COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
VIRGINIA TECH.

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February 10, 2020

To: Dr. Kerry Redican, Chair, and Members of the Commission on Undergraduate Studies & Policies (CUSP)

Subject: Opposition to Resolution 2019-2020.K, Resolution to approve new major, Environmental Economics, Management, and Policy, in Bachelor of Science in Applied Economic Management

The College of Natural Resources and Environment (CNRE) strongly objects to inclusion of the words 'management' and 'policy' in the title of the proposed major *Environmental Economics, Management, and Policy* (EEMP), which is seeking elevation from current status as an option within the B.S. Applied Economic Management (AEM). We object to this resolution for the following reasons:

Concept of the Major Name

- Although the EEMP name has been long established as an option in the AEM major, the breadth of expertise implied by EEMP as a major is spurious. Taken at face value, 'economics', 'management', and 'policy' encompass almost every aspect of human endeavors in the environmental studies realm. How can it be forthright to students, employers, and citizens that an undergraduate major can have this much breadth and simultaneously provide a graduate with sufficient depth to be a competent professional in any one of these three areas. Likewise, how is it fair to other academic units—and the faculty in those units—to allow such a broad claim of environment studies? Doing so encroaches on their academic enterprises and their professional identities on campus and beyond.
- There are already six majors offered across the university with names beginning with 'environmental'—two of which also share with EEMP the term 'management' or 'policy' in their names [*Environmental Resources Management* (ERM), *Environmental Policy and Planning* (EPP)] (Appendix A). In addition to offering the ERM major, CNRE offers a major focused on an environmental sector that includes the words 'management' and 'policy' (*Water: Resources, Policy, and Management*). We acknowledge that environmental studies is a field that is growing, evolving, and specializing—this merits additional choices for students. But are we confusing students by adding to a list of majors with such similar names? Are we leading students to make poor decisions about their academic majors that could, subsequently, lengthen time to degree completion? Are we truly offering more choices for students, or simply permitting cannibalism of a common pool of students with an interest in environmental studies?

- The current description of the EEMP option of the AEM major on Virginia Tech's Programs of Study website (vt.edu/academics/majors.html) provides no clear linkage of the curriculum to 'management' of the environment. A passage refers to 'use of natural resources'—a term that could be defined and interpreted in several ways—but typically connotes extractive or consumptive activities such as harvesting food, fiber, or energy. The Centre for Development, Environment and Policy at the SOAS University of London defines environmental management as "concerned with the description and monitoring of environmental changes, with predicting future changes and with attempts to maximise human benefit and to minimise environmental degradation due to human activities"[1]. Juxtapose this definition with the description of the ERM major offered through CNRE, which supports a "broad understanding of ecosystem management" and "critical skills and expertise needed to manage environmental resources". Career options listed for ERM include 'environmental resource manager', 'watershed manager', and 'wetlands manager'. Between the EEMP major and the ERM major, which one can rightfully claim to be preparing students for a career in environmental management and therefore use those terms in the name of the major?

Authenticity of the EEMP Curriculum

- Elevating a field of study to a major implies that students completing that curriculum possess knowledge and skills to work proficiently in that field upon graduation. This is a subtle—yet important—distinction from an option within a major. The existing arrangement of AEM and EEMP makes a clear distinction that a student completing the AEM major has primarily received education and training in the application of economics to environmental management and has secondarily developed basic awareness and competency in the application of policy to environmental management. This is and has been a fair and honest assessment of students completing the AEM–EEMP curriculum. To elevate EEMP to a major would imply an evolution of the curriculum checksheet: new courses and more coursework in environmental management. That is how you would justify a major and justify a claim that students completing the curriculum have elevated their competency in environmental management. Yet comparing the proposed checksheet for the EEMP major to the existing checksheet of the AEM-EEMP option (Appendix B), it is nearly the exact same curriculum with some structural changes to incorporate Pathways. There is not a single new technical course in the curriculum. How can this justify elevation to a major bearing that name?
- Another premise of the resolution is that the Department of Agricultural and Applied Economics (AAEC) "...provides coursework and experiential learning...that gives students an in-depth understanding of these respected fields". No doubt, the courses and instruction offered by AAEC are top notch. But how much experiential learning is offered to students, specifically field-based learning that is critical to competency in environmental management? There appears to be only one AAEC course that meets outside a standard lecture format, and no AAEC courses are designated as labs. Additionally, only two courses containing the word 'policy' appear within the proposed EEMP major checksheet. Only one of these courses is taught by AAEC (Appendix B).

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[1] *1.3 What is environmental management?. (2020). Soas.ac.uk. Retrieved 1 February 2020, from https://www.soas.ac.uk/cedep-demos/000_P500_ESM_K3736-Demo/unit1/page_10.htm*

- As with the existing checksheet of the AEM-EEMP option, the proposed checksheet for the EEMP major includes 18 credits of restricted elective coursework in which students develop an area of specialization. Here lies an opportunity for students to perhaps develop some expertise in environmental management. But this specialization coursework is a black box. There is no section in the AEM-EEMP checksheet that shows the list of courses from which students may build their specialization. The web link to EEMP option requirements on the AAEC website is disabled. How are decisions made about creating a specialization? What courses are considered for a specialization? This lack of transparency is problematic. Presumably students have in the past—and will continue in the future—to form a specialization in either economics, management, or policy through this coursework. That is a reasonable approach to professional preparation. The issue going forward is that students graduating with a major in EEMP and a specialization in management or policy may be indistinguishable in title from students graduating with existing majors in CRNE—yet have very different expertise. Are we comfortable with this potential dilemma for our students entering the job market and for prospective employers making hiring decisions?
- In contrast to the proposed EEMP major, degrees and majors within CNRE center on the intersection of environment, policy, and management—especially in the Department of Forest Resources and Environmental Conservation (FREC) majors: (1) *Environmental Resources Management*, (2) *Water: Resources, Policy, and Management*, and (3) *Environmental Conservation and Society*. These majors require that undergraduate students learn a multidisciplinary approach to environmental management and policy that is clearly articulated in their checksheets (Appendix C); these checksheets for CNRE majors have multiple courses with policy and management as central foci (and in fact, these words are present in the titles of many courses taught within CRNE, particularly FREC). In addition, curricula for these three majors offer significant field-based learning that is necessary for appropriate environmental management. For example, the ERM major has no fewer than seven courses offered by FREC that have a field-based lab component and there are several other labs in the ERM curriculum from other departments.
- Additionally, CNRE offers curricula that educate students about environmental economics. Existing degrees with CNRE include robust training in environmental economics (e.g., natural resource economics, forest economics, water resource economics and policy), but also in approaches that AAEC and the College of Agriculture and Life Sciences (CALS) cannot offer. For example, CNRE offers training in areas such as policy formation and grass roots advocacy, non-economic based human dimensions including cultural and normative values in management and policy, stakeholder interactions, leadership and sustainability, communication, education, psychology, collaborative methods and conflict, policy formation through legislative and non-legislative pathways, land management, water quality and quantity management, aspects of ecology important to management, and natural resource and environmental measurements that inform management and policy formation. Content in these critical areas are offered in CNRE courses that include FREC 2514 (Wildland Fire Ecology and Management), NR 2554 (Leadership for Global Sustainability), FREC 2614 (Human-Environment Systems), FREC 2784 (Global Forest Sustainability), FREC 3364 (Environmental Silviculture), FREC 3524 (Environmental Interpretation), FREC 3544 (Outdoor Recreation Management), FREC 3564 (Outdoor Recreation Planning), FREC 4014

(Natural Resource Economics), FREC 4434 (Natural Resource Policy), FREC 4464 (Water Resources Policy & Economics), among others, taught by a range of disciplinary scientists.

