In Partnership with the Land - An Environmentally Historic Overview of the Ancestral Puebloan People of Chaco Canyon During the Bonito Phase CE 850-1140

Ilyse Goldman
Skidmore College

Follow this and additional works at: https://creativematter.skidmore.edu/mals_stu_schol

Part of the Environmental Studies Commons, and the Other History Commons

Recommended Citation
Goldman, Ilyse, "In Partnership with the Land - An Environmentally Historic Overview of the Ancestral Puebloan People of Chaco Canyon During the Bonito Phase CE 850-1140" (2008). Master of Arts in Liberal Studies (MALS) Student Scholarship. 52.
https://creativematter.skidmore.edu/mals_stu_schol/52

This Thesis is brought to you for free and open access by the Academic Departments and Programs at Creative Matter. It has been accepted for inclusion in Master of Arts in Liberal Studies (MALS) Student Scholarship by an authorized administrator of Creative Matter. For more information, please contact jluo@skidmore.edu.
In Partnership with the Land – An Environmentally Historic Overview of the Ancestral Puebloan People of Chaco Canyon During the Bonito Phase CE 850-1140

by

Ilyse Goldman

FINAL PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN LIBERAL STUDIES

SKIDMORE COLLEGE
March 2008

Readers: Dale Willman, Hope Benedict
Table of Contents

Abstract......................................................................................................................... 2
Preface......................................................................................................................... 3
Chapter 1..................................................................................................................... 6
Chapter 2..................................................................................................................... 22
Chapter 3.................................................................................................................... 41
Chapter 4.................................................................................................................... 82
Works Cited.................................................................................................................142
Abstract

This paper is an environmental history of the Ancestral Puebloan People of Chaco Canyon in northwestern New Mexico from 850 – 1140 of the Common Era (CE), a period also known as the Bonito Phase. Environmental history explores the relationship between people and their landscape over time. To capture as complete a narrative as possible, this paper is written from three perspectives - the natural history of the desert southwest, how the Ancestral Puebloans adapted to these environmental conditions, and a discussion of how the Ancestral Puebloan religious cosmology assisted them in adapting to these conditions, enabling them to survive and thrive in the southwest. A first step in understanding the adaptive strategies of the Ancestral Puebloans is to explore how the sacred and the profane were intertwined in their day to day existence. Farming techniques, trading networks, astronomical observation and religious ceremony were all interconnected in a complex societal framework that ensured the survival of the people. Their farming techniques were adapted to local environmental conditions. They established strong social networks based on both the trade of practical goods such as corn, and the sharing of ceremonial paraphernalia and knowledge. These bonds provided a way for the disparate Ancestral Puebloan groups to unify, ensuring that subsistence activities, such as the planting schedule, were aligned with the proper season. Their astronomical knowledge, coupled with a strong ceremonial construct allowed them to develop an agricultural calendar which would help ensure crop surpluses which could be shared within outlying communities. Their religious cosmology, rooted in sound ecological practices, recognized that when the local environment was no longer conducive to farming, it was necessary to migrate and begin anew. Ultimately, the religious cosmology of the Ancestral Puebloan People, which was likely
centered at Chaco Canyon, was an adaptive practice which unified a variety of peoples to ensure their survival and success in the desert southwest.

**Preface – The Administrative History of Chaco Culture National Historical Park**

Chaco Culture National Monument was established on March 11, 1907 by President Theodore Roosevelt under the Federal Antiquities Act of 1906. In a lecture for the course “Environmental History and the Human Past,” Hal Rothman noted that the Antiquities Act is perhaps one of the most significant pieces of legislation for the National Park Service (Rothman, 2000). This act permits a President to create National Monuments for areas that demonstrate scientific or cultural significance. Archaeologist Edgar L. Hewett from the School of American Research, mapped Chacoan sites in 1902 and in 1906 lobbied Congress to enact this legislation to protect archaeological sites from poaching and neglect. Hewett’s efforts to acquire federal assistance to protect prehistoric sites was in response to the controversial work performed at Chaco Canyon by trader turned “archaeologist” Richard Wetherill (as cited in the Chaco Culture National Historical Park [CHCU], web site, 1902 and 1906 sections, 2000). From 1971 – 1982, the National Park Service partnered with the University of New Mexico and created the Division of Cultural Research (“Chaco Center”) directed by archaeologists Dr. James Judge and Dr. Robert H. Lister. Archaeological surveys and “limited excavations” were initiated. The results of the Center’s research on the Great House, Pueblo Alto, and the Chacoan road system had significant impact on the interpretation of Chaco Canyon’s role in the Ancestral Puebloan world, which today is seen as a possible ceremonial, administrative, trading and resource distribution center. In December of 1980, 13,000 acres were added to the park resulting in the creation of Chaco Culture National Historical Park. Seven years later, the global significance of Chaco Canyon was realized when it was established as a United Nations Educational, Scientific and
Cultural Organization (UNESCO) World Heritage Site “…for its monumental public and ceremonial buildings and its distinctive architecture – it has an ancient urban ceremonial centre that is unlike anything constructed before or since” (UNESCO web site, 2008, Description section, para. 1).

The worldwide significance of Chaco Canyon did not overshadow its importance to the local affiliated tribes. In 1991, the National Historical Park established the Chaco American Indian Consultation Committee to advise park officials on management issues and cultural artifacts, and educate staff and visitors about the history of the area and their ancestors. This brief history of Chaco Culture National Historical Park underscores the importance to the United States and the world of Chaco Canyon as an important research and education center. The work that was done as part of the Chaco Project from 1971-1982, and later synthesized by the Chaco Synthesis Project, continues to generate new interpretations. The Chaco Synthesis Project revisited the work of the past 100 years, combined it with the work from the Chaco Project and delivered two capstone publications, The Culture and Ecology of Chaco Canyon and the San Juan Basin (2005) and The Archaeology of Chaco Canyon (2006) (as cited in the Chaco Culture National Historical Park web site, 2000, brief history, 1981-2001 sections, and Lekson, 2006). These publications, however, do not represent the views of the Modern Puebloan Peoples. Due to litigation between tribal stakeholders and the National Park, the voices of the tribal affiliates, including those from the Chaco American Indian Consultation Committee, are absent from these works. Fortunately, many of their stories are captured in three publications, In Search of Chaco. New Approaches to an Archaeological Enigma, edited by David Grant Noble (2004), Video Documentary “Chaco Canyon” (2000) narrator’s text written by Russ Bodnar, Chief of Interpretation at Chaco Culture National Historical Park and DVD Documentary “The Mystery
of Chaco Canyon” produced and directed by Anna Sofaer of The Solstice Project (2003) (Lekson, 2006). These interviews augment existing research and personal communications with modern Puebloan People and shed light on how their ancestors related to the landscape of Chaco Canyon and the larger Ancestral Puebloan World through ceremony.

*Pueblo Bonito From Cliff*

(Photo by Russ Bodnar, CHCU, website, 2007 from photos and multimedia, photo gallery)
Chapter 1 - Understanding Environmental History

In America, alas, beauty has become something you
drive to, and nature an either/or proposition – either
you ruthlessly subjugate it...or you deify it, treat it as
something holy and remote, a thing apart, as along
the Appalachian Trail. Seldom would it occur to
anyone on either side that people and nature could
coexist to their mutual benefit...(Bryson, 1998, p. 200)

It is the height of the summer season and tourists arrive in droves hoping to cram every
museum, rock formation, trail, and tourist venue into their last vacation before the start of
another school year. They arrive at the Tusayan Museum, along the 23 mile Desert View Drive
in Grand Canyon National Park, exhausted and frustrated especially when they realize that their
plans to visit every inch of the 30,000 square mile area of the Four Corners region is at best
unrealistic. The museum, which is designed to look like an 800 year old ancestral pueblo, is tiny
and dark, but contains artifacts and information regarding one of America’s most successful
indigenous peoples, the Ancestral Puebloan People, formerly known as the Anasazi. As the
visitors stagger into the cave-like exhibit space, and their eyes adjust to the darkness, they
inevitably focus on the large painting that is the dominant feature in the room. This rendering,
by artist Roy H. Andersen, depicts what is thought to be daily life at Tusayan Pueblo, the
Ancestral Puebloan dwelling whose remains lie just outside the museum doors. Although it is
based on archaeological evidence from the Grand Canyon and other Ancestral Puebloan sites
within that 30,000 square mile area, most visitors stare at the painting in disbelief. They look at
the rendering, recall the drive through the high desert scrub leading to the Canyon, and squeal
"Oh my G-d, how could those people live in such a harsh environment?" This is the cue that every National Park Ranger awaits, the opportunity to debunk a myth.

The idea of what constitutes a "harsh" environment is subjective. The Ancestral Puebloans adapted to this climate and may not have considered it so. Many visitors to the Tusayan Museum believe that the Ancestral Puebloan People lived on the brink of death and that it was not possible for them to have thrived in this land. They may have made these assumptions because they were unfamiliar with this landscape and they did not realize that this cultural group had been living successfully on this land for centuries. In actuality, the desert southwest, like all landscapes, can be bountiful, if one knows where to look. When people visit National Parks, it is generally the responsibility of the Interpretive (educational) Park Ranger to provide a mechanism for interpreting the prehistoric landscape for the visitors to help them make intellectual and emotional connections with the natural and cultural resources of the site. One way to accomplish this task is to facilitate a comparison between the visitor's everyday experiences in their surroundings with the environments of those who lived long ago. Most citizens of the United States today understand how to live within the environments of the 21st Century. They have an
intimate understanding of how resources such as automobiles, computers and supermarkets help them to adapt to their urban, suburban and rural landscapes. Many visitors are far removed from the natural world and are only able to connect with it while they are on vacation. They may feel, as Bill Bryson does, that people and nature no longer coexist and rely on one another to survive. The fact is that we do; we may not realize it. The study of how cultures connect with their landscapes through time is the study of environmental history and will be the perspective from which this narrative of the Ancestral Puebloan People of Chaco Canyon will be written.

**What is Environmental History?**

Johnson Donald Hughes (2006) in his primer *What is Environmental History?* offers the following definition. Environmental history is “…a kind of history that seeks understanding of human beings as they lived, worked and thought in relationship to the rest of nature through the changes brought by time” (Hughes, 2006, p. 1). In short, environmental history explores the relationship between people and their landscape, how this relationship assists in a culture’s development, how that culture will in turn change the landscape over time, and the consequent adaptations that each makes to one another. To study this interplay, the student of environmental history must paint a picture of a culture and its environment using broad academic paintbrushes covering a gambit of sciences, including but not limited to anthropology, archaeology, ecology, geology, climatology, and cosmology. Donald Worster, considered one of the founding fathers of this academic field, (Hal Rothman, lecture notes “Environmental History and the Human Past, 2000) identified three basic elements which, when based on sound science and history, provide a strong foundation upon which a complete environmental history narrative is written. Published in the appendix of his book, *The Ends of the Earth: Perspectives of Modern Environmental History*, and summarized by Hughes (2006), these elements are (1) knowledge of the natural
history of the landscape within the study area and how it changed through time, (2) knowledge of the social and economic aspects of a culture as it relates to how they made use of the local landscape, and (3) knowledge about a culture’s attitude toward their environment, i.e. the culture’s cosmology. These guiding principles were not developed in a vacuum. They evolved over time and, in the United States, paralleled the growth of this country’s environmental movement.

A Brief Historiography of Environmental History in the United States

During this writer’s high school years, history teacher Robert Liebl explained that in order to understand a particular event of human history, one must focus on five primary elements. These elements, ingeniously summarized by the pneumonic “SPERM,” stand for the social, political, economic, religious and military components of a culture (Liebl, lecture notes, 1984). This approach is fairly complete, but like historic accounts prior to the 1960s and ‘70s, relegates the environment to a background role, not a role suggestive of its significance to a culture’s development. Hughes has noted that since humans and other forms of life have evolved together, it is important to reflect this in the writing of history (Hughes, 2006).

In the early twentieth century, history was written by people interested in exploring the hierarchical relationships that exist within and between cultures. Focus was placed on a country’s leaders, largely ignoring the contributions and perspectives of other people and of the landscape. Over the years, history has become more inclusive, as is exemplified by historical narratives written from the Marxist perspective, which does include the accounts of the working class (Hughes, 2006). Although histories written from other perspectives followed, the seeds for an environmental perspective of history would not be sown until the turn of the twentieth century.
The Beginnings of the Environmental Movement

Scholars of environmental studies remember the nineteenth century United States as a time of abundance (Nash, 1990). Land was plentiful and relatively inexpensive, particularly in the west. During this time, the primary role of the federal government was to distribute vast tracts of former Native American land to European Americans and other recent immigrants. The philosophy of this period promoted the idea that land was disposable. It was assumed that once a region's natural resources were depleted, one could simply move to another and begin again.

Roderick Frazier Nash (1990), editor of the book American Environmentalism Readings in Conservation History, describes this period as a time when "Nature ceased being a community to which humans belonged and became a commodity or 'resource' from which they could profit" (Nash, 1990, p. 10). This description echoes the sentiments of historian Frederick Jackson Turner in his essay "The Significance of the Frontier in American History." This 1893 essay began with a citation from the 1890 census, which officially announced the closing of the American Frontier. Turner's essay explored the implications of this statement which, to summarize, introduced the erroneous but widely accepted belief that since the frontier was gone, the age of the "rugged individualist," the person who made this country great through self-reliance and self-determinism, was a thing of the past. Turner supported his assertion by noting that the source of this country's strength was forged when city dwellers embarked on a journey to the west to create a new lifestyle in the wilderness, moving them along a continuum from a primitive condition to a civilized one. This idea stemmed from the belief that vast areas of uninhabited land provided a safety valve for cramped urban dwellers ultimately providing them with the space to remake them. With the closing of the frontier, this opportunity was no longer available, forcing the country to consider the implications of a United States without disposable
land. By the end of the nineteenth century, writers and politicians realized that future
generations were going to pay a high price for their grandparents’ misunderstandings regarding
the wise and varied use of land. In 1872, a new environmental concept emerged on the global
landscape. This concept was the national park. It was during this year that General Grant
established Yellowstone as the world’s first National Park. This legislation was significant as it
was the first time public lands were set aside for the nation to serve “…as a public park or
pleasing-ground for the benefit and enjoyment of the people” (enabling legislation for
Yellowstone National Park as cited in Mackintosh, 1999, from National Park Service [NPS] web
site, brief history, para. 3). Yellowstone National Park symbolized that the United States was a
land-rich country. Seldom could a country afford to trade an economic use of the land for an
aesthetic one. Although the United States government created a Yellowstone National Park, it
was not yet ready to support the idea with a federal agency dedicated to its protection. From the
late 1890s to the early 1900s other national parks were designated and yet, a National Park
Service was not forthcoming. The nation’s cultural resources, such as archaeological sites, were
also at risk as they were largely ignored. The degradation of such sites might have continued if
not for the efforts of archaeologists such as Edgar Hewett who lobbied Congress to protect these
neglected prehistoric sites. In 1889, Casas Grandes Ruin was the first prehistoric site to be set
aside for protection by the federal government. Increased commitment to the conservation of
public lands was demonstrated when The Forest Reserve Act of 1891 was enacted. This
commitment continued through the early twentieth century. In 1906, Mesa Verde National Park
was created to protect the Ancestral Puebloan sites in Southern Colorado and, later that year, the
Antiquities Act was passed by Congress. This act allowed presidents to reserve land for
“…historic or prehistoric structures, and other objects of historic or scientific interest”
In Partnership with the Land

(Antiquities Act as cited in Mackintosh, 1999, para. 5). These sites are known as National Monuments.

The Antiquities Act was signed during the Progressive Era (1901-1910), and President Roosevelt made great use of it, designating eighteen National Monuments during his tenure, including Chaco Canyon and Grand Canyon. The Antiquities Act, along with the progressive politics practiced by the Roosevelt administration, may lead one to conclude that the Progressive Era initiated an ethic of preservation; however this was not the case. Although land conservation was an extremely important topic, the ways to achieve conservation were conflicting and represented opposing philosophies. Representing one of these philosophies was Gifford Pinchot, Chief of the Division of Forestry and, later, head of the Forest Service. Pinchot and his supporters were known as “utilitarian conservationists” (Mackintosh, 1999, para. 7) or “progressive conservationists” (Nash, 1990, p. 69). This group supported the idea that government should regulate land for the economic use of future generations. Actions such as the construction of dams for irrigation (Mackintosh, 1999, para. 7), or the preservation of forests for future use are examples of this mindset. The second philosophy was espoused by John Muir, naturalist, founding member of the Sierra Club and its first president. Muir and his supporters, known as “aesthetic conservationists” (Nash, 1990, p. 94), held that land should be preserved for its own sake as well as for our emotional well being.

In 1913, tragedy struck the aesthetic conservation movement as utilitarian conservationists, with support from Congress, constructed a dam in the valley of Hetch Hetchy in Yosemite National Park. Although this dam was built to benefit the residents of San Francisco, it was antithetical to the premise of National Parks, which was to conserve public lands in the spirit of John Muir. Muir and his supporters launched a valiant attempt against this legislation
but did not succeed. The dam remains in place in Hetch Hetchy to this day. The construction of this dam in Yosemite National Park brought attention to the poorly executed national park movement. Congress was willing to create national parks, but did not seem interested in their protection. The United States Army assigned units to protect some of the parks, but only a dedicated federal agency could ensure the conservation of these lands for future enjoyment.

Stephen T. Mather, a park enthusiast and businessman, wrote a letter to Interior Secretary Franklin Lane criticizing the Department’s management of the national parks. Secretary Lane’s response was to hire Mather to create a bureau dedicated to the protection of national parks. Joined by Horace Albright, a young lawyer from California, the men successfully lobbied Congress and on August 25, 1916 the National Park Service was created under the Organic Act. The National Park Service is directed to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations (Organic Act as cited in the NPS legacy website, organic act, para. 3).

The creation of the National Park Service was the result of Mather and Albright’s tireless efforts to bridge the gap between the utilitarian and aesthetic conservation movements (Mackintosh, 1999, para. 8). The commitment by Congress to the National Park Service continued as more parks were added and funding trickled to them. Park Service policy enabled future generations
to make decisions regarding the national significance of lands and allowed them to add such landscapes to the National Park System. By the 1920s the Agency was expanded to include natural areas east of the Mississippi River. By the late 1920s and early 1930s historic battlefields and monuments in Washington D.C. were added to the National Park Service greatly increasing its size. By the 1930s, the stewardship of our nation’s public lands was put into the hands of everyday citizens through Franklin Delano Roosevelt’s New Deal package. This package included the Civilian Conservation Corps, an organization designated to rehabilitate and construct functional and aesthetically pleasing buildings for both the state and national parks. These structures and other initiatives, encouraged the recreational use of national parks along America’s highways, including the Blue Ridge and Natchez Trace Parkways, which were added to the system. Recreational activities on the water soon followed. The New Deal provided funds for the construction of large dams, such as Hoover Dam. The lakes that were formed behind these dams were added into the National Park system as National Recreation Areas (Mackintosh, 1999, para. 17). National Park sites and their associated recreational opportunities became increasingly popular in the years following the world wars. The 1950s ushered in an era of increased leisure time, much of which was spent in outdoor pursuits (Hughes, 2006). Many of the natural and cultural historians that would later write the early environmental histories would come from this period.

Historian Samuel P. Hays, in his essay “Conservation as Efficiency” noted that during the Theodore and Franklin Roosevelt administrations, the conservation movement was largely a collaboration between federal agencies and scientists who were charged with determining the most efficient way to develop physical resources (Hays reprinted in Nash, 1990), however, the environmental movement that followed World War II was launched by everyday people. This
increased interest among the masses was fueled by writers such as Rachel Carson (Silent Spring, 1962), the grass roots establishment of Earth Day (April 22, 1970) and the enactment of environmental policies by the Nixon administration (Hughes, 2006). Known as “popular ecology,” this movement brought human and land interaction to the forefront of people’s minds and into the subject matter of environmental history. In 1976, historians, philosophers and environmentally oriented literature experts formed the American Society for Environmental History and initiated a publication featuring articles uniting environmental and historic themes.

The early successful American environmental histories were those that maintained a regional focus. Since the methodology of environmental history tends to be interdisciplinary and broad, this regional approach resulted in a more focused and complete history. An example of such a history was the Dust Bowl written in 1979 by Donald Worster. As the field progressed, other environmental history themes emerged. These included the biographies of people important to the conservation and environmental movements, and the histories of the government agencies involved with land management, such as the National Park Service and the National Forest Service. Other narratives included histories of non-governmental environmental groups, urban environmental history, women and the environment, environmental technology and agricultural history. In fact, agricultural histories were written in the United States as early as 1919. The U.S. Forest History Society, created in 1946, published such histories. In 1996, the Forest History Society joined with the American Society of Environmental History to publish the Journal of Environmental History.

Environmental history in the United States continues to evolve and its historians have branched out to include the writing of narratives about areas outside of the United States. Although the breadth and depth of environmental history changes through time, the
interdisciplinary nature of this field is perhaps its greatest asset and most difficult challenge. If not written well, an environmental history may sacrifice breadth for depth. To ensure the usefulness of environmental histories, environmental historians such as William Cronon, Carolyn Merchant and Donald Worster have outlined basic points that need to be addressed when writing a good history. For the purposes of this paper, the system outlined by Donald Worster will be used.

*Environmental History and the Ancestral Puebloan People*

“You can’t really be Hopi if you don’t live on the land (Hopi colleague #1, personal communication, Spring, 2005).”

Substitute the names “...Zuni, Taos, Picuris, Sandia, Isleta, San Juan, Santa Clara, San Ildefonso, Nambe, Tesuque, Pojoaqué, Jemez, Pecos, Acoma, Cochiti, Laguna, San Felipe, Santa Ana, Santo Domingo, Zia...” (Shaaf, 1996, p. 7) for the name Hopi and the above sentiment is substantially true for almost all the members of the twenty-plus Native American Nations who are descendants of the Ancestral Puebloan People of the desert southwest. The Hopi woman’s comment was intended to acknowledge the important function of the land in the daily lives of the Puebloan people, and by extension their ancestors. Archaeologists have studied the Ancestral Puebloans for over one century and have uncovered evidence that demonstrates how they were able to survive and thrive in the landscape. The Ancestral Puebloans were primarily farmers, supplementing their diets with hunting and gathering. They relied on rainfall and water works projects such as check dams and other flood control devices. By 700 CE, these farmers built aboveground masonry structures known as unit pueblos, which consisted of rectangular rooms, some used for the storage of surplus crops, and a subterranean structure known as a *kiva*, which had a variety of uses, and sometimes functioned as a spiritual chamber. A partnership with the
land was key to their success. This partnership required knowledge of the local natural history but they also knew how to translate this knowledge into practical action. In Chaco Canyon, located in northern New Mexico, this understanding became a phenomenon that had not existed previously in the Ancestral Puebloan world. By 850 CE, a monumental construction era began at Chaco. The Ancestral Puebloans of Chaco Canyon (Chacoans) constructed extremely large pueblos known as Great Houses. These Great Houses consisted of over 100 rooms and in some cases, over 700. According to archaeologist Stephen Lekson, these houses were part of a planned city which grew into a political center for the Ancestral Puebloan world, which encompassed the four corners area and perhaps beyond into Mexico. Their success was a combination of favorable environmental conditions, landscape knowledge and group support. Their reliance on other villagers throughout the region was critical. Environmental conditions throughout the Ancestral Puebloan world was not uniform. If conditions degraded in one area, the Puebloans needed to establish trade with others as a means to survive. To ensure that crops would be planted throughout the region and increase the probability of a surplus, the Ancestral Puebloans needed to socially integrate the diverse villages into a cohesive agricultural unit. This was accomplished through their shared cosmology, or worldview. As will be discussed in chapter 2, the Ancestral Puebloans were not members of the same tribe but did share some elements of their culture. Ethnographies conducted with their descendants, the Modern Puebloans, coupled with the archaeological evidence from the pre-historic sites, revealed that their cosmological views share common themes. These themes are inextricably linked with their knowledge of the landscape providing a symbiotic relationship between their spiritual life and their practical life on the land. There seems to be an inherent understanding that in order to farm an area, one needs to make an appeal for rain at a time dictated by the environment. The
Puebloans were, and are, sky watchers, and as such, possessed the information necessary to design an agricultural calendar. This calendar was created in concert with the ceremonial schedule, integrating their spirituality with the timing of the monsoonal rains. Socially integrating this cosmology and the regional climate and ecology insured that at least some of the villagers in the outlying communities surrounding Chaco would produce the surplus crops necessary to provide aid to their neighbors who were not as fortunate. This shared cosmology moves beyond the agricultural calendar. Another common cosmological theme involves the relationship between migrations and the carrying capacity of the land. The Puebloans understood that when local conditions declined, families needed to migrate to more favorable locations, wisdom which was believed to have been passed down to the Ancestral Puebloans from their ancestors.

Archaeologists such as Stephen Lekson, Lynne Sebastian, H.W. Toll, James Judge, Linda Cordell and Colin Renfrew agree that Chaco Canyon served as either a regional spiritual center, a political center or both. Although the specifics differ amongst these archaeologists, the idea that Chaco Canyon provided regional spiritual support for the outlying communities is shared amongst them. In return for the spiritual/agricultural calendar, the Chacoans may have received food, labor, and ritually oriented trade goods. Trade is another way to socially integrate the diverse Ancestral Puebloan communities surrounding Chaco Canyon. When the environmental conditions were favorable, as they were during the most prolific construction period in Chaco Canyon known as the Bonito Phase (CE 850 – 1140), their cosmology was validated. The Ancestral Puebloans may have asked for productive rain, and it was received. After 1140 CE, when environmental conditions began to deteriorate, some families began to migrate out of the canyon, providing validation for the migratory theme of their cosmology. This feedback loop,
which united the people of this shared landscape and a shared worldview, was an adaptive mechanism employed by the Ancestral Puebloans. This is the central premise of this paper. When writing an environmental history, one must always consider the natural history of the land, the symbiotic relationship between subsistence on the land and its effects on the culture (and vice versa) and an understanding of how the culture’s cosmology affects how its members partner with the land and integrate their communities. This paper explores these relationships, some of which have been summarized by geographer Jared Diamond.

