



Environmental Science and Policy

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Applied Ecology and Ecosystem Management

EVPP 677 (3 credits)
Spring 2023

Syllabus

[Draft 11/14/22 – subject to change]

Instructor: Dr. V. Alaric (Al) Sample vsample@gmu.edu

Course meets: Wednesdays, 7:20-10:00 pm, Angel Cabrera Global Center 1405¹
Office hours: Wednesday 6-7 pm; by appointment

General policies:

Prerequisites: Due to the advanced applications focus of this course, BIOL/EVPP 307, 607 or equivalent is a prerequisite, or permission of the instructor.

Attendance: You are expected to attend every class session and to be there on time. If you have a legitimate excuse for missing a class or being late please let me know, in advance if possible. Unexcused absences or lateness will result in a lowered grade.

Submit dates: The date and time for submitting topics, preliminary statements of papers, case study papers, tests, etc., will be clearly stated. Unless you have cleared with the instructor in advance with a really good reason for delay, late submissions will not be accepted.

Course overview:

This course aims to create and empower a cadre of applied ecology practitioners and innovators. Through this course, students will gain experience in applying their ecological expertise to understand and address real world problems and to create ecologically-beneficial innovations, including applications to ecosystem-based management of natural resources.

By the end of this course, students should be able to:

1. *Recognize means for and challenges in applying ecology to environmental problems.* Demonstrate familiarity with the variegated ways in which ecological knowledge can be applied to environmental problem-solving and environmental management at various spatial, temporal, and organizational scales, as well as the challenges in doing so effectively.

¹ Some lecture sessions may be conducted via Zoom; notice will be given by instructor

2. *Practice applied ecological problem solving.* Use an applied ecology approach to identify, assess and address a set of critical and interesting environmental and ecosystem management questions.
3. *Practice adaptive ecosystem-based management.* Examine and practice aspects of the process of adaptive ecosystem-based management.
4. *Create ecological innovations.* Use applied ecology knowledge to develop an innovative product or service which addresses one or more important environmental problems and/or exploits ecological concepts to improve our environment.
5. *Produce a publishable paper based on an individual cased study on a topic in applied ecology or ecosystem management.* Demonstrate critical thinking required to produce a “triple-bottom line” ecological business plan or a scientific paper ready for peer review.

Through lectures and student-facilitated class discussions, this course will examine the key recent developments in applied ecology as they relate to the management of natural ecosystems, and the processes by which this science is translated into policy and practice. It will also examine current and emerging theories of response and adaptation to large-scale environmental change, including resistance, resilience, and realignment of goals and expectations.

Course objectives:

- Provide a functional understanding of the principles of ecological science that serve as the basis for public policies that authorize, limit, and guide natural resource management and planning.
- Facilitate student understanding and access to an expanding body of print and digital literature and other information sources on ecosystem resilience and adaptation to environmental change
- Improve critical thinking and presentation skills through information synthesis and written and oral communications
- Provide students with the necessary background to pursue advanced studies and professional careers that involve science synthesis and application in “real time” in the management of terrestrial, aquatic, or marine ecosystems.

Texts:

Required:

Skillen, J. 2015. *Federal Ecosystem Management: Its Rise, Fall, and Afterlife.* University Press of Kansas. 348 pp. ISBN 9780700621279

Sample, V.A., Bixler, R.P., and Miller, C. (eds.), 2016. *Forest Conservation in the Anthropocene: Science, Policy and Practice.* University Press of Colorado. 336 pp. ISBN 9781607325215

Recommended:

Cortner, H. and Moote, M.A., 1999. *The Politics of Ecosystem Management.* Island Press. 179 pp. ISBN 1559636726

Kingsland, S.E., 2005. *The Evolution of American Ecology, 1890-2000*. Johns Hopkins University Press. 313 pp. ISBN: 0081881714

Other reading will be assigned and provided on the course Blackboard.

Assignments:

Case study (oral presentation, written paper)

During the semester each student will prepare and present a case study, which will represent a significant portion of your grade and a particularly important part of your learning from this course. Grading will be based on substantive content, the degree of critical thinking the student exercises in examining his or her chosen subject, and the clarity and effectiveness of the written and oral communication.

