From:	Neal, Steve
To:	Smith, Randy
Cc:	Martin, Linda; Lawrence, Ann
Subject:	Proposed Revision of the Environmental Science Major
Date:	Wednesday, March 15, 2017 7:58:42 AM
Attachments:	image001.png Environmental Science Proposal Au2017.pdf

Randy,

The School of Environment and Natural Resources (SENR) is seeking University Council on Academic Affairs approval for revision of the Environmental Science undergraduate major as outlined in the attached proposal effective autumn semester 2017. Significant changes are being proposed to the Ecosystem Restoration and Water Science specializations, and SENR is proposing to deactivate the Environmental Science Education specialization.

The Ecosystem Restoration specialization is being modified to include a new core of courses and to ensure that students have a breadth of knowledge across terrestrial and aquatic/wetland restoration, and soil rehabilitation. The revised curriculum provides opportunities to develop skills in monitoring/experimental design and species identification and recording. Relevant courses from across the College and University were incorporated in a thematically-organized list of directed electives, seeking to foster interdisciplinary perspectives in SENR students.

Changes to the Water Science specialization include combining the categories of courses that students have to choose from into one Water Resource and Management category. Courses were selected to alleviate the demand on a few key aquatic courses and to provide more choices.

SENR is also proposing to deactivate the Environmental Science Education specialization due to low enrollment and the fact that the specialization does not include all of the required courses for a student interested in the masters program in STEM education. Students would be better served by following another specialization within the Environmental Science major and preparing for the graduate program or by pursuing the bachelors in education.

This proposal was approved by the SENR Academic Affairs Committee and was reviewed and endorsed by the College of Food, Agricultural, and Environmental Sciences Academic Affairs Committee.

Let me know if any additional information is needed in support of this request. Thank you.

Steve

THE OHIO STATE UNIVERSITY

Steven M. Neal, Ph.D.
Professor and Assistant Dean for Academic Affairs
College of Food, Agricultural, and Environmental Sciences
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January 18th 2017

Dr. Steve Neal
Assistant Dean
2120 Fyffe Road
100 Agricultural Admin Building
Columbus, OH 43210
CAMPUS

Dear Dr. Neal,

Our Academic Affairs Committee along with faculty and staff in the School of Environment & Natural Resources (SENR) recently completed a review of the Environmental Science major. As a result of that review we are proposing changes to three of the specializations: Ecosystem Restoration, Water Science and Environmental Science Education.

The Ecosystem Restoration specialization has attracted growing student numbers over the last few years (currently 45 students, 45% of the declared specializations in Environmental Science). In addition we have added a number of new faculty with research interests in the discipline and believe that it is timely to build on our growing strengths in this area. We are submitting a revised program of study for our existing specialization in Ecosystem Restoration. We last revised this program during the semester conversion.

The proposed revisions address several changes necessary to build depth-of-knowledge and expertise in ecosystem restoration and to bring it into line with the Society of Ecological Restoration's guidance that programs should provide "*trained professionals who understand not only the science of restoration ecology but also the management practices and social factors that lead to successful project implementation*". The revised program reflects the unique combination of disciplines in the School and ensures that students graduate with sound knowledge of the fundamental principles and techniques in restoration. To that end the program's revised structure includes a new, strong core, and ensures that students have a breadth of knowledge across terrestrial and aquatic/wetland restoration, and soil rehabilitation. Students are also now provided the opportunity to develop skills in monitoring/experimental design and species identification and recording – all key skills employers look for in graduates. We have also completed a thorough review of restoration-relevant courses across both the College and the University and have made these available as a thematically-organized list of directed electives. We are excited that this new structure draws on considerable strengths in other departments helping to foster interdisciplinary perspectives in our students and to further the "one university" mission.

Changes to the Water Science specialization are not as extensive and include combining the categories of courses that students have to choose from into one Water Resource and Management category. We have added additional courses to the list and removed two courses that our students are unable to take due to prerequisites. These changes will alleviate the demand on a few of our key aquatic courses by giving students additional courses to select from.

Finally, we are proposing to deactivate the Environmental Science Education specialization. This track was created during the quarter to semester conversion. At that time OSU did not offer a baccalaureate track to teacher licensure so this specialization was created to offer students interested in science education the option to prepare for a masters program. We have recently learned that the specialization does not include all of the required courses for a student interested in the masters program in STEM education. This specialization has not attracted more than 5 students at any one time. Those few students would be served just as well by following another specialization within the environmental science major and preparing for the graduate program or to pursue the bachelors in education.

Attached is the proposed program of study and the current program of study. We respectfully request that the Council on Academic Affairs review this proposal and provide their approval and/or recommendations to further improve our efforts to enhance this major.

I believe that the documents accompanying this cover letter fulfill the guidelines set forth by the Council of Academic Affairs. Should there be any additional information needed or requested by the Council, please contact me.

Thank you for your time and consideration of our proposal.

