

HUMAN IMPACTS ON THE ENVIRONMENT: AN ARCHAEOLOGICAL PERSPECTIVE

**ASB 326 (17724) – SPRING 2015, 3:00-4:15 MW, SHESC 340
SEE MYASU FOR COURSE BLACKBOARD SITE**

**Instructor: Michael Barton
Office: SHESC 152 or ISTB-1 404
Wednesday 11-12 (SHESC 152)
Thursday 4-5 (ISTB1 404)
Email: michael.barton@asu.edu**

**TA: Wendy Cegielski
Office: ISTB-1 Room 407
Monday 2-3 pm
Thursday 10:30-11:30
Email: wendy.cegielski@asu.edu**

Course Overview

In the globalized, post-industrial world of the 21st Century, it is apparent that human society is profoundly altering the world in many ways. In 2000, Paul Crutzen proposed giving our industrial and post-industrial age a new geological name, the “Anthropocene”, to reflect the scale of human influence on the earth. Over the past decade, this idea has taken hold and increasingly is used to indicate the importance of human impacts on “natural” systems. Indeed, humans now use over half the available fresh water, use more than half the earth's surface for crops and animal pasture, and move more sediment and cycle more Nitrogen than natural processes. The eventual social and biophysical consequences of human-caused environmental change remain far from clear. Public constituencies and private interest groups are continuing to debate (sometimes heatedly) the nature of human impact on the environment and alternative ways to minimize potentially harmful consequences of human activities. It is often difficult even to agree on what the ‘natural’ environment is (or was) in many cases, much less what it should be. The past few decades saw greater changes in some aspects of climate than have been recorded for millennia. How much this is a result of human activity (and which activities are the most important contributors) and how much is due to non-human causes remains a matter of considerable debate—especially as we now know that major climate change can happen with frightening swiftness even without human intervention. Two decades ago, demographers were predicting a world population exploding at an ever-increasing rate with dire consequences for the earth. Today, world population growth is unexpectedly and rapidly slowing, and population is even declining in most industrialized nations. For much of the twentieth century, we have tried to protect areas of forest from wildfires. Now it appears that this effort has made forests even more susceptible to destruction by fire. Our success in fighting infections that used to maim and kill many is contributing to the evolution of new and deadly strains of bacteria that are resistant to antibiotics.

The links between human actions and environmental are many and complex, and their consequences are often indirect and ‘non-linear,’ making them especially difficult to predict. And many of the effects of our actions today will not be felt for many years or perhaps even centuries. Modern ecosystems are not static communities to be maintained or repaired, but are only the current manifestation of continuous and complex interactions among living and acting organisms—including humans—and between organisms and the abiotic (i.e., non-living) parts of their surroundings. These interactions stretch far back into antiquity, and the state of modern ecosystems is as much a product of their histories as it is of current conditions. As you will see in this course, humans have been an integral and active component of earth’s ecology for many thousands of years. This long history of interaction between humans and their environment has had both beneficial and deleterious results—for us and for other species. This has critically important ramifications for those who would shape social and environmental policy. Archaeologists (and others interested in ecology of the past such as historical geographers, geomorphologists, paleontologists, and paleobotanists) are playing an increasingly important role in understanding the effects of humans on the earth. Only through studying the dynamic past of our planet’s ecosystems, and the ecological role of human society can we begin to understand what our future might hold. By learning the lessons of past human impacts—‘good’ and ‘bad’—we gain a better appreciation of the potential effects of our own activities today. Humans have always had an impact on their surroundings. The critical question facing us today is not whether we can avoid affecting our environment, but whether we can direct our impacts in ways that permit us as a species to survive and assure that earth will remain a planet worth living on.

Course Reading Materials

Summary texts on archaeological perspectives on human impact—or what some are calling historical ecology—are rare but beginning to appear. In addition to one of the required textbooks, *The Archaeology of Environmental Change* edited by C. T. Fisher, J. B. Hill, & G. M. Feinman, (2009 Tucson: University of Arizona Press), I have also assigned a number of journal articles and a few book chapters written by scientists currently involved in research on this topic. (You should know that ASU is one of the leading institutions in the world for studying long-term impacts of humans on the environment; some of the papers you will read are by scientists here. So you might want to take a class from one of them if you find their work interesting.) Some of these articles may be more difficult than others, but as experienced college students you should be able to follow the general gist of even the most difficult. I am more interested that you grasp the concepts involved rather than memorize the details of each research project. My goal is that you gain a solid understanding of both the long history of human/environment interaction, and of the way archaeologists and other scientists go about learning about this history.