Jared Diamond is a professor of geography at the University of California Los Angeles with research interests in geography and human society. His Pulitzer Prize winning book *Guns, Germs and Steel: The Fates of Human Societies* demonstrates how environmental conditions help to develop cultures and how cultures in turn affect the environment. His book *Collapse: How Societies Choose to Fail or Succeed*, examines the demise of societies as a function of land overuse. His chapter on the Ancestral Puebloans describes how population aggregation and land use exceeded the carrying capacity of the area and led to the collapse of the Chacoan world. He explains that the environmentally favorable conditions that existed in areas of the southwest and in Chaco Canyon in particular created the opportunity for the Puebloans to use land that would normally have been considered marginal. This led to increased population and increased land use. Once drought seized this over-used region (by 1130 CE), the large populations had limited choices as to where they could move, as others had already over-farmed these niches. The small-scale agricultural communities that existed before and after Chaco would have survived intact because they would have been able to move to the unexploited marginal areas and practice their small-scale farming techniques. They would have been in a better position to feed smaller populations and make use of food surpluses from past years. Diamond continues to explain that
when a population grows and becomes increasingly complex and interdependent, it is less likely to recover from several years of environmental stress than a small self-sufficient society could. As a result, the Chacoans were forced to migrate out of Chaco Canyon to areas with more reliable water sources resulting in the collapse of Chacoan society. Diamond acknowledges the role that religion played among the Chacoans and notes that environmental conditions may not have been the only reason the Chacoans left. When the environment changed and the crops no longer produced acceptable yields, those in the outliers may have lost faith in the Chacoan priests. Essentially, the collapse was a combination of climate change, human impact on land such as deforestation and erosion caused by the Chacoan irrigation system, regional breakdown of relationships with those from the outliers, and a loss of faith in the Chacoan religious system (Diamond, 2005).

What Diamond overlooks, however, is the resiliency of the Chacoans. Although Chaco Canyon lost its sphere of influence, the migrations of the Chacoans out of the canyon suggests that their social networks were intact, as their cosmology supports this type of behavior. As Lekson notes, Puebloan society to date has not reproduced the Chaco Phenomenon. Conversations with their descendants reveal the belief that the large Chacoan system is something that should never be repeated because it did not prove successful in the long term (Lekson, 2006). The cosmology of the Ancestral Puebloans socially integrated their societies and validated their decision to search for a spiritual and practical place to re-make their lives. As will be discussed in further detail in chapter 4, cosmology is adaptive because it integrates behaviors that are beneficial to the group. This narrative will explore the environmental conditions during Chaco’s heyday, the Bonito Phase CE 850 – 1140 (chapter 3) and demonstrate how those conditions, coupled with their socially integrative and environmentally oriented
cosmology, helped them to develop strategies to subsist and thrive in the seemingly harsh landscape of the desert southwest.
Chapter 2: The Ancestral Puebloan People of the North American Desert Southwest

The Chacoans are part of a much larger cultural group known alternately as the Anasazi, the Ancestral Puebloan People, Ancestral Pueblos, Hisatsinom, a Hopi term meaning people of long ago, or other Modern Puebloan words. The most commonly used term, Anasazi, is an English deviation of a Navajo word. Some sources define this word as meaning "ancient enemy" while others believe that the original Navajo name was meant to illustrate that these prehistoric peoples were the ancestors of others and that the translation, "ancient ancestor," is the more correct definition. The "what's in a name" sentiment has become a political issue, and although descendents such as the Hopi have officially requested the National Park Service to use the term "Ancestral Puebloan People," (since we cannot use the term Hisatsinom as it is a word used by only one group of descendents) the Park Rangers at Bandelier National Monument, a 600 year old "Ancestral Puebloan" site, have been asked by the local Pueblo groups to use the term "Ancestral Pueblo People." Scholars use all of these terms, but for the purposes of this narrative, the phrase Ancestral Puebloan People will appear throughout unless a citation uses one of the other terms.

The phrase "Ancestral Puebloan People" would seem to indicate that all Puebloan Nations belong to the same tribe; however this is not the case. The Puebloan Nations are distinctive tribes living in environmental conditions that are uniform enough to have resulted in similar subsistence and ritualistic practices by the different Puebloan groups. The culture of the Puebloan Nations today exhibits a rich diversity, which is seen in the variety of languages, architecture, material culture and ritual practices. One explanation for this diversity is the variety of ecological niches that populations were able to adapt to throughout the region. The Ancestral Puebloan People occupied a 30,000 – 40,000 square mile area within the Colorado Plateau, a
physiographic region within the Four Corners area of the desert southwest (see figure 2-1). The diversity of Pueblo tradition seen today echoes the diversity found in the past. Archaeologists categorize the variety of Ancestral Puebloan traditions based upon regional and cultural differences. A case can be made that these traditions also resulted from the variety of ecological niches in which the Ancestral Puebloans lived. Although archaeologist Jeffery Dean cautions researchers against suggesting that people are “mere pawns” of their environments (Dean, et al., 1985), the fact remains that people will react to different environments in different ways. In other words, the environment will affect how groups will engage in subsistence practices, how they will build their homes and how they will relate to one another. These differences are reflected tangibly in the archaeological record and the Ancestral Puebloan sub-groupings which archaeologists developed, providing a common language for researchers (Kantner, 2005, website Sipapu – The Anasazi Emergence into the Cyber World, timeline, section 400 AD, para. 7).

The following examples illustrate this point. In the area of agriculture, farming techniques based on the flooding of ephemeral streams (*akchin* farming) would be appropriate on valley bottoms or at the mouth of side canyons, but would not necessarily be useful on a mesa top where reliance on rainfall for crop irrigation is the preferred alternative (Lightfoot, 1978 as cited in Lightfoot, 1980). Reliance on agriculture has an effect on the type and use of architecture. As environmental conditions change, populations increase or decrease accordingly. In general, during times of environmental stress, populations tend to aggregate in a common location to intensify agricultural efforts (Dean, et al., 1985) and to prevent competition over favorable environments (S. Fish and P. Fish, 1994). The relationship between aggregation and architectural change can be seen in the increased number of dwellings in an area (S. Fish and P. Fish, 1994), the increase of storage units to store surpluses (Judge and Cordell, 2006) or the
differences in dwelling size. In Chaco Canyon for instance, the presence of large Great Houses contemporaneous with small village units may suggest that two different farming strategies were employed, which could be indicative of either the presence of different cultural groups (Lekson, 2004, Vivian, 2006) or of different social groupings resulting from the use of different farming strategies (Cordell, 2004). In general, changes in environmental conditions may also affect the depth of inter-group relationships. Downturns in environmental conditions may increase reliance on trade networks for food and other necessities, requiring that relationships with nearby communities be maintained (Plog, 1983 as cited in Dean et al., 1985, Lightfoot, 1980, Toll, 2004). These examples of how different Puebloan groups adapted to their environments, and to each other, underscore the usefulness of the development of general categories to identify the variety of Ancestral Puebloan groups throughout the southwest. Although very general, these groupings represent the diversity associated with geographic locations, societal organizations, and ceramic and architectural styles of the Ancestral Puebloan People (see Figure 2-2).

Archaeologist John Kantner identified five major categories of Ancestral Puebloan People: the Chaco Anasazi in northwestern New Mexico, the San Juan from southeastern Utah and southwestern Colorado, the Kayenta Anasazi from northeastern Arizona, the Virgin Anasazi from northwestern Arizona and southwestern Utah, and the Rio Grande Anasazi from north central New Mexico. Kantner notes that some researchers tend divide the Ancestral Puebloans into eastern and western groups (as the Modern Puebloan People are categorized today) and then further divide them into one of the five categories listed above (Kantner, Sipapu web site, frequently asked questions (faq), number [#] 9, 2005). This system, however, is very general, and “...is a typological device, to enable archaeologists to speak a common language” (E. Brennan, personal communication, October 28, 2007). Since this system is a generalization,
these references are not always referred to in publications today (Kantner, Sipapu website, faq, #9, 2005). Since this paper focuses on the Chaco Anasazi, a description of this group in the context of the Pecos Classification System is provided.

The Pecos Classification System

The Pecos Classification System was devised in part by Alfred Vincent Kidder in 1927. Known as the father of southwestern archaeology, Kidder began his career in 1907 as a volunteer with Edgar Hewett, director of the School of American Archaeology, known today as the School of American Research. Kidder received his doctorate from Harvard in 1914 and by 1915 was conducting field research at Pecos Pueblo in New Mexico. Kidder believed that the prehistoric people of the Pecos region were culturally connected to groups throughout the southwest. He applied a multidisciplinary approach to archaeology as is exemplified by his use of the principle of superposition from geology. The principle states that when sediments are deposited in a geologically undisturbed environment, the oldest layer is the one on the bottom. This method of
obtaining the relative dates of deposition can also be used to relatively date artifacts left behind in different stratigraphic layers. This multidisciplinary approach is now a widely practiced method in archaeology. In 1924, Kidder’s book, *An Introduction to the Study of Southwestern Archaeology*, was the first volume to synthesize a regional archaeological account for any cultural group in the new world. Kidder organized the first Pecos Conference in 1927, which provided the opportunity for southwestern archaeologists to discuss their research findings and discuss issues of common interests. Kidder and forty of his colleagues developed the Pecos Classification System. This first system included categories that spanned from Basketmaker through Pueblo periods. Since no absolute dating method was available to archaeologists at the time, cultural periods were placed into a relative dating scheme along the lines of “earlier than,” and “later than.” It is important to note that tree ring dating began to be developed at least by 1928 so the application of absolute dates was in its infancy at this time (E. Brennan, personal communication, January 21, 2008). Additionally, “…dates used for the different cultural categories within the system may vary by region. That is, what constitutes a PII [Pueblo II] occupation in the Grand Canyon may not be the same as one in New Mexico” (E. Brennan, personal communication, January 21, 2008). A modified Pecos Classification System continues to be used to provide a common language for southwestern archaeologists, particularly in the northern southwest. The Pecos Conference continues to be held (Stewart, 2004). Please note that in providing the summary below and carefully scrutinizing the variety of modified Pecos Systems, I have determined that the classification of groups remains stable, but the time periods are a general guide and change depending upon the archaeological site.
<table>
<thead>
<tr>
<th>Period</th>
<th>Dates</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketmaker I</td>
<td>6500 BCE – 1200 BCE</td>
<td>Hunting and gathering society, now known as the Desert Archaic Period.</td>
</tr>
<tr>
<td>Late Basketmaker I</td>
<td>1200 BCE – 1 CE</td>
<td>Hunting and gathering, use of caves, performed burials, non-intensive agricultural activities planting corn and squash.</td>
</tr>
<tr>
<td>Basketmaker II</td>
<td>CE 1 - 500</td>
<td>Same as above plus, construction of shallow pithouses and storage units, use of throwing spears (atlatls) and basket making.</td>
</tr>
<tr>
<td>Basketmaker III</td>
<td>CE 500 – 700</td>
<td>Same as above plus, deep pithouse or slab house construction, use of bow and arrow, beans are planted.</td>
</tr>
<tr>
<td>Pueblo I</td>
<td>CE 700 – 900</td>
<td>Unit pueblos and masonry built, some villages are large. The pueblos are above the ground, although they generally include a subterranean pithouse structure. Some Great Kivas are built. Puebloans are using cotton. From CE 850 – 1000, Early Bonito Phase at Chaco Canyon, pottery is Red Mesa black on white.</td>
</tr>
<tr>
<td>Pueblo II</td>
<td>CE 900 – 1100</td>
<td>Great Houses are built (large public work buildings) in Chaco and outlying communities. Ancestral Puebloan People mostly living these above ground structures, pithouses seem to have been completely converted to kivas. Roads to the various outliers are constructed. The pottery associated with this period is corrugated grey and black on white with decorations. Some areas are decorated with red and orange colors. CE 1000-1100 Classic Bonito phase at Chaco Canyon. Previous Puebloan buildings are expanded. Great Kivas are constructed at Chaco. Climate conducive to farming at Chaco.</td>
</tr>
<tr>
<td>Pueblo III</td>
<td>CE 1100 – 1300</td>
<td>Great, multi-storied pueblos, cliff houses and towers are constructed. Mesa Verde becomes a major site at this time. Plain grey pottery and decorated black on white is widespread. CE 1100-1150 McElmo or Late Bonito Phase at Chaco. Northern influence in pottery style and masonry is noted. Pottery style “Chaco-McElmo. CE 1130-1180 severe drought and consequent abandonment of outliers. Chaco Phenomenon nearing an end.</td>
</tr>
<tr>
<td>Pueblo IV</td>
<td>CE 1300 – 1600</td>
<td>Large pueblos focused around a plaza (work/ceremonial space). Great Kivas no longer constructed, focus on smaller kivas in communities. Appearance of the Kachina Religion. Black on white pottery declines, red, orange and yellow becomes more popular. CE 1300 Large abandonment of the Four Corners Region. Migrations to the Rio Grande, Little Colorado, Hopi Mesas.</td>
</tr>
<tr>
<td>Pueblo V</td>
<td>CE 1600 – present</td>
<td>Historic period begins with contact with the Spaniards in 1540 CE. Katchinas (spirits) appear in murals in kivas. Shift from round kivas to rectangular kivas, enclosed plazas become more popular throughout the region. (Jordan, accessed on October 28, 2007).</td>
</tr>
</tbody>
</table>
The Ancestral Puebloan People

The foundation for what would be later known as the Chaco Anasazi, or Chacoans, was laid during the favorable environmental conditions of CE 400 – 750, a period that correlates to the Basketmaker III tradition according to archaeologist and Chaco Canyon researcher Dr. John Kantner. As an aside, the Basketmaker traditions are so named for the high quality baskets produced during the early periods of this cultural tradition. In general, this cultural group tended to build subterranean housing, known as pit houses, and over time practiced hunting/gathering and relied slightly on cultivated plants. The first domesticated plants were those found naturally in the local environment. The Ancestral Puebloans may not have actively planted these species, but they may have cared for them by protecting them from other plants and perhaps providing water (E. Brennan, personal communication, January 21, 2008). Although corn was introduced into the southwest as early as 3000 years ago, the early Basketmaker peoples continued to observe non-intensive agricultural subsistence practices. In other words, the hunters and gatherers would plant corn in time for the growing season, continue their pattern of seasonal migrations in search of food, and return to the planting area in time for the harvest. This was a low risk strategy, and since they were not completely dependent upon the harvest, any production was a surplus. During the Basketmaker III period, however, the Colorado Plateau experienced consistent precipitation, improving agricultural prospects. The people increasingly relied on agricultural products as is indicated by findings of hybridized corn plants designed to grow in the arid climate of the Colorado Plateau.

One of the corn varieties is known as Maize de Ocho and was grown around 600 CE. This corn cob contained larger kernels, fewer rows and flowers earlier in the season than other types of corn plants. This early flowering plant proved beneficial to the southwestern peoples as
the early flowering meant that people living at higher elevations, with consequently shorter growing seasons, would have been able to cultivate this faster growing corn. Other varieties of corn appeared in the southwest. The Pima-Papago variety (Arizona) was designed to take advantage of the moisture deep within the soil and could therefore be planted deeper than other varieties. Additionally, the plant had a long taproot which was able to reach the water in aquifers. These varieties indicate a regional increase in agriculture. Increased agricultural activity also leads to a decrease in mobility and a shift in architecture. When crops have to be attended, it becomes too difficult to stray too far from the fields. Additionally, a shift to aboveground masonry structures, or pueblos, became increasingly popular. As reliance on agriculture increased, the need for the storage of surplus increased as well. Earlier in the Basketmaker traditions, food was stored below ground. Storage of food in aboveground structures such as the pueblo meant better protection of the corn from animals and from moisture. By increasing the shelf life of the corn, a society would be in a better position to survive unfavorable environmental conditions, such as a decrease in rainfall, or a drop in the water table (Kantner, 2005, Sipapu, timeline, 400 AD, para. 5-7). The interrelationship between environmental conditions, agriculture, architecture and its effects on society is a constant theme throughout southwestern archaeology and was prevalent throughout the history of the Colorado Plateau and the cultural evolution of its people.

The period from CE 750-925 correlates with overall unfavorable environmental conditions on the Colorado Plateau as effective moisture was low (Dean, et al., 1994 as cited in Huckleberry and Billman, 1998), erosion was high and water tables were consequently lowered (Kantner, 2005, Sipapu, timeline, 700 AD, para. 1). This period corresponds to the Pueblo I traditions in the Pecos System. Since conditions throughout the Colorado Plateau were not
conducive to farming, people in different areas developed different coping strategies. Places where the water table was lowered to the point of poor agricultural returns often were abandoned for more favorable areas near streams. In general, agricultural pursuits intensified during Pueblo I, with groups becoming more sedentary, or staying in villages up to 50 years in some cases, before migrating to other locations. Aboveground architecture became more prevalent. These aboveground masonry structures, sometimes known as “Prudden Unit Pueblos” were generally built one story tall and the common rectangular rooms formed an arc (Kantner, 2005, Sipapu, timeline, 700 AD, para. 5). The unit pueblo consisted of aboveground rectangular storage rooms as well, which were located behind rectangular living spaces. In the front of these living spaces was a courtyard and work area sometimes called a plaza. If a kiva was present, it was generally located in front of the plaza. A kiva is a “…subterranean circular room less than twenty feet in diameter and about seven to eight feet high with a ceiling hatchway for access. During and prior to the Pueblo III period (CE 1100 – 1300), the kiva was associated with living quarters and utilized by related family groups for meetings, rituals, weaving, making of tools and clothing, storytelling, and instruction of children…”(Ferguson, 1999, p.281). Kivas are associated with dwellings and may be remnants of the pit house living structures constructed by the Basketmaker peoples. Great Kivas are commonly found in Chaco Canyon and other areas in the Northern San Juan region (such as Aztec Ruins). Great Kivas are circular and subterranean and are much larger than other kivas, approximately forty-five feet or more in diameter. It is thought that these structures were used for large-scale rituals. The Great Kivas at Chaco Canyon may have been the primary purpose of Chaco, welcoming pilgrims from the outlying communities and serving the political needs of the region from Pueblo II to the middle of Pueblo III (CE 900 – 1140) (Ferguson, 1999). A trash mound was located south of the kiva. Both the mound and the kiva lie
on a north/south axis (Ferguson, 1999). Kantner adds that the *kivas* during this period may demonstrate a transition between a domicile (pit house) and a ceremonial structure and are sometimes referred to as protokivas. An element indicative of this transition between the domestic and ceremonial use of these pit structures is the presence of a small hole in the floor (Kantner, 2005, Sipapu, timeline, 700 AD, para. 4). Known today as a *sipapu*, Ancestral Puebloan descendants explain that this hole symbolically connects this world with the Place of Emergence, an important element in Puebloan creation stories.

The population tended to increase during the Pueblo I period and sites throughout the region reflected this trend. Instead of a small family group living in a unit pueblo, some areas were host to a cluster of families living in unit pueblos within a single complex. The correlation between agricultural intensification and population growth is supported by necessity. The Pueblo I period was marked by high temporal climatic variability. This condition makes it difficult for a farmer to be productive, as favorable farming conditions can change rapidly throughout such a period. One way to combat this is to increase farming efforts to increase surpluses which could then be stored during lean years. These efforts could initiate population growth, providing the labor for agricultural intensification. This seems to be the case region-wide from CE 700-1000 (Dean, et al., 1985). Kantner also notes that as the population increases and groups aggregate in communities to help with agriculture, ritual and exchange of food, power stratification may have arisen. Class systems are generally indicated by a disproportionate accessibility to valuables, and differences in house size (Kantner, 2005, Sipapu, timeline, 700 AD, para. 7).

The five subdivisions of the Anasazi continued to differentiate from one another during the Pueblo II era. In Chaco Canyon, the Pueblo II era marks the beginning of the divergence
between the Chaco Anasazi and other sub-groups. The intensification of agriculture and the consequent growth in population seen during this time are reflected in the initial construction of monumental buildings and Great Kivas. The massive scale of these structures along with public water works projects and the engineering of “roads” into and out of Chaco Canyon, occurred abruptly during this period and is known as the Bonito Phase, or the Golden Century (Judge, 2004) of Chaco Canyon.

An Overview of Chaco Canyon’s Pre-history From the Beginnings of the Chaco Phenomenon to the End of the Bonito Building Phase

Archaeologist Cynthia Irwin Williams coined the term Chaco Phenomenon in 1972 during an excavation of an 11th century pueblo today known as Salmon Ruins (Vivian and Hilpert 2002, 133f from The Chaco Phenomenon, accessed on December 23, 2007, website, para. 1). This archaeological site is located about 50 miles north of Chaco Canyon and is fashioned in the style of the Chacoan Great Houses containing approximately 250 rooms associated with a Great Kiva. The similarities to the Great Houses in Chaco Canyon cannot be overstated. It seems that the Chacoan worldview spread throughout the southwest and influenced the development of 150-200 outlying communities, such as Salmon Ruins, which were linked by common economic, political, social aspects, spiritual needs and in some cases, by a network of roads (Lekson, et al., 1988). The nexus of these features may have been located at Chaco Canyon. Archaeologist Dean J. Saitta (1997) in his article “Power, Labor, and the Dynamics of Change in Chacoan Political Economy” identifies and summarizes four features which characterize the Chaco Phenomenon (See Figures 2-4 a-d for a pictorial representation). These characteristics are (1) the establishment of two different housing communities, the Great Houses and the small villages, (2) the presence of goods suggesting trade over large areas, interaction with other communities and production of goods by specialists, (3) Chaco’s sphere of
influence beyond the borders of the Canyon to include 150 – 200 outlying communities and (4) the existence of prehistoric roadways that radiate out of Chaco Canyon. The Chaco Phenomenon, which will be discussed in the next two chapters, began during the Pueblo II stage but the earliest evidence of human use of the canyon dates to the Basketmaker III period, around the late 400s CE. The size of these pit house communities was large and seems to foreshadow the events that would occur during Chaco’s Golden Century (CE 1030 – 1130), a time when buildings were over engineered to serve a purpose other than merely residential (Windes, 2004).

The Basketmaker III villages of Shabik’eshchee and 29SJ423, were large pit house communities, and were larger than any other settlement in the San Juan Basin at the time. There were more than 100 of these subterranean structures in the canyon. Some of the pit houses were used as residences and one may have served as a Great Kiva. The two communities were occupied, perhaps seasonally, for nearly 100 years.

![Pit house village](image)

**Figure 2-3: Pit house community**
(Southwestern Parks and Monuments, 1995 Chetro Ketl Site Guide, website, image 3, para. 8)

By 800 CE, Chaco Canyon received migrants from the southern San Juan Basin. The immigrants to Chaco Canyon at this time spanned the Late Basketmaker III and Pueblo I periods. Aboveground unit-pueblos made their appearance at Chaco, although pit houses
continued to be in use. This began a major lifestyle shift in use of the canyon. The change from hunting and gathering to a more sedentary lifestyle was the result of agriculture and ushered in the building boom of the Golden Century.

The Golden Century marked a time of unprecedented architectural growth in Chaco Canyon and the southwest. When the Great House construction boom peaked at 1100 CE, most Ancestral Puebloan People throughout the four corners region were living in small unit pueblos with roughly six rooms and a kiva (Lekson, 2004). The definition of Great Houses tends to vary, but Dr. John Kantner offers the following definition

...an unusually massive, multistory building with large rooms and thick masonry walls. Other features that distinguish a great house from a typical Puebloan residence of the late ninth through the early twelfth century include circular kivas built inside the structure (rather than out in the plaza), roadways, earthen platforms and berms, and nearby great kivas (Kantner, 2004, p.73).

To illustrate how massive these structures were at the time of peak Great House construction in Chaco Canyon (1100 CE), Pueblo Bonito was five stories tall, consisted of about 700 rooms, had forty kivas and covered roughly 2.5 acres (Lekson, 2004). In addition to the construction at Pueblo Bonito, the first building phases of the Great Houses of Chetro Ketl, Peñasco Blanco and Una Vida were initiated between CE 1040-1110. Great Kivas were constructed as well, one associated with the Great House Chetro Ketl and the other across the Chaco Wash from Pueblo Bonito, known as Casa Rinconada. Later, Chaco Canyon would witness the construction of twelve additional Great Houses. The archetypical Great Houses of Pueblo Bonito and Chetro
Ketl (Kantner, 2004) as well as the other four major Great Houses or large complexes (Una Vida, Hungo Pavi, Pueblo del Arroyo and the Casa Rinconada complex) are clustered together, and today these Great Houses are accessible by a nine mile paved road called Canyon Loop Drive built by the National Park Service for Chaco Culture National Historical Park. This area is known as Downtown Chaco and has the largest concentration of Great Houses in the Canyon. The farming area around Pueblo Bonito and across the wash from Bonito at Casa Rinconada will be discussed at greater length in the next chapter, as they provide contrasting farming techniques, which some archaeologists (example - Vivian, Cordell) have interpreted to have a connection with the socio-political dynamic at Chaco.

