

Climate Change in Massachusetts: What Would Henry Say?

KHC BI 101

Fall 2012

Mondays/Wednesdays

1:30-3:00 PM

Room: KHC 107

Dr. Richard Primack

Office hours: Mondays 11AM-12 PM, Wednesday 10-11AM, Friday 11AM-12PM

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Course Description and Purpose

Henry David Thoreau spent decades observing and recording the natural history of Concord and other sites in Massachusetts. Thoreau is most well known for his book *Walden*, which includes extended essays on the changing seasons. Thoreau's journals and other unpublished writings also contain extensive quantitative records on plant flowering times, bird migration times, ice-out times in Walden Pond, and temperature records from water bodies. Thoreau's observation can be placed within a long tradition of naturalists observing the plants and animals of Massachusetts, and his records are now being used to document the reality of climate change. If Thoreau were alive today, he could readily observe the impacts of climate change and other human activities on the landscape of Concord. What would he think about it, and what would he do about it?

The purpose of this course will be to place Thoreau and *Walden* within the context of modern climate change research. The students will read *Walden* concurrently with *Eaarth* by Bill McKibben along with articles from the primary literature to gain an appreciation of how Thoreau anticipated many modern climate change issues. In particular, we will read research papers comparing the observations of Thoreau and other historical data sets with modern observations in order to detect the fingerprint of climate change. We will trace how these scientific papers have been presented in the magazines and newspapers to gain an appreciation of the process whereby science is communicated to the public.

Class discussions will often take place at local field sites, including Hall's Pond Sanctuary, the Charles River, and the Fenway. Weekend field trips will be made to sites of historical and scientific interest, including Walden Pond in Concord, the Hammond Woods in Newton, and Mt. Auburn Cemetery (where large numbers of bird watchers track bird movements).

Required Readings:

Thoreau, H.D. 2004. *Walden: A Fully Annotated Edition*. Jeffrey Cramer, ed. New Haven, CT: Yale University, 400pp. McKibben, B. 2010. *Eaarth*. Times Books.

Newman, J.A. and others. 2011. *Climate Change Biology*. CAB International. Primack, R.

Walden Warming. University of Chicago Press, in review.

Supplemental readings from the primary literature, related to both general climate change impacts and changes seen in Massachusetts in particular. Samples are as follows:

Hodgkins, G.A., I.C. James, and T.G. Huntington. 2002. Historical changes in lake ice-out dates as indicators of climate change in New England, 1850-2000: *International Journal of Climatology* 22: 1819-1827. (The impact of climate change on lakes and ponds.)

Leopold, A. and S.E. Jones. 1947. A phenological record for Sauk and Dane counties, Wisconsin, 1935-1945. *Ecological Monographs* 17(1): 81-122. (Aldo Leopold was a pioneer in using the timing of events to understand ecological interactions.)

Root, T.L., J.T. Price, K.R. Hall, S.H. Schneider, C. Rosenzweig, and J.A. Pounds. 2003. Fingerprints of global warming on wild animals and plants. *Nature* 421: 57-60. (A general treatment of the biological impacts of climate change.)

Miller-Rushing, A.J., T.L. Lloyd-Evans, R.B. Primack, and P. Satzinger. 2008. Bird migration times, climate change, and declining population sizes. *Global Change Biology* 14: 1-14. (Some birds are now arriving earlier at Manomet Bird Observatory.)

Miller-Rushing, A.J., R.B. Primack, and R. Stymieist. 2008. Interpreting variation in bird migration times as observed by volunteers. *Auk* 125: 565-573. (Volunteers can play a key role in climate change research.)

Miller-Rushing, A.J. and R.B. Primack. 2008. Global warming and flowering times in Thoreau's Concord: a community perspective. *Ecology* 89: 332-341. (Concord provides one of the best sources of data on the impacts of climate change on plants.)

Primack, R.B., A.J. Miller-Rushing, and K. Dharaneeswaran. 2009. Changes in the flora of Thoreau's Concord. *Biological Conservation* 142: 500-508. (The flora of Concord is changing due to many factors.)

