Forest Biology and Dendrology (2 credits)
FREC 2324 Dendrology Laboratory (1 credit)
FREC 2614 Human-Environment Systems (3 credits)
FREC 4014 (NR 4014) Natural Resources Economics (3 credits)
FREC 4114 Information Technologies for Natural Resources Management (3 credits)
FREC 4434 Natural Resource Policy (3 credits)

iii) Pathways minors and courses – We have created and achieved approval for two Pathways minors that help students across Virginia Tech meet the Pathways general education requirements, as follows:

Blue Planet
Ecological Cities

In addition, we have created and additional Pathways minor, Climate and Society, that is at the university level of governance for approval.

We also have created or revised the following courses to meet requirements for inclusion in Pathways general education:

FREC 1004 (GEOG 1084) Digital Planet (revised course)
FREC 2004 Forest Ecosystems (revised course)
FREC 2114 Ecology of Appalachian Forests (revised course)
FREC 2124 Forests, Society, & Climate (revised course)
FREC 2554 (NR 2554, LAR 2554) Leadership for Global Sustainability (revised course)
FREC 3004 Environmental Informatics (revised course)
FREC 3214 Forest Biometrics (revised course)
FREC 3364 Environmental Silviculture (revised course)
FREC 3524 Environmental Interpretation (revised course)
FREC 3734 Forest Fiber Supply (revised course)
FREC 4134 Forest Carbon Management and Policy (new course – awaiting final approval)
FREC 4174 (PSCI 4174, IS 4174) Climate Change and the International Policy Framework (new course)
FREC 4354 Forest Soil and Watershed Management (revised course)
FREC 4444 Integrated Forest Management Practicum (revised course)
FREC 4454 Urban and Community Forestry (revised course)
FREC 4464 (AAEC 4464, WATR 4464) Water Resources Policy & Economics (revised course)
FREC 4554 (BSE 4554, LAR 4554, HORT 4554, SPIA 4554) Creating the Ecological City (new course)

5. Emerging trends and FREC response

a) Demographic trends

Some the important demographic trends include: i) greater diversity of the US population (including those we serve and potential students), ii) greater % increases in urban-suburban populations than rural populations since 2000 (e.g., Pew Research Center 2018, https://www.pewresearch.org/social-trends/2018/05/22/demographic-and-economic-trends-in-urban-suburban-and-rural-communities/), iii) declining US college enrollment since 2010, projected to be flat through 2029 (https://nces.ed.gov/), and iv) an aging and retiring forestry workforce.

FREC response:
i) We are committed to building the diversity of our faculty, staff, and student body and seeking to improve the inclusiveness of our programs and instruction by creating and following a Diversity

and Inclusion Strategic Plan (2017), by implementing a search advocate on all search committees (began 2017), by participating in the Howard Hughes Medical Institute Inclusive Excellence Grant (began 2018), by hosting potential faculty candidates in the VT Future Faculty Diversity Program (2019 and 2020), and by establishing a FREC Diversity an Inclusion Committee. Certainly, we have a long way to go, but we are committed diversity and inclusion as a top priority.

ii) We have an Urban Forestry track in our Forestry major, which struggles for students. However, our urban forestry courses typically are full, and many of our students go on to related careers. We are actively participating in the CNRE Urban Natural Resources program initiative, and believe that urban forestry will play a key role in that program. We also believe that the breadth of our majors makes our program attractive to both rural and urban students.

iii) We believe that the best way to respond to stagnant or declining overall US college enrollment is to keep our program strong, and to offer a breadth of curricula that are relevant to a range of student demographics. We continue to fine tune our programs to keep us positioned as the place to be for those interested in forests and related environmental resources. Within the past 10 years, we have added undergraduate curricula in Water: Resources, Policy, and Management, and in Environmental Informatics. After conducting focus groups, we recently revised our Natural Resources Conservation major and changed the name to Environmental Conservation and Society, and we have seen a substantial increase in applications for that program. We currently are in the process of revising our Environmental Informatics major, including a potential name change, to better highlight what we offer and to better position the major with similar existing and proposed majors across campus. As have all others involved in higher education, we have greatly increased our skills and capacity in providing remote learning opportunities, those lessons, skills, and capacities gained will no doubt make our programs available to students across the nation and globe in the future.

iv) We continually have sought to keep our tradition programs strong through faculty hiring and curriculum revisions, seeking to maintain our hands-on, field-based instruction that supports careers in the more traditional, but evolving forestry profession.

b) Concern over climate and environment

i) Climate and carbon – Climate often is identified as one of the most critical grand challenges faced by human-kind in coming decades. In our field, there is significant on-going study of climate, global change, atmospheric carbon and other greenhouse gases, earth albedo, and forest and environmental impacts among numerous associated topics. In addition, forest products companies now consider forest-based carbon as an important economic product in their portfolios.

FREC response: We have established a Pathways minor in Climate and Society, created courses such as FREC 4134 Forest Carbon Management and Policy and FREC 4174 Climate Change and the International Policy Framework, established a study abroad to the Dominican Republic that focuses on climate-related impacts, and established a study abroad that allows students to observe the annual UNFCCC Conference of the Parties (COP) with official observer status.

ii) Environment – Environmental questions over topics such as forests and land-use change, sustainability, wildfire, water, renewable energy, invasive species, and human/social interactions with the environment continue to be a steadily growing proportion of news, social media, and policy debates.

FREC response: We have developed and continually refined a portfolio of majors that allow students to explore these questions from a range of disciplines and with the tools to assess and analyze the challenges they will face, including: biology/ecology, biometrics and data analytics, operations and business, management and economics, soils and hydrology, policy and human dimensions, genetics and genomics, and other areas. Recent additions to our portfolio that support this trend include development of a minor in Wildland Fire Ecology and a Pathways course in Forest Carbon Management and Policy, that are at the university level in the governance process. We also have recently revised and renamed a major in Environmental Conservation and Society, where students can explore the complex and multifaceted relationship between humans and the environment. We also have added an extension associate position to support landowner education and sustainable harvesting through funding from the Sustainable Forestry Initiative. Finally, we are working toward approval of graduate degrees in Water: Resources, Policy, and Management.

c) Globalization

As faced by all other programs on campus and across the nation, our students will be entering an increasingly globalized economy and work environment that is ever more diverse racially/ethnically and culturally, and it will be in that context that they will address the grand global challenges of coming decades.

FREC response: We seek to increase our students' global awareness and understanding through Pathways courses, primarily, but others that address global issues as well. In addition, we are conducting studies abroad to the Dominican Republic, Panama, and to the annual UNFCCC Conference of Parties. We also seek to be more attractive to international students, and are seeking STEM status for our degrees, that would improve recruitment of those students.

d) Data and Technology

Of course, data are needed in solving all forest and environmental challenges of the present and future, and cost reductions and technological advancements are steady or accelerating the acquisition and use of environmental data and data science tools.

FREC Response: We seek to provide our students with the latest skills and tools for data acquisition and analysis, from handheld computers, laser and sonic measurement devices, and GPS receivers used in the field to the remote sensing with drones and on-the-ground sensors and use of satellite and environmental flux tower data. We utilize a significant portion of our SCHEV Equipment Trust Fund support each year to update the tools our students take into the field, and well as the laboratory and computer equipment needed keep us up-to-date in research and instruction. Again, we are updating and renaming our Environmental Informatics major to better reflect the data science emphasis of the program as well. We also take advantage of our role in the state by providing a Geospatial Extension program that teaches skills needed by science educators across the Commonwealth.

References:

Brown, E.A. 2007. From Jamestown to Blacksburg: The Path to the College of Natural Resources. 57 p.

Pew Research Center, May 2018, “What Unites and Divides Urban, Suburban and Rural Communities” (https://www.pewresearch.org/social-trends/2018/05/22/what-unites-and-divides-urban-suburban-and-rural-communities/)

B. ACADEMIC PROGRAM INFORMATION

1. Degree/Program Summaries

FREC has two undergraduate degrees, a Bachelor of Science degree in Forest Resources and Environmental Conservation and a Bachelor of Science degree in Water: Resources, Policy, and Management.

B.S. in Forest Resources and Environmental Conservation (CIP code 03.0501 Forestry, General) – This bachelor of science is our oldest degree program, and it is designed to provide graduates with an understanding of the science needed to conserve and manage forests and associate environmental resources, and includes instruction in biology and ecology, land and resources measurements, soils and hydrology, operations and business, economics and management, and policy and human dimensions. Four majors are offered within this degree, Environmental Conservation and Society, Environmental Informatics, Environmental Resource Management, and Forestry. All of these majors are offered at the Blacksburg campus solely, are offered entirely as face-to-face programs (COVID exceptions aside), and share a common degree core comprised of 21 total credits of FREC courses.

Major in Environmental Conservation and Society – This major is designed for students interested in studying the relationships between humans and forest and environmental resources, blending natural and social sciences, providing understanding of stewardship and land-use ethics, and building communication and leadership skills necessary to engage people with the natural world in which they often recreate, and in which they all live and thrive. Core areas of study include forest and environmental sciences, natural resources policy, environmental interpretation, human dimensions, and information technology. As an integrated program, students will also take courses in disciplines such as economics, government and politics, psychology, biology, and fish and wildlife management. The major further allows students to concentrate their studies in recreation and tourism management, education and outreach, or leadership and sustainability.

Major in Environmental Informatics – Data are needed to understand and address every environmental resource question posed today, and with this major we seek to give students the foundations in environmental resources and in data science necessary to begin a career that applies information and information technologies to the complex questions of climate change, water, human health, and forest and wildlife conservation. Core courses in forest science, geospatial analysis, environmental economics, and natural resources policy are combined with business analytics and database technology, systems development, programming, forest photogrammetry, data science, and statistics.

Major in Environmental Resource Management – Forest and wildland soils, watersheds, and associated environmental resources are the focus of the ERM major, which prepares students to work with agencies, NGOs, and products companies in protected area and resources management. In addition to the core of forest science, geospatial analysis, environmental economics, and natural resources policy, students majoring in ERM take courses in forest soil and watershed management, forested wetlands, geology, and statistics.

Major in Forestry – Our forestry major is built to prepare students in sustainable management, operations, and conservation of vital wildland and urban forests for commercial, environmental, and social benefits. Through this major we address both the scientific and human elements of

forest management, and instill stewardship and land-use ethics through core coursework in forest science, geospatial analysis, forest economics, and natural resources policy, with an opportunity to concentrate in forest operations and business, forest resources management, or urban and community forestry.

B.S. in Water: Resources, Policy, and Management (CIP code 03.0299 Natural Resources Management and Policy, Other) – This single-major B.S. degree was developed as an interdisciplinary degree/major that brings together disciplines across several colleges at Virginia Tech, but is hosted in FREC. The degree/major emphasizes conservation, use, and sustainability of water resources, and through this program we seek to prepare graduates to solve challenges facing our global water system such as developing efficient water systems for homes, ensuring a supply of clean drinking water, and managing the effects of climate change. Students majoring in water: resources, policy, and management are required to take core courses in areas such as watershed assessment, management, and policy; water quality; watershed hydrology; water resources and environmental issues, and physics. Students also complete water science specialization courses, such as aquatic ecosystems, hydrology, water quality, and/or water treatment and public health, as well as courses in water law, planning, and economics; geospatial technology; water policy; and technical writing. This degree/major is offered at the Blacksburg campus solely, and is offered entirely as a face-to-face programs (COVID exceptions aside).

FREC Minors – All FREC minors are offered at the Blacksburg campus solely, and are offered entirely as face-to-face programs (COVID exceptions aside)

Blue Planet minor - The Blue Planet minor is an interdisciplinary program that includes courses from several departments, ensuring that students gain the necessary perspective required to solve the myriad of water problems being confronted by diverse societies. Courses for the minor show students the interconnectedness of water policy, planning, science, and sustainability and orients them to a diversity of perspectives for solving water issues. Blue Planet is a Pathways minor.

Climate and Society minor (awaiting final approval in university governance) – The Climate and Society minor is designed to provide students with the interdisciplinary knowledge and skill base to understand the science, causes, and impacts of climate change, and necessary actions and approaches to mitigate and/or adapt to climate change from environmental and social perspectives. The minor brings together coursework from the physical/natural sciences, environment and ecosystems, and human dimensions and policy, as well as the option to explore additional coursework on methodological approaches for mitigating or adapting to climate change. Climate and Society is a Pathways minor.

Ecological Cities minor - The Ecological Cities minor encourages students to explore ways to integrate the natural world with built environments, and courses help students understand the breadth of the ecological, social, and design challenges inherent in creating these new urban environments while also having the skills to work in interdisciplinary teams to design better solutions. This minor will prepare students to critically analyze sustainable designs and practices in cities and their scientific and cultural underpinnings. Ecological Cities is a Pathways minor.

Forestry minor - The Forestry minor is designed for those in related natural resource fields who would like to broaden their ability to work with forest-related issues. Expertise is gained in ecology, forestry fundamentals, tree identification, and land measurements.

Natural Resource Recreation minor – This minor emphasizes the tools and perspectives needed to manage and maintain high quality recreation resources and experiences with emphasis on the ecology of the setting, the psychology of recreation experiences, and the management science behind trails, parks, scenery and facilities management.

Urban and Community Forestry minor – This minor is especially suited to students majoring in environmental resource management, forestry, horticulture, landscape architecture, urban planning or other related fields who wish to develop expertise in managing forest resources in urbanized areas and learn to address the specific challenges related to trees in the built environment.