The extended Great Drought on the Colorado Plateau from CE 1130-1150 (Jones, et al., 1999) marked the end of the Golden Century in Chaco Canyon and the beginnings of a new seat of Chacoan influence in the outlying communities. Aztec East and West (now Aztec Ruins National Monument) 65 miles north of Chaco Canyon, peaked in the twelfth and thirteenth centuries and Casas Grandes (in northern Mexico) flourished in the fourteenth and fifteenth centuries. Although Chaco Canyon was mostly abandoned between CE 1210 and 1220 (Vivian, et al., 2006a), its influence was felt throughout the region, and it is still spoken of with an aspect of reverence by the Ancestral Puebloan’s descendents today. It has been estimated that more than forty thousand human hours per year between CE 1050 and 1125 were necessary to construct these massive public works buildings (Lekson, 2004) and they have left an impressive mark upon the landscape. The fact that Chacoans were able to flourish in this seemingly bleak locale is a testament to the extremes that people will endure and the knowledge they must have to effectively utilize what the environment has given them.
A Summary of Chaco Canyon and the Pecos Classification System (Lekson, 2006) from Late Basketmaker III (CE 600-700) to early Pueblo III

- Pithouses, storage units, two large organized communities, may have been associated with the Great Kivas.

- May have the beginnings of Great House settlements, around 800 CE, one near Fajada Butte (Windes, 2005 as cited in Lekson, 2006).

Early Pueblo I (CE 700-800)

- Pithouses deeper than Basketmaker III, pueblos may have had some storage units.

Pueblo I (CE 800-850)

- Sites built above ground, small to medium sized. First Great Houses appear, storage units increase dramatically.

Late Pueblo I Early Pueblo II (CE 850-925) Early Bonito

- Sites above ground, small to medium sized.

- Clusters of small houses increase.

Early Pueblo II (CE 900–1040) Early Bonito

- Clusters of small houses increase.

- Significant increase in population.

Late Pueblo II (CE 1040-1110) Classic Bonito

- Great House Construction at Chaco with Kivas.

- First phases of Una Vida, Peñasco Blanco and Chetro Ketl.

- Population decreases.

Early Pueblo III Late Bonito (CE 1090-1140)

- Great Houses built north of the San Juan River.

- First population increases than decreases.
Pueblo III (CE 1140-1200)

- No major architecture, population decreases, but construction of Outliers increases.

Archaeologists, ethnographers and other scientists who have studied Chaco Canyon and the region for a century have developed highly these detailed classification systems and dating techniques. The chapters that follow will discuss some of these findings to demonstrate the Ancestral Puebloan partnership with the land at Chaco Canyon.

Figure 2-4: Elements of the Chaco Phenomenon

Figure 2-4a: (1) Great Houses and Small Villages

Aerial view of Pueblo Bonito
(Photo by Brad Shattuck, Chaco Culture National Historical Park website, accessed on December 24, 2007, plan your visit section)
This stone flaked tool was probably used to cut scrap, clean, or butcher animals and plants, similar to how we use knives today.

Narbona [Washington Pass] Chert. L 5.8, W 3.7, T 1.2 cm Chaco Culture National Historical Park. CHCU 72145

**Figure 2-4c: (3) Examples of Outlying Communities which Peaked During the Twelfth and Thirteenth Centuries**

Salmon Ruins

Photo by Adriel Heisey from Center for Desert Archaeology, website, accessed December 24, 2007, Salmon Ruins section, image 1)

Aztec Ruins

From Aztec Ruins National Monument [AZRU], website accessed on December 24, 2007 image 2)
Small House Community – Note the circular kivas
(Southwestern Parks and Monuments, 1995, Casa Rinconada Site Guide, website, image 5 para. 13)

Figure 2-4b: (2) Goods Suggesting Widespread Interaction

Bell with Tinkler
Chaco Anasazi
Site name Pueblo Alto
AD 1020-1140
The loop was molded separately from the body and later fused. The tinkler is either made of stone or clay. Trade good from northern Mexico.
Copper. L 1.2, D 0.9 cm Chaco Culture National Historical Park. CHCU 31204

Copper Bell
(From CHCU, website, accessed on December 12, 2007, Chaco Collection, trade section, copper bell)
Figure 2-4d: (4) Presence of Road System

Fig. 1

From Sofaer and The Solstice Project Inc., 2003, designed by Suzanne Samuels, By Design Graphics; ©1995 by The Solstice Project
Chapter 3: Life on the Land: The Effect of the Paleoenvironment on the Chacoans

The landscape of the desert southwest is captivating. Travel by car throughout the Four Corners Region, and experience countryside of vast open plains, shallow valleys, short or “Grand” canyons and tousled desert scrub. The scene rises to great heights with stately mountain peaks, plateaus, mesas and buttes punctuating a landscape filled with hidden life and the resilient spirit found in the hearts of the people in the small towns and cities of Arizona, Colorado, New Mexico and Utah. The state mottos: “G-d enriches,” “Nothing without providence,” “Grows as it goes,” and “Industry” (respectively) describes a work ethic of innovation and partnership with the Divine, created by those who believe that they are working in the tradition of their pioneer ancestors to produce a civilization in the west. This is the land of the Modern and Ancestral Puebloans, the originators of this spirit.

A visit to Chaco Canyon reveals a landscape common to the southwest, one that is often described as marginal, scarce and harsh. These descriptions are not surprising, given its location. Chaco Canyon is located in northwestern New Mexico at an elevation between 6,000 and 6,800 feet with an average annual rainfall of 9.1 inches. This high desert environment experiences temperature extremes ranging from a high of 106 °F to a sub-freezing -24 °F. Chaco Canyon is typical of a high desert ecosystem, a vast big sky view and landscape with grassland and desert scrub. First impressions, however, can be deceiving. A closer look reveals that Chaco Canyon is a kind of oasis in the desert. Its shallow, flat-bottomed canyon with intermittent wash (stream) was perfect for “akchin” (floodwater) farming. The majestic cliffs of sandstone, shale and mudstone are criss-crossed with side canyons (rincons) through which rainwater surges to water the fields below. The walls of stone provide the raw materials for building the homes and grand structures befitting of the canyon’s future role as what some archaeologists believe would have
been the political and religious center of the Ancestral Puebloan world. The canyon serves as host to a variety of ecological niches containing a collection of edible plants and animals that thrive within the local environment. This surprising array of “…micro-climates associated with soil types, water availability, elevation, and solar aspect angle combine to create a rich variety of ecological zones within the park. “This diversity may account for a long history of human occupation – at least 7000 years in Chaco” (CHCU, web site, 2007, Nature and Science page, para. 5) and is in part responsible for the Chaco Phenomenon.

A complete environmental history must convey a natural history of a specific region, a discussion of how the local people are able to make use of the natural surroundings, and a survey of how their cosmological view dictates how they live on the land. I maintain that the cosmological view is the thread that ties knowledge of the resource with the knowledge of how to make use of these resources. To ensure that the natural resources are used wisely to assure survival and success, a culture needs to transmit this information to others. This shared knowledge, or common worldview, includes religion, and serves to unite followers in a common practice, in this case living in the desert southwest, specifically Chaco Canyon. What follows is a summary of the natural history of the Colorado Plateau, the San Juan Basin, and Chaco Canyon. Although the Chacoans probably did not fully understand the scientific processes behind the formation of the plateau, the basin and their canyon, they must have had a working knowledge of how to utilize the natural resources to their benefit.

The Colorado Plateau is a unique region. It was formed through the violent “continental car crashes (Mathis, lecture notes Interpretation and Geology, Fall, 2005)” of the earth’s plates. Although violent, the result was a mostly gentle uplift of a 130,000 square mile region today known as the Colorado Plateau. Atypically, this uplift did not result in the usual contorted layers
of deposited sediments and metamorphosed rock, but instead, the rock layers rose over one mile in mostly flat layers. The Plateau is comprised of deposits from an ancient interior sea, the remains of volcanic eruptions and the crystalline rocks which form the basement of the North American continent. The Ancestral Puebloans would eventually take advantage of these deposits, which were released from their rocky enclosure by the erosional forces of streams and rivers. These waterways were able to penetrate a variety of rock layers instead of merely one or two layers, which would have been the case if the layers did not rise mostly intact and flat. The multiple rock layers that the rivers were able to erode exposed a variety of niches which attracted diverse communities of flora and fauna and eventually the people who were searching for something to eat and places to live. The land had potential, and eventually the Ancestral Puebloans learned how to coax life from the sediments below. They farmed the uplands and the lowlands, and invented innovative farming techniques in response to the environmental changes they experienced. They knew that to be successful, they had to understand how to read the land and sky; knowledge of the latter enabled them to create an agricultural calendar. They predicted the seasonal changes in their world and knew when to plant their crops to take advantage of the weather patterns in their local area. To ensure success, they learned that they needed to share this knowledge with their neighbors and their children. Eventually a shared cosmology developed which helped in the transmission of this knowledge through ritual and ceremony. In order to understand the worldview and the practices of these people, we must look at the natural history of the Colorado Plateau, the San Juan Basin, and the Chaco Canyon.

*The Science of Landscape - The Geology of the Colorado Plateau*

Chaco Canyon is situated 36 degrees north latitude and 108 west (Lekson, 2006) in northwestern New Mexico and is part of a much larger geologic formation known as the
Colorado Plateau. The Colorado Plateau is a 130,000 square mile region that encompasses western Colorado, Southeastern Utah, Northern Arizona and the Northwest corner of New Mexico (Wheeler, website, 1990, adapted from “The Colorado Plateau Region, In Wilderness at the Edge: a citizen proposal to protect Utah's canyons and deserts, para. 1). The mountain building episode that created the plateau occurred about 70 million years ago and is the result of plate tectonics. The Earth is divided into roughly 52 tectonic (lithospheric) plates which are composed of two materials, continental crust and oceanic crust. Continental crust is lower in density than oceanic crust, so this crust will sit atop the oceanic crust which moves at an average of 2 inches (5 cm) per year. When the plates collide, geologic events such as mountain building episodes (orogenies) and volcanic activity occur at the boundary. The Larimide Orogeny (uplift) is responsible for the Colorado Plateau (Stanley, 1998) and is the result of collisions between the Farallon oceanic plate and the lithospheric plate of the western North American continent. The Farallon Plate, located off the western edge of the North American continent collided and was subducted underneath the western edge of the North American plate. The rate of the subducted plate increased while the angle of subduction decreased (Wagner, 2003). This decreased angle resulted in the formation of volcanoes not at the plate boundary, as is generally the case, but approximately 625 miles inland around Idaho (Wagner, 2003). The Farallon plate was therefore able to scrape the bottom of the North American plate causing a sinuous east-west belt of “folding and thrusting (Stanley, 1998, p. 487)” in western North America. This compression created a series of uplifts, which in turn created a 30-mile thick continental crust (average thickness is about 22 miles). The thickness of this resulting crust has a relatively low density and is therefore able to sit higher on the mantle. This is the reason that the Colorado Plateau is so high in elevation, about 7000 feet above sea level. The collisions and consequent rise of the
plateau occurred without much deformation to the depositional layers. This means that these depositional layers remained horizontal (Wagner, 2003) instead of contorted, which is usually what results when plates collide. The high elevation created different ecological zones, which were carved out by a network of rivers, such as the Colorado, Gunnison, Virgin and the San Juan (Ranney, 2005). A prime example of this is prominently exhibited on the Colorado Plateau at Grand Canyon National Park, whose vast bare-expanse has been compared to a geology text which exposes the geologic history of the Colorado Plateau, and the North American continent.

A brief description of the ecosystems of the Grand Canyon provides a sketch of the ecosystems that are found throughout the Colorado Plateau, including the San Juan Basin and Chaco Canyon. The presence of multiple ecosystems is based on a combination of climate, geology, geomorphology and the presence of water. The desert southwest, although seemingly barren, is actually ecologically diverse. The Grand Canyon alone contains five of the seven life zones in North America. In that respect, a hike from the North Rim of the canyon to the Colorado River is comparable to walking from Canada to Mexico (Grand Canyon National Park [GRCA], web site, “Nature and science,” 2007, para. 3). Although most of the park, and by extension, the southwest is semi-arid desert, the Grand Canyon and the southwest includes ecosystems ranging from spruce/fir forests at the North Rim (over 8,000 feet) to ponderosa pine forests (6200 – 8200 ft.), piñon/juniper forest at 6200 ft. This forest extends downward to the desert-scrub ecosystem and finally the riverine (riparian) community, which is located near the Colorado River (GRCA, website, 2006, Nature and Science, Natural Features and Ecosystems, para. 2). Local seeps and springs, which burst forth from rock walls, create local micro-niches. To underscore the importance of these seeps and springs to the environment a look at a representative landscape, such as Grand Canyon reveals that “...springs make up less than 0.01%
of Grand Canyon’s landscape, 500 times more species concentrate in them than in the surrounding desert” (GRCA website, 2007, Nature and Science, Springs and Seeps, para. 3). This last statistic illustrates how important seeps and springs are to the local flora and fauna, however, too much of a good thing could prove disastrous for the local farmer. When too much water flows too quickly through side canyons, it could uproot crops and destroy farm fields. This threat to farming is called an arroyo and presents a challenge to life on the Colorado Plateau.

"An arroyo is a nearly vertically walled, flat floored stream channel that forms in fine, cohesive, easily eroded material" (Vogt, website, “The Arroyo Problem in the Southwestern United States,” 2003, para. 2). Arroyos provide channels for the much needed water for akchin (floodwater farming). However, changes in environmental conditions can lower water tables and cause stream entrenchment. Arroyo cutting occurs when the velocity of a river or stream increases dramatically. This can happen when a natural dam is breached, sea level lowers (Wagner, 2003) or after the heavy monsoonal rains, typical of the desert southwest (Dellenbaugh, 1912 as cited in Vogt, 2003, under the heading “Natural Internal Adjustments”). When the speed of a river or stream increases, it will carry sediments downstream. These sediments are abrasive and will cut the channel so deep that the waterway becomes entrenched. Arroyo cutting can remove about 25% of the valley floor (Cooke and Reeves, 1976 as cited in Vogt, 2003, under the heading “Decreased Agricultural Productivity”). The resulting debris sediment is eventually brought downstream and will blanket the farm fields. The sediment generally consists of gravel and sand that is not conducive to farming further complicating the lives of the farmer (Cooperrider and Hendricks, 1937 as cited in Vogt, 2003 under the heading “Decreased Agricultural Productivity”). A lowered water table also prevents the taproots of the
plants from reaching the aquifer and will no longer grow. Arroyo cutting became a significant factor in the region by the middle of the eighth century.

**The Science of Landscape - The Geology of the San Juan Basin**

Chaco Canyon is in the center of the San Juan Basin. The basin encompasses a 4600 square mile area surrounding the Four Corners (the place where New Mexico, Arizona, Colorado and Utah meet). The elevation in the north varies from a low of about 1600 feet to a high of about 6600 feet. The highest elevation in the south is roughly 5000 feet. Most of the basin’s drainages flow northwest. Although permanent rivers and streams are not prolific, washes and arroyos are and provide intermittent opportunities for water (Vivian, et al., 2006a). The San Juan Mountains in southeastern Colorado and the Chuska Mountains in northwestern New Mexico border the basin. The basin was formed during the Cenozoic Era (65 million years before the present (mybp) and Mesozoic Era (248 to 65 mybp). The deposits are from the Cretaceous Period (144 – 65 mybp) and contain “…fluvial [deposits from rivers]-lacustrine [deposits from lakes]-marine [any deposits that have been transported to an ocean and accumulate on the seafloor] sequences of sediments averaging 5,000 feet in thickness” (The Bureau of Land Management San Juan Field Office, website, 1999, “A Brief History and Environmental Observations a Working Document,” II. Background, Geologic Setting Chapter, para. 1).

During the Cretaceous Period, an interior seaway known as the Western Interior Seaway split the continent between California and Colorado. By the middle of the Cretaceous period (about 90 mybp), the seaway expanded west to include central Utah, east to include the western Appalachian Mountains, north to the Arctic and south to the Gulf of Mexico. The basin deposits of the Basin (and Plateau) are reflective of this shallow marine environment. In the area of the San Juan Basin, these deposits were mostly comprised of sand and mud on the south and west,
indicating the Seaway’s former shoreline. Further inland, the deposits were mostly comprised of mud, reflecting the change in depth of the sea. Later in the Cretaceous (about 75 mybp), the seaway withdrew to the northeast leaving large tracts of alluvial plains (alluvium are deposits left by flowing water and are composed mostly of sand and mud). These deposits foreshadow its future use by the Ancestral Puebloans, as alluvial plains provide a good foundation for farming.

By the Late Cretaceous and early Tertiary (65 mybp), the seaway retreated and the early stages of the Laramide Orogeny were initiated (Blakey, web site, 1997, “Paleogeography of the Southwestern U.S.,” Cretaceous Period).

![Figure 3-1: Middle Cretaceous, about 90 Million Years Ago](Blakey, website, 1997, “Paleogeography of the Southwestern U.S.,” Cretaceous Period image 2)
The early Tertiary (50 mybp) Period was marked by continued uplift and the formation of huge lakes, which, although at the bottom of basins, were actually at altitudes similar to the Colorado Rockies today. The rivers and streams drained this mountainous region of the San Juan Basin (which includes central and southern Arizona, Nevada and Utah) into the lakes of the Colorado Plateau. The drainage systems of the Colorado Plateau remained interior to the area, although some streams probably drained to lower elevations and carved canyons along the outer rim of the Plateau. Volcanism spread throughout the Four Corners area, and initial development of the Rio Grande Rift began during this period. By 10 mybp, volcanism and stream formation continued along the Colorado Plateau (Blakey, website, 1997, “Paleogeography of the
Portions of this depositional environment have been exposed at Chaco Canyon and were utilized by the Ancestral Puebloans.

Figure 3-3: Late Cretaceous early Tertiary about 65 Million Years Ago
(Blakey, website, 1997, “Paleogeography of the Southwestern U.S.,” Cretaceous Period image 4)
The Science of Landscape - The Geology of Chaco Canyon

The layers of rocks that are exposed in Chaco Canyon also date to the Late Cretaceous Period (75 – 80 mybp). The rock layers are a result of the Western Interior Seaway and therefore have a similar history to the San Juan Basin and the Colorado Plateau. Migrants from the Four Corners region to the San Juan Basin and Chaco Canyon in particular, would have been familiar with this type of landscape and would have known how to take advantage of the geomorphology and hydrology of Chaco Canyon, which for hundreds of years, provided one of the most ecologically friendly places to farm in the whole region.

There are three units of rocks that make up most of the features at Chaco Canyon. The youngest of these is Cliff House Sandstone, followed by the Menefee Formation. Together with the oldest, the Point Lookout Sandstone (not exposed at Chaco) comprises what is known as the
Mesa Verde group. All three of these groups are exposed at another major Ancestral Puebloan site, Mesa Verde National Park in southern Colorado. The Meneffe formation is made primarily of mudstone, siltstone, sandstone, shale and thin coal beds (from ancient plant material) deposited from the Western Interior Seaway. As with all seaways, the edges are generally a mix of slowly moving streams which travel through vast, flat coastal plains creating lagoons, swamps and deltas (alluvial deposits) as well as the associated plant and animal material. The Meneffe is therefore relatively softer than the younger layer above, the Cliff House sandstone.

Cliff House sandstone is composed of marine sandstones and shales. The Cliff House Sandstone is made up of three chief units. The first layer is an 80-100 foot cliff face of sandstone. Directly above this layer sits a sandstone/shale unit. It was deposited in the marine environment of the deeper parts of the seaway. The highest unit is known as the Upper Sandstone. It is similar in composition to the lowest sandstone unit and also results in cliffs and ledges. The depositional environment was similar to the shallow area of the seaway, and is indicative of the retreat of the seaway (CHCU, web site, 2004, Geology).

The alternating pattern of high and low erosional resistance and nearly horizontal depositional layers found in Chaco Canyon and the whole of the Colorado Plateau results in a stair step profile to the region’s canyons, in other words, cliffs alternating with slopes. This appearance is obvious at places such as the Grand Canyon (see Figure 3 - 5). The slopes provide sediments for the alluvial fans, which form at the terminus of side canyons and, in non-arroyo cutting years, at the bottom of flat shallow canyons, such as that found in Chaco. The alternate layers of sandstone and shale also provide natural water retention and release system for the rains that occur in the southwest. Mesas in the southwest contain layers of sandstone, which are atop layers of clay and shale. During periods of high moisture, the rainwater soaks into the mesas.
The water will not drain below the level of the shales and clays as these layers are impermeable to water. The water will eventually reach the surface in the form of seeps and springs when the water penetrates a layer of sandstone.

![Figure 3-4: The Stair Step Profile of Rock Layers at Grand Canyon National Park](GRCA, web site, 2007, Geology, Age of Rocks, photo 14)

Downtown Chaco Canyon is bordered on the east by the headwaters of the Chaco Wash at the Continental Divide (a wash is a depression or channel formed by flowing water, in Chaco, the wash is intermittent) and the Escavada Wash on the northern boundary (Vivian, 2006a). The Chaco Wash travels through Chaco Canyon on a west/east axis and all contributing washes, including the Chaco Wash drains in a northwesterly direction. Chaco Canyon is about 19 miles (35 km) long when measured from the Great House outlier of Pueblo Pintado to the confluence of the Chaco and Escavada Washes at its northwestern end. The Canyon varies in width from 1640 to 3280 feet (0.5 – 1 km) wide. Chacra Mesa borders the southern boundary of the canyon with an elevation above the canyon floor of about 4900 feet to 9800 feet (1.5 – 3 km). There is a mesa on the north boundary as well which is roughly equal in height to Chacra Mesa. Chacra Mesa is separated into four gaps; from east to west these are the Pueblo Pintado Gap, Fajada Gap, South Gap and the Chaco-Escavada Gap. South Fork Wash drains through the Fajada Gap and Kin Klizhin Wash comes around the western edge of West Mesa (just west of South Gap).
and drains into the Chaco-Escavada Gap where Chaco and Escavada Washes merge (Vivian, 2006a).

The composition of the canyon, and its microclimates, allowed Chaco to be one of the most amenable places to farm while the rest of the San Juan Basin was experiencing drier conditions. One of the factors that created this local environment was a natural dune dam at the northwestern end of Chaco Canyon at the confluence of the Chaco and Escavada Washes. A natural dune dam behaves like a human-made dam. When a stream is dammed, the velocity of the stream slows down and deposits its sediments. A shallow lake then forms behind the dam, and in the case of Chaco Canyon, raised the canyon floor to a depth of 13-16 ft. (about 4-5m), creating the foundation for future farmland. While arroyo cutting (stream entrenchment) was occurring throughout the Colorado Plateau, the exact opposite was happening in Chaco Canyon, creating a kind of farmers’ oasis.

*The Science of Landscape - The Paleoclimate*

In general the only consistent comment one can make in regards to the paleoclimate of the Ancestral Puebloan region is that the climate is inconsistent (see Table 3-1 for a summary of research of the paleoclimate of the Colorado Plateau from CE 1 to 1350). This inconsistency resulted in significant changes in the social development of the Ancestral Puebloans in response to the environmental changes. Over the last 11,000 years (during the Holocene period) the overall climate for the Colorado Plateau oscillated between favorable and unfavorable conditions.

Three major conditions are used to quantify what is meant by the terms favorable and unfavorable. The first is related to precipitation and effective moisture. The effective moisture is critical to the growth of the native plant and animal species necessary for diet, medicine, or
fuel. Effective moisture is also important to the cultivation of non-native species such as crops (corn, squash and beans). Corn optimally requires between 110 and 130 consecutive frost-free days (over 30 °F) to mature (Vivian, 2004), which can be reduced significantly at the higher elevations. If overall effective moisture is too high, runoff can destroy irrigation constructions, such as dams, so it would behoove the farmer to farm at higher elevations and practice dry farming (reliance on rainfall and runoff without using irrigation controls). If overall effective moisture is low, the farmer may be more successful at lower elevations and making use of irrigation (Lightfoot, 1980). It is also important to note that frost free days can actually be fewer at canyon bottoms. As day turns into night, warm air from the canyon rises to the top and cold air sinks to the bottom of the canyon, causing colder temperatures and perhaps a killing frost, creating yet another challenge for the farmer.

The second condition that determines a favorable vs. unfavorable farming area is related to the hydrology of the landscape. Locally favorable hydrologic conditions occur when the water table is high allowing the cultigen’s taproot to reach the water in the aquifer. However, if the ground water table is too high, the farming surface can become too saturated and unstable to farm, resulting in a move to higher elevations (Dean et al., 1985). There also seems to be an increase in the shift between higher and lower elevations when effective moisture decreases and aggradation/hydrologic conditions are in flux (Dean et al., 1985). Another hydrologic condition that determines a favorable landscape is stream aggradation. During a period of aggradation, an arroyo experiences a depositional phase, which is beneficial to the farmer. A period of degradation is a time when arroyos undergo erosional effects which does not benefit the farmer.

The third factor compares the relationship between effective moisture and hydrology through time and location. High temporal variability means that a specific variable is in constant
flux throughout a specific time period. A period of high temporal variability in effective moisture may be viewed as an unfavorable condition since effective moisture changes constantly during a specific amount of time. Populations would find it difficult to farm if the supply of water were constantly changing, making it difficult to plan a farming schedule. A community could combat this condition by intensifying agricultural output during periods of high effective moisture to ensure a surplus, which would then be stored during periods of low effective moisture. Agricultural intensification could also be a solution during times of environmental stress.

Intensification efforts have been noted in the southwest through increased use of water control devices and an increase in waffle gardens (Dean et al., 1985). Dean et al. (1985) notes, however, that there are times when this strategy will fail, notably when environmental variability is high and when the carrying capacity of the land is exceeded by a large population.

A period of high spatial variability means that conditions of a particular variable are changeable in reference to its location. A condition of high spatial variability in terms of climate may be considered favorable because different locations within the same region can be experiencing drastically different conditions, enabling a population in a climatologically poor area the opportunity to move to a neighboring area that is experiencing better conditions. Alternatively, the former community could increase trade relationships with this neighboring community and share resources (Dean et al., 1985). These coping strategies, along with others, appear to have been utilized by the Chacoans.

