The social rise and demise of the Ancestral Pueblo: A look into climate change and the societal reaction in Chaco Canyon

Rebecca Forsman *

B.A. Candidate, Department of Anthropology, California State University Stanislaus, 1 University Circle, Turlock, CA 95382

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Abstract

The Ancestral Pueblo inhabited the Four Corners region of the American Southwest from AD 750-1300 and built a complex society. Their collapse in the early 12th century has been the subject of many archaeological studies and intense scholarly debates. In this article I examine a case study of their societal reactions, by way of violence and outmigration, to the climate change that preceded their collapse. The constantly changing climate in the American Southwest is an important topic to study, because it provides archaeologists with insight into cultural responses to the dramatic environmental change. Archaeological evidence demonstrates straightforward signs of migration from Chaco Canyon to more hospitable areas throughout the region, and in extreme cases violence that sometimes led to cannibalism. If scientists can gain an understanding into the ways societies successfully dealt with climate change in the past, it can help us understand how societies can better react to such drastic changes in climate in modern times.

Keywords: archaeology, dendrochronology, migration, American Southwest, climate change, Ancestral Pueblo, Chaco Canyon, Mesa Verde, Anasazi, drought, Pueblo Bonito, Cliff Palace

Introduction to the American Southwest and the Ancestral Pueblo

Looking into the societal reaction of the Ancestral Pueblo to climate change is something that could help modern societies better react to such changes differently than how societies reacted hundreds of years ago. The American Southwest is defined as the area from Durango, Colorado (in the north), down to Durango, Mexico (in the south), and from Las Vegas, Nevada (in the west), over to Las Vegas, New Mexico (in the east). Within this region is the Four Corners area, where four states, Utah, Colorado, New Mexico, and Arizona, all meet in one spot. The Southwest has a wide variety of climates ranging from heavily forested mountainous areas that are with an overabundance of rainfall, to deserts with little to no rainfall. The Ancestral Pueblo were a group of Native Americans that lived in the Four Corners region (Fagan 2011).

This article is a case study of the Ancestral Pueblo living in Chaco Canyon, in northwest New Mexico. Chaco Canyon is a region in the San Juan Basin, and the three main great houses in the area were Pueblo Bonito, Una Vida, and Peñasco Blanco (Harrod 2012). They were previously called the Anasazi, a Navajo word meaning "enemy ancestors" (Childs 2005). The living descendants of these indigenous people find the name to be derogatory, so the accepted term is Ancestral Pueblo. The Ancestral Pueblo lived in the Four Corners beginning around AD 750-900 (Fagan 2011) and remained in the region until roughly AD 1300 (Axtell 2002). They thrived in the region and developed a complex and well-established trading system with tribes located within a few hundred miles in every direction.

The staple diet of Ancestral Pueblo was maize, beans, and squash. This triad is nutritionally beneficial for all who lived in the region, because it provides all the essential amino acids needed to build proteins in the body. The plants also have a symbiotic relation when grown together. The squash's broad leaves create shade, maintaining soil moisture and inhibiting weed growth. Maize depletes the ground of the nitrogen essential to nourish the plants but the beans release nitrogen into the ground to make up for the maize and its consumption (Fagan 2011).

Chaco Canyon settlements

The sites in Chaco Canyon were all very similar to one another. While the overall architecture of each of the sites were different, they did have a lot of the same features in the sites. The masonry was done with local rock that was cut and then used to build the structures. The sites also were known for having kivas for different ceremonies, and an abundance of smaller, more commonly used rooms. Most of the smaller rooms were

* Corresponding author. Email: rforsman@csustan.edu

for everyday practices, such as their usual work duties, or even just rooms to sleep in. Some of the practices included working semi-precious stone, or just working shells for their religious ceremonies. The larger of the rooms used for everyday use are believed to have been used for those of higher statuses, whereas the smaller rooms were for those who were workers or just non-elite inhabitants (Fagan 2011, Plog 2008).

Figure 1: Pueblo Bonito
(after http://www.hiddenarchitecture.net/2016/01/pueblo-bonito.html)

Pueblo Bonito Greathouse

Ancestral Pueblo settlements are commonly located in Chaco Canyon Sites ranged in size from that of something small, like the site of Wijiji (smaller, with only two kivas) up to something larger, like the site of Pueblo Bonito (Figure 1, with 32 kivas and three great kivas; Fagan 2011). Archaeologists recognize Ancestral Pueblo sites through the architecture of the sites, and the presence/usage of kivas. The typical Ancestral Pueblo site had a lot of the same features. The site of Pueblo Bonito had around 1,200 inhabitants at its height. Other than the great kivas and the smaller kivas, they also had trash middens in specific sections of the communal area (primarily east or southeast) and more storage rooms for food preparation and other lifestyle practices. A kiva is a subterranean circular structure used for religious rituals or political meetings. Kivas have their origins in the Basketmaker period (1200 BC–AD 50) of the Ancestral Pueblo. (Plog 2008).