In addition to the Fisher et al. book, I have assigned a book called *Environmental Archaeology*, by Nick Branch and colleagues, to give you a background to the methods for studying past human ecosystems. It is a useful reference—including the sections not assigned—for anyone interested in the methods for studying the long history of interaction between humans and the environment.

Books available at the bookstore: Branch et al 2005, Fisher et al 2009, Redman 1999

Another couple of excellent books I've used in the past are Dena Dincauze's *Environmental Archaeology* (same name but considerably more detail than the book by Branch and colleagues) and Karl Butzer's *Archaeology as Human Ecology*.

Copies of all assigned readings, except those from Fisher et al. and the Branch et al book are posted on the class **Blackboard** site. The books used in this class are also on reserve at Hayden Library, and the articles can be found in appropriate journals in the periodicals section or on-line. I will post other class material on this site through the semester. If you have **any** questions over the material presented, **please** ask Claudine or me in class or during office hours.

Expectations and Grading

This course is listed as a lecture course and I can and will certainly do that. However, it will be more interesting if you and the other students ask questions and offer your thoughts on the readings and my comments. I encourage you to do this, and to do it in a professional and scholarly manner so that others in the class can benefit as well. This means that you will need to read the assigned articles and book chapters listed on the syllabus for that day **BEFORE** coming to class; this will make the class a more valuable experience for you. You are responsible for the material in the readings **and** in lectures. Lectures may amplify the readings **or present different material**.

It is probably unnecessary to mention this to most of you, but I expect students to act professionally and with consideration toward other members of the class at all times. Those enrolled in this class did so because they want to learn about archaeological perspectives on human impacts on the environment. They have a right to the opportunity to do so.

My goal is for you to be able to think critically and synthesize the information made available to you and apply relevant concepts in a research setting. Your grade will be based on three kinds of evaluations that attempt to assess how well you have met that goal.

30% of the grade will come from your ability to think critically about the reading material. You will be required to contribute to an online, Blackboard discussion board centered upon the weekly readings. You will be assigned to a small, discussion group responsible for choosing 8 sets of weekly readings (*only one set per week allowed*) from the those available on Blackboard. Each member of the group must act as a “discussion leader” at least one time during the semester. This person will be responsible for posting a question relating to the readings that the others in the group are to address. The group can choose any 8 sets of readings but *each must be submitted on Blackboard by Thursday at 10 AM of the week that we cover that material.*

45% of the grade will come from three short projects (15% each) that will be handed out during the semester.

25% of the grade will come from a final exam that comprehensively covers all material in the course.

If you have any questions, need help in understanding a topic or reading, or would like to discuss some aspect of the course, please come and see Claudine or me. If you are unable to come to our regular office hours, you can talk to either of us after class to schedule another time.

Student Standards and Academic Integrity

All students are required to read and act in accordance with university and Arizona Board of Regents policies, including:

- the Arizona Board of Regents Code of Conduct (ABOR Policies 5-301 through 5-308): <https://azregents.asu.edu/rrc/Policy%20Manual/5-303-Prohibited%20Conduct.pdf>,
- ASU’s policies on academic integrity: <http://provost.asu.edu/academicintegrity>, and
- ASU’s Computer, Internet and Electronic Communications Policy: <http://www.asu.edu/aad/manuals/acd/acd125.html>

If you fail to meet the standards of academic integrity in any of the criteria listed on the university policy website, sanctions will be imposed by the instructor, school, and/or dean. Academic dishonesty includes borrowing ideas without proper citation, copying others’ work (including information posted on the internet), and failing to turn in your own work for group projects. If you follow an argument closely, even if it is not directly quoted, you must provide a citation to the publication, including the author, date and page number. If you directly quote a source, you must use quotation marks and provide the same sort of citation for each quoted sentence or phrase.

You may work with other students on assignments. However, all writing that you turn in must be done independently by you. If you have any doubt about whether the form of cooperation you contemplate is acceptable, ask the TA or the instructor in advance of turning in an assignment. Any work submitted for credit in this class will be scanned using **SafeAssignment**, which compares them against everything posted on the Internet, online article/paper databases, newspapers and magazines, and papers submitted by other students.

Student Support and Disability Accommodations

ASU offers support services through:

- Counseling (<http://students.asu.edu/counseling>),
- The Learning Support Services (<http://www.asu.edu/housing/WITH/lss/>) and
- The Disability Resource Center (<http://www.asu.edu/studentaffairs/ed/drc/>).