Lack of Justification for the Proposed EEMP major

- A premise of the resolution for the EEMP major is that AEM "is not very meaningful to students". This implies that there is a 'branding' issue—the consumer is failing to recognize the features and benefits of the product based on the name. Rebranding is certainly an approach to improving consumer awareness of the product. But there also must be 'truth in advertising'. Changing a product name to include terms that will catch the eye of the consumer is savvy, but it is disingenuous for that rebranding to imply that the product has features it does not possess (as we have previously noted).
- A premise of the resolution for creating the EEMP major is that "students enrolled in one of these concentrations/options…are disappointed that it is not listed on their diploma". The reason that it is not listed on their diploma is because applied economics is their primary expertise, not environmental management and policy. Placing EEMP on a student's diploma, based on the checksheet presented, is misleading and is unfair to students who have completed similar CNRE majors and can rightfully claim expertise in environmental management and policy to the labor market.
- The proposed EEMP major **is not**, in our view, **needed** at Virginia Tech due to existing majors that fill this niche. Additionally, the proposed EEMP major is **not constructed** to adequately serve students interested in environmental management and policy. At face value, 'management' and 'policy' in the proposed title are redundant with majors currently existing at Virginia Tech. More importantly, however, the proposed EEMP major lacks the breath of management and policy courses necessary to prepare students for careers in environmental management and environmental policy, and this is clear from the paucity of courses on the proposed EEMP checksheet that do not include management or policy in course titles (Appendix B). Our position is therefore that the proposed title of the EEMP degree is potentially misleading because the actual content of the EEMP degree is more narrowly defined by economics rather than by the suite of processes and subjects that form a foundation for a rigorous and holistic curriculum in management and policy.

Concluding Statement

Our objections concerning the words management and policy are similar to the CALS objection raised with our water degree that was proposed a few years ago, which was initially titled as *Water: Resources, Policy, and Science*. CALS argued that the word 'science' should not be present in this degree name because they already offered an environmental science degree that covered aspects of science that we do not offer in CNRE. We compromised by substituting the word 'management' for 'science' given the faculty expertise and coursework present in FREC. As such, we are asking for a reciprocal (and thereby consistent) compromise for the EEMP major to not include 'management' or 'policy' in the name because CNRE majors are clearly management- and policy-based and offer the best option for students seeking those expertise and credentials.

Sincerely,

P. Eric Wiseman, Ph.D.
Associate Professor of Urban and Community Forestry and CNRE Representative to CUSP

Gregory Amacher

Gregory Amacher, Ph.D.
Professor of Forest Economics & Management

Kelly Cobourn

Kelly Cobourn, Ph.D.
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Jay Sullivan, Ph.D.
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Paul M. Winistorfer

Paul M. Winistorfer, Ph.D.
Dean, College of Natural Resources and Environment

Keith W. Goyne

Keith W. Goyne, Ph.D.
Associate Dean, College of Natural Resources and Environment

APPENDIX A

Excerpt from list of Programs of Study on the Undergraduate Majors website (vt.edu/academics/majors.html) showing majors with names beginning with 'environmental'.

Environmental Conservation and Society
Environmental Horticulture
Environmental Informatics
Environmental Policy and Planning
Environmental Resources Management
Environmental Science

APPENDIX B

Checksheet for the *Environmental Economics, Management, and Policy* Option of the *Applied Economic Management* Major (2020 graduating year).

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University Registrar

Virginia Polytechnic Institute & State University College of Agriculture & Life Sciences
Bachelor of Science in Applied Economic Management (BS AEM)
Environmental Economics, Management, and Policy Option (EEMP)
For Students Graduating in Calendar Year 2020

Part I. UNIVERSITY, COLLEGE, AND DEPARTMENT CLE*

*** The total number of credit hours will vary depending upon whether Curriculum for Liberal Education courses are used to meet specific requirements in Part II. Some Curriculum for Liberal Education courses may also fulfill departmental requirements, but the credit hours may not be counted twice.**

(Area 1)	ENGL 1105-1106	Freshman English	3____, 3____
(Area 2)	(Ideas, Cultural Traditions, and Values)		3____, 3____
(Area 3)	AAEC 1005-1006[1]	Econ. of the Food and Fiber System	3____, 3____
(Area 4)	(Scientific Reasoning and Discovery)	Lecture	3____, 3____
		Lab	1____, 1____
(Area 5)	MATH 1525-1526[2]	Elem. Calculus with Matrices	3____, 3____
(Area 6)	(Creativity and Aesthetic Experience)		1____
(Area 7)	(Critical Issues in a Global Context)		3____
	ACIS 2115	Principles of Accounting	3____
	FIN 3104[3]	Introduction to Finance	3____
	COMM 2004 or	Public Speaking	
	ALCE 3634[4]	Comm. Ag. & Life Sci. in Speaking	3____
	ENGL 3774[5]	Business Writing	3____

Part II. ENVIRONMENTAL ECONOMICS, MANAGEMENT AND POLICY OPTION (EEMP)

A. Disciplinary Core Courses (25 credit hours)

AAEC 2434[6]	Foundations of Agribusiness	3____
AAEC 3004	Agricultural Production and Consumption Econ.	3____
AAEC 4324	Rural and Regional Development Policy	3____
AAEC 3314	Environmental Law (also Area 7 Class)	3____
AAEC 3324	Environment and Sustainable Dev. Economics	3____
AAEC 4314	Environmental Economic Analysis and Mgmt.	3____
AAEC 3024	Monetary and Global Issues in Applied Econ.	3____
ENSC 1015	Foundations of Environmental Science	3____
AAEC 3015	AAEC Internship	1____

B. Analytical Methods (8-9 hours)

STAT 3005, STAT 3615 or BIT 2405	Statistical Methods or Quantitative Methods	3____
and AAEC 3014[7]	Analytic Methods in Applied Economics	3____
Take 1 of:		
AAEC 4504	Agricultural Price and Market Analysis	2 or 3____
GEOG 2084[8]	Introduction to Geographic Information Systems	
AAEC 3514	Agricultural Futures and Options	
AAEC 4804	Elementary Econometrics	
ALS 4614	Watershed Assessment, Management, and Policy	

C. Restricted Electives -- 9 hours total (6 hours must be at the 3000 level or higher)

AAEC_____	_____	3____
AAEC_____	_____	3____
AAEC_____	_____	3____

Part III. AREA OF SPECIALIZATION AND FREE ELECTIVES

A. Area of Specialization (18 hours) – AAEC advisor must approve area of specialization courses and the student must file an *area of specialization* form with the AAEC undergraduate office. Students should consider minors or double majors. At least 15 hours must be at the 3000 level or higher (unless noted otherwise for a minor in another academic department).

Course		Course	
_____	3____	_____	3____
_____	3____	_____	3____
_____	3____	_____	3____

B. Free Electives (number needed to complete 120 hours)

_____	3____	_____	3____
_____	3____	_____	3____

APPENDIX B (continued)

Checksheet for the *Environmental Economics, Management, and Policy* Option of the *Applied Economic Management* Major (2020 graduating year).

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University Registrar

NOTES:

Pre-requisites: Some courses required for this major have prerequisites. Please refer to the Undergraduate Course Catalog or consult your advisor for information about prerequisites.
Foreign Language Requirement: Students who do not successfully complete at least two units of a single foreign language, classical language or American Sign Language during high school must successfully complete six semester hours of a single college level foreign or classical language at the college level. Such semester hours are in addition to those normally required for graduation. Please see the Undergraduate Catalog for details.
GPA: In major calculation is from all AAEC and ECON classes taken. An overall GPA of at least 2.0 is required to meet the University's minimum standard for good academic standing. Overall and in-major GPA's of at least 2.00 are required for graduation.
Satisfactory progress: By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing and credit by examination), "satisfactory progress" will consist of 1) an overall GPA of at least 2.0; 2) at least 24 credits that apply to the University Curriculum for Liberal Education, and 3) 9 semester credits of departmental requirements.