Master of Science/Master of Forestry (M.S./M.F.) (CIP code 03.0510 Forest Resources Production and Management) - The M.F. is a non-thesis program designed for professionals with a minimum residency requirement of two semesters. Candidates prepare a professional paper pertinent to a topic and discipline associated with forests and environmental resources, and approved by the graduate committee, for which credit will be earned towards completion of the degree. The M.S. program in research-based, and designed to prepare students for additional graduate study or a career in the science of forests and environmental resources. Candidates are required to prepare a thesis based on approved research pertinent to a topic and discipline associated with forests and environmental resources, and approved by the graduate committee, for which credit will be earned towards completion of the degree.

Doctor of Philosophy (Ph.D.) (CIP code 03.0510 Forest Resources Production and Management) - The Ph.D. is a research-based degree designed as a terminal degree to prepare students for a career in teaching and/or research. Candidates are required to prepare a dissertation based on original research pertinent to a topic and discipline associate with forest and environmental resources, and approved by the graduate committee, for which credit will be earned towards completion of the degree.

2. Curriculum for each undergraduate program

Degrees/majors – see Appendix A for detailed degree/major requirements

Minors - see Appendix B for detailed minor requirements

Pathways minors - see Appendix C for detailed Pathways minor requirements

3. Contributions to Pathways General Education

Pathways minors offered:

Blue Planet minor - Pathways Concepts 1a, 2, 3, 4, 5a, 5f
Climate and Society minor - Pathways Concepts 1a, 2, 3, 4, 5a, 5f
Ecological Cities minor - Pathways Concepts 1a, 2, 3, 4, 5a, 5f, 6a, 6d, 7

Pathways courses offered:

FREC 1004 (GEOG 1084) Digital Planet – Pathways Concept(s) 5f
FREC 2004 Forest Ecosystems – Pathways Concept(s) 4
FREC 2114 Ecology of Appalachian Forests – Pathways Concept(s) 4
FREC 2124 Forests, Society, & Climate – Pathways Concept(s) 3, 4
FREC 2554 (NR 2554, LAR 2554) Leadership for Global Sustainability – Pathways Concept(s) 3, 4
FREC 3004 Environmental Informatics – Pathways Concept(s) 5a
FREC 3214 Forest Biometrics – Pathways Concept(s) 5a
FREC 3364 Environmental Silviculture – Pathways Concept(s) 6d
FREC 3524 Environmental Interpretation – Pathways Concept(s) 1a
FREC 3734 Forest Fiber Supply – Pathways Concept(s) 1a
FREC 4134 Forest Carbon Management and Policy – Pathways Concept(s) 3
FREC 4174 (PSCI 4174, IS 4174) Climate Change and the International Policy Framework – Pathways Concept(s) 1a, 3
FREC 4354 Forest Soil and Watershed Management – Pathways Concept(s) 5a
FREC 4444 Integrated Forest Management Practicum – Pathways Concept(s) 6d
FREC 4454 Urban and Community Forestry – Pathways Concept(s) 1a
FREC 4464 (AAEC 4464, WATR 4464) Water Resources Policy & Economics – Pathways Concept(s) 3, 7
FREC 4554 (BSE 4554, LAR 4554, HORT 4554, SPIA 4554) Creating the Ecological City – Pathways Concept(s) 3, 6a/6d

Pathways Concepts covered by FREC minors and courses:

1a Advanced/Applied Discourse
2 Critical Thinking in the Humanities
3 Reasoning in the Social Sciences
4 Reasoning in the Natural Sciences
5a Advanced/Applied Quantitative and Computational Thinking
5f Foundational Quantitative and Computational Thinking
6a/6d Critique and Practice in Design and the Arts
7 Critical Analysis of Identity and Equity in the United States

Service courses offered by FREC faculty members:

FREC 1004 Digital Planet, capacity 180/semester
FREC 2004 Forest Ecosystems, capacity 300/semester
FREC 2114 Ecology of Appalachian Forests, capacity 96/semester
FREC 2124 Forests, Society & Climate, capacity 72/semester
FREC 2324 Dendrology Laboratory, capacity 120/semester
FREC 2554 Leading Global Sustainability, capacity 140/semester
FREC 2614 Human-Environment Systems, capacity 100/semester
ECON 4014 Environmental Economics, capacity 120/semester (taught by FREC faculty member)

4. Graduate program contributions to VT portfolio

Our graduate programs provide the primary research and professional graduate degrees in forests and related environmental resources at Virginia Tech and the state of Virginia. Our thesis-based M.S. and Ph.D. degrees are research oriented, and our graduates find careers in academic institutions, government agencies, non-government organizations, and corporations domestically and internationally. Our Master of Forestry program is a non-thesis professional degree, with graduates being employed in non-research professional positions with agencies and the private sector.

- How do the department's graduate programs contribute to the Graduate School's Transformative Graduate Education initiatives such as Preparing the Future Professoriate, Preparing the Career Professional, communicating science, interdisciplinary graduate education, etc.?

Using the stated principles of the VT Graduate School's Transformative Graduate Education initiative:

a) Conduct meaningful and innovative research and scholarly inquiry – M.S. and Ph.D. degrees require intensive research experiences that involve identifying a research question/problem, establishing testable hypotheses, experimental design, development and defense of a research proposal, data collection, analysis, and interpretation, as directed by the major advisor and graduate committee. Our M.F. degree requires a project or professional paper that addresses a pertinent problem in the field, and is directed by a major advisor and graduate committee.

b) Work successfully in interdisciplinary and multidisciplinary settings – Our program is multidisciplinary collection of faculty members who address problems from a broad range of disciplinary background, including: biophysical sciences, data science/analytics, economics, and social sciences, and our students are exposed to are exposed to that breadth of disciplinary background in their coursework, and must work in that environment as they conduct their research. In addition, our faculty and students are connected with colleagues across a large number of programs across campus, across universities, and across professional settings.

c) Use innovative technologies in research, scholarship, teaching, learning, and engagement – Our faculty and graduate students use the latest technologies in their labs, in the field, in teaching, and in extension, as allowed by the annual SCHEV Equipment Trust Fund that

provides and opportunity to keep equipment updated, through the Network Learning Initiative (NLI) program that provides faculty with up-to-date computers and training, and through our FREC Annual Fund that we use partially to keep field equipment updated for lab exercises in our courses.

d) Apply scholarship to contemporary and global contexts – The nature of our research in forests and environmental resources, as supported primarily through sponsored projects and industry cooperatives, is contemporary, with much of the work seeking to address grand challenges faced today and in the future by society, public agencies, and private individuals and businesses. Many of the questions addressed are directly global in context, but I believe that all of our work has global implications through economic and environmental consequences. Our students are exposed to contemporary problems through our annual required seminar, and through much of their coursework and research.

e) Assume roles and responsibilities as faculty and career professionals – We have an active forestry graduate student association that provides leadership opportunities to many of our students as they organize our seminar series with faculty guidance, and organize numerous other activities through the year, such as the current environmental justice reading group. Our students are involved in other leadership opportunities around campus, including the campus sustainability initiative. All of our graduate students are required to serve as a teaching assistant in at least one course through their program, and most serve as TAs on multiple occasions. Our Ph.D. students regularly participate in the VT Future Professorate program, and we encourage them in participating. We also have courses that support development of research methods and proposal writing skills, such as:

FREC 5014 - Research Ethics & Integrity in Forest Resources & Environ Conservation
FREC 5464 - Social Science Research Methods in Natural Resources
FREC 5494 - Natural Resource Research Procedures

f) Work successfully in diverse and global communities – We seek to maintain a diverse and inclusive environment in FREC, and our students have the opportunity to interact and work with international graduate students from around the world, both within our program and across the campus community. Many of the problems they address in their work have global components or connections, and we encourage them to participate in scientific/professional conferences with diverse and international attendance. We expect our graduate students to respect and embrace the Virginia Tech Principles of Community (https://www.inclusive.vt.edu/Programs/vtpoc0.html), and we have graduate student representation on our FREC Diversity and Inclusion Committee.

g) Utilize critical thinking and problem-defining skills – We expect our graduate students to grow in their critical thinking and problem-defining skills, and this is most evident in the process of problem identification, development of testable hypotheses, experimental design, proposal development and defense, data collection, and analysis and inference identification process that our students go through in the research process that M.S. and Ph.D. students experience in our programs. The more professionally oriented students go also go through a process of problem identification, analysis, and inference identification in their professional projects and papers as a part of their M.F. programs.

h) Develop dynamic leadership skills – Again, graduate students have opportunities to develop leadership skills in our active Forestry Graduate student Association, as well as in any number of other activities and associates across the campus and community. Many of our graduate students also supervise undergraduate students in assisting with research projects. We also give them responsibility to conduct research rather independently in our on-campus labs, but perhaps given the nature of our work, in field data collection. That responsibility requires (and expects/anticipates) integrity in following approved research practices, and often in managing field teams who are visiting study site. We also expect our students to present their work at professional/scientific conferences, and being the one who is answering the questions raised about their work.

i) Utilize collaborative and team approach – Our faculty pride themselves in the collaborative/team atmosphere of our program, and applicants for our faculty positions almost always comment about that being the most frequent message they heard during the interview. That expectation is passed along to our graduate students as they work with their advisors and graduate committees in that environment. We also expect our students to mutually support each other in many of their data collection efforts, and our faculty model that collaboration in all facets of the work in FREC. The collaborative atmosphere and expectation are discussed explicitly in our graduate student orientations that are held at the beginning of each fall and spring semester and culminate with graduate student/faculty socials.

j) Understand and adhere to ethical standards and professional practices – We adhere to the VT Graduate School requirement to have all of our students complete approved training in ethics and scholarly integrity. The requirement can be met by enrolling and completing FREC 5014 Research Ethics & Integrity in Forest Resources & Environ Conservation that addresses the topics of: 1. plagiarism and other violations of the Graduate Honor Code; 2. proper use of professional conventions in citation of existing research and scholarship, accurate reporting and ownership of findings, and acknowledgement of contributions to the work; 3. ethical standards in teaching, mentoring, and professional activities; and 4. available avenues for reporting alleged misconduct. Alternatively, students who are unable to take FREC 5014 may follow a self-guided option that involves attending the departmental new student orientation, completing the GTA Workshop taught by the Virginia Tech Graduate School, completing the NSF Responsible Conduct of Research (RCR) training, and completing a Working Plan for Research within 1 year of enrollment. The detailed FREC plan for meeting this requirement is maintained on our departmental web site (https://frec.vt.edu/content/dam/frec_vt_edu/documents/FREC%20Graduate%20Ethics%20Plan%20April%202018.pdf), and is verified for each student by the FREC Graduate coordinator and the department Head.

More importantly, we have an expectation of our faculty and graduate students to maintain the highest measure of integrity and ethical conduct in their research, teaching, and professional work at Virginia Tech.

5. Successes and challenges in student recruitment, enrollment, retention, progression to degree, and graduation rates/degrees conferred

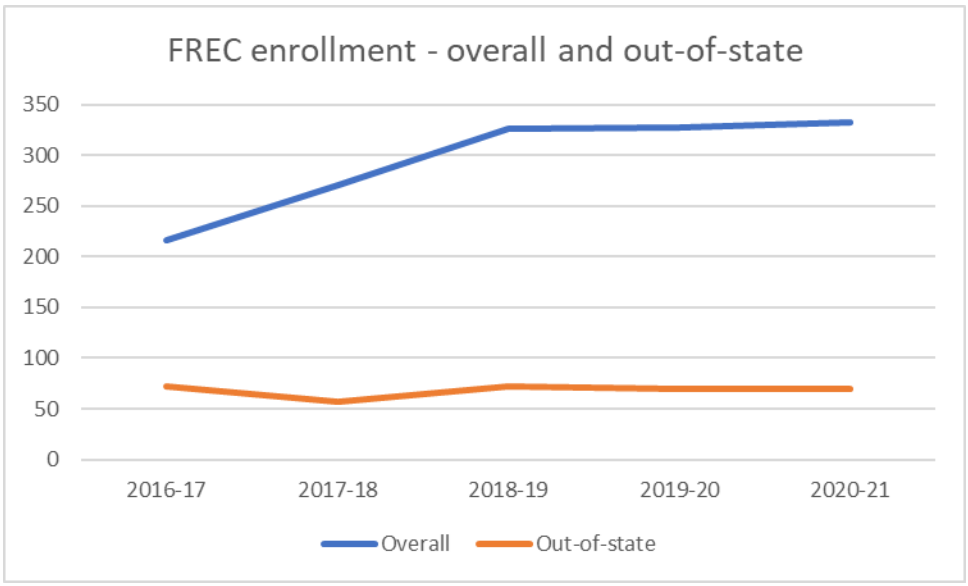
a) Undergraduate Enrollment Trends:

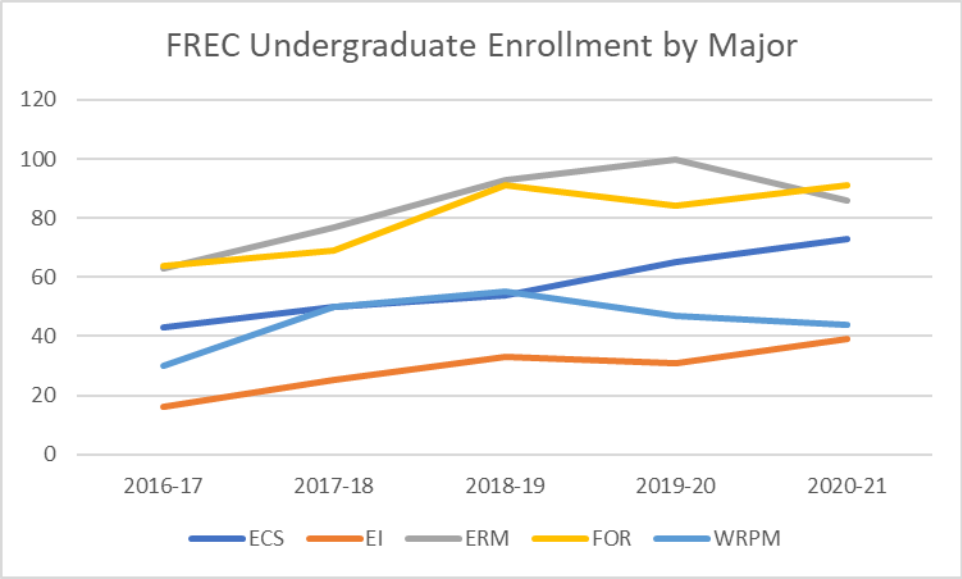
FREC Undergraduate Enrollment by Major

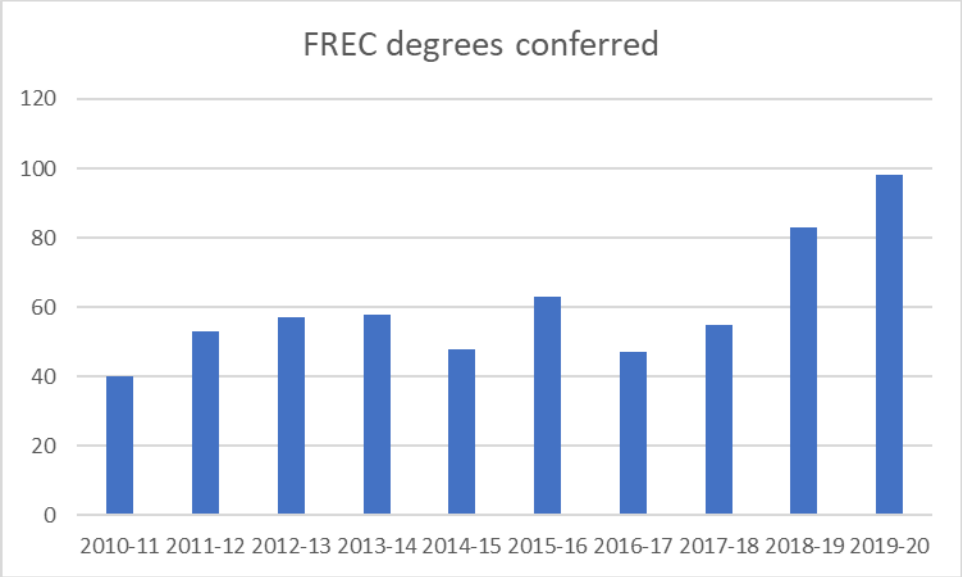
Headcount; Fall

Majors	2016-17	2017-18	2018-19	2019-20	2020-21
Environ. Conserv. & Society (formerly NRC)	43	50	54	65	73
Environmental Informatics	16	25	33	31	39
Environmental Resource Management	63	77	93	100	86
Forestry	64	69	91	84	91
Water: Resources, Policy, and Management	30	50	55	47	44
Overall	216	271	326	327	333

FREC's undergraduate program is thriving. CNRE had 1005 undergraduates in fall semester 2021; of which 333 students—or approximately 33%—were in FREC majors, having grown from 26% of CNRE enrollment since fall semester of 2016.







Overall, FREC undergraduate enrollment has shown substantial growth over the past 5 years, though the growth has leveled off in the past two years due to the enrollment cap at 30,000 students that currently is in place. Out-of-state enrollment has remained steady, though has been a decreasing proportion of overall enrollment. Applications have remained strong for FREC majors, and were up 24% for the fall semester of 2021 compared with fall 2020. Growth has occurred across all FREC majors, though there have been some differences between majors as we have continued to keep our curricula up to date. The most notable change has been the revision and renaming of the former Natural Resources Conservation major to Environmental Conservation and Society, which was put into effect in fall 2019. Degrees conferred have generally followed overall enrollment, and we anticipate that degrees will level off in coming years as a result of the enrollment cap that is in place at this time.

FREC undergraduate admissions - freshmen

	2015	2016	2017	2018	2019	2020
Applied	77	107	122	130	110	162
Offered	57	82	92	94	91	134
Enrolled	30	34	46	51	48	65
Offered Rate	74%	76.60%	75.40%	72.30%	82.70%	82.70%
Yield	52.60%	41.50%	50%	54.30%	52.70%	48.50%

FREC undergraduate admissions - transfers

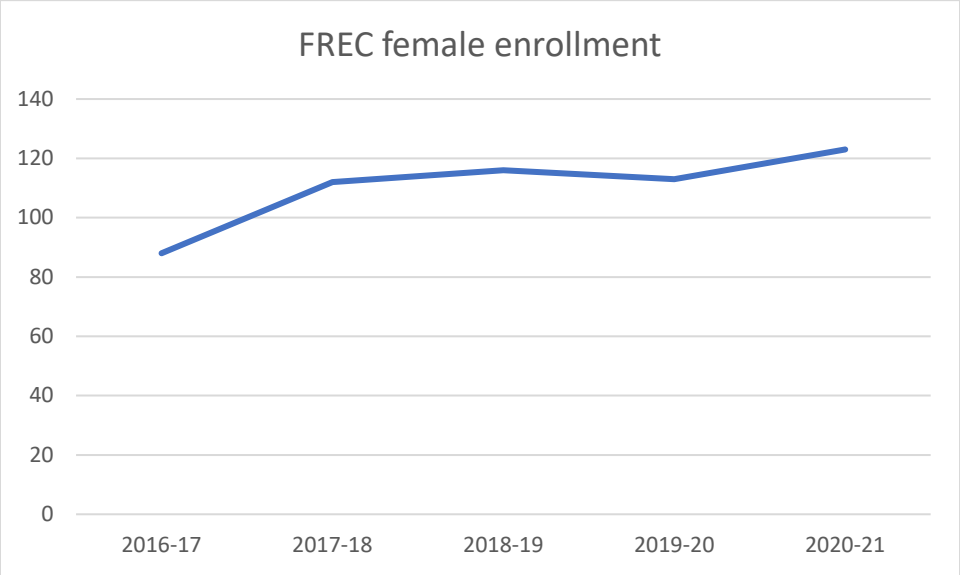
	2015	2016	2017	2018	2019	2020
Applied	27	28	38	37	25	27
Offered	10	15	22	23	14	14
Enrolled	8	11	20	20	12	13
Offered Rate	37%	53.60%	57.90%	62.20%	56%	51.90%
Yield	80%	73.30%	90.90%	87%	85.70%	92.90%

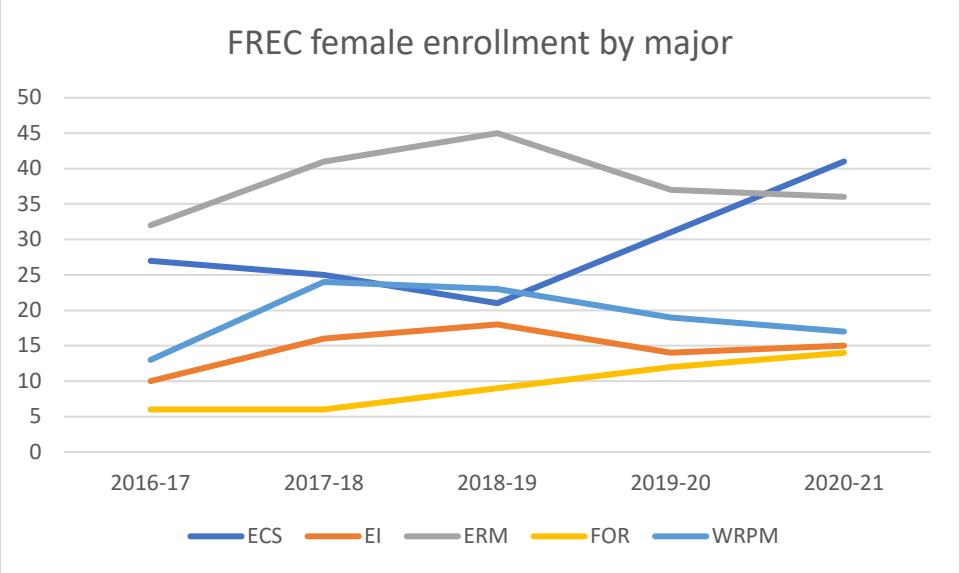
FREC undergraduate admissions - out-of-state

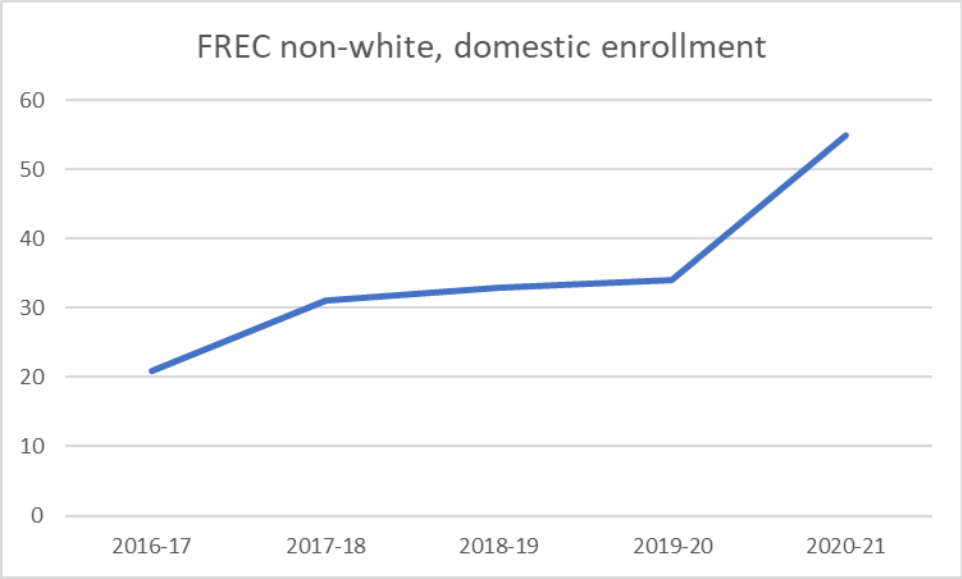
	2015	2016	2017	2018	2019	2020
Applied	20	38	30	56	42	55
Offered	20	34	25	45	35	46
Enrolled	5	8	3	11	5	11
Offered Rate	100%	89.50%	83.30%	80.40%	83.30%	83.60%
Yield	25%	23.50%	12%	24.40%	14.30%	23.90%

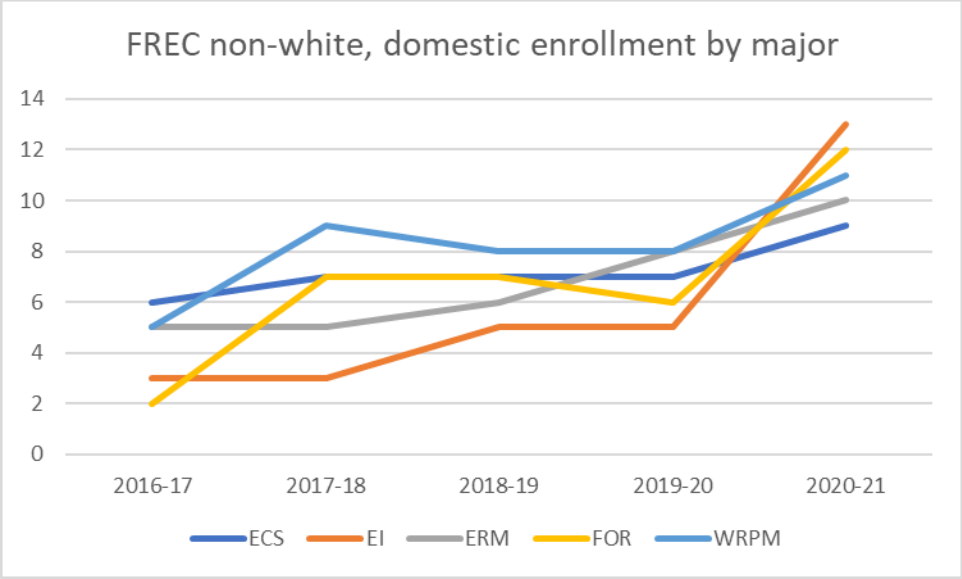
Freshman applications have been strong and trending upwards through recent years. Freshman applications grew to 201 for the fall 2021 (not shown), indicating that demand for our programs remain strong though we are limited by our allocation of the overall university cap in enrollment. Transfer applications have remained steady, though it is anticipated that limits associated with the university enrollment cap will be borne disproportionately by transfer admissions, based on discussions with the Office of Undergraduate Admissions. Out-of-state applications have represented approximately one-third of our overall freshman applications, though as expected yield has been substantially lower than for in-state students.