Overall, the weather patterns experienced in Chaco Canyon today are similar to those in the past. Local weather conditions are influenced by a landscape’s topography. Chaco Canyon is surrounded by mountain ranges. These ranges create their own local climate patterns. For example, when a storm front approaches a barrier, such as a mountain range, the warm air is
forced upward in order to rise to over the range. The inverse relationship between temperature
and elevation decreases the ability of the air to carry its water vapor. As a result, rain will fall on
the side of the mountain from whence the storm approached. The risen air, now devoid of
moisture, can drift over the mountaintop. The resulting air mass is dry and cold and creates what
is known as a rain shadow. As this dense air sinks, the temperature of the air mass rises,
resulting in the desert conditions familiar in the San Juan Basin (Bush, 1997). Prevailing winds
also have an impact on local weather conditions. Polar Continental and Polar Pacific air masses
from the north and northwest respectively converge on the San Juan Basin, as does the Tropical
Gulf (from the east, south east and south) and Tropical Pacific air masses (from the south west).
Chaco Canyon’s position in upper New Mexico and close to southern Colorado causes the
Canyon to experience interesting weather patterns. Chaco Canyon lies on the northern most
extent of the summer monsoonal storm path and its proximity to southern Colorado exposes
Chaco to the southern border of the snowstorm path. This means that Chaco Canyon, which is
close to both of these borders, can potentially experience snow pack at higher elevations (thereby
increasing the effective moisture for farming) as well as the heavy monsoonal rains from the
south, but only marginally since Chaco sits at the outer limits of both of these extreme
precipitation zones (Vivian, 2004). Monsoons are

A system of winds that influences the climate

of a large area and that reverses direction with

the seasons. Monsoons are caused primarily by

the much greater annual variation in temperature

over large areas of land than over large areas of

adjacent ocean water. This variation causes an excess
of atmospheric pressure over the continents in the winter.
and a deficit in the summer. The disparity causes strong
winds to blow between the ocean and the land, bringing

**Chaco Canyon: Paleoclimate Through the Years**

![Chaco Canyon Map](image)

*Figure 3-5: A Map of Downtown Chaco Canyon*
(CHCU, web site, 2001, Maps, Park Map in full color)

Archaeologists R. Gwinn Vivian, et al. in their chapter entitled “Ecology and Economy” (2006a and b) have identified four phases that connect local environmental conditions of Chaco
Canyon with the peopling of the canyon. The first phase, between CE 660 and 900 is known as the Early Aggradation phase, an allusion to the depositional environment of Chaco Canyon, which coincided with a time when most of the Colorado Plateau was experiencing arroyo cutting. Between CE 1 and 750 the Colorado Plateau was experiencing drought conditions on average of one significant drought per century. From CE 750 to 900, the paleoclimate of the plateau shifted to less severe droughts (Jones et al., 1999). The period of CE 750 to 1000 was characterized by high climatic temporal variability and low spatial variability. Relatively speaking, the Colorado Plateau was experiencing overall unfavorable farming conditions, as farmers were unable to predict precipitation (high climatic temporal variability) nor could they migrate to other locations as everyone on the plateau was experiencing the same overall climate (low spatial variability). However, the opposite was true at Chaco Canyon. From CE 600 to 900 most of the plateau was experiencing a period of arroyo cutting, while Chaco Canyon (around 850 CE) experienced a period of aggradation (deposition) because of the dune dam, resulting in a higher water table. Since the wash was not entrenched, akchin farming was possible. Chaco Canyon received good water flow from the flooding of the wash’s banks and side canyon runoff. The combination of sediments from these sources of water provided proportionate amounts of sand and clay conducive to farming. When clay layers lie underneath sandy soil layers the water is retained since clay is impermeable to water (Vivian, et al., 2006b). Additionally, the high temporal variability throughout the plateau may have been mitigated by the increase of spring and summer rains coming into the canyon. Together, the hydrologic and moisture rich conditions of the period CE 600 to 900 in Chaco Canyon resulted in a farmers’ paradise in the middle of the San Juan Basin (Vivian, et al., 2006b) and made it attractive to other farmers,
resulting in population growth during the Early Bonito phase, which occurred towards the mid to late ninth century (Lekson, 2006).

The period from CE 900 to 1025 is known as the Channel Cutting Phase as it describes the period that follows the breaching of the natural dune dam and the consequent arroyo cutting. It also corresponds to the end of the Early Bonito Phase and interestingly, ends with the beginning of Chaco’s Golden Century (Judge, 2004). The most likely explanation for the destruction of Chaco’s dune dam is heavy rainfall. Although rainfall is a critical factor for southwest farming, too much of a good thing proved detrimental. Towards the end of the ninth century, the record indicates a period of three extremely wet years from CE 897 to 900. This followed a ten-year relatively dry period. This increase in rainfall over an extremely dry canyon created a surge in runoff, which destroyed the dam. Rainfall in excess of 10 in/year is all that would have been necessary to obliterate the dam (Vivian, et al., 2006b). Without the dam to slow the speed of the runoff, arroyo cutting began and the water table was lowered. The opposite was happening throughout the Colorado Plateau. The farmers of Chaco Canyon were saved from the negative effects of the dune breach because of two important climatic events, an overall increase in effective moisture, which mitigated the effects of arroyo cutting, and the increase in the seasonal rains due to Chaco’s position relative to the storm paths. The early eleventh century was a time of high effective moisture and a period of channel filling. Although the climate oscillated between wet and dry periods, overall, a depositional environment prevailed in Chaco and ushered in Chaco’s Golden Century marked by another population increase and the building of more Great Houses. This is known as the Channel Filling period (CE 1025-1090), which corresponds to the Classic Bonito Phase.
From CE 1000 to 1140, overall spatial variability throughout the region increased and temporal variability decreased (Jones et al., 1999) thereby contributing to the overall favorable conditions of the region from CE 1000 to 1275 (noted by Dean et al., 1994 in Huckleberry and Billman, 1998), which includes high effective moisture and formation of flood-plains for farming. Although Chaco Canyon was experiencing some hardships, it seems that high spatial variability encouraged them to reach out to their neighbors, which could be one of the reasons for the increase in trade goods found at Chaco during this time. These goods included an influx in utilitarian pottery, pink chert (silica rock that contains microcrystalline quartz used to make specialized stone tools) from the Chuska Mountains, yellow chert from Zuni (in the southeast), green chert from the Four Corners and the importation of tens of thousands of fir and spruce trees from the Chuska Mountains and Mount Taylor (Toll, 2004, Toll, 2006), for construction during the peak of Great House construction from CE 1030-1100 (Toll, 2004). In an article entitled “Ancient Maize from Chacoan Great Houses: Where Was It Grown,” a team of researchers reported on the chemical analysis that they conducted on corn cobs found within some of the oldest sections of Pueblo Bonito and discovered that the corn was grown not in Chaco, but in the Newcomb area, located near the town of Shiprock, New Mexico, approximately 100 miles northwest of Chaco Canyon (Benson, et al., 2003). Although the sample size was small and larger conclusions cannot be drawn at this time, the results suggest that corn importation to Chaco did occur and other evidence from the article supports corn trade networks to other outlying Chacoan communities throughout the southwest. The article set out to test the hypothesis that the importation of corn was necessary for the construction of the Great Houses. This is surmised because in addition to trees, pottery and corn, labor was imported as well. We know that hundreds of thousands of human hours were necessary to construct the
Great Houses. Chacoan farmers could not possibly have grown enough food to support the laborers. This network of trade, whether supportive of a regional religious center or not, does indicate a desire to solidify trade relations with others, especially around the time of the great building period. Solidifying trade relations is important to socially integrate the communities surrounding Chaco Canyon with the residents of Chaco Canyon. Trade for goods that a society needs seems obvious, but some items imported to Chaco may not have been necessary. Chert, for example, was imported into Chaco from locations throughout the Four Corners region, but examination of Chaco's geology reveals that chert is found in abundance (Toll, 2004). From a subsistence level perspective, perhaps the Chacoans traded regionally for the chert not because they needed it to make tools, but to establish trade routes to ensure the survival of Chaco Culture during locally unfavorable climatological times (Dean, et al., 1985).

Vivian, et al. (2006a and b) refers to the years CE 1090 to 1125/1150 as the Late Aggradation period at Chaco, which corresponds to the Late Bonito Phase of CE 1090 to 1140. The beginning of this period in Chaco is reflective of the whole of southwestern climate, which was oscillating between favorable and unfavorable conditions. In Chaco Canyon, there was a brief period of increased precipitation from CE 1100 to 1130, low temporal variability, increase in water table and channel filling. Great House Construction resumed, as well as construction of outlying Great Houses near rivers such as the San Juan, La Plata and Animas. Corn yield dropped significantly between CE 1135 and 1155 (Sebastian, 1992 as cited in Vivian, et al., 2006a), which corresponds to a major drought that occurred from CE 1130 to 1180. The total effective moisture in the canyon decreased, water table lowered and migration out of the canyon ensued. This drought marked a time of low temporal climatic variability, hydrologic stress, and low spatial variability by the late 12th and 13th centuries. This would have had an adverse effect
on trade and interaction with the outlying communities. Increasing agricultural intensity would have been difficult because the overall region was affected. The regional population boom that began in 1050 CE created the need for farmers to use more of the surrounding land, eliminating viable land to retreat to by the time of this environmental downturn. In general, as populations increase during favorable conditions, people expand into areas that were not previously used. Favorable conditions lure people into farming marginal areas since these areas will produce some food above what was being produced in the favorable farming areas. Once environmental conditions become strained, these marginal areas no longer provided enough food for the population and the once-favorable floodplains become over-taxed (Diamond, 2005). The decrease in effective moisture that occurred in 1130 CE marked the end of Chaco Canyon as the center of the Chacoan world (Vivian et al., 2006a). Chaco Canyon was mostly abandoned between CE 1210 and 1220 (Vivian et al., 2006b) marking the end of an era.

**It's All About Water: Public Works Projects and Farming at Chaco Canyon**

"Water, water, every where,/Nor any drop to drink" (Electronic Text Center, University of Virginia Library, web site, accessed 2007, Coleridge, Samuel Taylor. "The Rime of the Ancient Mariner," Part the Second, section 16, stanza 5). The sentiment expressed in this quotation from Samuel Taylor Coleridge’s poem “Rime of the Ancient Mariner” is one of desperation and urgency, feelings that may have been shared by the farmers of the desert southwest. Where too much unusable water plagued Coleridge’s mariner, the Ancestral Pueblos were faced with too little usable water, but what they did have, they were able to use to the fullest extent possible. Water exists in the desert in the form of seeps, springs, washes and rivers.
Traditional farmers in the desert southwest practice a strategy known as dry farming. This method relies on the runoff from seasonal storms. Farmers adhere to an agricultural calendar, which informs them on when to sow the seeds in order to take advantage of the monsoonal rains, which tend to come from the south during the months of July and August. Modern Puebloans, such as “[t]he Hopi, for example, plant after threat of frost, when there might still be moisture in the soil from winter precipitation, then try to time it to capitalize on monsoonal moisture” (E. Brennan, personal communication, November 7, 2007).

As the rainwater cascades over cliff walls or races down the rincons, farmers may choose to slow down the water flow by constructing check dams and diverting the flow into gridded farm fields using diversion dams. At Chaco, farmers used both of these techniques, but they were also able to utilize the topography of the canyon to their benefit by constructing complex and massive public waterworks projects on the north side of Chaco Wash in Downtown Chaco.

Recall that the Chaco Wash runs east to west and divides the Canyon into a northern section and a southern one. The topography on either side of the wash is vastly different and as such provided two types of environmental conditions, both suited to different farming techniques: intensive public water works systems on the north, and dry farming on the south. Chaco Canyon is a shallow flat-bottomed canyon surrounded by tall slick rock capped sandstone cliffs in the north and three mesas, Chacra Mesa, South Mesa and West Mesa, to the south. The elevation ranges from 6,000 to 6,800 feet and runoff from the rincons drains to the northwest into Chaco Wash. There seems to be a correlation between runoff and the construction of Great Houses. A map of Chaco Canyon reveals that the largest Great Houses and one of the largest small house complexes are located in Downtown Chaco. These structures are Pueblo Bonito, and the Casa Rinconada Community. The Casa Rinconada Community is associated with the
largest of five Great Kivas found in the canyon and is among the largest found in the southwest. This Kiva was not built within the plazas of the Great Houses like the others, but stands alone on a rise in the landscape. Casa Rinconada is also located almost directly across from Pueblo Bonito. Looking to the Puebloan descendants today, there is a deep spiritual significance between these two communities, but perhaps there is a more mundane connection, an agricultural tie.

R. Gwinn Vivian, curator emeritus from Arizona State Museum, grew up at Chaco Canyon and followed in the footsteps of his father, Gordon Vivian, as one of the foremost researchers of Chaco Canyon. Gwinn Vivian spent many years examining the irrigation system at Chaco Canyon, and along with others, such as National Park Service archaeologist Thomas C. Windes and others, has written about the runoff/farming/irrigation cycle at Chaco. As previously noted, the presence of the natural dune dam in Chaco created conditions of channel filling and alluvial farming that were not present in most of the Colorado Plateau at the time. This prompted early farmers in Chaco Canyon to experiment with alternative forms of farming. Instead of relying merely on rainfall to water crops, the Chacoans, like other Ancestral Puebloans, made optimal use of the topography and instituted a variety of techniques appropriate for the environmental condition.

During the monsoon season, heavy rains pour into the canyon and will eventually drain into the Chaco Wash from the north, south and east. In general, this immense amount of water rushes through the wash and drains out of the canyon quickly, causing arroyo cutting. Once the stream becomes entrenched, the water drains quickly from the canyon leaving the farmer no water for irrigation. When the dune dam was present in the canyon, it created an opposite effect. The dam slowed down the velocity of the water, the wash was not entrenched, and the water
would spread evenly along the flat canyon bottom (Vivian, 2004, Vivian, 2006a). Over the past 40,000 to 70,000 years, the canyon bottom filled to a depth of 38 meters (125 feet) with alluvial deposits forming a farm field for the Chacoan farmers (CHCU, web site, 2007, nature and science, para. 3). *Akhin* farming was practiced in two different ways in the Pueblo Bonito-Casa Rinconada region of Downtown Chaco, and this was due to the difference in topography on either side of the wash. On the south side of the canyon, there are three mesas, Chacra, South and West, each separated by a gap. South Mesa and South Gap are directly across from Pueblo Bonito. The top of the mesas is not covered with slick rock as is the mesa on the north, but consists of naturally occurring stepped terraces, some with soil cover. The southern mesas also have long talus slopes at the base of the cliff. Together, these features impede the flow of the runoff, slowing down the velocity and resulting in increased absorption of water by the soils. The runoff generally does not reach the Chaco Wash, allowing the moisture that to be used for farming within the bottom of the rincon. Additional moisture on the south side can also be attributable to the gaps in the mesas.

Tom Windes conducted an experiment throughout Chaco Canyon to determine which locations receive more rain (Windes as cited in Vivian, 2004). Windes placed rain gauges in various locations and discovered that the gaps receive significantly more rainwater than other places. Storms are funneled into the gaps and remain there for prolonged periods resulting in the localized increase of annual precipitation. Windes also discovered that these areas had higher recorded temperatures. The Chacoans may have known that the higher temperatures and increased precipitation would have been beneficial for their crops and is perhaps the reason why the gaps (Fajada, Chaco-Escavada and South) are associated with four of the earliest Great Houses.
The cliffs on the north side of the canyon are capped with slick rock causing runoff from storms to progress quickly through the rincons (Vivian, 2006a). In order to slow down the velocity of the runoff, the Chacoans constructed elaborate dam systems. The diversion dams formed from earth or masonry near the terminus of rincons were constructed to divert the runoff into canals, which ended in head gates. These head gates were built to send the runoff into the akchin farm fields. To provide equal amounts of water for the plants the large field was gridded, giving the field a waffle patterned appearance. A gridded field found near Chetro Ketl averaged about 75 feet by 45 feet (Vivian, 2004).

The landscape helped to determine the farming methodology and complexity of the water control systems, but it may have also had a role in how the society was organized in Chaco Canyon. For three hundred years, the Chacoans were able to farm the canyon, import goods used for subsistence (examples include corn and utility pottery), and exotic goods for ritual (turquoise and macaws). Goods tended to flow into Chaco but were not exported (Toll, 2004), indicating that Chaco’s primary function was not as a re-distribution center but nonetheless had a purpose that held a special place in the Ancestral Puebloan world. As will be discussed in greater detail in the next chapter, the Chacoans may have linked their subsistence techniques, which were adapted to the local environmental conditions, with their cosmology and social structure. What follows is a discussion of the relationship between environmental conditions, its effects on the size and type of construction, and the organization of the labor and materials necessary for these constructions.

The size of the Great Houses and Great Kivas required a large investment of labor and materials, both of which needed to be imported. The large size of these houses was not necessary to produce crop yields, but it is clear that the Ancestral Puebloans were willing to
commit the resources to build these structures. Perhaps the construction went beyond mere subsistence and is indicative of a societal organization that required them to build these structures to satisfy other goals that may have been related to a successful life on the land. Archaeologists W. James Judge and Linda S. Cordell, in their article “Society and Polity,” explore the social structure of Chaco Canyon. Whether Chaco was a religious or political center, labor needed to be organized for this center to function (Judge et al., 2006). In a separate but related research project, Cordell examined the correlation between the location of the earliest Great Houses and the Chacoan’s agricultural strategies. The north side of Chaco Wash is associated with a preponderance of Great Houses, such as Pueblo Bonito, Peñasco Blanco and Una Vida whose construction began in the early 800s CE. By contrast, the south side contains small house communities such as the Casa Rinconada complex which is found almost directly across the wash from Pueblo Bonito. Cordell suggests that two types of farming techniques were employed in Chaco based on the differences in typography and was related to the construction of the Great Houses and the society’s organization. The method practiced on the north is known as “labor-intensive” (as cited in Vivian, 2004, p. 11) and the one practiced on the south is called “land-and time-intensive” (as cited in Vivian, 2004, p. 11). These labor types are associated with the size and function of the houses, as well as the microclimates of both areas and further demonstrates that the Chacoans had an intimate knowledge of the local environmental conditions and linked this knowledge with the social aspects, and as will be demonstrated in the next chapter, religious aspects of their society.

According to Cordell, the “labor-intensive” method was used on the north side of the canyon, where many of the Great Houses, diversion dams and head gates were located. These public works were technologically complex and required a large and specialized labor force to build and
maintain these structures. Cordell concluded that the Great Houses were built to organize this large labor force. This example reflects the connection between Great Houses, public water works and the microclimate. The location of Pueblo Bonito, Una Vida and Peñasco Blanco reflects a connection between Great Houses and microclimates. Pueblo Bonito was constructed across from South Gap and Una Vida was built across from Fajada Gap presumably to take advantage of the storm funneling effects of the gaps with the consequent increase in runoff. Peñasco Blanco was built next to a rincon that was suitable for farming. These examples underscore the importance of building Great Houses, which may have had an agricultural significance, near favorable microclimates to maximize the potential of high crop yields. They also demonstrate that the Chacoans were able to organize laborers. Gwinn Vivian notes that the shapes of the Great Houses, such as the common “D-shape” found in structures such as Pueblo Bonito and Chetro Ketl, is indicative of a Chacoan commitment to a rigid formality. This formality would need to have been transmitted to work groups over time since these buildings were built over centuries, again reflecting an ability of the Chacoans to organize a labor force (Judge and Cordell, 2006) both seasonally, in the form of seasonal labor groups and over time as the “blueprint” for the buildings were passed on through the decades. Another example of sharing knowledge through time is found in the reconstruction of the dune dam. In 1025 CE, the Chacoans built a rock dam to take the place of dune dam (Vivian, 2004), which is demonstrative of Chacoan society’s institutional memory. I would also argue that sharing this memory moves beyond mere subsistence. Sharing this information with future generations can be considered socially integrative. Younger residents and visitors to the canyon have the opportunity to rebuild structures that not only help them survive on the landscape but can work together to preserve their recent ancestors’ way of life, thereby uniting the communities within and surrounding
Chaco Canyon. Social integration is a constant theme throughout this paper and serves to demonstrate that knowledge of natural history, knowledge of how to make use of the local landscape, and a shared cosmology unite to enable communities, such as the Chacoans and their neighbors in the outlying communities, to survive and thrive on the landscape.

The examples cited above demonstrate that Great House placement and style reflected both an understanding of microclimates and an organization of labor. Steve Lekson and others propose that the Great Houses served an agricultural purpose other than that used for labor organization. Lekson proposed that initial construction of Great Houses such as Pueblo Bonito were early Pueblo I style unit pueblos. The oldest rooms in Pueblo Bonito may have originally been used as residences, but as the building grew, these initial rooms were covered by the resulting four-to-five-story structure. These rooms no longer had access to the outside and were poorly ventilated, making the building uninhabitable. The Chacoans may have used the Great House structures for storing crop surpluses (Windes and Ford, 1992 as cited in Judge and Cordell, 2006). The 800s to 900s were a time of favorable farming conditions in Chaco Canyon, relative to the Colorado Plateau, making the area attractive to visitors, some of whom may have used the canyon seasonally, while others may have begun to plant their residential roots. The
favorable environmental conditions of Chaco Canyon enticed people to move to Chaco with the hopes of increasing their crop surpluses which they would have then stored in the early Great Houses (Judge and Cordell, 2006), again, demonstrating the relationship between environmental conditions, agriculture and Great House construction on the north side of Chaco Wash.

Another example of the organization of labor involves the second of Cordell’s farming strategies, “land-and-time-intensive” which was practiced on the south side of Chaco Wash. This system is generally less technologically advanced but requires a significant amount of land. This traditional southwestern farming technique makes use of scattered plots, over planting of fields, letting fields lie fallow, and changing cultivation patterns. These Chacoans lived in the small-house complexes and took advantage of the microclimates available in the bottom of the rincons as well as at their mouths and in the sand dunes (Vivian, 2004). Evidence of bean plantings in the sand dunes of Werito’s Rincon have been found, a technique for the planting of beans that continues to be practiced today. It has been surmised that since these farming sites were not localized, groups of large extended families took care of these diverse plot locations (Vivian, 2004).

A final example relating organization, environment and house structure comes from archaeoastronomer Anna Sofaer. Her research focuses on the highly organized method of planning involved in Great House placement in relation to one another on the landscape and the cardinal directions. This seemingly ritualistic planning of the Great Houses may be indicative of the planning necessary to “read the sky” to predict seasonal change and rainfall, with the ultimate goal of designing a regional agricultural calendar (Sofaer, 2003). The commitment to this form of organization, which will be further developed in the next chapter, reflects a strong relationship between agriculture, architecture, landscape and cosmology.
From CE 960 to 1020, tree ring dates suggest that Great House construction was significantly reduced. This corresponds with the Channel Cutting phase and the breach of the natural dune dam identified by Vivian, et al, 2006a & b. This would have had a negative effect on the Chacoan farmers on the northern side of the wash. The breach of the dune dam would have increased the speed of the flow of water from the side canyon, flushing into the Chaco Wash and eroding the alluvial fill to its base as well as endangering the crops in the akchin fields. Farming on the south side of the canyon would not have been affected since the farming plots were not localized, and implemented a variety of farming strategies which took advantage of diverse locales, such as sand dunes and the different farming areas along rincons (Vivian, 2006a). Judge and Cordell suggest that although Great House construction diminished, farming intensified as is indicated by the expansion of canals, gridded fields and dams. A comparison with the climate suggests that overall, in both the region and within, Chaco farming conditions were favorable during this time and construction of other Great Houses resumed between CE 1010 to 1065. The Chacoans also constructed a rock dam in place of the original dune dam which may have also helped to mitigate the affects of arroyo cutting and led to increased deposition (Vivian et al., 2006a).

