

ECOLOGY SEMINAR
Zoology 956
Fall Semester 2017

Ecological and Social Dimensions of Changing Fire Regimes

Course Description, Syllabus and Reading List

(Version 1 September 2017)

INSTRUCTOR:

Dr. Monica G. Turner, Zoology Department, 432 Birge Hall
(Tel: 262-2592; turnermg@wisc.edu)

CREDIT HOURS: 1 credit

MEETING TIME: Fridays from 9:30 to 10:45 in 447 Birge Hall

COURSE STRUCTURE:

This graduate seminar will follow a conventional format that emphasizes discussion of primary literature. Most class meetings will entail student-led discussion of assigned readings.

COURSE DESCRIPTION AND OBJECTIVES:

Fire frequency, size, and severity are increasing in the US and worldwide as climate warms. In turn, changing fire regimes are having profound effects on ecosystems and society, and receiving substantial attention from scientists and policy makers. For example, the US released an inter-agency *National Cohesive Wildland Fire Management Strategy* in 2014; the National Academy of Sciences hosted an interdisciplinary workshop on *A Century of Wildland Fire Research* in March 2017; and numerous conferences and workshops have been addressed the topic. However, responding to increasing fire activity is considered a “wicked problem” that cannot be easily addressed with current science and policy paradigms. This seminar will follow a journal-club format that emphasizes reading and discussion of primary literature drawn from ecological and social sciences. At the end of the class, students have an understanding of the current literature, concepts, and research directions associated with the relationship of people with fire; the drivers of changing fire regimes; and the consequences of changing fire regimes for social-ecological systems.

ABSENCE POLICY:

Attendance expected and is recorded at each class meeting. If you have an *anticipated* absence (e.g., planned conference travel or necessary field work), please let me know before the class that you will miss. If you are *unexpectedly* absent (e.g., illness), please inform me at your earliest convenience.

For classes that are missed, students are responsible for the material that was covered in class and must complete the readings. ***A summary of the assigned readings (one single-space page maximum for each assigned paper) should be submitted before (if possible) but no later than one week after the missed class.*** The summary should include a brief statement of what was

covered in the paper, your thoughts on the primary contribution of the paper, any insights that were new for you, and questions that were raised in your mind by the paper.

READING ASSIGNMENTS:

This seminar emphasizes readings from the primary literature, with ~three papers assigned each week for discussion. *Everyone is expected to have read the assignments before class and be prepared to discuss the papers.* Responsibility for leading discussion will be rotated. Discussion leaders should raise questions or issues to be discussed; be prepared with an evaluation of the significant contributions of the paper; and facilitate discussion among the group (see additional notes below). *Brief unannounced reading quizzes will be administered occasionally.*

PDFs of reading assignments are in Box (see email for the link).

PARTICIPATING IN DISCUSSION:

Discussions are only effective when everyone is prepared and has perspectives to contribute. *Everyone is expected to have read the assigned articles before class and given thought to the content and context.* A good strategy for being prepared is to write down a couple of questions or observations about each paper as you are reading it. The class benefits from the diverse interests and backgrounds of the students, and we learn a lot by listening to one another.

LEADING DISCUSSION:

Students will have the opportunity to lead the class discussion of assigned readings. All students will have read the papers prior to class, so discussion leaders should **not** provide a detailed review of the paper. The discussion leader should provide a **very** brief summary of the main topic of the paper, just to remind everyone of which paper is being considered. Here are some tips for being effective at leading discussion.

- i. Summarize for yourself some of the important points about the paper. It's often useful to have a set of questions that you answer while planning discussion. For example, consider the following: What is the main conceptual contribution of the paper? Why might it be important or influential? Is it a representative example? Does it propose a new direction or idea? How does this paper relate to other papers or general concepts with which you are familiar? Are there any new approaches represented? Are there any problems with the study? How does this reflect the current state of the science?
- ii. Prepare in advance some open-ended questions that you can pose to the group to get the discussion going. Remember that questions with a "yes" or "no" answer do not facilitate a discussion! Feel free to call on people if there is silence!
- iii. Keep the discussion moving by including all members of the group (this means calling on reticent members of the group and gently redirecting away from individuals who may dominate the conversation) and by curtailing discussion that goes off into tangents or dead ends.

- iv. Try to summarize and synthesize as things go along. It's often helpful to use a mechanism like, "So far, we've identified the following main contributions of this paper:
....
- v. Be creative! Don't be reticent about trying out new approaches for catalyzing discussion, implementing some active exercises, and the like. Do not feel constrained to repeat the same structure as the classes before yours.

GRADING:

Grades will be based on leading (25%) and participating (70%) in class discussion, and short unannounced reading quizzes (5%). Numerical grades are assigned as follows: 93-100 (A), 88-92 (AB), 82-87 (B), 78-81 (BC). Attendance is required, and coming to class having read the assignments and being prepared to discuss is expected.