Sincerely,

Jeff Sharp, Ph.D.
Director and Professor

Attachments:

cc:

SENR Environmental Science

121 Hours - Summer Semester 2012

COURSE & NUMBER	Units		COURSE & NUMBER	Units	
UNIVERSITY REQUIREMENTS (GE)			**SENR REQUIREMENTS**		
Writing Skills	**6 Hours**		***SENR CORE REQUIREMENTS***	**21 Hours**	
English 1110 (First Year Writing Course)	3		ENR 1100 (ENR Survey)	1	
ENR 2367 (Communicating Environmental and Natural Resources Information)	3		ENR 2100 (Intro to Environmental Science)	3	
Arts & Humanities	**12 Hours**		ENR 2300 (Society and Natural Resources)	3	
GE Literature Course ●▲	3		ENR 3300 (Intro to Forestry, Fisheries & Wildlife)	3	
GE Arts Course ● ▲	3		ENR 3400 (Psychology of Environmental Problems) or ENR 3500 (Community, Environment & Development)	3	
GE History Course ● ▲	3		ENR 4000 (Natural Resources Policy)	3	
GE Culture & Ideas or other Humanities course ● ▲ [Recommended: ENR 3470 (Religion & Environmental Values in America]	3		ENR 3700 (Intro to Spatial Info for Natural Resources)	2	
Social Sciences	**6 Hours**		ENR 4900.01 (Senior Capstone) (Natural Resources Management)	3	
Rural Sociology 1500 ● (Recommended) or GE Social Science ● ▲	3		***Environmental Science Major Requirements***	**10 Hours**	
AED Econ 2001 or Economics 2001.01 (Microeconomics)	3		Chemistry 2310 (Intro Organic Chemistry)	4	
Diversity Courses	**overlapping**		EEOB 3410 (Intro to Ecology)	4	
Social Diversity in US ●	**----**		ENR 3280 (Water Quality Management)	2	
Global Studies Course 1 ▲	**----**		***Environmental Science Specializations:***	**27 Hours**	
Global Studies Course 2 ▲	**----**		***Ecosystem Restoration***		
Data Analysis, Quantitative & Logical Skills	**8 Hours**		***Environmental Molecular Science***		
ENR 2000 (Recommended) or GE Equivalent Statistics/Data Analysis course	3		***Environmental Science Education***		
Math 1156 or 1151 (Calculus for the Biological Sciences)	5		***Soil Resources & Environmental Sustainability***		
Natural Sciences	**31 Hours**		***Water Science***		
Chemistry 1210 (General Chemistry I)	5				
Chemistry 1220 (General Chemistry II)	5				
Biology 1113 (Biological Sciences: Energy Transfer & Development)	4				
Biology 1114 (Biological Sciences: Form, Function, Diversity, & Ecology) or an additional Biological Science or Physical Science Course	4				
Earth Sciences 1121 (The Dynamic Earth)	4				
Physics 1200 (Mechanics, Kinematics, Fluids, Waves)	5				
ENR 3000 (Soil Science)	3				
ENR 3001 (Soil Science Laboratory)	1				
Free Electives	**0 Hours**		**MINIMUM HRS FOR GRADUATION**	**121 Hours**	

Curriculum Draft 4.14
Updated 9/1/15

Ecosystem Restoration Specialization	Units	
Required Courses	**2**	
ENR 5560 Rehabilitation/Restoration of Ecosystems	2	
Ecosystem Science (select 2)	**6-7**	
ENR 3322 Forest Ecosystems	3	
ENR 4260 Soil Resource Management	3	
ENR 5280 Stream Ecology	4	
ENR 5273 Environmental Fate and Impact of Contaminants in Soil & Water	3	
ENR 5250.01 Wetland Ecology & Restoration	3	
Ecosystem Restoration (select 2)	**7**	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration	3	
Other courses may be added with faculty advisor approval		
Methods (select 1)	**3-4**	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 5362 Wildlife Ecology Methods	3	
ENR 5274 Ecosystems Simulation	3	
Directed Electives	**7-9**	
ENR 5268 Soils and Climate Change (recommended)	2	
University GE Total/SENR Core Total	**94**	
Ecosystem Restoration Specialization Total	**27**	
Degree Total	**121**	

Environmental Molecular Sciences Specialization	Units	
Biological Sciences	**5-9**	
Required (select 1)	**3-4**	
MICRBIO 4000 Basic & Practical Microbiology	4	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
Electives (select 1)	**2-5**	
MICRBIO 4100 General Microbiology	5	
MICRBIO 5155 Environmental Microbiology	3	
MICRBIO 5169H Microbial Evolution	3	
MICRBIO 5161H Bioinformatics & Molecular Microbiology	3	
PLNTBIO / MOLGEN 6625 Plant Metabolic Engineering (*GRAD—permission only*)	2	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
PLNTPTH 3001 General Plant Pathology Lecture	3	
PLNTPTH 5010 Phytobacteriology	2	
PLNTPTH 8400 Molecular Bases of Plant Host-Microbe Interactions (*GRAD—permission only*)	3	
PLNTPTH 5040 & 5041 Science of Fungi: Mycology Lecture & Lab	4	
Environmental Science	**5-6**	
Required (select 1)	**3**	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
Electives (select 1)	**2-3**	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 6610 Soil and Environmental Biochemistry (*GRAD—permission only*)	2	
Geochemistry & Mineralogy	**6-7**	
Required (select 1)	**3**	
EARTHSC 4421 Earth Materials	3	
EARTHSC 5621 Introduction to Geochemistry	3	
Electives (select 1)	**3-4**	
EARTHSC 5628 Environmental Isotope Geochemistry	3	
EARTHSC 5636 Advanced Topics in Mineralogy and Crystallography	3	
EARTHSC 5651 Hydrogeology	4	
EARTHSC 5676 Elemental Chemical Analysis using ICPOE and Mass Spectrometry	3	
EARTHSC 5680 Deep Earth Geophysics	3	
Molecular Biology	**5-8**	
Required (select 1)	**3-4**	
BIOCHEM 4511 Introduction to Biological Chemistry	4	
BIOCHEM 5613 Biochemistry & Molecular Biology I	3	
MOLGEN 4500 General Genetics	3	
Electives (select 1)	**2-4**	
ENR 5240 Environmental Molecular Sciences	2	
BIOCHEM 5614 Biochemistry & Molecular Biology II	3	
MICROBIO 4130 Microbial Genetics	3	
MICROBIO 4140 Molecular Microbiology Laboratory	3	
MOLGEN 4606 Molecular Genetics	4	
MOLGEN 5607 Cell Biology	3	
PLNTBIO / MOLGEN 5623 Genetics and Genomics	2	
Directed Electives	**0-7**	

