



**Graduate School**

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February 1, 2013

**Environmental Sciences Graduate Program**

CAA Committee Members:

The Environmental Sciences Graduate Program (ESGP) has presented a proposal to add an additional specialization in Agroecosystems Science to their program.

ESGP is an interdisciplinary graduate program which uses courses from multiple units across campus. The Graduate School Curriculum Committee reviewed this proposal and approved it at its December 13<sup>th</sup> meeting. It was subsequently approved by the Graduate Council at their January 14<sup>th</sup> meeting. The proposal is now presented to the Committee on Academic Affairs for your consideration.

Sincerely,

A handwritten signature in black ink that reads 'Scott Herness'.

Scott Herness  
Associate Dean

THE OHIO STATE UNIVERSITY  
**GRADUATE**  
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December 14, 2012

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Maurea Al-Khoury  
Graduate Coordinator, ESGP

## Environmental Sciences Graduate Program

Maurea,

The Graduate School Curriculum Committee (GSCC) met on December 13<sup>th</sup> and considered the revised proposal to add an agroecosystems specialization to the Environmental Sciences Graduate Program. The committee felt that the revision satisfied their requested clarifications (outlined previously in my Sept. 17<sup>th</sup> letter). The GSCC thanks everyone for providing clear responses to their queries about the curriculum and advising. In separate conversations with Dr. Casey Hoy, we recognize that providing concurrence from units for the proposed coursework (which the GSCC had previously recommended) is both too arduous a task and, given the number of students involved, unnecessary.

I will now release the proposal for the subsequent approval steps. It will be presented and voted on at an upcoming Graduate Council meeting and subsequently presented to the Council of Academic Affairs (CAA). Dr. Prewinder Grewal and/or Dr. Hoy will be invited to attend that CAA meeting.

Please share these comments with the current Graduate Studies Chair, Parwinder Grewal, and the Environmental Sciences network director, Richard Moore.

Don't hesitate to contact me with questions or clarifications.

Many thanks,

Scott Herness  
Associate Dean

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Maurea Al-Khoury  
Graduate Coordinator, ESGP

## Environmental Sciences Graduate Program

Maurea,

The Graduate School Curriculum Committee (GSCC) met on September 13<sup>th</sup> and reviewed the request to add an Agroecosystems Specialization to the Environmental Sciences Graduate Program. The Committee was fundamentally supportive of the addition of this specialization. They appreciated the background information and justification that was provided. However, they did request some clarifications which I will outline below. Further, since you mentioned that additional specializations may be added in the future, the committee felt that these requests could help to facilitate these future proposals by illustrating the desired materials. Please share these comments with the current Graduate Studies Chair, Parwinder Grewal, and the network director, Richard Moore.

- Please illustrate how the specialization will fit into the current curriculum. For example, how much of the credit hours will be in addition to the total required credit hours of 80? The committee noted that some courses will double count for the Core Course requirements in the focus areas for the PhD. A more detailed explanation (or table) of how the specialization integrates into the curriculum plan of the PhD would be appreciated.
- Please describe how students be advised in this specialization. Students should be clear that they are fulfilling both program requirements and the specialization requirements early in the program. Would an advising sheet, similar to that which exists for the PhD, be devised to include the specialization? Further, how will student eligibility for the specialization be determined?
- Concurrence letters of support should be obtained from all of the offering units who would provide course work. Previous concurrence for your courses was likely provided at the time of semester conversion. However, new courses are being added to the program as a result of this specialization and concurrence from those units is needed.

Please resubmit the proposal to me or my assistant, Dena Myers (myers.663@osu.edu), at your convenience. After we receive it, I will schedule it for re-review at the next upcoming

Graduate School Curriculum meeting. Subsequently, the proposal will be submitted to the Graduate Council and finally to the Committee on Academic Affairs. CAA approval will be the last required approval step prior to being able to administer this new specialization.

Please don't hesitate to contact me with questions or clarifications.