If you are a student in need of special arrangements, we will do all we can to help, based on the recommendations of these services. For the sake of equity for all students, we cannot make any accommodations without formal guidance from these services.

COURSE OUTLINE AND SYLLABUS

Background

Jan. 12Introduction

Hayashida, F.M. (2005). Archaeology, ecological history, and conservation. *Annual Review of Anthropology*, 34: 43-65.

Review first chapter of Fisher et al 2009:

Fisher, C. T., Hill, J. B., & Feinman, G. M. (2009). Environmental studies for Twenty-first Century conservation. In C. T. Fisher, J. B. Hill, & Feinman, Gary M (Eds.), *The Archaeology of Environmental Change* (pp. 1-12). Tucson: Univ. of Ariz. Press.

For further reading:

Hill, J. B., Fisher, C. T., & Feinman, G. M. (2009). The socio-natural connection. In C. T. Fisher, J. B. Hill, & G. M. Feinman (Eds.), *The Archaeology of Environmental Change* (pp. 249–258). Tucson: Univ. of Ariz. Press.

Kirch, P. V. (2005). Archaeology and global change: the Holocene record. *Annual Review of Environmental Resources* 30:409–40

Minnis, P.E. (2004). Extinction isn't always forever: biodiversity and prehistory. In *The Archaeology of Global Change*, edited by C.L. Redman, S.R. James, P.R. Fish, and J.D. Rogers. Smithsonian Books, Washington, DC. 249-256.

Jan. 14Concepts: long-term human-environmental interaction

Branch, N., Canti, M., Clark, P., & Turney, C. (2005). *Environmental Archaeology: Theoretical and Practical Approaches*. Key issues in environmental change. London: Hodder Arnold.

Chapter 1.

Foley, S. F., Gronenborn, D., Andreae, M. O., Kadereit, J. W., Esper, J., Scholz, D., ... Crutzen, P. J. (n.d.). The Palaeoanthropocene – The beginnings of anthropogenic environmental change. *Anthropocene*. doi:10.1016/j.ancene.2013.11.002

For further reading:

Redman, C. L. (1999). *Human Impact on Ancient Environments*. Tucson: University of Arizona Press. **pages 3-14.**

Jan. 19Martin Luther King Day (no classes)

Jan. 21Methods: stratigraphy and dating

Branch, N., Canti, M., Clark, P., & Turney, C. (2005). *Environmental Archaeology: Theoretical and Practical Approaches*. Key issues in environmental change. London: Hodder Arnold.

Chapters 2 & 4.

Jan. 26Methods: plant and animal remains

Branch, N., Canti, M., Clark, P., & Turney, C. (2005). *Environmental Archaeology: Theoretical and Practical Approaches*. Key issues in environmental change. London: Hodder Arnold.

Chapter 3.

Jan. 28Methods: the formation of the archaeological record

Butzer, K.W. (1982). *Archaeology as Human Ecology*. Cambridge University Press, Cambridge. **Pages 77-156.**

For further reading:

Dincauze, D. (2000). *Environmental Archaeology*. Cambridge University Press, Cambridge.

Chapter 12.

Hunter/Gatherers

Feb. 2Concepts: ecological decision-making

Bird DW, O'Connell JF (2006) Behavioral Ecology and Archaeology. *J Archaeol Res* 14:143–188. doi: 10.1007/s10814-006-9003-6

For further reading:

Alvard, M. S. (2003). The adaptive nature of culture. *Evolutionary Anthropology*, 12, 136–149.

Foley, R. (1985). Optimality Theory in Anthropology. *Man*, New Series, 20(2), 222-242.

Kelly, R. (1995). *The Foraging Spectrum*. Chapter 2, pp. 39-64.

Feb. 4Concepts & Methods: systems, ecosystems, and computational modeling

French, C. (2010). People, Societies, and Landscapes. *Science*, 328(5977), 443-444.

van der Leeuw, S. E. (2004). Why model? *Cybernetics and Systems: An International Journal*, 35(2), 117–128. doi:10.1080/01969720490426803

For further reading:

Banks, S. C. (2002). Agent-based modeling: A revolution? *PNAS*, 99(90003), 7199-7200.

Kohler, T.A., G. Gumerman and R.G. Reynolds (2005) Simulating Ancient Societies: Computer Modeling is Helping to Unravel the Archaeological Mysteries of the American Southwest. *Scientific American*. July: 76-83.