Although it remains unclear as to whether Chaco Canyon was a political and hierarchal center, a religious hierarchal center, both or egalitarian, it is evident that Chaco was the center of a regional Ancestral Puebloan system that shared similar religious beliefs, subsistence needs, architectural patterns, and agricultural calendar. It is possible that since Chaco Canyon experienced favorable conditions by at least 800 CE, it encouraged migrations to Chaco. Once critical population mass for agriculture was obtained, along with favorable farming conditions, building and agricultural intensification occurred, resulting in the need to further import labor to
build Great Houses, as well as trees for building roofs, corn and deer for food, and ritually important trade goods. Chaco Canyon eventually became a significant center, uniting people from diverse backgrounds (Schillaci, 2003) who shared the same practical and perhaps ritual connection to the southwestern landscape. As the population continued to increase in Chaco and throughout the region, the carrying capacity of the particular area eventually became overloaded. Overtime, all the favorable and marginal farming locations were filled. Although large populations constructed highly complex public water works systems and extended families maintained the less technological farming practices on the south side of the wash, the problem of feeding this population arose when the climate changed to unfavorable conditions. Stored surpluses last for a finite period, and when these unfavorable conditions became too severe, the marginal farming areas were no longer practicable. If Chaco was indeed a ritual center, entrusted with keeping the agricultural calendar (see Chapter 4), people may have become distrustful of the Chacoans' competence to keep such a system and decided to create other systems elsewhere, perhaps near more permanent sources of water. However, Jeffery Dean, et. al. cautions that

Environmental explanations of prehistoric events are commonly criticized for failing to take into consideration the fact that groups of intelligent human beings may select different mechanisms to cope with environmental change. In the absence of such mechanisms, humans are often considered to be mere pawns of the environment (Dean et al., 1985, pp. 546-547).
The Ancestral Puebloans were not “pawns” of their environment, although they were affected by environmental changes. They did make decisions that helped them survive and thrive on the landscape, solutions which reinforced their cultural traditions. These traditions served many functions, but in my view, the most important is a socially integrative purpose. A shared cosmology helped the Ancestral Puebloan People survive and thrive in this land. They knew how to read the landscape and the heavens to determine the best time to grow crops. They also understood that when environmental conditions deteriorated enough, it was time to move on to a new location and a new life. This understanding was transmitted to their neighbors and to their offspring through ceremony, ritual and through the seemingly mundane tasks of daily living. Together, these socially integrative activities provided for their future because it equipped them to understand their fickle environment. The adaptive quality of their religion afforded them a blueprint for their life on the land. This is the topic of the next chapter.
<table>
<thead>
<tr>
<th>Year (Common Era)</th>
<th>Colorado Plateau</th>
<th>San Juan Basin</th>
<th>Chaco Canyon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 – 750</strong></td>
<td>Series of droughts during the first millennium and a major drought per century until 750 CE</td>
<td>600-900 - 8.5 in. annual rainfall, usually not enough to practice dry farming.</td>
<td>600-900 - “persistence of hydrologic and aggradation degradation” (Vivian et al., 2006a, p. 52). Favorable farming conditions much better than any other place in the region. The high temporal variability may have been mitigated by the location of the canyon and the influx of spring and summer storms coming into the canyon. Dune dam prevented arroyo cutting and consequent water table lowering.</td>
</tr>
<tr>
<td></td>
<td>400-750 – overall favorable conditions, moisture effectiveness high, flood plain formation.</td>
<td>600-900 – Low spatial variability throughout the interior San Juan Basin, which prevented the Chacoans from leaving the canyon to search for other areas that may have been more suitable farming areas.</td>
<td>900-1025 – Dune Dam destroyed in the late tenth or early eleventh century. The new aggradation may have helped Chaco which was experiencing channel cutting and water table lowering (exacerbated by the dune breach). The canyon’s location continued to be advantageous as the predominant rains (from the south) funneled into the canyon.</td>
</tr>
<tr>
<td></td>
<td>750-925 – overall unfavorable conditions, effective moisture lowered (flood-plain degeneration)</td>
<td>1025-1090 – three periods of increasing precipitation (AD 1029…1038, 1040-1060 and 1070-1080) separated by dry spells” (Vivian et al., 2006b, p. 142). “…environmental stability that allowed deposition to occur” (Dean and Fudkoshser 2002:41 as cited in Vivian et al., 2006b, p. 142).</td>
<td>1080 CE began a twenty-year dry</td>
</tr>
<tr>
<td><strong>750 – 900</strong></td>
<td>Droughts decreased in severity until the late 900s. High temporal variability in effective moisture, but overall dry towards the end of this period.</td>
<td>Overall, uniform climate, but experienced a very wet period 736-737. From 738-757 dry period. 897 – 900 CE saw much rainfall which destroyed the dune dam (excess of 10 in. yr. would do this).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900-1025 – wet years, higher effective moisture and phased into a period of channel filling</td>
<td>1022-1027 – wet years, higher effective moisture and phased into a period of channel filling</td>
<td></td>
</tr>
<tr>
<td><strong>1000-1140</strong></td>
<td>Overall, spatial variability increased but temporal variability decreased. 1000-1275 – overall favorable conditions, moisture effectiveness high, flood plain formation.</td>
<td>1097 - 1135 (from NW New Mexico) - increase in summer rainfall (from Robison and Rose, cited in Gillespie 1984:40 cited in Hall:1988)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CE 1025 – 1050 Cool temperatures initiated the period followed by fifteen-year warm episode from CE 1035-1050, followed by another warm period from CE 1070-1090. Some of those years did mark periods of frosts which capable of killing crops.</td>
<td>1100-1135 (from NW New Mexico) - increase in summer rainfall (from Robison and Rose, cited in Gillespie 1984:40 cited in Hall:1988)</td>
<td></td>
</tr>
<tr>
<td><strong>1065 – 1100</strong></td>
<td>Long term drought, but areas of effective moisture existed.</td>
<td>1080 CE began a twenty-year dry</td>
<td></td>
</tr>
<tr>
<td>Period</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE 1080 – 1100</td>
<td>Increased effective moisture, increasing water table and channel filling may have enabled them to better deal with the dry period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1090-1125</td>
<td>Final years of the Thau geomorphic-stratigraphic period is named for the final interval of sediment deposition during the terminal years of the Chaco regional system (Vivian et al., 2006b, p. 450). Conditions locally and regionally similar to previous period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1130-1150</td>
<td>Long-term drought.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE 1100 – 1150</td>
<td>Increase in precipitation, low temporal variabiliy, increasing water table and channel filling, marked a brief effective period – Great House Construction resumed as well as Outliers (near rivers – San Juan, La Plata and Animas). Chacoan Farmers may have established some of these outliers.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1135-1179 (from NW New Mexico) | Decrease in summer rainfall (Robison and Rose as cited in Gillespie 1984:40 as cited in Hall, 1988) – End of period low spatial variability and a major drought from CE 1130-1180. Total effective moisture decreased, stabilized or lowered the water table and may have halted the channel filling process. Migration out of the Chaco may indicate such trying times. The Chacoans, particularly on the north side, relied very heavily on huge labor-intensive water works system and may not have been able to adapt to these changing conditions as a result (No TE supports my support of the ideas that ritual migrations also served to socially integrate the Ancestral Puebloans and served a practical survival function and that Chaco Canyon's system became too large to support the local population which is why Modern Puebloan societies have not…
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Event Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1150–1276</td>
<td>Series of less intense and short-lived droughts.</td>
<td>Brief period of increased moisture after 1180. A severe drought in the summer would have devastated Chacoan farmers as they relied on the summer storms and the consequent runoff. This period of moisture may have been too late for the Chacoan (Dean and Puleston, 2002 as cited in Vivian et al, 2006). Chaco was mostly abandoned between 1210–1220.</td>
</tr>
<tr>
<td>1276–1299</td>
<td>Great Drought 1275–1450 — overall conditions unfavorable, effective moisture lowered, floodplain degeneration.</td>
<td></td>
</tr>
<tr>
<td>1300–1350</td>
<td>Above average moisture, dry conditions returning.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3-2: Summary of Subsistence Practices in Chaco Canyon from CE 600 to 1150

<table>
<thead>
<tr>
<th>Year, CE</th>
<th>Flora in Chaco</th>
<th>Fauna in Chaco</th>
<th>Agricultural Methods</th>
<th>Pecos Classification/Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>600-900 (Early Aggradation)</td>
<td>Toll (as cited in Vivian et al., 2006b) reported that large twelve-row corn cobs made up 53% of the economy. Piñon nuts, weedy plants, grasses, seeds. Some of these plants grew in the disturbed areas of the farm fields. Piñon, Juniper, Saltbush and greasewood for fuel. Piñon and Juniper used in construction for small sites although also found in the later Great Houses.</td>
<td>Small mammal dependence (86%) (mostly cottontail rabbit) indicative of field hunting. Later in the period there was an increase in the finding of Jackrabbit bones, indicative of group hunting behavior. Small increase in large mammal (mostly pronghorn, 8.64%) (Vivian et al., 2006b)</td>
<td>Farming occurred, particularly corn. Detailed field studies needed. Akchin farming on South side of Chaco Core, may have practiced on North side using water control devices to mitigate stream flow, such as diversion dams, small scale canals and gates (simple) (Vivian a and b) Taking advantage of “funnel zones” (Vivian, et al., 2006b, p. 444) in the four gaps in Chacra Mesa</td>
<td>Late Basketmaker III (CE 600-700) Pithouses, storage units, two large organized communities, Great Kivas. May have the beginnings of Great House settlements, around 800 CE, one near Fajada Butte (Windes, 2005). Early Pueblo I (CE 700-800) Pithouses deeper than Basketmaker III, may have had some storage units. Pueblo I (CE 800-850) Sites built above ground, small to medium sized. First Great Houses appear, storage units increase dramatically. Late Pueblo I Early Pueblo II (CE 850-925) Early Bonito Sites above ground, small to medium sized. “Small house aggregation and increase in number”</td>
</tr>
<tr>
<td>Year, CE</td>
<td>Flora in Chaco</td>
<td>Fauna in Chaco</td>
<td>Agricultural Methods</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 900-1025 – Channel Cutting | Use of wild plants increased in the small sites and the Great Houses (Toll, 1985, 1987, 1993 as cited in Vivian, et al., 2006b), including use of piñon, hedgehog cactus, prickly pear cactus, and sunflower. Corn samples decrease. Lynne Sebastian’s test growing sites demonstrate that high corn growth is generally followed by lower production separated by 10 years or so (1992 as cited in Vivian, et al., 2006b) Squash and beans Wood: increase of ponderosa pine at both Great Houses and small sites, although there was a 59% increase of ponderosa pine use to build the Great Houses, probably all imported. Both small and Great House sites so a decrease in piñon and juniper use. Shrubby plants for fuel at Great Houses, while Saltbush and greasewood used at small sites (Vivian, et al., 2006b). | Data from Atkins, 1985 as cited in Vivian, 2006b from CE 920-1050. Ratio of small to large mammals continued. About 75% reliance on small mammals including cottontail rabbits, pocket gophers, prairie dogs, kangaroo rats, and field mice. Jackrabbit use may have increased at the end of the previous period, but may have decreased in use after 920 CE. Perhaps indicative of moving back towards increased hunting in the farm fields, due to more time spent in the fields and less time hunting in groups. Large mammals made up about 8% and included deer, pronghorn antelope and bighorn sheep. | The breach of the dune dam would have allowed the flow of water from side canyons to flush into the Chaco Wash, eroding the alluvial fill to its base, causing down cutting and entrenchment. Floodwater farming along the wash would have endangered the crops. The rincon farming on the south side of the Canyon would not have been entrenched so akchin farming would have continued. Head gates and canals made from stone found near Casa Rinconada on the south side. Handled runoff. Sand dune farming Channel entrenchment may have resulted in migrations to other areas outside of the core such as Kin Bineola (Windes cited in Vivian, 2006b), although evidence doesn’t support widespread migration. Perhaps farming on the alluvial floodplain at Escavada Wash. | Late Pueblo I Early Pueblo II (CE 850-925) Early Bonito Sites above ground, small to medium sized. “Small house aggregation and increase in number” (Windes’ chart as cited in Lekson, 2006, p. 7 under heading Major Architectural Events). Early Pueblo II (CE 900–1040) Early Bonito “Small house aggregation and increase in number” (Windes’ chart Chaco chronology as cited in Lekson, 2006, Figure 1-3 under the heading Major Architectural Events). Population significantly increases population (Windes’ chart as cited in Lekson, 2006, p. 7). Late Pueblo II (CE 1040-1110) Classic Bonito Great House Construction at Chaco with Kivas. First phases of Una Vida, Peñasco Blanco and Chetro.
<table>
<thead>
<tr>
<th>Year, CE</th>
<th>Flora in Chaco</th>
<th>Fauna in Chaco</th>
<th>Agricultural Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1025 – 1090 Channel Filling</td>
<td>Corn use very high during this time period. Wild plant use includes pigweed, goosefoot, stickseed, purslane and tobacco. Later in the period and in outliers such as Salmon Ruin, as the amount of corn use increased, wild plant use decreased (Doebley, 1981 as cited in Vivian et al., 2006b).</td>
<td>Small mammals still used much more than large animals (66% initially and 73% toward the latter half of the period and dropped to 68% by CE 1090). Cottontail use high in the beginning of the period. Jackrabbit increases in the middle, and Cottontail increases in the end of the period. Equal amounts of large animals used, 17% at first and then changing to 30% from CE 1050-1080 and then dropping to 23%. After 1050 CE deer seemed to be used more than pronghorn antelope and bighorn sheep. Trend is to use more hoofed animals when the population of farmers increases. The farmers organize hunting parties to acquire more protein. As the Ancestral Puebloans utilized the canyon and its resources, they would have to travel farther to hunt these type of Extensive water control systems and agricultural intensification. Ancestral Puebloans replaced the dune dam with a masonry structure. Not as efficient but may have helped with preventing channel entrenchment. Other large dams built over time in side canyons, such as Gallo and Cly’s Canyon, with associated canals and other control features. Dams and other water control devices generally found on north side to control the high velocity runoff. This helps spread the water flow allowing floodwater farming and grided fields. Terrace gardens found atop mesa at Pueblo Alto. The geomorphology of the south part of the canyon, with the gaps from Chacra Mesa with soil on top of the mesa leads to lower velocity of runoff, which is absorbed by the floodplain below, good for akchin farming. <em>During this period, the canyon shows a large increase in water control structures.</em></td>
<td>Early Pueblo II (CE 900–1040) Early Bonito Clusters of small houses increase Late Pueblo II (CE 1040–1110) Classic Bonito Great House Construction at Chaco with Kivas First phases of Una Vida, Peñasco Blanco and Chetro Ketl Population decreases. Early Pueblo III Late Bonito (CE 1090–1140) Great Houses built north of the San Juan River First population increases than decreases.</td>
</tr>
</tbody>
</table>
In the beginning, pronghorn was the most used, which naturally occurred in Chaco, but then there was the switch to deer, may be reflective of a switch in hunting strategy or overkill of the local pronghorn population.

### 1090 – 1125/1150
*Late Aggradation*

Farming settlements increased throughout the Core, example Pueblo Pintado, development of the East Community and at Kin Klizhin Great House (late 1080s). Small house sites generally relied on akchin and dune farming which may have resulted in smaller size corn than the Great House areas in the northern canyon, which relied on gridded fields.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1090 – 1125/1150</td>
<td>Corn yields decrease (1088 – 1098 CE), increases between CE 1099-1130 (higher precipitation at this time), CE 1101-1120 also shows high yields. Corn production drops significantly from CE 1135-1155 (Sebastian, 1992 as cited in Vivian et al., 2006b). Continued use of the wild plants.</td>
</tr>
</tbody>
</table>

### Early Pueblo III

- **Late Bonito (CE 1090-1140)**
  - Great Houses built north of the San Juan River.

- **Pueblo III (CE 1140-1200)**
  - No major architecture, population decreases, but construction of outliers increase.
Chapter 4: In Partnership With the Land; Environment, Ritual and Success

But sometimes the living forget us. Remind the people to make pahos [prayer feathers/sticks] for us at the time of the Soyal [Winter Solstice] ceremonies. In exchange for these pahos we can do things to help the people of Oraibi. We will send clouds to water their fields (Bear Clan Chief in Courlander, 1971, p. 107).

The quotation above is taken from the book Fourth World of the Hopis: The Epic Story of the Hopi Indians as Preserved in Their Legends and Traditions by Harold Courlander. Partially funded by a grant from the Wenner-Gren Foundation for Anthropological Research, Courlander and his family traveled to the Hopi Mesas in Northern Arizona to search for people willing to share their stories of the Hopi people. Although told from the perspective of those living in the twentieth century, these myths and legends demonstrate how communion with ancestral spirits and deities provides a blueprint for life in a land that promises to challenge people’s existence every day. As we saw in the previous chapter, life in the southwest requires knowledge of ecology, climatology and meteorology. As communities grew beyond the single family, living successfully on the land also required cooperation between disparate groups of people. As populations migrated throughout the region, they often settled in areas that were already occupied and the sharing of traditions became a necessary way of life. Although Puebloan People, modern and prehistoric, are not part of a single tribe, life in the desert southwest helped to create similarities between the groups. These similarities included similar
subsistence practices based on hunting/gathering and agriculture. Ethnographic studies indicate that there were also similarities between the cosmologies of each group. The American Heritage New Dictionary of Cultural Literacy defines the word cosmology as

A system of beliefs that seeks to describe or explain the origin and structure of the universe. A cosmology attempts to establish an ordered, harmonious framework that integrates time, space, the planets, stars, and other celestial phenomena. In so-called primitive societies, cosmologies help explain the relationship of human beings to the rest of the universe and are therefore closely tied to religious beliefs and practices. In modern industrial societies, cosmologies seek to explain the universe through astronomy and mathematics...


A culture's cosmology unites the human desire to understand his/her surroundings with the practical aspects of subsistence. For the Modern Puebloans, the relationship between cosmology and survival is found in their stories. For the Ancestral Puebloans, there is evidence to suggest that this link is found in the artifacts they left behind. The cosmology of the Modern Puebloans, and by extension, their ancestors, includes a religious component, and although the definition of cosmology suggests that primitive societies rely on religion only as a way of explaining their universe, I maintain that religion can have adaptive elements. The religious cosmology of the
Ancestral Puebloans served to socially integrate disparate groups from the Ancestral Puebloan community. They made use of their understanding of astronomy, climatology and ecology and linked this knowledge with their religious cosmology. This cosmology provided adaptive strategies such as a regional agricultural calendar and spiritual migrations to environmentally favorable locations, as ways to ensure the survival of their large community. In this way, the religious ceremonies that took place at Chaco Canyon can be seen as an adaptation.

Archaeology cannot explain what people knew, how people felt or their connection with the land. What archaeology can do is study what people have left behind and gain an understanding of a society’s daily activities. (Adler, 1993). The purpose of this final chapter is to review the material culture of the Ancestral Puebloans and discuss the relationship between these artifacts and the worldview of today’s Modern Puebloan people and other cultures, to demonstrate that a culture’s cosmology assists in socially integrating disparate populations to insure survival. In other words, religion is an adaptation for survival and success.

**Chaco Canyon as Ceremonial Center**

Almost no one denies that ritual activities and events were an extremely important component of Chacoan life; the Chacoans even transformed the physical world into a highly designed, clearly symbolic landscape. And if the physical world was ordered by ritual, it is likely that most of the human experience was ordered by ritual as well (Sebastian, 2004, p. 97).
British Archaeologist Colin Renfrew (also known as Lord Renfrew of Kaimsthom) in his paper "Production and Consumption in a Sacred Economy: The Material Correlates of High Devotional Expression at Chaco Canyon" (2001) applied his past research with devotional sites in Europe to Chaco Canyon. Lord Renfrew, Director of the McDonald Institute for Archaeological Research at Cambridge University, and former Disney Professor of Archaeology also at Cambridge University, represents a point of view that until recently, has largely been absent from southwestern archaeology, a perspective from abroad. In the introductory chapter to one of the Chaco Synthesis Project's capstone publications, "The Archaeology of Chaco Canyon...," Stephen Lekson noted that southwestern archaeology is "...perhaps too provincial (we seldom compare our sites with other regions in the world)” (Lekson, 2006a, p. 22). The inclusion of what he called “outsiders” (Lekson, 2006a, p. 22), offered a new perspective on the Chaco Canyon data. Sebastian also commented that consultations with the Modern Puebloans, while obviously advantageous, created an atmosphere for southwestern archaeologists in which to “...grow myopic and not consider other cultural patterns from beyond this region” (Sebastian, 2004, p. 98). The inclusion of Colin Renfrew’s work in Noble’s book In Search of Chaco New Approaches to an Archaeological Enigma and his 2001 paper on Locations of High Devotional Expression, provided an opportunity to compare the religious and spiritual activities of Chaco Canyon with others cross culturally.

Renfrew refers to places with high religious and spiritual functions as Locations of High Devotional Expression (LHDE). According to Renfrew, LHDEs are associated with four characteristics: (1) monumental constructions, (2) material culture which facilitates ritual, (3) pilgrims who come to witness or participate in ceremonies and (4) specialized places to hold gatherings at specific times (Renfrew, 2001). Renfrew demonstrates that since these four
elements are found at Chaco Canyon, Chaco is a LHDE. In order to show that religion played an adaptive role in Chacoan society, we must first examine how these LHDE elements were manifested in Chaco Canyon. (Note that in the explanations that follow, since the characteristic of “specialized places to hold gatherings” is closely tied with the characteristic of “monumental constructions,” they will be explained together.)

**Monumental Constructions**

The drive along the eighteen-mile dirt road to Chaco Canyon has an understated beauty. The monotonous southwestern desert scrub community is punctuated by mesas and *hogan*s (traditional circular homes of the Navajo). Upon entering the National Park, one is confronted with a monumental feature, the 6621 foot tall Fajada Butte. This natural feature dominates the view for miles and provides the appropriate introduction for the human-made monumental features for which Chaco Canyon is known, namely, Great Houses, Great *Kivas*, astronomical observatories and Chacoan “roads.”

![Figure 4-1: Fajada Butte at Sunset](Bodnar, CHCU web site, 2006, Photos and Multimedia, Photo Gallery, image 1)
Great Houses

"Overbuilt" or "over-engineered" are terms that often accompany descriptions of the Chacoan Great Houses. Chaco Canyon is home to more than twelve Great Houses, with Pueblo Bonito being the largest, covering approximately 2.5 acres, soaring to a height of five stories, with about 700 rooms and forty kivas (Lekson, 2004). At the peak of Great House construction in Chaco Canyon (around 1100 CE), most Ancestral Puebloan people throughout the southwest were living in modest structures with six rooms and a comparatively smaller kiva. The question that all archaeologists and many visitors ask as they drive past Fajada Butte to enter Downtown Chaco is why the need for such large pueblo structures. Frustratingly enough, no one knows the answer to this question. However, there is speculation from scholars and descendants ranging from a possible function as a trade and redistribution center, to a political capital or a ceremonial LHDE. Perhaps the answer is a combination of these.

As mentioned in chapter 3, there are Great Houses and small house communities in Chaco Canyon. Understanding the function of these structures would help to explain why the development of Chaco Canyon was unique in the southwest (Lekson, 2004). For example, if the Great Houses did represent elite residences for powerbrokers, then Chaco Canyon would have had a different purpose than if the size differences between the buildings was due to cultural preferences for different housing styles representing various cultural groups of Ancestral Pueblos. The differences in house size could be due to differences in agricultural techniques, as were suggested by Linda Cordell (as cited in Vivian, 2004). It could also be demonstrative of part time use of the canyon by visitors. If people were coming to the canyon for specific reasons, such as a pilgrimage, perhaps the smaller sites served as the seasonal homes for these visitors.
(archaeologist Marcia Truell as cited in Toll, 2004). Archaeologist Steve Lekson proposes that the Great Houses were “elite residences” (Lekson, 2006, p. 31). Citing research by archaeologist Jill Neitzel, Lekson offers the idea that people who were “…politically, socially, or ceremonially…” (Lekson, 2004, p. 27) connected to Chaco Canyon were rewarded with space in Pueblo Bonito. Since most of the interior rooms in the Great Houses are in areas that receive very little light and are poorly ventilated, it does not seem likely that these rooms would have been used for domestic purposes (Kohler and Sebastian, 1996) but would have been used for storage. Lekson suggests the residential structures in these Great Houses were the smaller *kivas* found within the enclosed plazas and not the interior rooms. These *kivas* were not used for ceremonial purposes but were used as residential structures just as they were during the 500 years before the Chaco Phenomenon (Lekson, 2004).

Lekson’s politically stratified view of Chacoan society does not dismiss Chaco Canyon as a place of ceremonial importance. In Lekson’s Chaco Canyon, the Great Houses demonstrate a geometric formality and a set of rules that mimic those found in “medieval churches or Buddhist stupas” (Lekson, 2004, p. 28). To further this connection between the Great House form and its religious function, Lekson suggests that Chaco Canyon “…resembles in conception if not in scale, the ceremonial centers of ancient Mexico and the Maya region” (Lekson, 2004, p. 29).

Another reason for the grand scale of structures such as Pueblo Bonito and Chetro Ketl is that the Chacoans may have undertaken this huge construction effort merely to impress the neighbors. Known as massing, (a term suggested by archaeologist John Stein as cited in Lekson, 2004) this idea suggests that the Chacoans built large structures simply because they could. A pilgrim trekking to Chaco Canyon during this time would have seen something unique in the desert southwest and might have been deeply moved by such a sighting. This is further bolstered by
archaeologist Mike Marshall’s observations that some of the Great Houses were built atop hills, which have the effect of magnifying the building’s appearance, making it visible from a greater distance (“The Mystery of Chaco Canyon” DVD Sofaer, 2003) and perhaps, signifying its importance. The impressive size may also be attributed to a form of hierarchical stratification in which, in addition to imparting a sense of awe to the pilgrims, the Great Houses may have also inspired a sense of respect for the leaders residing in Chaco Canyon. The connection between grand architecture and politico-religious importance is not unique to the desert southwest. A look across cultures reveals that structures such as Stonehenge in the British Isles, the Pyramids of Egypt (Renfrew, 2001) or the First and Second Temples in ancient Israel may have served similar purposes. A modern day example of grand architecture and politico-religious importance includes the Temple of Latter Day Saints in Salt Lake City, Utah. In these societies, there tends to be a relationship between ritual and political hierarchies, a theme explored in many of the articles cited in this paper, which will be further developed throughout this chapter.

**Great Kivas**

In casual use, the word *kiva* has become synonymous with the word ceremonial (Kidder at the Pecos Conference, 1927 as cited in Adler, 1993). Drawing from the ethnographies of the Modern Puebloan tribes, there is ample evidence to suggest that this is not completely the case. *Kivas* serve multiple functions and are not relegated to ceremonial use. “A society always celebrates in a particular kiva, but none of these kivas are now preserved exclusively for religious purposes;...the same kiva thus serves as a temple during a ritual feast, at other times as a council house for the discussion of public affairs ” (Mindeleff, employed by the Bureau of American Ethnology, 1891, p. 130, on architecture in Tusayan (Grand Canyon area) and Cibola (Zuni) as cited in Adler, 1993, p. 324). Evidence suggests, however, that Great *Kivas*, did satisfy
a mostly ceremonial function and, as such, provides further evidence that Chaco Canyon served as an LHDE.

Chaco Canyon is home to Great Kivas such as Chetro Ketl, Casa Rinconada, and the suspected Great Kiva associated with the late 400 CE Basketmaker III pit house village of Shabik’eshchee. In his article, “Why is a Kiva? New Interpretations of Prehistoric Social Integrative Architecture in the Northern Rio Grande Region of New Mexico” (1993) archaeologist Michael Adler explained that a kiva provided a multifunctional use, except when it would have been advantageous to build a kiva specifically designed to serve a ceremonial function. Adler refers to the ancestral kivas in the Northern Rio Grande to support his assertion. Kivas did not become ritually specialized until the twelfth century and Great Kivas and “formalized plaza areas” (Adler, 1993, p. 321) were not constructed until after 1250 CE. Adler
begins his discussion of specialized uses of these subterranean structures by exploring the pit house to *kiva* transition.