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[1] Or take ECON 2005-2006: Principles of Economics
[2] Or take MATH 1025-1026: Elem. Calculus; or MATH 1225-1226: Calculus of a Single Variable. Students considering graduate school in applied economics are encouraged to take MATH 1225-1226.
[3] Or take ACIS 2116: Principles of Accounting.
[4] Or take COMM 2014: Speech Communication; or COMM 3134: Argumentation and Decision-Making.
[5] Or take ENGL 3764: Technical Writing; or ENGL 3754: Advanced Composition.
[6] Or AAEC 2104: Personal Financial Planning.
[7] Or BIT 2405-2406, or STAT 3005-3006 or STAT 3615-3616.
[8] Or BSE 4344: Geographic Information Systems for Engineers.

APPENDIX B (continued)

Checksheet for the proposed *Environmental Economics, Management, and Policy* Major (2022 graduating year).

Virginia Polytechnic Institute & State University
College of Agriculture & Life Sciences
Bachelor of Science in Applied Economic Management
Environmental Economics, Management, and Policy Major (EEMP)
For Students Graduating in Calendar Year 2022 and Date of Entry under UG Catalog 2020-2021

Part I. UNIVERSITY, COLLEGE, AND DEPARTMENT PATHWAYS*

*** The total number of credit hours will vary depending upon whether Pathways courses are used to meet specific requirements in Part II. Some Pathways courses may also fulfill departmental requirements, but the credit hours may not be counted twice.**

Pathways Concepts (45 hours):		
Concept 1 - Discourse – Foundational	ENGL 1105-1106	3____, 3____
Discourse – Advanced	COMM 2004	3____
Concept 2 – Critical Thinking in the Humanities	Any Concept 2 Courses	3____, 3____
Concept 3 – Reasoning in the Social Sciences	AAEC 1005, 1006[1]	3____, 3____
Concept 4 – Reasoning in the Natural Sciences	Any Concept 4 Lecture Courses	3____, 3____
Concept 5 – Quantitative & Computational Thinking-Foundational	MATH 1025-1026[2]	3____, 3____
Quantitative & Computational Thinking-Advanced	*STAT 3615[3]	3____
Concept 6 – Critique & Practice in Design and the Arts-Design	Any Concept 6 Design Course	3____
Critique & Practice in Design and the Arts-Arts	Any Concept 6 Arts Course	3____
Concept 7 – Critical Analysis of Identity & Equity in the US	Any Concept 7 Course	3____

Part II. ENVIRONMENTAL ECONOMICS, MANAGEMENT AND POLICY MAJOR (EEMP)

A. Degree Core Courses (19 credit hours)

*AAEC 2434	Foundations of Agribusiness	3____
*AAEC 3004	Agricultural Production and Consumption Economics	3____
*AAEC 3024	Monetary and Global Issues in Applied Economics	3____
AAEC 3015	AAEC Internship	1____
*AAEC 3014[4]	Analytical Methods in Applied Economics	3____
ACIS 2115	Principles of Accounting	3
* ENGL 3774[5]	Business Writing	3____

B. Major Core Courses (18 hours):

AAEC 3314	Environmental Law	3____
*AAEC 3324	Environment and Sustainable Development Economics	3____
*AAEC 4314	Environmental Economic Analysis and Management	3____
*AAEC 4324	Rural and Regional Development Policy	3____
ENSC 1015	Foundations of Environmental Science	3____
*FIN 3104[6]	Introduction to Finance	3

C. Analytical Methods (2-3 hours)

Take 1 of:

*AAEC 4504	Agricultural Price and Market Analysis	2 or 3____
GEOG 2084[7]	Principles of Geographic Information Systems	
*AAEC 3514	Agricultural Futures and Options	
*AAEC 4804	Elementary Econometrics	
*ALS 4614	Watershed Assessment, Management, and Policy	

D. Restricted Electives – 9 hours total (6 hours must be at the 3000 level or higher)

AAEC_____	_____	3____
AAEC_____	_____	3____
AAEC _____	_____	3____

Part III. AREA OF SPECIALIZATION AND FREE ELECTIVES

A. Area of Specialization (18 hours) – AAEC advisor must approve area of specialization courses and the student must file an *area of specialization* form with the AAEC undergraduate office. Students should consider minors or double majors. At least 9 hours must be at the 3000 level or higher (unless noted otherwise for a minor in another academic department).

Course		Course	
_____	3____	_____	3____
_____	3____	_____	3____
_____	3____	_____	3____

B. Free Electives (9 hours -Number needed to complete 120 hours)

_____	3____	_____	3_____
_____	3____		

APPENDIX B (continued)

Checksheet for the proposed *Environmental Economics, Management, and Policy* Major (2022 graduating year).

NOTES:

***Pre-requisites:** Some courses required for this major have pre-/co-requisites and/or enrollment requirements. Please refer to the Undergraduate Course Catalog or consult your advisor for information about pre-/co-requisites and enrollment requirements.
Program Total Hours: 120 credit hours required for graduation with this degree.
Foreign Language Requirement: Students who do not successfully complete at least two units of a single foreign language, classical language or American Sign Language during high school must successfully complete six semester hours of a single college level foreign or classical language at the college level. Such semester hours are in addition to those normally required for graduation. Please see the Undergraduate Catalog for details.
GPA: In major calculation is from all AAEC and ECON classes taken. An overall GPA of at least 2.0 is required to meet the University's minimum standard for good academic standing. Overall and in-major GPA's of at least 2.00 are required for graduation.
Satisfactory progress: By the end of the academic year in which the student has attempted 72 hours (including transfer, advanced placement, advanced standing and credit by examination), "satisfactory progress" will consist of 1) an overall GPA of at least 2.0; 2) at least 30 credits that apply to the Pathways to General Education, and 3) 9 semester credits of departmental requirements.

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[1] Or take ECON 2005-2006: Principles of Economics
[2] Or take MATH 1225-1226: Calculus of a Single Variable. Students considering graduate school in applied economics are encouraged to take MATH 1225-1226.
[3] Or STAT 3005
[4] Or BIT 2406, or STAT 3006, or STAT 3616
[5] Or take ENGL 3764: Technical Writing; or ENGL 3754: Advanced Composition.
[6] Or ACIS 2116: Principles of Accounting.
[7] May also take BSE 4344 Geographic Information Systems for Engineers.

APPENDIX C

Checksheet for the *Environmental Resources Management* Major (2020 graduating year).

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University Registrar

COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
Department of Forest Resources and Environmental Conservation
Bachelor of Science in Forest Resources and Environmental Conservation
Major: Environmental Resource Management
For Students Graduating in Calendar Year 2020

Minimum credit hours required for graduation is 120. Prerequisites or enrollment restrictions may apply to some courses. Consult the undergraduate course catalog or the time table of classes.

Degree Core Requirements (21 credits)

Forest Science (9 credits – take all)

____ 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 3314 Forest Ecology and Silvics (3 credits)

Geospatial Analysis (3 credits – take all)

____ FREC 4114 Information Technologies for Natural Resource Management (3 credits)

Environmental Economics (3 credits – take all)

____ FREC 4014 (NR 4014) Natural Resources Economics (3 credits)

Policy (3 credits – take all)

____ FREC 4434 Natural Resource Policy (3 credits)

Oral Communication (3 credits – take one)

____ COMM 2004 Public Speaking (3 credits) **or** FREC 3524 Environmental Interpretation (3 credits)

Major Requirements (34 credits)

____ CHEM 1035 General Chemistry (3 credits)
____ CHEM 1045 General Chemistry Lab (1 credit)
____ CSES 3134 (ENSC 3134) Soils in the Landscape (3 credits)
____ FREC 2004 Forest Ecosystems (3 credits) **or** BIOL 2804 Ecology (3 credits)
____ FREC 2414 Field Experience in Forest Resources and Environmental Conservation (2 credits)
____ FREC 4354 Forest Soil and Watershed Management (3 credits)
____ FREC 4374 Forested Wetlands (3 credits)
____ FREC 4464 (AAEC 4464) Water Resources Policy and Economics (3 credits)
____ GEOS 1024 Resources Geology (3 credits)
____ GEOS 1124 Resources Geology Lab (1 credit)
____ GEOS 3014 Environmental Geosciences (3 credits)

Geospatial Analysis Elective (3 credits – take one)

____ FREC 4214 Forest Photogrammetry and Spatial Data Processing (3 credits)
____ GEOG 4354 (GEOS 4354) Introduction to Remote Sensing (3 credits)
____ STAT 3615 Biological Statistics (3 credits)

APPENDIX C (continued)

Checksheet for the *Environmental Resources Management* Major (2020 graduating year).