Purpose and Subject: The purpose of case study is to give the student an opportunity to apply the principles and insights from the lectures and class discussions to a specific example of particular interest to the student. The subject of your case study should be a current or historical natural resource or environmental policy issue relevant to your academic and/or career interests. The issue should be examined in terms of its origins and any historical antecedents, the perspectives and values of various organizations, individuals, or other entities with a vested interest in the outcome of the issue; the institutional, legal, and/or policy context within which the issue was addressed; how the decision was implemented and the factors that influenced its implementation; and your own reflections on the success or failure of the policy process in (1) effectively addressing the original issue and (2) advancing sustainability, environmental quality, and/or the conservation of natural resources.

A brief statement of your proposed case study subject should be submitted via email by the second meeting of the class and must be approved prior to the third meeting. I will be available by appointment for consultation and discussion of your proposed case study. A brief abstract (~250 words) of your case study with a preliminary list of references is due by the fourth class.

Oral Presentation: Each student will give an oral presentation based on his or her case study. The oral presentation should be roughly 30 minutes, and will be followed by class questions and discussion. Please notify me in advance if the presentation will include the use of PowerPoint slides or other illustrations requiring a projector or other equipment. be illustrated with slides, overheads, or whatever you choose. The presentation should be accompanied by a written outline, with bibliography, to be handed out to the class. The presentation should be of the type and quality for submission at a professional, scientific, or academic conference or symposium.

Written Paper: Each student will also prepare a written paper on his or her case study. Minimum length is 3,000 words, maximum 5,000, not including references. The paper should include an abstract of no more than 250 words, and 3-6 keywords to facilitate document searches. Pages should be double-spaced, and should be numbered. Please add your name to each page in a header or footer. The list of references should start on a separate page. Doctoral students should include at least 20 references, and other students at least 10 references. Citations should follow the standard CSE (Council of Science Editors) style. See the [Scientific Style and Format Quick Guide](https://www.scientificstyleandformat.org/Tools/SSF-Citation-Quick-Guide.html)² for information on how to cite books, articles, websites and other information sources. If

² <https://www.scientificstyleandformat.org/Tools/SSF-Citation-Quick-Guide.html>

needed, use the convenient [CSE citation generator](#)³. No more than 30 percent of your references should be websites.⁴

Facilitation of class discussion

For each class, one or two students will serve as leaders for class discussion of the reading assignments. Discussion facilitators will identify key issues and subjects which they believe should be considered by the class, and they will lead the class discussion on that part of the text in a portion of the class when the assignment is due, or at a later date if required by class scheduling. The discussion leader may highlight some key points, but most of their time should be spent in discussion by class members. Although an assigned student leads the discussion, every student is responsible for having read and being prepared to discuss the reading assignment. Each student will be expected to serve as discussion leader at least once during the course.

Exams (mid-term, final)

There will be a take-home, open-book midterm examination on the materials covered up to that point in the course, and a comprehensive take-home final examination. Instructions will be included on how to electronically submit the completed exam by the appropriate deadline.

Basis of grading:

Participation in class discussions	10 %
Written exams	40
Case study presentation	20
Case study paper	30

98 and up: A+	87-89: B+	70-79: C
94-97: A	84-86: B	<70: F
90-93: A-	80-83: B-	

Tentative course schedule:

January	25	Lecture 1. The evolving scientific context of ecosystem management Readings: <ul style="list-style-type: none">• Skillen, chapter 1, pp. 17-34;• Grumbine, “What is ecosystem management?”• Folke et al., “Regime shifts, resilience, and biodiversity in ecosystem management”• Gunderson, “Ecological resilience—in theory and application”• <i>Optional</i>: Cortner and Moote, chap 1-2; Kingsland, chapters 8 & 9
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³ <https://kingcitation.com/cse/>

⁴ Another useful guide is the “[Style Guide for Authors](#)” for the journal *Conservation Biology*. A quick guide to using this style with an automated reference manager (e.g., Zotero, Mendeley, BibTeX) can be found [here](#).