Many thanks,



Scott Herness  
Associate Dean



## Graduate Area of Specialization in Agroecosystems Science

### The Ohio State University Environmental Science Graduate Program

#### **Justification:**

Scientists studying agroecosystems need the analytical tools to understand complex systems, and measure variation over large spatial extents and long time frames. A growing number of graduate school candidates are interested in approaching agricultural science from an agroecosystems perspective, stemming from interest in such topics as food systems, sustainability, adaptation of agriculture to climate change, and systems approaches to maintaining environmental quality. Agroecosystems function as a combination of people and the land. Therefore, research on agroecosystems is interdisciplinary, requires ability to bridge the social and natural sciences, and is consistent with agroecosystems science as a specialization within ESGP.

#### **How does this specialization promote an interdisciplinary cluster?**

The Agroecosystems Management Program of The Ohio State University, OARDC, was initiated in the early 1990's by a committed group of faculty that spanned the physical, biological and social sciences. Based on their innovative approaches to the science, graduate education, and outreach associated with agroecosystems management, the program was endowed by the W. K. Kellogg Foundation in 1998. This specialization will provide a clear pathway for graduate students to become integrated more effectively into the ongoing work of the Agroecosystems Management Program and its many participating faculty and stakeholder partners.

#### **What are some of the cutting edge themes addressed by this specialization?**

*Local food system development, food system assessment and sustainability* – Over \$2.5 million in federal and foundation grants have been received by AMP faculty in the past few years in the area of building local economies around food and agriculture. Three recent or current ESGP students have pursued the coursework outlined above as an advising track because they are interested in food systems research.

*Watershed ecology and participatory water quality management programs* – the Sugar Creek Project has been enormously successful in attracting major research funding, a NSF GK12 training grant, and community-based approaches to creating new incentives for water quality improvement.

*Renewable energy from agroecosystems* – Research is needed to develop a rational approach to using open space found in agroecosystems for capturing wind and solar energy, and for converting biomass from agroecosystems to materials and energy in sustainable ways.

*Sustainability science and policy* – A new endowed network of Kellogg Chairs and other scholars from throughout the land grant system (INFAS, the Inter-institutional Network for Food, Agriculture and Sustainability) is currently developing a national research and research-driven policy agenda for sustainability in agriculture and food systems.

#### **Does this proposed transcript designation involve core subject matter from other disciplines?**

The agroecosystem science designation is too broadly interdisciplinary to exist within any of the many disciplines that contribute to the specialization. Furthermore, the subject matter is comprised of courses from many of the disciplines that comprise ESGP. The core course lists are comprised of options rather than requirements, therefore, no one department or discipline is placed in a position of responsibility for maintaining viability of the specialization. Furthermore, neither the core course lists nor the one

required course for this specialization are expected to result in an enrollment burden given the relatively small number of students involved.

**How does the core subject matter for the specialization relate to the core requirements of ESGP?**

For all ESGP specializations, students must complete the requirements for both the ESGP and the specialization. The purpose of specializations is to meet the needs of students with common, identifiable interests within the broad arena of environmental sciences and provide formal recognition for developing a particular area of expertise. The ESGP core courses are selected to be broadly applicable to any student in ESGP. Some, but certainly not all, of these courses could be expected to be relevant to a given specialization. However, ESGP students are expected to select many electives in addition to the core requirements, in collaboration with their advisors and advisory committees. Either ESGP core courses or courses that might be part of that broader list of electives may be identified as core course options for a specialization. Therefore, we expect overlap but not exact correspondence between the ESGP core requirements, and how they are organized, and the specialization objectives and core course requirements.

Any student admitted to the ESGP is eligible to pursue the Specialization in Agroecosystems Science. Requirements for admission to the specialization course of study, therefore, are 1.) consent of the student's advisor, and 2.) completion of the specialization coursework requirements as outlined in this document. The Specialization in Agroecosystem Science Plan of Study form, signed by the student, advisor, and specialization subcommittee chair (appointed by the ESGP Director for each specialization) will be required to document completion of the requirements.

Consistent with policy for ESGP, courses taken to satisfy the requirements of an Agroecosystem Science Specialization MS degree will not count toward the requirements for an Agroecosystem Science Specialization Ph. D. degree, with the exception of GEOG 5220 Fundamentals of Geographic Information Systems, which will be required for either degree and once taken will count for either or both.