Primack, R.B. and A. J. Miller-Rushing. 2012. Uncovering, collecting and analyzing records to investigate the ecological impacts of climate change: A template from Thoreau's Concord. *BioScience* 62: 170-181. Summary of how to locate historical information that can be used in climate change research.

Willis, C.G., B. Ruhfel, R.B. Primack, A.J. Miller-Rushing, and C. C. Davis. 2008. Phylogenetic patterns of species loss in Thoreau's woods are driven by climate change. *Proceedings of the National Academy of Sciences U.S.A.* 105: 17029-17033. (Warming temperatures are

implicated in the loss of Concord species.)

Attendance

Students will be required to attend all lectures and field trips. Students must make up any missed work. Work handed in late will be marked down 10% for each day late.

Academic Dishonesty

Students are required to be aware of and adhere to the Academic Code of Conduct.

<http://www.bu.edu/academics/resources/academic-conduct-code/>

Grading

- § First in-class presentation: 15%
- § Second in-class presentation: 15%
- § First paper: 5%
- § Second paper: 5%
- § Third paper: 10%
- § Mid-term exam: 25%
- § Final paper: 20%
- § Final paper presentation: 10%
- § Class participation: 10%

The first presentation will be based on a review of a paper or papers relevant to the course. The second presentation will be a review of a chapter from the readings and leading class discussion. The first paper will be based on natural history observations as related to climate change. The second paper will be an analysis of a specific climate change topic in relation to an observation related to climate change. The final paper and presentation at the end of the course will be based on the student's investigation of a specialized scientific topic combined with original observations, selected following a discussion with the professor. The final paper will be 15 pages long with 15-20 references and written in the style of BioScience, a journal that presents non-technical overview articles for researchers and science teachers.

Course Schedule

Topics will be presented on a weekly basis. Many of the course meetings will involve weekend field trips, each lasting half a day, and scheduled at a time of mutual convenience. Students will be encouraged to discuss their ideas on possible course projects. I will meet with students individually to discuss their projects and encourage them to select a project that is feasible and appropriate for the course.

<u>Week</u>	<u>Topic</u>	<u>Chapter</u>
Sept. 5	Concord as a living laboratory of climate change.	
Sept. 9	Field Trip: Walden Pond	
Sept. 10	Long-term changes in the weather. First presentation	Walden (W): Economy Where I lived; CCB
Sept. 16	Field Trip: Hammond Woods	
Sept. 17	Evidence from Concord. First paper due and presentation.	W: Reading, Sounds, Solitude; BioScience
Sept. 24	Long-term changes in bird arrival	Eaarth: Ch. 1&2, ; CCB; bird papers
Sept. 26	Nathan Phillips	
Oct. 1	Second presentation; The value of historical records in climate change research	RBP: Chapter 1-3. Concord plant papers
Oct. 9 (Tues)	Hour exam. Thoreau in Concord.	W: Visitors, Bean field, The Ponds.
Oct. 14	Field Trip: Mt. Auburn; 2-5pm	
Oct. 15	The role of volunteers in climate change research (Frontiers)	W: Baker Farm, Higher laws, Brute Neighbors; RBP: Ch. 4-5.
Oct. 22	The relationship between Thoreau's writings and contemporary social issues Second paper due and presentation.	W: House warming, Former inhabitants; RBP Ch. 6-7.
Oct. 29	Statistical problems of interpreting; historical data gathered by different observers.	W: Winter animals, The Pond in Winter; RBP: Ch. 8-9.
Nov. 5	Quantification of natural history data in the 19th century. Possible guest lecturer: Maurice Lee	E: Backing off, RBP: Ch. 9-10.
Nov. 12	Insects as the missing link in climate change research Third paper due and presentation.	W: Spring, Conclusions Polgar: Butterflies
Nov. 19	New England as a center for naturalists and natural history study. The marathon.	E: Lightly, Carefully, Gracefully RBP: Ch. 11
Nov. 26	Climate change and contemporary issues	Final chapter of Walden Warming
Dec. 3	Student presentations.	

Dec. 10 (Mon)	Final course summary. What would Thoreau think of global climate change, and what would he do?	
Dec. 14	Final Paper Due	