Ancestral Pueblo settlements were arranged uniquely when compared to other sites in the same geographical region, and best exemplified by the site of Pueblo Bonito, and the other sites, in Chaco Canyon. The site of Pueblo Bonito is arranged as a half-circle great house, divided in two by a wall that goes almost completely down the middle. On either side there are big, open areas used for socialization and other ritualistic practices. Within the open areas there are also great kivas, which are for all the individuals that live in the site, and around the perimeter of the site there are much more smaller kivas for specific, more individual practices of smaller groups of people.

Climate change begins

During the 9th century, the rainfall north of Chaco Canyon became sparse, which caused the inhabitants of Chaco communities to migrate south to live with the Ancestral Puebloans. This meant their communities were able to flourish with an abundance of people in the area. They were able to maintain the area, and the labor needed to allow the community to thrive. Around AD 1115 the Chaco trading system had branched out hundreds of miles to many other communities in the region. Some of the items traded were animal hide, foodstuffs, and shell beading used for religious ceremonies (Fagan 2011, Plog 2008).

Around AD 1130 a drought began that lasted fifty years. Tree-ring dating, or dendrochronology, is done by analyzing the individual rings of trees that form annually. Tree-ring analysis was pioneered in the American Southwest by an astronomer, A. E. Douglass. A year by year account of temperature and climate variability at Chaco Canyon has been found in tree-ring data from the area. By analyzing the width of these rings, archaeologists can reconstruct the year by year climate changes that a tree from the region experienced. The trees thrive, leaving wide rings, when there is plentiful rainfall but grow very little in dyer years. The tree rings are sometimes not as helpful as archaeologists would like, because logs can be replaced or reused throughout the use of a site. This can make dating more difficult, because the dates only match the age of the wood used and may be older or younger than the age of a building they are found in (Kelly & Thomas 2011, Plog 2008).

Once the climate began to change, the Ancestral Pueblo responded like other societies had done for centuries in this region, they relocated. Following the climate change in the region, the most logical reaction was to relocate to amore inhabitable environment. After fleeing Chaco Canyon, many of the Ancestral Puebloans migrated north to Mesa Verde. By the 1300s, archaeology shows Chaco Canyon was completely abandoned, because of the scarcity of the water, and the inability to provide themselves with the necessary food. The archaeological evidence shows they might have also traveled south and southeast towards the Hopi, Zuni, and the Rio Grande Pueblos. This is also found in some of the oral histories of the current people living in these regions. The oral histories are something these people hold very high in their beliefs (Fagan 2011).

Many of the people who migrated towards the south remained there and adapted to the new environment they had found, even going as far as adopting the customs and beliefs of their newfound neighbors. The belief of kachinas being one of the most important. The

belief of spirits coming from the underworld, are present and communicate through specially chosen individuals, and represent the spirits of their ancestors. They were finally settled into the new tribes by AD 1450 (Fagan 2011, Plog 2008).

Social reactions and outmigration due to climatic changes

After the climate change started to cause social changes within the communities, life for the Ancestral Pueblo started to become more difficult. With the scarcity of foods, there was more competition for the food that was present and more competition for the resources. The tree rings show many years of abundant rainfall, which would coincide with the thriving years when the communities were at their highest trading capacities. During their best years, the crops would thrive with bountiful harvests, and the trading network would reach as far south as Teotihuacán. It is believed they traded things as simple as shell beading, to maybe even chocolate (M. Lauriers, personal communication, April 2018). However, there are also many years of droughts, which would also coincide with the years in which they did not have enough goods for themselves, let alone enough to trade with anyone else.

The question as to whether the temperature affected the land and their communities came to around the year AD 1200, when the seasons became shorter, which meant there was not enough time to grow crops to sustain the society for the longer winter months needed. With less agriculture to help sustain them, they would have to resort to hunting and gathering much more. This would also put a physical strain on those living in this region, because the lack of rain would have made the weather much more unbearable at times for them. They would have been used to much shorter droughts, however the much longer ones would have been something they were not accustomed to adapting to. This was not a sudden change, because the drought last fifty years, but after many years with shortened crop-growing seasons a drastic change would have been seen (Salzer 2000).