Key objectives for the Specialization in Agroecosystem Science are:

Objective 1: Students will develop a set of Analytical Skills and Engineering expertise that are needed to address the measurement and analysis of variation and change in agroecosystems, including their biological, physical, social and economic dimensions.

Objective 2: Students will develop an understanding of ecology, in terms of the relationship among species and between the biological and physical components of ecosystems, consistent with the core biology and physical sciences subject areas of ESGP. In particular, however, students in the Specialization in Agroecosystems Science must demonstrate understanding of these ecological concepts through coursework that relates specifically to agriculture and food systems.

Objective 3: Students will develop an understanding of social, economic and political relationships that impact the functioning of agricultural ecosystems. This requirement will be met by requiring social science coursework that either relates specifically to agriculture and food systems or develops understanding and capabilities in the social sciences that are particularly important in addressing social, economic and policy issues in agriculture and food systems.

**Core Faculty Members:**

Biological sciences: Casey Hoy, John Cardina (additional ESGP faculty could include: Richard Dick, Charles Goebel, Susan Fisher, Parwinder Grewal, Brian McSpadden-Gardner, Alison Snow, Li Zhang)

Physical sciences and engineering: Jay Martin (additional ESGP faculty could include: Steve Gordon, Karen Mancl, Fred Michel)

Social Sciences: Richard Moore (additional ESGP faculty could include: Joe Heimlich, Elena Irwin, Tom Koontz, Brent Sohngen)

**Required and Optional Coursework:**

Coursework is organized according to the three specific objectives described above for the Specialization in Agroecosystems Science. The required coursework in each of these areas is outlined below. Courses marked with a √ may also satisfy core requirements of the ESGP.

Objective 1: Analytical and Engineering Skills for Agroecosystem Analysis

Required of all students:

GEOG 5220 - Fundamentals of Geographic Information Systems G 3

Basic principles of geographic and land information systems and their use in spatial analysis and information management.

Prereq: Not open to students with credit for 607 or equiv.

Choose at least 3 (MS) or 6 (Ph. D.) credits from the following:

AEDECON 6120 - Applied Quantitative Methods II G 4

Application of econometric and time series methods to the analysis of problems in agricultural, environmental, and development economics.

Prereq: 4001 (500) or Econ 4001 (501), and 2005 (205) or Stat 1430 (133). Not open to students with credit for 701.

AEDECON 7120 - Advanced Quantitative Methods II G 3

Application of econometric and time series methods to empirical problems in agricultural, environmental, and development economics.

Prereq: 4001 (500), or Econ 4001.01 (501.01), 4001.02 (501.02), or 4001.03 (501.03), and one course in mathematical statistics. Not open to students with credit for 802.

AEDECON 7130 - Advanced Quantitative Methods III G 3

Theoretical formulation and numerical analysis of stochastic dynamic models in agricultural, environmental, development and financial economics.

Prereq: Econ 8712 (804). Not open to students with credit for 801.

CIVILEN 5420 - Remote Sensing of Environment G 3

The energies of the natural and cultural environment, current remote sensing systems and case histories of applications in measuring the environment.

Prereq: 2410 (400), or permission of instructor. Not open to students with credit for 603 or 606.

CIVILEN 5421 - Spatial Analysis Techniques for Civil Engineering G 3

Principles of spatial analysis techniques for application to civil engineering, particularly in the water resources and geotechnical areas.

Prereq: 5001 (607), or permission of instruction. Not open to students with credit for 608.

ENVENG 7217 - Applied Mathematical Ecology G 4

Description and application of basic methods to model population, communities and the interactions between ecosystems and the earth system.

Prereq: 2060 (406) or Math 568, and EnGraph 167, CSE 1221, or 1222. Not open to students with credit for CivilEn 817.

√ ENR 5225 - Ecosystem Modeling G 3

Development and simulation of ecological models for natural resource/ecosystem management; conceptual and symbolic models, simulation techniques on main frame and microcomputers.

Prereq: Math 1151 (151) and EEOB 3005 (503.01); or Grad standing. Not open to students with credit for 760. Cross-listed in FABEng 760.

