

1. General Information

1a. Submitted by the College of: ARTS & SCIENCES

Date Submitted: 3/8/2016

1b. Department/Division: Geography

1c. Contact Person

Name: Alice Turkington

Email: alice.turkington@uky.edu

Phone: 859-257-2932

Responsible Faculty ID (if different from Contact)

Name: Jian Yang

Email: jian.yang@uky.edu

Phone: 859-257-5820

1d. Requested Effective Date: Semester following approval

1e. Should this course be a UK Core Course? No

2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: No

2b. Prefix and Number: GEO 570

2c. Full Title: Landscape Ecology for Natural Resources

2d. Transcript Title: Landscape Ecology for Natural Resources

2e. Cross-listing: FOR 570

2f. Meeting Patterns

LECTURE: 3

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 3

2i. Is this course repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester?

2j. Course Description for Bulletin: Principles of landscape ecology and their applications to contemporary ecological issues. Students will learn and apply the tool of geographic information system (GIS) and spatial analysis to problems in natural resource ecology, management, and conservation. Course covers the following topics: principals of landscape ecology (e.g., patch, mosaic, and scale), quantification of landscape patterns, formation and dynamics of landscape patterns, role of disturbance, landscape models and their applications.

2k. Prerequisites, if any: Upper level courses in GIS or consent of instructor.

2l. Supplementary Teaching Component:

3. Will this course taught off campus? No

If YES, enter the off campus address:

4. Frequency of Course Offering: Spring,

Will the course be offered every year?: Yes

If No, explain:

5. Are facilities and personnel necessary for the proposed new course available?: Yes

If No, explain:

6. What enrollment (per section per semester) may reasonably be expected?: 15

7. Anticipated Student Demand

Will this course serve students primarily within the degree program?: Yes

Will it be of interest to a significant number of students outside the degree pgm?: Yes

If Yes, explain: The course is cross-listed with FOR and GEO. Both forestry and geography students could have an interest in this course. This course may be of interest to other students in the College of Agriculture, Food and Environment and the College of Arts and Sciences.

8. Check the category most applicable to this course: Relatively New – Now Being Widely Established,

If No, explain:

9. Course Relationship to Program(s).

a. Is this course part of a proposed new program?: No

If YES, name the proposed new program:

b. Will this course be a new requirement for ANY program?: No

If YES, list affected programs:

10. Information to be Placed on Syllabus.

a. Is the course 400G or 500?: Yes

b. The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from 10.a above) are attached: Yes

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1. How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4. Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6. How do course requirements ensure that students make appropriate use of learning resources?

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)?

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10. Does the syllabus contain all the required components? NO

11. I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

Course number: FOR/GEO 570
Landscape Ecology for Natural Resources

Instructor: Dr. Jian Yang
Office Address: 223 T.P. Cooper Building
Email: jian.yang@uky.edu
Office Phone: 257-5820
Office hours: TBA

Scheduled Meeting Days, Time, and Location:

To be determined

Course Description from Course Bulletin:

Principles of landscape ecology and their applications to contemporary ecological issues. Students will learn and apply the tool of geographic information system (GIS) and spatial analysis to problems in natural resource ecology, management, and conservation. Course covers the following topics: principals of landscape ecology (e.g., patch, mosaic, and scale), quantification of landscape patterns, formation and dynamics of landscape patterns, role of disturbance, landscape models and their applications.

Course Overview:

This course provides students with an introduction to the principles of landscape ecology and their applications to contemporary ecological issues. Landscape ecology can be defined as the discipline focusing on the interplay between spatial pattern and process. Thus, students will also have opportunities to learn and apply the tool of geographic information system (GIS) and spatial analysis to problems in natural resource ecology, management, and conservation. The course will cover the following topics: principals of landscape ecology (e.g., patch, mosaic, and scale), quantification of landscape patterns, formation and dynamics of landscape patterns, role of disturbance, landscape models and their applications.

Weekly lectures will provide a broad introduction to the conceptual framework, contemporary research issues, and methodological toolbox of landscape ecology. Class discussions will facilitate creative thinking and open lines of communication. Laboratory exercises and class projects will allow students to develop proficiency in specific applications.

Prerequisites:

Upper level courses in GIS or consent of instructor. Basic statistics and Ecology courses helpful but not necessary. Comfort and basic proficiency with computers.

Student Learning Outcomes:

After completing this course, the student will be able to:

1. Evaluate and quantify landscape patterns with various metrics

2. Analyze landscape change and dynamics
3. Synthesize related scientific papers regarding the methods and applications of landscape ecology.