In general, the pit house served as the primary domicile, and the aboveground rectangular rooms served as storage units. Over time, domestic activities such as food preparation and sleeping quarters were moved to the aboveground structures (Adler, 1993), and the pit house was converted into a ceremonial structure. Adler does not totally agree with this view. He posits that once aboveground architecture became common, the pit houses served both a secular and ceremonial function. Ritualistic and non-ritualistic activities performed in the same unit can serve to socially integrate a society. Adler identifies non-ritual activities as cooking, hosting visitors, daily meals, sleeping and craft production. He defines ritual activities as society meetings, initiation rites, dances, multi-village ceremonies and storage for religious paraphernalia. To research his hypothesis regarding the socially integrative nature of *kivas*, in 1989, Adler conducted a cross-cultural study of twenty-eight cultures using the Human Relations Area Files database. Although he concedes that the data sample was not complete, the study did provide some interesting results. First, that socially integrative structures such as *kivas* are prevalent in “…politically unstratified societies…” (Adler, 1989 as cited in Adler, 1993, p. 324). Second, small *kivas* (646 ft.\(^2\) or less in floor space) were used by subsets of the community in groups between 25 and 75 for a variety of activities. Third, that high-level specialized integrative structures, such as those constructed specifically for ceremonies, tended to be large and built by the entire community. Fourth, smaller *kivas* in the western Pueblos were used by small social groups for both ritual and domestic activities. He also included the results of a Mesa Verde *kiva* study by W.D. Lipe (1989) which found that in the eastern Pueblos, the *kivas* that had larger floor areas tended to be less generalized in their use, similar to Adler’s findings. Adler
concludes that “Large kivas were built to integrate large social groups across the Anasazi world (Adler, 1993).” Through my readings and personal communications with Modern Puebloan descendents, I agree with this viewpoint. It seems that when mundane activities are conducted in the same place as spiritual ones, a general acceptance of the indistinguishable link between the sacred and the profane tends to develop. The Ancestral Puebloans linked the profane act of dry farming with the sacred act of praying to the ancestors for rain. They also viewed the necessary undertaking of migrating from environmentally unfavorable locales to more favorable ones as a sacred act. I also feel that Lekson’s suggestion that the smaller kivas found in Pueblo Bonito served a housing function and not a ceremonial one would also support this link between the sacred and profane. Since the smaller kivas are similar in form to the Great Kivas, a family living in a small kiva may feel this connection with the sacred everyday. By uniting the sacred and profane, the socially diverse Ancestral Puebloan groups were probably in a better position to adapt to the changing environment because these notions were already instilled in their cosmological view. That this view was shared throughout the whole of the Ancestral Puebloan world, and not merely centered in Chaco Canyon, is supported by the migratory data.

Ancestral Puebloan people tended to migrate throughout the southwest, particularly to find more favorable environmental locations (Toll, 2006). A study entitled “Population Diversity at Chaco Canyon” by Michael A. Schillaci (2003) found that the Chacoans were a very diverse group and were composed of many “ethnolinguistic groups with separate biogeographical affinities,” (Schillaci in abstract) yet they shared a common material culture. Creating large scale, socially integrative structures, would have been one way to unify these diverse groups. The existence of Great Kivas at Chaco Canyon would seem to support this. When the Chacoans eventually migrated out of the canyon towards places such as Zuni Pueblo
and the Rio Grande region it seems likely that they would have brought this specialized structure with them, thereby offering an explanation for the appearance of ceremonially specialized Great Kivas in the Taos and Northern Rio Grande region after 1250 CE.

Trash Middens or Ritual Mounds

A visitor to Downtown Chaco Canyon is rewarded with the opportunity to explore the remains of the Great Houses. As the hiker walks along the trails, she may feel dwarfed by the remains of the four-to-five story walls. The hiker may also feel this sensation as she exits the last room on the self-guided tour of Pueblo Bonito and is faced with large scrub covered mounds. These mounds are not natural features, but were constructed over time by the Ancestral Pueblos. The mounds in front of pueblos are generally considered to be trash middens which can grow to great heights as refuse is added to the pile. Traditionally, this was the most common interpretation for the large mounds associated with the Great Houses at Chaco Canyon.

However, recent interpretations suggest that these mounds were not trash but instead served as platforms for public ceremonies.

W.H. Wills in his article “Ritual and Mound Formation During the Bonito Phase in Chaco Canyon” (2001), explores this radical shift in interpretation. Citing a paper which resulted from the Chaco Project era excavation of Pueblo Alto in the 1980s, Wills points out that the pottery sherd assemblages found in the stratified layers of a test trench in a Pueblo Alto mound is suggestive of a cyclical depositional profile as opposed to a pattern associated with the everyday expulsion of household debris. The article, “The Chaco Canyon Community” by Lekson, Windes, Stein and Judge (1988), suggests that this depositional profile, along with the sheer number of pottery sherds found in this test site (which is approximately equal to the deposition of 2500 pots per year, a number that is considered extremely high), demonstrates a
ceremonial breakage of pots. To support this assertion, Lekson, et al. (1988) affirm that since the residential population at Chaco Canyon was relatively low, under 2000 (Judge, 2004), the assumption is that many of these of pots must have been brought into Chaco Canyon by visitors. This, coupled with the depositional pattern suggests that the pots were brought into Chaco for ceremonial breakage, a ritual that is practiced by Modern Puebloan groups today (Wills, 2001). Incidentally, importation of pots into Chaco Canyon for this purpose may also be an example of ritually oriented material culture.

Wills, however, disagrees with this interpretation for the mounds for two basic reasons. The first is that he disagrees with the calculation which determined that the number of pots associated with the mounds is high enough to suggest importation. Archaeologists’ estimates for the total number of vessels in a site is based on an assumption of the number of pot sherds which equate to a complete pot. The ratio that was calculated for the Pueblo Alto mound equates every rim sherd to one complete vessel an estimation which Wills suggests is too high. His second disagreement is the interpretation of the depositional cycle of the pots. Wills feels that the pot sherd assemblages represent debris from multiple sources, including the fragments left over from Great House construction and the destruction of former room elements but not necessarily the result of ritual breakage. In addition to construction debris, the number of sherds found could be the result of the routine breakage of pots from everyday use as is associated with water transportation. Since there weren’t springs or seeps associated with Pueblo Alto, residents needed to bring large quantities of water into the Great House. This would have necessitated a large volume of pottery, which, when broken, could account for the seemingly high number of pottery sherds resulting from a relatively small population. This interpretation, combined with a re-formulation of the mathematical sherd equation, would bring the estimated number of pots to
a number which could reasonably be associated with everyday pottery usage by the residential population (Wills, 2001). Although Wills does not agree with the “mound as ceremonial platform” interpretation for Pueblo Alto, he does concede that mounds may have been used in this way at Pueblo Bonito (Wills, 2001). An example of “earthen architecture” (Lekson, Windes and McKenna, 2006b, p. 106) is associated with Pueblo Bonito, where the mounds are rectangular, faced with masonry, (Lekson et al., 2006b) and possibly flattened at the top, suggestive of their use as a stage (Wills, 2001). The nearly seven foot high mounds were associated with staircases that connected the top of the platform with the ground. Lekson proposes that the mounds in front of both Chetro Ketl and Pueblo Alto were constructed intentionally and were not merely trash middens, despite Wills’ doubts regarding Pueblo Alto, which Lekson believes “…is probably wrong (Lekson et al., 2006b, p. 106).” Although the mounds at Pueblo Alto demonstrate the typical findings associated with trash middens, such as household refuse, it is possible that at least some of the mounds in Chaco Canyon, especially the ones associated with Pueblo Bonito, could have served a ceremonial purpose, and this evidence is, therefore, another example of the public ceremonies that may have occurred in Chaco Canyon, lending another measure of support for Chaco Canyon as a LHDE.
Astronomical Observatories

“Although the Chacoan people left no written record, there is a language in their architecture”
(Sofaer and the Solstice Project, Inc., 2003, p. 7).

Art and astronomy came together in Chaco Canyon during the Summer Solstice of 1977
when artist Anna Sofaer discovered two spiral shaped petroglyphs (see Figure 4-4) in a nook
behind three slabs of stone atop Fajada Butte. Sofaer, an artist interested in ancient “rock art,”
visited Chaco Canyon to study the petroglyphs (images pecked into a rock’s surface) and the
pictographs (images painted on to a rock’s surface). What she discovered reverberated
throughout the archaeological and archaeoastronomic communities. Anna Sofaer found that
these spirals, along with other images and markers in Chaco Canyon, were associated with astronomical events, such as the summer/winter solstices, spring/fall equinoxes, four cardinal directions, and zenith and nadir directions (points aligned directly above or below the observer respectively). The following year, the not for profit group, The Solstice Project was founded “…to study, document, and preserve the remarkable Sun Dagger – a celestial calendar of the ancient Pueblo Indians” (“About the Solstice Project,” web site, accessed 2007, para. 1). Since then, the Solstice Project members have researched, generated peer-reviewed articles and produced a DVD entitled “The Mystery of Chaco Canyon,” (2003) which details the connection between astronomy, the landscape and Modern Puebloan cosmology. This field of study is known as archaeoastronomy. The International Center for Archaeoastronomy, founded at the University of Maryland, defines archaeoastronomy as “The study of the astronomical practices, celestial lore, mythologies, religions and world-views of all ancient cultures…the ‘anthropology of astronomy’” (The Center for Archaeoastronomy, web site, 2002, “A Brief Introduction to Archaeoastronomy?,” para. 1). This multidisciplinary field combines the work of amateur and professional researchers in social sciences, hard sciences, and anthropology to explore how different cultures understand “…time and space…” (The Center for Archaeoastronomy, web site, 2002, “What is Archaeoastronomy?,” para. 4).

The spiral petroglyph above (see previous citation) contains three key elements, the large and small spirals and the “sun daggers” of light (shown in white). The sun daggers illustrate a
variety of astronomical interactions. The images below, taken from “The Mystery of Chaco Canyon Study Guide for Teachers (Anna Sofaer and the Solstice Project, 2003)” summarize the interactions that occur throughout the calendar year at Chaco Canyon. During the year, the sun changes position as the earth rotates which results in the seasonal changes. The summer and winter solstices represent the maximum that the sun rises or sets. During summer solstice, the sun rises at its maximum in the northeastern sky at Chaco Canyon and sets at its maximum in the northwest. During winter solstice, the sun rises at its furthest southeastern point and sets at its furthest southwestern point along the horizon (Sofaer, 2007). The equinoxes, occurring in the fall and the spring, represent the earth at its halfway positions as it makes its annual revolution around the sun and the sun rises due east and sets due west. In addition to the yearly monitoring of the sun’s position, the sun’s location can be tracked over the course of one day. The solstices and the equinoxes are recorded on the petroglyphs behind the three stone slabs at Fajada Butte. At summer solstice, a single sun dagger bisects the main spiral. At winter solstice, the main spiral is framed by the two sun daggers. During the equinoxes, a sun dagger will bisect the smaller spiral, while another sun dagger appears to the right of center on the main spiral. The Fajada Butte Sun Dagger site also records the lunar progression. The moon experiences a major and minor standstill once every 18.6 years. During a major standstill, the moon rises the furthest northeast and southeast and sets the furthest northwest and southwest. It will take approximately nine years for the moon to rise and set further along the horizon until the maxima are reached. After about the ninth year, the moon slowly moves in the other direction, reaching the minor standstill (Sofaer, 2007). The interplay of light and shadow crosses each of the eighteen lines of the major spiral. See the image below for details.
In addition to these markings, there is another image on Fajada Butte which is suggestive of an astronomical and cosmological meaning.

The hand-pecked image at the right is a petroglyph which Sofaer has identified as representing Pueblo Bonito. The D-shaped structure and the dot to the left of the arrow,
represents “Kiva A” one of the larger *kivas* in Chaco. The arrow is interpreted to be pointing to
the sun (Sofaer, Zinser and Sinclair, 1979). It is difficult to assign meanings to petroglyphs and
pictographs as meanings may change over time. The Modern Puebloans who are knowledgeable
in the modern symbology of these glyphs provide assistance, but in many cases, the absolute
meanings have been lost. Anthropologist Jonathan Reyman (1986) believes that Sofaer’s
interpretation of the so-called Pueblo Bonito petroglyph is incorrect, noting that ethnographic
studies of Modern Puebloan People indicate that spirals generally represent water or sometimes
serpents (Bunzel, 1929, Fewkes, 1904, Parsons, 1939 as cited in Reyman, 1986). However,
Sofaer’s interpretation could be correct as evidenced by a comparison between the petroglyph
and the actual pueblo. A closer look at Pueblo Bonito indicates that the center wall is almost in
perfect north/south alignment, indicated by the disappearance of the wall’s shadow at noon in
Chaco Canyon (Sofaer DVD, 2003) which correlates with her interpretation that the arrow in the
petroglyph points to the sun and is suggestive of a north/south alignment. As will be discussed
later, this alignment may have other cosmological significance which is common among the
different Puebloan groups and serves to unify them. The figures below indicate how placement
of the Great Houses with respect to one another illustrates other astronomical alignments in
Chaco Canyon.
Figure 4-6: Great House Astronomical Alignments
Sofaer and the Solstice Project, 2003 these three images
Through interviews with members of the Chaco American Indian Consultation Committee for Chaco Canyon National Historical Park, Anna Sofaer was able to uncover important connections between the archaeoastronomy of the Ancestral Puebloan People and the cosmology of the Modern Puebloan People. Although these people are separated by centuries, interviews and ethnographies do indicate that there is at least some commonality between the cosmologies of the past and present. In short, some Puebloan groups believe that they emerged into this current world from a world below. This place of emergence is located to the north and, according to the Hopi, at the bottom of the Grand Canyon at the confluence of the Little Colorado River with the Colorado River.
According to these informants, Puebloans journey from the north to the south in search of a "sacred middle place," (Sofaer, 2007, p.246) defined by the connection between the cardinal directions, the solstices, and the nadir and zenith directions. Since the alignment of the buildings mark these directions at Chaco Canyon, Chaco may have been this center place. That Pueblo Bonito is the place where daily travel of the sun is marked by the north/south central wall, is aligned with the equinox and is the central pueblo at Chaco Canyon is particularly significant (Sofaer, 2007). In Sofaer’s theory, Pueblo Bonito is the central point in the sacred middle place that is Chaco Canyon (Sofaer DVD, 2003).

In a conversation with archaeologist F. Eggen, Sofaer notes that Chaco Canyon may have been a place of “...mediation and transition... between the worlds of the living and the dead” (F. Eggen as cited in Sofaer, 2007, p. 246). This central point between the living and the dead is an important theme in Modern Puebloan cosmology. In this tradition, the living rely on the dead (the ancestors) for assistance, particularly in the form of rain (Courlander, 1971, Swan, 1988,
Personal communication – member of Tewa Nation, Summer, 2004). Sofaer also contends that the solar and lunar alignments present in the building orientation and their relationships on the landscape served a socially integrative function (Sofaer, 2007). This function is reminiscent of Adler’s socially integrative view of ritually specialized kivas. The formality and precision involved in aligning the buildings with astronomical events is suggestive of Lekson’s contention that the Great Houses were built according to a formal set of rules and would seem to indicate that the very act of constructing large buildings to an accepted set of standards was, in itself, a socially integrative and perhaps a cosmologically important activity.

The astronomy, spiritual significance and formalized structures are suggestive of a shared spiritual cosmology which may have helped these diverse populations adapt to their surroundings. Some Modern Puebloan People agree. Leigh J. Kuwanwisiwma, director of the Hopi Cultural Preservation Office and member of the Greasewood Clan, believes that Chaco Canyon’s astronomical correlations are connected to the sacred and profane activities conducted by his ancestors. The Motisinom, the ancestors of the Hisatsinom, used their knowledge of astronomy to create “…a calendar and ceremonial cycle and to keep track of mundane seasonal tasks” (Kuwanwisiwma, 2004, p. 43). Although it doesn’t necessarily follow that Modern Puebloan cosmology had its beginnings in the Ancestral Puebloan world view, the monumental constructions do play a socially integrative role in unifying diverse communities and, as will be explored throughout this chapter, it is this integrative function that helps to unify people in a way that maximizes their ability to survive and thrive in their environment.

Chacoan Roads

The socially integrative sphere of influence did not end at Chaco Canyon’s edge. One hundred and fifty Chacoan style Great Houses, or outliers, have been found around Chaco
Canyon (Lekson, 2006) and as far away as 150 miles (Lekson, 2004). Some of the outliers are located along massive public roads, presumably constructed by the Chacoans. These roads, some of which were 33 feet wide, were constructed by scraping away the soil to create berms along the roadside. The two major roads, the “North Road” and the “South Road” exit Chaco Canyon and run 43 miles north to Kutz Canyon and 37 miles southwest to Hosta Butte (a ritually significant landscape) respectively (Kantner, 2004). When cliff walls or other natural features blocked the roads, the Chacoans built staircases and ramps to continue the road. The roads were first noted by archaeologists in the late 1800s, but with the advent of aerial photography and infrared scanning, a vast web of roadways has subsequently been revealed (Kantner, 2004).

Although no one theory has emerged to explain the purpose of these roads or their cosmological significance, the theories that have been postulated fall into three categories, — economic, religious and integrative, and are summarized in an online paper entitled “Evaluation of Chaco Canyon Anasazi Roads,” which outlines the research conducted on Chacoan Roads of the period CE 900 to 1150 (a paper presented during the 1996 meeting of the Society for American Archaeology by John Kantner, from web site, accessed 2007).

**Possible Uses of Chacoan Roads**

The economic theory associated with the Chacoan roads suggests that they provided a means to transport goods and services between Chaco Canyon and other Great House communities or towns. During what archaeologist H. Wolcott Toll refers to as the “Massive Building and Proliferation” (Toll, 2006, p. 124) period in Chaco Canyon, large quantities of several varieties of wood were imported into Chaco Canyon. Since the Ancestral Puebloans were relying on the cooperation of their neighbors to import these goods, Toll speculates that supplies closer to Chaco were exhausted by the eleventh century (Toll, 2006). W. James Judge
and Linda S. Cordell in their article, “Society and Polity” (2006) note that during the eleventh century, outlying communities and roads were constructed throughout the San Juan Basin at around the same time the number of goods imported into Chaco Canyon increased. As Kantner notes, scholars that subscribe to the view of Chaco Canyon as a form of distribution center may interpret the Chacoan roads as a way to transport such items (Kantner, “Evaluation of Chaco Anasazi Roadways” web site, accessed 2007). Kantner’s study, however, does not seem to support this. Using Geographic Information System (GIS) mapping techniques and a mathematical equation developed by geographer Waldo Tobler in 1993 to calculate the most reasonable hiking routes between locations, Kantner found that the most efficient hiking roads as calculated does not correlate with the Chacoan road system.

From a political perspective, Lekson maintains that some of these roads, particularly the North Road, with near perfect northern alignment in places, (VanDyke, 2004), was built to connect Chaco Canyon with Salmon Ruins and then north to Aztec Ruins (Van Dyke, 2004), both major Chacoan Outliers. This is in line with Lekson’s assertion that Chaco Canyon served as a regional political capitol, akin to kingdoms or chiefdoms (Lekson as cited in Stewart, 2003).

Although the roads were probably used by Ancestral Puebloans to transport goods and laborers into Chaco Canyon and the outliers, it does not directly follow that the roads were built specifically for that reason. Religious explanations for the Chacoan Roads have therefore been offered. One such explanation attempts to reconcile the sudden disappearance of some of the Chacoan Roads. Anna Sofaer and Michael Marshall have suggested that the abrupt end of the North Road at Kutz Canyon was done purposefully to commemorate a ritually important landscape (Van Dyke, 2004). Sofaer comments in the DVD program, “The Mystery of Chaco Canyon,” that the numerous pottery sherds found in Kutz Canyon could likely have been an
offering. To support this interpretation, an interview with archaeologist Edmund Ladd from Zuni Pueblo revealed that the breaking of pots renders them unusable by the living, but they can still be used by the dead, and therefore this ritual functions as an offering as well as a means of purification (Sofaer DVD, 2003). Additional evidence for the ceremonial breakage of pots has been found through the excavations of the mounds found near the Great Houses. As discussed previously, the distribution of pottery sherds does not suggest a uniform use pattern, such as would be seen due to day to day breakage and consequent dumping in the trash mounds; instead, the sherds were found in layers separated from one another by relatively sherd-free layers. This pattern could indicate the breaking of pots in significant quantities, perhaps during large ceremonies at specific times, perhaps during a solstice or equinox (Sofaer DVD, 2003, Toll as cited in Lekson, Windes and McKenna, 2006 and cited as Lekson, et al., 2006). Other religiously oriented views consider the use of Chacoan Roads as a means to provide connection. These connections include those between the landscape and the heavens or between communities as a form of communication network to facilitate the sharing of ceremonial and calendrical information between Chaco Canyon and the outliers.

The connection between the landscape and the heavens is explained by both archaeologists and by Modern Puebloans. Leigh J. Kuwanwisiwma notes that in the Hopi view, the North connects back to the Creator and Sofaer’s research demonstrates that amongst Pueblo communities today, the South connects to heaven and is symbolized on the landscape by the North and South Roads (Sofaer DVD, 2003). She demonstrates this relationship by referring to the Pueblo Bonito petroglyph on Fajada Butte. The arrow in the petroglyph points to the large spiral, i.e. the sun. The North and the South (below and above respectively) represent earth and heaven, which are connected at the sacred center at Chaco (Sofaer DVD, 2003). Additional
support for this view comes from Lekson, who also believes that Chaco Canyon was a central ceremonial location (Lekson, 2004). Ruth Van Dyke cites Michael Marshall’s suggestion that north is the direction of the Place of Emergence of the Keres and Tewa Peoples and that according to the Keres, the dead return to this place along the North Road (Van Dyke, 2004). Van Dyke also points out that some of the Chacoan Road fragments serve as connections between sites through time. While standing on top of South Mesa in Chaco Canyon, facing the Great House Tsin Kletsin, she found that one segment of road faced north toward Pueblo Alto (an eleventh century structure) and the other fragment faced northwest and directed her view to New Alto (twelfth century). Her interpretation is that these road fragments were constructed to connect the present with the past (Van Dyke, 2004). Leigh J. Kuwanwisiwma links this concept to Modern Puebloan cosmology (specifically the Hopi view) when he states that traditionally, the Hopi are instructed to migrate to the cardinal directions “…place their footprints, and await signs” (Kuwanwisiwma, 2004, p. 44). These signs include items such as ruins, petroglyphs, migration passages and trails (Kuwanwisiwma, 2004). Visiting sites of the past is considered an important ritual by Modern Puebloans today. Migrations will be discussed at greater length later in this chapter.

In terms of communication, Lekson, Sofaer (2004, 2007 respectively) and others comment on the clear skies, the miles long line-of-sight views and the combination of space with mesas and buttes which serve as reference points for sky watching. Throughout the Chacoan World, there are shrines, kiva towers and low circular rock formations called herraduras (Kantner, 2004). These structures may have served as signal towers, where information from Chaco Canyon could have been relayed to other communities. One communication connection which is important to note is the connection between Chaco Canyon and Chimney Rock.
Located near Pagosa Springs, Colorado, Chimney Rock is considered a Chacoan Outlier. At the major lunar standstill, the moon appears between the two towering spires of Chimney Rock. J. McKim Malville, an astronomer from the University of Colorado suggests that monitoring the lunar standstill at Chimney Rock would have been significant to the Chacoans. He explains that the Chacoans may have viewed the standstill as being related to lunar eclipses. If one views Chaco Canyon as a center for yearly festivals, at the time of a full moon near the winter and summer solstices, one can understand why a priest would need to know when an eclipse would occur so he/she could avoid the potentially frightening event of scheduling a ceremony during a potentially frightful eclipse (Malville as cited in Brocious, 1998). Lekson cites a finding by Katy Freeman that the Chimney Rock Pueblo is in line-of-sight with Huerfano Mountain in northern New Mexico. This mountain contains the remains of fireboxes and shrines. It is also in line-of-sight with Pueblo Alto. Perhaps these shrines served as the communication network between Chimney Rock and Chaco Canyon (Lekson, 2004).

Moonrise during the Major Lunar Standstill at Chimney Rock
(“Chimney Rock Archaeological Area,” web site, accessed 2008, Chimney Rock Photo Tour, image 11)

Kantner’s study supports the idea that the Chacoan Roads served a socially integrative function, but perhaps not primarily economic or religious. To support this view, Kantner cites a
Bureau of Land Management Study (1992) by archaeologist John Roney which found that the Chacoan Roads served as an integrative feature for Puebloan groups over a small area. Besides the North and South roads, most of the Chacoan Roads are fragmentary, covering only one kilometer or so, and many of these fragments end at a Great House or Great Kiva. Roney believes that these roads served a function similar to the Chacoan Great Houses. If one associates the Great Houses with a socially integrative function, uniting local communities, then perhaps these roads symbolically served the same purpose (Roney, 1992 as cited in Kantner, “Evaluation of Chaco Anasazi Roadways” web site, accessed 2007). Kantner summarizes this notion by stating that the roads attracted people from the local communities and directed them to a specific architectural feature. The data is supported by Kantner’s calculations, as many of the preferred hiking roads fit the Chacoan fragments, and these fragments did lead to an architectural site and the roads generally did not move beyond the local community (Kantner, “Evaluation of Chaco Anasazi Roadways” web site, accessed 2007).