Feb. 9Case studies: the colonization of Sahul

McGlone, M. (2012). The Hunters Did It. *Science*, 335(6075), 1452–1453. doi:10.1126/science.1220176

Rule, S., Brook, B. W., Haberle, S. G., Turney, C. S. M., Kershaw, A. P., & Johnson, C. N. (2012). The Aftermath of Megafaunal Extinction: Ecosystem Transformation in Pleistocene Australia. *Science*, 335(6075), 1483–1486. doi:10.1126/science.1214261

Wroe, S., Field, J. H., Archer, M., Grayson, D. K., Price, G. J., Louys, J., ... Mooney, S. D. (2013). Climate change frames debate over the extinction of megafauna in Sahul (Pleistocene Australia-New Guinea). *Proceedings of the National Academy of Sciences*, 110(22), 8777–8781. doi:10.1073/pnas.1302698110

For further reading:

Diamond, J. M. (2008). Palaeontology: The last giant kangaroo. *Nature*, 454(7206), 835–836. doi:10.1038/454835a

Johnson, C. N. (2005). The Remaking of Australia's Ecology. *Science*, 309(5732), 255-256.

Gosden, C. (2010). When Humans Arrived in the New Guinea Highlands. *Science*, 330(6000), 41-42.

Roberts, R. G., & Brook, B. W. (2010). And Then There Were None? *Science*, 327(5964), 420-422.

Summerhayes, G. R., Leavesley, M., Fairbairn, A., Mandui, H., Field, J., Ford, A., & Fullagar, R. (2010). Human Adaptation and Plant Use in Highland New Guinea 49,000 to 44,000 Years Ago. *Science*, 330(6000), 78-81.

Pass out Assignment 1: Modeling socio-ecological dynamics. Note: Part I due Feb. 10th!

Feb. 11Case studies: the colonization of the Americas

Dixon, E. J. (2013). Late Pleistocene colonization of North America from Northeast Asia: New insights from large-scale paleogeographic reconstructions. *Quaternary International*, 285, 57–67. doi:10.1016/j.quaint.2011.02.027

Gill, J. L., Williams, J. W., Jackson, S. T., Lininger, K. B., & Robinson, G. S. (2009). Pleistocene Megafaunal Collapse, Novel Plant Communities, and Enhanced Fire Regimes in North America. *Science*, 326(5956), 1100 -1103

For further reading:

- Barton, C. M., S. Schlich and S. R. James (2004). The ecology of human colonization in pristine landscapes. In *The Settlement of the American Continents: a Multidisciplinary Approach to Human Biogeography*, edited by C. M. Barton, G. A. Clark, D. R. Yesner and G. Pearson, pp. 138-161. University of Arizona Press, Tucson.
- Gillespie, R. (2008). Updating Martin's global extinction model. *Quaternary Science Reviews*, 27(27-28), 2522-2529. doi:10.1016/j.quascirev.2008.09.007
- Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press, Tucson, **Pages 62-79**.

Feb. 16Case studies: Holocene hunter/gatherers

- Bliege Bird et al. (2008). The "fire stick farming" hypothesis: Australian Aboriginal foraging strategies, biodiversity, and anthropogenic fire mosaics. *PNAS* 105(39), 14796-14801.

For further reading:

- Anderson, K. & Wohlgemuth, E. (2012). California Indian Proto-Agriculture: Its Characterization and Legacy. In *Biodiversity in Agriculture*, edited by P. Gepts, T.R. Famula, R.L. Bettinger, S.B. Brush, A.B. Damania, P.E. McGwire, & C.O. Qualset. pp. 190-224. Cambridge University Press, Cambridge.
- Innes, J., Blackford, J., & Simmons, I. (2010). Woodland disturbance and possible land-use regimes during the Late Mesolithic in the English uplands: pollen, charcoal and non-pollen palynomorph evidence from Bluewath Beck, North York Moors, UK. *Vegetation History and Archaeobotany*, 19(5-6), 439-452. doi:10.1007/s00334-010-0266-y
- Mason, S.L.R. (2000). Fire and Mesolithic subsistence—managing oaks for acorns in northwest Europe? *Paleogeography, Paleoclimatology, Paleoecology*, 164(1-4), 139-150.
- Mccorriston, J., & Hole, F. (1991). The Ecology of Seasonal Stress and the Origins of Agriculture in the near-East. *American Anthropologist*, 93(1), 46-69.