University GE Total/SENR Core Total	**94**	
Environmental Molecular Sciences Specialization Total	**27**	
Degree Total	**121**	

Environmental Science Education Specialization	Units	
Science Education (select one)	**2-3**	
ENR 3611 Foundations for Environmental Communications, Education, & Interpretation	2	
ENR 4611 Environmental Interpretation & Visitor Services	3	
Ecosystem Science (select one course from each sub-category)	**9-10**	
Soils (select one)		
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
Wetlands and Aquatics (select one)		
ENR 5342 Principles of Fisheries Ecology & Management	3	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology & Restoration	3	
Forests and Wildlife (select one)		
ENR 5360 Principles of Wildlife Ecology & Management	3	
ENR 5340 Forest Ecosystem Management	3	
Methods for Ecosystem Restoration (select one)	**3-4**	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
ENR 5362 Wildlife Ecology Methods	3	
ENR 5345 Methods in Aquatic Ecology	4	
Science Certification		
Directed Electives (Board of Ed courses at OSU that count towards science certification)	**10-13**	
University GE Total/SENR Core Total	**94**	
Environmental Science Education Specialization Total	**27**	
Degree Total	**121**	

Soil Resources and Environmental Sustainability Specialization	Units	
Required Courses	**17-19**	
ENR 5261 Environmental Soil Physics	3	
AGSYSMGT 2370 Environmental Hydrology or Earth Sciences 5550 Geomorphology	2-4	
ENR 5260 Soil Landscapes: Morphology, Genesis & Classification	3	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5270 Soil Fertility or ENR 4260 Soil Resource Management	3	
Directed Electives	**8-10**	
ENVENG 2100 Environmental Engineering Analytical Methods	3	
CIVILEN 5130 Applied Hydrology	3	
EARTHSCI 5651 Hydrogeology	4	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology and Restoration	3	
ENR 5210 US Environmental Impact Assessment	3	
ENR 5211 International Environmental Impact Assessment	3	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 5271 Soils of Forest Ecosystems	3	
ENR 5451 Water Law	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 5268 Soils and Climate Change	2	
ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration	3	
ENR 5274 Ecosystems Simulation	3	
ENR 5560 Rehabilitation/Restoration of Ecosystems	2	
ENR 6610 Soil and Environmental Biochemistry *(GRAD—permission only)*	2	
University GE Total/SENR Core Total	**94**	
Soil Resources and Environmental Sustainability Specialization Total	**27**	
Degree Total	**121**	

Water Science Specialization	Units	
Water Science Required Courses	**12**	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology & Restoration	3	
AGSYSMGT 2370 Environmental Hydrology	2	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
Water Resource Courses (select 2)	**6**	
EEOB 5420 Ecology of Inland Waters (1.5 hr) and EEOB 5430 Aquatic Ecosystems - Fish Ecology (1.5 hr)	3	
CIVILEN 5130 Applied Hydrology	3	
EARTHSCI 2206 Principles of Oceanography	3	
ENR 5350.01 Taxonomy and Behavior of Aquatic Invertebrates	3	
Management and Restoration Courses (select 1)	**2-4**	
ENR 5355 Aquaculture	3	
ENR 5342 Principles of Fisheries Ecology and Management	3	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
ENR 5560 Rehabilitation/Restoration of Ecosystems	2	
Methods (select 1)	**3-4**	
ENR 5345 Methods in Aquatic Ecology	4	
ENVENG 2100 Environmental Engineering Analytical Methods	3	
Directed Electives	**1-4**	
University GE Total/SENR Core Total	**94**	
Water Science Specialization Total	**27**	
Degree Total	**121**	