- 30 Special guest Lecture. Biodiversity and extinction. **Stuart Pimm**, Doris Duke Professor of Conservation Ecology, Duke University.
Readings:
- Pimm, S.L., Jenkins, C.N., Abell, R., Brooks, T.M., Gittleman, J.L., Joppa, L.N., Raven, P.H., Roberts, C.M. and Sexton, J.O., 2014. The biodiversity of species and their rates of extinction, distribution, and protection. *Science*, 344(6187), p.1246752.
- Proposed case study subject to be submitted for approval*
- February 1 No class.
- 8 Lecture 2. The shifting scientific framework for ecosystem management and ecological resilience
Readings:
- Skillen, chapter 3 and 4, and pp.183-189
 - Shaffer, “Minimum population sizes for species conservation”
 - *Optional*: Cortner and Moote, chapter 3
- Deadline for obtaining approval of proposed case study subject*
- 15 Lecture 3. Assessing climate change effects on biodiversity and ecosystem resilience
Readings:
- Bellard et al., “Impacts of climate change on future biodiversity”
 - Hannah et al., “Conservation of biodiversity in a changing climate”
 - Ceballos et al., “Biological annihilation via the ongoing sixth mass extinction” (pp. 1-8 only)
 - Lovejoy, “Extinction tsunami can be avoided”
- Optional*:
- Ecosystems and biodiversity. National Climate Assessment. <https://nca2014.globalchange.gov/highlights/report-findings/ecosystems-and-biodiversity>
 - Sample et al., chapter 6
- Deadline for case study abstracts*
- 22 Lecture 4. Conserving biodiversity and ecological values in the context of accelerating environmental change
Readings:
- Sample et al., chapters 8, 9 and 13
 - Lawler, “Climate change adaptation strategies”
 - Hannah et al., “Protected areas and climate change”
 - Kareiva et al., “Conservation in the Anthropocene”
 - Lawler, “Reframing assisted colonization”

Optional:

- Mascarelli, “Climate zones will shift faster as world warms”
- Marris, “Planting forests of the future”
- Santiestevan, “Changing Climate, Changing Forests”
- Lugo, “Forestry in the Anthropocene”
- Marris, E., 2013. *Rambunctious Garden: Saving Nature in a Post-Wild World*. Bloomsbury, New York.

March

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Guest lecture. Assessing ecosystem vulnerability to environmental change, and developing adaptation strategies. **Jessica Halofsky** and **David Peterson**, Research Ecologists, University of Washington

Readings:

- Sample et al., chapters 12
- Halofsky et al., "Assessing vulnerabilities and adapting to climate change in northwestern U.S. forests
- Halofsky et al., “Developing and Implementing Climate Change Adaptation Options in Forest Ecosystems.”

Optional:

- Spies, et al., “Climate adaptation in the Pacific Northwest”
- Butler et al., “Adaptation strategies and approaches” (Wisconsin)

Course review

Mid-term exam (take home)

5

Deadline for completing and submitting mid-term exam

8

Lecture 5. Managing ecosystems in the Anthropocene

Readings:

- Sample et al., chapters 3, 4, 10 and 11
- Millar and Stephenson, “Temperate forest health in an age of emerging megadisturbance”

15

Spring recess. No classes.

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Managing fish and wildlife habitat in the age of climate change: providing actionable science to resource managers.

Guest Lecture. **Dr. Scott Covington**, Senior Ecologist, National Fish and Wildlife Refuge System, US Fish & Wildlife Service.