Required Materials:

Landscape Ecology in Theory and Practice (M.G. Turner, R.H.Gardner and R.V. O'Neill). Springer-Verlag, New York, 2001 (ISBN: 0-387-95123-7)

Course Assignments

- 2 Exams at 100 points each
- 5 graded class projects at 20 points each
- 1 group paper discussion and presentation at 100 points

Summary Description of Course Assignments

There will be an open-book mid-term exam and a closed-book final exam for this course. Five projects are designed for students to apply the concepts and methods they learned in the class to address real contemporary environmental issues. Students will be divided into groups for paper discussion. All groups shall submit a paper summary of maximum 3 pages in length for every assigned paper. Each group is responsible for leading one paper discussion section with responsibilities varying from oral presentation to moderating the discussion. Note that undergraduate students will not be required to moderate a paper discussion. They will have the option of doing so, in which case their allocation of grading criteria would be the same for the graduate students.

Course Grading**(i) Grading Scale****Undergraduate Grading Scale**

- A: $\geq 89.46\%$
- B: $\geq 79.46\%$ and $< 89.45\%$
- C: $\geq 69.46\%$ and $< 79.45\%$
- D: $\geq 59.46\%$ and $< 69.45\%$
- E: $< 59.45\%$

Graduate Grading Scale

- A: $\geq 89.46\%$
- B: $\geq 79.46\%$ and $< 89.45\%$
- C: $\geq 69.46\%$ and $< 79.45\%$
- E: $< 69.45\%$

(ii) Expectations for graduate students beyond the expectations for undergraduates (400G and 500 courses only)

Graduate students must deliver a formal oral presentation to summarize a project or paper and moderate a paper discussion session. Undergraduate students don't have to deliver an oral presentation. The grading metrics of presentation quality will be the same for both graduate and undergraduate students.

Final Exam Information

Date and time of the final exam is established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>).

Mid-term Grade

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>)

Course Policies:

Submission of Assignments

Paper summary and project report is due by the beginning of class time on the day the assignment is due. They need to be submitted online.

Attendance Policy

Class Participation is mandatory. This will take the form of participating in paper discussions and class projects. Students are welcome to ask the instructor/TA their particular questions in or after the class.

Excused Absences

Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Per Senate Rule 5.2.4.2, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Two weeks prior to the absence is reasonable, but should not be given any later. Information regarding major religious holidays may be obtained through the Ombud (859-257-3737, http://www.uky.edu/Ombud/ForStudents_ExcusedAbsences.php).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences

Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Academic Integrity

Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited. Part II of Student Rights and Responsibilities (available online <http://www.uky.edu/StudentAffairs/Code/part2.html>) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else’s work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student’s assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes

while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC). The DRC coordinates campus disability services available to students with disabilities. It is located on the corner of Rose Street and Huguelet Drive in the Multidisciplinary Science Building, Suite 407. You can reach them via phone at (859) 257-2754 and via email at drc@uky.edu. Their web address is <http://www.uky.edu/StudentAffairs/DisabilityResourceCenter/>.

Emergency Situations

If an emergency arises in this classroom, building or vicinity, your instructor will advise you of actions to follow to enhance your safety. If a situation requires emergency shelter (i.e., during a severe weather event), the nearest shelter location is the basement. If building evacuation occurs (i.e., fire alarm), follow posted evacuation routes and assemble on the sidewalk outside the front of the building so the instructor can help ensure their students have evacuated the building safely and they are not hindering emergency personnel access to the building. If you may require assistance during an emergency, notify the instructor at the beginning of the semester. In order to prepare for emergencies while on campus please continue to the below links for detailed emergency response guidelines: the UK Division of Crisis Management & Preparedness website (<http://www.uky.edu/EM/emergency-response-guide.html>) and the College of Agriculture, Food and Environment (<http://www.ca.uky.edu/>). To receive emergency messages, sign up for UK Alert (<http://www.uky.edu/EM/UKAlert>). Always turn cellular phones to silent mode when entering the classroom. If you observe or receive an emergency alert, immediately and calmly inform your instructor.

Tentative Course Schedule

A linear listing of topics, assignment due dates, and examination dates.