SENR Environmental Science

121 Hours - Summer Semester 2012

COURSE & NUMBER	Units		COURSE & NUMBER	Units	
UNIVERSITY REQUIREMENTS (GE)			**SENR REQUIREMENTS**		
Writing Skills	**6 Hours**		***SENR CORE REQUIREMENTS***	**22 Hours**	
English 1110 (First Year Writing Course)	3		ENR 1100 (ENR Survey)	1	
ENR 2367 (Communicating Environmental and Natural Resources Information)	3		ENR 2100 (Intro to Environmental Science)	3	
Arts & Humanities	**12 Hours**		ENR 2300 (Society and Natural Resources)	3	
GE Literature Course ●▲	3		ENR 3300 (Intro to Forestry, Fisheries & Wildlife)	3	
GE Arts Course ● ▲	3		ENR 3400 (Psychology of Environmental Problems) or ENR 3500 (Community, Environment & Development)	3	
GE History Course ● ▲	3		ENR 4000 (Natural Resources Policy)	3	
GE Culture & Ideas or other Humanities course ● ▲ [Recommended: ENR 3470 (Religion & Environmental Values in America]	3		ENR 3700 (Intro to Spatial Info for Natural Resources)*	3	
Social Sciences	**6 Hours**		ENR 4900.01 (Senior Capstone) (Natural Resources Management)	3	
Rural Sociology 1500 ● (Recommended) or GE Social Science ● ▲	3		***Environmental Science Major Requirements***	**10 Hours**	
AED Econ 2001 or Economics 2001.01 (Microeconomics)	3		Chemistry 2310 (Intro Organic Chemistry)	4	
Diversity Courses	**overlapping**		EEOB 3410 (Intro to Ecology)	4	
Social Diversity in US ●	**----**		ENR 3280 (Water Quality Management)	2	
Global Studies Course 1 ▲	**----**		***Environmental Science Specializations:***	**26 Hours**	
Global Studies Course 2 ▲	**----**		***Ecosystem Restoration***		
Data Analysis, Quantitative & Logical Skills	**8 Hours**		***Environmental Molecular Science***		
ENR 2000 (Recommended) or GE Equivalent Statistics/Data Analysis course	3		***Environmental Science Education***		
Math 1156 or 1151 (Calculus for the Biological Sciences)	5		***Soil Resources & Environmental Sustainability***		
Natural Sciences	**31 Hours**		***Water Science***		
Chemistry 1210 (General Chemistry I)	5				
Chemistry 1220 (General Chemistry II)	5				
Biology 1113 (Biological Sciences: Energy Transfer & Development)	4				
Biology 1114 (Biological Sciences: Form, Function, Diversity, & Ecology) or an additional Biological Science or Physical Science Course	4				
Earth Sciences 1121 (The Dynamic Earth)	4				
Physics 1200 (Mechanics, Kinematics, Fluids, Waves)	5				
ENR 3000 (Soil Science)	3				
ENR 3001 (Soil Science Laboratory)	1				
Free Electives	**0 Hours**		**MINIMUM HRS FOR GRADUATION**	**121 Hours**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives* to reach the 121-hour degree minimum.

Curriculum Draft 4.20
Updated 4/21/16

Commented [RLJ1]: Changing to Autumn 2017

Commented [RLJ2]: Changed from 21, due to increase in credit hours of ENR 3700

Commented [RLJ3]: Reduced to 26 hours in order to accommodate the extra hour in ENR 3700

Ecosystem Restoration Specialization	Units	
Required Courses	~~2~~ 7	
ENR 5560 Rehabilitation/Restoration of Ecosystems	~~2~~ 3	
~~**Ecosystem Science (select 2)**~~	**6-7**	
~~ENR 3322 Forest Ecosystems~~	3	
~~ENR 4260 Soil Resource Management~~	3	
~~ENR 5280 Stream Ecology~~	4	
~~ENR 5273 Environmental Fate and Impact of Contaminants in Soil & Water~~	3	
~~ENR 5250.01 Wetland Ecology & Restoration~~	3	
~~**Ecosystem Restoration (select 2)**~~	**7**	
~~ENVENG/FABENG 5310 Ecological Engineering & Science~~	4	
~~ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration~~	3	
~~*Other courses may be added with faculty advisor approval*~~		
~~**Methods (select 1)**~~	**3-4**	
~~ENR 5345 Methods in Aquatic Ecology~~	4	
~~ENR 5362 Wildlife Ecology Methods~~	3	
ENR 5274 Ecosystems Simulation	3	
Directed Electives*	~~6-8~~ 0-8	
ENR 5268 Soils and Climate Change (recommended)	2	
University GE Total/SENR Core Total	**95**	
Ecosystem Restoration Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives*, totaling 7-9 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

The above three categories within the specialization are being revised to:

Soil Remediation and Rehabilitation
Management of Terrestrial Ecosystems
Management of Aquatic and Wetland Ecosystems

Field Monitoring Methods
Species Identification and Recording

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Commented [RLJ4]: Two additional required courses are being added; ENR 3800 and 4800, both recently approved

Commented [RLJ5]: This section has been increased to include 5 different categories and a total of 39 courses for a student to select from

