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:** 353
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term: [ ] Fall [x] Spring [x] Summer *Year* 2018

Title: Current
Banner (30 characters max w/ spaces)
New: Small Population Management

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 406
[ ] 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)
Investigates species vulnerability to extinction and the methodologies of preserving genetic diversity in small populations, both in the wild and in captivity. Teaches modeling and laboratory techniques that promote successful captive breeding, such as hormone analysis and assisted reproductive techniques. Examines captive species in the Smithsonian Conservation Biology Institute to learn husbandry practices and skills from keepers and biologists.	
Indicate number of contact hours: Hours of Lecture or Seminar per week: 4	Hours of Lab or Studio:
When Offered: (check all that apply) [ ] Fall [x] Summer [x] 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

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 353 Small Population Management

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 course is unique and offers critical content and skills to students interested in the field of conservation biology. It utilized the unique relationship between Smithsonian scientists and facilities and GMU.
- Relationship to Existing Programs: The new biology course will be equivalent to CONS 406 which is 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: There are no similar course at GMU. This course will help set the foundation for CONS 491.
- Semester of Initial Offering: Spring 2018
- Proposed Instructors: James McNeil, Stephanie Lessard-Pilon, Anneke Deluycker
- Insert Tentative Syllabus Below

BIOL 353 - Small Population Management
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
The study of populations and their risk of extinction in the wild is crucial in order to effectively prioritize conservation decisions. Small populations are particularly vulnerable to extinction, and are affected by several factors including geographic isolation, rarity, reduced genetic variation, inbreeding depression, and survival and reproductive success. This course investigates species vulnerability to extinction and the methodologies of preserving genetic diversity in small populations, in both the wild and in captivity. Students will work with experts to use a variety of laboratory techniques in promoting success in captive breeding, such as non-invasive hormone analysis and assisted reproductive techniques. Students will also conduct various case study exercises using a quantitative population viability assessment, Population Viability Analysis (PVA), in order to assess the impact of human activities and prioritize different management techniques. Students will have the opportunity to examine several species in the Smithsonian Conservation Biology Institute animal collection, in order to learn first-hand from keepers and biologists about best husbandry practices and skills. Smithsonian staff, Mason faculty, and other experts provide additional instruction.

In the subsequent course in this semester – CONS 491: Conservation Planning – students will apply their knowledge to develop and analyze a complete conservation management plan for a species of concern.

Learning Objectives
Students will:
- Assess the vulnerability of endangered species in the wild and in captive settings using genetic and demographic data
- Develop and apply skills using Population Viability Analysis (PVA) to assess the impact of human activities and prioritize different management options
- Implement tools to preserve genetic diversity in both wild and captive settings, including species translocations and species survival plans
- Develop husbandry skills, including understanding species life history traits, nutritional requirements, and animal welfare and enrichment
- Practice laboratory-based techniques to promote success in captive breeding, including non-invasive analyses of hormones and assisted reproductive technologies

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:

Mills, L.S. (2013). *Conservation of Wildlife Populations: Demography, Genetics, and Management, 2nd ed.* Wiley-Blackwell.

Additional assigned readings from the primary literature will be accessible on BlackBoard 9.1, via MyMason portal (http://mymason.gmu.edu).

BlackBoard:

Many resources for the course will be accessible on 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. Select the combined course option.

Assignments

Population Growth Modeling (20%)

Students explore tenets of population biology by performing exercises to model population growth of endangered whooping cranes

Population Viability Analysis (20%)

Students explore the theory and practice of population viability assessments through exercises with software such as RAMAS and VORTEX

Monitoring Hormones and Reproduction (20%)

Students utilize laboratory techniques to analyze hormones using non-invasive techniques (e.g. fecal samples)

Husbandry Skills (20%)

Students will compile nutritional requirements, enclosure recommendations, social and behavioral well-being of a captive or collection species of choice

Participation (10%)

Active, positive engagement in the Semester is formally assessed twice during student-faculty interviews at the middle and end of the semester.

Final Exam (10%)

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:

Week	Topic	Readings & Assignments Due
Week 1	➢ Species extinctions • Intrinsic risks and external threats • Geographically restricted, rare, and declining populations • Categorical systems of assigning risk of extinction *Case study: Extinction in wild of Przewalski's horse* ➢ Risks to small populations in the wild and captivity • Loss of genetic variability • Demographic stochasticity • Environmental stochasticity *Case study: Population bottlenecks in felids* ➢ Evolutionary biology and molecular genetics of endangered species ➢ Habitat quality: fragmentation and connectivity issues ➢ Metapopulation theory and effective population size	*Readings*: • Mills, Ch 12: Predicting the dynamics of small and declining populations (pgs 224-243) • Mills, Ch 10: Dynamics of multiple populations (pgs. 175-198). • Terborgh, J. and Winter, B. 1980. Some Causes of Extinction. In: Soulé, M. E., and B.A. Wilcox (eds).Conservation Biology. Sinauer Assoc., Sunderland, MA, pp 119-133. • Johnson, W.E. and Koepfli, K. 2014. The role of genomics in conservation and reproductive sciences. (In: Holt, Brown, et al). • Merola M. 1994. A reassessment of homozygosity and the case for inbreeding depression in the cheetah, *Acinonyx jubatus*: implications for conservation. Conservation Biology, 8:961-971. • Packer, C., Pusey, A.E., Rowley, H., Gilbert, D.A., Martenson, J., and S. J. O'Brien. 1991. Case Study of a Population Bottleneck: Lions of the Ngorongoro Crater. *Conservation Biology*, 5:219-230.
Week 2	➢ Population Biology • Population structure: geographic distribution, density, growth rate, age	*Due:* Population Viability Analysis *Readings*:

