Course Approval Form

For instructions:
http://registrar.gmu.edu/facultystaff/catalog-revisions/course/

Action Requested: (definitions available at website above)
[x] Create NEW [ ] Inactivate
[ ] Modify (check all that apply below)

[ ] Title (must be 75% similar to original) [ ] Repeat Status [ ] Prereq/coreq [ ] Grade Mode
[ ] Credits [ ] Schedule Type [ ] Restrictions [ ] Other: ______

Course Level: [x] Undergraduate [ ] Graduate

College/School: Smithsonian Mason School of Conservation
Department:
Submitted by: David Luther
Ext: 3-5267
Email: dluther@gmu.edu

Subject Code: BIOL **Number:** 356
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term: [x] Fall [ ] Spring [x] Summer *Year* 2017

Title: Current:
Banner (30 characters max w/ spaces):
New: Landscape and Macrosystems Ecology

Fulfills Mason Core Req? (undergrad only)
[ ] Currently fulfills requirement
[ ] Submission in progress

Credits: (check one)
[ ] Fixed →
[ ] Variable → ___ to ___
[x] Lec + Lab/Rct → 3 + 1

Repeat Status: (check one)
[x] Not Repeatable (NR)
[ ] Repeatable within degree (RD) →
[ ] Repeatable within term (RT) →
Max credits allowed: (required for RT/RD status only)

Grade Mode: (check one)
[x] Regular (A, B, C, etc.)
[ ] Satisfactory/No Credit
[ ] Special (A, B C, etc. +IP)

Schedule Type: (check one) LEC can include LAB or RCT if linked sections will be offered
[x] Lecture (LEC)
[ ] Lab (LAB)
[ ] Recitation (RCT)
[ ] Internship (INT)
[ ] Independent Study (IND)
[ ] Seminar (SEM)
[ ] Studio (STU)

Prerequisite(s) (NOTE: hard-coding requires separate Prereq Checking form; see above website):
(EVPP 301 and EVPP 302) or INST 401 or BIOL 308 Ecology, or equivalent course

Corequisite(s):

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code(s).

Equivalencies (check only as applicable):
[x] YES, course is 100% equivalent to Cons 405
[ ] YES, course renumbered to or replaces

Catalog Copy (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
Detect and characterize patterns in landscapes. Investigate how they form and change over time, and with anthropogenic influences. Models populations and communities across landscapes, and ways of managing them to achieve goals in managing species and ecosystem processes at local, regional, and continental scales.	

Indicate number of contact hours: Hours of Lecture or Seminar per week: 4 Hours of Lab or Studio:
When Offered: (check all that apply) [x] Fall [x] Summer [ ] Spring

Approval Signatures

Department Approval ______ Date ______ College/School Approval ______ Date ______

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date

Undergraduate or Graduate Council Approval

UGC or GC Council Member | Provost's Office | UGC or GC Approval Date

Form revised 9/2/2016

Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL COURSES (required)

Course Number and Title: BIOL 356 Landscape and Macrosystems Ecology

Date of Departmental Approval: November 15, 2016

FOR INACTIVATED/REINSTATED COURSES (required if inactivating/reinstating a course)

- Reason for Inactivating/Reinstating:

FOR MODIFIED COURSES (required if modifying a course)

- Summary of the Modification:
- Text before Modification (title, repeat status, catalog description, etc.):
- Text after Modification (title, repeat status, catalog description, etc.):
- Reason for the Modification:

FOR NEW COURSES (required if creating a new course)

- Reason for the New Course: BIOL 356 will convey a fundamental skill set that is critical in most entry-level jobs in the field of conservation biology.
- Relationship to Existing Programs: BIOL 356 is equivalent to CONS 405 which will be taught at the Smithsonian Mason School of Conservation and will follow from the foundational framework set by the CONS 404 Biodiversity Monitoring course. The course will be part of the Smithsonian Mason School of Conservation and could help fulfil credits for concentrations in the Biology-environmental and conservation biology concentration, Environmental and Science and Policy-conservation concentration, the School of Integrative Studies- applied global conservation concentration, and the Environmental Studies and Sustainability – conservation and sustainability concentration.
- Relationship to Existing Courses: A course like this is currently not offered at GMU.
- Semester of Initial Offering: Fall 2017
- Proposed Instructors: James McNeil, Stephanie Lessard-Pilon, Anneke Deluycker
- Insert Tentative Syllabus Below

BIOL 356 – Landscape and Macrosystems Ecology
4 credits

Course Meeting Times:
This course will meet during weeks 6-10 of the semester, Monday afternoons from 1-3, and Tuesday through Friday, between 9:30 am-12 pm and 1:00-3:00 pm, with additional occasional early mornings and late evenings for sampling and field work.