Ecological and Social Dimensions of Changing Fire Regimes

SYLLABUS (9/1/2017)

Date	Topic	Readings
Sep 8	Introduction & context	Scott et al. (2016) (short) Pyne (2016) (short) Bowman et al. (2011) Chapin et al. (2008)
Sep 15	Urgency	Abatzoglou and Williams (2016) Balch et al. (2017) Cruz et al. (2012)
Sep 22	Relationships of people and fire–US perspectives	Stambaugh et al. (2013) Swetnam et al. (2016) Marlon et al. (2012)
Sep 29	Relationships of people and fire–global	Perry et al. (2014) Archibald (2016) Page and Hooijer (2016)
Oct 6	Fire effects on humans	Martin (2016) Johnston et al. (2016) Diakakis et al. (2016)
Oct 13	Fire in the wildland-urban interface (WUI)	Carroll & Paveglio (2016) Alexandre et al. (2016) Bentley & Penman (2017)
Oct 20	Attitudes and perceptions of fire	Twidwell et al. (2013) Doerr & Santin (2016) Wang et al. (2016)
Oct 27	Fire management, pros and cons of fire suppression	Thompson et al. (2017) Hope et al. (2016) Houtman et al. (2013)
Nov 3	Fire management, use of science	Hunter (2016) Ingalsbee (2017) Colavito (2017)
Nov 10	Policy implications	Steelman (2016) Fischer et al. (2016) Stidham et al. (2014)
Nov 17	Contemporary US wildfire policy	The National Strategy (2014)
Nov 24	THANKSGIVING	–
Dec 1	Social-ecological system resilience – general	Dietz et al. (2003) Davidson et al. (2016) Cumming and Peterson (2017)
Dec 8	Social-ecological system resilience - fire	Coughlan (2015) Roos et al. (2016) Schoennagel et al. (2017)

Reading list

September 8 – Introduction and Context

- Chapin, F. S., III, and many others. 2008. Increasing wildfire in Alaska's boreal forest: pathways to potential solutions of a wicked problem. *BioScience* 58:531-540.
- Bowman, D. M. J. S, and many others. 2011. The human dimensions of fire regimes on Earth. *Journal of Biogeography* 38:2223-2236.
- Scott, A. C., W. G. Chaloner, C. M. Belcher, and C. I. Roos. 2016. The interaction of fire and mankind: Introduction. *Philosophical Transactions of the Royal Society B* 371:20150162.
- Pyne, S. J. 2016. Fire in the mind: changing understanding of fire in Western civilization. *Philosophical Transactions of the Royal Society B* 371:20150166.

September 15 – Urgency

- Abatzoglou, J. T., and A. P. Williams. 2016. Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the US National Academy of Sciences* 113:11770-11775.
- Balch, J. K., B. A. Bradley, J. T. Abatzoglou, R. C. Nagy, E. J. Fusco, and A. L. Mahood. 2017. Human-started wildfires expand the fire niche across the United States. *Proceedings of the US National Academy of Sciences* www.pnas.org/cgi/doi/10.1073/pnas.1617394114
- Cruz, M. G., A. L. Sullivan, J. S. Gould, N. C. Sims, A. J. Bannister, J. J. Hollis, and R. J. Hurley. 2012. Anatomy of a catastrophic wildfire: The Black Saturday Kilmore East fire in Victoria, Australia. *Forest Ecology and Management* 284:269-285.

September 22 – Relationships of people and fire, US perspectives

- Marlon, J. R., and many others. 2012. Long-term perspective on wildfires in the western USA. *Proceedings of the US National Academy of Sciences*.
- Stambaugh, M. C., R. P. Guyette, and J. Marschall. 2013. Fire history in the Cherokee Nation of Oklahoma. *Human Ecology* 41:749-758.
- Swetnam, T. W., J. Farella, C. I. Roos, M. J. Liebmann, D. A. Falk, and C. D. Allen. 2016. Multiscale perspectives of fire, climate and humans in western North America and the Jemez Mountains, USA. *Philosophical Transactions of the Royal Society B* 371:20150168.

September 29 – Relationships of people and fire, global perspectives

- Archibald, S., A. C. Staver, and S. A. Levin. 2012. Evolution of human-driven fire regimes in Africa. *Proceedings of the US National Academy of Sciences* 109:847-852.
- Page, S. E., and A. Hooijer. 2016. In the line of fire: the peatlands of Southeast Asia. *Philosophical Transactions of the Royal Society B* 371:20150176.
- Perry, G. L. W., J. M. Wilmshurst, and M. S. McGlone. 2014. Ecology and long-term history of fires in New Zealand. *New Zealand Journal of Ecology* 38:157-176.

October 6– Fire effects on humans

- Johnston, F. H., S. Melody, and D. M. J. S. Bowman. 2016. The pyrohealth transition: how combustion emissions have shaped health through human history. *Philosophical Transactions of the Royal Society B* 371:20150173.

