Archaeologists model past and future landscapes

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Archaeology is a vital tool in understanding the long-term consequences of human impact on the environment. Computational modeling can refine that understanding. But according to Arizona State University archaeologist C. Michael Barton, it takes a revolution in thought, along with the newest methods of modeling, to produce a comprehensive picture of the past that can help inform land-use decisions for our future.

Barton, a professor in ASU's School of Human Evolution and Social Change, will discuss "Looking for the Future in the Past: Long-Term Change in Socioecological Systems" at the annual meeting of the American Association for the Advancement of Science on Feb. 20.

"We have lots of information in the archaeological record, but it actually represents a tiny fraction of what people used, which represents a small portion of how people lived," Barton explained. "We have artifacts from this point in time and that point in time, but we don't know what people used or how they lived in the interim. So we are left with connecting the dots and making inferences."

Enter computational modeling, which can help fill in the gaps with quantitative estimates by taking into account what we know about people based on sociology, economics, anthropology and other fields. But Barton isn't convinced that a computer can do a better job at such guesswork than archaeologists.

"We must use these tools but also change the way we think about the

archaeological record," he said. "When formal and computational modeling is used to experimentally simulate human socioecological dynamics, the empirical archaeological record can be used to validate and improve dynamic models of long-term change."

Considered a pioneer in the area of archaeological applications of computational modeling, Barton helms the Mediterranean Landscape Dynamics project, which is an example of using the past to develop and test decision-support models regarding interactions between land use and landscape evolution. At the AAAS meeting, he will present the project's findings from an agrarian region of northern Jordan.

Barton's team set up experiments that yielded expected and unexpected results. Among the expected findings were that shifting (or "swidden") cultivation produced more erosion than farming and fertilizing the same field repeatedly, and larger settlements had a greater impact on the land than smaller ones. Unexpectedly, the team found that in smaller communities, shifting cultivation and grazing can increase productivity because soil lost due to erosion from grazing can accumulate in farmed areas; however, when those hamlets grow, the same practices can cause soil loss throughout the land used by a village, leading to a significant drop in productivity. In fact, the archaeological record of northern Jordan shows the earliest farming communities experienced the kinds of impacts predicted by the modeling experiments.

More information: Related article featured in *Philosophical Transactions of the Royal Society A* (rsta.royalsocietypublishing.or … t/368/1931/5275.full)

Provided by Arizona State University

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