Week	Lecture Topic	Lab Exercise / Paper Discussion
Principles of Landscape Ecology		
01	Introduction to Landscape Ecology	Paper Discussion
02	Scale Concept and Hierarchy Theory	Paper Discussion
Quantify Landscape Patterns		
03	Landscape Pattern Analysis and GIS	Paper Discussion
04	Measuring Pattern: Metrics for Quantifying Landscape Pattern I	Project 1: Fragstats
05	Measuring Pattern: Metrics for Quantifying Landscape Pattern II	Project 1: Cont. & Paper Discussion
06	Landscape Pattern and Scales	Paper Discussion
07	Neutral Landscape Model and the Use of NLM in Landscape Pattern Analysis	Project 2: RULE & Paper Discussion
08	Measuring Pattern: Spatial Statistics	Project 3: SPP Analysis using R
09	Midterm Exam	Project 3: Cont. & Paper Discussion
10	Spatial Statistics and GIS Analysis	Project 4: ArcGIS

Formation of Landscape Patterns		
11	Causes of Landscape Pattern – Relating Patterns with Processes	Paper Discussion
12	Landscape Disturbance Dynamics	Paper Discussion
Models and Applications of Landscape Ecology		
13	Introduction to Landscape Models	Paper Discussion
14	Modeling Forest Landscape Succession and Management	Project 5: LANDIS
15	Applications of Landscape Ecology	Paper Discussion
Final		
16	Final Exam	

Reading list

Numbered citations are the discussion papers. Citations in both **bold** and *italic* font are the materials covered in lectures. Other citations are given for additional readings and assistance with associated lab exercises.

Week 1: Introduction to Landscape Ecology

Chapter 1, textbook

1. Turner, M. G. (2005). Landscape ecology: what is the state of the science? *Annual Review of Ecology, Evolution, and Systematics*, 319-344.

2. Damschen, E.I., Haddad, N.M., Orrock, J.L., Tewksbury, J.J., and Levey, D.J. 2006. Corridors increase plant species richness at large scales. *Science* 313(5791): 1284-1286.

Pickett, S.T.A., and Cadenasso, M.L. 1995. Landscape ecology - spatial heterogeneity in ecological-systems. *Science* 269(5222): 331-334.

Damschen, E.I. and L.A. Brudvig. 2012. Landscape connectivity strengthens local-regional richness relationships in successional plant communities. *Ecology* 93:704-710.

Week 2: Scale Concept and Hierarchy Theory

Chapter 2, textbook

3. Levin, S.A. 1992. The problem of pattern and scale in ecology. *Ecology* 73(6): 1943-1967.

4. Ludwig, J. A., Wiens, J. A., and Tongway, D. J. 2000. A scaling rule for landscape patches and how it applies to conserving soil resources in savannas. *Ecosystems*, 3(1), 84-97.

Wiens, J.A. 1989. Spatial Scaling in Ecology. *Functional Ecology* 3:385-397.

Rastetter, E. B., Aber, J. D., Peters, D. P., Ojima, D. S., & Burke, I. C. (2003). Using mechanistic models to scale ecological processes across space and time. *BioScience*, 53(1), 68-76.

Week 3: Landscape Pattern Analysis and GIS

Chapter 5, textbook

5. Gustafson, E.J., 1998. Quantifying landscape spatial pattern: What is the state of the art? *Ecosystems*, 1:143-156.

6. Meyer, S. R., Beard, K., Cronan, C. S., & Lillieholm, R. J. 2015. An analysis of spatio-temporal landscape patterns for protected areas in northern New England: 1900-2010. *Landscape Ecology*, 1-15.

Neel, M.C., McGarigal, K. and Cushman, S.A., 2004. Behavior of class-level landscape metrics across gradients of class aggregation and area. *Landscape Ecology*, 19:435-455.

Week 4: Measuring Pattern I

No readings

Week 5: Measuring Pattern II

7. Laurance, W. F., Camargo, J. L., Luizão, R. C., Laurance, S. G., Pimm, S. L., Bruna, E. M., ... & Lovejoy, T. E. 2011. The fate of Amazonian forest fragments: a 32-year investigation. *Biological Conservation*, 144(1), 56-67.

Week 6: Landscape Pattern and Scales

8. Oneill, R.V., Hunsaker, C.T., Timmins, S.P., Jackson, B.L., Jones, K.B., Riitters, K.H. and Wickham, J.D., 1996. Scale problems in reporting landscape pattern at the regional scale. *Landscape Ecology*, 11:169-180.

9. Villard, M. A., & Metzger, J. P. 2014. Beyond the fragmentation debate: A conceptual model to predict when habitat configuration really matters. *Journal of Applied Ecology*, 51(2), 309-318.

Tischendorf, L., 2001. Can landscape indices predict ecological processes consistently? *Landscape Ecology*, 16:235-254.