Martin, D. A. 2016. At the nexus of fire, water and society. *Philosophical Transactions of the Royal Society B* 371:20150172.

Diakakis, M., G. Zanthopoulos, and L. Gregos. 2016. Analysis of forest fire fatalities in Greece: 1977-2013. *International Journal of Wildland Fire* 25:797-809.

October 13–Fire in the WUI

Carroll, M., and T. Paveglio. 2016. Using community archetypes to better understand differential adaptation to wildfire risk. *Philosophical Transactions of the Royal Society B* 371:20150344.

Alexandre, P. M., S. I. Stewart, N. S. Keuler, M. K. Clayton, M. H. Mockrin, A. Bar-Massada, A. D. Syphard, and V. C. Radeloff. 2016. Factors related to building loss due to wildfires in the conterminous United States. *Ecological Applications* 26:2323-2338.

Bentley, P. D. and T. D. Penman. 2017. Is there an inherent conflict in managing fire for people and conservation? *International Journal of Wildland Fire* 26:455-468.

October 20– Attitudes and perceptions of fire

Doerr, S. H., and C. Santin. 2016. Global trends in wildfire and its impacts: perceptions versus realities in a changing world. *Philosophical Transactions of the Royal Society B* 371:20150345.

Twidwell, D., W. E. Rogers, S. D. Fuhlendorf, C. L. Wonkka, D. M. Engle, J. R. Weir, U. P. Kreuter, and C. A. Taylor, Jr. 2013. The rising Great Plains fire campaign: citizens' response to woody plant encroachment. *Frontiers in Ecology and the Environment Online Issue 1*: e64-e71.

Wang, Z., X. Ye, and M.-H. Tsou. 2016. Spatial, temporal, and content analysis of Twitter for wildfire hazards. *Natural Hazards* 83:523-540.

October 27– Fire management, pros and cons of fire suppression

Thompson, M. P., F. R. Silva, D. E. Calkin, and M. S. Hand. 2017. A review of challenges to determining and demonstrating efficiency of large fire management. *International Journal of Wildland Fire* 26:562-573.

Hope, E. S., D. W. McKenney, J. H. Pedlar, B. J. Stocks, and S. Gauthier. 2016. Wildfire suppression costs for Canada under a changing climate. *PLoS One* 11(8): e0157425. doi:10.1371/journal.pone.0157425

Houtman, R. M., C. A. Montgomery, A. R. Gagnon, D. E. Calkin, T. G. Dietterich, S. McGregor, and M. Crowley. 2013. Allowing a wildfire to burn: estimating the effect on future suppression costs. *International Journal of Wildland Fire* 22:871-882.

November 3–Fire management, use of science

Ingalsbee, T. 2017. Whither the paradigm shift? Large wildland fires and the wildfire paradox offer opportunities for a new paradigm of ecological fire management. *IJWF* 26:557-561.

Hunter, M. E. 2016. Outcomes of fire research: is science used? *International Journal of Wildland Fire* 25:494-504.

Colavito, M. M. 2017. Utilising scientific information to support resilient forest and fire management. *International Journal of Wildland Fire* 26:375-383.

November 10– Policy implications

- Fischer, A. P., and many others. 2016. Wildfire risk as a socioecological pathology. *Frontiers of Ecology and the Environment* 14:276-284.
- Steelman, T. 2016. U.S. wildfire governance as a social-ecological problem. *Ecology and Society* 21(4):3.
- Stidham, M., S. McCaffrey, E. Toman, and B. Shindler. 2014. Policy tools to encourage community-level defensible space in the United States: A tale of six communities. *Journal of Rural Studies* 35:59-69.

November 17– Contemporary US wildfire policy

- The National Strategy. 2014. The final phase in the development of the National Cohesive Wildland Fire Management Strategy.

December 1–SES resilience, general

- Dieta, T., E. Ostrom, and P. C. Stern. 2003. The struggle to govern the commons. *Science* 302.
- Davidson, J. L., and many others. 2016. Interrogating resilience: toward a typology to improve its operationalization. *Ecology and Society* 21(2):27.
- Cumming, G. S. and G. D. Peterson. 2017. Unifying research on social-ecological resilience and collapse. *Trends in Ecology & Evolution* (in press).

December 8–SES resilience, fire

- Coughlan, M. R. 2015. Traditional fire use, landscape transition, and the legacies of social theory past. *Ambio* 44:705-717.
- Roos, C I., and many others. 2016. Living on a flammable planet: interdisciplinary, cross-scalar and varied cultural lessons, prospects and challenges. *Philosophical Transactions of the Royal Society B* 371:20150469.
- Schoennagel, T., J. Balch, H. Brenkert-Smith, P. Dennison, B. Harvey, M. Krawchuk, N. Miekiewicz, P. Morgan, M. Moritz, R. Rasker, M. G. Turner, and C. Whitlock. 2017. Adapt to more wildfire in western North American forests as climate changes. *Proceedings of the National Academy of Sciences* 114:4582-4590.