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Environmental Molecular Sciences Specialization	Units	
Biological Sciences	**5-9**	
Required (select 1)	3-4	
MICRBIO 4000 Basic & Practical Microbiology	4	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
Electives (select 1)	2-5	
MICRBIO 4100 General Microbiology	5	
MICRBIO 5155 Environmental Microbiology	3	
MICRBIO 5169H Microbial Evolution	3	
MICRBIO 5161H Bioinformatics & Molecular Microbiology	3	
PLNTBIO / MOLGEN 6625 Plant Metabolic Engineering (*GRAD—permission only*)	2	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
PLNTPTH 3001 General Plant Pathology Lecture	3	
PLNTPTH 5010 Phytobacteriology	2	
PLNTPTH 8400 Molecular Bases of Plant Host-Microbe Interactions (*GRAD—permission only*)	3	
PLNTPTH 5040 & 5041 Science of Fungi: Mycology Lecture & Lab	4	
Environmental Science	**5-6**	
Required (select 1)	3	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
Electives (select 1)	2-3	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 6610 Soil and Environmental Biochemistry (*GRAD—permission only*)	2	
Geochemistry & Mineralogy	**6-7**	
Required (select 1)	3	
EARTHSC 4421 Earth Materials	3	
EARTHSC 5621 Introduction to Geochemistry	3	
Electives (select 1)	3-4	
EARTHSC 5628 Environmental Isotope Geochemistry	3	
EARTHSC 5636 Advanced Topics in Mineralogy and Crystallography	3	
EARTHSC 5651 Hydrogeology	4	
EARTHSC 5676 Elemental Chemical Analysis using ICPOE and Mass Spectrometry	3	
EARTHSC 5680 Deep Earth Geophysics	3	
Molecular Biology	**5-8**	
Required (select 1)	3-4	
BIOCHEM 4511 Introduction to Biological Chemistry	4	
BIOCHEM 5613 Biochemistry & Molecular Biology I	3	
MOLGEN 4500 General Genetics	3	
Electives (select 1)	2-4	
ENR 5240 Environmental Molecular Sciences	2	
BIOCHEM 5614 Biochemistry & Molecular Biology II	3	
MICROBIO 4130 Microbial Genetics	3	
MICROBIO 4140 Molecular Microbiology Laboratory	3	
MOLGEN 4606 Molecular Genetics	4	
MOLGEN 5607 Cell Biology	3	
PLNTBIO / MOLGEN 5623 Genetics and Genomics	2	
Directed Electives*	**0-5**	

University GE Total/SENR Core Total	**95**	
Environmental Molecular Sciences Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives,* totaling 0-6 hours, to reach 27 hours in the specialization and the 121-hour degree minimum

Commented [RLJ6]: Change to minimum of 5

Commented [RLJ7]: Change to minimum of 5

Commented [RLJ8]: Change to minimum of 6

Commented [RLJ9]: Change to minimum of 5

Environmental Science Education Specialization	Units	
Science Education (select one)	**2-3**	
ENR 3611 Foundations for Environmental Communications, Education, & Interpretation	2	
ENR 4611 Environmental Interpretation & Visitor Services	3	
Ecosystem Science (select one course from each sub-category)	**9-10**	
Soils (select one)		
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
Wetlands and Aquatics (select one)		
ENR 5342 Principles of Fisheries Ecology & Management	3	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology & Restoration	3	
Forests and Wildlife (select one)		
ENR 5360 Principles of Wildlife Ecology & Management	3	
ENR 5340 Forest Ecosystem Management	3	
Methods for Ecosystem Restoration (select one)	**3-4**	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
ENR 5362 Wildlife Ecology Methods	3	
ENR 5345 Methods in Aquatic Ecology	4	
Science Certification		
Directed Electives (Board of Ed courses at OSU that count towards science certification) *	**9-12**	
University GE Total/SENR Core Total	**95**	
Environmental Science Education Specialization Total	**26**	
Degree Total	**121**	

Commented [RLJ10]: Deactivating this specialization

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives*, totaling 10-13 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

Soil Resources and Environmental Sustainability Specialization	Units	
Required Courses	**17-19**	
ENR 5261 Environmental Soil Physics	3	
AGSYSMGT 2370 Environmental Hydrology or Earth Sciences 5550 Geomorphology	2-4	
ENR 5260 Soil Landscapes: Morphology, Genesis & Classification	3	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5270 Soil Fertility or ENR 4260 Soil Resource Management	3	
Directed Electives *	**7-9**	
ENVENG 2100 Environmental Engineering Analytical Methods	3	
CIVILEN 5130 Applied Hydrology	3	
EARTHSCI 5651 Hydrogeology	4	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology and Restoration	3	
ENR 5210 US Environmental Impact Assessment	3	
ENR 5211 International Environmental Impact Assessment	3	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 5271 Soils of Forest Ecosystems	3	
ENR 5451 Water Law	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 5268 Soils and Climate Change	2	
ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration	3	
ENR 5274 Ecosystems Simulation	3	
ENR 5560 Rehabilitation/Restoration of Ecosystems	2	
ENR 6610 Soil and Environmental Biochemistry *(GRAD—permission only)*	2	
University GE Total/SENR Core Total	**95**	
Soil Resources and Environmental Sustainability Specialization Total	**26**	
Degree Total	**121**	

Commented [RLJ11]: Change to minimum of 17

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives*, totaling 8-10 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

Water Science Specialization	Units	
Water Science Required Courses	**12**	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology & Restoration	3	
AGSYSMGT 2370 Environmental Hydrology	2	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
Water Resource Courses (select 2)	**6 - 7**	
EEOB 5420 Aquatic Ecosystems - Ecology of Inland Waters (4 hr) or EEOB 5430 Aquatic Ecosystems - Fish Ecology (3 hr)	3 - 4	
~~CIVILEN 5130 Applied Hydrology~~	3	
EARTHSCI 2206 Principles of Oceanography	3	
ENR 5350.01 Taxonomy and Behavior of Aquatic Invertebrates or ENR 5350.02 Taxonomy and Behavior of Fishes	3	
Management and Restoration Courses (select 1)	**~~2~~ 4 ~~3-4~~**	
ENR 5355 Aquaculture	3	
ENR 5342 Principles of Fisheries Ecology and Management	3	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
ENR 5560 Rehabilitation/Restoration of Ecosystems	~~2~~ 3	
Methods (select 1)	**3 - 4**	
ENR 5345 Methods in Aquatic Ecology	4	
~~ENVENG 2100 Environmental Engineering Analytical Methods~~	3	
Directed Electives *	**0 - 3**	
University GE Total/SENR Core Total	**95**	
Water Science Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives,* totaling 0-4 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

Commented [RLJ12]: Moving this course to the Water Resource and Management category, replacing it with ENR 5345

Commented [RLJ13]: Moving this course to the Water Resource and Management category, replacing it with ENR 3285

Commented [RLJ14]: These three categories are being combined into one "Water Resource and Management" and students are able to select 4 courses. Adding 4 additional courses to list; EARTHSC 4450, GEOG 5210, ENR 5348 and 5358.