Salzer (2000) discusses the ideal situation for maize to grow in being around 19°C, with a strong indication of if being able to grow in 10°C-40°C. However, during the droughts of the years in which Chaco Canyon started to show signs of some struggle, those temperatures were likely much higher than the ideal. This is because of the lack of the rain in the area needed to cool the ground to a sustainable temperature. Without the rain, it became a bit of a snowball effect in not only not cooling the ground, but also not enough water to keep the crops alive, and then not enough crops to sustain the people, and eventually not enough resources, which leads to many different problems.

There is also some evidence of volcanic activity around the polar ice caps coinciding with the failure of the crops and the lack of the rain. The volcanic event is seen in polar ice cores melting dating to AD 1259. This caused a warming event globally. The atmosphere filled up with gases that caused the overall temperature to rise. This caused an almost tropic weather pattern, and in turn caused the weather to be dryer (Salzer 2000).

Violence would also have been a bigger problem for those inhabitants of such a drastically changing area. When resources begin to become too scarce, people start to panic. This is what happens in modern times, and this is evident in archaeological contexts as well. Such as some site found in within the Ancestral Pueblo region of the Southwest of piles of bones at the bottom of cliffsides from people being pushed, or tossed, of the edges.

Another social change coinciding with the climate change is the archaeological evidence of cannibalism among the Ancestral Pueblo. There is evidence of violence leading up to the cannibalism, however cannibalism is the extreme case. This was not a common occurrence, and there are just a few examples of this in the archaeological record, however it is one of the effects of climate change, nonetheless. In 1967, Christy G. Turner II looked at the remains of some 30 humans from sites in Arizona. He claims to have found “cut marks and burns, just like animal bones that had been roasted and stripped of their flesh,” (Gibbons 1997).

The problem with interpreting cannibalism is the negative connotation attached to the interpretation. The descendants of these people do not ever want to believe their ancestors could have ever done such a thing, and the communities are very sensitive to such claims. Also, the cut marks on bones could have been misinterpreted and possibly were simply animal marks from being exposed, and later moved.

Some strongest evidence for cannibalism comes from a series of sites in Cowboy Wash, Colorado. There, archaeologists found evidence of bones with cut marks and pot polish on them. Pot polish happens when bones are processed, or cooked, in a pot. From being cooked, the ends of the bones get this smooth, shiny surface to it where it was rubbing against the side of the pot. There were also bones broken apart to have the bone marrow extracted, and likely eaten. There is evidence of roasted heads, amongst the others aforementioned.

There is evidence of cannibalism in a coprolite found in a site called Cowboy Wash, Southwest Colorado. This was discovered when anthropologist, Karl Reinhard, did a coprological analysis of the specimen. This coprolite showed evidence of myoglobin, which is only found in human meat (Marlar et al. 2000). Originally when the coprolite was found, science was not advanced enough to do an analysis to determine whether there was any evidence of

cannibalism. After coming back to the coprolite some years later, the science was advanced enough to show that the coprolite had evidence of a human protein that is only present in human meat, which would have only been in the feces if it had been ingested (Reinhard 2006). The one downside to coprological evidence is it only shows the last meal before it was deposited, so interpreting the finds could be a little difficult. Whether this was an isolated incident or not based on the one find is not enough evidence. Archaeologists must look at all the evidence.

Mesa Verde settlements

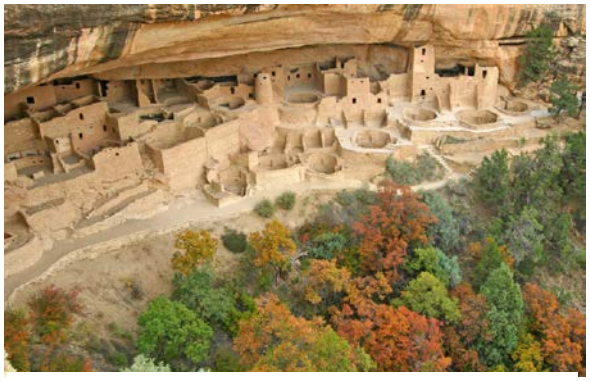

Figure 2: Cliff Palace, Mesa Verde
(after https://www.mesaverde.org)

Cliff Palace

The architecture of the sites in Mesa Verde was different from that previously found in Chaco Canyon. To contrast, the cliff dwellings in Mesa Verde were vastly different because of the structures being built into rockshelters. About 250 people inhabited Cliff Palace (Figure 2) when at its height. The area of Mesa Verde was much more secure for those who lived there. The access to the site is much different than the access to the sites they previously lived in. Residents of these sites needed to climb down from the mesa to the rockshelter, and this is safest only to do during the daylight, as there are only hand and foot holes made by these people to descend into the dwelling. The cliff dwellings also protected the inhabitants from the elements by providing natural barriers on three sides. The structures were often up to four stories high. This is because the Ancestral Pueblo were not as spread out in Mesa Verde as they were in Chaco Canyon. The kivas were also arranged differently. The kivas continued to be constructed as subterranean religious rooms, but because of the lack of space, they were many stories high as well, and not as spread out when compared to Pueblo Bonito. Some also being multi-use, as well as ceremonial rituals (Plog 2008).