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Restricted Electives (15 to 16 credits – see accompanying lists)

____ Global Environmental Issues Restricted Elective (3 credits)
____ Law Restricted Elective (3 credits)
____ Public Relations Restricted Elective (3 credits)
____ Urban Environments Restricted Elective (3 credits)
____ Water Restricted Elective (3 or 4 credits)

CLE Requirements (36 credits)

Area 1: Writing and Discourse (6 credits)

____ ENGL 1105 First-Year Writing (3 credits)
____ ENGL 1106 First-Year Writing (3 credits)

Area 2: Ideas, Cultural Traditions, and Values (6 credits)

____ FREC 2554 (LAR 2554, NR 2554) Leadership for Global Sustainability (3 credits)
____ CLE Area 2 course: _____ (3 credits)

Area 3: Society and Human Behavior (6 credits)

____ AAEC 1005 Economics of the Food & Fiber System **or** ECON 2005 Principles of Economics (3 credits)
____ CLE Area 3 course: _____ (3 credits)

Area 4: Scientific Reasoning and Discovery (8 credits)

____ BIOL 1105 Principles of Biology (3 credits)
____ BIOL 1115 Principles of Biology Lab (1 credit)
____ BIOL 1106 Principles of Biology (3 credits)
____ BIOL 1116 Principles of Biology Lab (1 credit)

Area 5: Quantitative and Symbolic Reasoning (6 credits)

____ MATH 1025 Elementary Calculus (3 credits)
____ MATH 1026 Elementary Calculus (3 credits)

Area 6: Creativity and Aesthetic Experience (1 credit)

____ CLE Area 6 course: _____ (1 credit)

Area 7: Critical Issues in a Global Context (3 credits)

____ FIW 2114 Principles of Fish & Wildlife (3 credits)

Free Electives (13 to 14 credits)

_____
_____
_____
_____

APPENDIX C (continued)

Checksheet for the *Environmental Resources Management* Major (2020 graduating year).

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Restricted Electives (15 to 16 credits – see lists below)

Global Environmental Issues Restricted Electives			(Choose 3 credits)
AAEC	3204	International Agricultural Development and Trade	3
FREC	2124	Forests, Society & Climate	3
FREC	2784	(SBIO 2784) Global Forest Sustainability	3
FREC	3604	Climate Science	3
GEOG	3104	Environmental Problems, Population and Development	3
GEOG	4204	Geography of Resources	3
GEOG	4764	(SOC 4764 and UAP 4764) International Development	3
UAP	3344	(PSCI 3344) Global Environmental Issues: Interdisciplinary Perspectives	3
UAP	4214	(GEOG 4214 and WGS 4214) Gender, Environment, & Int. Development	3

Law Restricted Electives			(Choose 3 credits)
AAEC	3314	Environmental Law	3
AAEC	3604	Agricultural Law	3
FIN	3054	Legal and Ethical Environment of Business	3
UAP	4344	Law of Critical Environmental Areas	3
UAP	4754	Legal Foundations of Planning	3

Public Relations Restricted Electives			(Choose 3 credits)
COMM	2044	Principles of Public Relations	3
COMM	3204	(HUM 3204 and RLCL 3204) Multicultural Communication	3
COMM	3244	(PSCI 3244) Political Communication	3
FREC	3524	Environmental Interpretation	3
UAP	4184	Community Involvement	3

Urban Environments Restricted Electives			(Choose 3 credits)
FREC	2134	(HORT 2134) Plants and Greenspaces in Urban Communities (CLE 3)	3
FREC	3354	(HORT 3354) Trees in the Built Environment	3
FREC	4454	Urban Forest Management and Policy	3
GEOG	3244	The U.S. City	3
UAP	2014	Urbanization and Development (CLE 3)	3
UAP	3354	Introduction to Environmental Policy and Planning	3
UAP	4374	Land Use and Environment	3

Water Restricted Electives			(Choose 3 or 4 credits)
BIOL	4004	Freshwater Ecology	4
BIOL	4354	(ENT 4354) Aquatic Entomology	4
FIW	4534	Ecology and Management of Wetland Systems	3
FIW	4614	Fish Ecology	3
FREC	3104	Principles of Watershed Hydrology	3
FREC	3754	Watersheds and Water Quality Monitoring	3
FREC	4784	Wetland Hydrology and Biogeochemistry	3

APPENDIX C (continued)

Checksheet for the *Water: Resources, Policy, and Management* Major (2020 graduating year).

APPROVED
UNIVERSITY REGISTRAR

COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
Department of Forest Resources and Environmental Conservation
B.S. Degree in Water: Resources, Policy, and Management
Major: Water: Resources, Policy, and Management
For Students Graduating in Calendar Year 2020

Minimum credits required for graduation is 120.

Degree Core Requirements (21 credits)

___ * ALS/NR 4614 Watershed Assessment, Management, and Policy (2) Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FREC, GEOL, LAR, CSES, ENT, BIOL, GEOG, AAEC, UAP or equivalent.
___ * ENSC 3604 Fundamentals of Environmental Science (3) Pre: BIOL 1105 or CHEM 1035
___ * ENSC/CSES 4314 Water Quality (3) OR FREC 3754 Watersheds and Water Quality Monitoring (3) Pre: BIOL 1106, CHEM 1035, (FREC 2004 or FREC 2114 or FREC 3114 or BIOL 2404 or ENSC 3604)
___ * FREC 3104 Principles of Watershed Hydrology (3) Pre: Junior Standing Pre: MATH 1206 or MATH 1226 or MATH 2015 or MATH 1026
___ * FREC/AAEC 4464 Water Resources Policy & Economics (3) Pre: AAEC 1005
___ * GEOG/NR 2004 Water, Environment, and Society (3)
___ PHYS 2205 General Physics (3) Pre: MATH 1016 or MATH 1016H or MATH 1023 or MATH 2015 or MATH 1026 or MATH 1203 or MATH 1205H or MATH 1525 or MATH 1535 or MATH 1225 or MATH 1225H
___ PHYS 2215 General Physics Lab (1) Co: PHYS 2205
In accordance with university guidelines, courses satisfying degree core requirements may not be double counted to satisfy other areas of a degree (e.g., CLE).