Although the archaeological evidence can be interpreted in many different ways, supporting the use of Chacoan Roads as economic, religious, or socially integrative, the one aspect that includes the other two is a socially integrative function of the roads. Economics and politics united various aspects of Ancestral Puebloan culture. For example, a look at the trade goods imported into Chaco Canyon can lead to both an interpretation as a distribution center, a form of tithing (explained later in this chapter) and as a means of “social cement,” (Toll, 2004, p. 39) a term used by Toll, to help forge relationships between outlying communities. As discussed in chapter 3, some of the goods, such as chert, did not need to be imported into Chaco. However, trade can be a means of establishing and maintaining relationships with other communities. This interaction may have been important for ceremonial reasons, or for subsistence reasons, as
In Partnership with the Land 111

evidenced by importation of timber, corn and fauna during a time when these items were already depleted at Chaco (Toll, 2004 and 2006), but the overall function was to integrate different communities. If Chaco Canyon did serve as a political center, the ceremonial function would have been an important aspect of their society, and it served to socially unify Chaco Canyon with the outliers as well.

Material Culture, Places and Pilgrims – Chaco as Ceremonial Center

Recall that according to Renfrew, LHDEs are associated with monumental structures, ritually oriented material culture, pilgrims and places specifically designed for ceremony. When material culture is associated with the LHDE, one of the primary purposes is to assist with ritual. Imported materials could be considered offerings made by pilgrims (Renfrew, 2001). The following are examples of the interrelationships between material culture, ceremonial places and pilgrims.

Ritually-Oriented Material Culture

The Chacoans imported a variety of objects ranging from the mundane such as stone, pottery, chert, plants and animals, to the more exotic, namely turquoise, copper bells and macaws. The importation of items such as corn may indicate an increased need to feed pilgrims and laborers coming to the villages at prescribed times (Benson, et al., 2003, Judge and Cordell, 2006). Increased numbers of imported goods such as deer, pottery, lumber and chert from mountainous areas coincide with the middle of the Bonito Phase (1000s CE) (Toll, 2004). Although these items may seem to be nothing more than everyday necessities, Toll and others point out that these goods may have served a socially integrative and ritually oriented function.

One such example is corn. On the one hand, corn was, and still is, a staple in Puebloan societies. However, corn has ritualistic importance as well. In the documentary entitled
“Chaco,” Hopi/Tewa Spiritual Elder Connie Mirabel discusses the importance of corn to the Puebloans. She says that corn is the heart of Puebloan life and that prayer, ceremony and food were all interrelated making prayer and nourishment one and the same. She tells the story of Hopi farmers who depended upon the Creator for rain. Some of the farmers would sing to the seeds as they were planting them (“Chaco” Video, 2000), again, demonstrating the link between the profane act of planting seeds with the spiritual.

Another link between the integrative nature of corn and importation of goods comes in the form of stone tools. Toll notes that the manos (large tools used for grinding corn) and metates (the rocks upon which the corn is ground) found at archaeological sites, are commonly found in rooms set aside for communal corn grinding. During excavations, archaeologists may uncover manos, but it is not very common to find metates in place. This scarcity may suggest that the user of the metate would take it with her when she migrated from the pueblo. These stone tools tend to be very heavy and difficult to carry from place to place, encouraging some to interpret that the metate is an important object, whose meaning may transcend the mundane and the hardships involved in moving such a heavy object from place to place. Toll suggests that further research into the significance of these corn grinding tools should be performed, especially since corn grinding is a ritually and socially important event in Modern Puebloan societies (Toll, 2004). Still another imported object that may be associated with a socially integrative function is the importation of chert. This may seem unusual as Chaco Canyon contains this material in abundance. As mentioned in the previous chapter, perhaps importing a material which the Chacoans did not need was a way to socially integrate communities. If the San Juan Basin was composed of diverse groups of Ancestral Puebloans, then perhaps Chaco Canyon is what Toll has named a “community of communities” (Toll, 2004, p. 39). What this means is that the
Chacoan system was established to integrate communities from the San Juan Basin, including the mountainous areas, into a system that was both socially and religiously based and the center of this function was located at the Chacoan Great Houses (Toll, 2004). If this is true, the goal of trade was twofold – subsistence and social integration.

Exotic items found in Chaco Canyon include turquoise, copper bells and macaws. Turquoise was mined in the Cerillos Hills, east of the Rio Grande. Toll notes that turquoise was mined by the Ancestral Puebloans by as early as the 900s and Modern Puebloan people have mined turquoise as well. Finished turquoise products such as beads have been found under the large pilasters (support beams) in Great Kivas, in the wall niches of Great Kivas, in Pueblo Bonito and in some of the burials found in Pueblo Bonito. Unfinished pieces, along with drilling tools, were found in some of the smaller residences. Toll suggests that perhaps skilled artisans were living in these smaller homes and produced finished products for use in a ritual setting that perhaps served as entrée into the Great House community elite. Renfrew in his paper on LHDE areas, cites three different models for interpreting the function of Chaco Canyon. One model views Chaco Canyon as a trading center, where goods such as copper bells and macaws, which came from Mexico, were traded for turquoise. Renfrew does not feel that this is the case, as the evidence does not seem to expressly support that the turquoise items found in Mexico were traded from Chaco. Toll concurs, stating that archaeologists have not yet been able to establish that turquoise from the Chacoan world accounts for a significant amount of the turquoise found in Mexico (Toll, 2004). Additionally, imported Chuskan Mountain pottery flowed into Chaco Canyon, but did not flow back out. Toll believes that in addition to providing a “social cement” between neighbors, the goods imported into Chaco were in exchange for ceremonial and religious access for the trader, and Judge and Cordell agree. Virginia More Roediger in her book
based on her doctoral thesis *Ceremonial Costumes of the Pueblo Indians Their Evolution, Fabrication, and Significance in the Prayer Drama* (1991), cites the use of turquoise pendants and beads in ceremonial regalia. She notes that the color of the turquoise “...reflects the power and glory of the daytime sky from which come life and beauty in the warmth of the purifying and nurturing sun and the repose of the rain-bringing and shadowing cloud” (Preferred Citation: Roediger, Virginia More. *Ceremonial Costumes of the Pueblo Indians: Their Evolution, Fabrication, and Significance in the Prayer Drama*. Berkeley: University of California Press, c1991 1991. http://ark.cdlib.org/ark:/13030/t8870087s/ visited on January 4, 2008, Accessories, p. 140, para 4 from now on cited as Roediger, 1991 followed by the location on the web site). She also notes that the Zuni have worn turquoise from at least the beginning of the historic period as noted in the diary of Coronado as translated from the Spanish by George Parker Winship (1894 Coronado’s journey to New Mexico and the Great Plains, Translated from the Spanish, American History Leaflets, No. XIII cited in Roediger, 1991, Accessories, p. 141, para 1). The connection between pre-historic and historic uses of turquoise in addition to its widespread use throughout the Ancestral Puebloan world is indicative of a socially integrative cosmology by the Ancestral Puebloans. This can also be seen in other artifacts, such as seashells, which were also imported from Mexico and may have been used in pre-historic ceremonies just as they are used in Modern Puebloan societies (Roediger, 1991, Accessories, p. 140, para 2). The socially integrative nature of exotic goods extends to living things as well.

During my tour of Sky City at Acoma Pueblo, the tour guide, a resident of Acoma, explained how Catholicism and Puebloan traditions were successfully united at Acoma, essentially combining the concepts of the kachinas with the saints. A visit to the church revealed another Pueblo tradition. Many of the decorations within the church were brightly colored. The
guide explained that use of these colors recalled the tradition of their ancestors. She explained that the macaw, an import from the south (Mexico) symbolized the place from where the rains come. Roediger echoes this sentiment in her description of the use and symbolism of feathers in ceremonial clothing. Roediger cites the work of Dr. Ruth Bunzel, formerly of Columbia University and expert in Zuni tradition and language (New York Times, “Ruth Bunzel, 91, Dies; Taught Anthropology, 1990, accessed on January 4, 2008). *Kachinas* “...wear macaw feathers because the macaw lives in the south and they want the macaw to bring the rain from the south. They always like to feel the south wind because the wind brings rain” (Bunzel, 1929 as cited in Roediger, 1991, Feathers p. 71 para. 2). Parrot feathers are used in the regalia of other Puebloan tribes, such as in the Buffalo Dance at San Idelfonso and the eagle dances at Zuni and Hopi (Roediger, 1991, The Buffalo Dance, San Idelfonso, p. 188, para. 1 and The Eagle Dance, p. 195, para. 2). Incidentally, Roediger notes that the Zuni received the Eagle Dance from the Hopi, again perhaps an indication of a shared cosmology, even though the groups are distinctive tribes. In addition to the macaws and macaw feather garments found throughout the Ancestral Puebloan world, evidence of the breeding of macaws has been uncovered. In Casas Grandes, breeding cages and skeletal evidence of a macaw population high enough for breeding were found (McMinnis et al., 1993).

In summary, a socially integrative cosmology is apparent in trade goods throughout the region and throughout time. Recall from Chapter 3 that the storm systems which cause some of the rainfall in the San Juan Basin and the Ancestral Puebloan world come from the tropical gulf and tropical pacific routes and cross Mexico, the same place from which the macaws were imported. Since both the Ancestral and Modern Puebloans relied heavily on farming and rainfall, this common cosmology regarding some of these trade items is not out of the realm of
possibility and provides for a socially integrative subsistence strategy which may have been centered for a time at Chaco Canyon.

Petroglyph of a Macaw at Petroglyph National Monument, New Mexico
(Petroglyph National Monument, web site, accessed 2008, History and Culture, link what a Petroglyph is?, image 1)

**Pilgrims**

The results of studies such as the Pueblo Alto excavations for the Chaco Project aided in the re-interpretation of Chaco Canyon from an area of economic redistribution of goods to a distribution of ceremonial power (Stewart, 2003). The idea that Chaco Canyon was essentially a sink hole for the redistribution of exotics such as turquoise, coupled with the excessive numbers of pottery sherd s found in the Pueblo Alto mounds and the astronomical landscape is suggestive of a different model of use. Chaco Canyon was a location where goods and services were traded for agricultural knowledge based on ritual from a shared cosmology.

One of the current models used to explain this idea of Chaco is known as the “Pilgrimage Fair” model (Judge as noted in Stewart, 2003). According to this model, the Ancestral Puebloans from the outlying communities would make pilgrimages into Chaco Canyon and bring goods such as corn, pottery, stone, turquoise and exotic items such as macaws and copper bells. They would also assist in the maintenance of the Great Houses and the roadways (as cited in Stewart, 2003) and perhaps the waterworks. In exchange, the pilgrims would be the recipients of
ritual knowledge. Additional support for the pilgrims would have been supplied by the small residential populations living in Chaco Canyon, as is indicated by the craft skills of those living in the smaller residences (Vivian, 2004). The craftspeople would produce goods that the pilgrims needed. In Tamara Stewart’s article from “American Archaeology” entitled “Understanding Chaco Canyon,” Stewart interviews archaeologists affiliated with either the Chaco Project or Chaco Synthesis Project (or both), giving credence to this model. One of the major debates is between the different schools of thought regarding the social structure of Chaco Canyon which would help to explain how the Chacoans were able to effectively manage the labor system. One school of thought is that Chaco was a regional political center (Lekson as cited in Stewart, 2003 and Lekson, 2006). Lekson supports the idea that Chaco may have served ceremonial functions and uses the presence of the Chacoan roads, Great Kivas and “perhaps waterworks” (Lekson, 2006, p. 31) as evidence. However he also feels that Chaco served as a regional political capital, akin to a chiefdom or kingdom, which was a common political structure in North America during the height of the Bonito phase, the tenth century (as cited in Stewart, 2003). Lekson holds the minority view, as many archaeologists believe that the egalitarian societies of today’s Modern Puebloan societies are more reflective of the social structure of the Ancestral Puebloan world (Lekson, 2006).

Lynne Sebastian, director of the Statistical Research Incorporated Foundation’s Historic Preservation Programs, and an expert in Southwestern archaeology, also supports a view of Chaco as a community with a strong political organization with an “emphasis on ritual” (Sebastian, 2004, p. 99) but from a different perspective. She takes a “give and take” view of Chaco Canyon. As discussed previously, throughout time, the local environments of the southwest varied. In Sebastian’s view, farmers from more productive areas would assist those in
In Partnership with the Land

less productive areas by hosting feasts or providing other means of assistance. In return, those less fortunate would provide labor for the building of Great Houses. Eventually, Great House construction became a means to express “power and wealth,” (Sebastian as cited in Stewart, 2003, p. 18) enticing people to form alliances with particular groups (Sebastian as cited in Stewart, 2003). The hierarchies that formed became systemic, and leaders shifted from managing labor to managing ritual knowledge. This knowledge was important to subsistence as the religious knowledge was directly linked with the creation of an agricultural calendar which, if institutionalized, would have assisted the Ancestral Puebloans in subsistence practices (Sebastian as cited in Stewart, 2003). Once environmental conditions became unfavorable, the Ancestral Puebloans would have been able to weather the non-existent storm by migrating to more favorable areas and bringing their socially integrative practices with them.

Other researchers such as Dean J. Saitta, Colin Renfrew, James Judge, and Linda Cordell also view Chaco as a ceremonial location but do not take a socially stratified approach. Judge contends that in a socially stratified society, such as a chiefdom, the archaeological evidence would support significant differences between those who had power and those who did not. Although exotic grave goods were found in a few burials at Pueblo Bonito, Judge does not feel that these few burials were enough to suggest this kind of stratification (Judge, 2004). Instead, Judge and Cordell report that one suggestion for Chaco Canyon is that it served to integrate disparate populations through a “ritual sodality.” According to Judge, “Sodalities are sociopolitical entities that draw their membership from kin-based organizations such as lineages and clans but are not based on kinship” (Judge, 2004, p. 3). Since they are based on a common cosmology, sodalities can assist in integrating diverse populations. This idea seems to be similar to the structure of some religious groups today, such as the Vatican which, although not a
country, does unify diverse groups of people throughout the world within the fold of a shared religion, namely Catholicism. “Perhaps a common belief system manifested in shared rituals, helped the Chacoans cope with their challenging environment and inspired them to build ceremonial centers, just as other people around the world have built temples, cathedrals and mosques” (Judge, 2004, p. 3).

Archaeologists such as Sebastian and Lekson, however, maintain that the evidence does suggest a Chacoan world that was hierarchical and points to the Great Houses, the small houses, and grave goods, as well as to the hypothesis that some structure needed to be in place to organize the labor; however, final proof lies within future research and excavations (Sebastian, 2004). Sebastian also feels that researchers who do not recognize Chaco as a politically stratified society do so because the idea of an inequitable distribution of labor is abhorrent to them and prevents them from seeing this relationship. “Political” connotes competition, but a society based on ritual is suggestive of something more communal. Sebastian suggests that instead of “dichotomizing” the terms of “ritual” and “political,” a more balanced view is gained, especially when the political concept “…refers simply to the web of relationships of social power that structures all human societies” (Sebastian, 2004, p. 97) and not a construct that is “…occupied by a single, self-aggrandizing individual…”(Sebastian, 2004, p. 95). Compromise views between hierarchical and egalitarian forms have been offered and are beyond the scope of this paper, but Dean J. Saitta (1997) and George Feinman, et al. (2000) provide good overviews. One interpretation that was suggested by Gwinn Vivian, et al. in the chapter “Economy and Ecology” suggests that Chaco Canyon may have had a moiety structure similar to that found among the Tewa of First Mesa on the Hopi Reservation. A moiety is “either of two kinship groups based on unilateral descent that together make up a tribe or society (moiety. (n.d.). The American
In the Tewa moiety, some groups are responsible for the government and other groups are in charge of ceremonies. Each group shares in the governing responsibilities throughout the year on an alternating basis (Vivian et al., 2006a as cited in Judge and Cordell, 2006). In a personal communication with Gwinn Vivian in 1999, Judge and Cordell explain that according to Vivian, “…ritual is organized around the economic cycles and includes a parallel series of subsistence-related activities, including food distribution” (Vivian as cited in Judge and Cordell, 2006, p. 196). Judge and Cordell also support the view that the Great Houses and elaborate grave goods reflect better nutritional standards and therefore greater access to ceremonial goods. They conclude that power was based on ritual and that the people who assisted the priests helped to build the irrigation systems and the Great Houses (Judge and Cordell, 2006).

From the examples cited above one can conclude that whether Chaco Canyon was organized hierarchically, equally, or as a combination of the two, Chaco probably served a significant ritual function. The main point of this chapter is to demonstrate that the Ancestral Puebloan cosmology, which included a ritual aspect, was a socially integrative system that assisted the Ancestral Puebloans in living on the land. The ceremonies were largely focused on the rainfall, which helped to grow their crops. In order to increase the yield of the crops, the Ancestral Puebloans needed to have an understanding of the cosmos and know when the rain was most likely to come. In this way, farmers in both environmentally favorable and unfavorable areas could maximize their yields and trade with one another in times when one community was doing better than another. In this way, religion can be adaptive, a view which is supported by researchers such as David Sloan Wilson, professor of biology and anthropology at
Binghamton University. Wilson provides cross-cultural examples to demonstrate this viewpoint, something that Sebastian would support as she believes that having multiple cultural perspectives will enable southwestern archaeologists to be more objective when interpreting archaeological remains. The assumption that Chaco Canyon functioned in precisely the same way that the Modern Puebloan societies function today may lead to conclusions that are subjective and not a clear picture of the past (Sebastian, 2004).

**Religion as Adaptation – Cross Cultural Examples**

David Sloan Wilson explores the idea of religion as an adaptive activity in his book *Darwin’s Cathedral: Evolution, Religion, and the Nature of Society*. Wilson revives Darwin’s group selection theory and the sociological theory of functionalism to demonstrate that if groups are looked upon as an organism, they can collectively practice behaviors adaptively. In his article, “Introduction: Multilevel Selection Theory Comes of Age,” (1997) Wilson explains why multilevel group selection theory deserves a second look when explaining the fitness of groups. In general, Darwin’s theory of evolution looks at how inherited genes can be passed from parents to offspring leading to greater fitness among individuals. By focusing only on the individual, one can conclude that a single organism acting in a manner that benefits only itself should be more successful than an individual who acts in a way that can benefit another individual (altruism). According to Wilson, this idea that fitness is tied to immoral behaviors (selfish – actions which benefit the individual over the group) is one reason why many people cannot accept Darwin’s theory of evolution. Wilson explains that Darwin recognized this disconnect between morality and fitness and suggested that “…natural selection can act at the group level in addition to the individual level” (Wilson, 1997, p. S2). Although selfish individuals in a group are more fit than individual altruists in the same group, groups of altruists out-compete groups of
selfish individuals. Wilson concludes that if all the components of fitness are present (such as genetics, inheritance and fitness outcomes), "...then groups can evolve in adaptive units" (Wilson, 1997, p. S2). Wilson defines this as multilevel group selection theory, and further develops this theory in his book *Darwin’s Cathedral*, where he demonstrates how religion is an adaptive behavior. Although rejection of this theory was popular in the 1960s as researchers believed that natural selection never acts above the level of the individual, research starting in the late 1970s indicates that multilevel selection theory is viable and is being studied today as a way to explain topics such as human societies (Wilson, 1997).

In *Darwin’s Cathedral*, Wilson explains that behaviors that can be considered “moral” can benefit an entire group. He describes the idea of reverse dominance, which is typically seen in egalitarian hunting and gathering societies. Essentially, such groups have a basic understanding of right and wrong, right being a behavior that benefits the group, and wrong being a behavior that acts selfishly and therefore may not benefit the group. In such cultures, the group would suppress the selfish behaviors. Wilson points to the work of Signe Howell and his research among the Chewong of the Malay Peninsula (Howell, 1984 as cited in Wilson, 2003).

This society is similar to the early Ancestral Puebloans in that they practice hunting and gathering along with some agriculture. In this society, a person who is not invited to share in a meal that he/she witnesses or is not given a share of the food would be placed in a state of *punen*, which is described as experiencing a misfortune because that person’s significant desire has not been met. The Chewong feel that eating alone is not proper behavior and, therefore, food should be shared with one another. This behavior is an outgrowth of the myth of Yinlugen Bud, an ancient spirit, who told the Chewong that eating alone was not proper behavior (Howell, 1984 as cited in Wilson, 2003), suggesting that “...superstitions, myths, and gods of Chewong culture are
intimately related to a matter of supreme practical importance - food sharing” (Wilson, 2003 p. 23). This is one of the examples that Wilson provides to demonstrate how a unified belief system can increase a group’s overall fitness. Wilson further provides a case study of how a religious system among the Balinese ensures that the group’s water control systems are maintained and provide a benefit to all.

The Balinese are farmers and depend upon rainfall to water their rice fields. Although they are not desert farmers like the Ancestral Puebloans, they have constructed complicated water control systems to ensure that the water which falls atop the mountain can be used for irrigation before it cuts into the soft layers of volcanic rock of which the mountain is composed. The Balinese built aqueducts with long tunnels that funnel the water from the rivers into the rice field terraces that they constructed. This public works system is similar to that built by the Chacoans and is tended by a culture that pays homage to Dewi Danu, the goddess of the waters whose grand temple is located on the top of the volcano on Bali. Every branch of the irrigation system is associated with a temple; the smallest temples are located at the terminals of each channel where the water reaches its final destination at the field. These are the water temples, but other temples are located around the towns in public places and in people’s homes. The water temples are mostly empty except for certain days, and each is associated with different gods. Anthropologist Steve Lansing studied this group and Wilson cites his study. The Balinese system works on a variety of levels, with different groups responsible for a degree of care for their respective water system. The smallest unit, at the terminus, is known as the *subak*. The *subak* is the size of a hunter-gatherer group and elects their leader democratically. The *subak* is responsible for their dam maintenance and the function of the waterways as well as the maintenance of the local roads and construction and maintenance of buildings and patrol and
policing of the same (Lansing, 1991 as cited in Wilson, 2003). The infrastructure, however, is much greater than the subak’s area. There is a structure in place to maintain all the water related structures at varying levels. Wilson points out that it is natural to assume that the Balinese have a hierarchical command structure with centralized authority in order to control and coordinate the large work groups necessary to manage the water works. The evidence does not seem to suggest this as the agricultural system operates separately from the kingdoms. Instead, Wilson offers another view, that of a “nested hierarchy of groups” (Wilson, 2003, p.128) bound together by a common religion.

It seems that the production of rice is coordinated through the gods that are associated with each of the water temples. Wilson describes that as one follows the water channel from the subak upstream, it connects with another branch and a structure which will unite the interests of both subaks. This continues throughout the network (Wilson, 2003). Essentially, each branch has a temple with its own deities and its own rituals. The rituals need to be different from one another because each branch would have challenges distinctive to their area. Overall, however, each congregation must carry out its duties as everyone depends upon the system working properly for their crops to grow. As one village leader described to Lansing, several subaks will meet together and collectively decide the best time for the planting of crops. The Jero Gde, the high priest, is believed to represent the goddess on earth, and offers daily sacrifices on the farmers’ behalf. Jero Gde also functions as a mediator, helping to reconcile disputes and other issues facing the farmers (Wilson, 2003). The Balinese water control system is based on religious beliefs and it is these beliefs that lend an air of credibility to the system as a whole that a secular system could not emulate (note: a secular control system known as the “green revolution” was instituted with catastrophic results. Crop yields were low, water distribution
was no longer equitable, and the pest population exploded, further decimating crop yields). The concept of holy water as symbol for the interdependence of the social groups along with the authority of the goddess, ensures that the system will work “Because the Goddess makes the waters flow, those who do not follow her laws may not possess her rice terraces” (Lansing, 1991 as cited in Wilson, 2003 p. 131). This “nested hierarchy of groups” and common religious beliefs can be applied to the Ancestral Puebloans of Chaco Canyon and provide one explanation for the Ancestral Puebloan culture’s successes in living with the land. Other examples of the adaptive and socially integrative nature of religion come from cultures living in similar environments, the Ancient Israelites and the Mormons.

Rabbi Stephen M. Wylen, author of the book The Jews in the Time of Jesus, maintains that the way Americans today define religion differs from the way it was defined by the Israelites prehistorically. Today, religion is generally defined as “…a set of beliefs and a set of voluntary institutions and rituals that teach and reinforce beliefs” (Wylen, 1996, p. 81). He contends that early Judaism was based on a cycle of service to one G-d within the context of the agricultural and animal husbandry cycle of Israel (Wylen, 1996). Pilgrimage holidays and sacrifices correlated with the planting and harvesting of crops and birth of livestock. This prehistoric view of religion, although perhaps largely forgotten by secular Jews today, forms the basic understanding of modern Jewish religious identity. Jewish holy days and the everyday prayers that are practiced today are reminders of the agricultural past. An example can be found in the daily prayer book (Siddur) in a prayer known as the Shema, the most important prayer in Jewish tradition. An excerpt of this prayer exemplifies the socially integrative nature and adaptive strength of religion, which ensures appropriate behavior and allegiance to one G-d and one set of rules, guaranteeing that the crops will grow.
It shall come to pass that if you will
hearken diligently to My commandments
which I enjoin on you this day, to love the
Lord your G-d and to serve Him with all
your heart and with all your soul, then will
I send the rain for your land in its due season,
the autumn rain and the spring rain, that
you may gather in your corn, your wine,
and your oil. And I will give you grass in
your field for your cattle, and you shall eat
and be satisfied. Take heed to yourselves
lest your heart be deceived, and you turn
aside and serve other gods and worship
them. For then the Lord's wrath will be
kindled against you, and He will shut up the
heavens that there be no rain, the land will not
yield her produce, and you shall perish quickly
from off the goodly land which the Lord gives
you (Deuteronomy 11:13-21 as cited in
Pool, 1960, p.190).