With the flattening out of FREC enrollment associated with a university enrollment cap, we are working closely with the Office of Undergraduate Admissions to utilize the offers we are allowed to ensure that our enrollment stays as strong as possible until the university cap is lifted. We seek to balance our enrollment across majors, and consider yield rates closely in an effort to avoid an enrollment decline that could occur if we allocate too many of our offers to low yield majors. We also are working currently to revise and rename our Environmental Informatics major, our lowest enrollment major, to improve marking of the program and to better position the major among environmental and data science programs across campus.

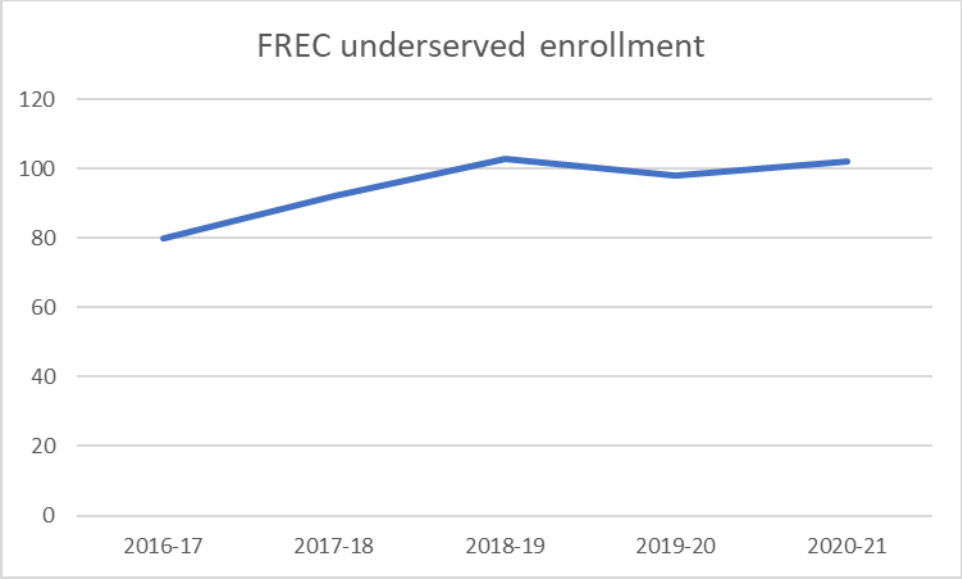

FREC female enrollment
140
120
100
80
60
40
20
0
2016-17
2017-18
2018-19
2019-20
2020-21

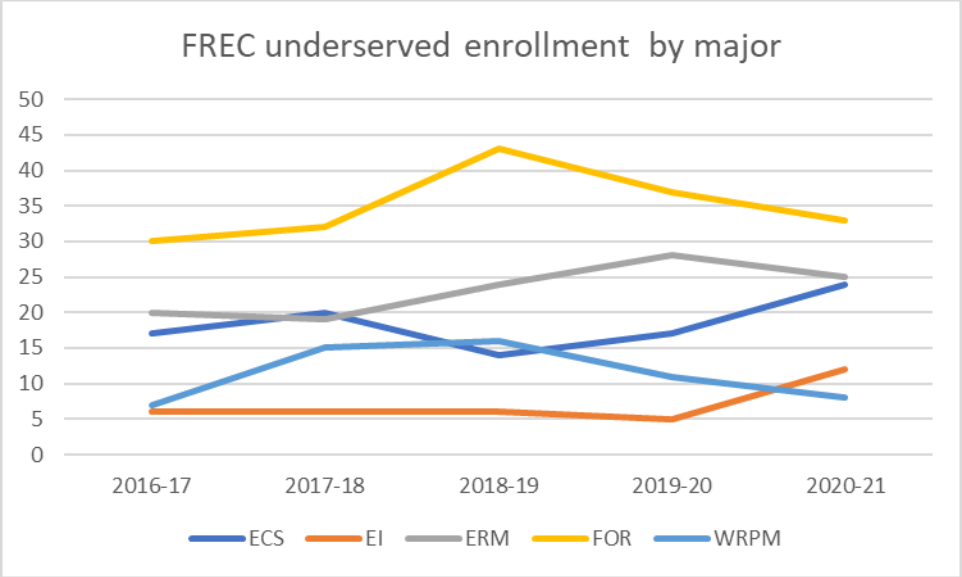

FREC female enrollment by major
50
45
40
35
30
25
20
15
10
5
0
2016-17
2017-18
2018-19
2019-20
2020-21
ECS
EI
ERM
FOR
WRPM





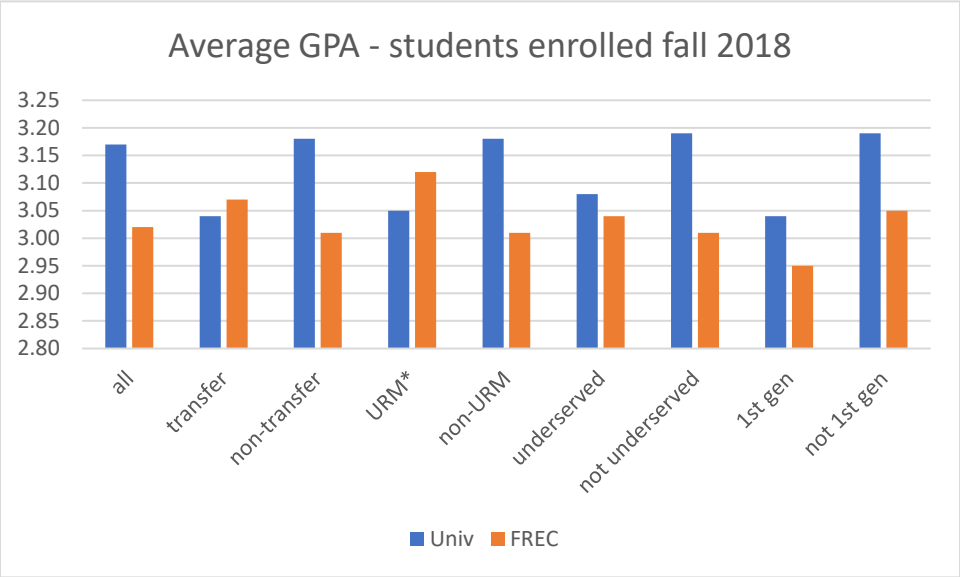
Female and racially/ethnically underrepresented student enrollment have grown overall, and as a proportion of overall FREC enrollment. Student diversity has increased across all majors, though female enrollment varies distinctively by major, growing most markedly in our Environmental Conservation and Society major in recent years. Certainly, we are not where we would like to be in terms of our enrollment reflecting the diversity of the Commonwealth population, and we remain committed to continuing our positive trends. We have joined the Howard Hughes Medical Institute grant for Inclusive Excellence to promote the inclusive environment of our program, and have established our second cohort of faculty (6 faculty enrolled thus far). We are working closely with our CNRE Director of Recruiting in recruiting events, including those directed primarily toward underrepresented populations, and have purchased contact information to promote our programs to these populations. We also seek to promote diversity in our faculty ranks, as we utilize diversity advocates in our searches and participate in the annual Future Faculty Diversity Program sponsored by the Office of Inclusion and Diversity.

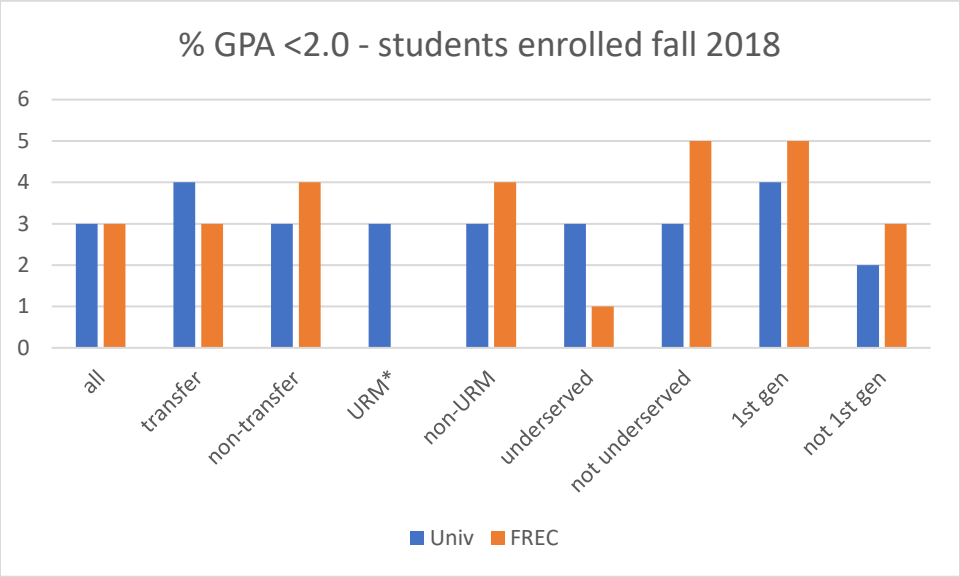


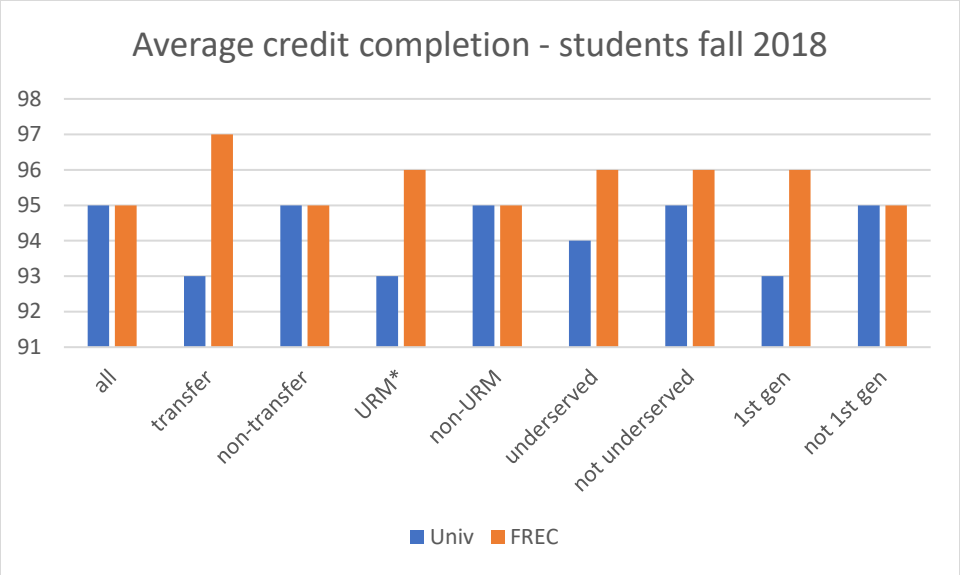


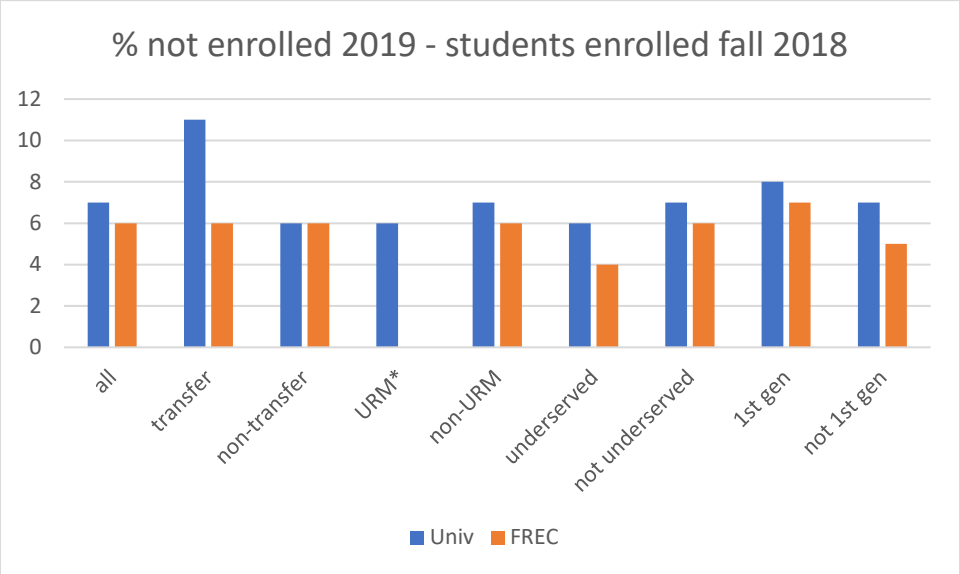
Underserved students, including those from low income portions of the state and first-generation students, comprise a substantial portion of FREC enrollment at approximately one-third of our students. The enrollment trend of underserved students follows overall FREC enrollment closely. Historically, underserved students have favored the Forestry major. This may reflect a rural and first-generation demographic of many of these students. Recently, the proportion of underserved students in the Forestry major appears to be declining, and increasing in Environmental Conservation and Society and in Environmental Informatics. This trend is only a short-term phenomenon at this point, though we will watch the trend to see if it warrants a change in marketing, recruiting, or some other adjustment to respond to demographic changes across majors.

