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: College of Science **Department:** Biology
Submitted by: David Luther **Ext:** 3-5267 **Email:** dluther@gmu.edu

Subject Code: BIOL **Number:** 352
(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: Monitoring and Assessment of Biodiversity
Banner (30 characters max w/ spaces):
New: Biodiversity Monitoring

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

Credits: (check one) [x] Fixed → 4 [ ] Variable → to [ ] Lec + Lab/Rct→ 0 +

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 or EVPP 302 or BIOL 308 or INTS 401 (or equivalent course)or permission of instructor

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 404
[ ] 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)
Assessment, monitoring and conservation of species and habitats. Use tools for sampling species and habitats as well as how to evaluate their effectiveness. Apply this practical, hands-on knowledge to prepare a series of reports and recommendations for future work.	
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 352 Biodiversity Monitoring

Date of Departmental Approval: October 19, 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: The new course will advance students skills in terms of field ecology and monitoring techniques especially in terms of conservation management.
- Relationship to Existing Programs: BIOL 352 will be housed in the Biology department but equivalent to CONS 404 within the Smithsonian Mason School of Conservation (SMSC) and will be offered in conjunction with several other conservation courses.
- Relationship to Existing Courses: There are currently no similar courses in Biology. CONS 404 is an equivalent course that takes place on the front royal campus.
- Semester of Initial Offering: Fall 2017
- Proposed Instructors: James McNeil, Stephanie Lessard-Pilon, Anneke Deluycker
- Insert Tentative Syllabus Below

BIOL 352 – Biodiversity Monitoring
4 credits

Course Meeting Times:
This course will meet during the first 5 weeks 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
In classroom, lab and field experiences, students will learn practical skills and techniques for the assessment, monitoring and conservation of species and habitats. Students will use a variety of tools for sampling species and habitats (including monitoring techniques for various taxa, such as camera trapping, mistnetting, invertebrate sampling, acoustic monitoring, habitat sampling, small mammal trapping, radio-tracking, water quality, and molecular sampling) and learn how to evaluate the effectiveness of those tools for various types of studies. Through individual and group projects, students will collect and analyze data and integrate the information across a variety of temporal and spatial scales. Students will apply this practical, hands-on knowledge of techniques to prepare a series of reports describing field techniques, results, analyses, and recommendations for future work.

Learning Objectives
Students will:

- Develop and evaluate inventory, assessment and experimental designs to monitor different taxa
- Assess biodiversity and habitat quality in forest, grassland, and aquatic systems
- Practice field techniques for surveying plants, insects, birds, fish, herpetofauna, and mammals
- Evaluate presence, distribution, movement and threats of species using innovative tools including non-invasive genetic techniques (environmental DNA, hormone analysis, barcoding) and remote telemetry (geolocators, GPS transmitters)
- Organize, analyze and synthesize ecological data collected during the course

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 (BIOL 308 or equivalent). 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:
McComb, Brenda, et al. 2010. Monitoring Animal Populations and Their Habitats: A Practitioner's Guide. CRC Press: ISBN 1420070584.

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".

BlackBoard:
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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. Select the combined course option.

Assignments

Fieldwork, laboratory work and data analysis (60%)

Students will be assessed on their ability to execute a variety of field and lab techniques and analyze data during course instruction and activities and will submit written reports including their field and lab notes for a series of activities that illustrate ecological principles using case studies, including:

- Mammal detection and occupancy using capture-recapture
- Water quality testing and impacts on fish and wood turtle distribution and abundance
- Radio-telemetry and acoustic monitoring to detect birds
- eDNA to detect bullfrog and chytrid presence

Independent monitoring plan proposal (20%)

Students will work independently to design a monitoring plan proposal for a species or habitat of conservation concern. This will include a stakeholder analysis, plan for data collection and analysis, and be directed towards making management recommendations for this species.

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.

Final examination (10%)

The final assessment for this class will be an techniques-based test in the field. The test will be designed to assess the students' understanding of and ability to integrate course concepts by engaging in independent survey and assessment of biodiversity in the field.