Commented [RLJ15]: Removed from list due to prerequisites

Commented [RLJ16]: These three categories are being combined into one "Water Resource and Management" and students are able to select 4 courses. Adding 2 additional courses to list; EARTHSC 4450 and GEOG 5210.

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Commented [RLJ17]: These three categories are being combined into one "Water Resource and Management" and students are able to select 4 courses. Adding 2 additional courses to list; EARTHSC 4450 and GEOG 5210.

Commented [RLJ18]: Removing from list due to prerequisites

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SENR Environmental Science

121 Hours – Autumn Semester 2017

COURSE & NUMBER	Units		COURSE & NUMBER	Units	
UNIVERSITY REQUIREMENTS (GE)			**SENR REQUIREMENTS**		
Writing Skills	**6 Hours**		***SENR CORE REQUIREMENTS***	**22 Hours**	
English 1110 (First Year Writing Course)	3		ENR 1100 (ENR Survey)	1	
ENR 2367 (Communicating Environmental and Natural Resources Information)	3		ENR 2100 (Intro to Environmental Science)	3	
Arts & Humanities	**12 Hours**		ENR 2300 (Society and Natural Resources)	3	
GE Literature Course ●▲	3		ENR 3300 (Intro to Forestry, Fisheries & Wildlife)	3	
GE Arts Course ● ▲	3		ENR 3400 (Psychology of Environmental Problems) or ENR 3500 (Community, Environment & Development)	3	
GE History Course ● ▲	3		ENR 4000 (Natural Resources Policy)	3	
GE Culture & Ideas or other Humanities course ● ▲ [Recommended: ENR 3470 (Religion & Environmental Values in America]	3		ENR 3700 (Intro to Spatial Info for Natural Resources)*	3	
Social Sciences	**6 Hours**		ENR 4900.01 (Senior Capstone) (Natural Resources Management)	3	
Rural Sociology 1500 ● (Recommended) or GE Social Science ● ▲	3		***Environmental Science Major Requirements***	**10 Hours**	
AED Econ 2001 or Economics 2001.01 (Microeconomics)	3		Chemistry 2310 (Intro Organic Chemistry)	4	
Diversity Courses	**overlapping**		EEOB 3410 (Intro to Ecology)	4	
Social Diversity in US ●	**----**		ENR 3280 (Water Quality Management)	2	
Global Studies Course 1 ▲	**----**		***Environmental Science Specializations:***	**26 Hours**	
Global Studies Course 2 ▲	**----**		***Ecosystem Restoration***		
Data Analysis, Quantitative & Logical Skills	**8 Hours**		***Environmental Molecular Science***		
ENR 2000 (Recommended) or GE Equivalent Statistics/Data Analysis course	3		***Soil Resources & Environmental Sustainability***		
Math 1156 or 1151 (Calculus for the Biological Sciences)	5		***Water Science***		
Natural Sciences	**31 Hours**				
Chemistry 1210 (General Chemistry I)	5				
Chemistry 1220 (General Chemistry II)	5				
Biology 1113 (Biological Sciences: Energy Transfer & Development)	4				
Biology 1114 (Biological Sciences: Form, Function, Diversity, & Ecology) or an additional Biological Science or Physical Science Course	4				
Earth Sciences 1121 (The Dynamic Earth)	4				
Physics 1200 (Mechanics, Kinematics, Fluids, Waves)	5				
ENR 3000 (Soil Science)	3				
ENR 3001 (Soil Science Laboratory)	1				
Free Electives	**0 Hours**		**MINIMUM HRS FOR GRADUATION**	**121 Hours**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives* to reach the 121-hour degree minimum.