Student success – transfer, URM, underserved, 1st generation:







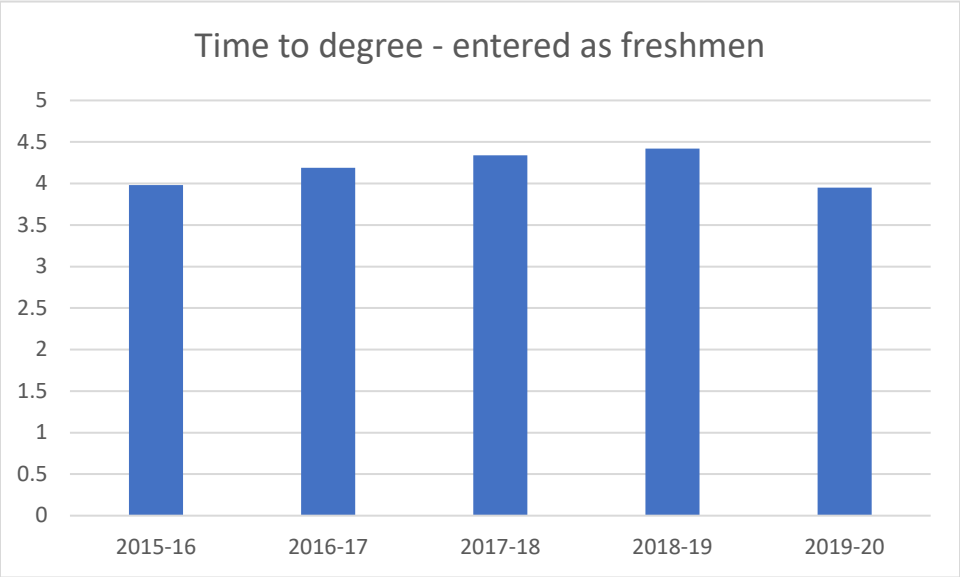


When we enrolled in the HHMI grant, the university provided data regarding success of our transfer students, underrepresented minority students, underserved students, and 1st generation students who were enrolled in fall 2018. Success metrics included GPA, percent with GPA below 2.0, percent of completed classes in fall 2018, and percent of the 2018 students not enrolled (or graduated) in fall of 2019. University students in the identified groups generally showed lower success in the specified metric than university students in general. In contrast, the success of FREC students in those groups compared favorably with all FREC students in nearly every category, with the exception of GPA for 1st generation students.

FREC Retention and Graduation of entering freshmen

	2014	2015	2016	2017	2018	2019
Entering Full-time Students	19	29	33	46	51	48
% Continued to 1st Spring	94.70%	96.60%	90.90%	91.30%	78.40%	83.30%
% Continued to 2nd Year	78.90%	69.00%	72.70%	71.70%	64.70%	58.30%
% Continued to 3rd Year	63.20%	58.60%	66.70%	67.40%	52.90%	
% Graduated in 3 Years		3.40%	3.00%	2.20%		
% Continued to 4th Year	63.20%	55.20%	63.60%	65.20%		
% Graduated in 4 Years	57.90%	51.70%	60.60%			
% Continued to 5th Year	5.30%	6.90%	3.00%			
% Graduated in 5 Years	63.20%	55.20%				

Retention of entering freshmen to the second and third years has declined somewhat recently. This apparent trend could be a result of a university enrollment cap, and students seeking alternative ways into high demand programs like Engineering and Business. We are working to refine our student mentoring program that was established when CNRE moved to a professional advising model, and we will monitor this trend closely to understand and respond to factors that we can control.

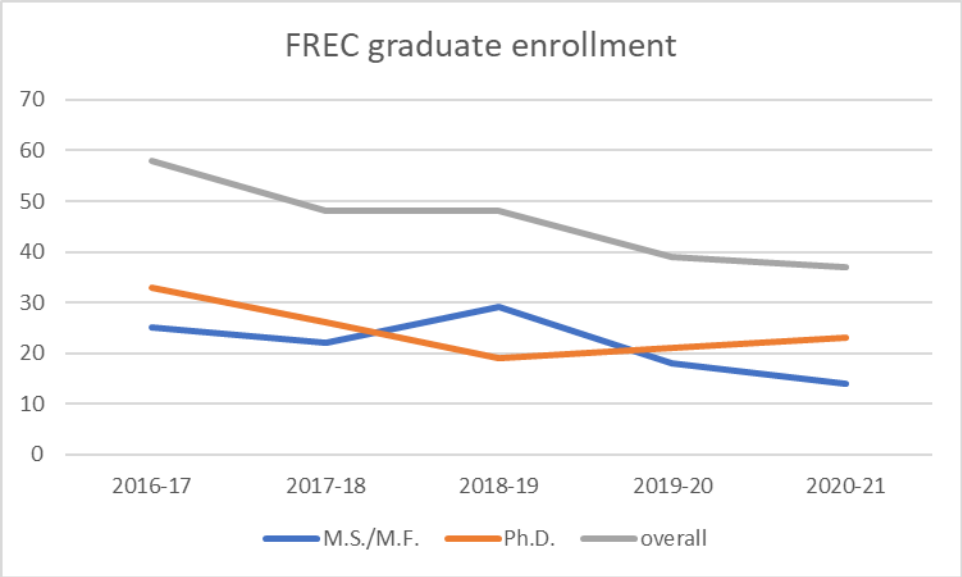


Our undergraduates who enter as freshmen are able to finish their B.S. degrees within four to four and one-half years. In some recent years the average exceeded four years, and the transition to Pathways General Education which has increased general education credit and subject/concept requirements may have played a role during these years. We will continue to watch this trend, and consider curricular issues that may be hindering our students' abilities to complete their degree requirements in four years.

b) Graduate Enrollment Trends:

Student Enrollment - College Department Major
Headcount; Graduate; Fall

	2016-17	2017-18	2018-19	2019-20	2020-21
M.S./M.F.	25	22	29	18	14
Ph.D.	33	26	19	21	23
overall	58	48	48	39	37

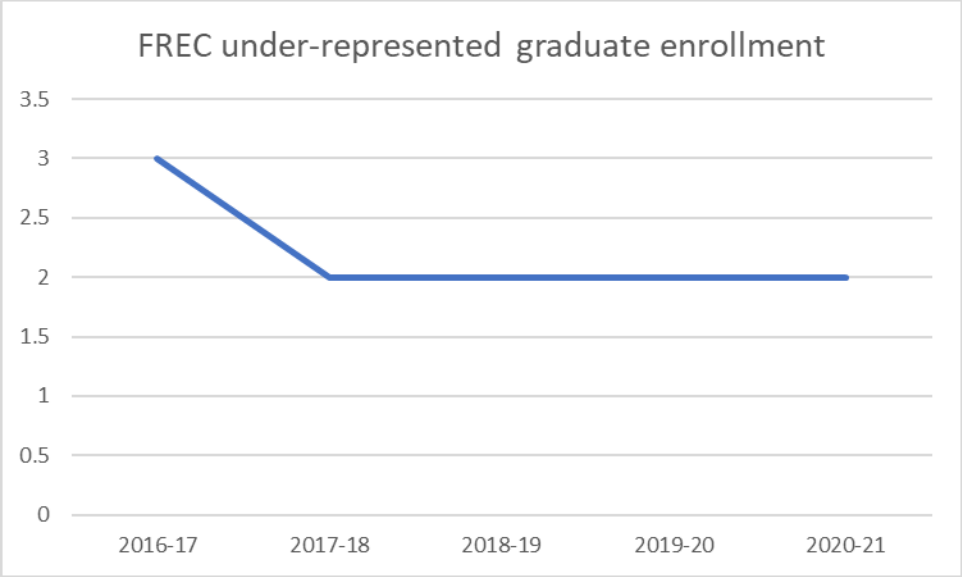


FREC graduate applications

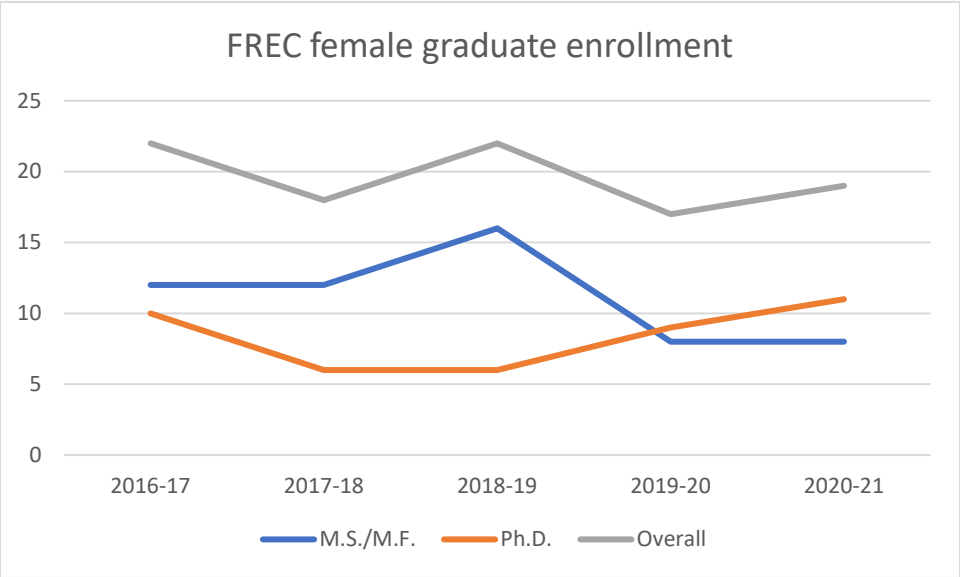
	2015	2016	2017	2018	2019	2020
Applied	33	27	30	36	29	26
Offered	11	14	11	17	10	9
Enrolled	10	14	9	13	8	6
Offered Rate	33.30%	51.90%	36.70%	47.20%	34.50%	34.60%

FREC graduate enrollment has declined substantially in the past 5 years, with M.S./M.F. enrollment declining to a greater extent than Ph.D. enrollment. With no obvious long-term downward trend in graduate applications, the observed decrease has been due to a combination of factors that include: faculty demographics, loss of 5 senior faculty members, and the increasing cost of graduate education. As many as 8 senior faculty members could retire in the next 5 years, and if we are able to fill openings with new junior faculty members the graduate student numbers are likely to increase. We have been able to fill most of the needs after we recently lost productive senior faculty members, though early career faculty taking time to build a research and graduate program, and the university pushing towards hiring collegiate faculty (1 position) has limited the recovery of lost sponsored grants and graduate enrollment for the time being. The increasing cost of graduate education (e.g., tuition, stipend rates,

greater university emphasis on Ph.D. students, and project overhead) has led to an increase in co-chairing graduate students on grants that provide limited resources and greater reliance on the use of post-docs and research associate positions to complete grant deliverables. The anticipated demographic shift in the next 5 to 10 years will lead to a partial recovery of graduate enrollment, though the continuing high cost of graduate education and more constrained ability to use tuition remission dollars to fill gaps in funding will continue to limit potential enrollment. We are proposing additional graduate degrees (M.S. and Ph.D.) in Water: Resources, Policy, and Management that we hope will increase our overall graduate student numbers, as well.



FREC enrollment of underrepresented graduate students has remained low, and though this situation is not unlike those found at similar institutions across the nation, we actively seek to grow the diversity of our graduate programs. Our faculty have participated annually in programs such as MAOP (Multicultural Academic Opportunities Program), bringing in annual cohort of undergraduate students from underrepresented groups for a research-intensive experience. Our faculty have been highly successful in USDA National Needs Fellowships that supports and encourages these summer research experiences and funding graduate students from underrepresented groups. We also have begun establishing collaborations with related programs at Minority Serving Institutions, such as Virginia State University, Southern University, and Florida A&M to promote our graduate programs with their students, and are exploring the possibility of developing 3+2 programs with these universities. We anticipate that graduate student enrollment diversity will follow the growth that we have seen in undergraduate enrollment diversity as those students begin to complete undergraduate degrees.



FREC female graduate student enrollment has declined slightly overall, though female Ph.D. enrollment has grown slightly. However, given the overall decline that we have experienced, the proportional representation of female graduate students has growth for both masters and Ph.D. students, with the proportion of female M.S./M.F. students going from 48% to 57% over the past 5 years, and the proportion of female Ph.D. students growing from 38% to 51% over the same period. We anticipate continued growth of the female proportion of graduate students as the number of female undergraduates continues to increase in our program and field.

C. STUDENT LEARNING AND SUPPORT

We believe that student learning is key to developing professionals who can contribute significantly to the forest and environmental resources questions of the future, while they find success in a highly competitive workforce. We define the quality of student learning as growth in understanding, processing and applying information, communicating, and integrating information and ideas for solving current and future environmental questions. Although we wrestle with appropriate ways to assess outcomes, our faculty have identified the following student learning objectives/outcomes:

B.S. in Forest Resources and Environmental Conservation

- Students in the B.S. program in Forest Resources and Environmental Conservation will be able to demonstrate competency in field identification of native and naturalized woody plants.
- Students will be able to demonstrate competency in quantification/measurement of forest and environmental resources.
- Students will be able to demonstrate competency in forest ecology principles, data collection, data analysis and synthesis of current knowledge in the field.
- Students will be able to demonstrate competency applying principles of policy analysis to issues related to forest resources.
- Students will be able to complete the program "on time" in four academic years.

B.S. in Water: Resources, Policy, and Management

- Students will be able to demonstrate competency and understanding of how humans exert stress on water resources and vice versa.
- Students will be able to demonstrate competency in the physical principles involved in water movement through and within watersheds.
- Students will be able to demonstrate competency in application of watershed management concepts.
- Students will be able to demonstrate competency in current and emerging challenges in water quantity and quality in the US.
- Students will be able to complete the program "on time" in four academic years.