Assignment 1, Part II due by 10:00 am
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Feb. 18Concepts: the evolution of agricultural socioecosystems

- Rindos, David (1980). Symbiosis, instability, and the origins and spread of agriculture: a new model. *Current Anthropology*, 21: 751-772.
- Smith BD (2007) Niche construction and the behavioral context of plant and animal domestication. *Evol Anthropol* 16:188-199. doi: 10.1002/evan.20135

For further reading:

- Cohen, M. N. (2009). Introduction: Rethinking the Origins of Agriculture. *Current Anthropology*, 50(5), 591-595. doi:10.1086/603548
- Diamond, Jared (1997). *Guns, Germs, and Steel: the Fates of Human Societies*, W.W. Norton, New York. Chapter 6, "To farm or not to farm" and Chapter 7 "How to make an almond", (pp. 114-130)
- Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press, Tucson, **Pages 81-117**.
- Winterhalder, B., & Kennett, D. J. (2009). Four Neglected Concepts with a Role to Play in Explaining the Origins of Agriculture. *Current Anthropology*, 50(5), 645-648. doi:10.1086/605355

Agricultural Socio-Ecological Systems

Feb. 23Case studies: the first farmers of southwest Asia

- Balter, M. (2010). The Tangled Roots of Agriculture. *Science*, 327(5964), 404-406.
- Zeder MA (2011) The Origins of Agriculture in the Near East. *Current Anthropology* 52:S221-S235.

For further reading:

- Riehl, S., Zeidi, M., & Conard, N. J. (2013). Emergence of Agriculture in the Foothills of the Zagros Mountains of Iran. *Science*, 341(6141), 65–67. doi:10.1126/science.1236743
- Roberts, N. (1998). *The Holocene: an Environmental History, 2nd Edition*. Blackwell, Oxford, **Pages 186-192.**]
- Rollefson, G. & I. Kohler-Rollefson (1992). Early Neolithic exploitation patterns in the Levant: cultural impact on the environment. *Population and Environment* 13(4): 243-254.
- Simmons, A. H. (2009). The earliest residents of Cyprus: ecological pariahs or harmonious settlers? In C. T. Fisher, J. B. Hill, & Feinman, Gary M (Eds.), *The Archaeology of Environmental Change* (pp. 177-191). Tucson: Univ. of Ariz. Press.
- Zeder, M. A. (2008). Domestication and early agriculture in the Mediterranean Basin: Origins, diffusion, and impact. *Proceedings of the National Academy of Sciences*, 105(33), 11597-11604. doi:10.1073/pnas.0801317105

Assignment 1: Due by midnight on Blackboard!

Feb. 25Case studies: ecosystem management in SE Asia

- Hunt, C. O., & Rabett, R. J. (2014). Holocene landscape intervention and plant food production strategies in island and mainland Southeast Asia. *Journal of Archaeological Science*. doi:10.1016/j.jas.2013.12.011

For further reading:

- Balter, M. (2009). Recipe for Rice Domestication Required Millennia. *Science*, 323(5921), 1550. doi:10.1126/science.323.5921.1550
- Kealhofer, L. (2003). Looking into the gap: land use and the tropical forests of southern Thailand. *Asian Perspectives* 42(1): 72-95.

Mar. 2Case studies: forest farming in temperate Europe

- Edwards, K. J. (1993). Models of mid-Holocene forest farming for north-west Europe. *Climate Change and Human Impact on the Landscape*. F. M. Chambers. London. Chapman and Hall: 132-145.
- Shennan S, Downey SS, Timpson A, et al. (2013) Regional population collapse followed initial agriculture booms in mid-Holocene Europe. *Nature Communications*. doi: 10.1038/ncomms3486

For further reading:

- Innes, J. B., Blackford, J. J., & Rowley-Conwy, P. A. (2013). Late Mesolithic and early Neolithic forest disturbance: a high resolution palaeoecological test of human impact hypotheses. *Quaternary Science Reviews*, 77, 80–100. doi:10.1016/j.quascirev.2013.07.012
- Moore, P. D. (1993). The origin of blanket mire, revisited. *Climate Change and Human Impact on the Landscape*. F. M. Chambers. London., Chapman and Hall: 217-224.
- Rowley-Conwy, P. (2004). How the West was lost: a reconsideration of agricultural origins in Britain, Ireland, and southern Scandinavia. *Current Anthropology* 45(S4): 83-99 (with comments 99-113).
- Turney, C.S. & Brown, H. (2007). Catastrophic early Holocene sea level rise, human migration and the Neolithic transition in Europe. *Quaternary Science Reviews*, 26(17-18), 2036-2041.