Curriculum Draft 4.22
Updated 1/19/2017

Ecosystem Restoration Specialization	Units	
Principles and Practice of Restoration	**7**	
Required		
ENR 3800 Principles and Tools of Ecological Restoration	2	
ENR 4800 Practical Skills for Terrestrial Ecosystem Restoration	2	
ENR 5560 Rehabilitation/Restoration of Ecosystems	3	
Ecosystem Science	**6 minimum**	
Refer to the approved Directed Electives below – select 1 course (3-4 credits) from the Ecology of Terrestrial Ecosystems and 1 course (3-4 credits) from the Ecology of Aquatic & Wetland Ecosystems	6-8	
Resource Management and Conservation	**2 minimum**	
Refer to the approved Directed Electives below – select 2-3 credits from the Resource Management and Conservation section		
Field Monitoring and Assessment for Ecosystem Restoration	**5 minimum**	
ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration - REQUIRED	3	
EEOB 4430 Ecological Methods I *(Recommended)*	2	
ENR 5260 Soil Landscapes: Morphology, Genesis and Classification	3	
ENR 3323 Forest Biometrics	3	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 5362 Wildlife Ecology Methods	3	
EEOB 4950 Field Ecology	2	
Species Ecology, Identification and Recording	**2 minimum**	
ENR 4610 Natural History of Ohio *(Recommended)*	3	
ENR 3321 Biol & ID of Woody Plants *or* EEOB 2210 OH Plants *or* HCS 2340 Landscp Plants *or* HCS 2202 Form & Func of Cultivated Plants	2 - 3	
ENR 5350.01 Taxonomy & Behavior of Aquatic Inverts. *or* ENTMLGY 4000 General Entomology	3	
ENR 5350.02 Taxonomy & Behavior of Fishes	3	
ENR 5364.01 Mammalian Wildlife Biology and Management	3	
ENR 5364.02 Avian Wildlife Biology & Management *or* ENR 2360 Ecology & Conservation of Birds (Stone Lab) *or* EEOB 2220 Ohio Birds	2 - 3	
PLNTPTH 5040 and PLNTPTH 5041 Science of Fungi: Mycology Lecture and Science of Fungi: Mycology Lab	4	
Directed Electives*	**0 - 4**	
Choose courses from any of the below categories to reach the 26-hour minimum for the specialization.*		
Ecology of Terrestrial Ecosystems		
EEOB 5470 Community and Ecosystems Ecology – recommended	3	
ENR 3322 Forest Ecosystems *or* ENR 5340 Forest Ecosystem Management	3	
ENR 5274 Ecosystems Simulation	3	
ENR 5263 Biology of Soil Ecosystems	3	
MICRBIO 5155 Environmental Microbiology	3	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
HCS 2201 Ecology of Managed Plant Systems	4	
HCS 5422 Biology and Management of Weeds and Invasive Plants	3	
HCS 5412 Agroecology of Grasslands and Prairies	3	
PLNTPTH/ENTMLGY 5110 Ecology and Management of Pathogens and Insects Affecting Trees in Forest and Urban Environments	3	
HCS 5602 The Ecology of Agriculture	3	
HCS 5730 Seed Ecology and Physiology	3	
Ecology of Aquatic and Wetland Ecosystems		
EEOB 5420 Ecology of Inland Waters	4	
ENR 3285 Watershed Hydrology	3	
ENR 5250.01 Wetland Ecology and Management	3	
ENR 5250.02 Wetland Field Laboratory	1	
ENR 5280 Stream Ecology	4	
Resource Management and Conservation		

Ecosystem Management and Conservation		
EEOB 2410 Biological Invasions: The Ecology and Evolution of Species Introductions	3	
ENR 3335.01 Introduction to Wildland Fire Management	2	
ENR 3335.02 Wildland Fire Management Laboratory	1	
ENR 5340 Forest Ecosystem Management	3	
ENR 5342 Principles of Fisheries Ecology and Management	3	
ENR 5370 Management of Wildlife Habitat	2	
HCS 5422 Biology and Management of Weeds and Invasive Plants	3	
AGSYSMT 2370 Environmental Hydrology	2	
Soil Resource Management and Conservation		
ENR 4260 Soil Resource Management	3	
ENR 5262 Soil Chemical Processes and Environmental Quality	3	
ENR 5268 Soils and Climate Change	2	
ENR 5270 Soil Fertility	3	
ENR 5273 Environmental Fate and Impact of Contaminants in Soil and Water	3	
Plant Production for Restoration		
HCS 3320 Plant Propagation: The Manipulation of Plant Reproduction	3	
HCS 3420 Seed Science	3	
HCS 3521 Basic Greenhouse Production	2	
Ecosystem History and Environmental Change		
ANTHROP 5614 Ethnobotany	3	
ANTHROP 5623 Environmental Anthropology	3	
ANTHROP 3350 Prehistoric Indians of the Ohio Valley	3	
GEOG 3900 Global Climate Change: Causes and Consequences	3	
PHIL 2342 Environmental Ethics	3	
Practical Experience in Restoration		
ENR 4191 or Professional Practice in Environment and Natural Resources ENR 4998 or Undergraduate Research	1-3	
University GE Total/SENR Core Total	**95**	
Ecosystem Restoration Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives*, totaling 0-5 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

Note regarding GE requirements: For the ecosystem restoration specialization, we recommend considering the following courses to meet GE requirements:

GE Culture & Ideas	LARCH 2367 Making and Meaning of the American Landscape
GE History	HISTORY 3700 American Environmental History
GE History/GE Global Studies	HISTORY 2700 Global Environmental History
GE Global Studies	ANTHROP 2201 Introduction to Archeology