Week 7: Neutral Landscape Model

Chapter 6, textbook

10. Gardner, R.H. and Urban, D.L., 2007. Neutral models for testing landscape hypotheses. *Landscape Ecology*, 22:15-29.

Gardner, R.H. 1999. RULE: Map Generation and a Spatial Analysis Program. In *Landscape Ecological Analysis: Issues and Applications*, ed. J.M. Klopatek, and R.H. Gardner, pp. 280-303 New York: Springer-Verlag.

With, K.A. and King, A.W., 1997. The use and misuse of neutral landscape models in ecology. *Oikos*, 79:219-229.

Week 8: Measuring Pattern: Spatial Statistics

Yang, J., He, H.S., Shifley, S.R. and Gustafson, E.J., 2007. Spatial patterns of modern period human-caused fire occurrence in the Missouri Ozark Highlands. *Forest Science*, 53:1-15.

Baddeley, A. J., & Turner, R. 2004. Spatstat: An R Package for Analyzing Spatial Point Patterns.

Week 9: Midterm Exam

11. Wagner, H.H. and Fortin, M.J., 2005. Spatial analysis of landscapes: Concepts and statistics. *Ecology*, 86:1975-1987.

Dale, M.R.T., Dixon, P., Fortin, M.J., Legendre, P., Myers, D.E. and Rosenberg, M.S., 2002. Conceptual and mathematical relationships among methods for spatial analysis. *Ecography*, 25:558-577.

Week 10: Spatial Statistics and GIS Analysis

Lichstein, J.W., Simons, T.R., Shriver, S.A. and Franzreb, K.E., 2002. Spatial autocorrelation and autoregressive models in ecology. *Ecological Monographs*, 72:445-463.

Rossi, R.E., Mulla, D.J., Journel, A.G. and Franz, E.H., 1992. Geostatistical tools for modeling and interpreting ecological spatial dependence. *Ecological Monographs*, 62:277-314.

Week 11: Causes of Landscape Pattern

Chapter 4, textbook

12. Foster, D.R., 1992. Land-use history (1730-1990) and vegetation dynamics in Central New-England, USA. *Journal of Ecology*, 80:753-772.

13. Radeloff, V. C., Mladenoff, D. J., & Boyce, M. S. 2000. Effects of interacting disturbances on landscape patterns: budworm defoliation and salvage logging. *Ecological Applications*, 10(1), 233-247.

Week 12: Landscape Disturbance Dynamics

Chapter 7, textbook

14. Turner, M. G. 2010. Disturbance and landscape dynamics in a changing world. *Ecology*, 91(10), 2833-2849.

15. Schoennagel, T., Veblen, T.T. and Romme, W.H., 2004. The interaction of fire, fuels, and climate across rocky mountain forests. *Bioscience*, 54:661-676.

Hobbs, R. J., & Huenneke, L. F. 1992. Disturbance, diversity, and invasion: implications for conservation. *Conservation Biology*, 6(3), 324-337.

Vanderwel, M. C., Coomes, D. A., & Purves, D. W. 2013. Quantifying variation in forest disturbance, and its effects on aboveground biomass dynamics, across the eastern United States. *Global change biology*, 19(5), 1504-1517.

Week 13: Introduction to Landscape Models

Chapter 3, textbook

16. Fitzpatrick, M. C., Preisser, E. L., Porter, A., Elkinton, J., & Ellison, A. M. (2012). Modeling range dynamics in heterogeneous landscapes: invasion of the hemlock woolly adelgid in eastern North America. *Ecological Applications*, 22(2), 472-486.

Baker, W.L. 1989. A review of models of landscape change. *Landscape Ecology* 2: 111-133.

Week 14: Modeling Forest Landscape Succession and Management

He, H.S. and Mladenoff, D.J., 1999. Spatially explicit and stochastic simulation of forest-landscape fire disturbance and succession. *Ecology*, 80:81-99.

Week 15: Applications of Landscape Ecology

Chapter 10, textbook

17. Wu, J. 2013. Landscape sustainability science: ecosystem services and human well-being in changing landscapes. *Landscape Ecology*, 28(6), 999-1023.

Helfenstein, J., Bauer, L., Clalüna, A., Bolliger, J., & Kienast, F. 2014. Landscape ecology meets landscape science. *Landscape ecology*, 29(7), 1109-1113.

Gagné, S. A., Eigenbrod, F., Bert, D. G., Cunnington, G. M., Olson, L. T., Smith, A. C., & Fahrig, L. 2015. A simple landscape design framework for biodiversity conservation. *Landscape and Urban Planning*, 136, 13-27.