M.S./M.F.

- Students will be able to demonstrate competency in writing a research working plan that identifies a professional/research question, critically evaluates and synthesizes past work, describes a plan for collection and analysis of relevant data.
- Students will be able to demonstrate competency in oral communication that would be expected of a professional in the field.
- Students will be able to make steady, satisfactory progress toward completion of coursework, teaching (TA assignments), and research.
- Students will be able to complete the program "on time."

Ph.D.

- Students in the Ph.D. program in Forest Resources and Environmental Conservation will be able to demonstrate competency in the scientific method, critical evaluation and synthesis of past research, experimental design, data collection and analysis.
- Students will be able to demonstrate competency in statistical analysis of data related to forest and environmental resources.

- Students will be able to demonstrate competency in oral communication that would be expected of a research professional in the field.
- Students will make steady, satisfactory progress toward completion of coursework, teaching (TA assignments), and research.
- Students will complete the program "on time."

1. How do program curricula reflect identified student learning outcomes?

The degree cores of our B.S. degrees were built around our expressed learning objectives. For the B.S. in Forest Resources and Environmental Conservation, the core curriculum includes tree identification and physiology, measurements of forest and environmental resources using latest technologies, forest ecosystems and ecology, and human dimensions/economics/policy analysis, plus the ability to analyze issues/problems/situations and synthesize lessons and concepts learned in developing plans or potential solutions. These components of our curriculum match those required by the accrediting body of our Forestry major, the Society of American Foresters. The remainder of the curricula across the FREC majors then broaden and deepen the understanding and application of those fundamental concepts as they apply to the specific major in-question. The B.S. degree in Water: Resources, Policy, and Management has been constructed with a similar concept in mind, though there is not a direct tie to an accreditation body at this time.

Our graduate curricula are driven by our desire to prepare students for research careers and/or advanced professional careers in forest and environmental resources, building the fundamental understanding and skills it takes to be successful in those careers, as reflected in the student learning outcomes. Specific graduate program is crafted in consultation with the faculty advisor and graduate committee to meet student objectives, disciplinary standards, and program requirements.

2. In what ways are students exceeding, meeting, or not meeting expectations related to student learning?

In general, our students have shown a high degree of success in academic coursework across all levels. These findings reflect the quality of students in our program and the outstanding faculty and culture of high-quality education in FREC. Some difficulty (expectations not met) has been seen by undergraduate students in synthesizing concepts and data associated with forest ecology principles, which involves complex, interwoven relationships between organisms and biotic and abiotic factors. Time to degree has been a challenge to meet by students at all levels, though some single outliers among the smaller number of graduate students has led to those criteria not being met in some cases.

3. Changes resulting from assessment of student learning outcomes

The difficulty collecting data on our criteria for our M.S./M.F. and Ph.D. degrees, and in meeting the time to degree criterion has motivated our FREC Graduate Affairs Committee to revise the required annual graduate student evaluation form to better clarify expectations and to gather additional data that we will add to our assessment criteria for future years.

In the case of the forest ecology criterion not being met, the instructor added an additional instructor feedback on the student work, and gave additional time for completion of the assignment.

In addition, we undertook (and now completed) a significant overhaul of our B.S. degree in Forest Resources and Environmental Conservation with the intent of improving student outcomes (especially time to degree) in the face of the university move to Pathways General Education. The revision involved reducing our 10 curriculum options under the B.S. degree to 5 majors and revising the degree core to better match our assessment criteria and to provide students with greater clarity about the nature of the FREC B.S. degree. The revision has allowed us to expand coursework in professional communications, as well.

4. In what ways is the department exceeding, meeting, or not meeting students' expectations?

Above all, we hear continually about the outstanding quality of the teaching and advising, and the personal treatment and inclusivity of the program environment in FREC. Our students and alumni appreciate the hands-on, field-based instruction that we have been known for through the years.

The recent switch at the CNRE level to a professional advising model has split the former advising-mentoring link, taking academic advising from the faculty and allowing them to focus on academic and professional mentoring. We have some concern that students may not be taking advantage of the mentoring opportunity they have with our faculty, and we are revisiting how we should conduct mentoring and how we reach out to students about that opportunity.

Based on the 2018-2019 and 2019-20220 Senior Survey, students appreciated the quality of the instruction that the faculty provided and the hands-on nature of the program. Comments also indicated that the new student mentoring arrangement was not yet functioning as hoped.

5. How does the collection of departmental services (e.g., advising and mentoring), activities (e.g., student organizations), and education (e.g., internships, study abroad, undergraduate research) foster student success and prepare students for their chosen careers?

Given their stature in the profession, our faculty have a wealth of knowledge of the field and connections to industry and agencies. We are seeking ways to improve the mentoring relationship with our undergraduate students since the advising-mentoring link was eliminated when CNRE went to a professional advising model. The professional advising model has been fantastic in providing our students with resources and consistent and available academic advising. However, we are concerned that the mentoring connection with the faculty is not being used to the greatest advantage by the students in this new model, and will be revisiting in coming months how to make this opportunity work better for our students.

Student clubs, such as the student chapter of the Society of American Foresters, the Xi Sigma Pi national honor society chapter, and the Forestry Club provide our students with leadership and service opportunities, give them opportunities to travel to regional and nation-level professional conferences and competitions, and help build camaraderie among those who will be linked by professional association and friendship for their entire careers and beyond.

We have active, but informal internship relationships between our employers and students. Many of our students take advantage of these opportunities, which exceed the number of students available to fill them. These opportunities provide hands-on look into the employment world that they will face upon graduation, and many of our students who take advantage of this opportunity go to work for the agency or company with whom they interned. The College of Natural Resources and Environment received a private financial gift to support the hiring of a CNRE Director of Employer Relations, who works to connect students with internship and employment opportunities. We believe that this position will increase the opportunities for our students, and connect our students with employers, many of whom are facing workforce aging/retirement and replacement issues at this time.

6. Other initiatives undertaken to enhance the student experience

In 2019, FREC joined the Howard Hughes Medical Institute grant for Inclusive Excellence, and we are in our second cohort of faculty involvement in that program. In addition to the inclusivity training opportunities and reading groups, participation has led to creation of a professional skills course (including topics of diversity and inclusion in the workforce), and creation of a field-lab equipment loan program for students in financial need.

D. FACULTY PROFILE, INCLUDING RESEARCH/CREATIVE ACTIVITY/SCHOLARLY WORK, TEACHING, OUTREACH, AND INTERNATIONAL INVOLVEMENT

Faculty Profile

	FREC Faculty and Staff				
	Fall 2016	**Fall 2017**	**Fall 2018**	**Fall 2019**	**Fall 2020**
Tenured/Tenure Track	27	28	29	28	28
Professor	10	9	10	10	12
Associate Professor	12	13	12	14	12
Assistant Professor	5	6	7	4	4
Non-Tenure-Track Instr.				1	1
Research Faculty	13	13	10	11	13
Admin & Professional Fac	1	1	1	1	1
Classified, Staff	12	10	11	11	10

Since 2015, 5 tenure-track FREC faculty members have resigned or retired, including the former department head in 2015. Four tenure-track faculty members and 1 collegiate faculty member have been hired over that period (fourth tenure-track faculty member hired in January 2021, and does not show in data above). All new faculty members have been hired at the assistant professor level.

FREC faculty come from a variety of backgrounds, strategically hired in areas that support both our traditional programs (e.g., Forestry) and emerging areas (e.g., EI and WRPM). All faculty in tenure-track positions (tenured or seeking tenure) hold a doctoral degree. Terminal degrees (Ph.Ds.) held by the Forestry faculty come from 21 different universities. Female faculty members include 1 professor, 3 associate professors, 1 assistant professor, and 7 research faculty at this time.

1. How is success/productivity defined and communicated to faculty members?

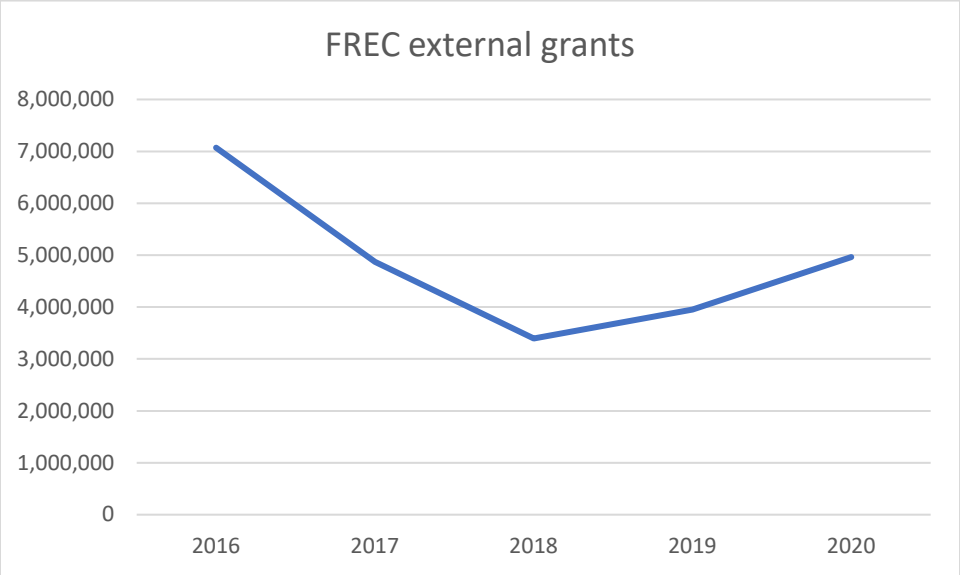
FREC faculty expectations are defined by the body of work in teaching, research, extension/outreach, and service in proportion to contract terms and according to the expectations defined by the faculty (see Appendix D: FREC Promotion and Tenure Expectations). Expectations are communicated to the faculty in the interview and on-boarding process, as well as by annual department head evaluations, 2-year and 4-year reviews conducted by the FREC Promotion and Tenure Committee, and through associate professor reviews now conducted 2 – 4 years following promotion to the awarding of tenure. When requested, a formal or informal mentor can be assigned for untenured faculty, as well.

2. In what ways are departmental faculty exceeding, meeting, or not meeting expectations for research, creative activity, and/or scholarly work?

2009-2018	**Scholarly Output**	**Citations per Publication**	**Field-Weighted Citation Impact**	**Citation Count**	**Outputs in Top 10% Citation Percentiles**

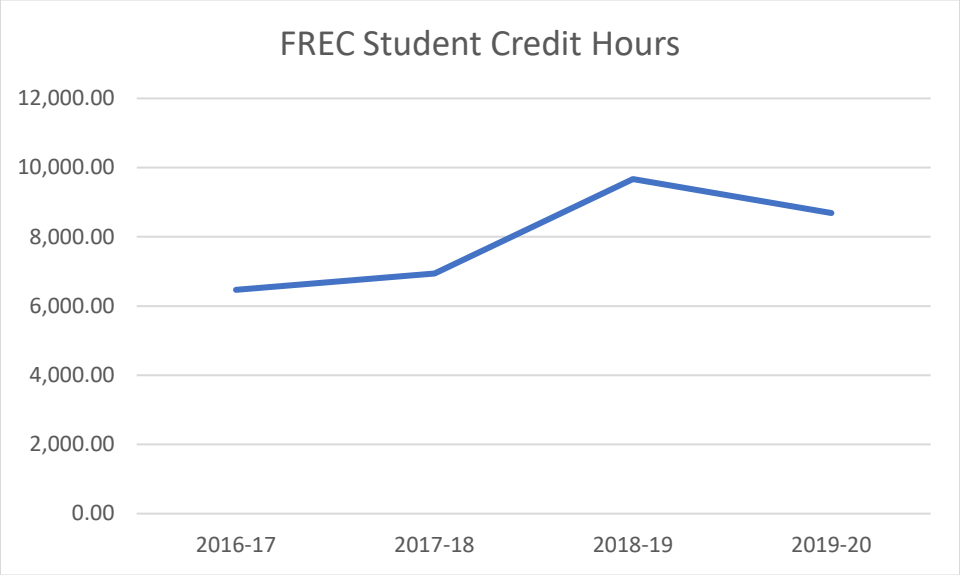
	All	≤10 authors	All	≤10 authors	All	≤10 authors	All	≤10 authors	All		≤10 authors	
FREC	681	579	16.8	19.9	1.51	1.28	11,295	8,938	114	16.7%	85	14.7%
CNRE	*1,934*	*1,651*	*16.2*	*15.1*	*1.32*	*1.18*	*31,339*	*25,012*	*333*	*17.2%*	*262*	*15.9%*

FREC faculty have performed well in producing scholarly publications, comparing favorably in Web of Science data to the college as a whole in scholarly outputs, citations, and field-weighted citation impact (top in citations per pub. And in field-weighted citation impact). In the only area that we do not exceed the CNRE % is outputs in the top 10% citation percentiles, in part due to the fact that we have the largest proportion of extension faculty in the college who produce scholarship of a practical nature that is not typically published in the top 10% cited journals in the field.