Readings:

- Sample et al., chapters 1 and 15
- Covington, “Incorporating Climate Uncertainty into Conservation Planning for Wildlife Managers”
- Covington, “Climate Change Decision Framework”

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Facilitating adaptation to climate change: mapping and networking resilient sites. Guest lecturer: **Dr. Mark Anderson**, Director, Center for Resilient Conservation Science, The Nature Conservancy

Readings:

- Anderson et al. “[Estimating climate resilience for conservation across geophysical settings](#)”
- Sample et al., pp. 179-194
https://www.fs.fed.us/rm/pubs/rmrs_p071.pdf

April	5	Lecture 6. Environmental, social, and economic resilience in the Anthropocene: managing risk and maintaining options in a no-analog future Readings: <ul style="list-style-type: none">• Sample et al., chapter 16• Millar et al., “Climate change and forests of the future: managing in the face of uncertainty”• Sample, “Is resilience the new sustainability?”• Agriculture. National Climate Assessment. https://nca2014.globalchange.gov/highlights/report-findings/agriculture <i>Optional:</i> <ul style="list-style-type: none">• Bloomberg et al., <i>Risky Business: The Economic Risks of Climate Change in the United States</i>. https://riskybusiness.org/site/assets/uploads/2015/09/RiskyBusiness_Report_WEB_09_08_14.pdf• Barnett and Adger, “Climate change, human security, and violent conflict”
	12	Case study presentations
	19	Case study presentations
	26	Case study presentations
May	3	Case study presentations <i>Case study papers due</i>
	10	Final exam (take home; due May 12)

About the instructor:

Dr. V. Alaric (Al) Sample is Adjunct Professor in Environmental Science and Policy at George Mason University in Fairfax, Virginia, and serves on the National Academy of Sciences Board on Agriculture and Natural Resources. He is also Senior Fellow and President Emeritus at the Pinchot Institute for Conservation in Washington, DC, where he served as President 1995-2015; and a Fellow of the Society of American Foresters. He is the author of numerous books, research papers, and articles on topics in national and international environmental and natural resource policy. His research focus is the integration of climate change mitigation, adaptation, and resilience into the evolving institutional, legal, and policy framework for natural resource

management. His most recent book is *Forest Conservation in the Anthropocene: Science, Policy, and Practice*, with R. Patrick Bixler and Char Miller (University Press of Colorado, 2016). Sample earned his doctorate in natural resource policy and economics from Yale University, for which he received the National Wildlife Federation Environmental Conservation Fellowship for excellence in graduate research. He holds an MBA and a Master of Forestry both from Yale, and a Bachelor of Science in forest resource management from the University of Montana.

His professional experience spans the public, private and nonprofit sectors and includes assignments with the U.S. Forest Service, Champion International, The Wilderness Society, and the Prince of Thurn und Taxis in Bavaria, Germany. He specialized in resource economics and natural resource policy as a Senior Fellow at the World Wildlife Fund in Washington, DC, as Vice President for Research at the American Forestry Association, and as a research affiliate on the faculty of the Yale School of Forestry and Environmental Studies. Sample has served on numerous national task forces and commissions, including the President's Commission on Environmental Quality Task Force on Biodiversity on Private Lands, and the National Commission on Science for Sustainable Forestry. He has served as a member of the US delegation to the United Nations Forum on Forests, and to the World Forestry Congress in Antalya, Turkey. Sample is a founding board member and past Chair of the Forest Stewards Guild. He was elected to the AYA Board of Governors at Yale University in 2010, and served on the board of the Yale School of Forestry & Environmental Studies Alumni Association (1994-2008) and as president 2001-2005. He continues to serve on the Yale FES Leadership Council (2000-present).

University policies:

Academic Integrity: GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt please ask for guidance and clarification.

Disabilities: If you are a student with a disability and you need academic accommodations, please contact the Disability Resource Center (DRC) at 703 993 2474. All academic accommodations must be arranged through that office (<http://ods.gmu.edu>.)

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.

Safe Return to Campus Statement

All students taking courses with a face-to-face component are required to follow the university's public health and safety precautions and procedures outlined on the university **Safe Return to Campus webpage** (<https://www2.gmu.edu/safe-return-campus>). Similarly, all students in face-to-face and hybrid courses must **also complete the Mason COVID Health Check daily**, seven days a week. The COVID Health Check system uses a color code system and students will

receive either a Green, Yellow, or Red email response. **Only students who receive a “Green” notification are permitted to attend courses with a face-to-face component.** If you suspect that you are sick or have been directed to self-isolate, please quarantine or get testing. **Faculty are allowed to ask you** to show them that you have received a green email and are thereby permitted to be in class.