Major Requirements (36 hours)

Writing (3 credits – choose one course)
___ ENGL 3764 Technical Writing (3) Junior standing required
___ ENGL 3534 Literature and Ecology (3) Pre: ENGL 1106 or ENGL 1204H or COMM 1016

Water Law, Planning, and Economics (6 credits – choose one course from each area below)
___ * AAEC 3314 Environmental Law (3), OR UAP 4344 Law of Critical Environmental Areas (3) Pre: AAEC 4754, AAEC 3314.
___ * UAP 3354 Introduction to Environmental Policy and Planning (3), OR UAP 4374 Land Use and Environment: Planning and Policy (3) Junior standing required

Geospatial Technology (3 credits – choose one course)
___ * BSE 4344 GIS for Engineers (3) Laboratory work and senior standing required.
___ * FREC 4114 Information Technologies for Natural Resource Management (3) Pre: FREC 2214 or GEOG 2314
___ * FREC 4214 Forest Photogrammetry and Spatial Data Processing (3) Senior standing required
___ * GEOG 2084 Principles of Geographic Information Systems (3)
___ * GEOG/GEOS 4354 Introduction to Remote Sensing (3)

Water Science Specialization (12 credits – choose 9 credits in <u>one</u> of the three specializations listed below and the remaining 3 credits in <u>any</u> of the four specializations listed below)
(see Water Science Specialization course list)

___ I. *Aquatic Ecosystems*	____*	____*	____*	____*
___ II. *Hydrology*	____*	____*	____*	____*
___ III. *Water Quality*	____*	____*	____*	____*

APPENDIX C (continued)

Checksheet for the *Water: Resources, Policy, and Management* Major (2020 graduating year).

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Water Policy Specialization (12 credits – choose 9 credits in <u>one</u> of the three specializations listed below and the remaining 3 credits in <u>any</u> of the three specializations listed below)
(see Water Policy Specialization course list)

___ I. *Watershed Management*	_____*	_____*	_____*	_____*	
___ II. *Water Planning, Policy, and Economics*	_____*	_____*	_____*	_____*	
___ III. *Water, Climate, Energy, and Global Issues*	_____*	_____*	_____*	_____*	

<u>Restricted Electives (Minimum 18 credits – see course lists:</u> choose from courses listed under the Water Science or Water Policy Specializations or from those listed as Restricted Electives)

_____

_____

_____

<u>Free Electives (9 credits)</u>

_____

_____

<u>CLE Requirements (36 credits)</u>

Area 1: Writing and Discourse (6 credits)
___ CLE Area 1 course: _____ (3)
___ CLE Area 1 course: _____ (3)

Area 2: Ideas, Cultural Traditions, and Values (6 credits)
___ CLE Area 2 course: _____ (3)
___ CLE Area 2 course: _____ (3)

Area 3: Society and Human Behavior (6 credits)
___ ECON 2005 Principles of Economics (3), ___ ECON 2006 Principles of Economics (3)
<u>OR</u>
___ AAEC 1005 Economics of Food and Fiber (3), ___AAEC 1006 Economics of Food and Fiber (3)

Area 4: Scientific Reasoning and Discovery (8 credits, including 2 labs)
___ BIOL 1106 Principles of Biology (3)
___ BIOL 1116 Principles of Biology Lab (1) Co: BIOL 1105
___ CHEM 1035 General Chemistry (3) Co: MATH 1025 or MATH 1225.
___ CHEM 1045 General Chemistry Lab (1) Co: CHEM 1035 or 1035H

Area 5: Quantitative and Symbolic Reasoning (6 credits)
___MATH 1025 Elementary Calculus (3), ___ MATH 1026 Elementary Calculus (3)
<u>OR</u>
___ MATH 1225 Calculus of a Single Variable (4), ___MATH 1226 Calculus of a Single Variable (4)

Area 6: Creativity and Aesthetic Experience (1 credit)
___ CLE Area 6 course: _____ (1)

Area 7: Critical Issues in a Global Context (3 credits)
___ CLE Area 7 course: _____ (3)

APPENDIX C (continued)

Checksheet for the *Water: Resources, Policy, and Management* Major (2020 graduating year).

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Water Science Specialization Courses
All water science specialization courses count toward in-major GPA.

I. Aquatic Ecosystems

BIOL	4004	Freshwater Ecology (4) Pre: BIOL 2004
BIOL/CSES/ENSC	4164	Environmental Microbiology (3) Pre: BIOL 2604
BIOL/ENT	4354	Aquatic Entomology (4) Pre: (BIOL 1005, 1006), (BIOL 1015, 1016) or (BIOL 1105, 1106, 1115, 1116)
BIOL	4454	Invertebrate Zoology (4) Pre: BIOL 2501
ENT/BIOL/FIW	4484	Freshwater Biomonitoring (4) Pre: (BIOL 2004), (BIOL 4004 or BIOL 4354 or ENT 4354 or FIW 4424 or FIW 4614)
FIW	4534	Ecology & Management of Wetland Systems (3) Enrollment restricted to junior, seniors and graduate students. Pre: BIOL 1204.
FIW	4614	Fish Ecology (3) Pre: BIOL 1606.
FIW	4624	Marine Ecology (3) Pre: BIOL 2804 or GEOS 5034.
FIW	4714	Fisheries Management (4) Pre: FIW 3514.
FREC	4374	Forested Wetlands (3) Pre: CSES 3114 or CSES 3134.

II. Hydrology

BSE	3324	Small Watershed Hydrology (3) Course requirements may be satisfied by taking CEE 3304 or CHE 3114 or ESM 3234 or ESM 1024 or ME 3404 prior to or concurrent with course
BSE	4224	Field Methods in Hydrology (3) Co: BSE 3324 or CEE 3314 or FREC 4354
CEE	3304	Fluid Mechanics for Civil and Environmental Engineering (3) A grade of C- or better in pre-requisite ESM 2104. Pre: ESM 2104.
CEE	3314	Water Resources Engineering (3) A grade of C- or better required in pre-requisite CEE 3304. Pre: CEE 3304.
CEE	4304	Hydrology (3) A grade of C- or better required in pre-requisite CEE 3304. Pre: CEE 3304.
CEE	4314	Groundwater Resources (3) A grade of C- or better required in pre-requisite CEE 3304. Pre: CEE 3304.
CEE	4324	Open Channel Flow (3) Pre: CEE 3314
CSES/GEOG/GEOS	3304	Geomorphology (3) Pre: GEOG 1104 or GEOS 1004 or GEOS 2104
CSES/ENSC	3614	Soil Physical & Hydrological Properties (3) Pre: (CSES 3114, 3124) or (GEOS 3614, GEOS 3624)
FREC	4354	Forest Soil and Watershed Management (3) Pre: CSES 3114 or ENSC 3114 or GEOS 3614 or CSES 3134 or ENSC 3134.
GEOS	3014	Environmental Geosciences (3) Pre: GEOS 1004 or 1024 or 2104 or 2024.
GEOS	4804	Groundwater Hydrology (3) Pre: (PHYS 2205 or PHYS 2105), (MATH 1206 or MATH 1226 or MATH 2016 or MATH 2024).

III. Water Quality

BSE	3334	Nonpoint Source Assessment & Control (3) Pre: BSE 3324
BSE	4304	Nonpoint Source Pollution Modeling & Management (3) Pre: BSE 3334
BSE	4394	Water Supply & Sanitation in Developing Countries (3) Pre: CEE 3104
CEE	3104	Introduction to Environmental Engineering (3) Pre: (CHEM 1015 or CHEM 1074), (CHEM 1045 or CHEM 1084), (MATH 1206 or MATH 1206H or MATH 1226 or MATH 2016 or MATH 2024), (PHYS 2305 or PHYS 2205).
CEE	4104	Water & Wastewater Treatment Design (3) Pre: CEE 3104, CEE 3304
CEE	4114	Fundamentals of Public Health Engineering (3) A grade of C- or better required in pre-requisite. Pre: CEE 3104.
CEE	4174	Solid & Hazardous Waste Management (3) A grade of C- or better required in pre-requisite CEE 3104. Pre: CEE 3104.
CSES	4644	Land Based Systems for Waste Treatment (3) Taught odd years
CSES/ENSC	3634	Physics of Pollution (3) Pre: CSES 3114, PHYS 2206, (MATH 2016 or MATH 2024).
CSES/BIOL/ENSC	4164	Environmental Microbiology (3) Pre: BIOL 2604.
CSES/ENSC/CHEM	4734	Environmental Soil Chemistry (3) Pre: CSES 3114, CSES 3124, CHEM 2514 or CHEM 2535, CHEM 3114, (MATH 2015 or MATH 1026)
FREC	4354	Forest Soil and Watershed Management (3) Pre: CSES 3114 or ENSC 3114 or GEOS 3614 or CSES 3134 or ENSC 3134.