FABENG 3510 - Introduction to Biological Engineering U G 4

An integration of biology, biochemistry and engineering fundamentals for engineering applications in fermentation microbiology and biotechnology, and for analysis of natural biological systems.

Prereq: 2110 and 2120. Not open to students with credit for 625.

√ FABENG 5320 - Agroecosystems G 3

Holistic analysis of agricultural systems. Application of energy analysis to evaluate and design sustainable agroecosystems.

Prereq: Sr or Grad standing, or permission of instructor. Not open to students with credit for 732.

√ FABENG 5180 - Ecological Engineering and Science G 4

Definition, classification, and practice of ecological engineering. Course explores ecological ecosystems, ecosystem restoration, and the utilization of natural processes to provide societal services and benefits to nature.

Prereq: At least one course in Biology, Ecology, Engineering, or Geology, and Jr standing. Not open to students with credit for 618, EnvEng 618 or ENR 618. Cross-listed in EnvEng 5180 and ENR 5222.

Objective 2: Biological and Physical Sciences Related to Agricultural Ecology

Choose at least 3 (MS) or 6 (Ph. D.) credits of the following:

√ EEOB 5470 - Community and Ecosystem Ecology G 3

A quantitative and descriptive approach to the establishment, development, succession, and dynamics of communities and their interrelations with historic, climatic, soil, and biotic factors.

Prereq: 3410, or Grad standing. Not open to students with credit for 700 or 720.

√ HCS 5602 - The Ecology of Agriculture G 3

Examines the key ecological and evolutionary processes at work in agricultural systems and the ways those processes interact with human systems.

Prereq: 6 cr hrs of Horticulture or Crops courses and 3 cr hrs of Soils course (3000 level or higher), or permission of instructor. Not open to students with credit for 602.

√ ENR 5263 - Biology of Soil Ecosystems G 3

A comprehensive study of microbial communities and their role in providing ecosystems services.

Sp Sem. Prereq: 3000 (300.01) or Soil Sci 300.01 or Grad standing. Not open to students with credit for 665 or 682.

EARTHSC 5651 – Hydrogeology G 4

Geologic and hydrologic factors controlling the occurrence, movement, storage, and chemical



quality of surface water and ground water; exploration, evaluation, development and management of water resources.

Prereq: EarthSc 1121 (EarthSci 121) or GeolSci 121; and Math 1152 (153) or above. Not open to students with credit for EarthSci 651 or GeolSci 651.

ENR 7700 - Watershed Ecology and Restoration G 3

Fundamental ecological processes affecting streams, wetlands, and rivers at the watershed scale and the emerging roles of restoration and adaptive management in disturbed aquatic ecosystems.

Au Sem. 3 hr lecture, field trips. Prereq: Grad standing. Not open to students with credit for 770.

Objective 3: Social Sciences and Policy Important in Agroecosystem Function and Change

Choose at least 3 (MS) or 6 (Ph. D.) credits of the following:

√ AEDECON 5330 - Benefit-Cost Analysis G 3

Benefit-cost analysis theory and methods and their application to projects pertaining to public infrastructure, agriculture, the environment, natural resources, and human health.

Prereq: 4310 (531) or 4001 (500), or Econ 4001 (501). Not open to students with credit for 631.

AEDECON 7320 - Advanced Resource Economics G 2

Application of advanced economic theory and methods to the allocation and optimal management of exhaustible and renewable natural resources.

Prereq: Econ 8712 (804).

AEDECON 7410 - Advanced Regional Economics G 2

Application of advanced economic theory and methods to problems of regional economic development.

Prereq: Econ 8712 (804). Not open to students with credit for 840.

√ CRPLAN 6410 - Planning for Sustainable Development G 3

Sustainable development is a broad concept; translated into reality through relevant theory and the implementation of key design, policy and project based solutions.

Prereq: Grad standing, or permission of instructor. Not open to students with credit for 724.

√ ENR 8350 - Ecosystem Management Policy G 3

Theory and practice of integrating natural and social science for managing watersheds, forests, and regions. Evolution of policies to address human-ecological systems. Service learning "lab".