Pass out Assignment 2: Synthesizing evidence of past human impacts

Mar. 4Concepts: ‘good’ reasons for ‘bad’ decisions

- Janssen, M.A., T.A. Kohler, and M. Scheffer (2003), Sunk-cost effects and vulnerability to collapse in ancient societies, *Current Anthropology* 44(5): 722-728.

For further reading:

Peeples, M. A., C. M. Barton, and S. Schlich (2006). Resilience lost: intersecting land use and landscape dynamics in the prehistoric southwestern United States. *Ecology and Society* 11(2): 22. [online] URL: [http:// www.ecologyandsociety.org/vol11/iss2/art22/](http://www.ecologyandsociety.org/vol11/iss2/art22/)

Mar. 9-13 Spring Break—no classes

Mar. 16Case studies: long-term effects of farming in the Amazon

Mann, Charles (2002). The Real Dirt on Rain forest Fertility. *Science* 297: 920-923.

McKey, D., Rostain, S., Iriarte, J., Glaser, B., Birk, J. J., Holst, I., & Renard, D. (2010). Pre-Columbian agricultural landscapes, ecosystem engineers, and self-organized patchiness in Amazonia. *Proceedings of the National Academy of Sciences*, 107(17), 7823-7828.

For further reading:

Glaser, B. (2007). Prehistorically modified soils of central Amazonia: a model for sustainable agriculture in the twenty-first century. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 362(1478), 187–196. doi:10.1098/rstb.2006.1978

Heckenberger, MJ (2007). The legacy of cultural landscapes in the Brazilian Amazon: implications for biodiversity. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*. 362(1478): 197 -208.

Neves, E. G., J. B. Pettersen, R. N. Bartone, C. A. da Silva (2003). Historical and Socio-cultural Origins of Amazonian Dark Earths. In *Amazonian Dark Earths: Origin, Properties, Management*, edited by J. Lehmann, D. Kern, B. Glaser, and W. Woods, pp 29-50. Kluwer Academic Publishers, Dordrecht, Netherlands.

Mar. 18Case studies: persistent impacts in the arid Southwest

Briggs, J., Spielmann, K., Schaafsma, H., Kintigh, K., Kruse, M., Morehouse, K., Schollmeyer, K. (2006). Why ecology needs archaeologists and archaeology need ecologists. *Frontiers in Ecology and the Environment* 4(4): 180-188.

Mar. 23Case studies: success and failure in the north Atlantic (The Lost Vikings)

No required readings assigned.

For further reading:

Dugmore, A. J., McGovern, T. H., Vesteinsson, O., Arneborg, J., Streeter, R., & Keller, C. (2012). Cultural adaptation, compounding vulnerabilities and conjunctures in Norse Greenland. *Proceedings of the National Academy of Sciences*, 109(10), 3658–3663. doi:10.1073/pnas.1115292109

Assignment 2 due online by 5:00 pm: Synthesizing evidence
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Mar. 25Case studies: colonizing the Pacific

Anderson, A. (2002). Faunal collapse, landscape change and settlement history in Remote Oceania. *World Archaeology* 33(3): 375-390.

Krulwich, R. 2013. What Happened On Easter Island — A New (Even Scarier) Scenario. <http://www.npr.org/blogs/krulwich/2013/12/09/249728994/what-happened-on-easter-island-a-new-even-scarier-scenario>

For further reading:

McWethy, D. B., Whitlock, C., Wilmshurst, J. M., McGlone, M. S., Fromont, M., Li, X., Dieffenbacher-Krall, A., et al. (2010). Rapid landscape transformation in South Island, New Zealand, following initial Polynesian settlement. *Proceedings of the National Academy of Sciences*, 107(50), 21343 -21348. doi:10.1073/pnas.1011801107

Complex Society and Urbanism

Mar. 30Concepts: complex adaptive systems and complex societies

- Barabasi, A.-L. (2012). The network takeover. *Nat Phys*, 8(1), 14–16. doi:10.1038/nphys2188
- Bentley, R. A. (2003). An introduction to complex systems. In *Complex Systems and Archaeology: Empirical and Theoretical Applications*. Edited by R. A. Bentley and H. D. G. Maschner. Salt Lake City, University of Utah Press pp. 9-24.
- Lawler, A. (2010). Collapse? What Collapse? Societal Change Revisited. *Science*, 330(6006), 907-909.