APPENDIX C (continued)

Checksheet for the *Water: Resources, Policy, and Management* Major (2020 graduating year).

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Water Policy Specialization Courses
All water policy specialization courses count toward in-major GPA.

I. Watershed Management

ALS	3404	Ecological Agriculture Theory & Practice (3) Pre: ALS 2204.
BSE	3324	Small Watershed Hydrology (3) Course requirements may be satisfied by taking CEE 3304 or CHE 3114 or ESM 3234 or ESM 3024 or ME 3404 prior to or concurrent with course.
BSE	3334	Nonpoint Source Assessment & Control (3) Pre: BSE 3324
BSE	4304	Nonpoint Source Pollution Modeling & Management (3) Pre: BSE 3334.
CEE	3274	Introduction to Land Development Design (3) A grade of C- or better in prerequisite. Pre: CEE 2814.
CEE	4264	Sustainable Land Development (3) Pre-requisite: Senior Standing required.
FREC	4374	Forested Wetlands (3) Pre: CSES 3114 or CSES 3134.
LAR	3154	Watershed Sensitive Design & Construction (4) Pre-requisite: LAR 2164 or consent of instructor.
UAP	3354	Introduction to Environmental Policy & Planning (3)
UAP	4374	Land Use & Environment: Planning & Policy (3) Pre: Junior standing.

II. Water Planning, Policy, & Economics

AAEC	3004	Agricultural Production & Consumption Economics (3) Pre: AAEC 1005.
AAEC	3014	Analytical Methods in Applied Economics (3) Pre: STAT 1005 or BIT 2405 or STAT 3615.
AAEC	3314	Environmental Law (3)
AAEC	3324	Environment and Sustainable Development Economics (3) Pre: AAEC 1005 or ECON 2005.
AAEC	3604	Agricultural Law (3)
AAEC	4314	Environmental Economic Analysis & Management (3) Pre: AAEC 3324 or ECON 4014 or FREC 3424.
AAEC	4344	Sustainable Development Economics (3) Pre: AAEC 3324 or AAEC 3004 or ECON 4014.
CEE	4134	Environmental Sustainability – A Systems Approach (3) Senior Standing. Pre: MATH 2214.
CEE	4344	Water Resources Planning (3) Senior standing required.
FREC/NR	4014	Natural Resources Economics (3) Pre: ECON 2005 or AAEC 1005.
FREC	4434	Natural Resource Policy (3) Pre: NR 4014 or FREC 4424 or FOR 4424 or ECON 4014 or FREC 4014 or FOR 4014.
GEOG	4204	Geography of Resources (3) Pre: Junior Standing.
LAR	3154	Watershed Sensitive Site Design & Construction (4) Pre-requisite: LAR 2164 or consent of instructor.
SPIA	2554	Collaborative Policy-Making and Planning (3)
UAP	3224	Policy Implementation (3) Must complete prerequisites UAP 3014 (B- or higher) or UAP 3154, and UAP 3024 (B- or higher). Pre: UAP 3024, (UAP 3014 or UAP 3354)
UAP	4344	Law of Critical Environmental Areas (3) Pre: UAP 4754, AAEC 3314.
UAP	4374	Land Use & Environment: Planning & Policy (3) Pre: Junior standing.

III. Water, Climate, Energy, & Global Issues

ALS/HORT	4714	Global Seminar (1) Pre: Junior or Senior Standing required.
BIOL	4114	Global Change Ecology (3) (Pre: BIOL 2704, 2804.)
BSE	4394	Water Supply & Sanitation in Developing Countries (3) Pre: CEE 3104.
CEE	4134	Environmental Sustainability – A Systems Approach (3) Senior Standing Pre: MATH 2214.
CEE	4264	Sustainable Land Development (3) Pre-requisite: Senior Standing required.
FREC	2124	Forests, Society & Climate (3)
FREC/SBIO	2784	Global Forest Sustainability (3)
FREC	3604	Climate Science (3) Pre: Junior Standing. MATH 1026 or MATH 1206 or MATH 1226 or MATH 2015.
GEOG	1514	Introduction to Meteorology (3)
GEOG	3104	Environmental Problems, Population, & Development (3)
GEOG	4134	Water, Hazards, & Development (3)

APPENDIX C (continued)

Checksheet for the *Water: Resources, Policy, and Management* Major (2020 graduating year).

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Restricted Electives

ALS	2204	Introduction to Civic Agriculture (3)
BIOL	1105	Principles of Biology (3) Co: BIOL 1115.
BIOL	1115	Principles of Biology Lab (1) Co: BIOL 1105.
BIOL	2504	General Zoology (3) Pre: (BIOL 1005 or 1105 or 1205H), (BIOL 1006 or 1106 or 1206H)
BIOL	2604	General Microbiology (3) Pre: (BIOL 1005 or BIOL 1105 or BIOL 1205H), (BIOL 1006 or BIOL 1106 or BIOL 1206H), (CHEM 1036 or CHEM 1056 or CHEM 1036H or CHEM 1056H or CHEM 1016).
BIOL	2704	Evolutionary Biology (3) Pre: (BIOL 1005 or 1105 or 1205H), (BIOL 1006 or 1106 or 1206H)
BIOL	2804	Ecology (3) Pre: (BIOL 1005 or 1105 or 1205H), (BIOL 1006 or 1106 or 1206H).
BIOL	3204	Plant Taxonomy (3) Pre: (BIOL 1005 or BIOL 1105 or BIOL 1205H), (BIOL 1006 or BIOL 1106 or BIOL 1206H).
BSE	2304	Landscape Measurements and Modeling (3) Pre: (MATH 1206 or MATH 1226)
CEE	2814	Civil and Environmental Engineering Measurement (4) Pre: (ENGE 1114 or ENGE 1216 or ENGE 1434 or IDC 1224), (MATH 1206 or MATH 1206H or MATH 1226). Co: CEE 2824.
CEE	3514	Introduction to Geotechnical Engineering (3) A grade of C- or better required in pre-requisites GEOS 2104 and ESM 2204. Pre: ESM 2204, (GEOS 1004 or GEOS 2104 or GEOL 1004 or GEOL 2104)
CHE	3114	Fluid Transport (3) Pre: CHE 2114, PHYS 2305, (MATH 2204 or MATH 2224). Co: MATH 4564.
CHE	3144	Mass Transfer (3) Pre: CHE 3114, CHE 2164, (MATH 4544 or MATH 4564)
CHEM	1036	General Chemistry (3) Pre: CHEM 1035 or CHEM 1055 or CHEM 1055H. Co: MATH 1025 or MATH 1225.
CHEM	1046	General Chemistry Lab (1) Co: CHEM 1036.
CHEM	2114	Analytical Chemistry (3) Pre: CHEM 1036 or CHEM 1056 or CHEM 1056H. Co: CHEM 2124.
CHEM	2514	Survey of Organic Chemistry (3) Pre: (CHEM 1035 or CHEM 1055 or CHEM 1055H), (CHEM 1036 or CHEM 1056 or CHEM 1056H), (CHEM 1045 or CHEM 1065), (CHEM 1046 or CHEM 1066).
CHEM	2535	Organic Chemistry (3) Pre: CHEM 1036 or CHEM 1056 or CHEM 1056H or CHEM 1036H
CSES/ENSC/GEOS	3114	Soils (3) Junior standing. Pre: CHEM 1016. Co: CSES/ENSC/GEOS 3124.
CSES/ENSC/GEOS	3124	Soils Lab (1) Co: CSES 3114
CSES/ENSC	3134	Soils in the Landscape (3) Pre: one year of introductory CHEM or BIOL or GEOS.
CSES/ENSC	4774	Reclamation of Drastically Disturbed Lands (3) Pre: CSES 3114 or ENSC 3114 or GEOS 3614 or CSES 3134 or ENSC 3134 or CSES 3301 or GEOG 3304 or GEOS 3304.
ECON	4014	Environmental Economics (3) Pre: ECON 2005 or 2116 or 2126 or 2025H
ENGL	3534	Literature and Ecology (3) Pre: ENGL 1106 or ENGL 1204H or COMM 1016
ENSC/CSES	4324	Water Quality Lab (1) Pre: CHEM 1046. Co: CSES 4314, 4314.
ENSC	4414	Monitoring and Analysis of the Environment (2) Senior standing required. Pre: (ENSC 3604 or ENSC 4314 or CSES 4314 or BIOL 4004), (MATH 1026 or MATH 2015, CHEM 1046, BIOL 1105)
ENSC/CSES	4854	Wetland Soils and Mitigation (3) Odd years. Pre: (CSES 3114, CSES 3124) or (ENSC 3114, ENSC 3124) or (GEOS 3614, GEOS 3624) or CSES 3134 or ENSC 3134.
ESM	3024	Introduction to Fluid Mechanics (3) Pre: ESM 2304, (MATH 2224 or MATH 2204 or MATH 2204H).
FIW	2114	Principles of Fisheries and Wildlife Management (3) Pre: BIOL 1006 or BIOL 1106.
FIW	3514	Fisheries Techniques (3) Pre: FIW 2114.
FIW	4424	Ichthyology (4)
FREC	2004	Forest Ecosystems (3)
FREC	2214	Introduction to Land and Field Measurements (3) Pre: (MATH 1016 or MATH 1025). Co: FREC 2324.
FREC	2314	Forest Biology and Dendrology (2) Pre: BIOL 1006 or BIOL 1106. Co: FREC 2324.
FREC	2324	Dendrology Lab (1)
FREC	2414	Field Experience in Forest Resources and Environmental Conservation (2)
FREC/LAR	2554	Leadership for Global Sustainability (3)
FREC	3314	Forest Ecology and Silvics (3) Pre: (2314 or FOR 2314), (FREC 2214 or FOR 2214).
FREC	3324	Silviculture Principles and Applications (4) Pre: FREC 3314
FREC/HORT	3354	Trees in the Built Environment (3) Pre: (FREC 2314 or BIOL 2304 or HORT 2304), (FREC 2324 or HORT 3325 or HORT 3326).
FREC	3724	Forest Boundaries and Roads (3) Pre: FREC 2214
FREC/CSES	4334	Principles and Practice of Agroforestry (3)
FREC	4424	Forest Resources Economics and Management (3) Pre: FREC 3324 or FREC 3364
GEOG	1104	Introduction to Physical Geography (3)