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 monitoring for ecology and sampling strategies o Setting management and monitoring goals o Why, where, what, when, how monitoring takes place o Stakeholder assessment *Case Study: Bobwhite Quail in Virginia* • Evaluating species richness, diversity and abundance using vegetation sampling in grassland and forest (quadrat and transect sampling) • Indicator species: amphibians and natural cover object surveys *Case study: Salamanders along the AT* • Collecting and preserving voucher specimens for inventory-based research (insects)	*Readings:* McComb Chapter 1: Introduction Chapter 2: Lessons learned from current monitoring programs Chapter 3: Community-based monitoring Chapter 4: Monitoring goals and objectives Lindenmayer, D. B., & Likens, G. E. (2010). The science and application of ecological monitoring. *Biological Conservation, 143*(6), 1317–1328. Nichols, J. D., and Williams, B. K. (2006). Monitoring for conservation. *Trends in Ecology & Evolution, 21*(12), 668–673.
Week 2	• Effects of climate change on species distributions: migrating species (birds) o Point counts and territory monitoring o Radiotelemetry of birds o Mistnetting and MAPS surveys o Acoustic monitoring	*Readings:* McComb Chapter 5: Designing a monitoring plan & Chapter 8: Field techniques for population sampling and estimation USGS. (2015). The Uses of Marking and Recovery Data in Migratory Bird Conservation, Research, and Management. Retrieved from http://www.pwrc.usgs.gov/BBL/homepage/gswhy.cfm Ziolkowski D, Pardieck K, Sauer J. (2010). On the road again: For a bird survey that counts. Birding 42: 32-40. Blumstein et al. (2011). Acoustic monitoring in terrestrial environments using microphone arrays: applications, technological considerations and prospectus. Journal of Applied Ecology 48: 758-767.
Week 3	• Tools for evaluating species presence and abundance in the field and lab • Water quality testing and indices *Case study: Fish sampling (seining,*	*Due:* - Radiotelemetry and acoustic monitoring analysis *Readings:*

	electrofishing) • Wood turtle detection • Indirect methods of assessment: eDNA *Case study: Bullfrog and chytrid presence in ponds*	McComb Chapter 9: Techniques for sampling habitat Erb, L. et al. 2015. Detecting long-term population trends for an elusive reptile species *The Journal of wildlife management*. 79 (7): 1062-1071 Lodge, D. M., Turner, C. R., Jerde, C. L., Barnes, M. A., Chadderton, L., Egan, S. P., Pfrender, M. E. (2012). Conservation in a cup of water: estimating biodiversity and population abundance from environmental DNA. *Molecular Ecology* 21(11): 2555–2558. Marucco, F., Boitani, L., Pletscher, D. H., & Schwartz, M. K. (2011). Bridging the gaps between non-invasive genetic sampling and population parameter estimation. *European Journal of Wildlife Research*, *57*(1), 1–13.
Week 4	• Monitoring population abundances over time: Capture-recapture techniques, distance sampling, and occupancy modeling o Small mammal trapping (Sherman traps) o Large mammal detection (camera traps and distance sampling)	*Due:* - Water quality and wood turtle analysis - eDNA analysis *Readings:* McComb Chapter 11: Data analysis in monitoring Borer, E.T., Seabloom, E.W., Jones, M.B., Schildhauer, M., 2009. Some simple guidelines for data management. Bull. Ecol. Soc. Amer, vol. 90 (2), pp. 205–214. Sutter, R. D., Wainscott, S. B., Boetsch, J. R., Palmer, C. J. and Rugg, D. J. (2015), Practical guidance for integrating data management into long-term ecological monitoring projects. Wildl. Soc. Bull., 39: 451–463. Tobler, M.W. and Powell, G.V.N.(2013). Estimating jaguar densities with camera traps: Problems with current designs and recommendations for future studies. Biological Conservation 159: 109-118. Thibault, K. NEON breeding bird and small mammal abundance and diversity

		sampling. NEON, Inc:
Week 5	• Data analysis, monitoring plan proposal work and final presentations	*Due*: - Mammal detection and occupancy analysis - Independent Monitoring Plan Proposal - Final Assessment *Readings:* McComb Chapter 13: Uses of the Data: Synthesis, Risk Assessment and Decision-Making, Chapter 14: Changing the Monitoring Approach & Chapter 15: The Future of Monitoring