For further reading:

- Barton, C. M. (2013). Complexity, Social Complexity, and Modeling. *Journal of Archaeological Method and Theory*. doi:10.1007/s10816-013-9187-2
- Bentley, R. A. (2003). Scale-free network growth and social inequality. In R. A. Bentley & H. D. G. Maschner (Eds.), *Complex Systems and Archaeology: Empirical and Theoretical Applications* (pp. 27–46). Salt Lake City: University of Utah Press.
- Bernabeu Auban, J., Moreno Martín, A., & Barton, C. M. (2012). Complex systems, social networks and the evolution of social complexity. In M. Berrocal, L. García Sanjuán, & A. Gilman (Eds.), *The Prehistory of Iberia: Debating Early Social Stratification and the State* (pp. 23–37). New York: Routledge.
- Brughmans, T. (2013). Thinking Through Networks: A Review of Formal Network Methods in Archaeology. *Journal of Archaeological Method and Theory*, 20(4), 623–662. doi:10.1007/s10816-012-9133-8
- Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press, Tucson. **pages 127-139, 160-164, 178-191.**

Apr. 1.....Case studies: water management and urbanism in southeast Asia

- Buckley BM, Anchukaitis KJ, Penny D, et al. (2010) Climate as a contributing factor in the demise of Angkor, Cambodia. *Proceedings of the National Academy of Sciences* 107:6748–6752. doi: 10.1073/pnas.0910827107
- Evans DH, Fletcher RJ, Pottier C, et al. (2013) Uncovering archaeological landscapes at Angkor using lidar. *Proceedings of the National Academy of Sciences* 110:12595–12600. doi: 10.1073/pnas.1306539110

For further reading:

- Buckley BM, Fletcher R, Wang S-YS, et al. (2014) Monsoon extremes and society over the past millennium on mainland Southeast Asia. *Quaternary Science Reviews* 95:1–19. doi: 10.1016/j.quascirev.2014.04.022
- Diamond, J. (2009). Archaeology: Maya, Khmer and Inca. *Nature*, 461(7263), 479-480.
- Kummu, M. (2009). Water management in Angkor: Human impacts on hydrology and sediment transportation. *Journal of Environmental Management*, 90(3), 1413-1421.
- Stone, R. (2006). The end of Angkor. *Science* 311: 1364-1368
- Stone, R. (2009). Tree Rings Tell of Angkor's Dying Days. *Science*, 323(5917), 999.

Apr. 6Case studies: Mesoamerican civilization

- Morehart, C. & C. Frederick (2014). The chronology and collapse of pre-Aztec raised field (chinampa) agriculture in the northern Basin of Mexico. *Antiquity* 88, 531-548.
- Lentz et al. (2014). Forests, fields, and the edge of sustainability at the ancient Maya city of Tikal. *PNAS Early Edition*, 1-6.

For further reading:

- Fisher, C. T. (2009). Abandoning the garden: the population/land degradation fallacy as applied to the Lake Pátzcuaro Basin in Mexico. In C. T. Fisher, J. B. Hill, & Feinman, Gary M (Eds.), *The Archaeology of Environmental Change* (pp. 209–231). Tucson: Univ. of Ariz. Press.

- Kennett, D. J., & Beach, T. (2013). Archaeological and Environmental Lessons for the Anthropocene from the Classic Maya Collapse. *Anthropocene*. doi:10.1016/j.ancene.2013.12.002.
- Lentz, D. L., & Hockaday, B. (2009). Tikal timbers and temples: ancient Maya agroforestry and the end of time. *Journal of Archaeological Science*, 36(7), 1342–1353. doi:10.1016/j.jas.2009.01.020
- Lozano-García, M. del S., Caballero, M., Ortega, B., Rodríguez, A., & Sosa, S. (2007). Tracing the effects of the Little Ice Age in the tropical lowlands of eastern Mesoamerica. *Proceedings of the National Academy of Sciences*, 104(41), 16200–16203. doi:10.1073/pnas.0707896104
- McNeil, C. L., Burney, D. A., & Burney, L. P. (2010). Evidence disputing deforestation as the cause for the collapse of the ancient Maya polity of Copan, Honduras. *Proceedings of the National Academy of Sciences*, 107(3), 1017–1022. doi:10.1073/pnas.0904760107
- Pringle, H. (2009). A New Look at the Mayas' End. *Science*, 324(5926), 454–456. doi:10.1126/science.324_454

Apr. 8.....Case studies: Aegean civilization

- Bintliff, J. (2002). Time, process and catastrophism in the study of Mediterranean alluvial history: a review. *World Archaeology*, 33(3), 417–435.