Another difference of living in Mesa Verde, the people had to climb up to the top of the plateaus to tend their crops. With not much room down in the cliffside, they had to utilize the resources they had. This was a dangerous task, because of the need to ascend ladders or steep trails to reach the top. However, the inhabitants were able to be safe once down in their houses (Plog 2008).

Discussion

The social rise and fall of the Ancestral Pueblo of great interest to archaeologists. The great preservation of the sites helps us investigate the past that is almost impossible at other sites. By the 12th century AD, the fall of the sites is evident. With the drought lasting 50 years, at least three generations would be able to see the effects of the failing crops. The lives of people were inevitably affected by the changing lifestyles in the Southwest, out of necessity.

The climate change in the American Southwest is something that is evident in the archaeological record through dendrochronology. By analyzing the tree rings and the continuous cycles of plentiful rain and drought, modern climate changes might be able to be understood a lot easier. The unique preservation of these two sites allow archaeologists a look into the past that would otherwise not have been possible. With the ability to investigate the past, and the cycles of the climate change, scientists could try to predict potential shifts in temperatures. With the ever-changing climate of today, learning from our history is something that is of utmost importance. By learning from the past, we can plan for our futures.

The study of the ways societies has reacted to such drastic changes in the past can also prove to be difficult. When thinking of the fact that the descendants of the people in this study do not believe a lot of these claims, we anthologists must be careful. The archaeologist studying the sites in question must also take ancient beliefs into consideration, to show respect to these people in the study.

Archaeologists must look at all aspects in a study, and as with almost every site, the evidence could possibly still be interpreted wrong. Therefore, anthropologists will look to modern societies, believed to be close to the society in question, look at how things are done now, how items similar to those found in the archaeological sites are used now, and then hypothesize about how things were done in the past. This is truly an artform that not everyone can master, but it is very possible!

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References

Axtell, Robert L., Joshua M Epstein, Jeffrey S. Dean, George J. Gumerman, Alan C. Swedlund, Jason Harburger, Shubha Chakravarty, Ross Hammond, Jon Parker, and Miles Parker. "Population growth and collapse in multiagent model of the Kayenta Anasazi in Long House Valley." *Proceedings of the National Academy of Sciences of the United States of America.* Vol. 99, No. 10 (May 14, 2002) 7275-7279.

Childs, Craig. "Anasazi: What's in a name?" High Country News. (2005).

Cordell, Linda S., Carla R. Van West, Jeffrey S. Dean, and Deborah A. Muenchrath. "Mesa Verde Settlement History and Relocation: Climate Change, Social Networks, and Ancestral Pueblo Migration." *Kiva*, Vol. 72, No. 4 (Summer, 2007) 379-405.

Fagan, Brian. *The First North Americans: An Archaeological Journey*. New York: Thames & Hudson, 2011.

Gibbons, Ann. "Archaeologists Rediscover Cannibals." *American Association for the Advancement of Science* (1997): 635-637.

Harrod, Ryan P. "Centers of control: Revealing elites among the Ancestral Pueblo during the 'Chaco Phenomenon.'" *International Journal of Paleopathology* 2 (2012). 123-135.

Kelly, Robert L., and David Hurst Thomas. *Archaeology: Down to Earth*. Belmont, Wadsworth, 2011.

Marlar, Richard A., et al. "Biochemical evidence of cannibalism at a prehistoric Puebloan site in southwestern Colorado." *Nature* Vol. 407 (2000): 74-78.

Plog, Stephen. *Ancient Peoples of the American Southwest.* London: Thames & Hudson Ltd., 2008.

Reinhard, Karl J. "A Coprological View of Ancestral Pueblo Cannibalism." *American Scientist* (2006): 254-261.

Salzer, Matthew W. "Temperature variability and the Northern Anasazi: Possible Implications for Regional Abandonment." *Kiva* Vol. 65, No. 4 (Summer, 2000): 295-318.