Au Sem. Prereq: Grad standing. Not open to students with credit for 835.

ENR 8400 - Human Dimensions of Ecosystems Management G 2

Provides an overview of interdisciplinary theories and frameworks for understanding and addressing environmental problems and natural resources management issues.

Au Sem. Prereq: Grad standing. Not open to students with credit for 840.

RURLSOC 5530 - Sociology of Agriculture and Food Systems G 3

Overview of sociological theory and research related to agricultural change and food system development, focusing on individual, family, farm, community and environmental impacts.

Au Sem. Prereq: 6 units in RurlSoc, Sociol, or related Social Sciences, or Grad standing, or permission of instructor. Not open to students with credit for 733.

RURLSOC 7600 - Concepts and Theories in Rural Sociology G 3

Examines the sociological significance of "rurality" and the conceptual perspectives applied to major substantive areas in rural sociology, such as community, environment, and agriculture.

\* Au Sem (odd years). Prereq: Grad standing. Not open to students with credit for 742.

√ RURLSOC 7560 - Environmental Sociology G 3

Sociological approaches to the study of environmental policy. Analysis of major issues relating to the use and abuse of natural resources and pollution.

Prereq: Grad standing. Not open to students with credit for 766.

Special topics:

Seminars, studios and group studies courses are offered regularly by faculty participating in the Agroecosystems Management Program, allowing students to focus on key topics in Agroecosystems Science, work in interdisciplinary teams, and partner with stakeholders on real-life case studies. At least 2 credit hours are required in special topics courses related to the Specialization in Agroecosystem Science for both the MS and Ph. D. degrees (e.g. Entomol 7890, ENR 8890.03, EEOB 8896.04, etc). These courses will be approved for credit by the specialization subcommittee.

Total ESGP core course options for the specialization:

Biological Sciences 4; Physical Sciences and Engineering - 3; Social Sciences - 4

Total additional course options in the specialization:

Biological Sciences 2; Physical Sciences and Engineering – 3; Analytical Skills - 7; Social Sciences - 5

Depending upon the student's choices, a PhD student pursuing the Specialization in Agroecosystems Science in ESGP could take as few as 25 required credit hours to achieve both the ESGP and Specialization requirements (18 credit hours that satisfy both ESGP core and Specialization requirements plus 2 ESGP seminar credits plus 5 credit hours in GIS and special topics that are unique to the Specialization) or as many as 43 credit hours (18 credit hours that satisfy ESGP core requirements plus 23 credit hours of non-ESGP core courses for the Specialization plus 2 ESGP seminar credits). Regardless, 37-55 of the student's 80 required credits will be electives selected by the student, advisor, and advisory committee.

**CAA**  
**11 of 11**

# ESGP Specialization in Agroecosystem Science Plan of Study

Name of student \_\_\_\_\_ Date \_\_\_\_\_ Degree MS PhD

Category	Courses Completed Or In Progress	Sem Hrs	Courses Proposed	Sem Hrs
GEOG 5220 Fundamentals of GIS or equivalent		3, MS or Phd		
Analytical and Engineering Skills for Agroecosystem Analysis		(≥ 3, MS, or 6, Phd)		
Biological and Physical Sciences In Agricultural Ecology		(≥ 3, MS, or 6, Phd)		
Social Sciences and Policy in Agroecosystem Function and Change		(≥ 3, MS, or 6, Phd)		
Special Topics in Agroecosystem Science		(≥ 2 MS or Phd)		
Totals				

X \_\_\_\_\_  
Advisor's Signature  
Please Print Name Here \_\_\_\_\_

X \_\_\_\_\_  
Student's Signature

X \_\_\_\_\_  
Advisory Committee Member's Signature  
Please Print Name Here \_\_\_\_\_

X \_\_\_\_\_  
Advisory Committee Member's Signature  
Please Print Name Here \_\_\_\_\_

X \_\_\_\_\_  
Advisory Committee Member's Signature  
Please Print Name Here \_\_\_\_\_

X \_\_\_\_\_  
ESGP GSC Specialization Subcommittee  
Chair's Signature  
Please Print Name Here \_\_\_\_\_