For further reading:

- van Andel, T. H., & Zangger, E. (1990). Landscape stability and destabilization in the prehistory of Greece. In S. Bottema, G. Entjes-Nieborg, & W. van Zeist (Eds.), *Man's Role in the Shaping of the Eastern Mediterranean Landscape* (pp. 139–157). Rotterdam: A.A. Balkema.
- van Andel, Tjeerd H. van, Zangger, E., & Demitrack, A. (1990). Land Use and Soil Erosion in Prehistoric and Historical Greece. *Journal of Field Archaeology*, 17(4), 379–396.

Pass out Assignment 3: Your ecological footprint

Apr. 13.....Case studies: The Mongolian empire, conquests, and the environment

- Pongratz et al. (2011). Coupled climate-carbon simulations indicate minor global effects of wars and epidemics on atmospheric CO₂ between AD 800 and 1850. *The Holocene*, 21(5), 843–851.
- “Warm, Wet Times Spurred Medieval Mongol Rise.” at <http://www.smithsonianmag.com/science-nature/warm-wet-times-spurred-medieval-mongol-rise-180950030/>

Demography and Health

Apr. 15Case studies: ecology of human demography

- Kohler, T.A. (2004). Population and resources in prehistory. In *The Archaeology of Global Change*, edited by C.L. Redman, S.R. James, P.R. Fish, and J.D. Rogers. Smithsonian Books, Washington, DC. 257-270.
- Lambert PM (2009) Health versus Fitness: Competing Themes in the Origins and Spread of Agriculture? *Current Anthropology* 50:603–608. doi: 10.1086/605354

For further reading:

- Gage, T. B., & DeWitte, S. (2009). What Do We Know about the Agricultural Demographic Transition? *Current Anthropology*, 50(5), 649–655
- Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press, Tucson. **pages 164-173.**

Apr. 20Case studies: humans as habitat

- Diamond, Jared (1997). The lethal gift of livestock. *Guns, Germs, and Steel: the Fates of Human Societies*, New York : W.W. Norton: 195-214 (Chapter 11).

For further reading:

Cohen, M. N. (1992). The epidemiology of civilization. *Human Impact on the Environment: Ancient Roots, Current Challenges*. J. E. Jacobson and J. Firor. Boulder, Westview Press: 51-70.

Wolfe, N. D., Dunavan, C. P., & Diamond, J. (2007). Origins of major human infectious diseases. *Nature*, 447(7142), 279-283.

Assignment 3 Part I due online by 5:00 pm: Ecological footprint poster

General Discussion

April 22Discussion (Human Planet: How Earth made us)

See link on Blackboard under “Assignments” tab.

April 27The future of the Anthropocene

White, J. (2006). Early and Profound Human Impact? *Science*, 311(5760), 472.

doi:10.1126/science.1121900

Naam R (2013) Grantham Is Wrong — We Are Not Headed For A Disaster Of Biblical Proportions. In: Business Insider. <http://www.businessinsider.com/the-world-is-not-headed-for-disaster-2013-4>. Accessed 25 Apr 2013

Glikson A (2013) Fire and human evolution: The deep-time blueprints of the Anthropocene. *Anthropocene* 3:89–92. doi: 10.1016/j.ancene.2014.02.002

For further information, read:

Ruddiman, W. (2003). The Anthropogenic Greenhouse Era Began Thousands of Years Ago. *Climatic Change* 61(3): 261-293.

Assignment 3 Part II due online by 5:00 pm: Ecological footprint poster evaluation

April. 29.....Discussion: science and policy

Kareiva, P., Watts, S., McDonald, R., & Boucher, T. (2007). Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare. *Science*, 316(5833), 1866 -1869

Pereira, H. M., Leadley, P. W., Proença, V., Alkemade, R., Scharlemann, J. P. W., Fernandez-Manjarrés, J. F., Araújo, M. B., et al. (2010). Scenarios for Global Biodiversity in the 21st Century. *Science*, 330(6010), 1496 -1501.

Schenkel, R. (2010). The Challenge of Feeding Scientific Advice into Policy-Making. *Science*, 330(6012), 1749 -1751.

For further reading:

Redman, C.L. (1999). *Human Impact on Ancient Environments*. University of Arizona Press, Tucson. pages 195-219.

FINAL EXAM DATE AND FORMAT TO BE ANNOUNCED