Description
Landscape ecology is the study of the relationship between spatial patterns and processes, including ways to characterize spatial patterns, what causes or influences these patterns, and how these patterns change over time. This course includes theory and application of landscape ecology for conservation biology, including the impacts of land use management on landscapes, movement of species, protected area (PA) management, and habitat connectivity and fragmentation. The course will focus on detecting and characterizing patterns in landscapes, how landscape patterns form and change over time and with anthropogenic influences, modeling populations (including metapopulations) and communities across landscapes, and ways of managing landscapes to achieve goals in managing species and ecosystem processes. A macrosystems ecology perspective, which incorporates multi-scale ecological patterns and processes to understand environmental dynamics across landscapes, will be emphasized throughout the course. The capstone project involves an analysis of habitat suitability and the proposal of a protected area for a threatened species or habitat.

Learning Objectives
Students will:

- Learn fundamental concepts of landscape ecology by detecting and characterizing patterns and their causes in landscape structure and ecosystem processes as well as implications of these patterns for populations and communities across spatial and temporal scales
- Develop and apply skills in the use of tools including remote sensing technology, spatial models, and networks of region-wide data collection (e.g. National Ecological Observatory Network and ForestGEO) to examine ecological processes and species distributions across spatial and temporal scales and to communicate those processes and distributions using clear and effective maps
- Analyze patterns of global environmental change including disturbance and succession, and the impacts of land use and strategies by which humans manage landscapes
- Understand and investigate anthropogenic drivers of landscape processes and propose sustainable landscape-level solutions for threatened species and habitats

Prerequisites

This semester is being offered to undergraduate juniors, seniors and post-baccalaureate students. Prerequisites include coursework to demonstrate a commitment to and understanding of conservation-related disciplines, with at least one upper level ecology course (e.g. BIOL 308, EVPP 301+302, or permission from instructor). Students should have completed 60 credit hours of undergraduate classes. Students must sign up for all Smithsonian-Mason Semester courses in a given semester.

Textbooks and Other Course Materials

Required:
Turner, M.G., R.H. Gardner, and R.V. O'Neill. 2001. Landscape Ecology in Theory and Practice: Pattern and Process. Springer-Verlag, New York, NY.

Most readings for the class will be accessible from our course via BlackBoard 9.1. You will access BlackBoard 9.1 via the MyMason portal (http://mymason.gmu.edu) using the browser of your choice. Enter the username and password from your GMU email account and then click on the "Courses" tab at the top, right side of the page. Readings are located under the e-reserves link on the left side of the Blackboard Home Page or in the folder "Assignments>Course Readings".

Assignments

Scenario planning activity (30%)
Students will assess development and wildlife needs and resources under different scenarios for development and conservation in the Warren County region. Students will integrate field data collection, ground truthing of satellite data, landscape ecology theory and models of various scenarios to identify habitats threatened by habitat fragmentation and degradation.

Protected area plan for a species of conservation concern (35%)
Students analyze the movement and habitat requirements of an endangered species of their choice, and propose a protected area or corridor to link landscape dynamics with endangered species management. They will present their analysis and major findings in an oral presentation at the end of the course.

Content quizzes (25%)
Weekly quizzes (5% each) will assess student understanding of the readings and in-class activities.

Participation (10%)
Active, positive engagement in the Semester is formally assessed at the end of the semester and is based on level of contribution to class discussions, activities and projects in addition to attendance and preparedness for class as well as attention to proper field safety protocols.

Grading
Grades for individual assignments and overall in the course will be assigned on the following scale:

A+	97-100%
A	93-96.9%
A-	90-92.9%
B+	87-89.9%
B	83-86.9%
B-	80-82.9%
C+	77-79.9%
C	73-76.9%
C-	70-72.9%
D	60-69.9%
F	<60%

Weekly Topics, Readings, and Assignments:

Date	Topic	Readings and Assignments
Week 1	• Overview of landscape ecology, including appropriate scale for assessing patterns and processes • Physical, biotic and disturbance drivers for pattern formation across landscapes • Introduce impacts of landscape dynamics on species, including island biogeography and metapopulation theories and patch dynamics	*Due:* Content quiz *Readings:* Turner Chapter 1: Introduction to Landscape Ecology Chapter 3: Introduction to Models Chapter 4: Causes of landscape patterns Ernoult, A., S Freire-Diaz, E. Langlois and D. Alard. 2006. Are similar landscapes the results of similar histories? Landscape Ecology 21:631-639. Swanson FJ, TK Kratz, N Caine, and RG Woodmansee. 1988. Landform effects on ecosystem patterns and processes. BioScience 38:92-98.
Week 2	• Understanding patterns in communities and biodiversity across landscapes • Quantifying landscape patterns as they relate to habitat fragmentation and loss (using FRAGSTATS) • Using neutral models to evaluate ecological hypotheses across spatial scales • Evaluating landscape management scenarios under different climate and land use approaches	*Due:* Content quiz *Readings:* Turner Chapter 5: Quantifying landscape patterns Chapter 6: Neutral landscape models Chapter 7: Landscape Disturbance Dynamics Gardner, R. H. and D. L. Urban. 2007. Neutral models for testing landscape hypotheses. Landscape Ecology 22:15-29. Li, H. and J. Wu. 2004. Use and misuse of landscape indices. Landscape Ecology 19:389-399. Wagner, H. H. and M-J Fortin. 2005. Spatial analysis of landscapes: concepts and statistics. Ecology 86:1975–1987. Wiens JA. 1989. Spatial scaling in ecology. Functional Ecol. 3:385-397.
Week 3	• Evaluating home range and habitats • Investigating animal movement	*Due:* - Scenario planning activity - Content quiz

	across landscapes • Introduction to protected area design and management for endangered species • Suitability modeling for endangered species *Case study: Golden lion tamarins in Brazil and Elephants in Myanmar*	*Readings:* <u>Turner</u> Chapter 8: Organisms and landscape patterns Chapter 9: Ecosystem processes in the landscape Chapter 10: Applied Landscape Ecology Leroux, S. J., F. K. A. Schmiegelow, R. B. Lessard and S. G. Cumming. 2007. Minimum dynamic reserves: a framework for determining reserve size in ecosystems structured by large disturbances. Biological Conservation 138:464-473. Primack, R. B. (2014). *Essentials of Conservation Biology* (Sixth ed.). Sinauer Associates, Inc. -Chapter 15 pp. 344-362 ("Establishing Protected Areas") -Chapter 16 pp 370-387 ("Designing Networks of Protected Areas") Kierulff et al. (2012). The Golden lion tamarin *Leontopithecus rosalia*: a conservation success story. Int. Zoo Yb. (2012) 46: 36–45 Hankerson, S.J. and J.M. Dietz. (2014). Predation rate and future reproductive potential explain home range size in golden lion tamarins. Animal Behaviour 96: 87-95. P Leimgruber, JB Gagnon, C Wemmer, DS Kelly, MA Songer, ER Selig (2003). Fragmentation of Asia's remaining wildlands: implications for Asian elephant conservation. Animal Conservation 6 (04), 347-359 Murphy, H.T. and J. Lovett-Doust. 2004. Context and connectivity in plant metapopulations and landscape mosaics: does the matrix matter? Oikos *1*05:3-14.
Week 4	• Introduction to macrosystems ecology • Long-term and large-scale ecological research (National Ecological Observatory Network, ForestGEO, Marine GEO) • Remote sensing technologies and strategies for collecting and	*Readings:* <u>Turner</u> Chapter 2: The Critical Concept of Scale S. Fei, Q Guo, K Potter. 2016. Macrosystems ecology: novel methods and new understanding of multi-scale patterns and processes. Landscape Ecology 31:1, 1-6.

	analyzing data across large temporal and spatial scales	Beck J. et al. 2012. What's on the horizon for macroecology? Ecography 35(8):673-683. Anderson-Teixeira K. et al 2015 CTFS-ForestGEO: a worldwide network monitoring forests in an era of global change. Global Change Biology 21:2, 528-549. Azuaje, Y. P. Springer, K. M. Thibault, V. J. McKenzie, M. Keller, L. F. Alves, E.-L. S. Hinckley, J. Parnell, and D. Schimel. 2012. NEON terrestrial field observations: designing continental-scale, standardized sampling. Ecosphere 3(12):115.
Week 5	• Final project work time: Developing analyses relevant to a particular threatened species or habitat, and designing a habitat suitability model and protected area for this species • Final presentations	*Due:* - Final protected area plan - Content quiz *Readings:* Burgman, M. A., D. B. Lindenmayer, and J. Elith. 2005. Managing landscape for conservation under uncertainty. Ecology 86:2007–2017. Cumming GS. 2007. Global biodiversity scenarios and landscape ecology. Landscape Ecology 22: 671-685. Lindenmayer, D., R. J. Hobbs, R. Montague-Drake, and many others. 2008. A checklist for ecological management of landscapes for conservation. Ecology Letters 11:78-91. Turner, M. G. 2005. Landscape ecology in North America: past, present and future. Ecology 86:1967–1974.