	structure • Species life history, behavior, physiology • Modeling population growth *Case study: Whooping cranes* *Field trip to Patuxent Wildlife Refuge* ➢ Perform quantitative viability assessment using Population Viability Analysis (PVA) including: • Assess minimum dynamic area of suitable habitat • Assess extinction risk: persistence threshold, time and likelihood • Assess various impacts of human activities • Assess various management plan strategies *Various case studies using RAMAS (see column to right)*	• **Various case studies**: Akçakaya H.R., Burgman M., Kindvall, O., Wood, C.C., Sjögren-Gulve, P., Hatfield, J.S., and McCarthy, M.A. (2004). *Species Conservation and Management: Case Studies*. Oxford University Press. 552 pp. • Mills, Chapters 3-6 • Lande, R. 1988. Genetics and demography in biological conservation. Science, 241 (4872):1455-1460. • Akçakaya H.R. and P. Sjögren-Gulve. 2000. Population viability analysis in conservation planning: an overview. *Ecological Bulletins*, 48:9-21.
Week 3	➢ Preserving genetic diversity in the wild and captivity • Species Survival Plans • Creating and maintaining studbooks, pedigree management • Species translocations: introduction, reintroduction, and restocking *Case study: Black footed ferrets* ➢ Practicing husbandry skills for species in captivity • Nutritional requirements, food preparation • Animal welfare and enrichment • Breeding and social requirements • Reducing stress in captive animals • Hand-rearing young and reducing imprinting *Students will visit several animal collection areas at SCBI and the National Zoo to see examples of each*	*Due:* Population growth modeling *Readings*: • Ballou, J.D., Lees, C., Faust, L.J., Long, S., Lynch, C., Bingaman Lackey, L., and Foose, T.J. 2012. Demographic and genetic management of captive populations. (In: Kleiman, et al, eds). • Santymire, R.M., Livieri, T.M., Branvold-Faber, H. and Marinari, P. 2014. The black-footed ferret: on the brink of recovery? (In: Holt, Brown, et al.). • McEvoy, T.G., and Robinson, J.J. 2002. Nutrition and its interaction with reproductive processes. (In: Holt, et al.) • Shepherdson, D. 2012. Principles of and research on environmental enrichment for mammals. (In: Kleiman et al, eds). • Kirk Baer, C. Ullrey, D.E., Schlegel, M.L., Agoramoorthy, G. and Baer, D.J. 2012. Contemporary topics in wild mammal nutrition. (In: Kleiman et al, eds). • Earnhardt, J.M. 2012. The role of captive populations in reintroduction programs. (IN: Kleiman et al, eds).

		• Mellen, J., and Sevenich Macphee, M. 2012. Animal learning and husbandry training for management. (In: Kleiman, et al, eds).
Week 4	➢ Monitoring health, hormones and reproduction in wild and captive populations • Non-invasive analysis of hormones *Case study: Health and reproduction of black rhinoceros in the wild* • Assisted reproductive technologies (artificial insemination, in vitro, fertility medication, reverse vasectomy) *Case study: Artificial insemination success story in Przewalski's horse at SCBI*	*Due:* Husbandry Skills *Readings*: • Monfort, S.L. Non-invasive endocrine measures of reproduction and stress in wild populations. 2002. (In Holt, et al). • Loskutoff, N.M. Role of embryo technologies in genetic management and conservation of wildlife. 2002. (In Holt, et al). • Mostl, E., and Palme, R. (2002). Hormones as indicators of stress. Domestic animal endocrinology. 23: 67-74. • Schwarzenberger, F., Brown, J. (2013). Hormone monitoring: An important tool for the breeding management of wildlife species. Wiener Tierarztliche Monatsschrift. 100: 209-225.
Week 5	➢ Defining and evaluating management success • Managing invasive species, disease, predators, competitors • Habitat restoration at managed sites • Monitoring current populations • Modeling future population growth • Community-based collaboration and partnerships *Case study: Reintroduction of scimitar-horned oryx in Chad*	*Due:* Monitoring Hormones and Reproduction *Readings*: • Jessup, D.A. Diseases and Parasites. 2010. In: Wildlife Management and Conservation: Contemporary Principles and Practices. Krausman, P.R. and Cain, J. W. (eds). Johns Hopkins University Press: Baltimore. Pp 112-129. • Boal, C. and Ballard, W.B. Predator-prey relationships and management. 2010. In: Wildlife Management and Conservation: Contemporary Principles and Practices. Krausman, P.R. and Cain, J. W. (eds). Johns Hopkins University Press: Baltimore. Pp 195-213. • Koprowski, J.L. and Fairbanks, W.S. Animal Behavior. 2010. In: Wildlife Management and Conservation: Contemporary Principles and Practices. Krausman, P.R. and Cain, J. W. (eds). Johns Hopkins University Press: Baltimore. Pp 214-245. • Jarzyna, M.A. Zuckerberg, B. and Porter, W.F.

		Climate Change and Wildlife. 2010. In: Wildlife Management and Conservation: Contemporary Principles and Practices. Krausman, P.R. and Cain, J. W. (eds). Johns Hopkins University Press: Baltimore. Pp 262-278. • Woodfine, T, Petretto, M. & Gilbert, T. (2014) Conservation of scimitar-horned oryx & their arid steppe habitat in Tunisia: A report for the scimitar-horned oryx EEP. Marwell Wildlife, U.K. • Kleymeyer, C.D. Cultural traditions and community-based conservation. 1994. In: Natural Connections: Perspectives in Community-based Conservation.Western, D., Wright, R.M., and Strum, S.C. (eds). Island Press: Washington DC. Pp. 323-346.