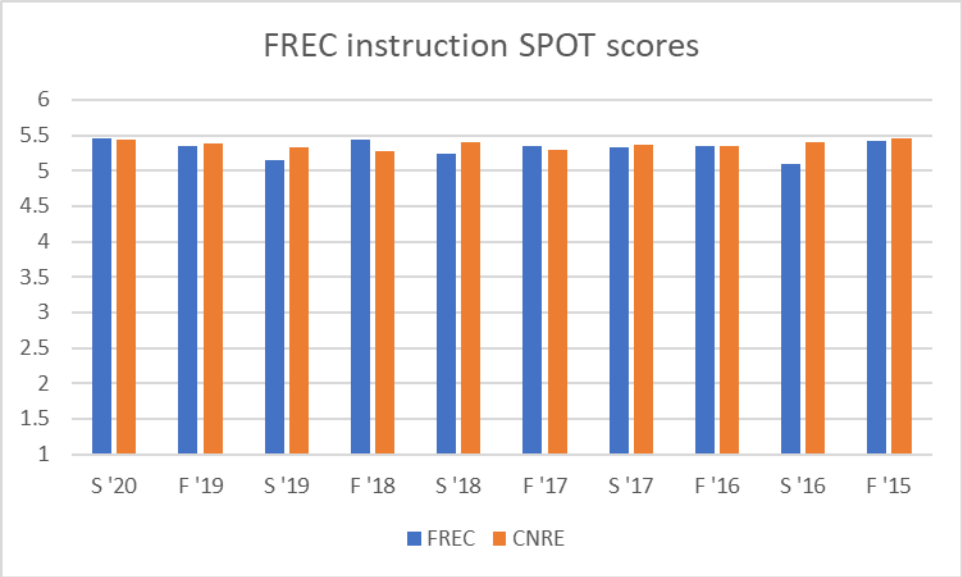


External grants have dipped overall in the past 5 years, likely a result of loss and replacement of senior faculty members. If the recent trend continues, external grant support should recover prior to the next Academic Program review in 5 years as the junior faculty build their programs, and it appears that they already are making excellent progress, though potential upcoming retirements and hiring could alter the trend somewhat.

3. In what ways are departmental faculty exceeding, meeting, or not meeting expectations for teaching/pedagogical competency?



FREC faculty produce the second highest level of Student Credit Hours in CNRE. Student perceptions of teaching (SPOT) scores show that students rank FREC instruction very highly, and at levels consistent with those across CNRE where teaching is renowned on campus.



In the recent Senior survey, the faculty were mentioned in numerous comments, indicating the quality of instruction and the personal support that they had received from the faculty.

4. How does the department support the professional growth of its faculty members?

The dossiers of untenured faculty are reviewed by the Promotion and Tenure Committee at years two and four, though additional reviews can also be conducted (e.g., third year review) upon request of the candidate faculty. In addition, the FREC P&T committee holds informal meetings annually with interested faculty to discuss the promotion and tenure process and expectations. We also require that untenured faculty receive at least two peer teaching evaluations prior to seeking tenure, which often include recommendations of on-campus workshops or instructional mentoring arrangements. Associate professor dossiers are reviewed at 2 to 4 years to support those faculty as they look forward toward promotion to the rank of Professor. For all faculty, performance is reviewed annually by the department head, including a face-to-face meeting, based on Faculty Activity Reports. Research personnel (i.e., research faculty and post-docs) are evaluated annually by assigned supervisors. Formal and informal mentoring of junior faculty are supported by the department, and four of our 5 recent hires have participated in the university new faculty mentoring grant program thus far.

FREC programs are supported by five office support staff members. Six technical staff members are located on campus and at our Reynolds Homestead Forest Resources Research Center in Critz, VA. IT support is provided through CNRE, and faculty receive computers and training through the university NLI program. FREC supports and rewards faculty participation in professional/scientific associations, including leadership roles, conference organization, editorships/associate editorships, and other roles.

5. How does faculty expertise support the strategic direction of the department?

We have sought to maintain a balance between our traditional strengths (e.g., forest biometrics, silviculture) and emerging directions (e.g., international forestry and land use change, and environmental data science). Additionally, we have been able to add capacity in wildland fire ecology as we seek to become the preeminent program in the relationship between hardwood resources and prescribed and wildland fire. We see an immediate need in urban forestry/natural resources to support the Ecological Cities Pathways minor and the CNRE effort in urban natural resources, and in the area of tree/forest pathology to support wildland and urban forest health, and an anticipated Destination Area proposal on Invasive Species. Longer term considerations include faculty positions in climate and terrestrial carbon, soils and wetlands/water, and environmental data science and statistics/analytics.

We also have participated in the Virginia Tech Future Faculty Diversity program, sponsoring potential faculty members, in 2019 and 2020 as we seek to diversify the faculty, though we have not yet hired a faculty position through that program.

6. What has resulted from collaborative or interdisciplinary work (e.g., projects, research programs, publications)?

The nature of research in forests and environmental resources is that it is fundamentally interdisciplinary and thereby most effectively done collaboratively. Nearly every question related to these resources entails an interaction of biophysical aspects with the economic and social realities that may create the issue in the first place, or provide the lasting solution or answer to the question. Further, in nearly all questions, data are a necessary element of understanding, analyzing, and

projecting outcomes. Hence, our faculty regularly work in collaborative, interdisciplinary settings, and the success of their funding and their research outcomes depend on the ability to function in that environment. Our faculty are involved in formal and informal collaborative research across campus, across the nation, and beyond. Some specific examples on campus, include:

Fralin Life Sciences Institute
Global Change Center
Ecosystem Dynamics and Forecasting working group

Collaborative, interdisciplinary projects in which FREC faculty are involved include those funded by the NASA Land and Land Use Change program, NSF Coupled Human Systems program, USDA National Institute of Food and Agriculture, the Department of Defense, the Joint Fire Science program, and numerous others.

7. In what specific ways does the department engage in outreach and contribute to the university's land-grant mission?

FREC is home to the following formal extension programming:

Virginia Forest Landowner Education – The Virginia Forest Landowner Education Program (VFLEP), in conjunction with numerous state, federal and private partners, offers a wide variety of science-based educational opportunities for new and experienced forest landowners. VFLEP also offers continuing education opportunities for natural resource and real estate professionals that include: short courses (both face-to-face and online), Fall Forestry & Wildlife Field Tours, Beginning Woodland Owner Retreats, Woods & Wildlife Conferences, Preparing for Generation NEXT program, and Tree Farm Dinners among other programs. Educational opportunities are provided for approximately 1,500 forest landowners, professionals, and others per year, with more than 50,000 acres represented annually. Virginia Forest Landowner Updates reach 7,200 landowners with 4 issues, and 12 e-newsletters are sent to 5,000 subscribers.

Virginia SHARP Logger Program - Provides training to loggers, foresters, and others on the principles of sustainable forestry, environmental protection, and workplace safety. This program is a partnership between FREC and the Sustainable Forestry Initiative, and allows us to provide training and research-based information to the vast majority of Virginia's logging businesses, with a recent survey indicating that over 63 percent of Virginia logging business owners made changes to their operations as a result of attending SHARP Logger trainings. Approximately 150 – 200 owner/operators are reached each year.

Virginia's Geospatial Education Program – This program serves to directly support the role of Virginia's communities and other stakeholders, by engaging professionals and organizations through technical training and assistance, through the development of educational resources, and through the identification and development of geospatial applications. The Geospatial Extension Program also coordinates with other organizations that have a vested interest in empowering local stakeholders and educators to better support the management of Virginia's resources. A key and unique component of this program, is its integration with Virginia Cooperative Extension, through all programming areas: Agriculture and Natural Resource, Community Viability, Food and Consumer Sciences, and 4-H Youth Educational initiatives, to support the dissemination of information, training, and application development at the grassroots level.

Virginia Master Naturalist Program – This program addresses the need for public engagement that is critical to the success of conservation and management of Virginia's woods, wildlife, and waters by supporting a statewide corps of volunteers providing education, outreach, and service dedicated to the beneficial management of natural resources and natural areas within their communities. With 29 chapters across Virginia, the program aims to extend the capacities of both state and local natural resource agencies and organizations to be able achieve their missions in new ways, engage new audiences, and work towards creating a citizenry more informed about and involved in natural resource conservation and management as they face difficult natural resource challenges, such as loss of forestland, sea level rise, and invasive species. The program, because of its chapter-based structure promotes education, stewardship, citizen science, and development of a social network that promotes solutions to these challenges. At the statewide level, the program is sponsored by seven state agencies, and on the local level, chapters partner with dozens of conservation and education organizations.

Agroforestry/Forest Farming – The agroforestry team is a collaborative, trans-disciplinary group of faculty, students, and staff working to advance and expand these practices and systems in temperate and tropical regions through innovative research, education and outreach programming. The mission is to discover, teach, and disseminate knowledge about the biophysical, social, and economic factors that affect management practices and influence the adoption and permanence of agroforestry systems. Specific activities have included: Non-timber Product Output Report for Forest Inventory Analysis, Forest Farming eXtension Community of Practice, Native Fruit and Nut Tree Riparian Buffers in the Chesapeake Bay Watershed, Agroforestry Preferences and Procedures in Cameroon, Building the Capacity of Appalachian Forest Farming Networks, Forest Certification Stakeholders, Bioenergy and Family Forest Sustainability, and Virginia's Link to Education about Forests (LEAF) program
Approximately 500 program participants, primarily.

Urban Forestry Extension – Our urban and community forestry program assists localities and citizens in making science-based decisions about tree care and urban forest stewardship. Because urban and community forestry is multi-disciplinary, our program relies on partnerships and expertise throughout Extension and across the Commonwealth.

Reynolds Homestead Forest Resources Research Center – The center was created to study forest biology, including genetics, physiology, and soils. The AREC was founded to serve a void that existed in our understanding of the biological and physical relationships of the forest ecosystem. Specific projects include harvesting to increase forest health and productivity, site preparation, forest fertilization, loblolly pine physiology, and forest herbicide testing. As a research facility primarily, the facility and staff provide an important outreach in the surrounding regional of Virginia, providing educational programs about forests, forestry, and water quality in the local schools.

E. INCLUSION AND DIVERSITY

1. In what specific ways does the department contribute to the college's and university's strategic plans for inclusion and diversity?

As identified by the FREC faculty, one of our core values is: "We actively seek and promote the contributions of diverse people and perspectives in pursuing our mission, and we commit to continuous improvement to foster an inclusive environment and to expand opportunities for all." Of course, the challenge is to truly put that into practice, and to maintain it as a priority throughout our program. Diversity and inclusion activities in which we are involved include the following:

FREC Diversity and Inclusion Committee – A Diversity and Inclusion committee was established in 2020 that includes faculty, staff, and graduate students. Currently, they are developing a mission statement, reviewing our existing Diversity and Inclusion Strategic Plan, working with the FREC Graduate Affairs Committee on developing a way to meet the new VT Graduate School diversity and inclusion requirement for all graduate programs, and reviewing our FREC Promotion and Tenure Expectations document.

FREC Diversity and Inclusion Strategic Plan - A Diversity and Inclusion Strategic Plan was developed in 2017 and submitted to the VT Office for Inclusion and Diversity for approval that outlines our vision, goals, and activities for promoting diversity and inclusion in our program.

USDA National Needs Fellowships – Our faculty have been successful in obtaining these diversity-based grants on an ongoing basis to support the diversity of our graduate student population.

Howard Hughes Medical Institute (HHMI) grant on Inclusive Excellence – We have been participating in the HHMI grant since 2018. Participation involves faculty training, reading groups, and development of departmental projects to be implemented in promotion of an inclusive environment. We are on our 2nd cohort of faculty (6 faculty members) involvement. Projects have included funding field equipment kits to be available for students with financial challenges to check out for a semester at a time. A professional skills course also has been developed by a faculty member involved with HHMI that includes a module on diversity and inclusion in the workplace, and that course is being offered to students across CNRE.

Future Faculty Diversity Program – Virginia Tech has a program that brings potential faculty members in for a four-day program on campus, with one day being devoted to a departmental interview process. The university supports hiring from this program by providing temporary funding for teaching and research faculty positions. FREC has hosted potential faculty members in 2019 and 2020 (virtual), though we have not yet been able to hire through this process.

2. Are the department's efforts to recruit and retain underrepresented students and faculty advancing the university's commitment to inclusion and diversity?

Our numbers of underrepresented undergraduate students have increased over the past 5 years, and those students generally are being successful in our programs. Although graduate student numbers have declined overall, the proportion of students from underrepresented groups has increased.

FREC faculty members from underrepresented groups has not increased over the past 5 years, though we have incorporated a search advocate on all searches over that time, and have participated in the Future Faculty Diversity Program. We are utilizing our FREC Diversity and Inclusion Committee and the new CNRE Director of Diversity, Equity, and Inclusion to further refine our recruitment of underrepresented faculty, and our search procedures.

3. How does the department create and sustain an organizational environment that acknowledges and celebrates diversity and employs inclusive practices throughout daily operations in classrooms, labs, and other department spaces?

We are participating in the HHMI grant, and continuing to recruit faculty cohorts for training in inclusive practices in courses and the department, support faculty reading groups, and developing inclusion projects to implement in our courses and program.

Our Forestry Graduate Student Association has formed an environmental justice reading group that meets regularly for discussion.

We are deploying our FREC Diversity and Inclusion Committee to evaluate our strategic plans, our expectations, and our faculty search procedures. We hope in the near future that they will help us evaluate the messaging on our website and other media, and to help us program special events that promote discussion of topics around diversity, equity, and inclusion.

Our FREC seminar series hosts weekly outside speakers in the spring semester, and for the past 5 years we have asked that at least one-half of speakers be female, or come from other underrepresented groups in our field.