The importance of following one set of religious rules may have been significant during the
harvest period in the deserts of Ancient Israel and many Jewish holidays, such as Sukkot, suggest
this connection. This holiday commemorates the wandering in the desert, and the flimsy huts
that the Jews built to provide some protection from the elements. The huts were flimsy to
demonstrate that G-d serves as the ultimate shelter, even when other ones fail (Sermon, Rabbi
Stephen Stern, September, 2007). Sukkot is also a celebration of the harvest when both grain
and fruit from the trees were harvested and brought to the Temple in Jerusalem. This
combination of secular (agricultural cycles) and religious aspects of this holy day was important.
Without the religion, there wouldn’t be a common agricultural calendar to assist the people in
their subsistence practices (Hareuveni, 1996). More research into the relationship between
Ancient Israel and the Ancestral Puebloans would need to be conducted in order to more fully
connect the hypothesis that similar cosmologies develop cross culturally in places that have
similar environments. A stronger connection between cosmology and environment is provided
by the following brief discussion of how the Mormon religion was socially integrative and
adaptive in an environment that was shared by the Ancestral Puebloans.

In his paper “Mormon Sociopolitical Development in Northern Arizona, 1876-1906:
Implications for a Model of Prehistoric Change,” archaeologist Kent G. Lightfoot uses historic
accounts of how Mormon settlers survived in the desert southwest as an analog for the Ancestral
Puebloans used to explain how the Ancestral Puebloans responded to the variable environmental
conditions of the desert southwest (instead of using the ethnographies of the Modern Puebloan
People). He found that labor intensification as it relates to irrigation works needs to be increased
in at least three cases: when floods destroy public works, when population increases to the point
where increased crop yields are necessary, and in times of plenty so food can be stored and
exchanged during the lean times. The journals of those living in Mormon towns reveal that dams
would wash away in the fall (Journal of John Bushman December 1879 as cited in Lightfoot,
1980). It was critical that dams and irrigation canals be rebuilt so they would be in place to take
advantage of the rains during the late spring and early summer months (the monsoon season). In one case, the equivalent of "...800 man-days..." (Lightfoot, 1980, p. 203) was needed to rebuild the Joseph City dam in 1878. The problem was that, at the time, Mormon towns were small and rebuilding such large works required an increased commitment to labor and their needs (such as food).

To organize enough labor to reconstruct the dams required that some form of bureaucracy be created. This bureaucracy evolved throughout the years into a regional system that could command the labor and financial funds necessary to accomplish the task. The highest form of Mormon government, the religious and administrative center at Salt Lake City, was physically too far removed from local issues of irrigation and food production. To solve this problem, two other institutions, one at the regional level (called a stake) and one at the local level (called a ward) was instituted. One of the purposes of this system was to coordinate labor forces to replace irrigation works after floods. Before this system, if families from one community migrated to another, those left in the former community lost important labor hours, a loss that would obviously be detrimental during flood times. Communities require a "...critical mass..." (Lightfoot, 1980, p. 205) of population to maintain irrigation works. The hierarchy that resulted was one where individual ownership of property was honored thereby creating the space necessary to recognize differences in economic and, by extension, social status. This system, known as the stewardship system, was based on a two-tier decision making process where local leaders (like the bishop) could make local decisions about irrigation, in addition to his religious duties. In fact, the records show that at times, irrigation issues were often discussed during worship meetings. The regional tier, or stake, was officiated by a stake President who had the power to mobilize labor units to fix dams or begin new irrigation projects, finance such projects.
through tithings, and settle water disputes between communities. Recall that the Ancestral Puebloans may have had a similar practice, when they provided labor and goods in trade or tithing for the ceremonial knowledge that they would receive at Chaco Canyon. The idea of exchange was further developed by Lightfoot and seems to correlate with what may have occurred at Chaco.

Exchange practices involve the trading of goods from one area to another. Dean, et al cite a study by archaeologist by Fred Plog who indicates that the trade of everyday items such as chert and ceramics occurred throughout the region and were “episodic” indicating the need to establish alliances (emphasis added, Plog, 1983 as cited in Dean, et al., 1985). As was discussed in the previous chapter, the need to create alliances, particularly when spatial variability decreases, is an important adaptive strategy when environmental conditions change and the community is no longer able to meet its needs locally. As Benson, et al mention, corn was also a trade item and was imported into Chaco Canyon. Looking at the historic analog from the early Mormon settlements in Northern Arizona, exchange of goods, such as crops, was also a behavioral strategy used during times of environmental stress. As we saw in the Chacoan model, these Mormon farmers on the north side of the Arizona settlements used a strategy that was heavily reliant on major public irrigation works, while on the southern side, this strategy was not necessary as the topography of the area was different. In areas where elevation is a factor, the labor intensive and labor and time intensive strategies were employed but on different gradients. In general, dry farming techniques were used in uplands, while irrigation works were used in the lowlands. At higher elevations, farmers were able to rely more on rainfall and runoff. However, these farmers did have to be concerned when the area was experiencing drought (as the rains were no longer falling) or killing frosts. When these conditions prevailed, surpluses decreased,
just as dam washouts would decrease crop yields at lower elevations. When drought impacted the upland farmer, the lowland farmer generally produced better yields. When dams were destroyed, upland farmers generally produced greater yields. Trading of food provided a source of stability for the different communities. Of course, the exchange of food was highly organized in the Mormon communities and on a variety of levels, ranging from local to regional sharing to a church sponsored trading company. Local sharing occurred when a successful farmer traded with a less successful one. Regional redistribution of food occurred within and between communities from warehouse stores that were filled with tithing contributions. A community’s bishop would be tasked with collecting the contributions and storing them for future use. About two thirds of the collection stayed locally for trade, while the remainder was exchanged for cash and sent to the church in Salt Lake City. The third exchange mechanism was the creation of the Arizona Cooperative Mercantile Institution (ACMI) which was financed by the church to be used locally for the exchange of goods between communities in the uplands and those in the lowlands. To assess the needs of the communities throughout the region, quarterly stake meetings were held (a stake is composed of the wards or local towns throughout a region). The bishops would gather and discuss crop success and failures and the need for food exchange (Lightfoot, 1980). Although the evidence at Chaco does not definitively suggest a regional storage and exchange center (Lekson, et al., 1988), it is something that does need to be considered as these methods of exchange were used productively in historic times and organized centrally through a common religious organization. Since Chaco Canyon is often interpreted as a ceremonial center for the region, the similarities need to be considered and will be addressed later in this chapter. The benefit of having ACMI and a tithing system helped farmers to survive and thrive on the landscape during difficult times. It also benefited those in charge, giving them
power and control over loans, who would get them and which communities would have new irrigation systems built. Perhaps something similar was occurring at Chaco, whereby those living in the Great Houses formed a political and ritual elite over those living in the smaller houses in the canyon and throughout the region.

Personal communications and formal interviews with descendants of the Ancestral Puebloans, suggest that Wylen’s “ways of the ancestors” plays a significant role in Modern Puebloan, and by extension, Ancestral Puebloan cultural understanding - “Farming and gardening in northern Arizona are high-risk activities because of cutworms, coyotes, rabbits, crows, ravens, flood, drought, and the arid climate. Agriculture is an act of faith for the Hopi that serves as a religious focus as well as an economic activity (“Hopi Agriculture Introduction,” web site, accessed 2007, para. 4). What follows is a brief discussion of the Modern Puebloan worldview. Although no one is certain when this religious perspective was fully integrated in the society, perhaps the rudiments were established during the Bonito Phase, and became the Kachina Cult, a more formalized religious system, in the twelfth and thirteenth centuries.

**Religion and Agriculture**

To understand the environmental context and social role of agriculture, then, is to understand the most essential factors that differentiated the Southwest as a culture area and distinctively shaped the lifeways of its inhabitants (Fish and Fish, 1994, p. 83)

Chaco Canyon is considered a Location of High Devotional Expression and the evidence suggests that Chaco was politically and ceremonially significant in the Ancestral Puebloan
world, although no one is quite certain as to precisely how that role manifested itself at Chaco.

One method used to gain an understanding of the Ancestral Puebloan worldview, and perhaps
the significance of Chaco, is to speak with the Modern Puebloan descendants. These discussions
have been printed in articles, essays and books and when one reads some of these sources and
speaks with some of the descendants, basic themes emerge. One such theme is that the
Puebloan cosmology and their subsistence practices complement one another, some suggesting
that Chaco Canyon’s priests were experts in controlling nature (or at least that is perhaps what
they thought). The second theme is that once the corn no longer grows, the community is
expected to migrate to another location, in search of a central place. These themes are
exemplified in the Hopi Creation Story.

According to Hopi Tradition, Spider Grandmother, the constant companion during the
migrations from the First World to today’s Fourth World, gave her people the advice that
migrations may be the key to survival. This sage message was given to the Hopi People after
they emerged into this Fourth World and discovered that theirs would be a life long in years but
filled with work and trials. The theme of moving on in search of a better life is a consistent
theme among the different Puebloan tribes and their specific Creation Stories (Courlander,1971).
The Creation Stories among Puebloan communities, whether they are from different tribes or
different villages within the tribes, share the common themes of Emergence into this current
world from a world beneath, and the understanding that the quest for a better life, a “promised
land,” can be attained through migrations. The Creation Story of the Hopi People has much in
common with those of the Eastern Pueblos, and it seems as though Hopi cultural traditions are a
conglomeration of “…myths, legends and histories and contributed by different clans and
different tribes” (Courlander, 1971, p. 204). There are some Hopi informants who would agree
with this sentiment (Courlander, 1971). In Hopi tradition, the current world is known as the Fourth World and the Sun Spirit Tawa created all the worlds. The First World did not contain people, only "insect-like creatures who lived in a dark cave deep in the earth" (Courlander, 1971, p. 17). Tawa was unhappy because he created creatures that did not understand the purpose of life. To correct this, he decided to create another world and instructed Spider Grandmother (Gogyeng Sowuhti) to prepare the inhabitants for a journey. While migrating to the Second World, the insect-creatures were transformed into animals. Over time, the animals began to fight with one another. Convinced that they did not understand the meaning of life, he again had them migrate to another world. Life in this world became harmonious, especially when the people received knowledge regarding how to create fire and how that fire could be used to bake pottery. Over time, powakas (sorcerers) brought evil to the Third World by creating "medicine" that would cause damage to people whom they did not like and by turning people away from living a good life. The people began to gamble, commit adultery and ignore their responsibilities of planting and grinding corn (Courlander, 1971). "Instead of seeking to understand the meaning of life, many began to believe that they had created themselves" (Courlander, 1971, p. 19). As a result, corn, squash and melon crops no longer produced food, the clouds no longer released rain and rivers and springs moved slowly or dried up completely (Courlander, 1971). The people who were not corrupted by the powakas, met in the kivas and attempted to change things, but they soon realized that they needed to go somewhere else. In the past they had heard footsteps above them and realized that there must be a world above this Third World. With the help of Tawa, Gogyeng Sowuhti and the efforts of a variety of animal species, the people were able to leave the Third World. The people needed some form of ladder to reach the world above. The excellent planting skills of Chipmunk were utilized and after trying several plant species, they
settled on bamboo. The people climbed the bamboo to reach the hole in the sky of the Third World, which the Hopi call a sipapuni. Other Pueblo people, such as the Laguna, refer to this hole, the place of Emergence, as the shipap (Swan, 1988). The people who were not swayed by the powakas climbed the bamboo and entered the Fourth World and no powaka was permitted to migrate out of the Third World. As the people emerged, they were grouped into various tribes and given a language to speak and a direction to travel. The Hopi believe that the sipapuni is located in the Grand Canyon, at the confluence of the Colorado and Little Colorado Rivers. It was discovered that a powaka did make it through the sipapuni, and after much discussion, she was allowed to stay. Eventually, the time came for the people to leave the sipapuni and travel in the direction they had been assigned. Before they left, each cultural group was allowed to select a species of corn that would represent the way of life of the tribe that selected it. Yellow corn was associated with a life of “enjoyment and prosperity” but the years of life would be short. A short ear of blue corn represented a long life, filled with work and trials. The Hopi chose last and they were left with the short ear of blue corn. The tribes began to leave the sipapuni, and the Bahanas (white people) and the Hopi were the last to leave. The powaka left with the Bahanas as they recognized and appreciated her great knowledge. Although the Hopi knew that the Bahanas would possess great knowledge, they also knew that they would understand the ways of evil, and therefore, they realized that they would have to maintain a certain distance from them. They did concede, however, that at some point in the future, a Bahana would come from the east to Hopi and bring friendship and prosperity to the people. The Hopi therefore decided that their dead would be buried with “their faces toward the east” (Courlander, 1971, p. 31) so they would be in a position to greet him. After the Bahanas left the sipapuni and the Hopi selected people to lead them on their trek, Gogyeng Sowhuti informed them that they would take long migrations.
They would build villages and then leave them for a new journey. They were instructed to leave signs of their passing on the rocks. She also told them that their ear of corn would provide guidance (Courlander, 1971). “If you reach a certain place and your corn does not grow, or if it grows and does not mature, you will know that you have gone too far. Return the way you came, build another village and begin again” (Gogyeng Sowhuti aka Spider Grandmother in Courlander, 1971, p. 33). In other words, the status of their crops would alert the people when it was time to move, and begin again. This is one of the first indications to suggest that religion may have helped to inform village leaders (or priests). The failure of crops can be due to many factors, such as nutrient depletion of the soil and local climate changes. Understanding crop failure as a spiritual message may have assisted the priests in explaining why the Chacoans needed to “abandon” Chaco Canyon and seek out a more reliable environment. One person’s abandonment is another person’s spiritual migration.

Today, many Modern Puebloans subscribe to a religion known as the Kachina Cult. Although the particulars regarding the ceremonies and rituals differ from one Puebloan group to another, the Kachina Cult is essentially worship of the “Great Ones” (Roediger, 1991, p. 181 para. 2). “The katcina (sic) cult is built upon worship principally through the impersonation of a group of supernaturals” (Bunzel, 1932d from “Zuñi, Bureau of American Ethnology, Annual Reports, XLVII, p. 843 as cited in Roediger, 1991, p. 31 under “Cults” para. 2). Although the Kachina Cult dates back to the twelfth or thirteenth centuries, when the Bonito Phase was ending and the migrations out of Chaco were occurring, it was probably built “…upon an older weather control organization” (Roediger, 1991, p. 31 under “Cults” para. 2).

The quotation from the Bear Clan chief at the beginning of this chapter from the Hopi story of “Maski, the Land of the Dead,” in Courlander, is a story that sheds light on the Hopi and
other Modern Puebloan tribes' reliance on the ancestors of the spirit world to aid in the food production process. According to tradition, when a villager dies, his/her spirit travels to a spirit world, in Hopi tradition, this world is known as Maski. Death in Puebloan societies may be considered a migration of body, spirit and purpose as some deceased ancestors will become Kachina spirits. The Kachinas, coming in the form of mists and clouds, are responsible for bringing the rains to the crops of the living. "Storm clouds are the physical form of the breath body of the ancestors who in turn become the kachina (sic) bringers of rain" (Swan, 1988, p. 231). This spiritual worldview has a practical purpose. The Kachinas come to live among the people in the various villages only at certain times during the year. Puebloan farmers needed to clear and sow their seeds in time to take advantage of Kachinas' gift of rain. To that end, knowledgeable men (priests or medicine men) were assigned the task of knowing when the Kachinas would come and when to schedule the appropriate ceremony to request the rains from them. In addition to keeping track of the astronomical markers that indicated a change in season, these priests may have kept a watchful eye out for the Kachinas themselves. For example, in Hopi tradition, one of the sacred peaks, known in English as Mt. Humphrey's (Neuvatikyao is the Hopi name for the San Francisco Peaks (Courlander, 1971)) in Flagstaff, Arizona is the dwelling place of the Kachinas at certain times during the year. When it is time, the Kachinas come from this mountaintop, south of the Hopi Mesas and bring the rains (Hopi coworker #2, personal communication, 2001). From a meteorological perspective, in the southwest, the monsoonal rains tend to come from this direction, thereby linking the Hopi cosmology and other Puebloan cosmologies with the weather. The following table illustrates the relationship between the Kachinas, the appropriate ceremony and the agricultural (or social) activity with which the ceremony is associated. Although this table describes a Hopi calendar, similar calendars and
modes of practice exist in other Puebloan cultures. As an aside, the socially integrative and adaptive aspect of religion is recognized throughout today’s modern Pueblos even in their language. Although every tribe speaks a different language, the words *kiva* and *Kachina*, derived from a Keresan Puebloan word, are words used universally among all of the Pueblo nations (Judge and Cordell, 2006).

**Hopi Agriculture**

*Table of Agricultural/Ceremonial Cycle*

<table>
<thead>
<tr>
<th>Month</th>
<th>Task (s)</th>
<th>Type of Ceremony</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>January</strong></td>
<td>************</td>
<td>Katsina Night Ceremonies</td>
</tr>
<tr>
<td><strong>February</strong></td>
<td>Clear Fields</td>
<td>Katsina Night Ceremonies</td>
</tr>
<tr>
<td><strong>Late March</strong></td>
<td>Plant early com (Hopi sweet corn)</td>
<td>Katsina Night Ceremonies</td>
</tr>
<tr>
<td><strong>April</strong></td>
<td>Plant early com</td>
<td>Katsina Night Ceremonies</td>
</tr>
<tr>
<td><strong>May</strong></td>
<td>Plant &quot;main&quot; com, melons, beans, squash</td>
<td>Katsina Day Ceremonies</td>
</tr>
<tr>
<td><strong>June</strong></td>
<td>Apricots harvested (Weather Permitting)</td>
<td>Katsina Day Ceremonies</td>
</tr>
<tr>
<td><strong>July</strong></td>
<td>Weeding, hoeing, and thinning individual corn plants, Harvest early corn</td>
<td>Katsina Day Ceremonies</td>
</tr>
<tr>
<td><strong>August</strong></td>
<td>Harvest main com and beans</td>
<td>Non-Katsina Ceremonies</td>
</tr>
<tr>
<td><strong>September</strong></td>
<td>Harvest main com, beans, squash, and fruits</td>
<td>Non-Katsina Ceremonies</td>
</tr>
<tr>
<td><strong>Oct.</strong></td>
<td>Harvest main com and fruits</td>
<td>Non-Katsina Ceremonies</td>
</tr>
<tr>
<td><strong>Nov.</strong></td>
<td>Final late harvest</td>
<td>Non-Katsina Ceremonies</td>
</tr>
</tbody>
</table>

Hopi Agriculture, web site, Table of Agricultural/Ceremonial Cycle, accessed 2007

During the ceremonial dances, specialized initiated members wear masks and ceremonial clothing representing certain *Kachinas*, and in the Puebloan cosmology, these people become the *Kachina*. Today, these ceremonies “...have become the most potent of rain-making rites, for since the divine ones no longer appear in flesh they come in their bodies, that is, as rain” (Bunzel:1932 Introduction to Zuñi ceremonialism. Bureau of American Ethnology, Annual Reports, XLVII, p. 571, as cited in Roediger, 1991, p. 35, para 1).
Towards the end of Chaco’s Golden Century, the environment experienced a dry period (CE 1080 – 1100). Because of the increase in the numbers of pilgrims coming into the canyon, coupled with field degradation from the agricultural intensification, Chaco Canyon was no longer able to provide for its people. Over time, residents and new migrants to the canyon may have lost faith in the priests’ abilities to understand the workings of the cosmos and perhaps questioned its ability to lead. This may have been one of the reasons the people chose to leave the canyon and establish new centers at what is now Aztec and Salmon Ruins (Lekson, 1999 as cited in Judge and Cordell, 2006). Chaco Canyon was once a socially integrative center, able to unite canyon residents with their neighbors, enabling them to cooperate instead of compete for resources, but by 1100 CE Chaco Canyon was largely becoming just another residential area in the San Juan Basin (Cordell and Judge, 2006).

Jared Diamond suggests that societies will eventually collapse under the weight of their success as they overuse the environment and he considers the abandonment of Chaco Canyon to be commensurate to the collapse of the Anasazi people (Diamond, 2005). Although the Ancestral Puebloans have descendants, Diamond remarks that the Modern Puebloan society is no longer as great as it once was. I maintain that a more appropriate view is that the abandonment of Chaco was a spiritual migration and not an indicator of the “collapse” of the whole Ancestral Puebloan world and is a demonstration as to the socially integrative nature and adaptive ability of religion. If one makes the assumption that a migratory lifestyle was instilled in the Pueblo children beginning in prehistoric times, the people would have expected to migrate and would therefore not be tied to a location that was obviously no longer productive (Rena Swentzell, “Chaco,” Video, 2000). Pueblo people today speak of Chaco Canyon with reverence. Some feel that Chaco was the sacred middle space, a place where the ceremonies were to be perfected
before they could be brought to the Hopi Mesas (Leigh J. Kuwanwisiwma, "Chaco," Video, 2000). They also speak of Chaco Canyon with a tinge of fear, as if something happened there that was not supposed to occur. Nothing like Chaco Canyon, with its sphere of influence, occurred again within the Ancestral or Modern Puebloan world. Some Pueblo people feel that the concentration of power among a few at Chaco Canyon was not condoned by the spiritual beings, and a new form of social structure needed to be created. This is one of the reasons why Lekson believes that Chaco Canyon was hierarchical and not egalitarian. His interpretation of the archaeological evidence, along with personal communications with Modern Puebloan People, has led him to the conclusion that the Puebloans are egalitarian today because they learned from their hierarchical oriented Chacoan ancestors in the past (Lekson, 2006). In light of this understanding, perhaps Diamond has a point. The ceremonial and political center at Chaco Canyon collapsed, probably as a consequence of a combination of land overuse and social factors. Perhaps losing faith in the priests of Chaco was an adaptive strategy. If the ancestors did not approve of the concentration of power at Chaco as was proven to them by circumstances such as poor crop yields, then according to tradition, they would have needed to leave for more favorable locations such as the Rio Grande. They would have brought with them some aspects of their religion including the Great Kivas. Eventually a new religion, the Kachina Cult was born which further connected the people with the land. Significantly, today’s Puebloan villages are much smaller than the settlements of Chaco Canyon, with correspondingly smaller ceremonies. Perhaps the Ancestral Puebloan cosmology assisted the Puebloans in deciding not to exceed the carrying capacity of the land, enabling them to survive, mostly intact, after their Chaco Canyon ceremonial center collapsed.
Environmental history gives the reader the opportunity to understand how a culture affects and is affected by its landscape, an appreciation which is especially important today, as global warming stories appear in the news on a daily basis. A view of the world from the perspective of a human-land partnership is critical to understanding a culture’s successes and failures. To gain as clear a picture of a culture as possible, a researcher needs to cross academic and cultural boundaries, as practiced by southwestern archaeologists since the days of A.V. Kidder, and as seen more recently when archaeologists from outside the San Juan Basin and outside the United States were invited to participate in the Chaco Synthesis conferences. This environmental history of the Ancestral Puebloan People of Chaco Canyon during the Bonito Phase attempts to present a picture of a culture from the perspectives of the natural history of the land, the cultural history of land use as interpreted by archaeologists and Modern Puebloans, and the culture’s cosmology, the glue which held the people and the land together in partnership.

Acknowledgements

This paper has benefited from the contributions of those representing a variety of disciplines and my deepest thanks and appreciation go to the following people. Academic advisor and environmental journalist Dale Willman who provided advice, support and direction for the final paper, historian Dr. Hope Benedict who offered both academic advice, historic interpretations and moral support throughout this process and Vanishing Treasures Archaeologist Ellen Brennan of Grand Canyon National Park, who in addition to her friendship, provided a comprehensive archaeological review regarding the Ancestral Puebloans. I would also like to acknowledge the efforts of the National Park Service staff of Chaco Culture National Historical Park, notably Russ Bodnar, Chief of Interpretation, who provided journal articles and texts relevant to this paper and former Chaco Canyon Park Ranger, Kirk Peterson, whose in depth conversation
In Partnership with the Land

During our all-day hike through Chaco Canyon, provided the academic recommendations which initiated the research that ultimately led to this finished product. My appreciation goes to my Supervisor Michael B. Shaver of Governors Island National Monument who approved hours of leave so that I could complete this paper. My friendships with colleagues of Puebloan descent have provided a depth of understanding and personal connection that could not be gained by any other means and I am deeply grateful for their presence in my life. Opportunities to volunteer in field experiences in southwestern archaeology provided by people such as Dr. John Kantner provided me with a deep appreciation for the work of archaeologists. Final review and support of this thesis was provided by grammarian Dr. Margot Krebs and engineer and photographer, Daniel C. Krebs. Technical and emotional support from my significant other Daniel C. Krebs, mother, Lenore Goldman, my sister and brother in law Julie and Joe Terrana, and the understanding shown by my nieces Aliya, Mikayla and Cassandra in regards to why I was unable to play with them during these past few months, are the reasons why I was able to accomplish this undertaking. John Anzalone, Sandy Welter, Michelle Paquette, Laurie Stanley, and the staff of the Masters of Arts in Liberal Studies at Skidmore College were supportive of my efforts throughout this journey for my Masters degree. Finally, I would like to acknowledge the efforts of my first advisor, geology professor Dr. Kenneth Johnson whose understanding of environmental history helped me to choose courses that provided a strong foundation for this thesis and my future career plans. Please note that any errors or oversights found in this thesis are the responsibility of the author.
Works Cited


The Bureau of Land Management San Juan Field Office. (December, 1999). *Brief history and environmental observations a working document.* Retrieved October 18, 2007 from [http://www.oil-gas.state.co.us/Library/sanjuanbasin/blm/Background/geoseting.htm](http://www.oil-gas.state.co.us/Library/sanjuanbasin/blm/Background/geoseting.htm).


Wylen, S.M. *The Jews in the time of Jesus.* Mahwah: Paulist Press.


*Parenthetically cited in the body of the paper as Vivian, et al., 2006a
** Parenthetically cited in the body of the paper as Vivian, et al., 2006b