APPENDIX C (continued)

Checksheet for the *Environmental Conservation and Society* Major (2021 graduating year).

APPROVED
COMMISSION ON UNDERGRADUATE STUDIES AND POLICIES

COLLEGE OF NATURAL RESOURCES AND ENVIRONMENT
Department of Forest Resources and Environmental Conservation
Bachelor of Science in Forest Resources and Environmental Conservation
Major: Environmental Conservation & Society
For students graduating in calendar year 2021

Minimum credit hours required for graduation is 120. Prerequisites or enrollment restrictions may apply to some courses; consult the undergraduate course catalog, timetable of classes, or check with your advisor.

Degree Core Requirements (21 credits):
____ 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 3524 Environmental Interpretation* (3 credits) **or** COMM 2004 Public Speaking (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)

Required Courses for Environmental Conservation & Society Major (9 or 12 credits)
Note: If FREC 3524 is taken to meet the oral communication requirement in the degree core, then select 9 credits below; otherwise, select 12 credits below to include FREC 3524.
____ FREC 2004 Forest Ecosystems **or** FREC 3314 Forest Ecology and Silvics* (3 credits)
____ FREC 3524 Environmental Interpretation* (3 credits)
____ FREC 3544 Outdoor Recreation Planning and Management (3 credits)
____ FIW 4464 Human Dimensions of Fisheries and Wildlife (3 credits)

Required Restricted Electives for Environmental Conservation & Society Major (21 credits)
____ Business Restricted Electives (3 credits)
____ Environmental Education & Outreach Restricted Electives (3 hours)
____ Environmental Science Restricted Electives (6 credits)
____ Human Dimensions Restricted Electives (6 credits)
____ Role of Science in Society Restricted Elective (3 credits)

Track Areas with Remaining Required Restricted Electives (12 credits)
Students must customize their curriculum to complete one of the following three tracks by selecting an additional 12 credits from one of the three sets of restricted electives outlined below.
(Note: 9 of the 12 credits must be 3000-level or above)

Recreation and Tourism Management Track:
____ Human Dimensions of Natural Resources Restricted Electives (3 hours)
____ Outdoor Recreation Management & Tourism Restricted Electives (9 hours)

Environmental Education and Outreach Track:
____ Environmental Education & Outreach Restricted Electives (6 hours)
____ Human Dimensions of Natural Resources Restricted Electives (3 hours)
____ Leadership & Sustainability in Natural Resources Restricted Electives (3 hours)

Leadership and Sustainability Track:
____ Human Dimensions of Natural Resources Restricted Electives (3 hours)
____ Leadership & Sustainability in Natural Resources Restricted Electives (9 hours)

APPENDIX C (continued)

Checksheet for the *Environmental Conservation and Society* Major (2021 graduating year).

APPROVED
COMMISSION ON UNDERGRADUATE STUDIES AND POLICIES

CLE Requirements (36 credits)

Area 1: Writing and Discourse (6 credits)

____ ENGL 1105 First Year Writing (3 credits)
____ ENGL 1106 First Year Writing (3 credits)

Area 2: Ideas, Cultural Traditions, and Values (6 credits)

____ FREC 2554 Leadership for Global Sustainability (3 credits)
____ CLE Area 2 course: _____ (3 credits)

Area 3: Society and Human Behavior (6 credits)

____ Select one course from the following list (3 credits):
- ____ AAEC 1005 Economics of the Food & Fiber System
- ____ ECON 2005 Principles of Economics

____ Select one course from the following list (3 credits):
- ____ COMM 1014 Introduction to Communication Studies
- ____ GEOG 1004 Introduction to Human Geography
- ____ GEOG 1115 Seeking Sustainability
- ____ PSCI 1014 Introduction to United States Government and Politics
- ____ PSCI 1024 Introduction to Comparative Government and Politics
- ____ PSYC 1004 Introduction to Psychology
- ____ SOC 1004 Introductory Sociology
- ____ SOC 1014 Introduction to Social Anthropology

Area 4: Scientific Reasoning and Discovery (8 credits)

____ BIOL 1105 Principles of Biology (3 credits)
____ BIOL 1115 Principles of Biology Lab* (1 credit)
____ BIOL 1106 Principles of Biology (3 credits)
____ BIOL 1116 Principles of Biology Lab* (1 credit)

Area 5: Quantitative and Symbolic Reasoning (6 credits)

____ MATH 1025 Elementary Calculus (3 credits)
____ STAT 3604 Statistics for the Social Sciences* or STAT 3615 Biological Statistics* (3 credits)

Area 6: Creativity and Aesthetic Experience (1 credit)

____ CLE Area 6 course: _____ (1 credit)

Area 7: Critical Issues in a Global Context (3 credits)

____ FIW 2114 Principles of Fish & Wildlife Management* (3 credits)

Free Electives (18 or 21 credits)

APPENDIX C (continued)

Checksheet for the *Environmental Conservation and Society* Major (2021 graduating year).