Part II: Where does the department hope to be in five years?

1. Five-year plan

Based upon our FREC Vision, Mission, and Core Values, and our Academic Program Review findings, our direction for FREC over the next 5 years includes the following:

a) Continue undergraduate enrollment growth to 400 or more students – Making all undergraduate programs vibrant and successful, and to meet the needs of employers, involves continued enrollment growth to 400 or more students.

b) Be a diverse body of undergraduate students across majors and degrees that is reflective of the diversity of Virginia – We envision diversity in our enrollment that better reflects the diversity of the Commonwealth, and enrichens the growth of all of our students and prepares them for professional and personal lives that befit the Virginia Tech motto "*Ut Prosim*," that I may serve.

c) Graduate student enrollment of 60 or more students – We seek to rebuild our graduate enrollment to 60 or more students to revitalize that aspect of our educational mission, and to support the undergraduate teaching and research missions of our program.

d) Diverse body of graduate students – We envision greater diversity of our graduate student population, particularly racial/ethnic diversity, and a larger international student population.

e) Diverse faculty across currently underrepresented groups – We believe that greater diversity, both in gender and racial/ethnic proportions would help build a more inclusive environment, enrich all perspectives and ideas, and improve student diversity.

f) External research grant level that allows us to make meaningful contributions to grand challenges and support our desired graduate student population – A strong external gran program allows us to contribute to solving the grand challenges associated with forest and environmental resources of the Commonwealth, the nation, and the globe, and is necessary to support a vibrant graduate student education program.

g) Continued excellence in extension/outreach to Virginia, with enhanced engagement of rural SW Virginia and underrepresented/underserved populations – We seek to continue and build on our outstanding extension/outreach program, developing further outreach into rural, southwest Virginia that is struggling with economic opportunity, and into underserved communities across the state for the betterment of the Commonwealth as a whole and in keeping with our land grant mission.

h) Continued team-oriented, service-oriented staff environment with greater development of specialized skills and roles – Strong teaching, research, and extension/outreach programs requires a team-oriented/service-oriented staff with the skills needed to support faculty and students in the time, and with sufficient cross-training to ensure continuity of operations through difficulties.

2. Gaps between where our programs are now and where we would like them to be

a) Continue undergraduate enrollment growth to 400 or more students –

Gap: Recent stagnation in our overall enrollment trend, due to university enrollment cap. In particular, we see lower than desired enrollment in Environmental Informatics and Water: Resources, Policy, and Management.

b) Be a diverse body of undergraduate students across majors and degrees that is reflective of the diversity of Virginia –

Gap: FREC undergraduate diversity is growing, but remains low overall.

c) Graduate student enrollment of 60 or more students –

Gap: FREC has a declining enrollment trend in graduate students, and our official count in fall 2020 was 37 students. Our official numbers represent a slight undercount, due to FREC funded students using the interdisciplinary Geospatial and Environmental Analysis students, and students not fully enrolled as they complete degrees.

d) Diverse body of graduate students –

Gap: We have low graduate student diversity among racially/ethnically underrepresented groups.

e) Diverse faculty across currently underrepresented groups –

Gap: FREC has low faculty diversity among underrepresented groups.

f) External research grant level that allows us to make meaningful contributions to grand challenges and support our desired graduate student population –

Gap: Although the recent trend is upward, we have seen a dip in external grant support since the last review.

g) Continued excellence in extension/outreach to Virginia, with enhanced engagement of rural SW Virginia and underrepresented/underserved populations –

Gap: We are known for strong outreach to currently targeted communities, though we could go further to reach potential clientele who have not yet been reached.

h) Continued team-oriented, service-oriented staff environment with greater development of specialized skills and roles –

Gap: Greater attention to staff training and development will be needed to support higher undergraduate and graduate enrollment, increased external grant funding, and expanded extension/outreach.

3. Extent to which available resources reflect the department's capacity to achieve its desired goals

- Personnel –

  T/R faculty needs –

  -Urban forestry – Currently, we are down ½ FTE in urban forestry due to lose of a faculty member who was shared with CALS. This faculty position is needed to meet current needs in supporting the Ecological Cities Pathways minor, and could give us greater ability to participate in the CNRE initiative in Urban Natural Resources. The position could support urban forestry directly, especially in the area of human dimensions of urban forestry, or more indirectly in the area for tree/forest health as a pathologist or entomologist.

  -Destination area(s) – To support an Invasive Species destination area, we envision an additional T/R faculty position in Tree/Forest Pathology or Entomology, though this position potentially could serve both of our urban forestry and invasive species needs. An additional T/R faculty position would be needed to support an additional DA proposal in climate and carbon, environmental data sciences, or related areas.

  Extension faculty/extension associate –

  -Extension associate in forest landowner/logger education – This need is being met currently though an extension associate funded on external grant, and the funding stream is likely to not be sustained. Permanent salary resources are needed to keep these programs viable in the future.

  -Additional outreach position – An additional position is needed to support any expansion of outreach into underserved communities, and/or to support outreach that will be associated with work in invasive species.

  Staff – Reassessment of the allocation of staff resources, training, and professional development is needed to support plans for the next 5 years.

- Financial –

  Faculty and staff salaries have lagged for several years, and there has been little opportunity to reward faculty or staff for meritorious efforts. Attrition of faculty is likely to occur if salaries continue to remain relatively stagnant.

  Greater flexibility in use of university-provided tuition remission funds, would allow the department head to support faculty who are piecing together graduate student funding, and increase graduate student enrollment

  Resources to support professional meetings and international travel would improve faculty visibility and allow for greater networking opportunities for our graduate students.

- Facilities – Space is severely limited for additional faculty and staff offices, as well as laboratory and equipment storage space.

Part III: How will the department get there?

FREC 5-year action plan

Desired condition	Existing gap from desired condition	Strategies and Resources	Target condition
a) Continue undergraduate enrollment growth to 400 or more students	Recent stagnation in overall enrollment trend – low enrollment in Environmental Informatics and Water: Resources, Policy, and Management	Strategies: 1) University allowing sufficient enrollment in a necessity (university administration) 2) Revision of Environmental Informatics major to establish its distinctiveness as a program, and its place among data analytics/data science programs on campus and in the Commonwealth (FREC faculty and department head) 3) Review and revise, if necessary, the marketing and content of our Water: Resources, Policy, and Management B.S. degree/major to ensure that it is recognized and accessible to students interested in water policy and management (FREC faculty and department head) 4) Participate as a key component of CNRE Urban Natural Resources initiative to build programming in urban environments (FREC faculty and department head) 5) Continue to support culture of outstanding teaching, and reward high quality teaching (FREC faculty and department head) 6) Continue the ongoing process of reviewing and updating our overall curricula marketing and content to retain our recognition as the "go to" place for those looking for answers to grand challenges of forest and environmental questions at the local, regional, national, and global scales, and to be the "go-to" place for those looking to hire the next generation of practitioners, researchers, and leaders (FREC faculty, staff, and department head) 6) Achieve STEM status for our undergraduate degree programs (FREC faculty and department head) Resources needed: 1) Relaxation of university restriction on enrollment 2) Salary funds to reward quality teaching	400 undergrads in FREC programs by fall 2026
b) Diverse body of undergraduate students across majors and degrees that is reflective of	Growing, but low student diversity	Strategies: 1) Continue to build inclusive environment through faculty training opportunities and projects supported by programs like the HHMI grant (FREC faculty and department head) 2) Seek funding of additional scholarships for students from underrepresented groups (FREC department head and CNRE Development)	Continued upward trending diversity across all options through the period to 2026

the diversity of Virginia		3) Partner in CNRE Urban Natural Resources initiative to build programming in urban environments with coordinated Urban Forestry curricula and faculty support (FREC faculty and department head) 4) Build on existing studies abroad and experiential learning opportunities that develop cultural awareness (FREC faculty and department head) 5) Continue faculty participation in outreach programs to potential/future underrepresented-underserved students (FREC faculty and department head) 6) Achieve STEM status for our undergraduate degrees to support ROTC scholarships and for program visibility among underrepresented populations (FREC faculty and department head) 7) Build greater faculty diversity (FREC faculty and department head) <u>Resources needed</u>: 1) FREC faculty position to support Urban Natural Resources initiative	
c) Graduate student enrollment of 60 or more students	Declining enrollment trend	<u>Strategies</u>: 1) Faculty will create opportunities through increased external grant funding (FREC faculty and department head) 2) Dept Head and GAC will utilize Burress, Dann, and Georgia Pacific fellowship funds to create recruitment tools for new graduate students (FREC department head) 3) Build on recently developed Accelerated Degree Program and 3+2 program(s) to promote more accessible graduate degree opportunities for qualified undergraduates at Virginia Tech and other programs (FREC faculty and department head) 4) Establish M.S. and Ph.D. programs in Water: Resources, Policy, and Management (FREC faculty and department head) 5) Achieve STEM status for our graduate degrees for program visibility, and to attract top international graduate students (2 year OPT for STEM degrees) (FREC faculty and department head) <u>Resources needed</u>: 1) Greater flexibility in use of salary remission funds to support graduate enrollment 2) Salary funds to reward faculty research success	60 graduate students in FREC by fall 2026
d) Diverse body of graduate students	Low graduate student diversity among racially/ethnically underrepresented groups	<u>Strategies</u>: 1) Continue to build inclusive environment through faculty training opportunities and projects supported by programs like the HHMI grant (FREC faculty and department head) 2) Explore establishment of “3+2” programs with HBCUs/HSIs/MSIs (FREC faculty and department head)	Continued upward trending diversity across degrees through the period to 2026

		3) Achieve STEM status for our undergraduate degrees to support ROTC scholarships and for program visibility among underrepresented populations (FREC faculty and department head) 4) Build greater faculty diversity (FREC faculty and department head)	
e) Diverse faculty across currently underrepresented groups	Low faculty diversity among underrepresented groups	<u>Strategies</u>: 1) Continue to participate in Future Faculty Diversity program - having faculty identify and pursue potential candidates (FREC faculty and department head) 2) Work with new CNRE Director of Diversity and Inclusion to establish ways to identify and recruit talent for FFD program (FREC faculty, department head, and Director of Diversity and Inclusion) 3) Continue to utilize search advocate in all faculty searches (FREC faculty and department head) 4) Have FREC Diversity and Inclusion Committee review P&T Expectations document and search position descriptions (FREC faculty and department head) 5) Enact annual review of FREC Diversity and Inclusion strategic plan and evaluate progress – department head and D&I committee (FREC faculty and department head) <u>Resources needed</u>: 1) Position support for opportunistic hiring	Continued upward trending faculty diversity through the period to 2026
f) External research grant level that allows us to make meaningful contributions to grand challenges and support our desired graduate student population	Dip in external grant support – continued current growth desired	<u>Strategies</u>: 1) Continue to promote mentoring relationships that build proposal-writing/grantsmanship skills in junior faculty members (FREC faculty and department head) 2) Seek to establish funds to assist faculty in proposal development and support faculty in pursuing high impact, transformative research proposals (FREC faculty and CNRE Development) 3) Continue to support high impact scholarship, and reward high impact effort (FREC faculty and department head) 4) Continue strategic faculty hiring to promote productive areas of endeavor (FREC faculty and department head) 5) Continue to support industrial affiliates programs to promote private sector support and collaboration in the research endeavor (FREC faculty and department head) 6) Participate in one or more Destination Area proposals developed around existing or emerging challenges associate with forests and environmental resources, such as invasive species, climate and carbon, environmental data sciences, and related areas (FREC faculty and department head) <u>Resources needed</u>: 1) Salary funds to reward faculty research success	Achieve sustained expenditure level of over $7.5 million (real) annually by 2026

g) Continued excellence in extension/outreach to Virginia, with enhanced engagement of rural SW Virginia and underrepresented/underserved populations	Strong outreach to currently targeted communities, with potential clientele who have not yet been reached	Strategies: 1) Seek support for permanent extension associate position to assist with current and new programming (FREC department head and Virginia Cooperative Extension) 2) Seek support for additional extension faculty for programming with rural, southwest Virginia, and/or underserved populations across the state (FREC department head and Virginia Cooperative Extension) 3) Seek greater partnership with Virginia State University in programming Partnerships (FREC faculty and department head) 4) Continue to support high quality/high impact extension/outreach programs, and reward high quality/high impact programs (FREC department head and Virginia Cooperative Extension) Resources needed: 1) Permanent salary funding of soft money portion of extension associate position 2) Additional extension faculty position for extended programming to SW Virginia and/or underserved-underrepresented communities 3) Salary funds to reward extraordinary extension/outreach programming	Continued outstanding extension/outreach program where reach is extended to underserved areas and populations
h) Continued team-oriented, service-oriented staff environment with greater development of specialized skills and roles	Greater attention will be needed to support higher undergraduate and graduate enrollment, increased external grant funding, and expanded extension/outreach	Strategies: 1) Promote greater staff cross-training on essential departmental functions/back-up functions (FREC department head and Admin) 2) Promote and greater professional development opportunities and specialized skills training (FREC staff and department head) 3) Training in inclusive practices in academic work environments (FREC staff and department head) 4) Reward team-oriented, service-oriented work (FREC department head) 5) Reward development of specialized skills (e.g., media development, grant support, and others) (FREC department head) Resources needed: 1) Salary funds to reward exemplary performance	Staff team with specialized roles within a team-oriented, service-oriented