Environmental Molecular Sciences Specialization	Units	
Biological Sciences	**5 minimum**	
Required (select 1)	3-4	
MICRBIO 4000 Basic & Practical Microbiology	4	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
Electives (select 1)	2-5	
MICRBIO 4100 General Microbiology	5	
MICRBIO 5155 Environmental Microbiology	3	
MICRBIO 5169H Microbial Evolution	3	
MICRBIO 5161H Bioinformatics & Molecular Microbiology	3	
PLNTBIO / MOLGEN 6625 Plant Metabolic Engineering (*GRAD—permission only*)	2	
PLNTBIO / MOLGEN 5630 Plant Physiology	3	
PLNTPTH 3001 General Plant Pathology Lecture	3	
PLNTPTH 5010 Phytobacteriology	2	
PLNTPTH 8400 Molecular Bases of Plant Host-Microbe Interactions (*GRAD—permission only*)	3	
PLNTPTH 5040 & 5041 Science of Fungi: Mycology Lecture & Lab	4	
Environmental Science	**5 minimum**	
Required (select 1)	3	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
Electives (select 1)	2-3	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 6610 Soil and Environmental Biochemistry (*GRAD—permission only*)	2	
Geochemistry & Mineralogy	**6 minimum**	
Required (select 1)	3	
EARTHSC 4421 Earth Materials	3	
EARTHSC 5621 Introduction to Geochemistry	3	
Electives (select 1)	3-4	
EARTHSC 5628 Environmental Isotope Geochemistry	3	
EARTHSC 5636 Advanced Topics in Mineralogy and Crystallography	3	
EARTHSC 5651 Hydrogeology	4	
EARTHSC 5676 Elemental Chemical Analysis using ICPOE and Mass Spectrometry	3	
EARTHSC 5680 Deep Earth Geophysics	3	
Molecular Biology	**5 minimum**	
Required (select 1)	3-4	
BIOCHEM 4511 Introduction to Biological Chemistry	4	
BIOCHEM 5613 Biochemistry & Molecular Biology I	3	
MOLGEN 4500 General Genetics	3	
Electives (select 1)	2-4	
ENR 5240 Environmental Molecular Sciences	2	
BIOCHEM 5614 Biochemistry & Molecular Biology II	3	
MICROBIO 4130 Microbial Genetics	3	
MICROBIO 4140 Molecular Microbiology Laboratory	3	
MOLGEN 4606 Molecular Genetics	4	
MOLGEN 5607 Cell Biology	3	
PLNTBIO / MOLGEN 5623 Genetics and Genomics	2	
Directed Electives*	**0-5**	

University GE Total/SENR Core Total	**95**	
Environmental Molecular Sciences Specialization Total	**26**	
Degree Total	**121**	

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Soil Resources and Environmental Sustainability Specialization	Units	
Required Courses	**17 minimum**	
ENR 5261 Environmental Soil Physics	3	
AGSYSMGT 2370 Environmental Hydrology or Earth Sciences 5550 Geomorphology	2-4	
ENR 5260 Soil Landscapes: Morphology, Genesis & Classification	3	
ENR 5262 Soil Chemical Processes & Environmental Quality	3	
ENR 5263 Biology of Soil Ecosystems	3	
ENR 5270 Soil Fertility or ENR 4260 Soil Resource Management	3	
Directed Electives *	**7-9**	
ENVENG 2100 Environmental Engineering Analytical Methods	3	
CIVILEN 5130 Applied Hydrology	3	
EARTHSCI 5651 Hydrogeology	4	
ENR 5280 Stream Ecology	4	
ENR 5250.01 Wetland Ecology and Restoration	3	
ENR 5210 US Environmental Impact Assessment	3	
ENR 5211 International Environmental Impact Assessment	3	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 5271 Soils of Forest Ecosystems	3	
ENR 5451 Water Law	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
ENR 5268 Soils and Climate Change	2	
ENR 5279 Urban Soils and Ecosystem Services: Assessment and Restoration	3	
ENR 5274 Ecosystems Simulation	3	
ENR 5560 Rehabilitation/Restoration of Ecosystems	2	
ENR 6610 Soil and Environmental Biochemistry *(GRAD—permission only)*	2	
University GE Total/SENR Core Total	**95**	
Soil Resources and Environmental Sustainability Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives*, totaling 8-10 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.

Water Science Specialization	Units	
Water Science Required Courses	**14**	
ENR 5280 Stream Ecology	4	
ENR 5345 Methods in Aquatic Ecology	4	
ENR 3285 Watershed Hydrology	3	
ENR 5273 Environmental Fate & Impact of Contaminants in Soil & Water	3	
Water Resource and Management Courses (select 4)	**10 minimum**	
ENR 5250.01 Wetland Ecology & Restoration	3	
AGSYSMGT 2370 Environmental Hydrology	2	
ENR 5350.01 Taxonomy and Behavior of Aquatic Invertebrates	3	
ENR 5350.02 Taxonomy and Behavior of Fishes	3	
ENR 5355 Aquaculture	3	
ENR 5348 Conservation and Management of Aquatic Populations	3	
ENR 5358 Applied Vertebrate Physiological Ecology	3	
ENR 5342 Principles of Fisheries Ecology and Management	3	
ENR 3800 Principles and Tools of Ecosystem Restoration	2	
EEOB 5420 Ecology of Inland Waters or EEOB 5430 Aquatic Ecosystems - Fish Ecology	3 - 4	
ENVENG/FABENG 5310 Ecological Engineering & Science	4	
EARTHSCI 2206 Principles of Oceanography	3	
EARTHSCI 4450 Water, Ice and Energy in the Earth System	3	
GEOG 5210 Fundamentals of Geographic Information Systems	3	
Directed Electives	**0-2**	
University GE Total/SENR Core Total	**95**	
Water Science Specialization Total	**26**	
Degree Total	**121**	

***ENR 3700 credit hours:** If you took ENR 3700 *before* AU16, you must take an additional hour in *Directed Electives,* totaling 0-4 hours, to reach 27 hours in the specialization and the 121-hour degree minimum.