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Restricted Electives

Business Restricted Electives			
AAEC/MGT	3454	Small Business Management and Entrepreneurship*	3
ACIS	1004	Accounting Foundations	3
ACIS	2115	Principles of Accounting	3
MGT	3304	Management Theory and Leadership Practice	3
MGT	4334	Ethical Leadership & Corporate Social Responsibility*	3
MKTG	3104	Marketing Management*	3
SBIO	2614	Introduction to Forest Product Marketing	3
SBIO	3004	Sustainable Nature-based Enterprises	3
SBIO	3464	Forest Product Business Systems*	3
Environmental Education & Outreach Restricted Electives			
ALCE	4004	Teaching Adults in Agriculture	2
ALCE	4014	Intro to Cooperative Education	3
ALCE	4034	Methods of Planning Education Programs for Agriculture*	3
ALCE	4304	Community Education and Development	3
ALCE	4884	Youth Program Management	3
COMM	2044	Principles of Public Relations	3
COMM	3064	Persuasion*	3
FREC	3574	Environmental Education Service Learning	3
HUM/RLCL	3204	Multicultural Communication	3
TA	2024	Introduction to Acting	3
Environmental Science Restricted Electives			
BIOL	2504	General Zoology*	3
BIOL	2704	Evolutionary Biology*	3
BIOL	2804	Ecology*	3
BIOL	4004	Freshwater Ecology*	4
CSES/ENSC/GEOS	3114/3114/3614	Soils*	3
CSES/ENSC	3134	Soils in the Landscape	3
CSES/HORT	3444	World Crops and Cropping Systems	3
ENSC	3604	Fundamentals of Environmental Science*	3
FIW	2314	Wildlife Biology*	3
FIW	2324	Wildlife Field Biology*	3
FIW	3514	Fisheries Techniques*	3
FIW	4214	Wildlife Field Techniques*	4
FIW	4314	Conservation Biology*	4
FIW	4334	Mammalogy*	3
FIW	4414	Population Dynamics and Estimation*	4
FIW	4424	Ichthyology	3
FIW	4434	Wildlife Habitat Ecology and Management*	3
FIW	4534	Ecology and Management of Wetland Systems*	3
FIW	4614	Fish Ecology*	3
FIW	4624	Marine Ecology*	3
FREC	2514	Wildland Fire: Ecology and Management*	3
FREC/HORT	3354	Trees in the Built Environment*	3
FREC	3364	Environmental Silviculture*	3
FREC	3714	Forest Harvesting*	3
FREC/CSES	4334	Principles and Practice of Agroforestry	3
FREC	4354	Forest Soil and Watershed Management*	3
FREC	4374	Forested Wetlands*	3
FREC	4414	Advanced Wildland Fire Management*	3

APPENDIX C (continued)

Checksheet for the *Environmental Conservation and Society* Major (2021 graduating year).

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HORT/FREC	2134	Plants and Greenspaces in Urban Communities	3
SBIO/FREC	2784	Global Forest Sustainability	3

Human Dimensions Restricted Electives

AAEC	3314	Environmental Law	3
AAEC	3324	Environment and Sustainable Development Economics*	3
AAEC	4754	Real Estate Law	3
FREC	4454	Urban and Community Forestry	3
GEOG	3104	Environmental Problems, Population, and Development	3
LAR	3044	Land Analysis and Site Planning*	3
LAR	3264	People, Community, and Place*	3
PHIL	2304	Global Ethics	3
PSCI	3214	Political Participation*	3
PSCI	3224	Public Opinion*	3
PSCI	3334	Judicial Process*	3
PSCI	3354	Constitutional Law: Structures and Relationships*	3
PSCI/UAP	3414/3434	Public Administration*	3
PSCI	3424	State and Local Government*	3
PSCI	3554	Comparative Political Economy*	3
PSCI/UAP	3744	Public Policy Analysis*	3
SOC	2004	Social Problems	3
SOC	3004	Social Inequality*	4
SOC	3204	Social Research Methods*	3
SOC	3504	Population Trends and Issues*	3
SPIA	2554	Collaborative Policy Making and Planning	3
UAP	3014	Urban Policy and Planning*	3
UAP/PSCI	3344	Global Environmental Issues: Interdisciplinary Perspectives	3
UAP	3354	Introduction to Environmental Policy and Planning	3
UAP	4264	Environmental Ethics and Policy	3
UAP	4344	Law of Critical Environmental Areas	3
UAP	4374	Land Use and Environment	3

Leadership and Sustainability Restricted Electives (only 3 credits may be below 2000-level)

ALCE	3014	Leadership Effective for Ag*	3
GEOG	1116	Seeking Sustainability	3
GEOG/NR	4444	Practicing Sustainability	3
LDRS	1015	Exploring Citizen Leadership	3
LDRS	3104	The Dynamics of Leadership	3
LDRS	3304	Elements of Team Leadership*	3
NR	4105	Leadership in Natural Resources*[1]	3
NR	4106	Leadership in Natural Resources*[2]	3
SBIO	3004	Sustainable Nature-Based Enterprises	3
SBIO	3454	Society, Sustainable Biomaterials and Energy	3
UAP	4394	Community Renewable Energy Systems*	3

APPENDIX C (continued)

Checksheet for the *Environmental Conservation and Society* Major (2021 graduating year).

APPROVED
COMMISSION ON UNDERGRADUATE STUDIES AND POLICIES

Outdoor Recreation & Tourism Management Restricted Electives			
HTM	2454	Travel & Tourism Management	3
HTM	2464	Introduction to Service	3
HTM	3454	Tourism Analysis	3
HTM	3484	Socio-Cultural Impacts of Tourism	3
HTM	4354	Information Technology and Social Media	3
Study Abroad	Any study abroad course focusing on human-environment interactions		3-6

Role of Science in Society			
HIST/STS	3706	History of Modern Science	3
PHIL	2605	Reason and Revolution in Science	3
PHIL	2606	Reason and Revolution in Science	3
RLCL/STS	2464	Religion and Science	3
STS	1504	Introduction to Science, Technology, and Society	3
STS	2154	Humanities, Technology, and the Life Sciences	3
STS	2454	Science, Technology, and Environment	3
STS	3105	Science and Technology in Modern Society	3
STS	3334	Energy and Society	3

*Some courses may have prerequisites, corequisites, or other restrictions. Consult Course Catalog for details.

IMPORTANT NOTES BELOW

ENVIRONMENTAL CONSERVATION & SOCIETY NOTES

1. **Satisfactory Progress:** By the end of the semester in which the student has attempted 60 hours (including transfer, advanced placement, advanced standing, and credit by examination), "satisfactory progress" towards a B.S. degree in the College of Natural Resources and Environment will include the following minimum criteria:
   - Having an in-major and overall grade point average of at least 2.0
   - Passing at least 24 semester credits that apply to the Curriculum for Liberal Education (CLE)
   - Passing the following courses, or their equivalents: BIOL 1105, 1106 and 1115, 1116; MATH 1025
2. **Foreign Language Requirement:** A sequence of two (2) foreign language courses is required for graduation unless two (2) high school credits of the same foreign language or six (6) transfer credit hours of foreign language have been earned. These credits do not count toward graduation. See catalog section on "Graduation Requirements."
3. **Policy on Student Exchanges:** Studying overseas or at another U.S. university is a wonderful opportunity to enhance your education. However, planning for an exchange should begin at least 9 months prior to leaving. This will allow time to determine what substitutions, if any, will be allowed and time to arrange your schedule at Virginia Tech to ensure that all requirements for graduation are met.
4. **In-major GPA Computation:** Includes all courses designated as FIW, FREC, GEOG, NR, and SBIO.
5. An in-major and overall GPA of 2.0 is required for graduation.
6. In accordance with university guidelines, courses satisfying degree core requirements may not be double counted to satisfy other areas of a degree (e.g. CLE).
7. Some of the listed courses have prerequisites and some courses must be taken in sequence to satisfy prerequisites. Be sure to consult with the Undergraduate Course Catalog or check with your advisor.